Prefix Lists

bintec-Dm 780-I

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Chapter 1 Introduction

1.1 Prefix Lists

Prefix Lists provide a powerful and simple mechanism for controlling the distribution and installation of routes in our routers.

Prefix Lists emerged as a complement to access control lists (see manual *bintec-Dm 752-I "Access Control"*) to facilitate route filtering and are far more powerful and versatile than the latter for this purpose.

A Prefix List is a sequential list of permit or deny conditions and is applied to imported or exported routes for various routing protocols such as RIP, OSPF or BGP.

Prefix Lists can be applied both at entry (controlling the installation of routes in the device routing table) and at exit (controlling the routes to be exported).

A Prefix List as such does not imply a filter to control the route flow in the router. The Prefix Lists need to be associated with a protocol. The protocols that can use Prefix Lists use them to set filters on sent or received routes and incorporate commands to allow their association with said lists. Protocols that can use the Prefix Lists are RIP (see manual *bintec-Dm 718-I "RIP Protocol"*), OSPF and BFP, these latter two through Route Maps (see manual *bintec-Dm 764-I "Route Mapping"*).

The Prefix Lists notify the associated protocol of the entry search results. The route reception search results can be:
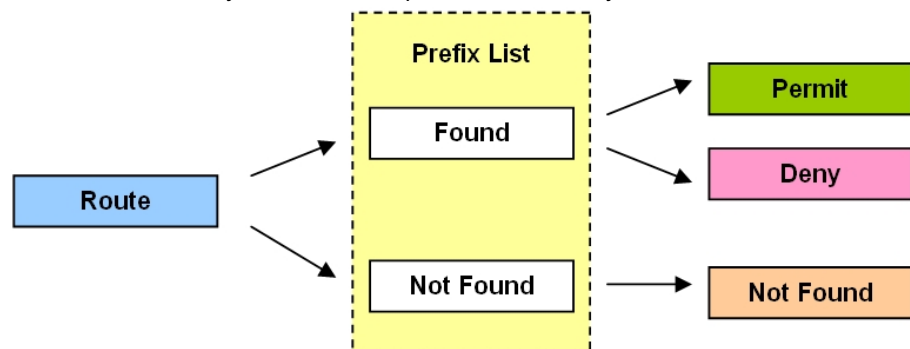

The associated protocol determines what to do with the route, according to the result of applying the Prefix List.

Chapter 2 Configuration

2.1 Introduction

A Prefix List consists of a series of *entries* which define the properties that a route must have for it to be considered as belonging to that entry and, consequently, to that list.

Each entry on a Prefix List is a block of *sentences* and an *action* and is identified by a unique number (the identifier or the entry ID field). The sentence block is what determines the filtering condition to be applied to a route. Typically, you'll specify at least the subnet prefix (with its address and mask), and optionally a range of lengths between which the mask of the route to be checked can vary. The *action* determines the processing assigned to the routes matching the associated block of sentences: PERMIT or DENY.
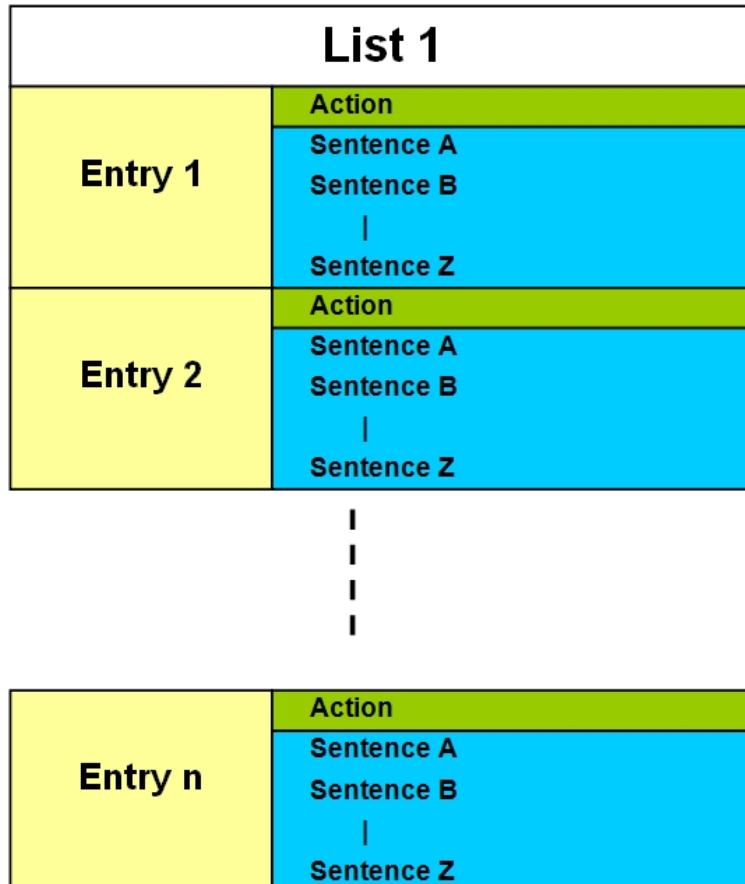
> **Note**
>
> A Prefix List as such does not imply a filter to control the route flow in the router. The Prefix Lists must be associated with a protocol.

