

BGP



BGP Overview

Is an inter-domain routing protocol that communicates prefix reachability

Is a path vector routing protocol

View the internet as a collection of autonomous system

Supports CIDR

Exchanges routing information between pairs

BGP Fundamentals

Each BGP update contains one path advertisements and attributes

Many prefixes can share the same path

Routes consists of destination prefixes with an AS path and other BGP specific attributes

BGP compares the AS path and other attributes to choose the best path

BGP withdraws unreachable routes

BGP Connections

BGP updates are incremental

- No regular refreshes
- Except at session establishment, when volume of routing can be high

BGP runs over TCP connection

- Tcp Port 179
- Tcp services
 - Fragmentation
 - Acknowledgements
 - Checksums
 - Sequencing
 - Flow control

No automatic neighbor discovery

BGP Neighbor States

TCP connectivity

- Idle
- Connect
- Active

BGP connectivity

- Opensent
- OpenConfirm
- Established

BGP Message Types

BGP Message Types

- Open
- Update
- Keepalive
- Notification
- Refresh

Messages use a common header

BGP Route Selection

Can the BGP next-hop be resolved

Prefer the highest local preference value

Prefer shortest AS Path

Prefer the lowest origin value

Prefer the lowest MED value

Prefer routes learned using EBGP over IBGP

Prefer routes with the lowest IGP metric

- **Prefer routes from inet.3 over inet.0**
- **Prefer routes with a greater number of next hops**
- **When using route reflectors, prefer the route with shorter cluster list**

Prefer routes from the peer with lowest Router ID

Prefer routes from peer with lowest peer ID

BGP Attributes: Next Hop

An ip address of a BGP peer

BGP next hop must be reachable by router prior to placing an advertised route into RIB-local

- **Next hop might require recursive lookup and the services of an IGP**

Value is changed by default only across EBGp links

Value is not changed by default across IBGP links

Value can be changed by a policy

Attribute is always present and is transmitted across all BGP links

BGP Attribute: Local Preference

Determined the preferred path out of the AS

All BGP traffic in an AS flows toward the peer with the highest local preference value

Values are used only within an individual AS

BGP Attribute: AS Path

Provides a path back to the source of the route, preventing routing loops

- **Routes with router's own AS number in the path must be looped; these routes are dropped immediately**

Each router on the edge of the AS adds its AS number to the front of the path; for example

- **34 67 195 6743 701**

AS Path attribute is always present and is transmitted across all BGP links.

BGP Attribute: Origin

Added by routers that added the route to BGP

Describes where first router received the information

- i = IGP (0)
- E = EGP (1)
- ? = Incomplete (2)

Attribute is always present and is transmitted across all BGP links.

BGP Attributes: Community

Generic mechanism for tagging routes

Communities can be:

- **Used by policy to perform an action on a particular set of routes tagged with a community**
- **Added to the community list (community add command)**
- **Deleted from current community list (community delete command)**
- **Set to the community list (community set command)**

