

Beginning System Administration DeCal

Week 4

March 1, 2010

I just the other day got, an internet was sent by my staff at 10 o'clock in the morning on Friday and I just got it yesterday. Why?

Because it got tangled up with all these things going on the internet commercially...

They want to deliver vast amounts of information over the internet. And again, the internet is not something you just dump something on. It's not a truck.

It's a series of tubes.

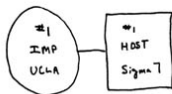
And if you don't understand those tubes can be filled and if they are filled, when you put your message in, it gets in line and its going to be delayed by anyone that puts into that tube enormous amounts of material, enormous amounts of material.

Former senator, Ted Stevens

(Brief) History of the Internet

- 1958 - Advanced Research Projects Agency (ARPA)
- ARPANET
 - Private military communications network
- 1988 - Commercial networks gain access to ARPANET
- 1990s - World wide web created by CERN.

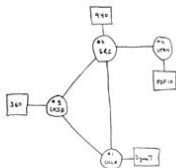
<http://blog.icann.org/?p=115>



THE ARPA NETWORK

SEPT 1969

1 NODE



THE ARPA NETWORK

DEC 1969

4 NODES

The OSI Model

- Open Systems Interconnection
- The basic reference model
- 7 layers but we focus primarily on 3 of the layers.
- Physical Layer
 - Wires, hardware, equipment
- Transport Layer
 - Protocols for communication
 - “Hello? Are you there?”
 - TCP, UDP
- Application Layer
 - How do I read the data?
 - HTTP (web), SMTP (email), BitTorrent

Administrivia

- If you haven't created an OCF account, do so **ASAP** as you will need one to do this week's lab.
- Be sure to turn in labs in addition to HW.
- Must complete majority of labs and homework for a Pass.
- Attendance also impacts grade.
- Read everything!

Physical Layer

- Standalone Networks
 - AT&T, Verizon, Sprint
- Lots of wires
 - Ethernet, Fiber Optics
- Routers and Peering Points
 - How do I cross the web?

<http://flickr.com/photos/digitalslurp>



The internet's undersea world

The vast majority of the world's communications are not carried by land fibre but by submarine cable systems. As a ship can literally sail over and under the ocean, this map shows how not only an collection of wires of fibre that cross distances to link us all together

Fibre-optic submarine cable systems

Legend

Planned

Completed

Operational

Under construction

Proposed

Planned

Completed

Operational

Under construction

Proposed

Planned

Completed

Operational

Under construction

Proposed

Planned

Completed

Operational

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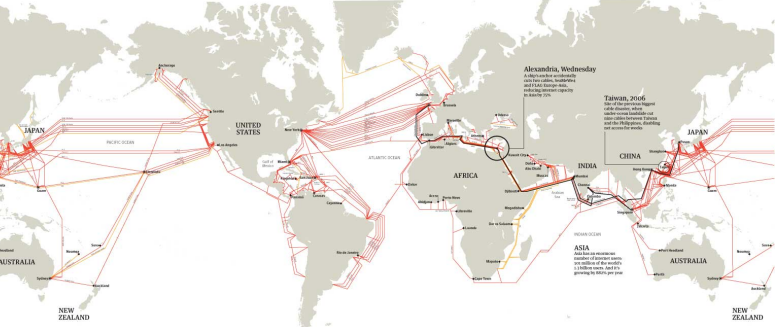
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Alexandria, Wednesday

A ship's hull can actually cut a cable, breaking it and taking it out of service. This is why cables are buried under the seabed.

Taiwan, 2006

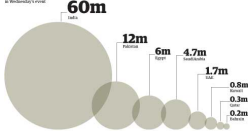
One of the greatest things about the industry, which has become a hotbed of innovation, is that it has become a global industry.

ASIA

Asia has the most submarine cables in the world, and is growing by 10% per year.

Internet users affected by the Alexandria incident

The main routes affected by the incident in Egypt



World cable capacity

The world's capacity to carry data is growing rapidly. This is due to the fact that the world's capacity to carry data is growing rapidly.



What makes up "used capacity"?



The longest submarine cables

The world's longest submarine cables are the Transatlantic Express, the South Atlantic Cable, and the Asia-Europe Gateway.

Transatlantic Express	20,000 km
South Atlantic Cable	19,475 km
Asia-Europe Gateway	18,000 km
South America 1	17,000 km

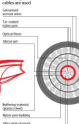
The world's cables in bandwidth

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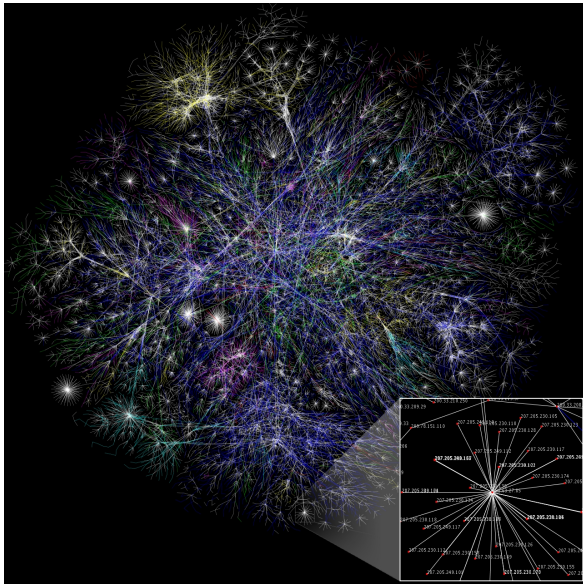
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Cross-section of a cable

A cross-section of a cable shows the various layers and components that make up the cable's structure.



<http://image.guardian.co.uk/sys-images/Technology/Pix/pictures/2008/02/01/SeaCableHi.jpg>



http://upload.wikimedia.org/wikipedia/commons/d/d2/Internet_map_1024.jpg

Transport Layer

- Transmission Control Protocol (TCP/IP)
 - Reliable, in-order delivery
- User Datagram Protocol (UDP)
 - Short messages, non-guaranteed delivery
- Internet Protocol (IP)
 - Actually a part of the Link Layer, but we'll let that slide for simplicity.
 - IPv4 address: `xxx.xxx.xxx.xxx`
 - Each `xxx` is between 0-255.
 - 4,294,967,296 addresses!
 - <http://technical.cns.berkeley.edu/internet/access/ucb-nets.shtml>
 - IPv6: 3×10^{38} addresses!

Application Layer

- Domains
 - Internet Corporation for Assigned Names and Numbers (ICANN)
 - `www.ocf.berkeley.edu = 192.58.221.243`
- DNS Servers
- Protocols
 - Web Browsers - HTTP
 - Mail - SMTP/IMAP/POP3
 - P2P - BitTorrent, GNUtella, Usenet, Winny, Skype

Extra Topics

- Firewalls
- Network Services
- IP Allocation
- Network Neutrality