

4 GateD Global Configuration

The GateD configuration file uses groups of statements with a specific order and a specific syntax to control the operations of routing. Some of these statements act on specifically defined interfaces, while other commands have a wider range and affect all interfaces and protocols.

The order of the statement groups in the configuration file tends to move from general to specific in terms of the scope of the network that the statement controls. For example, commands configured in the options statement group (early in the configuration file) affect the performance of all GateD interfaces, while commands in the protocol statement group (later in the configuration file) affect only interfaces defined by the specific protocol (for example, RIP or OSPF).

This chapter explains the globally configurable options in the GateD configuration file. The following topics will be discussed:

Route Preference

Route Preference commands allow the user to specify a hierarchy among routes. Preference statements can be listed in several places in the **gated.conf** file. For information on route preference, see *Route Preference* on page 4-5.

Options Statements

Options statements allow you to specify global GateD parameters. Options statements are listed in the first group of the **gated.conf** file. For information on the statements and syntax of commands that fall under the options statement heading, see *The Options Statement* on page 4-8.

Definition Statements

Definition statements allow you to specify commands that affect at least two or more protocols. Definition statements are listed in the third group of the **gated.conf** file.

In addition, this chapter also explains the GateD UI commands that are not protocol-specific (i.e., RIP, OSPF, BGP). GateD global UI commands are detailed in the section called *GateD Global UI Commands* on page 4-2.

GateD Global UI Commands

When GateD loads into your switch, it adds a submenu named “Gated” to the Networking menu. The GateD User Interface (UI) commands differ from other UI commands on your switch. The GateD commands in this section require a root command followed by a subcommand (or parameter). Entering a root command without a valid subcommand returns an error message.

GateD global UI commands are accessed with the root command **gated**. There are several subcommands that can be used with the **gated** command. Entering the **gated** command at the system prompt displays a list of possible subcommands, as shown below:

parameters for gated root command are:

stat	GateD status display
routes	Displays GateD internal routing table
reconfig	Reloads configuration file
restart	Restarts GateD

Enter the desired parameter in conjunction with the **gated** root command. For example, to see GateD statistics, enter the following:

gated stat

For information using the **gated** root command:

- See *Displaying GateD Status* on page 4-3 for details on viewing GateD operational status.
- See *Displaying GateD Routing Information* on page 4-3 for details on displaying GateD internal routing information.
- See *Reloading the GateD Configuration File* on page 4-4 for details on reinitializing GateD with a new **gated.conf** file.
- See *Restarting GateD* on page 4-4 for details on restarting GateD.

◆ **Note** ◆

GateD commands are only accessible if GateD is operational. If GateD is not running (for example, errors are detected in the **gated.conf** file on startup), an error message displays when attempting to use these commands. You will need to correct the error and restart the switch.

GateD Subcommands

The GateD menu has subcommands available that allow you to access the various protocols used by GateD. Enter a question mark (?) at the **gated** system prompt to see the protocol submenus available. A screen similar to the following is shown:

Command	Gated Menu
ospf	OSPF control command
rip	RIP control command
bgp	BGP control command

The commands listed in this menu are root commands (like the **gated** command) and need an accompanying parameter. The UI commands for viewing GateD protocols are described in Chapter 6 (RIP), Chapter 7 (OSPF), and Chapter 8 (BGP) of this manual.

Displaying GateD Status

The **gated stat** command allows you to view the status of GateD and the available protocols used by GateD (RIP, OSPF, and BGP). To display general information about GateD, enter the following command:

```
gated stat
```

A screen similar to the following displays:

```
***** GATED Status *****

Gated is running

RIP           : enabled
OSPF          : configured/inactive
BGP           : disabled
ICMP Router Discovery : disabled
```

This screen shows whether or not GateD is running and the current state of each of the supported protocols. The possible entries for each protocol are:

enabled. An entry was found in the configuration file that enabled the protocol.

disabled. An entry was found in the configuration file that disabled the protocol, or the protocol was never activated.

configured/inactive. An entry was found in the configuration file that enabled the protocol, but it is not active because the switch has been configured *not* to forward packets.

