Connecting Systems Using Reactive Network Configuration in Oracle® Solaris 11.1

ORACLE®

Contents

Preface

Welcome to *Connecting Systems Using Reactive Network Configuration in Oracle Solaris 11.1*. This book is a part of the series *Establishing An Oracle Solaris 11.1 Network* that cover basic topics and procedures to configure Oracle Solaris networks. This book assumes that you have already installed Oracle Solaris. You should be ready to configure your network or ready to configure any networking software that is required on your network.

Note – This Oracle Solaris release supports systems that use the SPARC and x86 families of processor architectures. The supported systems appear in the *Oracle Solaris OS: Hardware Compatibility Lists*. This document cites any implementation differences between the platform types.

Who Should Use This Book

This book is intended for anyone responsible for administering systems that run Oracle Solaris, which are configured in a network. To use this book, you should have at least two years of UNIX system administration experience. Attending UNIX system administration training courses might be helpful.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info` or visit `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs` if you are hearing impaired.

Typographic Conventions

The following table describes the typographic conventions that are used in this book.

TABLE P–1 Typographic Conventions

Typeface	Description	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your `.login` file.
		Use `ls -a` to list all files.
		`machine_name% you have mail.`
AaBbCc123	What you type, contrasted with onscreen computer output	`machine_name% `**`su`**
		`Password:`
aabbcc123	Placeholder: replace with a real name or value	The command to remove a file is `rm` *filename*.
AaBbCc123	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the *User's Guide*.
		A *cache* is a copy that is stored locally.
		Do *not* save the file.
		Note: Some emphasized items appear bold online.

Shell Prompts in Command Examples

The following table shows the default UNIX system prompt and superuser prompt for shells that are included in the Oracle Solaris OS. Note that the default system prompt that is displayed in command examples varies, depending on the Oracle Solaris release.

TABLE P–2 Shell Prompts

Shell	Prompt
Bash shell, Korn shell, and Bourne shell	`$`
Bash shell, Korn shell, and Bourne shell for superuser	`#`
C shell	`machine_name%`
C shell for superuser	`machine_name#`

Reactive Network Configuration (Overview)

Reactive network configuration (formerly known as Network Auto-Magic (NWAM)) simplifies basic network configuration by automatically addressing basic Ethernet and WiFi configurations. The basic network configuration includes connecting to wired or wireless network at startup and displaying notifications about the status of your currently active network connection from the desktop. Reactive or automatic network configuration also simplifies some of the more complex networking tasks, such as the creation and management of system-wide network profiles, for example, the configuration of naming services, IP Filter, and IP Security (IPsec), all of which are features of Oracle Solaris.

This chapter provides background information about reactive network configuration. A detailed description of the profiles that the system uses to simplify and automate network configuration is also provided.

This chapter covers the following topics:

This chapter is intended for users and system administrators who have an understanding of basic networking concepts, as well as some experience managing network configuration by using traditional networking tools and commands. If you are ready to use reactive network

configuration to manage your network configuration, skip to Chapter 2, "Creating and Configuring Reactive Network Profiles (Tasks)."

For basic information about administering network interfaces in Oracle Solaris, see *Configuring and Administering Oracle Solaris 11.1 Networks* and *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

Highlights of Profile-Managed Network Configuration

In Oracle Solaris 11, network configuration is based on profiles. A system's network configuration is managed by a specific network configuration profile (NCP) and a corresponding Location profile. For a fuller description of profile-managed network configuration, see "Network Configuration Profiles" in *Introduction to Oracle Solaris 11 Networking*.

Note – For network configuration, the principal profile types are NCPs, Location profiles, external network modifiers (ENMs), and known wireless local area networks (known WLANs). Of these types, the main profile type is the NCP. For more information about network profile types, see "Network Profiles and Types" on page 11.

The highlights of profile-based network configuration follow:

- Only one pair of NCP and Location profiles can be active at one time to manage a system's network configuration. All other existing NCPs on the system are non-operational.
- The active NCP can be either reactive or fixed. With a reactive profile, the system monitors the network configuration to adapt to changes in the system's network environment. With a fixed profile, the network configuration is instantiated but not monitored.
- The values of the different properties of an NCP constitute a policy that governs how the profile manages the network configuration.
- Changes to the NCP's properties are immediately implemented as new property values, which become part of the profile's policy that manages the network configuration.

If your system is configured for fixed networking, then the active NCP that manages its network configuration is DefaultFixed. This profile is generated by the operating system (OS) and is the only fixed profile on the system. A system does not support multiple fixed profiles. For more information, see *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

The conceptual information, procedures, and examples in this book relate to reactive network configuration where multiple NCPs can be created and configured but only one profile can be active at a time on the system.

What Is Reactive Network Configuration?

In reactive network configuration, the system automatically adapts to any change in network condition and network configuration without requiring manual reconfiguration. For example, if your wired network interface becomes unplugged or if a new wireless network becomes available, the system adapts accordingly. With the primary focus on mobility, a reactive configuration policy allows the system's configuration to be changed dynamically, in response to different network events or at a user's request.

The system's network configuration is organized into profiles. Profiles are either reactive or fixed. A reactive profile includes properties that determine when the profile or its components should be enabled. These properties enable the profile to be applied dynamically by the network management daemon, nwamd. For information about fixed network configuration and the distinction between fixed network and reactive network configuration, see "What Is Fixed Network Configuration?" in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

When to Use Reactive Network Configuration

Reactive network configuration is a valuable feature for users of laptop models and systems that require frequent changes in their network environment and connection methods. You can set up user-defined profiles that enable you to connect to networks in a variety of settings, for example, at the office, at home, or on the road. In addition, the network administration graphical user interface (GUI) (formerly known as the NWAM GUI) makes the setting up of static IP configurations and connections to WiFi networks much easier than traditional networking tools and commands. Reactive network profiles can be configured to adapt to changes in your network environment, such as the loss of Ethernet connectivity or the addition or removal of a network interface card (NIC).

Network Profiles and Types

The system manages network configuration by storing preferred property values in the form of profiles. These property values determine how a network is configured and when its components need to be configured depending on current network conditions. The reactive profiles implementation is a primary component of reactive network configuration. The two primary network profile types are the NCP and the Location profile. Exactly one NCP and one Location profile must be active on the system at all times.

The following are the profile types and configuration objects that comprise the system's network configuration:

- **Network configuration profiles (NCPs)**

  An NCP specifies the configuration of network links and interfaces. The system always defines an NCP called the Automatic NCP. This profile is the default reactive NCP. The Automatic NCP is created and maintained by the system and cannot be modified or removed. You can also create additional user-defined NCPs, as needed. For a complete description of the Automatic and user-defined NCPs, see "Description of the Automatic and User-Defined NCPs" on page 13. For a complete description of an NCP, see "Description of an NCP" on page 12.

- **Network configuration units (NCUs)**

  NCUs are the individual configuration objects that contain all of the properties that define an NCP. There are two types of NCUs: a link NCU and an interface NCU. Each NCU represents a physical link or an interface and contains properties that define the configuration for that link or interface. For a complete description of an NCU, see "Description of an NCU" on page 14.

- **Location profiles**

  The Location profile is one of the two primary profile types that make up the system's network configuration. The Location profile specifies the system-wide network configuration, for example, the naming services, the domain, the IP Filter configuration, and the IPsec configuration. There are both system-defined and user-defined locations. For a complete description of the Location profile, see "Description of a Location Profile" on page 14.

- **External network modifiers (ENMs)**

  ENMs are profiles that are used to manage applications that create their own network configuration, which is external to the configuration managed by the system, for example, a VPN application. The network management daemon, nwamd, enables or disables an ENM, depending on the conditions that are specified as a part of the ENM. For a complete description of an ENM, see "Description of an ENM" on page 15.

- **Known WLANs**

  Known WLAN profiles store information about wireless networks that are known to your system. The system uses this information while configuring wireless links automatically to determine the order in which connections to available wireless networks are attempted and to find key information for protected wireless networks. For a complete description of known WLANs, see "Description of a Known WLAN" on page 16.

Description of an NCP

An NCP defines the network configuration of a system. The NCUs that make up an NCP specify how to configure the various network links and interfaces as well as the conditions

under which that link or interface should be brought up. All NCPs have a management-type property that determines how the profiles are managed. The possible values for this property are fixed and reactive.

NCUs that define the reactive NCP include property values that describe the conditions under which each NCU should be enabled. The system's network uses the properties and conditions that are specified for each NCU to enforce the NCP activation policy. For information about the NCP activation policy, see "Profile Activation Policy" on page 17.

The system defines one reactive NCP: the Automatic NCP. You can also create additional user-defined reactive NCPs.

Fixed NCPs are also managed by the network management daemon. However, their configuration is always applied when the fixed NCP is enabled and is not altered by the system while the NCP remains active. There is only one fixed NCP on the system, the DefaultFixed NCP. For more information about the fixed NCP, see *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

Description of the Automatic and User-Defined NCPs

The Automatic NCP is a system-defined profile that is made up of one link NCU and one interface NCU for each physical link that is present on the system. For information about NCUs, see "Description of an NCU" on page 14. The content of the Automatic NCP changes if network devices are added or removed. However, the configuration preferences that are associated with the Automatic NCP cannot be edited.

The Automatic NCP utilizes dynamic host configuration protocol (DHCP) and address autoconfiguration to obtain IP addresses for the system. This profile also implements an NCU activation policy in this NCP that favors wired links over wireless links and that plumbs both IPv4 and IPv6 on each enabled link. If the specification of an alternate IP configuration policy or an alternate link selection policy is required, you can create additional user-defined NCPs on your system. The Automatic NCP changes dynamically when a new link is inserted or removed from the system. All NCUs that correspond to the inserted or removed link are also added or removed at the same time. The profile is updated automatically by the network management daemon.

User-defined NCPs are created and managed by the user. You must explicitly add and remove NCUs from the specified profile. You can create NCUs that do not correlate to any link that is currently present on the system. You can also remove NCUs that do not correlate to any link that is present on the system. In addition, you can determine the policy for the user-defined NCP. For example, you can allow multiple links and interfaces to be enabled on the system at a given time, as well as specify different dependency relationships between NCUs and static IP addresses.

For step-by-step instructions about creating a user-defined NCP and adding and removing NCUs to and from this NCP, see "Creating an NCP" on page 41.

Description of an NCU

NCUs are the individual configuration objects that make up an NCP. NCU represents a physical link or an interface on a system. The process of configuring a user-defined NCP includes creating NCUs that specify how each link and interface must be configured. For NCUs in a reactive NCP, the conditions under which each link or interface should be configured must also be specified.

There are two types of NCUs:

- **Link NCUs**

  Link NCUs, for example, physical devices, are Layer 2 entities in the Open Systems Interconnection (OSI) model.

- **Interface NCUs**

  Interface NCUs, specifically, IP interfaces, are Layer 3 entities in the OSI model.

Link NCUs represent datalinks. There are several different classes of datalinks:

- Physical links (Ethernet or WiFi)
- Tunnels
- Aggregations
- Virtual local area networks (VLANs)
- Virtual network interface cards (VNICs)

For more information about how to configure virtual NICs to create virtual networks, see *Using Virtual Networks in Oracle Solaris 11.1*.

Description of a Location Profile

A Location profile provides additional networking details after the basic IP connectivity has been established. Locations contain network configuration information that is comprised of a set of properties that relate to network configuration on a system-wide level.

A Location profile consists of certain network configuration information, for example, a naming service and firewall settings, that are applied together, when required. Also, because a location does not necessarily correspond to a physical location, you can set up several Location profiles to meet different networking needs. For example, one location can be used when you are connected to the company intranet. Another location can be used when you are connected to the public Internet by using a wireless access point that is located in your office.

Each Location profile contains properties that define the location activation selection criteria. For information about the location activation criteria, see "Location Activation Selection Criteria" on page 19.

By default, three Location profiles are predefined by the system:

- `NoNet`

  The `NoNet` location has very specific activation conditions. This profile is applied to a system when no local interfaces have an assigned IP address. You can modify the `NoNet` location after it is enabled on your system for the first time. A read-only copy of the original `NoNet` location is stored on the system, in case you want to restore the default settings for this location.

- `Automatic`

  The `Automatic` location is enabled if there are networks available, but no other Location profile supersedes it. You can modify the `Automatic` location after it has been enabled on your system for the first time. A read-only copy of the original `Automatic` location is stored on the system, in case you want to restore the default settings for this location.

  Note – The `Automatic` location should not be confused with the `Automatic` NCP. The `Automatic` location is a Location profile type that defines system-wide network properties after the initial network configuration of a system takes place. The `Automatic` NCP specifies link and interface network configuration on a system.

- `DefaultFixed`

  The `DefaultFixed` location is enabled if the `DefaultFixed` NCP is active and at least one interface is configured with an IP address. The system updates the `DefaultFixed` location to reflect the changes made to relevant Service Management Facility (SMF) properties while the location is active. You must not modify the `DefaultFixed` location directly. For more information about fixed network configuration, see *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

User-defined locations are profiles that you create with values that you specify for the system-wide network configuration. User-defined locations are identical to system-defined locations, except that a user-defined location is configured with values that you set, but system-defined locations have preset values.

For more information about creating user-defined locations, see "Creating a Location Profile" on page 48.

Description of an ENM

ENMs enable you to specify when applications or scripts, for example, a VPN application, should perform their own network configuration external to the configuration specified in the NCP and Location profiles. ENMs can also be defined as services or applications that directly modify your network configuration when they are enabled or disabled. You can specify the conditions under which an ENM should be enabled or disabled. You can also enable or disable

an ENM manually. Unlike an NCP or a Location profile, where only one of each profile type can be active on the system at any given time, multiple ENMs can potentially be active on the system at the same time. The ENMs that are active on a system at any given time are not necessarily dependent on the NCP or Location profile that is also enabled on the system at the same time.

Although there are several external applications and services for which you can create an ENM, the obvious example is the VPN application. After you install and configure VPN on your system, you can create an ENM that automatically enables and disables the application under the conditions that you specify.

Note – Reactive network configuration cannot automatically detect external applications that are capable of directly modifying the network configuration on a system. To manage the activation or deactivation of a VPN application, or any external application or service, you must first install the application, then create an ENM for it by using either the command-line interface (CLI) or the network administration GUI.

Persistent information about any network configuration that is performed by an ENM is not stored or tracked by the system in exactly the same way as information about an NCP or a Location profile is stored. However, reactive network configuration is capable of noting an externally initiated network configuration. Based on any configuration changes that are made to the system by an ENM, reactive network configuration reevaluates which Location profile should be active, and subsequently enables that location. For example, switching to a location that is enabled conditionally when a certain IP address is in use. If the svc:/network/physical:default service is restarted at any time, the network configuration that is specified by the active NCP is reinstated. ENMs are restarted as well, possibly tearing down and re-creating the network configuration in the process.

For information about creating and modifying the properties of an ENM, see "Creating an ENM Profile" on page 54.

Description of a Known WLAN

Known WLAN profiles store information about wireless networks, enabling NCPs to automatically configure wireless interfaces based on the configuration information of wireless networks that you connect to from your system.

Known WLAN profiles provide details about WLANs that might be connected to automatically. For example, each profile contains a priority value, which determines the order of preference for different wireless networks to be connected when two or more known networks are available. A profile with a lowest number as its priority value has the highest priority. When an NCP includes a wireless link to be enabled, the Known WLAN profile list is examined. If a wireless network that has a Known WLAN profile is available, the wireless link is automatically connected to that WLAN. If two or more known networks are available, the

wireless network that has the highest priority (lowest number) is connected to the WLAN. The most recent wireless network that a wireless link is connected to (by explicit user action) is added to the top of the Known WLAN list, and that network becomes the new highest priority wireless network. This means that more recently connected WLANs are preferred over WLANs that you had connected to earlier. Known WLANs do not share the same priority at any point of time. If a new WLAN is added to the list with the same priority value as an existing WLAN, the existing entry is shifted to a lower priority value. Subsequently, the priority value of all other WLANs in the list is dynamically shifted to a lower priority value.

One or more key names can also be associated with a known WLAN. *Key names* enable you to create your own keys by using the `dladm create-secobj` command. You can then associate these keys with WLANs by adding the secure object names to the known WLAN `keyname` property. For more information, see the dladm(1M) man page. For more information about working with datalinks using the `dladm` command, see Chapter 3, "Working With Datalinks," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

For more information about using the command-line utilities to manage WLANs, see "Performing a Wireless Scan and Connecting to Available Wireless Networks" on page 83.

Profile Activation Policy

Reactive network configuration enables you to specify the NCP activation policy for reactive NCPs. This policy describes when NCUs are enabled. Each Location profile also contains properties that define the activation criteria.

NCUs, Location profiles, and ENMs have an `activation-mode` property. The allowable values for each profile type differ. In addition, how the `activation-mode` property is validated differs for each profile type, as do the conditions under which each profile is enabled.

Note – The `activation-mode` property for the NCU can be either set to `manual` or `prioritized`. The `activation-mode` property for the Location profile can be set to `manual`, `conditional-any`, `conditional-all`, or `system`.

NCP Activation Policy

The NCP activation policy is enforced through the use of properties and conditions that can be specified for each NCU. Examples of policy that you might specify include: "prefer wired connections over wireless connections" or "activate one interface at a time." How and when NCPs are enabled is defined in the properties that are set for each NCU type.

Note – An interface NCU must always be associated with an underlying link NCU. Each interface NCU becomes active when its associated link NCU is enabled. You can override the default behavior of an NCU by using the netadm command. However, the dependency on the underlying link NCU can never be removed. For example, if you enable an interface NCU without enabling its associated link NCU, the interface do not actually come online until the underlying NCU for that interface is enabled.

NCU Activation Properties

How network connections are enabled is set in the link NCU properties. The following properties are used to define the NCP activation policy:

- activation-mode property

  This property can be set to either manual or prioritized.

  - manual – The NCU activation is managed by the administrator. You can use the netadm command or the network administration GUI to enable or disable the NCU. If an NCU's activation-mode property is set to manual, values that are set for both the priority-group and priority-mode NCU properties are ignored.

  - prioritized – The NCU is enabled according to the values that are set in the priority-group and priority-mode properties for the specified NCU. The enabled property is always true for prioritized NCUs.

    Prioritized activation enables groups of links to be enabled at the same time. This activation mode also enables one or more links to be preferred over other links. The priority-group property assigns a numeric priority level to a given link. All links at the same priority level are examined as a group. The priority-mode property defines how many of the group members might or must be available for the group to be enabled.

- enabled property (activation-mode is set to manual)

  The value of this property can be true or false. You cannot set the value of this property. Rather, the value reflects the current state of a manually enabled NCU, which can be changed by using the netadm command or by using the network administration GUI.

- priority-group property (activation-mode is set to prioritized)

  The value is numeric. Zero (0) indicates the highest priority. Negative values are invalid.

  Among all of the available priority groups, only the NCUs in the highest available priority group are enabled. When more than one NCU with the same priority is available, activation behavior is defined by the priority-mode property. The priority number is not an absolute value. It can change, as the NCP repository is updated.

  Note – The priority order is strictly enforced.

- priority-mode property (activation-mode is set to prioritized)

The property is set when a value for the `priority-group` property has been specified.

The values for this property are as follows:

- `exclusive` – Specifies that only one NCU in the priority group can be active at any given time. The first available NCU within the priority group is enabled, and the other NCUs in the group are ignored.

- `shared` – Specifies that multiple NCUs in the priority group can be active at the same time. Any available NCUs in the priority group are enabled.

- `all` – Specifies that all of the NCUs in the priority group must be made available for the priority group to be considered available and thus made active.

Examples of an NCP Policy

In the following example, NCU properties are set according to an NCP policy which specifies that multiple wired links are enabled at the same time.

For all physical links:

- NCU type: `link`
- NCU class: `phys`
- `activation-mode: prioritized`
- `priority-group: 0` for wired
- `priority-mode: shared` for wired

In the following example, NCU properties are set according to an NCP policy which specifies that there can be only one active link on the system at any given time.

