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/
  - The website has lecture transcripts that are not on Moodle



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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 13:00-15:00 – Labs	Thursday 16:00-18:00 – Lecture and Discussion
1		#1: The Changing Internet
2	#1: Introduction to Network Programming in C	#2: Connection Establishment in a Fragmented Network
3	#2: Connection Establishment	#3: Secure Communications
4	#3: Transport Layer Security	#4: Improving Secure Connection Establishment
5	#4: QUIC	#5: Reliability and Data Transfer
6	#5: TCP Behaviour and Congestion Control	#6: Lowering Latency
7		#7: Real-time and Interactive Applications
8	#6: Network Topology	#8: Naming and the Tussle for Control
9		#9: Networks and Inter-domain Routing
10		#10: Future Directions (video lecture only)

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8	#6: Network Topology	#8: Naming and the Tussle for Control
9		#9: Networks and Inter-domain Routing
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- Lecture recordings will be made available ahead of time
- Each lecture is accompanied by discussion questions
- Timetabled session from 16:00-18:00 on Thursdays is for discussion – you **must** watch the lecture and think about the discussion questions **before** the timetabled slot

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- Labs materials will be made available in advance, and are to be completed in your own time
- Timetabled sessions from 13:00-15:00 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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Assessed Exercise

- The assessed exercise is worth 20% of the marks for this course
  - Available on the day of Lecture 5
  - Deadline on the day of Lecture 7
- Note well:
  - Following the code of assessment, late submissions of assessed exercises will be accepted for up to 5 working days beyond the due date. Such late submissions will receive a two band penalty for each working day, or part thereof, the submission is late. Submissions that are received more than five working days after the due date will be awarded a band of H. Submissions of assessed exercises that do not follow the instructions given in the handout will be given a two band penalty. **These penalties will be strictly enforced.**
  - If you are ill, or have other circumstances that may affect your submission, then you may contact the course coordinator **before the deadline** to request an extension, following the usual procedure.

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Examination

- The final exam is worth 80% of the marks for this course
- Exam format: answer all three questions
  - The aim is to test your understanding of the material, not just to test your memory of all the details – **explain why, don't just recite what**
  - Note that the University code of assessment (https://www.gla.ac.uk/media/Media_106264_smxx.pdf) states that excellent performance (Grade A) is likely to be characterised by various factors, including:
    - reasoned arguments developing logical conclusions
    - evidence of wide, relevant reading
    - application of learning to new situations and problem solving
  - Material covered in the lectures and lab exercises is examinable (you will not be expected to write code in the exam) – you are also expected to follow the required readings
- Past papers are on Moodle and on the website

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Required Reading

- You are expected to read one of the following:
  - Peterson and Davie, Computer Networks: A Systems Approach, 5th Edition, Morgan Kaufman, 2011, ISBN 0123851386 (£). The authors make an updated version of this book available for free online at https://book.systemsapproach.org
  - Bonaventure, Computer Networking: Principles, Protocols and Practice, free online textbook available at https://www.computer-networking.info/
  - Kurose and Ross, Computer Networking: A Top-Down Approach, 8th Edition, Addison-Wesley, 2021, ISBN 978-1292405469 (£)
  - Tanenbaum, Feamster, and Wetherall, Computer Networks, 6th Edition, Prentice Hall, 2021, ISBN 978-1292374062 (£)
- **You are expected to read-along with the lectures – the lectures introduce the core ideas, while the books and linked papers, RFCs, and blog posts provide detail and context**

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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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