



BEA Tuxedo

C Function Reference

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Section 3c - C Functions

BEA Tuxedo C Functions

Name	Description
Introduction to the C Language Application-Transaction Monitor Interface	Provides an introduction to the C language ATMI
AEMsetblockinghook(3c)	Establishes an application-specific blocking hook function
AEOaddtypesw(3c)	Installs or replaces a user-defined buffer type at execution time
AEPisblocked(3c)	Determines if a blocking call is in progress
AEWsetunsol(3c)	Posts Windows message for BEA Tuxedo unsolicited event
buffer(3c)	Semantics of elements in tmtime_sw_t
catgets(3c)	Reads a program message
catopen, catclose(3c)	Opens/closes a message catalogue
decimal(3c)	Decimal conversion and arithmetic routines
gp_mktime(3c)	Converts a tm structure to a calendar time
nl_langinfo(3c)	Language information
recomp, rematch(3c)	Regular expression compile/execute
rpc_sm_allocate, rpc_ss_allocate(3c)	Allocates memory within the RPC stub
rpc_sm_client_free, rpc_ss_client_free(3c)	Frees memory returned from a client stub

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Name	Description
<code>rpc_sm_disable_allocate,</code> <code>rpc_ss_disable_allocate(3c)</code>	Releases resources and allocated memory within the stub memory management scheme
<code>rpc_sm_enable_allocate,</code> <code>rpc_ss_enable_allocate(3c)</code>	Enables the stub memory management environment
<code>rpc_sm_free,</code> <code>rpc_ss_free(3c)</code>	Frees memory allocated by the <code>rpc_sm_allocate()</code> routine
<code>rpc_sm_set_client_alloc_free,</code> <code>rpc_ss_set_client_alloc_free(3c)</code>	Sets the memory allocation and freeing mechanisms used by the client stubs
<code>rpc_sm_swap_client_alloc_free,</code> <code>rpc_ss_swap_client_alloc_free(3c)</code>	Exchanges current memory allocation and freeing mechanism used by client stubs with one supplied by client
<code>setlocale(3c)</code>	Modifies and queries a program's locale
<code>strerror(3c)</code>	Gets error message string
<code>strftime(3c)</code>	Converts date and time to string
<code>tpabort(3c)</code>	Routine for aborting current transaction
<code>tpacall(3c)</code>	Routine for sending a service request
<code>tpadmcall(3c)</code>	Administers unbooted application
<code>tpadvertise(3c)</code>	Routine for advertising a service name
<code>tpalloc(3c)</code>	Routine for allocating typed buffers
<code>tpbegin(3c)</code>	Routine for beginning a transaction
<code>tpbroadcast(3c)</code>	Routine to broadcast notification by name
<code>tpcall(3c)</code>	Routine for sending service request and awaiting its reply
<code>tpcancel(3c)</code>	Routine for canceling a call descriptor for outstanding reply
<code>tpchkauth(3c)</code>	Routine for checking if authentication required to join an application
<code>tpchkunsol(3c)</code>	Routine for checking for unsolicited message

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Name	Description
<code>tpclose(3c)</code>	Routine for closing a resource manager
<code>tpcommit(3c)</code>	Routine for committing current transaction
<code>tpconnect(3c)</code>	Routine for establishing a conversational service connection
<code>tpconvert(3c)</code>	Convert structures to/from string representations
<code>tpcryptpw(3c)</code>	Encrypt application password in administrative request
<code>tpdequeue(3c)</code>	Routine to dequeue a message from a queue
<code>tpdiscon(3c)</code>	Routine for taking down a conversational service connection
<code>tpenqueue(3c)</code>	Routine to enqueue a message
<code>tpenvelope(3c)</code>	Accesses the digital signature and encryption information associated with a typed message buffer
<code>tperrordetail(3c)</code>	Gets additional detail about an error generated from the last BEA Tuxedo system call
<code>tpexport(3c)</code>	Converts a typed message buffer into an exportable, machine-independent string representation, that includes digital signatures and encryption seals
<code>tpforward(3c)</code>	Routine for forwarding a service request to another service routine
<code>tpfree(3c)</code>	Routine for freeing a typed buffer
<code>tpgetadmkey(3c)</code>	Gets administrative authentication key
<code>tpgetctxt(3c)</code>	Retrieves a context identifier for the current application association
<code>tpgetlev(3c)</code>	Routine for checking if a transaction is in progress
<code>tpgetrply(3c)</code>	Routine for getting a reply from a previous request
<code>tpgprio(3c)</code>	Routine for getting a service request priority
<code>tpimport(3c)</code>	Converts an exported representation back into a typed message buffer

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Name	Description
<code>tpinit(3c)</code>	Joins an application
<code>tpkey_close(3c)</code>	Closes a previously opened key handle
<code>tpkey_getinfo(3c)</code>	Gets information associated with a key handle
<code>tpkey_open(3c)</code>	Opens a key handle for digital signature generation, message encryption, or message decryption
<code>tpkey_setinfo(3c)</code>	Sets optional attribute parameters associated with a key handle
<code>tpnotify(3c)</code>	Routine for sending notification by client identifier
<code>tpopen(3c)</code>	Routine for opening a resource manager
<code>tppost(3c)</code>	Posts an event
<code>tprealloc(3c)</code>	Routine to change the size of a typed buffer
<code>tprecv(3c)</code>	Routine for receiving a message in a conversational connection
<code>tpresume(3c)</code>	Resumes a global transaction
<code>tpreturn(3c)</code>	Routine for returning from a service routine
<code>tpscmt(3c)</code>	Routine for setting when <code>tpcommit()</code> should return
<code>tpseal(3c)</code>	Marks a typed message buffer for encryption
<code>tpsend(3c)</code>	Routine for sending a message in a conversational connection
<code>tpservice(3c)</code>	Template for service routines
<code>tpsetctxt(3c)</code>	Sets a context identifier for the current application association
<code>tpsetunsol(3c)</code>	Sets the method for handling unsolicited messages
<code>tpsign(3c)</code>	Marks a typed message buffer for digital signature
<code>tpsprio(3c)</code>	Routine for setting service request priority
<code>tpstrerror(3c)</code>	Gets error message string for a BEA Tuxedo system error
<code>tpstrerrordetail(3c)</code>	Gets error detail message string for a BEA Tuxedo system

BEA Tuxedo C Functions

Name	Description
<code>tpsubscribe(3c)</code>	Subscribes to an event
<code>tpsuspend(3c)</code>	Suspends a global transaction
<code>tpsvrdone(3c)</code>	Terminates a BEA Tuxedo system server
<code>tpsvrinit(3c)</code>	Initializes a BEA Tuxedo system server
<code>tpsvrthrdone(3c)</code>	Terminates a BEA Tuxedo server thread
<code>tpsvrthrinit(3c)</code>	Initializes a BEA Tuxedo server thread
<code>tpterm(3c)</code>	Leaves an application
<code>tptypes(3c)</code>	Routine to determine information about a typed buffer
<code>tpunadvertise(3c)</code>	Routine for unadvertising a service name
<code>tpunsubscribe(3c)</code>	Unsubscribes to an event
<code>TRY(3c)</code>	Exception-returning interface
<code>tuxgetenv(3c)</code>	Returns value for environment name
<code>tuxputenv(3c)</code>	Changes or adds value to environment
<code>tuxreadenv(3c)</code>	Adds variables to the environment from a file
<code>tx_begin(3c)</code>	Begins a global transaction
<code>tx_close(3c)</code>	Closes a set of resource managers
<code>tx_commit(3c)</code>	Commits a global transaction
<code>tx_info(3c)</code>	Returns global transaction information
<code>tx_open(3c)</code>	Opens a set of resource managers
<code>tx_rollback(3c)</code>	Rolls back a global transaction
<code>tx_set_commit_return(3c)</code>	Sets <i>commit_return</i> characteristic
<code>tx_set_transaction_control(3c)</code>	Sets <i>transaction_control</i> characteristic
<code>tx_set_transaction_timeout(3c)</code>	Sets <i>transaction_timeout</i> characteristic

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Name	Description
userlog(3c)	Writes a message to the BEA Tuxedo system central event log
Usignal(3c)	Signal handling in a BEA Tuxedo system environment
Uunix_err(3c)	Prints UNIX system call error

Introduction to the C Language Application-Transaction Monitor Interface

Description The application-transaction monitor interface provides the interface between the application and the transaction processing system. This interface is known as the ATMI interface. It provides function calls to open and close resources, manage transactions, manage typed buffers, and invoke request/response and conversational service calls.

Communication Paradigms The function calls described in the ATMI reference pages imply a particular model of communication. This model is expressed in terms of how client and server processes can communicate using request and reply messages.

There are two basic communication paradigms: request/response and conversational. Request/response services are invoked by service requests along with their associated data. Request/response services can receive exactly one request (upon entering the service routine) and send at most one reply (upon returning from the service routine). Conversational services, on the other hand, are invoked by connection requests along with a means of referring to the open connection (that is, a descriptor used in calling subsequent connection routines). Once the connection has been established and the service routine invoked, either the connecting program or the conversational service can send and receive data as defined by the application until the connection is torn down.

Note that a process can initiate both request/response and conversational communication, but cannot accept both request/response and conversational service requests. The following sections describe the two communication paradigms in greater detail.

Note: In various parts of the BEA Tuxedo documentation we refer to *threads*. When this term is used in a discussion of multithreaded applications, it is self-explanatory. In some instances, however, the term is used in a discussion of a topic that is relevant for both single-threaded and multithreaded applications. In such cases, readers who are running single-threaded applications may assume that the term *thread* refers to an entire process.

BEA Tuxedo System Request/Response Paradigm for Client/Server With regard to request/response communication, a client is defined as a process that can send requests and receive replies. By definition, clients cannot receive requests nor send replies. A client can send any number of requests, and can wait for the replies synchronously or receive (some limited number of) the replies at its convenience. In certain cases, a client can send a request that has no reply. `tpinit()` and `tpterm()` allow a client to join and leave a BEA Tuxedo system application.

A request/response server is a process that can receive one (and only one) service request at a time and send at most one reply to that request. (If the server is multithreaded, however, it can receive multiple requests at one time and issue multiple replies at one time.) While a server is working on a particular request, it can act like a client by initiating request/response or conversational requests and receiving their replies. In such a capacity, a server is called a requester. Note that both client and server processes can be requesters (in fact, a client can be nothing but a requester).

A request/response server can forward a request to another request/response server. Here, the server passes along the request it received to another server and does not expect a reply. It is the responsibility of the last server in the chain to send the reply to the original requester. Use of the forwarding routine ensures that the original requester ultimately receives its reply.

Servers and service routines offer a structured approach to writing BEA Tuxedo system applications. In a server, the application writer can concentrate on the work performed by the service rather than communications details such as receiving requests and sending replies. Because many of the communication details are handled by BEA Tuxedo system's `main`, the application must adhere to certain conventions when writing a service routine. At the time a server finishes its service routine, it can send a reply using `tpreturn()` or forward the request using `tpforward()`. A service is not allowed to perform any other work nor is it allowed to communicate with any other process after this point. Thus, a service performed by a server is started when a request is received and ended when either a reply is sent or the request is forwarded.

Concerning request and reply messages, there is an inherent difference between the two: a request has no associated context before it is sent, but a reply does. For example, when sending a request, the caller must supply addressing information, whereas a reply is always returned to the process that originated the request, that is, addressing context is maintained for a reply and the sender of the reply can exert no control over its destination. The differences between the two message types manifest themselves in the parameters and descriptions of the routines described in `tpcall()`.

When a request message is sent, it is sent at a particular priority. The priority affects how a request is dequeued: when a server dequeues requests, it dequeues the one with the highest priority. To prevent starvation, the oldest request is dequeued every so often regardless of priority. By default, a request's priority is associated with the service name to which the request is being sent. Service names can be given priorities at configuration time (see `UBBCONFIG(5)`). A default priority is used if none is defined. In addition, the priority can be set at runtime using a routine, `tpsprio()`. By doing so, the caller can override the configuration or default priority when the message is sent.

BEA Tuxedo System Conversational Paradigm for Client/Server

With regard to conversational communication, a client is defined as a process that can initiate a conversation but cannot accept a connection request.

A conversational server is a process that can receive connection requests. Once the connection has been established and the service routine invoked, either the connecting program or the conversational service can send and receive data as defined by the application until the connection is torn down. The conversation is half-duplex in nature such that one side of the connection has control and can send data until it gives up control to the other side. In a single-threaded server, while the connection is established, the server is "reserved" such that no other process can establish a connection with it. When a connection is established to a multithreaded server, however, that server is not reserved for exclusive use by one process. Instead, it can accept requests from multiple client threads.

As with a request/response server, the conversational server can act as a requester by initiating other requests or connections with other servers. Unlike a request/response server, a conversational server cannot forward a request to another server. Thus, a conversational service performed by a server is started when a request is received and ended when the final reply is sent via `tpreturn()`.

Once the connection is established, the connection descriptor implies any context needed regarding addressing information for the participants. Messages can be sent and received as needed by the application. There is no inherent difference between the request and reply messages and no notion of priority of messages.

Message Delivery

Sending and receiving messages, whether in conversation mode or request/response mode, implies communication between two units of an application. The great majority of messages lead to a reply or at least an acknowledgment, so that is an assurance that the message was received. There are, however, certain messages (some originated by the system, others originated by an application) where a reply or acknowledgment is not expected. For example, the system can send an unsolicited message using

`tpnotify()` without the `TPACK()` flag, or an application can send a message using `tpacall()` with the `TPNOREPLY()` flag. If the message queue of the receiving program is full, the message is dropped.

If the sending and receiving side are on different machines, the communication takes place between bridge processes that send and receive messages across a network. This raises the additional possibility of non-delivery due to a circuit failure. Even when either of these conditions leads to the positing of an event or to a `ULOG` message, it is not easy to associate the event or `ULOG` message with the non-arrival of a particular message.

Because the BEA Tuxedo system is designed to handle large volumes of messages across broad networks, it is not programmed to detect and correct the small percentage of failures-to-deliver described in the preceding paragraphs. For that reason, there can be no guarantee that every message will be delivered.

Message Sequencing

In the conversational model, for messages being exchanged using `tpsend()` and `tprecv()`, a sequence number is added to the message header and messages are received in the order in which they are sent. If a server or client gets a message out of order, the conversation is stopped, any transaction in progress is rolled back, and message 1572 in `LIBTUX`, “Bad Conversational Sequence Number,” is logged.

In the Request/Response model, messages are not sequenced by the system. If the application logic implies a sequence, it is the responsibility of the application to monitor and control it. The parallel message transmission made possible by the support of multiple network addresses for bridge processes increases the possibility that messages will not be received in the order sent. An application that is concerned about this may choose to specify a single network address for each bridge process, add sequence numbers to their messages or require periodic acknowledgments.

Queued Message Model

The BEA Tuxedo system queued message model allows for enqueueing a request message to stable storage for subsequent processing without waiting for its completion, and optionally getting a reply via a queued response message. The ATMI functions that queue messages and dequeue responses are `tpenqueue()` and `tpdequeue()`. They can be called from any type of BEA Tuxedo system application processes: client, server, or conversational. The functions `tpenqueue()` and `tpdequeue()` can also be used for peer-to-peer communication where neither the enqueueing application nor the dequeueing application are designated as server or client.

The queued message facility is an XA-compliant resource manager. Persistent messages are enqueue and dequeue within transactions to ensure one-time-only processing.

ATMI Transactions The BEA Tuxedo system supports two sets of mutually exclusive functions for defining and managing transactions: the BEA Tuxedo system's ATMI transaction demarcation functions (the names of which include the prefix `tp`) and X/Open's TX Interface functions (the names of which include the prefix `tx_`). Because X/Open used ATMI's transaction demarcation functions as the base for the TX Interface, the syntax and semantics of the TX Interface are quite similar to those of the ATMI. This section is an overview of ATMI transaction concepts. The next section introduces additional concepts about the TX Interface.

In the BEA Tuxedo system, a *transaction* is used to define a single logical unit of work that either wholly succeeds or has no effect whatsoever. A transaction allows work performed in many processes, possibly at different sites, to be treated as an atomic unit of work. The initiator of a transaction normally uses `tpbegin()` and either `tpcommit()` or `tpabort()` to delineate the operations within a transaction.

The initiator may also suspend its work on the current transaction by issuing `tpsuspend()`. Another process may take over the role of the initiator of a suspended transaction by issuing `tpresume()`. As a transaction initiator, a process must call one of the following: `tpsuspend()`, `tpcommit()`, or `tpabort()`. Thus, one process can start a transaction that another may finish.

If a process calling a service is in transaction mode, then the called service routine is also placed in transaction mode on behalf of the same transaction. Otherwise, whether the service is invoked in transaction mode or not depends on options specified for the service in the configuration file. A service that is not invoked in transaction mode can define multiple transactions between the time it is invoked and the time it ends. On the other hand, a service routine invoked in transaction mode can participate in only one transaction, and work on that transaction is completed upon termination of the service routine. Note that a connection cannot be upgraded to transaction mode: if `tpbegin()` is called while a conversation exists, the conversation remains outside of the transaction (as if `tpconnect()` had been called with the `TPNOTTRAN()` flag).

A service routine joining a transaction that was started by another process is called a *participant*. A transaction can have several participants. A service can be invoked to do work on the same transaction more than once. Only the initiator of a transaction (that is, a process calling either `tpbegin()` or `tpresume()`) can call `tpcommit()` or `tpabort()`. Participants influence the outcome of a transaction by using `tpreturn()` or `tpforward()`. These two calls signify the end of a service routine and indicate that the routine has finished its part of the transaction.

TX Transactions Transactions defined by the TX Interface are practically identical with those defined by the ATMI functions. An application developer may use either set of functions when writing clients and service routines, but should not intermingle one set of functions with the other within a single process (that is, a process cannot call `tpbegin()` and later call `tx_commit()`).

The TX Interface has two calls for opening and closing resource managers in a portable manner, `tx_open()` and `tx_close()`, respectively. Transactions are started with `tx_begin()` and completed with either `tx_commit()` or `tx_rollback()`. `tx_info()` is used to retrieve transaction information, and there are three calls to set options for transactions: `tx_set_commit_return()`, `tx_set_transaction_control()`, and `tx_set_transaction_timeout()`. The TX Interface has no equivalents to ATMI's `tpsuspend()` and `tpresume()`.

In addition to the semantics and rules defined for ATMI transactions, the TX Interface has some additional semantics that are worth introducing here. First, service routine writers wanting to use the TX Interface must supply their own `tpsvrinit()` routine that calls `tx_open()`. The default BEA Tuxedo system-supplied `tpsvrinit()` calls `tpopen()`. The same rule applies for `tpsvrdone()`: if the TX Interface is being used, then service routine writers must supply their own `tpsvrdone()` that calls `tx_close()`.

Second, the TX Interface has two additional semantics not found in ATMI. These are chained and unchained transactions, and transaction characteristics.

Chained and Unchained Transactions The TX Interface supports chained and unchained modes of transaction execution. By default, clients and service routines execute in the unchained mode; when an active transaction is completed, a new transaction does not begin until `tx_begin()` is called.

In the chained mode, a new transaction starts implicitly when the current transaction completes. That is, when `tx_commit()` or `tx_rollback()` is called, the BEA Tuxedo system coordinates the completion of the current transaction and initiates a new transaction before returning control to the caller. (Certain failure conditions may prevent a new transaction from starting.)

Clients and service routines enable or disable the chained mode by calling `tx_set_transaction_control()`. Transitions between the chained and unchained mode affect the behavior of the next `tx_commit()` or `tx_rollback()` call. The call to `tx_set_transaction_control()` does not put the caller into or take it out of transaction mode.

Since `tx_close()` cannot be called when the caller is in transaction mode, a caller executing in chained mode must switch to unchained mode and complete the current transaction before calling `tx_close()`.

Transaction Characteristics

A client or a service routine may call `tx_info()` to obtain the current values of their transaction characteristics and to determine whether they are executing in transaction mode.

The state of an application process includes several transaction characteristics. The caller specifies these by calling `tx_set_*()` functions. When a client or a service routine sets the value of a characteristic, it remains in effect until the caller specifies a different value. When the caller obtains the value of a characteristic via `tx_info()`, it does not change the value.

Error Handling

Most of the ATMI functions have one or more error returns. An error condition is indicated by an otherwise impossible returned value. This is usually `-1` or `error`, or `0` for a bad field identifier (`BADFLDID`) or address. The error type is also made available in the external integer `tperrno()`. `tperrno()` is not cleared on successful calls, so it should be tested only after an error has been indicated.

The `tpstrerror()` function is provided to produce a message on the standard error output. It takes one argument, an integer (found in `tperrno()`) and returns a pointer to the text of an error message in `LIBTUX_CAT`. The pointer can be used as an argument to `userlog()`.

`tperrordetail()` can be used as the first step of a three step procedure to get additional detail about an error in the most recent BEA Tuxedo system call on the current thread. `tperrordetail()` returns an integer which is then used as an argument to `tpstrerrordetail()` to retrieve a pointer to a string that contains the error message. The pointer can then be used as an argument to `userlog` or to `fprintf()`.

The error codes that can be produced by an ATMI function are described on each ATMI reference page. The `F_error()` and `F_error32()` functions are provided to produce a message on the standard error output for FML errors. They take one parameter, a string; print the argument string appended with a colon and a blank; and then print an error message followed by a newline character. The error message displayed is the one defined for the error number currently in `Error()` or `Error32()`, which is set when errors occur.

`Fstrerror()`, and its counterpart, `Fstrerror32()`, can be used to retrieve the text of an FML error message from a message catalog; it returns a pointer that can be used as an argument to `userlog`.

The error codes that can be produced by an FML function are described on each FML reference page.

Timeouts There are three types of timeouts in the BEA Tuxedo system: one is associated with the duration of a transaction from start to finish. A second is associated with the maximum length of time a blocking call will remain blocked before the caller regains control. The third is a service timeout and occurs when a call exceeds the number of seconds specified in the `SVCTIMEOUT` parameter in the `SERVICES` section of the configuration file.

The first kind of timeout is specified when a transaction is started with `tpbegin()`. (See `tpbegin(3c)` for details.) The second kind of timeout can occur when using the BEA Tuxedo system communication routines defined in `tpcall(3c)`. Callers of these routines typically block when awaiting a reply that has yet to arrive, although they can also block trying to send data (for example, if request queues are full). The maximum amount of time a caller remains blocked is determined by a BEA Tuxedo system configuration file parameter. (See the `BLOCKTIME` parameter in `UBBCONFIG(5)` for details.)

Blocking timeouts are performed by default when the caller is not in transaction mode. When a client or server is in transaction mode, it is subject to the timeout value with which the transaction was started and is not subject to the blocking timeout value specified in the `UBBCONFIG` file.

When a transaction timeout occurs, replies to asynchronous requests made in transaction mode become invalid. That is, if a process is waiting for a particular asynchronous reply for a request sent in transaction mode and a transaction timeout occurs, the descriptor for that reply becomes invalid. Similarly, if a transaction timeout occurs, an event is generated on the connection descriptor associated with the transaction and that descriptor becomes invalid. On the other hand, if a blocking timeout occurs, the descriptor is still valid and the waiting process can re-issue the call to await the reply.

The service timeout mechanism provides a way for the system to kill processes that may be frozen by some unknown or unexpected system error. When a service timeout occurs in a request/response service, the BEA Tuxedo system kills the server process that is executing the frozen service and returns error code `TPESVCERR`. If a service timeout occurs in a conversational service, the `TP_EVSVCCERR` event is returned.

If a transaction has timed out, the only valid communications before the transaction is aborted are calls to `tpcall()` with `TPNOREPLY`, `TPNOTRAN`, and `TPNOBLOCK` set.

Since Release 6.4, some additional detail has been provided beyond the `TPESVCERR` error code. If a service fails due to exceeding the timeout threshold, an event, `.SysServiceTimeout`, is posted.

Dynamic Service Advertisements By default, a server's services are advertised when it is booted and unadvertised when it is shut down. If a server needs to control the set of services that it offers at run time, it can do so by calling `tpadvertise()` and `tpunadvertise()`. These routines affect only the services offered by the calling server unless that server belongs to a multiple server, single queue (MSSQ) set. Because all servers in an MSSQ set must offer the same set of services, these routines also affect the advertisements of all servers sharing the caller's MSSQ set.

Buffer Management Initially, a process has no buffers. Before sending a message, a buffer must be allocated using `tpalloc()`. The sender's data can then be placed in the buffer and sent. This buffer has a specific structure. The particular structure is denoted by the `type` argument to the `tpalloc()` function. Since some structures can need further classification, a subtype can also be given (for example, a particular type of C structure).

When receiving a message, a buffer is required into which application data can be received. This buffer must be one originally gotten from `tpalloc()`. Note that a BEA Tuxedo system server, in its `main`, allocates a buffer whose address is passed to a request/response or conversational service upon invoking the service. (See `tpservice(3c)` for details on how this buffer is treated.)

Buffers used for receiving messages are treated slightly differently than those used for sending: the size and address usually change upon receipt of a message, since the system internally swaps the buffer passed into the receive call with internal buffers it used to process the buffer. A buffer may grow or shrink when it receives data. Whether it grows or shrinks depends on the amount of data sent by the sender, and the internal data flow needed to get the data from sender to receiver. Many factors can affect the buffer size, including compression, receiving a message from a different type of machine, and the action of the `postrecv()` function for the type of buffer being used (see `buffer(3c)`). The buffer sizes in Workstation clients are usually different from those in native clients.

It is best to think of the receive buffer as a placeholder, rather than the actual container that will receive the message. The system sometimes uses the size of the buffer you pass as a hint, so it does help if it is big enough to hold the expected reply.

On the sending side, buffer types that might be filled to less than their allocated capacity (for example, FML or STRING buffers) send only the amount used. A 100K FML32 buffer with one integer field in it is sent as a much smaller buffer, containing only that integer.

This means that the receiver will receive a buffer smaller than what was originally allocated by the sender, yet larger than the data that was sent. For example, if a STRING buffer of 10K bytes is allocated, and the string “HELLO” is copied into it, only the six bytes are sent, and the receiver will probably end up with a buffer that is around 1K or 4K bytes. (It may be larger or smaller, depending on other factors.) The BEA Tuxedo system guarantees only that a received message will contain all of the data that was sent; it does not guarantee that the message will contain all the free space it originally contained.

The process receiving the reply is responsible for noting size changes in the buffer (using `tptypes()`) and reallocating the buffer if necessary. All BEA Tuxedo functions change a receiver’s buffer return information about the amount of data in the buffer, so it should become standard practice to check the buffer size every time a reply is received.

One can send and receive messages using the same data buffer. Alternatively, a different data buffer can be allocated for each message. It is usually the responsibility of the calling process to free its buffers by invoking `tpfree()`. However, in limited cases, the BEA Tuxedo system frees the caller’s buffer. For more information about buffer usage, see the descriptions of communication functions such as `tpfree()`.

Buffer Type Switch The `tmttype_sw_t` structure provides the description required when adding new buffer types to `tm_typesw()`, the buffer type switch for a process. The switch elements are defined in `typesw(5)`. The function names used in this entry are templates for the actual function names defined by the BEA Tuxedo system or by applications in which custom buffer types are created. These function names can be mapped easily to switch elements: to create a template name simply add the prefix `_tm` to the element name of a function pointer. For example, the template name for the element `initbuf` is `_tm_initbuf`.

The `type` element must be non-NULL and at most 8 characters in length. If this element is not unique in the switch, then `subtype()` must be non-NULL.

The `subtype()` element can be NULL, a string of at most 16 characters, or * (the wild card character). The combination of `type()` and `subtype()` must uniquely identify an element in the switch.

A given type can have multiple subtypes. If all subtypes are to be treated the same for a given type, then the wild card character, “*”, can be used. Note that the `tptypes()` function can be used to determine a buffer’s type and subtype if subtypes need to be distinguished. If some subset of the subtypes within a particular type are to be treated individually, and the rest are to be treated identically, then those that are to be singled out with specific subtype values should appear in the switch before the subtype designated with the wild card. Thus, searching for types and subtypes in the switch is done from top to bottom, and the wild card subtype entry accepts any “leftover” type matches.

The `dfltsize()` element is used when allocating or re-allocating a buffer. The semantics of `tpalloc()` and `tprealloc()` are such that the larger of the following two values is used to create or re-allocate a buffer: the value of `dfltsize()` or the value of the `size` parameter for the `tpalloc()` and `tprealloc()` functions. For some types of structures, such as a fixed-sized C structure, the buffer size should equal the size of the structure. If `dfltsize()` is set to this value, then the caller may not need to specify the buffer’s length to routines in which a buffer is passed. `dfltsize()` can be 0 or less. However, if `tpalloc()` or `tprealloc()` is called and the `size` parameter for the function being called is also less than or equal to 0, then the routine will fail. We recommend setting `dfltsize()` to a value greater than 0.

The BEA Tuxedo system provides five basic buffer types:

- `CARRAY`—a character array, possibly containing NULL characters, which is neither encoded nor decoded during transmission
- `STRING`—a NULL-terminated character array
- `FML`—fielded buffers (`FML` or `FML32`)
- `XML`—XML document or datagram buffer
- `VIEW`—simple C structures (`VIEW` or `VIEW32`); all views are handled by the same set of routines. The name of a particular view is its subtype name.

Two of these buffer types have synonyms: `X_OCTET` is a synonym for `CARRAY`, and both `X_C_TYPE` and `X_COMMON` are synonyms for `VIEW`. `X_C_TYPE` supports all the same elements as `VIEW`, whereas `X_COMMON` supports only longs, shorts, and characters. `X_COMMON` should be used when both C and COBOL programs are communicating.

An application wishing to supply its own buffer type can do so by adding an instance to the `tm_typesw()` array. Whenever adding or deleting a buffer type, be careful to leave a NULL entry at the end of the array. Note that a buffer type with a NULL name

is not permitted. An application client or server is linked with the new buffer type switch by explicitly specifying the name of the source or object file on the `buildserver()` or `buildclient()` command line using the `-f` option.

Unsolicited Notification

There are two methods for sending messages to application clients outside the boundaries of the client/server interaction defined above. The first is the broadcast mechanism supported by `tpbroadcast()`. This function allows application clients, servers, and administrators to broadcast typed buffer messages to a set of clients selected on the basis of the names assigned to them. The names assigned to clients are determined in part by the application (specifically, by the information passed in the `TPINIT` typed buffer at `tpinit()` time) and in part by the system (based on the processor through which the client accesses the application).

The second method is the notification of a particular client as identified from an earlier or current service request. Each service request contains a unique client identifier that identifies the originating client for the service request. Calls to the `tpcall()` and `tpforward()` functions from within a service routine do not change the originating client for that chain of service requests. Client identifiers can be saved and passed between application servers. The `tpnotify()` function is used to notify clients identified in this manner.

Single or Multiple Application Contexts per Process

The BEA Tuxedo system allows client programs to create an association with one or more applications per process. If `tpinit()` is called with the `TPMULTICONTEXTS` parameter included in the `flags` field of the `TPINIT` structure, then multiple client contexts are allowed. If `tpinit()` is called implicitly, is called with a `NULL` parameter, or the `flags` field does not include `TPMULTICONTEXTS`, then only a single application association is allowed.

In single-context mode, if `tpinit()` is called more than once (that is, if it is called after the client has already joined the application), no action is taken and success is returned.

In multicontext mode, each call to `tpinit()` creates a new application association. The application can obtain a handle representing this application association by calling `tpgetctxt()`. Any thread in the same process can call `tpsetctxt()` to set that thread's context.

Once an application has chosen single-context mode, all calls to `tpinit()` must specify single-context mode until all application associations are terminated. Similarly, once an application has chosen multicontext mode, all calls to `tpinit()` must specify multicontext mode until all application associations are terminated.

Server programs can be associated with only a single application and cannot act as clients. However, within each server program, there may be multiple server dispatch contexts. Each server dispatch context works in its own thread.

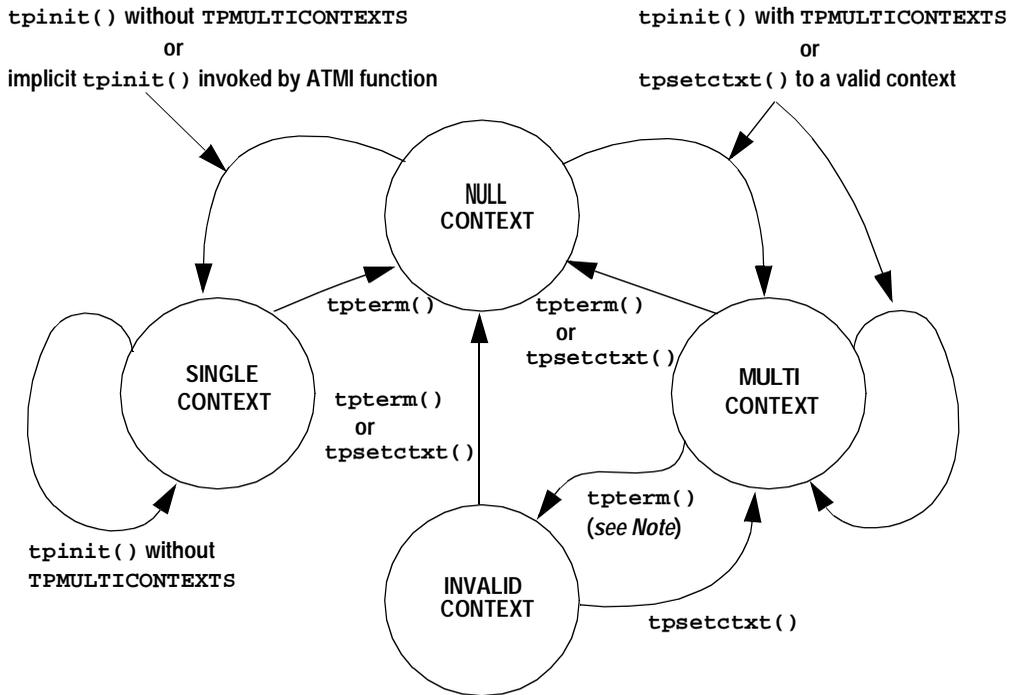
The following state table shows the transitions that may occur, within a client process, among the following states: the uninitialized state, the initialized in single-context mode state, and the initialized in multicontext mode state.

Per-Process Context Modes

Function	States		
	Uninitialized S_0	Initialized Single-context Mode S_1	Initialized Multicontext Mode S_2
tpinit without TPMULTICONTEXTS	S_1	S_1	$S_2(\text{error})$
tpinit with TPMULTICONTEXTS	S_2	$S_1(\text{error})$	S_2
implicit tpinit	S_1	S_1	$S_2(\text{error})$
tpterm - not last association			S_2
tpterm - last association		S_0	S_0
tpterm - no association	S_0		

Context State Changes for a Client Thread In a multicontext application, calls to various functions result in context state changes for the calling thread and any other threads that are active in the same context as the calling process. The following diagram illustrates the context state changes that result from calls to the `tpinit()`, `tpsetctxt()`, and `tpterm()` functions. (The `tpgetctxt()` function does not produce any context state changes.)

Multicontext State Transitions



Note: When `tpterm()` is called by a thread running in the multicontext state (`TPMULTICONTEXTS`), the calling thread is placed in the null context state (`TPNULLCONTEXT`). All other threads associated with the terminated context are switched to the invalid context state (`TPINVALIDCONTEXT`).

The following table lists all possible context state changes produced by calling `tpinit()`, `tpsetctxt()`, and `tpterm()`. These states are thread-specific; different threads can be in different states when they are part of a multicontexted application. By contrast, each context state listed in the preceding table (“Per-Process Context Modes”) applies to an entire process.

Context State Changes for a Client Thread

When this function is executed . . .	Then a thread in this context state results in . . .			
	Null Context	Single Context	Multicontext	Invalid Context
<code>tpinit</code> without <code>TPMULTICONTEXTS</code>	Single context	Single context	Error	Error
<code>tpinit</code> with <code>TPMULTICONTEXTS</code>	Multicontext	Error	Multicontext	Error
<code>tpsetctxt</code> to <code>TPNULLCONTEXT</code>	Null	Error	Null	Null
<code>tpsetctxt</code> to context 0	Error	Single context	Error	Error
<code>tpsetctxt</code> to context > 0	Multicontext	Error	Multicontext	Multicontext
Implicit <code>tpinit</code>	Single context	N/A	N/A	Error
<code>tpterm</code> in this thread	Null	Null	Null	Null
<code>tpterm</code> in a different thread of this context	N/A	Null	Invalid	N/A

Support for Threads Programming

The BEA Tuxedo system supports multithreaded programming in several ways. If the process is using single-context mode, then as the application creates new threads, those threads share the BEA Tuxedo context for the process. In a client, after a thread issues a `tpinit()` call in single-context mode, other threads may then proceed to issue ATMI calls. For example, one thread may issue a `tpacall()` and a different thread in the same process may issue a `tpgetreply()`.

When in multicontext mode, threads initially are not associated with a BEA Tuxedo application. A thread can either join an existing application association by calling `tpsetctxt()` or create a new association by calling `tpinit()` with the `TPMULTICONTEXTS` flag set.

Whether running in single-context mode or multicontext mode, the application is responsible for coordinating its threads so that ATMI operations are performed at the appropriate time.

An application may create additional threads within a server by using OS thread functions. These threads may operate independently of the BEA Tuxedo system, or they may operate in the same context as one of the server dispatch threads. Initially, application-created server threads are not associated with any server dispatch context. An application-created server thread may call `tpsetctxt()` to associate itself with a server dispatch thread. The application-created server thread must complete all of its ATMI calls before the dispatched thread calls `tpreturn()` or `tpforward()`. A server thread dispatched by the BEA Tuxedo system may not call `tpsetctxt()`. In addition, application-created threads may not make ATMI calls that would cause an implicit `tpinit()` when not associated with a context. On the other hand, this failure to make ATMI calls does not occur with dispatcher-created threads because those threads are always associated with a context. All server threads are prohibited from calling `tpinit()`.

In a multithreaded application, a thread that is operating in the `TPINVALIDCONTEXT` state is prohibited from calling many ATMI functions. The following lists specify which functions may and may not be called under these circumstances.

The BEA Tuxedo system allows a thread operating in the `TPINVALIDCONTEXT` state to call the following functions:

- `catgets(3c)`
- `catopen, catclose(3c)`
- `decimal(3c)`
- `gp_mktime(3c)`
- `nl_langinfo(3c)`
- `recomp, rematch(3c)`
- `rpc_sm_allocate, rpc_ss_allocate(3c)`
- `rpc_sm_client_free, rpc_ss_client_free(3c)`
- `rpc_sm_disable_allocate, rpc_ss_disable_allocate(3c)`
- `rpc_sm_enable_allocate, rpc_ss_enable_allocate(3c)`
- `rpc_sm_free, rpc_ss_free(3c)`
- `rpc_sm_set_client_alloc_free, rpc_ss_set_client_alloc_free(3c)`

- `rpc_sm_swap_client_alloc_free`,
`rpc_ss_swap_client_alloc_free(3c)`
- `setlocale(3c)`
- `strerror(3c)`
- `strftime(3c)`
- `tpalloc(3c)`
- `tpconvert(3c)`
- `tpcryptpw(3c)`
- `tperrordetail(3c)`
- `tpfree(3c)`
- `tpgetctxt(3c)`
- `tprealloc(3c)`
- `tpsetctxt(3c)`
- `tpstrerror(3c)`
- `tpstrerrordetail(3c)`
- `tpterm(3c)`
- `tptypes(3c)`
- `TRY(3c)`
- `tuxgetenv(3c)`
- `tuxputenv(3c)`
- `tuxreadenv(3c)`
- `userlog(3c)`
- `Usignal(3c)`
- `Uunix_err(3c)`

The BEA Tuxedo system *does not allow* a thread operating in the `TPINVALIDCONTEXT` state to call the following functions:

- `AEWsetunsol(3c)`
- `tpabort(3c)`
- `tpacall(3c)`
- `tpadmcall(3c)`

- `tpbegin(3c)`
- `tpbroadcast(3c)`
- `tpcall(3c)`
- `tpcancel(3c)`
- `tpchkauth(3c)`
- `tpchkunsol(3c)`
- `tpclose(3c)`
- `tpcommit(3c)`
- `tpconnect(3c)`
- `tpdequeue(3c)`
- `tpenqueue(3c)`
- `tpgetadmkey(3c)`
- `tpgetlev(3c)`
- `tpgetrply(3c)`
- `tpgprio(3c)`
- `tpinit(3c)`
- `tpnotify(3c)`
- `tpopen(3c)`
- `tppost(3c)`
- `tprecv(3c)`
- `tpresume(3c)`
- `tpscmt(3c)`
- `tpsend(3c)`
- `tpsetunsol(3c)`
- `tpsprio(3c)`
- `tpsubscribe(3c)`
- `tpsuspend(3c)`
- `tpunsubscribe(3c)`
- `tx_begin(3c)`

- tx_close(3c)
- tx_commit(3c)
- tx_info(3c)
- tx_open(3c)
- tx_rollback(3c)
- tx_set_commit_return(3c)
- tx_set_transaction_control(3c)
- tx_set_transaction_timeout(3c)

C Language ATMI Return Codes and Other Definitions

The following return code and flag definitions are used by the ATMI routines. For an application to work with different transaction monitors without change or recompilation, each system must define its flags and return codes as stated here.

```
/*
 * The following definitions must be included in atmi.h
 */

/* Flags to service routines */

#define TPNOBLOCK      0x00000001 /* non-blocking send/rcv */
#define TPSIGRSTRT    0x00000002 /* restart rcv on interrupt */
#define TPNOREPLY     0x00000004 /* no reply expected */
#define TPNOTRAN      0x00000008 /* not sent in transaction mode */
#define TPTRAN        0x00000010 /* sent in transaction mode */
#define TPNOTIME      0x00000020 /* no timeout */
#define TPABSOLUTE    0x00000040 /* absolute value on tmsetprio */
#define TPGETANY      0x00000080 /* get any valid reply */
#define TPNOCHANGE    0x00000100 /* force incoming buffer to match */
#define RESERVED_BIT1 0x00000200 /* reserved for future use */
#define TPCONV        0x00000400 /* conversational service */
#define TPSENDONLY    0x00000800 /* send-only mode */
#define TPRECVONLY    0x00001000 /* rcv-only mode */
#define TPACK         0x00002000 /* */

/* Flags to tpreturn - also defined in xa.h */
#define TPFAIL        0x20000000 /* service FAILURE for tpreturn */
#define TPEXIT        0x08000000 /* service FAILURE with server exit */
#define TPSUCCESS     0x04000000 /* service SUCCESS for tpreturn */
```

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```
/* Flags to tpscmnt - Valid TP_COMMIT_CONTROL
 * characteristic values
 */
#define TP_CMT_LOGGED 0x01      /* return after commit
                               * decision is logged */
#define TP_CMT_COMPLETE 0x02  /* return after commit has
                               * completed */

/* client identifier structure */
struct clientid_t {
    long clientdata[4];        /* reserved for internal use */
}
typedef struct clientid_t CLIENTID;
/* context identifier structure */
typedef long TPCONTEXT_T;
/* interface to service routines */
struct tpsvcinfo {
    name[32];
    long flags;                /* describes service attributes */
    char *data;                /* pointer to data */
    long len;                  /* request data length */
    int cd;                    /* connection descriptor
    * if (flags TPCONV) true */
    long appkey;               /* application authentication client
    * key */
    CLIENTID cltid;           /* client identifier for originating
    * client */
};

typedef struct tpsvcinfo TPSVCINFO;

/* tpinit(3c) interface structure */
#define MAXTIDENT 30

struct tpinfo_t {
    char username[MAXTIDENT+2]; /* client user name */
    char clname[MAXTIDENT+2];   /* app client name */
    char passwd[MAXTIDENT+2];   /* application password */
    long flags;                 /* initialization flags */
    long datalen;               /* length of app specific data */
    long data;                  /* placeholder for app data */
};
typedef struct tpinfo_t TPINIT;

/* The transactionID structure passed to tpsuspend(3c) and tpresume(3c) */
struct tp_tranid_t {
    long info[6];               /* Internally defined */
};
```

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```
};

typedef struct tp_tranid_t TPTRANID;

/* Flags for TPINIT */
#define TPU_MASK 0x00000007 /* unsolicited notification
                             * mask */
#define TPU_SIG 0x00000001 /* signal based
                             * notification */
#define TPU_DIP 0x00000002 /* dip-in based
                             * notification */
#define TPU_IGN 0x00000004 /* ignore unsolicited
                             * messages */
#define TPU_THREAD 0x00000040 /* THREAD notification */
#define TPSA_FASTPATH 0x00000008 /* System access ==
                             * fastpath */
#define TPSA_PROTECTED 0x00000010 /* System access ==
                             * protected */
#define TPMULTICONTEXTS 0x00000020 /* multiple context associa-
                             * tions per process */

/* /Q tpqctl_t data structure */
#define TMQNAMELEN 15
#define TMMSGIDLEN 32
#define TMCORRIDLEN 32

struct tpqctl_t { /* control parameters to queue primitives */
    long flags; /* indicates which values are set */
    long deq_time; /* absolute/relative time for dequeuing */
    long priority; /* enqueue priority */
    long diagnostic; /* indicates reason for failure */
    char msgid[TMMSGIDLEN]; /* ID of message before which to queue */
    char corrid[TMCORRIDLEN]; /* correlation ID used to identify message */
    char replyqueue[TMQNAMELEN+1]; /* queue name for reply message */
    char failurequeue[TMQNAMELEN+1]; /* queue name for failure message */
    CLIENTID cltid; /* client identifier for */
    /* originating client */
    long urcode; /* application user-return code */
    long appkey; /* application authentication client key */
    long delivery_qos; /* delivery quality of service */
    long reply_qos; /* reply message quality of service */
    long exp_time; /* expiration time */
};

typedef struct tpqctl_t TPQCTL;

/* /Q structure elements that are valid - set in flags */
#ifndef TPNOFLAGS
#define TPNOFLAGS 0x00000 /* no flags set -- no get */
#endif
#define TPQCORRID 0x00001 /* set/get correlation ID */
```

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```
#define TPQFAILUREQ          0x00002    /* set/get failure queue */
#define TPQBEFOREMSGID      0x00004    /* enqueue before message ID */
#define TPQGETBYMSGIDOLD    0x00008    /* deprecated */
#define TPQMSGID            0x00010    /* get msgid of enq/deq message */
#define TPQPRIORITY        0x00020    /* set/get message priority */
#define TPQTOP              0x00040    /* enqueue at queue top */
#define TPQWAIT            0x00080    /* wait for dequeuing */
#define TPQREPLYQ          0x00100    /* set/get reply queue */
#define TPQTIME_ABS        0x00200    /* set absolute time */
#define TPQTIME_REL        0x00400    /* set relative time */
#define TPQGETBYCORRIDOLD  0x00800    /* deprecated */
#define TPQPEEK            0x01000    /* non-destructive dequeue */
#define TPQDELIVERYQOS     0x02000    /* delivery quality of service */
#define TPQREPLYQOS       0x04000    /* reply msg quality of service*/
#define TPQEXPTIME_ABS     0x08000    /* absolute expiration time */
#define TPQEXPTIME_REL     0x10000    /* relative expiration time */
#define TPQEXPTIME_NONE    0x20000    /* never expire */
#define TPQGETBYMSGID      0x40008    /* dequeue by msgid */
#define TPQGETBYCORRID     0x80800    /* dequeue by corrid */

/* Valid flags for the quality of service fields in the TPQCTL structure */
#define TPQQOSDEFAULTPERSIST 0x00001    /* queue's default persistence */
/* policy */
#define TPQQOSPERSISTENT    0x00002    /* disk message */
#define TPQQOSNONPERSISTENT 0x00004    /* memory message */

/* error return codes */
extern int tperrno;
extern long tपुरcode;

/* tperrno values - error codes */
* The reference pages explain the context in which the following
* error codes can return.
*/

#define TPMINVAL            0          /* minimum error message */
#define TPEABORT            1
#define TPEBADDESC         2
#define TPEBLOCK           3
#define TPEINVAL           4
#define TPELIMIT           5
#define TPENOENT           6
#define TPEOS              7
#define TPEPERM            8
#define TPEPROTO           9
#define TPESVCERR          10
#define TPESVCFAIL         11
#define TPESYSTEM          12
#define TPETIME            13
```

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```
#define TPETRAN 14
#define TPGOTSIG 15
#define TPERMERR 16
#define TPEITYPE 17
#define TPEOTYPE 18
#define TPERELEASE 19
#define TPEHAZARD 20
#define TPEHEURISTIC 21
#define TPEEVENT 22
#define TPEMATCH 23
#define TPEDIAGNOSTIC 24
#define TPEMIB 25
#define TPEMAXVAL 26 /* maximum error message */

/* conversations - events */
#define TPEV_DISCONIMM 0x0001
#define TPEV_SVCERR 0x0002
#define TPEV_SVCFAIL 0x0004
#define TPEV_SVCSUCC 0x0008
#define TPEV_SENDOONLY 0x0020

/* /Q diagnostic codes */
#define QMEINVAL -1
#define QMEBADRMID -2
#define QMENOTOPEN -3
#define QMETRAN -4
#define QMEBADMSGID -5
#define QMESYSTEM -6
#define QMEOS -7
#define QMEABORTED -8
#define QMENOTA QMEABORTED
#define QMEPROTO -9
#define QMEBADQUEUE -10
#define QMENOMSG -11
#define QMEINUSE -12
#define QMENOSPACE -13
#define QMERELEASE -14
#define QMEINVHANDLE -15
#define QMESHARE -16

/* EventBroker Messages */
#define TPEVSERVICE 0x00000001
#define TPEVQUEUE 0x00000002
#define TPEVTRAN 0x00000004
#define TPEVPERSIST 0x00000008

/* Subscription Control Structure */
struct tpevctl_t {
    long flags;
```

Section 3c - C Functions

```
    char name1[XATMI_SERVICE_NAME_LENGTH];
    char name2[XATMI_SERVICE_NAME_LENGTH];
    TPQCTL qctl;
};
typedef struct tpevctl_t TPEVCTL;
```

C Language TX Return Codes and Other Definitions The following return code and flag definitions are used by the TX routines. For an application to work with different transaction monitors without change or recompilation, each system must define its flags and return codes as stated here.

```
#define TX_H_VERSION            0                /* current version of this
                                           * header file */

/*
 * Transaction identifier
 */
#define XIDDATASIZE            128             /* size in bytes */
struct xid_t {
    long formatID;                       /* format identifier */
    long gtrid_length;                 /* value not to exceed 64 */
    long bqual_length;                 /* value not to exceed 64 */
    char data[XIDDATASIZE];
};
typedef struct xid_t XID;
/*
 * A value of -1 in formatID means that the XID is null.
 */

/*
 * Definitions for tx_ routines
 */
/* commit return values */
typedef long COMMIT_RETURN;
#define TX_COMMIT_COMPLETED 0
#define TX_COMMIT_DECISION_LOGGED 1

/* transaction control values */
typedef long TRANSACTION_CONTROL;
#define TX_UNCHAINED 0
#define TX_CHAINED 1

/* type of transaction timeouts */
typedef long TRANSACTION_TIMEOUT;

/* transaction state values */
typedef long TRANSACTION_STATE;
#define TX_ACTIVE 0
```

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```
#define TX_TIMEOUT_ROLLBACK_ONLY 1
#define TX_ROLLBACK_ONLY 2

/* structure populated by tx_info */
struct tx_info_t {
    XID xid;
    COMMIT_RETURN when_return;
    TRANSACTION_CONTROL transaction_control;
    TRANSACTION_TIMEOUT transaction_timeout;
    TRANSACTION_STATE transaction_state;
};
typedef struct tx_info_t TXINFO;

/*
 * tx_return codes
 * (transaction manager reports to application)
 */
#define TX_NOT_SUPPORTED 1 /* option not supported */
#define TX_OK 0 /* normal execution */
#define TX_OUTSIDE -1 /* application is in an RM
 * local transaction */
#define TX_ROLLBACK -2 /* transaction was rolled
 * back */
#define TX_MIXED -3 /* transaction was
 * partially committed and
 * partially rolled back */
#define TX_HAZARD -4 /* transaction may have been
 * partially committed and
 * partially rolled back */
#define TX_PROTOCOL_ERROR -5 /* routine invoked in an
 * improper context */
#define TX_ERROR -6 /* transient error */
#define TX_FAIL -7 /* fatal error */
#define TX_EINVAL -8 /* invalid arguments were given */
#define TX_COMMITTED -9 /* transaction has
 * heuristically committed */

#define TX_NO_BEGIN -100 /* transaction committed plus
 * new transaction could not
 * be started */
#define TX_ROLLBACK_NO_BEGIN (TX_ROLLBACK+TX_NO_BEGIN)
/* transaction rollback plus
 * new transaction could not
 * be started */
#define TX_MIXED_NO_BEGIN (TX_MIXED+TX_NO_BEGIN)
/* mixed plus new transaction
 * could not be started */
#define TX_HAZARD_NO_BEGIN (TX_HAZARD+TX_NO_BEGIN)
```

