

## Component 4: Introduction to Information and Computer Science

### Unit 10: Future of Computing Lecture 2

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### Topic III: Cloud Computing

- "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models."

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### Distributed computing

- Sharing the processing workload between connected computer systems
- One well-known example is SETI@home to examine radio telescope data for signs of intelligence using computers connected over the Internet

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## Characteristics

- On-demand self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

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## Service models

- Cloud Software as a Service (SaaS)
- Cloud Platform as a Service (PaaS)
- Cloud Infrastructure as a Service (IaaS)

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## Deployment models

- Private cloud
- Community cloud
- Public cloud
- Hybrid cloud

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## Virtualization

- Multiple virtual computer systems running on a single physical system
- Component of cloud computing
- Not a new idea; IBM's Virtual Machine Facility/370 released in 1972
- Each user appeared to have a dedicated system

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## Hypervisor

- Virtual systems do not have to be the same operating system or instruction set as the physical hardware
- Virtual systems are managed on the physical system by a hypervisor
- The hypervisor emulates the instruction set of the virtual hardware
- Available through open-source software and commercial vendors

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## Cloud computing issues

- Access
- Security

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## Topic IV: Social Implications

- Computers have changed the way we communicate
  - E-mail
  - Instant messaging
  - VoIP
  - Video
  - SMS
  - Social networks
  - Local based services
- Personal health records
- Privacy

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## E-mail

- Most individuals in the United States now have an e-mail address
- Initially limited to text
- Multi-media capabilities added
- Easy to "spoof" sender address
- 90% of all e-mail is estimated to be spam
- Rejected by ISPs or mail servers

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## Instant messaging

- Initially used to communicate to computer mainframe operators
- Could communicate between users on same system
- Can now be used to send text between users over global Internet

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## Video and Voice over IP

- Makes calls over the internet to another VoIP phone
- VoIP only phones available from commercial vendors
- Soft phones available which use computer microphone and speakers
- Commercial voice and video services, often at no cost to users

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## Short Message Service

- Text messaging
- Limited to 140 characters

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## Social networks

- SixDegrees (1997)
- Friendster (2002)
- LinkedIn, MySpace (2003)
- Facebook, Twitter (2006)

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## Location based services

- GPS in many mobile devices
- Can identify local services
- Can also provide information on where you are to selected individuals
- Extends to social networking services

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## Personal health records

- May be stored on a personal computer
- May be on personal storage device
- Moving towards web-based services
  - Google Health
  - Microsoft HealthVault

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## Privacy

- Increasing on-line presence
- Increases in customized content delivery
- Individual reputation over time
- The internet is forever
- Privacy of medical records
  - HHS breach list

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## Topic V: Ubiquitous Computing

- Mobile devices
- Personal area networks
- Telemedicine
- Elder care
- Next?

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## Mobile devices

- Laptops
- Netbooks
- PDAs
- Mobile devices

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## Personal area networks (PAN)

- Bluetooth
- Wireless connection
- 1 to 100 meter range connection radius
- Used for mice, keyboards, headsets, etc.

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## Implications for healthcare

- Telemedicine
  - Brings the doctor to the patient
  - Can use current technology, such as the Internet and integrated audio and video capabilities
- Elder care
  - Can use unobtrusive sensors
  - Monitor activities of daily living

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## Summary

- Decrease in system size and increase in system performance
- Increasing options for system control
- Movement to network applications
- Changes in our society
- Pervasiveness of computer technology
- Futures:
  - Wearable systems?
  - Elimination of the keyboard?
  - Societal changes?
  - Changes in home health care?

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