> **Note**
>
> The Prefix Lists notify the associated protocol of the entry search results. The search results can take the following values: Not found, Permit or Deny. The associated protocol determines what should happen to a route depending on the result given by the Prefix List.

2.2 Accessing the configuration

Creating, modifying or eliminating Prefix Lists is done from a specific menu where you can also view the created lists.

In the router configuration structure, the Prefix Lists are organized as a FEATURE. In order to view the features that can be configured in the router, you need to enter the **feature** command followed by a question mark (?).

Example:

```
Config>feature ?
  access-lists            Access generic access lists configuration
                          environment
  bandwidth-reservation   Bandwidth-Reservation configuration environment
  control-access          Control-access configuration environment
  dns                     DNS configuration environment
  frame-relay-switch      Frame Relay Switch configuration environment
  ip-discovery            TIDP configuration environment
  ldap                    LDAP configuration environment
  mac-filtering           Mac-filtering configuration environment
  nsla                    Network Service Level Advisor configuration
  nsm                     Network Service Monitor configuration environment
  ntp                     NTP configuration environment
  prefix-lists            Access generic prefix lists configuration
                          environment
  radius                  RADIUS protocol configuration environment
  route-map               Route-map configuration environment
  scada-forwarder         SCADA Forwarder configuration environment
  sniffer                 Sniffer configuration environment
  stun                    Stun facility configuration environment
  syslog                  Syslog configuration environment
  tms                     TMS configuration environment
  vlan                    IEEE 802.1Q switch configuration environment
  vrf                     VRF configuration environment
  wrr-backup-wan          WRR configuration environment
  wrs-backup-wan          WRS configuration environment
Config>
```

To access the Prefix Lists configuration menu, you need to enter the word **feature** followed by **prefix-lists** from either the static (PROCESS 4) or dynamic (PROCESS 5) configuration root menu.

Example:

```
Config>feature prefix-lists
-- Prefix Lists user configuration --
Prefix Lists config>
```

This accesses the main Prefix Lists feature configuration menu. Here you can create, eliminate and view the access lists.

Each Prefix List is made up of entries, where you can indicate criteria and the parameters permitting or denying the routes. The configuration for all of these values is indicated below.

2.3 Main Configuration Menu

You can create and eliminate lists from the main Prefix Lists configuration menu. You can also view the configuration of the created lists.

As already said, a Prefix List consists of a series of entries. Each entry in the list is made up of a block of **sentences** and an **action.** The sentences determine the filtering to apply to a route, while the action determines the criteria to apply to the routes matching the condition indicated by the sentences. The action can be one of two types, *permit* or *deny*.

You can configure 199 Prefix Lists in the router. The 199 Prefix Lists are empty by default. A Prefix List is considered empty when it does not contain any entries.

Entry parameters or options that are not configured in the Prefix Lists will not be taken into account when checking the routes.

The configuration of these parameters is analyzed in the following sections.

> **Note**
>
> The order of the entries in the Prefix List is very important when the information that the sentences refer to overlaps with different entries.
>
> You must bear in mind that the order in which the entries in a list are dealt with is defined by the ENTRY IDENTIFIER NUMBER, with the lower numbers being consulted first. If when moving through the list, beginning with the first entry with the lowest identifier, an element is found matching the search

criteria, no further search is carried out and the action indicated by said entry is executed.

Please note that the search order among the entries in a Prefix List DIFFERS from that used in an Access Control List (please see manual *bintec-Dm 752-I "Access Control"*) where this order is given by the order in which the user has introduced the entries and not by the identifier.

The following commands are available in the main Prefix Lists menu:

Command	Function
? (HELP)	Lists the available commands or their options.
prefix-list	Configures a Prefix List.
list	Displays the configuration of the Prefix Lists.
no	Negates a command or sets the default value.

2.3.1 ? (HELP)

Use this command to list the valid commands at the level the router is programmed. You can also use this command after a specific command to list the available options.

Syntax:

```
Prefix Lists config>?
```

Example:

```
Prefix Lists config>?
  list          Display prefix lists configuration
  no            Negate a command or set its defaults
  prefix-list   Configure a prefix-list
  exit          Exit to parent menu
Prefix Lists config>
```

2.3.2 PREFIX-LIST

Use this command to access the submenu that allows you to configure entries in a Prefix List. The Prefix Lists are identified by a numerical value which can take values between 1 and 199, i.e., the router permits you to configure 199 Prefix Lists. On introducing this command followed by an identifier, you pass to a submenu where you can configure the Prefix List for said identifier, with the identifier for the list to be configured appearing at the new prompt.

