Chapter 4

Generic Attribute Registration Protocol (GARP)

Introduction

The purpose of the *Generic Attribute Registration Protocol* (GARP) is to provide a generic framework whereby devices in a bridged LAN, e.g. end stations and switches, can register and de-register *attribute* values, such as VLAN Identifiers, with each other. In doing so, the attributes are propagated to devices in the bridged LAN, and these devices form a "reachability" tree that is a subset of an active topology. For a bridged LAN, the active topology is normally that created and maintained by the *Spanning Tree Protocol* (STP).

GARP defines the architecture, rules of operation, state machines and variables for the registration and de-registration of attribute values. By itself, GARP is not directly used by devices in a bridged LAN. It is the applications of GARP that specify what the attribute represents and so perform meaningful actions. The *GARP VLAN Registration Protocol* (GVRP) application distributes dynamic filter entries for VLAN membership among the Forwarding Databases of VLAN-aware switches.

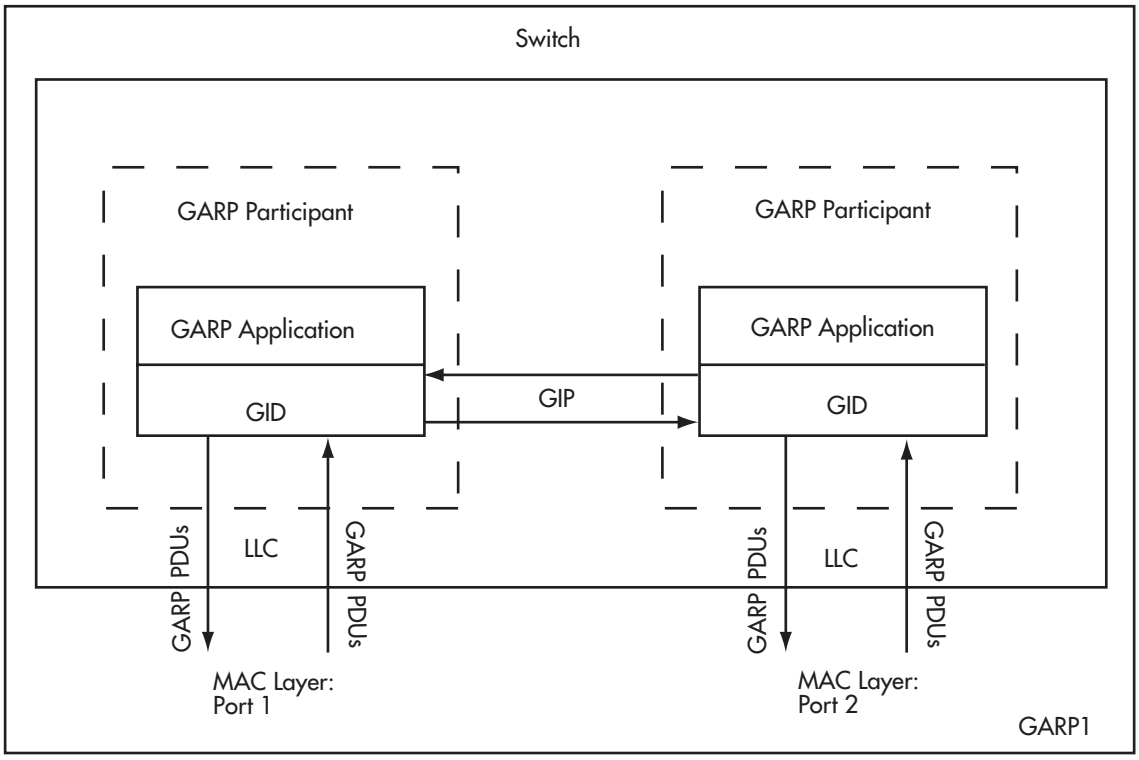
Overview of GARP

A GARP Participant in a switch or an end station consists of a GARP Application component, and a GARP Information Declaration (GID) component associated with each port of the switch. One such GARP Participant exists per port, per GARP Application. The propagation of information between GARP Participants for the same Application in a switch is carried out by the *GARP Information Propagation* (GIP) component. Protocol exchanges take place between GARP Participants by means of LLC Type 1 services, using the group MAC address and PDU format defined for the GARP Application concerned.

Every instance of a GARP application includes a database to store the values of the attributes. Within GARP, attributes are mapped to GID indexes.

The architecture of GARP is shown in Figure 4-1 on page 4-3.

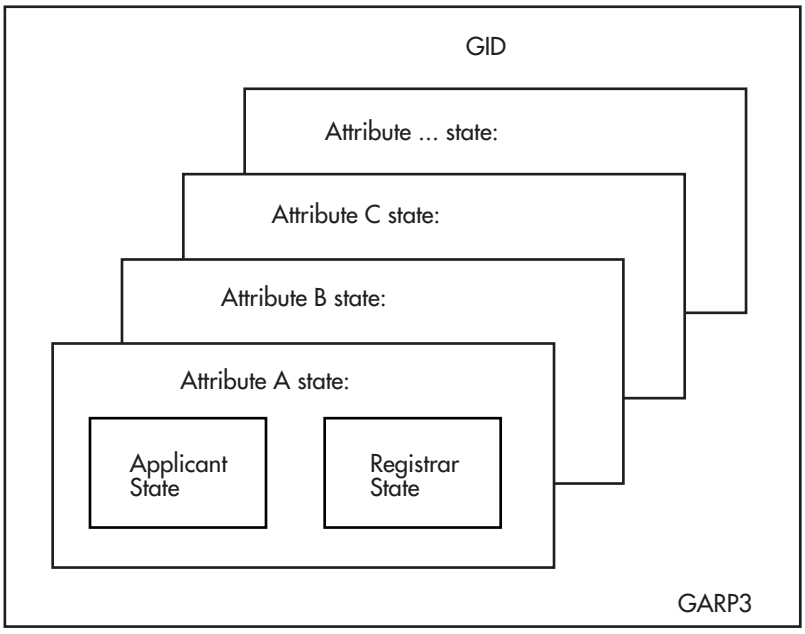
Figure 4-1: GARP Architecture



The GARP Application component of the GARP Participant is responsible for defining the semantics associated with the parameter values and operators received in GARP PDUs, and for generating GARP PDUs for transmission. The Application makes use of the GID component, and the state machines associated with the operation of GID, in order to control its protocol interactions.