```

/* hazard plus new transaction
 * could not be started */
#define TX_COMMITTED_NO_BEGIN      (TX_COMMITTED+TX_NO_BEGIN)
/* heuristically committed plus
 * new transaction could not
 * be started */

```

ATMI State Transitions

The BEA Tuxedo system keeps track of the state for each process and verifies that legal state transitions occur for the various function calls and options. The state information includes the process type (request/response server, conversational server, or client), the initialization state (uninitialized or initialized), the resource management state (closed or open), the transaction state of the process, and the state of all asynchronous request and connection descriptors. When an illegal state transition is attempted, the called function fails, setting `tperrno()` to `TPEPROTO`. The legal states and transitions for this information are described in the following tables.

The table below indicates which functions may be called by request/response servers, conversational servers, and clients. Note that `tpsvrinit()`, `tpsvrdone()`, `tpsvrthrinit()`, and `tpsvrthrdone()` are not included in this table because they are not called by applications (that is, they are application-supplied functions that are invoked by the BEA Tuxedo system).

Available Functions

Function	Process Type		
	Request/response Server	Conversational Server	Client
<code>tpabort</code>	Y	Y	Y
<code>tpacall</code>	Y	Y	Y
<code>tpadvertise</code>	Y	Y	N
<code>tpalloc</code>	Y	Y	Y
<code>tpbegin</code>	Y	Y	Y
<code>tpbroadcast</code>	Y	Y	Y
<code>tpcall</code>	Y	Y	Y
<code>tpcancel</code>	Y	Y	Y

Available Functions

Function	Process Type		
	Request/response Server	Conversational Server	Client
tpchkauth	Y	Y	Y
tpchkunsol	N	N	Y
tpclose	Y	Y	Y
tpcommit	Y	Y	Y
tpconnect	Y	Y	Y
tpdequeue	Y	Y	Y
tpdiscon	Y	Y	Y
tpenqueue	Y	Y	Y
tpforward	Y	N	N
tpfree	Y	Y	Y
tpgetctxt	Y	Y	Y
tpgetlev	Y	Y	Y
tpgetrply	Y	Y	Y
tpgprio	Y	Y	Y
tpinit	N	N	Y
tpnotify	Y	Y	Y
tpopen	Y	Y	Y
tppost	Y	Y	Y
tprealloc	Y	Y	Y
tprecv	Y	Y	Y
tpresume	Y	Y	Y

Available Functions

Function	Process Type		
	Request/response Server	Conversational Server	Client
<code>tpreturn</code>	Y	Y	N
<code>tpscmt</code>	Y	Y	Y
<code>tpsend</code>	Y	Y	Y
<code>tpservice</code>	Y	Y	N
<code>tpsetctxt</code>	Y (in application-created threads)	Y (in application-created threads)	Y
<code>tpsetunsol</code>	N	N	Y
<code>tpsprio</code>	Y	Y	Y
<code>tpsubscribe</code>	Y	Y	Y
<code>tpsuspend</code>	Y	Y	Y
<code>tpterm</code>	N	N	Y
<code>tptypes</code>	Y	Y	Y
<code>tpunadvertise</code>	Y	Y	N
<code>tpunsubscribe</code>	Y	Y	Y

The remaining state tables are for both clients and servers, unless otherwise noted. Keep in mind that because some functions cannot be called by both clients and servers (for example, `tpinit()`), certain state transitions shown below may not be possible for both process types. The above table should be consulted to determine whether the process in question is allowed to call a particular function.

The following state table indicates whether or not a thread in a client process has been initialized and registered with the transaction manager. Note that this table assumes the use of `tpinit()`, which is optional in single-context mode. That is, a single-context

client may implicitly join an application by issuing one of many ATMI functions (for example, `tpconnect()` or `tpcall()`). A client must use `tpinit()` when one of the following is true:

- Application authentication is required. (See `tpinit(3c)` and the description of the `SECURITY` keyword in `UBBCONFIG(5)` for details.)
- The client wants to access an XA-compliant resource manager directly. (See `tpinit(3c)` for details.)
- The client wants to create multiple application associations.

A server is placed in the initialized state by the BEA Tuxedo system's `main()` before its `tpsvrinit()` function is invoked, and it is placed in the uninitialized state by the BEA Tuxedo system's `main()` after its `tpsvrdone()` function has returned. Note that in all of the state tables shown below, an error return from a function causes the thread to remain in the same state, unless otherwise noted.

Thread Initialization States

Function	States	
	Uninitialize I₀	Initialize I₁
<code>tpalloc</code>	I ₀	I ₁
<code>tpchkauth</code>	I ₀	I ₁
<code>tpfree</code>	I ₀	I ₁
<code>tpgetctxt</code>	I ₀	I ₁
<code>tpinit</code>	I ₁	I ₁
<code>tprealloc</code>	I ₀	I ₁
<code>tpsetctxt</code> (set to a non-null context)	I ₁	I ₁
<code>tpsetctxt</code> (with the <code>TPNULLCONTEXT</code> context set)	I ₀	I ₀
<code>tpsetunsol</code>	I ₀	I ₁

Thread Initialization States

Function	States	
	Uninitialize I ₀	Initialize I ₁
tpterm (in this thread)	I ₀	I ₀
tpterm (in a different thread of this context)	I ₀	I ₀
tptypes	I ₀	I ₁
All other ATMI functions	I ₁	I ₁

The remaining state tables assume a precondition of state I₁ (regardless of whether a process arrived in this state via `tpinit()`, `tpsetctxt()`, or the BEA Tuxedo system's `main()`).

The following table indicates the state of a client or server with respect to whether or not a resource manager associated with the process has been initialized.

Resource Management States

Function	States	
	Closed R ₀	Open R ₁
tpopen	R ₁	R ₁
tpclose	R ₀	R ₀
tpbegin		R ₁
tpcommit		R ₁
tpabort		R ₁
tpsuspend		R ₁

Resource Management States

Function	States	
	Closed R_0	Open R_1
tpresume		R_1
tpservice with flag TPTRAN		R_1
All other ATMI functions	R_0	R_1

The following state table indicates the state of a process with respect to whether or not the process is associated with a transaction. For servers, transitions to states T_1 and T_2 assume a precondition of state R_1 (for example, `tpopen()` has been called with no subsequent call to `tpclose()` or `tpterm()`).

Transaction State of Application Association

Function	State		
	Not in transaction T_0	Initiator T_1	Participant T_2
tpbegin			
tpabort		T_0	
tpcommit		T_0	
tpsuspend		T_0	
tpresume	T_1	T_0	
tpservice with flag TPTRAN	T_2		
tpservice (not in transaction mode)	T_0		
tpreturn	T_0		T_0
tpforward	T_0		T_0

Transaction State of Application Association

Function	State		
	Not in transaction T ₀	Initiator T ₁	Participant T ₂
tpclose	R ₀		
tpterm	I ₀	T ₀	
All other ATMI functions	T ₀	T ₁	T ₂

The following state table indicates the state of a single request descriptor returned by `tpacall()`.

Asynchronous Request Descriptor States

Function	States	
	No Descriptor A ₀	Valid Descriptor A ₁
tpacall	A ₁	
tpgetrply		A ₀
tpcancel		A ₀ ^a
tpabort	A ₀	A ₀ ^b
tpcommit	A ₀	A ₀ ^b
tpsuspend	A ₀	A ₁ ^c
tpreturn	A ₀	A ₀
tpforward	A ₀	A ₀
tpterm	I ₀	I ₀
All other ATMI functions	A ₀	A ₁

Note: ^a This state change occurs only if the descriptor is not associated with the caller's transaction.

^b This state change occurs only if the descriptor is associated with the caller's transaction.

^c If the descriptor is associated with the caller's transaction, then `tpsuspend()` returns a protocol error.

The following state table indicates the state of a connection descriptor returned by `tpconnect()` or provided by a service invocation in the `TPSVCINFO` structure. For primitives that do not take a connection descriptor, the state changes apply to all connection descriptors, unless otherwise noted.

The states are as follows:

- C₀ - No descriptor
- C₁ - `tpconnect()` descriptor send-only
- C₂ - `tpconnect()` descriptor receive-only
- C₃ - `TPSVCINFO` descriptor send-only
- C₄ - `TPSVCINFO` descriptor receive-only

Connection Request Descriptor States

Function/Event	States				
	C ₀	C ₁	C ₂	C ₃	C ₄
<code>tpconnect</code> with <code>TPSENDONLY</code>	C ₁ ^a				
<code>tpconnect</code> with <code>TPRECVONLY</code>	C ₂ ^a				
<code>tpservice</code> with flag <code>TPSENDONLY</code>	C ₃ ^b				
<code>tpservice</code> with flag <code>TPRECVONLY</code>	C ₄ ^b				
<code>tprecv</code> /no event			C ₂		C ₄
<code>tprecv</code> / <code>TPEV_SENDONLY</code>			C ₁		C ₃

Connection Request Descriptor States

Function/Event	States				
	C ₀	C ₁	C ₂	C ₃	C ₄
tprecv/TPEV_DISCONIMM			C ₀		C ₀
tprecv/TPEV_SVCERR			C ₀		
tprecv/TPEV_SVCFALL			C ₀		
tprecv/TPEV_SVCSUCC			C ₀		
tpsend/no event		C ₁		C ₃	
tpsend with flag TPRECVONLY		C ₂		C ₄	
tpsend/TPEV_DISCONIMM		C ₀		C ₀	
tpsend/TPEV_SVCERR		C ₀			
tpsend/TPEV_SVCFALL		C ₀			
tpterm (client only)	C ₀	C ₀			
tpcommit (originator only)	C ₀	C ₀ ^c	C ₀ ^e		
tpsuspend (originator only)	C ₀	C ₁ ^d	C ₂ ^d		
tpabort (originator only)	C ₀	C ₀ ^c	C ₀ ^c		
tpdiscon		C ₀	C ₀		
tpreturn (CONV server)		C ₀	C ₀	C ₀	C ₀
tpforward (CONV server)		C ₀	C ₀	C ₀	C ₀
All other ATMI functions	C ₀	C ₁	C ₂	C ₃	C ₄

Note: ^a If process is in transaction mode and TPNOTRAN is not specified, the connection is in transaction mode.

^b If the TPTRAN flag is set, the connection is in transaction mode.

^c If the connection is not in transaction mode, no state change.

^d If the connection is in transaction mode, then `tpsuspend()` returns a protocol error.

TX State Transitions The BEA Tuxedo system ensures that a process calls the TX functions in a legal sequence. When an illegal state transition is attempted (that is, a call from a state with a blank transition entry), the called function returns `TX_PROTOCOL_ERROR`. The legal states and transitions for the TX functions are shown in the table below. Calls that return failure do not make state transitions, unless they are described by specific state table entries. Any BEA Tuxedo system client or server is allowed to use the TX functions.

The states are defined below:

- **S₀**: No RMs have been opened or initialized. An application association cannot start a global transaction until it has successfully called `tx_open`.
- **S₁**: An application association has opened its RM but is not in a transaction. Its `transaction_control` characteristic is `TX_UNCHAINED`.
- **S₂**: An application association has opened its RM but is not in a transaction. Its `transaction_control` characteristic is `TX_CHAINED`.
- **S₃**: An application association has opened its RM and is in a transaction. Its `transaction_control` characteristic is `TX_UNCHAINED`.
- **S₄**: An application association has opened its RM and is in a transaction. Its `transaction_control` characteristic is `TX_CHAINED`.

Function	States				
	S ₀	S ₁	S ₂	S ₃	S ₄
<code>tx_begin</code>		S ₃	S ₄		
<code>tx_close</code>	S ₀	S ₀	S ₀		
<code>tx_commit -> TX_SET1</code>				S ₁	S ₄
<code>tx_commit -> TX_SET2</code>					S ₂
<code>tx_info</code>		S ₁	S ₂	S ₃	S ₄

Function	States				
	S ₀	S ₁	S ₂	S ₃	S ₄
tx_open	S ₁	S ₁	S ₂	S ₃	S ₄
tx_rollback -> TX_SET1				S ₁	S ₄
tx_rollback -> TX_SET2					S ₂
tx_set_commit_return		S ₁	S ₂	S ₃	S ₄
tx_set_transaction_control control = TX_CHAINED		S ₂	S ₂	S ₄	S ₄
tx_set_transaction_control control = TX_UNCHAINED		S ₁	S ₁	S ₃	S ₃
tx_set_transaction_timeout		S ₁	S ₂	S ₃	S ₄

- TX_SET1 denotes any of the following: TX_OK, TX_ROLLBACK, TX_MIXED, TX_HAZARD, or TX_COMMITTED. TX_ROLLBACK is not returned by tx_rollback() and TX_COMMITTED is not returned by tx_commit().
- TX_SET2 denotes any of the following: TX_NO_BEGIN, TX_ROLLBACK_NO_BEGIN, TX_MIXED_NO_BEGIN, TX_HAZARD_NO_BEGIN, or TX_COMMITTED_NO_BEGIN. TX_ROLLBACK_NO_BEGIN is not returned by tx_rollback() and TX_COMMITTED_NO_BEGIN is not returned by tx_commit().
- If TX_FAIL is returned on any call, the application process is in an undefined state with respect to the above table.
- When tx_info() returns either TX_ROLLBACK_ONLY or TX_TIMEOUT_ROLLBACK_ONLY in the transaction state information, the transaction is marked rollback-only and will be rolled back whether the application program calls tx_commit() or tx_rollback().

See Also [buffer\(3c\)](#), [tpadvertise\(3c\)](#), [tpalloc\(3c\)](#), [tpbegin\(3c\)](#), [tpcall\(3c\)](#), [tpconnect\(3c\)](#), [tpgetctxt\(3c\)](#), [tpinit\(3c\)](#), [tpopen\(3c\)](#), [tpservice\(3c\)](#), [tpsetctxt\(3c\)](#), [tuxtypes\(5\)](#), [typesw\(5\)](#)

AEMsetblockinghook(3c)

Name AEMsetblockinghook() - establish an application-specific blocking hook function

Synopsis #include <atmi.h>
int AEMsetblockinghook(_TM_FARPROC)

Description AEMsetblockinghook() is an “ATMI Extension for Mac” that allows a Mac task to install a new function which the ATMI networking software uses to implement blocking ATMI calls. It takes a pointer to the procedure instance address of the blocking function to be installed.

A default function, by which blocking ATMI calls are handled, is included. The function AEMsetblockinghook() gives the application the ability to execute its own function at “blocking” time in place of the default function. If called with a NULL pointer, the blocking hook function is reset to the default function.

When an application invokes a blocking ATMI operation, the operation is initiated and then a loop is entered which is equivalent to the following pseudocode:

```
for(;;) {
    execute operation in non-blocking mode
    if error
        break;
    if operation complete
        break;
    while(BlockingHook())
        ;
}
```

Return Values AEMsetblockinghook() returns a pointer to the procedure-instance of the previously installed blocking function. The application or library that calls the AEMsetblockinghook() function should save this return value so that it can be restored if necessary. (If “nesting” is not important, the application may simply discard the value returned by AEMsetblockinghook() and eventually use AEMsetblockinghook(NULL) to restore the default mechanism.) AEMsetblockinghook() returns NULL on error and sets tperrno() to indicate the error condition.

Errors Under failure, AEMsetblockinghook() sets tperrno() to one of the following values.

[TPEPROTO]

`AEMsetblockinghook()` was called while a blocking operation was in progress.

Portability This interface is supported only in Mac clients.

Notices The blocking function is reset after `tpterm(3c)` is called by the application.

AEOaddtypesw(3c)

Name AEOaddtypesw() - install or replace a user-defined buffer type at execution time

Synopsis #include <atmi.h>
#include <tmtypes.h>

```
int FAR PASCAL AEOaddtypesw(TMTYPESW *newtype)
```

Description AEOaddtypesw() is an “ATMI Extension for OS/2” that allows an OS/2 client to install a new, or replace an existing user defined buffer type at execution time. The argument to this function is a pointer to a TMTYPESW structure that contains the information for the buffer type to be installed.

If the `type()` and the `subtype()` match an existing buffer type already installed, then all the information is replaced with the new buffer type. If the information does not match the `type()` and the `subtype()` fields, then the new buffer type is added to the existing types registered with the BEA Tuxedo system. For new buffer types, make sure that the WSH and other BEA Tuxedo system processes involved in the call processing have been built with the new buffer type.

The function pointers in the TMTYPESW array should appear in the Module Definition file of the application in the EXPORTS section.

The application can also use the BEA Tuxedo system’s defined buffer type routines. The application and the BEA Tuxedo system’s buffer routines can be intermixed in one user defined buffer type.

Return Values Upon success, AEOaddtypesw() returns the number of user buffer types in the system. Upon failure, AEOaddtypesw() returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, AEOaddtypesw() sets `tperrno()` to one of the following values.

[TPEINVAL]

AEOaddtypesw() was called and the `type` parameter was NULL.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

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Portability This interface is supported only in Windows clients. The preferred way to install a type switch is to add it to the BEA Tuxedo system typeswitch DLL. Please refer to *Setting Up a BEA Tuxedo Application* for more information.

Notices FAR PASCAL is used only for the 16-bit OS/2 environment.

Examples

```
#include <os2.h>
#include <atmi.h>
#include <tmtypes.h>

int FAR PASCAL Nfinit(char FAR *, long);
int (FAR PASCAL * lpFinit)(char FAR *, long);
int FAR PASCAL Nfreinit(char FAR *, long);
int (FAR PASCAL * lpFreinit)(char FAR *, long);
int FAR PASCAL Nfuninit(char FAR *, long);
int (FAR PASCAL * lpFuninit)(char FAR *, long);

TMTYPESW      newtype =
{
  "MYFML",      "",      1024,      NULL,      NULL,
  NULL,      _fprecv,      _fpostsend,      _fpostrecv,      _fencdec,
  _froute
};

newtype.initbuf = Nfinit;
newtype.reinitbuf = Nfreinit;
newtype.uninitbuf = Nfuninit;

if(AEOaddtypesw(newtype) == -1) {
    userlog("AEOaddtypesw failed %s", tpstrerror(tperrno));
}

int
FAR PASCAL
Nfinit(char FAR *ptr, long len)
{
    .....
    return(1);
}

int
FAR PASCAL
Nfreinit(char FAR *ptr, long len)
{
    .....
    return(1);
}
```

```
int
FAR PASCAL
Nfuninit(char FAR *ptr, long mdlen)
{
    .....
    return(1);
}
```

The application Module Definition File:

```
; EXAMPLE.DEF file

NAME          EXAMPLE

DESCRIPTION    'EXAMPLE for OS/2'

EXETYPE       OS/2

EXPORTS
    Nfinit
    Nfreinit
    Nfuninit
    ....

See Also      buildwsh(1), buffer(3c), typesw(5)
```

AEPisblocked(3c)

Name	AEPisblocked() - determine if a blocking call is in progress
Synopsis	<pre>#include <atmi.h> int far pascal AEPisblocked(void)</pre>
Description	AEPisblocked() is an “ATMI Extension for OS/2 Presentation Manager” that allows a OS/2 PM task to determine if it is executing while waiting for a previous blocking call to complete.
Return Values	If there is an outstanding blocking function awaiting completion, AEPisblocked() returns 1. Otherwise, it returns 0.
Errors	No errors are returned.
Portability	This interface is supported only in OS/2 PM clients.
Comments	Although a blocking ATMI call appears to an application as though it “blocks,” the OS/2 PM ATMI DLL has to relinquish the processor to allow other applications to run. This means that it is possible for the application which issued the blocking call to be re-entered, depending on the message(s) it receives. In this instance, the AEPisblocked() function can be used to ascertain whether the task has been re-entered while waiting for an outstanding blocking call to complete. Note that ATMI prohibits more than one outstanding call per thread.
See Also	AEMsetblockinghook(3c)

AEWsetunsol(3c)

Name	AEWsetunsol() - post Windows message for BEA Tuxedo unsolicited event
Synopsis	<pre>#include <windows.h> #include <atmi.h> int far pascal AEWsetunsol(HWND hWnd, WORD wMsg)</pre>
Description	<p>In certain Microsoft Windows programming environments it is natural and convenient for the BEA Tuxedo system's unsolicited messages to be posted to the Windows event message queue.</p> <p>AEWsetunsol() controls which window to notify, <i>hWnd</i>, and which Windows message type to post, <i>wMsg</i>. When a BEA Tuxedo unsolicited message arrives, a Windows message is posted. <i>lParam()</i> is set to the BEA Tuxedo system buffer pointer, or zero if none. If <i>lParam()</i> is non-zero, the application must call <i>tpfree()</i> to release the buffer.</p> <p>If <i>wMsg</i> is zero, any future unsolicited messages will be logged and ignored.</p> <p>In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to AEWsetunsol().</p>
Return Values	Upon failure, AEWsetunsol() returns -1 and sets <i>tperrno()</i> to indicate the error condition.
Errors	<p>Upon failure, AEWsetunsol() sets <i>tperrno()</i> to one of the following values.</p> <p>[TPESYSTEM] A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.</p> <p>[TPEOS] An operating system error has occurred.</p>
Portability	This interface is supported only in Microsoft Windows clients.
Notices	AEWsetunsol() posting of Windows messages may not be activated simultaneously with a <i>tpsetunsol()</i> callback routine. The most recent <i>tpsetunsol()</i> or AEWsetunsol() request controls how unsolicited messages will be handled.
See Also	<i>tpsetunsol(3c)</i>

buffer(3c)

Name `buffer()` - semantics of elements in `tmttype_sw_t`

Synopsis

```
int      /* Initialize a new data buffer */
_tminitbuf(char *ptr, long len)
int      /* Re-initialize a re-allocated data buffer */
_tmreinitbuf(char *ptr, long len)
int      /* Un-initialize a data buffer to be freed */
_tmuninitbuf(char *ptr, long len)
long     /* Process buffer before sending */
_tmpresend(char *ptr, long dlen, long mdlen)
void     /* Process buffer after sending */
_tmpostsend(char *ptr, long dlen, long mdlen)
long     /* Process buffer after receiving */
_tmpostrecv(char *ptr, long dlen, long mdlen)
long     /* Encode/decode a buffer to/from a transmission format */
_tmencdec(int op, char *encobj, long elen, char *obj, long olen)
int      /* Determine server group for routing based on data */
_tmroute(char *routing_name, char *service, char *data, long \ len, char *group)
int      /* Evaluate boolean expression on buffer's data */
_tmfilter(char *ptr,
long dlen, char *expr, long exprlen)
int      /* Extract buffer's data based on format string */
_tmformat(char *ptr,
long dlen, char *fmt, char *result, long \ maxresult)
long     /* Process buffer before sending, possibly generating copy */
_tmpresend2(char *iptr, long ilen, long mdlen, char *optr, long olen, int *flags )
```

Description This page describes the semantics of the elements and routines defined in the `tmttype_sw_t` structure. These descriptions are necessary for adding new buffer types to a process buffer type switch, `tm_typesw`. The switch elements are defined in `typesw(5)`. The function names used in this entry are templates for the actual function names defined by the BEA Tuxedo system as well as by applications adding their own buffer types. The names map to the switch elements very simply: the template names are made by taking each function pointer's element name and prepending `_tm` (for example, the element `initbuf` has the function name `_tminitbuf()`).

The element `type` must be non-NULL and up to 8 characters in length. The element `subtype` can be NULL, a string of up to 16 characters, or the wild card character, `"*"`. If `type` is not unique in the switch, then `subtype` must be used; the combination of `type` and `subtype` must uniquely identify an element in the switch.

A given type can have multiple sub-types. If all sub-types are to be treated the same for a given type, then the wild card character, “*”, can be used. Note that the function `tptypes()` can be used to determine a buffer’s type and sub-type if sub-types need to be distinguished. If some subset of the sub-types within a particular type are to be treated individually, and the rest are to be treated identically, then those which are to be singled out with specific sub-type values should appear in the switch before the sub-type designated with the wild card. Thus, searching for types and sub-types in the switch is done from top to bottom, and the wild card sub-type entry accepts any “leftover” type matches.

`dfltsize()` is used when allocating or re-allocating a buffer. The larger of `dfltsize()` and the routines’ *size* parameter is used to create or re-allocate a buffer. For some types of structures, like a fixed sized C structure, the buffer size should equal the size of the structure. If `dfltsize()` is set to this value, then the caller may not need to specify the buffer’s length to routines in which a buffer is passed. `dfltsize()` can be 0 or less; however, if `tpalloc()` or `tprealloc()` is called and its *size* parameter is also less than or equal to 0, then the routine will fail. It is not recommended to set `dfltsize()` to a value less than 0.

Routine Specifics The names of the functions specified below are template names used within the BEA Tuxedo system. Any application adding new routines to the buffer type switch must use names that correspond to real functions, either provided by the application or library routines. If a NULL function pointer is stored in a buffer type switch entry, the BEA Tuxedo system calls a default function that takes the correct number and type of arguments, and returns a default value.

_tminitbuf `_tminitbuf()` is called from within `tpalloc()` after a buffer has been allocated. It is passed a pointer to the new buffer, `ptr()`, along with its size so that the buffer can be initialized appropriately. `len()` is the larger of the length passed into `tpalloc()` and the default specified in `dfltsize()` in that type’s switch entry. Note that `ptr()` will never be NULL due to the semantics of `tpalloc()` and `tprealloc()`. Upon successful return, `ptr()` is returned to the caller of `tpalloc()`.

If a single switch entry is used to manipulate many sub-types, then the writer of `_tminitbuf()` can use `tptypes()` to determine the sub-type.

If no buffer initialization needs to be performed, specify a NULL function pointer.

Upon success, `_tminitbuf()` returns 1. If the function fails, it returns -1 causing `tpalloc()` to also return failure setting `tperrno()` to `TPESYSTEM`.

_tmreinitbuf `_tmreinitbuf()` behaves the same as `_tminitbuf()` except it is used to re-initialize a re-allocated buffer. It is called from within `tprealloc()` after the buffer has been re-allocated.

If no buffer re-initialization needs to be performed, specify a NULL function pointer.

Upon success, `_tmreinitbuf()` returns 1. If the function fails, it returns -1 causing `tprealloc()` to also return failure setting `tperrno()` to `TPESYSTEM`.

_tmuninitbuf `_tmuninitbuf()` is called by `tpfree()` before the data buffer is freed. `_tmuninitbuf()` is passed a pointer to the application portion of a data buffer, along with its size, and can be used to clean up any structures or state information associated with that buffer. `ptr()` will never be NULL due to `tpfree()`'s semantics. Note that `_tmuninitbuf()` should not free the buffer itself. The `tpfree()` function is called automatically for any `FLD_PTR` fields in the data buffer.

If no processing needs to be performed before freeing a buffer, specify a NULL function pointer.

Upon success, `_tmuninitbuf()` returns 1. If the function fails, it returns -1 causing `tpfree()` to print a log message.

_tmpresent `_tmpresent()` is called before a buffer is sent in `tpcall()`, `tpacall()`, `tpconnect()`, `tpsend()`, `tpbroadcast()`, `tpnotify()`, `tpreturn()`, or `tpforward()`. It is also called after `_tmroute()` but before `_tmencdec()`. If `ptr()` is non-NULL, pre-processing is performed on a buffer before it is sent. `_tmpresent()`'s first argument, `ptr()`, is the application data buffer passed into the send call. Its second argument, `dlen()`, is the data's length as passed into the send call. Its third argument, `mdlen()`, is the actual size of the buffer in which the data resides.

One important requirement on this function is that it ensures that when the function returns, the data pointed to by `ptr()` can be sent "as is." That is, since `_tmencdec()` is called only if the buffer is being sent to a dissimilar machine, `_tmpresent()` must ensure upon return that no element in `ptr()`'s buffer is a pointer to data that is not contiguous to the buffer.

If no pre-processing needs to be performed on the data and the amount of data the caller specified is the same as the amount that should be sent, specify a NULL function pointer. The default routine returns `dlen()` and does nothing to the buffer.

If `_tmpresent2()` is not NULL, `_tmpresent()` is not called and `_tmpresent2()` is called in its place.

Upon success, `_tmppresent()` returns the amount of data to be sent. If the function fails, it returns -1 causing `_tmppresent()`'s caller to also return failure setting `tperrno()` to `TPESYSTEM`.

`_tmppostsend` `_tmppostsend()` is called after a buffer is sent in `tpcall()`, `tpbroadcast()`, `tpnotify()`, `tpacall()`, `tpconnect()`, or `tpsend()`. This routine allows any post-processing to be performed on a buffer after it is sent and before the function returns. Because the buffer passed into the send call should not be different upon return, `_tmppostsend()` is called to repair a buffer changed by `_tmppresent()`. This function's first argument, `ptr()`, points to the data sent as a result of `_tmppresent()`. The data's length, as returned from `_tmppresent()`, is passed in as this function's second argument, `dlen()`. The third argument, `mdlen()`, is the actual size of the buffer in which the data resides. This routine is called only when `ptr()` is non-NULL.

If no post-processing needs to be performed, specify a NULL function pointer.

`_tmppostrecv` `_tmppostrecv()` is called after a buffer is received, and possibly decoded, in `tpgetreply()`, `tpcall()`, `tprecv()`, or in the BEA Tuxedo system's server abstraction, and before it is returned to the application. If `ptr()` is non-NULL, `_tmppostrecv()` allows post-processing to be performed on a buffer after it is received and before it is given to the application. Its first argument, `ptr()`, points to the data portion of the buffer received. Its second argument, `dlen()`, specifies the data's size coming in to `_tmppostrecv()`. The third argument, `mdlen()`, specifies the actual size of the buffer in which the data resides.

If `_tmppostrecv()` changes the data length in post-processing, it must return the data's new length. The length returned is passed up to the application in a manner dependent on the call used (for example, `tpcall()` sets the data length in one of its arguments for the caller to check upon return).

The buffer's size might not be large enough for post-processing to succeed. If more space is required, `_tmppostrecv()` returns the negative absolute value of the desired buffer size. The calling routine then resizes the buffer, and calls `_tmppostrecv()` a second time.

If no post-processing needs to be performed on the data and the amount of data received is the same as the amount that should be returned to the application, specify a NULL function pointer. The default routine returns `dlen()` and does nothing to the buffer.

On success, `_tmpostrecv()` returns the size of the data the application should be made aware of when the buffer is passed up from the corresponding receive call. If the function fails, it returns -1 causing `_tmpostrecv()`'s caller to return failure, setting `tperrno()` to `TPESYSTEM`.

`_tmencdec` `_tmencdec()` is used to encode/decode a buffer sent/received over a network to/from a machine having different data representations. The BEA Tuxedo system recommends the use of XDR; however, any encoding/decoding scheme can be used that obeys the semantics of this routine.

This function is called by `tpcall()`, `tpacall()`, `tpbroadcast()`, `tpnotify()`, `tpconnect()`, `tpsend()`, `tpreturn()`, or `tpforward()` to encode the caller's buffer only when it is being sent to an "unlike" machine. In these calls, `_tmencdec()` is called after both `_tmroute()` and `_tmprsend()`, respectively. Recall from the description of `_tmprsend()` that the buffer passed into `_tmencdec()` contains no pointers to data that is not contiguous to the buffer.

On the receiving end, `tprecv()`, `tpgetrply()`, the receive half of `tpcall()` and the server abstraction all call `_tmencdec()` to decode a buffer after they have received it from an "unlike" machine but before calling `_tmpostrecv()`.

`_tmencdec()`'s first argument, `op()`, specifies whether the function is encoding or decoding data. `op()` can be one of `TMENCODE` or `TMDECODE`.

When `op()` is `TMENCODE`, `encobj()` points to a buffer allocated by the BEA Tuxedo system where the encoded version of the data will be copied. The un-encoded data resides in `obj()`. That is, when `op()` is `TMENCODE`, `_tmencdec()` transforms `obj()` to its encoded format and places the result in `encobj()`. The size of the buffer pointed to by `encobj()` is specified by `elen()` and is at least four times the size of the buffer pointed to by `obj()` whose length is `olen()`. `olen()` is the length returned by `_tmprsend`. `_tmencdec()` returns the size of the encoded data in `encobj()` (that is, the amount of data to actually send). `_tmencdec()` should not free either of the buffers passed into the function.

When `op()` is `TMDECODE`, `encobj()` points to a buffer allocated by the BEA Tuxedo system where the encoded version of the data resides as read off a communication endpoint. The length of the buffer is `elen()`. `obj()` points to a buffer that is at least the same size as the buffer pointed to by `encobj()` into which the decoded data is copied. The length of `obj()` is `olen()`. As `obj()` is the buffer ultimately returned to the application, this buffer may be grown by the BEA Tuxedo system before calling `_tmencdec()` to ensure that it is large enough to hold the decoded data. `_tmencdec()` returns the size of the decoded data in `obj()`. After `_tmencdec()` returns,

`_tmpostrecv()` is called with `obj()` passed as its first argument, `_tmencdec()`'s return value as its second, and `olen()` as its third. `_tmencdec()` should not free either of the buffers passed into the function.

`_tmencdec()` is called only when non-NULL data needs to be encoded or decoded.

If no encoding or decoding needs to be performed on the data even when dissimilar machines exist in the network, specify a NULL function pointer. The default routine returns either `olen()` (`op()` equals `TMENCODE`) or `elen()` (`op()` equals `TMDECODE`).

On success, `_tmencdec()` returns a non-negative length as described above. If the function fails, it returns -1 causing `_tmencdec()`'s caller to return failure, setting `tperrno()` to `TPESYSTEM`.

`_tmroute` The default for message routing is to route a message to any available server group that offers the desired service. Each service entry in the `UBBCONFIG` file can specify the logical name of some routing criteria for the service using the `ROUTING` parameter. Multiple services can share the same routing criteria. In the case that a service has a routing criteria name specified, `_tmroute()` is used to determine the server group to which a message is sent based on data in the message. This mapping of data to server group is called "data-dependent routing." `_tmroute()` is called before a buffer is sent (and before `_tmprsend()` and `_tmencdec()` are called) in `tpcall()`, `tpacall()`, `tpconnect()`, and `tpforward()`.

`routing_name` is the logical name of the routing criteria (as specified in the `UBBCONFIG` file) and is associated with every service that needs data dependent routing. `service` is the name of the service for which the request is being made. The parameter `data` points to the data that is being transmitted in the request and `len` is its length. Unlike the other routines described in these pages, `_tmroute()` is called even when `ptr()` is NULL. The `group` parameter is used to return the name of the group to which the request should be routed. This group name must match one of the group names listed in the `UBBCONFIG` file (and one that is active at the time the group is chosen). If the request can go to any available server providing the specified service, `group` should be set to the NULL string and the function should return 1.

If data dependent routing is not needed for the buffer type, specify a NULL function pointer. The default routine sets `group` to the NULL string and returns 1.

Upon success, `_tmroute()` returns 1. If the function fails, it returns -1 causing `_tmroute()`'s caller to also return failure; as a result, `tperrno()` is set to `TPESYSTEM`. If `_tmroute()` fails because a requested server or service is not available, `tperrno()` is set to `TPENOENT`.

If *group* is set to the name of an invalid server group, the function calling `_tmroute()` will return an error and set `tperrno()` to `TPESYSTEM`.

_tmfilter `_tmfilter()` is called by the EventBroker server to analyze the contents of a buffer posted by `tpost()`. An expression provided by the subscriber (`tpsubscribe()`) is evaluated with respect to the buffer's contents. If the expression is true, `_tmfilter()` returns 1 and the EventBroker performs the subscription's notification action. Otherwise, if `_tmfilter()` returns 0, the EventBroker does not consider this posting a "match" for the subscription.

If `exprlen()` is -1, `expr()` is interpreted as a null-terminated character string. Otherwise `expr()` is interpreted as `exprlen` bytes of binary data. An `exprlen` of 0 indicates no expression.

If filtering does not apply to this buffer type, specify a NULL function pointer. The default routine returns 1 if there is no expression or if `expr()` is an empty null-terminated string. Otherwise the default routine returns 0.

_tmformat `_tmformat()` is called by the EventBroker server to convert a buffer's data into a printable string, based on a format specification named *fmt*. The EventBroker converts posted buffers to strings as input for `userlog()` or `system()` notification actions.

The output is stored as a character string in the memory location pointed to by `result()`. Up to `maxresult()` bytes are written in `result()`, including a terminating null character. If `result()` is not large enough, `_tmformat()` truncates its output. The output string is always null terminated.

On success, `_tmformat()` returns a non-negative integer. 1 means success, 2 means the output string is truncated. If the function fails, it returns -1 and stores an empty string in `result()`.

If formatting does not apply to this buffer type, specify a NULL function pointer. The default routine succeeds and returns an empty string in `result()`.

_tmpresend2 `_tmpresend2()` is called before a buffer is sent in `tpcall()`, `tpacall()`, `tpconnect()`, `tpsend()`, `tpbroadcast()`, `tpnotify()`, `tpreturn()`, and `tpforward()`. It is also called after `_tmroute()` but before `_tmencdec()`. If *iptr* is not NULL, preprocessing is performed on a buffer before the buffer is sent.

The first argument to `_tmpresend2()`, *iptr*, is the application data buffer passed into the send call. The second argument, *ilen*, is the length of the data as passed into the send call. The third argument, *mdlen*, is the actual size of the buffer in which the data resides.

Unlike `_tmpsend()`, `_tmpsend2()` receives a pointer, `optr`, which is used to pass a pointer to a buffer into which the data in `iptr` can be placed, after any required processing is done. Use this pointer if you want to use a new buffer for the data modified by `_tmpsend2()` instead of modifying the input buffer. The fifth argument, `olen`, is the size of the `optr` buffer. The sixth argument, `flags`, tells `_tmpsend2()` whether the buffer being processed is the parent buffer (the one being sent). The `flags` argument is returned by `_tmpsend2()` to indicate the results of processing.

The size of the `optr` buffer may not be large enough for successful postprocessing. If more space is required, `_tmpsend2()` returns the negative absolute value of the desired buffer size. All `olen` bytes of the `optr` buffer are preserved. The calling routine then resizes the buffer and calls `_tmpsend2()` a second time.

If no postprocessing needs to be performed on the data, and the amount of data received is the same as the amount that should be returned to the application, specify a NULL function pointer. The default routine returns `ilen` and does not modify the buffer.

The following is a valid flag on input to `_tmpsend2()`:

[TMPARENT]

This is the parent buffer (the one being sent).

The flags returned in `flags` specify the results of `_tmpsend2()`. Possible values are:

[TMUSEIPTR]

`_tmpsend2()` was successful: the processed data is in the buffer referenced by `iptr`, and the return value contains the length of the data to be sent.

[TMUSEOPTR]

`_tmpsend2()` was successful: the processed data is in the buffer referenced by `optr`, and the return value contains the length of the data to be sent.

If `TMUSEOPTR` is returned, the processing done after messages are transmitted is different from the processing done by `_tmpsend()`: the `iptr` buffer remains unchanged and `_tmpsend()` is not called. If `TMUSEIPTR` is returned, `_tmpsend()` is called, as it is called for `_tmpsend()`. It is the responsibility of the caller to allocate and to free or cache the `optr` buffer.

There are several reasons why you may want to use this approach for a typed buffer:

- The buffer created by processing for transmission is larger than the maximum length allowed for the input buffer.
- Undoing the processing to prepare a buffer for transmission is so complicated that it is easier to copy the data to a different buffer.

The `_tmpresend2()` function ensures that when a function returns, the data in the buffer to be sent can be sent without further processing. Because `_tmncdec()` is called only if the buffer is being sent to a dissimilar machine, `_tmpresend2()` ensures, upon return, that all data is stored contiguously in the buffer to be sent.

If no preprocessing needs to be performed on the data, and the amount of data specified by the caller is the same as the amount that should be sent, specify a `NULL` function pointer for `_tmpresend2()` in the buffer type switch. If `_tmpresend2()` is `NULL`, `_tmpresend()` is called by default.

Upon success, `_tmpresend2()` returns the amount of data to be sent or, if a larger buffer is needed, the negative absolute value of the desired buffer size. If the function fails, it returns -1, causing the caller of `_tmpresend2()` to also return failure, setting `tperrno()` to `TPESYSTEM`.

See Also `tpacall(3c)`, `tpalloc(3c)`, `tpcall(3c)`, `tpconnect(3c)`, `tpdiscon(3c)`, `tpfree(3c)`, `tpgetrply(3c)`, `tpgprio(3c)`, `tprealloc(3c)`, `tprecv(3c)`, `tpsend(3c)`, `tpsprio(3c)`, `tptypes(3c)`, `tuatypes(5)`

catgets(3c)

- Name** `catgets()` - read a program message
- Synopsis** `#include <nl_types.h>`
 `char *catgets (nl_catd catd, int set_num, int msg_num, char *s)`
- Description** `catgets()` attempts to read message *msg_num*, in set *set_num*, from the message catalogue identified by *catd*. *catd* is a catalogue descriptor returned from an earlier call to `catopen()`. *s* points to a default message string which will be returned by `catgets()` if the identified message catalogue is not currently available.
- A thread in a multithreaded application may issue a call to `catgets()` while running in any context state, including `TPINVALIDCONTEXT`.
- Diagnostics** If the identified message is retrieved successfully, `catgets()` returns a pointer to an internal buffer area containing the null terminated message string. If the call is unsuccessful because the message catalogue identified by *catd* is not currently available, a pointer to *s* is returned.
- See Also** `catopen`, `catclose(3c)`

catopen, catclose(3c)

Name `catopen()`, `catclose()` - open/close a message catalogue

Synopsis

```
#include <nl_types.h>
nl_catd catopen (char *name, int oflag)
int catclose (nl_catd catd)
```

Description `catopen()` opens a message catalogue and returns a catalogue descriptor. *name* specifies the name of the message catalogue to be opened. If *name* contains a “/” then *name* specifies a pathname for the message catalogue. Otherwise, the environment variable `NLSPATH` is used. If `NLSPATH` does not exist in the environment, or if a message catalogue cannot be opened in any of the paths specified by `NLSPATH`, then the default path is used (see `nl_types(5)`).

The names of message catalogues, and their location in the filestore, can vary from one system to another. Individual applications can choose to name or locate message catalogues according to their own special needs. A mechanism is therefore required to specify where the catalogue resides.

The `NLSPATH` variable provides both the location of message catalogues, in the form of a search path, and the naming conventions associated with message catalogue files. For example:

```
NLSPATH=/nlslib/%L/%N.cat:/nlslib/%N/%L
```

The metacharacter `%` introduces a substitution field, where `%L` substitutes the current setting of the `LANG` environment variable (see following section), and `%N` substitutes the value of the *name* parameter passed to `catopen()`. Thus, in the above example, `catopen()` will search in `/nlslib/$LANG/name.cat`, then in `/nlslib/name/$LANG`, for the required message catalogue.

`NLSPATH` will normally be set up on a system wide basis (for example, in `/etc/profile`) and thus makes the location and naming conventions associated with message catalogues transparent to both programs and users.

The following table lists the full set of metacharacters.

<code>%N</code>	The value of the name parameter passed to <code>catopen</code> .
<code>%L</code>	The value of <code>LANG</code> .

%l	The value of the language element of LANG.
----	--

%t	The value of the territory element of LANG.
----	---

%c	The value of the codeset element of LANG.
----	---

%%	A single %.
----	-------------

The LANG environment variable provides the ability to specify the user's requirements for native languages, local customs and character set, as an ASCII string in the form LANG=language[_territory[.codeset]]

A user who speaks German as it is spoken in Austria and has a terminal that operates in ISO 8859/1 codeset, would want the setting of the LANG variable to be as follows:

```
LANG=De_A.88591
```

With this setting it should be possible for the user to find relevant catalogues if they exist.

If the LANG variable is not set then the value of LC_MESSAGES as returned by setlocale(3c) is used. If this is NULL then the default path as defined in nl_types(5) is used.

oflag() is reserved for future use and should be set to 0. The results of setting this field to any other value are undefined.

catclose() closes the message catalogue identified by catd.

A thread in a multithreaded application may issue a call to catopen() or catclose() while running in any context state, including TPINVALIDCONTEXT.

Diagnostics If successful, catopen() returns a message catalogue descriptor for use on subsequent calls to catgets() and catclose(). Otherwise catopen() returns (nl_catd) -1. catclose() returns 0 if successful, otherwise -1.

See Also catgets(3c), setlocale(3c), nl_types(5)

decimal(3c)

Name decimal() - decimal conversion and arithmetic routines

Synopsis

```
#include "decimal.h"

int
lddecimal(cp, len, np)          /* load a decimal */
char*cp;                       /* input: location of compacted format */

int
len;                            /* input: length of compacted format */
dec_t*np;                       /* output: location of dec_t format */

void
stdecimal(np, cp, len)         /* store a decimal */
dec_t*np;                      /* input: location of dec_t format */
char*cp;                       /* output: location of compacted format */
int len;                       /* input: length of compacted format */

int
deccmp(n1, n2)                /* compare two decimal numbers */
dec_t*n1;                      /* input: number to be compared */
dec_t*n2;                      /* input: number to be compared */

int
dectoasc(np, cp, len, right) /* convert dec_t to ascii */
dec_t*np;                      /* input: number to be converted */
char*cp;                       /* output: number after conversion */
int len;                       /* input: length of output string */
int right;                     /* input: number of places to right of decimal point */

int
deccvasc(cp, len, np)         /* convert ascii to dec_t */
char*cp;                       /* input: number to be converted */
int len;                       /* input: maximum length of number to be converted */
dec_t*np;                      /* output: number after conversion */

int
dectoint(np, ip)              /* convert int to dec_t */
dec_t*np;                      /* input: number to be converted */
int *ip;                       /* output: number after conversion */

int
deccvint(in, np)             /* convert dec_t to int */
```

```
int in;          /* input: number to be converted */
dec_t*np;       /* output: number after conversion */

int
dectolong(np, lngp)          /* convert dec_t to long */
dec_t*np;                   /* input: number to be converted */
long*lngp;                  /* output: number after conversion */

int
deccvlong(lng, np)          /* convert long to dec_t */
long*lng;                   /* input: number to be converted */
dec_t*np;                   /* output: number after conversion */

int
dectodbl(np, dblp)          /* convert dec_t to double */
dec_t*np;                   /* input: number to be converted */
double *dblp;              /* output: number after conversion */

int
deccvdbl(dbl, np)          /* convert double to dec_t */
double *dbl;               /* input: number to be converted */
dec_t*np;                   /* output: number after conversion */

int
dectoflt(np, fltp)          /* convert dec_t to float */
dec_t*np;                   /* input: number to be converted */
float*fltp;                /* output: number after conversion */

int
deccvflt(flt, np)          /* convert float to dec_t */
double *flt;               /* input: number to be converted */
dec_t*np;                   /* output: number after conversion */

int
decadd(*n1, *n2, *n3)      /* add two decimal numbers */
dec_t*n1;                   /* input: addend */
dec_t*n2;                   /* input: addend */
dec_t*n3;                   /* output: sum */

int
decsub(*n1, *n2, *n3)      /* subtract two decimal numbers */
dec_t*n1;                   /* input: minuend */
dec_t*n2;                   /* input: subtrahend */
dec_t*n3;                   /* output: difference */

int
decmul(*n1, *n2, *n3)      /* multiply two decimal numbers */
dec_t*n1;                   /* input: multiplicand */
dec_t*n2;                   /* input: multiplicand */
dec_t*n3;                   /* output: product */
```

```
int
decdiv(*n1, *n2, *n3)    /* divide two decimal numbers */
dec_t*n1;                /* input: dividend */
dec_t*n2;                /* input: divisor */
dec_t*n3;                /* output: quotient */
```

Description These functions allow storage, conversion, and manipulation of packed decimal data on the BEA Tuxedo system. Note that the format in which the decimal data type is represented on the BEA Tuxedo system is different from its representation under CICS.

A thread in a multithreaded application may issue a call to any of the decimal conversion functions while running in any context state, including `TPINVALIDCONTEXT`.

Native Decimal Representation Decimals are represented on native BEA Tuxedo system nodes using the `dec_t` structure. This definition of this structure is as follows:

```
#define DECSIZE                16
struct decimal {
    short dec_exp;              /* exponent base 100 */
    short dec_pos;              /* sign: 1=pos, 0=neg, -1=null */
    short dec_ndgts;           /* number of significant digits */
    char  dec_dgts[DECSIZE];   /* actual digits base 100 */
};
typedef struct decimal dec_t;
```

It should never be necessary for programmers to directly access the `dec_t` structure, but it is presented here nevertheless to give an understanding of the underlying data structure. If large amounts of decimal data need to be stored, the `stddecimal()` and `lddecimal()` functions may be used to obtain a more compact format. `dectoasc()`, `dectoint()`, `dectolong()`, `dectodbl()`, and `dectoflt()` allow the conversion of decimals to other data types. `deccvasc()`, `deccvint()`, `deccvlong()`, `deccvdbl()`, and `deccvflt()` allow the conversion of other data types to the decimal data type. `deccmp()` is the function which compares two decimals. It returns -1 if the first decimal is less than the second, 0 if the two decimals are equal, and 1 if the first decimal is greater than the second. A negative value other than -1 is returned if either of the arguments is invalid. `decadd()`, `decsub()`, `decmul()`, and `decdiv()` perform arithmetic operations on decimal numbers.

Return Value Unless otherwise stated, these functions return 0 on success and a negative value on error.

gp_mktime(3c)

Name gp_mktime() - converts a tm structure to a calendar time

Synopsis #include <time.h>
time_t gp_mktime (struct tm *timeptr);

Description gp_mktime() converts the time represented by the tm structure pointed to by *timeptr* into a calendar time (the number of seconds since 00:00:00 Universal Coordinated Time—UTC, January 1, 1970).

The tm structure has the following format.

```
struct tm {
    int tm_sec;      /* seconds after the minute [0, 61] */
    int tm_min;     /* minutes after the hour [0, 59] */
    int tm_hour;    /* hour since midnight [0, 23] */
    int tm_mday;    /* day of the month [1, 31] */
    int tm_mon;     /* months since January [0, 11] */
    int tm_year;    /* years since 1900 */
    int tm_wday;    /* days since Sunday [0, 6] */
    int tm_yday;    /* days since January 1 [0, 365] */
    int tm_isdst;   /* flag for daylight savings time */
};
```

In addition to computing the calendar time, `gp_mktime()` normalizes the supplied tm structure. The original values of the `tm_wday` and `tm_yday` components of the structure are ignored, and the original values of the other components are not restricted to the ranges indicated in the definition of the structure. On successful completion, the values of the `tm_wday` and `tm_yday` components are set appropriately, and the other components are set to represent the specified calendar time, but with their values forced to be within the appropriate ranges. The final value of `tm_mday` is not set until `tm_mon` and `tm_year` are determined.

The original values of the components may be either greater than or less than the specified range. For example, a `tm_hour` of -1 means 1 hour before midnight, `tm_mday` of 0 means the day preceding the current month, and `tm_mon` of -2 means 2 months before January of `tm_year`.

If `tm_isdst` is positive, the original values are assumed to be in the alternate timezone. If it turns out that the alternate timezone is not valid for the computed calendar time, then the components are adjusted to the main timezone. Likewise, if `tm_isdst` is zero,

the original values are assumed to be in the main timezone and are converted to the alternate timezone if the main timezone is not valid. If *tm_isdst* is negative, the correct timezone is determined and the components are not adjusted.

Local timezone information is used as if `gp_mktime()` had called `tzset()`.

`gp_mktime()` returns the specified calendar time. If the calendar time cannot be represented, the function returns the value `(time_t)-1`.

A thread in a multithreaded application may issue a call to `gp_mktime()` while running in any context state, including `TPINVALIDCONTEXT`.

Example What day of the week is July 4, 2001?

```
#include <stdio.h>
#include <time.h>

static char *const wday[] = {
    "Sunday", "Monday", "Tuesday", "Wednesday",
    "Thursday", "Friday", "Saturday", "-unknown-"
};

struct tm time_str;
/*...*/
time_str.tm_year      = 2001 - 1900;
time_str.tm_mon       = 7 - 1;
time_str.tm_mday      = 4;
time_str.tm_hour      = 0;
time_str.tm_min       = 0;
time_str.tm_sec       = 1;
time_str.tm_isdst     = -1;
if (gp_mktime(time_str) == -1)
    time_str.tm_wday=7;
printf("%s\n", wday[time_str.tm_wday]);
```

Notices *tm_year* of the `tm` structure must be for year 1970 or later. Calendar times before 00:00:00 UTC, January 1, 1970 or after 03:14:07 UTC, January 19, 2038 cannot be represented.

Portability On systems where the C compilation system already provides the ANSI C `mktime()` function, `gp_mktime()` simply calls `mktime()` to do the conversion. Otherwise, the conversion is provided directly in `gp_mktime()`.

In the latter case, the TZ environment variable must be set. Note that in many installations, TZ is set to the correct value by default when the user logs on. The default value for TZ is GMT0. The format for TZ is the following.

