Network Layer

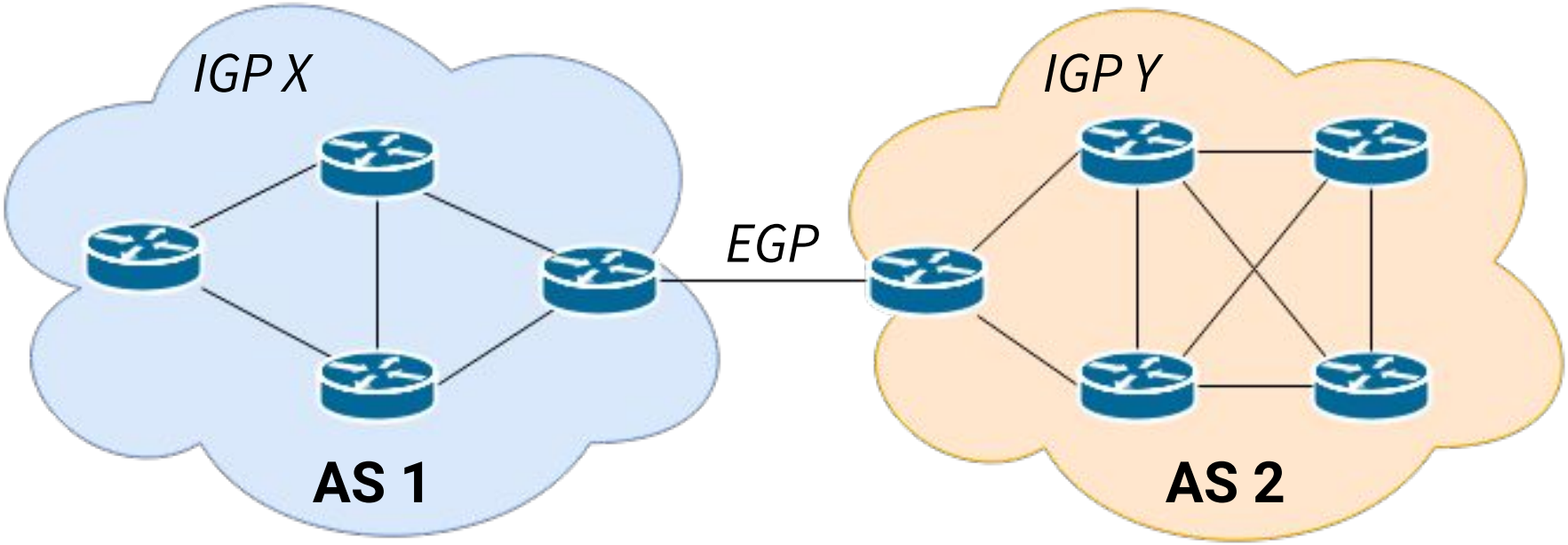
Routing among AS - EGP

Contents !

- How AS are connected ?
- External routing. BGP
- Lab! BGP with Docker and Quagga

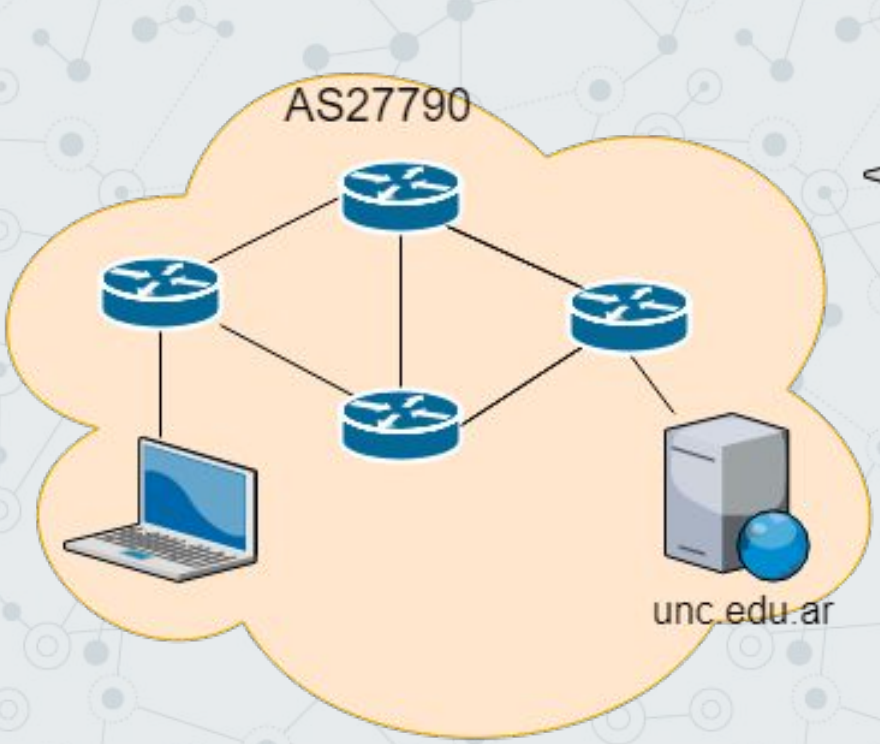
What is an Autonomous System(AS) ?

