Please pick up one copy of the handout as you enter. Handouts are located in the front row by the aisles.

The lecturer: Tim Moors. He talks too fast...

All slides from lectures will be available on the course web page in PDF format.

Lectures may also be recorded

Ask questions / give comments.

The course is entitled Data Networks
& the text is entitled “Computer Networks”
but the subject is really Communication networks.

Modern networks communicate all sorts of content:
• “Data”, e.g. MP3 file transfers
• Messaging, e.g. email, instant messaging, SMS
• Streaming media, e.g. Realmedia, video on demand
• Interactive media, e.g. telephony, games, process control
• and many many more,
and they interconnect all manner of devices: computers, telephones, video cameras, PDAs, control systems, etc.

This subject differs from many other telecommunication subjects, in that it focuses on networks:
• Less emphasis on physical transmission.
• More emphasis on connecting links together, and providing end-to-end services for applications.

Prerequisites:
• COMP1021 (C programming) → Labs
• ELEC1041 (not a core dependency – useful prereq was ELEC2041: micros and interfacing)

You can learn more about:
• the “Physical Layer” in TELE 3013, 4363, 4323 & 4353
• the coding of audio/video in ELEC3004 & TELE4343
• Networks in TELE 4333 (wireless)
& those having TELE 3018 as a prerequisite:
4352 (performance analysis), 4354 (management), 9301 (switches & routers), 9337 (advanced aspects)

CCNA/P/IE - http://cisco.ee.unsw.edu.au/
Objectives of this course

Understand how communication networks that use the TCP/IP protocol suite operate.
Be able to explain the observed behaviour (e.g., performance and pathological states) of such communication networks.
Appreciate some of the design decisions underlying the TCP/IP protocol suite, including possible alternatives and explanations for why the protocols are as they are.
Be able to select protocols that are appropriate for a given task, and develop software that uses and interacts with communication networks.

What you are expected to learn

Fundamental principles, not specifics of instantiations.

Caveat: You’re expected to be competent with common protocols.
- There are too many specifics:
  - Protocol definitions can be hundreds of pages long
  - Thousands of definitions & abbreviations are used in networking
    e.g. see http://subjects.ee.unsw.edu.au/tele3018/abbrevs.txt
  - Not humanly possible to memorise them all & not good use of your brain.
    The lecturer hasn’t memorised them all & doesn’t expect you to.
- They change too often (good for commercial training courses)
  - If there is an exam question along the lines of “How many bits does the HDLC sequence number field have?” then you’ll probably be penalised for getting the right answer! (3)
  - Leave questions about nitty-gritty detail to CCNA!

All the numbers you need to know

- 7 layers in OSI model (4 or 5 in Internet)
- Address lengths: MAC=48b, IPv4=32b, IPv6=128b
- Data unit lengths:
  - IP: header (20B IPv4, 40B IPv6) + options + payload ≤ 64KB
  - ATM: cell = 48B payload + 5B header
  - Ethernet: 0-1500B payload
- Transmission speeds (‘rounded’, including overheads):
  - DS1/T1: 1.5Mb/s (DS3=45Mb/s)
  - OC-3: 155Mb/s (OC-3n = n×OC-3)
- Voice bandwidth: 4kHz
- Port numbers for common services: telnet=23, SMTP=25, DNS=53, HTTP=80, POP-3=110, SSL=443
- Standards: 802.3 (Ethernet), 802.11 (Wireless LANs)

What, when, where, why, how?

What?: This course places heavy emphasis on describing communication technologies.
  - Again: Emphasis is on concepts underlying the technologies, rather than technical minutiae.
When, where?: The communications mantra: ‘Anytime, anyplace’
Why?:
  - Why communicate? Taken as a given.
  - Why communicate this way? Little justification in this course.
    Some principles are appearing, but still hazy and full of exceptions.
    You can create better ways!
How?: Some emphasis in this course (e.g. routing algorithms), but not as much as most engineering courses. The “what” is very involved, often requiring much effort (see labs).

What this means for assessment: Many questions will be descriptive, rather than applying principles (e.g. Kirchoff’s law, Fourier transforms)
Platypuses

A beaked egg-laying mammal that swims?
18th Century England: It must be a hoax!