```
stdoffset[dst[offset],[start[time],end[time]]]
```

std and *dst*

Three or more bytes that designate the standard timezone (*std*) and daylight savings time timezone (*dst*). Only *std* is required. If *dst* is missing, then daylight savings time does not apply in this locale. Upper- and lower-case letters are allowed. Any characters except a leading colon (:), digits, a comma (,), a minus (-) or a plus (+) are allowed.

offset

Indicates the value one must add to the local time to arrive at Coordinated Universal Time. The *offset* has the following form: *hh[:mm[:ss]]*. The minutes (*mm*) and seconds (*ss*) are optional. The hour (*hh*) is required and may be a single digit. The *offset* following *std* is required. If no *offset* follows *dst*, daylight savings time is assumed to be one hour ahead of standard time. One or more digits may be used; the value is always interpreted as a decimal number. The hour must be between 0 and 24, and the minutes (and seconds) if present, between 0 and 59. Out of range values may cause unpredictable behavior. If preceded by a “-”, the timezone is east of the Prime Meridian; otherwise it is west (which may be indicated by an optional preceding “+” sign).

start/time,end/time

Indicates when to change to and back from daylight savings time, where *start/time* describes when the change from standard time to daylight savings time occurs, and *end/time* describes when the change back happens. Each *time* field describes when, in current local time, the change is made. The formats of *start* and *end* are one of the following:

Jn

The Julian day *n* ($1 \leq n < 365$). Leap days are not counted. That is, in all years, February 28 is day 59 and March 1 is day 60. It is impossible to refer to the occasional February 29.

n

The zero-based Julian day ($0 \leq n < 365$). Leap days are counted, and it is possible to refer to February 29.

Mm.n.d

Day *d* ($0 \leq d < 6$) of week *n* of month *m* in the year ($1 \leq n \leq 5, 1 \leq m \leq 12$), where week 5 means “the last *d*-day in month *m*,” which may occur in either the fourth or the fifth week). Week 1 is the first week in which day *d* occurs. Day 0 (zero) is Sunday.

Implementation specific defaults are used for *start* and *end* if these optional fields are not given.

The *time* has the same format as *offset* except that no leading sign (“-” or “+”) is allowed. The default, if *time* is not specified, is 02:00:00.

See Also `ctime(3c)`, `getenv(3c)`, `timezone(4)` in a UNIX system reference manual

nl_langinfo(3c)

- Name** nl_langinfo() - language information
- Synopsis**

```
#include <nl_types.h>
#include <langinfo.h>

char *nl_langinfo (nl_item item);
```
- Description** nl_langinfo() returns a pointer to a null-terminated string containing information relevant to a particular language or cultural area defined in the programs locale. The manifest constant names and values of *item* are defined by langinfo.h.
- For example:
- ```
nl_langinfo (ABDAY_1);
```
- returns a pointer to the string “Dim” if the identified language is French and a French locale is correctly installed; or “Sun” if the identified language is English.
- A thread in a multithreaded application may issue a call to nl\_langinfo() while running in any context state, including TPINVALIDCONTEXT.
- Diagnostics** If setlocale() has not been called successfully, or if langinf0() data for a supported language is either not available or *item* is not defined therein, then nl\_langinfo() returns a pointer to the corresponding string in the C locale. In all locales, nl\_langinfo() returns a pointer to an empty string if *item* contains an invalid setting.
- Notices** The array pointed to by the return value should not be modified by the program. Subsequent calls to nl\_langinfo() may overwrite the array.
- See Also** setlocale(3c), strftime(3c), langinfo(5), nl\_types(5)

# recomp, rematch(3c)

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                | <code>recomp()</code> , <code>rematch()</code> - regular expression compile/execute                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Synopsis            | <pre>char *recomp( pattern-1, [pattern-2, ...], 0 ) char *pattern-1, [*pattern-2, ...];  extern int    _Cerrnbr; extern char  *_Cerrmsg[];  char *rematch( pat, text, [substr-0, ..., substr-9,] 0 ); char *pat, *text, [*substr-0, ..., *substr-9];  extern char  *_Mbegin; extern int    _Merrnbr; extern char  *_Merrmsg[]; extern char   _Eol;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Description         | <p>The routines, <code>recomp()</code> and <code>rematch()</code>, provide a regular expression pattern matching scheme for C. There are two parts: a pattern compiler, <code>recomp()</code>; and a pattern interpreter, <code>rematch()</code>. They are, in effect and in spirit, extensions of the standard routines, <code>regcmp(3)</code> and <code>regex(3)</code>.</p> <p>Significant features are the inclusion of regular expression alternation and portability of the code.</p> <p><code>recomp()</code> compiles a pattern, in the form of a regular expression, into an intermediate code sequence. <code>rematch()</code> then searches user text for a pattern match by interpreting the codes.</p> <p>The code sequence, an array of characters, can be computed off-line by the command <code>rex()</code>, which reads regular expressions from the standard input and writes the corresponding character arrays to the standard output. The output can then be included in a regular C compile.</p> <p>A thread in a multithreaded application may issue a call to <code>recomp()</code> or <code>rematch()</code> while running in any context state, including <code>TPINVALIDCONTEXT</code>.</p> |
| Regular Expressions | <p>The patterns for these routines are given with regular expressions, much like those used in the UNIX System editor, <code>ed(1)</code>. The alternation operator, <code>( )</code>, has been added along with some other practical things. In general, however, there should be few surprises.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Regular expressions (REs) are constructed by applying any of the following production rules one or more times.

## Regular Expressions

| Rule                | Matching Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| character           | itself ( <i>character</i> is any ASCII character except the special ones mentioned below).                                                                                                                                                                                                                                                                                                                                                                                                   |
| \ character         | itself except as follows: <ul style="list-style-type: none"> <li>■ \\ -- newline</li> <li>■ \t -- tab</li> <li>■ \b -- backspace</li> <li>■ \r -- carriage return</li> <li>■ \f -- formfeed</li> </ul>                                                                                                                                                                                                                                                                                       |
| \ special-character | its <i>un</i> special self. The special characters are . * + ?   ( ) [ { and \\. <ul style="list-style-type: none"> <li>. -- any character except the end-of-line character (usually newline or null).</li> <li>^ -- beginning of the line.</li> <li>\$ -- end-of-line character.</li> </ul>                                                                                                                                                                                                 |
| [ class ]           | any character in the class denoted by a sequence of characters and/or ranges. A range is given by the construct <i>character-character</i> . For example, the character class, [a-zA-Z0-9_], will match any alphanumeric character or “_”. To be included in the class, a hyphen, “-”, must be escaped (preceded by a “\”) or appear first or last in the class. A literal “]” must be escaped or appear first in the class. A literal “^” must be escaped if it appears first in the class. |
| [^ class ]          | any character in the complement of the class with respect to the ASCII character set, excluding the end-of-line character.                                                                                                                                                                                                                                                                                                                                                                   |
| RE RE               | the sequence. (catenation)                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| RE   RE             | either the left RE or the right RE. (left to right alternation)                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RE *                | zero or more occurrences of RE.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RE +                | one or more occurrences of RE.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RE ?                | zero or one occurrences of RE.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RE { n }            | <i>n</i> occurrences of RE. <i>n</i> must be between 0 and 255, inclusive.                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Regular Expressions

| Rule        | Matching Text                                                                                                                                                                    |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RE { m, n } | m through n occurrences of RE, inclusive. A missing m is taken to be zero. A missing n denotes m or more occurrences of RE.                                                      |
| ( RE )      | explicit precedence/grouping.                                                                                                                                                    |
| ( RE ) \$ n | the text matching RE is copied into the nth user buffer. n may be 0 through 9. User buffers are cleared before matching begins and loaded only if the entire pattern is matched. |

There are three levels of precedence. In order of decreasing binding strength they are:

- catenation closure (\*,+,?,{...})
- catenation
- alternation (|)

As indicated above, parentheses are used to give explicit precedence.

recomp:  
Regular  
Expression  
Compiler

recomp() concatenates its arguments up to a terminating zero into a single expression. The expression is then compiled into a character array whose address is returned as the function value.

Space for the array is obtained from the standard C routine, malloc(), and may be released (by the user) with a call to the standard free() routine.

recomp() returns a zero (NULL) value if the pattern cannot be processed. The reason is indicated by a global variable, \_Cerrnbr, which is set to a non-zero value on any failure. \_Cerrnbr may be used directly or as an index into a table of error messages, \_Cerrmsg. \_Cerrnbr is reset on each call to recomp(). The possible values for \_Cerrnbr and the corresponding messages from \_Cerrmsg are given below.

### Regular Expression Compiler

| _Cerrnbr | _Cerrmsg[_Cerrnbr]                                                                                                                                                         |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0        | “Ok”                                                                                                                                                                       |
| 1        | “Syntax error at col <i>colnbr</i> , char ‘ <i>char</i> ”<br>( <i>colnbr</i> is the position where the error is discovered; <i>char</i> is the character at that position) |

**Regular Expression Compiler**

| <code>_Cerrnbr</code> | <code>_Cerrmsg[_Cerrnbr]</code>                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------|
| 2                     | “Out of node storage”                                                                                   |
| 3                     | “Out of vector storage”                                                                                 |
| 4                     | “Too many OR's”                                                                                         |
| 5                     | “More than 255 repetitions”<br>(a number in the “ <code>rE{...}</code> ” construct is greater than 255) |
| 6                     | “Negative range”<br>(a range for a character class or a closure is given backward)                      |
| 7                     | “Out of heap storage”<br>( <code>malloc</code> failed)                                                  |

Conditions that cause `_Cerrnbr` values of 2, 3, and 4 relate to the size of `recomp()`'s internal data structures and are unlikely to occur.

The first and second characters of the code array form the least significant byte and the most significant byte, respectively, of an unsigned 16 bit quantity that gives the length, in bytes, of the entire array. This value will prove useful for copying or otherwise manipulating the array.

**rematch:** `rematch()` interprets the code sequence produced by `recomp()` to search a user string for a match. When a match is found, `rematch()` returns as its value the address of the first character beyond the matching text (which may then be used as the text argument in a subsequent call to `rematch()`). Also, the variable `_Mbegin` is set to the address of the first character of the matching text.

Any text matching a specified sub-pattern (see “( `rE` ) \$ n” above) is copied into the corresponding user buffer, providing one was supplied on the call. All supplied user buffers are reset on each `rematch()` call and filled only on a successful match.

**Note:** `rematch()`, unlike its role model, `regex(3)`, requires a zero terminating argument.

`rematch()` returns NULL if no match can be found or if something else goes wrong. If no match is found the variable, `_Merrnbr`, is set to zero. If something worse happens it is set to a non-zero value. As above, `_Merrnbr` serves as an index for a table of diagnostic messages as indicated below.

| <code>_Merrnbr</code> | <code>_Merrmsg[_Merrnbr]</code>                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------------------------|
| 0                     | “Ok”<br>(If <code>rematch()</code> returned NULL, no match was found)                                          |
| 1                     | “Too many closures”                                                                                            |
| 2                     | “Line too long”                                                                                                |
| 3                     | “Corrupt vector”<br>(check <code>recomp()</code> for failure)                                                  |
| 4                     | “More than 10 substr args”<br>(User probably forgot to terminate <code>rematch()</code> arguments with a zero) |
| 5                     | “Too many assignments”                                                                                         |

`_Merrnbr` values of 1, 2, or 5 are not likely to occur. They relate to the size of data structures used by `rematch()`.

The variable `_Eol` is the current end-of-line character. It is initialized to “\0” but may be changed by the user to other reasonable values (for example, “\n”). The end-of-line character determines what the special character, `$`, matches.

**Example** The following program scans its input for C identifiers and prints each one on a separate line.

```
#include <stdio.h>
main()
{
 char *recomp(), *rematch();
 char *patVect, *cursor, line[100], usrBuf[100];

 patVect = recomp("[a-zA-Z_][a-zA-Z0-9_]*$0", 0);
```

```
while (gets(line)) {
 cursor = line;
 while (cursor=rematch(patVect,cursor,usrBuf,0))
 printf("%sn", usrBuf);
 }
}
```

Note the use of the variable, `cursor`, to indicate a successful match as well as to provide (on success) the starting point for the next search. A less courageous programmer would check `recomp()`'s return value and restrict the length of the pattern match to the receiving buffer's size (for example, "{0,98}" instead of "\*").

**Implementation** `recomp()` and `rematch()` are written in portable C code. `recomp()` employs YACC, which accounts for the fact that it is bigger and somewhat slower than its counterpart, `regcmp()`. The intermediate code produced by `recomp()` is generally more compact than that of `regcmp()`.

`rematch()` is about the same size and has about the same speed as its counterpart, `regex()`.

**Notices** Support for the functions described in this manual page will be withdrawn in Release 5.0 of the BEA Tuxedo system.

**See Also** `rex(1)`

`ed(1)`, `free(3)`, `malloc(3)`, `regcmp(3)`, `regex(3)` in a UNIX system reference manual

## rpc\_sm\_allocate, rpc\_ss\_allocate(3c)

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name        | <code>rpc_sm_allocate()</code> , <code>rpc_ss_allocate()</code> - allocates memory within the RPC stub memory management scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Synopsis    | <pre>#include &lt;rpc/rpc.h&gt; idl_void_p_t rpc_sm_allocate(unsigned32 size, unsigned32 *status) idl_void_p_t rpc_ss_allocate(unsigned32 size)</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description | <p>Applications call <code>rpc_sm_allocat3()</code> to allocate memory within the RPC stub memory management scheme. The input parameter, <i>size</i>, specifies in bytes, the size of memory to be allocated. Before a call to this routine, the stub memory management environment must have been established. For service code that is called from the server stub, the stub itself normally establishes the necessary environment. When <code>rpc_sm_allocate()</code> is used by code that is not called from the stub, the application must establish the required memory management environment by calling <code>rpc_sm_enable_allocate()</code>.</p> |

Specifically, if the parameters of a server stub include any pointers other than those used for passing parameters by reference or the `[enable_allocate]` attribute is specified for the operation in the ACS file, then the environment is automatically set up. Otherwise, the environment must be set up by the application by calling `rpc_sm_enable_allocate()`.

When the stub establishes the memory management environment, the stub itself frees any memory allocated by `rpc_sm_allocate()`. The application can free such memory before returning to the calling stub by calling `rpc_sm_free()`.

When the application establishes the memory management environment, it must free any memory allocated, either by calling `rpc_sm_free()` or by calling `rpc_sm_disable_allocate()`.

The output parameter, *status*, returns the status code from this routine. This status code indicates whether the routine completed successfully or, if not, why not. Possible status codes and their meanings include:

`rpc_s_ok`

Always returned. The return value is used to determine failure.

`rpc_ss_allocate()` is the exception-returning version of this function and has no *status* output parameter. No exceptions are raised.

A thread in a multithreaded application may issue a call to `rpc_sm_allocate()` or `rpc_ss_allocate()` while running in any context state, including `TPINVALIDCONTEXT`.

**Return Values** Upon success, the routines return a pointer to the allocated memory. Note that in the ISO standard C environments, `idl_void_p_t` is defined as `void *` and in other environments it is defined as `char *`.

If there is insufficient memory, the routines return a `NULL` pointer.

**See Also** `rpc_sm_disable_allocate`, `rpc_ss_disable_allocate(3c)`,  
`rpc_sm_enable_allocate`, `rpc_ss_enable_allocate(3c)`, `rpc_sm_free`,  
`rpc_ss_free(3c)`

*Programming a BEA Tuxedo Application Using TxRPC*

## rpc\_sm\_client\_free, rpc\_ss\_client\_free(3c)

**Name** `rpc_sm_client_free()`, `rpc_ss_client_free()` - frees memory returned from a client stub

### Synopsis

```
#include <rpc/rpc.h>
void rpc_sm_client_free (idl_void_p_t node_to_free, unsigned32 *status)
void rpc_ss_client_free (idl_void_p_t node_to_free)
```

**Description** The `rpc_sm_client_free()` routine releases memory allocated and returned from a client stub. The input parameter, `node_to_free`, specifies a pointer to memory returned from a client stub. Note that in the ISO standard C environments, `idl_void_p_t` is defined as `void *` and in other environments is defined as `char *`.

This routine enables a routine to deallocate dynamically allocated memory returned by an RPC call without knowledge of the memory management environment from which it was called.

Note that this routine is always called from client code, even if the code can be executing as part of a server.

The output parameter, `status`, returns the status code from this routine. This status code indicates whether the routine completed successfully or, if not, why not. Possible status codes and their meanings include:

```
rpc_s_ok
 Success.
```

`rpc_ss_client_free()` is the exception-returning version of this function and has no `status` output parameter. No exceptions are raised.

A thread in a multithreaded application may issue a call to `rpc_sm_client_free()` or `rpc_ss_client_free()` while running in any context state, including `TPINVALIDCONTEXT`.

**Return Values** None.

**See Also** `rpc_sm_free`, `rpc_ss_free(3c)`, `rpc_sm_set_client_alloc_free`,  
`rpc_ss_set_client_alloc_free(3c)`, `rpc_sm_swap_client_alloc_free`,  
`rpc_ss_swap_client_alloc_free(3c)`

*Programming a BEA Tuxedo Application Using TxRPC*

# rpc\_sm\_disable\_allocate, rpc\_ss\_disable\_allocate(3c)

**Name** `rpc_sm_disable_allocate()`, `rpc_ss_disable_allocate()` - releases resources and allocated memory within the stub memory management scheme

**Synopsis**

```
#include <rpc/rpc.h>
void rpc_sm_disable_allocate(unsigned32 *status);
void rpc_ss_disable_allocate(void);
```

**Description** The `rpc_sm_disable_allocate()` routine releases all resources acquired by a call to `rpc_sm_enable_allocate()`, and any memory allocated by calls to `rpc_sm_allocate()` after the call to `rpc_sm_enable_allocate()` was made.

The `rpc_sm_enable_allocate()` and `rpc_sm_disable_allocate()` routines must be used in matching pairs. Calling this routine without a previous matching call to `rpc_sm_enable_allocate()` results in unpredictable behavior.

The output parameter, `status`, returns the status code from this routine. This status code indicates whether the routine completed successfully or, if not, why not. Possible status codes and their meanings include:

`rpc_s_ok`  
Success.

`rpc_ss_disable_allocate()` is the exception-returning version of this function and has no `status` output parameter. No exceptions are raised.

A thread in a multithreaded application may issue a call to `rpc_sm_disable_allocate()` or `rpc_ss_disable_allocate()` while running in any context state, including `TPINVALIDCONTEXT`.

**Return Values** None.

**See Also** `rpc_sm_allocate`, `rpc_ss_allocate(3c)`, `rpc_sm_enable_allocate`, `rpc_ss_enable_allocate(3c)`

*Programming a BEA Tuxedo Application Using TxRPC*

# rpc\_sm\_enable\_allocate, rpc\_ss\_enable\_allocate(3c)

**Name** `rpc_sm_enable_allocate()`, `rpc_ss_enable_allocate()` - enables the stub memory management environment

**Synopsis**

```
#include <rpc/rpc.h>
void rpc_sm_enable_allocate(unsigned32 *status)
void rpc_ss_enable_allocate(void)
```

**Description** Applications can call `rpc_sm_enable_allocate()` to establish a stub memory management environment in cases where one is not established by the stub itself. A stub memory management environment must be established before any calls are made to `rpc_sm_allocate()`. For service code called from the server stub, the stub memory management environment is normally established by the stub itself. Code that is called from other contexts needs to call `rpc_sm_enable_allocate()` before calling `rpc_sm_allocate()` (for example, if the service code is called directly instead of from the stub).

The output parameter, *status*, returns the status code from this routine. This status code indicates whether the routine completed successfully or, if not, why not. Possible status codes and their meanings include:

`rpc_s_ok`  
Success.

`rpc_s_no_memory`  
Insufficient memory available to set up necessary data structures.

`rpc_ss_enable_allocate()` is the exception-returning version of this function and has no *status* output parameter. The following exceptions are raised by this routine.

`rpc_x_no_memory`  
Insufficient memory available to set up necessary data structures.

A thread in a multithreaded application may issue a call to `rpc_sm_enable_allocate()` or `rpc_ss_enable_allocate()` while running in any context state, including `TPINVALIDCONTEXT`.

**Return Values** None.

See Also `rpc_sm_allocate`, `rpc_ss_allocate(3c)`, `rpc_sm_disable_allocate`,  
`rpc_ss_disable_allocate(3c)`

*Programming a BEA Tuxedo Application Using TxRPC*

# rpc\_sm\_free, rpc\_ss\_free(3c)

**Name**     `rpc_sm_free, rpc_ss_free()` - frees memory allocated by the `rpc_sm_allocate()` routine

**Synopsis**   `#include <rpc/rpc.h>`  
`void rpc_sm_free(idl_void_p_t node_to_free, unsigned32 *status)`  
`void rpc_ss_free(idl_void_p_t node_to_free)`

**Description**   Applications call `rpc_sm_free()` to release memory allocated by `rpc_sm_allocate()`. The input parameter, `node_to_free`, specifies a pointer to memory allocated by `rpc_sm_allocate()`. Note that in ISO standard C environments, `idl_void_p_t` is defined as `void *` and in other environments is defined as `char *`.

When the stub allocates memory within the stub memory management environment, service code called from the stub can also use `rpc_sm_free()` to release memory allocated by the stub.

Unpredictable behavior results if `rpc_ss_free()` is called with a pointer to memory not allocated by `rpc_sm_allocate()` or memory allocated by `rpc_sm_allocate()`, but not the first address of such an allocation.

The output parameter, `status`, returns the status code from this routine. This status code indicates whether the routine completed successfully or, if not, why not. Possible status codes and their meanings include:

`rpc_s_ok`  
       Success.

`rpc_ss_free` is the exception-returning version of this function and has no `status` output parameter. No exceptions are raised.

A thread in a multithreaded application may issue a call to `rpc_sm_free()` or `rpc_ss_free()` while running in any context state, including `TPINVALIDCONTEXT`.

**Return Values**   None.

**See Also**       `rpc_sm_allocate, rpc_ss_allocate(3c)`

*Programming a BEA Tuxedo Application Using TxRPC*

# rpc\_sm\_set\_client\_alloc\_free, rpc\_ss\_set\_client\_alloc\_free(3c)

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name        | <code>rpc_sm_set_client_alloc_free()</code> , <code>rpc_ss_set_client_alloc_free()</code> - sets the memory allocation and freeing mechanisms used by the client stubs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Synopsis    | <pre>#include &lt;rpc/rpc.h&gt; void rpc_sm_set_client_alloc_free(     idl_void_p_t (*p_allocate)(unsigned long size),     void (*p_free) (idl_void_p_t ptr), unsigned32 *status)  void rpc_ss_set_client_alloc_free(     idl_void_p_t (*p_allocate)(unsigned long size),     void (*p_free) (idl_void_p_t ptr))</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Description | <p>The <code>rpc_sm_set_client_alloc_free()</code> routine overrides the default routines that the client stub uses to manage memory. The input parameters, <code>p_allocate</code> and <code>p_free</code> specify memory allocator and free routines. The default memory management routines are ISO C <code>malloc()</code> and <code>free()</code> except when the remote call occurs within server code in which case the memory management routines must be <code>rpc_ss_allocate()</code> and <code>rpc_ss_free()</code>.</p> <p>The output parameter, <code>status</code>, returns the status code from this routine. This status code indicates whether the routine completed successfully or, if not, why not. Possible status codes and their meanings include:</p> <pre>rpc_s_ok     Success.</pre> <pre>rpc_s_no_memory     Insufficient memory available to set up necessary data structures.</pre> <p><code>rpc_ss_set_client_alloc_free</code> is the exception-returning version of this function and has no <code>status</code> output parameter. The following exceptions are raised by this routine.</p> <pre>rpc_x_no_memory     Insufficient memory available to set up necessary data structures.</pre> |

A thread in a multithreaded application may issue a call to `rpc_sm_set_client_alloc_free()` or `rpc_ss_set_client_alloc_free()` while running in any context state, including `TPINVALIDCONTEXT`.

**Return Values**    None.

**See Also**        `rpc_sm_allocate`, `rpc_ss_allocate(3c)`, `rpc_sm_free`, `rpc_ss_free(3c)`

*Programming a BEA Tuxedo Application Using TxRPC*

# rpc\_sm\_swap\_client\_alloc\_free, rpc\_ss\_swap\_client\_alloc\_free(3c)

**Name** `rpc_sm_swap_client_alloc_free()`, `rpc_ss_swap_client_alloc_free()` - exchanges current memory allocation and freeing mechanism used by client stubs with one supplied by client

**Synopsis**

```
#include <rpc/rpc.h>
void rpc_sm_swap_client_alloc_free(
 idl_void_p_t (*p_allocate)(unsigned long size),
 void (*p_free) (idl_void_p_t ptr),
 idl_void_p_t (**p_p_old_allocate)(unsigned long size),
 void (**p_p_old_free)(idl_void_p_t ptr),
 unsigned32 *status)

void rpc_ss_swap_client_alloc_free(
 idl_void_p_t (*p_allocate)(unsigned long size),
 void (*p_free) (idl_void_p_t ptr),
 idl_void_p_t (**p_p_old_allocate)(unsigned long size),
 void (**p_p_old_free)(idl_void_p_t ptr))
```

**Description** The `rpc_sm_swap_client_alloc_free()` routine exchanges the current allocate and free mechanisms used by the client stubs for routines supplied by the caller. The input parameters, `p_allocate` and `p_free`, specify new memory allocation and free routines. The output parameters, `p_p_old_allocate` and `p_p_old_free` return the memory allocation and free routines in use before the call to this routine.

When a callable routine is an RPC client, it may need to ensure which allocate and free routines are used, despite the mechanism its caller had selected. This routine allows scoped replacement of the allocation/free mechanism to allow this.

The output parameter, `status`, returns the status code from this routine. This status code indicates whether the routine completed successfully or, if not, why not. Possible status codes and their meanings include:

`rpc_s_ok`  
Success.

`rpc_s_no_memory`  
Insufficient memory available to set up necessary data structures.

`rpc_ss_swap_client_alloc_free` is the exception-returning version of this function and has no *status* output parameter. The following exceptions are raised by this routine.

`rpc_x_no_memory`

Insufficient memory available to set up necessary data structures.

A thread in a multithreaded application may issue a call to `rpc_sm_swap_client_alloc_free()` or `rpc_ss_swap_client_alloc_free()` while running in any context state, including `TPINVALIDCONTEXT`.

**Return Values**    None.

**See Also**        `rpc_sm_allocate`, `rpc_ss_allocate(3c)`, `rpc_sm_free`, `rpc_ss_free(3c)`,  
`rpc_sm_set_client_alloc_free`, `rpc_ss_set_client_alloc_free(3c)`

*Programming a BEA Tuxedo Application Using TxRPC*

## setlocale(3c)

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name        | <code>setlocale()</code> - modify and query a program's locale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Synopsis    | <pre>#include &lt;locale.h&gt; char *setlocale (int category, const char *locale);</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Description | <p><code>setlocale()</code> selects the appropriate piece of the program's locale as specified by the <i>category</i> and <i>locale</i> arguments. The <i>category</i> argument may have the following values:</p> <pre>LC_CTYPE LC_NUMERIC LC_TIME LC_COLLATE LC_MONETARY LC_MESSAGES LC_ALL</pre> <p>These names are defined in the <code>locale.h</code> header file. For the BEA Tuxedo system compatibility functions, <code>setlocale()</code> allows only a single <i>locale</i> for all categories. Setting any category is treated the same as <code>LC_ALL</code>, which names the program's entire locale.</p> <p>A value of "C" for <i>locale</i> specifies the default environment.</p> <p>A value of "" for <i>locale</i> specifies that the locale should be taken from an environment variable. The environment variable <code>LANG</code> is checked for a locale.</p> <p>At program startup, the equivalent of</p> <pre>setlocale(LC_ALL, "C")</pre> <p>is executed. This has the effect of initializing each category to the locale described by the environment "C".</p> <p>If a pointer to a string is given for <i>locale</i>, <code>setlocale()</code> attempts to set the locale for all the categories to <i>locale</i>. The <i>locale</i> must be a simple locale, consisting of a single locale. If <code>setlocale()</code> fails to set the locale for any category, a null pointer is returned and the program's locale for all categories is not changed. Otherwise, <i>locale</i> is returned.</p> |

A null pointer for *locale* causes `setlocale()` to return the current locale associated with the *category*. The program's locale is not changed.

A thread in a multithreaded application may issue a call to `setlocale()` while running in any context state, including `TPINVALIDCONTEXT`.

**Files**     `$TUXDIR/locale/C/LANGINFO` - time and money database for the C locale  
          `$TUXDIR/locale/locale/*` - locale specific information for each locale  
          `$TUXDIR/locale/C/*_CAT` - text messages for the C locale

**Note**     A composite locale is not supported. A composite locale is a string beginning with a “/”, followed by the locale of each category, separated by a “/”.

**See Also**   `mklanginfo(1)`

`ctime(3c)`, `ctype(3c)`, `getdate(3c)`, `localeconv(3c)`, `strftime(3c)`, `strtod(3c)`, `printf(3S)`, `environ(5)` in a UNIX system reference manual

## strerror(3c)

- Name**     `strerror()` - get error message string
- Synopsis**   `#include <string.h>`  
              `char *strerror (int errnum);`
- Description**   `strerror` maps the error number in `errnum` to an error message string, and returns a pointer to that string. `strerror` uses the same set of error messages as `perror`. The returned string should not be overwritten.
- A thread in a multithreaded application may issue a call to `strerror()` while running in any context state, including `TPINVALIDCONTEXT`.
- See Also**     `perror(3)` in a UNIX system reference manual

# strptime(3c)

**Name**     strptime() - convert date and time to string

**Synopsis**   #include <time.h>

```
size_t *strptime (char *s, size_t maxsize, const char *format, const
struct tm *timeptr);
```

**Description**   strptime() places characters into the array pointed to by *s* as controlled by the string pointed to by *format*. The *format* string consists of zero or more directives and ordinary characters. All ordinary characters (including the terminating null character) are copied unchanged into the array. For *strptime()*, no more than *maxsize* characters are placed into the array.

If *format* is (char \*)0, then the locale's default format is used. The default format is the same as "%c".

Each directive is replaced by appropriate characters as described in the following list. The appropriate characters are determined by the LC\_TIME category of the program's locale and by the values contained in the structure pointed to by *timeptr*.

---

%%   same as %

---

%a   locale's abbreviated weekday name

---

%A   locale's full weekday name

---

%b   locale's abbreviated month name

---

%B   locale's full month name

---

%c   locale's appropriate date and time representation

---

%C   locale's date and time representation as produced by date(1)

---

%d   day of month ( 01 - 31 )

---

%D   date as %m/%d/%y

---

%e   day of month (1-31; single digits are preceded by a blank)

## Section 3c - C Functions

---

|                 |                                                                    |
|-----------------|--------------------------------------------------------------------|
| <code>%h</code> | locale's abbreviated month name.                                   |
| <code>%H</code> | hour ( 00 - 23 )                                                   |
| <code>%I</code> | hour ( 01 - 12 )                                                   |
| <code>%j</code> | day number of year ( 001 - 366 )                                   |
| <code>%m</code> | month number ( 01 - 12 )                                           |
| <code>%M</code> | minute ( 00 - 59 )                                                 |
| <code>%n</code> | same as \                                                          |
| <code>%p</code> | locale's equivalent of either AM or PM                             |
| <code>%r</code> | time as %I:%M:%S [AM PM]                                           |
| <code>%R</code> | time as %H:%M                                                      |
| <code>%S</code> | seconds ( 00 - 61 ), allows for leap seconds                       |
| <code>%t</code> | insert a tab                                                       |
| <code>%T</code> | time as %H:%M:%S                                                   |
| <code>%U</code> | week number of year ( 00 - 53 ), Sunday is the first day of week 1 |
| <code>%w</code> | weekday number ( 0 - 6 ), Sunday = 0                               |
| <code>%W</code> | week number of year ( 00 - 53 ), Monday is the first day of week 1 |
| <code>%x</code> | locale's appropriate date representation                           |
| <code>%X</code> | locale's appropriate time representation                           |
| <code>%Y</code> | year within century ( 00 - 99 )                                    |
| <code>%Y</code> | year as ccyy (for example, 1986)                                   |
| <code>%Z</code> | timezone name or no characters if no timezone exists               |

The difference between `%U` and `%W` lies in which day is counted as the first of the week. Week number 01 is the first week in January starting with a Sunday for `%U` or a Monday for `%W`. Week number 00 contains those days before the first Sunday or Monday in January for `%U` and `%W`, respectively.

If the total number of resulting characters including the terminating null character is not more than *maxsize*, `strptime()`, returns the number of characters placed into the array pointed to by *s* not including the terminating null character. Otherwise, zero is returned and the contents of the array are indeterminate.

A thread in a multithreaded application may issue a call to `strptime()` while running in any context state, including `TPINVALIDCONTEXT`.

- Selecting the Output Language** By default, the output of `strptime()`, appears in US English. The user can request that the output of `strptime()` be in a specific language by setting the *locale* for category `LC_TIME` in `setlocale()`.
- Timezone** The timezone is taken from the environment variable `TZ`. See `ctime(3c)` for a description of `TZ`.
- Examples** The example illustrates the use of `strptime()`. It shows what the string in *str* would look like if the structure pointed to by *tm\_ptr* contains the values corresponding to Thursday, August 28, 1986 at 12:44:36 in New Jersey.
- ```
strptime (str, strsize, "%A %b %d %j", tm_ptr)
```
- This results in *str* containing "Thursday Aug 28 240".
- Files** `$TUXDIR/locale/locale/LANGINFO` - file containing compiled locale-specific date and time information
- See Also** `mklanginfo(1)`, `setlocale(3c)`

tpabort(3c)

Name `tpabort()` - routine for aborting current transaction

Synopsis

```
#include <atmi.h>
int tpabort(long flags)
```

Description `tpabort()` signifies the abnormal end of a transaction. When this call returns, all changes made to resources during the transaction are undone. Like `tpcommit()`, this function can be called only by the initiator of a transaction. Participants (that is, service routines) can express their desire to have a transaction aborted by calling `tpreturn()` with `TPFAIL`.

If `tpabort()` is called while call descriptors exist for outstanding replies, then upon return from the function, the transaction is aborted and those descriptors associated with the caller's transaction are no longer valid. Call descriptors not associated with the caller's transaction remain valid.

For each open connection to a conversational server in transaction mode, `tpabort()` will send a `TPEV_DISCONIMM` event to the server, whether or not the server has control of a connection. Connections opened before `tpbegin()` or with the `TPNOTRAN` flag (that is, not in transaction mode) are not affected.

Currently, the sole argument to the `tpabort()` function, *flags*, is reserved for future use and should be set to 0.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpabort()`.

Return Values Upon failure, `tpabort()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpabort()` sets `tperrno()` to one of the following values.

[`TPEINVAL`]
flags is not equal to 0. The caller's transaction is not affected.

[`TPEHEURISTIC`]
Due to a heuristic decision, the work done on behalf of the transaction was partially committed and partially aborted.

[TPEHAZARD]

Due to some failure, the work done on behalf of the transaction could have been heuristically completed.

[TPEPROTO]

`tpabort()` was called improperly (for example, by a participant).

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Notices When using `tpbegin()`, `tpcommit()`, and `tpabort()` to delineate a BEA Tuxedo system transaction, it is important to remember that only the work done by a resource manager that meets the XA interface (and is linked to the caller appropriately) has transactional properties. All other operations performed in a transaction are not affected by either `tpcommit()` or `tpabort()`.

See Also `tpbegin(3c)`, `tpcommit(3c)`, `tpgetlev(3c)`

tpacall(3c)

Name `tpacall()` - routine for sending a service request

Synopsis

```
#include <atmi.h>
int tpacall(char *svc, char *data, long len, long flags)
```

Description `tpacall()` sends a request message to the service named by *svc*. The request is sent out at the priority defined for *svc* unless overridden by a previous call to `tpsprpri()`. If *data* is non-NULL, it must point to a buffer previously allocated by `tpalloc()` and *len* should specify the amount of data in the buffer that should be sent. Note that if *data* points to a buffer of a type that does not require a length to be specified, (for example, an FML fielded buffer), then *len* is ignored (and may be 0). If *data* is NULL, *len* is ignored and a request is sent with no data portion. The type and sub-type of *data* must match one of the types and sub-types recognized by *svc*. Note that for each request sent while in transaction mode, a corresponding reply must ultimately be received.

The following is a list of valid *flags*.

TPNOTRAN

If the caller is in transaction mode and this flag is set, then when *svc* is invoked, it is not performed on behalf of the caller's transaction. If *svc* belongs to a server that does not support transactions, then this flag must be set when the caller is in transaction mode. Note that *svc* may still be invoked in transaction mode but it will not be the same transaction: a *svc* may have as a configuration attribute that it is automatically invoked in transaction mode. A caller in transaction mode that sets this flag is still subject to the transaction timeout (and no other). If a service fails that was invoked with this flag, the caller's transaction is not affected.

TPNOREPLY

Informs `tpacall()` that a reply is not expected. When `TPNOREPLY` is set, the function returns 0 on success, where 0 is an invalid descriptor. When the caller is in transaction mode, this setting cannot be used unless `TPNOTRAN` is also set.

TPNOBLOCK

The request is not sent if a blocking condition exists (for example, the internal buffers into which the message is transferred are full). When `TPNOBLOCK` is

not specified and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpacall()`.

Return Values Upon successful completion, `tpacall()` returns a descriptor that can be used to receive the reply of the request sent.

Upon failure, `tpacall()` returns a value of -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpacall()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[TPEINVAL]

Invalid arguments were given (for example, `svc` is `NULL`, `data` does not point to space allocated with `tpalloc()`, or `flags` are invalid).

[TPENOENT]

Cannot send to `svc` because it does not exist or is a conversational service.

[TPEITYPE]

The type and sub-type of `data` is not one of the allowed types and sub-types that `svc` accepts.

[TPELIMIT]

The caller's request was not sent because the maximum number of outstanding asynchronous requests has been reached.

[TPETRAN]

`svc` belongs to a server that does not support transactions and `TPNOTRAN` was not set.

[TPETIME]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is marked abort-only; otherwise, a blocking timeout occurred and neither TPNOBLOCK nor TPNOTIME was specified. If a transaction timeout occurred, then with one exception, any attempts to send new requests or receive outstanding replies will fail with TPETIME until the transaction has been aborted. The exception is a request that does not block, expects no reply, and is not sent on behalf of the caller's transaction (that is, tpcall() with TPNOTRAN, TPNOBLOCK, and TPNOREPLY set).

[TPEBLOCK]

A blocking condition exists and TPNOBLOCK was specified.

[TPGOTSIG]

A signal was received and TPSIGRSTRT was not specified.

[TPEPROTO]

tpcall() was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred. If a message queue on a remote location is filled, TPEOS may be returned even if tpcall() returned successfully.

See Also tpallocc(3c), tpcall(3c), tpcancel(3c), tpgetreply(3c), tpgprio(3c), tpsprio(3c)

tpadmcall(3c)

Name	<code>tpadmcall()</code> - administer unbooted application
Synopsis	<pre>#include <atmi.h> #include <fml32.h> #include <tpadm.h> int tpadmcall(FBFR32 *inbuf, FBFR32 **outbuf, long flags)</pre>
Description	<p><code>tpadmcall()</code> is used to retrieve and update attributes of an unbooted application. It may also be used in an active application to perform direct retrievals of a limited set of attributes without requiring communication to an external process. This function provides sufficient capability such that complete system configuration and administration can take place through system provided interface routines.</p> <p><i>inbuf</i> is a pointer to an FML32 buffer previously allocated with <code>tpalloc()</code> that contains the desired administrative operation and its parameters.</p> <p><i>outbuf</i> is the address of a pointer to the FML32 buffer that should contain the results. <i>outbuf</i> must point to an FML32 buffer originally allocated by <code>tpalloc()</code>. If the same buffer is to be used for both sending and receiving, <i>outbuf</i> should be set to the address of <i>inbuf</i>.</p> <p>Currently, <code>tpadmcall()</code>'s last argument, <i>flags</i>, is reserved for future use and must be set to 0.</p> <p>MIB(5) should be consulted for generic information on construction of administrative requests. <code>TM_MIB(5)</code> and <code>APPQ_MIB(5)</code> should be consulted for information on the classes that are accessible through <code>tpadmcall()</code>.</p> <p>There are four modes in which calls to <code>tpadmcall()</code> can be made.</p> <p>Mode 1: Unbooted, Unconfigured Application:</p> <p>The caller is assumed to be the administrator of the application. The only operations permitted are to SET a NEW T_DOMAIN class object, thus defining an initial configuration for the application, and to GET and SET objects of the classes defined in <code>APPQ_MIB()</code>.</p> <p>Mode 2: Unbooted, Configured Application:</p> <p>The caller is assigned administrator or other privileges based on a comparison of their UID/GID to that defined in the configuration for the administrator on</p>

the local system. The caller may GET and SET any attributes for any class in `TM_MIB()` and `APPQ_MIB()` for which they have the appropriate permissions. Note that some classes contain only attributes that are inaccessible in an unbooted application and attempts to access these classes will fail.

Mode 3: Booted Application, Unattached Process:

The caller is assigned administrator or other privileges based on a comparison of their UID/GID to that defined in the configuration for the administrator on the local system. The caller may GET any attributes for any class in `TM_MIB()` for which they have the appropriate permissions. Similarly, the caller may GET and SET any attributes for any class in `APPQ_MIB()`, subject to class-specific restrictions. Attributes accessible only while ACTIVE will not be returned.

Mode 4: Booted Application, Attached Process:

Permissions are determined from the authentication key assigned at `tpinit()` time. The caller may GET any attributes for any class in `TM_MIB()` for which they have the appropriate permissions. Additionally, the caller may GET and SET any attributes for any class in `APPQ_MIB()`, subject to class-specific restrictions.

Access to and update of binary BEA Tuxedo system application configuration files through this interface routine is controlled through the use of UNIX System permissions on directory names and filenames.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpadmcall()`.

Environment Variables

The following environment variables must be set prior to calling this routine.

`TUXCONFIG`

Name of the file or device on which the binary BEA Tuxedo system configuration file for this application is or should be stored.

Notices

Use of the `TA_OCCURS` attribute on GET requests is not supported when using `tpadmcall()`. `GETNEXT` requests are not supported when using `tpadmcall()`.

Return Values

`tpadmcall()` returns 0 on success and -1 on failure.

Errors

Upon failure, `tpadmcall()` sets `tperrno()` to one of the following values.

Note: Except for TPEINVAL, the caller's output buffer, *outbuf*, will be modified to include TA_ERROR, TA_STATUS, and possibly TA_BADFLD attributes to further qualify the error condition. See MIB(5), TM_MIB(5), and APPQ_MIB(5) for an explanation of possible error codes returned in this fashion.

[TPEINVAL]

Invalid arguments were specified. The *flags* value is invalid or *inbuf* or *outbuf* are not pointers to typed buffers of type "FML32."

[TPEMIB]

The administrative request failed. *outbuf* is updated and returned to the caller with FML32 fields indicating the cause of the error as is discussed in MIB(5) and TM_MIB(5).

[TPEPROTO]

tpadmcall() was called improperly.

[TPERELEASE]

tpadmcall() was called with the TUXCONFIG environment variable pointing to a different release version configuration file.

[TPEOS]

An operating system error has occurred. A numeric value representing the system call that failed is available in *Unixerr*.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to *userlog()*.

Interoperability This interface supports access and update to the local configuration file and bulletin board only; therefore, there are no interoperability concerns.

Portability This interface is available only on UNIX System sites running BEA Tuxedo Release 5.0 or later.

Files `${TUXDIR}/lib/libtmib.a`, `${TUXDIR}/lib/libqm.a`,
`${TUXDIR}/lib/libtmib.so.<rel>`, `${TUXDIR}/lib/libqm.so.<rel>`,
`${TUXDIR}/lib/libtmib.lib`, `${TUXDIR}/lib/libqm.lib`

The libraries must be linked manually when using *buildclient*. The user must use:
`-L${TUXDIR}/lib -ltmid -lqm`

See Also ACL_MIB(5), APPQ_MIB(5), EVENT_MIB(5), MIB(5), TM_MIB(5), WS_MIB(5)
Setting Up a BEA Tuxedo Application
Administering a BEA Tuxedo Application at Run Time

tpadvertise(3c)

Name `tpadvertise()` - routine for advertising a service name

Synopsis `#include <atmi.h>`
`int tpadvertise(char *svcname, void (*func)(TPSVCINFO *))`

Description `tpadvertise()` allows a server to advertise the services that it offers. By default, a server's services are advertised when it is booted and unadvertised when it is shutdown.

All servers belonging to a multiple server, single queue (MSSQ) set must offer the same set of services. These routines enforce this rule by affecting the advertisements of all servers sharing an MSSQ set.

`tpadvertise()` advertises *svcname* for the server (or the set of servers sharing the caller's MSSQ set). *svcname* should be 15 characters or less, but cannot be NULL or the NULL string (""). (See *SERVICES section of `UBBCONFIG(5)`.) *func* is the address of a BEA Tuxedo system service function. This function will be invoked whenever a request for *svcname* is received by the server. *func* cannot be NULL. Explicitly specified function names (see `servopts(5)`) can be up to 128 characters long. Names longer than 15 characters are accepted and truncated to 15 characters. Users should make sure that truncated names do not match other service names.

If *svcname* is already advertised for the server and *func* matches its current function, then `tpadvertise()` returns success (this includes truncated names that match already advertised names). However, if *svcname* is already advertised for the server but *func* does not match its current function, then an error is returned (this can happen if truncated names match already advertised names).

Service names starting with dot (.) are reserved for administrative services. An error will be returned if an application attempts to advertise one of these services.

Return Values Upon failure, `tpadvertise()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpadvertise()` sets `tperrno()` to one of the following values.

[TPEINVAL]

svcname is NULL or the NULL string (""), or begins with a "." or *func* is NULL.

[TPELIMIT]

svcname cannot be advertised because of space limitations. (See MAXSERVICES in the RESOURCES section of UBBCONFIG(5).)

[TPEMATCH]

svcname is already advertised for the server but with a function other than *func*. Although the function fails, *svcname* remains advertised with its current function (that is, *func* does not replace the current function).

[TPEPROTO]

`tpadvertise()` was called in an improper context (for example, by a client).

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpservice(3c)`, `tpunadvertise(3c)`

tpalloc(3c)

Name `tpalloc()` - routine for allocating typed buffers

Synopsis

```
#include <atmi.h>
char * tpalloc(char *type, char *subtype, long size)
```

Description `tpalloc()` returns a pointer to a buffer of type `type`. Depending on the type of buffer, both `subtype` and `size` are optional. The BEA Tuxedo system provides a variety of typed buffers, and applications are free to add their own buffer types. Consult `tuxtypes(5)` for more details.

If `subtype` is non-NULL in `tmttype_sw` for a particular buffer type, then `subtype` must be specified when `tpalloc()` is called. The allocated buffer will be at least as large as the larger of `size` and `dfltsize`, where `dfltsize` is the default buffer size specified in `tmttype_sw` for the particular buffer type. For buffer type `STRING` the minimum is 512 bytes; for buffer types `FML` and `VIEW` the minimum is 1024 bytes.

Note that only the first eight bytes of `type` and the first 16 bytes of `subtype` are significant.

Because some buffer types require initialization before they can be used, `tpalloc()` initializes a buffer (in a BEA Tuxedo system-specific manner) after it is allocated and before it is returned. Thus, the buffer returned to the caller is ready for use. Note that unless the initialization routine cleared the buffer, the buffer is not initialized to zeros by `tpalloc()`.

A thread in a multithreaded application may issue a call to `tpalloc()` while running in any context state, including `TPINVALIDCONTEXT`.

Return Values Upon successful completion, `tpalloc()` returns a pointer to a buffer of the appropriate type aligned on a long word; otherwise, it returns `NULL` and sets `tperrno()` to indicate the condition.

Errors Upon failure, `tpalloc()` sets `tperrno()` to one of the following values.

[`TPEINVAL`]

Invalid arguments were given (for example, `type` is `NULL`).

[`TPENOENT`]

No entry in `tmttype_sw` matches `type` and, if non-`NULL`, `subtype`.

[TPEPROTO]

`tpalloc()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Usage If buffer initialization fails, the allocated buffer is freed and `tpalloc()` fails returning NULL.

This function should not be used in concert with `malloc()`, `realloc()`, or `free()` in the C library (for example, a buffer allocated with `tpalloc()` should not be freed with `free()`).

Two buffer types are supported by any compliant implementation of the BEA Tuxedo system extension. Details are in the Introduction to the C Language Application-Transaction Monitor Interface.

See Also `tpfree(3c)`, `tprealloc(3c)`, `tptypes(3c)`

tpbegin(3c)

Name `tpbegin()` - routine for beginning a transaction

Synopsis

```
#include <atmi.h>
int tpbegin(unsigned long timeout, long flags)
```

Description A transaction in the BEA Tuxedo system is used to define a single logical unit of work that either wholly succeeds or has no effect whatsoever. A transaction allows work being performed in many processes, at possibly different sites, to be treated as an atomic unit of work. The initiator of a transaction uses `tpbegin()` and either `tpcommit()` or `tpabort()` to delineate the operations within a transaction. Once `tpbegin()` is called, communication with any other program can place the latter (of necessity, a server) in “transaction mode” (that is, the server’s work becomes part of the transaction). Programs that join a transaction are called participants. A transaction always has one initiator and can have several participants. Only the initiator of a transaction can call `tpcommit()` or `tpabort()`. Participants can influence the outcome of a transaction by the return values (*rvals*) they use when they call `tpreturn()`. Once in transaction mode, any service requests made to servers are processed on behalf of the transaction (unless the requester explicitly specifies otherwise).

Note that if a program starts a transaction while it has any open connections that it initiated to conversational servers, these connections will not be upgraded to transaction mode. It is as if the `TPNOTRAN` flag had been specified on the `tpconnect()` call.

`tpbegin()`’s first argument, *timeout*, specifies that the transaction should be allowed at least *timeout* seconds before timing out. Once a transaction times out it must be marked abort-only. If *timeout* is 0, then the transaction is given the maximum number of seconds allowed by the system before timing out (that is, the timeout value equals the maximum value for an unsigned long as defined by the system).

Currently, `tpbegin()`’s second argument, *flags*, is reserved for future use and must be set to 0.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpbegin()`.

Return Values Upon failure, `tpbegin()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpbegin()` sets `tperrno()` to one of the following values.

[TPEINVAL]

flags is not equal to 0.

[TPETRAN]

The caller cannot be placed in transaction mode because an error occurred starting the transaction.

[TPEPROTO]

`tpbegin()` was called in an improper context (for example, the caller is already in transaction mode).

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Notices When using `tpbegin()`, `tpcommit()`, and `tpabort()` to delineate a BEA Tuxedo system transaction, it is important to remember that only the work done by a resource manager that meets the XA interface (and is linked to the caller appropriately) has transactional properties. All other operations performed in a transaction are not affected by either `tpcommit()` or `tpabort()`. See `buildserver()` for details on linking resource managers that meet the XA interface into a server such that operations performed by that resource manager are part of a BEA Tuxedo system transaction.

See Also `tpabort(3c)`, `tpcommit(3c)`, `tpgetlev(3c)`, `tpscmt(3c)`

tpbroadcast(3c)

Name `tpbroadcast()` - routine to broadcast notification by name

Synopsis `#include <atmi.h>`