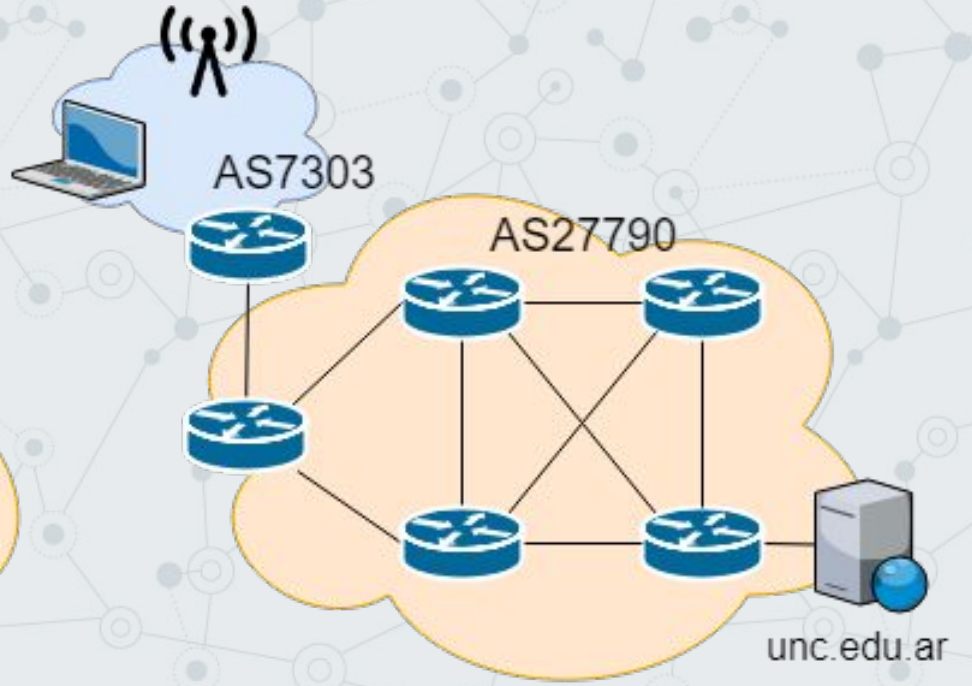
One or more IP networks controlled by one or more operators with a **clear policy that governs how routing decisions are made**.



