ADTRAN Switch Engine (ASE)

MRP and MVRP

Configuration Guide

To the Holder of this Document

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Revision History

| Rev A | March 2019 | Initial release |
| Rev B | May 2020 | Updated format and supported hardware. |

Table of Contents

1. Overview

This document explains the fundamentals of Multiple virtual local area network (VLAN) Registration Protocol (MVRP) as an application of the Multiple Registration Protocol (MRP) suit, and its configuration on ADTRAN switch engine (ASE) products. Included in this guide are a brief introduction to MRP and MVRP concepts, the basic MVRP configuration steps using both the graphical user interface (GUI) and command line interface (CLI), and a brief troubleshooting section.

2. MRP and MVRP Overview

Multiple Registration Protocol (MRP) is a protocol suite that provides the generic framework for automatically managing the registration and deregistration of network attributes, such as virtual local area network (VLAN) IDs and VLAN memberships, across the Data Link Layer. MRP was developed as a replacement for the Generic Attribute Registration Protocol (GARP) in the IEEE 802.1Q-2014 standard, allows GARP function to become VLAN-aware in the form of MRP.

A part of the MRP suite is the Multiple VLAN Registration Protocol (MVRP), which replaces GARP VLAN Registration Protocol (GVRP) as it is VLAN-aware and also overcomes bandwidth issues that could limit GVRP usefulness. MVRP is an MRP application that functions as a messaging protocol, providing VLAN registration and deregistration information to devices on the Layer 2 network. Through MVRP messages, VLAN configurations can be handled automatically and disseminated quickly through the network without the burden of manual configuration. MVRP's main function in the network is to provide switches a method of automatically discovering VLAN information that would otherwise need to be configured manually; thus saving time, effort, and network resources.

MRP and MVRP Components

There are several components specified in MRP that are used by MVRP to complete dynamic VLAN registration maintenance across the network. Included in these components are MRP attribute declarations (MADs) and MRP attribute propagations (MAPs), MRP timers, and specific VLAN registration modes. The following sections describe these MRP features and how they are used by MVRP.

MADs and MAPs

MRP uses MADs and MAPs as standards to provide network device propagation and machine state information across the network. The MAD standard is responsible for using state machine information on a port to make device registration and deregistration declarations for the port. State machine information included in the MAD standard are of four types:

- Applicant machine state: the base of the MRP protocol; it controls transmission of MRP protocol data units (PDUs).

- Registrar machine state: contains the state of each device's registration and interacts closely with the applicant.

- LeaveAll machine state: refreshes the registration information between connected devices, removing all inactive registration information.

- Periodic machine state: updates the registration information on a periodic basis.

The MAP standard, on the other hand, is responsible for providing declarations, registrations, and other activity across the ASE device and not just on a per-port basis. It maintains a list of declarations provided by the MAD standard and organizes which components should be communicating with each other. This information, in turn, is used by the Spanning Tree Protocol (STP) to communicate to MVRP the topology of connected devices.

MVRP uses both MADs and MAPs to populate and maintain VLAN registration information across the network. Each device connected as a member of the MVRP system has one MAD and one MAP standard associated with it.

Protocol Data Unit (PDU) Messages

PDU messages are informational messages used by MVRP to keep track of VLAN registrations, deregistrations, inactivity, or other state changes. When MVRP is enabled, PDU messages are sent to all MVRP members (other MVRP-enabled devices) whenever another MVRP-member VLAN is updated. The PDU message itself communicates the VLAN updates to the other MVRP members, including which devices and interfaces are part of the updated VLAN and all VLAN registration information. MVRP uses PDU messages to keep abreast of the changes across the Layer 2 network and to keep the network synchronized.

PDU Messages and MRP Timers

MRP timers dictate when PDU messages are sent across the network and when MVRP information can be updated on a device. MRP timers are configurable on a per-port basis, and control the PDU transmit interval, how long an interface waits before becoming unregistered, the frequency that valid registrations are deregistered, and the period of time between registration updates. The four MRP timers used by MVRP to control PDU messages are the following:

- Join timers: These timers control when PDU messages are sent. This value is user-configurable and has a valid range of **1** to **20** centiseconds.

