Chapter 7
Interface Statement

7.1 Overview

An interface statement connects a router or host to a layer 1 subsystem.

7.2 Interface Syntax

GateD's interface syntax provides support for aliases and tunnels.

```
interfaces {
    [ options
        [ strictinterfaces ]
        [ scaninterval time ]
        [ aliases-nexthop ( primary | lowestip ) ] ; ]
    [ interface interface_list
        [ preference interfacepreference ]
        [ down preference downpreference ]
        [ enable ]
        [ disable ]
        [ passive ]
        [ simplex ]
        [ reject ]
        [ blackhole ]
        [ AS autonomoussystem ]
        [ alias primary address mask mask ]
        [ aliases-nexthop ( primary | lowestip ) ] ; ]
    [ define ( subnet | p2p ) local address
        [ broadcast address ]
        [ remote address ]
        [ tunnel encapsulation_protocol ]
        [ netmask mask ]
        [ multicast | nomulticast ]
        [ unicast | nounicast ] ; ]
```

```
};
```

More detailed descriptions of these commands can be found on page 15 of the *Command Reference Guide*.

7.3 Default Configuration

The default configuration for the **interface** clause is:

```
interfaces {
    options scaninterval 60 ;
    aliases-nexthop primary ;
    interface all down-preference 120 ;
    interface all preference 0 ;
    interface all enable;
} ;
```

Notes:

- On systems without a routing socket, the scaninterval is reduced to 15 seconds to allow GateD to notice changes more quickly.
- On systems with a routing socket, a scaninterval of zero disables periodic interface scans.
- Systems that utilize a routing socket that do not prevent loss of data on the socket may result in a FIB that is inconsistent with GateD's routing table. A scaninterval of zero is highly discouraged on systems with a "lossy" routing socket.

7.4 Sample Interface Configurations

```
interfaces {
    define p2p local 198.108.60.89 remote
        141.213.10.41 multicast nounicast
        tunnel ipip;
    define subnet local 192.168.12.114 netmask
        255.255.255.0;
    define subnet local 192.168.13.129 netmask
        255.255.255.252
        broadcast 192.168.13.131;
    define p2p local 192.168.13.114 remote
        192.168.13.116;
};
```

The **define** statement allows the user to configure an interface that may not exist at the time of setup. The interface may then be used in protocol configurations, with the configuration becoming active when the interface appears and is up.

The first **define** configures a multicast-only IP-in-IP tunnel usable by routing protocols for the multicast RIB. (See "Chapter 9 Multiple Routing Information Bases (RIBs)" on page 33 for more information about multicast RIBs.) Note that the keywords **multicast** and **nounicast** here are redundant with the defaults for **tunnel ipip**. In fact, the standard multicast kernel cannot support any other combination.

The second **define** tells GateD to treat the interface with the local address 192.168.12.114 as a subnet (192.168.12/24), even if it's actually a point-to-point link. (This does, however, require that the actual remote point-to-point address fall within the configured subnet prefix.)

The third **define** shows how a /30 may be implemented in the define statement. The **define** tells GateD to treat the interface with a local address of 192.168.13.129, a netmask of 255.255.255.252, and a broadcast of 192.168.13.131.

The fourth **define** tells GateD to treat the interface with the local address 192.168.13.114 as a point-to-point link to 192.168.13.116, even if it's not actually a point-to-point link. (If it's actually a subnet, this requires that the configured remote point-to-point address fall within the actual subnet prefix.)

7.5 IP Interface Addresses and Routes

The *BSD 4.3* and later networking implementations allow four types of interfaces. Some implementations allow multiple protocol addresses per physical interface. These implementations are mostly based on *BSD 4.3 Reno* or later.

loopback

loopback must have the address of 127.0.0.1. Packets sent to **loopback** are sent back to the originator. This interface is also used as a catch-all interface for implementing other features, such as **reject** and **blackhole** routes. Although a netmask is reported on this interface, it is ignored. Assign an additional address to this interface that is the same as the OSPF or BGP **routerid** to allow routing to a system based on the **routerid** that will work if some interfaces are down. This may require advertising the address in the protocol.

broadcast

broadcast is a multi-access interface capable of a physical level broadcast, such as Ethernet, Token Ring and FDDI. This interface has an associated subnet mask and broadcast address. The interface route to a **broadcast** network will be a route to the complete subnet.

point-to-point

point-to-point is a tunnel to another host, usually on some sort of serial link. This interface has a local address and a remote address. Although it may be possible to specify multiple addresses for a point-to-point interface, there does not seem to be a useful reason for doing so. The remote address must be unique among all the interface addresses on a given router. The local address may be shared among many point-to-point and up to one non-point-to-point interface. **point-to-point** is technically a form of the **routerid** method for addressless links. This technique conserves subnets because none are required when using it.

If a subnet mask is specified on a point-to-point interface, it is only used by RIP version 1 to determine which subnets may be propagated to the router on the other side of this interface. All point-to-point interfaces are, by default, given a host subnet mask in GateD.

non-broadcast multi-access or **nbma**

nbma is multi-access, but not capable of broadcast. An example of this would be `frame relay` and `X.25`. This type of interface has a local address and a subnet mask.

