

Using the AS_PATH Attribute

Aim: To understand and demonstrate the use of the AS_PATH attribute in Border Gateway Protocol (BGP) for path selection and traffic engineering by simulating a multi-AS network topology using GNS3.

Theory: The Border Gateway Protocol (BGP) is a standardized exterior gateway protocol designed to exchange routing and reachability information among autonomous systems (ASes) on the Internet. BGP is classified as a path-vector routing protocol, and it makes routing decisions based on paths, network policies, or rule-sets configured by a network administrator.

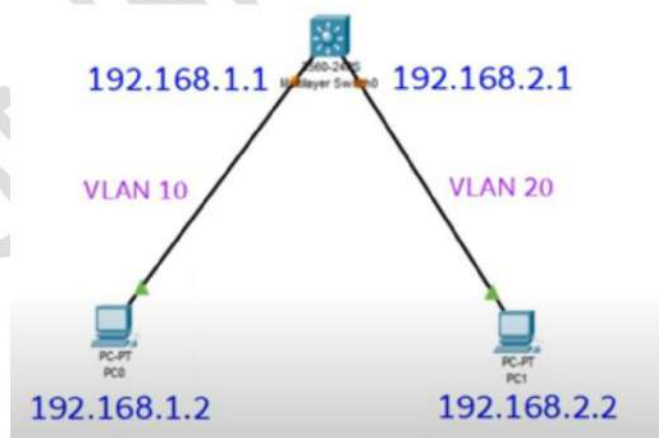
One of the key attributes in BGP is the AS_PATH attribute. This attribute lists the sequence of ASes that routing information has traversed. It serves two primary purposes:

Loop Prevention: By examining the AS_PATH, a BGP router can detect routing loops. If a router sees its own AS number in the AS_PATH of a received route, it will reject that route to prevent a loop.

Path Selection: BGP prefers routes with shorter AS_PATHs, assuming all other attributes are equal. This preference helps in selecting the most efficient path to a destination.

Additionally, network administrators can manipulate the AS_PATH attribute using a technique called AS Path Prepending. This involves adding multiple instances of an AS number to the AS_PATH to make a route less attractive, thereby influencing the path selection process.

Topology:



Code: sa

In the GNS3 simulation, we set up a network topology with three routers, each representing a different AS:

Router R1: AS 100
Router R2: AS 200
Router R3: AS 300

The goal is to advertise a network from R1 and observe how AS_PATH influences the route selection on R3.

Step 1: Configure BGP on R1

```
router bgp 100
network 192.168.1.0 mask 255.255.255.0
neighbor 10.0.12.2 remote-as 200
```

Step 2: Configure BGP on R2

```
router bgp 200
neighbor 10.0.12.1 remote-as 100
neighbor 10.0.23.3 remote-as 300
```

Step 3: Configure BGP on R3

```
router bgp 300
neighbor 10.0.23.2 remote-as 200
```

Step 4: Verify AS_PATH on R3

On R3, use the following command to view the BGP table:

```
show ip bgp
```

We observe the route to 192.168.1.0/24 with an AS_PATH of 200 100, indicating that the route has traversed AS 200 and AS 100.

Step 5: Apply AS Path Prepending on R2

To make the path through R2 less preferred, prepend AS 200 multiple times:

```
router bgp 200
neighbor 10.0.23.3 remote-as 300
neighbor 10.0.23.3 route-map PREPEND out
route-map PREPEND permit 10
set as-path prepend 200 200 200
```

After applying the route-map, R3 will see the AS_PATH as 200 200 200 100, making it longer and thus less preferred compared to other available paths.

Conclusion:

This practical demonstrates the significance of the AS_PATH attribute in BGP for both loop prevention and path selection. By manipulating the AS_PATH using techniques like AS Path Prepending, network administrators can influence routing decisions to achieve desired traffic engineering outcomes. The GNS3 simulation effectively illustrates how BGP routers use the AS_PATH attribute to determine the best path to a destination network.

For video demonstration of the above practical scan the following QR-code or type the link address

<https://youtu.be/28yj646Wwro?si=WRZ4ePgwTNJQ-zWP>

