Oracle® SD-WAN Edge

WAN Optimization Guide Capabilities and Configuration

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Table of Contents

About This Document

This document discusses how to configure WAN Optimization functionality on supported platforms running APN 7.0 GA or later.

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- Corruption of system databases that requires service affecting corrective actions

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   A list of the entire documentation set for the selected product and release appears.

5. To download a file to your location, right-click the PDF link, select Save target as (or similar command based on your browser), and save to a local folder.

References

The following documents are available:

- *Talari Glossary*
- *Talari APN 7.0 GA Release Notes*
- *Talari APN 7.0 New Feature Guide*
- *Talari APN 7.2 New Feature Guide*
- *Talari APN 7.3 New Feature Guide*
- *Talari TCP Termination Application Note*

Introduction to WAN Optimization

Benefits

WAN Optimization (WANOp) increases efficiency across the WAN for unencrypted bulk filetransfer traffic, specifically for data requested by more than one user at the same location. By utilizing the Talari WAN Optimization solution, users can now simplify their branch network infrastructure by consolidating SD-WAN and WANOp services on a single device.

Capabilities

Talari now provides the ability to perform WAN Optimization on TCP-based flows within an appliance. These Flows are then mapped into the Talari conduit to provide resilience across the WAN infrastructure. The WANOp process performs two key functions: **compression**, using the Zstandard algorithm; and **deduplication**, which eliminates the transfer of redundant data across the WAN by sending references in place of the actual data.

The TCP session **must be an unencrypted session** for the compression and deduplication capability to provide maximum value. The data that will fit this model will typically be clear text bulk file transfers. The configuration of the WANOp capability is simple—the user can enable the capability on a specific TCP-based rule. When WANOp is enabled, this also enables another feature, TCP Termination, for traffic matching the rule.

Note: The Talari Appliance must see the initial TCP handshake (SYN, SYN-ACK, ACK) for a Flow to be TCP Terminated and WAN Optimized. Additionally, if the IP header is more than 20 bytes or options have been filed in the IP header, the Flow will not be TCP Terminated and WAN Optimized.

TCP Termination

TCP Termination provides the ability to split a single TCP connection (as shown in Figure 1) into three separate TCP connections all managed and maintained by the APN, as shown in Figure 2. TCP Termination offers maximum throughput by locally terminating the TCP session, and offers reliable transfer across the WAN via the Talari conduit.
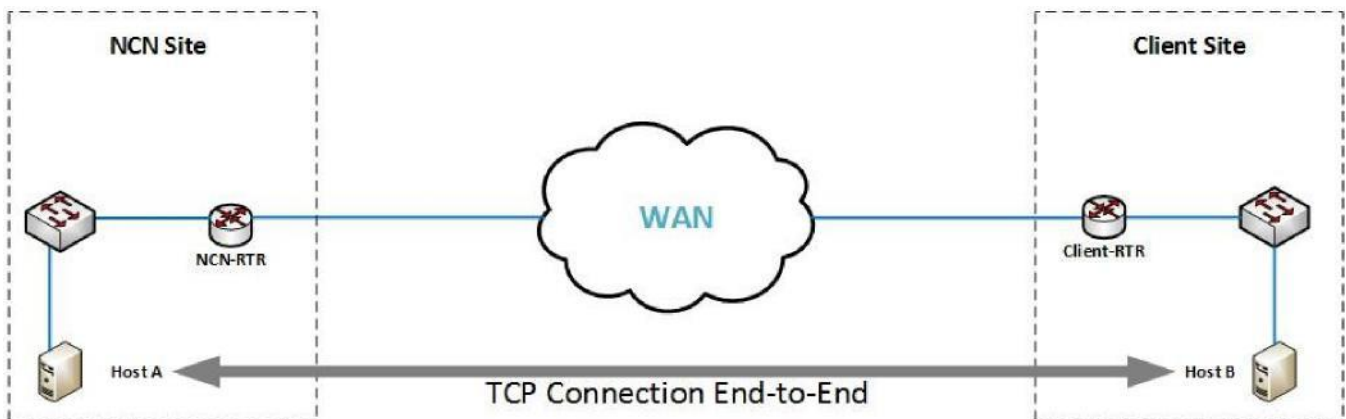
Figure 1
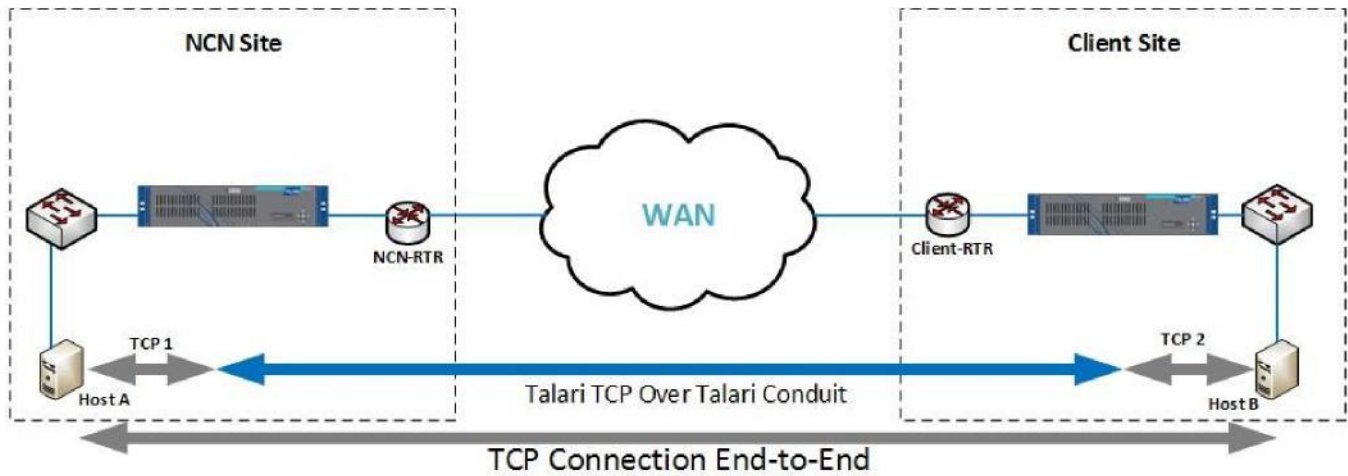
igure 2