Networking is a nascent technology
• Systems are often defined verbally or in software;
not in terms of some comprehensive taxonomy.
Surprises continually arise:
• Unicast vs multicast vs anycast
• Client-server file transfer vs peer-to-peer
• We’ll cover many different technologies, but that doesn’t
mean the coverage is comprehensive, neither of known or
possible technologies.
• Ask yourself questions
& don’t dismiss them if you don’t find an answer:
You might be on to the “Next Big Thing”.

Image from http://www.edu.pe.ca/southernkings/platypus.htm

Fashions in networking

This course will cover some topics that may seem obsolete:
• OSI
• Circuit switching
• Aloha, shared Ethernet

Important to appreciate to:
• Enhance understanding of what currently exists
• Prepare for changing fashions, e.g.:
  Medium Access Control (MAC):
  • popular in 1980s
  • declined in 1990s
  • resurgence in 21C wireless
  Circuit switching:
  • popular in 50s telephones
  • declined in 60s-90s
  • resurgence with 21C optical networks

Warning about resources

You will likely experience cases where multiple
resources have conflicting statements. Causes include:
• Conflicting definitions
• New field: Things change, so two documents written at different
times may say different things (e.g. IP address classes/CIDR)
• Complicated systems are difficult to describe
• Verbal – hard to test/prove
• Confusion/ambiguity may be deliberate for marketing
  purposes (e.g. switch/router)

Internet search engines may be an easy source of information, but
often not a trustworthy source
“The Internet makes it possible to find information quickly, but a
lot of it is ill-informed, misleading, or downright wrong.”
[Tanenbaum p. 14]

Resources

• Texts
• Internet
• Lecturer
• Slides used in lectures
Textbook


Light-hearted; lots of jokes, some fairly weak & distract from substance.
Prescribed. Highly recommended that you read & understand it.
- Assessment will cover material covered in the text + that covered in lectures (Lectures will mainly follow the text.)
- Feedback about mid-session test will be related to sections of the text.
Older editions – Marginally OK but not recommended

Other useful texts 1

* more applications-oriented
* definitive guide to Internet protocols
* Electronic access through http://safari.oreilly.com/0201633469
* CompSci approach; little emphasis on underlying realisation
* Lots of slides for lazy lecturers!
* emphasis on details, rather than philosophy/understanding
* many other similar texts by the same author

Course outline in the context of the text

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>1,2</td>
<td>2,4</td>
<td>Physical Layer</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Data Link Layer</td>
</tr>
<tr>
<td>5,6</td>
<td>4</td>
<td>Medium Access Sublayer</td>
</tr>
<tr>
<td>7,8</td>
<td>5</td>
<td>Network layer</td>
</tr>
<tr>
<td>9,10</td>
<td>6</td>
<td>Transport Layer</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>Application layer</td>
</tr>
<tr>
<td>-</td>
<td>8</td>
<td>Security</td>
</tr>
</tbody>
</table>

Approximate only. See more complete schedule in Course Outline.

Other useful texts 2

* Solid text

* Emphasis on principles rather than protocols. Used in TELE 9301.

* Performance analysis of protocols
* Was used in TELE-4352
Internet

Course web page:
http://subjects.ee.unsw.edu.au/tele3018/
- Slides used in lectures
- Video of lectures (within UNSW only)
- Tutorial questions
- Lab tasks
- Further Reading list, with links to:
  - Citeseer - Free
  - IEEE Xplore, ACM Digital Library, Safari – free from within UNSW

+ Most information about this topic is freely available on the Internet, e.g. start with http://authors.phptr.com/tanenbaumcn4/webResources/coverPageWebResources.html

webCT

webCT: http://www.webct.unsw.edu.au/
- Discussion fora
- Submit lab reports
- View marks
- Mid-session test, etc

Activities

- Lectures
- Labs
- Tutorials

Exemptions:
- Lecture timetable clashes? No problem, just make sure you find out from friends what was covered.
- Labs: Done previously? Exemption only if your lab grade was above 70%.

Lectures

When:
5:00 6:00 Tuesday Murphy Theatre
11:00 12:00 Wednesday OMB112
10:00 11:00 Friday Rex Vowels Theatre

You don’t have to attend lectures.
- But material covered in lectures is examinable.
- Bonus marks for attendance (lectures & tutes)
- If you do attend, then don’t distract others (be quiet).
- If you have to talk, do it outside.

