University of Glasgow

The Changing Internet

Networked Systems (H)

Lecture 1

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Course Administration

- Aims, Objectives, Learning Outcomes
- Timetable
- Assessment
- Recommended Reading

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Course Coordinator and Materials

- Lecturer and course coordinator
  - Dr Colin Perkins (colin.perkins@glasgow.ac.uk)
  - Office: S101b, Lilybank Gardens

- Course materials on Moodle and https://csperkins.org/teaching/



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Aims and Objectives

- To introduce fundamental concepts and theory of communications
- To provide a solid understanding of the technology that supports modern networked computer systems
- To give students the ability to evaluate and advise industry on the use and deployment of networked systems
- To introduce low-level network programming, and give students practice with systems programming in C

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Intended Learning Outcomes

- By the end of the course, you should be able to:
  - Describe and compare capabilities of various communication technologies and techniques;
  - Know the differences between networks of different scale, and how these affect their design;
  - Understand demands of different applications on quality of service requirements for the underlying communication network;
  - Describe the issues in connecting heterogeneous networks;
  - Describe importance of layering, and the OSI reference model;
  - Demonstrate an understanding of the design and operation of an IP network, such as the Internet, and explain the purpose and function of its various components; and
  - Write simple low-level communication software, showing awareness of good practice for correct and secure programming

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Course Structure

Week	Thursday 10:00-11:00 – Discussion	Thursday 11:00-12:00	Thursday 14:00-16:00 – Labs
1	#1: The Changing Internet	Office Hour	#1: Introduction to Network Programming in C
2	#2: Connection Establishment in a Fragmented Network	Office Hour	#2: Connection Establishment
3	#3: Secure Communications	Office Hour	#3: NAT Traversal
4	#4: Improving Secure Connection Establishment	Office Hour	#4: Secure Communications
5	#5: Reliability and Data Transfer	Office Hour	#5: TCP Behaviour and Congestion Control
6	#6: Lowering Latency	Office Hour	
7	#7: Real-time and Interactive Applications	Office Hour	#6: Naming and Network Topology
8	#8: Naming and the Tussle for Control	Office Hour	
9			
10	#9: Networks and Inter-domain Routing	Office Hour	#10: Future Directions

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Course Structure: Lectures

Week	Thursday 10:00-11:00 – Discussion	Thursday 11:00-12:00	Thursday 14:00-16:00 – Labs
1	#1: The Changing Internet	Office Hour	#1: Introduction to Network Programming in C
2	#2: Connection Establishment in a Fragmented Network	Office Hour	#2: Connection Establishment
3	#3: Secure Communications	Office Hour	#3: NAT Traversal
4	#4: Improving Secure Connection Establishment	Office Hour	
5	#5: Reliability and Data Transfer	Office Hour	
6	#6: Lowering Latency	Office Hour	
7	#7: Real-time and Interactive Applications	Office Hour	
8	#8: Naming and the Tussle for Control	Office Hour	#8: Naming and Network Topology
9			
10	#9: Networks and Inter-domain Routing	Office Hour	#10: Future Directions

- Lecture recordings will be made available ahead of time – approximately two hours of material per week, split into several parts
- Each lecture is accompanied by discussion questions
- Timetabled session from 10:00-11:00 on Thursdays via Zoom is for discussion – watch the lecture and think about the discussion questions **before** the timetabled slot

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Course Structure: Office Hours

Week	Thursday 10:00-11:00 – Discussion	Thursday 11:00-12:00	Thursday 14:00-16:00 – Labs
1	#1: The Changing Internet	Office Hour	#1: Introduction to Network Programming in C
2	#2: Connection Establishment in a Fragmented Network	Office Hour	#2: Connection Establishment
3	#3: Secure Communications	Office Hour	#3: NAT Traversal
		Office Hour	#4: Secure Communications
		Office Hour	#5: TCP Behaviour and Congestion Control
6	#6: Lowering Latency	Office Hour	
7	#7: Real-time and Interactive Applications	Office Hour	#6: Naming and Network Topology
8	#8: Naming and the Tussle for Control	Office Hour	
9			
10	#9: Networks and Inter-domain Routing	Office Hour	#10: Future Directions

- Office hour from 11:00-12:00 on Thursdays via Zoom
- For one-to-one discussion relating to the course

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Course Structure: Labs

Week	Thursday 10:00-11:00 – Discussion	Thursday 11:00-12:00	Thursday 14:00-16:00 – Labs
1	#1: The Changing Internet	Office Hour	#1: Introduction to Network Programming in C
2	#2: Connection Establishment in a Fragmented Network	Office Hour	#2: Connection Establishment
3	#3: Secure Communications	Office Hour	#3: NAT Traversal
4	#4		#4: Secure Communications
5	#5		#5: TCP Behaviour and Congestion Control
6	#6		
7	#7		#6: Naming and Network Topology
8	#8: Naming and the Tussle for Control	Office Hour	
9			
10	#9: Networks and Inter-domain Routing	Office Hour	#10: Future Directions

- Labs will run via Microsoft Teams
- Materials will be made available in advance, and are to be completed in your own time
- Timetabled sessions from 14:00-16:00 on Thursdays are for live support with the lab exercises – try to solve the exercise, and think of questions you might need to ask, **before** the timetabled support slot

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Assessment

- Assessed exercises: 20%
  - Exercise 1: TCP Behaviour and Congestion Control (10%)
    - Available with lab 5 (11 February 2021)
    - Deadline: start of lab 6 (14:00 on 25 February 2021)
  - Exercise 2: Naming and Network Topology (10%)
    - Available with lab 6 (25 February 2021)
    - Deadline: end of week 9 (18:00 on 12 March 2021)
  - Don’t leave coursework to the last minute: it’s designed to be completed over a few weeks, allowing time for thought and reflection, and is too large to do in a rush in a couple of days
- Examination: 80%
  - Exam format: answer all three questions

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Required Reading

- Any good text on computer networks, for example:
  - Peterson and Davie, Computer Networks: A Systems Approach, 5th Edition, Morgan Kaufman, 2011, ISBN 0123851386 (https://book.systemsapproach.org)
  - Kurose and Ross, Computer Networking: A Top-Down Approach, 6th Edition, Addison-Wesley, 2012, ISBN 0273768964
  - Tanenbaum and Wetherall, Computer Networks, 5th Edition, Prentice Hall, 2010, ISBN 0132553171
  - Bonaventure, Computer Networking: Principles, Protocols and Practice, online textbook (http://cnp3book.info.ucl.ac.be/index.html)
    - Blog relating to the book: https://obonaventure.github.io/cnp3blog/

- **You are expected to read-along with the lectures – the lectures introduce the concepts, and the books provide detail**

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The Changing Internet

- Review of the Internet architecture
  - Protocols and Layers
  - Physical and Data Link Layers
  - Network Layer and Internet Protocols
  - Transport Layer
  - Higher Layer Protocols
- The Changing Internet

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