Syntax:

```
Prefix Lists config>prefix-list ?
  <1..199>    Prefix List number (1-199)
```

Example:

```
Prefix Lists config>prefix-list 1
Prefix List 1>
```

2.3.3 LIST

The **LIST** command displays configuration information on the Prefix Lists feature in an intuitive and user-friendly way.

Syntax:

```
Prefix Lists config>list ?
  <1..199>    Prefix List number (1-199)
  all         Display all prefix lists information
Prefix Lists config>
```

2.3.3.1 LIST <id>

Displays the configuration information for the Prefix List whose identifier is specified after the command.

Syntax:

```
Prefix Lists config>list <id>
```

Example:

```
Prefix Lists config>list 1
Prefix List 1
Description: RIP in prefix-list
 PREFIX LIST ENTRIES
1     DESCRIPTION: prefix for 10.0.220.x permitted
1     PERMIT  PREFIX=10.0.220.0/24   Exact prefix match

2     DESCRIPTION: prefixes for 10.7.x.x/16-24 permitted
2     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
3     DESCRIPTION: everything else denied
3     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
Prefix Lists config>
```

2.3.3.2 LIST ALL

Displays the configuration information for all the Prefix Lists configured in the device.

Syntax:

```
Prefix Lists config>list all
```

Example:

```
Prefix Lists config>list all
Prefix List 1
Description: RIP in prefix-list

 PREFIX LIST ENTRIES

1     DESCRIPTION: prefix for 10.0.220.x permitted
1     PERMIT  PREFIX=10.0.220.0/24   Exact prefix match

2     DESCRIPTION: prefixes for 10.7.x.x/16-24 permitted
2     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
3     DESCRIPTION: everything else denied
3     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
Prefix List 2
Description: RIP out prefix-list
 PREFIX LIST ENTRIES
1     DESCRIPTION: prefix for 10.9.120.x permitted
1     PERMIT  PREFIX=10.9.120.0/24   Exact prefix match

2     DESCRIPTION: prefixes for 10.x.x.x/8-24 permitted
2     PERMIT  PREFIX=10.0.0.0/8   Prefix length between 8 and 24
Prefix List 7
Description: BGP in prefix-list
 PREFIX LIST ENTRIES

2     DESCRIPTION: prefixes for 172.24.x.x/16-24 permitted
2     PERMIT  PREFIX=172.24.0.0/16   Prefix length between 16 and 24

4     DESCRIPTION: everything else denied
4     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
Prefix Lists config>
```

2.3.4 NO

This command is used to disable functionalities or to set default values in some parameters.

Syntax:

```
Prefix Lists config>no ?
  prefix-list   Configure a prefix-list
```

2.3.4.1 NO PREFIX-LIST <id>

Eliminates the contents of a Prefix List.

Syntax:

```
Prefix Lists config>no prefix-list <id>
```

Example:

```
Prefix Lists config>no prefix-list 1
Prefix Lists config>
```

2.3.5 EXIT

Exits the Prefix Lists feature configuration environment and returns to the general configuration prompt.

Syntax:

```
Prefix Lists config>exit
```

Example:

```
Prefix Lists config>exit
Config>
```

2.4 Prefix List

In this submenu, you can configure the parameters for a Prefix List and most importantly the configuration for the entries. To access this submenu from the main Prefix List configuration menu, enter the **prefix-list** command followed by the identifier for the list to be configured.

The identifier for the list being configured appears at the new submenu prompt.

Example:

```
Prefix Lists config>prefix-list 1
Prefix List 1>
```

The Prefix Lists submenu admits the following commands:

Command	Function
? (HELP)	Lists the available commands or their options.
entry	Configures an entry in this Prefix List.
list	Displays the configuration for the Prefix List being configured.
description	Allows you to insert a textual description in the Prefix List.
no	Negates a command or sets its default value.

2.4.1 ? (HELP)

This command is used to list the valid commands at the level the router is programmed. You can also use this command after a specific command to list the available options.

Syntax:

```
Prefix List #>?
```

Example:

```
Prefix List 1>?
  entry         Configure an entry for this prefix-list
  no            Negate a command or set its defaults
  description   Configure a description for this prefix-list
  list          Display current prefix list configuration
  exit          Exit to parent menu
Prefix List 1>
```

2.4.2 ENTRY

Allows you to create and modify an entry or element in a Prefix List.

This command must always be introduced followed by the identifier of the entry to be configured and a sentence.

If on configuring a parameter there are no entries that have the identifier provided, this entry is created and the corresponding parameter configured. Contrariwise, if an entry with the said identifier already exists, then this modifies the value of the introduced parameter.