May be recorded for access by the lecturer & students.
Time needed for this course

- There is a difference in kind between eating an ice cream cone every day, and eating 365 ice cream cones on your birthday.“ [Tanenbaum, 3rd edition, p. 86]

- 6 units of credit × 25-30 hours/UOC = 150-180 hours

- Spread over the session, not the night before the exam.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 3 × 45 min × 14 weeks</td>
<td>32 hours</td>
</tr>
<tr>
<td>Reading the text</td>
<td>70 hours</td>
</tr>
<tr>
<td>Labs: 3 hours × 6 labs</td>
<td>18 hours</td>
</tr>
<tr>
<td>Tutorials: 1 hour × 6 weeks</td>
<td>6 hours</td>
</tr>
<tr>
<td>Problem solving: 1 hour × 14 weeks</td>
<td>14 hours</td>
</tr>
<tr>
<td>Reflection: 1 hour × 14 weeks</td>
<td>14 hours</td>
</tr>
</tbody>
</table>

Spend additional time on labs & problem solving.

The lecturer

He talks too fast...

Best way to contact:
1. Verbally during Consultation Time for technical issues:
   1. During session: Immediately after Wed & Fri lectures, until half past the hour
   2. Study and Exam Periods: Two one-hour time slots (time tbd)
2. By email to tele3018admin AT ee.unsw.edu.au for admin

Don’t try:
- Email to other addresses
- Telephone
- Visiting office
These avenues simply don’t scale well enough to deal with 400 students p.a.

Ask questions!

- If you have a question:
  1. Ask another student
  2. Look through the textbook and Further Reading list
  3. Use the appropriate discussion forum in webCT. Read before you post.
  4. Ask the tutor at the end of a tutorial
  5. Ask the Lecturer In Charge during consultation time.

Tutorials and labs

Start in week 3
Questions/specifications will be available on the course web page. (Based on those from last year – already on the web page.)

Answers to tutorial problems will only be discussed during tutorials; they won’t be distributed in other forms (e.g. electronically).

Submit “Declaration of Originality” at 1st lab.
Assessment

22% Test: Fri. Sep. 10 2004 between 8am & 11am. Details this Fri.
28% Labs: 4 tasks @ 7% ea
50% Exam
+ Bonuses (for participation and 5% Bonus Lab)

Your marks only reflect how well you did on the set assessment tasks.
Duh!?
- If you just scrape over a threshold, great ☺: you win some.
- If you just miss a threshold, sorry ☹: you lose some.
  You won’t get a second chance at TELE3018 until next year.
- If you “need” a certain grade in this subject (returning to home country, got a job, etc), sorry, but marks are only affected by performance on assessment tasks.
⇒ prepare well to perform well; extra effort on labs/test to prevent reliance on exam

Bonus marks

Receive up to 5% more for either/both:
- Bonus lab: TCP sockets programming
- Participation:
  - attendance
  - asking thought-provoking questions
  - giving insightful answers to questions
  - Evidence suggests that participation is correlated with improved overall performance→

Participation ‘helps’ you overall

Average: 57.7  59.4  68.0  73.9  62.2
Numbers in italics indicate sample sizes.
Caveat: ‘helps’: Correlation does not imply causation.

Feedback

I encourage you to provide feedback about ways to improve the course
email tele3018admin AT ee.unsw.edu.au
or post in the “Suggestions for improving the course” section of webCT.
Responses to feedback from 2003

The 2003 subject review expressed dissatisfaction with:

× “weight given to the assessments” & “How helpful were the ... laboratory sessions”
  ✓ # of compulsory labs reduced from 5 to 4 (one is now a bonus)
  ✓ weighting of labs increased from 6% to 7% ea
× “feedback on your progress”
  ✓ More details about mid-session test performance
  ✓ 2005: introduce a fortnightly quiz
× co-ordination of subject components
  ✓ more mature in 2nd year
  ✓ extrapolate this year’s activities from last year’s web page
× too much material
  ✓ deleted security

• The end of the admin.
• Next lecture: Network structures & scope; client-server, peer-to-peer