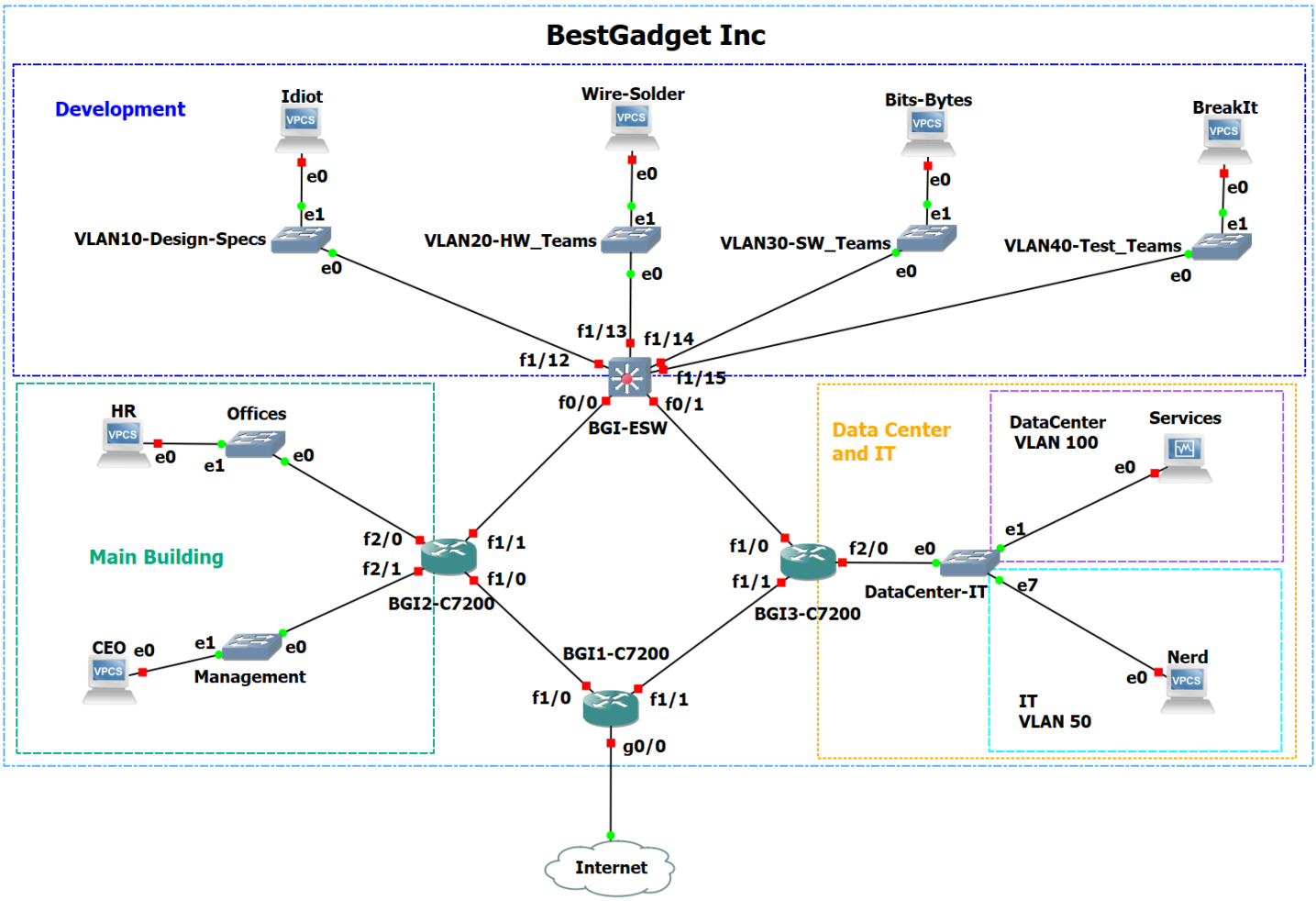
Redes de Comunicação I

Repeat Project 2023/2024

Professors: Susana Sargento susana@ua.pt
Pedro Rito pedrorito@ua.pt
Victor Marques victor@ua.pt

BestGadget Inc is a company that defines, designs, specifies, develops (hardware and software) and tests Gadgets, delivering to the market the Best Gadgets of the Universe.



Public IPv4 (sub)Network: 201.1X_5X_4.1X_3X_2.128/25

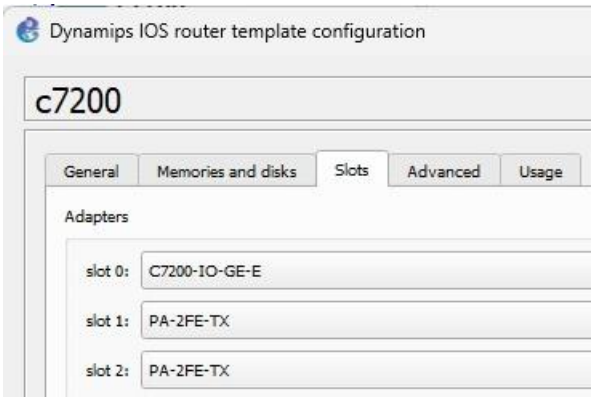
Private IPv4 Network: 172.2X_3.1$X_4$2.0/23

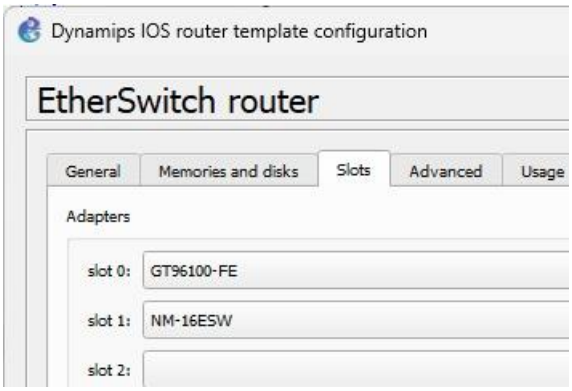
Global IPv6 Network: 2002:A$X_1X_5X_4$:B$X_1X_3X_2$::/48

Student University Number: 0/1 $X_1X_2X_3X_4X_5$

BestGadget Inc has a routing core network composed of 3 Cisco 7200 (BGI1-C7200, BGI2-C7200 and BGI3-C7200)and one Cisco EtherSwitch Router (BGI-ESW)).

