Computer Networks
COSC 6377
Lecture 1

Spring 2014

January 13, 2014
Course Goals

• Overview of the basics
• Principles and Philosophies
• Read research papers
• Hands-on experience with networked systems
Prerequisites

• Undergraduate level networking/OS course
• Some systems programming
• Familiar with Linux environment
• Access to a Linux environment
  – Use department server
  – Use your own machine
Structure

• Lectures
• Paper discussions
• Homeworks
• Projects
• Exams
• Class participation
Homeworks

• 3-4 homeworks
• Concepts
• Calculations
• Some hands-on work
• Allowed to discuss with other students, but you should turn in your own writeup
• Submit through Moodle
Projects

• Two projects
• Build a networked system

• Possible to propose your own project
  – Talk to the instructor before P2 is out
Exams

• No final exam!
• The second exam will cover topics not covered by the first exam
• Open notes
• In-class scheduling
  – Conflicts should be reported by this week
Grades

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>40%</td>
</tr>
<tr>
<td>Homeworks</td>
<td>15%</td>
</tr>
<tr>
<td>Projects</td>
<td>40%</td>
</tr>
<tr>
<td>Class Participation</td>
<td>5%</td>
</tr>
</tbody>
</table>

- It is possible to get a C or lower grades
- No incompletes
Readings

• No required textbook
• Recommended texts
  – Computer Networks: A Systems Approach
  – UNIX Network Programming
• Research papers
• Standards
• Wikipedia
Academic Honesty

• The work you turn in should be yours

• Acknowledge
  – Group discussions
  – Internet sources

• Plagarism results in an F
Course Staff

• Instructor: Omprakash Gnawali
• Office Hours: M 230-330

• TA: Hessam Mohammadmoradi
• Contact: hmoradi@cs.uh.edu
• Office Hours: MW 1030-1200 at PGH313
Communication

• Send questions and answers to Piazza
• Contact TA before contacting the instructor
• Emails MUST have COSC6377 in the subject
• Check course website and Piazza regularly

http://www2.cs.uh.edu/~gnawali/courses/cosc6377-s14/
Some Questions

• How difficult is this course?
• What is the workload?
• Will I learn anything useful?
• Any other questions?
Internet

- What is Internet?
- How did it start?
- How do we use it?
- Where is it going?
Inter-net

- Network of Networks
  - Deficiencies in this classical definition?

http://www.chrisharrison.net

From: http://www.telepresenceoptions.com/2008/04/att_first_service_provider_to/
Connecting the Networks

• Cables
• Even under the sea

http://www.cablemap.info/
A Brief History

- Packet switching technology
- ARPANET and other research projects
- Commercial Internet by the early 90’s
- Core networks still owned by a handful of companies

Reference
How do we use it?

• Emails/Facebook
• Phone calls
• Government services
• Connect systems and services
Where is it going?

- More inter-connection
- Internet of Things / Web of things
- More mobile and wireless
- More networked applications
Internet and Us

http://earthobservatory.nasa.gov/Features/Lights/

http://www.chrisharrison.net

http://www.chrisharrison.net

Power struggle: Texas woman uses gun to stop utility worker

by Vicente Arenas / KHOU.com

Posted on July 19, 2012 at 1:54 PM

HOUSTON – Theima Taormina didn’t want a new electric meter, and she went to great lengths to keep her old one.

When a worker showed up at her northwest Harris County home to install a smart meter, she grabbed her gun.

Accelerating waves

<table>
<thead>
<tr>
<th>“Fixed” computing (you go to the device)</th>
<th>Mobility / BYOD (the device goes with you)</th>
<th>Internet of Things (age of devices)</th>
<th>Internet of Everything (people, process, data, things)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doubled every 1.3 years</td>
<td>Doubled every 1.4 years</td>
<td>Doubles every (?) years</td>
<td>50B things</td>
</tr>
<tr>
<td>200M</td>
<td></td>
<td>10B</td>
<td></td>
</tr>
</tbody>
</table>

Cisco
# Connected public lighting: moving from dumb to smart network

<table>
<thead>
<tr>
<th>Traditional lighting operations</th>
<th>Intelligent lighting operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical failure inspection</strong></td>
<td><strong>Remote monitoring</strong></td>
</tr>
<tr>
<td>Scouting team drives during night to visually spot failures</td>
<td>Lighting failures are automatically reported by system, saving time and costs</td>
</tr>
<tr>
<td><strong>Paper-based mapping / archiving</strong></td>
<td><strong>Smart asset management</strong></td>
</tr>
<tr>
<td>Use paper maps and files to manage maintenance of lighting stock</td>
<td>Digital system smartly plans and routes maintenance works to minimize street blockages</td>
</tr>
<tr>
<td><strong>Undifferentiated lighting levels</strong></td>
<td><strong>Smart dimming / scene setting</strong></td>
</tr>
<tr>
<td>Lights burn uniformly throughout night</td>
<td>Lights are dimmed during low-traffic hours to save energy or enhanced in problematic neighborhoods to improve safety</td>
</tr>
<tr>
<td><strong>Estimation-based metering</strong></td>
<td><strong>Intelligent metering / billing</strong></td>
</tr>
<tr>
<td>As multiple entities are connected to the grid, energy consumption roughly estimated by the utility</td>
<td>Smart meter accurately calculates energy consumption, taking into account varying rates; automatically bills all entities</td>
</tr>
</tbody>
</table>
Efficient transportation

- 1 billion cars on the road today
- 4 billion projected by mid-century
- China: 100 km traffic jam lasts nine days in August 2012
- Sao Paulo, Brazil: traffic jams typically exceed 100 miles; average commute 2–3 hours
- By 2040, 75% of cars will be autonomous

Connected, intelligent cars could boost highway capacity by 273%
Plan for next four weeks

• Review of undergraduate material
• Watch lectures/read slides from COSC4377
  – Cover approx. 5 lectures per week
• Discuss the material in the class
• Grab lectures from:
  http://www2.cs.uh.edu/~gnawali/courses/cosc4377-s12/