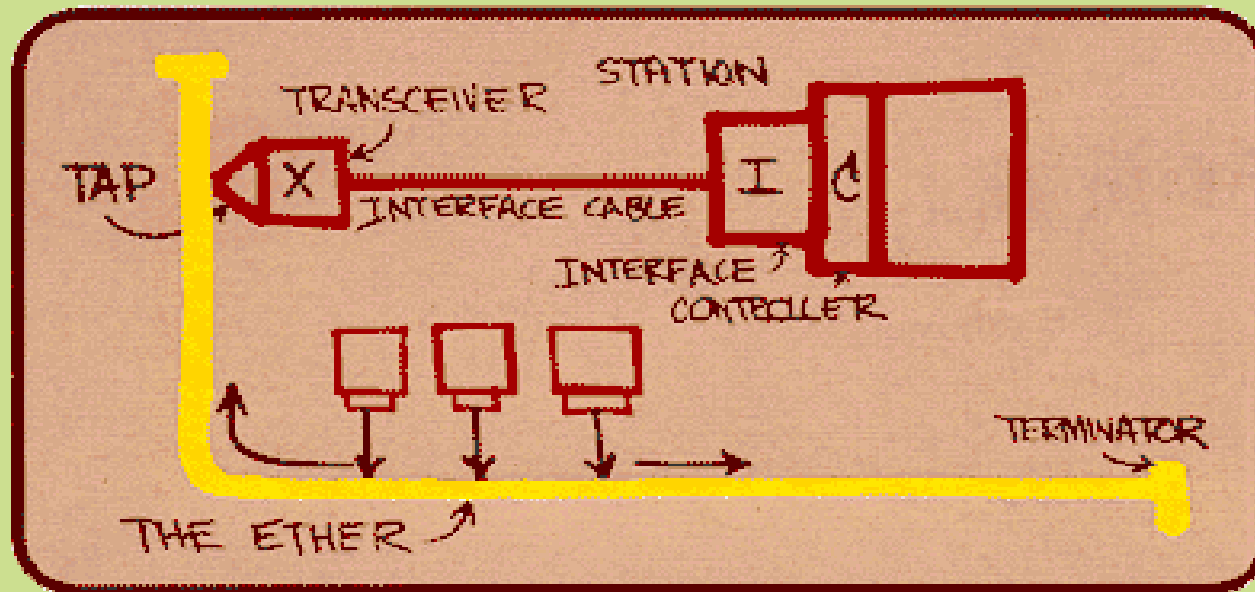


# IP For The Technician



Original Ethernet design as drawn by Bob Metcalf, Ethernet creator.

Presented by Stuart Strong



# Networking

- Protocols: set of rules governing a connection
- Each network device (node) must be unique
- Each unique node must be a member of a network group (domain)
- Most common cause of network issues is human error

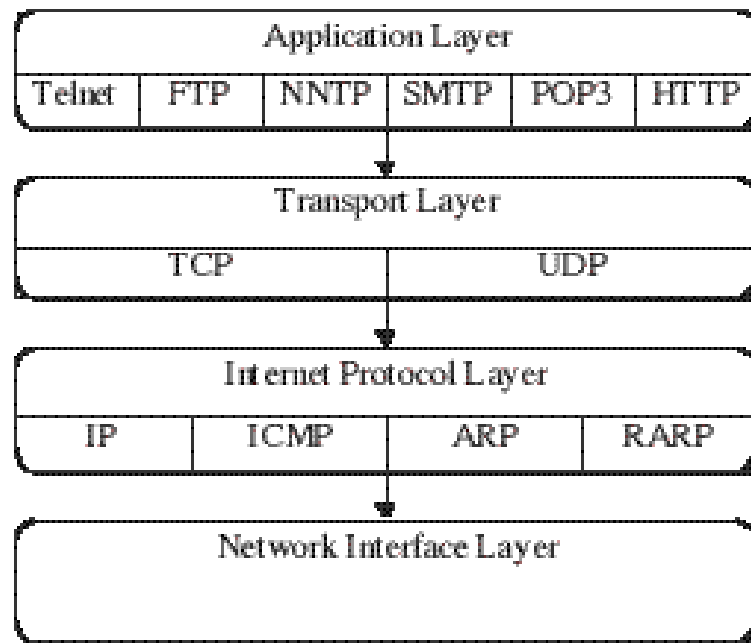


# How networks work

- A computer program creates data
- Data is moved down through the layers of the operating system
- Layer 4, Transport
  - Protocol is TCP UDP
    - Layer 4 controls the **sessions** between computers
    - Port numbers are used to track different conversations/sessions
    - Windows operating systems use a Socket API to implement network access

