Cisco Lab@Politecnico di Torino

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Main objectives

- Main use: teaching
  - So, features, not performances
- Not experimental devices, but what students will use in their work life
  - Students are happier
  - Total cost of ownership (install/restore)
  - Simpler CLI (compared to using several Linux daemons)
  - More features
  - Smaller (and less power hungry)
  - Not very expensive
- Easier to manage
  - Everyday use (student accounts)
  - Re-configuration (e.g. Different logical topologies)
  - Easy to restore (e.g., in case the OS is deleted from FLASH)
- Possibility to generate and capture network traffic
Why is the lab remote?

- H24 availability
  - We can use it also in courses with large number of students

- To control the lab better
  - Student do no have physical access
    - E.g. they cannot break a cable
Structure of the lab

Characteristics
- 9 routers, controlled by a single PC
- Remote access to the "master" server
- Possibility to change the logical topology by reconfiguring the intermediate switch
How the lab looks like

General view

Routers details
Physical devices

- **Router: Cisco 1700 / Cisco 870**
  - Entry-level
    - Low cost, but it maintains all the features of the high-end devices (although it is slower)
  - Maximum size for FLASH and RAM
  - "Switched" ports (can be used either as a router, or as a switch)

- **Switch: Cisco 2950**
  - Reconfigurable L2 switch, VLAN, 2 GE ports (for sniffing)

- **Server: standard PC, Windows 2003 Server**
  - Pentium 4HT, 3.0GHz, 1GB RAM, 40GB HD
  - Windows 2003
    - RDP is currently the best solution for remote desktop
  - Multi-serial card

- **Total cost**
  - About 15K€
Rear view of a router: Cisco 1721

- Kensington lock
- Serial port (WIC)
- Console port
- Ethernet 10BaseT (WIC)
- ON/OFF switch
- Serial led
- Ethernet leads
- AUX port
- Ethernet leads
- Power
- Ethernet leds
- On board FastEthernet
Connection between devices: console

Console cable: usually RJ45 on one site, DB9 on the other side (often made with a straight Ethernet cable with one adapter on one side)
Ethernet cables (1)

Couple 1: Phone
Couple 2: Ethernet RX
Couple 3: Ethernet TX
Couple 4: Not used

BR, W-BR, O, W-BL, BL, W-O, G, W-G
**Ethernet cables (2)**

### Table: Straight-thru and Crossover Connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Color</th>
<th>Signal</th>
<th>Color</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W-G</td>
<td>TRD0+</td>
<td>W-O</td>
<td>TRD1+</td>
</tr>
<tr>
<td>2</td>
<td>G</td>
<td>TRD0-</td>
<td>BL</td>
<td>TRD1-</td>
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<tr>
<td>3</td>
<td>W-O</td>
<td>TRD1+</td>
<td>W-G</td>
<td>TRD0+</td>
</tr>
<tr>
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<td>BL</td>
<td>TRD2+</td>
<td>W-BR</td>
<td>TRD3+</td>
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<tr>
<td>5</td>
<td>W-BL</td>
<td>TRD2-</td>
<td>BR</td>
<td>TRD3-</td>
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<td>6</td>
<td>BL</td>
<td>TRD1-</td>
<td>G</td>
<td>TRD0-</td>
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<tr>
<td>7</td>
<td>W-BR</td>
<td>TRD3+</td>
<td>BL</td>
<td>TRD2+</td>
</tr>
<tr>
<td>8</td>
<td>BR</td>
<td>TRD3-</td>
<td>W-BL</td>
<td>TRD2-</td>
</tr>
</tbody>
</table>

The diagram illustrates the connections for Ethernet/FastEthernet and GigabitEthernet cables.
DTE/DCE cables

DCE/DTE: usually connected to a geographical modem (e.g. HDSL)
Lab: connected back-to-back (required to set the interface speed on the DCE)
Multiserial card
The Netlab server

- Public interface (for remote access)
- Sniffing interface (No IP address)
- Interface on the NetLab LAN (ping, ...)