Displaying GateD Routing Information

The **gated routes** command displays the switch's known routes. To display switch routing information, enter the following command:

```
gated routes
```

A screen similar to the following is displayed:

Destination	Subnet Mask	Gateway	Metric	Tag	Pref	Protocol
127.0.0.1	255.0.0.0	127.0.0.1	1	0	0	Static
127.0.0.1	255.255.255.0	127.1.0.1	1	0	0	Direct
163.49.45.0	255.255.255.224	163.49.45.1	1	0	0	RIP
163.49.49.0	255.255.255.0	163.46.45.4	20	0	0	OSPF

Destination. The address of the interface that is the end point of this route. The origin address would be the interface on the local switch.

Subnet Mask. The subnet mask for the destination address.

Gateway. The gateway, or interim router, through which data on this route travels in order to reach the destination address.

Metric. The determined metric for the route. A metric is a marker indicating the distance the destination address is from the local switch. The metric unit is different depending on the protocol being used. For RIP, the metric is the number of router hops. For OSPF and BGP, the metric is a cost of path number. For specifics on metrics, see Chapter 3 of this manual.

Tag. This field is used for OSPF. The OSPF protocol statement allows you to add a tag line to propagate AS path information. Usually this is a keyword specified by the network administrator. For more information on setting the **tag** token, see Chapter 7 of this manual.

Pref. The configured route preference for this route. Route preference determines which route is used. For information on configuring route preference, see *Route Preference* on page 4-5.

Protocol. The type of protocol the route uses. There are ten possible types of route protocols:

RIP	Routing Information Protocol (version 1 or 2).
OSPF	Open Shortest Path First protocol.
BGP	Border Gateway Protocol.
Static	A configured static route.
Direct	A direct connection to the network maintained by the switch, rather than another router.
Kernel	Routes learned from the kernel routing table.
Default	The default route generated by the gendefault statement
OSPF ASE	External routes propagated by OSPF.
Aggregate	Routes generated by the aggregate statement.
Rtr Disc	Routes generated by ICMP router discovery.

Reloading the GateD Configuration File

To cause GateD to reload its configuration file, enter the following command:

```
gated reconfig
```

No message is displayed as GateD rereads the **gated.conf** file. This command is typically used to implement changes to GateD's operation without requiring a reboot.

Restarting GateD

To restart the GateD initialization process (as if the switch had been rebooted), enter the following command:

```
gated restart
```

A series of messages indicating GateD shutting down, then restarting, are displayed. This command is useful if you need to restart GateD but do not wish to actually reboot the switch.

Reconfig or Restart?

Use the **restart** command when GateD software has been shut down due to an error or other event. Use the **reconfig** command when GateD is still operational. You can check whether or not GateD is running by issuing the **gated stat** command.

The **reconfig** command is useful for reloading the **gated.conf** file (e.g., after you make changes to routing parameters).

The **restart** command is intended for use in situations in which GateD shuts down due to an error, such as a **gated.conf** syntax error, or other event.

The **reconfig** and **restart** commands do not require a switch reboot.

Route Preference

Route preference is a value GateD uses to order its choice of routes when multiple routing options are available. Preference can be set based on one network interface over another, one protocol over another, or one remote gateway over another. Preference may not be used to control the selection of routes within an IGP. This control is accomplished automatically by the protocol based on metrics. Preference may be used to select routes from the same EGP learned from different peers or autonomous systems. Each route has only one preference value associated with it, even though preference can be set at many places in the configuration file. The last or most specific preference value set for a route is the value used.

The preference value is an arbitrarily assigned value used to determine the order of routes to the same destination in a single routing database. The active route is chosen by the lowest preference value. Some protocols implement a second preference (*preference2*), sometimes referred to as a tie-breaker.

