National Tsing Hua University, Hsinchu, Taiwan

CS 5263: Wireless Multimedia Networking Technologies and Applications

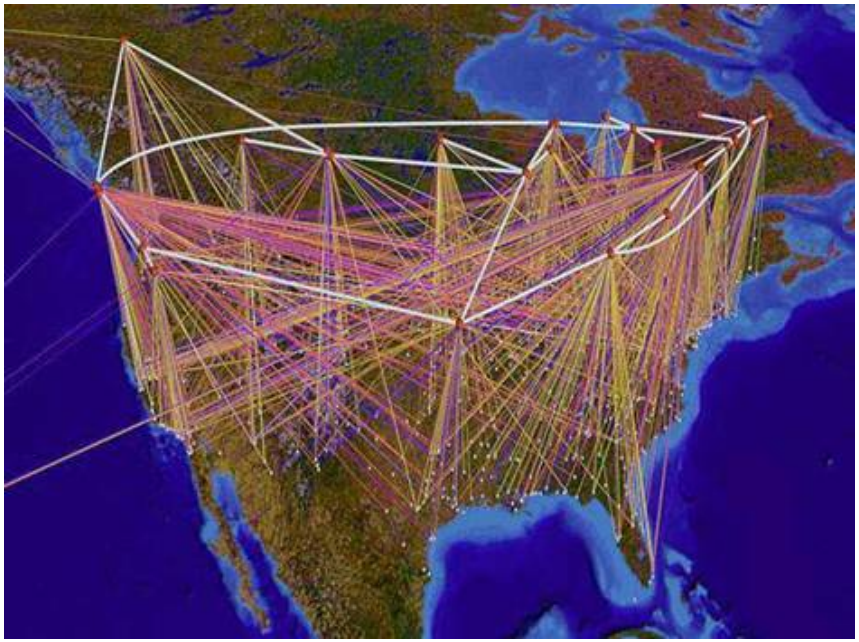
Introduction

Instructor: Cheng-Hsin Hsu

Acknowledgement: The instructor thanks Prof. Mohamed Hefeeda at Simon Fraser University for sharing his course materials

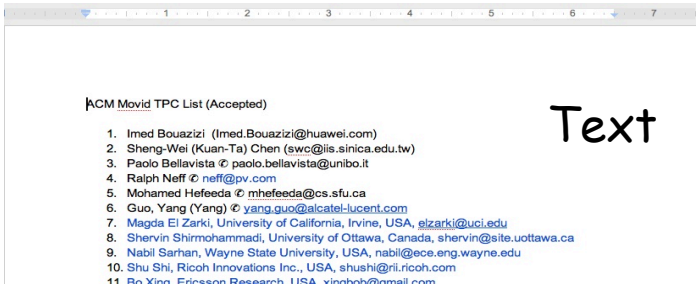
What is Networking?

- Multiple computers connected by communication channels for
  - Information sharing: WWW, Facebook, and BitTorrent
  - Resource sharing: X-Window and Cloud Computing



What is Multimedia?