- Leave timers: These timers control when a VLAN is deregistered, after it initializes a deregistration request, while also allowing enough time for connected devices to keep the registration alive while the request is being made. This user-configurable timer should always be set to be larger than the join timer. Valid leave timer range is **60** to **300** centiseconds.

- LeaveAll timers: These timers control the frequency with which interfaces generate deregistration requests. This value is user-configurable with a valid range of **1000** to **5000** centiseconds.

- Periodic timers: These timers control the period of time between registration updates. This timer is not user-configurable and has a fixed interval of **100** centiseconds.

Registration Modes of MVRP Participants

MVRP uses registration modes on a per-port basis to determine when interfaces do or do not participate in MVRP. The following MVRP registration modes are supported on the ASE device:

- Normal: This registration mode indicates the interface is in a normal MVRP operational state, accepting MVRP messages and participating in MVRP operations.

- Fixed: This registration mode indicates that the interface does not fully participate in MVRP; it ignores incoming MVRP messages although it remains registered in the network.

- Forbidden: This registration mode indicates that the interface does not participate in MVRP at all; it ignores incoming MVRP messages and it remains unregistered.

MVRP Functionality

MVRP functions by using its component parts in the following manner:

1. When MVRP is enabled, and any MVRP-member VLAN updates its machine state, that VLAN transmits MRP PDU messages to all other active VLANs with MVRP enabled. The PDU messages inform the other VLANs which devices and interfaces belong to the transmitting VLAN, keeping all MVRP-enabled VLANs in sync with the latest VLAN information on the network.

2.   MRP timers indicate when PDU messages are sent, thus dictating when MVRP updates occur for VLANs on the network.

3.   VLANs participating in MVRP are placed in a registration mode, dictated by their machine state. When the machine state changes, and the timers allow, new PDU information is sent through MVRP to other VLANs with MVRP enabled.

4.   When VLANs are added to the network, MVRP updates all other member VLANs with the new VLAN information, but only when timers allow the update PDU messages to be sent.

5.   When VLANs become unavailable, MVRP automatically removes them from the compiled VLAN data for the network.

In this manner, dynamic changes to registration, deregistration, availability, and inactivity of managed VLANs are automatically propagated across the network by MVRP, with very little manual configuration or user intervention.

3.   Hardware and Software Requirements and Limitations

MRP and MRVP features are supported on the ASE products outlined in *Table 1* that are running ASE firmware 4.4.0 or later.

Table 1. Supported Products

Product	P/N
NetVanta 1560-08-150W Switch	17108108PF2
NetVanta 1560-24-740W Switch	17108124PF2
NetVanta 1560-48-740W Switch	17108148PF2
NetVanta 1560-08-65W Switch	17101561PF2
NetVanta 1560-24-370W Switch	17101564PF2
NetVanta 1560-48-370W Switch	17101568PF2

Guidelines for MVRP Configuration

The following guidelines should be considered when configuring MVRP on the ASE device:

•   ASE ports can be configured in three modes: Access, Hybrid, and Trunk. MVRP does not distinguish between these port modes, and care must be taken to ensure that MVRP-capable devices are connected to the correct port type for MVRP operation. MVRP can be enabled on both trunk and hybrid ports and function correctly with MVRP-capable devices attached. Ports in access mode, however, do not support MVRP-capable devices. If a trunk port is accidentally configured as an access port, or if an MVRP-capable device is connected to a port in access mode, MVRP will register dynamic VLANs to the access port and place it as a member of more than one VLAN. This can cause unexpected network behavior.

•   MVRP is designed to manage the entire supported range of VLANs on the ASE device (valid range is **1** to **4094**), but managing all VLANs through MVRP can require large amounts of memory and processing power. VLANs should only be members of the MVRP configuration if their place in the network requires dynamically managed VLAN registration updates.