If no preferences are set, then default values are assigned. The following table summarizes the default preference values for routes learned in various ways. The table lists the statements (some of these are suboptions within statements) that set preference, and shows the types of routes to which each statement applies. The default preference for each type of route is listed. The more narrow the scope of the statement, the higher the precedence its preference value is given, but the smaller the set of routes it affects. Lower preference values are given higher route priority.

Route Type	Defined by Statement	Default
Directly connected networks	Interface	0
OSPF routes	OSPF	10
Internally generated defaults	gendefault	20
Redirects	redirect	30
Routes learned via route socket	Kernel	40
Router discovery	router discovery client	55
Configured static routes	Static	60
RIP routes	RIP	100
Direct aggregate	Interfaces	110
Point-to-Point Interface	Interfaces	120
Aggregate/Generate routes	aggregate/generate	130
OSPF AS external routes	OSPF	150
BGP routes	BGP	170
Kernel remnant	Kernel	254

Selecting a Route

GateD uses the following rules to compute the best route (or next hop) to a destination:

- The route with the best (numerically smallest) preference is preferred.
- If the two routes have the same preference, the route with the best (numerically smallest) preference2 (also known as a tie-breaker) is preferred.
- A route learned from an IGP is preferred to a route learned from an EGP. Least preferred is a route learned indirectly by an IGP from an EGP.
- If AS path information is available, it is used to help determine the most preferred route.
 - A route with an AS path is preferred over one without an AS path.
 - If the AS paths and origins are identical, the route with the lower metric is preferred.
 - A route with an AS path origin of IGP is preferred over a route with an AS path origin of EGP. Least preferred is an AS path with an unknown origin.
 - A route with a shorter AS path is preferred.
- If both routes are from the same protocol and AS, the one with the lowest metric is preferred.
- The route with the lowest numeric next-hop address is used.

Assigning Preferences

A default preference is assigned to each source from which GateD receives routes. Preference values range from 0 to 255, with the lowest number indicating the most preferred route.

Setting Route Preference

There are several places in the configuration file that allow you to set route preference. In all instances, it is done by entering the token **preference**, then a number value to set the preference. For example, to set a preference of 30, enter the following:

preference 30

If no preference is set, a default preference value is assigned to the route based on the table shown in the previous section. Low numbers take priority over higher numbers. For example, a route with a preference of 30 would be selected before a route with a preference of 60.

The statement groups that allow you to set a preference for routes are listed below:

- **Options.** In the options statement group, the **gendefault** command can be modified with a preference value for the default interface specified. For specific information, see *The Options Statement* on page 4-8.
- **Interfaces.** In the interfaces statement group, the **interface** command can be modified with a preference value for the interface. An interface can also be modified with the token **down preference**. This refers to a preference value set for the interface if it is suspected by GateD that the interface is not operational. This is the only place the **down preference** token is used. For specific information, see Chapter 5 of this manual.
- **Protocols.** All of the protocol statements allow you to modify a specified protocol interface with a preference value. For specific information, see Chapter 6 (RIP), Chapter 7 (OSPF), and Chapter 8 (BGP) of this manual.
- **Static.** In the static statement group, a configured static route can be modified with a preference value. For specific information, see Chapter 9 of this manual.
- **Control.** In the control statement group, imported and exported routes can be modified with a preference value. For specific information, see Chapter 10 of this manual.
- **Aggregate.** In the aggregate statement group, aggregated or generated routes can be modified with a preference value. For specific information, see Chapter 11 of this manual.

The last or most specific preference set (at the interface level) is the preference used for a route.

The Options Statement

The options statement allows specification of global options. If used, options must appear *before* any other type of configuration statement in the **gated.conf** file.

The following shows the entire options statement and its syntax:

```
options
[ nosend ]
[ noresolv ]
[ gendefault [ preference preference ] [ gateway gateway ] ]
[ syslog [ upto ] log_level ]
[ mark time ]
;
```

The syntax and label conventions for statements are described in Chapter 3 of this manual.