For all physical links:

- NCU type: `link`
- NCU class: `phys`
- `activation-mode: prioritized`
- `priority-group: 0` for wired
- `priority-mode: exclusive`

Location Activation Selection Criteria

The properties that define the activation criteria specify information about the conditions under which a Location profile is enabled. A Location profile can be manually enabled by using the `netadm` command or by using the network administration GUI. If you do not explicitly enable a location, the network management daemon, `nwamd`, checks the activation rules for all of the conditionally enabled and system-enabled Location profiles, and then chooses the location that best matches the current network environment.

The nwamd daemon uses an algorithm to continuously reevaluate the selection criteria for all the configured locations, each time determining which location has the criteria that is the best match for the current network environment. If there is no suitable match for a location, the Automatic location is then enabled.

Changes in the network environment cause the nwamd daemon to continually reassess the location selection to determine the best match for the new environment. However, if you explicitly enable a Location profile by using the netadm command (either a location that is manually enabled or a location that is conditionally enabled), that location remains active until you explicitly disable it or enable a different location. In this situation, changes in the network environment do not result in a change in Location profiles, regardless of whether there might be a better match available. The fact that you explicitly specified the current location makes it, in effect, the best possible match. For instructions about enabling and disabling profiles, see "Enabling and Disabling Profiles" on page 69.

The selection criteria for when and how a user-defined location is enabled are specified by the following properties:

- activation-mode
- conditions

The activation-mode property is set to one of the following possible values:

- manual
- conditional-any
- conditional-all
- system

Note – The system value of the activation-mode property can only be assigned to system-provided locations: the Automatic, NoNet, and DefaultFixed locations. The system value indicates that the system determines when to activate these locations.

If the activation-mode property is set to conditional-any or conditional-all, the conditions property contains a conditional expression or expressions that are user-defined. Each expression contains a condition that can be assigned a boolean value, for example, ncu ip:net0 is-not active. The condition in this example can be used for activating a location or an ENM. The condition is true when the IP NCU for net0 is not online. This expression determines when the location or ENM is enabled and if the condition is not met, the location or ENM is disabled.

If the activation-mode property is set to conditional-any, the condition is satisfied if any one of the conditions is true.

If the activation-mode property is set to conditional-all, the condition is satisfied only if *all* of the conditions are true.

Locations and ENMs can be activated based on a set of user-specified conditions. The conditions can be set for the object types which include profile types and profile properties. The criteria and operations that can be used to construct the condition strings are defined in the following table.

TABLE 1–1 Criteria and Operations for Constructing Condition Strings

Object Type	Condition	Object	Example
`ncp, ncu, enm, loc`	is/is-not active	Name of the object	`ncp Automatic is active`
`essid`	is/is-not contains/does-not-contain	essid of the WiFi network	`essid contains guest`
`bssid`	is/is-not	bssid/MAC address of the WiFi network's access point	`bssid is clear-guest`
`ip-address`	is/is-not	IPv4 or IPv6 address	`ip-address is 10.0.8.0/24`
`ip-address`	is-in-range/is-not-in-range	IPv4 or IPv6 address plus netmask/prefixlen	`ip-address is-in-range 10.34.24.0/24`
`advertised-domain`	is/is-not contains/does-not-contain	Name of the domain	`advertised-domain is example.com`
`system-domain`	is/is-not contains/does-not-contain	Name of the domain	`system-domain contains mycompany`

Note – The `essid` property represents an Extended Server Set Identifier (ESSID), which is the network name of a wireless LAN (WLAN). The `bssid` property represents a Basic Service Set Identifier (BSSID), which is the MAC address of a specific wireless access point (WAP) or any access point (AP).

Note the distinction between the `advertised-domain` and the `system-domain` profile properties. The advertised domain is discovered through external communications, for example, the `DNSdmain` or `NISdmain` domain names, which are advertised by a DHCP server. This profile property is useful for the conditional activation of locations, for example, if the advertised domain is `mycompany.com`, then enable the `work` location. The `system-domain` profile property is the domain that is currently assigned to the system. It is the value that is returned by the `domainname` command. This profile property is useful for the conditional activation of ENMs, as it becomes true only after a location has been enabled, and the system has been configured for that particular domain. For more information, see the `domainname(1M)` man page.

For more information about location properties, see "Description of a Location Profile" on page 14.

Profile Configuration Tasks

In reactive network configuration, you can create and configure profiles and obtain information about them by using the netcfg and netadm commands. To configure your network connections through profiles, you can use the netcfg command. To administer and obtain the status of profiles (NCPs, locations, ENMs, and WLANs) and NCUs, the individual configuration objects that make up an NCP, you can use the netadm command. In addition, you can use the netadm command to interact with the network management daemon, nwamd, in the absence of a GUI.

The following are the tasks that you perform in a reactive networking environment:

- Create a user-defined profile by using the netcfg create command. For information, see "Creating User-Defined Profiles" on page 39.
- Set or modify one or all of the properties of a specified user-defined profile by using the netcfg set or netcfg walkprop command. For information, see "Setting and Changing Property Values for a Profile" on page 60 and "Viewing and Changing Property Values by Using the walkprop Subcommand" on page 68.
- Delete any changes that were made to a profile and revert to the previous configuration for that profile by using the netcfg revert command.
- List all of the profiles that exist on a system and their property values by using the netcfg list command. For information, see "Listing All of the Profile Configuration Information on a System" on page 63.
- List all of the property values for a specified profile by using the netcfg list command. For information, see "Displaying the Current State of a Profile" on page 76.
- List each property that is associated with a profile by using the netcfg get command. For information, see "Obtaining the Value of a Specific Property" on page 65.
- Verify that a profile has a valid configuration by using the netcfg verify command.
- Commit the current profile specification to persistent storage and also verify that a profile has a valid configuration by using the netcfg commit command.
- Remove a user-defined profile by using the netcfg destroy command. For information, see "Removing Profiles" on page 81.

Note – You cannot create or destroy a system-defined profile.

- Export the current configuration for a user-defined profile to standard output or a file by using the netcfg export command. For information, see "Exporting and Restoring a Profile Configuration" on page 77.

> **Note –** You cannot export any system-defined profiles. System-defined profiles include the `Automatic` and `DefaultFixed` NCPs and the `Automatic`, `NoNet`, and `DefaultFixed` locations.

- Enable and disable a specified profile by using the `netadm enable` and `netadm disable` commands. For information, see "Enabling and Disabling Profiles" on page 69.
- List all of the available profiles and their current states by using the `netadm list` command. For information, see "Displaying Information About Profile States" on page 75.
- Listen to and display a stream of events from reactive networking by using the `netadm show-events` command. For information, see "Monitoring the Current State of All Network Connections" on page 84.
- Initiate a wireless scan for a specified link and select a wireless network to connect to from the scan results on that specified link by using the `netadm scan-wifi` and `netadm select-wifi` commands. For information, see "Performing a Wireless Scan and Connecting to Available Wireless Networks" on page 83.

For all task-related information, see Chapter 2, "Creating and Configuring Reactive Network Profiles (Tasks)," and Chapter 3, "Administering Your Reactive Network Configuration (Tasks)."

> **Note –** For NCUs, the set of properties that you can view or modify by using the `netcfg` command is limited. You can use the `ipadm` and `dladm` commands to create, view, or modify all possible link and interface properties of the currently active NCP. However, for reactive NCPs, the `netcfg` command must be used to modify an NCU's activation conditions.
>
> For more information about the `ipadm` and `dladm` commands, see Chapter 4, "Working With IP Interfaces," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1* and Chapter 3, "Working With Datalinks," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

You can use the `netcfg` command in interactive mode, command-line mode, or command-file mode. Because the `netcfg` command is hierarchical, it is more easily understood when used in interactive mode. For more information about the different modes, see "Configuring Profiles by Using the `netcfg` Command" on page 32.

For information about the `netcfg` command, see the `netcfg`(1M) man page. For information about the `netadm` command, see the `netadm`(1M) man page.

How Reactive Network Profiles Work

The system provides the `Automatic` NCP and the `Automatic` Location profile, as the default reactive profiles. These profiles perform the basic configuration of your wired or wireless networking automatically, without any user interaction. The only time you are required to interact with reactive networking is if you are prompted by the system for more information, for example, to provide a security key or password for a wireless network.

The automatic or reactive network configuration is triggered by the following events and activities:

- Connecting or disconnecting an Ethernet cable
- Connecting or disconnecting a WLAN card
- Booting a system when a wired interface, a wireless interface, or both, is available
- Resuming from suspend when a wired interface, a wireless interface, or both, is available (if supported)
- Acquiring or losing a DHCP lease

To perform the basic configuration of your network automatically, the `Automatic` NCP implements the following basic policy:

- Configure all available (connected) Ethernet interfaces by using DHCP.
- If no Ethernet interfaces are connected, or if none can obtain an IP address, enable one wireless interface, automatically connecting to the best available WLAN from the Known WLAN list. Alternatively, wait for the user to select a wireless network to connect to.
- Until at least one IPv4 address has been obtained, keep the `NoNet` location active. This Location profile provides a strict set of IP Filter rules that only pass data that is relevant to IP address acquisition (DHCP and IPv6 `autoconf` messages). All of the properties of the `NoNet` location, with the exception of the activation conditions, can be modified.
- When at least one IPv4 address has been assigned to one of the system's interfaces, activate the `Automatic` location. This Location profile has no IP Filter or IPsec rules. The Location profile applies the domain name system (DNS) configuration data that is obtained from the DHCP server. As with the `NoNet` location, all of the properties of the `Automatic` location, with the exception of its activation conditions, can be modified.
- Always apply the `NoNet` location when the system has no IPv4 addresses assigned to it. When at least one IPv4 address is assigned, select the Location profile with the activation rules that best match the current network conditions. In the absence of a better match, fall back to the `Automatic` location.

For more information, see "Profile Activation Policy" on page 17.

For more information about how to administer the DHCP service to automatically configure the network, see *Working With DHCP in Oracle Solaris 11.1*.

How Reactive Networking Works With Other Oracle Solaris Networking Technologies

Reactive network configuration works with the following Oracle Solaris networking technologies:

- **Network virtualization**

    Reactive network configuration works with the various Oracle Solaris network virtualization technologies as follows:

    - **Virtual machines: Oracle VM Server for SPARC (formerly Logical Domains) and Oracle VM VirtualBox**

        Reactive network profiles are supported in both Oracle Solaris hosts and guests. Reactive network configuration manages only the interfaces that belong to the specified virtual machines and does not interfere with other virtual machines.

    - **Oracle Solaris Zones and stack instances**

        Reactive network profiles work in the global zone or in an exclusive stack, non-global zone.

        Note – Reactive network profiles cannot be used in a shared stack zone, as the network configuration for shared stack zones is always managed in the global zone.

- **Dynamic reconfiguration and NCPs**

    The system's network configuration supports dynamic reconfiguration (DR) and hot-plug features only on systems that support these capabilities. You can use these features to add or remove a device if the active NCP on the system is either reactive (`Automatic` or any user-defined reactive profile) or fixed (`DefaultFixed`). However, the behavior of the system varies depending on the active profile.

    When the `Automatic` profile is active and a device is plugged in, the `Automatic` NCP automatically creates the IP configuration for the newly added device. If a device is removed while any reactive (`Automatic` or user-defined) profile is active, IP is unconfigured for the device, though only the `Automatic` NCP removes the persistent configuration. When a fixed profile is the active NCP, IP configuration must be explicitly added after adding a device, or removed before removing a device.

    For more information about dynamically configuring devices, see *Oracle Solaris 11.1 Administration: Devices and File Systems*. For more information about performing dynamic reconfiguration when you are using a fixed profile, see "How to Replace a Network Interface Card With Dynamic Reconfiguration" in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

- **Fixed networking commands**

  You can use the ipadm and dladm commands to view the current network configuration and to modify the currently active NCP, when the active NCP is DefaultFixed or a user-defined NCP that is managed by reactive networking. Note that when a reactive (NWAM-managed) NCP is active, links and interfaces created with these commands are assigned implicit activation conditions, such that they depend on their underlying link or interface. For example, if dladm is used to create a VNIC, that VNIC NCU has an implicit dependency on its underlying link.

  For more information about the ipadm and dladm commands, see Chapter 4, "Working With IP Interfaces," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1* and Chapter 3, "Working With Datalinks," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

SMF Network Services

In Oracle Solaris, network configuration is implemented by multiple SMF services as follows:

- svc:/network/loopback:default – Creates the IPv4 and IPv6 loopback interfaces.
- svc:/network/netcfg:default – Manages the network configuration repository, with its primary function being to start the netcfgd daemon. This service is a prerequisite for the svc:/network/physical:default service.
- svc:/network/physical:default – Brings up links and plumbs IP interfaces. This service starts the network management daemon, nwamd.
- svc:/network/location:default – Enables the Location profile that is selected by the nwamd daemon. This service is dependent on the svc:/network/physical:default service.

Note – The svc:/network/location:default service has a property that stores the current Location profile. Do not directly manipulate this property. Rather, use the CLI or the network administration GUI to make these types of changes.

Network Configuration Security and Authorizations

Security for reactive network configuration encompasses the following components:

- CLI (netcfg and netadm commands)
- Network administration GUI
- Network profile repository daemon (netcfgd)
- Network management daemon (nwamd)
- Network configuration management library (libnwam)

The netcfgd daemon controls the repository where all of the network configuration information is stored. The netcfg command, the network administration GUI, and the nwamd

daemon send requests to the `netcfgd` daemon to access the repository. These functional components make requests through the network configuration management library, `libnwam`.

Authorizations and Profiles Related to Network Configuration

The current network configuration implementation uses the following authorizations to perform specific tasks:

- `solaris.network.autoconf.read` – Enables the reading of network profile data, which is verified by the `netcfgd` daemon
- `solaris.network.autoconf.write` – Enables the writing of network profile data, which is verified by the `netcfgd` daemon
- `solaris.network.autoconf.select` – Enables new configuration data to be applied, which is verified by the `nwamd` daemon
- `solaris.network.autconf.wlan` – Enables the writing of known WLAN configuration data

These authorizations are registered in the `auth_attr` database. For more information, see the `auth_attr(4)` man page.

The `solaris.network.autoconf.read` authorization is included in the Basic Solaris User rights profile, which is assigned to all users by default. Any user with this authorization is therefore able to view the current network state and the contents of all network profiles.

Two additional rights profiles are provided: Network Autoconf User and Network Autoconf Admin. The Network Autoconf User profile has read, select, and wlan authorizations. The Network Autoconf Admin profile adds the write authorization. The Network Autoconf User profile is assigned to the Console User profile. Therefore, by default, anyone who is logged in to the console can view, enable, and disable profiles. Because the Console User profile is not assigned the `solaris.network.autoconf.write` authorization, any user with this authorization cannot create or modify NCPs, NCUs, locations, or ENMs. However, the Console User profile can view, create, and modify WLANs.

Authorizations Required to Use the User Interfaces

The `netcfg` and `netadm` commands can be used to view network profiles by any user who has the Basic Solaris User rights profile. This profile is assigned to all users by default.

The `netadm` command can also be used to enable network profiles by any user who has the Network Autoconf User or Console User profile. The Console User profile is automatically assigned to the user who is logged in to the system from `/dev/console`.

To modify network profiles by using the `netcfg` command, you need the `solaris.network.autoconf.write` authorization or the Network Autoconf Admin profile.

You can determine the privileges that are associated with a rights profile by using the `profiles` command with the profile name. For more information, see the `profiles(1)` man page.

For example, to determine privileges that are associated with the Console User rights profile, use the following command:

```
$ profiles -p "Console User" info
Found profile in files repository.
    name=Console User
    desc=Manage System as the Console User
    auths=solaris.system.shutdown,solaris.device.cdrw,solaris.smf.manage.vbiosd,
    solaris.smf.value.vbiosd
    profiles=Suspend To RAM,Suspend To Disk,Brightness,CPU Power Management,
    Network Autoconf User,Desktop Removable Media User
    help=RtConsUser.html
```

The network administration GUI includes the following components, which are not privileged. These components are granted authorizations, depending on how they are started and the tasks they need to perform.

- **Network configuration and status panel presence**

    This component is the panel applet in the desktop that enables a user to interact with the network configuration. The panel can be run by any user and is used to monitor the autoconfiguration of the system and handle event notifications. The panel can also be used to perform some basic network configuration tasks, for example, selecting a WiFi network or manually switching locations. To perform these types of tasks, the Network Autoconf User rights profile is required. This rights profile is available in the default configuration, because the panel is running with the authorizations of the user who is logged in from `/dev/console`, and hence has the Console User profile.

- **Network administration GUI**

    The network administration GUI (previously known as NWAM GUI) is the primary means for interacting with the network configuration from the desktop. The GUI is used to view the network status, to create and modify NCPs and Location profiles, and to start and stop configured ENMs. Interaction with the GUI requires four of the `solaris.network.autoconf` authorizations or the Network Autoconf Admin profile. By default, the Console User profile has sufficient authorizations to view the network status and profiles by using the GUI. In addition, you require the `solaris.network.autoconf.write` authorization or the Network Autoconf Admin profile to modify profiles by using the GUI.

You can obtain additional authorizations in one of the following ways:

- Assign the Network Autoconf Admin profile to a specific user.

    You can assign appropriate authorizations, or rights profiles, directly to a given user by editing the `/etc/user_attr` file for that user.

■ Assign the Network Autoconf Admin profile to the Console User profile.

You can assign this profile to the Console User profile instead of the Network Autoconf User profile that is assigned by default. To assign this profile, edit the entry in the `/etc/security/prof_attr` file.

Where to Find Network Configuration Tasks

The following table lists network configuration topics and where to go for more information.

Networking Task	For More Information
Create, modify, and list profiles and configuration objects by using the `netcfg` command.	Chapter 2, "Creating and Configuring Reactive Network Profiles (Tasks)"
View information about and administer profiles and configuration objects by using the `netadm` command.	Chapter 3, "Administering Your Reactive Network Configuration (Tasks)"
View information about your network status, switch network connections, and create and modify profiles and configuration objects by using the network administration GUI from the desktop.	Chapter 4, "Using the Network Administration Graphical User Interface," and the online help
Switch between reactive network configuration and fixed network configuration.	"Switching Between Fixed and Reactive Network Configurations" on page 74
Create a network configuration in the currently active NCP.	Chapter 3, "Working With Datalinks," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1* and Chapter 4, "Working With IP Interfaces," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*
Configure and manage virtual networks.	Chapter 1, "Network Virtualization and Resource Management in Oracle Solaris," in *Using Virtual Networks in Oracle Solaris 11.1*

2

Creating and Configuring Reactive Network Profiles (Tasks)

This chapter describes profile-based network configuration tasks that you can perform to configure reactive network on your system by using the netcfg command in either interactive mode or command-line mode. These configuration tasks include creating user-defined profiles, modifying user-defined profiles, as well as managing the various SMF services that control the system network configuration.

Although the primary focus of this chapter is on reactive profiles, the netcfg command also includes limited features related to fixed profiles, primarily for viewing fixed profiles and their properties. For more information, see "Listing All of the Profile Configuration Information on a System" on page 63.

The following topics are covered in this chapter:

- "Configuring Profiles by Using the netcfg Command" on page 32
- "netcfg and netadm Subcommands" on page 35
- "Creating User-Defined Profiles" on page 39
- "Setting and Changing Property Values for a Profile" on page 60
- "Listing Profile Configuration Information on a System" on page 63
- "Enabling and Disabling Profiles" on page 69

For information about switching network configuration, displaying profile states, exporting and restoring profiles, removing profiles, and managing known wireless networks, see Chapter 3, "Administering Your Reactive Network Configuration (Tasks)."

For information about how to interact with the system network and to manage your network configuration from the desktop, see Chapter 4, "Using the Network Administration Graphical User Interface."

For overview information about reactive network configuration, see Chapter 1, "Reactive Network Configuration (Overview)."

Configuring Profiles by Using the netcfg Command

You can use the netcfg command to select, create, modify, and remove user-defined profiles. For information about the netcfg subcommands, see "netcfg Subcommands" on page 35. The netcfg command can be used in either interactive mode or command-line mode. This command also supports the export of profile configuration information to an output file.

You can use the netcfg command to display profile configuration data, and to display, create, and modify Known WLAN objects, if you have the Console User privileges. These privileges are automatically assigned to any user who is logged in to the system from /dev/console. Users who have the Network Autoconf Admin rights profile can also create and modify all types of reactive network (NWAM-managed) profiles and configuration objects. For more information, see "Network Configuration Security and Authorizations" on page 26.