•   MVRP can function using STP, Rapid STP (RSTP) and Multiple STP (MSTP), but not VLAN STP (VSTP).

•   MVRP can only function on trunk ports that are single-tagged.

- As MVRP was designed as a replacement for GVRP, MVRP cannot be used simultaneously with GVRP on the Layer 2 network to disseminate VLAN information.

4. Configuring MVRP Using the GUI

Because most of MVRP's functionality occurs automatically, configuration of MVRP on the ASE device is not complex. In fact, MVRP configuration requires only that MVRP is enabled globally for specified VLANs, that MVRP is enabled on the appropriate port(s), that MRP timers are configured on the port(s), and that STP is enabled on the port(s).

To configure the MVRP settings, connect to the ASE GUI and complete the following tasks:

> **i** | **NOTE**
>
> *It is recommended to restore defaults on the ASE device before beginning any configuration. To restore the defaults on the device, connect to the GUI, navigate to the **Maintenance** tab, and select **Factory Defaults**. Be aware this will erase the IP address of the switch itself.*

Enable MVRP Globally for Specified VLANs Using the GUI

To begin MVRP configuration on the ASE device, the first step is to enable MVRP globally on the switch and specify which VLANs will be managed by MVRP. To complete this task, follow these steps:

1. In the ASE GUI, navigate to the **Configuration** tab, and select **MRP** > **MVRP**. In the **MVRP Global Configuration** menu, select **Enabled** from the **Global State** drop-down menu.

MVRP Global Configuration	
Global State	Enabled ▼
Managed VLANs	2-250

2. Next, specify the VLANs that will be managed by MVRP by entering the VLAN IDs in the **Managed VLANs** field. Valid VLAN ID range is **1** to **4094**, and can be specified as a single VLAN ID, a range of VLAN IDs, or a combination of both separated by a comma.

> **i** | **NOTE**
>
> *VLANs should only be managed by MVRP if their place in the network requires dynamically managed VLAN registration updates. Managing all available VLANs through MVRP can require large amounts of memory and processing power.*

> **i** | **NOTE**
>
> *If the list of MVRP-managed VLANs needs to be edited, disable MVRP on the ASE switch before updating the VLAN list.*
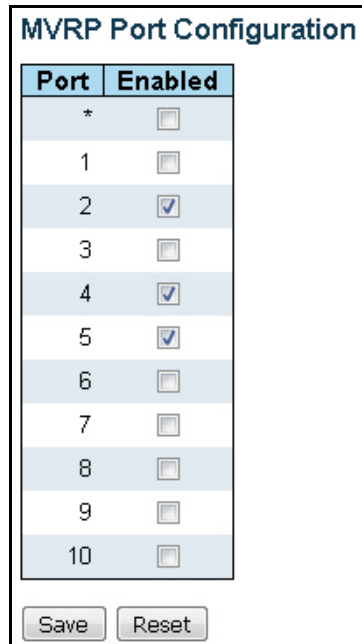
3. Select **Save** at the bottom of the menu to save the MVRP configuration.

Once MVRP has been enabled across the ASE device, and the managed VLANs have been specified, you can begin to configure MVRP on a per-port basis.

Enable MVRP on the Port(s) Using the GUI

To enable MVRP on a per-port basis, connect to the ASE GUI and follow these steps:

1. Navigate to the **Configuration** tab and select **MRP** > **MVRP**. In the **MVRP Port Configuration** menu, select the **Enabled** check box for the ports on which you want to enable MVRP.

2. Once the required ports have MVRP enabled, select **Save** at the bottom of the menu to save these settings.

Once MVRP has been enabled on the required port(s), you can begin to configure the MRP timers.

Configure the MRP Timers Using the GUI

MRP timers dictate when PDU messages are sent across the network and when MVRP information can be updated on a device. MRP timers are configurable on a per-port basis, and control the PDU transmit interval, how long an interface waits before becoming unregistered, the frequency that valid registrations are deregistered, and the period of time between registration updates.