IGP: Interior gateway protocol
EGP: Exterior gateway protocol

EGP in action

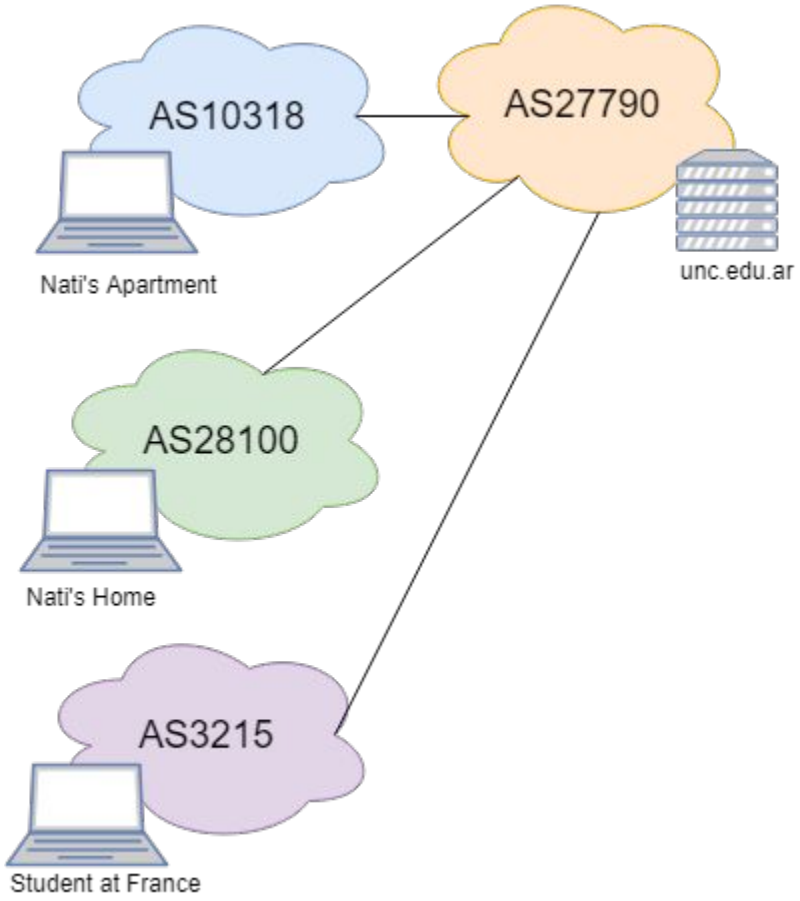





```
traceroute unc.edu.ar
```

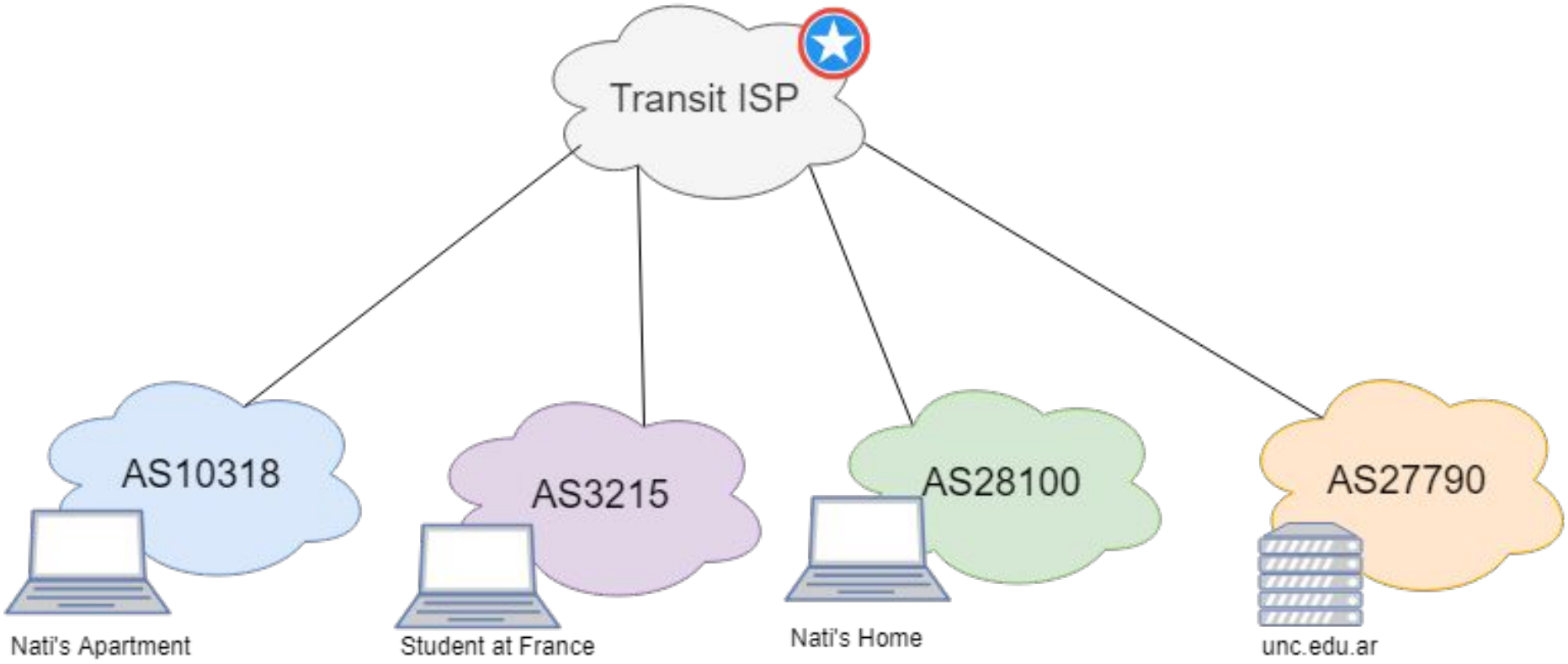
```
traceroute unc.edu.ar
```

How AS are connected ?



