BGP (Border Gateway Protocol)

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- ➢ What is BGP ?
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Definition:-

- ➢ BGP is an Inter- autonomous system routing protocol. The primary function is to exchange network reachability information among other networks.

Definition:- contd

- ➢ what is an *Autonomous* system ?
  An Autonomous system is a group of networks and routers under the authority of single administration.

- ➢ Routing between Autonomous system is referred to as Exterior Routing (BGP)

Path Vector Messages

- ➢ Path Vector Messages
- ➢ Loop Prevention
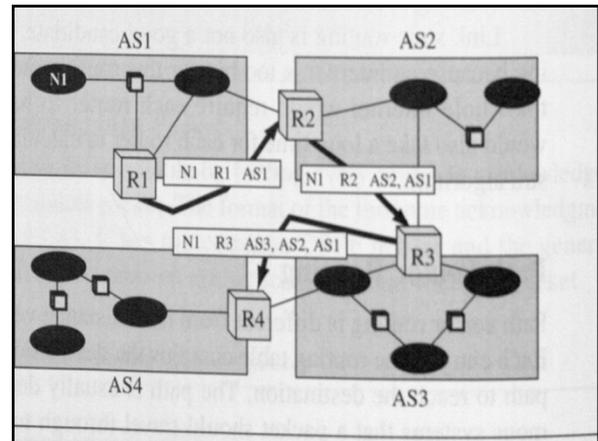- ➢ Policy Routing
- ➢ Path Attributes

Path Vector Routing

- ➢ Each entry in the routing table contains the destination network, the next router and the path to reach the destination

Network	Next router	Path
N01	R01	AS14,AS23, AS67
N02	R04	AS22, AS67,AS 19
N03	R06	AS 67,AS 78,AS 09,AS 26
NO4	R13	AS 52,AS 03,AS 11

Path Vector Messages

The Autonomous boundary routers that participate in path vector routing advertise the reachability of the networks in their own Autonomous systems to neighbor Autonomous boundary routers

Loop Prevention

➢ When a router receives a message, it checks to see if its autonomous system is in the path list to the destination. If it is, looping is involved and the message is ignored

Policy Routing

➢ Policy routing can be easily implemented through path vector routing.

➢ When a router receives the message, it checks the path. If one of the autonomous systems listed in the path is against its policy, it can ignore that path and destination

Message Formats

➢BGP uses four different types of messages
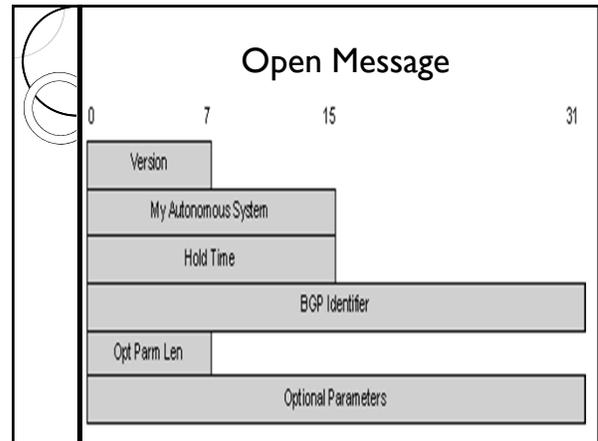
- Open
- Update
- Keep alive
- Notification

Packet Format

➢ All BGP Packets have the common Header

Packet Format – (contd)

- <u>Marker</u>- The 16 byte marker field is reserved for Authentication

- <u>Length-</u> The two byte field defines the length of the total message including the header

- <u>Type</u>- This one byte field defines the type of the packet

Open Message

Open Message (contd)

- <u>Version</u> – This one byte field defines the version of BGP
- <u>Autonomous System-</u> This two byte field defines the autonomous system number
- <u>Hold Time</u> –This two byte field defines the maximum number of seconds that can elapse before one of the parties receives a keep alive or update message from the other.

Open Message (contd)

- <u>BGP Identifier</u> – This is a four byte field defining the router that sends the open message.
- <u>Option Parameter Length-</u> This one byte field defines the length of total option parameters
- <u>Option Parameters-</u> Each option Parameter itself has two sub fields: the length of the parameter and parameter value
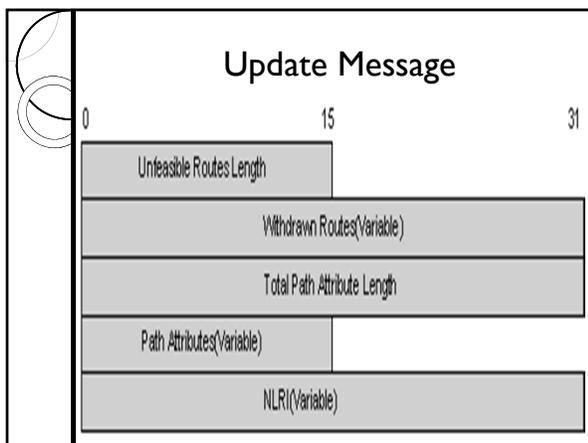
Update Message