Syntax:

```
Prefix List #>entry <id> <sentence> [value]
```

The configuration options for an entry are as follows:

```
Prefix List #>entry <id> ?
  default       Sets default values to an existing or a new entry
  permit        Configures type of entry as permit
  deny          Configures type of entry as deny
  prefix        Prefix specification: network address and mask
  description   Description text for this entry
```

2.4.2.1 ENTRY <id> DEFAULT

Sets all the parameters for an entry to their default values. The default values mean said entry matches any route.

These parameters are:

- PERMIT
- PREFIX: 0.0.0.0/0
- GE = 0
- LE = 32

Syntax:

```
Prefix List #>entry <id> default
```

Example:

```
Prefix List 1>entry 1 default
Prefix List 1>
```

2.4.2.2 ENTRY <id> PERMIT

Identifies the entry as PERMIT. This parameter indicates that all routes fulfilling the filtering criteria for this entry are marked as *accepted* for this list. This is made up of an **action** indicator and consequently determines the function of the entry sentences (inclusive in this case).

Syntax:

```
Prefix List #>entry <id> permit
```

Example:

```
Prefix List 1>entry 2 permit
Prefix List 1>
```

2.4.2.3 ENTRY <id> DENY

Identifies the entry as DENY. This parameter indicates that all routes fulfilling the filtering criteria for this entry are marked as *denied* for this list. This is made up of an **action** indicator and consequently determines the function of the entry sentences (exclusive in this case).

Syntax:

```
Prefix List #>entry <id> deny
```

Example:

```
Prefix List 1>entry 2 deny
Prefix List 1>
```

2.4.2.4 ENTRY <id> PREFIX

This establishes the sentence that determines the type of filtering performed on the routes checked against this entry. This has various options, some of which are not mandatory.

Syntax:

```
Prefix List #>entry <id> prefix <parameters>
```

The options that can be entered in the prefix sentence are as follows:

```
Prefix List #>entry <id> prefix ?
 <a.b.c.d>    Subnet address
 ge           Minimum prefix length for matching (optional)
 le           Maximum prefix length for matching (optional)
```

2.4.2.4.1 ENTRY <id> PREFIX <address> <mask>

Establishes the route prefix sentence. Through this command, you establish the subnet that must be checked in order to consider that a route matches the entry. To establish this parameter, you need to enter a subnet address and mask. If no further parameters related to the prefix sentence are configured, a route is considered to match the entry when its address and mask *faithfully* coincide with that configured through the **entry <id> prefix <address> <mask>**. This behavior changes if you configure the **ge** and **le** parameters for the entry, as explained below.

Syntax:

```
Prefix List #>entry <id> prefix <address> <mask>
```

Example:

```
Prefix List 1>entry 1 prefix 172.26.0.0 255.255.0.0
Prefix List 1>
```

In this example, only route 172.26.0.0/16 matches the configured entry.

2.4.2.4.2 ENTRY <id> PREFIX GE and/or LE <value>

Prior to executing these optional commands, it is essential to have configured the **entry <id> prefix <address> <mask>**. Configuring the *ge* and/or *le* modifies the meaning of the *address* and *mask* parameters, which go from specifying the specific subnet to check against the route to specifying the *minimum part* (or the *prefix*) that must match the route. Additionally, the **ge** value determines the *minimum length* required for the subnet mask of the routes checked against the entry for a match, while the **le** value determines the *maximum length* required for the subnet mask of said routes.

In this way, a route whose beginning coincides with the prefix specified through the **entry <id> prefix <address> <mask>** (i.e., a route that is a *subnet of the prefix*) and whose mask length is greater than or equal to the value configured with **entry <id> prefix ge <value>** and less than or equal to the value configured with the **entry <id> prefix le <value>** will match the entry.

The **le** and **ge** parameters are completely optional, and can be specified together or separately.

Syntax:

```
Prefix List #>entry <id> prefix ge <value>Prefix List #>entry <id> prefix le <value>
```

Example:

```
Prefix List 1>entry 1 prefix 172.26.0.0 255.255.0.0
Prefix List 1>entry 1 prefix ge 16
Prefix List 1>entry 1 prefix le 24
Prefix List 1>
```

In this example, all routes beginning with 172.26.x.x that have a mask length between 16 and 24 (inclusive) match the configured entry. Therefore, for example, route 172.26.160.0/20 will match the entry whereas routes 172.25.0.0/18 or 172.26.0.0/26 will not.

Please note that in the example it was necessary to execute **entry 1 prefix 172.26.0.0 255.255.0.0** before configuring the **ge** and **le** parameters.

2.4.2.5 ENTRY <id> DESCRIPTION

Allows you to establish a textual description which can subsequently be used to help you understand the purpose or use of the entry.

Syntax:

```
Prefix List #>entry <id> description ?
  <1..64 chars>    Description text for this entry
```

Example:

```
Prefix List 1>entry 1 description "First entry"
Prefix List 1>
```

2.4.3 LIST

The **LIST** command displays configuration information on the Prefix List being edited, i.e., the list whose identifier is indicated at the menu prompt.