You can create and configure your profiles in any of the following modes:

- Command-line mode
- Interactive mode
- Command-file mode

When you are in netcfg interactive mode, it is fairly easy to understand the syntax to use for this command. However, in command-line mode, the syntax might be less obvious.

netcfg Interactive Mode

The concept of a *scope* is used for the netcfg command. When you use the command interactively, the scope you are in at any given time depends on the profile type and the task that you are performing. When you type the netcfg command in a terminal window, a prompt is displayed at the *global scope*.

From the global scope prompt, you can use the select or create subcommands to view, modify, or create the following profile types, which are the top-level profiles:

- NCPs
- Locations
- ENMs
- Known WLANs

Before you can create or select a profile, the netcfg interactive prompt is displayed in the following form:

netcfg>

After you have created or selected a profile, the netcfg interactive prompt is displayed as follows:

netcfg:*profile-type*:*profile-name*>

You can use the netcfg command in interactive mode to perform the following tasks:

- Create a profile.
- Select and modify a profile.
- Verify that all of the required information about a profile is set and valid.
- Commit the changes for a new profile.
- Cancel the current profile configuration without committing any changes to persistent storage.
- Revert the changes that you made for a profile.

Selecting or creating a top-level profile while working in netcfg interactive mode results in a command prompt that is displayed in the *profile scope* for Location profiles and ENMs. For example:

```
netcfg> select loc test-loc
netcfg:loc:test-loc>
```

If an NCP is selected, the command prompt is displayed is the *NCP scope*. From the NCP scope, an NCU can be selected or created. Selecting or creating an NCU results in a profile scope prompt for the selected NCU. In this scope, all of the properties that are associated with the currently selected profile can be viewed and set.

In the following example, the User NCP is first selected, then an NCU is created in the NCP scope. This action results in the profile scope for the newly created NCU. In this scope, the properties of the NCU can be viewed or set.

```
netcfg> select ncp User
netcfg:ncp:User> create ncu phys net2
Created ncu 'net2'.  Walking properties ...
activation-mode (manual) [manual|prioritized]>
```

At any given scope, the command prompt indicates the currently selected profile. Any changes that you make to the profile in this scope can be *committed*, meaning that the changes are saved to the persistent storage. Changes are implicitly committed upon exiting the scope. If you do not want to commit the changes that you made to the selected profile, you can revert to the last committed state for that profile. Doing this action reverts any changes that you made to the profile at that level. The revert and cancel subcommands work similarly.

Note – The walkprop subcommand, which "walks" you through each property that is associated with a profile is meaningful when used in interactive mode. For information about the netcfg subcommands, see "netcfg Subcommands" on page 35.

---

netcfg Command-Line Mode

In command-line mode, any subcommand that affects a selected profile or property must be performed in the particular scope in which the selected profile or property exists. Thus, to obtain the value of a property of an NCU, you would use the get subcommand in the scope of that particular NCU.

For example, to obtain the value of a property ip-version which is an attribute of an NCU called myncu in the User NCP, you would use the following syntax:

```
$ netcfg "select ncp User; select ncu ip myncu; get ip-version"
```

In this syntax, note the following:

- Each scope is separated by a semicolon.
- The select subcommand is issued at each scope, once at the global scope and once at the profile scope.
- The get subcommand is used within the scope in which the property ip-version exists.
- Straight quotation marks are required to prevent the shell from interpreting the semicolons.

Note – In command-line mode, you must type the complete command on a single line. Changes that you make to a selected profile by using the netcfg command in command-line mode are committed to the persistent storage as soon as you finish typing the command.

You can use any of the subcommands listed in "netcfg Subcommands" on page 35 in command-line mode except the walkprop subcommand.

---

netcfg Command-File Mode

In command-file mode, profile configuration information and commands are taken from a file. The commands in the file are same as that in the interactive mode or those that are given by the export subcommand. The export subcommand is used to produce this file. The configuration can then be printed to standard output, or the -f option can also be used to specify an output file. For example, the following command exports the current configuration to a file:

```
$ netcfg export -f /tmp/nwam.config
```

To import configuration from a file, type the following command:

```
$ netcfg -f /tmp/nwam.config
```

The export subcommand can also be used interactively. For information about how to export profile configuration by using netcfg command-file mode see, Example 3–4.

netcfg and netadm Subcommands

The netcfg command manipulates system network configuration profiles. The netcfg command can be invoked interactively, with an individual subcommand, or by specifying a command file that contains a series of subcommands. The netadm command administers the profiles and also interacts with nwamd by using the subcommands.

netcfg Subcommands

The following netcfg subcommands are supported in interactive mode and command-line mode. Note that certain subcommands have different semantics within each scope. If a subcommand cannot be used in a certain mode, the subcommand's description notes that. The subcommands are ordered alphabetically.

- cancel

  Ends the current profile specification without committing the current changes to persistent storage, then proceeds to the previous scope, which is one level higher.

- clear *prop-name*

  Clears the value for the specified property.

- commit

  Commits the current profile specification to persistent storage. A configuration must be correct to be committed. Therefore, this operation automatically performs a verify operation on the profile or object as well. The commit operation is attempted automatically upon exiting the current scope by using either the end or exit subcommand.

- create [-t *template*] *object-type* [*class*] *object-name*

  Creates an in-memory profile with the specified type and name. The -t *template* option specifies that the new profile be identical to *template*, where *template* is the name of an existing profile of the same type. If the -t option is not used, the new profile is created with the default values.

- destroy -a

  Removes all user-defined profiles from memory and persistent storage.

- destroy *object-type* [*class*] *object-name*

  Removes the specified user-defined profile from memory and persistent storage.

> ⚠️ **Caution** – This operation is immediate and does not need to be committed. A removed profile cannot be reverted.

- end

Ends the current profile specification and proceeds to the previous scope, which is one level higher. The current profile is verified and committed before the edit operation ends. If either the verify or commit operation fails, an error message is displayed. You are then given the opportunity to end the operation without committing the current changes. Alternatively, you can remain in the current scope and continue editing the profile.

- exit

   Exits the netcfg interactive session. The current profile is verified and committed before the current session ends. If either the verify or commit operation fails, an error message is displayed. You are then given the opportunity to end the session without committing the current changes. Alternatively, you can remain in the current scope and continue editing the profile.

- export [-d] [-f *output-file*] [*object-type* [*class*] *object-name*]

   Prints the current configuration at the current or specified scope to standard output or to a file that is specified with the -f option. The -d option generates the destroy -a subcommand as the first line of output. This subcommand produces output in a form that is suitable for use in a command file. For information about how to export and restore profile configuration, see "Exporting and Restoring a Profile Configuration" on page 77.

   Note – You cannot export system-defined profiles. System-defined profiles include the Automatic and DefaultFixed NCPs and the Automatic, NoNet, and DefaultFixed locations.

- get [-V] *prop-name*

   Gets the current, in-memory value of the specified property. By default, both the property name and value are printed. If the -V option is specified, only the property value is printed.

- help [*subcommand*]

   Displays general help or help about a specific subject.

- list [-a] [*object-type* [*class*] *object-name*]

   Lists all profiles property-value pairs that are used at the current or specified scope. When listing properties of an object, the default behavior is to only list properties that apply to the specified configuration. That is, if listing an IP NCU for which ipv4-addrsrc is dhcp, the ipv4-addr property is not listed. Including the -a option results in all properties being listed, whether or not they apply to the current settings.

- revert

   Deletes any current changes that were made to a profile, then reverts to the values from persistent storage.

- select *object-type* [*class*] *object-name*

   Selects the object that is specified.

- set *prop-name*=*value*

Sets the current, in-memory value of the specified property.

If performed in command-line mode, the change is also committed immediately to persistent storage.

The delimiter for properties with multiple values is a comma (,). If an individual value for a given property contains a comma, it must be preceded it with a backslash (\). Commas within properties that only have a single value are not interpreted as delimiters and do not need to be preceded by a backslash.

- verify

  Verifies that the current, in-memory profile or object has a valid configuration.

- walkprop [-a]

  "Walks" each property that is associated with the current profile. For each property, the name and current value are displayed. A prompt is provided to enable you to change the current value.

  The delimiter for properties with multiple values is a comma (,). If an individual value for a given property contains a comma, it must be preceded by a backslash (\). Commas within properties that only have a single value are not interpreted as delimiters and do not need to be preceded by a backslash.

  By default, only properties that are required based on properties that are already set are walked. If ipv4-addrsrc is set to dhcp, then ipv4-addr is not walked. Including the -a option iterates all available properties for the specified profile or object.

Note – The walkprop subcommand is meaningful when used in interactive mode only.

---

netadm Subcommands

The following netadm subcommands are supported:

- enable [-p *profile-type*] [-c *ncu-class*] *profile-name*

  Enables the specified profile. If the profile name is not unique, the profile type must be specified. If the profile type is ncu, and the name is not unique, for example, if both a link and an interface NCU have the same name, both NCUs are enabled, unless the -c option is used to specify the NCU class.

  The profile type must be one of the following:

  - ncp
  - ncu
  - loc
  - enm
  - wlan

  The NCU class must be specified as either phys for link NCU or ip for interface NCU.

- disable [-p *profile-type*] [-c *ncu-class*] *profile-name*

  Disables the specified profile. If the profile name is not unique, the profile type must be specified to identify the profile that is to be disabled. If the profile type is ncu and the name is not unique, for example, if both a link and an interface ncu have the same name, both NCUs are disabled, unless the -c option is used to specify the NCU class.

  The profile type must be one of the following:

  - ncp
  - ncu
  - loc
  - enm
  - wlan

  The NCU class must be specified as either phys or ip.

- list [-x] [-p *profile-type*] [-c *ncu-class*] [*profile-name*]

  Lists all of the available profiles and their current state. If a profile is specified by name, then only the current state of that profile is listed. If the profile name is not unique, all of the profiles with that specified name are listed. Alternatively, the profile type, the NCU class, or both can be included to identify a specific profile. If just the profile type is specified, all of the profiles of that type are listed.

  Listing the enabled NCP includes all of the NCUs that make up that NCP.

  If the -x option is specified, an expanded description of the auxiliary state of each listed profile is included in the output.

  Possible profile auxiliary state values include the following:

  - disabled

    Indicates a manually enabled profile that has not been enabled.

  - offline

    Indicates a conditionally enabled or system-enabled profile that has not been enabled. The profile might not be active because its conditions have not been satisfied. Alternatively, the profile might not be active because another profile with more specific conditions that are met has been enabled. This condition applies to profile types that must be enabled one at a time, for example, the Location profile.

  - online

    Indicates a conditionally enabled or system-enabled profile whose conditions have been met and that has been successfully enabled. Alternatively, it might indicate a manually enabled profile that has been successfully enabled at the request of the user.

  - maintenance

    Indicates that activation of the profile was attempted, but failed.

  - initialized

Indicates that the profile represents a valid configuration object for which no action has yet been taken.

- uninitialized

  Indicates that the profile represents a configuration object that is not present on the system. For example, this state could indicate an NCU that corresponds to a physical link that was removed from the system.

- show-events

  Listens for and displays a stream of events from the network management daemon, nwamd.

- scan-wifi *link-name*

  Initiates a wireless scan on the link that is specified as *link-name*.

- select-wifi *link-name*

  Selects a wireless network to connect to from scan results on the link that is specified as *link-name*.

- help

  Displays a usage message with a short description of each subcommand.

Creating User-Defined Profiles

You can use the netcfg command to create user-defined profiles. The command can be used in either interactive mode or command-line mode. The netcfg command also supports the export of profile configuration information to an output file. For more information about command-line mode and interactive mode, see "netcfg Command-Line Mode" on page 34 and "netcfg Interactive Mode" on page 32.

You can use the netcfg command to create user-defined profiles, if you have the Console User privileges. These privileges are automatically assigned to any user who is logged in to the system from /dev/console. Users who have the Network Autoconf Admin rights profile can also create and modify all types of reactive network (NWAM-managed) profiles and configuration objects. For more information, see "Network Configuration Security and Authorizations" on page 26.

You can create the following profiles and configuration objects:

- Network configuration profiles (NCPs)
- Location profiles
- External network modifiers (ENMs)
- Known wireless local area networks (Known WLANs)
- Network configuration units (NCUs)

For information about profiles and configuration objects, see "Network Profiles and Types" on page 11.

> **Note –** The `Automatic` and `DefaultFixed` NCPs and Location profiles are system-defined. Do not attempt to create these profiles by using the `netcfg` command.

The basic command syntax to create a profile from the command-line is as follows:

`netcfg create [ -t` *template* **`]`** *object-type* **`[`** *class* **`]`** *object-name*

create
: Creates an in-memory profile (or configuration object) of the specified type and name.

-t *template*
: Specifies that the new profile be identical to *template*, where *template* is the name of an existing profile of the same type. If the `-t` option is not used, the new profile is created with default values.

object-type
: Specifies the type of profile to be created.

  You can specify one of the following values for the *object-type* option:

  - ncp
  - ncu
  - loc
  - enm
  - wlan

  All profiles that are specified by the *object-type* option, with the exception of an ncu, must be created at the global scope before you can use the `netcfg select` command to select the particular object.

class
: Specifies the class of profile that is specified by *object-type*. This parameter is only used for the ncu object type, and has two possible values, phys (for link NCUs) or ip (for interface NCUs).

object-name
: Specifies the name of the user-defined profile. For an NCU, *object-name* is the name of the corresponding link or interface. For all the other profile types, *object-name* is any user-defined name.

> **Note –** For the creation of NCPs, the `class` option is not required.

Optionally, you can use a copy of the `Automatic` NCP as your template, then make changes to that profile, as shown here:

```
$ netcfg> create -t Automatic ncp test
```

To create a Location profile with the name `office`, you would type the following command:

```
$ netcfg> create loc office
```

For information about the netcfg subcommands, see "netcfg Subcommands" on page 35.

Creating an NCP

Creating a profile in interactive mode results in a command prompt in one of the following scopes:

- In the NCP scope, if an NCP is created
- In the profile scope, if a Location profile, an ENM profile, or a Known WLAN profile is created

Creating an NCP or an NCU moves the focus into that object's scope, walking you through the default properties for the specified profile.

To interactively create an NCP, you begin by initiating a netcfg interactive session. Then, you use the create subcommand to create the new NCP. For example:

```
$ netcfg
netcfg> create ncp User
netcfg:ncp:User>
```

Creating NCUs for an NCP

The NCP is essentially a container that consists of a set of NCUs. All NCPs contain both link and interface NCUs. Link NCUs specify both the link configuration and link selection policy. Interface NCUs specify the interface configuration policy. If IP connectivity is required, both a link and an interface NCU are required. NCUs must be added or removed explicitly by using the netcfg command or by using the network administration GUI. For more information about adding and removing NCUs using the network administration GUI, see "Editing Network Profiles" on page 102.

The DefaultFixed NCP cannot be modified by using the netcfg command. You can use the ipadm and dladm commands to create, modify, or delete NCUs in the DefaultFixed NCP while the NCP is active. You can also use the ipadm and dladm commands to add NCU classes other than physical links and IP interfaces to reactive NCPs. The ipadm and dladm commands provide the capabilities to create and modify more complex link and interface classes.

For more information about the ipadm and dladm commands, see Chapter 3, "Working With Datalinks," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1* and Chapter 4, "Working With IP Interfaces," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

> **Note** – You can add NCUs that do not correlate to any link that is currently installed on the system. Additionally, you can remove NCUs that map to a link that is currently installed on the system.

You can create NCUs by using the netcfg command in either interactive mode or command-line mode. Because creating an NCU involves several operations, it is easier and more efficient to create NCUs in interactive mode, rather than trying to construct a single-line command that creates the NCU and all of its properties. NCUs can be created when you initially create an NCP or afterward. The process of creating or modifying an NCU involves setting general NCU properties, as well as setting properties that specifically apply to each NCU type.

The properties that you are presented with during the process of creating NCUs for an NCP make the most sense based on the choices that you made during the creation of that particular NCP.

When you create an NCU interactively, netcfg walks you through each relevant property, displaying both the default value, where a default exists, and the possible values. Pressing Return without specifying a value applies the default value (or leaves the property empty if there is no default), or you can specify an alternate value. The properties that are displayed during the process of creating NCUs for an NCP are relevant based on the choices that you have already made. For example, if you choose dhcp for the ipv4-addrsrc property for an interface NCU, you are not prompted to specify a value for the ipv4-addr property.

The following table describes all of the NCU properties that you might specify when creating or modifying an NCU. Some properties apply to both NCU types. Other properties apply to either a link NCU or an interface NCU. For a complete description of all of the NCU properties, including rules and conditions that might apply when you specify these properties, see the netcfg(1M) man page.

TABLE 2–1 NCU Properties to Create or Modify an NCU

Property	Description	Possible Values	NCU Type
type	Specifies the NCU type, either link or interface.	link or interface	Link and interface
class	Specifies the NCU class.	phys (for link NCUs) or ip (for interface NCUs)	Link and interface
parent	Specifies the NCP to which this NCU belongs.	*parent-NCP*	Link and interface

TABLE 2–1   NCU Properties to Create or Modify an NCU   *(Continued)*

Property	Description	Possible Values	NCU Type
enabled	Specifies whether the NCU is enabled or disabled. This property is read-only. It is changed indirectly when you use the `netadm` command or the network administration GUI to enable or disable the NCU.	`true` or `false`	Link and interface
activation-mode	Specifies the type of trigger for the automatic activation of the NCU.	`manual` or `prioritized` The default value is `manual`.	Link
priority-group	Specifies the group priority number.	`0` (for wired links) or `1` (for wireless links) For user-defined NCPs, different policies can be specified, for example, wireless link 1 is priority 1, wired link 1 is priority 2, and wired link 2 is priority 3. **Note –** A lower number indicates a higher priority.	Link
priority-mode	Specifies the mode that is used to determine the activation behavior for a priority group, if the `activation-mode` property is set to `prioritized`.	`exclusive`, `shared`, or `all` For the rules that apply when you specify these values, see the netcfg(1M) man page.	Link
mac-address	Specifies the MAC address that is assigned to this link. By default, the factory-assigned or the default MAC address is used for the link. A different value can be set here to override that selection.	A string containing a 48–bit MAC address	
autopush	Identifies modules that are automatically pushed over the link when it is opened.	A list of strings (modules that are to be pushed over the link) For information, see the autopush(1M) man page.	Link
mtu	Is automatically set to the default MTU for the physical link. The value can be overridden by setting the property to a different value.	MTU size for the link	Link
ip-version	Specifies the version of IP to use. Multiple values can be assigned.	`ipv4` and `ipv6` The default value is `ipv4`, `ipv6`.	Interface

TABLE 2–1 NCU Properties to Create or Modify an NCU   *(Continued)*

Property	Description	Possible Values	NCU Type
`ipv4-addrsrc`	Identifies the source of IPv4 addresses that are assigned to this NCU. Multiple values can be assigned.	`dhcp` and `static` The default value is `dhcp`.	Interface
`ipv6-addrsrc`	Identifies the source of IPv6 addresses assigned to this NCU. Multiple values can be assigned.	`dhcp`, `autoconf`, or `static` The default value is `dhcp`, `autoconf`.	Interface
`ipv4-addr`	Specifies one or more IPv4 addresses to be assigned to this NCU.	One or more IPv4 addresses to be assigned	Interface
`ipv6-addr`	Specifies one or more IPv6 addresses to be assigned to this NCU.	One or more IPv6 addresses to be assigned	Interface
`ipv4-default-route`	Specifies the default route for an IPv4 address.	An IPv4 address	Interface
`ipv6-default-route`	Specifies the default route for an IPv6 address.	An IPv6 address	Interface

▼ How to Interactively Create an NCP With NCUs

The following procedure describes how to create an NCP and NCUs for the NCP in interactive mode.

Note – The "walk" process that the system network performs during the initial profile creation ensures that you are prompted for only those properties that are applicable, given the choices that you made previously.

---

1 **Initiate an `netcfg` interactive session.**

```
$ netcfg
netcfg>
```

2 **Create the NCP.**

```
netcfg> create ncp User
netcfg:ncp:User>
```

where `ncp` is the profile type and `User` is the profile name.

