

# BENCHMARK

**NEW!**

# Net Sys **T**

*Network Systems Lab.  
Multiple Network Protocols,  
Layers and Topologies.*



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# Net Sys T

## SYSTEM-LEVEL EXPERIENCE IN A LAB ENVIRONMENT

The complete study of network systems is, as such, a vast subject. Traditionally, in both the Electronics & Communication and the Computer Science engineering streams, teaching of computer networks or LAN/WAN subjects is oriented towards signal transmission methods or network architecture and protocols study.

Signal transmission methods usually focus on physical layer connections such as:

- Wireless, fibre optics, satellites, etc., mainly for bandwidth utilization – modulation- demodulation techniques such as PSK, QAM, OFDM, carrier modulation, etc.
- Signal impairments – noise, interference, distortion, etc.
- Clock synchronization techniques at the transmitter / receiver end – line coding, frequency, phase-offset correction, etc.

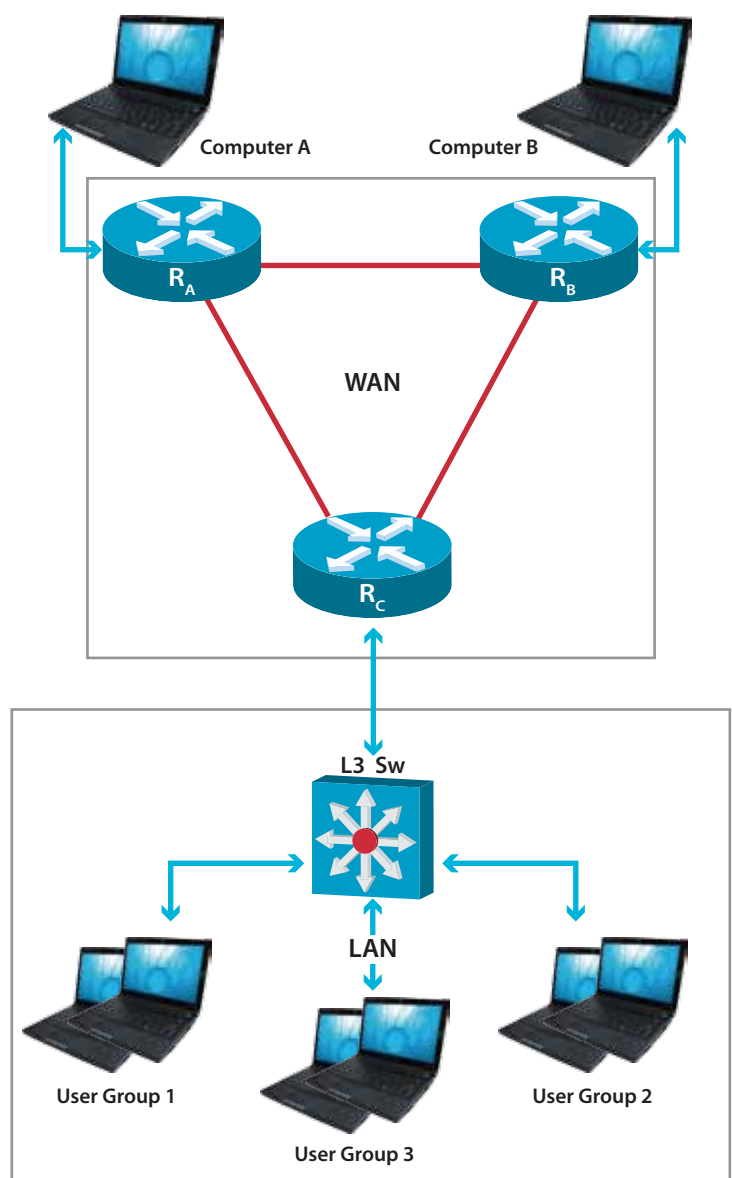
Network architecture and protocols study focuses on:

- Switching techniques – circuit switching, packet switching, data/multimedia content streaming, etc.
- Queuing models - throughput, delay, blocking, burstiness, etc.
- Computer networks – protocols, algorithms, etc.

So, while focusing on the above topics is mandatory to ensure that basics are strengthened, once they are covered, it is essential to move towards a system-level approach that helps students visualize entire network systems in operation.