BGP Peering

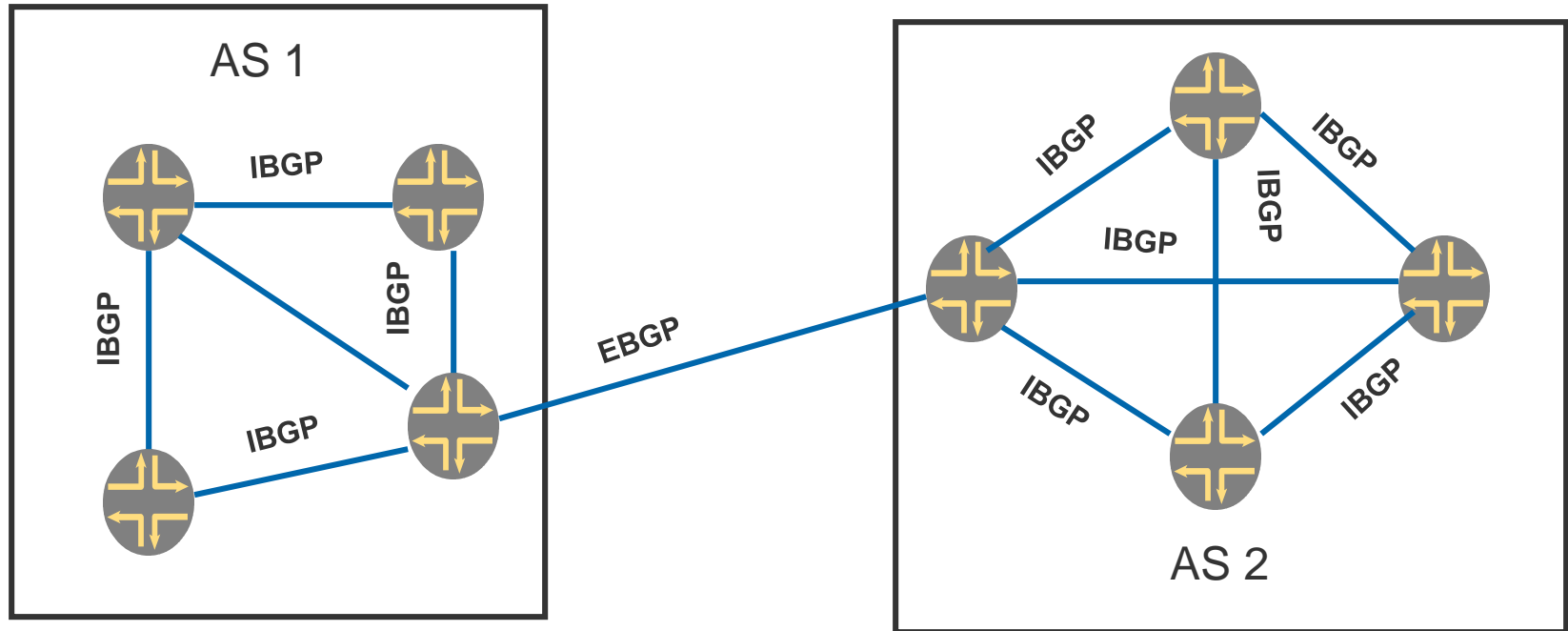
BGP sessions are established between peers

- **BGP speakers**

Two types of peering sessions

- **EBGP (external) peers with different AS**
- **IBGP (internal) peers within the same AS**
 - **IGP connects BGP speakers within the AS**
 - **IGP advertises internal routes.**

EBGP & IBGP



BGP Route Advertisement Rules

Advertise only the active BGP routes to peers

- **BGP Next-hop attribute must be reachable**

Never forward IBGP routes to IBGP peers

- **Prevent loops**

Withdraw routes if active BGP routes become unreachable.

Basic BGP Configuration

[edit routing-options]

- autonomous-system 4755;

[edit protocols bgp]

- group ibgp{
 - type internal;
 - neighbor 203.122.67.89;
 - local-address 202.167.23.42;
 - }
- group ebgp{
 - type external;
 - neighbor 10.3.3.6;
 - peer-as 1
 - }

Refer the Link for complete configuration guidelines :

<http://www.juniper.net/techpubs/software/junos/junos94/swconfig-routing/bgp-configuration-guidelines.html>

Configuring Route Reflection

In route reflection, BGP systems are arranged in *clusters*. Each cluster consists of at least one system that acts as a *route reflector*, along with any number of *client peers*. BGP peers outside the cluster are called *nonclient peers*. The route reflector reflects (redistributes) routing information to each client peer (*intracluster reflection*) and to all nonclient peers (*intercluster reflection*). Because the route reflector redistributes routes within the cluster, the BGP systems within the cluster do not have to be fully meshed.