Creating the NCP automatically takes you into the NCP scope. If you were creating a location, an ENM, or a WLAN object, the command prompt would take you to that profile scope.

> **Note –** Repeat Steps 3 and 4 until all of the required NCUs for the NCP are created.

3 **Create the link and interface NCUs for the NCP.**

    a. **To create the link NCU, type the following command:**

```
netcfg:ncp:User> create ncu phys net0
Created ncu 'net0', Walking properties ...
```

    where ncu is the object type, phys is the class, and net0 (for example purposes *only*) is the object name.

    Creating an NCU moves you into that object's scope and walks you through the default properties for the object.

    For information about NCU properties, see Table 2–1.

    b. **To create an interface NCU, type the following command:**

```
netcfg:ncp:User> create ncu ip net0
Created ncu 'net0'. walking properties ...
```

    where ncu is the object type, ip is the class, and net0 (for example purposes *only*) is the object name.

    Creating an NCU moves you into that object's scope and walks you through the default properties for the object.

    During the creation of an NCU, the class option is used to differentiate between the two types of NCUs. This option is especially valuable in situations where different NCU types share the same name. If the class option is omitted, it is much more difficult to distinguish NCUs that share the same name.

4 **Add the appropriate properties for the NCU that you created.**

5 **During the creation of the NCU, or when setting property values for a specified NCU, use the verify subcommand to ensure that the changes that you made are correct.**

```
netcfg:ncp:User:ncu:net0> verify
All properties verified
```

The verify subcommand verifies your configuration and notifies if any required values are missing. You can verify your changes by using the verify subcommand explicitly when creating or modifying a profile.

6 **Commit the properties that you set for the NCU.**

```
netcfg:ncp:User:ncu:net0> commit
committed changes.
```

The commit subcommand implicitly verifies your changes.

Alternatively, you can use the end subcommand to perform an implicit commit, which moves the interactive session up one level to the next higher scope. In this instance, if you have completed creating the NCP and adding NCUs to it, you can exit the interactive session directly from the NCP scope.

In interactive mode, changes are not saved to persistent storage until you commit them. When you use the commit subcommand, the entire profile is committed. To maintain the consistency of persistent storage, the commit operation also includes a verification step. If the verification fails, the commit operation also fails. If an implicit commit fails, you are given the option of ending or exiting the interactive session without committing the current changes. Alternatively, you can remain in the current scope and continue making changes to the profile.

Note – To cancel the changes that you made, use the cancel or the revert subcommand.

The cancel subcommand ends the current profile configuration without committing the current changes to persistent storage, then moves the interactive session up on level to the next higher scope. The revert subcommand undoes the changes that you made and rereads the previous configuration. When you use the revert subcommand, the interactive session remains in the same scope.

7   **Use the list subcommand to display the NCP configuration.**

8   **When you are finished configuring the NCP, exit the interactive session.**

```
netcfg:ncp:User> exit
```

Any time that you use the exit subcommand to end a netcfg interactive session, the current profile is verified and committed. If either the verification or the commit operation fails, an appropriate error message is issued, and you are given the opportunity to exit without committing the current changes. Alternatively, you can remain in the current scope and continue making changes to the profile.

Note – To exit the scope without exiting the netcfg interactive session, type the end subcommand:

```
netcfg:ncp:User> end
netcfg>
```

Example 2–1   Interactively Creating an NCP With NCUs

In the following example, an NCP and two NCUs (one link and one interface) are created.

```
$ netcfg
netcfg> create ncp User
netcfg:ncp:User> create ncu phys net0
Created ncu 'net0', Walking properties ...
```

```
activation-mode (manual) [manual|prioritized]>
mac-address>
autopush>
mtu>
netcfg:ncp:User:ncu:net0> end
Committed changes
netcfg:ncp:User> create ncu ip net0
Created ncu 'net0'. Walking properties ...
ip-version (ipv4,ipv6) [ipv4|ipv6]> ipv4
ipv4-addrsrc (dhcp) [dhcp|static]> dhcp
ipv4-default-route>
netcfg:ncp:User:ncu:net0> verify
All properties verified
netcfg:ncp:User:ncu:net0> end
Committed changes
netcfg:ncp:User> list
ncp:User
        management-type      reactive
NCUs:
        phys     net0
        ip       net0
netcfg:ncp:User> list ncu phys net0
ncu:net0
        type                 link
        class                phys
        parent               "User"
        activation-mode      manual
        enabled              true
netcfg:ncp:User> list ncu ip net0
ncu:net0
        type                 interface
        class                ip
        parent               "User"
        enabled              true
        ip-version           ipv4
        ipv4-addrsrc         dhcp
        netcfg:ncp:User> exit
$
```

In this example, because the value ipv4 is chosen, no prompt is displayed for the ipv6-addrsrc property, as this property is unused. Likewise, for the phys NCU, the default value (manual activation) for the priority-group property is accepted, so no other conditionally related properties are applied.

Example 2–2 Interactively Creating an NCU for an Existing NCP

To create an NCU for an existing NCP or to modify the properties of any existing profile, use the netcfg command with the select subcommand.

In the following example, an IP NCU is created for an existing NCP. The process of modifying an existing profile in interactive mode is similar to creating a profile. The difference between the following example and Example 2–1 is that in this example, the select subcommand is used instead of the create subcommand because the NCP already exists.

```
$ netcfg
netcfg> select ncp User
netcfg:ncp:User> list
ncp:User
        management-type     reactive
NCUs:
        phys    net0
netcfg:ncp:User> create ncu ip net0
Created ncu 'net0'. Walking properties ...
ip-version (ipv4,ipv6) [ipv4|ipv6]> ipv4
ipv4-addrsrc (dhcp) [dhcp|static]> dhcp
ipv4-default-route>
netcfg:ncp:User:ncu:net0> end
Committed changes
netcfg:ncp:User> list
ncp:User
        management-type     reactive
NCUs:
        phys    net0
        ip      net0
netcfg:ncp:User> list ncu phys net0
ncu:net0
        type                link
        class               phys
        parent              "User"
        activation-mode     manual
        enabled             true
netcfg:ncp:User> list ncu ip net0
NCU:net0
        type                interface
        class               ip
        parent              "User"
        enabled             true
        ip-version          ipv4
        ipv4-addrsrc        dhcp
        netcfg:ncp:User> exit
$
```

Creating a Location Profile

A Location profile contains properties that define network configuration values that are not directly related to basic link and IP connectivity. Some examples include naming service and IP Filter settings that are applied together, when required. At any given time, one Location profile and one NCP must be active on the system.

There are system-defined locations and user-defined locations. System-defined locations are the default locations chosen by the network management daemon, nwamd, under certain conditions, for example, if you did not specify a location, or if no manually enabled locations are enabled, and none of the conditions of the conditionally enabled locations has been met. System-defined locations have a system activation mode. User-defined locations are configured to be manually or conditionally enabled, according to network conditions, for example, an IP address that is obtained by a network connection.

For information about manually activating (enabling) a Location profile, see "Enabling and Disabling Profiles" on page 69.

You can create locations by using the `netcfg` command in either interactive mode or command-line mode. When you create a Location profile, you must set the properties for the location by specifying values that define the particular configuration properties for that location. Location properties are categorized by group, where the group signifies a particular class of configuration preferences.

Location properties are also stored in a repository. When a particular Location profile is enabled, its properties are automatically applied to the running system. Creating or modifying Location profiles involves setting various properties that define how the profile is configured and setting properties that define when the profile should be enabled. The properties that you are presented with during the configuration process are based on the property values that you have already set.

The following table describes all of the location properties that can be specified. Note that location properties are categorized by group. For a complete description of all of the location properties, including any rules, conditions, and dependencies that might apply when you specify any of these properties, see the `netcfg(1M)` man page.

TABLE 2–2 Location Properties and Their Descriptions

Property Group and Description	Property Value and Description
Selection criteria Specifies the criteria for how and when a location is enabled or disabled.	■ `activation-mode` The possible values for the `activation-mode` property are `manual`, `conditional-any`, and `conditional-all`. ■ `conditions` For information about the criteria and operations that can be used to construct the condition strings, see Table 1–1.
System domain Determines a host's domain name for direct use by the NIS naming service.	The `system-domain` property consists of the `default-domain` property. This property specifies the system-wide domain that is used for Remote Procedure Call (RPC) exchanges.

TABLE 2–2   Location Properties and Their Descriptions   *(Continued)*

Property Group and Description	Property Value and Description
Name services information Specifies the naming service to use and the naming service switch configuration.	The following is a list of properties for the specified naming service: ■ `domain-name` ■ `nameservices` ■ `nameservices-config-file` ■ `dns-nameservice-configsrc` ■ `dns-nameservice-domain` ■ `dns-namservice-servers` ■ `dns-nameservice-search` ■ `dns-nameservice-sortlist` ■ `dns-nameservice-options` ■ `nis-nameservice-configsrc` ■ `nis-namservice-servers` ■ `ldap-nameservice-configsrc` ■ `ldap-namservice-servers` For more information about these properties, see the "Location Properties" section in the netcfg(1M) man page.
NFSv4 domain Specifies the NFSv4 domain.	The value that is used for the system's nfsmapid_domain property. This value is used to set the nfsmapid_domain SMF property, as described in the nfsmapid man page, while the location is active. If this property is not set, the system's nfsmapid_property is cleared when the location is active. For more information, see the nfsmapid(1M) man page .
IP Filter configuration Specifies the parameters that are used for IP Filter configuration. For these properties, the paths to the appropriate ipf and ipnat files containing IP filter and NAT rules are specified.	■ `ipfilter-config-file` ■ `ipfilter-v6-config-file` ■ `ipnat-config-file` ■ `ippool-config-file` If a configuration file is specified, the rules that are contained in the identified file are applied to the appropriate ipfilter subsystem.
Configuration files for IPsec Specifies which files to use for IPsec configuration.	■ `ike-config-file` ■ `ipsecpolicy-config-file`

▼ How to Interactively Create a Location Profile

The following procedure describes how to create a Location profile.

> **Note –** The "walk" process that the reactive network performs during an initial profile creation only prompts you for those properties that are applicable, given the values that you entered previously.

For information about the netcfg subcommands, see "netcfg Subcommands" on page 35.

1   Initiate an `netcfg` interactive session.

```
$ netcfg
netcfg>
```

2   Create or select the location.

```
netcfg> create loc office
netcfg:loc:office>
```

In this example, the location office is created.

Creating the location automatically moves you to into the profile scope for this location.

3   Set the appropriate properties for the location.

For information about the location properties, see Table 2–2.

4   Display the profile configuration.

For example, the following output displays the properties for the location office:

```
netcfg:loc:office> list
LOC:office
    activation-mode            conditional-any
    conditions                 "ncu ip:wpi0 is active"
    enabled                    false
    nameservices               dns
    nameservices-config-file   "/etc/nsswitch.dns"
    dns-nameservice-configsrc  dhcp
    ipfilter-config-file       "/export/home/test/wifi.ipf.conf"
```

5   Verify that the profile configuration is correct.

In the following example, the configuration for the location office is verified:

```
netcfg:loc:office> verify
All properties verified
```

The verify subcommand verifies your configuration and notifies if any required values are missing. You can verify your changes by using the verify subcommand explicitly when creating or modifying a profile.

6   When you complete the verification, commit the Location profile to persistent storage.

```
netcfg:loc:office> commit
Committed changes
```

The commit subcommand implicitly verifies your changes.

Alternatively, you can use the end subcommand to end the session, which also saves the profile configuration.

```
netcfg:loc:office> end
Committed changes
```

In interactive mode, changes are not saved to persistent storage until you commit them. When you use the commit subcommand, the entire profile is committed. To maintain the consistency of persistent storage, the commit operation also includes a verification step. If the verification fails, the commit operation also fails. If an implicit commit fails, you are given the option of ending or exiting the interactive session without committing the current changes. Alternatively, you can remain in the current scope and continue making changes to the profile.

Note – To cancel the changes that you made, use the cancel subcommand.

The cancel subcommand ends the current profile configuration without committing the current changes to persistent storage, then moves the interactive session up one level to the next higher scope.

---

7   Exit the interactive session.

```
netcfg> exit
$
```

Example 2–3   Interactively Creating a Location Profile

In the following example, a location named office is created.

```
$ netcfg
netcfg> create loc office
Created loc 'office'.  Walking properties ...
activation-mode (manual) [manual|conditional-any|conditional-all]> conditional-any
conditions> ncu ip:wpi0 is active
nameservices (dns) [dns|files|nis|ldap]>
nameservices-config-file ("/etc/nsswitch.dns")>
dns-nameservice-configsrc (dhcp) [manual|dhcp]>
nfsv4-domain>
ipfilter-config-file> /export/home/test/wifi.ipf.conf
ipfilter-v6-config-file>
ipnat-config-file>
ippool-config-file>
ike-config-file>
ipsecpolicy-config-file>
netcfg:loc:office> list
LOC:office
    activation-mode             conditional-any
    conditions                  "ncu ip:wpi0 is active"
    enabled                     false
    nameservices                dns
    nameservices-config-file    "/etc/nsswitch.dns"
    dns-nameservice-configsrc   dhcp
```

```
    ipfilter-config-file         "/export/home/test/wifi.ipf.conf"
netcfg:loc:office> verify
All properties verified
netcfg:loc:office> commit
Committed changes
netcfg:loc:office> end
netcfg> list
NCPs:
    DefaultFixed
    User
    Automatic
Locations:
    Automatic
    NoNet
    office
    DefaultFixed
WLANs:
    sunwifi
    ibahn
    gogoinflight
    admiralsclub
    hhonors
    sjcfreewifi
netcfg> exit
$
```

In this example, the following properties were specified for the office location:

- The activation-mode property was set to conditional-any, which resulted in a command prompt that enabled the conditions for activation to be specified. For information about the criteria and operations that can be used to construct the condition strings, see Table 1–1.

- The condition for activation was specified as: ncu ip:wpi0 is active.

Note – The conditions property was required because the conditional-any property was specified in the previous step. If, for example, the manual property had been specified, the conditions property would not be required.

- The following default values were accepted by pressing Return:
    - nameservices
    - nameservices-config-file
    - dns-nameservice-configsrc
    - nfsv4-domain
- For the ipfilter-config-file property, the /export/home/test/wifi.ipf.conf file was specified.
- The following default values were accepted by pressing Return:
    - ipfilter-v6-config-file
    - ipnat-config-file
    - ippool-config-file

- ike-config-file
- ipsecpolicy-config-file
- The list subcommand was used to view the properties of the Location profile.
- The verify subcommand was used to perform a verification of the configuration.
- The commit subcommand was used to commit the changes to persistent storage.
- The list subcommand was used again to ensure that the new location was created correctly and that it contains the correct information.
- The exit subcommand was used to exit the netcfg interactive session.

Creating an ENM Profile

ENMs enable you to specify when applications or scripts, for example, a VPN application, should perform their own network configuration external to the configuration specified in the NCP and Location profiles. For more information about ENMs, see "Description of an ENM" on page 15.

Note – The system does not automatically recognize an application for which you might create an ENM. These applications must first be installed and then configured on your system before you can use the netcfg command to create an ENM for them.

To create an ENM, type the following command:

```
$ netcfg
netcfg> create enm my_enm
Created enm 'my_enm'.  Walking properties ...
```

where enm is the ENM profile and my_enm is the object name.

The process of creating the ENM takes you to the profile scope for the newly created ENM, and automatically begins a walk of the properties in the newly created ENM. From the profile scope, you can set properties for the ENM that dictate when and how the ENM is enabled, as well as other conditions, including the ENM's start and stop method.

For further instructions about specifying ENM properties, see the netcfg(1M) man page.

The following table describes the properties that you might specify when creating or modifying an ENM.

TABLE 2–3   ENM Properties and Descriptions

Property Name	Description	Possible Values
activation-mode	Mode that is used to determine activation of an ENM.	conditional-any, conditional-all, manual

TABLE 2–3 ENM Properties and Descriptions   *(Continued)*

Property Name	Description	Possible Values
conditions	If activation-mode is conditional-any or conditional-all, specifies the test to determine whether the ENM must be enabled.	A string or strings formatted as specified in the Table 1–1, if the property is used
start	(Optional) Absolute path to the script to be executed upon activation.	Path to script, if this property is used
stop	(Optional) Absolute path to the script to be executed upon deactivation.	Path to script, if this property is used
fmri	(Optional) FMRI (fault managed resource identifier) to be enabled upon ENM activation. **Note –** Either an FMRI or a start script must be specified. If an FMRI is specified, both the start and stop properties are ignored.	Path to script

▼ How to Interactively Create an ENM Profile

The following procedure describes how to create an ENM profile by using test-enm as an example.

1 Initiate an `netcfg` interactive session.

```
$ netcfg
netcfg>
```

2 Create the ENM.

```
netcfg> create enm test-enm
Created enm 'test-enm'.  Walking properties ...
activation-mode (manual) [manual|conditional-any|conditional-all]>
fmri> svc:/application/test-enm:default
start>
stop>
netcfg:enm:test-enm>
```

Creating the ENM automatically moves you into the profile scope for this ENM and walks the properties. Then, set the fmri property.

For information about ENM properties, see Table 2–3.

3 Display the profile configuration.

```
netcfg:enm:test-enm> list
ENM:test-enm
    activation-mode    manual
    enabled            false
```

```
        fmri                "svc:/application/test-enm:default"
netcfg:enm:test-enm>
```

4   Verify that the profile configuration is correct.

```
netcfg:enm:test-enm> verify
All properties verified
```

The verify subcommand verifies your configuration and notifies if any required values are missing. You can verify your changes by using the verify subcommand explicitly when creating or modifying a profile.

5   When you complete the verification, commit the ENM profile to persistent storage.

```
netcfg:enm:test-enm> commit
Committed changes
```

The commit subcommand verifies the changes implicitly and then commits the changes.

Alternatively, you can use the end subcommand to end the session, which also saves the profile configuration.

```
netcfg:enm:test-enm> end
Committed changes
```

Example 2–4   Interactively Creating an ENM Profile

In the following example, an ENM named test-enm is created in interactive mode.

```
$ netcfg
netcfg> create enm test-enm
Created enm 'testenm'.  Walking properties ...
activation-mode (manual) [manual|conditional-any|conditional-all]>
fmri> svc:/application/test-app:default
start>
stop>
netcfg:enm:test-enm> list
ENM:test-enm
    activation-mode    manual
    enabled            false
    fmri               "svc:/application/test-enm:default"
netcfg:enm:test-enm> verify
All properties verified
netcfg:enm:test-enm> end
Committed changes
netcfg> list
NCPs:
    DefaultFixed
    User
    Automatic
Locations:
    Automatic
    NoNet
    test-loc
    DefaultFixed
ENMs:
```

```
    test-enm
WLANs:
    sunwifi
    ibahn
    gogoinflight
    admiralsclub
    hhonors
    sjcfreewifi
netcfg> exit
$
```

In this example, an ENM named test-enm was created with the following property values:

- The default value (manual) for the activation-mode property was accepted by pressing the Return key.
- The SMF FMRI property svc:/application/test-enm:default was specified as the method to use for enabling and disabling the application.

  Note that because an FMRI was specified, the start and stop method properties were bypassed.
- The list subcommand was used to view the properties of the ENM.
- The verify subcommand was used to ensure that the profile configuration is correct.
- The end subcommand was used to implicitly save the configuration.
- The end subcommand was used again to end the interactive session.

Creating a Known WLAN Profile

Known WLAN profiles store information about wireless networks, enabling NCPs to automatically configure wireless interfaces based on the configuration information of wireless networks that you connect to from your system. For more information about known WLANs, see "Description of a Known WLAN" on page 16.

To create a WLAN object, type the following command:

```
$ netcfg
netcfg> create wlan mywifi
Created wlan 'mywifi'.  Walking properties ...
```

where wlan is the WLAN object and mywifi is the object name.

The process of creating a WLAN object takes you to the profile scope for the newly created WLAN, and automatically begins a walk of the properties in the newly created WLAN. From here, you can set properties for the WLAN that define its configuration.

The following table describes the properties that you might specify when creating or modifying WLANs.