Figure 1 and Figure 2 show traffic flowing from the NCN site to a Client site. The diagrams could also be Client-to-Client traffic through a dynamic conduit. For simplicity, a typical two-site Talari APN is depicted, with one NCN and one Client site. In Figure 2, it is assumed that there is a Talari Conduit between the Talari Appliances.

The three separate connections used for TCP Termination would be defined as:

- Host A to NCN
- ANCN to Client
- AClient to Host B

The primary benefit of TCP Termination is the ability to increase potential throughput across the WAN. Significant performance improvements can be seen when there is loss on the link or there is a high round trip time (RTT) across the WAN. File transfer applications will typically yield the most benefit from TCP Termination performance.

ote: TCP Termination is enabled by default when WANOp is enabled. However, TCP Termination may also be enabled independently of WANOp.

WAN Optimization

Figures 3 and 4 show how a WAN Optimized session flows through a Talari Appliance.

Figure 3: WAN Ingress

In Figure 3, we can see how a TCP session flows from the LAN to the WAN through an appliance that is configured to support WAN Optimization.

As the Flow is received by the LAN interface the appliance will perform a number of tasks to identify if the session should be WAN Optimized. These include:

- Validate that the session is a Conduit session
- Identify whether the Flow matches a specific Rule. If the Flow matches a rule with WANOp enabled:
  - Perform TCP Termination on the TCP Flow
  - Internally forward the Flow to the WANOp process for optimization

Note: Once there has been a Rule match the system **must** see the initial TCP 3-way handshake for a Flow to be WAN Optimized.

Once the session is directed to the WANOp process, the first operation performed is deduplication. on the session. Deduplication is designed to provide the maximum benefit with a full deduplication buffer. If the deduplication buffer is not full, there is a brief timeout before the buffer is processed in the event more packets are received for the Flow. Once the deduplication buffer is full, the deduplication process creates a chunk identifier. The chunk identifier is used between the Talari Appliances to identify that data reduction "chunk". Once deduplication is complete, the WANOp process compresses the data using the Zstandard compression algorithm.

When the WANOp process is complete, the optimized data is used to create a WAN-based TCP Terminated Flow between WANOp-enabled Talari Appliances. The WANOp packets maintain their source and destination IP information as they are routed across the Conduit. Prior to sending the Flow out the WAN interface, the Talari Appliance will apply any other applicable Conduit properties configured by the user. Additionally, all WAN Optimized data packets are set for reliability to ensure packets transported across the WAN reach their destination appliance.
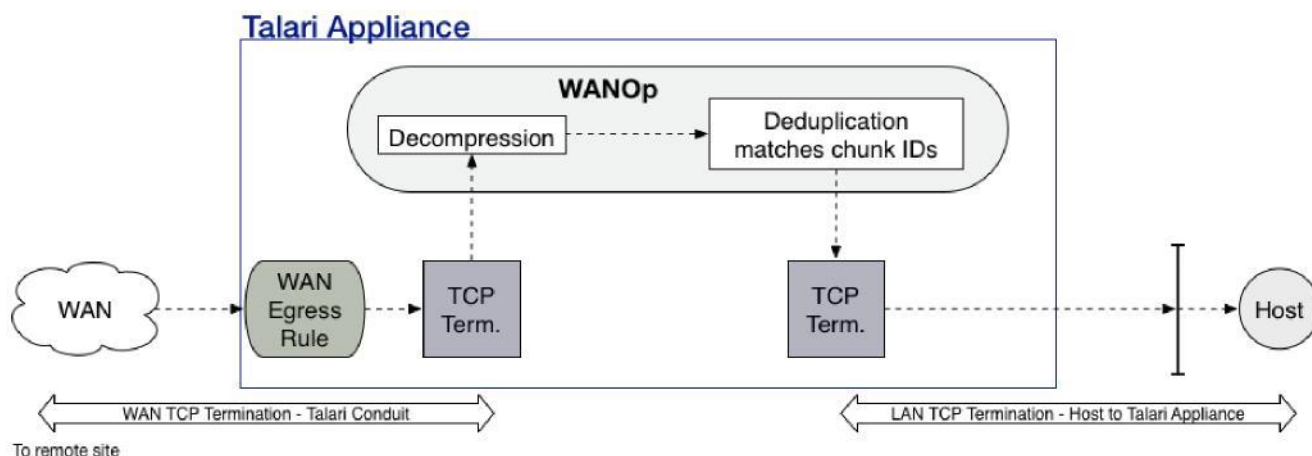
Figure 4: WAN Egress

In Figure 4, we see WANOp packets being received and processed by an appliance. WANOp packets received by a destination appliance are uncompressed and the deduplication process is used to match any chunk identifications with the local cache. After this process is complete, the data frame is passed to a LAN side TCP Termination process that has been established between the local Talari Appliance and the local host. The data is then forwarded to the local host.