An instance of GID consists of the set of state machines that define the current registration and declaration state of all *attribute* values associated with the GARP Participant. Separate state machines exist for the Applicant and Registrar. This is shown in Figure 4-2 on page 4-4.

Figure 4-2: GID Architecture



GARP registers and de-registers *attribute* values through GARP messages sent at the GID level. A GARP Participant that wishes to make a declaration (an Applicant registering an *attribute* value) sends a JoinIn or JoinEmpty message. An Applicant that wishes to withdraw a declaration (de-registering an *attribute* value) sends a LeaveEmpty or LeaveIn message. Following the de-registration of an *attribute* value, the Applicant will send a number of Empty messages. The purpose of the Empty message is to prompt other Applicants to send JoinIn/ JoinEmpty messages. For the GARP protocol to be resilient against multiple lost messages, a LeaveAll message is available. Timers are used in the state machines to generate events and control state transitions.

The job of the Applicant is twofold:

- to ensure that this Participant's declarations are registered by other Participants' Registrars
- to ensure that other Participants have a chance to re-declare (rejoin) after anyone withdraws a declaration (leaves).

The Applicant is therefore looking after the interests of all would-be Participants. This allows the Registrar to be very simple.

The job of the Registrar is to record whether an attribute is registered, in the process of being de-registered, or is not registered for an instance of GID.

To control the Applicant state machine, an Applicant Administrative Control parameter is provided. This parameter determines whether or not the Applicant state machine participates in GARP protocol exchanges. The default value is to have the Applicant participating in the exchanges.

To control the Registrar state machine, a Registrar Administrative Control parameter is provided. Basically this parameter determines whether or not the Registrar state machine listens to incoming GARP messages. The default value is to have the Registrar listening to incoming GARP messages.

The propagation of information between GARP Participants for the same Application in a switch is carried out by the GIP component. The operation of GIP is dependent upon STP being enabled on a port, as only ports in the STP

Forwarding state are eligible for membership to the GIP connected ring. Ports in the GIP connected ring propagate GID Join and Leave requests to notify each other of attribute registrations and de-registrations. The operation of GIP allows ports in the switch to share information between themselves and the LANs/end stations to which the ports are connected.

If a port enters the STP Forwarding state and the GARP application that the port belongs to is enabled, then the port will be added to the GIP connected ring for the GARP application. All attributes registered by other ports in the GIP connected ring will be propagated to the recently connected port. All attributes registered by the recently connected port will be propagated to all other ports in the GIP connected ring.

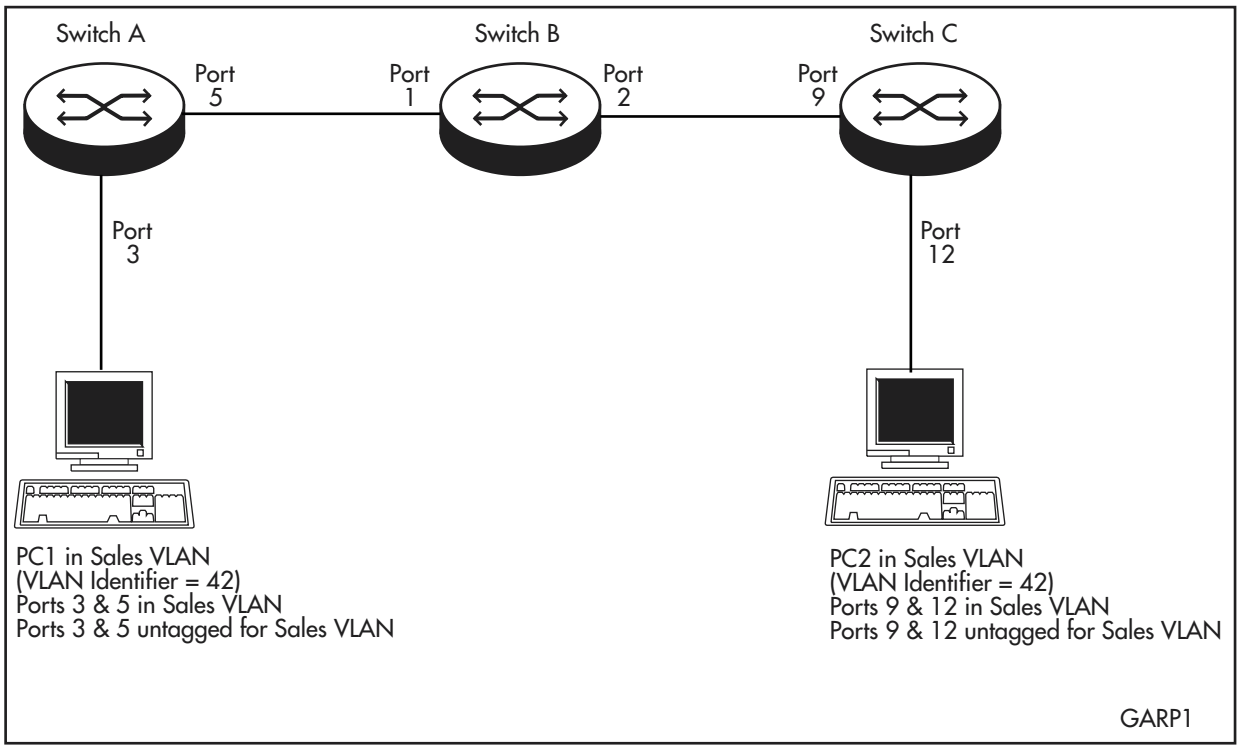
Similarly, if a port leaves the STP Forwarding state and the GARP application that the port belongs to is enabled, then the port will be removed from the GIP connected ring for the GARP application. Prior to removal, GID leave requests will be propagated to all other ports in the GIP connected ring if the port to be removed has previously registered an attribute and no other port in the GIP connected ring has registered that attribute. The operations of GIP can be enabled or disabled by user command.