TABLE 2–4 Known WLAN Properties and Data Types

Known WLAN Property	Data Type for Property
name	ESSID (wireless network name).
bssids	Base Station IDs of WLANs that your system has connected to while connected to the specified WLAN.
priority	WLAN connection preference (lower values are preferred).
keyslot	Slot number (1–4) in which the WEP key is contained.
keyname	Name of the WLAN key that is created by using the dladm create-secobj command. For more information about the dladm command, see Chapter 3, "Working With Datalinks," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.
security-mode	The type of encryption key in use. The type must be none, wep, or wpa.

▼ How to Interactively Create a Known WLAN Profile

The following procedure describes how to create a known WLAN profile by using mywifi as an example.

1 **Initiate an netcfg interactive session.**

```
$ netcfg
netcfg>
```

2 **Create the WLAN.**

```
netcfg> create wlan mywifi
Created wlan 'mywifi'.  Walking properties ...
priority (0)> 100
bssids>
keyname> mywifi-key
keyslot>
security-mode [none|wep|wpa]> wpa
netcfg:wlan:mywifi>
```

Creating the WLAN automatically moves you into the profile scope for this WLAN and walks the properties.

For information about the known WLAN properties, see Table 2–4.

3 **Display the profile configuration.**

```
netcfg:wlan:mywifi> list known wlan:mywifi
    priority             100
    keyname              "mywifi-key"
    security-mode        wpa
netcfg:wlan:mywifi>
```

4 Verify that the profile configuration is correct.

```
netcfg:wlan:mywifi> verify
All properties verified
```

The verify subcommand verifies your configuration and notifies if any required values are missing. You can verify your changes by using the verify subcommand explicitly when creating or modifying a profile.

5 When you complete the verification, end the session.

```
netcfg:wlan:mywifi> end
Committed changes
```

The end subcommand ends the session and also saves the profile configuration.

6 Exit the interactive session.

```
netcfg> exit
```

Example 2–5 Interactively Creating a WLAN Profile

In the following example, a WLAN object named mywifi is created.

This example assumes that a secure object named mywifi-key, which contains the key that is specified by the keyname property for the WLAN mywifi, is created *before* adding the WLAN.

The priority number can change as other WLANs are added or removed. Note that no two WLANs can be assigned the same priority number. Lower numbers indicate a higher priority, in terms of which WLANs are preferred. In this example, the WLAN is assigned the priority number 100 to ensure that it has a lower priority than any other known WLANs.

When the list subcommand is used at the end of the procedure, the new WLAN is added to the bottom of the list, indicating that it has the lowest priority of all the existing known WLANs. If the WLAN was assigned a priority number of zero (0), which is the default, it would have been displayed at the top of the list, indicating the highest priority. Subsequently, the priority of all other existing WLANs would have shifted down in priority and would have been displayed in the list after the newly added WLAN.

```
$ netcfg
netcfg> create wlan mywifi
Created wlan 'mywifi'.  Walking properties ...
priority (0)> 100
bssids>
keyname> mywifi-key
keyslot>
security-mode [none|wep|wpa]> wpa
netcfg:wlan:mywifi> list
known wlan:mywifi
    priority          100
    keyname           "mywifi-key"
    security-mode     wpa
netcfg:wlan:mywifi> verify
```

```
                    All properties verified
                    netcfg:wlan:mywifi> end
                    Committed changes
                    netcfg> list
                    NCPs:
                         DefaultFixed
                         User
                         Automatic
                    Locations:
                         Automatic
                         NoNet
                         test-loc
                         DefaultFixed
                    ENMs:
                         test-enm
                    WLANs:
                         sunwifi
                         ibahn
                         gogoinflight
                         admiralsclub
                         hhonors
                         sjcfreewifi
                         mywifi
                    netcfg> exit
                    $
```

Setting and Changing Property Values for a Profile

Property values for new and existing user-defined profiles are set or modified by using the netcfg command with the set subcommand. This subcommand can be used in interactive mode or in command-line mode. If a property value is set or changed in command-line mode, the change is immediately committed to persistent storage.

Note – You can modify the DefaultFixed location by directly changing the relevant SMF properties or by using the tools provided by a given subsystem, such as nscfg. The property changes are directly saved in the SMF repository and are propagated to the network repository only when the DefaultFixed location is disabled. You can view the modified DefaultFixed location properties by using the netcfg command that accesses the network repository, only when the DefaultFixed location is disabled. The property values stored in the SMF repository are the authoritative values when the DefaultFixed location is active.

The syntax for the set subcommand is as follows:

$ **netcfg set** *prop-name***=***value1***[,***value2...***]**

For information about the netcfg subcommands, see "netcfg Subcommands" on page 35.

If you need to retrieve a specific property value, use the netcfg get command. For more information, see "Obtaining the Value of a Specific Property" on page 65.

EXAMPLE 2–6   Setting Property Values in netcfg Command-Line Mode

If you are using the netcfg command to set a property value in command-line mode, multiple subcommands can be typed on the command-line.

For example, to set the mtu property for a link NCU named net1, you would type the following command:

```
$ netcfg "select ncp User; select ncu phys net1; set mtu=1492"
```

In this example, the select subcommand is used to select the top-level profile, then again to select the NCU that contains the mtu property value that is modified.

From the command-line, multiple values can be set for a given property at the same time. When setting multiple values, each value must be separated by a comma (,). If individual values for a specified property also contain a comma, the comma that is part of the property value must be preceded by a backslash (\). Commas within properties that only have a single value are not interpreted as delimiters and therefore do not need to be preceded by a backslash.

In the following example, the ip-version property value for the NCU, myncu, in the NCP User is set:

```
$ netcfg "select ncp User; select ncu ip myncu; set ip-version=ipv4,ipv6"
```

▼ How to Interactively Set Property Values

When interactively setting property values, you must first select a profile at the current scope, which moves the interactive session into that profile's scope. From this scope, you can select the object whose property you want to modify. The selected profile is then loaded into memory from persistent storage. At this scope, you can modify the profile or its properties.

The following procedure describes how to set property values by taking an example to set the ipfilter-config-file property of the location test-loc.

1   **Initiate an netcfg interactive session.**

```
$ netcfg
netcfg>
```

2   **(Optional) List the profiles.**

```
netcfg> list
NCPs:
    DefaultFixed
    Automatic
    User
Locations:
    Automatic
    NoNet
    test-loc
    DefaultFixed
```

3 **Select the profile or configuration object that needs to be set.**

```
netcfg> select loc test-loc
```

4 **(Optional) List the configuration information of the selected profile.**

```
netcfg:loc:test-loc> list
LOC:test-loc
    activation-mode          manual
    enabled                  false
    nameservices             dns
    dns-nameservice-configsrc dhcp
    nameservices-config-file  "/etc/nsswitch.dns"
```

5 **Set the property value.**

```
netcfg:loc:test-loc> set ipfilter-config-file = /path/to/ipf-file
```

6 **(Optional) List the configuration information to verify the setting.**

```
netcfg:loc:test-loc> list
LOC:test-loc
    activation-mode          manual
    enabled                  false
    nameservices             dns
    dns-nameservice-configsrc dhcp
    nameservices-config-file  "/etc/nsswitch.dns"
    ipfilter-config-file      "/path/to/ipf-file"
```

7 **End the session.**

```
netcfg:loc:test-loc> end
Committed changes
```

The end subcommand saves the change and ends the session.

8 **Exit the interactive session.**

```
netcfg> exit
```

Example 2–7   Interactively Setting Property Values for a Profile

```
$ netcfg
netcfg> select ncp User
netcfg:ncp:User> select ncu ip iwk0
netcfg:ncp:User:ncu:iwk0> set ipv4-default-route = 172.24.1.1
```

In the above example, the ipv4-default-route property of the NCP User is set. For more information about configuring an IPv4 router, see "Configuring an IPv4 Router" in *Configuring and Administering Oracle Solaris 11.1 Networks*.

In the following example, the mtu property of the NCU net0 in the NCP User is modified interactively:

```
$ netcfg
netcfg> select ncp User
netcfg:ncp:User> select ncu phys net0
```

```
netcfg:ncp:User:ncu:net0> list
NCU:net0
    type              link
    class             phys
    parent            "User"
    enabled           true
    activation-mode   prioritized
    priority-mode     exclusive
    priority-group    1
netcfg:ncp:User:ncu:net0> set mtu = 5000
netcfg:ncp:User:ncu:net0> list
NCU:net0
    type              link
    class             phys
    parent            "User"
    enabled           true
    activation-mode   prioritized
    priority-mode     exclusive
    priority-group    1
    mtu            5000
netcfg:ncp:User:ncu:net0> commit
Committed changes
netcfg:ncp:User:ncu:net0> exit
$
```

Listing Profile Configuration Information on a System

The netcfg command can be used with the list subcommand to list all of the profiles, property-value pairs, and resources that exist at the current or specified scope. Use the list subcommand to query the system for general information about all profiles or to retrieve specific information about a particular profile. The list subcommand can be used in either interactive mode or command-line mode.

For information about the netcfg subcommands, see "netcfg Subcommands" on page 35.

If you need to obtain information about profiles and their current state, use the netadm command with the list subcommand. For more information, see "Displaying the Current State of a Profile" on page 76.

Listing All of the Profile Configuration Information on a System

The netcfg list command lists all of the system-defined and user-defined profiles on a system. Note that using the list subcommand without any options displays all of the top-level profiles that are on a system. The command does not list the state of each profile. To display a list of the profiles and their state (online or offline), use the netadm list command.

You can list all of the top-level profiles on a system by using the list subcommand.

```
$ netcfg list
NCPs:
        DefaultFixed
        Automatic
        User
Locations:
        Automatic
        NoNet
        home
        office
        DefaultFixed
ENMs:
        myvpn
        testenm
WLANs:
        workwifi
        coffeeshop
        homewifi
```

In this example, the following profiles are listed:

- NCPs

  The following NCPs are listed:

  - `DefaultFixed` NCP – System-defined fixed profile
  - `Automatic` NCP – System-defined reactive profile
  - `User` NCP – User-defined reactive NCP

- Locations

  The following Location profiles are listed:

  - System-defined locations:

    - `Automatic`
    - `NoNet`
    - `DefaultFixed`

  - User-defined reactive locations:

    - `home`
    - `office`

- ENMs

  The following ENMs are listed:

  - `myvpn` – An ENM for an installed and configured VPN application
  - `testenm` – A test ENM for testing the working of ENMs

- WLANs

  The following WLANs are listed:

  - `workwifi` – WLAN for work
  - `coffeeshop` – WLAN for the local coffee shop
  - `homewifi` – WLAN for the user's home wireless network

Listing All Property Values for a Specific Profile

Use the netcfg command with the list subcommand to list all of the property values for a specified profile.

The syntax for the list subcommand is as follows:

$ **netcfg list [** *object-type* **[** *class* **]** *object-name* **]**

EXAMPLE 2–8   Listing All of the Property Values of an NCU

For example, to list all of the property values for an IP NCU in the User NCP, you would type the following command:

```
$ netcfg "select ncp User; list ncu ip net0"
NCU:net0
      type                  interface
      class                 ip
      parent                "User"
      enabled               true
      ip-version            ipv4
      ipv4-addrsrc          dhcp
      ipv6-addrsrc          dhcp,autoconf
```

EXAMPLE 2–9   Listing All of the Property Values of an ENM

In the following example, all of the properties for an ENM named myenm are listed.

```
$ list enm myenm
ENM:myenm
activation-mode manual
enabled         true
start           "/usr/local/bin/myenm start"
stop            "/bin/alt_stop"
```

In this example, the output of the list subcommand displays the following information:

- The activation-mode property for this ENM is set to manual.

- The ENM is enabled.

- The start and stop method properties have been specified, rather than using an FMRI.

Obtaining the Value of a Specific Property

You can use the netcfg command with the get subcommand to obtain and list the specific value for a specified property. This subcommand can be used in either interactive mode or command-line mode.

The syntax for the get subcommand is as follows:

netcfg get [-V] *prop-name*

To obtain the value of the ip-version property of an NCU named myncu, which is a part of the User NCP, you would type the following command. For example:

```
$ netcfg "select ncp User; select ncu ip myncu; get -V ip-version"
ipv4
```

If the -V option is used with the get subcommand, only the property value is displayed, as shown here:

```
netcfg:ncp:User:ncu:net0> get -V activation-mode
manual
```

Otherwise, both the property and its value are displayed. For example:

```
netcfg:ncp:User:ncu:net0> get activation-mode
activation-mode         manual
```

▼ How to Interactively Obtain a Single Property Value

This procedure describes how to obtain and list a single property value by using the netcfg get command while in the netcfg interactive mode. In this particular procedure, some of the examples show how to obtain a single property value for an NCU in the User NCP. These examples are used for demonstration purposes *only*. The information that you provide when using this command would vary, depending on the profile and the property value that you attempt to retrieve.

If you want to view all of the property values for a profile, you can alternatively use the walkprop subcommand. This subcommand walks you through all of the properties of a given profile, one at a time, enabling you to modify one or all of the profile's properties. For more information, see .

1   Initiate an netcfg interactive session.

```
$ netcfg
netcfg>
```

2   Select the profile or configuration object that contains the property value that you want to obtain.

netcfg> **select** *object-type* **[** *class* **]** *object-name*

> **Note –** The *class* parameter is applicable *only* if you are selecting an NCU. Also, the `class` parameter must be specified if both the `phys` and `ip` class NCU share the same name. However, if the NCU name is unique, the `class` parameter is not required.

For example, to select the `User` NCP, you would type:

```
netcfg> select NCP User
```

In this example, selecting the `User` NCP moves the interactive session into the selected object's scope.

3 (Optional) Display the components of the profile.

```
netcfg:ncp:User> list
ncp:User
        management-type      reactive
NCUs:
        phys    net0
        ip      net0
```

4 Select the object that contains the property value that you want to obtain.

In the following example, the link (phys) NCU `net0` in the `User` NCP is selected:

```
netcfg:ncp:User> select ncu phys net0
```

Selecting the NCU `net0` moves the interactive session to that object's scope and loads the current properties for the NCU from memory.

5 Obtain the specified property value.

```
netcfg:ncp:User:ncu:net0> get property-value
```

For example, to obtain the value of the `activation-mode` property, you would type:

```
netcfg:ncp:User:ncu:net0> get activation-mode
        activation-mode          manual
```

Next Steps At this point, you can set a new value for the property by using the `set` subcommand, or you can exit the interactive session without making any changes. Note that if you modify a property value while in interactive mode, you must use the `commit` or `exit` subcommand to save your changes. For information about setting a property value in `netcfg` interactive mode, see "Setting and Changing Property Values for a Profile" on page 60.

Viewing and Changing Property Values by Using the `walkprop` Subcommand

The `walkprop` subcommand can be used interactively to view the properties of a profile. This subcommand "walks" you through a profile, one property at a time, displaying the name and current value for each property. An interactive command prompt is also displayed, that you can use to change the current value of the specified property. The delimiter for multi-valued properties is a comma (`,`). If an individual value for a given property contains a comma, it must be preceded with a backslash (`\`). Commas within properties that only have a single value are not interpreted as delimiters and do not need to be preceded by a backslash. For information about the `netcfg` subcommands, see "netcfg Subcommands" on page 35.

Note – The `walkprop` subcommand is meaningful when used in interactive mode only.

EXAMPLE 2–10   Viewing and Changing Property Values for a Specific Profile

In the following example, the `activation-mode` property for the location `test-loc` is viewed and then changed by using the `walkprop` subcommand. Note that when using the `walkprop` subcommand, you do not need to use the `set` subcommand to set the property value.

```
$ netcfg
netcfg> select loc test-loc
netcfg:loc:test-loc> list
loc:test-loc
        activation-mode             manual
        enabled                     false
        nameservices                dns
        nameservices-config-file    "/etc/nsswitch.dns"
        dns-nameservice-configsrc   dhcp
        nfsv4-domain                "Central.example.com"
netcfg:loc:test-loc> walkprop
activation-mode (manual) [manual|conditional-any|conditional-all]> conditional-all
conditions> advertised-domain is example.com
nameservices (dns) [dns|files|nis|ldap]>
nameservices-config-file ("/etc/nsswitch.dns")>
dns-nameservice-configsrc (dhcp) [manual|dhcp]>
nfsv4-domain ("Central.example.com")>
ipfilter-config-file>
ipfilter-v6-config-file>
ipnat-config-file>
ippool-config-file>
ike-config-file>
ipsecpolicy-config-file>
netcfg:loc:test-loc> list
loc:test-loc
        activation-mode             conditional-all
        conditions                  "advertised-domain is example.com"
        enabled                     false
        nameservices                dns
        nameservices-config-file    "/etc/nsswitch.dns"
        dns-nameservice-configsrc   dhcp
```

EXAMPLE 2–10   Viewing and Changing Property Values for a Specific Profile   *(Continued)*

```
        nfsv4-domain                        "Central.example.com"
netcfg:loc:test-loc> commit
Committed changes
netcfg:loc:test-loc> end
netcfg> exit
$
```

Note – Only relevant properties are walked. For example, if the `ipv4-addrsrc` property is set to `static`, the `ipv4-addr` property is included in the walk. However, if `ipv4-addrsrc` is set to `dhcp`, the `ipv4-addr` property is not walked.

Enabling and Disabling Profiles

User-defined NCUs, Location profiles, and ENMs all have `activation-mode` properties. The `activation-mode` property is set when you create or modify a profile by using the `netcfg` command. For more information, see . NCPs do not have an `activation-mode` property. All NCPs are manually enabled. The possible values for the `activation-mode` property of different profile types is shown in the following table:

TABLE 2–5   `activation-mode` Property Values

Profile Type	`activation-mode` Value
NCU	`manual` or `prioritized`
Location	`manual`, `conditional-any`, `conditional-all`, or `system`
ENM	`manual`, `conditional-any`, or `conditional-all`

To manually enable or disable (activate and deactivate) a profile or configuration object, use the `netadm enable` command or the `netadm disable` command.

At any given time, there must be one active NCP and one active Location profile on the system. The active NCP remains active until you enable a different NCP. Enabling a different NCP implicitly disables the currently active NCP. You cannot explicitly disable the NCP that is currently active on a system. If you explicitly disable the currently active NCP, the basic network connectivity of the system shuts down.

You can also manually enable and disable individual NCUs that are a part of the currently active NCP and whose `activation-mode` property is set to `manual`. If the NCU class is not specified, all of the NCUs with that name (one link and one interface NCU) are enabled or disabled.

By default, the system chooses the best Location profile to enable. The system selects a location from the set of locations with the system or conditional activation-mode. However, the user can at any time override the system's selection by manually enabling any location, regardless of the location's activation mode. When you enable a Location profile manually, the system does not change the active location automatically. The automatic selection of a location by the system is disabled. You must explicitly disable the manually enabled location to restore the conditional location selection by the system.

ENMs can have a manual or conditional activation-mode property. If you set the activation-mode property to conditional, the system enables or disables the ENM based on the specified conditions. For information about the criteria and operations that can be used to construct the condition strings, see Table 1–1. If you set activation-mode to manual, you can enable or disable the ENM by using the netadm command. There are no constraints on ENM activation. Zero or more ENMs can be active on a system at any given time. Enabling or disabling an ENM has no effect on other currently active ENMs.

Enabling and disabling of objects is performed asynchronously. Therefore, the request to enable or disable might succeed, while the action itself fails. Such failure is reflected in the profile's state, which changes to maintenance, indicating that the last action taken on the profile failed. For information about displaying the state of profiles, see "Displaying Information About Profile States" on page 75.

EXAMPLE 2–11 Enabling a Profile

In the following example, a location named office is enabled:

```
$ netadm enable -p loc office
```

Similarly, an NCP named User is enabled:

```
$ netadm enable -p ncp User
Enabling ncp 'User'
.
.
.
```

Note that when you specify profile names, the netadm command is case-insensitive.

EXAMPLE 2–12 Disabling a Link NCU

In the following example, a link NCU named net1 is disabled:

```
$ netadm disable -p ncu -c phys net1
```

EXAMPLE 2–13 Switching Profiles

In the following example, the fixed profile (DefaultFixed) is enabled:

```
$ netadm enable -p ncp DefaultFixed
```

EXAMPLE 2–13 Switching Profiles *(Continued)*

Similarly, the Automatic NCP is enabled:

```
$ netadm enable -p ncp Automatic
```

For more information about the netadm command, see the netadm(1M) man page.