The commands in the options group are not required for the **gated.conf** file, and one or more can be specified jointly. When specifying more than one command, the semicolon (;) marks the end of *all* modifiers. For example, if the statement required the **nosend** and the **mark *time*** parameters, the statement in the configuration file could appear in one of the following ways:

```
options
  nosend mark time;
```

or

```
options
  nosend
  mark time;
```

where *time* would be replaced with a valid integer. Either example is correct.

The possible statements in the options group are described below:

nosend

When this option is specified, GateD does not send any packets. This option makes it possible to run GateD on a live network solely to test protocol interactions without actually participating in the routing protocols. The packet traces in the GateD log can be examined to verify that GateD is functioning properly.

noresolv

By default, GateD will try to resolve symbolic names into IP addresses by using the Domain Name System (DNS). If there is insufficient routing information to send DNS queries, GateD will deadlock during startup. This option can be used to prevent these calls for address resolutions from occurring.

◆ Note ◆

If you set this parameter, symbolic names will result in configuration file errors. Only IP address and DNS names will be accepted.

gendefault [**preference** *preference*] [**gateway** *gateway*]

When **gendefault** is enabled, and a BGP peer for this switch is operational, a default route is created. The default route is used as a route for packets that cannot be forwarded because the destination is unknown to the router. This route is installed in the routing table with a protocol label of **default**. This can be disabled per BGP group with the **nogendefault** option (configurable in the BGP protocol statement section of the configuration file). By default, this route has a preference of 20. This route is normally not installed in the kernel forwarding table. It is only present so it can be announced to other protocols. If a gateway is specified, the default route will be installed in the kernel forwarding table with the next hop being the listed gateway. For example, if the statement is entered in the configuration file as follows:

gendefault preference 50 ;

then a default route with a protocol of **default** is created. The route in this example would override the default preference of **20** and advertise it as **50**. This route would not be part of the routing table.

However, if the statement were written as shown:

gendefault preference 50 gateway 1.1.1.1 ;

then the default route behaves in the manner of the previous example, with the exception that it *would* be part of the routing table and the next hop would be the gateway with IP address 1.1.1.1.

◆ Note ◆

The use of the **generate** statement is preferred to the use of the **gendefault** option. See Chapter 11 of this manual for more information on the **generate** statement.

The **preference** and **gateway** modifiers are not required modifiers for the **gendefault** token.

mark *time*

Specifying this option causes GateD to output a message to the console screen at the specified interval, in seconds. For example if the statement was written:

mark 30

then every thirty seconds an entry would be appear in the console screen. This can be used as one method for determining if GateD is still running.

Options Statement Example

The following is an example of an options statement using several different modifiers:

```
options
  noresolve
  gendefault gateway 1.1.1.5
;
```

In this statement, following characteristics are true:

- The **noresolve** token means that non-IP address identifiers for networks and interfaces (identifiers, domain names) are not resolved to IP addresses.
- The **gendefault** token allows the creation of a default route. The **gateway** token (with the gateway address) means that the route created by the **gendefault** token is included in the routing table, with a next hop of **1.1.1.5**.

Definition Statements

Definition statements are general configuration statements that relate to all of GateD, or at least to more than one protocol. The three definition statements are **autonomoussystem**, **routerid**, and **martians**. If used, definition statements must be listed after the options statement and before any type of protocol configuration statement in the **gated.conf** file.

The following shows all definition statements and their syntax:

```
autonomoussystem autonomous_system [ loops number ] ;
routerid host ;
martians {
    host host [ allow ] ;
    network [ allow ] ;
    network mask mask [ allow ] ;
    network masklen number [ allow ] ;
    default [ allow ] ;
};
```

The syntax and label conventions for statements are described in Chapter 3 of this manual.

