



Master of International Business and Entrepreneurship

## Networking Core Concepts

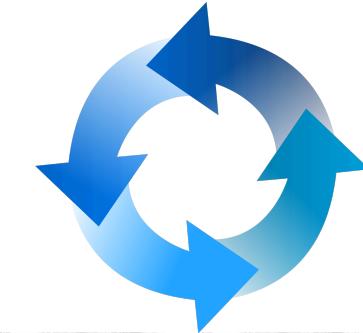
Information Systems for Managers

## Learning Objectives

- ❖ Understand and be able to describe the different computing architectures in use today.
- ❖ Understand the cloud computing architecture and be able to articulate its implications for organizations.
- ❖ Be able to define and describe computer networks and their elements.
- ❖ Understand how communication protocols work and be able to articulate their importance in communication networks.
- ❖ Be able to differentiate the Internet from the services available on it.
- ❖ Be able to explain how the Internet works using appropriate terminology.

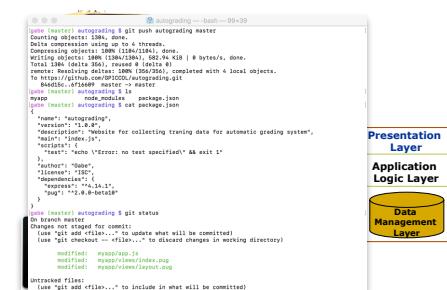
## Computing Architectures

- ❖ Mainframes and terminals
- ❖ Personal computers and workstations
- ❖ The client server model
- ❖ Cloud computing



## Mainframes and Terminals

- ❖ A centralized computing architecture.
- ❖ All components of all the applications are centralized.
- ❖ Multiple end-users share processing time on the mainframe, using 'dumb' terminals.
- ❖ Dumb terminals: Input / output device, with no computing power, used to access a mainframe.
- ❖ Terminal software enables access to modern mainframes.



## Personal Computing

- ❖ A distributed computing architecture.
- ❖ All processing is performed independently on end-users' machines.
- ❖ Each personal computer houses all three components of the applications.
- ❖ No network connectivity is needed for stand-alone computers to perform computations.
- ❖ Data sharing occurs through the "snickers net".



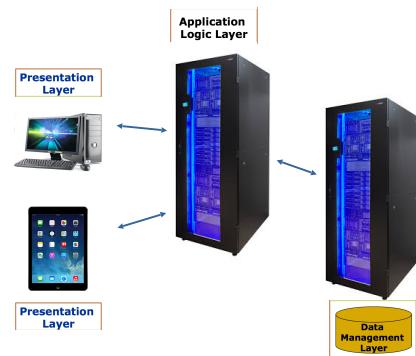
## Client Server Model

- ❖ A shared computing architecture: It leverages computing power at both the server and client side.
- ❖ Server: A software program that provides a resource to other programs - the clients.
  - ❖ File servers, print servers, mail servers.
  - ❖ Colloquially, but incorrectly, used for hardware.
- ❖ Client: A software program that accesses a resource from another program - the server.



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- ❖ Client: A software program that accesses a resource from another program - the server.
- ❖ Main advantages:
  - ❖ Resource sharing
  - ❖ Ease of use



Three Tier Architecture

## Cloud Computing Architecture

- ❖ An extension of the client-server computing model
- ❖ It implies the access of remote resources over the Internet.
- ❖ Dynamic and agile utilization:
  - ❖ Available resources scale with needs
  - ❖ Both the type and amount of resources will scale with the client needs
- ❖ Utility billing. You only pay for what you use.



<https://aws.amazon.com/products/?hp=tile&so-exp=below>

## Commodity Servers

In the 10 years between Excite and JotSpot, hardware has literally become 100X cheaper. It's two factors – Moore's law and the rise of Linux as an operating system designed to run on generic hardware. Back in the Excite days, we had to buy proprietary Sun hardware and Sun hard drive arrays. Believe me, none of it was cheap. Today, we buy generic Intel boxes provided by one of a million different suppliers.