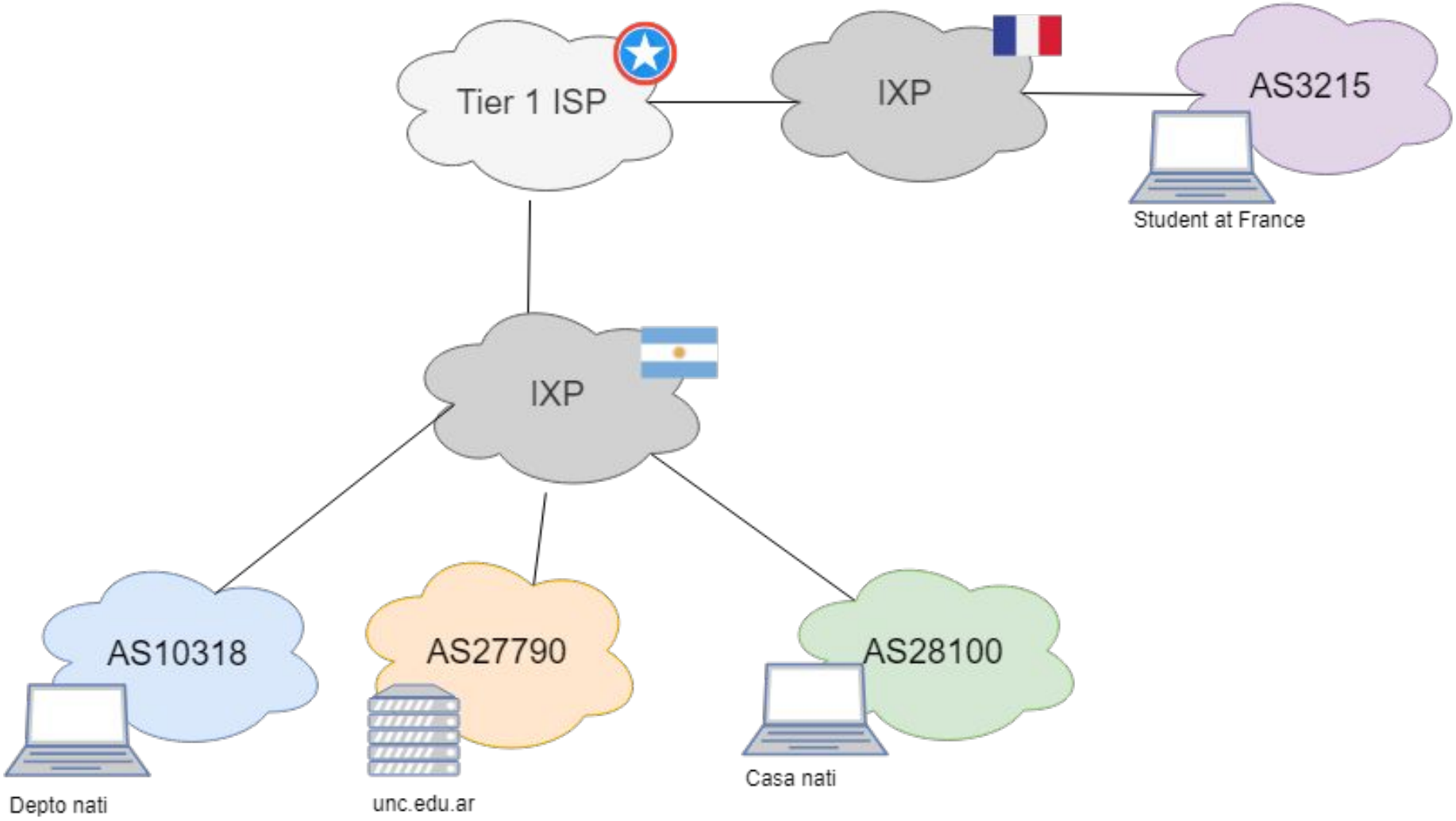
UNC AS would need to peer every network in the world.

How AS are connected ?



- **Transit ISP** would need to have a huge infrastructure and a lot of network resources.
- A message from **Nati's home** to **unc.edu.ar** would travel to USA and back to Argentina !