When the route reflector receives a route, it selects the best path. Then, if the route came from a nonclient peer, the route reflector sends the route to all client peers within the cluster. If the route came from a client peer, the route reflector sends it to all nonclient peers and to all client peers except the originator. In this process, none of the client peers send routes to other client peers.

To configure route reflection, you specify a cluster identifier only on the BGP systems that are to be the route reflectors. These systems then determine, from the network reachability information they receive, which BGP systems are part of its cluster and are client peers, and which BGP systems are outside the cluster and are nonclient peers.

RR Server/Client configuration

RR Server Configuration :

```
group RR {  
    type internal;  
    local-address 10.100.11.3;  
    cluster 1.1.1.1; -----> Cluster ID only added to RR server  
    neighbor 10.100.3.1;  
    neighbor 10.100.3.2;
```

RR Client Configuration :

```
group RR {  
    type internal;  
    local-address 10.100.3.1;  
    export ibgp;  
    neighbor 10.100.11.2;  
    neighbor 10.100.3.2;  
    neighbor 10.100.11.3;  
}
```

Enabling Multiprotocol BGP

Multiprotocol BGP (MP-BGP) is an extension to BGP that enables BGP to carry routing information for multiple network layers and address families. MP-BGP can carry the unicast routes used for multicast routing separately from the routes used for unicast IP forwarding.

To enable MP-BGP, you configure BGP to carry network layer reachability information (NLRI) for address families other than unicast IPv4 by including the family inet statement:

family inet {

(any | flow | labeled-unicast | multicast | unicast) {

To enable MP-BGP to carry Layer 3 VPN NLRI for the IPv4 address family, include the family inet-vpn statement:

family inet-vpn {

(any | flow | multicast | unicast)

To enable MP-BGP to carry Layer 3 VPN NLRI for the IPv6 address family, include the family inet6-vpn statement:

family inet6-vpn {

(any | multicast | unicast)

To enable MP-BGP to carry multicast VPN NLRI for the IPv4 address family and to enable VPN signaling, include the family inet-mvpn statement:

family inet-mvpn {

signaling ;

To enable MP-BGP to carry multicast VPN NLRI for the IPv6 address family and to enable VPN signaling, include the family inet6-mvpn statement:

family inet6-mvpn {

signaling

Example from Bharti Netowrk

```
group VPNv4-ibgp { -----RR Client
    type internal;
    local-address 202.123.37.93;
    family inet {
        unicast; -----Enabling MP-BGP for IPV4 Unicast
    }
    family inet-vpn {
        unicast; -----Support for L3VPN NLRI for IPV4
    }
    family inet-mdt {
        signaling; -----Support Multicast VPN NLRI for IPV4
    }
    authentication-key "$9$EzQSyKLxdsgJLxoG"; ## SECRET-DATA -----Authentication support MD5 only
    neighbor 202.123.37.12 { -----RR Server Address
        description "VPNv4 RR A";
    }
}
```

Verifying BGP session

The `show bgp summary` provides you with a good snapshot of the protocol on your router.

- `user@M20> show bgp summary`

- Groups: 2 Peers: 4 Down peers: 0

Table	Tot Paths	Act Paths	Suppressed	History	Damp	State	Pending
inet.0	12	12	0			0	0

Peer	AS I	nPkt	OutPkt	OutQ	Flaps	Last Up/Dwn	State
172.16.1.1	10	428	430	0	0	3:33:00	4/4/0
172.16.2.1	30	428	430	0	0	3:32:56	4/4/0
192.168.6.6	20	392	392	0	0	3:14:30	2/2/0
192.168.7.7	20	390	391	0	0	3:14:02	2/2/0

Displaying BGP Group Information

To view the configured groups on your router, use show bgp group command

```
user@M20> show bgp group
```

```
Group Type: External Local AS: 20
```

```
Name: ebgp-peers
```

```
Total peers: 2 Established: 2
```

```
172.16.1.1+179
```

```
172.16.2.1+179
```

```
Route Queue Timer: unset Route Queue: empty
```

```
Group Type: Internal AS: 20 Local AS: 20
```

```
Name: ibgp-peers
```

```
Total peers: 2 Established: 2
```

```
192.168.6.6+1910
```

```
192.168.7.7+1127
```

```
Route Queue Timer: unset Route Queue: empty
```

