Introduction

An introduction to the equipment and organization of the Internet Lab.

Internet Lab Equipment

- 4 Linux PCs
- 4 Cisco Routers
- 4 Ethernet hubs
- 1 monitor, 1 keyboard, 1 mouse
- 1 KVM switch
- Cables

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Linux PC

- PCs are labeled as: PC1, PC2, PC3, PC4.
- PCs Linux Red Hat 8.0 or a later version installed.
- Each PC has:
  - a floppy drive,
  - a serial port,
  - two 10/100 Mbps Ethernet interface cards (NICs).

Cisco Router

- Routers are labeled: Router1, Router2, Router3, Router4.
- Routers run Cisco IOS 12.0 or a later version.
- Each router has:
  - a console port
  - two 10 or 100 Mbps Ethernet interfaces
  - two WAN serial interfaces
Ethernet Hubs

- Each hub has 4 or more RJ-45 ports
- Ports operate at 10 Mbps, 100 Mbps or both

Lab Sequence

Core Labs:

- Lab 1 - Introduction to the Internet Lab
- Lab 2 - Single Segment IP Networks
- Lab 3 - Static Routing
- Lab 4 - Dynamic Routing Protocols
- Lab 5 - Transport Protocols: UDP and TCP

Advanced Labs:

- Lab 6 - LAN switching
- Lab 7 - NAT and DHCP
- Lab 8 - Domain Name System
- Lab 9 - SNMP
- Lab 10 - IP Multicast
## Core Labs

<table>
<thead>
<tr>
<th>Lab 1 – Introduction to the Internet Lab</th>
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<tbody>
<tr>
<td>Overview of the Internet Lab equipment; introduction to ethereal and tcpdump.</td>
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<tr>
<th>Lab 2 – Single Segment IP Networks</th>
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<tr>
<td>Configuring a network interface for IP networking; address resolution with ARP; security problems of common Internet applications.</td>
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<th>Lab 3 – Static routing</th>
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<td>IP forwarding and routing between IP networks; setup a Linux PC and a Cisco router as an IP router; manual configuration of routing tables.</td>
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<th>Lab 4 – Dynamic Routing Protocols</th>
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<td>Routing protocols RIP, OSPF and BGP; count-to-infinity problem in RIP; hierarchical routing in OSPF; setup of autonomous systems in BGP.</td>
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<tr>
<th>Lab 5 – Transport Protocols: UDP and TCP</th>
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<td>Data transmissions with TCP and UDP; TCP connection management; TCP flow control; retransmissions in TCP; TCP congestion control.</td>
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## Advanced Labs

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<tr>
<th>Lab 6 – LAN switching</th>
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<tr>
<td>LAN switching in Ethernet networks; forwarding of Ethernet frames between LAN switches/bridges; spanning tree protocol for loop free routing between interconnected LANs.</td>
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<th>Lab 7 – NAT and DHCP</th>
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<td>Setup of a private network; dynamic assignment of IP addresses with DHCP.</td>
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<th>Lab 8 – Domain Name System</th>
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<td>Domain name resolution with DNS; name server hierarchy; setup of a DNS root server.</td>
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<th>Lab 9 – SNMP</th>
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<td>Network management with SNMP; SNMP agents and SNMP managers; Security features of different versions of SNMP.</td>
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<th>Lab 10 – IP Multicast</th>
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<td>Multicast group management with IGMP; IP multicast forwarding; Multicast routing protocols PIM-SM and PIM-DM.</td>
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Structure of the Labs

• Each lab has three phases:
  1. Prelab
  2. Lab session
  3. Lab report.

• Pre-laboratory Assignment (Prelab). Exercises to be completed in advance of the associated lab session. The prelabs ask you to acquire background knowledge that is needed during the lab exercises. Each prelab has a question sheet that must be completed before the corresponding lab session. The answers to the prelab questions are graded.

Structure of the Labs

• Lab Session. Lab exercises that are performed on the equipment of the Internet lab. All lab exercises can be completed without supervision. The time to complete a lab session should be three hours on the average, but may vary. Complete the laboratory activities to the extent that you can. The activities during the lab session are not graded, however, data collected during the lab session are needed to complete a lab report.
  • Floppy disk symbol in the lab manual indicates when you have to collect data.
Structure of the Labs

• **Lab Reports.** After each lab session, you prepare a
  lab report that summarizes and analyzes the findings
  from the lab session. A notepad symbol indicates an
  assignment for the lab report. The lab reports should be
  submitted as a typewritten document.

• The lab report is generally due 1 week after the lab
  session. The lab report is graded.

• **Note:** Saved data should be included in the report only if
  it is requested in the lab report, and if it is used to answer
  a question. Filtering the relevant measurements for the
  answers of the lab report is part of the analysis.

Info on the Lab Sessions

• In the Internet lab:
  – Bring formatted floppy disks, the lab manual and the
    solutions to prelab
  – Reboot Linux PCs
  – Complete exercises as described in the lab manual
  – Take measurements as instructed
  – Save data to floppy disk

• The equipment of the Internet Lab is not connected to the
  Internet.

• Each lab has an anonymous feedback sheet. The feedback is
  used to improve the setup and organization of the labs.

• Since you have administrative (root) privileges on the Internet
  Lab equipment, exercise caution when modifying the
  configuration of the Internet Lab equipment.