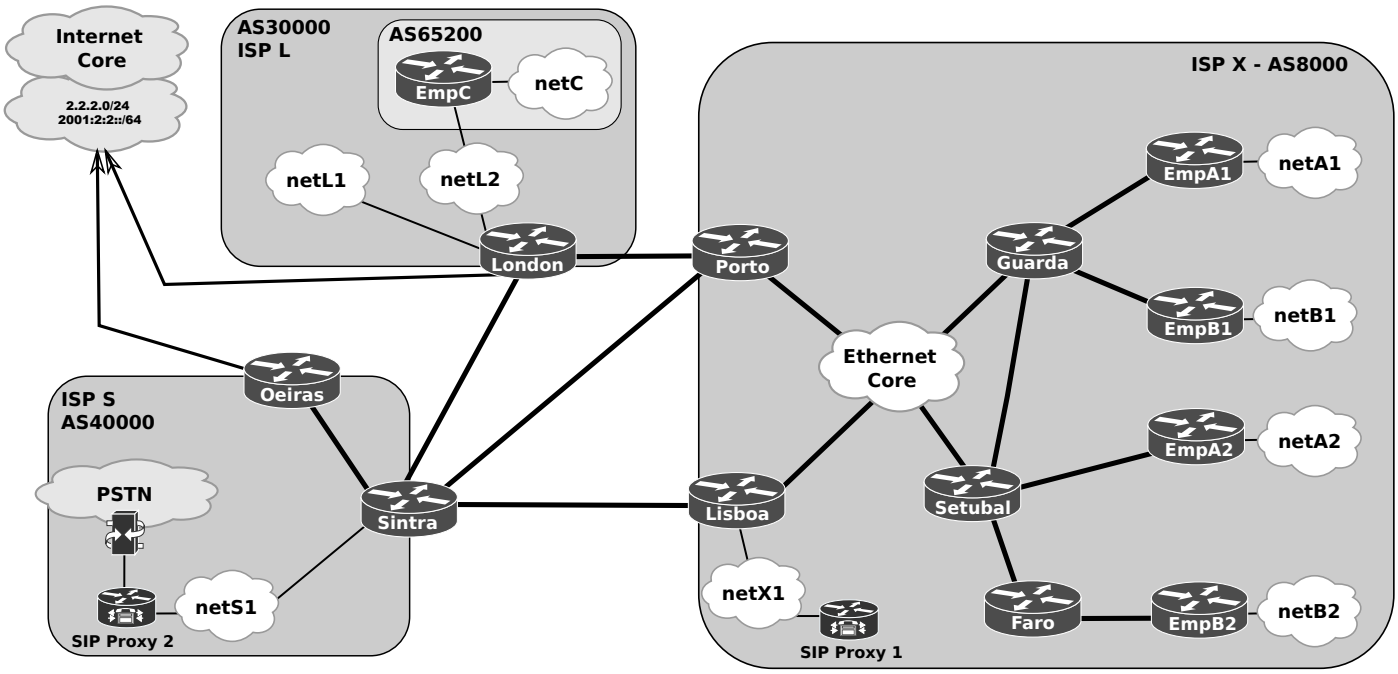
Arquitetura de Redes Avançadas
Project (Recurso)

Professors:
Rui Aguiar (ruilaa@ua.pt); Paulo Salvador (salvador@ua.pt)

- **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 networks of all ISPs depicted above.
- AS8000 has one peering relation with ISP L (AS30000) via Porto, and two peering relations with ISP S (AS40000) via Lisboa and via Porto.
- 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 client A has two branches, one in Guarda and another in Setúbal. Corporate client B has two branches, one in Guarda and another in Faro.
- Corporate client C, has a single location in London, however corporate client C is a private BGP autonomous system (AS 65200).
- 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	192.100.1.0/24 10.0.0.0/16	2001:100:1::/48
Corporate client A	110.1.1.0/24	2001:110:1::/48
Corporate client B	111.1.1.0/24	2001:111::/48
Corporate client C	112.1.1.0/24	2001:112::/48
ISP L - netL1	100.100.1.0/24	2001:100:100::/48
ISP L - netL2	100.200.1.0/24	2001:100:200::/48
ISP S - netS1	110.0.1.0/24	2001:110:0:/48
External BGP peering links	4.4.4.0/26	2001:4:4::/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 ISP L, if not possible via ISP S/Porto, and if not possible via ISPS/Lisboa.
  - IP traffic towards all AS30000 networks, should be preferably routed via Porto from Guarda, and via Lisboa from Setúbal.
  - IP traffic for remote SIP proxy 2 (to network netS1) cannot be routed via Lisboa using the direct peering link to ISP S.

  Note: You must assume that (i) ISPs L and S receives multiple network prefixes from the Internet Core, and (ii) those prefixes are sent to all its BGP peers.

MPLS (7 points)

- Client B requested two bi-directional channels, between its two branches, with dedicated bandwidth of 10Mbps: (i) one that uses the ISP network core, and (ii) another that uses the direct link between Guarda and Setúbal routers. Traffic between the network branches should be load-balanced between the two channels.
- Deploy a MPLS VPN for Corporate client A (interconnecting Guarda and Setúbal 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 27110xxxx and 26510xxxx and for Corporate client B 27111xxxx and 28911xxxx.

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:

- To test BGP announcements of Internet prefixes, configure (i) IP networks 2.2.2.0/24 and 2001:2:2::/64 in the Internet core connections, and (ii) respective BGP configurations
- During demonstration, if necessary due to lack of computational resources, some routers may be turned off (where/when irrelevant to mechanisms being shown).
- To test SIP deployment just make SIP proxy 2 “answer” all calls forwarded towards him as a simple client.