Syntax:

```
Prefix List #>list
```

Example:

```
Prefix List 1>list
Prefix List 1
Description: RIP in prefix-list
 PREFIX LIST ENTRIES
1     DESCRIPTION: prefix for 10.0.220.x permitted
1     PERMIT  PREFIX=10.0.220.0/24   Exact prefix match

2     DESCRIPTION: prefixes for 10.7.x.x/16-24 permitted
2     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
3     DESCRIPTION: everything else denied
3     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
Prefix List 1>
```

2.4.4 DESCRIPTION

Use this command to add a textual description to a Prefix List. This can subsequently be used to help you understand its purpose or use.

Syntax:

```
Prefix List #>description ?
  <1..64 chars>    Description text
```

Example:

```
Prefix List 1>description "Entry list for BGP"
Prefix List 1>list
Prefix List 1
Description: Entry list for BGP
 PREFIX LIST ENTRIES
1     DESCRIPTION: Permitted prefixes 10.7.x.x/16-24
1     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
Prefix List 1>
```

2.4.5 NO

Use this command to disable functionalities or to set default values in some parameters.

Syntax:

```
Prefix List #>no ?
  entry         Configure an entry for this prefix-list
  description   Configure a description for this prefix-list
```

2.4.5.1 NO ENTRY <id>

Eliminates an entry from the Prefix List. To do this, enter the identifier of the entry you wish to eliminate.

Syntax:

```
Prefix List #>no entry <id>
```

Example:

```
Prefix List 1>no entry 3
Prefix List 1>
```

2.4.5.2 NO DESCRIPTION

Eliminates the textual description that is associated with the Prefix List you are currently configuring.

Syntax:

```
Prefix List #>no description
```

Example:

```
Prefix List 1>no description
Prefix List 1>
```

2.4.6 EXIT

Exits the Prefix List configuration environment and returns to the main Prefix List menu prompt.

Syntax:

```
Prefix List #>exit
```

Example:

```
Prefix List 1>exit
Prefix Lists config>
```

2.5 Practical Examples

2.5.1 Matching an entry

We're going to analyze matching between different routes and an entry from a Prefix List. We have the following configuration for an entry on a list:

```
        entry 1 default
        entry 1 permit
        entry 1 prefix 172.24.0.0 255.255.0.0
```

As we haven't configured the *ge* and/or *le* parameter in this entry, route 172.24.0.0/16 is the *only* route that *exclusively* matches.

If, however, we configure:

```
        entry 1 default
        entry 1 permit
        entry 1 prefix 172.24.0.0 255.255.0.0
        entry 1 prefix ge 16
        entry 1 prefix le 24
```

In this case we can say that all routes that are subnets of the 172.24.0.0/16 network and whose network mask is between 16 and 24 will match this entry. That is, routes with format 172.24.x.x/16-24 match the entry. We are going to analyze some of the example routes, indicating how they match the previous entry:

Match	Do NOT Match
172.24.0.0/16	172.24.0.0/28
172.24.0.0/24	172.23.0.0/16
172.24.0.0/20	172.24.255.1/32
172.24.1.0/24	0.0.0.0/0
172.24.255.0/24	

172.24.252.0/22	

2.5.2 Authentic Case

The following example will illustrate how Prefix Lists are handled and used in an authentic situation.