To configure the MRP timers on MVRP-enabled ports, follow these steps:

1. Navigate to the **Configuration** tab and select **MRP** > **Ports**. In the **MRP Overall Port Configuration** menu you can specify the **Join**, **Leave**, and **LeaveAll** timer values, as well as enable periodic transmissions.

MRP Overall Port Configuration

Port	Join Timeout	Leave Timeout	LeaveAll Timeout	Periodic Transmission
*	20	60	1000	☐
1	20	60	1000	☐
2	10	100	2000	☑
3	20	60	1000	☐
4	10	100	2000	☑
5	10	100	2000	☑
6	20	60	1000	☐
7	20	60	1000	☐
8	20	60	1000	☐
9	20	60	1000	☐
10	20	60	1000	☐

Save   Reset

2. Specify the Join timer value by entering a value in the **Join Timeout** field for the port(s) on which MVRP is enabled. This value controls when PDU messages are sent. Valid range is **1** to **20** centiseconds, with a default value of **20** centiseconds.

3. Specify the Leave timer value by entering a value in the **Leave Timeout** field for the port(s) on which MVRP is enabled. This value controls when a VLAN is deregistered, after it initializes a deregistration request, while also allowing enough time for connected devices to keep the registration alive while the request is being made. This value should always be set to be larger than the join timer value. Valid leave timer range is **60** to **300** centiseconds, with a default value of **60** centiseconds.

4. Specify the LeaveAll timer value by entering a value in the **LeaveAll Timeout** field for the port(s) on which MVRP is enabled. This value controls the frequency with which interfaces generate deregistration requests. Valid range of **1000** to **5000** centiseconds, with a default value of **1000** centiseconds.

5. Optionally enable Periodic registration transmissions for the port(s) on which MVRP is enabled by selecting the **Periodic Transmission** check box for the appropriate port(s).

6. Once the timers have been configured for the MVRP-enabled ports, select **Save** at the bottom of the menu to apply the configuration.

Once the MRP timers have been configured, the next step in MVRP configuration is to enable STP on the appropriate ports.

Enable STP on the MVRP-Enabled Port(s) Using the GUI

MVRP is designed to operate with STP, and although not required, STP should be enabled on all ports for which MVRP has been enabled. To enable STP on the appropriate port(s), connect to the ASE GUI and follow these steps:

1. Navigate to the **Configuration** tab and select **Spanning Tree** > **CIST Ports**. This menu enables STP on common and internal spanning tree (CIST) ports. In the **Normal Port Configuration** menu, select the **STP Enabled** check box for each port with MVRP enabled.

2. Once STP has been enabled on the appropriate port(s), select **Save** at the bottom of the menu to save these settings.

MVRP configuration is now complete on the ASE device. To view MRP and MVRP operational statistics, refer to *Troubleshooting on page 15*.

5. Configuring MVRP Using the CLI

Because most of MVRP's functionality occurs automatically, configuration of MVRP on the ASE device is not complex. In fact, MVRP configuration requires only that MVRP is enabled globally for specified VLANs, that MVRP is enabled on the appropriate port(s), that MRP timers are configured on the port(s), and that STP is enabled on the port(s).

To configure the MVRP settings, connect to the ASE CLI and complete the following tasks:

- *Enable MVRP Globally for Specified VLANs Using the CLI on page 12*
- *Enable MVRP on the Port(s) Using the GUI on page 9*
- *Configure the MRP Timers Using the CLI on page 13*
- *Enable STP on the MVRP-Enabled Port(s) Using the CLI on page 13*

> ℹ️ **NOTE**
>
> *It is recommended to restore defaults on the ASE device before beginning any configuration. To restore the defaults on the device, connect to the CLI, and enter the* `reload defaults` *command from the Enable mode prompt. Be aware this will erase the IP address of the switch itself.*

Enable MVRP Globally for Specified VLANs Using the CLI

To begin MVRP configuration on the ASE device, the first step is to enable MVRP globally on the switch and specify which VLANs will be managed by MVRP.