◆ ◆ ◆ **CHAPTER 3**

3

CHAPTER 3

Administering Your Reactive Network Configuration (Tasks)

This chapter describes how to administer these profiles by using the netadm command: NCPs, locations, ENMs, and known WLANs. You can manage NCUs, which are the individual configuration objects that make up an NCP by using the netadm command. You can also interact with the daemon, nwamd, in the absence of the network administration GUI, by using the netadm command. This chapter also describes how to export and remove user-defined profiles by using the netcfg command.

For more information about using the netadm command see the netadm(1M) man page. For more information about using the netcfg command, see the netcfg(1M) man page.

The following topics are covered in this chapter:

- "Switching Between Fixed and Reactive Network Configurations" on page 74
- "Displaying Information About Profile States" on page 75
- "Exporting and Restoring a Profile Configuration" on page 77
- "Removing Profiles" on page 81
- "Performing a Wireless Scan and Connecting to Available Wireless Networks" on page 83
- "Troubleshooting Reactive Network Configuration Issues" on page 84

For information about creating and configuring profiles, modifying profiles, listing profiles, and enabling and disabling profiles, see Chapter 2, "Creating and Configuring Reactive Network Profiles (Tasks)."

For information about how to interact with the reactive network configuration and how to manage your network configuration from the desktop by using the network administration GUI, see Chapter 4, "Using the Network Administration Graphical User Interface."

For overview information about reactive network configuration, see Chapter 1, "Reactive Network Configuration (Overview)."

Switching Between Fixed and Reactive Network Configurations

Network configuration management is profile-based and involves switching between the two types of network configuration: fixed and reactive. To switch between the fixed and reactive networks configurations, enable the appropriate NCP. For fixed network configuration, enable the `DefaultFixed` NCP. For reactive network configuration, enable the `Automatic` NCP or a user-defined NCP. For more information about fixed network configuration, see *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

▼ How to Switch From Reactive Network Configuration to Fixed Network Configuration

If you prefer fixed network configuration management, you can enable the `DefaultFixed` NCP, as explained in the following procedure.

1 **Become the `root` user.**

2 **Enable the `DefaultFixed` NCP.**

```
$ netadm enable -p ncp DefaultFixed
```

3 **Verify that the `network/physical:default` service has restarted and is online.**

```
$ svcs -xv network/physical:default
svc:/network/physical:default (physical network interface configuration)
 State: online since Thu Jun 21 17:30:25 2012
   See: man -M /usr/share/man -s 1M ipadm
   See: man -M /usr/share/man -s 5 nwam
   See: man -M /usr/share/man -s 1M dladm
   See: /var/svc/log/network-physical:default.log
Impact: None.
$
```

4 **Verify that the `DefaultFixed` NCP is active.**

```
$ netadm list
TYPE        PROFILE        STATE
ncp         DefaultFixed   online
ncp         ncp1           disabled
ncp         Automatic      disabled
loc         Automatic      offline
loc         NoNet          offline
loc         User           disabled
loc         DefaultFixed   online
$
```

▼ How to Switch From Fixed Network Configuration to Reactive Network Configuration

To switch back to the reactive network configuration from the fixed network configuration, enable the network configuration profile that you want to use.

1 Become the **root** user.

2 Enable an NCP, for example, **Automatic**.

```
$ netadm enable -p ncp Automatic
```

3 Verify that the **network/physical:default** service has restarted and is online.

```
$ svcs -xv network/physical:default
svc:/network/physical:default (physical network interface configuration)
 State: online since Thu Jun 21 15:30:25 2012
   See: man -M /usr/share/man -s 1M ipadm
   See: man -M /usr/share/man -s 5 nwam
   See: man -M /usr/share/man -s 1M dladm
   See: /var/svc/log/network-physical:default.log
Impact: None.
$
```

4 Check the state of the NCP and the other reactive (NWAM-managed) profiles.

```
$ netadm list -x
TYPE        PROFILE       STATE        AUXILIARY STATE
ncp         DefaultFixed  disabled     disabled by administrator
ncp         Automatic     online       active
ncu:phys    net0          online       interface/link is up
ncu:ip      net0          online       interface/link is up
ncu:phys    net1          offline      interface/link is down
ncu:ip      net1          offline      conditions for activation are unmet
ncp         User          disabled     disabled by administrator
loc         Automatic     online       active
loc         NoNet         offline      conditions for activation are unmet
loc         DefaultFixed  offline      conditions for activation are unmet
$
```

Displaying Information About Profile States

You can use the netadm command with the list subcommand to display all of the available profiles on a system and their current state, or to display a specific profile and its state. For information about the netadm subcommands, see "netadm Subcommands" on page 37.

The syntax for the list subcommand is as follows:

netadm list [**-p** *profile-type*] [**-c** *ncu-class*] [*profile-name*]

For example, to display all of the profiles on a system and their state, you would type the following command:

```
$ netadm list
TYPE          PROFILE      STATE
ncp           DefaultFixed disabled
ncp           ncp1         disabled
ncp           Automatic    online
ncu:phys      net0         online
ncu:phys      net1         offline
ncu:ip        net0         online
ncu:ip        net1         offline
loc           Automatic    online
loc           NoNet        offline
loc           User         disabled
loc           DefaultFixed offline
$
```

In this example, the current state is displayed for every system-defined and user-defined profile that is on the system. Note that the list subcommand displays the enabled NCP and all of the NCUs that make up that particular NCP.

Displaying the Current State of a Profile

The profile type and NCU class can be included in the command syntax to identify a specific profile. If only a profile type is provided, all of the profiles that are of that type are displayed. If a profile is specified by name, the current state of that profile is displayed. If the profile name is not unique, all of the profiles with that name are listed.

EXAMPLE 3–1   Displaying the Current State of a Specified Profile

The following example lists the current state of profiles named Automatic, which has been specified by name.

```
$ netadm list Automatic
TYPE          PROFILE      STATE
ncp           Automatic    online
ncu:ip        net1         offline
ncu:phys      net1         offline
ncu:ip        net0         online
ncu:phys      net0         online
loc           Automatic    online
$
```

In the following example, the list subcommand is used with the -p option to display all of the locations that are currently on the system.

```
$ netadm list -p loc
TYPE          PROFILE      STATE
loc           office       disabled
loc           NoNet        offline
loc           Automatic    online
$
```

In the following example, the list subcommand is used with the -c option to display all of the interface NCUs in the active NCP.

EXAMPLE 3–1   Displaying the Current State of a Specified Profile   *(Continued)*

```
$ netadm list -c ip
TYPE            PROFILE         STATE
ncu:ip          net0            online
ncu:ip          net1            disabled
$
```

Displaying Auxiliary State Values

The auxiliary state of a profile provides an explanation about why a given profile is online or offline (enabled or disabled). To list auxiliary state values, use the -x option with the list subcommand, as shown in the following example:

```
$ netadm list -x
TYPE            PROFILE         STATE           AUXILIARY STATE
ncp             DefaultFixed    disabled        disabled by administrator
ncp             ncp1            disabled        disabled by administrator
ncp             Automatic       online          active
ncu:phys        net0            online          interface/link is up
ncu:phys        net1            offline         interface/link is down
ncu:ip          net0            online          interface/link is up
ncu:ip          net1            offline         conditions for activation are unmet
loc             Automatic       offline         conditions for activation are unmet
loc             NoNet           offline         conditions for activation are unmet
loc             office          online          active
loc             DefaultFixed    offline         conditions for activation are unmet
$
```

Auxiliary state values vary, depending on the profile type. For detailed information about auxiliary states, see the nwamd(1M) man page.

Exporting and Restoring a Profile Configuration

You can use the export subcommand of the netcfg command to save and restore profile configurations. Exporting a profile can be useful for system administrators who are responsible for maintaining multiple servers that require identical network configurations. The export subcommand can be used in either interactive mode or command-line mode. Alternatively, you can use the command in command-file mode to specify a file as the output of the command.

Note – The export feature is of limited use for some configurations. You can only export or restore configuration objects that are initially created by the netcfg command. You cannot export the configuration objects of an NCP that were created by using the dladm or ipadm command, such as aggregations or IPMP groups. Also, you cannot export or restore the DefaultFixed NCP and Location profiles.

The command syntax for the export subcommand is as follows:

$ **netcfg export [-d] [-f** *output-file* **] [** *object-type* **[** *class* **]** *object-name* **]**

where *output-file* is the output file name, *object-type* is the profile type, *class* is the NCU class, and *object-name* is the profile name.

For information about the netcfg subcommands, see "netcfg Subcommands" on page 35.

Note – The -d and -f options of the export subcommand can be used independently of each other. The -f option prints the current configuration at the current or specified scope to standard output, or to a file specified. The -d option generates a destroy -a as the first line of output.

EXAMPLE 3–2   Exporting a Profile Configuration in netcfg Interactive Mode

In the following example, the export subcommand of the netcfg command is used to display a system's profile configuration onscreen.

```
$ netcfg
netcfg> export
create ncp "User"
create ncu ip "net2"
set ip-version=ipv4
set ipv4-addrsrc=dhcp
set ipv6-addrsrc=dhcp,autoconf
end
create ncu phys "net2"
set activation-mode=manual
set mtu=5000
end
create ncu phys "wpi2"
set activation-mode=prioritized
set priority-group=1
set priority-mode=exclusive
set mac-address="13:10:73:4e:2"
set mtu=1500
end
end
create loc "test"
set activation-mode=manual
set nameservices=dns
set nameservices-config-file="/etc/nsswitch.dns"
set dns-nameservice-configsrc=dhcp
set nfsv4-domain="domainl.example.com"
end
create loc "test-loc"
set activation-mode=conditional-all
set conditions="system-domain is example.com"
set nameservices=dns
set nameservices-config-file="/etc/nsswitch.dns"
set dns-nameservice-configsrc=dhcp
set nfsv4-domain="domain.example.com"
end
create enm "myenm"
set activation-mode=conditional-all
```

EXAMPLE 3–2 Exporting a Profile Configuration in netcfg Interactive Mode   *(Continued)*

```
set conditions="ip-address is-not-in-range 10.2.3.4"
set start="/my/start/script"
set stop="/my/stop/script"
end
create wlan "mywlan"
set priority=0
set bssids="0:13:10:73:4e:2"
end
netcfg> end
$
```

EXAMPLE 3–3 Exporting a Profile Configuration in netcfg Interactive Mode With the -d Option

In the following example, the -d option is used with the export subcommand. The -d option adds the destroy -a command as the first line of the netcfg export output.

```
$ netcfg
netcfg> export -d
destroy -a
create ncp "User"
create ncu ip "net2"
set ip-version=ipv4
set ipv4-addrsrc=dhcp
set ipv6-addrsrc=dhcp,autoconf
end
create ncu phys "net2"
set activation-mode=manual
set mtu=5000
end
create ncu phys "wpi2"
set activation-mode=prioritized
set priority-group=1
set priority-mode=exclusive
set mac-address="13:10:73:4e:2"
set mtu=1500
end
end
create loc "test"
set activation-mode=manual
set nameservices=dns
set nameservices-config-file="/etc/nsswitch.dns"
set dns-nameservice-configsrc=dhcp
set nfsv4-domain="domain.example.com"
end
create loc "test-loc"
set activation-mode=conditional-all
set conditions="system-domain is example.com"
set nameservices=dns
set nameservices-config-file="/etc/nsswitch.dns"
set dns-nameservice-configsrc=dhcp
set nfsv4-domain="domain.example.com"
end
create enm "myenm"
set activation-mode=conditional-all
set conditions="ip-address is-not-in-range 10.2.3.4"
```

EXAMPLE 3–3 Exporting a Profile Configuration in netcfg Interactive Mode With the -d Option *(Continued)*

```
set start="/my/start/script"
set stop="/my/stop/script"
end
create wlan "mywlan"
set priority=0
set bssids="0:13:10:73:4e:2"
end
netcfg> end
$
```

EXAMPLE 3–4 Exporting a Profile Configuration in netcfg Command-File Mode

In the following example, the configuration information for the User NCP is written to a file by using the netcfg export command with the -f option. The -f option writes the output to a new file named user2. The -d option adds the destroy -a command as the first line of the netcfg export output.

```
$ netcfg export -d -f user2 ncp User

$ ls -al
drwx------   3 root     root            4 Oct 14 10:53 .
drwxr-xr-x  37 root     root           40 Oct 14 10:06 ..

-rw-r--r--   1 root     root          352 Oct 14 10:53 user2
$

$ cat user2
destroy -a
create ncp "User"
create ncu ip "net2"
set ip-version=ipv4
set ipv4-addrsrc=dhcp
set ipv6-addrsrc=dhcp,autoconf
end
create ncu phys "net2"
set activation-mode=manual
set mtu=5000
end
create ncu phys "wpi2"
set activation-mode=prioritized
set priority-group=1
set priority-mode=exclusive
set mac-address="13:10:73:4e:2"
set mtu=1500
end
end
create loc "test"
set activation-mode=manual
set nameservices=dns
set nameservices-config-file="/etc/nsswitch.dns"
set dns-nameservice-configsrc=dhcp
set nfsv4-domain="domain.example.com"
```

EXAMPLE 3–4 Exporting a Profile Configuration in `netcfg` Command-File Mode *(Continued)*

```
end
create loc "test-loc"
set activation-mode=conditional-all
set conditions="system-domain is example.com"
set nameservices=dns
set nameservices-config-file="/etc/nsswitch.dns"
set dns-nameservice-configsrc=dhcp
set nfsv4-domain="domain.example.com"
end
create enm "myenm"
set activation-mode=conditional-all
set conditions="ip-address is-not-in-range 10.2.3.4"
set start="/my/start/script"
set stop="/my/stop/script"
end
create wlan "mywlan"
set priority=0
set bssids="0:13:10:73:4e:2"
end
$
```

Restoring a User-Defined Profile

You can restore an exported configuration by using the `netcfg` command with the `-f` option, as follows:

$ **netcfg [-f]** *profile-name*

For example:

$ **netcfg -f user2**

This command executes the command file that contains the exported configuration.

Removing Profiles

You can remove all user-defined profiles or a specified user-defined profile from memory and persistent storage by using the `netcfg destroy -a` command.

Note – You cannot remove system-defined profiles. System-defined profiles include the `Automatic` and `DefaultFixed` NCPs and the `NoNet`, `Automatic`, and `DefaultFixed` Location profiles.

The syntax for the `destroy` subcommand is as follows:

netcfg destroy [-a | *object-type* **[** *class* **]** *object-name***]**

For information about the netcfg subcommands, see "netcfg Subcommands" on page 35.

Note – At least one profile must be active on the system at all times. Make sure that you enable the Automatic NCP before using the destroy -a command to avoid in-use errors when removing user-defined profiles.

EXAMPLE 3–5 Removing a Specific User-Defined Profile by Using netcfg Command-Line Mode

To remove a specific user-defined profile on the system, for example, the NCP named User, type the following command:

```
$ netcfg destroy ncp User
```

The destroy subcommand can also be used to remove NCUs from an existing NCP. In the following example, an interface NCU with the name net1 is removed from the user-defined NCP.

```
$ netcfg "select ncp User; destroy ncu ip net1"
```

To confirm that a profile has been removed, use the list subcommand, as shown here:

```
$ netcfg
netcfg> select ncp User
netcfg:ncp:User> list
ncp:User
        management-type    reactive
NCUs:
        phys    net1
netcfg:ncp:User> exit
$
```

EXAMPLE 3–6 Removing a Specific User-Defined Profile by Using netcfg Interactive Mode

In the following example, an IP NCU named net2 is removed.

```
$ netcfg list
NCPs:
        DefaultFixed
        Automatic
        User
Locations:
        Automatic
        NoNet
        test
        test-loc
        DefaultFixed
$ netcfg
netcfg> select ncp User
netcfg:ncp:User> list
ncp:User
        management-type    reactive
NCUs:
```

EXAMPLE 3–6 Removing a Specific User-Defined Profile by Using `netcfg` Interactive Mode *(Continued)*

```
        phys    net2
        ip      net2
netcfg:ncp:User> destroy ncu ip net2
Destroyed ncu 'net2'
netcfg:ncp:User> list
ncp:User
        management-type    reactive
NCUs:
        phys    net2
netcfg:ncp:User> end
netcfg> exit
$
```

Performing a Wireless Scan and Connecting to Available Wireless Networks

You can scan for and connect to available wireless networks by using the `netadm` command.

Use the `netadm scan-wifi` *link-name* command to scan a wireless link to obtain a list of available wireless networks.

Use the `netadm select-wifi` *link-name* command to select and connect to a wireless network from the scan results on the link that is specified as *link-name*. The `select-wifi` *link-name* subcommand prompts you for a WiFi selection, a key, and a key slot, if required.

For information about the `netadm` subcommands, see "netadm Subcommands" on page 37.

Note – You must have already created a key prior to using the `netadm select-wifi` command.

You can also trigger a subsequent scan of the network to search for available wireless networks by using the `netadm scan-wifi` *link-name* command. Note that a subsequent scan might not trigger a scan event, if the new scan results are identical to the existing scan results. The `nwamd` daemon performs the scan, regardless of whether the data has changed since the last scan.

In the following example, the `netadm scan-wifi` command is used to perform a scan of the wireless link, net1. The `netadm select-wifi` command is then used to display a list of wireless networks from which to select. The list that is displayed is based on the results of the scan that was previously performed on net1.

EXAMPLE 3–7 Connecting to Wireless Networks

```
$ netadm select-wifi net1
1: ESSID home BSSID 0:b:e:85:26:c0
2: ESSID neighbor1 BSSID 0:b:e:49:2f:80
```

EXAMPLE 3–7   Connecting to Wireless Networks   *(Continued)*

```
3: ESSID testing BSSID 0:40:96:29:e9:d8
4: Other
Choose WLAN to connect to [1-4]: 1
$
```

In this example, the wireless network that is represented by the number 1, selects the home network.

EXAMPLE 3–8   Connecting to a Wireless Network That Is Not Listed

```
$ netadm select-wifi net1
1: ESSID home BSSID 0:b:e:85:26:c0
2: ESSID neighbor1 BSSID 0:b:e:49:2f:80
3: ESSID testing BSSID 0:40:96:29:e9:d8
4: Other
Choose WLAN to connect to [1-4]: 4
Enter WLAN name: clear
1: None
2: WEP
3: WPA
Enter security mode:1
$
```

In this example, the Other option to select a wireless network that is not listed, which is represented by the number 4, prompts you to enter the name of the wireless network and the security mode.

If the WLAN requires a key, you are prompted to enter the key and key slot, if WEP is specified for the security mode. For example:

```
Enter WLAN key for ESSID home: mywlankey
Enter key slot [1-4]: 1
```

Troubleshooting Reactive Network Configuration Issues

This section describes how to troubleshoot reactive network configuration issues.

Monitoring the Current State of All Network Connections

The netadm command can be used with the show-events subcommand to listen for and display events that are being monitored by the network management daemon, nwamd. This subcommand provides useful information about events that are related to the configuration process for network profiles and configuration objects.

The syntax for the netadm show-events command is as follows:

netadm show-events [-v]

For information about the netadm subcommands, see "netadm Subcommands" on page 37.

In the following example, the netadm show-events command is used with the -v option when an Automatic NCP is enabled. The -v option display events in verbose mode to show the change in different states.

```
$ netadm show-events -v
EVENT                 DESCRIPTION
OBJECT_ACTION         ncp Automatic -> action enable
OBJECT_STATE          ncp Automatic -> state online, active
OBJECT_STATE          ncu link:net0 -> state offline*, (re)initialized but not config
OBJECT_STATE          ncu link:net0 -> state online, interface/link is up
OBJECT_STATE          ncu interface:net0 -> state offline*, (re)initialized but not c
OBJECT_STATE          ncu interface:net0 -> state offline*, waiting for IP address to
PRIORITY_GROUP        priority-group: 0
LINK_STATE            net0 -> state up
OBJECT_STATE          loc NoNet -> state offline*, method/service executing
OBJECT_STATE          loc Automatic -> state offline, conditions for activation are u
OBJECT_STATE          loc NoNet -> state online, active
IF_STATE              net0 -> state flags 1004843 addr 10.153.125.198/24
OBJECT_STATE          ncu interface:net0 -> state offline*, interface/link is up
OBJECT_STATE          ncu interface:net0 -> state online, interface/link is up
IF_STATE              net0 -> state flags 2080841 addr 2002:a99:7df0:1:221:28ff:fe3c:
IF_STATE              net0 -> state flags 2004841 addr 2001:db8:1:2::4ee7/128
OBJECT_STATE          loc Automatic -> state offline*, method/service executing
OBJECT_STATE          loc NoNet -> state offline, conditions for activation are unmet
OBJECT_STATE          loc Automatic -> state online, active
```

Troubleshooting Network Interface Configuration Issues

The netadm list -x command is useful for determining why a network interface might not be configured correctly. This command displays the various profiles and configuration objects, their current state, and the reason why they are in that state.

