

BGP Packet Types



- **Open:** Establishes BGP adjacency
- **Update:** Advertises, updates or withdraws routes
- **Notification:** Advises a neighbor of an error condition, such as a hold timer expiring. Closes the BGP session.
- **Keepalive:** Verifies BGP neighbors are still available

BGP OPEN Messages



- OPEN messages are used to establish BGP adjacencies
- Both routers negotiate session capabilities before peering
- The OPEN message includes:
 - BGP version number
 - AS number
 - Hold time
 - BGP Router Identifier
 - Any other optional session attributes

BGP OPEN Messages



These settings must match for a pair of BGP routers to peer with each other:

- BGP version (usually v4)
- Source address must match the neighbor configured on the peer
- AS number must match the neighbor configured on the peer

```
R1(config-router)#neighbor 10.0.0.1 remote-as 65002
```

- BGP ID must be unique
- Security parameters, eg password and TTL
- Lowest Hold Timer is used (does not have to match)

BGP Hold Timer



- The default hold timer is 180 seconds. It can be set to 0 to disable it
- A KEEPALIVE or UPDATE message must be received before the hold timer expires
- If the hold timer expires, the BGP session is torn down, routes from the neighbor are removed, and an UPDATE is sent to other neighbors to remove those routes
- KEEPALIVE messages are sent every one third of the hold timer – 60 seconds by default

BGP Neighbor States



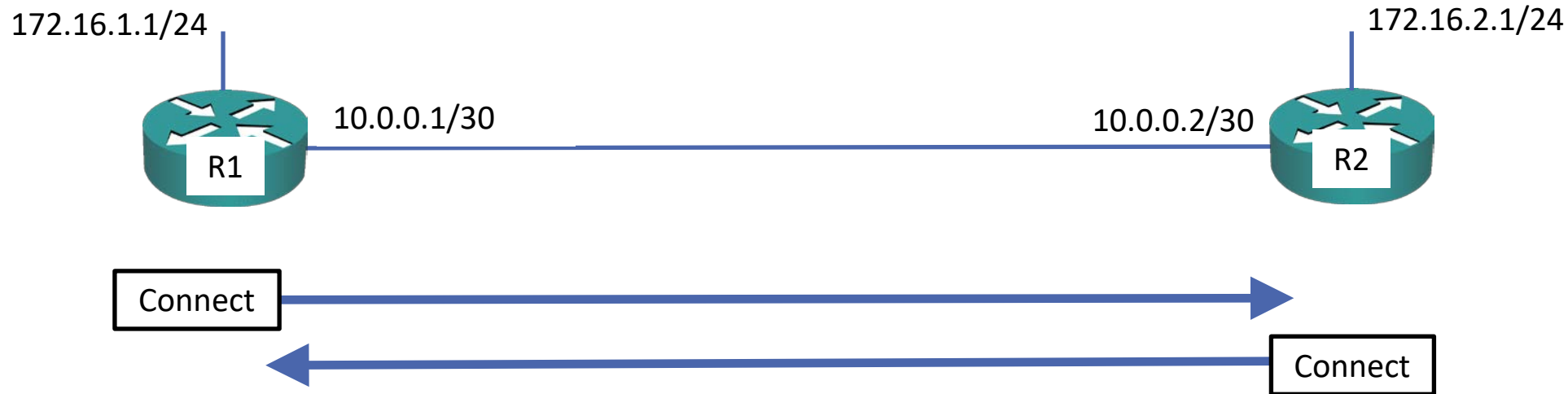
- Idle
- Connect
- Active
- OpenSent
- OpenConfirm
- Established

Neighbor States - Idle



- BGP tries to initiate a TCP connection with the peer.
- Errors cause the state to revert back to Idle and the ConnectRetryTimer to be set to 60 seconds initially, doubling on subsequent failures.

Neighbor States - Connect



- If 3-way TCP handshake completes, ConnectRetryTimer is reset and Open message is sent.