Enable MVRP on the ASE device by entering the **[no] mvrp** command from the Global Configuration mode prompt. Use the **no** form of this command to disable the MVRP feature. Enter the command as follows:

```
#configure terminal
(config)#mvrp
```

Specify the VLANs to be managed by MVRP, or edit the managed VLAN list, by entering the **[no] mvrp managed vlan [**<vlan id> **| add** <vlan id> **| all | except** <vlan id> **| none | remove** <vlan id>**]** command from the Global Configuration mode prompt. The <vlan id> parameter is used to specify which VLANs are being managed by MVRP, or those being removed, added, or singled out in the MVRP managed VLAN list. Valid <vlan id> range is **1** to **4094**, and can be specified as a single VLAN ID, a range of VLAN IDs, or a combination of both separated by a comma. The **add** <vlan id> parameter adds a VLAN ID to the managed VLANs list. The **all** parameter specifies that all VLANs are managed by MVRP. The **except** <vlan id> parameter specifies a VLAN ID that is not to be managed by MVRP. The **none** parameter specifies that no VLANs are manged by MVRP, and the **remove** <vlan id> parameter removes the VLAN ID from the managed VLANs list. Using the **no** form of this command removes all VLANs from the managed VLANs list.

To specify that MVRP manages VLAN **125**, enter the command as follows:

```
(config)#mvrp managed vlan 125
```

> **i** | **NOTE**
>
> *VLANs should only be managed by MVRP if their place in the network requires dynamically managed VLAN registration updates. Managing all available VLANs through MVRP can require large amounts of memory and processing power.*

> **i** | **NOTE**
>
> *If the list of MVRP-managed VLANs needs to be edited, disable MVRP on the ASE switch before updating the VLAN list.*

Once MVRP has been enabled across the ASE device, and the managed VLANs have been specified, you can begin to configure MVRP on a per-port basis.

Enable MVRP on the Port(s) Using the CLI

To enable MVRP on the appropriate port(s), enter the **[no] mvrp** command from the interface's configuration mode. Use the **no** form of this command to disable MVRP on the interface.

You can enable MVRP on each interface individually, or you can specify a range of ports on which to enable MVRP by using the **interface** <slot/port> or **interface** <slot/port_range> commands from the Global Configuration mode prompt.

For example, to enable MVRP on ports **1**, **2**, and **3** of the GigabitEthernet interface, enter the commands as follows:

```
(config)#interface GigabitEthernet 1/1-3
(config-if)#mvrp
```

Once MVRP has been enabled on the required port(s), you can begin to configure the MRP timers.

Configure the MRP Timers Using the CLI

MRP timers dictate when PDU messages are sent across the network and when MVRP information can be updated on a device. MRP timers are configurable on a per-port basis, and control the PDU transmit interval, how long an interface waits before becoming unregistered, the frequency that valid registrations are deregistered, and the period of time between registration updates. There are two commands used to configure the MRP timers and to enable periodic MRP transmissions from the interface.

To configure the MRP timers on a per-port basis, enter the `[no] mrp timers [default | join-time <value> | leave-all-time <value> | leave-time <value>]` command from the interface's configuration mode prompt. The `default` parameter sets all MRP timers to their default values. The `join-time <value>` parameter configures the Join timer, which controls when PDU messages are sent. Valid `join-time <value>` range is **1** to **20** centiseconds, with a default value of **20** centiseconds. The `leave-all-time <value>` parameter configures the LeaveAll timer, which controls the frequency with which interfaces generate deregistration requests. Valid `leave-all-time <value>` range is **1000** to **5000** centiseconds, with a default value of **1000** centiseconds. The `leave-time <value>` parameter configures the Leave timer, which controls when a VLAN is deregistered, after it initializes a deregistration request, while also allowing enough time for connected devices to keep the registration alive while the request is being made. This value should always be set to be larger than the join timer value. Valid `leave-time <value>` range is **60** to **300** centiseconds, with a default value of **60** centiseconds. Using the `no` form of this command returns all timers to their default value.