For example, if a cable is unplugged, you can use the netadm list -x command to determine if the link state is offline and why, for example, "link is down." Similarly, for duplicate address detection, the output of the netadm list -x command reveals that the physical link is online (up), but the IP interface is in a maintenance state. In this instance, the reason that is given is "Duplicate address detected."

The following is an example of the netadm list -x command output:

```
$ netadm list -x
TYPE        PROFILE      STATE        AUXILIARY STATE
ncp         DefaultFixed offline      disabled by administrator
ncp         Automatic    online       active
```

```
ncu:phys   net0          offline      interface/link is down
ncu:ip     net0          offline      conditions for activation are unmet
ncu:phys   net1          offline*     need WiFi network selection
ncu:ip     net1          offline      conditions for activation are unmet
ncp        User          disabled     disabled by administrator
loc        Automatic     offline      conditions for activation are unmet
loc        NoNet         online       active
loc        office        offline      conditions for activation are unmet
loc        DefaultFixed  offline      conditions for activation are unmet
$
```

After determining the reason that a link or interface is offline, you can proceed to correct the problem. In the case of a duplicate IP address, you must modify the static IP address that is assigned to the specified interface by using the netcfg command. For instructions, see "Setting and Changing Property Values for a Profile" on page 60. After you commit the changes, run the netadm list -x command again to check that the interface is now configured correctly, and that its state is displayed as online.

Another example of why an interface might not be configured correctly is if no known WLANs are available. In this case, the WiFi link's state would be displayed as offline, and the reason would be need WiFi network selection. Alternatively, if a WiFi selection was made, but a key is required, the reason would be need WiFi key.

4

Using the Network Administration Graphical User Interface

This chapter provides an introduction to the network administration graphical user interface (formerly known as NWAM GUI) on the Oracle Solaris desktop, which includes a description of the components that make up its network administration GUI. Basic instructions for interacting with reactive network profiles from the desktop, controlling network connections, adding wireless networks, and creating and managing network profiles are also included in this chapter.

This chapter does not provide step-by-step instructions on managing your network exclusively by using the network administration GUI. For detailed instructions, refer to the online help, which can be accessed by right-clicking the Network Status icon that is displayed in the panel notification area of the desktop at all times. Links within the network administration GUI take you to pages in the online help that provide more detailed information about each topic. You can also navigate through the online help by clicking links that are displayed in the text or by clicking the various topics in the side pane.

The following topics are covered in this chapter:

Introduction to the Network Administration Graphical User Interface

The network administration GUI is the graphical equivalent to the network command-line interface (CLI). The network administration GUI enables you to view and monitor the status of your network from the desktop, as well as interact with reactive network profiles to manage your Ethernet and wireless configuration. In addition, you can perform various networking tasks from the desktop, such as connecting to a wired or wireless network at startup and configuring new wired or wireless networks. The network administration GUI can also be used to create and manage locations, which are profiles that simplify the complex task of system-wide network configurations, such as those configurations that require a different name server or security type, or a network interface configuration that must be enabled at different times. The GUI includes a feature that displays notifications about the current status of your network connection, as well as information about the overall condition of your network environment.

Basic capabilities of the network administration GUI include the following:

- Network status notification
- Detection of hot-plugged events
- Creation and management of network profiles
- Management of wireless networks

The network administration GUI manages network configuration the same way that the network CLI does, by storing desired property values in the form of profiles on the system. The system's network service determines which profile should be active at a given time, based on current network conditions, and then enables the most appropriate profile.

Accessing the Network Administration GUI From the Desktop

Two components make up the network administration GUI: the Network Status notification icon that is displayed continuously on the desktop panel and the network configuration dialogs. These dialogs can be accessed from the System → Administration menu or by right-clicking the notification icon. The network administration GUI behaves much the same as any other application that has a continuous status notification icon, for example, the power management icon. These applications enable you perform certain tasks by accessing their right-click (context) menu or by using configuration dialogs that are accessed from either the icon or from various preferences menus.

The panel icon is your most frequent point of contact with network configuration. The icon shows whether you are currently connected to a wired or wireless network. By hovering your mouse over the icon, a tool tip displays additional information, such as the currently active NCP

and Location profile. By right-clicking the icon, you can change basic network configuration of your system, such as connecting to a different wireless network.

Clicking (left-clicking) the panel icon opens the Network Preferences dialog. This dialog can also be opened from the System →Administration menu. Here, you can perform more detailed network configuration such as defining static IPv4 and IPv6 addresses, setting connection priorities, managing external network modifiers (ENMs), and creating groups of network settings for use in different locations.

Differences Between the Network Administration GUI and the Network CLI

You can use either the network administration GUI or the network CLI to manage the network configuration and interact with the reactive network configuration. Whether you choose to use the GUI or the CLI to perform a particular task depends on the task and the given situation. For some tasks, the most logical choice is to use the network administration GUI. An example would be checking the status of your currently active network connection or choosing a wireless network to connect to at startup. These tasks can be more easily and quickly performed by directly interacting with reactive network configuration from the desktop through the GUI. For more complicated tasks, such as specifying a script as the start and stop method for a new ENM, you might choose to work in the command-line mode.

Although the CLI and GUI are essentially the same, the following differences should be noted:

- **Functionality differences**

  The network administration GUI includes functionality that enables you to interact with reactive network configuration and check network connections from the desktop. How you obtain information regarding the status of your network varies slightly between the GUI and the CLI commands. If you are using the GUI, notifications are displayed on the desktop as they occur. If you are using the CLI, you can monitor the reactive networking events as they occur by using the netadm show-events command. For more information, see "Monitoring the Current State of All Network Connections" on page 84.

  Also, to obtain information about the status of your network by using the network administration GUI, you would visually check, hover your mouse over, or click the Network Status notification icon that is displayed on the desktop. To obtain information about the status of your network from the command line, use the netadm command with the list subcommand. The output of this command provides information about the basic state of each network object that is configured on your system. However, the network administration GUI provides more complete information and details about your network status, such as which wireless network you are connected to and the IP address of your network connection.

Some commands that you can perform by using the CLI cannot be performed by using the GUI. For example, you cannot export a profile configuration by using the GUI. To export a profile configuration, use the netcfg export command. For more information, see "Exporting and Restoring a Profile Configuration" on page 77.

In addition, you cannot create or modify fixed network profiles by using the GUI. You can use the ipadm and dladm commands to modify the fixed profile.

For more information about the ipadm command, see the ipadm(1M) man page and Chapter 4, "Working With IP Interfaces," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

For more information about the dladm command, see the dladm(1M) man page and Chapter 3, "Working With Datalinks," in *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

- **Component name and term usage differences**

  In the GUI, a network configuration profile (NCP) is the same as a *network profile*. What are called network configuration units (NCUs) in the CLI are referred to as *network connections* in the GUI.

  Enabling and disabling NCPs by using the CLI is the same as the task for switching network profiles or connections if you are using the GUI.

Functional Components of the GUI

The network administration GUI includes several functional components that are used to accomplish virtually the same tasks that you can perform by using the CLI. Table 4–1 describes each of these components. Note that some dialogs can be accessed or opened in several ways. Also, some dialogs display different information, depending on how the dialog was accessed. Specific information about these differences are noted in the related sections throughout this chapter and explained in detail in the online help.

TABLE 4–1 Network Administration GUI Primary Components

Component	Function	How to Access
Network Status notification icon	Method for viewing the status of your network and interacting with the network from the desktop. The icon also contains a contextual menu that can be accessed to create and manage network configuration by using the GUI.	■ By viewing the icon, which is displayed on the desktop panel's notification area at all times. ■ By hovering your mouse over the icon to display a tool tip that provides information about your current network status. ■ By clicking the icon, which displays the Network Preferences dialog. ■ By right-clicking the icon, which opens its contextual menu.

TABLE 4–1 Network Administration GUI Primary Components *(Continued)*

Component	Function	How to Access
Network Preferences dialog	Method for switching between reactive and fixed network profiles. This method is also used for enabling and managing the two primary network profile types, the system-defined `Automatic` profile and multiple user-defined network profiles. The `Automatic` and user-defined network profiles manage network configuration for individual network interfaces. This dialog is also used to configure IPv4 and IPv6 addresses for individual network interfaces and to manage favorite wireless networks.	■ By clicking the Network Status notification icon on the desktop. ■ By choosing System → Administration → Network from the Main Menu bar on the desktop panel. ■ By choosing Network Preferences from the Network Status notification icon's contextual menu.
Network Locations dialog	Method for creating, enabling, and managing the properties of system-defined and user-defined Location profiles. Locations specify certain elements of a network configuration, for example a naming service and firewall settings, that are applied together when required.	■ By choosing Network Locations from the Network Status notification icon's contextual menu. ■ From the Connection Status view of the Network Preferences dialog, click the Locations button.
Join Wireless Network dialog	Method for joining wireless networks and managing a list of favorite networks. **Note –** This dialog opens automatically if you attempt to add a wireless network and more information about that network is required.	■ By selecting the Join Unlisted Wireless Network option in the notification icon's contextual menu. ■ By clicking the Join Unlisted button in the Wireless Chooser dialog. ■ By clicking a notification message that says, "No wireless networks found. Click this message to join an unlisted wireless network."
Wireless Chooser dialog	Method for choosing and connecting to a wireless network.	By clicking a notification message that says, "*interface* disconnected from *ESSID*. Click this message to view other available networks." **Note –** This dialog opens automatically whenever you have a choice of available wireless networks to join.

TABLE 4–1 Network Administration GUI Primary Components   *(Continued)*

Component	Function	How to Access
Network Modifiers dialog	Method for adding external network modifier applications that are capable of creating or modifying the network configuration. This dialog is also used to stop or start the network modifier. For information about network modifiers, see "About External Network Modifiers" on page 109	■ By clicking the Modifiers button in the Connection Status view of the Network Preferences dialog. ■ By right-clicking the Network Status notification icon, then selecting the Network Modifier Preferences menu item.

Interacting With Reactive Network Profiles From the Desktop

The Network Status notification icon, which is displayed on the desktop panel's notification area at all times is the primary method for viewing the status of your network and for interacting with automatic network configuration processes. The Network Status notification icon is also where informational messages about your network are displayed. The icon's contextual (right-click) menu enables quick access to essential network functionality. The icon's appearance indicates the overall condition of your network.

Checking the Status of Your Network Connection

The quickest way to obtain essential information about your network is to look at the Network Status notification icon that is displayed in the panel notification area of the desktop. The Network Status notification icon is the primary method for viewing the status of your currently enabled network connection and for interacting with reactive network configuration. The icon's appearance changes, depending on the status of the currently enabled network connection. Another way you can display information about your currently enabled network connection is to hover your mouse over the Network Status notification icon. To access the notification icon's context menu, right-click the icon. From here, you can change the currently enabled network interface and view more detailed information about the wireless network, if any, you are connected to.

Note – The Network Status notification icon is displayed on the desktop when any network profile is active. If a fixed profile is active, you cannot modify the network configuration but you can still view properties. For example, you can view IP address, status, and connection speed in the panel icon tool tip and in the Connection Status view of the Network Preferences dialog.

The following table illustrates the Network Status icon's appearance, which changes to reflect the status of the network connections that are enabled on your system when a reactive profile is active.

TABLE 4–2 Network Status Icon's Appearance When a Reactive Profile Is Active

Icon	Status	Description
	Full connectivity	Indicates that all manually enabled connections that are in the active network profile are online and that the required number of connections in the active profile group (if such a group exists) are online. The required number is as follows: ■ One connection if the group is of the Exclusive priority type ■ One or more connections if the group is of the Shared priority type ■ All connections in the group if the group is of the All priority type For more information, see "Working With Priority Groups" on page 104.
	Partial connectivity	Indicates that one or more manually enabled or priority group connections are offline. It also indicates that a connection is waiting for user input, such as the choice of an available wireless network to connect to or the input of a WEP/WPA key.
	No connectivity	Indicates that the network has a configuration issue.

The following table illustrates the Network Status icon's appearance when a fixed network profile is active.

TABLE 4–3 Network Status Icon's Appearance When a Fixed Profile Is Active

Icon	Status	Description
	Full connectivity	Indicates that all configured connections are online.
	Partial connectivity	Indicates that one or more configured connections are offline.
	No connectivity	Indicates that the network has a configuration issue.

For more information about reactive and fixed network profiles, see "Managing Network Profiles" on page 99.

▼ How to Show Details About an Enabled Network Connection

1 **Open the Network Preferences dialog and select Connection Status from the drop-down list, if required.**

You can open the Network Preferences dialog in one of the following ways:

- **Click the Network Status notification icon on the desktop panel.**

- **Choose System → Administration → Network from the Main Menu bar on the desktop panel.**

- **Right-click the Network Status notification icon to open its menu, then select Network Preferences.**

  For wireless network connections, the IP address, signal strength, connection speed, connection status, and security type are displayed.

  If a fixed network profile is active, the list shows the status of all wired and wireless connections in the profile.

  If a reactive network profile is active, the list shows the status of all of the connections that are manually enabled.

2 **To view or edit more properties of a specific network connection, double-click the connection in the list or select the connection from the Show drop-down menu that is located at the top of the dialog.**

Note – The properties of specific network connections cannot be displayed when a fixed network profile is active using this method.

Controlling Network Connections From the Desktop

By default, network configuration attempts to maintain a network connection at all times. If a wired network connection fails, an attempt is made to connect to one of your favorite wireless networks. If the attempt fails, other available wireless networks are tried, with your permission.

You can also manually switch between wired and wireless networks, as required.

Note – For all connection types, the connection behavior is set for the current session *only*. When you reboot your system or disconnect, an attempt is made to establish network connections, according to the priorities that are defined by the enabled network profile.

You can control network connections from the desktop by using the network configuration in the following ways:

- **Modify the default connection priority.**

  By default, all wired network connections take priority over all wireless network connections. That is, a wireless network connection is only attempted if a wired connection cannot be established. If more than one wireless network is available at the current location, you are prompted to select which network to join. This behavior is defined by the Automatic network profile (a network profile in GUI is same as NCP), which is enabled by default. To enforce a different behavior, you must create and enable a different network profile.

  You can add a connection to a user-defined profile. This connection is enabled when the profile becomes active. To disable the connection, you can remove the connection from the profile. For more information about adding and removing connections, see "Editing Network Profiles" on page 102.

- **Switch from a wired network to a wireless network.**

  If the Automatic network profile is enabled, disconnect any network cables from all enabled wired interfaces.

  By default, if any of your favorite wireless networks are available, an attempt is made to join them in the order in which they appear in the favorites list. Otherwise, the Wireless Chooser dialog is displayed. In this dialog you can select which network to join.

  Note – You can change the way wireless networks are joined on the Wireless tab of the Connection Properties view.

  If a network profile other than the Automatic network profile is enabled, the method that you use to switch to a wireless network depends on the definition of that network profile.

  Choose one of the following methods:

  - Use the Connections submenu of the Network Status notification icon's contextual menu to disable the wired connection and then enable a wireless connection.

    Note that this method is only possible if both connections have the Manual activation type, and the active network profile is of the reactive type.

  - Edit the enabled network profile to enable the wireless connection and disable other connections, as required.

    Note that this method is only possible if the active network profile is of the reactive type.

  When the wireless connection is established, a notification message is displayed.

- **Switch from a wireless network to a wired network.**

  If the Automatic network profile is enabled, plug a network cable into an available wired interface.

If a network profile other than the `Automatic` network profile is enabled, the method that you use to switch to a wired network depends on the definition of that network profile.

Choose one of the following methods:

- Use the Connections submenu of the Networks Status notification icon's contextual menu to disable the wireless connection and then enable a wired connection.

  Note that this method is only possible if both connections have the Manual activation type, and the active network profile is of the reactive type.

- Edit the enabled network profile to enable the wired connection and disable the wireless connection.

  Note that this method is only possible if the active network profile is of the reactive type.

  When the wired connection is established, a notification message is displayed.

Note – You cannot manually switch between connections when a fixed network profile is active.

For other tasks that you can perform by using the network administration GUI, see the online help.

Joining and Managing Favorite Wireless Networks

By default, when wireless network connection is enabled, reactive network configuration attempts to connect to any available network in the favorites list, without asking, in the priority order in which the connections are listed. If no favorite networks are available, the Wireless Chooser dialog opens. In this dialog you can choose which wireless network to join.

You can also modify the way in which connections to wireless networks are attempted in the Wireless tab of the Network Preferences dialog's Connection Properties view. When a reactive profile is active, you can manually connect to a different wireless network by accessing the Network Status notification icon's contextual menu.

Tip – You can access the Connection Properties view for a selected network through the Network Preferences dialog. This dialog contains a drop-down list that is labeled, Show. This list enables you to switch between views for a given network. In each view, there are different tasks you can perform and information about the selected network that is specific to that view.

The following views exist for every network connection in each network profile that is on the system:

- Connection status
- Network profile
- Connection properties

For more information about working with network profiles, including a description of the Network Preferences dialog, see "Managing Network Profiles" on page 99.

▼ How to Join a Wireless Network

Wireless networks are joined by choosing the Join Wireless Network option that is available by right-clicking the Network Status notification icon. The Wireless Chooser dialog is where you select a wireless network to connect to, from the list of available networks that is displayed.

1 **To manually connect to a different wireless network when a reactive network profile is active, you can do one of the following:**

- **Choose an available wireless network from the Network Status notification icon's contextual menu.**

- **Choose the Join unlisted wireless network option from the Network Status notification icon's contextual menu.**

  An unlisted wireless network has been configured so that it does not broadcast its network name, yet is still available to join.

- **Select an available wireless network from the Wireless Chooser dialog.**

  This dialog is displayed automatically when there is a choice of available wireless networks to join.

FIGURE 4–1 Wireless Chooser Dialog
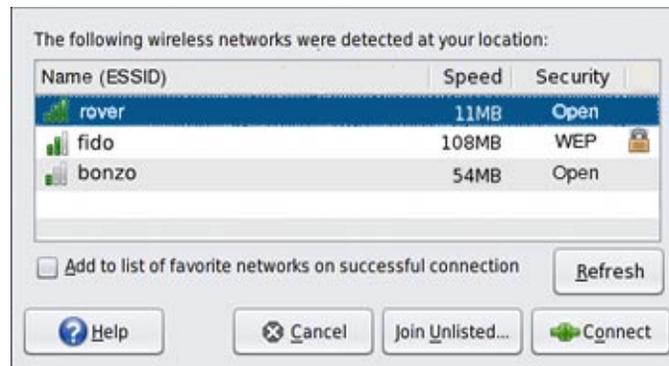
Note – You cannot manually select a different wireless network when a fixed network profile is active.

2 **If the Join Wireless Network dialog opens, provide all of the necessary information for the wireless network you have chosen.**

For more details about the information that you might need to provide, refer to the network administration GUI online help.

Managing Favorite Networks

By default, when you join a wireless network for the first time, a check box that is labeled, Add to list of favorite networks on successful connection, is displayed in the Join Wireless Network dialog.

- To add the wireless network to your list of favorites, if the connection is successful, select this box. If you do not want the network to be added to your list of favorites, deselect the box. The box is selected by default.

- To add a wireless network that is not currently available, or not currently broadcasting its network name to your favorites list, go to the Wireless tab of the Connection Properties view, then click the Add button. To add the network, you need to know its network name, security type, and security key.

FIGURE 4–2   Wireless Tab of the Connection Properties View

Managing Network Profiles

In the network administration GUI, network profiles are equivalent to the NCPs that are described in "Description of an NCP" on page 12.