Joe Krause, Google Ventures (2005)



Google 2004

“We knew that the largest consumers of infrastructure would be large enterprise because they spend more absolute dollars. But we also had a mental image of a college kid in his dorm room having the same access, the same scalability and same infrastructure costs as the largest businesses in the world.”



Andy Jassy, CEO Amazon

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Products Solutions Pricing Documentation Learn Partner Network AWS Marketplace Customer Enablement Events Explore More

**airbnb**

### Airbnb on AWS

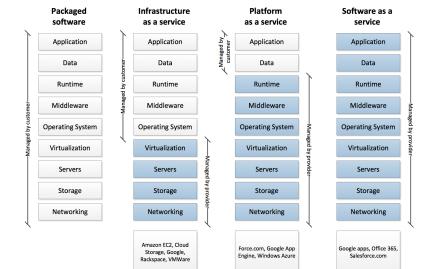
Founded in 2008, San Francisco-based Airbnb is a community marketplace with over 7 million accommodations and more than 40,000 unique Experiences for customers to book on the company's website or through its iOS and Android applications.

[Customer Stories](#) | [Architecture](#) | [Additional Resources](#)



## Cloud Computing Architecture

- ❖ Infrastructure as a Service (IaaS): The provider owns and manages the hardware.
- ❖ Platform as a Service (PaaS): The provider owns and manage the hardware, the operating system and system software.
- ❖ Software as a Service (SaaS): The provider owns and manages the 'full stack', from hardware to applications.



## Cloud Computing: Implications

- ◊ Enterprise software becomes more robust and cheaper thanks to economies of scale.
- ◊ Technology barriers to innovation are minimal (e.g., deploying a new App).
- ◊ Hardware devices with limited computing capability can perform very complex operations
  - ◊ Internet of Things (IoT).
- ◊ Physical products improve during their useful lifetime (e.g., Tesla cars).
- ◊ Outages, while rare, affect multiple systems and companies.



## Communication Network



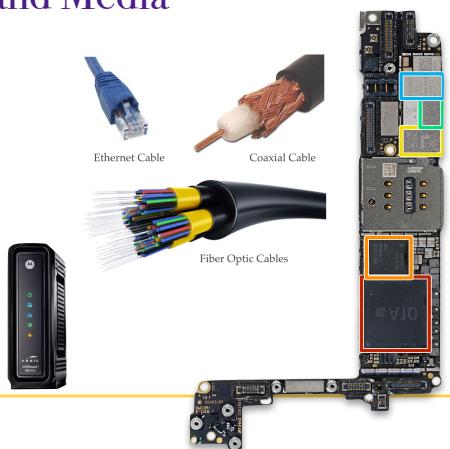
## Communication Network

- ◊ Network: A collection of interconnected nodes.
- ◊ Node: Any entity connected to the network.
- ◊ Elements of a communication network:
  - ◊ Sender
  - ◊ Receiver
  - ◊ Channel
  - ◊ Message
  - ◊ Language
  - ◊ Protocol



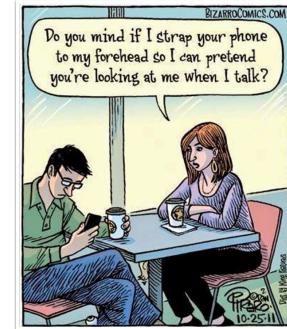
## Signals and Media

- ❖ Analog signal: Is a codified message represented as a continuous time varying variable that changes as a function of the quantity it encodes - its analogue.
- ❖ Digital signal: Is a codified message represented as a sequence of discrete values.
- ❖ MODulator - DEModulator (Modem)
  - ❖ Wired
  - ❖ Wireless



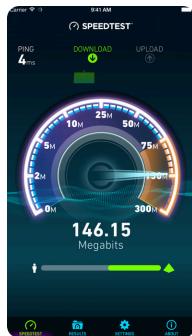
## Bandwidth and Protocols

- ❖ Protocol: An agreed upon set of rules or conventions governing communication among network nodes.
- ❖ Every service has a protocol:
  - ❖ HyperText Transfer Protocol (HTTP)
  - ❖ File Transfer Protocol (FTP)
  - ❖ Simple Mail Transfer Protocol (SMTP)
- ❖ Bandwidth: the rate of data transfer of a communication channel. Measured in bits per second (bps).



