Chapter 5

IT INFRASTRUCTURE AND EMERGING TECHNOLOGIES

VIDEO CASES

Case 1: ESPN.com: Getting to eXtreme Scale on the Web
Case 2: Salesforce.com: Managing by Smartphone
Case 3: Hudson’s Bay Company and IBM: Virtual Blade Platform

Instructional Video 1: Google and IBM Produce Cloud Computing
Instructional Video 2: IBM Blue Cloud is Ready to Use Computing

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Management Information Systems
Chapter 5: IT Infrastructure and Emerging Technologies

IT Infrastructure

• IT infrastructure:
  – Set of physical devices and software required to operate the firm
  – Set of firmwide services including:
    • Computing platforms providing computing services
    • Telecommunications services
    • Data management services
    • Application software services
    • Physical facilities management services
    • IT management, education, and other services

  “Service platform” perspective
  – More accurate view of value of investments

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Evolution of IT infrastructure (cont.)

– Enterprise computing era: 1992 to present
  • Move toward integrating different networks, applications using Internet standards
  • Combining several networks into an enterprise wide network

– Cloud and mobile computing: 2000 to present
  • Cloud computing: computing power and software applications supplied over the Internet or other network
  – Fastest growing form of computing

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• Evolution of IT infrastructure
  – General-purpose mainframe and minicomputer era: 1959 to present
    • 1958: IBM first mainframes introduced
    • 1965: less expensive DEC minicomputers introduced

  – Personal computer era: 1981 to present
    • 1970’s: MITS Altair B800, Xerox Alto and Apple II
    • 1981: Introduction of IBM PC – widely adopted by American businesses

  – Client/server era: 1983 to present
    • Desktop clients networked to servers, with processing work split between clients and servers
    • Network may be two-tiered or multitiered (N-tiered)
    • Various types of servers (network, application, Web)

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IT Infrastructure

• IT infrastructure:
  – Shared technology resources that provide the platform for the firm’s applications
  – Investments in Hardware and Software = $3.6 trillion (including internet services, data transmission, etc.)
  – Investments in business processes & consulting = $400 billion
  – IT Infrastructure investments = 25 to 50% of IT expenditures for large firms

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Illustrated here are the typical computing configurations characterizing each of the five eras of IT infrastructure evolution.

**FIGURE 5-2**

- **STAGES IN IT INFRASTRUCTURE EVOLUTION**

**IT Infrastructure**

- **Cloud Computing**
  - Provides access to a shared pool of computing resources over a network or even the Internet.
  - Including Computers, Storage, Applications and Services
  - Can be accessed “as needed”
  - Companies are spending $109 billion on public cloud services in 2012 and estimated $207 by 2016 making Cloud computing is the fastest growing form of computing

**FIGURE 5-3**

- **A MULTITIERED CLIENT/SERVER NETWORK (N-TIER)**

**IT Infrastructure**

- **Cloud Computing**
  - Hundreds of Thousands computers are located in cloud data centers.
  - These computers are accessed by iPads, laptops, smartphones and other client machines (personal and corporate)
  - IBM, HP, Dell, Amazon provide Cloud services for computing power and data storage for those firms who want to maintain their IT infrastructure remotely.

**FIGURE 5-4**

- **Moore’s law and microprocessing power**
  - Microprocessor power doubles every 18 months
Law of Mass Digital Storage

- The amount of data being stored each year doubles.
- However, the cost of storing data is falling exponentially:
  - One Dollar in 1955 could store 1 Kb.
  - At $90 for 2 Tb External Hard Drive in 2015.
  - One Dollar in 2015 can store 22.2 Gb = 22,200 Mb = 22,200,000 Kb.

Technology drivers of infrastructure evolution (cont.):

- Metcalfe’s Law and network economics:
  - Value or power of a network grows exponentially as a function of the number of network members.
  - As network members increase, more people want to use it (demand for network access increases).

Technology drivers of infrastructure evolution (cont.):

- Declining communication costs and the Internet:
  - An estimated 2.3 billion people worldwide have Internet access.
  - As communication costs fall toward a very small number and approach 0, utilization of communication and computing facilities explodes.

IT Infrastructure has seven main components:

1. Computer hardware platforms
2. Operating system platforms
3. Enterprise software applications
4. Data management and storage
5. Networking/telecommunications platforms
6. Internet platforms
7. Consulting system integration services
• Computer hardware platforms
  – Client machines
    • Desktop PCs, mobile devices—PDAs, laptops
  – Servers
    • Blade servers: ultrathin computers stored in racks
  – Mainframes:
    • IBM mainframe equivalent to thousands of blade servers
  – Top chip producers: AMD, Intel, IBM
  – Top firms: IBM, HP, Dell, Sun Microsystems

• Operating system platforms
  – Operating systems
    • Server level: 65% run Unix or Linux; 35% run Windows
    • Client level:
      – 90% run Microsoft Windows (XP, 2000, CE, etc.)
      – Mobile/multitouch (Android, iOS)
      – Cloud computing (Google's Chrome OS)
  – Enterprise software applications
    – Enterprise application providers: SAP and Oracle

• Data management and storage
  – Database software:
    • IBM (DB2), Oracle, Microsoft (SQL Server), Sybase (Adaptive Server Enterprise), MySQL
  – Physical data storage:
    • EMC Corp (large-scale systems), Seagate, Maxtor, Western Digital

• Networking/telecommunications platforms
  – Telecommunication services
    • Telecommunications, cable, telephone company charges for voice lines and Internet access
    • AT&T, Verizon
  – Network operating systems:
    • Windows Server, Linux, Unix
  – Network hardware providers:
    • Cisco, Alcatel-Lucent, Nortel, Juniper Networks

• Grid computing
  – Connects geographically remote computers into a single network to combine processing power and create virtual supercomputer
  – Provides cost savings, speed, agility

• Cloud computing
  – On-demand (utility) computing services obtained over network
    • Infrastructure as a service
    • Platform as a service
    • Software as a service
  – Cloud can be public or private
  – Allows companies to minimize IT investments
  – Drawbacks: Concerns of security, reliability
  – Hybrid cloud computing model
Cloud computing

- Infrastructure as a service: Consumers use processing and storage from cloud service providers to run their Information Systems (e.g., Amazon uses spare capacity for simple storage).
- Platform as a service: Consumers use programming tools supported by the cloud to develop their own applications (e.g., IBM offers Smart Business Development for software development and service).
- Software as a service: Consumers use software hosted by the vendor’s cloud and deliver it over the network (e.g., Google Apps).