University of Massachusetts Amherst

ECE697AA – Lecture 6

Network Measurement

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Network Measurement

- Why do we want to measure in the network?
  - Understand/fix operational problems
  - Understand protocol behavior
  - Identify performance problems
  - Observe anomalies
  - Record long-term trends
  - Experiment with new applications/protocols
- Where should we measure?
- What should we measure?
- How should we measure?

Active vs. Passive Measurement

- Active measurement
  - Injects “probes” into the network
  - Measurement can be directed
    - » Destination
    - » Path (limited)
  - Might require end-system support
- Passive measurement
  - Observation of traffic on a node/link
  - Collection of all packets traversing node
    - » Typically packet headers
    - » Packet payload possible
  - Myopic view of network
- Control plane measurements
  - BGP tables

Examples of Active Measurement

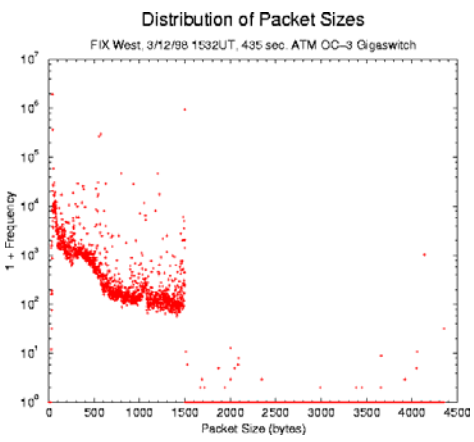
- Connectivity
  - “ping”
- Path discovery
  - “traceroute”
- Bandwidth discovery
  - Packet train analysis
- Delay measurement
  - “ping”
- End-system probing
  - Port scan
  - Etc.

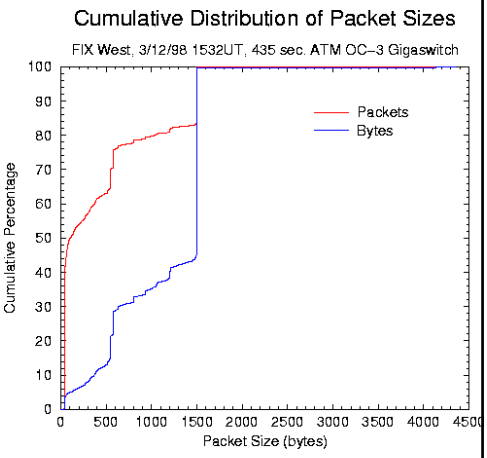
Examples of Passive Measurement

- Statistical results
  - Distribution of protocols
  - Distribution of applications
  - Etc.
- Flow-based results
  - Number of active flows
  - Flow size
  - Etc.
- Connection-based results
  - TCP throughput
  - RTT
  - Etc.

Packet size distribution

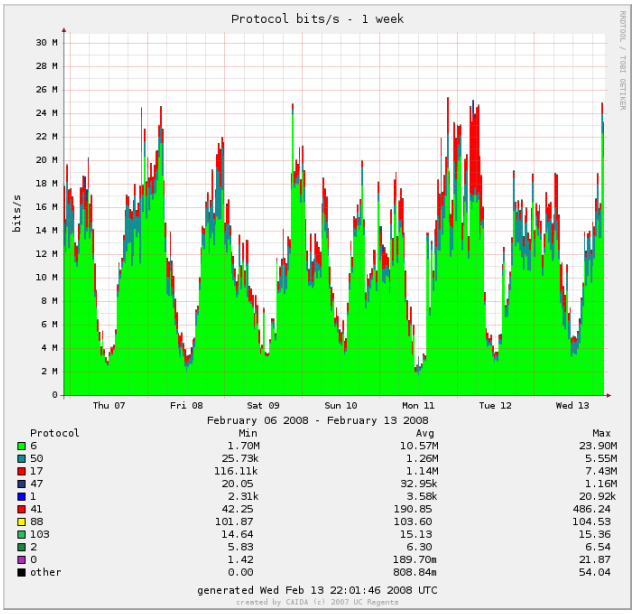
- From: http://www.caida.org/analysis/learn/packetsizes/