Supported Platforms

WAN Optimization is supported on the following Talari Appliances when running APN 7.0 GA or above:

Model	Maximum TCP Terminated Sessions	Maximum WANOp Performance	WANOp Cache Size
E50	500	223 Mbps	64 GB*

E100	8000	386 Mbps	64 GB*
E500	16000	480 Mbps	180 GB
T3010v2	16000	583 Mbps	64 GB*
E1000	16000	1.8 Gbps	180 GB*
T5000v2	16000	1.3 Gbps	64 GB*
T5200	16000	2 Gbps	128 GB*

* Cache size based on APN 7.2

Note: The hardware version of an appliance may be determined by navigating to the home page for the appliance. Hardware version will be displayed in the "Local Versions" box, along with information about the current configuration, software, and OS. If WAN Optimization is configured on an appliance which does not support the feature, WAN Optimization will not be performed on that appliance.

Note: When a WANOp-capable appliance is upgraded to APN 7.0 or above for the first time, the /home partition is expanded. To complete the operation and allow WANOp to take advantage of the expanded partition, the appliance must be rebooted. If the appliance has not yet been rebooted, you will see the following banner displayed on the home screen of the appliance:

> ⚠ Warning:As a result of the latest software installation the /home partition has been resized.
> A one-time Reboot of this appliance is required.

An immediate reboot is not necessary. WANOp and the Talari service will function normally, although without the benefit of the expanded partition.

Virtual Talari Appliances

WAN Optimization is also supported on the VT800 and CT800 platforms when running APN 7.1 GA or above, and on the VT800-128 and CT800-128 platforms when running APN 7.3 GA P4 or abive, with the following specifications:

Platform	License Level	WANOp Capacity	VCPUs	RAM	Max WANOp Sessions	Cloud Instance Type
VT800 for ESXi	20 Mbps	8 Mbps	2	8GB	1,500	
VT800 for ESXi	2 Gbps	200 Mbps	14 (2.10GHz)	16GB	10,000	
VT800-128 for ESXi	2 Gbps	200 Mbps	14 (2.10GHz)	16GB	10,000	

VT800 for Azure	20 Mbps	8 Mbps	4	28GB	10,000	D12_v2
VT800 for Azure	500 Mbps	100 Mbps	8 (2.4GHz)	56GB	16,000	D13_v2
VT800-128 for Azure	500 Mbps	100 Mbps	8 (2.4GHz)	56GB	16,000	D13_v2
VT800 for Hyper-V	20 Mbps	8 Mbps	2	8GB	1,500	
VT800 for Hyper-V	200 Mbps	100 Mbps	10 (2.10GHz)	10GB	5,000	
VT800-128 for Hyper-V	200 Mbps	100 Mbps	10 (2.10GHz)	10GB	5,000	
CT800 for AWS	20 Mbps	8 Mbps	8	15GB	5,000	c4.xlarge
CT800 for AWS	200 Mbps	50 Mbps	8	15GB	5,000	c4.2xlarge
CT800-128 for AWS	500 Mbps	50 Mbos	16	32GB	16,000	c5.4xlarge

All Virtual and Cloud Talari appliances running WANOp require a minimum of 160 GB of dedicated storage.

Note: The maximum number of WANOp sessions is scaled based on available memory. If a virtual appliance has insufficient dedicated RAM, the maximum number of WANOp sessions will be lower. Provisioning a virtual appliance below recommended system specifications will not disable WANOp, but will impact WANOp performance. Provisioning a virtual appliance below recommended minimum specifications is not supported.

A warning banner will be displayed in the Web Console if WANOp is enabled on a Virtual or Cloud Talari Appliance that does not meet the minimum recommended system specifications. An example is shown below, on a VT800 with insufficient RAM and VCPUs:

Warning:
- WAN Optimization will likely have degraded performance unless at least 8 GB of RAM are allocated to the appliance. The system currently only has 4.06 GB.
- WAN Optimization will likely have degraded performance unless at least 2 cores are allocated to the appliance. The system currently only has 1.

