**"BGP Scenario: Multi-AS Topology with Policy-Based Traffic Engineering"**

RULES:

1. You are allowed to work in groups of up to 2 students.
2. **Important**: each **screenshot** should include the date and time of your computer**.**
3. Assign the IP addresses with respect to **one of the student IDs** in your group as follows:

* Client Network (AS 100) is ready.
* Client Network (AS 400) assign networks between routers as: if the ID is 121**2031** then the IPs are: 1**20**.**31**.40.0/**24**, 1**20**.**31**.50.0/**24,** 1**20**.**31**.60.0/**24** …
* IX network (AS 200) assign networks between routers as: if the ID is 121**2031** then the IPs are: **20**.**31**.1.0/**24**, **20**.**31**.2.0/**24, 20**.**31**.3.0/**24** …
* ISP Network (AS 300) assign networks between routers as: if the ID is 121**2031** then the IPs are: **31**. **20**.10.0/**24**, **31**. **20**.20.0/**24**, **31**. **20**.30.0/**24**,…
* External Connections between ASes: assign networks between routers as: if the ID is 121**2031** then the IPs are: 11.**31**. **20**.0/**30**, 11.**31**. **20**.4/**30**, 11.**31**. **20**.8/**30**,…
* Note that any solution without including the ID as above **will not be accepted**.

**SUBMISSION:**

1. A technical report in pdf format (**only pdf format**) on moodle (**itc.birzeit.edu**) that contains snapshots with detailed explanation, commands, runs, etc.
2. Labels are required to be added to the complete topology in the .pkt file.
3. You are also required to submit .pkt file of the full design with the required addressing and routing.

**Objective:**

* Design and implement a BGP environment that simulates a multi-autonomous system (multi-AS) network.
* Showcase advanced features of BGP such as route filtering, policy-based routing, load balancing, and inter-AS Routing.
* Demonstrate case understanding. (discussion)

**Project Scope:**

**1. Network Topology – Attached-**

* 4 Autonomous Systems (AS) connected as in the attached Packet tracer file
* Mix of eBGP (External BGP) and iBGP (Internal BGP) peering.
* Include redundant links for failover testing.

**2. BGP Features:**

* iBGP Routes within AS.
* BGP attributes (e.g., Local Preference, MED, AS\_PATH) for traffic engineering.

**3. Traffic Engineering:**

* Influence outbound traffic using Local Preference.
* Influence inbound traffic using AS\_PATH or MED metrics

**4. Monitoring & Troubleshooting:**

* Monitoring of BGP sessions.
* Troubleshooting scenarios like session flaps and routing loops.

**Tools:**

* Use GNS3

**Topology:**

* AS100 (Enterprise Network)
* AS200 (IX Provider)
* AS300 (Transit Provider)
* AS400 (Enterprise Network)

**Project Tasks:**

1. **Initial Configuration: Interior Gateway Protocols:**

* Configure single area OSPF routing protocol in AS300 internal network.
* Configure RIP in AS400 internal network
* Configure single area OSPF in AS100 internal network
* Don’t forget to add a /24 on one of the router to represent the network clients – you can use a switch for this purpose.

1. **BGP Configuration:**

* Configure eBGP between ASes and iBGP within each AS.
* Ensure full connectivity and establish BGP sessions.

1. **Traffic Engineering:** Modify BGP attributes to control traffic as follows:

* **Route Optimization:** Aggregate prefixes in AS200.
* **Redundancy Testing:** Simulate link failures and ensure traffic automatically reroutes.
* **Monitoring & Troubleshooting:** Use BGP debugging commands to verify routing protocol session and messages.

**Documentation:**

Prepare a detailed report covering:

1. **Network Design Diagram:** including IP addresses and subnets used.
2. **Configuration Files:** For all routers in the topology.
3. **Screenshots for connectivity tests and Routing entries:** Commands and processes used. (**Every Screenshot has to include the date and time of your PC)**

**Deliverables:**

* Complete topology with working configurations.
* Recorded test scenarios and evidence of successful traffic engineering.
* A final presentation summarizing the project activities.