Consider an organization with several Branches, each with different Departments. The organization has a private class B prefix to distribute addresses in all of its Branches. Each Branch has a range of addresses equivalent to a / 19 prefix. The address space for each of the Branches is distributed in /24 subnets (class C) pertaining to the Departments together with some subnets reserved for the installation of servers whose services are common to all the Branch Departments. In the following figure we can see an example of this architecture in a specific Branch which address range **192.168.0.0/19** corresponds to.
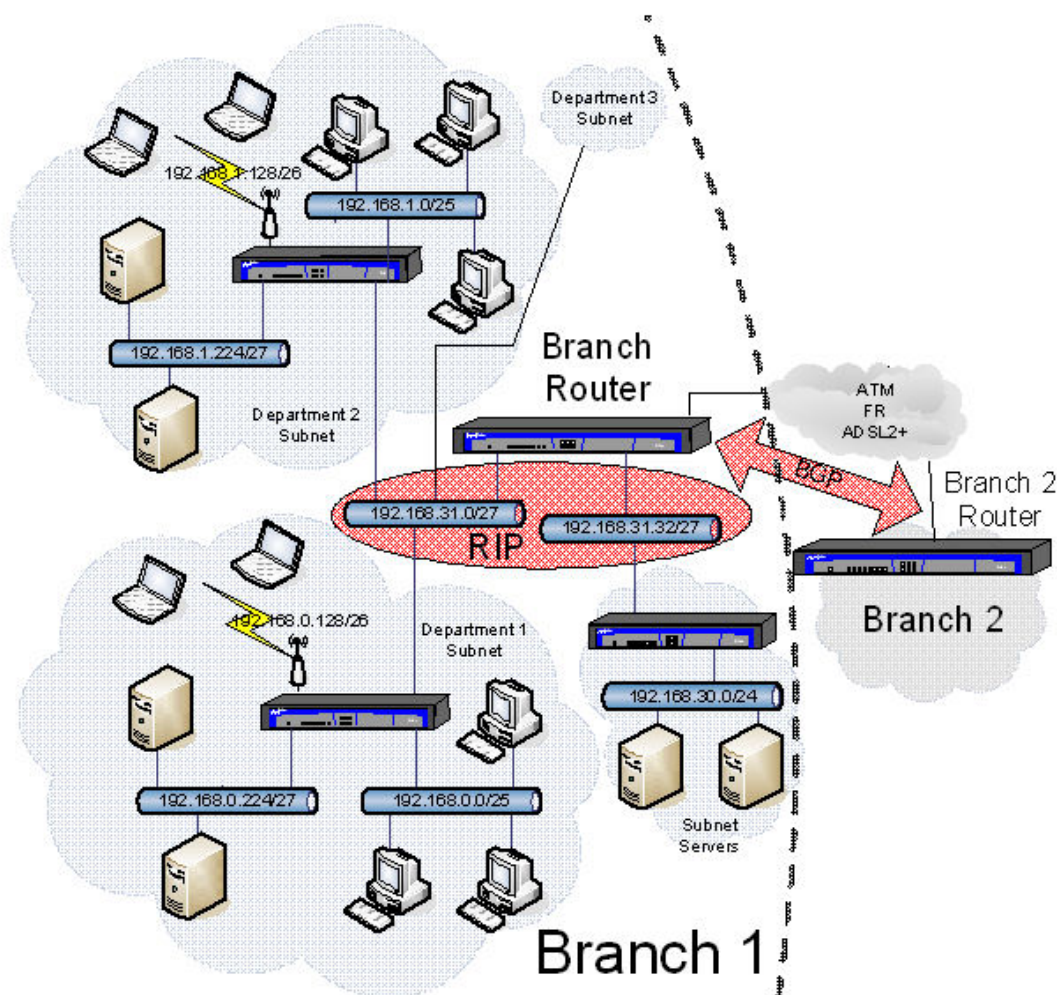
As you can see, each Department divides its network into one part destined to a LAN Ethernet (with prefix /25) where the user PCs are connected, a small address pool (with prefix /26) for WLAN access and finally a small LAN where the Department's private servers reside (with prefix /27). The idea is for this latter subnet to remain private and only be accessible **to other devices within the same Branch** (including the other Departments), but **never accessible to other Branches**.

As you can see, there are some different networks other than the Department networks where the common servers reside. You want **all the Branches** to be able to access these servers. *The exact configuration of these networks is unknown,* but you do know that they are all grouped in subnet 192.168.30.0/24.

All the Departments connect to a *Branch router* (boundary) through their *Department router* over Ethernet. This Branch router communicates with the other Branches through a WAN network based on technology such as ATM or Frame Relay. All routers within a Branch exchange their routes using **RIP**, while for route exchanges between Branches, the **BGP** protocol is used.

At this point, we are going to configure the Branch router shown in the figure, together with the corresponding Prefix Lists, to perform appropriate filtering for the routes in this scenario.

Firstly we need to enable the RIP protocol and configure it to redistribute the routes (both those from BGP as well as the static and directly connected ones) within the Branch. This configuration also needs to be carried out for each of the Departments' routers and also for the Branch servers.

```
Config>protocol rip
-- RIP protocol user configuration --
RIP config$redistribute bgp
RIP config$redistribute connected
RIP config$redistribute static
RIP config$enable
```

Next we define the Prefix List that controls the distribution of the routes to other Branches through BGP:

```
Config$feature prefix-lists
-- Prefix Lists user configuration --
Prefix Lists config$prefix-list 1
Prefix List 1$description "BGP output list in Branch 1"
```

Firstly we need to configure an entry to distribute the routes corresponding to the Branch servers' subnets which must be accessible from all the Branches. The internal configuration for these subnets is unknown, but we do know that they are all grouped under subnet 192.168.30.0/24, and therefore we simply need to enter:

```
Prefix List 1$entry 1 permit
Prefix List 1$entry 1 prefix 192.168.30.0 255.255.255.0
Prefix List 1$entry 1 prefix ge 24
Prefix List 1$entry 1 description "Permit the Branch servers"
```

With this configuration we can be sure that all the routes to subnets within 192.168.30.x/24-32 will be distributed.