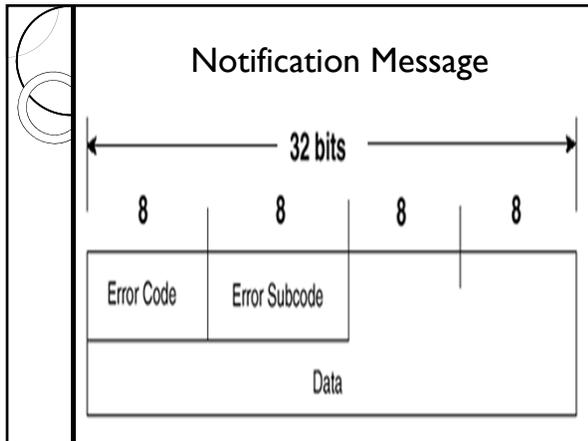
Update Message (Contd)

- <u>Unfeasible Routes Length-</u> This two byte field defines the length of the next field.
- <u>Withdrawn Routes-</u> This field lists all the routes that should be deleted from the previously advertised list.
- <u>Path attributes length-</u> This two byte field defines the length of the next field.

Update Message (Contd)

➢ Path attributes- This field defines the attributes of the path (route) to the network whose reachability is being announced in this message

➢ Network layer reachability Information (NLRI)- This field defines the network that is actually advertised by this message. It has a length field and an IP address prefix.

Keepalive Message

➢ The routers running the BGP protocols, exchange keepalive messages regularly (before their hold time expires) to tell each other that they are alive. The keepalive message consists of only the common header.

Notification Message

Notification Message (contd)

➢ Error Code- This one byte field defines the category of the error.

➢ Error Subcode- This one byte field further defines the type of error in each category.

➢ Error data- This field can be used to give more diagnostic information about the error.
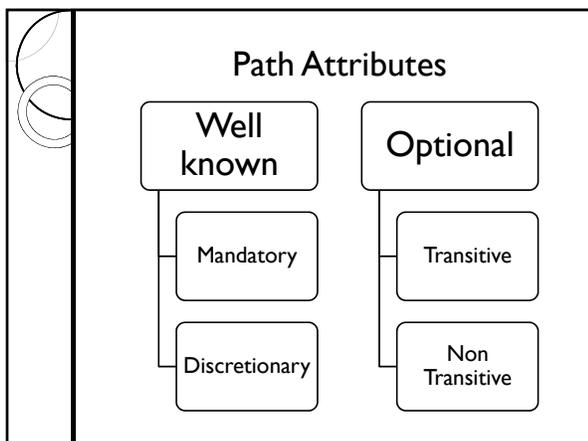
Path Attributes

Well Known Attributes

➢ Well Known Mandatory Attribute- It is one that must appear in the description of a route

➢ Well Known Discretionary Attribute- It is one that must be recognized by every router, but is not required to be included in every update message

Some Well Known Mandatory Attributes

- ORIGIN- This defines the source of routing information.

- AS_PATH- This defines the list of Autonomous systems through which the destination can be reached.

- NEXT-HOP- This defines the next router to which the packet must be sent.

Well Known Discretionary Attributes

- Attomic_Aggregate- When a BGP speaker aggregates several routes for the purpose of advertisement to a particular peer, the AS_PATH of the aggregated route normally includes an AS_SET formed from the set of ASes from which the aggregate was formed.

Optional Attributes

- Optional Transitive Attribute- An optional transitive attribute is one that must be passed to the next router by the router that has not implemented this attribute.
- Optional Non Transitive Attribute-An optional non transitive attribute is one that should be discarded if the receiving router has not implemented it.

Optional Transitive Attribute

- AGGREGATOR- It is an optional transitive attribute, which MAY be included in updates that are formed by aggregation . A BGP speaker that performs route aggregation MAY add the AGGREGATOR attribute, which SHALL contain its own AS number and IP address

Optional Non Transitive Attribute

- MULTI_EXIT_DISC – It is an optional non-transitive attribute that is intended to be used on external (inter-AS) links to discriminate among multiple exit or entry points to the same neighboring AS. The value of the MULTI_EXIT_DISC attribute is a four-octet unsigned number, called a metric.

References

- http://www.rfc-editor.org/rfc/rfc4271.txt
- http://en.wikipedia.org/wiki/Bgp
- TCP/IP Protocol suite by Behrouz A. Forouzan.
- Searchtelecom.techtarget.com/definition/BGP.

Questions

Thank you!