Feedback‹‹

LAN-Trainer

Single Trainer. Multiple Network Protocols, Layers and Topologies.

Versatile Kit

The LAN-T, LAN Trainer is a versatile laboratory system that supplements courses on Computer Networks and LANs. The Trainer exposes users to networking concepts at the physical, MAC, network and transport layers through a carefully designed series of experiments.

The experiments reinforce the theory covered in lectures, while hands-on programming exercises train users to fit into networking positions in industry. The Trainer can also be used for project work involving many layers of the network hierarchy.

Wide Functionality at Low Cost

With minimal investment in a single Trainer and 2-3 PCs, users can obtain hands- on experience with a wide variety of different network topologies and protocols, including all the popular ones such as CSMA/CD (Ethernet) and token passing (Arcnet, Token Ring).

The LAN-T, LAN Trainer consists of a Network Emulator Unit (NEU) with PC plug-in Network Interface Units (NIU) and Win95 based Experiment Software. The software contains a series of experiments in the form of stand-alone applications, 'C' source code for the experiments, and a 'C' library to access the NIU. The source code provides better understanding of the experiments, while the library allows users to program new experiments, modify existing experiments, and try out various network layers and protocols.

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Scalable & Configurable

The NEU emulates six nodes, which can be configured to Star or Ring topologies. It also has error generators and delay generators between nodes. Each NIU card emulates two independent nodes supporting various MAC layer protocols on a single PC. The system scales up to emulate larger networks by adding on more NEUs, NIUs and PCs.

NETWORK EMULATOR UNIT
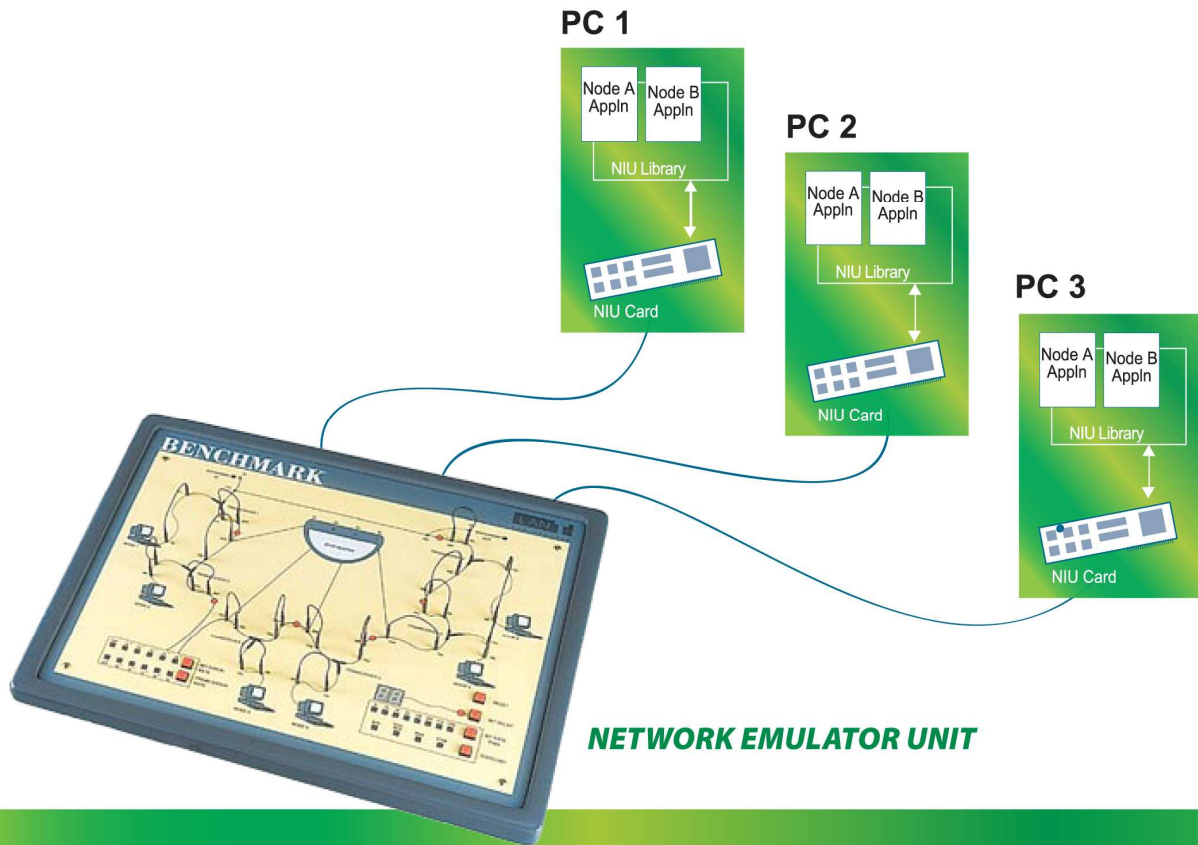
EXPERIMENTS

Observation and measurement of behaviour of various network protocols. Step-by-Step instructions given in manual under "Trying it out" section.

