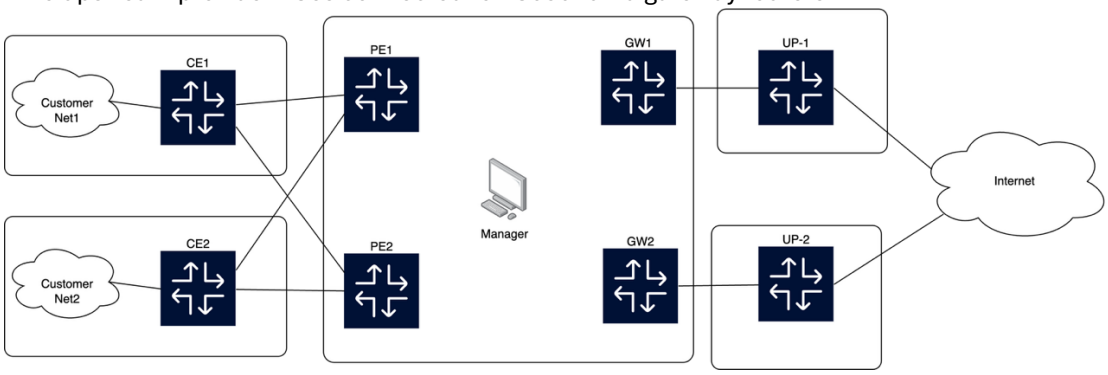
ACN Group Project

Network Topology Description

Consider the following network, consisting of five autonomous systems:

- Customer Autonomous System 1
- Customer Autonomous System 2
- Provider Autonomous System (AS65020)
- Two upstream provider ASes connected to AS65020 via gateway routers



Both customer ASes are multi-homed to AS65020 for redundancy and reliability. AS65020 connects to the two upstream providers through dedicated gateway routers. For the sake of simplicity, assume all routers within AS65020 are part of the same Local Area Network (LAN).

Task 1: Configuration Templates with Jinja2

Develop reusable configuration templates for all routers in the network using Jinja2 scripting. These templates should support parameterization for device-specific details such as AS numbers, router IDs, interface IP addresses, and BGP neighbor relationships. The goal is to streamline the deployment and management of router configurations, ensuring consistency and reducing manual errors.

Task 2: Network Emulation with Containerlab and FRR

Use containerlab to instantiate the described network topology. Each router should be base on FRR. The topology must reflect the characteristics described above. Document the steps to build, deploy, and verify the emulated network environment.

Task 3: Network Automation System for AS65020

Design and implement a network automation system that operates within a *Manager* node in AS65020. This system should:

- Periodically receive traffic prediction matrices (provided as input files or through an API).
- Analyze the matrices to determine optimal traffic distribution across upstream links.
- DAdjust BGP attributes (e.g., MED and LOCAL_PREF), to influence inbound and outbound traffic paths.
- Apply the necessary configuration changes to the relevant routers automatically.

The automation system should be integrated with the emulated network environment established in Task 2.

Submission Guidelines

- Jinja2 configuration templates and associated scripts.
- Containerlab topology files and deployment instructions.
- Source code for the network automation system.
- A short report describing your assumptions, approach, software design and testing methodology.

Include all scripts and configuration files necessary to reproduce your work.