Enter the command as follows from the interface's configuration mode to configure the MRP Join timer:

```
(config)#interface GigabitEthernet 1/1
(config-if)#mrp timers join-time 10
```

You can enter the **join-time**, **leave-all-time**, and **leave-time** parameters of the `mrp timers` command in any order, and in a single command if necessary. For example, to configure all three timers at once, enter the command as follows:

```
(config)#interface GigabitEthernet 1/1
(config-if)#mrp timers leave-all-time 2000 join-time 10 leave-time 100
```

To enable periodic MRP transmissions on the interface, enter the `[no] mrp periodic` command from the interface's configuration mode prompt. Using the `no` form of this command disables MRP periodic transmissions on the interface. Enter the command as follows:

```
(config)#interface GigabitEthernet 1/1
(config-if)#mrp periodic
```

Once the MRP timers have been configured, the next step in MVRP configuration is to enable STP on the appropriate ports.

Enable STP on the MVRP-Enabled Port(s) Using the CLI

MVRP is designed to operate with STP, and although not required, STP should be enabled on all ports for which MVRP has been enabled.

To enable STP on the appropriate port(s), enter the `[no] spanning-tree` command from the interface's configuration mode. Using the `no` form of this command disables STP on the interface.

You can enable STP on each interface individually, or you can specify a range of ports on which to enable STP by using the **interface** *<slot/port>* or **interface** *<slot/port_range>* commands from the Global Configuration mode prompt.

For example, to enable STP on ports **1**, **2**, and **3** of the GigabitEthernet interface, enter the commands as follows:

```
(config)#interface GigabitEthernet 1/1-3
(config-if)#spanning-tree
```

MVRP configuration is now complete on the ASE device. To view MRP and MVRP operational statistics, refer to .

6. MVRP Configuration Command Summary

The following tables summarize the commands used in conjunction with MVRP configurations on the ASE device.

Table 2. MVRP Configuration Commands

Prompt	Command	Description
(config)#	**[no] mvrp**	Globally enables MVRP on the ASE device. Using the **no** form of the command disables MVRP on the ASE device.
(config)#	**[no] mvrp managed vlan [***<vlan id>*** | add ***<vlan id>*** | all | except ***<vlan id>*** | none | remove ***<vlan id>***]**	Specifies the VLANs to be managed by MVRP. Valid *<vlan id>* range is **1** to **4094**. The **add** *<vlan id>* parameter adds a VLAN ID to the managed VLANs list. The **all** parameter specifies that all VLANs are managed by MVRP. The **except** *<vlan id>* parameter specifies a VLAN ID that is not to be managed by MVRP. The **none** parameter specifies that no VLANs are manged by MVRP, and the **remove** *<vlan id>* parameter removes the VLAN ID from the managed VLANs list. Using the **no** form of the command remove all VLANs from the managed VLAN list.
(config-if)#	**[no] mvrp**	Enables MVRP on the interface. Using the **no** form of the command disables MVRP on the interface.
(config-if)#	**[no] mrp timers [default | join-time ***<value>*** | leave-all-time ***<value>*** | leave-time ***<value>***]**	Configures MRP timers on the port. The **default** parameter sets all MRP timers to their default values. The **join-time** *<value>* parameter configures the Join timer; valid range is **1** to **20** centiseconds, with a default value of **20** centiseconds. The **leave-all-time** *<value>* parameter configures the LeaveAll timer; valid range is **1000** to **5000** centiseconds, with a default value of **1000** centiseconds. The **leave-time** *<value>* parameter configures the Leave timer; valid range is **60** to **300** centiseconds, with a default value of **60** centiseconds. Using the **no** form of the command returns the MRP timers to the default settings.
(config-if)#	**[no] mrp periodic**	Enables periodic MRP transmissions on the port. Using the **no** form of the command disables MRP periodic transmissions on the port.
(config-if)#	**[no] spanning-tree**	Enables STP on the port. Using the **no** form of the command disables STP on the port.