Configuration

Configuration Overview

WANOp is configured through the Talari Configuration Editor tool. In the Advanced view of the Configuration Editor, go to **Global > Default Sets > Conduit Default Sets > [Conduit Default Set] > Rules** and create a new rule for the type of traffic to be optimized. WANOp configuration is also supported for Dynamic Conduit Default sets (**Global > Default Sets > Dynamic Conduit Default Sets > [Conduit Default Set] > Rules**).
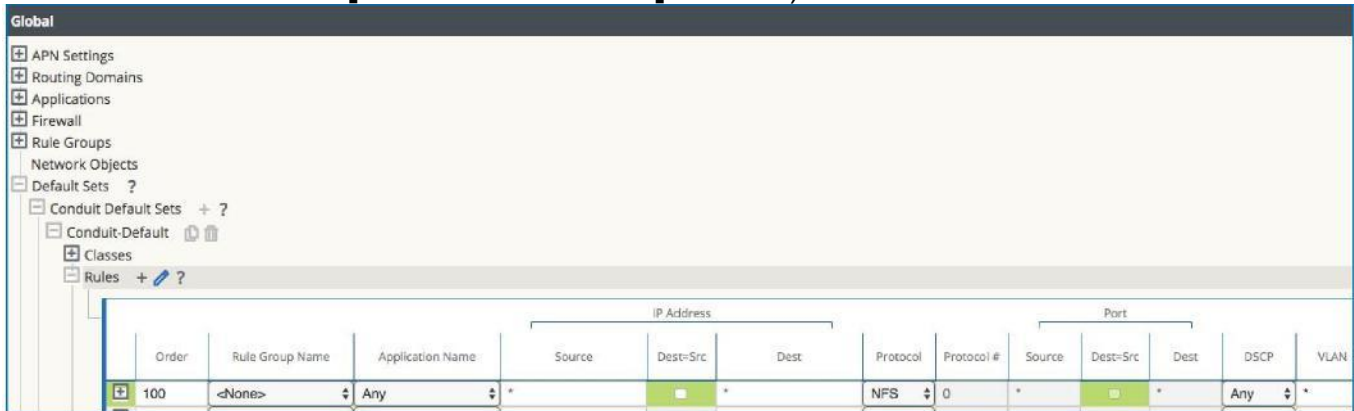
Note: Make the rule as specific as possible, or inappropriate traffic may be processed for WANOp, resulting in performance degradation. It is best to create a rule for each specific type of unencrypted TCP traffic to be WAN Optimized.

xpand the rule properties. WAN Optimization is enabled via a dropdown menu under the WAN General heading. When WANOp is enabled, TCP Termination is also enabled by default.
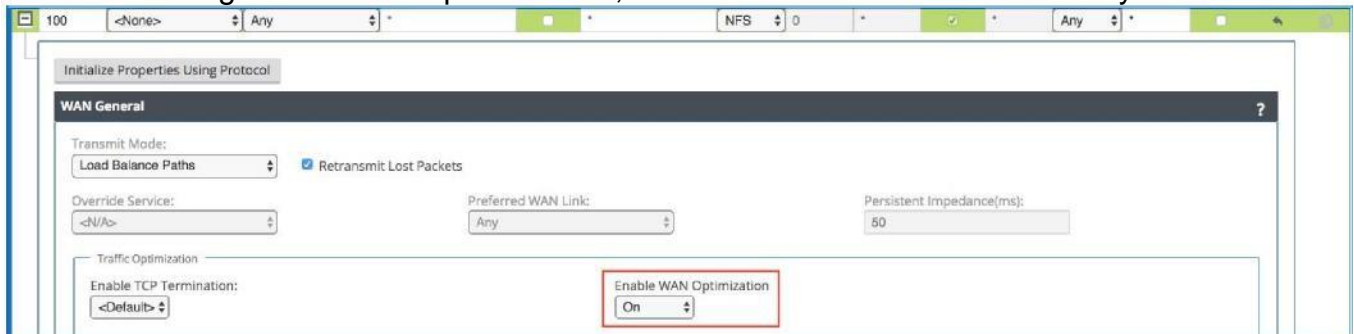
A reciprocal rule with WANOp enabled will be automatically generated at the remote site.

Note: WANOp rules can also be configured under **Connections > [Site Name] > Conduits > [Conduit Name] > Local Site > Rules**, if preferred. The process for enabling WANOp on a rule at the Conduit level is the same as above.

Note: TCP Termination may also be configured separately from WAN Optimization. Please see the *Talari TCP Termination Application Note* for more information on configuring TCP Termination as a stand-alone feature.

Verification and Troubleshooting

WAN Optimization Dashboard

APN 7.2 provides a new at-a-glance dashboard for WAN Optimization with more detailed reports and more data about the protocols being optimized. The dashboard refreshes automatically every minute to provide up-to-date information. To view the dashboard, navigate to **WAN Optimization > Dashboard**.

Bandwidth Saved (MB)	Data Reduction (%)	(Ingress) Optimized (MB)	Non Optimized (...	(Egress) Optimized (MB)	Non Optimized (...	Optimized Sessions	Tota...
906 | 2,678	**13.3 | 16.9**	**5,978 | 7,046**	**12,825 | 15,760**	**3208 | 9811**
Ingress | Egress	*Ingress | Egress*			

Data Reduction % by App/Protocol (LAN to WAN)

Data Reduction % by App/Protocol (WAN to LAN)

Optimized Traffic by App / Protocol (From LAN)

Unknown: 0.0 % HTTP: 2.7 % SMB: 18.4 % FTP: 0.0 % NFS: 78.9 %

Optimized Traffic by App / Protocol (To LAN)

Unknown: 0.0 % NFS: 0.7 % FTP: 0.0 % HTTP: 41.5 % SMB: 57.9 %

Application Data Reduction Table

Show 10 entries   Search:

Application	Reduction Ingress (%)	Reduction Egress (%)	From LAN (MB)	To WAN (MB)	From WAN (MB)	To LAN (MB)
FTP	0	27.26	0	0	0	0
HTTP	20.67	42.55	189	150	3754	6534
SMB	0	1.45	1295	1311	8991	9123
NFS	18.77	21.63	5561	4517	81	103
Unknown	100	0	0	0	0	0

Showing 1 to 5 of 5 entries   Previous 1 Next

WAN Optimization Dashboard Overview

Note: The new WAN Optimization dashboard takes advantage of the Application objects that can be defined in the Talari Configuration (**Global > Applications**). Application Recognition was introduced in APN 6.1. Please see the APN 6.1 New Features Guide for configuration details.