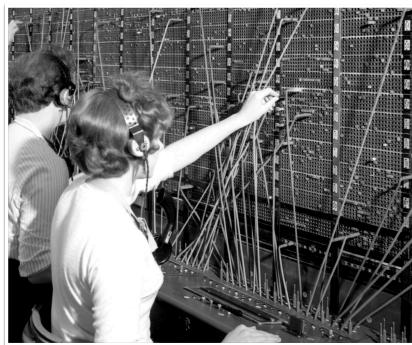
## Measuring Bandwidth

- ❖ Visit: <http://www.speedtest.net/>
- ❖ Or download the Speedtest by Ookla App
- ❖ Perform a test to measure bandwidth in upload and download.



## Circuit Switching

- ❖ A dedicated circuit is created between sender and receiver
- ❖ The circuit is dedicated for the duration of the transmission
- ❖ If no channel is available transmission cannot occur (busy signal)



## Packet Switching

- ❖ The message is subdivided into standard sized packets
- ❖ Each packet is
  - ❖ Self-contained
  - ❖ Independent
- ❖ Packets are reassembled at their destination into the original message
- ❖ Routers need only to be able to forward packets onward toward their destination



## IP Addressing and URLs

IP Address: 130.39.21.79

URL:

<http://dds.cct.lsu.edu/ddslab/pdf/rc.pdf>

http = protocol (e.g., ftp, http)

lsu.edu = domain name

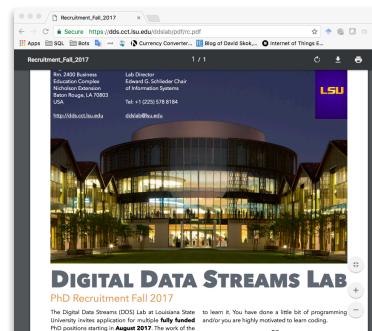
.edu = top level domain

dds.cct.lsu.edu = server at domain

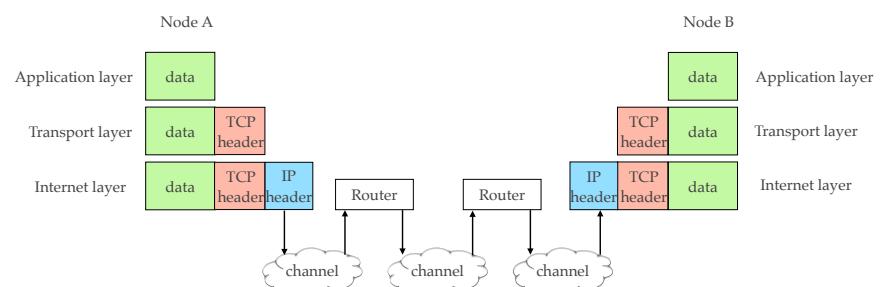
ddslab = a directory on server

pdf = a subdirectory on server

rc.pdf = a file containing html code



## Internet Protocol Suite



## Internet and Internet Services

- ❖ Internet: A **network of networks**
- ❖ Offering a multitude of **services**
  - ❖ Electronic Mail
  - ❖ World Wide Web
  - ❖ File Transfer Protocol
  - ❖ Streaming Audio/Video
  - ❖ Voice over IP/Messaging
- ❖ With **distributed ownership**
- ❖ Connecting **different devices** (device agnostic)
- ❖ Characterized by **open standards**



## What We Learned

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