A network profile specifies which network interfaces can be enabled or disabled at any given time. Using network profiles can be helpful in situations where you have more than one network interface available. For example, most modern laptop brands have both a wired and a wireless interface. Depending on your physical location and your work environment, you might want to use only one of those interfaces and disable the other interface for security or other reasons.

The network profiles that are available in the network administration GUI are either reactive or fixed. By default, there is one reactive network profile, Automatic, and one fixed network profile, DefaultFixed. You can switch between the profiles by using the GUI, as required. You can create, edit, and delete user-defined reactive profiles by using the GUI, but you cannot edit or delete the default system-defined profiles.

By default, the Automatic network profile first attempts to enable one wired connection. If that attempt fails, it then attempts to enable one wireless connection.

About the Network Preferences Dialog

The Network Preferences dialog is where individual network connections are configured and how the current state of each network connection is viewed. The dialog provides access to various views that you can switch to by using the drop-down list located at the top of the dialog.

You can open the dialog in the following ways:

- By clicking the Network Status notification icon on the desktop
- By choosing System → Administration → Network from the Main Menu bar on the desktop panel
- By choosing Network Preferences from the Network Status notification icon's contextual menu

At the top of the Network Preferences dialog is a drop-down list that is labeled Show. This list enables you to switch between the Connection Status view, the Network Profile view, and the Connection Properties view for every network connection in each network profile.

- **Connection Status view**

  The Connection Status view displays information about network connections in the active network profile. If the profile is of the fixed type, this view shows all configured wired and wireless connections in the profile. If the profile is of the reactive type, this view shows each enabled network connection with the Manual activation type. For more information, see "How to Show Details About an Enabled Network Connection" on page 94.

- **Network Profile view**

  Network profile information can be viewed in the Network profile view of the Network Preferences dialog.

  To display this view, select Network Profile in the drop-down list that is located at the top of the Network Preferences dialog.

FIGURE 4–3   Network Preferences Dialog
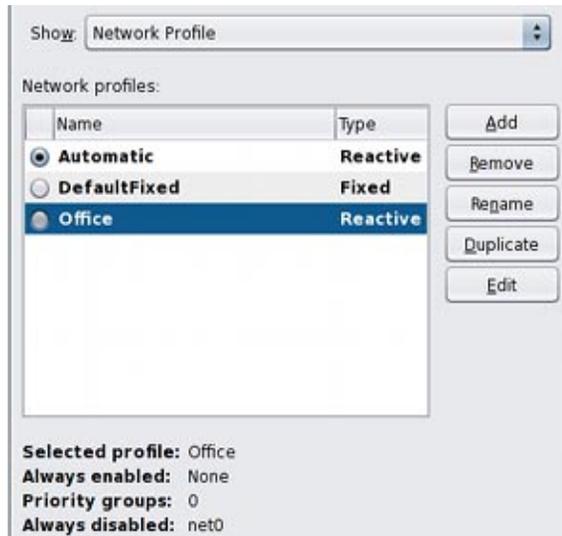
- **Connection Properties view**

  The Connection Properties view enables you to view and change properties of a specified network connection. To switch to this view, select the connection name from the Show drop-down list or double-click the connection name while in either the Connection Status or the Network Profile view. A tabbed view is displayed, whereby you can view or edit the connection's properties.

  Note – You cannot access the Connection Properties view for any connection when a fixed network profile is active.

  The Connection Properties view has two tabs: an IP address tab and a wireless tab. The wireless tab is only displayed if the connection type is wireless. In this IP address tab, you can configure both IPv4 and IPv6 addresses. In the wireless tab, you can configure the list of favorite networks and choose how the wireless interface connects to available networks.

FIGURE 4–4   Connection Properties View
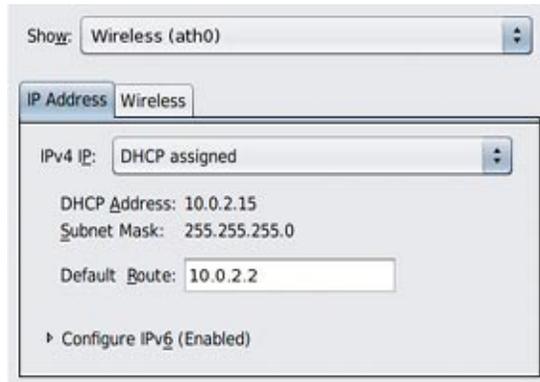
Viewing Information About Network Profiles

Network profile information can be viewed in the Network Profile view of the Network Preferences dialog.

To display this view, select Network Profile in the drop-down list that is located at the top of the Network Preferences dialog.

The Network Profiles list displays the name of each available network profile. The currently enabled profile is shown with a radio button indicator. By default, there is one reactive network profile, Automatic, and one fixed network profile, DefaultFixed. You can enable these default system-defined profiles, but you cannot edit or delete them. However, you can create multiple user-defined reactive network profiles. The reactive network profiles that are manually created can be enabled, edited, or deleted, as needed.

Below the Network Profiles list is a summary of the profile that is selected. To view the selected profile in full or to edit the profile, click the Edit button.

Note – The *selected* profile might be different than the *enabled* profile.

▼ How to Switch From One Network Profile to Another Network Profile

1   **Open the Network Profile view of the Network Preferences dialog.**

2   **Select the radio button next to the network profile that you want to enable.**

3   **To switch network profiles, click OK or Cancel to close the dialog without switching profiles.**

Adding or Removing a Network Profile

To create or edit a network profile, select Network Profile from the drop-down list that is located at the top of the Network Preferences dialog.

- To create a new network profile, click the Add button, then type the name of the new profile. Note that only reactive network profiles can be created.

- To duplicate an existing network profile, select the profile in the list, click the Duplicate button, then type the name of the new profile. Note that only reactive network profiles can be duplicated.

- To remove a network profile, select the profile in the list, then click the Remove button.

Note – You cannot remove the `Automatic` network profile or the `DefaultFixed` network profile.

For more information about editing a profile that you have added or duplicated, see "Editing Network Profiles" on page 102.

Editing Network Profiles

To edit a reactive network profile, select the profile in the Network Profile view of the Network Preferences dialog, and then click the Edit button. The Edit Network Profile dialog opens. In this dialog, you can add or remove connections (NCUs) from the profiles. If you add a connection to a profile, the added connection is enabled when the profile is active. If you remove a connection from the profile, the connection is disabled. See "Working With Priority Groups" on page 104.

Note – You can edit and remove a manually created network profile. However, you cannot edit or remove the `Automatic` network profile.

▼ How to Edit a Fixed Network Profile

You cannot edit fixed network profiles by using the Edit Network Profile dialog.

1 **Select the profile in the Network Profile view of the Network Preferences dialog.**

2 **Select the radio button of the fixed network connection profile that you want to edit, and then click OK to enable the profile.**

3 **Use the `ipadm` and `dladm` commands to make the required changes to the active profile.**

For more information about the ipadm and dladm commands, see the ipadm(1M) man page, the dladm(1M) man page, and *Connecting Systems Using Fixed Network Configuration in Oracle Solaris 11.1*.

▼ How to Add or Remove Connections

You can add or remove connections (NCUs) from the profiles. If you add a connection to a profile, the added connection is enabled when the profile is active. If you remove a connection from the profile, the connection is disabled.

1   Select the profile in the Network Profile view of the Network Preferences dialog, and then click the Edit button.

FIGURE 4–5   Edit Network Profiles Dialog
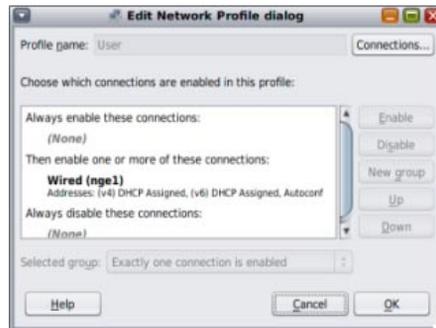
The network connections that are enabled for the selected profiles are listed. You can add or remove connections for the selected profile.

Note – The `Automatic` network profile cannot be edited or deleted. Any time the `Automatic` network profile is selected in the Edit Network Profile dialog, all of the profile editing buttons and drop-down lists are disabled.

For more information, see the online help.

2   In the Edit Network Profile dialog, click the Connections button.

Alternatively, you can choose a connection from the list of available connections to be enabled or disabled and click the Enable or Disable button.

The Edit Connections dialog is displayed.

3   To add or remove connections, choose one of the following:

■   **Select the connections to add to the profile, and click OK.**

The connections are added to the profile and are enabled when the profile becomes active.

- **Deselect the selected connections to remove from the profile, and click OK.**

  The connections are removed from the profile and are disabled.

Note – By default, all wired network connections take priority over all wireless network connections. That is, a wireless network connection is only attempted if a wired connection cannot be established. If more than one wireless network is available at the current location, you are prompted to select which network to join.

Working With Priority Groups

You can create a network profile that treats one or more network interfaces as a group. If one or more of the interfaces in the highest priority group cannot be enabled, according to the group's priority type, then the group with the next highest priority is considered.

The following table describes the three different priority group types that are available.

Priority Type	Description
Exclusive	One connection in the group is enabled, and all the other connections are disabled. As long as at least one connection in the group is enabled (not necessarily the same one all the time), no attempt is made to enable connections in any of the lower priority groups.
Shared	All of the connections in the group that can be enabled are enabled. As long as at least one connection in the group remains enabled, no attempt is made to enable connections in any of the lower priority groups.
All	All of the connections in the group are enabled. If any of the connections are lost, all of the connections in the group are disabled. As long as all of the connections remain enabled, no attempt is made to enable connections in any of the lower priority groups.

For example, the default `Automatic` network profile contains two exclusive priority groups. The higher priority group contains all of the *wired* network connections. The lower priority group contains all of the *wireless* network connections.

For detailed instructions about performing these and other tasks, see the online help.

▼ How to Move a Network Connection to the Always Enabled Group

A network connection in the "always enabled" group is always enabled when the selected network profile is active.

1 **Enable the network profile that you want to edit.**

2   In the Edit Network Profile dialog, select the connection to be always enabled.

3   Click the Up button until the connection moves to the "always enabled" group.

▼ How to Remove a Network Connection

A network connection is disabled if it is removed from the profile when the profile is active.

1   In the Edit Network Profile dialog, click the Connections button.

The Edit Connections dialog is displayed.

2   Deselect the connection to be disabled and click OK.

Creating and Managing Locations

A location contains certain elements of a network configuration, for example, a naming service and firewall settings, that are applied together, when required. You can create multiple locations for various uses. For example, one location can be used when you are connected at the office by using the company intranet. Another location can be used at home when you are connected to the public Internet by using a wireless access point. Locations can be enabled manually or automatically, according to environmental conditions, such as the IP address that is obtained by a network connection.

The Network Locations dialog is where you can to switch locations, edit location properties, create new locations, and remove locations. Note that only user-defined locations can be created and removed. The Locations dialog can be opened from the Connection Status view of the Network Preferences dialog.

FIGURE 4–6   Locations Dialog
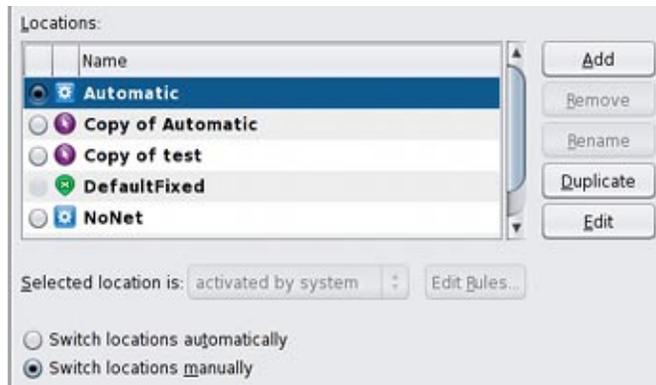
The Locations list is similar to the list in the Network Status notification icon's contextual menu. Each available location, with an icon that represents its activation type, is listed.

Location types are dependent on their activation mode. They are as follows:

- System – Locations of this type are system-defined locations (`Automatic`, `NoNet`, and `DefaultFixed`), which means the system determines when to enable the location, based on current network conditions. The `DefaultFixed` location is only enabled when the corresponding `DefaultFixed` network profile is enabled. A `DefaultFixed` location cannot be manually enabled or disabled.
- Manual – Locations of this type can be manually enabled or disabled by using the Network Locations dialog or by interacting with the Network Status notification icon.
- Conditional – Locations of this type are enabled or disabled automatically, according to the rules that you specify during the creation of the location.

Note – When a system location or a fixed location is selected, the drop-down list shows Activated by System or Activated by Fixed Profile, respectively. Both the drop-down list and the Edit Rules button are disabled.

▼ How to Change a Location's Activation Mode

The following procedure describes how to change the activation mode for a location by using the GUI. If you are using the `netcfg` command, you would change the activation mode by modifying the properties of the specified location. For more information, see "Setting and Changing Property Values for a Profile" on page 60.

1   **From the Network Status notification icon's Location submenu, choose Network Locations. Or, from the Connection Status view of the Network Preferences dialog, click the Locations button.**

2   **To change the activation mode of a location, select the location in the list, then select the new activation mode from the Selected location drop-down list.**

When a system location or a fixed location is selected, the drop-down list shows Activated by System or Activated by Fixed Profile, respectively. Both the drop-down list and the Edit Rules button are disabled.

When a manual or a conditional location is selected, the drop-down list options are as follows:

- Manual activation only: This location is only enabled when it is manually selected. When this option is selected, the Edit Rules button is *disabled*.
- Activated by rules: This location is automatically selected under certain network conditions. When this option is selected, the Edit Rules button is *enabled*.

3   **(Optional) To set rules for how and when a location is enabled, click the Edit Rules button.**

For further instructions, see "Working With the Rules Dialog" in the online help.

▼ How to Switch From One Location to Another Location

The following procedure describes how to switch from one location to another location by using the GUI. To switch locations by using the CLI, use the netadm command to enable a new location. Because exactly one location must be enabled on the system at all times, enabling a new location implicitly disables the currently enabled location. The same rule applies when enabling a network profile. For more information about enabling and disabling locations, see "Enabling and Disabling Profiles" on page 69.

● **From the Network Status notification icon's Location submenu, choose the location that you want to enable.**

If the switch locations automatically option is selected on the Locations submenu, you cannot manually choose a location to enable. The most appropriate System or Conditional location is enabled automatically at any given time, according to changes in the network environment.

If the switch locations manually option is selected on the Location submenu, you can enable any available location, regardless of its activation type. The selected location remains enabled indefinitely.

- **Alternatively, you can switch locations in the Network Locations dialog. To do so, follow these steps:**

  a. **From the Network Status notification icon's Location submenu, select Network Locations. Or, from the Connection Status view of the Network Preferences dialog, click the Locations button.**

    b. Select the radio button of the location to which you want to switch, then click OK.

- **If the switch locations automatically radio button is selected in the Network Locations dialog, you cannot manually choose a location to enable. The most appropriate System or Conditional location is enabled automatically at any given time, according to changes in the network environment.**

- **If the switch locations manually radio button is selected in the Network Locations dialog, you can enable any available location, other than a fixed location. The new location remains enabled indefinitely.**

Editing Locations

Editing a location by using the GUI is the equivalent to modifying a location's properties if you are using the CLI.

▼ How to Edit a Location

1 Choose Network Locations from the Network Status notification icon's submenu.

Alternatively, from the Connection Status view of the Network Preferences dialog, click the Locations button.

2 Select the location in the list, then click Edit.

Alternatively, you can double-click the location in the list.

Note – You cannot edit the properties of fixed locations.

The Edit Location dialog opens, with the following two tabs available:

Name Services   Enables you to configure naming services in the specified location.

Security   Enables you to select configuration files to be used by IP Filter and IPsec features, when the specified location is enabled.

3 Select the appropriate tab to display the information to be edited.

About External Network Modifiers

External Network Modifiers (ENMs) provide the ability to specify when applications or scripts, for example, a VPN application, should perform their own network configuration external to that specified in the NCP and Location profiles. ENMs can also be defined as services or applications that directly modify the network configuration when they are enabled or disabled. ENMs are configured and monitored in the GUI by using the Network Modifiers dialog.

Note – Before you can manage a network modifier application or service by using the GUI, you must manually install it, then complete any initial setup, such as the installation of a certificate or shared secret.

An ENM can be started and stopped manually, as required. An ENM can also be started automatically, according to user-defined rules. To be managed by using this dialog, a network modifier application must either be implemented as a command-line tool, or as an SMF service.

To learn more about how to create and manage ENMs by using the CLI, see "Creating an ENM Profile" on page 54.

About the Network Modifiers Dialog

This dialog is used to add or remove, start and stop, and edit ENMs, applications that are capable of creating and modifying network configuration.

FIGURE 4–7 Network Modifiers Dialog
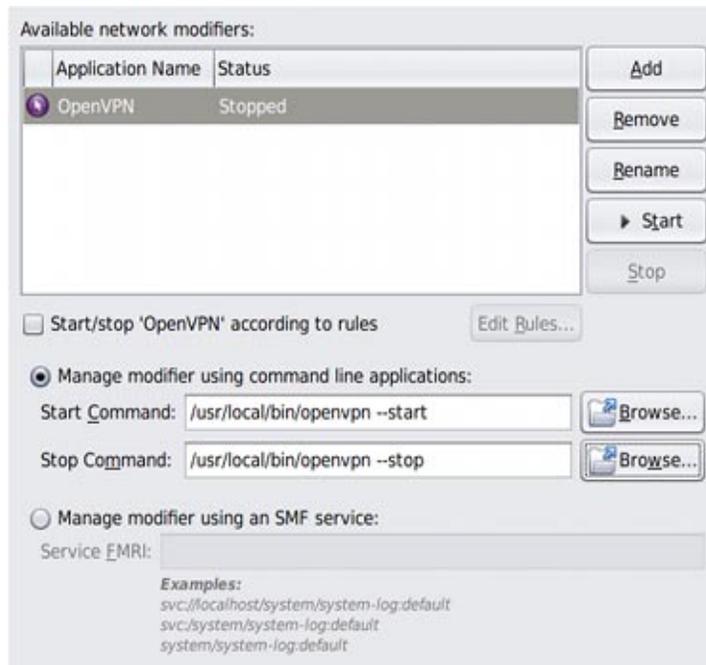
Open the dialog by using one of the following methods:

- Click the Modifiers button in the Connection Status view of the Network Preferences dialog.
- Right-click the Network Status notification icon, then choose the Network Modifier Preferences menu item.

The main section of the dialog Available network modifiers that displays the following information for each ENM:

- Activation state icon (Manual or Conditional)
- User-defined name (Modifier Name), for example, "OpenVPN"
- Current status, "Running" or "Stopped"

The Start/Stop according to rules check box is checked if the selected network modifier application has a Conditional activation type, and unchecked if the activation type is Manual. To change the activation type, toggle the check box.

▼ How to Add a Command-Line ENM

The following procedure describes how to add a command-line ENM. For information about adding a network modifier application service, see the online help.

1   **Open the Network Modifiers dialog by using one of the following methods:**

   - From then Connection Status view of the Network Preferences dialog, click the Modifiers button.

   - Right-click the Network Status notification icon, then choose the Network Modifier Preferences menu item.

2   **Click the Add button.**

3   **Type the name of the new network modifier application.**

4   **To add a new entry or cancel your changes, choose one of the following:**

   - **To add a new entry that has the Manual activation type, press Enter or Tab.**

      The two Manage modifiers radio buttons are enabled. The first of these, Command Line Applications, is selected by default. The Start and Stop command fields, and the two Browse buttons, are also enabled.

   - **To cancel your changes, press Escape.**

5   **Type the command that starts the network modifier application into the Start Command field.**

   Alternatively, you can use the Browse button to open a file chooser dialog, where you can select the command to use.

   The Start button remains disabled for the network modifier application until a valid command has been typed into this field.

6   **Type the command that stops the network modifier application into the Stop Command field.**

   Alternatively, you can use the Browse button to open a file chooser dialog, where you can select the command to use.

   The Stop button remains disabled for the network modifier application until a valid command has been typed into this field.

7   **To add this application, click OK.**

   The external network modifier is added.

Index