If an application is defined in the configuration and used in policies or rules, individual WANOp statistics will be tracked for that application and tagged with the application name defined in the configuration.

The first section of the WAN Optimization dashboard presents summary information about WAN Optimization function at the site:

Bandwidth Saved (MB)	Data Reduction (%)	(Ingress) Optimized (MB) | Non Optimized (MB)	(Egress) Optimized (MB) | Non Optimized (MB)	Optimized Sessions | Total Flows
4 | 4,925	0 | 14	9,516 | 10,234	29,072 | 35,268	2651 | 9232
Ingress | Egress	*Ingress | Egress*			

Bandwidth Saved (MB): Total bandwidth saved using WAN Optimization in MB, for WAN Ingress and WAN Egress. Links to **WAN Optimization > Monitor WANOp** with the Kbytes Saved report pre-selected.

Data Reduction (%): Data reduction percentage using WAN Optimization, for WAN Ingress and WAN Egress. Links to **WAN Optimization > Monitor WANOp** with the Data Reduction % report pre-selected.
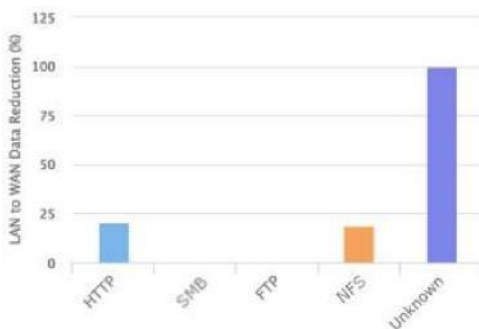
(Ingress) Optimized (MB) | Non Optimized (MB): Total WAN Ingress bandwidth optimized vs non-optimized, in MB. Links to **WAN Optimization > Statistics**.

(Egress) Optimized (MB) | Non Optimized (MB): Total WAN Egress bandwidth optimized vs non-optimized, in MB. Links to **WAN Optimization > Statistics**.
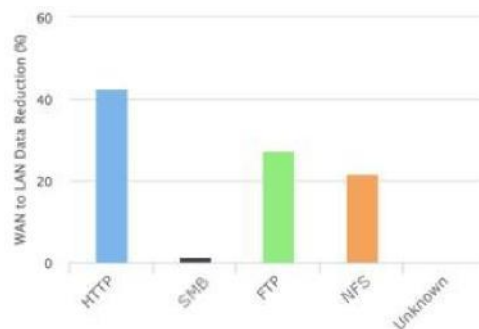
Optimized Sessions | Total Flows: Total number of active WAN Optimized sessions vs total active sessions. Links to **WAN Optimization > Flows**, with WAN Ingress, WAN Egress, and TCP Termination Table pre-selected.

The second section of the WAN Optimization dashboard provides data reduction reports by application/protocol:

Data Reduction % by App/Protocol (LAN to WAN): Data reduction percentage for each protocol or application (for applications defined in the Talari configuration), for upload/WAN Ingress.

Data Reduction % by App/Protocol (WAN to LAN): Data reduction percentage for each protocol or application (for applications defined in the Talari configuration), for download/WAN Egress.

The third section of the WAN Optimization dashboard provides information about optimized traffic by application/protocol:

Optimized Traffic by App / Protocol (From LAN)

Unknown: 0.0 %   HTTP: 2.7 %
SMB: 18.4 %
FTP: 0.0 %
NFS: 78.9 %

Optimized Traffic by App / Protocol (To LAN)

Unknown: 0.0 %
NFS: 0.7 %
FTP: 0.0 %
HTTP: 41.5 %
SMB: 57.9 %

Optimized Traffic by App/Protocol (From LAN): Chart displaying the percentage of total optimized upload/WAN Ingress traffic for each protocol or application (for applications defined in the Talari configuration).

Optimized Traffic by App/Protocol (To LAN): Chart displaying the percentage of total optimized download/WAN Egress traffic for each protocol or application (for applications defined in the Talari configuration).

The final section of the WAN Optimization dashboard is the **Application Data Reduction Table**:

Application Data Reduction Table

Show 10 entries   Search:

Application	Reduction Ingress (%)	Reduction Egress (%)	From LAN (MB)	To WAN (MB)	From WAN (MB)	To LAN (MB)
FTP	0	27.26	0	0	0	0
HTTP	20.67	42.55	189	150	3754	6534
SMB	0	1.45	1295	1311	8991	9123
NFS	18.77	21.63	5561	4517	81	103
Unknown	100	0	0	0	0	0

Showing 1 to 5 of 5 entries   Previous 1 Next

The Application Data Reduction table shows flow statistics for WAN Optimized sessions that match user-defined Application objects in the Talari configuration, as well as WAN Optimized HTTP, HTTPS, FTP, SSH, and Telnet sessions that do not match a defined Application object.