Overview of Generic VLAN Registration Protocol (GVRP)

The Generic VLAN Registration Protocol (GVRP) allows a LAN device to signal other neighbouring devices that it wishes to receive packets for one or more VLANs. The main purpose of GVRP is to allow switches to automatically discover some of the VLAN information that would otherwise have to be manually configured in each switch. This is achieved by using GARP to propagate VLAN Identifier attributes across a bridged LAN. GVRP can also be run by network servers. These servers are usually configured to join several VLANs, and then signal the network switches of the VLANs they want to join.

Figure 4-3 on page 4-6 shows a network example using GVRP. Switches A, B and C are VLAN-aware. Switch B has not been configured to route packets between Switches A and C.

Figure 4-3: Network example using GVRP.



Without GVRP operating, end stations PC1 and PC2 can communicate to each other only if a network administrator has configured ports 1 and 2 on Switch B to be in the same VLAN. For a large network, such manual configuration would be required on all switches with the correct allocation of ports into VLANs on all switches.

By enabling GVRP on Switches A, B and C, the Sales VLAN Identifier (42) will be propagated to Switch B on ports 1 and 2. These ports will register the VLAN Identifier attribute and a VLAN named gvrp42 with VLAN Identifier 42 will be created on Switch B. Ports 1 and 2 on Switch B will be added into the gvrp42 VLAN as tagged ports. Thus, Switch B is now able to forward Sales VLAN traffic from Switch A to Switch C and vice-versa, and end stations PC1 and PC2 can communicate to each other.

GVRP creates dynamic VLANs in switches that do not already have a VLAN with the VLAN Identifier propagated by GARP. These VLANs cannot be destroyed by the user using the DESTROY VLAN command. Ports assigned to the dynamic VLANs cannot be modified by the user.

Static VLAN attribute registrations and de-registrations occur every time a port is added to or deleted from a VLAN, or a VLAN is added to or deleted from an STP.

Dynamic VLAN attribute registrations and de-registrations are triggered by receiving GARP PDUs and by the timeout of the LeaveAll timer.

Creating an instance of an STP also creates an instance of a GVRP application. Destroying the STP instance will destroy the instance of the GVRP application. Because a default STP exists in the switch, a default instance of GVRP exists in the switch. Whenever a port is added to an STP (either when a VLAN that contains ports is added to or removed from an STP, or when a port is added to or removed from a VLAN), then a GID instance will be created representing the port in the GVRP instance. The GID instances in a GVRP instance mirror the ports in the underlying STP instance.

Configuring GARP

To use GARP, a GARP application has to be created. The Layer 3 switch has one GARP application - the GARP VLAN Registration Protocol (GVRP). The purpose of GVRP is to propagate VLAN information between VLAN-aware switches. GVRP creates dynamic VLANs when GARP is enabled on the switch.

GVRP is disabled by default.The GARP parameter in the GARP commands specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

To enable or disable packet reception and transmission operation of a GARP application, use the commands:

```
ENABLE GARP=GVRP [STP={stp-name|ALL}]

DISABLE GARP=GVRP [STP={stp-name|ALL}]
```

These commands have precedence over the per-port mode setting.

To set the port parameters of a GARP application, use the command:

```
SET GARP=GVRP PORT={port-list|ALL} [MODE={NONE|NORMAL}]
    [SHOWDEBUG={ON|OFF}] [STP={stp-name|ALL}]
```

Whenever ports are added to a GARP application, e.g. from the ADD/DELETE VLAN PORT commands or the ADD/DELETE STP VLAN commands, the new ports will be in NORMAL mode and SHOWDEBUG will be ON.

Timers are used in the state machines to generate events and control state transitions. To set the timeout values used by all timers in a GARP application, use the commands:

```
SET GARP=GVRP TIMER [JOINTIME=4..60] [LEAVETIME=12..120]
    [LEAVEALLTIME=96..6000] [STP={stp-name|ALL}]

SET GARP=GVRP TIMER DEFAULT [STP={stp-name|ALL}]
```

The timers used by GARP measure time in units of deciseconds (one-tenths of a second).

To clear dynamically learnt information from a GARP application, use the command:

```
RESET GARP=GVRP [STP={stp-name|ALL}]
```

This will have the side-effect of destroying dynamically created VLANs made during the operation of the GVRP instance. However, these VLANs may be re-created immediately following the command if the switch receives GVRP packets.

To display information for all GARP applications, use the commands:

```
SHOW GARP
SHOW GARP=GVRP [STP={stp-name|ALL}]
```

To display GVRP information for all STPs, use either of the following commands:

```
SHOW GARP=GVRP
SHOW GARP=GVRP STP=ALL
```

Command Reference

This section describes the commands available to configure GARP in the Layer 3 switch.

Because of the possibility that GMRP may also be implemented, the command handlers require the explicit declaration of the GARP application, i.e. GARP=GVRP must be specified instead of GARP with no value, for all commands other than the SHOW GARP commands.

DISABLE GARP

Syntax `DISABLE GARP=GVRP [STP={stp-name|ALL}]`

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command disables the packet reception and transmission operation of a GARP application. The default setting is for all GARP applications to be disabled. This command has precedence over the per-port mode setting.

Disabling a GARP application will purge all non-static attribute registrations from the GARP application. Existing static attribute registrations will be moved down in the database for the GARP application to form a contiguous

sequence, similarly for the GID state machines. All ports in the GIP connected ring will be disconnected. Ports in a disabled GARP application will not be re-connected into the GIP connected ring if the STP status for the port changes. The LeaveAll timer will be stopped on all ports in the GARP application.