# IP basics

- Protocols include Dynamic Name Service (DNS)
  - Matches domain names to IP addresses





# IP basics

- Layer 3 Network
- Globally unique addresses based on:
  - An address 10.10.10.10
    - 32 bits 4 octets separated by periods
  - And a subnet mask 255.255.255.0
    - 32 bits
    - CIDR notation (/24)
- Data is encapsulated in packets



# Local area subnets

- Layer2 data link
  - Local network scope
    - No IP address, unique based on:
      - Media Access Control (MAC) address
        - » The first ½ is the manufacturers ID
        - » The last is unique to the local network



# Datalink protocols

- Virtual local area network
  - A switch based Datalink layer protocol to keep information streams separate based on Media Access Control (MAC) tables
  - Creates a broadcast domain
  - Use spanning tree or ring technologies to avoid switching loops



# Network problem solving

- Three approaches
  - Start from the bottom and work up
  - Start from the top and work down
  - Split the problem into smaller pieces
- Start where you can and work toward the most likely direction
  - Requires a baseline knowledge
  - Requires network mapping to develop knowledge





# Network problem solving

- Establish a base line of what is normal
- Do the easiest first
  - Are the lights on?
    - Bottom up approach
  - No lights?
    - Start with power and connections
  - Lights on? Are they flashing?
    - Can you browse the WEB?
    - Top down approach



