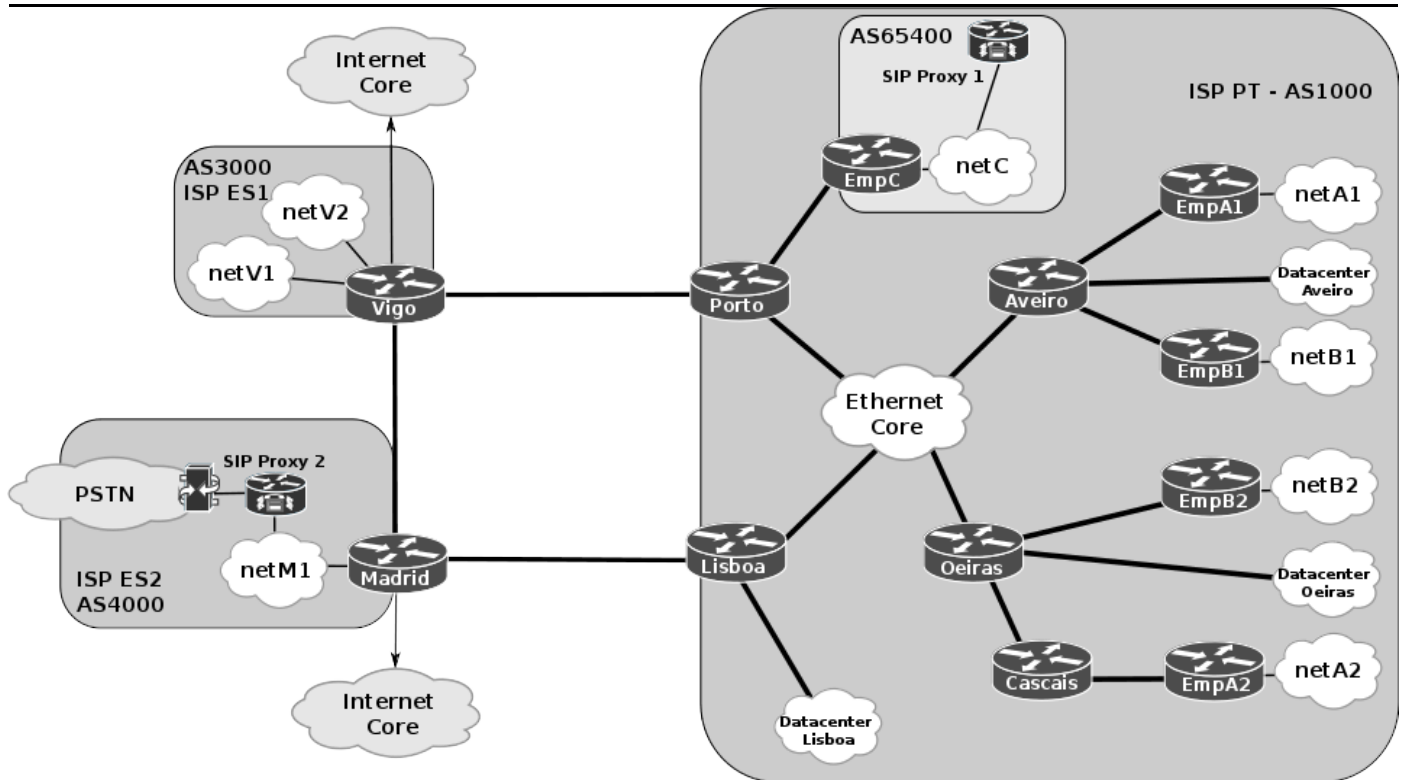# Arquitetura de Redes Avançadas
Project (Recurso)

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- **The project must be deployed and tested using GNS3.**
- **All engineering choices must have a valid justification. A report providing these justifications is required to be delivered at the work presentation time (and not after!).**

Scenario description:

- Assume that you are the engineer responsible for ISP PT (AS1000) depicted above. All other ISPs are configured with default/minimal BGP configurations.
- AS1000 has one peering relation with ISP ES1 (AS3000) via Porto, and one peering relation with ISP ES2 (AS4000) via Lisboa.
- ISP PT is a transit AS.
- ISP PT has two corporate clients/partners (A, B), to which provides IP inter-connectivity and a VoIP service with PSTN inter-connectivity (using partner C SIP Proxy).
- Corporate partner C, has a single location in Porto, however is a private BGP autonomous system (AS 65400).
- Corporate clients A and B have two branches, one in Aveiro and another in Oeiras/Cascais.
- ISP PT has three independent datacenters in Lisboa, Aveiro, and Oeiras.
- Both ISP ES1 and ISP ES2 provide IP interconnection to the Internet Core.
- ISP ES2 provides PSTN interconnection through SIP Proxy 2.

- ISPs and Corporate clients have the following IPv4 and IPv6 IP networks:

ISP PT - core, datacenters, and internal point-to-point links	192.100.1.0/24 10.0.0.0/8	2001:100:1::/48
Corporate client A	110.1.1.0/24	3001:110::/48
Corporate client B	111.1.1.0/24	3001:111::/48
Corporate partner C	112.1.1.0/24	3001:112::/48
ISP ES1 - netV1	200.100.1.0/24	2201:200:100::/48
ISP ES1 - netV2	200.200.1.0/24	2201:200:200::/48
ISP ES2 - netM1	65.0.1.0/24	2301:65:0:/48
External BGP peering links	4.4.4.0/26	2001:4:4::/60

Deployment requirements:

Basic mechanisms and BGP (6 points)
- Provide full IPv4 and IPv6 between ISP PT clients and Internet Core, according to scenario constrains (above) and ISP networking good practices.
- Implement the following MP-BGP routing constrains (within ISP PT2):
    - IP traffic towards Internet should be preferably routed via ISP ES2.
    - IP traffic towards all AS3000 networks, should be preferably routed via Porto (ISP ES1) from Aveiro, and via Lisboa (ISP ES2) from Oeiras.
    - IP traffic for remote SIP proxy 2 (to network netL1) cannot be routed via Porto using the peering link to ISP ES1.
    Note: You must assume that (i) ISPs PT1 and ES receive multiple network prefixes from the Internet Core, and (ii) those prefixes are sent to all its BGP peers.

MPLS (6 points)
- External AS transit traffic should be routed (between Lisboa and Porto) over a MPLS tunnel with 50Mpbs reserved bandwidth.
- Deploy a MPLS VPN for Corporate client B (interconnecting Aveiro and Oeiras branches).

VoIP - SIP (2 points)
- Deploy a VoIP - SIP service for all ISP PT corporate clients. The service provides VoIP connectivity (through ISP proxy 1) between internal clients and forwards all other calls (including PSTN numbers) to ISP ES2 SIP proxy. The assign (PSTN compatible) telephone numbers are: for Corporate client A 23410xxxx and 21910xxxx and for Corporate client B 23411xxxx and 21911xxxx.

CDN (4 point)
- Deploy a CDN routing service (Conditional DNS) for corporate clients. The service DNS server is located in the Lisboa Datacenter, and must be able to redirect clients to the closest Datacenter according to their location, i.e., terminals in Aveiro to the Aveiro Datacenter, terminals in Oeiras to the Oeiras Datacenter, and all other internal or external terminals to the Lisboa Datacenter.
- Improve the CDN routing service (Conditional DNS) by including a link/router/server load condition in the decision process.

Extra (2 Points):
- Conversion of the Ethernet Core to an ATM core with three ATM switches in a triangle configuration. Students are advised that they may need to use a different router image for this work.
- Alternative: 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).
- To test SIP deployment just make SIP proxy 2 "answer" all calls forwarded towards him as a simple client.