```
int tpbroadcast(char *lmid, char *username, char *cltname,  
               char *data, long len, long flags)
```

Description `tpbroadcast()` allows a client or server to send unsolicited messages to registered clients within the system. The target client set consists of those clients matching identifiers passed to `tpbroadcast()`. Wildcards can be used in specifying identifiers.

lmid, *username*, and *cltname* are logical identifiers used to select the target client set. A NULL value for any argument constitutes a wildcard for that argument. A wildcard argument matches all client identifiers for that field. A 0-length string for any argument matches only 0-length client identifiers. Each identifier must meet the size restrictions defined for the system to be considered valid, that is, each identifier must be between 0 and MAXTIDENT characters in length.

The data portion of the request is pointed to by *data*, a buffer previously allocated by `tpalloc()`. *len* specifies how much of *data* to send. Note that if *data* points to a buffer type that does not require a length to be specified (for example, an FML fielded buffer), then *len* is ignored (and may be 0). Also, *data* may be NULL, in which case *len* is ignored. The buffer passes through the typed buffer switch routines just as any other outgoing or incoming message would; for example, encode/decode are performed automatically.

The following is a list of valid *flags*.

TPNOBLOCK

The request is not sent if a blocking condition exists (for example, the internal buffers into which the message is transferred are full).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued. Upon successful return from `tpbroadcast()`, the message

has been delivered to the system for forwarding to the selected clients. `tpbroadcast()` does not wait for the message to be delivered to each selected client.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpbroadcast()`.

- Return Values** Upon failure, `tpbroadcast()` returns -1 and sets `tperrno()` to indicate the error condition.
- Errors** Upon failure, `tpbroadcast()` sends no broadcast messages to application clients and sets `tperrno()` to one of the following values.
- [`TPEINVAL`]
Invalid arguments were given (for example, identifiers too long or invalid flags). Note that use of an illegal LMID will cause `tpbroadcast()` to fail and return `TPEINVAL`. However, non-existent user or client names will simply successfully broadcast to no one.
- [`TPETIME`]
A blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` was specified.
- [`TPEBLOCK`]
A blocking condition was found on the call and `TPNOBLOCK` was specified.
- [`TPGOTSIG`]
A signal was received and `TPSIGRSTRT` was not specified.
- [`TPEPROTO`]
`tpbroadcast()` was called improperly.
- [`TPESYSTEM`]
A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.
- [`TPEOS`]
An operating system error has occurred.
- Portability** The interfaces described in `tpnotify(3c)` are supported on native site UNIX-based processors. In addition, the routines `tpbroadcast()` and `tpchkunsol()` as well as the function `tpsetunsol()` are supported on UNIX and MS-DOS workstation processors.

Usage Clients that select signal-based notification may not be signal-able by the system due to signal restrictions. When this occurs, the system generates a log message that it is switching notification for the selected client to dip-in and the client is notified then and thereafter via dip-in notification. (See the description of the `RESOURCES NOTIFY` parameter in `UBBCONFIG()` for a detailed discussion of notification methods.)

Because signaling of clients is always done by the system, the behavior of notification is always consistent, regardless of where the originating notification call is made. Therefore to use signal-based notification:

- A native client must be running as an application administrator
- A Workstation client is not required to be running as the application administrator

The ID for the application administrator is identified as part of the configuration for the application.

If signal-based notification is selected for a client, then certain ATMI calls can fail, returning `TPGOTSIG` due to receipt of an unsolicited message if `TPSIGRSTRT` is not specified. See `UBBCONFIG(5)` and `tpinit(3c)` for more information on notification method selection.

See Also `tpalloc(3c)`, `tpinit(3c)`, `tpnotify(3c)`, `tpterm(3c)`, `UBBCONFIG(5)`

tpcall(3c)

Name	tpcall() - routine for sending service request and awaiting its reply
Synopsis	int tpcall(char *svc, char *idata, long ilen, char **odata, long *olen, long flags)
Description	<p>tpcall() sends a request and synchronously awaits its reply. A call to this function is the same as calling tpcall() immediately followed by tpgetrply(). tpcall() sends a request to the service named by <i>svc</i>. The request is sent out at the priority defined for <i>svc</i> unless overridden by a previous call to tpspri(). The data portion of a request is pointed to by <i>idata</i>, a buffer previously allocated by tpalloc(). <i>ilen</i> specifies how much of <i>idata</i> to send. Note that if <i>idata</i> points to a buffer of a type that does not require a length to be specified, (for example, an FML fielded buffer), then <i>ilen</i> is ignored (and may be 0). Also, <i>idata</i> may be NULL, in which case <i>ilen</i> is ignored. The type and sub-type of <i>idata</i> must match one of the types and sub-types recognized by <i>svc</i>.</p>

odata is the address of a pointer to the buffer where a reply is read into, and *olen* points to the length of that reply. **odata* must point to a buffer originally allocated by tpalloc(). If the same buffer is to be used for both sending and receiving, *odata* should be set to the address of *idata*. FML and FML32 buffers often assume a minimum size of 4096 bytes; if the reply is larger than 4096, the size of the buffer is increased to a size large enough to accommodate the data being returned. Also, if *idata* and **odata* were equal when tpcall() was invoked, and **odata* is changed, then *idata* no longer points to a valid address. Using the old address can lead to data corruption or process exceptions.

Buffers on the sending side that may be only partially filled (for example, FML or STRING buffers) will have only the amount that is used send. The system may then enlarge the received data size by some arbitrary amount. This means that the receiver may receive a buffer that is smaller than what was originally allocated by the sender, yet larger than the data that was sent.

The receive buffer may grow, or it may shrink, and its address almost invariably changes, as the system swaps buffers around internally. To determine whether (and how much) a reply buffer changed in size, compare its total size before tpgetrply() was issued with **ilen*. See “Introduction to the C Language Application-Transaction Monitor Interface” for more information about buffer management.

If **olen* is 0 upon return, then the reply has no data portion and neither **odata* nor the buffer it points to were modified. It is an error for **odata* or *olen* to be NULL.

The following is a list of valid *flags*.

TPNOTRAN

If the caller is in transaction mode and this flag is set, then when *svc* is invoked, it is not performed on behalf of the caller's transaction. Note that *svc* may still be invoked in transaction mode but it will not be the same transaction: a *svc* may have as a configuration attribute that it is automatically invoked in transaction mode. A caller in transaction mode that sets this flag is still subject to the transaction timeout (and no other). If a service fails that was invoked with this flag, the caller's transaction is not affected.

TPNOCHANGE

By default, if a buffer is received that differs in type from the buffer pointed to by **odata*, then **odata*'s buffer type changes to the received buffer's type so long as the receiver recognizes the incoming buffer type. When this flag is set, the type of the buffer pointed to by **odata* is not allowed to change. That is, the type and sub-type of the received buffer must match the type and sub-type of the buffer pointed to by **odata*.

TPNOBLOCK

The request is not sent if a blocking condition exists (for example, the internal buffers into which the message is transferred are full). Note that this flag applies only to the send portion of `tpcall()`: the function may block waiting for the reply. When `TPNOBLOCK` is not specified and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. However, if the caller is in transaction mode, this flag has no effect; it is subject to the transaction timeout limit. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpcall()`.

Return Values Upon successful return from `tpcall()` or upon return where `tperrno()` is set to `TPESVCFAIL`, `tpurcode()` contains an application defined value that was sent as part of `tpreturn()`.

Upon failure, `tpcall()` returns -1 and sets `tperrno()` to indicate the error condition. If a call fails with a particular `tperrno()` value, a subsequent call to `tperrordetail()`, with no intermediate ATMI calls, may provide more detailed information about the generated error. Refer to the `tperrordetail(3c)` reference page for more information.

Errors Upon failure, `tpcall()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[TPEINVAL]

Invalid arguments were given (for example, `svc` is NULL or `flags` are invalid).

[TPENOENT]

Cannot send to `svc` because it does not exist, or it is a conversational service, or the name provided begins with a dot (.).

[TPEITYPE]

The type and sub-type of `idata` is not one of the allowed types and sub-types that `svc` accepts.

[TPEOTYPE]

Either the type and sub-type of the reply are not known to the caller; or, `TPNOCHANGE` was set in `flags` and the type and sub-type of `*odata` do not match the type and sub-type of the reply sent by the service. Neither `*odata`, its contents, nor `*olen` is changed. If the service request was made on behalf of the caller's current transaction, then the transaction is marked abort-only since the reply is discarded.

[TPETRAN]

`svc` belongs to a server that does not support transactions and `TPNOTRAN` was not set.

[TPETIME]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is marked abort-only; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` was specified. In either case, neither `*odata`, its contents, nor `*olen` is changed. If a transaction timeout occurred, then with one exception, any attempts to

send new requests or receive outstanding replies will fail with `TPETIME` until the transaction has been aborted. The exception is a request that does not block, expects no reply, and is not sent on behalf of the caller's transaction (that is, `tpacall` with `TPNOTRAN`, `TPNOBLOCK`, and `TPNOREPLY` set).

[TPESVCFAIL]

The service routine sending the caller's reply called `tpreturn()` with `TPFAIL`. This is an application-level failure. The contents of the service's reply, if one was sent, is available in the buffer pointed to by `*odata`. If the service request was made on behalf of the caller's current transaction, then the transaction is marked abort-only. Note that regardless of whether the transaction has timed out, the only valid communications before the transaction is aborted are calls to `tpacall()` with `TPNOREPLY`, `TPNOTRAN`, and `TPNOBLOCK` set.

[TPESVCERR]

A service routine encountered an error either in `tpreturn(3c)` or `tpforward(3c)` (for example, bad arguments were passed). No reply data is returned when this error occurs (that is, neither `*odata`, its contents, nor `*olen` is changed). If the service request was made on behalf of the caller's transaction (that is, `TPNOTRAN` was not set), then the transaction is marked abort-only. Note that regardless of whether the transaction has timed out, the only valid communications before the transaction is aborted are calls to `tpacall()` with `TPNOREPLY`, `TPNOTRAN`, and `TPNOBLOCK` set. If either `SVCTIMEOUT` in the `UBBCONFIG` file or `TA_SVCTIMEOUT` in the `TM_MIB` is non-zero, `TPESVCERR` is returned when a service timeout occurs.

[TPEBLOCK]

A blocking condition was found on the send call and `TPNOBLOCK` was specified.

[TPGOTSIG]

A signal was received and `TPSIGRSTRT` was not specified.

[TPEPROTO]

`tpcall()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred. If a message queue on a remote location is filled, TPEOS may be returned even if `tpcall()` returned successfully.

See Also `tpacall(3c)`, `tpalloc(3c)`, `tperrordetail(3c)`, `tpforward(3c)`, `tpfree(3c)`, `tpgprio(3c)`, `tprealloc(3c)`, `tpreturn(3c)`, `tpsprio(3c)`, `tpstrerrordetail(3c)`, `tptypes(3c)`

tpcancel(3c)

- Name** `tpcancel()` - routine for canceling a call descriptor for outstanding reply
- Synopsis**
`#include <atmi.h>`
`int tpcancel(int cd)`
- Description** `tpcancel()` cancels a call descriptor, `cd`, returned by `tpacall()`. It is an error to attempt to cancel a call descriptor associated with a transaction.
- Upon success, `cd` is no longer valid and any reply received on behalf of `cd` will be silently discarded.
- In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpcancel()`.
- Return Values** Upon failure, `tpcancel()` returns `-1` and sets `tperrno()` to indicate the error condition.
- Errors** Upon failure, `tpcancel()` sets `tperrno()` to one of the following values.
- [TPEBADDESC]
`cd` is an invalid descriptor.
- [TPETRAN]
`cd()` is associated with the caller's transaction. `cd` remains valid and the caller's current transaction is not affected.
- [TPEPROTO]
`tpcancel()` was called improperly.
- [TPESYSTEM]
A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.
- [TPEOS]
An operating system error has occurred.
- See Also** `tpacall(3c)`

tpchkauth(3c)

Name	tpchkauth() - routine for checking if authentication required to join an application
Synopsis	<pre>#include <atmi.h> int tpchkauth(void)</pre>
Description	<p>tpchkauth() checks if authentication is required by the application configuration. This is typically used by application clients prior to calling <code>tpinit()</code> to determine if a password should be obtained from the user.</p> <p>In a multithreaded application, a thread in the <code>TPINVALIDCONTEXT</code> state is not allowed to issue a call to <code>tpchkauth()</code>.</p>
Return Values	<p>Upon success, <code>tpchkauth()</code> returns one of the following non-negative values.</p> <p><code>TPNOAUTH</code> Indicates that no authentication is required.</p> <p><code>TPSYSAUTH</code> Indicates that system authentication only is required.</p> <p><code>TPAPPAUTH</code> Indicates that both system and application specific authentication are required.</p> <p>Upon failure, <code>tpchkauth()</code> returns -1 and sets <code>tperrno()</code> to indicate the error condition.</p>
Errors	<p>Upon failure, <code>tpchkauth()</code> sets <code>tperrno()</code> to one of the following values.</p> <p>[<code>TPESYSTEM</code>] A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.</p> <p>[<code>TPEOS</code>] An operating system error has occurred.</p>
Interoperability	<code>tpchkauth()</code> is available only on sites running Release 4.2 or later.

Section 3c - C Functions

Portability The interfaces described in `tpchkauth(3c)` are supported on UNIX, Windows, and MS-DOS operating systems.

See Also `tpinit(3c)`

tpchkunsol(3c)

Name	tpchkunsol() - routine for checking for unsolicited message
Synopsis	<pre>#include <atmi.h> int tpchkunsol(void)</pre>
Description	<p>tpchkunsol() is used by a client to trigger checking for unsolicited messages. Calls to this routine in a client using signal-based notification do nothing and return immediately. This call has no arguments. Calls to this routine can result in calls to an application-defined unsolicited message handling routine by the BEA Tuxedo system libraries.</p> <p>In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tpchkunsol().</p>
Return Values	Upon successful completion, tpchkunsol() returns the number of unsolicited messages dispatched; otherwise it returns -1 and sets tperrno() to indicate the error condition.
Errors	<p>Upon failure, tpchkunsol() sets tperrno() to one of the following values.</p> <p>[TPEPROTO] tpchkunsol() was called in an improper context (for example, from within a server).</p> <p>[TPESYSTEM] A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.</p> <p>[TPEOS] An operating system error has occurred.</p>
Portability	The interfaces described in tnotify(3c) are supported on native site UNIX-based processors. In addition, the routines tpbroadcast() and tpchkunsol() as well as the function tpsetunsol() are supported on UNIX and MS-DOS workstation processors.

Clients that select signal-based notification may not be signal-able by the system due to signal restrictions. When this occurs, the system generates a log message that it is switching notification for the selected client to dip-in and the client is notified then and thereafter via dip-in notification. (See the description of the `RESOURCES NOTIFY` parameter in `UBBCONFIG(5)` for a detailed discussion of notification methods.)

Because signaling of clients is always done by the system, the behavior of notification is always consistent, regardless of where the originating notification call is made. Therefore to use signal-based notification:

- A native client must be running as an application administrator
- A Workstation client is not required to be running as the application administrator

The ID for the application administrator is identified as part of the configuration for the application.

If signal-based notification is selected for a client, then certain ATMI calls can fail, returning `TPGOTSIG` due to receipt of an unsolicited message if `TPSIGRSTRT` is not specified. See `UBBCONFIG(5)` and `tpinit(3c)` for more information on notification method selection.

See Also `tpbroadcast(3c)`, `tpinit(3c)`, `tpnotify(3c)`, `tpsetunsol(3c)`

tpclose(3c)

Name	tpclose() - routine for closing a resource manager
Synopsis	#include <atmi.h> int tpclose(void)
Description	tpclose() tears down the association between the caller and the resource manager to which it is linked. Since resource managers differ in their close semantics, the specific information needed to close a particular resource manager is placed in a configuration file. If a resource manager is already closed (that is, tpclose() is called more than once), no action is taken and success is returned. In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tpclose().
Return Values	Upon failure, tpclose() returns -1 and sets tperrno() to indicate the error condition.
Errors	Upon failure, tpclose() fails and sets tperrno() to one of the following values. [TPERMERR] A resource manager failed to close correctly. More information concerning the reason a resource manager failed to close can be obtained by interrogating a resource manager in its own specific manner. Note that any calls to determine the exact nature of the error hinder portability. [TPEPROTO] tpclose() was called in an improper context (for example, while the caller is in transaction mode). [TPESYSTEM] A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file. [TPEOS] An operating system error has occurred.
See Also	tpopen(3c)

tpcommit(3c)

Name	<code>tpcommit()</code> - routine for committing current transaction
Synopsis	<pre>#include <atmi.h> int tpcommit(long flags)</pre>
Description	<p><code>tpcommit()</code> signifies the end of a transaction, using a two-phase commit protocol to coordinate participants. <code>tpcommit()</code> can be called only by the initiator of a transaction. If any of the participants cannot commit the transaction (for example, they call <code>tpreturn()</code> with <code>TPFAIL</code>), then the entire transaction is aborted and <code>tpcommit()</code> fails. That is, all of the work involved in the transaction is undone. If all participants agree to commit their portion of the transaction, then this decision is logged to stable storage and all participants are asked to commit their work.</p>

Depending on the setting of the `TP_COMMIT_CONTROL` characteristic (see `tpscmt(3c)`), `tpcommit()` can return successfully either after the commit decision has been logged or after the two-phase commit protocol has completed. If `tpcommit()` returns after the commit decision has been logged but before the second phase has completed (`TP_CMT_LOGGED`), then all participants have agreed to commit the work they did on behalf of the transaction and should fulfill their promise to commit the transaction during the second phase. However, because `tpcommit()` is returning before the second phase has completed, there is a hazard that one or more of the participants can heuristically complete their portion of the transaction (in a manner that is not consistent with the commit decision) even though the function has returned success.

If the `TP_COMMIT_CONTROL` characteristic is set such that `tpcommit()` returns after the two-phase commit protocol has completed (`TP_CMT_COMPLETE`), then its return value reflects the exact status of the transaction (that is, whether the transaction heuristically completed or not).

Note that if only a single resource manager is involved in a transaction, then a one-phase commit is performed (that is, the resource manager is not asked whether or not it can commit; it is simply told to commit). In this case, the `TP_COMMIT_CONTROL` characteristic has no bearing and `tpcommit()` will return heuristic outcomes if present.

If `tpcommit()` is called while call descriptors exist for outstanding replies, then upon return from the function, the transaction is aborted and those descriptors associated with the caller's transaction are no longer valid. Call descriptors not associated with the caller's transaction remain valid.

`tpcommit()` must be called after all connections associated with the caller's transaction are closed (otherwise `TPEABORT` is returned, the transaction is aborted and these connections are disconnected in a disorderly fashion with a `TPEV_DISCONIMM` event). Connections opened before `tpbegin()` or with the `TPNOTRAN` flag (that is, connections not in transaction mode) are not affected by calls to `tpcommit()` or `tpabort()`.

Currently, `tpcommit()`'s sole argument, *flags*, is reserved for future use and must be set to 0.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpcommit()`.

Return Values Upon failure, `tpcommit()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpcommit()` sets `tperrno()` to one of the following values.

[`TPEINVAL`]

flags is not equal to 0. The caller's transaction is not affected.

[`TPETIME`]

The transaction timed out and the status of the transaction is unknown (that is, it can have been either committed or aborted). Note that if the transaction timed out and its status is known to be aborted, then `TPEABORT` is returned.

[`TPEABORT`]

The transaction could not commit because either the work performed by the initiator or by one or more of its participants could not commit. This error is also returned if `tpcommit()` is called with outstanding replies or open conversational connections.

[`TPEHEURISTIC`]

Due to a heuristic decision, the work done on behalf of the transaction was partially committed and partially aborted.

[`TPEHAZARD`]

Due to some failure, the work done on behalf of the transaction could have been heuristically completed.

[TPEPROTO]

`tpcommit()` was called in an improper context (for example, by a participant).

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Notices When using `tpbegin()`, `tpcommit()`, and `tpabort()` to delineate a BEA Tuxedo system transaction, it is important to remember that only the work done by a resource manager that meets the XA interface (and is linked to the caller appropriately) has transactional properties. All other operations performed in a transaction are not affected by either `tpcommit()` or `tpabort()`. See `buildserver(1)` for details on linking resource managers that meet the XA interface into a server such that operations performed by that resource manager are part of a BEA Tuxedo system transaction.

See Also `tpabort(3c)`, `tpbegin(3c)`, `tpconnect(3c)`, `tpgetlev(3c)`, `tpreturn(3c)`, `tpscmt(3c)`

tpconnect(3c)

Name `tpconnect()` - routine for establishing a conversational service connection

Synopsis `#include <atmi.h>`

```
int tpconnect(char *svc, char *data, long len, long flags)
```

Description `tpconnect()` allows a program to set up a half-duplex connection to a conversational service, *svc*. The name must be one of the conversational service names posted by a conversational server.

As part of setting up a connection, the caller can pass application defined data to the listening program. If the caller chooses to pass data, then *data* must point to a buffer previously allocated by `tpalloc()`. *len* specifies how much of the buffer to send. Note that if *data* points to a buffer of a type that does not require a length to be specified, (for example, an FML fielded buffer), then *len* is ignored (and may be 0). Also, *data* can be NULL in which case *len* is ignored (no application data is passed to the conversational service). The type and sub-type of *data* must match one of the types and sub-types recognized by *svc*. *data* and *len* are passed to the conversational service via the `TPSVCINFO` structure with which the service is invoked; the service does not have to call `tprecv()` to get the data.

The following is a list of valid *flags*.

TPNOTRAN

If the caller is in transaction mode and this flag is set, then when *svc* is invoked, it is not performed on behalf of the caller's transaction. Note that *svc* may still be invoked in transaction mode but it will not be the same transaction: a *svc* may have as a configuration attribute that it is automatically invoked in transaction mode. A caller in transaction mode that sets this flag is still subject to the transaction timeout (and no other). If a service fails that was invoked with this flag, the caller's transaction is not affected.

TPSENDONLY

The caller wants the connection to be set up initially such that it can only send data and the called service can only receive data (that is, the caller initially has control of the connection). Either `TPSENDONLY` or `TPRECVONLY` must be specified.

TPRECVONLY

The caller wants the connection to be set up initially such that it can only receive data and the called service can only send data (that is, the service being called initially has control of the connection). Either `TPSENDONLY` or `TPRECVONLY` must be specified.

TPNOBLOCK

The connection is not established and the data is not sent if a blocking condition exists (for example, the data buffers through which the message is sent are full). Note that this flag applies only to the send portion of `tpconnect()`; the function may block waiting for an acknowledgement from the server. When `TPNOBLOCK` is not specified and a blocking condition exists, the caller blocks until the condition subsides or a blocking timeout or transaction timeout occurs.

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts will still affect the program.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted call is reissued.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpconnect()`.

Return Values Upon successful completion, `tpconnect()` returns a descriptor that is used to refer to the connection in subsequent calls. Otherwise it returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpconnect()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[TPEINVAL]

Invalid arguments were given (for example, `svc` is `NULL`, `data` is non-`NULL` and does not point to a buffer allocated by `tpalloc()`, `TPSENDONLY` or `TPRECVONLY` was not specified in `flags`, or `flags` are otherwise invalid).

[TPENOENT]

Cannot initiate a connection to `svc` because it does not exist or is not a conversational service.

[TPEITYPE]

The type and subtype of *data* is not one of the allowed types and subtypes that *svc* accepts.

[TPELIMIT]

The caller's request was not sent because the maximum number of outstanding connections has been reached.

[TPETRAN]

svc belongs to a program that does not support transactions and TPNOTRAN was not set.

[TPETIME]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is marked abort-only; otherwise, a blocking timeout occurred and neither TPNOBLOCK nor TPNOTIME were specified. If a transaction timeout occurred, then any attempts to send or receive messages on any connections or to start a new connection will fail with TPETIME until the transaction has been aborted.

[TPEBLOCK]

A blocking condition exists and TPNOBLOCK was specified.

[TPGOTSIG]

A signal was received and TPSIGRSTRT was not specified.

[TPEPROTO]

tpconnect() was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpalloc(3c)`, `tpdiscon(3c)`, `tprecv(3c)`, `tpsend(3c)`, `tpservice(3c)`

tpconvert(3c)

Name	<code>tpconvert()</code> - convert structures to/from string representations
Synopsis	<pre>#include <atmi.h> #include <xa.h> int tpconvert(char *strrep, char *binrep, long flags)</pre>
Description	<code>tpconvert()</code> converts the string representation of interface structures (<i>strrep</i>) to or from the binary representation (<i>binrep</i>).

Both the direction of the conversion and the interface structure type are determined from the *flags* argument. To convert a structure from binary representation to string representation, the programmer must set the `TPTOSTRING` bit in *flags*. To convert a structure from string to binary the programmer must clear the bit. The following flags are defined to indicate the particular structure type to be converted; only one may be specified at a time:

`TPCONVCLTID`
Convert `CLIENTID` (see `atmi.h`).

`TPCONVTRANID`
Convert `TPTRANID` (see `atmi.h`).

`TPCONVXID`
Convert `XID` (see `xa.h`).

For conversions from binary to string representation, *strrep* should be at least `TPCONVMAXSTR` characters in length.

Note that unequal string versions of `TPTRANID` and `XID` values may be considered *equal* by the system when accessing `TM_MIB(5)` classes that allow these values as key fields (for example, `T_TRANSACTION` or `T_ULONG`). Therefore, string values for these data types should not be fabricated or manipulated by application programs. `TM_MIB(5)` guarantees that only objects matching the global transaction identified by the string are returned when one of these values is used as a key field.

A thread in a multithreaded application may issue a call to `tpconvert()` while running in any context state, including `TPINVALIDCONTEXT`.

- Return Values** Upon failure, `tpconvert()` returns -1 and sets `tperrno()` to indicate the error condition.
- Errors** Under the following conditions, `tpconvert()` fails and sets `tperrno()` to one of the following values.
- [TPEINVAL]
 Invalid arguments were specified. *strrep* or *binrep* is a NULL pointer, or *flags* does not indicate exactly one structure type.
- [TPEOS]
 An operating system error has occurred. A numeric value representing the system call that failed is available in `Unixerr`.
- [TPESYSTEM]
 A BEA Tuxedo system error has occurred. The exact nature of the error is written to `userlog(3c)`.
- Portability** This interface is available only on BEA Tuxedo Release 5.0 or later. This interface is available on workstation platforms.
- See Also** `tpresume(3c)`, `tpservice(3c)`, `tpsuspend(3c)`, `tx_info(3c)`, `TM_MIB(5)`

tpcryptpw(3c)

Name	<code>tpcryptpw()</code> - encrypt application password in administrative request
Synopsis	<pre>#include <atmi.h> #include <fml32.h> int tpcryptpw(FBFR32 *buf)</pre>
Description	<p><code>tpcryptpw()</code> is used to encrypt the application password stored in an administrative request buffer prior to sending the request for servicing. Application passwords are stored as string values using the FML32 field identifier <code>TA_PASSWORD</code>. This encryption is necessary to insure that clear text passwords are not compromised and that appropriate propagation of the update can take place to all active application sites. Additional system fields may be added to the callers buffer and existing fields may be modified to satisfy the request.</p> <p>A thread in a multithreaded application may issue a call to <code>tpcryptpw()</code> while running in any context state, including <code>TPINVALIDCONTEXT</code>.</p>
Return Values	Upon failure, <code>tpcryptpw()</code> returns -1 and sets <code>tperrno()</code> to indicate the error condition.
Errors	Upon failure, <code>tpcryptpw()</code> sets <code>tperrno()</code> to one of the following values.
	<p>[TPEINVAL] Invalid arguments were specified. The <code>buf</code> value is NULL, does not point to a FML32 typed buffer or <code>appdir</code> could not be determined from the input buffer or the environment.</p> <p>[TPEPERM] The calling process did not have the appropriate permissions necessary to perform the requested task.</p> <p>[TPEOS] An operating system error has occurred. A numeric value representing the system call that failed is available in <code>Unixerr</code>.</p> <p>[TPESYSTEM] A BEA Tuxedo system error has occurred. The exact nature of the error is written to <code>userlog(3c)</code>.</p>

Portability This interface is available only on UNIX System sites running BEA Tuxedo Release 5.0 or later. This interface is not available to workstation clients.

Files `${TUXDIR}/lib/libtmib.a, ${TUXDIR}/lib/libtmib.so.rel`

See Also `MIB(5)`, `TM_MIB(5)`

Setting Up a BEA Tuxedo Application

Administering a BEA Tuxedo Application at Run Time

tpdequeue(3c)

Name tpdequeue() - routine to dequeue a message from a queue

Synopsis

```
#include <atmi.h>
int tpdequeue(char *qspace, char *qname, TPQCTL *ctl, char **data,
long *len, long flags)
```

Description tpdequeue() takes a message for processing from the queue named by *qname* in the *qspace* queue space.

By default, the message at the top of the queue is dequeued. The order of messages on the queue is defined when the queue is created. The application can request a particular message for dequeuing by specifying its message identifier or correlation identifier using the *ctl* parameter. *ctl* flags can also be used to indicate that the application wants to wait for a message, in the case when a message is not currently available. It is possible to use the *ctl* parameter to look at a message without removing it from the queue or changing its relative position on the queue. See the section below describing this parameter.

data is the address of a pointer to the buffer into which a message is read, and *len* points to the length of that message. **data* must point to a buffer originally allocated by `tpalloc()`. If a message is larger than the buffer passed to `tpdequeue`, the buffer is increased in size to accommodate the message. To determine whether a message buffer changed in size, compare its (total) size before `tpdequeue()` was issued with **len*. If **len* is larger, then the buffer has grown; otherwise, the buffer has not changed size. Note that **data* may change for reasons other than the buffer's size increased. If **len* is 0 upon return, then the message dequeued has no data portion and neither **data* nor the buffer it points to were modified. It is an error for **data* or *len* to be NULL.

The message is dequeued in transaction mode if the caller is in transaction mode and the `TPNOTRAN` flag is not set. This has the effect that if `tpdequeue()` returns successfully and the caller's transaction is committed successfully, then the message is removed from the queue. If the caller's transaction is rolled back either explicitly or as the result of a transaction timeout or some communication error, then the message will be left on the queue (that is, the removal of the message from the queue is also rolled back). It is not possible to enqueue and dequeue the same message within the same transaction.

The message is not dequeued in transaction mode if either the caller is not in transaction mode, or the `TPNOTRAN` flag is set. When not in transaction mode, if a communication error or a timeout occurs, the application will not know whether or not the message was successfully dequeued and the message may be lost.

The following is a list of valid *flags*.

TPNOTRAN

If the caller is in transaction mode and this flag is set, the message is not dequeued within the caller's transaction. A caller in transaction mode that sets this flag is still subject to the transaction timeout (and no other) when dequeuing the message. If message dequeuing fails, the caller's transaction is not affected.

TPNOBLOCK

The message is not dequeued if a blocking condition exists. If this flag is set and a blocking condition exists such as the internal buffers into which the message is transferred are full, the call fails and `tperrno()` is set to `TPEBLOCK`. If this flag is set and a blocking condition exists because the target queue is opened *exclusively* by another application, the call fails, `tperrno()` is set to `TPEDIAGNOSTIC`, and the diagnostic field of the `TPQCTL` structure is set to `QMESHAPE`. In the latter case, the other application, which is based on a BEA product other than the BEA Tuxedo system, opened the queue for exclusive read and/or write using the Queuing Services API (QSAPI).

When `TPNOBLOCK` is not set and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout). This blocking condition does not include blocking on the queue itself if the `TPQWAIT` option in *flags* (of the `TPQCTL` structure) is specified.

TPNOTIME

Setting this flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPNOCHANGE

When this flag is set, the type of the buffer pointed to by **data* is not allowed to change. By default, if a buffer is received that differs in type from the buffer pointed to by **data*, then **data*'s buffer type changes to the received buffer's type so long as the receiver recognizes the incoming buffer type. That is, the type and sub-type of the dequeued message must match the type and sub-type of the buffer pointed to by **data*.

TPSIGRSTRT

Setting this flag indicates that any underlying system calls that are interrupted by a signal should be reissued. When this flag is not set and a signal interrupts a system call, the call fails and sets `tperrno()` to `TPGOTSIG`.

If `tpdequeue()` returns successfully, the application can retrieve additional information about the message using the `ctl` data structure. The information may include the message identifier for the dequeued message; a correlation identifier that should accompany any reply or failure message so that the originator can correlate the message with the original request; the quality of service the message was delivered with, the quality of service any replies to the message should be delivered with; the name of a reply queue if a reply is desired; and the name of the failure queue on which the application can queue information regarding failure to dequeue the message. These are described below.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpdequeue()`.

Control Parameter

The `TPQCTL` structure is used by the application program to pass and retrieve parameters associated with dequeuing the message. The `flags` element of `TPQCTL` is used to indicate what other elements in the structure are valid.

On input to `tpdequeue()`, the following elements may be set in the `TPQCTL` structure:

```
long flags;                /* indicates which of the values
                           * are set */
char msgid[32];           /* ID of message to dequeue */
char corrid[32];         /* correlation identifier of
                           * message to dequeue */
```

The following is a list of valid bits for the `flags` parameter controlling input information for `tpdequeue()`.

TPNOFLAGS

No flags are set. No information is taken from the control structure.

TPQGETBYMSGID

Setting this flag requests that the message with the message identifier specified by `ctl->msgid` be dequeued. The message identifier may be acquired by a prior call to `tpenqueue(3c)`. Note that a message identifier changes if the message has moved from one queue to another. Note also that the entire 32 bytes of the message identifier value are significant, so the value specified by `ctl->msgid` must be completely initialized (for example, padded with null characters).

TPQGETBYCORRID

Setting this flag requests that the message with the correlation identifier specified by `ctl->corrid` be dequeued. The correlation identifier is specified by the application when enqueueing the message with `tpenqueue()`. Note that the entire 32 bytes of the correlation identifier value are significant, so the value specified by `ctl->corrid` must be completely initialized (for example, padded with null characters).

TPQWAIT

Setting this flag indicates that an error should not be returned if the queue is empty. Instead, the process should wait until a message is available. If **TPQWAIT** is set in conjunction with **TPQGETBYMSGID** or **TPQGETBYCORRID**, it indicates that an error should not be returned if no message with the specified message identifier or correlation identifier is present in the queue. Instead, the process should wait until a message meeting the criteria is available. The process is still subject to the caller's transaction timeout, or, when not in transaction mode, the process is subject to the timeout specified on the **TMQUEUE** process by the `-t` option.

If a message matching the desired criteria is not immediately available and the configured action resources are exhausted, `tpdequeue` returns -1, `tperrno()` is set to **TPEDIAGNOSTIC**, and the diagnostic field of the **TPQCTL** structure is set to **QMESYSTEM**.

Note that each `tpdequeue()` request specifying the **TPQWAIT** control parameter requires that a queue manager (**TMQUEUE**) action object be available if a message satisfying the condition is not immediately available. If an action object is not available, the `tpdequeue()` request fails. The number of available queue manager actions are specified when a queue space is created or modified. When a waiting dequeue request completes, the associated action object associated is made available for another request.

TPQPEEK

If this flag is set, the specified message is read but is not removed from the queue. This flag implies the **TPNOTRAN** flag has been set for the `tpdequeue()` operation. That is, non-destructive dequeuing is non-transactional. Note that it is not possible to read messages enqueued or dequeued within a transaction before the transaction completes.

When a thread is non-destructively dequeuing a message using **TPQPEEK**, the message may not be seen by other non-blocking dequeuers for the brief time the system is processing the non-destructive dequeue request. This includes

dequeueers using specific selection criteria (such as message identifier and correlation identifier) that are looking for the message currently being non-destructively dequeued.

On output from `tpdequeue()`, the following elements may be set in the `TPQCTL` structure:

```
long flags;                /* indicates which of the values
                           * should be set */

long priority;             /* enqueue priority */
char msgid[32];           /* ID of message dequeued */
char corrid[32];          /* correlation identifier used to
                           * identify the message */
long delivery_qos;        /* delivery quality of service */
long reply_qos;           /* reply message quality of service */
char replyqueue[16];      /* queue name for reply */
char failurequeue[16];    /* queue name for failure */
long diagnostic;          /* reason for failure */
long appkey;              /* application authentication client
                           * key */

long urcode;              /* user-return code */
CLIENTID cltid;          /* client identifier for originating
                           * client */
```

The following is a list of valid bits for the `flags` parameter controlling output information from `tpdequeue()`. For any of these bits, if the flag bit is turned on when `tpdequeue()` is called, the associated element in the structure is populated with the value provided when the message was queued, and the bit remains set. If a value is not available (that is, no value was provided when the message was queued) or the bit is not set when `tpdequeue()` is called, `tpdequeue()` completes with the flag turned off.

TPQPRIORITY

If this flag is set, the call to `tpdequeue()` is successful, and the message was queued with an explicit priority, then the priority is stored in `ctl->priority`. The priority is in the range 1 to 100, inclusive, and the higher the number, the higher the priority (that is, a message with a higher number is dequeued before a message with a lower number). For queues not ordered by priority, the value is informational.

If no priority was explicitly specified when the message was queued and the call to `tpdequeue()` is successful, the priority for the message is 50.

TPQMSGID

If this flag is set and the call to `tpdequeue()` is successful, the message identifier is stored in `ctl->msgid`. The entire 32 bytes of the message identifier value are significant.

TPQCORRID

If this flag is set, the call to `tpdequeue()` is successful, and the message was queued with a correlation identifier, then the correlation identifier is stored in `ctl->corrid`. The entire 32 bytes of the correlation identifier value are significant. Any BEA Tuxedo /Q provided reply to a message has the correlation identifier of the original request message.

TPQDELIVERYQOS

If this flag is set, the call to `tpdequeue()` is successful, and the message was queued with a delivery quality of service, then the flag—`TPQQOSDEFAULTPERSIST`, `TPQQOSPERSISTENT`, or `TPQQOSNONPERSISTENT`—is stored in `ctl->delivery_qos`. If no delivery quality of service was explicitly specified when the message was queued, the default delivery policy of the target queue dictates the delivery quality of service for the message.

TPQREPLYQOS

If this flag is set, the call to `tpdequeue()` is successful, and the message was queued with a reply quality of service, then the flag—`TPQQOSDEFAULTPERSIST`, `TPQQOSPERSISTENT`, or `TPQQOSNONPERSISTENT`—is stored in `ctl->reply_qos`. If no reply quality of service was explicitly specified when the message was queued, the default delivery policy of the `ctl->replyqueue` queue dictates the delivery quality of service for any reply.

Note that the default delivery policy is determined when the reply to a message is enqueued. That is, if the default delivery policy of the reply queue is modified between the time that the original message is enqueued and the reply to the message is enqueued, the policy used is the one in effect when the reply is finally enqueued.

TPQREPLYQ

If this flag is set, the call to `tpdequeue()` is successful, and the message was queued with a reply queue, then the name of the reply queue is stored in `ctl->replyqueue`. Any reply to the message should go to the named reply queue within the same queue space as the request message.

TPQFAILUREQ

If this flag is set, the call to `tpdequeue()` is successful, and the message was queued with a failure queue, then the name of the failure queue is stored in `ctl->failurequeue`. Any failure message should go to the named failure queue within the same queue space as the request message.

The following remaining bits for the `flags` parameter are cleared (set to zero) when `tpdequeue()` is called: `TPQTOP`, `TPQBEFOREMSGID`, `TPQTIME_ABS`, `TPQTIME_REL`, `TPQEXPTIME_ABS`, `TPQEXPTIME_REL`, and `TPQEXPTIME_NONE`. These bits are valid bits for the `flags` parameter controlling input information for `tpenqueue()`.

If the call to `tpdequeue()` failed and `tperrno()` is set to `TPEDIAGNOSTIC`, a value indicating the reason for failure is returned in `ctl->diagnostic`. The possible values are defined below in the `DIAGNOSTICS` section.

Additionally on output, if the call to `tpdequeue()` is successful, `ctl->appkey` is set to the application authentication key, `ctl->ctlid` is set to the identifier for the client originating the request, and `ctl->urcode` is set to the user-return code value that was set when the message was enqueued.

If the `ctl` parameter is `NULL`, the input flags are considered to be `TPNOFLAGS`, and no output information is made available to the application program.

Return Values Upon failure, `tpdequeue()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpdequeue()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[TPEINVAL]

Invalid arguments were given (for example, `qname` is `NULL`, `data` does not point to space allocated with `tpalloc()` or `flags` are invalid).

[TPENOENT]

Cannot access the `qspace` because it is not available (that is, the associated `TMQUEUE(5)` server is not available), or cannot start a global transaction due to the lack of entries in the Global Transaction Table (GTT).

[TPEOTYPE]

Either the type and sub-type of the dequeued message are not known to the caller; or, `TPNOCHANGE` was set in `flags` and the type and sub-type of `*data` do not match the type and sub-type of the dequeued message. In either case, `*data`, its contents, and `*len` are *not* changed. When the call is made in

transaction mode and this error occurs, the transaction is marked abort-only, and the message remains on the queue.

[TPETIME]

A timeout occurred. If the caller is in transaction mode, a transaction timeout occurred and the transaction is to be aborted; otherwise, a blocking timeout occurred and neither TPNOBLOCK nor TPNOTIME was specified. If a transaction timeout occurred, any attempts to dequeue new messages will fail with TPETIME until the transaction has been aborted.

[TPEBLOCK]

A blocking condition exists and TPNOBLOCK was specified.

[TPGOTSIG]

A signal was received and TPSIGRSTRT was not specified.

[TPEPROTO]

tpdequeue() was called improperly. There is no effect on the queue or the transaction.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file. There is no effect on the queue.

[TPEOS]

An operating system error has occurred. There is no effect on the queue.

[TPEDIAGNOSTIC]

Dequeuing a message from the specified queue failed. The reason for failure can be determined by the diagnostic value returned via *ctl* structure.

Diagnostic The following diagnostic values are returned during the dequeuing of a message.

[QMEINVAL]

An invalid flag value was specified.

[QMEBADRMID]

An invalid resource manager identifier was specified.

[QMENOTOPEN]

The resource manager is not currently open.

[QMETRAN]

The call was not in transaction mode or was made with the TPNOTRAN flag set and an error occurred trying to start a transaction in which to dequeue the

message. This diagnostic is not returned by queue managers from BEA Tuxedo Release 7.1 or later.

[QMEBADMSGID]

An invalid message identifier was specified for dequeuing.

[QMESYSTEM]

A system error has occurred. The exact nature of the error is written to a log file.

[QMEOS]

An operating system error has occurred.

[QMEABORTED]

The operation was aborted. When executed within a global transaction, the global transaction has been marked rollback-only. Otherwise, the queue manager aborted the operation.

[QMEPROTO]

A dequeue was done when the transaction state was not active.

[QMEBADQUEUE]

An invalid or deleted queue name was specified.

[QMENOMSG]

No message was available for dequeuing. Note that it is possible that the message exists on the queue and another application process has read the message from the queue. In this case, the message may be put back on the queue if that other process rolls back the transaction.

[QMEINUSE]

When dequeuing a message by message identifier or correlation identifier, the specified message is in use by another transaction. Otherwise, all messages currently on the queue are in use by other transactions. This diagnostic is not returned by queue managers from BEA Tuxedo Release 7.1 or later.

[QMESHARE]

When dequeuing a message from a specified queue, the specified queue is opened *exclusively* by another application. The other application is one based on a BEA product other than the BEA Tuxedo system that opened the queue for exclusive read and/or write using the Queuing Services API (QSAPI).

See Also `qmadm(1)`, `tpalloc(3c)`, `tpenqueue(3c)`, `APPQ_MIB(5)`, `TMQUEUE(5)`

tpdiscon(3c)

Name tpdiscon() - routine for taking down a conversational service connection

Synopsis #include <atmi.h>
 int tpdiscon(int cd)

Description tpdiscon() immediately tears down the connection specified by *cd* and generates a TPEV_DISCONIMM event on the other end of the connection.

tpdiscon() can be called only by the initiator of the conversation. tpdiscon() cannot be called within a conversational service on the descriptor with which it was invoked. Rather, a conversational service must use tpreturn() to signify that it has completed its part of the conversation. Similarly, even though a program communicating with a conversational service can issue tpdiscon(), the preferred way is to let the service tear down the connection in tpreturn(); doing so ensures correct results.

tpdiscon() causes the connection to be torn down immediately (that is, abortive rather than orderly). Any data that has not yet reached its destination may be lost. tpdiscon() can be issued even when the program on the other end of the connection is participating in the caller's transaction. In this case, the transaction must be aborted. Also, the caller does not need to have control of the connection when tpdiscon() is called.

Return Values Upon failure, tpdiscon() returns -1 and sets tperrno() to indicate the error condition.

Errors Upon failure, tpdiscon() sets tperrno() to one of the following values.

[TPEBADDESC]

cd is invalid or is the descriptor with which a conversational service was invoked.

[TPETIME]

 A timeout occurred. The descriptor is no longer valid.

[TPEPROTO]

 tpdiscon() was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file. The descriptor is no longer valid.

[TPEOS]

An operating system error has occurred. The descriptor is no longer valid.

See Also `tpabort(3c)`, `tpcommit(3c)`, `tpconnect(3c)`, `tprecv(3c)`, `tpreturn(3c)`,
`tpsend(3c)`

tpenqueue(3c)

Name	tpenqueue() - routine to enqueue a message
Synopsis	<pre>#include <atmi.h> int tpenqueue(char *qspace, char *qname, TPQCTL *ctl, char *data, long len, long flags)</pre>
Description	<p>tpenqueue() stores a message on the queue named by <i>qname</i> in the <i>qspace</i> queue space. A queue space is a collection of queues, one of which must be <i>qname</i>.</p>

When the message is intended for a BEA Tuxedo system server, the *qname* matches the name of a service provided by the server. The system provided server, `TMQFORWARD(5)`, provides a default mechanism for dequeuing messages from the queue and forwarding them to servers that provide a service matching the queue name. If the originator expects a reply, then the reply to the forwarded service request is stored on the originator's queue, unless otherwise specified. The originator will dequeue the reply message at a subsequent time. Queues can also be used for a reliable message transfer mechanism between any pair of BEA Tuxedo system processes (clients and/or servers). In this case, the queue name does not match a service name but some agreed upon name for transferring the message.

If *data* is non-NULL, it must point to a buffer previously allocated by `tpalloc()` and *len* should specify the amount of data in the buffer that should be queued. Note that if *data* points to a buffer of a type that does not require a length to be specified (for example, an FML fielded buffer), then *len* is ignored. If *data* is NULL, *len* is ignored and a message is queued with no data portion.

The message is queued at the priority defined for *qspace* unless overridden by a previous call to `tpsprio()`.

If the caller is within a transaction and the `TPNOTRAN` flag is not set, the message is queued in transaction mode. This has the effect that if `tpenqueue()` returns successfully and the caller's transaction is committed successfully, then the message is guaranteed to be available subsequent to the transaction completing. If the caller's transaction is rolled back either explicitly or as the result of a transaction timeout or some communication error, then the message will be removed from the queue (that is, the placing of the message on the queue is also rolled back). It is not possible to enqueue then dequeue the same message within the same transaction.

The message is not queued in transaction mode if either the caller is not in transaction mode, or the `TPNOTRAN` flag is set. Once `topenqueue()` returns successfully, the submitted message is guaranteed to be in the queue. When not in transaction mode, if a communication error or a timeout occurs, the application will not know whether or not the message was successfully stored on the queue.

The order in which messages are placed on the queue is controlled by the application via `ctl` data structure as described below; the default queue ordering is set when the queue is created.

The following is a list of valid *flags*.

TPNOTRAN

If the caller is in transaction mode and this flag is set, the message is not queued within the caller's transaction. A caller in transaction mode that sets this flag is still subject to the transaction timeout (and no other) when queuing the message. If message queuing fails, the caller's transaction is not affected.

TPNOBLOCK

The message is not enqueued if a blocking condition exists. If this flag is set and a blocking condition exists such as the internal buffers into which the message is transferred are full, the call fails and `tperrno()` is set to `TPEBLOCK`. If this flag is set and a blocking condition exists because the target queue is opened *exclusively* by another application, the call fails, `tperrno()` is set to `TPEDIAGNOSTIC`, and the diagnostic field of the `TPQCTL` structure is set to `QMESHAPE`. In the latter case, the other application, which is based on a BEA product other than the BEA Tuxedo system, opened the queue for exclusive read and/or write using the Queuing Services API (QSAPI).

When `TPNOBLOCK` is not set and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout). If a timeout occurs, the call fails and `tperrno()` is set to `TPETIME`.

TPNOTIME

Setting this flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If this flag is set and a signal interrupts any underlying system calls, the interrupted system call is reissued. If `TPSIGRSTRT` is not set and a signal interrupts a system call, `topenqueue()` fails and `tperrno()` is set to `TPGOTSIG`.

Additional information about queuing the message can be specified via *ctl* data structure. This information includes values to override the default queue ordering placing the message at the top of the queue or before an enqueued message; an absolute or relative time after which a queued message is made available; an absolute or relative time when a message expires and is removed from the queue; the quality of service for delivering the message; the quality of service that any replies to the message should use; a correlation identifier that aids in correlating a reply or failure message with the queued message; the name of a queue to which a reply should be enqueued; and the name of a queue to which any failure message should be enqueued.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpenqueue()`.

Control Parameter The `TPQCTL` structure is used by the application program to pass and retrieve parameters associated with enqueueing the message. The *flags* element of `TPQCTL` is used to indicate what other elements in the structure are valid.

On input to `tpenqueue()`, the following elements may be set in the `TPQCTL` structure:

```
long flags;           /* indicates which of the values
                     * are set */
long deq_time;       /* absolute/relative for dequeuing */
long priority;       /* enqueue priority */
long exp_time        /* expiration time */
long delivery_qos    /* delivery quality of service */
long reply_qos       /* reply quality of service */
long urcode;         /* user-return code */
char msgid[32];      /* ID of message before which to queue
                     * request */
char corrid[32];     /* correlation identifier used to
                     * identify the msg */
char replyqueue[16]; /* queue name for reply message */
char failurequeue[16]; /* queue name for failure message */
```

The following is a list of valid bits for the *flags* parameter controlling input information for `tpenqueue()`.

TPNOFLAGS

No flags or values are set. No information is taken from the control structure.

TPQTOP

Setting this flag indicates that the queue ordering be overridden and the message placed at the top of the queue. This request may not be granted depending on whether or not the queue was configured to allow overriding

the queue ordering. `TPQTOP` and `TPQBEFOREMSGID` are mutually exclusive flags.

`TPQBEFOREMSGID`

Setting this flag indicates that the queue ordering be overridden and the message placed in the queue before the message identified by `ctl->msgid`. This request may not be granted depending on whether or not the queue was configured to allow overriding the queue ordering. `TPQTOP` and `TPQBEFOREMSGID` are mutually exclusive flags. Note that the entire 32 bytes of the message identifier value are significant, so the value identified by `ctl->msgid` must be completely initialized (for example, padded with null characters).

`TPQTIME_ABS`

If this flag is set, the message is made available after the time specified by `ctl->deq_time`. The `deq_time` is an absolute time value as generated by `time(2)`, `mkttime(3C)`, or `gp_mktime(3c)` (the number of seconds since 00:00:00 Universal Coordinated Time—UTC, January 1, 1970). `TPQTIME_ABS` and `TPQTIME_REL` are mutually exclusive flags. The absolute time is determined by the clock on the machine where the queue manager process resides.

`TPQTIME_REL`

If this flag is set, the message is made available after a time relative to the completion of the enqueueing operation. `ctl->deq_time` specifies the number of seconds to delay after the enqueueing completes before the submitted message should be available. `TPQTIME_ABS` and `TPQTIME_REL` are mutually exclusive flags.

`TPQPRIORITY`

If this flag is set, the priority at which the message should be enqueued is stored in `ctl->priority`. The priority must be in the range 1 to 100, inclusive. The higher the number, the higher the priority (that is, a message with a higher number is dequeued before a message with a lower number). For queues not ordered by priority, this value is informational.

If this flag is not set, the priority for the message is 50 by default.

`TPQCORRID`

If this flag is set, the correlation identifier value specified in `ctl->corrid` is available when a message is dequeued with `tpdequeue()`. This identifier accompanies any reply or failure message that is queued so that an application

can correlate a reply with a particular request. Note that the entire 32 bytes of the correlation identifier value are significant, so the value specified in `ctl->corrid` must be completely initialized (for example, padded with null characters).

TPQREPLYQ

If this flag is set, a reply queue named in `ctl->replyqueue` is associated with the queued message. Any reply to the message will be queued to the named queue within the same queue space as the request message. This string must be NULL terminated (maximum 15 characters in length).

TPQFAILUREQ

If this flag is set, a failure queue named in the `ctl->failurequeue` is associated with the queued message. If (1) the enqueued message is processed by `TMQFORWARD()`, (2) `TMQFORWARD` was started with the `-d` option, and (3) the service fails and returns a non-null reply, a failure message consisting of the reply and its associated `tpurcode` is enqueued to the named queue within the same queue space as the original request message. This string must be NULL-terminated (maximum 15 characters in length).

TPQDELIVERYQOS, TPQREPLYQOS

If the `TPQDELIVERYQOS` flag is set, the flags specified by `ctl->delivery_qos` control the quality of service for delivery of the message. In this case, one of three mutually exclusive flags—`TPQQOSDEFAULTPERSIST`, `TPQQOSPERSISTENT`, or `TPQQOSNONPERSISTENT`—must be set in `ctl->delivery_qos`. If `TPQDELIVERYQOS` is not set, the default delivery policy of the target queue dictates the delivery quality of service for the message.

If the `TPQREPLYQOS` flag is set, the flags specified by `ctl->reply_qos` control the quality of service for any reply to the message. In this case, one of three mutually exclusive flags—`TPQQOSDEFAULTPERSIST`, `TPQQOSPERSISTENT`, or `TPQQOSNONPERSISTENT`—must be set in `ctl->reply_qos`. The `TPQREPLYQOS` flag is used when a reply is returned from messages processed by `TMQFORWARD`. Applications not using `TMQFORWARD` to invoke services may use the `TPQREPLYQOS` flag as a hint for their own reply mechanism.

If `TPQREPLYQOS` is not set, the default delivery policy of the `ctl->replyqueue` queue dictates the delivery quality of service for any reply. Note that the default delivery policy is determined when the reply to a message is enqueued. That is, if the default delivery policy of the reply queue

is modified between the time that the original message is enqueued and the reply to the message is enqueued, the policy used is the one in effect when the reply is finally enqueued.

The following is the list of valid flags for `ctl->delivery_qos` and `ctl->reply_qos`:

`TPQQOSDEFAULTPERSIST`

This flag specifies that the message is to be delivered using the default delivery policy specified on the target queue.

`TPQQOSPERSISTENT`

This flag specifies that the message is to be delivered in a persistent manner using the disk-based delivery method. Setting this flag overrides the default delivery policy specified on the target queue.

`TPQQOSNONPERSISTENT`

This flag specifies that the message is to be delivered in a non-persistent manner using the memory-based delivery method. Specifically, the message is queued in memory until it is dequeued. Setting this flag overrides the default delivery policy specified on the target queue. If the caller is transactional, non-persistent messages are enqueued within the caller's transaction, however, non-persistent messages are lost if the system is shut down, crashes, or the IPC shared memory for the queue space is removed.

`TPQEXPTIME_ABS`

If this flag is set, the message has an absolute expiration time, which is the absolute time when the message will be removed from the queue. The absolute expiration time is determined by the clock on the machine where the queue manager process resides.

The absolute expiration time is indicated by the value stored in `ctl->exp_time`. The value of `ctl->exp_time` must be set to an absolute time value generated by `time(2)`, `mkttime(3C)`, or `gp_mkttime(3c)` (the number of seconds since 00:00:00 Universal Coordinated Time—UTC, January 1, 1970).

If an absolute time is specified that is earlier than the time of the enqueue operation, the operation succeeds, but the message is not counted for the purpose of calculating thresholds. If the expiration time is before the message availability time, the message is not available for dequeuing unless either the availability or expiration time is changed so that the availability time is before the expiration time. In addition, these messages are removed from the queue

at expiration time even if they were never available for dequeuing. If a message expires while it is within a transaction, the expiration does not cause the transaction to fail. Messages that expire while being enqueued or dequeued within a transaction are removed from the queue when the transaction ends. There is no notification that the message has expired.

TPQEXPTIME_ABS, TPQEXPTIME_REL, and TPQEXPTIME_NONE are mutually exclusive flags. If none of these flags is set, the default expiration time associated with the target queue is applied to the message.

TPQEXPTIME_REL

If this flag is set, the message has a relative expiration time, which is the number of seconds *after* the message arrives at the queue that the message is removed from the queue. The relative expiration time is indicated by the value stored in `ctl->exp_time`.

If the expiration time is before the message availability time, the message is not available for dequeuing unless either the availability or expiration time is changed so that the availability time is before the expiration time. In addition, these messages are removed from the queue at expiration time even if they were never available for dequeuing. The expiration of a message during a transaction, does not cause the transaction to fail. Messages that expire while being enqueued or dequeued within a transaction are removed from the queue when the transaction ends. There is no acknowledgment that the message has expired.

TPQEXPTIME_ABS, TPQEXPTIME_REL, and TPQEXPTIME_NONE are mutually exclusive flags. If none of these flags is set, the default expiration time associated with the target queue is applied to the message.

TPQEXPTIME_NONE

Setting this flag indicates that the message should not expire. This flag overrides any default expiration policy associated with the target queue. A message can be removed by dequeuing it or by deleting it via an administrative interface.

TPQEXPTIME_ABS, TPQEXPTIME_REL, and TPQEXPTIME_NONE are mutually exclusive flags. If none of these flags is set, the default expiration time associated with the target queue is applied to the message.

Additionally, the `urcode` element of `TPQCTL` can be set with a user-return code. This value will be returned to the application that dequeues the message.

On output from `tpenqueue()`, the following elements may be set in the `TPQCTL` structure:

```
long flags;           /* indicates which of the values
                       * are set */
char msgid[32];      /* ID of enqueued message */
long diagnostic;     /* indicates reason for failure */
```

The following is a valid bit for the `flags` parameter controlling output information from `tpenqueue()`. If this flag is turned on when `tpenqueue()` is called, the /Q server `TMQUEUE(5)` populates the associated element in the structure with a message identifier. If this flag is turned off when `tpenqueue()` is called, `TMQUEUE()` does *not* populate the associated element in the structure with a message identifier.

TPQMSGID

If this flag is set and the call to `tpenqueue()` is successful, the message identifier is stored in `ctl->msgid`. The entire 32 bytes of the message identifier value are significant, so the value stored in `ctl->msgid` is completely initialized (for example, padded with null characters). The actual padding character used for initialization varies between releases of the BEA Tuxedo /Q component.

The remaining members of the control structure are not used on input to `tpenqueue()`.

If the call to `tpenqueue()` failed and `tperrno()` is set to `TPEDIAGNOSTIC`, a value indicating the reason for failure is returned in `ctl->diagnostic`. The possible values are defined below in the `DIAGNOSTICS` section.

If this parameter is `NULL`, the input flags are considered to be `TPNOFLAGS` and no output information is made available to the application program.

Return Values Upon failure, `tpenqueue()` returns -1 and sets `tperrno()` to indicate the error condition. Otherwise, the message has been successfully queued when `tpenqueue()` returns.

Errors Upon failure, `tpenqueue()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[TPEINVAL]

Invalid arguments were given (for example, `qspace` is `NULL`, `data` does not point to space allocated with `tpalloc()`, or `flags` are invalid).

[TPENOENT]

Cannot access the *qspace* because it is not available (that is, the associated `TMQUEUE(5)` server is not available), or cannot start a global transaction due to the lack of entries in the Global Transaction Table (GTT).

[TPETIME]

A timeout occurred. If the caller is in transaction mode, a transaction timeout occurred and the transaction is to be aborted; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` was specified. If a transaction timeout occurred, any attempts to enqueue new messages will fail with `TPETIME` until the transaction has been aborted.

[TPEBLOCK]

A blocking condition exists and `TPNOBLOCK` was specified.

[TPGOTSIG]

A signal was received and `TPSIGRSTRT` was not specified.

[TPEPROTO]

`tpenqueue()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

[TPEDIAGNOSTIC]

Enqueuing a message on the specified queue failed. The reason for failure can be determined by the diagnostic returned via `ctl`.

Diagnostic The following diagnostic values are returned during the enqueueing of a message.

[QMEINVAL]

An invalid flag value was specified.

[QMEBADRMID]

An invalid resource manager identifier was specified.

[QMENOTOPEN]

The resource manager is not currently open.

[QMETRAN]

The call was not in transaction mode or was made with the `TPNOTRAN` flag set and an error occurred trying to start a transaction in which to enqueue the message. This diagnostic is not returned by queue managers from BEA Tuxedo Release 7.1 or later.

[QMEBADMSGID]

An invalid message identifier was specified.

[QMESYSTEM]

A system error occurred. The exact nature of the error is written to a log file.

[QMEOS]

An operating system error occurred.

[QMEABORTED]

The operation was aborted. When executed within a global transaction, the global transaction has been marked rollback-only. Otherwise, the queue manager aborted the operation.

[QMEPROTO]

An enqueue was done when the transaction state was not active.

[QMEBADQUEUE]

An invalid or deleted queue name was specified.

[QMENOSPACE]

Due to an insufficient resource, such as no space on the queue, the message with its required quality of service (persistent or non-persistent storage) was not enqueued. `QMENOSPACE` is returned when any of the following configured resources is exceeded: (1) the amount of disk (persistent) space allotted to the queue space, (2) the amount of memory (non-persistent) space allotted to the queue space, (3) the maximum number of simultaneously active transactions allowed for the queue space, (4) the maximum number of messages that the queue space can contain at any one time, (5) the maximum number of concurrent actions that the Queuing Services component can handle, or (6) the maximum number of authenticated users that may concurrently use the Queuing Services component.

[QMERELASE]

An attempt was made to enqueue a message to a queue manager that is from a version of the BEA Tuxedo system that does not support a newer feature.

[QMESHARE]

When enqueueing a message from a specified queue, the specified queue is opened *exclusively* by another application. The other application is one based on a BEA product other than the BEA Tuxedo system that opened the queue for exclusive read and/or write using the Queuing Services API (QSAPI).

See Also `qadmin(1)`, `gp_mktime(3c)`, `tpacall(3c)`, `tpalloc(3c)`, `tpdequeue(3c)`, `tpinit(3c)`, `tpsprio(3c)`, `APPQ_MIB(5)`, `TMQFORWARD(5)`, `TMQUEUE(5)`

tpenvelope(3c)

Name	<code>tpenvelope()</code> - access the digital signature and encryption information associated with a typed message buffer
Synopsis	<pre>#include <atmi.h> int tpenvelope(char *data, long len, int occurrence, TPKEY *outputkey, long *status, char *timestamp, long flags)</pre>
Description	<p><code>tpenvelope()</code> provides access to the following types of digital signature and encryption information associated with a typed message buffer:</p> <ul style="list-style-type: none">■ Digital-signature registration requests <p>A sending process <i>explicitly</i> registers a digital signature request for a message buffer by calling <code>tpsign()</code>, or <i>implicitly</i> registers a digital signature request for a message buffer by calling <code>tpkey_open()</code> with the <code>TPKEY_AUTOSIGN</code> flag specified.</p> <ul style="list-style-type: none">■ Digital signatures <p>Just before the message buffer is sent, the public key software generates and attaches a digital signature to the message buffer for each digital-signature registration request; a digital signature enables a receiving process to verify the signer (originator) of the message.</p> <ul style="list-style-type: none">■ Encryption registration requests <p>A sending process <i>explicitly</i> registers an encryption (seal) request for a message buffer by calling <code>tpseal()</code>, or <i>implicitly</i> registers an encryption (seal) request for a message buffer by calling <code>tpkey_open()</code> with the <code>TPKEY_AUTOENCRYPT</code> flag specified.</p> <ul style="list-style-type: none">■ Encryption envelopes <p>Just before the message buffer is sent, the public key software encrypts the message content and attaches an encryption envelope to the message buffer for each encryption registration request; an encryption envelope enables a receiving process to decrypt the message.</p> <p>Signature and encryption information is available to both sending and receiving processes. In a sending process, digital signature and encryption information is generally in a pending state, waiting until the message is sent. In a receiving process,</p>

digital signatures have already been verified, and encryption and decryption have already been performed. Failures in decryption or signature verification might prevent message delivery, in which case the receiving process never receives the message buffer and therefore has no knowledge of the message buffer.

data must point to a valid typed message buffer either (1) previously allocated by a process calling `tpalloc()` or (2) delivered by the system to a receiving process. If the message buffer is self-describing, *len* is ignored (and may be 0). Otherwise, *len* must contain the length of data in *data*.

There may be multiple occurrences of digital-signature registration requests, digital signatures, encryption registration requests, and encryption envelopes associated with a message buffer. The occurrences are stored in sequence, with the first item at the zero position and subsequent items in consecutive positions. The *occurrence* input parameter indicates which item is requested. When the value of *occurrence* is beyond the position of the last item, `tpenvelope()` fails with the `TPENOENT` error condition. All items may be examined by calling `tpenvelope()` repeatedly until `TPENOENT` is returned.

The handle to the key associated with a digital-signature registration request, digital signature, encryption registration request, or encryption envelope is returned via *outputkey*. The key handle returned is a separate copy of the original key opened by calling `tpkey_open()`. Properties of the key, such as the `PRINCIPAL` attribute parameter, can be obtained by calling `tpkey_getinfo()`. It is the caller's responsibility to release key handle *outputkey* by calling `tpkey_close()`.

Note: If *outputkey* is `NULL`, no key handle is returned.

The *status* output parameter reports the state of the digital-signature registration request, digital signature, encryption registration request, or encryption envelope. If the value of the status is not `NULL`, it is set to one of the following states.

`TPSIGN_PENDING`

A digital signature has been requested on behalf of the *signer* principal associated with the corresponding private key, and will be generated when the message buffer is transmitted from this process.

`TPSIGN_OK`

The digital signature has been verified.

`TPSIGN_TAMPERED_MESSAGE`

The digital signature is not valid because the content of the message buffer has been altered.

TPSIGN_TAMPERED_CERT

The digital signature is not valid because the signer's digital certificate has been altered.

TPSIGN_REVOKED_CERT

The digital signature is not valid because the signer's digital certificate has been revoked.

TPSIGN_POSTDATED

The digital signature is not valid because its timestamp is too far into the future.

TPSIGN_EXPIRED_CERT

The digital signature is not valid because the signer's digital certificate has expired.

TPSIGN_EXPIRED

The digital signature is not valid because its timestamp is too old.

TPSIGN_UNKNOWN

The digital signature is not valid because the signer's digital certificate was issued by an unknown Certification Authority (CA).

TPSEAL_PENDING

An encryption (seal) has been requested for the *recipient* principal associated with the corresponding public key, and will be performed when the message buffer is transmitted from this process.

TPSEAL_OK

The encryption envelope is valid.

TPSEAL_TAMPERED_CERT

The encryption envelope is not valid because the recipient's digital certificate has been altered.

TPSEAL_REVOKED_CERT

The encryption envelope is not valid because the recipient's digital certificate has been revoked.

TPSEAL_EXPIRED_CERT

The encryption envelope is not valid because the recipient's digital certificate has expired.

TPSEAL_UNKNOWN

The encryption envelope is not valid because the recipient's digital certificate was issued by an unknown CA.

The *timestamp* output parameter contains the digital signature's timestamp according to the local clock on the machine where the digital signature was generated. The integrity of this value is protected by the associated digital signature. The memory location indicated by *timestamp* is set to the null-terminated signature time in format YYYYMMDDHHMMSS, where YYYY=year, MM=month, DD=day, HH=hour, MM=minute, and SS=second. *timestamp* may be NULL, in which case no value is returned. Encryption seals do not contain timestamps, and the memory location indicated by *timestamp* is unchanged.

The *flags* parameter may be set to one of the following values:

- TPKEY_REMOVE—The item at position *occurrence* is removed (that is, it is no longer associated with the buffer). Output parameters *outputkey*, *status*, and *timestamp* related to the item are captured before the item is removed. Items at subsequent positions are shifted down by one, so there are never any gaps in the numbering of *occurrence*.
- TPKEY_REMOVEALL—All items associated with the message buffer are removed. The output parameters *outputkey*, *status*, and *timestamp* are not returned.
- TPKEY_VERIFY—All digital signatures associated with the message buffer are re-verified. The status of a signature may change after re-verification. For example, if a message buffer has been modified by a receiving process, the status of the originator's signature changes from TPSIGN_OK to TPSIGN_TAMPERED_MESSAGE.

Return Values On failure, this function returns -1 and sets `tperrno()` to indicate the error condition.

Errors [TPEINVAL]

Invalid arguments were given. For example, the value of *data* is NULL or the value assigned to *flags* is unrecognized.

[TPENOENT]

This *occurrence* does not exist.

[TPESYSTEM]

An error occurred. Consult the system error log file for details.

See Also `tpkey_close(3c)`, `tpkey_getinfo(3c)`, `tpkey_open(3c)`, `tpseal(3c)`, `tpsign(3c)`

tperrordetail(3c)

Name `tperrordetail()` - get additional detail about an error generated from the last BEA Tuxedo system call

Synopsis

```
#include <atmi.h>
int tperrordetail(long flags)
```

Description `tperrordetail()` returns additional detail related to an error produced by the last BEA Tuxedo system routine called in the current thread. `tperrordetail()` returns a numeric value that is also represented by a symbolic name. If the last BEA Tuxedo system routine called in the current thread did not produce an error, then `tperrordetail()` will return zero. Therefore, `tperrordetail()` should be called after an error has been indicated; that is, when `tperrno()` has been set.

Currently `flags` is reserved for future use and must be set to 0.

A thread in a multithreaded application may issue a call to `tperrordetail()` while running in any context state, including `TPINVALIDCONTEXT`.

Return Values Upon failure, `tperrordetail()` returns a -1 and sets `tperrno()` to indicate the error condition.

These are the symbolic names and meaning for each numeric value that `tperrordetail()` may return. The order in which these are listed is not significant and does not imply precedence.

`TPED_CLIENTDISCONNECTED`

A Jolt client is disconnected currently. The `TPACK` flag is used in a `tpnotify()` call and the target of `tpnotify()` is a currently disconnected Jolt client. When `tpnotify()` fails, a subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_CLIENTDISCONNECTED`.

`TPED_DECRYPTION_FAILURE`

A process receiving an encrypted message cannot decrypt the message. This error most likely occurs because the process does not have access to the private key required to decrypt the message.

When a call fails due to this error, a subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_DECRYPTION_FAILURE`.

TPED_DOMAINUNREACHABLE

A domain is unreachable. Specifically, a domain configured to satisfy a request that a local domain cannot service was not reachable when a request was made. After the request failure, a subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_DOMAINUNREACHABLE`.

The following table indicates the corresponding values returned by `tperrno()` when calls to `tpcall()`, `tpgetrply()`, or `tprecv()` fail because of an unreachable domain. The error detail returned by a subsequent call to `tperrordetail()` is `TPED_DOMAINUNREACHABLE`.

ATMI Call	tperrno	Error Detail
<code>tpcall</code>	<code>TPESVCERR</code>	<code>TPED_DOMAINUNREACHABLE</code>
<code>tpgetrply</code>	<code>TPESVCERR</code>	<code>TPED_DOMAINUNREACHABLE</code>
<code>tprecv</code>	<code>TPEEVENT</code> <code>TPEV_SVCERR</code>	<code>TPED_DOMAINUNREACHABLE</code>

Note that the `TPED_DOMAINUNREACHABLE` feature applies to BEA Tuxedo Domains only. It does not apply to other domains products such as Connect OSI TP Domains and Connect SNA Domains.

TPED_INVALID_CERTIFICATE

A process receiving a digitally signed message cannot verify the digital signature because the associated digital certificate is invalid. This error most likely occurs because the digital certificate has expired, the digital certificate was issued by an unknown Certification Authority (CA), or the digital certificate has been altered.

When a call fails due to this error, a subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_INVALID_CERTIFICATE`.

TPED_INVALID_SIGNATURE

A process receiving a digitally signed message cannot verify the digital signature because the signature is invalid. This error most likely occurs because the message has been altered, the timestamp for the digital signature is too old, or the timestamp for the digital signature is too far into the future.

When a call fails due to this error, a subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_INVALID_SIGNATURE`.

TPED_INVALIDCONTEXT

A thread is blocked in an ATMI call when another thread terminates its context. Specifically, any thread blocked in an ATMI call when another thread terminates its context will return from the ATMI call with a failure return; `tperrno()` is set to `TPESYSTEM`. A subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_INVALIDCONTEXT`.

TPED_NOCLIENT

No client exists. The `TPACK` flag is used in a `tpnotify()` call but there is no target for `tpnotify()`. When `tpnotify()` fails, `tperrno()` is set to `TPENOENT`. A subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_NOCLIENT`.

TPED_NOUNSOLHANDLER

A client does not have an unsolicited handler set. The `TPACK` flag is used in a `tpnotify()` call and the target of the `tpnotify()` is in a BEA Tuxedo session, but it has not set an unsolicited notification handler. When `tpnotify()` fails, `tperrno()` is set to `TPENOENT`. A subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_NOUNSOLHANDLER`.

TPED_SVCTIMEOUT

A server was terminated due to a service timeout. The service timeout is controlled by the value of `SVCTIMEOUT` in the `UBBCONFIG` file or `TA_SVCTIMEOUT` in `T_SERVER` and `T_SERVICE` classes in the `TM_MIB`. When a call fails due to this error, a subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_SVCTIMEOUT`.

TPED_TERM

A Workstation client has been disconnected from the application. When a call fails due to this error, a subsequent call to `tperrordetail()` with no intermediate ATMI calls will return `TPED_TERM`.

Errors Upon failure, `tperrordetail()` sets `tperrno()` to one of the following values.

TPEINVAL

flags not set to zero

See Also Introduction to the C Language Application-Transaction Monitor Interface, `tpstrerrordetail(3c)`, `tperrno(5)`

tpexport(3c)

Name	<code>tpexport()</code> - convert a typed message buffer into an exportable, machine-independent string representation, that includes digital signatures and encryption envelopes
Synopsis	<pre>#include <atmi.h> int tpexport(char *ibuf, long ilen, char *ostr, long *olen, long flags)</pre>
Description	<code>tpexport()</code> converts a typed message buffer into an externalized representation. An externalized representation is a message buffer that does <i>not</i> include any BEA Tuxedo header information that is normally added to a message buffer just before the buffer is transmitted.

The externalized representation may be transmitted between processes, machines, or BEA Tuxedo applications via any communication mechanism. It may be archived on permanent storage, and remains valid after a system shutdown and reboot.

An externalized representation includes:

- Any digital signatures associated with *ibuf*. They are verified later when the buffer is imported.
- Any encryption envelopes associated with *ibuf*. The buffer content remains protected by encryption. Only specified recipients with access to a valid private key for decryption may later import the buffer.

ibuf must point to a valid typed message buffer either (1) previously allocated by a process calling `tpalloc()` or (2) delivered by the system to a receiving process. *ilen* specifies how much of *ibuf* to export. Note that if *ibuf* points to a buffer type for which a length need not be specified (for example, an FML fielded buffer), then *ilen* is ignored (and may be 0).

ostr is a pointer to the output area that will hold an externalized representation of the buffer's content and associated properties. If `TPEX_STRING` is set in *flags*, then the externalized format will be a string type. Otherwise, the output length is determined by **olen* and may contain embedded null bytes.

On input, **olen* specifies the maximum storage size available at *ostr*. On output **olen* is set to the actual number of bytes written to *ostr* (including a terminating null character if `TPEX_STRING` is set in *flags*).

The *flags* argument may be set to `TPEX_STRING` if string format (base 64 encoded) is desired for the output buffer. Otherwise, the output will be binary.

Return Values On failure, this function returns `-1` and sets `tperrno()` to indicate the error condition.

Errors `[TPEINVAL]`

Invalid arguments were given. For example, the value of *ibuf* is `NULL` or the value of *flags* is not set correctly.

`[TPEPERM]`

Permission failure. The cryptographic service provider was not able to access a private key necessary to produce a digital signature.

`[TPESYSTEM]`

An error occurred. Consult the system error log file for details.

`[TPELIMIT]`

Insufficient output storage was provided. **olen* is set to the necessary amount of space.

See Also `tpimport(3c)`

tpforward(3c)

Name	tpforward() - routine for forwarding a service request to another service routine
Synopsis	<pre>#include <atmi.h> void tpforward(char *svc, char *data, long len, long flags)</pre>
Description	<p>tpforward() allows a service routine to forward a client's request to another service routine for further processing. tpforward() acts like tpreturn() in that it is the last call made in a service routine. Like tpreturn(), tpforward() should be called from within the service routine dispatched to ensure correct return of control to the BEA Tuxedo system dispatcher. tpforward() cannot be called from within a conversational service.</p>

This function forwards a request to the service named by *svc* using data pointed to by *data*. The service name must not begin with a dot. A service routine forwarding a request receives no reply. After the request is forwarded, the service routine returns to the communication manager dispatcher and the server is free to do other work. Note that because no reply is expected from a forwarded request, the request may be forwarded without error to any service routine in the same executable as the service that forwarded the request.

If the service routine is in transaction mode, tpforward() puts the caller's portion of the transaction in a state where it may be completed when the originator of the transaction issues either tpccommit() or tpabort(). If a transaction was explicitly started with tpbegin() while in a service routine, the transaction must be ended with either tpccommit() or tpabort() before calling tpforward(). Thus, all services in a "forward chain" are either all started in transaction mode or none are.

The last server in a forward chain sends a reply back to the originator of the request using tpreturn(). In essence, tpforward() transfers to another server the responsibility of sending a reply back to the awaiting requester.

tpforward() should be called after receiving all replies expected from service requests initiated by the service routine. Any outstanding replies which are not received will automatically be dropped by the communication manager dispatcher upon receipt. In addition, the descriptors for those replies become invalid and the request is not forwarded to *svc*.

data points to the data portion of a reply to be sent. If *data* is non-NULL, it must point to a buffer previously obtained by a call to `tpalloc()`. If this is the same buffer passed to the service routine upon its invocation, then its disposition is up to the BEA Tuxedo system dispatcher; the service routine writer does not have to worry about whether it is freed or not. In fact, any attempt by the user to free this buffer will fail. However, if the buffer passed to `tpforward()` is not the same one with which the service is invoked, then `tpforward()` will free that buffer. *len* specifies the amount of the data buffer to be sent. If *data* points to a buffer which does not require a length to be specified, (for example, an FML fielded buffer), then *len* is ignored (and can be 0). If *data* is NULL, then *len* is ignored and a request with zero length data is sent.

The *flags* argument is reserved for future use and should be set to 0 (zero).

Return Values A service routine does not return any value to its caller, the communication manager dispatcher. Thus, `tpforward()` is declared as a void. See `tpreturn(3c)` for a more extensive discussion.

Errors If any errors occur either in the handling of the parameters passed to the function or in its processing, a “failed” message is sent back to the original requester (unless no reply is to be sent). The existence of outstanding replies or subordinate connections, or the caller’s transaction being marked abort-only, qualify as failures which generate failed messages.

If either `SVCTIMEOUT` in the `UBBCONFIG` file or `TA_SVCTIMEOUT` in the `TM_MIB` is non-zero, the event, `TPEV_SVCERR` is returned when a service timeout occurs.

Failed messages are detected by the requester with the `TPESVCERR` error indication. When such an error occurs, the caller’s data is not sent. Also, this error causes the caller’s current transaction to be marked abort-only.

If a transaction timeout occurs either while in the service routine or while forwarding the request, the requester waiting for a reply with either `tpcall()`, or `tpgetrply()` will get a `TPETIME` error return. Also, the waiting requester will not receive any data. Service routines, however, are expected to terminate using either `tpreturn()` or `tpforward()`. A conversational service routine must use `tpreturn()`, and cannot use `tpforward()`.

If a service routine returns without using either `tpreturn()` or `tpforward()` (that is, it uses the C language `return` statement or simply “falls out of the function”) or if `tpforward()` is called from a conversational server, the server will print a warning message in a log file and return a service error to the original requester. All open connections to subordinates will be disconnected immediately, and any outstanding asynchronous replies will be marked stale. If the server was in transaction mode at the

time of failure, the transaction is marked abort-only. Note also that if either `tpreturn()` or `tpforward()` are used outside of a service routine (for example, in clients, or in `tpsvrinit()` or `tpsvrdone()`), then these routines simply return having no effect.

See Also `tpalloc(3c)`, `tpconnect(3c)`, `tpreturn(3c)`, `tpservice(3c)`,
`tpstrerrordetail(3c)`

tpfree(3c)

Name	<code>tpfree()</code> - routine for freeing a typed buffer
Synopsis	<pre>#include <atmi.h> void tpfree(char *ptr)</pre>
Description	<p>The argument to <code>tpfree()</code> is a pointer to a buffer previously obtained by either <code>tpalloc()</code> or <code>tprealloc()</code>. If <code>ptr</code> is <code>NULL</code>, no action occurs. Undefined results will occur if <code>ptr</code> does not point to a typed buffer (or if it points to space previously freed with <code>tpfree()</code>). Inside service routines, <code>tpfree()</code> returns and does not free the buffer if <code>ptr</code> points to the buffer passed into a service routine.</p> <p>Some buffer types require state information or associated data to be removed as part of freeing a buffer. <code>tpfree()</code> removes any of these associations (in a communication manager-specific manner) before a buffer is freed.</p> <p>Once <code>tpfree()</code> returns, <code>ptr</code> should not be passed as an argument to any BEA Tuxedo system routine or used in any other manner.</p> <p>A thread in a multithreaded application may issue a call to <code>tpfree()</code> while running in any context state, including <code>TPINVALIDCONTEXT</code>.</p> <p>When freeing an <code>FML32</code> buffer using <code>tpfree()</code>, the routine recursively frees all embedded buffers to prevent memory leaks. In order to preserve the embedded buffers, you should assign the associated pointer to <code>NULL</code> before issuing the <code>tpfree()</code> command. As stated above, if <code>ptr</code> is <code>NULL</code>, no action occurs.</p>
Return Values	<code>tpfree()</code> does not return any value to its caller. Thus, it is declared as a void.
Usage	This function should not be used in concert with <code>malloc()</code> , <code>realloc()</code> , or <code>free()</code> in the C library (for example, a buffer allocated with <code>tpalloc()</code> should not be freed with <code>free()</code>).
See Also	Introduction to the C Language Application-Transaction Monitor Interface, <code>tpalloc(3c)</code> , <code>tprealloc(3c)</code>

tpgetadmkey(3c)

Name	tpgetadmkey() - get administrative authentication key
Synopsis	<pre>#include <atmi.h> long tpgetadmkey(TPINIT *tpinfo)</pre>
Description	<p>tpgetadmkey() is available for application use by an application specific authentication server. It returns an application security key suitable for assignment to the indicated user for the purpose of administrative authentication. This routine must be called with a client name (that is, <i>tpinfo->cltname</i>) of either <i>tpsyzadm()</i> or <i>tpsyzop()</i>; otherwise, a valid administrative key will not be returned.</p> <p>In a multithreaded application, a thread in the <i>TPINVALIDCONTEXT</i> state is not allowed to issue a call to <i>tpgetadmkey()</i>.</p>
Return Values	Upon success, <i>tpgetadmkey()</i> returns a non-0 value with the high-order bit (0x80000000) set; otherwise it returns 0. Zero may be returned if <i>tpinfo</i> is <i>NULL</i> , <i>tpinfo->cltname</i> is not <i>tpsyzadm()</i> or <i>tpsyzop()</i> , or lastly if the effective user ID is not the configured application administrator for this site.
Errors	A zero return value is the only indication that a valid administrative key was not assigned.
Portability	This interface is available only on UNIX System sites running BEA Tuxedo Release 5.0 or later.
See Also	<i>tpadduser(1)</i> , <i>tpinit(3c)</i> , <i>AUTHSVR(5)</i> <i>Setting Up a BEA Tuxedo Application</i> <i>Administering a BEA Tuxedo Application at Run Time</i>

tpgetctxt(3c)

Name `tpgetctxt()` - retrieve a context identifier for the current application association

Synopsis

```
#include <atmi.h>
int tpgetctxt(TPCONTEXT_T *context, long flags)
```

Description `tpgetctxt()` retrieves an identifier that represents the current application context and places that identifier in `context`. This function operates on a per-thread basis in a multithreaded environment, and on a per-process basis in a non-threaded environment.

Typically, a thread

1. Calls `tpinit()`
2. Calls `tpgetctxt()`
3. Handles the value of `context` as follows:
 - In a multithreaded application—Passes the value of `context` to another thread in the same process so the other thread can call `tpsetctxt()`
 - In a single-threaded or multithreaded application—Saves this context identifier for itself so it can switch back to the indicated context later

The second argument, `flags`, is not currently used and must be set to 0.

`tpgetctxt()` may be called in single-context applications as well as in multicontext applications.

A thread in a multithreaded application may issue a call to `tpgetctxt()` while running in any context state, including `TPINVALIDCONTEXT`.

Return Values Upon successful completion, `tpgetctxt()` returns a non-negative value. Context is set to the current context ID, which may be represented by any of the following:

- A context ID greater than 0, indicating a context in a multicontexted application
- `TPSINGLECONTEXT`, indicating that the current thread has successfully executed `tpinit()` without the `TPMULTICONTEXTS` flag, or that the current thread was just created in a process that has successfully executed `tpinit()` without the `TPMULTICONTEXTS` flag. The value of `TPSINGLECONTEXT` is 0.

- `TPNULLCONTEXT`, indicating that the current thread is not associated with a context.
- `TPINVALIDCONTEXT`, indicating that the current thread is in the invalid context state. If a thread in a multicontexted client issues a call to `tpterm()` while other threads in the same context are still working, the working threads are placed in the `TPINVALIDCONTEXT` context. The value of `TPINVALIDCONTEXT` is `-1`.

A thread in the `TPINVALIDCONTEXT` state is prohibited from issuing calls to most ATMI functions. For a complete list of functions that may and may not be called, see Introduction to the C Language Application-Transaction Monitor Interface.

For details about the `TPINVALIDCONTEXT` context state, see `tpterm(3c)`.

Upon failure, `tpgetctxt()` returns a value of `-1` and sets `tperrno` to indicate the error condition.

Errors Upon failure, `tpgetctxt()` sets `tperrno` to one of the following values.

[`TPEINVAL`]

Invalid arguments have been given. For example, the value of `context` is `NULL` or the value of `flags` is not `0`.

[`TPESYSTEM`]

A BEA Tuxedo system error has occurred. The exact nature of the error has been written to a log file.

[`TPEOS`]

An operating system error has occurred.

See Also Introduction to the C Language Application-Transaction Monitor Interface, `tpsetctxt(3c)`, `tpterm(3c)`

tpgetlev(3c)

Name	<code>tpgetlev()</code> - routine for checking if a transaction is in progress
Synopsis	<pre>#include <atmi.h> int tpgetlev()</pre>
Description	<p><code>tpgetlev()</code> returns to the caller the current transaction level. Currently, the only levels defined are 0 and 1.</p> <p>In a multithreaded application, a thread in the <code>TPINVALIDCONTEXT</code> state is not allowed to issue a call to <code>tpgetlev()</code>.</p>
Return Values	<p>Upon successful completion, <code>tpgetlev()</code> returns either a 0 to indicate that no transaction is in progress, or 1 to indicate that a transaction is in progress;</p> <p>Upon failure, <code>tpgetlev()</code> returns -1 and sets <code>tperrno()</code> to indicate the error condition.</p>
Errors	<p>Upon failure, <code>tpgetlev()</code> sets <code>tperrno()</code> to one of the following values.</p> <p>[TPEPROTO] <code>tpgetlev()</code> was called improperly.</p> <p>[TPESYSTEM] A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.</p> <p>[TPEOS] An operating system error has occurred.</p>
Notices	<p>When using <code>tpbegin()</code>, <code>tpcommit()</code> and <code>tpabort()</code> to delineate a BEA Tuxedo system transaction, it is important to remember that only the work done by a resource manager that meets the XA interface (and is linked to the caller appropriately) has transactional properties. All other operations performed in a transaction are not affected by either <code>tpcommit()</code> or <code>tpabort()</code>. See <code>buildserver(1)</code> for details on linking resource managers that meet the XA interface into a server such that operations performed by that resource manager are part of a BEA Tuxedo system transaction.</p>
See Also	<code>tpabort(3c)</code> , <code>tpbegin(3c)</code> , <code>tpcommit(3c)</code> , <code>tpscmt(3c)</code>

tpgetrply(3c)

- Name** tpgetrply() - routine for getting a reply from a previous request
- Synopsis**

```
#include <atmi.h>
int tpgetrply(int *cd, char **data, long *len, long flags)
```
- Description** tpgetrply() returns a reply from a previously sent request. This function's first argument, *cd*, points to a call descriptor returned by `tpacall()`. By default, the function waits until the reply matching *cd* arrives or a timeout occurs.
- data* must be the address of a pointer to a buffer previously allocated by `tpalloc()` and *len* should point to a long that `tpgetrply()` sets to the amount of data successfully received. Upon successful return, *data* points to a buffer containing the reply and *len* contains the size of the data. FML and FML32 buffers often assume a minimum size of 4096 bytes; if the reply is larger than 4096, the size of the buffer is increased to a size large enough to accommodate the data being returned.
- Buffers on the sending side that may be only partially filled (for example, FML or STRING buffers) will have only the amount that is used send. The system may then enlarge the received data size by some arbitrary amount. This means that the receiver may receive a buffer that is smaller than what was originally allocated by the sender, yet larger than the data that was sent.
- The receive buffer may grow, or it may shrink, and its address almost invariably changes, as the system swaps buffers around internally. To determine whether (and how much) a reply buffer changed in size, compare its total size before `tpgetrply()` was issued with *len*. See "Introduction to the C Language Application-Transaction Monitor Interface" for more information about buffer management.
- If *len* is 0, then the reply has no data portion and neither *data* nor the buffer it points to were modified.
- It is an error for *data* or *len* to be NULL.
- Within any particular context of a multithreaded program:
- Calls to `tpgetrply(TPGETANY)` and `tpgetrply()` for a specific handle cannot be issued concurrently.
 - Multiple calls to `tpgetrply(TPGETANY)` cannot be issued concurrently.

Any `tpgetrply()` call that would, if issued, cause a violation of either of these restrictions, returns `-1` and sets `tperrno` to `TPEPROTO`.

It is acceptable to issue:

- Concurrent calls to `tpgetrply()` for different handles
- A call to `tpgetrply(TPGETANY)` in a single context concurrently with a call to `tpgetrply()`, with or without `TPGETANY`, in a different context

The following is a list of valid *flags*.

TPGETANY

This flag signifies that `tpgetrply()` should ignore the descriptor pointed to by `cd`, return any reply available and set `cd` to point to the call descriptor for the reply returned. If no replies exist, `tpgetrply()` by default will wait for one to arrive.

TPNOCHANGE

By default, if a buffer is received that differs in type from the buffer pointed to by `*data`, then `*data`'s buffer type changes to the received buffer's type so long as the receiver recognizes the incoming buffer type. When this flag is set, the type of the buffer pointed to by `*data` is not allowed to change. That is, the type and sub-type of the received buffer must match the type and sub-type of the buffer pointed to by `*data`.

TPNOBLOCK

`tpgetrply()` does not wait for the reply to arrive. If the reply is available, then `tpgetrply()` gets the reply and returns. When this flag is not specified and a reply is not available, the caller blocks until the reply arrives or a timeout occurs (either transaction or blocking timeout).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely for its reply and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued.

Except as noted below, `*cd` is no longer valid after its reply is received.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpgetrply()`.

Return Values Upon successful return from `tpgetrply()` or upon return where `tperrno()` is set to `TPESVCFAIL`, `tpurcode()` contains an application defined value that was sent as part of `tpreturn()`.

Upon failure, `tpgetrply()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpgetrply()` sets `tperrno()` as indicated below. Note that if `TPGETANY` is not set, then `*cd` is invalidated unless otherwise stated. If `TPGETANY` is set, then `cd` points to the descriptor for the reply on which the failure occurred; if an error occurred before a reply could be retrieved, then `cd` points to 0. Also, the failure does not affect the caller's transaction, if one exists, unless otherwise stated. If a call fails with a particular `tperrno()` value, a subsequent call to `tperrordetail()` with no intermediate ATMI calls, may provide more detailed information about the generated error. Refer to the `tperrordetail(3c)` reference page for more information.

[TPEINVAL]

Invalid arguments were given (for example, `cd`, `data`, `*data` or `len` is NULL or `flags` are invalid). If `cd` is non-NULL, then it is still valid after this error and the reply remains outstanding.

[TPEOTYPE]

Either the type and sub-type of the reply are not known to the caller; or, `TPNOCHANGE` was set in `flags` and the type and sub-type of `*data` do not match the type and sub-type of the reply sent by the service. Regardless, neither `*data`, its contents nor `*len` are changed. If the reply was to be received on behalf of the caller's current transaction, then the transaction is marked abort-only since the reply is discarded.

[TPEBADDESC]

`cd` points to an invalid descriptor.

[TPETIME]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is marked abort-only; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` were specified. In either case, neither `*data`, its contents nor `*len` are changed. `*cd` remains valid unless the caller is in transaction mode (and `TPGETANY` was not set). If a transaction timeout occurred, then with one exception, any attempts to send new requests or receive outstanding replies will fail with `TPETIME` until the transaction has been aborted. The exception is a request that does not block, expects no reply and is not sent on behalf of the caller's

transaction (that is, `tpacall()` with `TPNOTRAN`, `TPNOBLOCK` and `TPNOREPLY` set).

[TPESVCFAIL]

The service routine sending the caller's reply called `tpreturn()` with `TPFAIL`. This is an application-level failure. The contents of the service's reply, if one was sent, is available in the buffer pointed to by `*data`. If the service request was made on behalf of the caller's transaction, then the transaction is marked abort-only. Note that regardless of whether the transaction has timed out, the only valid communications before the transaction is aborted are calls to `tpacall()` with `TPNOREPLY`, `TPNOTRAN`, and `TPNOBLOCK` set.

[TPESVCERR]

A service routine encountered an error either in `tpreturn()` or `tpforward()` (for example, bad arguments were passed). No reply data is returned when this error occurs (that is, neither `*data`, its contents nor `*len` are changed). If the service request was made on behalf of the caller's transaction, then the transaction is marked abort-only. Note that regardless of whether the transaction has timed out, the only valid communications before the transaction is aborted are calls to `tpacall()` with `TPNOREPLY`, `TPNOTRAN`, and `TPNOBLOCK` set. If either `SVCTIMEOUT` in the `UBBCONFIG` file or `TA_SVCTIMEOUT` in the `TM_MIB` is non-zero, `TPESVCERR` is returned when a service timeout occurs.

[TPEBLOCK]

A blocking condition exists and `TPNOBLOCK` was specified. `*cd` remains valid.

[TPGOTSIG]

A signal was received and `TPSIGRSTRT` was not specified.

[TPEPROTO]

`tpgetrply()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred. If a message queue on a remote location is filled, `TPEOS` may possibly be returned.

See Also `tpacall(3c)`, `tpalloc(3c)`, `tpcancel(3c)`, `tperrordetail(3c)`,
 `tprealloc(3c)`, `tpreturn(3c)`, `tpstrerrordetail(3c)`, `tptypes(3c)`

tpgprio(3c)

Name `tpgprio()` - routine for getting a service request priority

Synopsis
`#include <atmi.h>`
`int tpgprio(void)`

Description `tpgprio()` returns the priority for the last request sent or received by the current thread in its current context. Priorities can range from 1 to 100, inclusive, with 100 being the highest priority. `tpgprio()` may be called after `tpcall()` or `tpacall()`, (also `tpenqueue()`, or `tpdequeue()`, assuming the queued management facility is installed), and the priority returned is for the request sent. Also, `tpgprio()` may be called within a service routine to find out at what priority the invoked service was sent. `tpgprio()` may be called any number of times and will return the same value until the next request is sent.

In a multithreaded application `tpgprio()` operates on a per-thread basis.

Because the conversation primitives are not associated with priorities, issuing `tpsend()` or `tprecv()` has no effect on the priority returned by `tpgprio()`. Also, there is no priority associated with a conversational service routine unless a `tpcall()` or `tpacall()` is done within that service.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpgprio()`.

Return Values Upon success, `tpgprio()` returns a request's priority;

Upon failure, `tpgprio()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpgprio()` sets `tperrno` to one of the following values.

[`TPENOENT`]

`tpgprio()` was called and no requests (via `tpcall()` or `tpacall()`) have been sent, or it is called within a conversational service for which no requests have been sent.

[`TPEPROTO`]

`tpgprio()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpacall(3c)`, `tpcall(3c)`, `tpdequeue(3c)`, `tpenqueue(3c)`, `tpservice(3c)`, `tpsprio(3c)`

tpimport(3c)

Name `tpimport()` - convert an externalized representation of a message buffer into a typed message buffer

Synopsis

```
#include <atmi.h>
int tpimport(char *istr, long ilen, char **obuf, long *olen,
             long flags)
```

Description `tpimport()` converts an externalized representation of a message buffer into a typed message buffer. An externalized representation is a message buffer that does *not* include any BEA Tuxedo header information that is normally added to a message buffer just before the buffer is transmitted. A process converts a typed message buffer into an externalized representation by calling the `tpexport()` function.

Any digital signatures associated with `istr` are verified when the buffer is imported, and are available for examination after importing via `tpenvelope()`.

If the `istr` buffer representation is encrypted, the importing process must have access to a valid private key for decryption. Decryption is performed automatically during the importing process.

If `TPEX_STRING` is *not* set in `flags`, then `ilen` contains the length of the binary data contained in `istr`. If `ilen` is 0, `istr` is assumed to point to a null-terminated string, and the `TPEX_STRING` flag is inferred.

`*obuf` must point to a valid typed message buffer either (1) previously allocated by a process calling `tpalloc()` or (2) delivered by the system to a receiving process. The buffer will be reallocated as necessary to accommodate the result, and its buffer type or subtype may change.

`*olen` is set to the amount of valid data contained in the output buffer. If `olen` is NULL on input, it is ignored.

The `flags` argument should be set to `TPEX_STRING` if the input externalized representation is in string format (base 64 encoded). Otherwise, the input is in binary format of length `ilen`.

Return Values On failure, this function returns -1 and sets `tperrno()` to indicate the error condition.

Errors [TPEINVAL]

Invalid arguments were given. For example, the value of *istr* is NULL or the *flags* parameter is not set correctly.

[TPEPERM]

Permission failure. The cryptographic service provider was not able to access a private key necessary for decryption.

[TPEPROTO]

A protocol failure occurred. The failure involves an invalid data format in *istr* or a digital signature that failed verification.

[TPESYSTEM]

An error occurred. Consult the system error log file for more details.

See Also `tpenvelope(3c)`, `tpexport(3c)`

tpinit(3c)

Name	<code>tpinit()</code> - joins an application
Synopsis	<pre>#include <atmi.h> int tpinit(TPINIT *tpinfo)</pre>
Description	<code>tpinit()</code> allows a client to join a BEA Tuxedo system application. Before a client can use any of the BEA Tuxedo system communication or transaction routines, it must first join a BEA Tuxedo system application.

`tpinit()` has two modes of operation: single-context mode and multicontext mode, which will be discussed in detail below. Because calling `tpinit()` is optional when in single-context mode, a single-context client may also join an application by calling many ATMI routines (for example, `tpcall()`), which transparently call `tpinit()` with `tpinfo` set to `NULL`. A client may want to call `tpinit()` directly so that it can set the parameters described below. In addition, `tpinit()` must be used when multicontext mode is required, when application authentication is required (see the description of the `SECURITY` keyword in `UBBCONFIG(5)`), or when the application wishes to supply its own buffer type switch (see `typesw(5)`). After `tpinit()` successfully returns, the client can initiate service requests and define transactions.

In single-context mode, if `tpinit()` is called more than once (that is, if it is called after the client has already joined the application), no action is taken and success is returned.

In a multithreaded client, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpinit()`. To join a BEA Tuxedo application, a multithreaded workstation client must always call `tpinit()` with the `TPMULTICONTEXTS` flag set, even if the client is running in single-context mode.

Description of the TPINFO Structure

`tpinit()`'s argument, `tpinfo`, is a pointer to a typed buffer of type `TPINIT` and a `NULL` sub-type. `TPINIT` is a buffer type that is typedefed in the `atmi.h` header file. The buffer must be allocated via `tpalloc()` prior to calling `tpinit()`. The buffer should be freed using `tpfree()` after calling `tpinit()`. The `TPINIT` typed buffer structure includes the following members:

```
char    username[MAXTIDENT+2];
char    cltname[MAXTIDENT+2];
```

```

char    passwd[MAXTIDENT+2];
char    grpname[MAXTIDENT+2];
long    flags;
long    datalen;
long    data;

```

The values of `usrname`, `cltname`, `grpname`, and `passwd` are all NULL-terminated strings. `usrname` is a name representing the caller. `cltname` is a client name whose semantics are application defined. The value `sysclient` is reserved by the system for the `cltname` field. The `usrname` and `cltname` fields are associated with the client at `tpinit()` time and are used for both broadcast notification and administrative statistics retrieval. They should not have more characters than `MAXTIDENT`, which is defined as 30. `passwd` is an application password in unencrypted format that is used for validation against the application password. The `passwd` is limited to 30 characters. `grpname` is used to associate the client with a resource manager group name. If `grpname` is set to a 0-length string, then the client is not associated with a resource manager and is in the default client group. The value of `grpname` must be the null string (0-length string) for Workstation clients. Note that `grpname` is not related to ACL GROUPS.

Single-context Mode versus Multicontext Mode

`tpinit()` has two modes of operation: single-context mode and multicontext mode. In single-context mode, a process may join at most one application at any one time. Multiple application threads may access this application. Single-context mode is specified by calling `tpinit()` with a NULL parameter or by calling it without specifying the `TPMULTICONTEXTS` flag in the `flags` field of the `TPINIT` structure. Single-context mode is also specified when `tpinit()` is called implicitly by another ATMI function. The context state for a process operating in single-context mode is `TPSINGLECONTEXT`.

In single-context mode, if `tpinit()` is called more than once (that is, if it is called after the client has already joined the application), no action is taken and success is returned.

Multicontext mode is entered by calling `tpinit()` with the `TPMULTICONTEXTS` flag set in the `flags` field of the `TPINIT` structure. In multicontext mode, each call to `tpinit()` results in the creation of a separate application association.

An application association is a context that associates a process and a BEA Tuxedo application. A client may have associations with multiple BEA Tuxedo applications, and may also have multiple associations with the same application. All of a client's

associations must be made to applications running the same release of the BEA Tuxedo system, and either all associations must be native clients or all associations must be workstation clients.

For native clients, the value of the `TUXCONFIG` environment variable is used to identify the application to which the new association will be made. For workstation clients, the value of the `WSNADDR` or `WSENVFILE` environment variable is used to identify the application to which the new association will be made. The context for the current thread is set to the new association.

In multicontext mode, the application can get a handle for the current context by calling `tpgetctxt()` and pass that handle as a parameter to `tpsetctxt()`, thus setting the context in which a particular thread or process will operate.

Mixing single-context mode and multicontext mode is not allowed. Once an application has chosen one of these modes, calling `tpinit()` in the other mode is not allowed unless `tpterm()` is first called for all application associations.

TPINFO Structure Field Descriptions

In addition to controlling multicontext and single-context modes, the setting of `flags` is used to indicate both the client-specific notification mechanism and the mode of system access. These two settings may override the application default. If these settings cannot override the application default, `tpinit()` prints a warning in a log file, ignores the setting, and restores the application default setting in the `flags` field upon return from `tpinit()`. For client notification, the possible values for `flags` are as follows:

`TPU_SIG`

Select unsolicited notification by signals. This flag should be used only with single-threaded, single-contexted applications; it cannot be used when the `TPMULTICONTEXTS` flag is set.

`TPU_DIP`

Select unsolicited notification by dip-in.

`TPU_THREAD`

Select `THREAD` notification in a separate thread managed by the BEA Tuxedo system. This flag is allowed only on platforms that support multithreading. If `TPU_THREAD` is specified on a platform that does not support multithreading, it is considered an invalid argument and will result in an error return with `tperrno()` set to `TPEINVAL`.

TPU_IGN

Ignore unsolicited notification.

Only one of the above flags can be used at a time. If the client does not select a notification method via the `flags` field, then the application default method will be set in the `flags` field upon return from `tpinit()`.

For setting the mode of system access, the possible values for `flags` are as follows:

TPSA_FASTPATH

Set system access to fastpath.

TPSA_PROTECTED

Set system access to protected.

Only one of the above flags can be used at a time. If the client does not select a notification method or a system access mode via the `flags` field, then the application default method(s) will be set in the `flags` field upon return from `tpinit()`. See `UBBCONFIG(5)` for details on both client notification methods and system access modes.

If your application uses multithreading and/or multicontexting, you must set the following flag:

TPMULTICONTEXTS

See description in “Single-context Mode versus Multicontext Mode.”

`datalen` is the length of the application-specific data that follows. The buffer type switch entry for the `TPINIT` typed buffer sets this field based on the total size passed in for the typed buffer (the application data size is the total size less the size of the `TPINIT` structure itself plus the size of the data placeholder as defined in the structure). `data` is a place holder for variable length data that is forwarded to an application-defined authentication service. It is always the last element of this structure.

A macro, `TPINITNEED`, is available to determine the size `TPINIT` buffer necessary to accommodate a particular desired application specific data length. For example, if 8 bytes of application-specific data are desired, `TPINITNEED(8)` will return the required `TPINIT` buffer size.

A `NULL` value for `tpinfo` is allowed for applications not making use of the authentication feature of the BEA Tuxedo system. Clients using a `NULL` argument will get: defaults of 0-length strings for `username`, `cltname` and `passwd`; no flags set; and no application data.

Return Values	Upon failure, <code>tpinit()</code> leaves the calling process in its original context, returns <code>-1</code> , and sets <code>tperrno</code> to indicate the error condition. Also, <code>tpurcode()</code> is set to the value returned by the <code>AUTHSVR(5)</code> server.
Errors	Upon failure, <code>tpinit()</code> sets <code>tperrno()</code> to one of the following values. [TPEINVAL] Invalid arguments were specified. <code>tpinfo</code> is non-NULL and does not point to a typed buffer of type <code>TPINIT</code> . [TPENOENT] The client cannot join the application because of space limitations. [TPEPERM] The client cannot join the application because it does not have permission to do so or because it has not supplied the correct application password. Permission may be denied based on an invalid application password, failure to pass application-specific authentication, or use of restricted names. <code>tpurcode()</code> may be set by an application-specific authentication server to explain why the client cannot join the application. [TPEPROTO] <code>tpinit()</code> has been called improperly. For example: (a) the caller is a server; (b) the <code>TPMULTICONTEXTS</code> flag has been specified in single-context mode; or (c) the <code>TPMULTICONTEXTS</code> flag has not been specified in multicontext mode. [TPESYSTEM] A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file. [TPEOS] An operating system error has occurred.
Interoperability	<code>tpchkauth()</code> and a non-NULL value for the <code>TPINIT</code> typed buffer argument of <code>tpinit()</code> are available only on sites running Release 4.2 or later.
Portability	The interfaces described in <code>tpinit(3c)</code> are supported on UNIX System, Windows, and MS-DOS operating systems. However, signal-based notification is not supported on 16-bit Windows or MS-DOS platforms. If it is selected at <code>tpinit()</code> time, then a <code>userlog()</code> message is generated and the method is automatically set to <code>dip-in</code> .
Environment Variables	<code>TUXCONFIG</code> Used within <code>tpinit()</code> when invoked by a native client. It indicates the application to which the client should connect. Note that this environment

variable is referenced only when `tpinit()` is called. Subsequent calls make use of the application context.

WSENVFILE

Used within `tpinit()` when invoked by a workstation client. It indicates a file containing environment variable settings that should be set in the caller's environment. See `compilation(5)` for details on environment variable settings necessary for workstation clients. Note that this file is processed only when `tpinit()` is called and not before.

WSNADDR

Used within `tpinit()` when invoked by a workstation client. It indicates the network addresses of the workstation listener that is to be contacted for access to the application. This variable is required for Workstation clients and is ignored for native clients.

TCP/IP addresses may be specified in the following forms:

```
//host.name:port_number
```

```
//#. #. #. #:port_number
```

In the first format, the domain finds an address for *hostname* using the local name resolution facilities (usually DNS). *hostname* must be the local machine, and the local name resolution facilities must unambiguously resolve *hostname* to the address of the local machine.

In the second format, the string *#. #. #. #* is in dotted-decimal format. In dotted-decimal format, each *#* should be a number from 0 to 255. This dotted-decimal number represents the IP address of the local machine.

In both of the above formats, *port_number* is the TCP port number at which the domain process will listen for incoming requests. *port_number* can either be a number between 0 and 65535 or a name. If *port_number* is a name, then it must be found in the network services database on your local machine.

The address can also be specified in hexadecimal format when preceded by the characters `0x`. Each character after the initial `0x` is a number between 0 and 9 or a letter between A and F (case insensitive). The hexadecimal format is useful for arbitrary binary network addresses such as IPX/SPX or TCP/IP.

The address can also be specified as an arbitrary string. The value should be the same as that specified for the `NLSADDR` parameter in the `NETWORK` section of the configuration file.

More than one address can be specified if desired by specifying a comma-separated list of path names for `WSNADDR`. Addresses are tried in order until a connection is established. Any member of an address list can be specified as a parenthesized grouping of pipe-separated network addresses. For example:

```
WSNADDR=(//m1.acme.com:3050|//m2.acme.com:3050),//m3.acme.com:3050
```

For users running under Windows, the address string looks like the following.