# Network startup

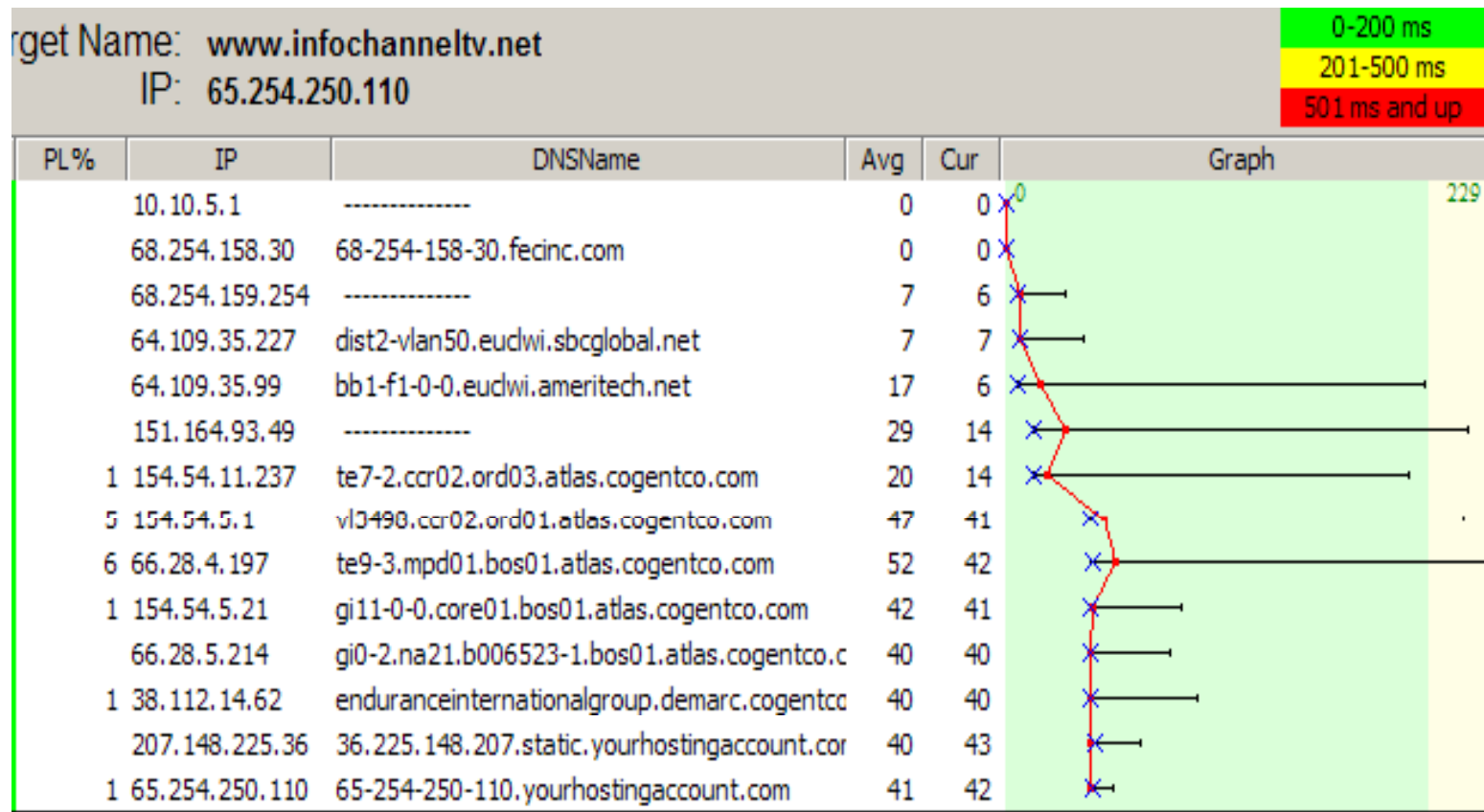
No. -	Time	Source	Destination	Protocol	Info
7	3.131089	0.0.0.0	255.255.255.255	DHCP	DHCP Request - Transaction ID 0xe4ec99aa
8	3.132517	10.10.5.10	255.255.255.255	DHCP	DHCP ACK - Transaction ID 0xe4ec99aa
9	3.142194	Dell_c3:82:8c	Broadcast	ARP	Gratuitous ARP for 10.10.5.127 (Request)
10	3.277155	Dell_c3:82:8c	Broadcast	ARP	who has 10.10.5.10? Tell 10.10.5.127
11	3.277295	Intel_da:eb:9f	Dell_c3:82:8c	ARP	10.10.5.10 is at 00:02:b3:da:eb:9f
12	3.277305	10.10.5.127	10.10.5.10	DNS	Standard query A wifinleydc01.Finleywisconsin.local
13	3.277564	10.10.5.10	10.10.5.127	DNS	Standard query response A 10.10.5.10
14	3.341162	10.10.5.127	10.10.5.10	TCP	3589 > epmap [SYN] Seq=0 Len=0 MSS=1460
15	3.341366	10.10.5.10	10.10.5.127	TCP	epmap > 3589 [SYN, ACK] Seq=0 Ack=1 win=16384 Len=0 M

- Dynamic Host Control Protocol (DHCP)
- Transfers network (group) settings to machines starting up
- Address Resolution Protocol (ARP) match Media Access Control (MAC) with Internet Protocol (IP) addresses
- Windows, Start, Run, CMD, ARP –a Windows, ipconfig /all



# Network problem solving

On networking equipment you need a physical/logical map of the network



The map does not have to be exhaustive. *Graphic from PingPlotter.*



# Network problem solving

- Your network map must contain your problem space
- To start network documentation use the show command
  - Show arp for ethernet
  - Show Interface for connection settings
  - On switches Show VLAN
    - Switches that have the same broadcast domain
    - Usually a member of the same subnet
- To check the Network layer
  - Tracert, Ping plotter



# Network access

- How fast is the network?
  - As fast as the slowest link
  - Always runs at a constant “speed”
- Better question is: What kind of throughput are you getting?
- Better yet: How many packets are you dropping?



# Network measurement

- What is a normal day on the Internet?
- How good is the network?
  - You need a description of
    - Speed
    - Capacity
    - Distortion of transactions
    - Latency
    - Jitter
    - Loss rate