

MPhil in Advanced Computer Science

Network Architectures

Leader:	Jon Crowcroft
Timing:	Michaelmas
Prerequisites:	AST, Digicom II, OS II, Security
Structure:	e.g., 16 Lectures

AIMS

This module aims to provide the world with more network architects. The 2010/2011 version is oriented around the evolution of IP to support new services like multicast, mobility, multihoming, pub/sub and, in general, data oriented networking.

SYLLABUS

1. IPng (4L, including Overview/Revision from DC-I and DC-II, Jon Crowcroft)
2. Multicast (3L, Jon Crowcroft)
3. Software/Hardware Interface (1L, Andrew Moore)
4. Naming (2L, /Jon Crowcroft)
5. Pub/Sub (1L Jon Crowcroft)
6. Data Driven Networks (3L, Jon Crowcroft)
7. Sensors/Internet of Things (2L Cecilia Mascolo)

OBJECTIVES

On completion of this module students should:

- Contribute to new network system designs
- Engineer evolutionary changes in network systems
- Identify and repair Architectural design flaws in networked systems
- See that there are no perfect solutions (aside from academic ones) for routing, addressing, naming.
- Understand tradeoffs in modularisation and other pressures on clean software systems implementation, and see how the world is changing the proper choices in protocol layering, or non layered or cross-layered.

COURSEWORK

Assessment is through three graded essays (each chosen individually from a number of suggested or student-chosen topics), consisting:

1. Analysis of two different architectures for a particular scenario in terms of cost/performance tradeoffs for some functionality and design dimension, for example:
 - ATM - e.g. for h/w v. s/w tradeoff
 - IP - e.g. for mobility, multi-homing, multicast, multipath
 - 3GPP - e.g. for plain complexity versus complicatedness.
2. A discursive essay on a specific communications systems component, in a particular context, such as ad hoc routing, or wireless sensor networks.
3. A bespoke network design for a narrow, well specified specialised target scenario, for example:
 - A customer baggage tracking network for an airport.
 - An in-flight entertainment system.
 - An in-car network for monitoring and control.
 - An inter-car sensor/control network for automatic highways.

PRACTICAL WORK

Rapid simulation and modeling...

ASSESSMENT

- There will be a mix of reading club, and design and evaluation. Evaluation will be a mix of analysis, back-of-an-envelope simulation and models.
- The reading club will involve essay material with comparative evaluation of approaches in papers
Given network problems (much like narrative way of teaching economics in Chicago) we want a lot of hands on problem solving - one size doesn't fit all.
- Reading/essays: 60% practical lessons 40%
- Results - just percentage.

RECOMMENDED READING

Book 0 - pre-course reading

Prior to this course, we recommend reading/revision of both Keshav's book "An Engineering Approach to Computer Networks", and Peterson&Davie's book "Computer Networks: A Systems Approach".

Book 1 - Design Patterns Patterns in Network Architecture: A Return to Fundamentals (Hardcover) by John Day

Book 2 - Example Systems Possible books on Web and on Social Networks by Bala (if out in time) (e.g. see <http://www.amazon.com/Web-Protocols-Practice-Networking-Measurement/dp/0201710889>)

Book 3 - economics and networks The Economic Naturalist: Why Economics Explains Almost Everything by Robert H. Frank

Papers Certainly, a collection of papers (see ACM CCR at <http://ccr.sigcomm.org/> which publishes notable network researchers' favourite ten papers every 6 months or so).

Last updated: Mar 2010