Disabling a GARP application does not impact upon port movements that affect the GARP application. For example, if the GVRP instance of the default STP is disabled, and a VLAN that has untagged member ports is deleted from the default STP, then the member ports of the VLAN will also be deleted from the GVRP instance of the default STP.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples To disable all GVRP instances, use either of the commands:

```
DISABLE GARP=GVRP

DISABLE GARP=GVRP STP=ALL
```

To disable the GVRP instance of the *accounting* STP, use the command:

```
DISABLE GARP=GVRP STP=ACCOUNTING
```

See Also ENABLE GARP
SHOW GARP
SHOW GARP COUNTER

DISABLE GARP DEBUG

Syntax `DISABLE GARP=GVRP DEBUG={MSG|PKT|STATE|ALL} [STP={`*`stp-name`*`|ALL}]`

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command disables the debugging option of a GARP application. The default setting is for the debugging option of a GARP application to be disabled. This command is effective on disabled GARP applications. By specifying the SHOWDEBUG parameter on the SET GARP PORT command, the output of debugging can be switched on or off on a per-port, per STP instance basis.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The DEBUG parameter specifies which debugging options are to be disabled. The value of this parameter is a single item. The debugging that results from specifying the item is shown in Table 4-1 on page 4-10.

Table 4-1: GARP debugging options.

Option	Description
MSG	Decoded display of received and transmitted GARP packets.
PKT	Raw ASCII display of received and transmitted GARP packets.
STATE	GID attribute state machine transitions.
ALL	All debugging options.

The debugging options can be disabled independently of each other, except for the ALL case where all debugging is disabled.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples To disable the PKT debugging option of the instance of GVRP belonging to the *sales* STP, use the command:

```
DISABLE GARP=GVRP DEBUG=PKT STP=SALES
```

See Also ENABLE GARP DEBUG
SET GARP PORT
SHOW GARP DEBUG

DISABLE GARP GIP

Syntax `DISABLE GARP=GVRP GIP [STP={`*`stp-name`*`|ALL}]`

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command disables the operation of GIP for the GARP application. By disabling GIP, attribute registrations and de-registrations processed on a port are not propagated to other ports in the GIP connected ring. All ports in the GIP connected ring are removed from the ring as a result of this command. The default state is for GIP operation to be enabled for a GARP application.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples To disable GIP operation for all GVRP instances, use either of the commands:

```
DISABLE GARP=GVRP GIP
```

```
DISABLE GARP=GVRP GIP STP=ALL
```

To disable GIP operation for the GVRP instance of the *accounting* STP, use the command:

```
DISABLE GARP=GVRP GIP STP=ACCOUNTING
```

See Also ENABLE GARP GIP
SHOW GARP

ENABLE GARP

Syntax `ENABLE GARP=GVRP [STP={`*`stp-name`*`|ALL}]`

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command enables the packet reception and transmission operation of a GARP application. The default setting is for all GARP applications to be disabled. This command has precedence over the per-port mode setting.

Enabling a GARP application will re-connect all ports of the GARP application in the STP Forwarding state into the GIP connected ring. The LeaveAll timer will be started on all ports in the GARP application.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples To enable all GVRP instances, use either of the commands:

```
ENABLE GARP=GVRP
```

```
ENABLE GARP=GVRP STP=ALL
```

To enable the GVRP instance of the *accounting* STP, use the command:

```
ENABLE GARP=GVRP STP=ACCOUNTING
```

See Also DISABLE GARP
SHOW GARP
SHOW GARP COUNTER

ENABLE GARP DEBUG

Syntax

```
ENABLE GARP=GVRP DEBUG={MSG|PKT|STATE|ALL}
    [OUTPUT=CONSOLE] [TIMEOUT={NONE|1..4000000000}]
    [STP={stp-name|ALL}]
```

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description

This command enables the debugging option of a GARP application. The default setting is for the debugging option of a GARP application to be disabled. This command is effective on disabled GARP applications. By specifying the SHOWDEBUG parameter on the SET GARP PORT command on page 4-14, the output of debugging can be switched on or off on a per-port, per STP instance basis.

Caution: Enabling debug may flood the receiving Telnet session or asynchronous port with raw data.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The DEBUG parameter specifies which debugging option is to be enabled. The value of this parameter is a single item. The debugging that results from specifying the item is shown in Figure 4-7 on page 4-23. The debugging options can be enabled independently of each other, except for the ALL case where all debugging is enabled.

The OUTPUT parameter set to CONSOLE specifies that the debugging information produced is sent to the console. The debugging data is by default sent to the port on which it received the ENABLE GARP DEBUG command. Use this option if the ENABLE GARP DEBUG command is used in a script, since a script is not received on a port.

The TIMEOUT parameter specifies the time in seconds for which any debugging will be enabled on the specified ports. This value overrides any previous GARP debugging timeout values for these ports, even if they were specified for other debugging modes. If TIMEOUT is not specified, the time out is the most recent TIMEOUT value previously set in an ENABLE GARP DEBUG command, or NONE if it has not been previously set.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples

To enable the PKT debugging option of the instance of GVRP belonging to the *sales* STP, use the command:

```
ENABLE GARP=GVRP DEBUG=PKT STP=SALES
```

See Also

DISABLE GARP DEBUG
SET GARP PORT
SHOW GARP DEBUG

ENABLE GARP GIP

Syntax `ENABLE GARP=GVRP GIP [STP={`*`stp-name`*`|ALL}]`

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command enables the operation of GIP for the GARP application. By enabling GIP, attribute registrations and de-registrations processed on a port are propagated to other ports in the GIP connected ring. All ports in the STP Forwarding state are added to the GIP connected ring as a result of this command. The default state is for GIP operation to be enabled for a GARP application. GIP operation is dependent upon having STP enabled on switch ports.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples To enable GIP operation for all GVRP instances, use either of the commands:

```
ENABLE GARP=GVRP GIP
```

```
ENABLE GARP=GVRP GIP STP=ALL
```

To enable GIP operation for the GVRP instance of the *accounting* STP, use the command:

```
ENABLE GARP=GVRP GIP STP=ACCOUNTING
```