Subsequently, we need to restrict the resending of the subnets' routes corresponding to the Departments' servers as these must be hidden from the rest of the Branches. To do this, write a new entry:

```
Prefix List 1$entry 2 deny
Prefix List 1$entry 2 prefix 192.168.0.0 255.255.224.0
Prefix List 1$entry 2 prefix ge 27
Prefix List 1$entry 2 prefix le 27
Prefix List 1$entry 2 description "Deny the Department servers"
```

Through this entry, we deny routes with a mask length of 27 that belong to subset 192.168.0.0/19 (which corresponds to the address range for this Branch). Please note that we must enter this entry after the previous one, otherwise the routes to the Branch servers' subnets will be blocked.

Now we need to configure a new entry so that the rest of the Branch routes are resent, knowing that all of them are within subnet 192.168.0.0/19.

```
Prefix List 1$entry 3 permit
Prefix List 1$entry 3 prefix 192.168.0.0 255.255.224.0
Prefix List 1$entry 3 prefix ge 19
Prefix List 1$entry 3 description "Permit the rest of the networks"
```

The rest of the routes that do not match the above configured entries are automatically denied as this is the default behavior when there is no match. Thus, it is not necessary to configure an entry for this purpose.

We can easily view the configuration by executing the "list" command:

```
Prefix List 1$list
Prefix List 1
Description: BGP output list in Branch 1
 PREFIX LIST ENTRIES
1     DESCRIPTION: Permit the Branch servers
1     PERMIT  PREFIX=192.168.30.0/24   Prefix length between 24 and 32

2     DESCRIPTION: Deny the Department servers
2     DENY    PREFIX=192.168.0.0/19   Prefix length between 27 and 27
3     DESCRIPTION: Permit the rest of the networks
3     PERMIT  PREFIX=192.168.0.0/19   Prefix length between 19 and 32
```

The next step is to assign the Prefix List to the BGP protocol in order to perform filtering on the routes sent to the routers of the other branches. This filtering is executed in BGP through Route Maps (for further information, please see manual *bintec-Dm 764-I "Route Mapping"*). Therefore, we need to firstly create a Route Map and associate it with the Prefix List:

```
Config$feature route-map
-- Route maps user configuration --
Route map config$route-map "BGPOUT"
Route map BGPOUT$entry 1 permit
```

```
Route map BGPOUT$entry 1 match ip prefix-list 1
```

At this point, we can assign this Route Map to BGP through the **option** or **peer** command (please see manual *bintec-Dm 763 "BGP Protocol"* for further information). One possible configuration, assuming that the Branch 2 router's IP address is 192.168.224.1, could be:

```
Config$protocol bgp
-- Border Gateway Protocol user configuration --
BGP config$as 100
BGP config$group type external peer-as 101
-- BGP group configuration --
Group config$option out-route-map BGPOUT
Do not forget to create route-map BGPOUT
Group config$peer 192.168.224.1
Group config$exit
BGP config$enable
```

In this way, the routes sent by the Branch 1 router to the Branch 2 router are filtered by the previously configured Prefix List.

-- BGP group configuration --

Chapter 3 Monitoring

3.1 Monitoring Commands

This section describes the commands for using the Prefix Lists feature monitoring tools.

To access the Prefix Lists feature monitoring environment, introduce the **FEATURE PREFIX-LISTS** command at the general monitoring prompt (+) which is accessed through PROCESS 3.

Example:

```
+feature prefix-lists
-- Prefix Lists user console --
Prefix Lists+
```

The following commands are available in the Prefix Lists monitoring environment:

Command	Function
? (HELP)	Lists the available commands or their options.
LIST	Displays the Prefix Lists monitoring parameters.
CLEAR-HITS	Deletes the hits counter for the entries for one or various Prefix Lists.

3.1.1 ? (HELP)

This command is used to list the valid commands at the layer where the router is programmed. You can also use this command after a specific command to list the available options.

Syntax:

```
Prefix Lists+?
```

Example:

```
Prefix Lists+?
  clear-hits    Clear prefix lists hits information
  list          Display prefix lists configuration
  exit          Exit to parent menu
Prefix Lists+
```

3.1.2 LIST

The **LIST** command displays the configuration information on the Prefix Lists that are active. As an information statistic, the number of hits that have transpired in an entry i.e., the number of times a route has coincided with the entry sentences (Hits) appear. The latest route to have coincided with this entry is displayed together with this number.

Syntax:

```
Prefix Lists+list ?
  <1..199>    Prefix List number (1-199)
  all         Display all prefix lists information
```

3.1.2.1 LIST <id>

Lists all the configuration information related to the Prefix List whose identifier is specified after the command, together with the hit counters for each entry and the latest route to match the said entry.