```
set WSNADDR=(//m1.acme.com:3050^|//m2.acme.com:3050),//m3.acme.com:3050
```

Because the pipe symbol (`|`) is considered a special character in Windows, it must be preceded by a caret (`^`)—an escape character in the Windows environment—when it is specified on the command line. However, if `WSNADDR` is defined in an `envfile`, the BEA Tuxedo system gets the values defined by `WSNADDR` through the `tuxgetenv(3c)` function. In this context, the pipe symbol (`|`) is not considered a special character, so you do not need to escape it with a caret (`^`).

The BEA Tuxedo system randomly selects one of the parenthesized addresses. This strategy distributes the load randomly across a set of listener processes. Addresses are tried in order until a connection is established. Use the value specified in the application configuration file for the workstation listener to be called. If the value begins with the characters `0x`, it is interpreted as a string of hex-digits; otherwise, it is interpreted as ASCII characters.

WSFADDR

Used within `tpinit()` when invoked by a workstation client. It specifies the network address used by the workstation client when connecting to the workstation listener or workstation handler. This variable, along with the `WSFRANGE` variable, determines the range of TCP/IP ports to which a workstation client will attempt to bind before making an outbound connection. This address must be a TCP/IP address. The port portion of the TCP/IP address represents the base address from which a range of TCP/IP ports can be bound by the workstation client. The `WSFRANGE` variable specifies the size of the range. For example, if this address is `//mymachine.bea.com:30000` and `WSFRANGE` is 200, then all native processes attempting to make outbound connections from this `LMID` will bind a port on `mymachine.bea.com` between 30000 and 30200. If not set, this variable defaults to the empty string, which implies the operating system chooses a local port randomly.

WSFRANGE

Used within `tpinit()` when invoked by a workstation client. It specifies the range of TCP/IP ports to which a workstation client process will attempt to bind before making an outbound connection. The `WSFADDR` parameter specifies the base address of the range. For example, if the `WSFADDR` parameter is set to `//mymachine.bea.com:30000` and `WSFRANGE` is set to `200`, then all native processes attempting to make outbound connections from this `LMID` will bind a port on `mymachine.bea.com` between `30000` and `30200`. The valid range is `1-65535`. The default is `1`.

WSDEVICE

Used within `tpinit()` when invoked by a workstation client. It indicates the device name to be used to access the network. This variable is used by workstation clients and ignored for native clients. Note that certain supported transport level network interfaces do not require a device name; for example, sockets and NetBIOS. Workstation clients supported by such interfaces need not specify `WSDEVICE`.

WSTRYPE

Used within `tpinit()` when invoked by a workstation client to negotiate encode/decode responsibilities with the native site. This variable is optional for workstation clients and ignored for native clients.

WSRPLYMAX

Used by `tpinit()` to set the maximum amount of core memory that should be used for buffering application replies before they are dumped to file. The default for this parameter `256,000` bytes. For more information, see the programming documentation for your instantiation.

TMMINENCRYPTBITS

Used to establish the minimum level of encryption required to connect to the BEA Tuxedo system. “0” means no encryption, while “56” and “128” specify the encryption key length (in bits). The link-level encryption value of 40 bits is also provided for backward compatibility. If this minimum level of encryption cannot be met, link establishment will fail. The default is “0”.

TMMAXENCRYPTBITS

Used to negotiate the level of encryption up to this level when connecting to the BEA Tuxedo system. “0” means no encryption, while “56” and “128” specify the encryption length (in bits). The link-level encryption value of 40 bits is also provided for backward compatibility. The default is “128.”

Warning Signal-based notification is not allowed in multicontext mode. In addition, signal restrictions may prevent the system from using signal-based notification even though it has been selected by a client. When this happens, the system generates a log message that it is switching notification for the selected client to dip-in and the client is notified then and thereafter via dip-in notification. (See the description of the `NOTIFY` parameter in the `RESOURCES` section of `UBBCONFIG(5)` for a detailed discussion of notification methods.)

Because signaling of clients is always done by the system, the behavior of notification is always consistent, regardless of where the originating notification call is made. Therefore to use signal-based notification:

- A native client must be running as an application administrator
- A Workstation client is not required to be running as the application administrator

The ID for the application administrator is identified as part of the configuration for the application.

If signal-based notification is selected for a client, then certain ATMI calls may fail, returning `TPGOTSIG` due to receipt of an unsolicited message if `TPSIGRSTRT` is not specified.

See Also Introduction to the C Language Application-Transaction Monitor Interface, `tpgetctxt(3c)`, `tpsetctxt(3c)`, `tpterm(3c)`

tpkey_close(3c)

Name tpkey_close() - close a previously opened key handle

Synopsis #include <atmi.h>
int tpkey_close(TPKEY *hKey*, long *flags*)

Description tpkey_close() releases a previously opened key handle and all resources associated with it. Any sensitive information, such as the principal's private key, is erased from memory.

Key handles can be opened in one of two ways:

- By an explicit call to tpkey_open()
- As output from tpenvelope()

It is the application's responsibility to release key resources by calling tpkey_close(). Once a process closes a key, the process can no longer use the key handle to register a message buffer for digital signature or encryption. If the process opened the key using tpkey_open() with the TPKEY_AUTOSIGN or TPKEY_AUTOENCRYPT flag specified, the key handle no longer applies to future communication operations after the key is closed.

Even though a key is closed, however, the key handle continues to be valid for any associated signature or encryption request registered before the key was closed. When the last buffer associated with a closed key is freed or overwritten, resources attributable to the key are released.

The *flags* argument is reserved for future use and must be set to 0.

Return Values On failure, this function returns -1 and sets tperrno() to indicate the error condition.

Errors [TPEINVAL]
Invalid arguments were given. For example, the value of *hKey* is not a valid key.

[TPESYSTEM]
An error occurred. Consult the system error log file for details.

See Also tpenvelope(3c), tpkey_getinfo(3c), tpkey_open(3c), tpkey_setinfo(3c)

tpkey_getinfo(3c)

Name tpkey_getinfo() - get information associated with a key handle

Synopsis

```
#include <atmi.h>
int tpkey_getinfo(TPKEY hKey, char *attribute_name, void *value,
long *value_len, long flags)
```

Description tpkey_getinfo() reports information about a key handle. A key handle represents a specific principal's key and the information associated with it.

The key under examination is identified by the *hKey* input parameter. The attribute for which information is desired is identified by the *attribute_name* input parameter. Some attributes are specific to a cryptographic service provider, but the following core set of attributes should be supported by all providers.

Attribute	Value
PRINCIPAL	The name identifying the principal associated with the key (key handle), represented as a null-terminated character string.
PKENCRYPT_ALG	An ASN.1 Distinguished Encoding Rules (DER) <i>object identifier</i> of the public key algorithm used by the key for public key encryption. The object identifier for RSA is identified in the following table, "Mapping of Algorithm Object Identifiers to Algorithms."
PKENCRYPT_BITS	The key length of the public key algorithm (RSA modulus size). The value must be within the range of 512 to 2048 bits, inclusive.
SIGNATURE_ALG	An ASN.1 DER <i>object identifier</i> of the digital signature algorithm used by the key for digital signature. The object identifiers for RSA and DSA are identified in the following table, "Mapping of Algorithm Object Identifiers to Algorithms."
SIGNATURE_BITS	The key length of the digital signature algorithm (RSA modulus size). The value must be within the range of 512 to 2048 bits, inclusive.

Attribute	Value
ENCRYPT_ALG	An ASN.1 DER <i>object identifier</i> of the symmetric key algorithm used by the key for bulk data encryption. The object identifiers for DES, 3DES, and RC2 are identified in the following table, "Mapping of Algorithm Object Identifiers to Algorithms."
ENCRYPT_BITS	The key length of the symmetric key algorithm. The value must be within the range of 40 to 128 bits, inclusive. When an algorithm with a fixed key length is set in ENCRYPT_ALG, the ENCRYPT_BITS value is automatically set to the fixed key length. For example, if ENCRYPT_ALG is set to DES, the ENCRYPT_BITS value is automatically set to 56.
DIGEST_ALG	An ASN.1 DER <i>object identifier</i> of the message digest algorithm used by the key for digital signature. The object identifiers for MD5 and SHA-1 are identified in the following table, "Mapping of Algorithm Object Identifiers to Algorithms."
PROVIDER	The name of the cryptographic service provider.
VERSION	The version number of the cryptographic service provider's software.

The ASN.1 DER algorithm object identifiers supported by the default public key implementation are given in the following table.

Mapping of Algorithm Object Identifiers to Algorithms

ASN.1 DER Algorithm Object Identifier	Algorithm
{ 0x06, 0x08, 0x2a, 0x86, 0x48, 0x86, 0xf7, 0x0d, 0x02, 0x05 }	MD5
{ 0x06, 0x05, 0x2b, 0x0e, 0x03, 0x02, 0x1a }	SHA1
{ 0x06, 0x09, 0x2a, 0x86, 0x48, 0x86, 0xf7, 0x0d, 0x01, 0x01, 0x01 }	RSA
{ 0x06, 0x05, 0x2b, 0x0e, 0x03, 0x02, 0x0c }	DSA
{ 0x06, 0x05, 0x2b, 0x0e, 0x03, 0x02, 0x07 }	DES
{ 0x06, 0x08, 0x2a, 0x86, 0x48, 0x86, 0xf7, 0x0d, 0x03, 0x07 }	3DES

Mapping of Algorithm Object Identifiers to Algorithms

ASN.1 DER Algorithm Object Identifier	Algorithm
{ 0x06, 0x08, 0x2a, 0x86, 0x48, 0x86, 0xf7, 0x0d, 0x03, 0x02 }	RC2

The information associated with the specified *attribute_name* parameter will be stored in the memory location indicated by *value*. The maximum amount of data that can be stored at this location is specified by the caller in *value_len*.

After `tpkey_getinfo()` completes, *value_len* is set to the size of the data actually returned (including a terminating null value for string values). If the number of bytes that need to be returned exceeds *value_len*, `tpkey_getinfo()` fails (with the TPELIMIT error code) and sets *value_len* to the required amount of space.

The *flags* argument is reserved for future use and must be set to 0.

Return Values On failure, this function returns -1 and sets `tperrno()` to indicate the error condition.

Errors [TPEINVAL]
Invalid arguments were given. For example, *hKey* is not a valid key.

[TPESYSTEM]
An error occurred. Consult the system error log file for details.

[TPELIMIT]
Insufficient space was provided to hold the requested attribute value.

[TPENOENT]
The requested attribute is not associated with this key.

See Also `tpkey_close(3c)`, `tpkey_open(3c)`, `tpkey_setinfo(3c)`

tpkey_open(3c)

Name	tpkey_open() - open a key handle for digital signature generation, message encryption, or message decryption
Synopsis	<pre>#include <atmi.h> int tpkey_open(TPKEY *hKey, char *principal_name, char *location, char *identity_proof, long proof_len, long flags)</pre>
Description	<p>tpkey_open() makes a key handle available to the calling process. A key handle represents a specific principal's key and the information associated with it.</p>

A key may be used for one or more of the following purposes:

- Generating a digital signature, which protects a typed message buffer's content and proves that a specific principal originated the message. (A principal may be a person or a process.) This type of key is a private key and is available only to the key's owner.

Calling tpkey_open() with the principal's name and either the TPKEY_SIGNATURE or TPKEY_AUTOSIGN flag returns a handle to the principal's private key and digital certificate.

- Verifying a digital signature, which proves that a typed message buffer's content remains unaltered and that a specific principal originated the message.

Signature verification does not require a call to tpkey_open(); the verifying process uses the public key specified in the digital certificate accompanying the digitally signed message to verify the signature.

- Encrypting a message buffer destined for a specific principal. This type of key is available to any process with access to the principal's public key and digital certificate.

Calling tpkey_open() with the principal's name and either the TPKEY_ENCRYPT or TPKEY_AUTOENCRYPT flag returns a handle to the principal's public key via the principal's digital certificate.

- Decrypting a message buffer intended for a specific principal. This type of key is a private key and is available only to the key's owner.

Calling tpkey_open() with the principal's name and the TPKEY_DECRYPT flag returns a handle to the principal's private key and digital certificate.

The key handle returned by `tpkey_open()` is stored in `*hKey`, the value of which cannot be NULL.

The `principal_name` input parameter specifies the key owner's identity. If the value of `principal_name` is a NULL pointer or an empty string, a default identity is assumed. The default identity may be based on the current login session, the current operating system account, or another attribute such as a local hardware device.

The file location of a key may be passed into the `location` parameter. If the underlying key management provider does not require a location parameter, the value of this parameter may be NULL.

To authenticate the identity of `principal_name`, proof material such as a password or pass phrase may be required. If required, the proof material should be referenced by `identity_proof`. Otherwise, the value of this parameter may be NULL.

The length of the proof material (in bytes) is specified by `proof_len`. If `proof_len` is 0, `identity_proof` is assumed to be a null-terminated character string.

The type of key access required for a key's mode of operation is specified by the `flags` parameter.

TPKEY_SIGNATURE:

This private key is available to generate digital signatures.

TPKEY_AUTOSIGN:

Whenever this process transmits a message buffer, the public key software uses the signer's private key to generate a digital signature and then attaches the digital signature to the buffer. TPKEY_SIGNATURE is implied.

TPKEY_ENCRYPT:

This public key is available to identify the recipient of an encrypted message.

TPKEY_AUTOENCRYPT:

Whenever this process transmits a message buffer, the public key software encrypts the message content, uses the recipient's public key to generate an encryption envelope, and then attaches the encryption envelope to the buffer. TPKEY_ENCRYPT is implied.

TPKEY_DECRYPT:

This private key is available for decryption.

Any combination of one or more of these flag values is allowed. If a key is used only for encryption (`TPKEY_ENCRYPT`), *identity_proof* is not required and may be set to `NULL`.

Return Values Upon successful completion, **hKey* is set to a value that represents this key, for use by other functions such as `tpsign()` and `tpseal()`.

On failure, this function returns `-1` and sets `tperrno()` to indicate the error condition.

Errors [`TPEINVAL`]

Invalid arguments were given. For example, the value of *hKey* is `NULL` or the *flags* parameter is not set correctly.

[`TPEPERM`]

Permission failure. The cryptographic service provider was not able to access a private key for this principal, given the proof information and current environment.

[`TPESYSTEM`]

A system error occurred. Consult the systems error log file for details.

See Also `tpkey_close(3c)`, `tpkey_getinfo(3c)`, `tpkey_setinfo(3c)`

tpkey_setinfo(3c)

Name tpkey_setinfo() - set optional attribute parameters associated with a key handle

Synopsis

```
#include <atmi.h>
int tpkey_setinfo(TPKEY hKey, char *attribute_name, void *value,
long value_len, long flags)
```

Description tpkey_setinfo() sets an optional attribute parameter for a key handle. A key handle represents a specific principal's key and the information associated with it.

The key for which information is to be modified is identified by the *hKey* input parameter. The attribute for which information is to be modified is identified by the *attribute_name* input parameter. Some attributes may be specific to a certain cryptographic service provider, but the core set of attributes presented on the `tpkey_getinfo(3c)` reference page should be supported by all providers.

The information to be associated with the *attribute_name* parameter is stored in the memory location indicated by *value*. If the data content of *value* is self-describing, *value_len* is ignored (and may be 0). Otherwise, *value_len* must contain the length of data in *value*.

The *flags* argument is reserved for future use and must be set to 0.

Return Values On failure, this function returns -1 and sets `tperrno()` to indicate the error condition.

Errors [TPEINVAL]

Invalid arguments were given. For example, *hKey* is not a valid key or *attribute_name* refers to a read-only value.

[TPELIMIT]

The *value* provided is too large.

[TPESYSTEM]

An error occurred. Consult the system error log file for details.

[TPENOENT]

The requested attribute is not recognized by the key's cryptographic service provider.

See Also `tpkey_close(3c)`, `tpkey_getinfo(3c)`, `tpkey_open(3c)`

tpnotify(3c)

Name tpnotify() - routine for sending notification by client identifier

Synopsis #include <atmi.h>
 int tpnotify(CLIENTID *clientid, char *data, long len, long flags)

Description tpnotify() allows a client or server to send an unsolicited message to an individual client.

clientid is a pointer to a client identifier saved from the TPSVCINFO structure of a previous or current service invocation, or passed to a client via some other communications mechanism (for example, retrieved via the administration interface).

The data portion of the request is pointed to by *data*, a buffer previously allocated by `tpalloc()`. *len* specifies how much of *data* to send. Note that if *data* points to a buffer type that does not require a length to be specified, (for example, an FML fielded buffer) then *len* is ignored (and may be 0). Also, *data* may be NULL in which case *len* is ignored.

Upon successful return from `tpnotify()`, the message has been delivered to the system for forwarding to the identified client. If the `TPACK` flag was set, a successful return means the message has been received by the client. Furthermore, if the client has registered an unsolicited message handler, the handler will have been called.

The following is a list of valid *flags*.

TPACK

The request is sent and the caller blocks until an acknowledgement message is received from the target client.

TPNOBLOCK

The request is not sent if a blocking condition exists in sending the notification (for example, the internal buffers into which the message is transferred are full).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued.

Unless the `TPACK` flag is set, `tpnotify()` does not wait for the message to be delivered to the client.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpnotify()`.

Return Values Upon failure, `tpnotify()` returns -1 and sets `tperrno()` to indicate the error condition. If a call fails with a particular `tperrno()` value, a subsequent call to `tperrordetail()`, with no intermediate ATMI calls, may provide more detailed information about the generated error. Refer to the `tperrordetail(3c)` reference page for more information.

Errors Upon failure, `tpnotify()` sets `tperrno()` to one of the following values.

[TPEINVAL]

Invalid arguments were given (for example, invalid flags).

[TPENOENT]

The target client does not exist or does not have an unsolicited handler set and the `TPACK` flag is set.

[TPETIME]

A blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` were specified, or `TPACK` was set but no acknowledgment was received and `TPNOTIME` was not specified.

[TPEBLOCK]

A blocking condition was found on the call and `TPNOBLOCK` was specified.

[TPGOTSIG]

A signal was received and `TPSIGRSTRT` was not specified.

[TPEPROTO]

`tpnotify()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

[TPERELEASE]

When the `TPACK` is set and the target is a client from a prior release of BEA Tuxedo that does not support the acknowledgment protocol.

See Also Introduction to the C Language Application-Transaction Monitor Interface, `tpalloc(3c)`, `tpbroadcast(3c)`, `tpchkunsol(3c)`, `tperrordetail(3c)`, `tpinit(3c)`, `tpsetunsol(3c)`, `tpstrerrordetail(3c)`, `tpterm(3c)`

tpopen(3c)

Name `tpopen()` - routine for opening a resource manager

Synopsis
`#include <atmi.h>`
`int tpopen(void)`

Description `tpopen()` opens the resource manager to which the caller is linked. At most one resource manager can be linked to the caller. This function is used in place of resource manager-specific `open()` calls and allows a service routine to be free of calls that may hinder portability. Since resource managers differ in their initialization semantics, the specific information needed to open a particular resource manager is placed in a configuration file.

If a resource manager is already open (that is, `tpopen()` is called more than once), no action is taken and success is returned.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpopen()`.

Return Values Upon failure, `tpopen()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpopen()` sets `tperrno()` to one of the following values.

[`TPERMERR`]

A resource manager failed to open correctly. More information concerning the reason a resource manager failed to open can be obtained by interrogating a resource manager in its own specific manner. Note that any calls to determine the exact nature of the error hinder portability.

[`TPEPROTO`]

`tpopen()` was called in an improper context (for example, by a client that has not joined a BEA Tuxedo system server group).

[`TPESYSTEM`]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[`TPEOS`]

An operating system error has occurred.

See Also `tpclose(3c)`

tppost(3c)

- Name** tppost() - post an event
- Synopsis**

```
#include <atmi.h>
int tppost(char *eventname, char *data, long len, long flags)
```
- Description** The caller uses tppost() to post an event and any accompanying data. The event is named by *eventname* and *data*, if not NULL, points to the data. The posted event and its data are dispatched by the BEA Tuxedo EventBroker to all subscribers whose subscriptions successfully evaluate against *eventname* and whose optional filter rules successfully evaluate against *data*.

eventname is a NULL-terminated string of at most 31 characters. *eventname*'s first character cannot be a dot (".") as this character is reserved as the starting character for all events defined by the BEA Tuxedo system itself.

If *data* is non-NULL, it must point to a buffer previously allocated by tppalloc() and *len* should specify the amount of data in the buffer that should be posted with the event. Note that if *data* points to a buffer of a type that does not require a length to be specified (for example, an FML fielded buffer), then *len* is ignored. If *data* is NULL, *len* is ignored and the event is posted with no data.

When tppost() is used within a transaction, the transaction boundary can be extended to include those servers and/or stable-storage message queues notified by the EventBroker. When a transactional posting is made, some of the recipients of the event posting are notified on behalf of the poster's transaction (for example, servers and queues), while some are not (for example, clients).

If the poster is within a transaction and the TPNOTRAN flag is not set, the posted event goes to the EventBroker in transaction mode such that it dispatches the event as part of the poster's transaction. The broker dispatches transactional event notifications only to those service routine and stable-storage queue subscriptions that used the TPEVTRAN bit setting in the *ctl->flags* parameter passed to tpsubscribe(). Client notifications, and those service routine and stable-storage queue subscriptions that did not use the TPEVTRAN bit setting in the *ctl->flags* parameter passed to tpsubscribe(), are also dispatched by the EventBroker but not as part of the posting process's transaction.

If the poster is outside a transaction, `tpost()` is a one-way post with no acknowledgement when the service associated with the event fails. This occurs even when `TPEVTRAN` is set for that event (using the `ctl->flags` parameter passed to `tpsubscribe()`). If the poster is in a transaction, then `tpost()` returns `TPESVCFAIL` when the associated service fails in the event.

The following is a list of valid *flags*.

TPNOTRAN

If the caller is in transaction mode and this flag is set, then the event posting is not made on behalf of the caller's transaction. A caller in transaction mode that sets this flag is still subject to the transaction timeout (and no other) when posting events. If the event posting fails, the caller's transaction is not affected.

TPNOREPLY

Informs `tpost()` not to wait for the EventBroker to process all subscriptions for *eventname* before returning. When `TPNOREPLY` is set, `tpurcode()` is set to zero regardless of whether `tpost()` returns successfully or not. When the caller is in transaction mode, this setting cannot be used unless `TPNOTRAN` is also set.

TPNOBLOCK

The event is not posted if a blocking condition exists. If such a condition occurs, the call fails and `tperrno()` is set to `TPEBLOCK`. When `TPNOBLOCK` is not specified and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued. When `TPSIGRSTRT` is not specified and a signal interrupts a system call, then `tpost()` fails and `tperrno()` is set to `TPGOTSIG`.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpost()`.

Return Values Upon successful return from `tppost()`, `tpurcode()` contains the number of event notifications dispatched by the EventBroker on behalf of *eventname* (that is, postings for those subscriptions whose event expression evaluated successfully against *eventname* and whose filter rule evaluated successfully against *data*). Upon return where `tperrno()` is set to `TPESVCFAIL`, `tpurcode()` contains the number of non-transactional event notifications dispatched by the EventBroker on behalf of *eventname*.

Upon failure, `tppost()` returns -1 sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tppost()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[TPEINVAL]

Invalid arguments were given (for example, *eventname* is NULL).

[TPENOENT]

Cannot access the BEA Tuxedo User EventBroker.

[TPETRAN]

The caller is in transaction mode, `TPNOTRAN` was not set and `tppost()` contacted an EventBroker that does not support transaction propagation (that is, `TMUSREVT(5)` is not running in a BEA Tuxedo system group that supports transactions).

[TPETIME]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is to be aborted; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` were specified. If a transaction timeout occurred, any attempts to do new work will fail with `TPETIME` until the transaction has been aborted.

[TPESVCFAIL]

The EventBroker encountered an error posting a transactional event to either a service routine or to a stable storage queue on behalf of the caller's transaction. The caller's current transaction is marked abort-only. When this error is returned, `tpurcode()` contains the number of non-transactional event notifications dispatched by the EventBroker on behalf of *eventname*; transactional postings are not counted since their effects will be aborted upon completion of the transaction. Note that so long as the transaction has not timed out, further communication may be performed before aborting the transaction and that any work performed on behalf of the caller's transaction will be aborted upon transaction completion (that is, for subsequent

communication to have any lasting effect, it should be done with `TPNOTRAN` set).

[`TPEBLOCK`]

A blocking condition exists and `TPNOBLOCK` was specified.

[`TPGOTSIG`]

A signal was received and `TPSIGRSTRT` was not specified.

[`TPEPROTO`]

`tppost()` was called improperly.

[`TPESYSTEM`]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[`TPEOS`]

An operating system error has occurred.

See Also `tpsubscribe(3c)`, `tpunsubscribe(3c)`, `EVENTS(5)`, `TMSYSEVT(5)`, `TMUSREVT(5)`

tprealloc(3c)

Name tprealloc() - routine to change the size of a typed buffer

Synopsis #include <atmi.h>
char * tprealloc(char *ptr, long size)

Description tprealloc() changes the size of the buffer pointed to by *ptr* to *size* bytes and returns a pointer to the new (possibly moved) buffer. Similar to `tpalloc()`, the size of the buffer will be at least as large as the larger of *size* and `dfltsize`, where `dfltsize` is the default buffer size specified in `tmttype_sw`. If the larger of the two is less than or equal to zero, then the buffer is unchanged and NULL is returned. A buffer's type remains the same after it is re-allocated. After this function returns successfully, the returned pointer should be used to reference the buffer; *ptr* should no longer be used. The buffer's contents will not change up to the lesser of the new and old sizes.

Some buffer types require initialization before they can be used. `tprealloc()` re-initializes a buffer (in a communication manager-specific manner) after it is re-allocated and before it is returned. Thus, the buffer returned to the caller is ready for use.

A thread in a multithreaded application may issue a call to `tprealloc()` while running in any context state, including `TPINVALIDCONTEXT`.

Return Values Upon successful completion, `tprealloc()` returns a pointer to a buffer of the appropriate type aligned on a long word.

Upon failure, `tprealloc()` returns NULL and sets `tperrno()` to indicate the error condition.

Errors If the re-initialization function fails, `tprealloc()` fails, returning NULL and the contents of the buffer pointed to by *ptr* may not be valid. Upon failure, `tprealloc()` sets `tperrno()` to one of the following values.

[TPEINVAL]

Invalid arguments were given (for example, *ptr* does not point to a buffer originally allocated by `tpalloc()`).

[TPEPROTO]

`tprealloc()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Usage If buffer re-initialization fails, `tprealloc()` fails returning `NULL` and the contents of the buffer pointed to by `ptr` may not be valid. This function should not be used in concert with `malloc()`, `realloc()` or `free()` in the C library (for example, a buffer allocated with `tprealloc()` should not be freed with `free()`).

See Also `tpalloc(3c)`, `tpfree(3c)`, `tptypes(3c)`

tprecv(3c)

- Name** tprecv() - routine for receiving a message in a conversational connection
- Synopsis**

```
#include <atmi.h>
int tprecv(int cd, char **data, long *len, long flags, long \
          *revent)
```
- Description** tprecv() is used to receive data sent across an open connection from another program. tprecv()'s first argument, *cd*, specifies on which open connection to receive data. *cd* is a descriptor returned from either tpcconnect() or the TPSVCINFO parameter to the service. The second argument, *data*, is the address of a pointer to a buffer previously allocated by tpalloc().
- data* must be the address of a pointer to a buffer previously allocated by tpalloc() and *len* should point to a long that tprecv() sets to the amount of data successfully received. Upon successful return, **data* points to a buffer containing the reply and **len* contains the size of the buffer. FML and FML32 buffers often assume a minimum size of 4096 bytes; if the reply is larger than 4096 bytes, the size of the buffer is increased to a size large enough to accommodate the data being returned.
- Buffers on the sending side that may be only partially filled (for example, FML or STRING buffers) will have only the amount that is used sent. The system may then enlarge the received data size by some arbitrary amount. This means that the receiver may receive a buffer that is smaller than what was originally allocated by the sender, yet larger than the data that was sent.
- The receive buffer may grow, or it may shrink, and its address almost invariably changes, as the system swaps buffers around internally. To determine whether (and how much) a reply buffer changed in size, compare its total size before tprecv() was issued with **len*. See "Introduction to the C Language Application-Transaction Monitor Interface" for more information about buffer management.
- If **len* is 0, then no data was received and neither **data* nor the buffer it points to were modified. It is an error for *data*, **data* or *len* to be NULL.
- tprecv() can be issued only by the program that does not have control of the connection.
- The following is a list of valid *flags*.

TPNOCHANGE

By default, if a buffer is received that differs in type from the buffer pointed to by **data*, then **data*'s buffer type changes to the received buffer's type so long as the receiver recognizes the incoming buffer type. When this flag is set, the type of the buffer pointed to by **data* is not allowed to change. That is, the type and sub-type of the received buffer must match the type and subtype of the buffer pointed to by **data*.

TPNOBLOCK

`tprecv()` does not wait for data to arrive. If data is already available to receive, then `tprecv()` gets the data and returns. When this flag is not specified and no data is available to receive, the caller blocks until data arrives.

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts will still affect the program.

TPSIGRSTRT

If a signal interrupts the underlying receive system call, then the call is reissued.

If an event exists for the descriptor, *cd*, then `tprecv()` will return setting `tperrno()` to `TPEEVEVENT`. The event type is returned in *revent*. Data can be received along with the `TPEV_SVCSUCC`, `TPEV_SVCFAIL`, and `TPEV_SENDOONLY` events. Valid events for `tprecv()` are as follows.

TPEV_DISCONIMM

Received by the subordinate of a conversation, this event indicates that the originator of the conversation has either issued an immediate disconnect on the connection via `tpdiscon()`, or it issued `tpreturn()`, `tpcommit()` or `tpabort()` with the connection still open. This event is also returned to the originator or subordinate when a connection is broken due to a communications error (for example, a server, machine, or network failure). Because this is an immediate disconnection notification (that is, abortive rather than orderly), data in transit may be lost. If the two programs were participating in the same transaction, then the transaction is marked abort-only. The descriptor used for the connection is no longer valid.

TPEV_SENDOONLY

The program on the other end of the connection has relinquished control of the connection. The recipient of this event is allowed to send data but cannot receive any data until it relinquishes control.

TPEV_SVCERR

Received by the originator of a conversation, this event indicates that the subordinate of the conversation has issued `tpretreturn()`. `tpretreturn()` encountered an error that precluded the service from returning successfully. For example, bad arguments may have been passed to `tpretreturn()` or `tpretreturn()` may have been called while the service had open connections to other subordinates. Due to the nature of this event, any application defined data or return code are not available. The connection has been torn down and is no longer a valid descriptor. If this event occurred as part of the `cd` recipient's transaction, then the transaction is marked abort-only.

TPEV_SVCFAIL

Received by the originator of a conversation, this event indicates that the subordinate service on the other end of the conversation has finished unsuccessfully as defined by the application (that is, it called `tpretreturn()` with `TPFAIL` or `TPEXIT`). If the subordinate service was in control of this connection when `tpretreturn()` was called, then it can pass an application defined return value and a typed buffer back to the originator of the connection. As part of ending the service routine, the server has torn down the connection. Thus, `cd` is no longer a valid descriptor. If this event occurred as part of the recipient's transaction, then the transaction is marked abort-only.

TPEV_SVCSUCC

Received by the originator of a conversation, this event indicates that the subordinate service on the other end of the conversation has finished successfully as defined by the application (that is, it called `tpretreturn()` with `TPSUCCESS`). As part of ending the service routine, the server has torn down the connection. Thus, `cd` is no longer a valid descriptor. If the recipient is in transaction mode, then it can either commit (if it is also the initiator) or abort the transaction causing the work done by the server (if also in transaction mode) to either commit or abort.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tprecv()`.

Return Values

Upon return from `tprecv()` where `revent` is set to either `TPEV_SVCSUCC` or `TPEV_SVCFAIL`, the `tpurcode` global contains an application defined value that was sent as part of `tpretreturn()`.

Upon failure, `tprecv()` returns -1 and sets `tperrno()` to indicate the error condition. If a call fails with a particular `tperrno` value, a subsequent call to `tperrordetail()`, with no intermediate ATMI calls, may provide more detailed information about the generated error. Refer to the `tperrordetail(3c)` reference page for more information.

Errors Upon failure, `tprecv()` sets `tperrno` to one of the following values.

[TPEINVAL]

Invalid arguments were given (for example, data is not the address of a pointer to a buffer allocated by `tpalloc()` or `flags` are invalid).

[TPEOTYPE]

Either the type and subtype of the incoming buffer are not known to the caller, or `TPNOCHANGE` was set in `flags` and the type and subtype of `*data` do not match the type and subtype of the incoming buffer. Regardless, neither `*data`, its contents nor `*len` are changed. If the conversation is part of the caller's current transaction, then the transaction is marked abort-only because the incoming buffer is discarded.

[TPEBADDESC]

`cd` is invalid.

[TPETIME]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is marked abort-only; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` were specified. In either case, neither `*data` nor its contents are changed. If a transaction timeout occurred, then any attempts to send or receive messages on any connections or to start a new connection will fail with `TPETIME` until the transaction has been aborted.

[TPEEVENT]

An event occurred and its type is available in `revent`. There is a relationship between the `[TPETIME]` and the `[TPEEVENT]` return codes. While in transaction mode, if the receiving side of a conversation is blocked on `tprecv` and the sending side calls `tpabort()`, then the receiving side gets a return code of `[TPEVENT]` with an event of `TPEV_DISCONIMM`. However, if the sending side calls `tpabort()` before the receiving side calls `tprecv()`, then the transaction may have already been removed from the GTT, which causes `tprecv()` to fail with the `[TPETIME]` code.

[TPEBLOCK]

A blocking condition exists and TPNOBLOCK was specified.

[TPGOTSIG]

A signal was received and TPSIGRSTRT was not specified.

[TPEPROTO]

`tprecv()` was called in an improper context (for example, the connection was established such that the calling program can only send data).

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Usage A server can pass an application defined return value and typed buffer when calling `tpreturn()`. The return value is available in the global variable `tpurcode` and the buffer is available in `data`.

See Also `tpalloc(3c)`, `tpconnect(3c)`, `tpdiscon(3c)`, `tperrordetail(3c)`, `tpsend(3c)`, `tpservice(3c)`, `tpstrerrordetail(3c)`

tpresume(3c)

Name	<code>tpresume()</code> - resume a global transaction
Synopsis	<pre>#include <atmi.h> int tpresume(TPTRANID *tranid, long flags)</pre>
Description	<p><code>tpresume()</code> is used to resume work on behalf of a previously suspended transaction. Once the caller resumes work on a transaction, it must either suspend it with <code>tpsuspend()</code>, or complete it with one of <code>tpcommit()</code> or <code>tpabort()</code> at a later time.</p> <p>The caller must ensure that its linked resource managers have been opened (via <code>tpopen()</code>) before it can resume work on any transaction.</p> <p><code>tpresume()</code> places the caller in transaction mode on behalf of the global transaction identifier pointed to by <i>tranid</i>. It is an error for <i>tranid</i> to be NULL.</p> <p>Currently, <i>flags</i> are reserved for future use and must be set to 0.</p> <p>In a multithreaded application, a thread in the <code>TPINVALIDCONTEXT</code> state is not allowed to issue a call to <code>tpresume()</code>.</p>
Return Value	<code>tpresume()</code> returns -1 on error and sets <code>tperrno()</code> to indicate the error condition.
Errors	<p>Under the following conditions, <code>tpresume()</code> fails and sets <code>tperrno()</code> to:</p> <p>[TPEINVAL] Either <i>tranid</i> is a NULL pointer, it points to a non-existent transaction identifier (including previously completed or timed-out transactions), or it points to a transaction identifier that the caller is not allowed to resume. The caller's state with respect to the transaction is not changed.</p> <p>[TPEMATCH] <i>tranid</i> points to a transaction identifier that another process has already resumed. The caller's state with respect to the transaction is not changed.</p> <p>[TPETRAN] The BEA Tuxedo system is unable to resume the global transaction because the caller is currently participating in work outside any global transaction with one or more resource managers. All such work must be completed before a global transaction can be resumed. The caller's state with respect to the local transaction is unchanged.</p>

[TPEPROTO]

`tpresume()` was called in an improper context (for example, the caller is already in transaction mode). The caller's state with respect to the transaction is not changed.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Notes XA-compliant resource managers must be successfully opened to be included in the global transaction. (See `tpopen(3c)` for details.)

A process resuming a suspended transaction must reside on the same logical machine (LMID) as the process that suspended the transaction. For a workstation client, the workstation handler (WSH) to which it is connected must reside on the same logical machine as the handler for the workstation client that suspended the transaction.

See Also `tpabort(3c)`, `tpcommit(3c)`, `tpopen(3c)`, `tpsuspend(3c)`

tpreturn(3c)

Name	<code>tpreturn()</code> - returns from a BEA Tuxedo system service routine
Synopsis	<pre>void tpreturn(int rval, long rcode, char *data, long len, long \ flags)</pre>
Description	<p><code>tpreturn()</code> indicates that a service routine has completed. <code>tpreturn()</code> acts like a return statement in the C language (that is, when <code>tpreturn()</code> is called, the service routine returns to the BEA Tuxedo system dispatcher). It is recommended that <code>tpreturn()</code> be called from within the service routine dispatched to ensure correct return of control to the BEA Tuxedo system dispatcher.</p> <p><code>tpreturn()</code> is used to send a service's reply message. If the program receiving the reply is waiting in either <code>tpcall()</code>, <code>tpgetrply()</code>, or <code>tprecv()</code>, then after a successful call to <code>tpreturn()</code>, the reply is available in the receiver's buffer.</p> <p>For conversational services, <code>tpreturn()</code> also tears down the connection. That is, the service routine cannot call <code>tpdiscon()</code> directly. To ensure correct results, the program that connected to the conversational service should not call <code>tpdiscon()</code>; rather, it should wait for notification that the conversational service has completed (that is, it should wait for one of the events, like <code>TPEV_SVCSUCC</code> or <code>TPEV_SVCFAIL</code>, sent by <code>tpreturn()</code>).</p> <p>If the service routine was in transaction mode, <code>tpreturn()</code> places the service's portion of the transaction in a state from which it may be either committed or rolled back when the transaction is completed. A service may be invoked multiple times as part of the same transaction so it is not necessarily fully committed or rolled back until either <code>tpcommit()</code> or <code>tpabort()</code> is called by the originator of the transaction.</p> <p><code>tpreturn()</code> should be called after receiving all replies expected from service requests initiated by the service routine. Otherwise, depending on the nature of the service, either a <code>TPESVCERR</code> status or a <code>TPEV_SVCERR</code> event will be returned to the program that initiated communication with the service routine. Any outstanding replies that are not received will automatically be dropped by the communication manager. In addition, the descriptors for those replies become invalid.</p>

`tpreturn()` should be called after closing all connections initiated by the service. Otherwise, depending on the nature of the service, either a `TPESVCERR` or a `TPEV_SVCERR` event will be returned to the program that initiated communication with the service routine. Also, an immediate disconnect event (that is, `TPEV_DISCONIMM`) is sent over all open connections to subordinates.

Since a conversational service has only one open connection which it did not initiate, the communication manager knows over which descriptor data (and any event) should be sent. For this reason, a descriptor is not passed to `tpreturn()`.

The following is a description of the arguments for `tpreturn()`. `rval` can be set to one of the following.

TPSUCCESS

The service has terminated successfully. If data is present, then it will be sent (barring any failures processing the return). If the caller is in transaction mode, then `tpreturn()` places the caller's portion of the transaction in a state such that it can be committed when the transaction ultimately commits. Note that a call to `tpreturn()` does not necessarily finalize an entire transaction. Also, even though the caller indicates success, if there are any outstanding replies or open connections, if any work done within the service caused its transaction to be marked rollback-only, then a failed message is sent (that is, the recipient of the reply receives a `TPESVCERR` indication or a `TPEV_SVCERR` event). Note that if a transaction becomes rollback-only while in the service routine for any reason, then `rval` should be set to `TPFAIL`. If `TPSUCCESS` is specified for a conversational service, a `TPEV_SVCSUCC` event is generated.

TPFAIL

The service has terminated unsuccessfully from an application standpoint. An error will be reported to the program receiving the reply. That is, the call to get the reply will fail and the recipient receives a `TPSVCFAIL` indication or a `TPEV_SVCFAIL` event. If the caller is in transaction mode, then `tpreturn()` marks the transaction as rollback-only (note that the transaction may already be marked rollback-only). Barring any failures in processing the return, the caller's data is sent, if present. One reason for not sending the caller's data is that a transaction timeout has occurred. In this case, the program waiting for the reply will receive an error of `TPETIME`. If `TPFAIL` is specified for a conversational service, a `TPEV_SVCFAIL` event is generated.

TPEXIT

This value behaves the same as `TPFAIL` with respect to completing the service, but when `TPEXIT` is returned, the server exits after the transaction is rolled back and the reply is sent back to the requester.

When specified for a multithreaded process, `TPEXIT` indicates that an entire process (not only a single thread within that process) will be killed.

If the server is restartable, then the server is restarted automatically.

If `rval` is not set to one of these three values, then it defaults to `TPFAIL`.

An application defined return code, `rcode`, may be sent to the program receiving the service reply. This code is sent regardless of the setting of `rval` as long as a reply can be successfully sent (that is, as long as the receiving call returns success or `TPESVCFAIL`). In addition, for conversational services, this code can be sent only if the service routine has control of the connection when it issues `tpreturn()`. The value of `rcode` is available in the receiver in the variable, `tpurcode()`.

`data` points to the data portion of a reply to be sent. If `data` is non-NULL, it must point to a buffer previously obtained by a call to `tpalloc()`. If this is the same buffer passed to the service routine upon its invocation, then its disposition is up to the BEA Tuxedo system dispatcher; the service routine writer does not have to worry about whether it is freed or not. In fact, any attempt by the user to free this buffer will fail. However, if the buffer passed to `tpreturn()` is not the same one with which the service is invoked, then `tpreturn()` frees that buffer. Although the main buffer is freed, any buffers referenced by embedded fields within that buffer are not freed. `len` specifies the amount of the data buffer to be sent. If `data` points to a buffer which does not require a length to be specified, (for example, an FML fielded buffer), then `len` is ignored (and can be 0).

If `data` is NULL, then `len` is ignored. In this case, if a reply is expected by the program that invoked the service, then a reply is sent with no data. If no reply is expected, then `tpreturn()` frees `data` as necessary and returns sending no reply.

Currently, `flags` is reserved for future use and must be set to 0 (if set to a non-zero value, the recipient of the reply receives a `TPESVCERR` indication or a `TPEV_SVCERR` event).

If the service is conversational, there are two cases where the caller's return code and the data portion are not transmitted:

- if the connection has already been torn down when the call is made (that is, the caller has received `TPEV_DISCONIMM` on the connection), then this call simply ends the service routine and rolls back the current transaction, if one exists.

- if the caller does not have control of the connection, either `TPEV_SVCFail` or `TPEV_SVCERR` is sent to the originator of the connection as described above. Regardless of which event the originator receives, no data is transmitted; however, if the originator receives the `TPEV_SVCFail` event, the return code is available in the originator's `tpurcode()` variable.

Return Values A service routine does not return any value to its caller, the BEA Tuxedo system dispatcher; thus, it is declared as a `void`. Service routines, however, are expected to terminate using either `tpreturn()` or `tpforward()`. A conversational service routine must use `tpreturn()`, and cannot use `tpforward()`. If a service routine returns without using either `tpreturn()` or `tpforward()` (that is, it uses the C language `return` statement or just simply “falls out of the function”) or `tpforward()` is called from a conversational server, the server will print a warning message in the log and return a service error to the service requester. In addition, all open connections to subordinates will be disconnected immediately, and any outstanding asynchronous replies will be dropped. If the server was in transaction mode at the time of failure, the transaction is marked rollback-only. Note also that if either `tpreturn()` or `tpforward()` are used outside of a service routine (for example, in clients, or in `tpsvrinit()` or `tpsvrdone()`), then these routines simply return having no effect.

Errors Since `tpreturn()` ends the service routine, any errors encountered either in handling arguments or in processing cannot be indicated to the function's caller. Such errors cause `tperrno()` to be set to `TPESVCERR` for a program receiving the service's outcome via either `tpcall()` or `tpgetrply()`, and cause the event, `TPEV_SVCERR`, to be sent over the conversation to a program using `tpsend()` or `tprecv()`.

If either `SVCTIMEOUT` in the `UBBCONFIG` file or `TA_SVCTIMEOUT` in the `TM_MIB` is non-zero, the event `TPEV_SVCERR` is returned when a service timeout occurs.

`tperrordetail()` and `tpstrerrordetail()` can be used to get additional information about an error produced by the last BEA Tuxedo system routine called in the current thread. If an error occurred, `tperrordetail()` returns a numeric value that can be used as an argument to `trstrerrordetail()` to retrieve the text of the error detail.

See Also `tpalloc(3c)`, `tpcall(3c)`, `tpconnect(3c)`, `tpforward(3c)`, `tprecv(3c)`, `tpsend(3c)`, `tpservice(3c)`

tpscmt(3c)

Name	<code>tpscmt()</code> - routine for setting when <code>tpcommit()</code> should return
Synopsis	<pre>#include <atmi.h> int tpscmt(long flags)</pre>
Description	<code>tpscmt()</code> sets the <code>TP_COMMIT_CONTROL</code> characteristic to the value specified in <i>flags</i> . The <code>TP_COMMIT_CONTROL</code> characteristic affects the way <code>tpcommit()</code> behaves with respect to returning control to its caller. A program can call <code>tpscmt()</code> regardless of whether it is in transaction mode or not. Note that if the caller is participating in a transaction that another program must commit, then its call to <code>tpscmt()</code> does not affect that transaction. Rather, it affects subsequent transactions that the caller will commit.

In most cases, a transaction is committed only when a BEA Tuxedo system thread of control calls `tpcommit()`. There is one exception: when a service is dispatched in transaction mode because the `AUTOTRAN` variable in the `*SERVICES` section of the `UBBCONFIG` file is enabled, then the transaction completes upon calling `tpreturn()`. If `tpforward()` is called, then the transaction will be completed by the server ultimately calling `tpreturn()`. Thus, the setting of the `TP_COMMIT_CONTROL` characteristic in the service that calls `tpreturn()` determines when `tpcommit()` returns control within a server. If `tpcommit()` returns a heuristic error code, the server will write a message to a log file.

When a client joins a BEA Tuxedo system application, the initial setting for this characteristic comes from a configuration file. (See the `CMTRET` variable in the `RESOURCES` section of `UBBCONFIG(5)`)

The following are the valid settings for *flags*.

`TP_CMT_LOGGED`

This flag indicates that `tpcommit()` should return after the commit decision has been logged by the first phase of the two-phase commit protocol but before the second phase has completed. This setting allows for faster response to the caller of `tpcommit()` although there is a risk that a transaction participant might decide to heuristically complete (that is, abort) its work due to timing delays waiting for the second phase to complete. If this occurs, there is no way to indicate this situation to the caller since `tpcommit()` has already returned (although the BEA Tuxedo system writes a message to a log file

when a resource manager takes a heuristic decision). Under normal conditions, participants that promise to commit during the first phase will do so during the second phase. Typically, problems caused by network or site failures are the sources for heuristic decisions being made during the second phase.

`TP_CMT_COMPLETE`

This flag indicates that `tpcommit(3c)` should return after the two-phase commit protocol has finished completely. This setting allows for `tpcommit()` to return an indication that a heuristic decision occurred during the second phase of commit.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpscmt()`.

Return Values Upon success, `tpscmt()` returns the previous value of the `TP_COMMIT_CONTROL` characteristic.

Upon failure, `tpscmt()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpscmt()` sets `tperrno` to one of the following values.

[`TPEINVAL`]

flags is not one of `TP_CMT_LOGGED` or `TP_CMT_COMPLETE`.

[`TPEPROTO`]

`tpscmt()` was called improperly.

[`TPESYSTEM`]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[`TPEOS`]

An operating system error has occurred.

Notices When using `tpbegin()`, `tpcommit()` and `tpabort()` to delineate a BEA Tuxedo system transaction, it is important to remember that only the work done by a resource manager that meets the XA interface (and is linked to the caller appropriately) has transactional properties. All other operations performed in a transaction are not affected by either `tpcommit()` or `tpabort()`. See `buildserver(1)` for details on

linking resource managers that meet the XA interface into a server such that operations performed by that resource manager are part of a BEA Tuxedo system transaction.

See Also `tpabort(3c)`, `tpbegin(3c)`, `tpcommit(3c)`, `tpgetlev(3c)`

tpseal(3c)

Name	tpseal() - mark a typed message buffer for encryption
Synopsis	<pre>#include <atmi.h> int tpseal(char *data, TPKEY hKey, long flags)</pre>
Description	<p>tpseal() marks, or registers, a message buffer for encryption. The principal who owns <i>hKey</i> can decrypt this buffer and access its content. A buffer may be sealed for more than one recipient principal by making several calls to tpseal().</p> <p><i>data</i> must point to a valid typed message buffer either (1) previously allocated by a process calling tpalloc() or (2) delivered by the system to a receiving process. The content of the buffer may be modified after tpseal() is invoked.</p> <p>When the message buffer pointed to by <i>data</i> is transmitted from a process, the public key software encrypts the message content and attaches an encryption envelope to the message buffer for each encryption registration request. An encryption envelope enables a receiving process to decrypt the message.</p> <p>The <i>flags</i> argument is reserved for future use and must be set to 0.</p>
Return Values	On failure, this function returns -1 and sets tperrno() to indicate the error condition.
Errors	<p>[TPEINVAL] Invalid arguments were given. For example, <i>hKey</i> is not a valid key for encrypting or <i>data</i> is NULL.</p> <p>[TPESYSTEM] An error has occurred. Consult the system error log file for details.</p>
See Also	tpkey_close(3c), tpkey_open(3c)

tpsend(3c)

Name tpsend() - routine for sending a message in a conversational connection

Synopsis #include <atmi.h>
int tpsend(int *cd*, char **data*, long *len*, long *flags*, long **revent*)

Description tpsend() is used to send data across an open connection to another program. The caller must have control of the connection. tpsend()'s first argument, *cd*, specifies the open connection over which data is sent. *cd* is a descriptor returned from either tpcconnect() or the TPSVCINFO parameter passed to a conversational service.

The second argument, *data*, must point to a buffer previously allocated by tppalloc(). *len* specifies how much of the buffer to send. Note that if *data* points to a buffer of a type that does not require a length to be specified (for example, an FML fielded buffer), then *len* is ignored (and may be 0). Also, *data* can be NULL in which case *len* is ignored (no application data is sent - this might be done, for instance, to grant control of the connection without transmitting any data). The type and sub-type of *data* must match one of the types and sub-types recognized by the other end of the connection.

The following is a list of valid *flags*.

TPPRECVONLY

This flag signifies that, after the caller's data is sent, the caller gives up control of the connection (that is, the caller can not issue any more tpsend() calls). When the receiver on the other end of the connection receives the data sent by tpsend(), it will also receive an event (TPEV_SENDOONLY) indicating that it has control of the connection (and can not issue more any tpprecv() calls).

TPNOBLOCK

The data and any events are not sent if a blocking condition exists (for example, the internal buffers into which the message is transferred are full). When TPNOBLOCK is not specified and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued.

If an event exists for the descriptor, *cd*, then `tpsend()` will fail without sending the caller's data. The event type is returned in *revent*. Valid events for `tpsend()` are as follows:

TPEV_DISCONIMM

Received by the subordinate of a conversation, this event indicates that the originator of the conversation has issued an immediate disconnect on the connection via `tpdiscon()`, or it issued `tpreturn()`, `tpcommit()` or `tpabort()` with the connection still open. This event is also returned to the originator or subordinate when a connection is broken due to a communications error (for example, a server, machine, or network failure).

TPEV_SVCERR

Received by the originator of a conversation, this event indicates that the subordinate of the conversation has issued `tpreturn()` without having control of the conversation. In addition, `tpreturn()` has been issued in a manner different from that described for TPEV_SVCFAIL below. This event can be caused by an ACL permissions violation; that is, the originator does not have permission to connect to the receiving process. This event is not returned at the time the `tpconnect()` is issued, but is returned with the first `tpsend()` (following a `tpconnect()` with flag `TPSENDONLY`) or `tprecv()` (following a `tpconnect()` with flag `TPRECVONLY`). A system event and a log message are also generated.

TPEV_SVCFAIL

Received by the originator of a conversation, this event indicates that the subordinate of the conversation has issued `tpreturn()` without having control of the conversation. In addition, `tpreturn()` was issued with the *rval* set to `TPFAIL` or `TPEXIT` and *data* to `NULL`.

Because each of these events indicates an immediate disconnection notification (that is, abortive rather than orderly), data in transit may be lost. The descriptor used for the connection is no longer valid. If the two programs were participating in the same transaction, then the transaction has been marked abort-only.

If the value of either `SVCTIMEOUT` in the `UBBCONFIG` file or `TA_SVCTIMEOUT` in the `TM_MIB` is non-zero, `TPEV_SVCERR` is returned when a service timeout occurs.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpsend()`.

Return Values Upon return from `tpsend()` where *revent* is set to either `TPEV_SVCSUCC` or `TPEV_SVCFAIL`, the `tpurcode()` global contains an application-defined value that was sent as part of `tpreturn()`. The function `tpsend()` returns -1 on error and sets `tperrno()` to indicate the error condition. Also, if an event exists and no errors were encountered, `tpsend()` returns -1 and `tperrno()` is set to `[TPEVENT]`.

Errors Upon failure, `tpsend()` sets `tperrno()` to one of the following values.

`[TPEINVAL]`

Invalid arguments were given (for example, *data* does not point to a buffer allocated by `tpalloc()` or *flags* are invalid).

`[TPEBADDESC]`

cd is invalid.

`[TPETIME]`

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is marked abort-only; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` was specified. In either case, no changes are made to **data*, its contents nor **len*. If a transaction timeout occurred, then any attempts to send or receive messages on any connections or to start a new connection will fail with `TPETIME` until the transaction has been aborted.

`[TPEVENT]`

An event occurred. *data* is not sent when this error occurs. The event type is returned in *revent*.

`[TPEBLOCK]`

A blocking condition exists and `TPNOBLOCK` was specified.

`[TPGOTSIG]`

A signal was received and `TPSIGRSTRT` was not specified.

`[TPEPROTO]`

`tpsend()` was called in an improper context (for example, the connection was established such that the calling program can only receive data).

`[TPESYSTEM]`

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpalloc(3c)`, `tpconnect(3c)`, `tpdiscon(3c)`, `tprecv(3c)`, `tpservice(3c)`

tpservice(3c)

Name `tpservice()` - template for service routines

Synopsis