See Also DISABLE GARP GIP
SHOW GARP

RESET GARP

Syntax `RESET GARP=GVRP [STP={`*`stp-name`*`|ALL}]`

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command clears dynamically learnt information from a GARP application. Counters for the GARP application are initialised to zero. During the processing of this command, all ports are disconnected from the GIP connected ring. The ports are re-connected into the GIP connected ring if the

GARP application is enabled and the ports are in the STP Forwarding state. This will ensure attributes are propagated correctly through the GIP connected ring.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples To reset all GVRP instances, use either of the commands:

```
RESET GARP=GVRP

RESET GARP=GVRP STP=ALL
```

To reset the GVRP instance of the *accounting* STP, use the command:

```
RESET GARP=GVRP STP=ACCOUNTING
```

See Also SHOW GARP
SHOW GARP COUNTER

SET GARP PORT

Syntax

```
SET GARP=GVRP PORT={port-list|ALL} [MODE={NONE|NORMAL}]
   [SHOWDEBUG={ON|OFF}] [STP={stp-name|ALL}]
```

where:

- *port-list* is a port number, a range of port numbers (specified as *n-m*), or a comma separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port.
- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command sets the port parameters of a GARP application. Whenever ports are added to a GARP application the new ports will be in NORMAL mode and SHOWDEBUG will be ON.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The PORT parameter specifies the ports that belong to the GARP application. If ALL is specified then all ports belonging to the GARP application will be affected by this command. If the GARP application has no ports and ALL is specified then an information message will be displayed stating this fact. If the command applies to an individual GARP application then the ports specified must all belong to that GARP application. If the command applies to all GARP applications of a certain type, e.g. all GVRP applications, then the command will only succeed on those GARP applications that the specified ports belong to.

If the port-list supplied does not match all the STP instances perfectly, the command will still succeed as a whole.

The MODE parameter specifies the mode of operation of the Applicant and Registrar state machines. If NONE is specified then the GARP application does not listen to or send any GARP messages in a GARP PDU. If NORMAL is specified then the GARP application listens to and sends GARP messages in GARP PDUs. The default value for this parameter is NORMAL.

The SHOWDEBUG parameter specifies whether debugging information is displayed for the port if debugging is enabled on the GARP application. If ON is specified, then debugging information is displayed as per the debug mode setting for the GARP application (see the SHOW GARP DEBUG command on page 4-23). If OFF is specified, then no debugging information will be displayed for the port. It recommended that this command be entered first with SHOWDEBUG set to OFF for all ports in the GARP application before debugging is enabled on the GARP application. This is because of the large volume of debugging information that can be generated. The default value for this parameter is ON.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected. Because a port can belong to only one instance of an STP a port can belong to only one instance of a GVRP. Therefore, it is not necessary to specify the STP parameter.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. The default STP parameter is ALL. Because a port can belong to more than one STP instance a port can belong to more than one instance of a GVRP. If the STP parameter ALL is specified for a port then all GVRP instances that belong to the port will be affected.

Examples To set the mode of operation to NONE for ports 3 and 6 of the GVRP instance belonging to the *accounting* STP, use either of the commands:

```
SET GARP=GVRP PORT=3,6 MODE=NONE STP=ACCOUNTING

SET GARP=GVRP PORT=3,6 MODE=NONE
```

To refrain from displaying debugging information for port 8 of the respective GVRP instance, use the command:

```
SET GARP=GVRP PORT=8 SHOW DEBUG=OFF
```

See Also DISABLE GARP DEBUG
ENABLE GARP DEBUG
SHOW GARP

SET GARP TIMER

Syntax

```
SET GARP=GVRP TIMER [JOINTIME=4..60] [LEAVETIME=12..120]
   [LEAVEALLTIME=96..6000] [STP={stp-name|ALL}]

SET GARP=GVRP TIMER DEFAULT [STP={stp-name|ALL}]
```

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description

This command sets the timeout values used by all timers in a GARP application.

The GARP parameter specifies the GARP application. Because only one GARP application has been implemented, GVRP must be specified.

The JOINTIME parameter sets the duration of the Join Period timer for the GARP applications in deciseconds. The timer is used to control the interval between opportunities to transmit GARP PDUs. Each port in the GARP application has a Join Period timer. The default value for this parameter is 5 deciseconds (i.e. 0.5 seconds).

The LEAVETIME parameter sets the duration of the Leave Period timer for the GARP applications in deciseconds. The timer controls the period of time that the Registrar state machine will wait in the LV state before entering the MT state, i.e. how quickly a Registrar will de-register an attribute from the registered IN state. Each port in the GARP application has a single Leave Period timer. Although a Leave Period timer is strictly required on a per-attribute basis, this implementation of GARP uses a Leave Timer that expires four times to timeout the LEAVETIME period. This granularity allows multiple Leave Period durations to be timed out using a single timer on each port belonging to the GARP application. The default value for this parameter is 15 deciseconds (i.e. 1.5 seconds).

The LEAVEALLTIME parameter sets the duration of the LeaveAll Period timer for the GARP application in deciseconds. The timer controls the frequency with which the LeaveAll state machine generates a LeaveAll message in a GARP PDU. Each port in the GARP application has a LeaveAll timer. The default value for this parameter is 120 deciseconds (i.e. 12 seconds).

The Join Period, Leave Period and LeaveAll Period durations are interrelated. The two criteria for setting the timers are:

```
LEAVETIME >= JOINTIME * 3
```

derived from IEEE standard 802.1D, and

```
LEAVEALLTIME >= LEAVETIME * 8
```

which states that the LeaveAll Period must be significantly greater than the Leave Period, as per the IEEE standard.

The DEFAULT parameter sets the Join Period, Leave Period and LeaveAll Period timers to their default values. The DEFAULT parameter cannot be specified in conjunction with any timer duration parameter.

The optional STP parameter specifies which GVRP instance is affected by this command. Each STP has its own instance of GVRP. If ALL is specified then all GVRP instances will be affected.