To ensure consistency, GateD installs a route in the kernel's FIB (Forwarding Information Base) for the address of each IP interface that is configured and up.

For point-to-point interfaces, GateD installs some special routes. If the local address on one or more point-to-point interfaces is not shared with a non-point-to-point interface, GateD installs a route to the local address pointing at the **loopback** interface with a preference of **110**. This insures that packets originating on this router destined for this local address are handled locally. OSPF prefers to route packets for the local interface across the point-to-point link where they will be returned by the router on the remote end. This is used to verify operation of the link. Because OSPF installs routes with a preference of **10**, these routes will override the route installed with a preference of **110**.

If the local address of one or more point-to-point interfaces is shared with a non-point-to-point interface, GateD installs a route to the local address with a preference of **0** that will not be installed in the forwarding table. This is to prevent protocols like OSPF from routing packets to this address across a serial interface when this system could be functioning as a host.

When the status of an interface changes, GateD notifies all the protocols, which take the appropriate action. GateD assumes on startup that interfaces that are not marked UP do not exist.

GateD ignores any interfaces that have invalid data for the local, remote or broadcast addresses, or the subnet mask. Invalid data includes zeros in any of these fields. GateD will also ignore any point-to-point interface that has the same local and remote addresses. GateD assumes that the interface is in some sort of loopback test mode.

Interface aging is turned off by default. It can be turned on again via a compile-time option. Refer to the **passive** statement on page 38 of the *GateD Command Reference Guide*.

7.6 Interface Aliases

7.6.1 Aliases Overview

GateD allows the use of aliases on interfaces -- more than one logical interface can exist for each physical interface on the machine. Typically, you create these logical interfaces using the **ifconfig(1)** command. Two options in the **interfaces** command affect the operation of GateD with respect to aliases.

1. **aliases-nh (lowestip | primary)**
2. **interface** *interface-name* **alias primary** *address* **mask** *mask*

The configuration information in the **interfaces** command directly affects the behavior of the protocols when aliases are configured. When used with the **options** command, **aliases-nh** specifies the default behavior. When used with the **interface** command, **aliases-nh** indicates the default for aliases of the physical interface(s) specified.

7.6.2 Using **aliases-nh primary** (default)

When configured with **aliases-nh primary**, which is the default, GateD chooses a primary address on each subnet that is configured on the interface. The primary chosen by GateD is based on the order in which the addresses are read from the kernel. For example, consider a machine with one physical interface, le0, with five logical addresses:

```
le0: flags=1000843 <UP, BROADCAST, RUNNING, MULTICAST, IPv4> mtu 1500
        inet 172.16.0.178 netmask ffff0000 broadcast 172.16.255.255
        inet 172.16.0.179 netmask ffff0000 broadcast 172.16.255.255
        inet 12.1.1.2 netmask ff000000 broadcast 12.255.255.255
        inet 12.1.1.1 netmask ff000000 broadcast 12.255.255.255
        inet 192.168.10.1 netmask ffffff00 broadcast 192.168.10.255
```

In this case, GateD will mark the following interfaces as primary addresses:

- 172.16.0.178 for subnet 172.16.0.0/16
- 12.1.1.2 for subnet 12.0.0.0/8
- 192.168.10.1 for subnet 192.168.10.0/24

The flags for the interface can be seen in the gii **show interfaces** command, in the trace file after an interface scan, or in the GateD dump file. (See "GateD Interactive Interface" in *Operating GateD*, for more information about gii.)

When configured as above, the protocols use the primary address for operation. Attempting to use a logical address that has not been marked as primary will lead to undesired results (to change the primary addresses, see below).

When using a physical interface name in the configuration file, some protocols will attempt to operate on all primary addresses on that interface. Here is an example OSPF statement:

```
ospf yes {
    backbone {
        interface le0 cost 1;
    }
}
```

When configured this way, OSPF will run over the three primary addresses shown above. In the case where there are no neighbors on some of the interfaces, stub links will be announced to these networks. See "Chapter 12 Open Shortest Path First (OSPF)" on page 45 for more information about OSPF.

To mark primary addresses for a subnet in the configuration file, use the **alias primary** option. GateD will allow only one primary address to be configured for each subnet on the interface -- attempting to configure more than one will result in a parse error. Note that, in addition to the interface address, the mask must be specified.

For interface routes, the next hop for a direct subnet will be the primary address.

7.6.3 Using **aliases-nh lowestip**

Versions of GateD prior to 8.0 defaulted to using the lowest IP of an interface for all protocol operations. This feature has been left in place for compatibility. Note that aliases are not really supported with this option; the only valid logical interface is the interface with the numerically lowest IP address.

When configured to use **lowestip**, GateD will install routes to direct nets with a next hop of the lowest IP address for that network configured on the machine. We recommend that operators avoid using this option.