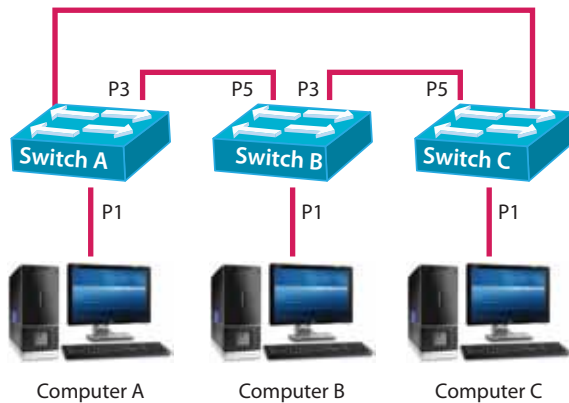
Between two end PCs in a WAN or between a user and a server in the internet, there lies a vast list of equipment such as switchers, routers, firewalls, IDSs, etc., all working 24 hours a day, seven days a week and following various disparate technologies such as Ethernet, WLAN, E1/T1, DSL, SDH, FDDI, ATM, etc.; and, all aimed at ensuring that the end systems or users send and receive their required data without any loss, disruption or hassle.

Understanding how the entire system works seamlessly in the network is always a thrilling experience for students. The **Benchmark NetSys-T** – Network Systems Lab – brings this system-level experience to users in a lab environment. Diffusing boundaries between voice and data, wired and wireless, LAN and WAN etc., the **Benchmark NetSys-T** helps its users to get the feel of a realistic end-to-end network service in a lab environment.

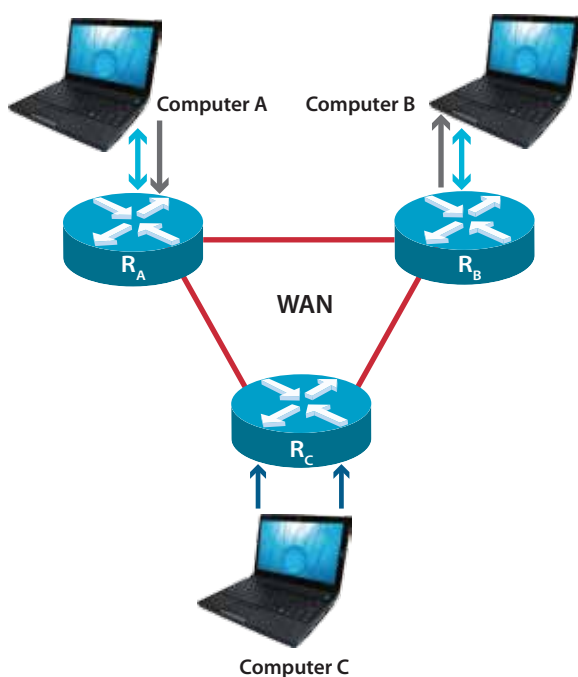


## EXPERIMENTS

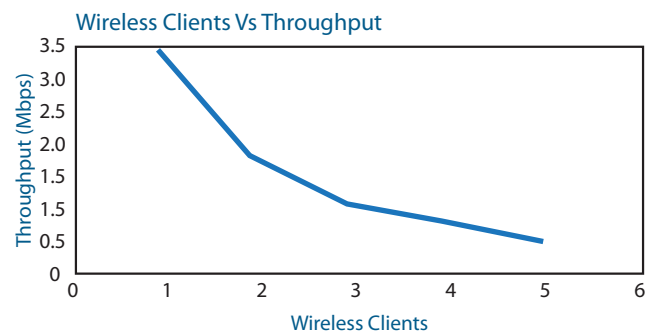
- 1** Shared and switched bandwidth utilization in LANs using Hub and switches
  - Throughput measurement using file transfer in shared and switched connectivity with Hub and switch respectively
- 2** LAN realization using Layer 2 (L2) switches and demonstrating key aspects of the Ethernet protocol
  - Observe MAC table formation in switches
  - Create loop conditions and observe loop prevention in spanning tree protocol (STP)



- 3** VLAN realization using Layer 3 (L3) and L2 switches and demonstration of inter VLAN routing
- 4** Demonstration and performance measurement of routing protocols (RIP, OSPF)
  - Establish a WAN connectivity with 3 routers and demonstrate:
    - RIP performance – with Hop Count as cost
    - OSPF performance – with Bandwidth as cost
  - Measure throughput using FTP sessions – under background traffic
  - Convergence time