Examples To set the Join Period timer to 1 second, Leave Period timer to 3.5 seconds and the LeaveAll Period timer to 36 seconds for all GVRP applications, use either of the commands:

```
SET GARP=GVRP TIMER JOINTIME=10 LEAVETIME=35 LEAVEALLTIME=360

SET GARP=GVRP TIMER JOINTIME=10 LEAVETIME=35
   LEAVEALLTIME=360 STP=ALL
```

To set the timers to their default value for all GVRP applications, use either of the commands:

```
SET GARP=GVRP TIMER DEFAULT

SET GARP=GVRP TIMER DEFAULT STP=ALL
```

To set the Join Period timer to 0.4 seconds for the GVRP instance belonging to the *marketing* STP, use the command:

```
SET GARP=GVRP TIMER JOINTIME=4 STP=MARKETING
```

See Also SHOW GARP

SHOW GARP

Syntax

```
SHOW GARP

SHOW GARP=GVRP [STP={stp-name|ALL}]
```

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command displays information about the GARP application (Figure 4-4 on page 4-18, Table 4-2 on page 4-18).

Figure 4-4: Example output from the SHOW GARP command.

```
GARP Information
---------------------------------------------------------
Size of Database .......... 100

GARP Application .......... GVRP
STP ....................... fred
  Status .................. ON
  GIP Operation ........... OFF
  JoinTime ................ 5
  LeaveTime ............... 15
  LeaveAllTime ............ 120
  Hold Time ............... 2

Port Information:
  Mode NONE ............... -
  Mode NORMAL ............. 10-24
  Show Debug OFF .......... -
  Show Debug ON ........... 10-24

  Attribute Information:
  VLAN Identifier(s) ...... 11 (v11)

GARP Application .......... GVRP
STP ....................... default
  Status .................. ON
  GIP Operation ........... OFF
  JoinTime ................ 5
  LeaveTime ............... 15
  LeaveAllTime ............ 120
  Hold Time ............... 2

Port Information:
  Mode NONE ............... 2
  Mode NORMAL ............. 1,3-9
  Show Debug OFF .......... -
  Show Debug ON ........... 1-9

  Attribute Information:
  VLAN Identifier(s) ...... 1 (default)
---------------------------------------------------------
```

.

Table 4-2: Parameters displayed in the output of the SHOW GARP command .

Parameter	Meaning
Size of Database	Maximum size of the internal database belonging to each GARP application. This database matches attribute values to GID indexes used by GARP. This parameter is fixed.
GARP Application	Identifies the GARP application, i.e. “GVRP”.
STP	Present if the GARP application is GVRP; identifies the STP that owns this instance of GVRP.
Status	The state of the GARP application, either “ON” or “OFF”.
GIP Operation	The state of GIP operation for the GARP application, either “ON” or “OFF”.
JoinTime	The duration of the Join Period timer in deciseconds. This parameter can be set by Management.

Table 4-2: Parameters displayed in the output of the SHOW GARP command (Continued).

LeaveTime	The duration of the Leave Period timer in deciseconds. This parameter can be set by Management.
LeaveAllTime	The duration of the LeaveAll Period timer in deciseconds. This parameter can be set by Management.
Hold Time	The duration of the Hold timer in deciseconds. This parameter is fixed. The Hold timer prevents successive opportunities to transmit occurring immediately.
Port Information	Port settings for the GARP application. There are two parameters available: Mode and Show Debug.
Mode	Mode setting for ports in the GARP application. One of "NONE" or "NORMAL". A list of ports is printed if the mode setting is applicable on the port.
Show Debug	Show debug setting for ports in the GARP application. One of "ON" or "OFF". A list of ports is printed if the mode setting is applicable on the port.
Attribute Information	Values of the attributes presently registered by the GARP application. The attributes are specific to each type of GARP application. If no attributes are registered, "None" is displayed.
VLAN Identifier(s)	Value of the GVRP VID Attribute, a VLAN Identifier. The name of the VLAN is shown in brackets.

Examples To display information for all GARP applications, use the command:

```
SHOW GARP
```

To display GVRP information for all STPs, use either of the following commands:

```
SHOW GARP=GVRP
```

```
SHOW GARP=GVRP STP=ALL
```

See Also DISABLE GARP
ENABLE GARP
RESET GARP
SET GARP PORT
SET GARP TIMER

SHOW GARP COUNTER

Syntax `SHOW GARP COUNTER`

`SHOW GARP=GVRP COUNTER [STP={`*`stp-name`*`|ALL}]`

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command displays information about the GARP packet and message counters (Figure 4-5 on page 4-20, Table 4-3 on page 4-20).

Figure 4-5: Example output from the SHOW GARP COUNTER command.

```
GARP Application: GVRP     STP: default
  Receive:                                Transmit:
  Total GARP Packets               1      Total GARP Packets               5
  Invalid GARP Packets             0

  Discarded:
  GARP Disabled                    0      GARP Disabled                   24
  Port Not Listening               0      Port Not Sending                 0
  Invalid Port                     0
  Invalid Protocol                 0
  Invalid Format                   0
  Database Full                    0

GARP Messages:
  LeaveAll                         0      LeaveAll                        24
  JoinEmpty                        1      JoinEmpty                      157
  JoinIn                           0      JoinIn                         112
  LeaveEmpty                       0      LeaveEmpty                      31
  LeaveIn                          0      LeaveIn                          0
  Empty                            0      Empty                            9
  Bad Message                      0
  Bad Attribute                    0
```

Table 4-3: Parameters displayed in the output of the SHOW GARP COUNTER command.

Parameter	Meaning
GARP Application	Identifies the GARP application, i.e. "GVRP".
STP	Present if the GARP application is GVRP; identifies the STP that owns this instance of GVRP.
Receive: Total GARP Packets	Total number of GARP packets (PDUs) received by this GARP application.
Transmit: Total GARP Packets	Total number of GARP packets (PDUs) transmitted by this GARP application.
Receive: Invalid GARP Packets	Number of invalid GARP packets (PDUs) received by this GARP application.
Receive Discarded: GARP Disabled	Number of received GARP packets (PDUs) discarded because the GARP application was disabled.