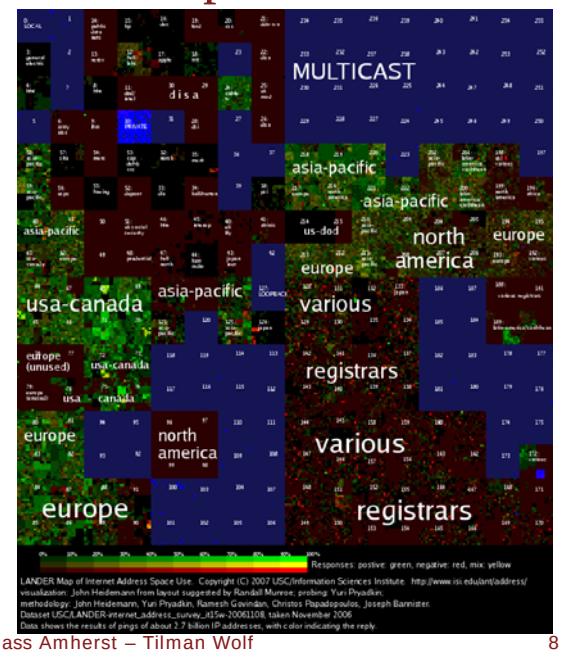
Protocol distribution

- From: http://www.caida.org/data/realtime/passive/?monitor=sdnap



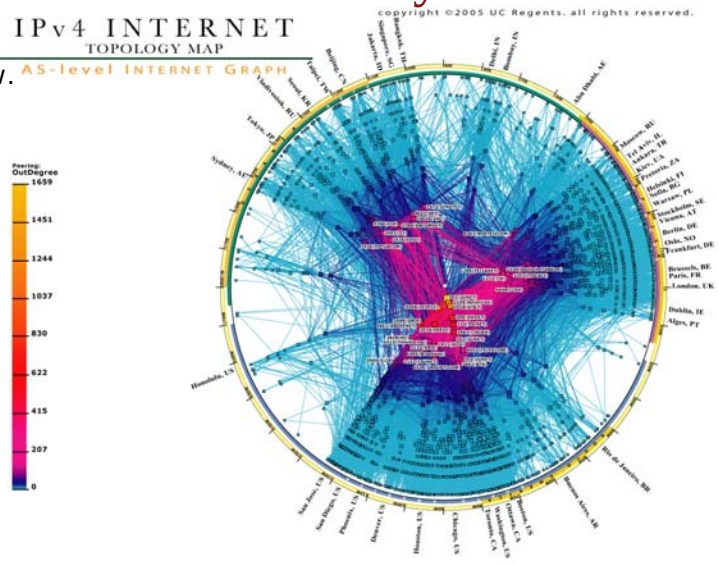
IP address space

- From: http://www.isi.edu/ant/address/



Core Autonomous Systems

- From: http://www.caida.org/analysis/topology/as_core_network/



Demos/tools

- Realtime network monitor
  - http://www.caida.org/data/realtime/index.xml
- AS topology
  - AS video: http://www.caida.org/publications/animations/active_monitoring/as_core.mpg
  - AS map: http://www.caida.org/research/topology/as_core_network/
  - Animated changes: http://www.caida.org/publications/animations/active_monitoring/animAS.20000702-20020120.gif
- Maps
  - Backbone networks: http://www.caida.org/tools/visualization/mapnet/Backbones/
- Network protocol analyzer:
  - Ethereal/wireshark: http://www.wireshark.org/

Assignments

- Read
  - Kurose & Ross: Chapter 4.3
- SPARK
  - Assessment quiz