1.) Packet transmission - packetization of data, simple point-to-point communication

2.) 2 MAC Layer – Observe and measure the performance of various MAC layer protocols by changing the network load, distance between the nodes wherever applicable and compare them

BUS Topology:
- ALOHA: Exposure to multiple access to a shared medium, throughput vs offered load
- CSMA: Throughput vs offered load for various node distances in the form of bit delays
- CSMA/CD: Throughput vs offered load, packet delay vs throughput at various loads
- Token-Passing BUS: Demand assignment when compared to random access protocols, packet delay vs throughput – comparison with CSMA/CD
- CSMA/CA: DCF mode operation - Throughput vs offered load - comparison with CSMA/CD performance

RING Topology:
Token Ring: Throughput vs average packet delay at various loads and timeout values, performance comparison with CSMA/CD

3.) DLL: Observe and measure the performance of various DLL protocols by changing the network load, various timeout period, introducing bit errors and compare them
- Stop-and-Wait: Throughput vs BER for different packet lengths and timeout values
- Sliding Window – Go-Back-N: Pipelining concept – through- put vs BER for different packet lengths and timeout values – comparison with Stop-and-Wait
- Sliding Window – Selective-Repeat: Pipelining with selective re-transmissions concept – throughput vs BER for different packet lengths and timeout values – comparison with Go-Back-N

4.) Network Layer: Study of Routing Protocols
- Distance Vector routing: Hop-by-hop routing, routing table updation, count-to-infinity problem exposure
- Link State routing: Routing table updation, effect of shortest path algorithm, comparison with DV routing

5.) Application Layer:
- File transfer using sockets: TCP connection establishment, session management

6.) Serial/Parallel port networking: Simple network connectivity using serial and parallel ports in a PC, setup TCP/IP communication through PPP

7.) Data security in computer networks:
- Data protection: RC4 symmetric stream cipher-key generation, encryption-decryption steps
- Network threat: Sniffing of raw data and encrypted data in a LAN

8.) STAR Topology (Optional):
- ALOHA, CSMA, CSMA/CD, Stop & Wait and Sliding Window GBN protocols performance in STAR topology
- Switching in LAN: Switching at Layer 2, self-learning using Baran's backward learning algorithm

SUGGESTED PROJECTS

The following projects can be undertaken with the user detailing the specification and implementation:
- CSMA/CA – PCF mode
- CSMA/CA – Add-hoc network
- Sliding Window – Jumping Window
- Routing in a Mesh WAN Network Management Spoofing in a LAN

FEATURES

- Comprehensive set of experiments to observe and measure the behaviour of several LAN protocols:
  MAC Layer: ALOHA, CSMA, CSMA/CD, CSMA/CA, Token Bus, Token Ring, Star Data Link Layers: Stop-and-Wait, Sliding Window – Go-Back-N and Sliding Window – Selective-Repeat
- User configurable data rates – 8, 16, 32, 64,128, 256, 512 Kbps, 1Mbps
- Generation of Bit errors and Frame errors between nodes – up to 10-6
- Variable Network size - up to six nodes with each NEU. NEUs can be cascaded to increase the network size
- Emulation of two nodes by each PC. Halves the number of PCs required
- User configurable delays between nodes - emulates the propagation delay in real networks
- Allows experimentation using the software provided; source code included for better understanding. Allows programming all experiments from scratch using the library, for more in-depth exposure
- Menu driven user interface to experiments
- Comprehensive manual - suitable for both lab instruction as well as self-study, requiring minimal involvement on the part of the lab staff

Developed with IIT Madras

SPECIFICATIONS

Experiment Software
- LAN Trainer Shell - provides a menu-driven interface to the experiments
- C Library – programming interface to the NIU
- Stand-alone programs for Level 1 experiments. Source code provided for study and analysis
- Saving of experiment results to a file
- Display of experiment activities in the application window, wherever applicable

Hardware
- Network Emulator Unit (NEU)
  - Data rates: 8, 16, 32, 64,128, 256, 512Kbps,1Mbps
  - Topology: Bus, Ring, Star
  - Delay: 0 to 15 bits between each pair of nodes
  - Error Generators: Bit Error - 0 to 10-6
                          Frame Error - 0 to 10-5
  - Nodes: 6 nodes per NEU (3 PCs can be connected per NEU. Each PC acts as 2 nodes)
- Network Interface Unit (NIU)
  - PC plug-in card: 32 bit, 33 MHz PCI Bus (PCI ver 2.0 compliant)
  - MAC Layer support: ALOHA, CSMA, CSMA /CD, Token Bus, Token Ring
  - Nodes: 2 nodes per NIU

Specifications subject to change without notice

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ORDERING INFORMATION

LAN-T comprising:
- Network Emulation unit (NEU)   – 1
- Network Interface Unit (NIU)   – 3
- Experiment software with libraries and source code of available experiments
- Manuals:
  User manual   – 1
  Installation manual   – 1
  Programmer's manual   – 1

Option – STAR Topology:
- Star dongle   – 1
- Network Interface Unit (NIU)   – 1
- User Manual   – 1

SYSTEM REQUIREMENTS

PC: Pentium or higher
One PCI slot required
512 MB RAM
Operating System: Windows XP or Windows 2000
Number of PCs: 2, 3
Visual C++ compiler: V5.0 or above
(Optional for programming/modifying experiments as suggested in exercise and for further development)

For further information on Feedback equipment please contact ...

Feedback Instruments
5 & 6 Warren Court
Park Road, Crowborough
East Sussex
TN6 2QX
United Kingdom
Tel: +44 1892 653322
Sales: sales@feedback-instruments.com
Website: www.feedback-instruments.com

Feedback reserves the right to change these specifications without notice.