Reduction Ingress (%): Percentage of reduction achieved via deduplication and compression for WAN Ingress (upload) traffic.

Reduction Egress (%): Percentage of reduction achieved via deduplication and compression for WAN Egress (download) traffic.

From LAN (MB): Actual MB of traffic received from LAN, before de-duplication and compression.

To WAN (MB): Actual MB of WAN Optimized traffic sent to WAN, after de-duplication and compression.

From WAN (MB): Actual MB of WAN Optimized traffic received from WAN.

To LAN (MB): Actual MB of traffic sent to WAN, after expansion and reconstruction.

WAN Optimization Flows

A Flow is a stored record used to track and administer policies for application traffic from its source to its destination. To verify the rule properties of a TCP Flow, go to **Monitor > Flows.** With the WAN Ingress and WAN Egress Flow Types checked, hover over a Flow to get more detailed information. The tooltip will display the properties of the rule being used by the TCP Flow.

Both WAN Ingress and WAN Egress Flows

Routing Domain	Source IP Address	Dest IP Address	Direction	Source Port	Dest Port	IPP	IP DSCP	Hit Count	Service Type
Default_RoutingDomain	111.221.29.198	192.168.62.114	WAN Ingress	443	56256	TCP	default	11	CONDUIT
Default_RoutingDo			WAN Ingress	56256	443	TCP	default	10	CONDUIT
Default_RoutingDo			WAN Ingress	37942	80	TCP	default	6	INTERNET
Default_RoutingDo			WAN Ingress	123	123	UDP	cs6	2	CONDUIT
Default_RoutingDo			WAN Ingress	37612	443	TCP	default	11	CONDUIT
Default_Routing Do			WAN Ingress	37253	80	TCP	default	6	INTERNET

Tooltip text:
```
VLAN ID = 0
Rule ID = 1519 Configured Properties:
Override = NO
Demote on Large Packets = NO
Separate TCP ACK Class = NO
Packet Sequence Inorder = YES
  Inorder Holdtime: 900
Late Packet Action = DISCARD
Packet Duplication = NO
Persistent Paths = NO
Reliable = YES
TCP Standalone ACKs = NO
Check Flow TOS = NO
Deep Packet Inspection = NO
IP,TCP,UDP Header Compression = YES
GRE Header Compression = YES
Packet Aggregation = YES
TCP Termination = NO
WAN Optimization = YES
```

Note: When WANOp is enabled, the tooltip displaying rule properties will not show that TCP Termination is enabled. TCP Termination will only display as enabled when TCP Termination is explicitly enabled on a rule in the Talari Configuration.

To view only TCP Terminated Flows and verify that a Flow is currently being WAN Optimized, go to **WAN Optimization > Flows**.

TCP Terminated / WAN Optimized Flows

Routing Domain	Source IP Address	Dest IP Address	Source Port	Dest Port	IPP	Age (mS)	From LAN kbps	To WAN kbps	To WAN Data Reduction %	From WAN kbps	To LAN kbps	From WAN Data Reduction %	Bytes Pending To LAN	Bytes Pending To WAN	State	Is WANOp
Default_RoutingDomain	192.168.50.140	23.32.70.7	37612	443	6	4625644	0.000	0.000	0.0	0.000	0.000	0.0	0	0	CLOSE_WAIT0	Yes
Default_RoutingDomain	192.168.50.99	162.125.18.133	37096	443	6	79440	0.000	0.146	0.0	0.000	0.000	0.0	0	0	ESTABLISHED	Yes
Default_RoutingDomain	172.16.200.13	172.18.1.10	46360	443	6	59988	0.000	0.009	0.0	0.000	0.000	0.0	0	1	LAN_SYN_RECEIVED	Yes
Default_RoutingDomain	192.168.50.14	111.221.29.111	60725	443	6	3784730	0.000	0.000	0.0	0.000	0.000	0.0	0	0	CLOSE_WAIT0	Yes
Default_RoutingDomain	192.168.23.130	131.253.34.251	54302	443	6	62830	0.000	0.130	0.0	0.000	0.000	0.0	0	0	ESTABLISHED	Yes
Default_RoutingDomain	192.168.51.75	40.97.188.226	63567	443	6	142503	0.000	0.099	0.0	0.000	0.000	0.0	0	0	ESTABLISHED	Yes
Default_RoutingDomain	192.168.50.91	17.249.108.11	50123	443	6	961268	0.000	0.000	0.0	0.000	0.000	0.0	0	0	CLOSE_WAIT0	Yes

The Toggle Columns button can be used to hide and reveal columns in the Flow table as desired. Click on a header to sort.

- **From LAN kbps:** LAN Ingress kilobits per second over the period since the last
  - refresh. **To WAN kbps:** WAN Ingress kilobits per second over the period since the last refresh.
- **To WAN Data Reduction %:** WAN Ingress data reduction percentage over the period since the last refresh.
- **From WAN kbps:** WAN Egress kilobits per second over the period since the last refresh.
- **To LAN kbps:** LAN Egress kilobits per second over the period since the last refresh.
- **From WAN Data Reduction %:** WAN Egress data reduction percentage over the period since the last refresh.
- **Bytes Pending To LAN:** The number of bytes currently buffered to send to the LAN for the Flow.
- **Bytes Pending To WAN:** The number of bytes currently buffered to send to the WAN for the Flow.
- **State:** Indicates the current TCP connection state of the Flow.
- **Is WANOp:** Indicates whether the Flow is being WAN Optimized or not.