- 5** Network access control in a LAN/WAN network using L3 switch & router
  - Implement a security policy in a LAN connected to a WAN- Intra-LAN security and WAN/LAN security
- 6** Network security realization using firewall
- 7** Radio survey of WLAN design
  - Measure the radiation pattern of a given access point and suggest a optimum location for the access point
- 8** WLAN realization and throughput measurement
  - Measure the throughput with more number of nodes participation in the WLAN and plot the curve



## FEATURES

- Facilitates emulating a real world computer network within a lab
  - Backbone realization using IP routers
  - Wired LAN realization using HUB, Layer 2 & Layer 3 switches, Firewall
  - Wireless LAN realization using Access points
- In-depth understanding of router protocol performance, firewall, Layer 3 & Layer 2 switch concepts, wireless LAN performance, RF Survey of wireless Access Points
- Separate Ethernet port for equipment management and monitoring purposes - Monitoring of key protocol packets such as "update" in RIP, "hello" in OSPF without the need to tap the routing ports
- Formatted routing table information available periodically to identify the route changes that takes place in real time
- Routing Table information "Save" option facilitates analysis at later stage
- RS232 serial ports with upto 1Mbps data rate and Fast Ethernet ports for WAN interface in routers
- Firewall and Layer 3 uses IPTables rules and can be tagged with a name for the user to identify the rules set in use
- Fast Ethernet interface for outside network, DMZ and inside network in firewall
- Built-in LAN ports for ease of use while experimenting
- Provides a challenging environment to understand and handle the network security related issues
- Comprehensive experiment user manual

## SPECIFICATIONS

### Benchmark NetSys-T Routers

Protocol : RIPV2.0, OSPFV4

WAN Ports :

#### **NetSys-T RTR-SFE model:**

Serial ports – 2 (RS232 upto 1Mbps);

Fast Ethernet ports – 1

#### **NetSys-T RTR-FE model:**

Fast Ethernet ports – 2

Management Port

: One Fast Ethernet port for device management and protocol packets monitoring

LAN Ports : Fast Ethernet ports – 4

Equipment Management & User Interface

: Web browser access for ports configuration, device restart, shutdown, Protocol parameters configuration, Routing Table information - periodic update (every 3 or 1 sec), table saving

### Benchmark NetSys-T Firewall/Layer 3 switch

Ports:

Firewall Mode : Outside network – 1 Fast Ethernet

: DMZ – 1 Fast Ethernet

: Inside network – 4 LAN ports

L3 Mode : Outside network – 1 Fast Ethernet

: Inside network – 1 Fast Ethernet and 4 LAN ports

Management : One Fast Ethernet port for device management

VLAN Support : Tag based VLAN

User Writable Rules

: IPTables rules, NAT/PAT Address translation, Packet filtering

Equipment Management & User Interface

: Web browser access for ports configuration, device restart, shutdown, user written rules update, current active rules information display and saving

### Managed L2 switch

MAC Address Table

Rapid Spanning Tree

Port, Tag Based VLAN

Equipment Management

: Web browser access for VLAN assignment, device reset, MAC table observation

### Access Points

802.11b/g

Repeater Mode Operation

Variable Power and Channel Selection

Transmit Power : +14dBm

Receiver Sensitivity : -66dBm for 54Mbps

Coverage Area : Indoor upto 100m depending on the obstacles

### System Requirements:

5 Windows / Linux PCs + 1 Linux PC + 1 Windows laptop (minimum 512MB RAM per system) + 100Mbps fast Ethernet Network Interface.

*Additional packages:* FTP Server, Wire Shark, vim editor, hping2, VLC Media Player, Ekahau Heatmapper, Netstumbler

### Ordering Information

#### Benchmark NetSys-T

##### Comprising:

- NetSys-T RTR-SFE – Router with Serial and ethernet WAN ports - 3
- NetSys-T RTR-FE – Router with fast ethernet WAN ports – 1
- NetSys-T FWL3 – Firewall / Layer 3 switch – 1

Managed Layer 2 switch – 3

Unmanaged Layer 2 switch – 1

Wireless Access Points – 2

Wireless USB adaptors – 3

AC-DC adaptors for equipment – 1 set

Cables – 1 set

User Manual – 1

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