Table 4-3: Parameters displayed in the output of the SHOW GARP COUNTER command. (Continued)

Parameter	Meaning
Transmit Discarded: GARP Disabled	Number of GARP packets (PDUs) discarded because the GARP application was disabled. This counter will be incremented when ports are added to or deleted from the GARP application arising from port movements in the underlying VLAN or STP.
Receive Discarded: Port Not Listening	Number of GARP packets (PDUs) discarded because the port that the packets were received on was not listening, i.e. MODE=NONE has been set on the port.
Transmit Discarded: Port Not Sending	Number of GARP packets (PDUs) discarded because the port that the packets were to be transmitted on was not sending, i.e. MODE=NONE has been set on the port.
Receive Discarded: Invalid Port	Number of GARP packets (PDUs) discarded because the port that the packet was received on does not belong to the GARP application.
Receive Discarded: Invalid Protocol	Number of GARP packets (PDUs) discarded because the GARP PDU contained an invalid protocol.
Receive Discarded: Invalid Format	Number of GARP packets (PDUs) discarded because the format of the GARP PDU was not recognised.
Receive Discarded: Database Full	Number of GARP packets (PDUs) discarded because the database for the GARP application was full, i.e. maximum number of attributes for the GARP application in use.
Receive GARP Messages: LeaveAll	Number of GARP LeaveAll messages received by the GARP application.
Transmit: GARP Messages: LeaveAll	Number of GARP LeaveAll messages transmitted by the GARP application.
Receive GARP Messages: JoinEmpty	Total number of GARP JoinEmpty messages received for all attributes in the GARP application.
Transmit GARP Messages: JoinEmpty	Total number of GARP JoinEmpty messages transmitted for all attributes in the GARP application.
Receive GARP Messages: JoinIn	Total number of GARP JoinIn messages received for all attributes in the GARP application.
Transmit GARP Messages: JoinIn	Total number of GARP JoinIn messages transmitted for all attributes in the GARP application.
Receive GARP Messages: LeaveEmpty	Total number of GARP LeaveEmpty messages received for all attributes in the GARP application.
Transmit GARP Messages: LeaveEmpty	Total number of GARP LeaveEmpty messages transmitted for all attributes in the GARP application.
Receive GARP Messages: LeaveIn	Total number of GARP LeaveIn messages received for all attributes in the GARP application.
Transmit GARP Messages: LeaveIn	Total number of GARP LeaveIn messages transmitted for all attributes in the GARP application.
Receive GARP Messages: Empty	Total number of GARP Empty messages received for all attributes in the GARP application.
Transmit GARP Messages: Empty	Total number of GARP Empty messages transmitted for all attributes in the GARP application.

Table 4-3: Parameters displayed in the output of the SHOW GARP COUNTER command. (Continued)

Parameter	Meaning
Receive GARP Messages: Bad Message	Number of GARP messages that had an invalid Attribute Type value, an invalid Attribute Length value or an invalid Attribute Event value.
Receive GARP Messages: Bad Attribute	Number of GARP messages that had an invalid Attribute Value value.

Examples To display information for all GARP application counters, use the command:

```
SHOW GARP COUNTER
```

See Also RESET GARP

SHOW GARP DB

Syntax `SHOW GARP[=GVRP] DB`

Description This command displays the internal database for the GARP application (Figure 4-6 on page 4-22, Table 4-4 on page 4-22). Each attribute is represented by a GID index within the GARP application.

Figure 4-6: Example output from the SHOW GARP DB command.

```
GARP Application: GVRP      STP: default
  GID index  Attribute               Used    GID index   Attribute            Used
  ---------------------------------------    ---------------------------------------
     0       1                       Yes       1         11                   No
     2       42                       Yes
```

Table 4-4: Parameters displayed in the output of the SHOW GARP DB command.

Parameter	Meaning
GARP Application	Identifies the GARP application, i.e. "GVRP".
STP	Present if the GARP application is GVRP; identifies the STP that owns this instance of GVRP.
GID index	Value of the GID index corresponding to the attribute. GID indexes begin at 0. If the GARP application has no attributes presently registered, "No attributes have been registered" is displayed.
Attribute	Value of the attribute.
Used	Indicates whether the GID index is currently being used by any port in the GARP application. The definition of "used" is whether the Applicant and Registrar state machine for the GID index are in a non-initialised state, i.e. not in {Vo, Mt} state. The value of this parameter is either "Yes" or "No".

Examples To display the database for all GARP applications, use the command:

```
SHOW GARP DB
```

See Also SHOW GARP MACHINE

SHOW GARP DEBUG

Syntax

```
SHOW GARP DEBUG

SHOW GARP=GVRP DEBUG [STP={stp-name|ALL}]
```

where:

- *stp-name* is a character string, 1 to 15 characters long. Valid characters are uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), the underscore character ("_") and the hyphen character ("-"). The *stp-name* cannot be ALL.

Description This command displays debugging information for the GARP application (Figure 4-7 on page 4-23, Table 4-5 on page 4-23).

Figure 4-7: Example output from the SHOW GARP DEBUG command.

```
GARP Application: GVRP              STP: default
  Enabled Debug Modes                  Output     Timeout
  ---------------------------------------------------------------------------
  PKT                                  16         None
  ---------------------------------------------------------------------------
```

Table 4-5: Parameters displayed in the output of the SHOW GARP DEBUG command.

Parameter	Meaning
GARP Application	Identifies the GARP application, i.e. "GVRP".
STP	Present if the GARP application is GVRP; identifies the STP that owns this instance of GVRP.
Enabled Debug Modes	The debugging option for the GARP application; one of "MSG", "PKT", "STATE" or "None".
Output	The output device for the GARP application; shown only if a debug mode is presently enabled.
Timeout	The length of time, in seconds, that the debugging options for the GARP application will be enabled; shown only a debug mode is presently enabled. If no timeout has been set or the timeout is set to NONE, "None" is displayed.