7. Troubleshooting

You can view several types of MRP and MVRP statistics on the ASE device that can aid in troubleshooting MVRP operations. MVRP statistics can be used to aid in debug procedures and other troubleshooting measures. MRP and MVRP statistics can be viewed using either the GUI or the CLI.

Viewing MVRP Statistics Using the GUI

Detailed information about MVRP-enabled ports can be viewed by navigating to the **Monitor** tab and selecting **MVRP**. Port information, failed registrations, and the last PDU message origin are displayed in the **MVRP Statistics** menu.

MVRP Statistics

Port	Failed Registrations	Last PDU Origin
1	0	00-00-00-00-00-00
2	0	00-00-00-00-00-00
3	0	00-00-00-00-00-00
4	0	00-00-00-00-00-00
5	0	00-00-00-00-00-00
6	0	00-00-00-00-00-00
7	0	00-00-00-00-00-00
8	0	00-00-00-00-00-00
9	0	00-00-00-00-00-00
10	0	00-00-00-00-00-00

Viewing MRP and MVRP Statistics Using the CLI

The CLI can also be used to view various MRP and MVRP statistics, including whether MVRP is enabled on an interface, any failed registrations, and the origin of the last PDU message for the interface.

Use the **show mrp status [all | interface** *<interface>* **| mvrp]** command to view MRP and MVRP information in the CLI. The **all** parameter specifies that all MRP and MVRP statistics are displayed. The **interface** *<interface>* parameter limits the statistical output to a single interface. The *<interface>* parameter is specified in the format **GigabitEthernet** *<slot/port>* or **10GigabitEthernet** *<slot/port>*. This parameter can also optionally be entered after the **all** or **mvrp** keywords to limit the output to a single interface. The **mvrp** parameter specifies that MVRP statistics for all interfaces with MVRP enabled are displayed.

To display MVRP statistics for all interfaces with MVRP enabled, enter the command from the Enable mode prompt as follows:

```
>enable
#show mrp status mvrp
GigabitEthernet 1/1 :
--------------------
MRP Appl   FailedRegistrations   LastPduOrigin
--------   -------------------   -------------
MVRP       0                     00-00-00-00-00-00


GigabitEthernet 1/2 :
--------------------
MRP Appl   FailedRegistrations   LastPduOrigin
--------   -------------------   -------------
MVRP       0                     00-00-00-00-00-00
```

```
GigabitEthernet 1/3 :
---------------------
MRP Appl  FailedRegistrations  LastPduOrigin
--------  -------------------  -------------
MVRP      0                    00-00-00-00-00-00

GigabitEthernet 1/4 :
---------------------
MRP Appl  FailedRegistrations  LastPduOrigin
--------  -------------------  -------------
MVRP      0                    00-00-00-00-00-00

GigabitEthernet 1/5 :
---------------------
MRP Appl  FailedRegistrations  LastPduOrigin
--------  -------------------  -------------
MVRP      0                    00-00-00-00-00-00

GigabitEthernet 1/6 :
---------------------
MRP Appl  FailedRegistrations  LastPduOrigin
--------  -------------------  -------------
MVRP      0                    00-00-00-00-00-00
```

8. Warranty and Contact Information

Warranty

Warranty information can be found at:

www.adtran.com/warranty.

Contact Information

For all customer support inquiries, please contact ADTRAN Customer Care:

Contact	Support	Contact Information
Customer Care	From within the U.S. From outside the U.S. **Technical Support:** • Web: **Training:** • Email: • Web:	1-888-4ADTRAN (1-888-423-8726) + 1 (256) 963-8716 www.adtran.com/support training@adtran.com www.adtran.com/training www.adtranuniversity.com
Sales	Pricing and Availability	1-800-827-0807