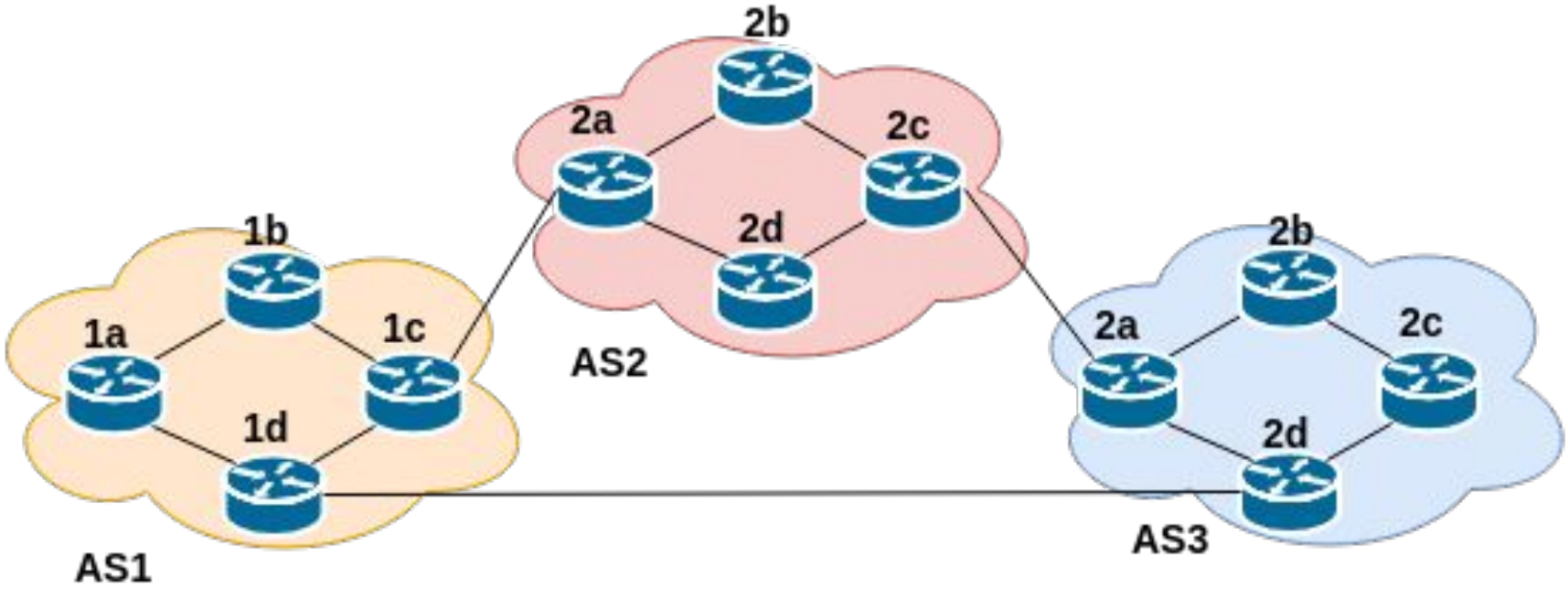
How AS are connected ?



https://www.cabase.org.ar/wp-content/uploads/2018/07/Poster-Cabase-2018-FINAL-web.gif

BGP - Border Gateway Protocol

- Establish TCP connection between peers
- Each peer sends positive or negative reachability information
- Ongoing peer verification



AS PATH: contains the list of ASs through which the route advertisement has passed.
NEXT HOP: the IP address of the router interface that begins the AS-PATH

BGP - Border Gateway Protocol

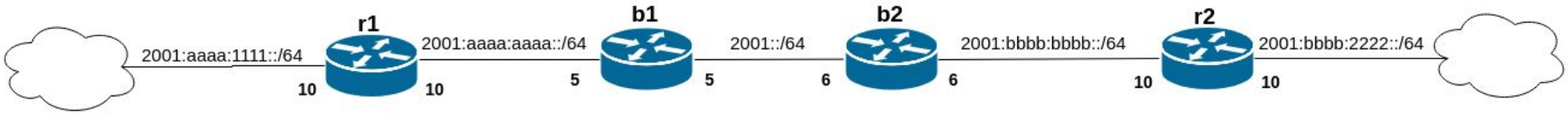
Route Selection Algorithm

1. Highest local preference value
2. The shortest AS PATH
3. The closest NEXT HOP router *(hot potato algorithm)*
4. Use BGP route identifiers

Lab!