Neighbor States - Open Sent (awaiting reply)

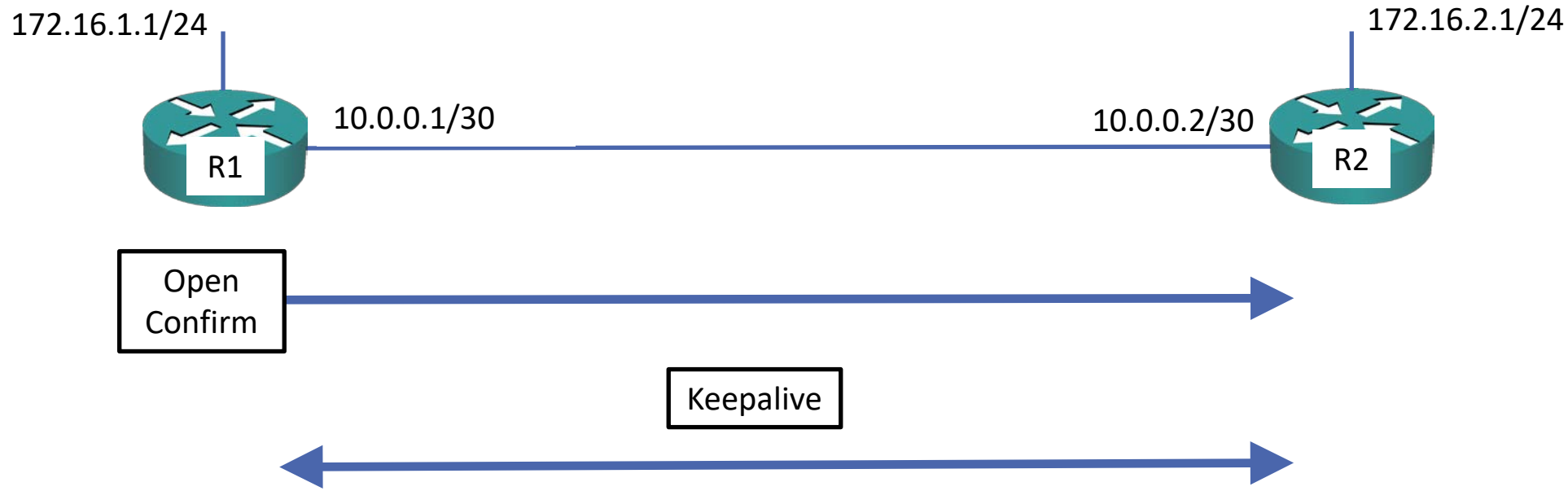


- OPEN message is sent with BGP version, AS number etc.

Neighbor States – Open Sent



Neighbor States - Open Confirm



- Received Keepalive moves the state to Established

Neighbor States - Established



- Routers are now ready to exchange routes with UPDATE messages

debug ip bgp



```
R1#debug ip bgp
```

```
R1(config-router)#neighbor 198.51.100.1 remote-as 65001
```

```
*Mar 27 16:11:18.561: BGP: 198.51.100.1 passive open to 198.51.100.2
*Mar 27 16:11:18.561: BGP: 198.51.100.1 passive went from Idle to Connect
*Mar 27 16:11:18.565: BGP: 198.51.100.1 passive rcv OPEN, version 4, holdtime 180 seconds
*Mar 27 16:11:18.566: BGP: 198.51.100.1 passive OPEN has ROUTE-REFRESH capability
*Mar 27 16:11:18.567: BGP: 198.51.100.1 passive rcvd OPEN w/ remote AS 65001, 4-byte remote AS 65001
*Mar 27 16:11:18.568: BGP: 198.51.100.1 passive went from Connect to OpenSent
*Mar 27 16:11:18.568: BGP: 198.51.100.1 passive sending OPEN, version 4, my as: 65011, holdtime 180
seconds, ID C0A80001
*Mar 27 16:11:18.568: BGP: 198.51.100.1 passive went from OpenSent to OpenConfirm
*Mar 27 16:11:18.570: BGP: 198.51.100.1 passive went from OpenConfirm to Established
*Mar 27 16:11:18.570: %BGP-5-ADJCHANGE: neighbor 198.51.100.1 Up ter)#
```

```
! truncated
```

Verification – show ip bgp neighbors

```
R2#show ip bgp neighbors
BGP neighbor is 172.16.0.1, remote AS 65002, internal link
  BGP version 4, remote router ID 172.16.0.1
  BGP state = Established, up for 00:03:05
  Last read 00:00:23, last write 00:00:25, hold time is 180, keepalive interval is 60 seconds
  Neighbor sessions:
    1 active, is not multisession capable (disabled)
  Neighbor capabilities:
    Route refresh: advertised and received(new)
    Four-octets ASN Capability: advertised and received
    Address family IPv4 Unicast: advertised and received
    Enhanced Refresh Capability: advertised and received
    Multisession Capability:
    Stateful switchover support enabled: NO for session 1
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
```

	Sent	Rcvd
Opens:	1	1
Notifications:	0	0
Updates:	1	1
Keepalives:	5	5
Route Refresh:	0	0
Total:	7	7