The Cisco 7200 routers and the EtherSwitch (ESW) are equipped with the following interface cards:





All the remaining network is composed of simple Ethernet Switches capable of handling VLANs.

BestGadget Inc uses both Public and Private IPv4 and it also uses global IPv6 addresses inside its several buildings and departments, as explained below.

Public IPv4

BestGadget Inc has received from its ISP a part of a public IPv4 class C network: $201.1X_5X_4.1X_3X_2.128/25$

These addresses are needed and distributed according to the identified needs (please note that you should consider addresses for the router interfaces on top of the following needs):

- NAT/PAT: 20 addresses
- DataCenter VLAN: 16 addresses
- IT VLAN: 10 addresses
- Management: 12 addresses
- Offices: 4 addresses
- Design-Specs VLAN: 5 addresses
- Test_Teams: 13 addresses
- Hardware_Teams: 0 addresses
- Software_Teams: 0 addresses

Private IPv4

BestGadget Inc also uses private IPv4 addresses inside its network for internal communication between the teams of the several departments. The network used is: $172.2X_3.1X_42.0/23$

The addresses needed at each location are:

- DataCenter VLAN: 0 addresses
- IT VLAN: 0 addresses
- Management: 0 addresses

- Offices: 61 addresses
- Design-Specs VLAN: 12 addresses
- Test_Teams: 28 addresses
- Hardware_Teams: 125 addresses
- Software_Teams: 240 addresses

The routers interconnections also use private IPv4 addressing from the SAME address pool.

Global IPv6

With respect to IPv6, BestGadget Inc received from its ISP the following IPv6 network: 2002:AX$_1$X$_5$X$_4$:BX$_1$X$_3$X$_2$::/48 that is distributed in the following manner:

- Each of the routers (including the ESW) will manage a different /56 subnetwork, taken from the main /48.
- Each department/VLAN must be assigned with a /64, taken from the /56 of the router that provides its connectivity.
- The routers interconnections must use /126 global IPv6, taken from another /56 (different form the /56 assigned to the routers).

Internet Connectivity

The BGI1-C7200 Gigabit Ethernet interface 0/0 (g0/0) must be configured with the 192.168.101.1X$_3$X$_5$ /24

A default IPv4 route must be configured on this router with 192.168.101.11 as the gateway.

All terminals (VPCs) and servers must be able to access the Internet, either directly (public IPv4), either via NAT/PAT that must be configured on this same router. The ONLY Exception is for the terminals with private addresses of the VLAN of the TEST_TEAMS – These ARE NOT ALLOWED to access Internet.

The BG1-C7200 Gigabit Ethernet interface 0/0 (g0/0) must be configured with the 2002:5755:: X$_2$X$_4$X$_3$X$_5$/64

A default IPv6 route must be added with 2002:5755::1 as gateway.

Distribute the addresses (Public and private IPv4 and IPv6) according to the specifications provided:

1. Identify the network address and broadcast address (if applicable) for all networks/sub-networks, both for IPv4 and IPv6. Do not forget the addresses of the routers.
2. Identify the range of IP addresses for the devices (PCs, routers, etc.) for each network/sub-network.
3. Identify the NAT/PAT networks and range.
4. Choose/identify the gateway and/or default gateway address(es) for each network/sub-network, when applicable.

Configure the network in GNS3 and add services and applications

1 . Build the Network using the same exact devices and interfaces as presented in the network diagram.

2 . Configure the routers interfaces and verify point-to-point connectivity between them.

3 . Add static IP routes (both default and specific) to the routers to guarantee full network connectivity between all routers. Try to optimize the routes to have shorter paths between origin and destination.

4 . Try to optimize the configuration, using the least routes possible (e.g. if a default route is enough on one router, there is no need to add extra routes).

5 . Configure the Ethernet Switches to have them with the correct VLAN configuration (when appliable).

6 . Configure DHCP pools for all the private networks on the BGI1-C7200 router. Use the “ip helper-address” on the other routers to redirect the DHCP request to the right server (BGI1-C7200). Include the DNS server option on the DHCP pool. The DNS server will run on the “Services” VM.

7 . Configure the Services VM (based on the LabComServer VM) to run the following services:

- DNS server: create (at least) a main zone for the BestGadget Inc and include the main devices with Static Public IPv4 addresses.
- HTTP Server: create a Web Page for the BestGadget Inc.

8 – Develop a Chat Client/Server application (using sockets) that allows a client to contact the server and send messages to all clients connected to the server (with its hostname and IP address). Additionally, the server also displays the number of times it received requests from each client. The server IP address (or its name as presented on the DNS) must be an input parameter of the client application. The server application must run on the “Services” VM and the client Application should run from another VM or from a real PC on the “Internet”.

Extras:

- Create DNS sub-zones for each department and register their terminals/PCs/Routers/Servers.
- Add an FTP server to allow the remote download of the chat client application.
- Create a second web site on the same VM.
- Place a second VM at the “Offices” and demonstrate the WEB and Chat between the two VMs.

Good Luck