Arquitetura de Redes Avançadas
Project

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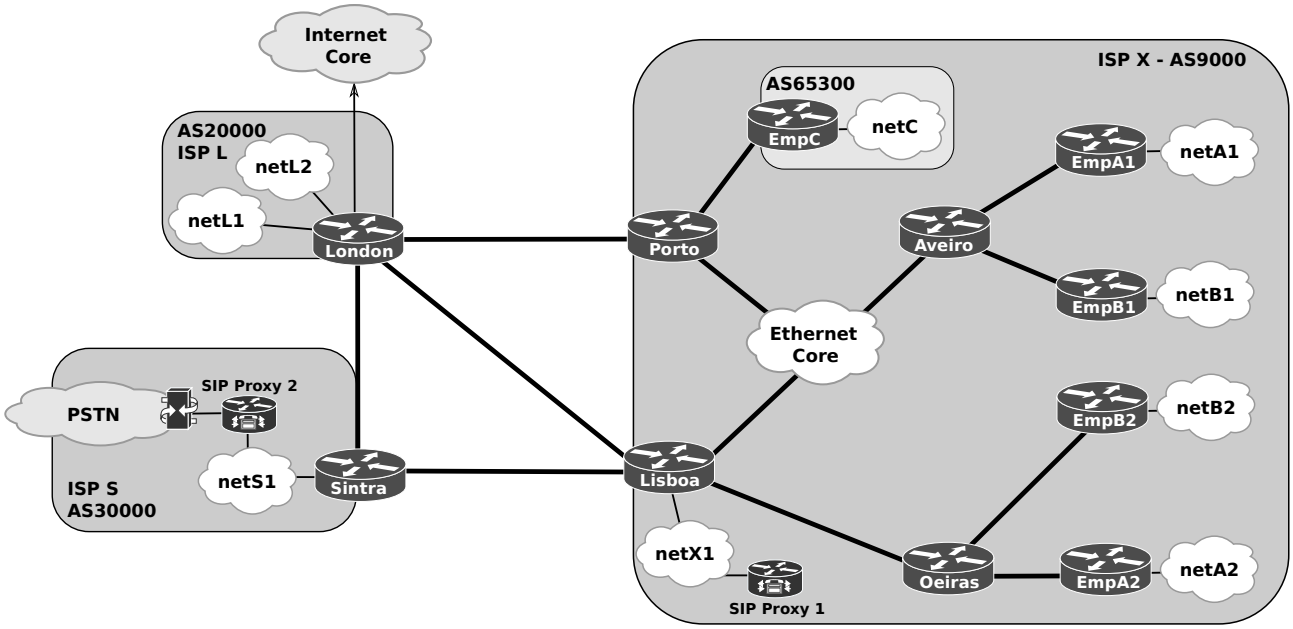
- **The project must be deployed and tested using GNS3.**
- **All engineering choices must have a valid justification.**



Scenario description:

- Assume that you are the engineer responsible for the network of ISP X with AS 9000 (depicted above).
- AS9000 has two peering relation with ISP L (AS20000) via Porto and Lisboa, and one peering relation with ISP S (AS30000) via Lisboa.
- ISP X should be configured as a non-transit AS assuming possible future BGP peering relations.
- ISP X has three corporate clients (A, B and C), to which provides IP inter-connectivity and a VoIP service with PSTN inter-connectivity.
- Corporate clients A and B have (both) two branches, one in Aveiro and another in Oeiras.
- Corporate client C, has a single location in Porto, however corporate client C is a private BGP autonomous system (AS 65300).
- ISP S provides interconnection to Internet Core and PSTN interconnection through SIP Proxy 2.
- ISPs and Corporate clients have the following IPv4 and IPv6 IP networks:

ISP X - core, netX1 and internal point-to-point links	192.172.1.0/24 10.0.0.0/16	2001:200::/48
Corporate client A	120.1.1.0/24	2001:120::/48
Corporate client B	130.1.1.0/24	2001:130::/48
Corporate client C	140.1.1.0/24	2001:140::/48
ISP L - netL1	200.100.1.0/24	2100:200:100::/48
ISP L - netL2	200.200.1.0/24	2100:200:200::/48
ISP S - netS1	210.0.1.0/24	2100:210::/48
BGP peering links	4.20.20.0/26	2001:420::/60

Deployment requirements:

Basic mechanisms and BGP (10 points)

- Provide full IPv4 and IPv6 between ISP X clients and Internet Core, according to scenario constrains (above) and ISP networking good practices.
- Implement the following MP-BGP routing constrains (within ISP X):
  - IP traffic towards Internet should be preferably routed via Porto.
  - IP traffic towards netL2, should be preferably routed via Porto from Aveiro, and via Lisboa from Oeiras.
  - IP traffic for remote SIP proxy 2 (to network netS1) should be routed only via Lisboa using the direct peering link to ISP S.

  Note: You must assume that (i) ISP L receives multiple network prefixes from the Internet Core, and (ii) those prefixes are sent to ISP X and ISP S.

MPLS (7 points)

- Client B requested two bi-directional channels with dedicated bandwidth of 2Mbps each: (i) one between the Aveiro branch and Lisbon just for VoIP traffic, and (ii) one between the Aveiro and Oeiras branch for all HTTP (port 80) and HTTPS (port 443) traffic. Deploy the required MPLS tunnels and respective routing mechanisms.
- Deploy a MPLS VPN for Corporate client A (interconnecting Aveiro and Oeiras branches).

VoIP - SIP (2 points)

- Deploy a VoIP - SIP service for all ISP X corporate clients. The service provides VoIP connectivity (through ISP proxy 1) between internal clients and forwards all other calls (including PSTN numbers) to ISP S SIP proxy. The assign (PSTN compatible) telephone numbers are: for Corporate client A 23410xxxx and 21010xxxx, for Corporate client B 23411xxxx and 21011xxxx and for Corporate client C 22012xxxx.

CDN (1 point)

- Deploy a CDN routing service (Conditional DNS) for corporate clients.

Extra:

- Students may propose additional services/mechanisms to incorporate into the project (subject to professors approval). Professors may also suggest other additions upon completion of the mandatory requirements.

Deployment and Demonstration notes:

- During demonstration, if necessary due to lack of computational resources, some routers may be turned off (where/when irrelevant to mechanisms being shown).
- You may assume that the IP subnet of all VoIP VLANs in corporate clients' networks is known by ISP X. Also, netS1 only contains VoIP related services.
- To test SIP deployment just make SIP proxy 2 “answer” all calls forwarded towards him as a simple client.