- Media, or content, in various forms, including



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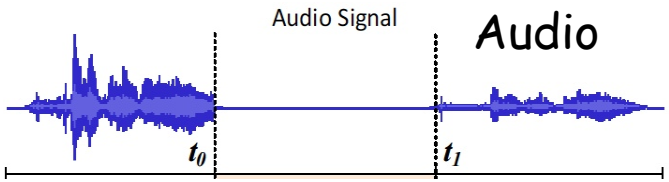
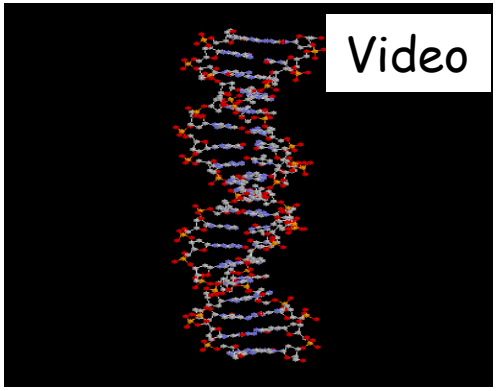
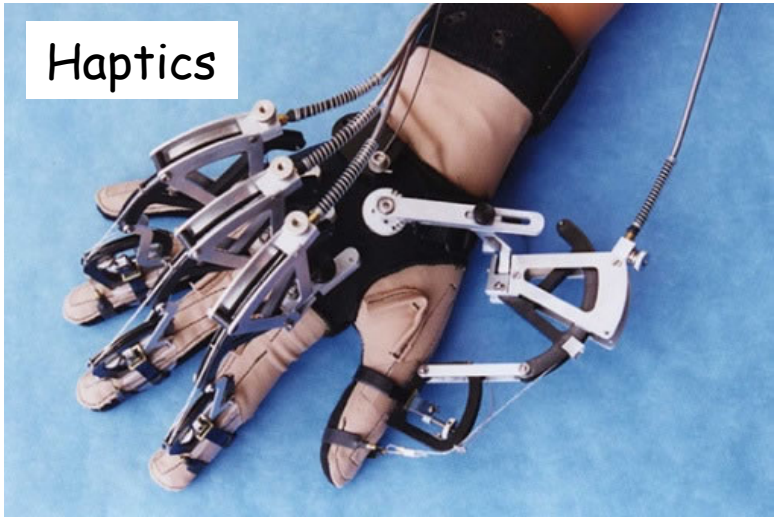
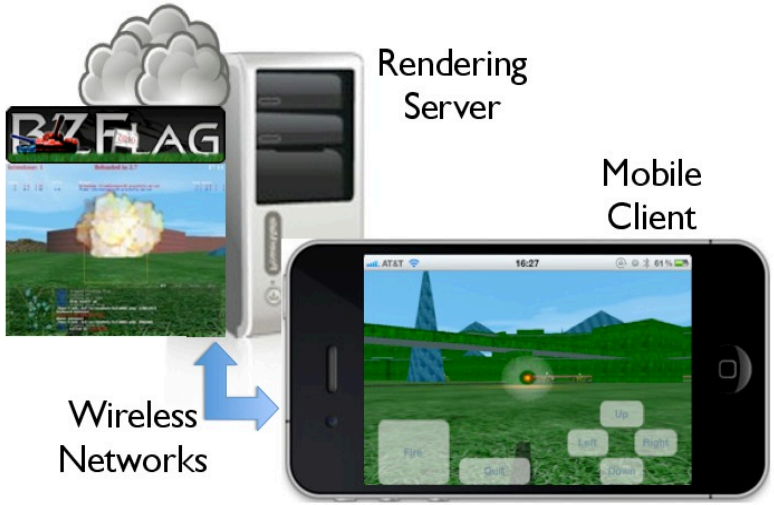






What is Multimedia Networks, Then?

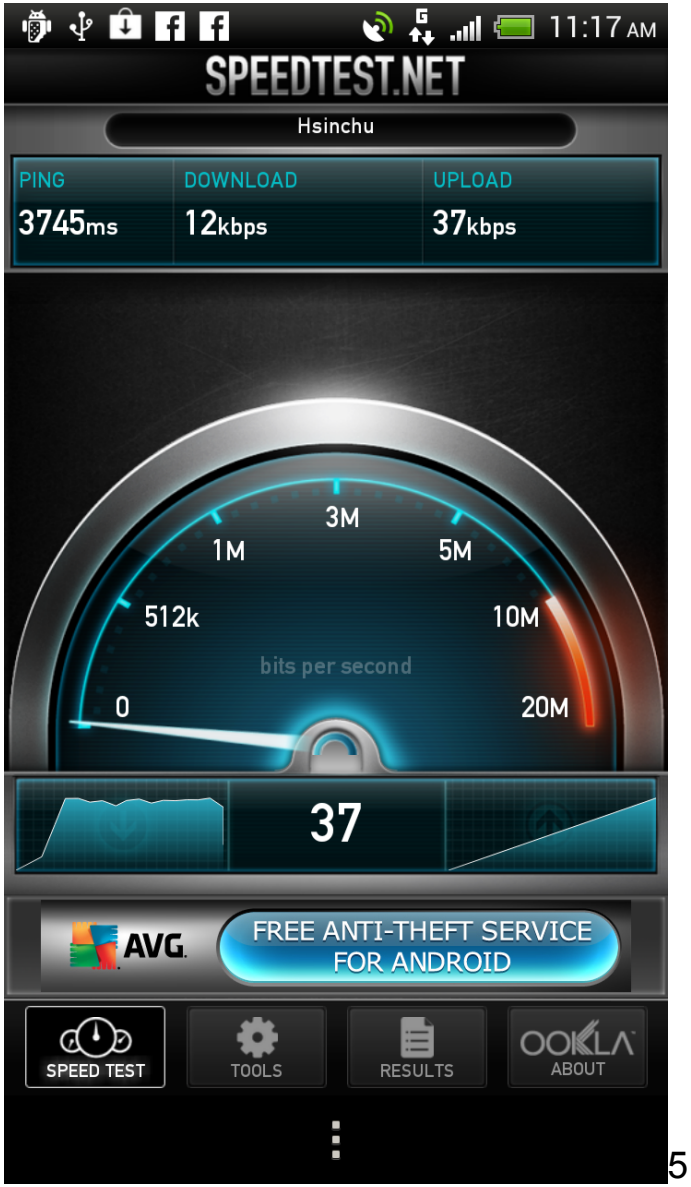
- Distributed multimedia applications
  - Versus local multimedia applications, such as BlueRay
  - Examples: video streaming, video conferencing, mobile TV, rich-content emails