Internet
A possible logical topology
Physical topology

R1: Cisco 1711VPN/K9

R2: Cisco 1711VPN/K9

Cisco Catalyst 2950T-48 SI

HP dc5100
Access to the remote lab (1)

- **Physical address of the Windows 2003 servers**
  - Labreti-mondovi.ipv6.polito.it
  - Labreti-torino.ipv6.polito.it

- **Remote Desktop**
  - Windows XP/Vista: Use Remote Desktop Connection
  - UNIX: use `rdesktop`
Access to the remote lab (2)
Access to the remote lab (3)
Available apps (1)

TFTP server
- Server not active by default (security issues)
- Please note the root folder

Command prompt
For ping, traceroute...
Please take in ming which interface the server is using, and the availability of an IP path
Available apps (2)

Interfaces:
- Sniffing interface (passive interface, sniffing only)
  - Captures traffic flowing on all the other interfaces (except serial links)
  - Captures all traffic (so, please set the proper filter)
- Interface toward routers backbone LAN (active interface)
Accesso ai router del laboratorio

L’accesso da remoto alle risorse del laboratorio è schematizzato nella figura seguente.


Pertanto, i passi necessari ad accedere agli apparati da configurare sono i seguenti:

- Accesso al server di laboratorio, remotizzando l’input e l’output su un terminale utente remoto
- Accesso e configurazione degli apparati, una volta aperta una sessione di lavoro virtuale con il server di laboratorio
Some tips: switched/routed interfaces

Switched Ethernet interfaces

Routed Ethernet interface

!! Please take care about interfaces marked with “*” on the network map!!
Some tips: Groups and Workplaces

Groups

- Max 4 students/group
- Each group has its own password (ask the Assistant for credentials)
- Please use your workplace (not the entire physical topology)
- Workplace may vary according to the different assignment
Some tips: logistics

- **Remote Desktop**
  - Log-off explicitly
  - Please do not DISCONNECT or CLOSE
    - !! Router may be blocked !!

- **Access to routers**
  - Please refer to the appropriate slides
  - !! Remember to initialize routers before use !!

- **When capturing traffic with Analyzer**
  - Please check that you are using the sniffing interface
Some tips: assistance and lab hours

- **Routers are available H24, assistance is not**
  - A professor will be available only during lab hours for consultancy
  - Lab hours are NOT intended as the sole time for lab exercises
    - In other terms, you have to complete your exercises at home, and come to the lab if you have trouble
    - This is valid only for assignments involving Cisco routers

- **Suggestions:**
  - Do your exercises at home, then come to the lab if you need help
  - In this case, please bring with you all the required material
    - Router configs (time is always missing... So better having configs ready)
    - Valid accounts in order to be able to reproduce the problem on the routers)
Lab and assistance

- Lab hours can be used as consultancy hours
- If you want to get a better use of this time, please do your exercises at home, and if something does not work, please come and ask
  - You have to try before asking
  - If something does not work, please come with your configuration scripts ready
Some tips: troubleshooting

- **Routers are real devices so, you may expect...**
  - Strange behaviours
  - Cable not working
  - Need to reboot the device

- **If your target destination does not reply to your pings...**
  - Is your local interface up? (interface + line)
  - Is there a route to the remote destination?
  - Is your interface replying to a local “ping”?  
  - Is the interface on the other side of the link replying to a “ping”?  
  - Switch to the next router and repeat these steps
Netlab Torino

NOTE
*: Interfaccia switched (richiede la configurazione delle VLAN)

Internet
Vlan 777

LAN PC interna (Laboratorio)
Vlan 888

IP: 192.168.0.100
DG: -
NIC: Intel Pro/1000

labreti-torino.ipv6.polito.it
IP: 130.192.86.10
DG: 10.0.0.2 (??)
NIC: Broadcom Nextreme

Rete router
Vlan 999

IP: 192.168.100.1
DG: -
NIC: Intel Pro/1000

NOTE
*: Interfaccia switched (richiede la configurazione delle VLAN)

Vlan 999
Vlan 777
Vlan 46
Vlan 45
Vlan 56
Vlan 50
Vlan 80
Vlan 90
Vlan 78
Vlan 79
Vlan 888
Vlan 77
Vlan 10