```
#include <atmi.h>                /* C interface */
void tpservice(TPSVCINFO *svcinfo) /* C++ interface - must have
                                   * C linkage */
extern "C" void tpservice(TPSVCINFO *svcinfo)
```

Description `tpservice()` is the template for writing service routines. This template is used for services that receive requests via `tpcall()`, `tpacall()` or `tpforward()` routines as well as by services that communicate via `tpconnect()`, `tpsend()` and `tprecv()` routines.

Service routines processing requests made via either `tpcall()` or `tpacall()` receive at most one incoming message (in the *data* element of *svcinfo*) and send at most one reply (upon exiting the service routine with `tpreturn()`).

Conversational services, on the other hand, are invoked by connection requests with at most one incoming message along with a means of referring to the open connection. When a conversational service routine is invoked, either the connecting program or the conversational service may send and receive data as defined by the application. The connection is half-duplex in nature meaning that one side controls the conversation (that is, it sends data) until it explicitly gives up control to the other side of the connection.

Concerning transactions, service routines can participate in at most one transaction if invoked in transaction mode. As far as the service routine writer is concerned, the transaction ends upon returning from the service routine. If the service routine is not invoked in transaction mode, then the service routine may originate as many transactions as it wants using `tpbegin()`, `tpcommit()`, and `tpabort()`. Note that `tpreturn()` is not used to complete a transaction. Thus, it is an error to call `tpreturn()` with an outstanding transaction that originated within the service routine.

Service routines are invoked with one argument: *svcinfo*, a pointer to a service information structure. This structure includes the following members:

```
char      name[32];
char      *data;
long      len;
long      flags;
int       cd;
```

```

long          appkey;
CLIENTID     cltid;

```

name is populated with the service name that the requester used to invoke the service.

The setting of *flags* upon entrance to a service routine indicates attributes which the service routine may want to note. The following are the possible values for *flags*.

TPCONV

A connection request for a conversation has been accepted and the descriptor for the conversation is available in *cd*. If not set, then this is a request/response service and *cd* is not valid.

TPTRAN

The service routine is in transaction mode.

TPNOREPLY

The caller is not expecting a reply. This option will not be set if TPCONV is set.

TPSENDONLY

The service is invoked such that it can only send data across the connection and the program on the other end of the connection can only receive data. This flag is mutually exclusive with TPRECVONLY and may be set only when TPCONV is also set.

TPRECVONLY

The service is invoked such that it can only receive data from the connection and the program on the other end of the connection can only send data. This flag is mutually exclusive with TSENDONLY and may be set only when TPCONV is also set.

data points to the data portion of a request message and *len* is the length of the data. The buffer pointed to by *data* was allocated by `tpalloc()` in the communication manager. This buffer may be grown by the user with `tprealloc()`; however, it cannot be freed by the user. It is recommended that this buffer be the one passed to either `tpreturn()` or `tpforward()` when the service ends. If a different buffer is passed to those routines, then that buffer is freed by them. Note that the buffer pointed to by *data* will be overwritten by the next service request even if this buffer is not passed to `tpreturn()` or `tpforward()`. *data* may be NULL if no data accompanied the request. In this case, *len* will be 0.

When TPCONV is set in *flags*, *cd* is the connection descriptor that can be used with `tpsend()` and `tprecv()` to communicate with the program that initiated the conversation.

appkey is set to the application key assigned to the requesting client by the application defined authentication service. This key value is passed along with any and all service requests made while within this invocation of the service routine. *appkey* will have a value of -1 for originating clients that do not pass through the application authentication service.

cltid is the unique client identifier for the originating client associated with this service request. The definition of this structure is made available to the application in `atmi.h` solely so that client identifiers may be passed between application servers if necessary. Therefore, the semantics of the fields defined below are not documented and applications should not manipulate the contents of CLIENTID structures. Doing so will invalidate the structures. The CLIENTID structure includes the following member:

```
long          clientdata[4];
```

Note that for C++, the service function must have C linkage. This is done by declaring the function as `'extern "C."`

Return Values

A service routine does not return any value to its caller, the communication manager dispatcher; thus, it is declared as a void. Service routines, however, are expected to terminate using either `tpreturn()` or `tpforward()`. A conversational service routine must use `tpreturn()`, and cannot use `tpforward()`. If a service routine returns without using either `tpreturn()` or `tpforward()` (that is, it uses the C language `return` statement or just simply “falls out of the function”) or `tpforward()` is called from a conversational server, the server will print a warning message in a log file and return a service error to the originator or requester. All open connections to subordinates will be disconnected immediately, and any outstanding asynchronous replies will be marked stale. If the server was in transaction mode at the time of failure, the transaction is marked abort-only. Note also that if either `tpreturn()` or `tpforward()` are used outside of a service routine (for example, in `clients`, or in `tpsvrinit()` or `tpsvrdone()`), then these routines simply return having no effect.

Errors

Since `tpreturn()` ends the service routine, any errors encountered either in handling arguments or in processing cannot be indicated to the function’s caller. Such errors cause `tperrno()` to be set to `TPESVCERR` for a program receiving the service’s outcome via either `tpcall()` or `tpgetrply()`, and cause the event, `TPEV_SVCERR`, to be sent over the conversation to a program using `tpsend()` or `tprecv()`.

See Also

`tpalloc(3c)`, `tpbegin(3c)`, `tpcall(3c)`, `tpconnect(3c)`, `tpforward(3c)`, `tpreturn(3c)`, `servopts(5)`

tpsetctxt(3c)

Name tpsetctxt() - sets a context identifier for the current application association

Synopsis #include <atmi.h>
int tpsetctxt(TPCONTEXT_T *context*, long *flags*)

Description tpsetctxt() defines the context in which the current thread operates. This function operates on a per-thread basis in a multithreaded environment, and on a per-process basis in a non-threaded environment.

Subsequent BEA Tuxedo calls made in this thread reference the application indicated by context. The context should have been provided by a previous call to tpgetctxt() in one of the threads of the same process. If the value of *context* is TPNULLCONTEXT, then the current thread is disassociated from any BEA Tuxedo context.

You can put an individual thread in a process operating in multicontext mode into the TPNULLCONTEXT state by issuing the following call:

```
tpsetctxt(TPNULLCONTEXT, 0)
```

TPINVALIDCONTEXT is not a valid input value for *context*.

A thread in the TPINVALIDCONTEXT state is prohibited from issuing calls to most ATMI functions. (For a complete list of the functions that may and may not be called, see “Introduction to the C Language Application-Transaction Monitor Interface” on page .) Therefore, you may sometimes need to move a thread out of the TPINVALIDCONTEXT state. To do so, call tpsetctxt() with context set to TPNULLCONTEXT or another valid context. (It is also allowable to call the tpterm() function to exit from the TPINVALIDCONTEXT state.)

The second argument, *flags*, is not currently used and must be set to 0.

A thread in a multithreaded application may issue a call to tpsetctxt() while running in any context state, including TPINVALIDCONTEXT.

Return Values Upon successful completion, tpsetctxt() returns a non-negative value.

Upon failure, it leaves the calling process in its original context, returns a value of -1, and sets *tperrno* to indicate the error condition.

Errors Upon failure, tpsetctxt() sets *tperrno* to one of the following values.

[TPEINVAL]

Invalid arguments have been given. For example, *flags* has been set to a value other than 0 or the context is `TPINVALIDCONTEXT`.

[TPENOENT]

The value of *context* is not a valid context.

[TPEPROTO]

`tpsetctxt()` has been called in an improper context. For example: (a) it has been called in a server-dispatched thread; (b) it has been called in a process that has not called `tpinit()`; or (c) it has been called in a process that has called `tpinit()` without specifying the `TPMULTICONTEXTS` flag.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error has been written to a log file.

[TPEOS]

An operating system error has occurred.

See Also Introduction to the C Language Application-Transaction Monitor Interface, `tpgetctxt(3c)`

tpsetunsol(3c)

Name	tpsetunsol() - sets the method for handling unsolicited messages
Synopsis	<pre>#include <atmi.h> void (*tpsetunsol (void (_TMDLLENTY *))(*disp) (char *data, long len, long flags))) (char *data, long len, long flags)</pre>
Description	<p>tpsetunsol() allows a client to identify the routine that should be invoked when an unsolicited message is received by the BEA Tuxedo system libraries. Before the first call to tpsetunsol(), any unsolicited messages received by the BEA Tuxedo system libraries on behalf of the client are logged and ignored. A call to tpsetunsol() with a NULL function pointer has the same effect. The method used by the system for notification and detection is determined by the application default, which can be overridden on a per-client basis (see tpinit(3c)).</p>

The function pointer passed on the call to tpsetunsol() must conform to the parameter definition given. *data* points to the typed buffer received and *len* is the length of the data. *flags* are currently unused. *data* can be NULL if no data accompanied the notification. *data* may be of a buffer type/subtype that is not known by the client, in which case the message data is unintelligible.

data cannot be freed by application code. However, the system frees it and invalidates the data area following return.

Processing within the application's unsolicited message handling routine is restricted to the following BEA Tuxedo functions: tmalloc(), tpfree(), tpgetctxt(), tpgetlev(), tprealloc(), and tptypes().

Note that in a multithreaded programming environment, it is possible for an unsolicited message handling routine to call tpgetctxt(), create another thread, have that thread call tpsetctxt() to the appropriate context, and have the new thread use the full set of ATMI functions that are available to clients.

If tpsetunsol() is called from a thread that is not currently associated with a context, this establishes a per-process default unsolicited message handler for all new tpinit() contexts created. It has no effect on contexts already associated with the system. A specific context may change this default unsolicited message handler by calling tpsetunsol() again when the context is active. The per-process default unsolicited message handler may be changed by again calling tpsetunsol() in a thread not currently associated with a context.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpsetunsol()`.

Return Values Upon success, `tpsetunsol()` returns the previous setting for the unsolicited message handling routine. (NULL is a successful return indicating that no message handling function had been set previously.)

Upon failure, it returns `TPUNSOLERR` and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpsetunsol()` sets `tperrno()` to one of the following values.

[TPEPROTO]

`tpsetunsol()` has been called in an improper context. For example, it has been called from within a server.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

Portability The interfaces described in `tpnotify(3c)` are supported on native site UNIX-based and Windows NT processors. In addition, the routines `tpbroadcast()` and `tpchkunsol()`, as well as the function `tpsetunsol()`, are supported on UNIX and MS-DOS workstation processors.

See Also `tpinit(3c)`, `tpterm(3c)`

tpsign(3c)

Name	<code>tpsign()</code> - mark a typed message buffer for digital signature
Synopsis	<pre>#include <atmi.h> int tpsign(char *data, TPKEY hKey, long flags)</pre>
Description	<p><code>tpsign()</code> marks, or registers, a message buffer for digital signature on behalf of the principal associated with <i>hKey</i>.</p> <p><i>data</i> must point to a valid typed message buffer either (1) previously allocated by a process calling <code>tpalloc()</code> or (2) delivered by the system to a receiving process. The content of the buffer may be modified after <code>tpsign()</code> is invoked.</p> <p>When the buffer pointed to by <i>data</i> is transmitted from a process, the public key software generates and attaches a digital signature to the message buffer for each digital-signature registration request. A digital signature enables a receiving process to verify the signer (originator) of the message.</p> <p>The <i>flags</i> argument is reserved for future use and must be set to 0.</p>
Return Values	On failure, this function returns -1 and sets <code>tperrno()</code> to indicate the error condition.
Errors	<p>[TPEINVAL] Invalid arguments were given. For example, <i>hKey</i> is not a valid key for signing or the value of <i>data</i> is NULL.</p> <p>[TPESYSTEM] An error occurred. Consult the system error log file for details.</p>
See Also	<code>tpkey_close(3c)</code> , <code>tpkey_open(3c)</code>

tpsprio(3c)

Name tpsprio() - sets the service request priority

Synopsis #include <atmi.h>
int tpsprio(prio, flags)

Description tpsprio() sets the priority for the next request sent or forwarded by the current thread in the current context. The priority set affects only the next request sent. Priority can also be set for messages enqueued or dequeued by tpenqueue() or tpdequeue(), if the queued message facility is installed. By default, the setting of *prio* increments or decrements a service's default priority up to a maximum of 100 or down to a minimum of 1, depending on its sign, where 100 is the highest priority. The default priority for a request is determined by the service to which the request is being sent. This default may be specified administratively (see UBBCONFIG(5)), or take the system default of 50. tpsprio() has no effect on messages sent via tpconnect() or tpsend().

A lower priority message does not remain enqueued forever because every tenth message is retrieved on a “first-in, first-out” (FIFO) basis. Response time should not be a concern of the lower priority interface or service.

In a multithreaded application tpsprio() operates on a per-thread basis.

The following is a list of valid flags.

TPABSOLUTE

The priority of the next request should be sent out at the absolute value of *prio*. The absolute value of *prio* must be within the range 1 and 100, inclusive, with 100 being the highest priority. Any value outside of this range causes a default value to be used.

In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tpsprio().

Return Values Upon failure, tpsprio() returns -1 and sets tperrno() to indicate the error condition.

Errors Upon failure, tpsprio() sets tperrno() to one of the following values.

[TPEINVAL]

flags are invalid.

[TPEPROTO]

`tpsrio()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpacall(3c)`, `tpcall(3c)`, `tpdequeue(3c)`, `tpenqueue(3c)`, `tpgprio(3c)`

tpstrerror(3c)

Name	<code>tpstrerror()</code> - get error message string for a BEA Tuxedo system error
Synopsis	<pre>#include <atmi.h> char * tpstrerror(int err)</pre>
Description	<p><code>tpstrerror()</code> is used to retrieve the text of an error message from <code>LIBTUX_CAT</code>. <code>err</code> is the error code set in <code>tperrno()</code> when a BEA Tuxedo system function call returns a -1 or other failure value.</p> <p>You can use the pointer returned by <code>tpstrerror()</code> as an argument to <code>userlog()</code> or the UNIX function <code>fprintf()</code>.</p> <p>A thread in a multithreaded application may issue a call to <code>tpstrerror()</code> while running in any context state, including <code>TPINVALIDCONTEXT</code>.</p>
Return Values	<p>Upon success, <code>tpstrerror()</code> returns a pointer to a string that contains the error message text.</p> <p>If <code>err</code> is an invalid error code, <code>tpstrerror()</code> returns a <code>NULL</code>.</p>
Errors	Upon failure, <code>tpstrerror()</code> returns a <code>NULL</code> but does not set <code>tperrno()</code> .
Example	<pre>#include <atmi.h> . . . char *p; if (tpbegin(10,0) == -1) { p = tpstrerror(tperrno); userlog("%s", p); (void)tpabort(0); (void)tpterm(); exit(1); }</pre>
See Also	<code>userlog(3c)</code> , <code>Fstrerror</code> , <code>Fstrerror32(3fml)</code>

tpstrerrordetail(3c)

Name	tpstrerrordetail() - get error detail message string for a BEA Tuxedo system error
Synopsis	<pre>#include <atmi.h> char * tpstrerrordetail(int err, long flags)</pre>
Description	<p>tpstrerrordetail() is used to retrieve the text of an error detail of a BEA Tuxedo system error. <i>err</i> is the value returned by tperordetail().</p> <p>The user can use the pointer returned by tpstrerrordetail() as an argument to userlog() or the UNIX function fprintf().</p> <p>Currently <i>flags</i> is reserved for future use and must be set to 0.</p> <p>A thread in a multithreaded application may issue a call to tpstrerrordetail() while running in any context state, including TPINVALIDCONTEXT.</p>
Return Values	<p>Upon success, the function returns a pointer to a string that contains the error detail message text.</p> <p>Upon failure (that is, if <i>err</i> is an invalid error code), tpstrerrordetail() returns a NULL.</p>
Errors	Upon failure, tpstrerrordetail() returns a NULL but does not set tperrno().
Example	<pre>#include <atmi.h> . . . int ret; char *p; if (tpbegin(10,0) == -1) { ret = tperordetail(0); if (ret == -1) { (void) fprintf(stderr, "tperordetail() failed!\n"); (void) fprintf(stderr, "tperrno = %d, %s\n", tperrno, tpstrerror(tperrno)); } }</pre>

```
        else if (ret != 0) {
            (void) fprintf(stderr, "error detail: %s\n",
                tpstrerrordetail(ret, 0));
        }
        .
        .
        .
    }
```

See Also Introduction to the C Language Application-Transaction Monitor Interface, `tperrordetail(3c)`, `tpstrerror(3c)`, `userlog(3c)`, `tperrno(5)`

tsubscribe(3c)

Name	tsubscribe() - subscribe to an event
Synopsis	<pre>#include <atmi.h> long tsubscribe(char *eventexpr, char *filter, TPEVCTL *ctl, long flags)</pre>
Description	<p>The caller uses <code>tsubscribe()</code> to subscribe to an event or set of events named by <i>eventexpr</i>. Subscriptions are maintained by the BEA Tuxedo EventBroker, <code>TMUSREVT(5)</code>, and are used to notify subscribers when events are posted via <code>tpost()</code>. Each subscription specifies a notification method which can take one of three forms: client notification, service calls, or message enqueueing to stable-storage queues. Notification methods are determined by the subscriber's process type and the arguments passed to <code>tsubscribe()</code>.</p>

The event or set of events being subscribed to is named by *eventexpr*, a NULL-terminated string of at most 255 characters containing a regular expression. For example, if *eventexpr* is “`\e\e.*`”, the caller is subscribing to all system-generated events; if *eventexpr* is “`\e\e.SysServer.*`”, the caller is subscribing to all system-generated events related to servers. If *eventexpr* is “`[A-Z].*`”, the caller is subscribing to all user events starting with A-Z; if *eventexpr* is “`.*(ERR|err).*`”, the caller is subscribing to all user events containing either the substring `ERR` or the substring `err` in the event name. Events called `account_error` and `ERROR_STATE`, for example, would both qualify.

If present, *filter* is a string containing a boolean filter rule that must be evaluated successfully before the EventBroker posts the event. Upon receiving an event to be posted, the EventBroker applies the filter rule, if one exists, to the posted event's data. If the data passes the filter rule, the EventBroker invokes the notification method; otherwise, the broker does not invoke the associated notification method. The caller can subscribe to the same event multiple times with different filter rules.

Filter rules are specific to the typed buffers to which they are applied. For FML and view buffers, the filter rule is a string that can be passed to each's boolean expression compiler (see `Fboolco(3fml)` and `Fvboolco(3fml)`, respectively) and evaluated against the posted buffer (see `Fboolev(3fml)` and `Fvboolev(3fml)`, respectively). For `STRING` buffers, the filter rule is a regular expression. All other buffer types require

customized filter evaluators (see `buffer(3c)` and `typesw(5)` for details on adding customized filter evaluators). `filter` is a NULL-terminated string of at most 255 characters.

If the subscriber is a BEA Tuxedo system client process and `ctl` is NULL, then the EventBroker sends an unsolicited message to the subscriber when the event to which it subscribed is posted. That is, when an event name is posted that evaluates successfully against `eventexpr`, the EventBroker tests the posted data against the filter rule associated with `eventexpr`. If the data passes the filter rule or if there is no filter rule for the event, then the subscriber receives an unsolicited notification along with any data posted with the event. In order to receive unsolicited notifications, the client must register (via `tpsetunsol()`) an unsolicited message handling routine. If a BEA Tuxedo system server process calls `tpsubscribe()` with a NULL `ctl` parameter, then `tpsubscribe()` fails setting `tperrno()` to TPEPROTO.

Clients receiving event notification via unsolicited messages should remove their subscriptions from the EventBroker's list of active subscriptions before exiting (see `tpunsubscribe(3c)` for details). Using `tpunsubscribe()`'s wild-card handle, -1, clients can conveniently remove all of their "non-persistent" subscriptions which include those associated with the unsolicited notification method (see the description of TPEVPERSIST below for subscriptions and their associated notification methods that persist after a process exits). If a client exits without removing its non-persistent subscriptions, then the EventBroker will remove them when it detects that the client is no longer accessible.

If the subscriber (regardless of process type) wants event notifications to go to service routines or to stable-storage queues, then the `ctl` parameter must point to a valid TPEVCTL structure. This structure contains the following elements:

```
long    flags;
char    name1[32];
char    name2[32];
TPQCTL  qctl;
```

The following is a list of valid bits for the `ctl->flags` element controlling options for event subscriptions.

TPEVSERVICE

Setting this flag indicates that the subscriber wants event notifications to be sent to the BEA Tuxedo system service routine named in `ctl->name1`. That is, when an event name is posted that evaluates successfully against `eventexpr`, the EventBroker tests the posted data against the filter rule associated with `eventexpr`. If the data passes the filter rule or if there is no

filter rule for the event, then a service request is sent to `ctl->name1` along with any data posted with the event. The service name in `ctl->name1` can be any valid BEA Tuxedo system service name and it may or may not be active at the time the subscription is made. Service routines invoked by the EventBroker should return with no reply data. That is, they should call `tpreturn()` with a NULL data argument. Any data passed to `tpreturn()` will be dropped. `TPEVSERVICE` and `TPEVQUEUE` are mutually exclusive flags.

If `TPEVTRAN` is also set in `ctl->flags`, then if the process calling `tppost()` is in transaction mode, the EventBroker calls the subscribed service routine such that it will be part of the poster's transaction. Both the EventBroker, `TMUSREVT(5)`, and the subscribed service routine must belong to server groups that support transactions (see `UBBCONFIG(5)` for details). If `TPEVTRAN` is not set in `ctl->flags`, then the EventBroker calls the subscribed service routine such that it will not be part of the poster's transaction.

TPEVQUEUE

Setting this flag indicates that the subscriber wants event notifications to be enqueued to the queue space named in `ctl->name1` and the queue named in `ctl->name2`. That is, when an event name is posted that evaluates successfully against `eventexpr`, the EventBroker tests the posted data against the filter rule associated with `eventexpr`. If the data passes the filter rule or if there is no filter rule for the event, then the EventBroker enqueues a message to the queue space named in `ctl->name1` and the queue named in `ctl->name2` along with any data posted with the event. The queue space and queue name can be any valid BEA Tuxedo system queue space and queue name, either of which may or may not exist at the time the subscription is made.

`ctl->qctl` can contain options further directing the EventBroker's enqueueing of the posted event. If no options are specified, then `ctl->qctl.flags` should be set to `TPNOFLAGS`. Otherwise, options can be set as described in the "Control Parameter" subsection of `tpenqueue(3c)` (specifically, see the section describing the valid list of flags controlling input information for `tpenqueue(3c)`). `TPEVSERVICE` and `TPEVQUEUE` are mutually exclusive flags.

If `TPEVTRAN` is also set in `ctl->flags`, then if the process calling `tppost()` is in transaction mode, the EventBroker enqueues the posted event and its data such that it will be part of the poster's transaction. The EventBroker,

TMUSREVT(5), must belong to a server group that supports transactions (see UBBCONFIG(5) for details). If TPEVTRAN is not set in *ctl->flags*, then the EventBroker enqueues the posted event and its data such that it will not be part of the poster's transaction.

TPEVTRAN

Setting this flag indicates that the subscriber wants the event notification for this subscription to be included in the poster's transaction, if one exists. If the poster is not a transaction, then a transaction is started for this event notification. If this flag is not set, then any events posted for this subscription will not be done on behalf of any transaction in which the poster is participating. This flag can be used with either TPEVSERVICE or TPEVQUEUE.

TPEVPERSIST

By default, the BEA Tuxedo EventBroker deletes subscriptions when the resource to which it is posting is not available (for example, the EventBroker cannot access a service routine and/or a queue space/queue name associated with an event subscription). Setting this flag indicates that the subscriber wants this subscription to persist across such errors (usually because the resource will become available again in the future). When this flag is not used, the EventBroker will remove this subscription if it encounters an error accessing either the service name or queue space/queue name designated in this subscription.

If this flag is used with TPEVTRAN and the resource is not available at the time of event notification, then the EventBroker will return to the poster such that its transaction must be aborted. That is, even though the subscription remains intact, the resource's unavailability will cause the poster's transaction to fail.

If the EventBroker's list of active subscriptions already contains a subscription that matches the one being requested by *tpssubscribe()*, then the function fails setting *tperrno()* to TPEMATCH. For a subscription to match an existing one, both *eventexpr* and *filter* must match those of a subscription already in the EventBroker's active list of subscriptions. In addition, depending on the notification method, other criteria are used to determine matches.

If the subscriber is a BEA Tuxedo system client process and *ctl* is NULL (such that the caller receives unsolicited notifications when events are posted), then its system-defined client identifier (known as a CLIENTID) is also used to detect matches. That is, *tpssubscribe()* fails if *eventexpr*, *filter*, and the caller's CLIENTID match those of a subscription already known to the EventBroker.

If the caller has set `ctl->flags` to `TPEVSERVICE`, then `tsubscribe()` fails if `eventexpr`, `filter`, and the service name set in `ctl->name1` match those of a subscription already known to the EventBroker.

For subscriptions to stable-storage queues, the queue space, queue name, and correlation identifier are used, in addition to `eventexpr` and `filter`, when determining matches. The correlation identifier can be used to differentiate among several subscriptions for the same event expression and filter rule, destined for the same queue. Thus, if the caller has set `ctl->flags` to `TPEVQUEUE`, and `TPQCOORDID` is not set in `ctl->qctl.flags`, then `tsubscribe()` fails if `eventexpr`, `filter`, the queue space name set in `ctl->name1`, and the queue name set in `ctl->name2` match those of a subscription (which also does not have a correlation identifier specified) already known to the EventBroker. Further, if `TPQCOORDID` is set in `ctl->qctl.flags`, then `tsubscribe()` fails if `eventexpr`, `filter`, `ctl->name1`, `ctl->name2`, and `ctl->qctl.corrid` match those of a subscription (which has the same correlation identifier specified) already known to the EventBroker.

The following is a list of valid `flags` for `tsubscribe()`:

TPNOBLOCK

The subscription is not made if a blocking condition exists. If such a condition occurs, the call fails and `tperrno()` is set to `TPEBLOCK`. When `TPNOBLOCK` is not specified and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued. When `TPSIGRSTRT` is not specified and a signal interrupts a system call, then `tsubscribe()` fails and `tperrno()` is set to `TPGOTSIG`.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tsubscribe()`.

Return Values

Upon successful completion, `tsubscribe()` returns a handle that can be used to remove this subscription from the EventBroker's list of active subscriptions. The subscriber or any other process is allowed to use the returned handle to delete this subscription.

Upon failure, `tpsubscribe()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpsubscribe()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[TPEINVAL]

Invalid arguments were given (for example, *eventexpr* is NULL).

[TPENOENT]

Cannot access the BEA Tuxedo EventBroker.

[TPELIMIT]

The subscription failed because the EventBroker's maximum number of subscriptions has been reached.

[TPEMATCH]

The subscription failed because it matched one already listed with the EventBroker.

[TPEPERM]

The client is not attached as `tpsysadm` and the subscription action is either a service call or the enqueueing of a message.

[TPETIME]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is to be aborted; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` were specified. If a transaction timeout occurred, any attempts to do new work will fail with `TPETIME` until the transaction has been aborted.

[TPEBLOCK]

A blocking condition exists and `TPNOBLOCK` was specified.

[TPGOTSIG]

A signal was received and `TPSIGRSTRT` was not specified.

[TPEPROTO]

`tpsubscribe()` was called improperly.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `buffer(3c)`, `recomp`, `rematch(3c)`, `tpenqueue(3c)`, `tppost(3c)`,
`tpsetunsol(3c)`, `tpunsubscribe(3c)`, `Fboolco`, `Fboolco32`, `Fvboolco`,
`Fvboolco32(3fml)`, `Fboolev`, `Fboolev32`, `Fvboolev`, `Fvboolev32(3fml)`,
`EVENTS(5)`, `EVENT_MIB(5)`, `TMSYSEVT(5)`, `TMUSREVT(5)`, `tuxtypes(5)`,
`typesw(5)`, `UBBCONFIG(5)`

tpsuspend(3c)

Name `tpsuspend()` - suspend a global transaction

Synopsis

```
#include <atmi.h>
int tpsuspend(TPTRANID *trandid, long flags)
```

Description `tpsuspend()` is used to suspend the transaction active in the caller's process. A transaction begun with `tpbegin()` may be suspended with `tpsuspend()`. Either the suspending process or another process may use `tpresume()` to resume work on a suspended transaction. When `tpsuspend()` returns, the caller is no longer in transaction mode. However, while a transaction is suspended, all resources associated with that transaction (such as database locks) remain active. Like an active transaction, a suspended transaction is susceptible to the transaction timeout value that was assigned when the transaction first began.

For the transaction to be resumed in another process, the caller of `tpsuspend()` must have been the initiator of the transaction by explicitly calling `tpbegin()`. `tpsuspend()` may also be called by a process other than the originator of the transaction (for example, a server that receives a request in transaction mode). In the latter case, only the caller of `tpsuspend()` may call `tpresume()` to resume that transaction. This case is allowed so that a process can temporarily suspend a transaction to begin and do some work in another transaction before completing the original transaction (for example, to run a transaction to log a failure before rolling back the original transaction).

`tpsuspend()` returns in the space pointed to by *trandid* the transaction identifier being suspended. The caller is responsible for allocating the space to which *trandid* points. It is an error for *trandid* to be NULL.

To ensure success, the caller must have completed all outstanding transactional communication with servers before issuing `tpsuspend()`. That is, the caller must have received all replies for requests sent with `tpacall()` that were associated with the caller's transaction. Also, the caller must have closed all connections with conversational services associated with the caller's transaction (that is, `tprecv()` must have returned the `TPEV_SVCSUCC` event). If either rule is not followed, then `tpsuspend()` fails, the caller's current transaction is not suspended and all transactional communication descriptors remain valid. Communication descriptors not associated with the caller's transaction remain valid regardless of the outcome of `tpsuspend()`.

Currently, *flags* are reserved for future use and must be set to 0.

In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to `tpsuspend()`.

Return Value `tpsuspend()` returns -1 on error and sets `tperrno()` to indicate the error condition.

Errors Under the following conditions, `tpsuspend()` fails and sets `tperrno()` to:

[TPEINVAL]

trandid is a NULL pointer or *flags* is not 0. The caller's state with respect to the transaction is not changed.

[TPEABORT]

The caller's active transaction has been aborted. All communication descriptors associated with the transaction are no longer valid.

[TPEPROTO]

`tpsuspend()` was called in an improper context (for example, the caller is not in transaction mode). The caller's state with respect to the transaction is not changed.

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpacall(3c)`, `tpbegin(3c)`, `tprecv(3c)`, `tpresume(3c)`

tpsvrdone(3c)

`tpsvrdone()` - terminates a BEA Tuxedo system server

Synopsis `#include <atmi.h>`
`void tpsvrdone(void)`

Description The BEA Tuxedo system server abstraction calls `tpsvrdone()` after it has finished processing service requests but before it exits. When this routine is invoked, the server is still part of the system but its own services have been unadvertised. Thus, BEA Tuxedo system communication can be performed and transactions can be defined in this routine. However, if `tpsvrdone()` returns with open connections, asynchronous replies pending or while still in transaction mode, the BEA Tuxedo system will close its connections, ignore any pending replies, and abort the transaction before the server exits.

If a server is shut down by the invocation of `tmshutdown -y`, services are suspended and the ability to perform communication or to begin transactions in `tpsvrdone()` is limited.

If an application does not provide this routine in a server, then the default version provided by the BEA Tuxedo system is called instead. If a server has been defined as a single-threaded server, the default `tpsvrdone()` calls `tpsvrthrdone()`, and the default version of `tpsvrthrdone()` calls `tx_close()`. If a server has been defined as a multithreaded server, `tpsvrthrdone()` is called in each server dispatch thread, but is not called from `tpsvrdone()`. Regardless of whether the server is multithreaded, the default `tpsvrdone()` calls `userlog` to indicate that the server is about to exit.

Usage When called in `tpsvrdone()`, the `tpreturn()` and `tpforward()` functions simply return with no effect.

See Also `tpsvrthrdone(3c)`, `tpsvrthrinit(3c)`, `servopts(5)`

tpsvrinit(3c)

Name tpsvrinit() - initializes a BEA Tuxedo system server

Synopsis

```
#include <atmi.h>
int tpsvrinit(int argc, char **argv)
```

Description The BEA Tuxedo system server abstraction calls `tpsvrinit()` during its initialization. This routine is called after the thread of control has become a server but before it handles any service requests; thus, BEA Tuxedo system communication may be performed and transactions may be defined in this routine. However, if `tpsvrinit()` returns with either open connections or asynchronous replies pending, or while still in transaction mode, the BEA Tuxedo system closes the connections, ignores any pending replies, and aborts the transaction before the server exits.

If an application does not provide this routine in a server, then the default version provided by the BEA Tuxedo system is called instead.

If a server has been defined as a single-threaded server, the default `tpsvrinit()` calls `tpsvrthrinit()`, and the default version of `tpsvrthrinit()` calls `tx_open()`. If a server has been defined as a multithreaded server, `tpsvrthrinit()` is called in each server dispatch thread, but is not called from `tpsvrinit()`. Regardless of whether the server is single-threaded or multithreaded, the default version of `tpsvrinit()` calls `userlog()` to indicate that the server started successfully.

Application-specific options can be passed into a server and processed in `tpsvrinit()` (see `servopts(5)`). The options are passed through `argc` and `argv`. Since `getopt()` is used in a BEA Tuxedo system server abstraction, `optarg()`, `optind()`, and `opterr()` may be used to control option parsing and error detection in `tpsvrinit()`.

If an error occurs in `tpsvrinit()`, the application can cause the server to exit gracefully (and not take any service requests) by returning `-1`. The application itself should not call `exit()`.

Return Values A negative return value causes the server to exit gracefully.

Usage When used outside a service routine (for example, in clients, in `tpsvrinit()`, or in `tpsvrdone()`), the `tpreturn()` and `tpforward()` functions simply return with no effect.

See Also `tpopen(3c)`, `tpsvrdone(3c)`, `tpsvrthrinit(3c)`, `servopts(5)`
`getopt(3)` in a C language reference manual

tpsvrthrdone(3c)

- Name** `tpsvrthrdone()` - terminates a BEA Tuxedo server thread
- Synopsis** `#include <atmi.h>`
 `void tpsvrthrdone(void)`
- Description** The BEA Tuxedo server abstraction calls `tpsvrthrdone()` during the termination of each thread that has been started to handle dispatched service requests. In other words, even if a thread is terminated before it has handled a request, the `tpsvrdone()` function is called. When this routine is called, the thread of control is still part of the BEA Tuxedo server, but the thread has finished processing all service requests. Thus, BEA Tuxedo communication may be performed and transactions may be defined in this routine. However, if `tpsvrthrdone()` returns with either open connections or asynchronous replies pending, or while still in transaction mode, the BEA Tuxedo system closes the connections, ignores any pending replies, and aborts the transaction before the server dispatch thread exits.
- If an application does not provide this routine in a server, then the default version of `tpsvrthrdone()` provided by the BEA Tuxedo system is called instead. The default version of `tpsvrthrdone()` calls `tx_close()`.
- `tpsvrthrdone()` is called even in single-threaded servers. In a single-threaded server, `tpsvrthrdone()` is called from the default version of `tpsvrdone()`. In a server with the potential for multiple dispatch threads, `tpsvrdone()` does not call `tpsvrthrdone()`.
- Usage** When called from `tpsvrthrdone()`, the `tpreturn()` and `tpforward()` functions simply return with no effect.
- See Also** `tpforward(3c)`, `tpreturn(3c)`, `tpsvrdone(3c)`, `tpsvrthrinit(3c)`,
 `tx_close(3c)`, `servopts(5)`

tpsvrthrinit(3c)

Name tpsvrthrinit() - initializes a BEA Tuxedo server thread

Synopsis #include <atmi.h>
int tpsvrthrinit(int *argc*, char ***argv*)

Description The BEA Tuxedo server abstraction calls tpsvrthrinit() during the initialization of each thread that handles dispatched service requests. This routine is called after the thread of control has become part of the BEA Tuxedo server but before the thread handles any service requests. Thus, BEA Tuxedo communication may be performed and transactions may be defined in this routine. However, if tpsvrthrinit() returns with either open connections or asynchronous replies pending, or while still in transaction mode, the BEA Tuxedo system closes the connections, ignores any pending replies, and aborts the transaction before the server dispatch thread exits.

If an application does not provide this routine in a server, then the default version of tpsvrthrinit() provided by the BEA Tuxedo system is called instead. The default version of tpsvrthrinit() calls tx_open().

tpsvrthrinit() is called even in single-threaded servers. In a single-threaded server, tpsvrthrinit() is called from the default version of tpsvrinit(). In a server with the potential for multiple dispatch threads, tpsvrinit() does not call tpsvrthrinit().

Application-specific options can be passed into a server and processed in tpsvrthrinit(). For more information about options, see servopts(5). The options are passed *argc* and *argv*. Because getopt() is used in a BEA Tuxedo server abstraction, optarg(), optind(), and opterr() may be used to control option parsing and error detection in tpsvrthrinit().

If an error occurs in tpsvrthrinit(), the application can cause the server dispatch thread to exit gracefully (and not take any service requests) by returning -1. The application should not call exit() or any operating system thread exit function.

Return Values A negative return value will cause the server dispatch thread to exit gracefully.

Usage When used outside a service routine (for example, when used in a client or in tpsvrinit(), tpsvrdone(), tpsvrthrinit(), or tpsvrthrdone()), the tpreturn() and tpforward() functions simply return with no effect.

See Also `tpforward(3c)`, `tpreturn(3c)`, `tpsvrthrdone(3c)`, `tpsvrthrinit(3c)`,
`tx_open(3c)`, `servopts(5)`
`getopt(3)` in a C language reference manual

tpterm(3c)

Name	<code>tpterm()</code> - leaves an application
Synopsis	<pre>#include <atmi.h> int tpterm(void)</pre>
Description	<p><code>tpterm()</code> removes a client from a BEA Tuxedo system application. If the client is in transaction mode, then the transaction is rolled back. When <code>tpterm()</code> returns successfully, the caller can no longer perform BEA Tuxedo client operations. Any outstanding conversations are immediately disconnected.</p> <p>If <code>tpterm()</code> is called more than once (that is, if it is called after the caller has already left the application), no action is taken and success is returned.</p>

Multithreading and Multicontexting Issues

In good programming practice, all threads but one should either exit or switch context before the single remaining thread issues a call to `tpterm()`. If this is not done, then the remaining threads are put in a `TPINVALIDCONTEXT` context. A description of the semantics of this context follows.

When invoked by one thread in a context with which multiple threads are associated, `tpterm()`:

- Operates on all threads in a context, but not on all contexts in a process
- Executes immediately, even if other threads in the same process are still associated with that context

Any thread blocked in an ATMI call when another thread terminates its context will return from the ATMI call with a failure return; `tperrno()` is set to `TPESYSTEM`. In addition, if `tperrordetail()` is invoked after such a failure return, it returns `TPED_INVALIDCONTEXT`.

In a single-context application, whenever a single thread calls `tpterm()`, the context state for all threads is set to `TPNULLCONTEXT`.

In a multicontexted application, however, when `tpterm()` is invoked by one thread, all other threads in the same context are placed in a state such that if they subsequently call most ATMI functions, those functions will, instead, return failure with `tperrno`

set to TPEPROTO. Lists of the functions that are allowed and disallowed in such an invalid context state are provided in “Introduction to the C Language Application-Transaction Monitor Interface” on page . If a thread in the invalid context state (TPINVALIDCONTEXT) calls the `tpgetctx()` function, `tpgetctx()` sets the context parameter to TPINVALIDCONTEXT.

A thread may exit from the TPINVALIDCONTEXT state by calling one of the following:

- `tpsetctx()` with the TPNULLEXEC context or another valid context
- `tpterm()`

It is forbidden to call `tpsetctx()` with a context of TPINVALIDCONTEXT; doing so results in failure with `tperrno` set to TPEPROTO. When a thread invokes ATMI functions other than `tpsetunsol()` that do not require the caller to be associated with an application, these functions behave as if they were invoked in the null context.

After invoking `tpterm()`, a thread is placed in the TPNULLEXEC context. Most ATMI functions invoked by a thread in the TPNULLEXEC context perform an implicit `tpinit()`. Whether or not the call to `tpinit()` succeeds depends on the usual determining factors, unrelated to context-specific or thread-specific issues.

A thread in a multithreaded application may issue a call to `tpterm()` while running in any context state, including TPINVALIDCONTEXT.

Return Values

Upon success in a single-context application, all threads in the application’s current context are placed in the TPNULLEXEC state.

Upon success in a multicontexted application, the calling thread is placed in the TPNULLEXEC state and all other threads in the same context as the calling thread are placed in the TPINVALIDCONTEXT state. The user may change the context state of the latter threads by running `tpsetctx()` with the *context* argument set to TPNULLEXEC or another valid context.

Upon failure, `tpterm()` leaves the calling process in its original context state, returns -1, and sets `tperrno()` to indicate the error condition.

Errors

Upon failure, `tpterm()` sets `tperrno()` to one of the following values.

[TPEPROTO]

`tpterm()` was called in an improper context (for example, the caller is a server).

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpinit(3c)`, `tpgetctxt(3c)`, `tpsetctxt(3c)`, `tpsetunsol(3c)`

tptypes(3c)

Name	tptypes() - routine to determine information about a typed buffer
Synopsis	<pre>#include <atmi.h> long tptypes(char *ptr, char *type, char *subtype)</pre>
Description	<p>tptypes() takes as its first argument a pointer to a data buffer and returns the type and subtype of that buffer in its second and third arguments, respectively. <i>ptr</i> must point to a buffer gotten from <code>tpalloc()</code>. If <i>type</i> and <i>subtype</i> are non-NULL, then the function populates the character arrays to which they point with the names of the buffer's type and subtype, respectively. If the names are of their maximum length (8 for <i>type</i>, 16 for <i>subtype</i>), the character array is not null-terminated. If no subtype exists, then the array pointed to by <i>subtype</i> will contain a NULL string.</p> <p>Note that only the first eight bytes of <i>type</i> and the first 16 bytes of <i>subtype</i> are populated.</p> <p>A thread in a multithreaded application may issue a call to <code>tptypes()</code> while running in any context state, including <code>TPINVALIDCONTEXT</code>.</p>
Return Values	<p>Upon success, <code>tptypes()</code> returns the size of the buffer;</p> <p>Upon failure, it returns -1 and sets <code>tperrno()</code> to indicate the error condition.</p>
Errors	<p>Upon failure, <code>tptypes()</code> sets <code>tperrno()</code> to one of the following values.</p> <p>[TPEINVAL] Invalid arguments were given (for example, <i>ptr</i> does not point to a buffer gotten from <code>\% tpalloc()</code>).</p> <p>[TPEPROTO] <code>tptypes()</code> was called improperly.</p> <p>[TPESYSTEM] A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.</p> <p>[TPEOS] An operating system error has occurred.</p>
See Also	<code>tpalloc(3c)</code> , <code>tpfree(3c)</code> , <code>tprealloc(3c)</code>

tpunadvertise(3c)

Name `tpunadvertise()` - routine for unadvertising a service name

Synopsis

```
#include <atmi.h>
int tpunadvertise(char *svcname)
```

Description `tpunadvertise()` allows a server to unadvertise a service that it offers. By default, a server's services are advertised when it is booted and they are unadvertised when it is shutdown.

All servers belonging to a multiple server, single queue (MSSQ) set must offer the same set of services. These routines enforce this rule by affecting the advertisements of all servers sharing an MSSQ set.

`tpunadvertise()` removes *svcname* as an advertised service for the server (or the set of servers sharing the caller's MSSQ set). *svcname* cannot be NULL or the NULL string (""). Also, *svcname* should be 15 characters or less. (See *SERVICES section of UBBCONFIG(5)). Longer names will be accepted and truncated to 15 characters. Care should be taken such that truncated names do not match other service names.

Return Values Upon failure, `tpunadvertise()` returns -1 and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpunadvertise()` sets `tperrno()` to one of the following values.

[TPEINVAL]

svcname is NULL or the NULL string ("").

[TPENOENT]

svcname is not currently advertised by the server.

[TPEPROTO]

`tpunadvertise()` was called in an improper context (for example, by a client).

[TPESYSTEM]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tpadvertise(3c)`

tpunsubscribe(3c)

Name	<code>tpunsubscribe()</code> - unsubscribe to an event
Synopsis	<pre>#include <atmi.h> int tpunsubscribe(long subscription, long flags)</pre>
Description	<p>The caller uses <code>tpunsubscribe()</code> to remove an event subscription or a set of event subscriptions from the BEA Tuxedo EventBroker's list of active subscriptions. <i>subscription</i> is an event subscription handle returned by <code>tpsubscribe()</code>. Setting <i>subscription</i> to the wild-card value, -1, directs <code>tpunsubscribe()</code> to unsubscribe to all non-persistent subscriptions previously made by the calling process. Non-persistent subscriptions are those made without the <code>TPEVPERSIST</code> bit setting in the <code>ctl->flags</code> parameter of <code>tpsubscribe()</code>. Persistent subscriptions can be deleted only by using the handle returned by <code>tpsubscribe()</code>.</p>

Note that the -1 handle removes only those subscriptions made by the calling process and not any made by previous instantiations of the caller (for example, a server that dies and restarts cannot use the wild-card to unsubscribe to any subscriptions made by the original server).

The following is a list of valid *flags*.

TPNOBLOCK

The subscription is not removed if a blocking condition exists. If such a condition occurs, the call fails and `tperrno()` is set to `TPEBLOCK`. When `TPNOBLOCK` is not specified and a blocking condition exists, the caller blocks until the condition subsides or a timeout occurs (either transaction or blocking timeout).

TPNOTIME

This flag signifies that the caller is willing to block indefinitely and wants to be immune to blocking timeouts. Transaction timeouts may still occur.

TPSIGRSTRT

If a signal interrupts any underlying system calls, then the interrupted system call is reissued. When `TPSIGRSTRT` is not specified and a signal interrupts a system call, then `tpunsubscribe()` fails and `tperrno()` is set to `TPGOTSIG`.

In a multithreaded application, a thread in the `TPINVALIDCONTEXT` state is not allowed to issue a call to `tpunsubscribe()`.

Return Values Upon completion of `tpunsubscribe()`, `tpurcode()` contains the number of subscriptions deleted (zero or greater) from the EventBroker's list of active subscriptions. `tpurcode()` may contain a number greater than 1 only when the wild-card handle, `-1`, is used. Also, `tpurcode()` may contain a number greater than 0 even when `tpunsubscribe()` completes unsuccessfully (that is, when the wild-card handle is used, the EventBroker may have successfully removed some subscriptions before it encountered an error deleting others).

Upon failure, `tpunsubscribe()` returns `-1` and sets `tperrno()` to indicate the error condition.

Errors Upon failure, `tpunsubscribe()` sets `tperrno()` to one of the following values. (Unless otherwise noted, failure does not affect the caller's transaction, if one exists.)

[`TPEINVAL`]

Invalid arguments were given (for example, *subscription* is an invalid subscription handle).

[`TPENOENT`]

Cannot access the BEA Tuxedo EventBroker.

[`TPETIME`]

A timeout occurred. If the caller is in transaction mode, then a transaction timeout occurred and the transaction is to be aborted; otherwise, a blocking timeout occurred and neither `TPNOBLOCK` nor `TPNOTIME` were specified. If a transaction timeout occurred, any attempts to do new work will fail with `TPETIME` until the transaction has been aborted.

[`TPBLOCK`]

A blocking condition exists and `TPNOBLOCK` was specified.

[`TPGOTSIG`]

A signal was received and `TPSIGRSTRT` was not specified.

[`TPPROTO`]

`tpunsubscribe()` was called improperly.

[`TPESYSTEM`]

A BEA Tuxedo system error has occurred. The exact nature of the error is written to a log file.

[TPEOS]

An operating system error has occurred.

See Also `tppost(3c)`, `tpssubscribe(3c)`, `EVENTS(5)`, `EVENT_MIB(5)`, `TMSYSEVT(5)`,
`TMUSREVT(5)`

TRY(3c)

Name	TRY() - exception-returning interface
Synopsis	<pre>#include <texc.h> TRY try_block [CATCH(exception_name) handler_block] ... [CATCH_ALL handler_block] ENDTRY TRY try_block FINALLY finally_block ENDTRY RAISE(exception_name) RERAISE /* declare exception */ EXCEPTION exception_name; /* initialize address (application) exception */ EXCEPTION_INIT(EXCEPTION exception_name) /* initialize status exception (map status to exception */ exc_set_status(EXCEPTION *exception_name, long status) /* map status exception to status */ exc_get_status(EXCEPTION *exception_name, long *status) /* compare exceptions */ exc_matches(EXCEPTION *e1, EXCEPTION *e2) /* print error to stderr */ void exc_report(EXCEPTION *exception)</pre>
Description	<p>The TRY/CATCH interface provides a mechanism to handle exceptions without the use of status variables (for example, <i>errno</i> or status variables passed back from an RPC operation). These macros are defined in <i>texc.h</i> and this header is automatically included in any header files generated by <i>tid1(1)</i>.</p>

The `TRY` *try_block* is a block of C or C++ declarations and statements in which an exception may be raised (code that is not associated with raising an exception should be placed before or after the *try_block*). Each `TRY/ENDTRY` pair constitutes a “scope,” with respect to exceptions (not unlike C scoping), or a region of code over which exceptions are caught. These scopes can be properly nested. When an exception is raised, an error is reported to the application by searching the active scopes for actions written to handle (“absorb”) an exception (`CATCH` or `CATCH_ALL` clauses) or complete the scopes (`FINALLY` clauses). If a scope does not handle an exception, the scope is torn down with the exception raised at the next higher level (unwinding the stack of exception scopes). Execution resumes at the point after which the exception is handled; there is no provision for resuming execution at the point of error. If the exception is not handled by any scope, the program is terminated (a message is written to the log via `userlog(3c)` and `abort(3)` is called).

Zero or more occurrences of `CATCH` (*exception_name*) *handler_block* may be provided. Each *handler_block* is a block of C or C++ declarations and statements in which the associated exception (*exception_name*) is processed (normally, actions are specified for recovery from the failure). If an exception is raised by a statement in *try_block*, then the first `CATCH` clause that matches the exception is executed.

Within a `CATCH` or `CATCH_ALL` *handler_block*, the current exception can be referenced by the `EXCEPTION` pointer `THIS_CATCH` (for example, for logic based on or printing the exception value).

If the exception is not handled by one of the `CATCH` clauses, then the `CATCH_ALL` clause is executed. By default, no further action is taken for an exception that is handled by a `CATCH` or `CATCH_ALL` clause. If no `CATCH_ALL` clause exists, then the exception is raised at the *try_block* at the next higher level, assuming that the *try_block* is nested within another *try_block*. If an ANSI C compiler is used, register and automatic variables that are used in the handler blocks should be declared with the `volatile` attribute (as is true of any blocks that use `set jmp/long jmp`). Also note that output parameters and return values from the functions that can generate an exception are indeterminate.

Within a `CATCH` or `CATCH_ALL` *handler_block*, the current exception can be propagated to the next higher level (the exception is “reraised”) using the `RERAISE` statement. The `RERAISE` statement must appear lexically within the scope of a *handler_block* (that is, not within a function called by the *handler_block*). Any exception that is caught but not fully handled should be reraised. In many cases, a `CATCH_ALL` handler should reraise the exception because the handler is not written to handle every exception. The application should also be written such that an exception

is raised to the proper scope such that the handler blocks take the appropriate actions and modify the appropriate state (for example, if an exception occurs while opening a file, the handler function for that level should not try to close the unopened file).

An exception can be raised from anywhere by using the `RAISE(exception_name)` statement. This statement causes the exception to start propagating at the current *try_block* and will be reraised until it is handled.

The `FINALLY` clause can be used to specify an epilogue block of code that is executed after the *try_block*, whether or not an exception is raised. If an exception is raised in the *try_block*, it is reraised after the *finally_block* is executed. This clause can be used to avoid replicating epilogue code twice, once in a `CATCH_ALL` clause, and again after the `ENDTRY`. It is normally used to execute cleanup activities, restoring invariants (for example, shared data, locks) as the scopes are unwound, whether or not exceptions are raised (that is, on both normal and abnormal exits from the block). Note (in the “Synopsis” section) that a `FINALLY` clause cannot be used with a `CATCH` or `CATCH_ALL` clause for the same *try_block*; use nested *try_blocks*.

The `ENDTRY` statement must be used to complete the `TRY` block, since it contains code that must be executed to make sure that exceptions are handled and the context is cleaned up. A *try_block*, *handler_block*, or *finally_block* must not contain a `return`, non-local jump, or any other means of leaving the block such that the `ENDTRY` is not reached (for example, `goto()`, `break()`, `continue()`, `longjmp()`).

This interface is provided to handle exceptions from RPC operations. However, this is a generic interface that can be used for any application. An exception is declared to be of type `EXCEPTION`. (This is a complex data type; don't try to use it like a long integer.) There are two types of exceptions. They are declared in the same manner but initialized differently.

One type of exception is used to propagate status values associated with operating system signals and exceptions raised by the RPC run-time primitives. For each status value, an exception has been pre-defined (for example, exception `rpc_x_no_memory` is defined for status `rpc_s_no_memory`); these are declared in the `trpcsts.h` header file. While not necessary (since the status exceptions are pre-defined), a status exception can be declared by the application and initialized with the `exc_set_status()` macro which takes a pointer to the `EXCEPTION` to be initialized, and the status value. The status value associated with a *status* exception can be retrieved using the `exc_get_status()` macro. It takes a pointer to the `EXCEPTION` and a pointer to the variable in which the status value is to be returned; the value of the macro is 0 if it is a *status* exception, and -1 otherwise.

The second type of exception is used to define application exceptions. It is initialized by calling the `EXCEPTION_INIT()` macro. The address of the exception is stored as the value within the *address* exception. Note that this value is valid only within a single address space and will change if the exception is an automatic variable. For this reason, an *address* exception should be declared as a static or external variable, not an automatic or register variable. The `exc_get_status()` macro will evaluate to -1 for an *address* exception. Using the `exc_set_status()` macro on this exception will make it a *status* exception.

The `exc_matches` macro can be used to compare two exceptions. To compare equal, the exceptions must both be the same type and have the same value (for example, the same status value for *status* exceptions, or the same addresses for *address* exceptions). This comparison is used for the `CATCH` clause, described above.

When status exceptions are raised, a common part of handling the exception might be to print out the status value, or better yet, a string indicating what status value occurred. If the string is to be printed to the standard error output, then the function `exc_report()` can be called with a pointer to the *status* exception to print the string in one operation.

