COMP9332
Network Routing & Switching
Week 1

Lecturer - Mahbub Hassan

http://www.cse.unsw.edu.au/~cs9332/
Lecture Overview

- Course management
- Motivation
- Course content and roadmap
Teaching Team

- Lecturer
  - Mahbub Hassan

- Assisted by tutors + markers

- Lecturer’s rating for COMP9332 (CATEI Survey) “overall I was satisfied with the quality of this lecturer’s teaching”
  - 2005 (S1): 92% Agreed
  - 2005 (S2): 95% Agreed
  - 2006 (S1): 86% Agreed
  - 2007 (S1): 86% Agreed
Teaching support

- 3-hour lecture per week (compulsory)
- 1-hour laboratory per week, 8 weeks (compulsory)
- Self-assessed homework/tutorial
  - No formal grading
- Two 1-hour consultations per week
  - Weeks 3-15
  - One-to-one interaction on FCFS basis

Course portal
- http://www.cse.unsw.edu.au/~cs9332/
Pre-requisite

- COMP9331 / 3331
- Or other introductory networking courses
Learning objectives

- Objective 1: Gain good understanding of the role of routing and switching in modern communication networks (lectures+mid-test+exam)
Objective 2: Learn generic architectures, protocols, and algorithms for routing and switching (lectures, mid-test, exam);

- More emphasis on fundamentals
- No vendor-specific training
Learning objectives (cont'd)

- **Objective 3:** Develop abilities to design routing solutions for new networking requirements (assignment).
- **Objective 4:** Learn how to configure, tune, and analyse the performance of popular routing protocols (labs);
Text Book

Not really necessary to pass the course
Recommended for those who want to delve deeper
**IBM Redbook on TCP/IP**
**Comer**: classic book on TCP/IP protocol
**Hassan & Jain**: a popular advanced networking book that covers many topics, but we’ll be using this text for mainly *optical switching*
Additional Reading

- Electronic copies on the course website
  - white papers
  - magazine articles
  - Standard documents (eg IETF RFCs)
- “May be” specific pages from reference or other books
Assessment

- **Mid-Session Test (closed book, MCQ): 15%**
  - Week 6 in the lecture (start-time, duration TBA)
  - Negative marking (penalty for incorrect guessing)

- **Assignment (due week 12): 25%**

- **Lab test (week 10): 10%**

- **Final Exam (open book): 50%**
  - You need to understand the subject matter!
  - You need to demonstrate (analytical) thinking ability and creativity
To pass the course, you must get
- at least 40% in the final exam, and
- a overall 50% (mid-sess test+lab test+assgn+exam)

If you get less than 40% in the Final Exam (i.e. you fail), maximum 40% will be reported as your overall course mark
Special Consideration

- Must submit fully documented application to NewSouthQ
- Application does not guarantee a favourable consideration
- Each application is scrutinised thoroughly and your past performance is also considered
- Common flu, sore throat etc. are not considered
Supplementary Examination

- Only available for Final Exam under exceptional cases
  - cold, flu, immigration, travel, job etc not considered
  - You need to have consistence good grades in midterm, lab test, and assignment
  - no supplementary if you attend and fail the final exam (i.e., no 2\textsuperscript{nd} chance, sorry!)

- No supplementary for mid-term and lab test
Feedback to student

- Regular feedback throughout the session
- Weekly homework (self assessment)
- Week 7 - Mid-session test
- Week 11 - Lab test
- Week 13 - Assignment
Lecture Overview

- Important course information
- Motivation
- Course content and roadmap
  - What is this course about?
  - How is this course put together?
Networking Market is Heating Up

- Router giants recorded large revenue growth in coming years
- Smaller competitors are benefiting too
- Investments are being shifted from *software* and *chips* to *networking*
- These investments are expected to drive new jobs in networking in the coming years
Driving Factors

- Internet traffic is doubling since 2002
- Technology convergence to IP
- New IP services, e.g. VoIP
- Broadband subscription growth
Challenges and Opportunities

- **Scalability**
  - BGP routing tabling are ballooning fast
  - Design better products and protocols

- **Reliability**
  - Critical businesses now rely on IP networks
  - Design better products and protocols

- **Integration of new services (e.g. VoIP)**
  - Quality of service
  - Design new protocols
The BGP Scalability Problem

- It is quite serious
- Thousands of devices connected everyday
- Routers need GB memory
- Too many updates
  - Processors will crash
- Multi-homing is a problem
  - One network needs multiple BGP entries
BGP Table Growth

source - Light Reading, November 2001
New Routing Products

source - cisco systems

Cisco mobile router  cisco optical switch  CRS-1 (carrier routing system)
Lecture Overview

- Important course information
- Motivation
  - Introduction to course contents
    - What is this course about?
    - How is this course put together?
Internet Revolution

- Internet connects millions of people and devices all over the world
- You can “move” data through the Internet to these millions of people and devices
- Internet is based on packet switching
  - The transportation unit is packets
  - Each IP packet carries a destination address
Internet as a Black Box
Internet as a Black Box

A → D

A

B

C

D

Internet

A → D
A Closer Look at the Internet Black Box (1)

IP Router

Internet

A
B
C
D
A Closer Look at the Internet Black Box (2)
Routing and Switching

Routers and switches
- Move data packets from the incoming port to outgoing port
- How do they know which outgoing port to use?

Routing
- The process of identifying a route from source to destination through one or more transit routers or switches

Due to its large scale, Internet routing is not trivial
Routing algorithms and protocols

- Routing algorithms: how to find the shortest route to destination etc.
- Routing protocols: what conventions routers use to talk to each other
- Routing must be able to deal with the scale of the Internet
  - Part of the solution is to use hierarchical IP addressing
Course map

- **Foundation and knowledge refreshment (wks 2-4)**
  - IP Addressing
  - Principles of routing algorithms and protocols

- **Popular routing techniques (wks 5-7)**
  - RIP, BGP, OSPF
  - Includes recess and mid-session test

- **Advanced routing and switching (wks 8-12)**
  - Multicast, mobile IP, ad-hoc, MPLS, optical switching