1. Environment Setup - IPv4 and IPv6
2. Editing the infrastructure

BGP Environment Setup



Goals:

- Identify the topology in docker-compose file.
- Read quagga bgp configuration files
- Read IPv6 routing tables

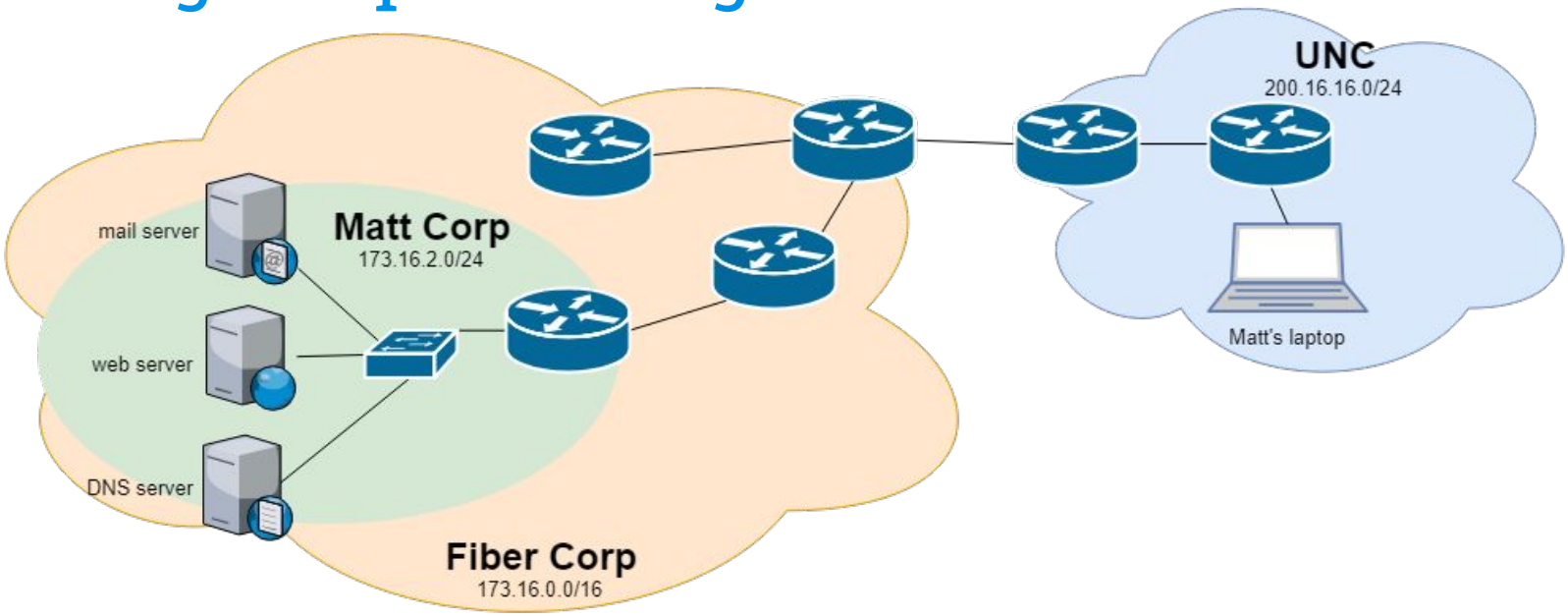
Steps:

- Clone the repository. (https://github.com/maticue/docker_quagga.git)
- Go to **bgp** folder. Run `docker-compose up`
- Verify docker port mapping in order to access the daemons via telnet

Useful commands:

- `telnet localhost <daemon_port>`
- `docker exec -ti <container_name> ash`

Putting the pieces together



Goals:

- Add a web server and a client to the previous lab's topo.
- Test connectivity between client and server.

Steps:

- Add a web server to router r1.
- Add a client to router r2.
- Generate a http request from the client to the server.

Resources

- https://www.juniper.net/documentation/en_US/junos/topics/concept/ospf-routing-designated-router-overview.html
- https://learningnetwork.cisco.com/blogs/vip-perspectives/2017/11/08/ospf-graphs-lsas-and-the-lsdb
- https://docs.cumulusnetworks.com/display/CL332/Configuring+Quagga
- Configuring FRRouting (Similar to quagga): http://docs.frrouting.org/en/latest/index.html