Syntax:

```
Prefix Lists+list <id>
```

Example:

```
Prefix Lists+list 1
Prefix List 1
Description: RIP in prefix-list
 PREFIX LIST ENTRIES
```

```
1     DESCRIPTION: prefix for 10.0.220.x permitted
1     PERMIT  PREFIX=10.0.220.0/24   Exact prefix match
        Hits: 1
  Last route match:  10.0.220.0/24
2     DESCRIPTION: prefixes for 10.7.x.x/16-24 permitted
2     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
        Hits: 256
  Last route match:  10.7.255.0/24
3     DESCRIPTION: everything else denied
3     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
        Hits: 1698
  Last route match:  11.134.159.0/24
Prefix Lists+
```

3.1.2.2 LIST ALL

Displays all the configuration information related to all the Prefix Lists configured in the device, together with the hit counters for all the entries.

Syntax:

```
Prefix Lists+list all
```

Example:

```
Prefix Lists+list all
Prefix List 1
Description: RIP in prefix-list
 PREFIX LIST ENTRIES
1     DESCRIPTION: prefix for 10.0.220.x permitted
1     PERMIT  PREFIX=10.0.220.0/24   Exact prefix match
        Hits: 1
  Last route match:  10.0.220.0/24
2     DESCRIPTION: prefixes for 10.7.x.x/16-24 permitted
2     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
        Hits: 256
  Last route match:  10.7.255.0/24
3     DESCRIPTION: everything else denied
3     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
        Hits: 1698
  Last route match:  11.134.159.0/24

Prefix List 2
Description: RIP out prefix-list
 PREFIX LIST ENTRIES
1     DESCRIPTION: prefix for 10.9.120.x permitted
1     PERMIT  PREFIX=10.9.120.0/24   Exact prefix match
        Hits: 1
  Last route match:  10.9.120.0/24
2     DESCRIPTION: prefixes for 10.x.x.x/8-24 permitted
2     PERMIT  PREFIX=10.0.0.0/8   Prefix length between 8 and 24
        Hits: 65536
  Last route match:  10.255.255.0/24
Prefix List 7
Description: BGP in prefix-list
 PREFIX LIST ENTRIES

2     DESCRIPTION: prefixes for 172.24.x.x/16-24 permitted
2     PERMIT  PREFIX=172.24.0.0/16   Prefix length between 16 and 24
        Hits: 0
4     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
        Hits: 21
  Last route match:  192.168.1.0/24
Prefix Lists+
```

3.1.3 CLEAR-HITS

The **CLEAR-HITS** command sets any entry hits counters specified by the user, as well as information relating to the latest route to match said entries, back to zero. In this way, you can get your monitoring information to return to the state it was in just after the device was switched on.

Syntax:

```
Prefix Lists+clear-hits ?
  <1..199>    Prefix List number (1-199)
  all         Reset all prefix lists hit counters
```

3.1.3.1 CLEAR-HITS <id_list> [id_entry]

Deletes the hit information for the entries on the list whose identifier is specified after the command. Optionally, you can specify an additional parameter that will restrict deletion to the list entry whose number matches said parameter.

Syntax:

```
Prefix Lists+clear-hits <id_list> [id_entry]
```

With:

id_list	List number from which you are going to delete the information.
id_entry	Entry number on the list specified by **id_list** whose information you wish to delete.

Example:

```
Prefix Lists+clear-hits 1 2
Prefix Lists+list 1
Prefix List 1
Description: RIP in prefix-list
 PREFIX LIST ENTRIES
1     DESCRIPTION: prefix for 10.0.220.x permitted
1     PERMIT  PREFIX=10.0.220.0/24   Exact prefix match
        Hits: 1
  Last route match:  10.0.220.0/24
2     DESCRIPTION: prefixes for 10.7.x.x/16-24 permitted
2     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
        Hits: 0
3     DESCRIPTION: everything else denied
3     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
        Hits: 1698
  Last route match:  11.134.159.0/24
Prefix Lists+clear-hits 1
Prefix Lists+list 1
Prefix List 1
Description: RIP in prefix-list
 PREFIX LIST ENTRIES
1     DESCRIPTION: prefix for 10.0.220.x permitted
1     PERMIT  PREFIX=10.0.220.0/24   Exact prefix match
        Hits: 0
2     DESCRIPTION: prefixes for 10.7.x.x/16-24 permitted
2     PERMIT  PREFIX=10.7.0.0/16   Prefix length between 16 and 24
        Hits: 0
3     DESCRIPTION: everything else denied
3     DENY    PREFIX=0.0.0.0/0   Prefix length between 0 and 32
        Hits: 0
Prefix Lists+
```

3.1.3.2 CLEAR-HITS ALL

Through this command, you can delete all the information on the hits counters for all the active lists in the device.

Syntax:

```
Prefix Lists+clear-hits all
```

Example:

```
Prefix Lists+clear-hits all
Prefix Lists+
```

3.1.4 EXIT

Exits the Prefix Lists monitoring environment and returns to the main monitoring menu prompt.

Syntax:

```
Prefix List+>exit
```

Example:

```
Prefix Lists+exit
+
```