Mobile Cloud Games

Challenges

- Multimedia contents are
  - Large: Batman video consists of 820 frames in 720p (1280x720) resolution. It plays in 16.4 s, but has a staggering size of 1.1 GB. Took my NTHU network 130 s to download!
  - Real-time requirements: for continuous playouts!
- The current Internet is
  - Bandwidth limited
  - Best-of-effort: packets may be late, lost, and corrupted



Challenges (cont.)

- Networked multimedia applications have stringent requirements on
  - Delay: real-time
  - Quality: user experience, related to: (i) video quality, (ii) playout continuity, (iii) synchronization, and (iv) loss robustness
- Conflicts (or tradeoffs) between
  - Content size and network bandwidth
  - Real-time requirements and best-effort networks
- Heterogeneous devices and networks ← How to make everyone happy?

Tons of research problems and industrial applications

About the Course

- Time: Mondays 10 – 12 p.m. and Wednesday 9 – 10 a.m.
- Location: EECS 127
- Format:
  - The lectures will be given in English
  - All written reports, assignments, and slides must be in English
  - Students are encouraged to give oral presentations in English
  - In-class discussion, questions, and comments can be in Mandarin
- Course Website, please read carefully:

  http://nmsl.cs.nthu.edu.tw/index.php/courses

Course Objectives

- Open-ended
  - You are free to work on any aspects in multimedia and/or networking

- Understand fundamentals of networked multimedia systems
- Know current research issues in multimedia systems
- Develop research skills through hands-on experiences (term projects)
- Have fun

Tentative Scope

- 50% lectures on networking and image/video background
  - 50% of those lectures on networking, and the other 50% on image/video basis
- 50% lectures on advanced topics through paper reading and term projects
  - Each student will pick a direction

Textbooks References

- Textbooks
  - **[KR08]** Kurose and Rose, **Computer Networking: A top-down Approach Featuring the Internet**, 4th edition, Addison Wesley, 2008 ← **more recent versions also work**
  - **[Burg09]** Burg, **The Science of Digital Media**, Prentice Hall, 2009
  - **[SC07]** Schaar and Chou (editors), **Multimedia over IP and Wireless Networks: Compression, Networking, and Systems**, Elsevier, 2007 ← **ecopy available at the library**
  - Complemented by research papers
- References
  - **[WOZ02]** Wang, Ostermann, and Zhang, **Video Processing and Communications**, Prentice Hall, 2002.
  - **[LD04]** Li and Drew, **Fundamentals of Multimedia**, Pearson Education, 2004.
  - **[SN04]** Steinmetz and Nahrstedt, **Multimedia Systems**, Springer, 2004.

Grading

- Course Participation: 10% Bonus
  - Students who ask question(s) during the lectures get 1 bonus point (with a cap of 1 point per week)
- Assignments: 20%
  - Four written assignments: two from networking, two from image/video
- Programming Projects: 30%
  - Three programming projects on RTSP, RTP, and DASH
- No Final Exam, actually no exam at all

Grading (cont.)

- Term Project: 50%
  - Three types:
    - New research idea
    - Quantitative and qualitative comparisons among already-published algorithms/techniques/systems
    - A survey of a multimedia topic
  - Live demos lead to bonus points
  - Check web page for potential topics; please feel free to suggest new topics
- Deliverables of Term Project:
  - Written proposal, mid-term report, and final technical report ← incremental
  - Short presentation for each report, and optional demo in the final presentation
  - Paper presentation ← a 60-min presentation

Questions?