ISM 50 - Business Information Systems
Lecture 18

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Class announcements
- Database Assignment due today!
- Business Papers due next week!
- Read "IT Doesn't Matter" for next Wednesday
- Student Presentations June 1st Wednesday
  - Karina Sainz
  - Stephen Moss?

Outline For Today
- Class Announcements
- Student Presentation
- Networks
- Akamai

Student Presentation
- Michael Connare (News Article)

Routing in the Internet

Routing
- Updating the routing table
- Objective: each packet gets closer to destination
Packet forwarding
- Transmitting each packet on the appropriate output link
- Based on routing table

Many feasible paths from source to destination.
Routing Algorithms
Routers talk to each other to build their routing tables.

Internet Routing is Hierarchical
Autonomous System (AS)
Backbone or NSP (MCI, ATT)
ISP or IAP (CRUZIO, AOL)
Customer AS

Today Internet Billing done between ASes
- Customer pays an ISP
  - Often Flat Rate per month
- ISP pays a backbone AS
  - Often just flat rate, dependent on access link speed.
- Backbone NSPs peer with each other
  - Often for free is they exchange comparable amounts of traffic.
- Overall...
  - Internet billing is much more course grained than telephone billing.

Routing Table has Wild Cards

Routing Concerns
- Long routes
- Circular routes
- Hijacking routes
- Route flapping

Domain Names
IP addresses are inconvenient for people
- 32 bits hard to remember
- 128 bits very hard to remember
Domain names
- e.g. argus.eecs.berkeley.edu
- Easier to remember than IP addresses
- However, we need some way of mapping domain names to IP addresses.
Domain Name System (DNS)

Hierarchy in Addresses vs. Names

Addresses hierarchical in topology
- Maximize "wild cards" and distribute address administration

Names hierarchical in administration
- Single administered organizations often distributed topologically (e.g. ibm.com)

Transport Protocols

- The Internet is unreliable
  - It will make a "best effort" to get your packet to its destination
- Packets can be lost because of
  - Congestion
  - Link errors
  - Routing problems

Transmission Control Protocol (TCP)

Retransmit mechanism for reliability
- Receiver sends acknowledgements to sender
- If a packet is lost, source fails to get ACK, and then retransmits.
- Congestion control
  - If congestion perceived (by lost packets)
  - Source reduces its send rate

TCP cont'd

- TCP port numbers
  - TCP Header has a "port" number field
  - Helps host sort out how to route packets to applications

UDP

- For some applications packet retransmissions are not worthwhile
  - Why?
- For those applications, we use UDP
- UDP is a transport protocol that
  - Does not do retransmissions
  - Does not do congestion control
**OSI Layers**

- **Application**: Internet Explorer, Outlook Email, Real Player, ...
- **Presentation**: ...
- **Session**: TCP, UDP
- **Transport**: Internet Protocol (IP), ...
- **Network**: Ethernet, Wi-Fi, SONNET, ...
- **Link**: Modulation Schemes: QAM, OFDM, etc...
- **Physical**

**Some Typical Topologies**

**Home Network**

- Ethernet
- Wifi
- DSL Modem
- Telephone

**Small/Medium Business**

- DSL Modem
- T1 Line
- Ethernet Switch
- Web Site Server

**ISP Topology**

- PON (Passive Optical Network)
- DSLAM
- NAP (Network Access Point)
- Local Loop

**Network Service Provider**

**Large E-Business**

- Load Balancer
- Web Servers
- Application Servers
- Databases
- Customers
- Merchandise
- Orders

Interconnected with Gigabit Ethernet or other technology
Web Caching

- Speed up web page loading by storing previously seen components locally

http://www.ucsc.edu

Web Caching can also Happen at
Proxy Server at ISP

Break

QUIZ 3: Akamai Case Study

1) Akamai’s is a
   A) Content Distribution Network (CDN) company
   B) Maker of Routers
   C) Database Management System
2) Akamai’s founding scientists were from
   A) Berkeley
   B) Stanford
   C) MIT
3) Akamai’s first product was called
   A) NetFlow
   B) FreeFlow
   C) Inktomi

Akamai case Presentation

Shira Ben-Or
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