```
CATCH_ALL
{
    exc_report(THIS_CATCH);
}
ENDTRY
```

If something else is to be done with the string (for example, printing the error to the `userlog`), `exc_get_status()` can be used on `THIS_CATCH` to get the status value (remember that `THIS_CATCH` is already a pointer to an `EXCEPTION`, not an `EXCEPTION`), and `dce_error_inq_text()` can be used to get the string value associated with the status value.

```
CATCH_ALL
{
    unsigned long status_to_convert;
    unsigned char error_text[200];
    int status;

    exc_get_status(THIS_CATCH, status_to_convert);
    dce_error_inq_text(status_to_convert, error_text, status);
    userlog("%s", (char *)error_text);
}
ENDTRY
```

Note: A thread in a multithreaded application may invoke the TRY/CATCH interface while running in any context state, including TPINVALIDCONTEXT.

When to Use Exception and Status Returns

The status of RPC operations can be determined portably by defining status variables for each operation ([`comm_status`] and [`fault_status`] parameters are defined via the Attribute Configuration File). The status-returning interface is the only interface provided in the X/OPEN RPC specification. The `fault_status` attribute indicates that errors occurring on the server due to incorrectly specified parameter values, resource constraints, or coding errors be reported by an additional status argument or return value. Similarly, the `comm_status` attribute indicates that RPC communications failures be reported by an additional status argument or return value. Using status values works well for fine-grained error handling (on a per-call basis) with recovery specified for each possible error on each call, and where it is necessary to retry from the point of failure. The disadvantage is that it is not transparent whether or not the call is local or remote. The remote call has additional status parameters, or a status return value instead of being a void return. Thus, the application must have procedure declarations adjusted between local and distributed code.

For application portability from an OSF/DCE environment, the TRY/CATCH exception-returning interface is also provided. This interface may not be provided in all environments. However, it has the advantage that procedure declarations need not be adjusted between local and distributed code, maintaining existing interfaces. The checking for errors can be simplified such that each procedure call does not have specific failure checking or recovery code. If an error is not handled at some level, then the program exits with a system error message such that the error is detected and can be corrected (omissions become more obvious). Exceptions work better for coarse-grained exception handling.

Built-in Exceptions

The following exceptions are “built-in” to the use of this exception interface. The first TRY clause sets up a signal handler to catch the signals list below if they are not currently ignored or caught; the other exceptions are defined only for DCE program portability.

Built-In Exceptions

Exception	Description
<code>exc_e_SIGBUS</code>	An unhandled SIGBUS signal occurred.
<code>exc_e_SIGEMT</code>	An unhandled SIGEMT signal occurred.
<code>exc_e_SIGFPE</code>	An unhandled SIGFPE signal occurred.

Built-In Exceptions

Exception	Description
<code>exc_e_SIGILL</code>	An unhandled SIGILL signal occurred.
<code>exc_e_SIGIOT</code>	An unhandled SIGIOT signal occurred.
<code>exc_e_SIGPIPE</code>	An unhandled SIGPIPE signal occurred.
<code>exc_e_SIGSEGV</code>	An unhandled SIGSEGV signal occurred.
<code>exc_e_SIGSYS</code>	An unhandled SIGSYS signal occurred.
<code>exc_e_SIGTRAP</code>	An unhandled SIGTRAP signal occurred.
<code>exc_e_SIGXCPU</code>	An unhandled SIGXCPU signal occurred.
<code>exc_e_SIGXFSZ</code>	An unhandled SIGXFSZ signal occurred.
<code>pthread_e_badparam</code>	
<code>pthread_e_defer_q_full</code>	
<code>pthread_e_existence</code>	
<code>pthread_e_in_use</code>	
<code>pthread_e_nostackmem</code>	
<code>pthread_e_nostack</code>	
<code>pthread_e_signal_q_full</code>	
<code>pthread_e_stackovf</code>	
<code>pthread_e_unimp</code>	
<code>pthread_e_use_error</code>	
<code>exc_e_decovf</code>	
<code>exc_e_exquota</code>	
<code>exc_e_fltdiv</code>	
<code>exc_e_fltovf</code>	
<code>exc_e_fltund</code>	

Built-In Exceptions

Exception	Description
<code>exc_e_SIGILL</code>	An unhandled SIGILL signal occurred.
<code>exc_e_SIGIOT</code>	An unhandled SIGIOT signal occurred.
<code>exc_e_SIGPIPE</code>	An unhandled SIGPIPE signal occurred.
<code>exc_e_SIGSEGV</code>	An unhandled SIGSEGV signal occurred.
<code>exc_e_SIGSYS</code>	An unhandled SIGSYS signal occurred.
<code>exc_e_SIGTRAP</code>	An unhandled SIGTRAP signal occurred.
<code>exc_e_SIGXCPU</code>	An unhandled SIGXCPU signal occurred.
<code>exc_e_SIGXFSZ</code>	An unhandled SIGXFSZ signal occurred.
<code>pthread_e_badparam</code>	
<code>pthread_e_defer_q_full</code>	
<code>pthread_e_existence</code>	
<code>pthread_e_in_use</code>	
<code>pthread_e_nostackmem</code>	
<code>pthread_e_nostack</code>	
<code>pthread_e_signal_q_full</code>	
<code>pthread_e_stackovf</code>	
<code>pthread_e_unimp</code>	
<code>pthread_e_use_error</code>	
<code>exc_e_decovf</code>	
<code>exc_e_exquota</code>	
<code>exc_e_fltdiv</code>	
<code>exc_e_fltovf</code>	
<code>exc_e_fltund</code>	

Built-In Exceptions

Exception	Description
<code>exc_e_SIGILL</code>	An unhandled SIGILL signal occurred.
<code>exc_e_SIGIOT</code>	An unhandled SIGIOT signal occurred.
<code>exc_e_SIGPIPE</code>	An unhandled SIGPIPE signal occurred.
<code>exc_e_SIGSEGV</code>	An unhandled SIGSEGV signal occurred.
<code>exc_e_SIGSYS</code>	An unhandled SIGSYS signal occurred.
<code>exc_e_SIGTRAP</code>	An unhandled SIGTRAP signal occurred.
<code>exc_e_SIGXCPU</code>	An unhandled SIGXCPU signal occurred.
<code>exc_e_SIGXFSZ</code>	An unhandled SIGXFSZ signal occurred.
<code>pthread_e_badparam</code>	
<code>pthread_e_defer_q_full</code>	
<code>pthread_e_existence</code>	
<code>pthread_e_in_use</code>	
<code>pthread_e_nostackmem</code>	
<code>pthread_e_nostack</code>	
<code>pthread_e_signal_q_full</code>	
<code>pthread_e_stackovf</code>	
<code>pthread_e_unimp</code>	
<code>pthread_e_use_error</code>	
<code>exc_e_decovf</code>	
<code>exc_e_exquota</code>	
<code>exc_e_fltdiv</code>	
<code>exc_e_fltovf</code>	
<code>exc_e_fltund</code>	

Built-In Exceptions

Exception	Description
<code>exc_e_illaddr</code>	
<code>exc_e_insfmem</code>	
<code>exc_e_intdiv</code>	
<code>exc_e_intovf</code>	
<code>exc_e_nopriv</code>	
<code>exc_e_privinst</code>	
<code>exc_e_resaddr</code>	
<code>exc_e_resoper</code>	
<code>exc_e_subrng</code>	
<code>exc_e_uninitexc</code>	

These same exception codes are also defined with the “_e” at the end of the name (for example, `exc_e_SIGBUS` is also defined as `exc_SIGBUS_e`). Equivalent status codes are defined with similar names but the “_e_” is changed to “_s_” (for example, `exc_e_SIGBUS` is equivalent to the `exc_s_SIGBUS` status code).

Caveats In OSF/DCE, the header file is named `exc_handling.h`; the BEA Tuxedo system header file is `texc.h`. It is not possible for the same source file to use both DCE and BEA Tuxedo system exception handling. Further, within a program, the handling of signal exceptions can only be done by either DCE or the BEA Tuxedo system, not both. See *Programming a BEA Tuxedo Application Using TxRPC* for a discussion of integrating BEA Tuxedo System/TxRPC stubs and OSF/DCE stubs in a single program.

When linking a program using this interface, `$TUXDIR/lib/libtrpc.a` must be included.

Examples Here is an example C source file that uses exceptions.

```
#include <texc.h>

EXCEPTION badopen_e;                               /* declare exception for bad open() */
```

Section 3c - C Functions

```
doit(char *filename)
{
    EXCEPTION_INIT(badopen_e);           /* initialize exception */
    TRY get_and_update_data(filename);   /* do the operation */
    CATCH(badopen_e)                    /* exception - open() failed */
        fprintf(stderr, "Cannot open %s\n", filename);
    CATCH_ALL                            /* handle other errors */
        /* handle rpc service not available, ... */
        exc_report(THIS_CATCH)
    ENENTRY
}
/*
 * Open output file
 * Get the remote data item
 * Write out to file
 */
get_and_update_data(char *filename)
{
    FILE *fp;
    if ((fp == fopen(filename)) == NULL) /* open output file */
        RAISE(badopen_e);               /* raise exception */
    TRY
        /* in this block, file is opened successfully -
         * use associated FINALLY to close file
         */
        long data;
        /*
         * Execute RPC call - exceptions are raised to the calling
         * function, doit()
         */
        data = remote_get_data();
        fprintf(fp, "%ld\n", data);
    FINALLY
        /* Whether or not exceptions are raised, close the file */
        fclose(fp);
    ENENTRY
}
```

See Also `tid1(1)`, `userlog(3c)`

`abort(2)` in a UNIX system reference manual

Programming a BEA Tuxedo Application Using TxRPC

tuxgetenv(3c)

Name	tuxgetenv() - return value for environment name
Synopsis	<pre>#include <atmi.h> char *tuxgetenv(char *name)</pre>
Description	<p>tuxgetenv() searches the environment list for a string of the form <i>name=value</i> and, if the string is present, returns a pointer to the <i>value</i> in the current environment. Otherwise, it returns a null pointer.</p> <p>This function provides a portable interface to environment variables across the different platforms on which the BEA Tuxedo system is supported, including those platforms that do not normally have environment variables.</p> <p>Note that <code>tuxgetenv</code> is case-sensitive.</p> <p>A thread in a multithreaded application may issue a call to <code>tuxgetenv()</code> while running in any context state, including <code>TPINVALIDCONTEXT</code>.</p>
Return Values	If a pointer to the string exists, <code>tuxgetenv()</code> returns that pointer. If a pointer does not exist, <code>tuxgetenv()</code> returns a null pointer.
Portability	<p>On MS Windows, this function overcomes the inability to share environment variables between an application and a Dynamic Link Library. The BEA Tuxedo Workstation DLL maintains an environment copy for each application that is attached to it. This associated environment and context information is destroyed when <code>tpterm()</code> is called from a Windows application. The value of an environment variable could be changed after the application program calls <code>tpterm()</code>.</p> <p>It is recommended that upper case variable names be used for the DOS, Windows, OS/2, and NetWare environments. (<code>tuxreadenv()</code> converts all environment variable names to upper case.)</p>
See Also	<code>tuxputenv(3c)</code> , <code>tuxreadenv(3c)</code>

tuxputenv(3c)

Name `tuxputenv()` - change or add value to environment

Synopsis

```
#include <atmi.h>
int tuxputenv(char *string)
```

Description *string* points to a string of the form “name=value.” `tuxputenv()` makes the value of the environment variable name equal to value by altering an existing variable or creating a new one. In either case, the string pointed to by *string* becomes part of the environment.

This function provides a portable interface to environment variables across the different platforms on which the BEA Tuxedo system is supported, including those platforms that do not normally have environment variables.

Note that `tuxputenv()` is case-sensitive.

A thread in a multithreaded application may issue a call to `tuxputenv()` while running in any context state, including `TPINVALIDCONTEXT`.

Return Values If `tuxputenv()` cannot obtain enough space, via `malloc()`, for an expanded environment, it returns a non-zero integer. Otherwise, it returns zero.

Portability On MS Windows, this function overcomes the inability to share environment variables between an application and a Dynamic Link Library. The BEA Tuxedo system Workstation DLL maintains an environment copy for each application that is attached to it. This associated environment and context information is destroyed when `tpterm()` is called from a Windows application. The value of an environment variable could be changed after the application program calls `tpterm()`.

We recommend using upper case variable names for the DOS, Windows, and OS/2, environments. (`tuxreadenv()` converts all environment variable names to upper case.)

See Also `tuxgetenv(3c)`, `tuxreadenv(3c)`

tuxreadenv(3c)

Name	tuxreadenv() - add variables to the environment from a file
Synopsis	<pre>#include <atmi.h> int tuxreadenv(char *file, char *label)</pre>
Description	tuxreadenv() reads a file containing environment variables and adds them to the environment, independent of platform. These variables are available using tuxgetenv() and can be reset using tuxputenv().

The format of the environment file is as follows.

- Any leading space or tab character on a line is ignored and is not considered in the following points.
- Lines containing variables to be put into the environment are of the form

```
variable=value
```

or

```
set variable=value
```

where *variable* must begin with an alphabetic or underscore character and contain only alphanumeric or underscore characters, and *value* may contain any character except newline.
- Within the *value*, strings of the form $\${env}$ are expanded using variables already in the environment (forward referencing is not supported and if a value is not set, the variable is replaced with the empty string). Backslash (\) may be used to escape the dollar sign and itself. All other shell quoting and escape mechanisms are ignored and the expanded *value* is placed into the environment.
- Lines beginning with slash (/), pound sign (#), semicolon (;), or exclamation point (!) are treated as comments and ignored. Lines beginning with other characters besides these comment characters, a left square bracket, or an alphabetic or underscore character are reserved for future use; their use is undefined.

- The file is partitioned into sections by lines beginning with left square bracket ([), which acts as a label. The label will be silently truncated if longer than 31 characters. The format of a label is

```
[label]
```

where *label* follows the same rules for *variable* above (lines with invalid *label* values are ignored).

- Variable lines between the top of the file and the first label are put into the environment for all labels (this is the global section). Other variables are put into the environment only if the label matches the label specified for the application. A label of [] will indicate the global section.

If *file* is NULL, then a default filename is used. The fixed filenames are as follows:

```
DOS, Windows, OS2, NT: C:\TUXEDO\TUXEDO.ENV
MAC: TUXEDO.ENV in the system preferences directory
NETWARE: SYS:SYSTEM\TUXEDO.ENV
POSIX: /usr/tuxedo/TUXEDO.ENV or /var/opt/tuxedo/TUXEDO.ENV
```

If *label* is NULL, then only variables in the global section are put into the environment. For other values of *label*, the global section variables plus any variables in a section matching the *label* are put into the environment.

An error message is printed to the `userlog()` if there is a memory failure, if a non-null filename does not exist, or if a non-null label does not exist.

A thread in a multithreaded application may issue a call to `tuxreadenv()` while running in any context state, including `TPINVALIDCONTEXT`.

Example Here is an example environment file.

```
TUXDIR=/usr/tuxedo
[application1]
;this is a comment
/* this is a comment */
#this is a comment
//this is a comment
FIELDTBLS=appl_flds
FLDTBLDIR=/usr/app1/udataobj
[application2]
FIELDTBLS=app2_flds
FLDTBLDIR=/usr/app2/udataobj
```

- Return Values** If `tuxreadenv()` cannot obtain enough space, via `malloc()`, for an expanded environment, or if it cannot open and read a file with a non-NULL name, it returns a non-zero integer. Otherwise, `tuxreadenv()` returns zero.
- Portability** In the DOS, Windows, OS/2, and NetWare environments, `tuxreadenv()` converts all environment variable names to upper case.
- See Also** `tuxgetenv(3c)`, `tuxputenv(3c)`

tx_begin(3c)

Name	<code>tx_begin()</code> - begin a global transaction
Synopsis	<pre>#include <tx.h> int tx_begin(void)</pre>
Description	<p><code>tx_begin()</code> is used to place the calling thread of control in transaction mode. The calling thread must first ensure that its linked resource managers have been opened (via <code>tx_open()</code>) before it can start transactions. <code>tx_begin()</code> fails (returning <code>[TX_PROTOCOL_ERROR]</code>) if the caller is already in transaction mode or <code>tx_open()</code> has not been called.</p> <p>Once in transaction mode, the calling thread must call <code>tx_commit()</code> or <code>tx_rollback()</code> to complete its current transaction. There are certain cases related to transaction chaining where <code>tx_begin()</code> does not need to be called explicitly to start a transaction. See <code>tx_commit()</code> and <code>tx_rollback()</code> for details.</p> <p>In a multithreaded application, a thread in the <code>TPINVALIDCONTEXT</code> state is not allowed to issue a call to <code>tx_begin()</code>.</p>
Optional Set-up	<code>tx_set_transaction_timeout()</code>
Return Value	Upon successful completion, <code>tx_begin()</code> returns <code>TX_OK</code> , a non-negative return value.
Errors	<p>Under the following conditions, <code>tx_begin()</code> fails and returns one of these negative values:</p> <p><code>[TX_OUTSIDE]</code> The transaction manager is unable to start a global transaction because the calling thread of control is currently participating in work outside any global transaction with one or more resource managers. All such work must be completed before a global transaction can be started. The caller's state with respect to the local transaction is unchanged.</p> <p><code>[TX_PROTOCOL_ERROR]</code> The function was called in an improper context (for example, the caller is already in transaction mode). The caller's state with respect to transaction mode is unchanged.</p>

[TX_ERROR]

Either the transaction manager or one or more of the resource managers encountered a transient error trying to start a new transaction. When this error is returned, the caller is not in transaction mode. The exact nature of the error is written to a log file.

[TX_FAIL]

Either the transaction manager or one or more of the resource managers encountered a fatal error. The nature of the error is such that the transaction manager and/or one or more of the resource managers can no longer perform work on behalf of the application. When this error is returned, the caller is not in transaction mode. The exact nature of the error is written to a log file.

See Also `tx_commit(3c)`, `tx_open(3c)`, `tx_rollback(3c)`,
`tx_set_transaction_timeout(3c)`

Warnings XA-compliant resource managers must be successfully opened to be included in the global transaction. (See `tx_open(3c)` for details.) Both the X/Open TX interface and the X-Windows system define the type `XID`. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_close(3c)

Name	<code>tx_close()</code> - close a set of resource managers
Synopsis	<pre>#include <tx.h> int tx_close(void)</pre>
Description	<p><code>tx_close()</code> closes a set of resource managers in a portable manner. It invokes a transaction manager to read resource-manager-specific information in a transaction-manager-specific manner and pass this information to the resource managers linked to the caller.</p> <p><code>tx_close()</code> closes all resource managers to which the caller is linked. This function is used in place of resource-manager-specific “close” calls and allows an application program to be free of calls which may hinder portability. Since resource managers differ in their termination semantics, the specific information needed to “close” a particular resource manager must be published by each resource manager.</p> <p><code>tx_close()</code> should be called when an application thread of control no longer wishes to participate in global transactions. <code>tx_close()</code> fails (returning <code>[TX_PROTOCOL_ERROR]</code>) if the caller is in transaction mode. That is, no resource managers are closed even though some may not be participating in the current transaction.</p> <p>When <code>tx_close()</code> returns success (<code>TX_OK</code>), all resource managers linked to the calling thread are closed.</p> <p>In a multithreaded application, a thread in the <code>TPINVALIDCONTEXT</code> state is not allowed to issue a call to <code>tx_close()</code>.</p>
Return Value	Upon successful completion, <code>tx_close()</code> returns <code>TX_OK</code> , a non-negative return value.
Errors	<p>Under the following conditions, <code>tx_close()</code> fails and returns one of these negative values:</p> <p><code>[TX_PROTOCOL_ERROR]</code></p> <p>The function was called in an improper context (for example, the caller is in transaction mode). No resource managers are closed.</p>

[TX_ERROR]

Either the transaction manager or one or more of the resource managers encountered a transient error. The exact nature of the error is written to a log file. All resource managers that could be closed are closed.

[TX_FAIL]

Either the transaction manager or one or more of the resource managers encountered a fatal error. The nature of the error is such that the transaction manager and/or one or more of the resource managers can no longer perform work on behalf of the application. The exact nature of the error is written to a log file.

See Also `tx_open(3c)`

Warnings Both the X/Open TX interface and the X-Windows system define the type `XID`. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_commit(3c)

Name	<code>tx_commit()</code> - commit a global transaction
Synopsis	<pre>#include <tx.h> int tx_commit(void)</pre>
Description	<p><code>tx_commit()</code> is used to commit the work of the transaction active in the caller's thread of control.</p> <p>If the <i>transaction_control</i> characteristic (see <code>tx_set_transaction_control(3c)</code>) is <code>TX_UNCHAINED</code>, then when <code>tx_commit()</code> returns, the caller is no longer in transaction mode. However, if the <i>transaction_control</i> characteristic is <code>TX_CHAINED</code>, then when <code>tx_commit()</code> returns, the caller remains in transaction mode on behalf of a new transaction (see the RETURN VALUE and ERRORS sections below).</p> <p>In a multithreaded application, a thread in the <code>TPINVALIDCONTEXT</code> state is not allowed to issue a call to <code>tx_commit()</code>.</p>
Optional Set-up	<ul style="list-style-type: none">■ <code>tx_set_commit_return()</code>■ <code>tx_set_transaction_control()</code>■ <code>tx_set_transaction_timeout()</code>
Return Value	Upon successful completion, <code>tx_commit()</code> returns <code>TX_OK</code> , a non-negative return value.
Errors	<p>Under the following conditions, <code>tx_commit()</code> fails and returns one of these negative values:</p> <p>[<code>TX_NO_BEGIN</code>]</p> <p>The current transaction committed successfully; however, a new transaction could not be started and the caller is no longer in transaction mode. This return value may occur only when the <i>transaction_control</i> characteristic is <code>TX_CHAINED</code>.</p> <p>[<code>TX_ROLLBACK</code>]</p> <p>The current transaction could not commit and has been rolled back. In addition, if the <i>transaction_control</i> characteristic is <code>TX_CHAINED</code>, a new transaction is started.</p>

[TX_ROLLBACK_NO_BEGIN]

The transaction could not commit and has been rolled back. In addition, a new transaction could not be started and the caller is no longer in transaction mode. This return value can occur only when the *transaction_control* characteristic is TX_CHAINED.

[TX_MIXED]

The work done on behalf of the transaction was partially committed and partially rolled back. In addition, if the *transaction_control* characteristic is TX_CHAINED, a new transaction is started.

[TX_MIXED_NO_BEGIN]

The work done on behalf of the transaction was partially committed and partially rolled back. In addition, a new transaction could not be started and the caller is no longer in transaction mode. This return value can occur only when the *transaction_control* characteristic is TX_CHAINED.

[TX_HAZARD]

Due to a failure, some of the work done on behalf of the transaction may have been committed and some of it may have been rolled back. In addition, if the *transaction_control* characteristic is TX_CHAINED, a new transaction is started.

[TX_HAZARD_NO_BEGIN]

Due to a failure, some of the work done on behalf of the transaction may have been committed and some of it may have been rolled back. In addition, a new transaction could not be started and the caller is no longer in transaction mode. This return value can occur only when the *transaction_control* characteristic is TX_CHAINED.

[TX_PROTOCOL_ERROR]

The function was called in an improper context (for example, the caller is not in transaction mode). The caller's state with respect to transaction mode is not changed.

[TX_FAIL]

Either the transaction manager or one or more of the resource managers encountered a fatal error. The nature of the error is such that the transaction manager and/or one or more of the resource managers can no longer perform work on behalf of the application. The exact nature of the error is written to a log file. The caller's state with respect to the transaction is unknown.

Section 3c - C Functions

See Also `tx_begin(3c)`, `tx_set_commit_return(3c)`,
`tx_set_transaction_control(3c)`, `tx_set_transaction_timeout(3c)`

Warnings Both the X/Open TX interface and the X-Windows system define the type `XID`. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_info(3c)

Name tx_info() - return global transaction information

Synopsis #include <tx.h>
int tx_info(TXINFO *info)

Description tx_info() returns global transaction information in the structure pointed to by *info*. In addition, this function returns a value indicating whether the caller is currently in transaction mode or not. If *info* is non-null, then tx_info() populates a TXINFO structure pointed to by *info* with global transaction information. The TXINFO structure contains the following elements:

```
XID                xid;
COMMIT_RETURN      when_return;
TRANSACTION_CONTROL transaction_control;
TRANSACTION_TIMEOUT transaction_timeout;
TRANSACTION_STATE  transaction_state;
```

If tx_info() is called in transaction mode, then *xid* will be populated with a current transaction branch identifier and *transaction_state* will contain the state of the current transaction. If the caller is not in transaction mode, *xid* will be populated with the null XID (see <tx.h> for details). In addition, regardless of whether the caller is in transaction mode, *when_return*, *transaction_control*, and *transaction_timeout* contain the current settings of the *commit_return* and *transaction_control* characteristics, and the transaction timeout value in seconds.

The transaction timeout value returned reflects the setting that will be used when the next transaction is started. Thus, it may not reflect the timeout value for the caller's current global transaction since calls made to tx_set_transaction_timeout() after the current transaction was begun may have changed its value.

If *info* is null, no TXINFO structure is returned.

In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tx_info().

Return Value If the caller is in transaction mode, then 1 is returned. If the caller is not in transaction mode, then 0 is returned.

Errors Under the following conditions, tx_info() fails and returns one of these negative values:

[TX_PROTOCOL_ERROR]

The function was called in an improper context (for example, the caller has not yet called `tx_open()`).

[TX_FAIL]

The transaction manager encountered a fatal error. The nature of the error is such that the transaction manager can no longer perform work on behalf of the application. The exact nature of the error is written to a log file.

See Also `tx_open(3c)`, `tx_set_commit_return(3c)`,
`tx_set_transaction_control(3c)`, `tx_set_transaction_timeout(3c)`

Warnings Within the same global transaction, subsequent calls to `tx_info()` are guaranteed to provide an XID with the same *gtrid* component, but not necessarily the same *bqual* component. Both the X/Open TX interface and the X-Windows system define the type XID. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_open(3c)

Name	tx_open() - open a set of resource managers
Synopsis	<pre>#include <tx.h> int tx_open(void)</pre>
Description	<p>tx_open() opens a set of resource managers in a portable manner. It invokes a transaction manager to read resource-manager-specific information in a transaction-manager-specific manner and pass this information to the resource managers linked to the caller.</p> <p>tx_open() attempts to open all resource managers that have been linked with the application. This function is used in place of resource-manager-specific “open” calls and allows an application program to be free of calls which may hinder portability. Since resource managers differ in their initialization semantics, the specific information needed to “open” a particular resource manager must be published by each resource manager.</p> <p>If tx_open() returns TX_ERROR, then no resource managers are open. If tx_open() returns TX_OK, some or all of the resource managers have been opened. Resource managers that are not open will return resource-manager-specific errors when accessed by the application. tx_open() must successfully return before a thread of control participates in global transactions.</p> <p>Once tx_open() returns success, subsequent calls to tx_open() (before an intervening call to tx_close()) are allowed. However, such subsequent calls will return success, and the TM will not attempt to re-open any RMs.</p> <p>In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tx_open().</p>
Return Value	Upon successful completion, tx_open() returns TX_OK, a non-negative return value.
Errors	<p>Under the following conditions, tx_open() fails and returns one of these negative values:</p> <p>[TX_ERROR]</p> <p>Either the transaction manager or one or more of the resource managers encountered a transient error. No resource managers are open. The exact nature of the error is written to a log file.</p>

[TX_FAIL]

Either the transaction manager or one or more of the resource managers encountered a fatal error. TX_FAIL is returned if `tpinit()` is not called before the call to `tx_open` in a secure application (SECURITY APP_PW). The nature of the error is such that the transaction manager and/or one or more of the resource managers can no longer perform work on behalf of the application. The exact nature of the error is written to a log file.

See Also `tx_close(3c)`

Warnings Both the X/Open TX interface and the X-Windows system define the type XID. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_rollback(3c)

Name	tx_rollback() - roll back a global transaction
Synopsis	<pre>#include <tx.h> int tx_rollback(void)</pre>
Description	<p>tx_rollback() is used to roll back the work of the transaction active in the caller's thread of control.</p> <p>If the <i>transaction_control</i> characteristic (see tx_set_transaction_control(3c)) is TX_UNCHAINED, then when tx_rollback() returns, the caller is no longer in transaction mode. However, if the <i>transaction_control</i> characteristic is TX_CHAINED, then when tx_rollback() returns, the caller remains in transaction mode on behalf of a new transaction (see the RETURN VALUE and ERRORS sections below).</p> <p>In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tx_rollback().</p>
Optional Set-up	<ul style="list-style-type: none"> ■ tx_set_transaction_control() ■ tx_set_transaction_timeout()
Return Value	Upon successful completion, tx_rollback() returns TX_OK, a non-negative return value.
Errors	<p>Under the following conditions, tx_rollback() fails and returns one of these negative values:</p> <p>[TX_NO_BEGIN]</p> <p>The current transaction rolled back; however, a new transaction could not be started and the caller is no longer in transaction mode. This return value may occur only when the <i>transaction_control</i> characteristic is TX_CHAINED.</p> <p>[TX_MIXED]</p> <p>The work done on behalf of the transaction was partially committed and partially rolled back. In addition, if the <i>transaction_control</i> characteristic is TX_CHAINED, a new transaction is started.</p>

[TX_MIXED_NO_BEGIN]

The work done on behalf of the transaction was partially committed and partially rolled back. In addition, a new transaction could not be started and the caller is no longer in transaction mode. This return value can occur only when the *transaction_control* characteristic is TX_CHAINED.

[TX_HAZARD]

Due to a failure, some of the work done on behalf of the transaction may have been committed and some of it may have been rolled back. In addition, if the *transaction_control* characteristic is TX_CHAINED, a new transaction is started.

[TX_HAZARD_NO_BEGIN]

Due to a failure, some of the work done on behalf of the transaction may have been committed and some of it may have been rolled back. In addition, a new transaction could not be started and the caller is no longer in transaction mode. This return value can occur only when the *transaction_control* characteristic is TX_CHAINED.

[TX_COMMITTED]

The work done on behalf of the transaction was heuristically committed. In addition, if the *transaction_control* characteristic is TX_CHAINED, a new transaction is started.

[TX_COMMITTED_NO_BEGIN]

The work done on behalf of the transaction was heuristically committed. In addition, a new transaction could not be started and the caller is no longer in transaction mode. This return value can occur only when the *transaction_control* characteristic is TX_CHAINED.

[TX_PROTOCOL_ERROR]

The function was called in an improper context (for example, the caller is not in transaction mode).

[TX_FAIL]

Either the transaction manager or one or more of the resource managers encountered a fatal error. The nature of the error is such that the transaction manager and/or one or more of the resource managers can no longer perform work on behalf of the application. The exact nature of the error is written to a log file. The caller's state with respect to the transaction is unknown.

See Also `tx_begin(3c)`, `tx_set_transaction_control(3c)`,
`tx_set_transaction_timeout(3c)`

Warnings Both the X/Open TX interface and the X-Windows system define the type `XID`. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_set_commit_return(3c)

Name tx_set_commit_return() - set *commit_return* characteristic

Synopsis

```
#include <tx.h>
int tx_set_commit_return(COMMIT_RETURN when_return)
```

Description tx_set_commit_return() sets the *commit_return* characteristic to the value specified in *when_return*. This characteristic affects the way tx_commit() behaves with respect to returning control to its caller. tx_set_commit_return() may be called regardless of whether its caller is in transaction mode. This setting remains in effect until changed by a subsequent call to tx_set_commit_return().

The initial setting for this characteristic is TX_COMMIT_COMPLETED.

The following are the valid settings for *when_return*.

TX_COMMIT_DECISION_LOGGED

This flag indicates that tx_commit() should return after the commit decision has been logged by the first phase of the two-phase commit protocol but before the second phase has completed. This setting allows for faster response to the caller of tx_commit(). However, there is a risk that a transaction will have a heuristic outcome, in which case the caller will not find out about this situation via return codes from tx_commit(). Under normal conditions, participants that promise to commit during the first phase will do so during the second phase. In certain unusual circumstances however (for example, long-lasting network or node failures) phase 2 completion may not be possible and heuristic results may occur.

TX_COMMIT_COMPLETED

This flag indicates that tx_commit() should return after the two-phase commit protocol has finished completely. This setting allows the caller of tx_commit() to see return codes that indicate that a transaction had or may have had heuristic results.

In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tx_set_commit_return().

Return Value Upon successful completion, tx_set_commit_return() returns TX_OK, a non-negative return value.

Errors Under the following conditions, `tx_set_commit_return()` does not change the setting of the `commit_return` characteristic and returns one of these negative values:

[TX_EINVAL]

when_return is not one of TX_COMMIT_DECISION_LOGGED or TX_COMMIT_COMPLETED.

[TX_PROTOCOL_ERROR]

The function was called in an improper context (for example, the caller has not yet called `tx_open()`).

[TX_FAIL]

The transaction manager encountered a fatal error. The nature of the error is such that the transaction manager can no longer perform work on behalf of the application. The exact nature of the error is written to a log file.

See Also `tx_commit(3c)`, `tx_info(3c)`, `tx_open(3c)`

Warnings Both the X/Open TX interface and the X-Windows system define the type `XID`. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_set_transaction_control(3c)

Name tx_set_transaction_control() - set *transaction_control* characteristic

Synopsis

```
#include <tx.h>
int tx_set_transaction_control(TRANSACTION_CONTROL control)
```

Description tx_set_transaction_control() sets the *transaction_control* characteristic to the value specified in *control*. This characteristic determines whether tx_commit() and tx_rollback() start a new transaction before returning to their caller. tx_set_transaction_control() may be called regardless of whether the application program is in transaction mode. This setting remains in effect until changed by a subsequent call to tx_set_transaction_control().

The initial setting for this characteristic is TX_UNCHAINED.

The following are the valid settings for *control*.

TX_UNCHAINED

This flag indicates that tx_commit() and tx_rollback() should not start a new transaction before returning to their caller. The caller must issue tx_begin() to start a new transaction.

TX_CHAINED

This flag indicates that tx_commit() and tx_rollback() should start a new transaction before returning to their caller.

In a multithreaded application, a thread in the TPINVALIDCONTEXT state is not allowed to issue a call to tx_set_transaction_control().

Return Value Upon successful completion, tx_set_transaction_control() returns TX_OK, a non-negative return value.

Errors Under the following conditions, tx_set_transaction_control() does not change the setting of the *transaction_control* characteristic and returns one of these negative values:

[TX_EINVAL]

control is not one of TX_UNCHAINED or TX_CHAINED.

[TX_PROTOCOL_ERROR]

The function was called in an improper context (for example, the caller has not yet called `tx_open()`).

[TX_FAIL]

The transaction manager encountered a fatal error. The nature of the error is such that the transaction manager can no longer perform work on behalf of the application. The exact nature of the error is written to a log file.

See Also `tx_begin(3c)`, `tx_commit(3c)`, `tx_info(3c)`, `tx_open(3c)`, `tx_rollback(3c)`

Warnings Both the X/Open TX interface and the X-Windows system define the type `XID`. It is not possible to use both X-Windows calls and TX calls in the same file.

tx_set_transaction_timeout(3c)

Name	<code>tx_set_transaction_timeout()</code> - set <i>transaction_timeout</i> characteristic
Synopsis	<pre>#include <tx.h> int tx_set_transaction_timeout(TRANSACTION_TIMEOUT timeout)</pre>
Description	<p><code>tx_set_transaction_timeout()</code> sets the <i>transaction_timeout</i> characteristic to the value specified in <i>timeout</i>. This value specifies the time period in which the transaction must complete before becoming susceptible to transaction timeout; that is, the interval between the AP calling <code>tx_begin()</code> and <code>tx_commit()</code> or <code>tx_rollback()</code>. <code>tx_set_transaction_timeout()</code> may be called regardless of whether its caller is in transaction mode or not. If <code>tx_set_transaction_timeout()</code> is called in transaction mode, the new <i>timeout</i> value does not take effect until the next transaction.</p> <p>The initial <i>transaction_timeout</i> value is 0 (no timeout).</p> <p><i>timeout</i> specifies the number of seconds allowed before the transaction becomes susceptible to transaction timeout. It may be set to any value up to the maximum value for a <code>long</code> as defined by the system. A <i>timeout</i> value of zero disables the timeout feature.</p> <p>In a multithreaded application, a thread in the <code>TPINVALIDCONTEXT</code> state is not allowed to issue a call to <code>tx_set_transaction_timeout()</code>.</p>
Return Value	Upon successful completion, <code>tx_set_transaction_timeout()</code> returns <code>TX_OK</code> , a non-negative return value.
Errors	<p>Under the following conditions, <code>tx_set_transaction_timeout()</code> does not change the setting of the <i>transaction_timeout</i> characteristic and returns one of these negative values:</p> <p>[<code>TX_EINVAL</code>] The timeout value specified is invalid.</p> <p>[<code>TX_PROTOCOL_ERROR</code>] The function was called improperly. For example, it was called before the caller called <code>tx_open()</code>.</p>

[TX_FAIL]

The transaction manager encountered an error. The nature of the error is such that the transaction manager can no longer perform work on behalf of the application. The exact nature of the error is written to a log file.

See Also `tx_begin(3c)`, `tx_commit(3c)`, `tx_info(3c)`, `tx_open(3c)`, `tx_rollback(3c)`

Warnings Both the X/Open TX interface and the X-Windows system define the type XID. It is not possible to use both X-Windows calls and TX calls in the same file.

userlog(3c)

Name userlog() - write a message to the BEA Tuxedo system central event log

Synopsis

```
#include "userlog.h"
extern char *proc_name;

int userlog (format [ ,arg] . . .)
char *format;
```

Description userlog() accepts a printf(3S) style format specification, with a fixed output file—the BEA Tuxedo system central event log.

The central event log is an ordinary UNIX file whose pathname is composed as follows: If the shell variable ULOGPFX is set, its value is used as the prefix for the filename. If ULOGPFX is not set, ULOG is used. The prefix is determined the first time userlog() is called. Each time userlog() is called the date is determined, and the month, day, and year are concatenated to the prefix as mmddyy to set the name for the file. The first time a process writes to the userlog, it first writes an additional message indicating the associated BEA Tuxedo system version.

The message is then appended to the file. With this scheme, processes that call userlog() on successive days will write into different files.

Messages are appended to the log file with a tag made up of the time (hhmmss), system name, process name, and process ID, thread ID, and context ID of the calling process. The tag is terminated with a colon (:). The name of the process is taken from the pathname of the external variable proc_name. If proc_name has value NULL, the printed name is set to ?proc.

BEA Tuxedo system-generated error messages in the log file are prefixed by a unique identification string of the form:

```
<catalog>:number>:
```

This string gives the name of the internationalized catalog containing the message string, plus the message number. By convention, BEA Tuxedo system-generated error messages are used only once, so the string uniquely identifies a location in the source code.

If the last character of the *format* specification is not a newline character, userlog() appends one.

If the first character of the shell variable `ULOGDEBUG` is `1` or `y`, the message sent to `userlog()` is also written to the standard error of the calling process, using the `fprintf(3S)` function.

`userlog()` is used by the BEA Tuxedo system to record a variety of events.

The `userlog` mechanism is entirely independent of any database transaction logging mechanism.

A thread in a multithreaded application may issue a call to `userlog()` while running in any context state, including `TPINVALIDCONTEXT`.

Portability The `userlog()` interface is supported on UNIX and MS-DOS operating systems. The system name produced as part of the log message is not available on MS-DOS systems; therefore, the value `PC` is used as the system name for MS-DOS systems.

Examples If the variable `ULOGPFX` is set to `/application/logs/log` and if the first call to `userlog()` occurred on 9/7/90, the log file created is named `/application/logs/log.090790`. If the call:

```
userlog("UNKNOWN USER '%s' (UID=%d)", username, UID);
```

is made at 4:22:14pm on the UNIX System file named `m1` by the `sec` program, whose process-id is 23431, and the variable `username` contains the string "sxx", and the variable `UID` contains the integer 123, the following line appears in the log file:

```
162214.m1!sec.23431: UNKNOWN USER 'sxx' (UID=123)
```

If the message is sent to the central event log while the process is in transaction mode, the user log entry has additional components in the tag. These components consist of the literal `gtrid` followed by three `long` hexadecimal integers. The integers uniquely identify the global transaction and make up what is referred to as the global transaction identifier. This identifier is used mainly for administrative purposes, but it does make an appearance in the tag that prefixes the messages in the central event log. If the foregoing message is written to the central event log in transaction mode, the resulting log entry will look like this:

```
162214.logsys!security.23431: gtrid x2 x24e1b803 x239: UNKNOWN USER 'sxx' (UID=123)
```

If the shell variable `ULOGDEBUG` has a value of `y`, the log message is also written to the standard error of the program named `security`.

Errors `userlog()` hangs if the message sent to it is larger than `BUFSIZ` as defined in `stdio.h`

Diagnostics `userlog()` returns the number of characters output, or a negative value if an output error was encountered. Output errors include the inability to open, or write to the current log file. Inability to write to the standard error, when `ULOGDEBUG` is set, is not considered an error.

Notices It is recommended that applications' use of `userlog()` messages be limited to messages that can be used to help debug application errors; flooding the log with incidental information can make it hard to spot actual errors.

See Also `printf(3S)` in a UNIX system reference manual

Usignal(3c)

Name	Usignal() - signal handling in a BEA Tuxedo system environment
Synopsis	<pre>#include "Usignal.h" UDEFERSIGS() UENSURESIGS() UGDEFERLEVEL() URESUMESIGS() USDEFERLEVEL(level) int (*Usignal(sig,func)()) int sig; int (*func)(); void Usiginit()</pre>
Description	<p>Many of the facilities provided by the BEA Tuxedo system software require concurrent access to data structures in shared memory. Processes accessing the shared data structures run in user mode, and are thus interruptable by signals sent to them. In order to ensure the consistency of the shared data structures, it is important that the operations which access them not be interrupted by the receipt of certain UNIX signals. The functions described in this section provide protection against the most common signals, and are used internally by much of the BEA Tuxedo system code. Additionally, they are available to applications to prevent the untimely arrival of a signal.</p> <p>The idea behind the BEA Tuxedo system signal handling package is that signals should be deferrable while in critical code sections. To this end, signals are not immediately processed when received. Instead, a BEA Tuxedo system routine first catches the sent signal. If it is safe to process the signal, the specified action for the signal is taken. If it is not safe to process the signal when it arrives, the arrival is noted, but the processing is deferred until the user indicates that the critical section of code has been terminated.</p> <p>We recommend against any use of signals in multithreaded programs, although the software does not prevent such usage. If signals are used, however, a thread in a multithreaded application may issue a call to <code>Usignal()</code> while running in any context state, including <code>TPINVALIDCONTEXT</code>.</p>

Catching Signals User code that uses calls `rmopen()` or `tpinit()` should catch signals through the use of the `Usignal()` function. `Usignal()` behaves like the UNIX `signal()` system call, except that `Usignal()` first arranges for the signal to be caught by an internal routine before dispatching the user routine.

Deferring and Restoring Signals The calls described in this section need only be used if application code wishes to defer signals. In general, these routines are called automatically by BEA Tuxedo system routines to protect themselves from untimely signal arrival.

Before deferring or restoring signals, the mechanism must be initialized. This is done automatically for BEA Tuxedo system clients when they call `tpinit()` and for BEA Tuxedo system servers. It is also done the first time that the application calls `Usignal()`. It can be done explicitly by calling `Usiginit()`.

The `UDEFERSIGS()` macro should be used when entering a section of critical code. After `UDEFERSIGS()` is called, signals are held in a pending state. The `URESUMESIGS()` macro should be invoked when the critical section is exited. Note that signal deferrals stack. The stack is implemented via a counter which is initially set to zero. When signals are deferred by a call to `UDEFERSIGS()`, the counter is incremented. When signals are resumed, by a call to `URESUMESIGS()`, the counter is decremented. If a signal arrives while the counter is non-zero, the processing of the signal is deferred. If the counter is zero when the signal arrives, the signal is processed immediately. If signal resumption causes the counter to become zero (that is, prior to the resumption it had value 1), any signals that arrived during the deferral period are processed. In general, each call to `UDEFERSIGS()` should have a counterpart call to `URESUMESIGS()`.

`UDEFERSIGS` increments the deferral counter, but returns the value of the counter prior to its incrementation. The macro `UENSURESIGS()` may be used to explicitly set the deferral counter to zero (and thus force the processing of deferred signals), in case the user wishes to protect against unmatching `UDEFERSIGS()` and `URESUMESIGS()`.

The function `UGDEFERLEVEL()` returns the current setting of the deferral counter. The macro `USDEFERLEVEL(level)` allows the setting of a specific deferral level. `UGDEFERLEVEL()` and `USDEFERLEVEL()` are useful to set the counter appropriately in `set jmp/long jmp` situations where a set of deferrals/resumes are bypassed. The idea is to save the value of the counter when `set jmp()` is called, via a call to `UGDEFERLEVEL()`, and to restore it via a call to `USDEFERLEVEL()` when the `long jmp()` is performed.

Notices `Usignal` provides signal deferral for the following signals: `SIGHUP`, `SIGINT`, `SIGQUIT`, `SIGALRM`, `SIGTERM`, `SIGUSR1`, and `SIGUSR2`. Handling requests for all other signal numbers are passed directly to `signal()` by `Usignal()`. Signals may be deferred for

a considerable time. For this reason, during signal deferral, individual signal arrivals are counted. When it is safe to process a signal that may have arrived many times, the signal's processing routine is iteratively called to process each arrival of the signal. Before each call the default action for the signal is instantiated. The idea is to handle the deferred occurrences of the signal as if they happened in quick succession in safe code.

In general, users should not mix calls to `signal()` and `Usignal()` for the same signal. The recommended procedure is to go through `Usignal()`, so that it is always aware of the state of the signal. Sometimes it may be necessary, such as when an application wants to use alarms within BEA Tuxedo system services. To do this, `Usignalinit()` should be called to initialize the signal deferring mechanism. Then `signal()` can be called to override the mechanism for the desired signal. To restore the deferring mechanism for the signal, it is necessary to call `Usignal()` for the signal with `SIG_IGN`, and then again with the desired signal-handling function.

The shell variable `UIMMEDSIGS` can be used to override the deferral of signals. If the value of this variable begins with the letter `y` as in:

```
UIMMEDSIGS=y
```

signals are not intercepted (and thus not deferred) by the `Usignal()` code. In such a case, a call to `Usignal()` is passed immediately to `signal()`.

`Usignal` is not available under DOS operating systems.

Files `Usignal.h`

See Also `signal(2)` in a UNIX system reference manual

Uunix_err(3c)

Name Uunix_err() - print UNIX system call error

Synopsis #include Uunix.h

```
void Uunix_err(s)
char *s;
```

Description When a BEA Tuxedo system function calls a UNIX system call that detects an error, an error is returned. The external integer Uunixerr() is set to a value (as defined in Uunix.h) that identifies the system call that returned the error. In addition, the system call sets errno() to a value (as defined in errno.h) that tells why the system call failed.

The Uunix_err() function is provided to produce a message on the standard error output, describing the last system call error encountered during a call to a BEA Tuxedo system function. It takes one argument, a string. The function prints the argument string, then a colon and a blank, followed by the name of the system call that failed, the reason for failure, and a newline. To be of most use, the argument string should include the name of the program that incurred the error. The system call error number is taken from the external variable Uunixerr(), the reason is taken from errno(). Both variables are set when errors occur. They are not cleared when non-erroneous calls are made.

To simplify variant formatting of messages, the array of message strings

```
extern char *Uunixmsg[];
```

is provided; Uunixerr() can be used as an index into this table to get the name of the system call that failed (without the newline).

A thread in a multithreaded application may issue a call to Uunix_err() while running in any context state, including TPINVALIDCONTEXT.

Examples #include Uunix.h
extern int Uunixerr, errno;

```
.....
    if((fd=open("myfile", 3, 0660)) == -1)
```

```
{
Uunixerr = UOPEN;
Uunix_err("myprog");
exit(1);
}
```