Examples To display debugging information for all GARP applications, use the command:

```
SHOW GARP DEBUG
```

See Also DISABLE GARP DEBUG
ENABLE GARP DEBUG

SHOW GARP GIP

Syntax `SHOW GARP[=GVRP] GIP`

Description This command displays the GIP connected ring for the GARP application (Figure 4-8 on page 4-24, Table 4-6 on page 4-24).

Figure 4-8: Example output from the SHOW GARP GIP command.

```
GARP Application: GVRP      STP: default
  Connected Ring:
  24 ->  1 ->  2 ->  3 ->  4 ->  5 ->  6 ->  7 ->  8 ->  9 ->
  10 -> 11 -> 12 -> 13 -> 14 -> 15 -> 16 -> 17 -> 18 -> 19 ->
  20 -> 21 -> 22 -> 23 -> 24
```

Table 4-6: Parameters displayed in the output of the SHOW GARP GIP command.

Parameter	Meaning
GARP Application	Identifies the GARP application, i.e. "GVRP".
STP	Present if the GARP application is GVRP; identifies the STP that owns this instance of GVRP.
Connected Ring	Ring of connected ports. Only ports presently in the STP Forwarding state are eligible for membership to the GIP connected ring. If no ports exist in the GIP connected ring, "No ports are connected" is displayed. If the GARP application has no ports, "No ports have been assigned" is displayed.

Examples To display the GIP connected ring for all GARP applications, use the command:

```
SHOW GARP GIP
```

See Also DISABLE GARP
ENABLE GARP
RESET GARP

SHOW GARP MACHINE

Syntax `SHOW GARP[=GVRP] MACHINE`

Description This command displays the GID state machines for the GARP application (Figure 4-9 on page 4-25, Table 4-7 on page 4-25). The output is shown on a per-GID index basis; each attribute is represented by a GID index within the GARP application.

Figure 4-9: Example output from the SHOW GARP MACHINE command.

```
GARP Application: GVRP      STP: default
  GID | Port  App  Reg | Port  App  Reg | Port  App  Reg | Port  App  Reg |
 -----------------------------------------------------------------------
    0 |   1   Qa   Fix |   2   Qa   Fix |   3   Qa   Fix |   4   Qa   Fix |
      |   5   Qa   Fix |   6   Qa   Fix |   7   Qa   Fix |   8   Qa   Fix |
      |   9   Vo   Mt  |  10   Vo   Mt  |  11   Vo   Mt  |  12   Vo   Mt  |
      |  13   Vo   Mt  |  14   Vo   Mt  |  15   Vo   Mt  |  16   Vo   Mt  |
      |  17   Qa   Fix |  18   Qa   Fix |  19   Qa   Fix |  20   Qa   Fix |
      |  21   Qa   Fix |  22   Qa   Fix |  23   Qa   Fix |  24   Qa   Fix |
 -----------------------------------------------------------------------
    1 |   1   Vo   Mt  |   2   Vo   Mt  |   3   Vo   Mt  |   4   Vo   Mt  |
      |   5   Vo   Mt  |   6   Vo   Mt  |   7   Vo   Mt  |   8   Vo   Mt  |
      |   9   Vo   Mt  |  10   Vo   Mt  |  11   Vo   Mt  |  12   Vo   Mt  |
      |  13   Vo   Mt  |  14   Vo   Mt  |  15   Vo   Mt  |  16   Vo   Mt  |
      |  17   Vo   Mt  |  18   Vo   Mt  |  19   Vo   Mt  |  20   Vo   Mt  |
      |  21   Vo   Mt  |  22   Vo   Mt  |  23   Vo   Mt  |  24   Vo   Mt  |
 -----------------------------------------------------------------------
```

Table 4-7: Parameters displayed in the output of the SHOW GARP MACHINE command.

Parameter	Meaning	
GARP Application	Identifies the GARP application, i.e. "GVRP".	
STP	Present if the GARP application is GVRP; identifies the STP that owns this instance of GVRP.	
GID	Value of the GID index corresponding to the attribute. GID indexes begin at 0. If the GARP application has no attributes presently registered, "No attributes have been registered" is displayed.	
Port	Port number on the switch; this port belongs to the GARP application. If the GARP application has no ports, "No ports have been assigned" is displayed.	
App	Applicant state machine for the GID index on that particular port. One of:	
	Normal Participant Management state:	
	"Vo"	Very Anxious Observer
	"Ao"	Anxious Observer
	"Qo"	Quiet Observer
	"Lo"	Leaving Observer
	"Vp"	Very Anxious Passive Member
	"Ap"	Anxious Passive Member
	"Qp"	Quiet Passive Member
	"Va"	Very Anxious Active Member
	"Aa"	Anxious Active Member
	"Qa"	Quiet Active Member
	"La"	Leaving Active Member

Table 4-7: Parameters displayed in the output of the SHOW GARP MACHINE command. (Continued)

Parameter	Meaning	
App (*Continued*)	*Non-Participant Management state:*	
	"Von"	Very Anxious Observer
	"Aon"	Anxious Observer
	"Qon"	Quiet Observer
	"Lon"	Leaving Observer
	"Vpn"	Very Anxious Passive Member
	"Apn"	Anxious Passive Member
	"Qpn"	Quiet Passive Member
	"Van"	Very Anxious Active Member
	"Aan"	Anxious Active Member
	"Qan"	Quiet Active Member
	"Lan"	Leaving Active Member
	The initialised state for the Applicant is Vo.	
Reg	Registrar state machine for the GID index on that particular port. One of:	
	"Mt"	Empty
	"Lv3"	Leaving substate 3 (final Leaving substate)
	"Lv2"	Leaving substate 2
	"Lv1"	Leaving substate 1
	"Lv"	Leaving substate (initial Leaving substate)
	"In"	In
	"Fix"	Registration Fixed
	"For"	Registration Forbidden
	The initialised state for the Registrar is Mt.	

Examples To display GID state machines for all GARP applications, use the command:

```
SHOW GARP MACHINE
```

See Also SHOW GARP DB