Monitoring WAN Optimization

HTo monitor current WAN Optimization status and site-wide statistics, navigate to **WAN Optimization > Monitor WANOp**. Status information is available for WAN Ingress and WAN Egress traffic. WAN Ingress traffic is Conduit traffic moving from the LAN into the WAN. WAN Egress traffic is Conduit traffic coming from the WAN and moving to the LAN. If "Show data for last minute" is checked, the statistics shown will only be for the last minute. Otherwise, the statistics will be calculated from the last restart of the WANOp service.

Site-Wide Statistics

This screen represents the site-wide calculations since the last restart of the WAN Optimization subsystem.

[Refresh] ☐ Show data for last minute.

Notes:

    Statistics updated once per minute.

    The data reductions presented on this screen are based on application layer data transferred across the WAN and do not include any IP protocol savings that may be reported on the raw flow data. For very low reduction values, the differences between this screen and the Monitor -> Flows screen will become more apparent.

    Click **here** to view detailed statistics per connection.

WAN Ingress		WAN Egress	
Data Reduction Percentage:	0.0 %	Data Reduction Percentage:	13.7 %
Total KBytes Saved:	3836	Total KBytes Saved:	5088235
Compression Ratio:	1.0 : 1		
Deduplication Ratio:	1.0 : 1		
Fixed Cache Size:	180 GB		

- **WAN Ingress Data Reduction Percentage**: WAN Ingress percentage of savings using WANOp.
- **WAN Ingress Total Kbytes Saved**: Total number of kilobytes saved from WAN to LAN.
- **WAN Ingress Compression Ratio**: Ratio of the number of bytes that would have been sent if not compressed (before compression:after compression).
- **WAN Ingress Deduplication Ratio**: Ratio of the number of bytes that would have been sent if not found in the deduplication cache (before dedupe:after dedupe).
- **Fixed Cache Size**: Size of the WANOp cache.
- **WAN Egress Data Reduction Percentage**: WAN Egress percentage of savings using WANOp.
- **WAN Egress Total Kbytes Saved**: Total number of kilobytes saved from LAN to WAN.

WAN Optimization Reports

In APN 7.1 and above, the **WAN Optimization > Monitor WANOp** page includes graphical reports displaying key WANOp data over time. Reports are shown below Site-Wide Statistics, and have one data point per minute.
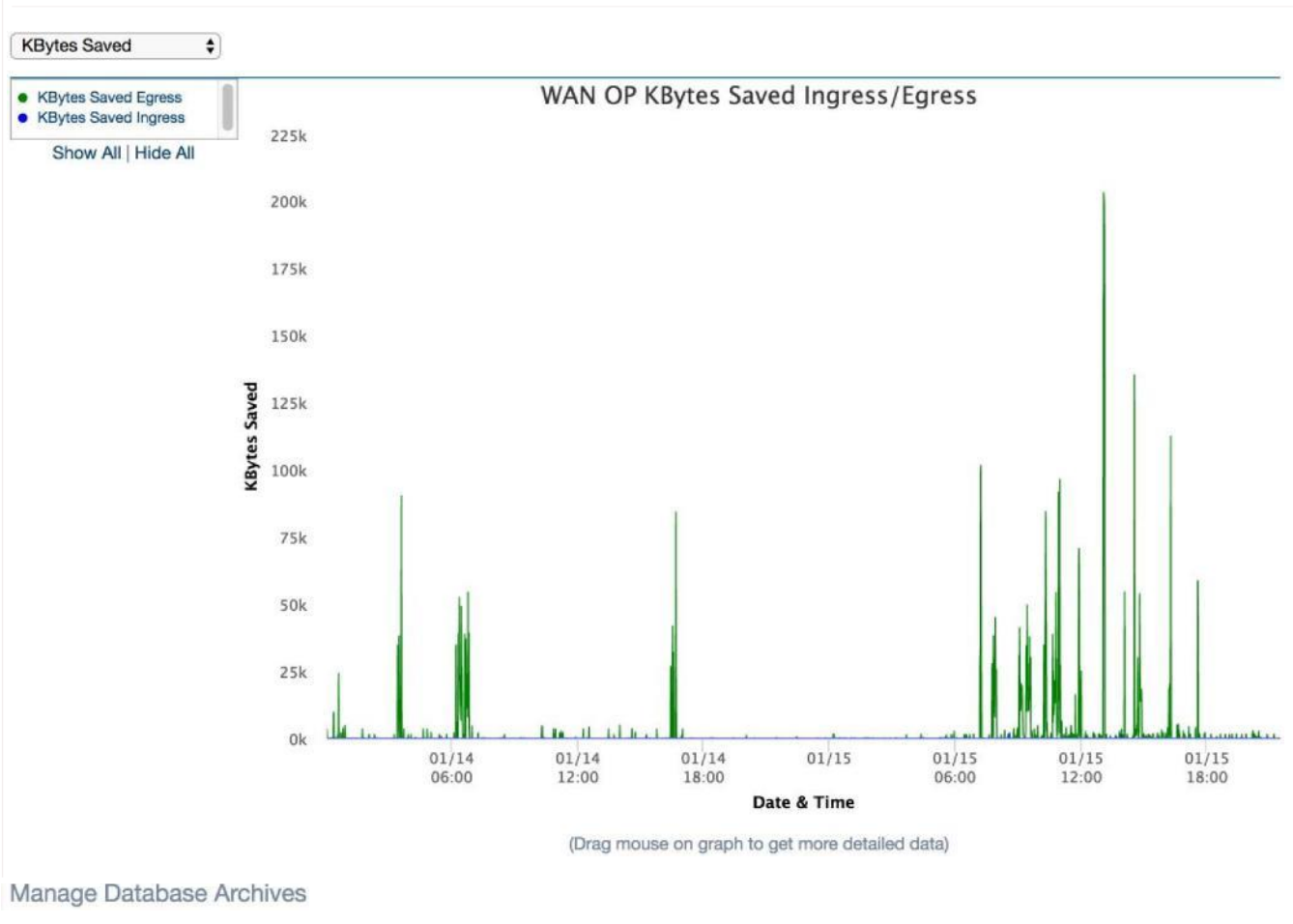
Different reports may be selected from the dropdown in the upper left-hand corner of the Report pane, and filtered using the criteria to the left of the graph. Available reports include:

- Kilobytes Saved (Egress/Ingress) ○ Bandwidth in kilobytes saved using WAN Optimization, for WAN Egress
  (Download)and WAN Ingress (Upload)
- Compression Ratio (Egress/Ingress) ○ WANOp compression ratio, for WAN Egress (Download) and WAN Ingress (Upload). Higher compression ratios indicate greater bandwidth savings.
- Deduplication Ratio (Egress/Ingress) ○ Deduplication ratio, showing the reduction of redundant data, for WAN Egress (Download) and WAN Ingress (Upload).
- Data Reduction Percentage (Egress/Ingress)
  - ○ Total data reduction percentage achieved using WANOp, for WAN Egress (Download) and WAN Ingress (Upload).
- Deduplication Cache Percentage (Hit/New) ○ Percentage of chunks identifiers matched in the deduplication cache (data already contained in the cache), and percentage of new chunks (not already contained in the deduplication cache).

- Deduplication Cache Count (Hit/New) ○ Number of chunk identifiers matched in the deduplication cache (data already contained in the cache), and of new data (not already contained in the deduplication cache).
- Deduplication Cache Kilobytes (Hit/New) ○ Kilobytes matched in the deduplication cache (data already contained in the cache), and kilobytes of new data (not already contained in the deduplication cache).

Users may also view reports for archived databases by selecting the report they wish to view, then scrolling down to the Manage Database Archives pane and selecting an archived database from the dropdown. Changing reports after selecting an archived database will reset the report to the current database.

WAN Optimization Statistics

To view detailed WANOp statistics between sites, navigate to **WAN Optimization > Statistics**. The WAN Ingress statistics are for traffic coming from the LAN, being WAN Optimized, and sent to the WAN, while the WAN Egress statistics are for WAN Optimized traffic coming from the WAN.

Here you can see Data Reduction percentage, Total Bytes Saved over WAN, Compression and Deduplication Ratios, and Deduplication Cache Hit and Miss statistics.

- **WAN Ingress Data Reduction %:** WAN Ingress percentage of savings using WANOp.
- **WAN Ingress Total Kbytes Saved over WAN:** Total number of kilobytes saved from WAN to LAN.
- **WAN Ingress Compression Ratio:** Ratio of the number of bytes that would have been sent if not compressed (before compression:after compression).
- **WAN Ingress Dedupe Ratio:** Ratio of the number of bytes that would have been sent if not found in the deduplication cache (before dedupe:after dedupe).
- **WAN Ingress Successful Dedupe %:** Percentage of successfully deduplicated data chunks (data found in the cache).
- **WAN Ingress Non Dedupe %:** Percentage of non-deduplicated data chunks (data not found in the cache).
- **WAN Ingress Dedupe Cache Match Count:** Number of successfully deduplicated data chunks (data found in the cache).
- **WAN Ingress Dedupe Cache New Count:** Number of non-deduplication cache attempts.
- **WAN Ingress Dedupe Cache Match Kbytes:** Number of kilobytes retrieved from successful deduplication operations.
- **WAN Ingress Dedupe Cache New Kbytes:** Number of kilobytes transferred because chunks were not found in the cache.
- **WAN Egress Data Reduction %:** WAN Egress percentage of savings using WANOp.
  otal Kbytes Saved over WAN: Total number of kilobytes saved from LAN to WAN.

WAN Optimization Service Functions

To disable WANOp, restart the WANOp service, or purge the WANOp cache on the appliance, navigate to **Manage Appliance ⫸ Enable/Disable Services.**

> **Disable**: Disables WANOp services on this Talari only. The WANOp cache is not cleared.
> **Restart Service**: WANOp service is restarted. All existing WANOp Flows are dropped. The WANOp cache is not cleared.
> **Purge Cache**: Restarts WANOp service and purges the WANOp cache. All existing WANOp Flows are dropped.

Hard Disk Usage

To monitor hard disk usage and projected remaining SSD life, navigate to **Monitor > System Information**.

When your Estimated SSD Life Remaining reaches 5% or less, please contact the Talari Support team for assistance.