Displaying BGP Neighbors

To receive most detailed information about your BGP neighbor use show bgo neighbor command

```
user@Shiraz> show bgp neighbor 172.16.1.1
Peer: 172.16.1.1+179 AS 10 Local: 172.16.1.2+1028 AS 20
Type: External State: Established Flags: <>
Last State: OpenConfirm Last Event: RecvKeepAlive
Last Error: None
Options: <Preference HoldTime PeerAS Refresh>
Holdtime: 90 Preference: 170
Number of flaps: 0
Peer ID: 192.168.2.2 Local ID: 192.168.5.5 Active Holdtime: 90
Keepalive Interval: 30
Local Interface: so-0/0/1.0
NLRI advertised by peer: inet-unicast
NLRI for this session: inet-unicast
Peer supports Refresh capability (2)
Table inet.0 Bit: 10000
Send state: in sync
Active prefixes: 4
Received prefixes: 4
Suppressed due to damping: 0
Last traffic (seconds): Received 13 Sent 13 Checked 13
Input messages: Total 438 Updates 4 Refreshes 0 Octets 8473
Output messages: Total 440 Updates 4 Refreshes 0 Octets 8526
Output Queue[0]: 0
```


BGP Route Advertisement Commands

show route receive-protocol bgp *address*

- Displays routes received by a peer before policy is applied

```
user@M20> show route receive-protocol bgp 192.168.7.7
```

```
inet.0: 26 destinations, 27 routes (26 active, 0 holddown, 0 hidden)
```

```
+ = Active Route, - = Last Active, * = Both
```

```
10.20.3.0/24
```

192.168.7.7 0	100	I
---------------	-----	---

```
10.20.4.0/24
```

192.168.7.7 0	100	I
---------------	-----	---

Show route advertising-protocol bgp *address*

- Displays routes advertised to specific peer

```
user@Chablis> show route advertising-protocol bgp 192.168.5.5
```

```
inet.0: 21 destinations, 22 routes (13 active, 0 holddown, 8 hidden)
```

```
+ = Active Route, - = Last Active, * = Both
```

```
10.20.3.0/24
```

Self	0	100	I
------	---	-----	---

```
10.20.4.0/24
```

Self	0	100	I
------	---	-----	---

Showing BGP routes

To view just the BGP learned routes use show route protocol bgp command

```
user@Shiraz> show route protocol bgp
inet.0: 26 destinations, 27 routes (26 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
10.10.1.0/24 *[BGP/170] 00:23:21, MED 0, localpref 100
AS path: 10 I
> to 172.16.1.1 via so-0/0/1.0
10.10.2.0/24 *[BGP/170] 00:23:21, MED 0, localpref 100
AS path: 10 I
> to 172.16.1.1 via so-0/0/1.0
10.10.3.0/24 *[BGP/170] 00:23:21, MED 0, localpref 100
AS path: 10 I
> to 172.16.1.1 via so-0/0/1.0
10.10.4.0/24 *[BGP/170] 00:23:21, MED 0, localpref 100
AS path: 10 I
> to 172.16.1.1 via so-0/0/1.0
10.20.1.0/24 *[BGP/170] 02:37:11, MED 0, localpref 100, from 192.168.6.6
AS path: I
> to 192.168.100.2 via ge-0/2/0.0
10.20.2.0/24 *[BGP/170] 02:37:11, MED 0, localpref 100, from 192.168.6.6
AS path: I
> to 192.168.100.2 via ge-0/2/0.0
10.20.3.0/24 *[BGP/170] 02:36:34, MED 0, localpref 100, from 192.168.7.7
AS path: I
> via at-0/1/0.100
```

Thank you!

<http://www.juniper.net>