The possible statements in the definition group are described below:

autonomoussystem *autonomous_system* [**loops** *number*] ;

This option is required if BGP is in use. This parameter sets the autonomous system number to which this router belongs. An autonomous system (AS) is a set of routers within a managed network group that use a common IGP (RIP, OSPF) for routing within the group, and an EGP (BGP) for routing to other ASs. The AS number is an assigned number between 1 and 65534.

For example, to assign a router to AS number 5, you would enter the following into the **gated.conf** file:

```
autonomoussystem 5
```

◆ Note ◆

If your AS is advertised on the Internet, and is accessible to the general public, you may need to contact the Internet Assigned Numbers Authority (IANA) to receive an AS number assignment. The IANA is in charge of allocating IP addresses and other Internet resources. Their website is located at **www.iana.org**. RFC 1930 lists guidelines for requesting an AS number, as well as criteria for deciding if you need to contact the IANA to request an AS number.

Loops is used for protocols supporting AS paths, such as BGP. It controls the number of times this autonomous system may appear in an AS path. The default for this parameter is **1**. For more information on BGP and AS paths, see Chapter 8 of this manual.

routerid *host* ;

A **routerid** is used by OSPF and BGP. This parameter sets the router identifier used by the BGP and OSPF protocols. The default is the IP address of the first interface encountered by GateD (usually the IP address of the default VLAN). The IP address of a non-point-to-point interface is preferred over the local address of a point-to-point interface. An address on a loopback interface that is not the loopback address (i.e., 127.0.0.1) is most preferred.

```
martians {  
    host host [ allow ] ;  
    network [ allow ] ;  
    network mask mask [ allow ] ;  
    network masklen number [ allow ] ;  
    default [ allow ] ;  
};
```

Sometimes a misconfigured system sends out obviously invalid destination addresses. These invalid addresses, called *martians*, are rejected by the GateD routing software. This parameter, along with its modifiers, defines a list of martian addresses about which all routing information is ignored. Martians can be specified using the following modifiers. In all of the following cases, the **allow** modifier reverses the parameter; if **allow** is added to the statement, this route will be accepted even if it has been previously marked as a martian:

host *host* [**allow**]

A specific host address for a switch or router on the network, in dotted quad notation.

network [**allow**]

A network address in dotted quad notation (for example, 128.8.0.0).

network mask *mask* [**allow**]

A network address in dotted quad notation (for example, 128.8.0.0), with an accompanying subnet mask notation if a default mask is not used. This parameter is only used if default masks have been changed to more specific masks. See *Definition Statement Example* on page 4-13 for a specific example.

network masklen *number* [**allow**]

A network address in dotted quad notation (for example, 128.8.0.0), with an accompanying mask length notation if the default mask is not used. This parameter is only used if default masks have been changed to more specific masks. See *Definition Statement Example* on page 4-13 for a specific example.

default [**allow**] ;

This token is a shorthand way of specifying the default route as a martian. It is equivalent to entering the following:

0.0.0.0 mask 0.0.0.0 exact

Definition Statement Example

The following is an example of a definition statement with several optional modifiers:

```
autonomoussystem 249 ;  
routerid 1.1.1.2 ;  
martians {  
    host 1.1.1.4 ;  
    2.0.0.0 mask 225.255.0.0 allow ;  
    128.8.0.0 masklen 24 ;  
};
```

The statements in the sample perform the following functions:

- The **autonomoussystem** statement tells GateD to use AS number 249.
- The **routerid** statement specifies a router identification of 1.1.1.2 for OSPF and BGP.
- The first statement in the **martian** clause prevents routes to host 1.1.1.4 from ever being accepted by or added to the routing database.
- The second statement in the **martian** clause notes that any route from network 2.0.0.0 and subnetmask 225.255.0.0 should be allowed even if it has been internally noted by GateD to be a martian. If the allow **token** were removed, these routes would not be accepted.
- The third statement in the **martian** clause notes that any route from network 128.8.0.0 with a subnet mask length of 24 is not to be accepted or added to the routing database.

