Inter-networking and Internet working with Bridges, Routers and Switches

A four-day seminar

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Seminar Outline

1.- The OSI 7 layers model for communications networks

- the issue
- what and how
- layer 1 - 7
- data flow

2.- Extended Networks

3.- Internetworking Relays

4.- The Repeater

- types of repeaters
- conclusions

5.- The Bridge

- types of bridges
- the learning process
- bridges dilemma

- IBM: Source routing algorithm
- DEC: Spanning tree algorithm
- SR - TB bridging
- SRT bridging
- Bridging between different types of LAN
    - the need
    - the problem
    - LAN frame formats (Ethernet, IEEE 802.3, IEEE 802.2)
        - Ethernet
        - IEEE 802.3
        - IEEE 802.2
        - SNAP
        - IEEE 802.2 over IEEE 802.X or FDDI
        - TCP/IP over IEEE 802.2
        - Summary of frame formats
    - Option 1: Encapsulating bridging
        - Advantages / Disadvantages
    - Option 2: Flat Bridging
        - LAN X to Central LAN bridging
            - case a: transparent bridging
                - example: IEEE 802.5 to FDDI
                - example: IEEE 802.3 to FDDI
                - example: IEEE 802.3 to IEEE 802.11
            - case b: translation bridging
                - the problem
                - the solution
                - the ARP / RARP case
                    - the problem
                    - the solution
            - case c: tunnel encapsulation bridging
                    - the problem
                    - the solution

- Summary of bridging techniques
- case d: CSMA/CD LANs bridging
    - bridging algorithm
- Summary of frame formats
- Conclusions

- Central LAN to LAN Y bridging
- case a: transparent bridging
- case b: Central LAN to CSMA/CD LAN bridging
    - bridging algorithm
- Conclusions for the case LAN X, LAN Y = CSMA/CD (Ethernet / IEEE 802.3)
- Some more issues

6.- The Router (in the TCP/IP world)

- The need for routers
- Basic Operation
    - LAN to LAN routing
    - LAN to leased line
    - LAN to LAN via WAN
- Basic routing process
    - Station identifiers
    - Stations on same LAN
    - Stations on LANs separated by bridges
    - Stations on LANs separated by routers
    - Summary flow chart
- Internetworking definitions
- Internetworking aspects
- Main IP routing documents (RFC)
- History of the Internet
- The user connection
- Basic connectionless service
    - Addresses

- Class-based, IPv4
    - Special addresses
    - Multicasting
    - Subnetting
    - Conclusions
- IPv6
- CIDR
- Conclusions

- Other fields in the IP header
  - IPv4
    - Fragmentation
  - IPv6

- Autonomous systems (AS)
- Intra-domain issues
  - Neighbor greeting
  - Routing tables
    - classless environment
    - updating routing tables
  - Routing protocols
    - Distance Vector routing
    - Link State routing
    - Link State vs. Distance Vector
    - RIP
    - OSPF
    - IS-IS
    - IGRP, E-IGRP
    - Resolving a datagram
      - RIP environment
      - OSPF environment
- Inter-domain Issues
  - Routing tables
  - Routing protocols

- BGP
- Intra-domain and inter-domain routing protocols interaction
- Domain Name System (DNS)
  - DNS tree
  - Name servers hierarchy
  - Root name servers
  - Resolving a domain name
- Dynamic Host Configuration Protocol (DHCP)

7.- The Switch

- Hub
- Layer 1 switching
- Layer 2 switching
  - VLAN
  - VLAN tagging
    - IEEE 802.1.Q
    - IEEE 802.1.p
    - IEEE 802.1.Q-in-Q
- Layer 3 switching
- Layer 4 identifiers
- Network Address translation (NAT)
- Layer 4 switching - NAPT