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Introduction

SCC.203 – Computer Networks

Geoff Coulson

Week 11 Lecture 1a

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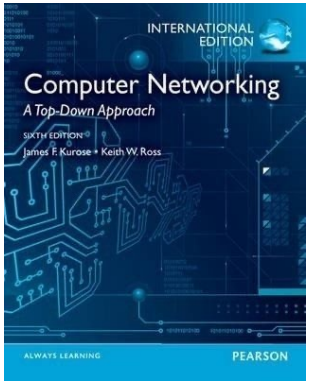
Chapter 1.1

What is the Internet?



Overview

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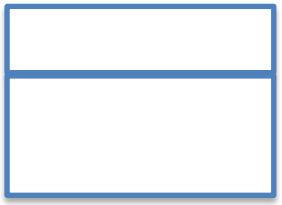
- Internet fundamentals
- Protocols
- Importance of the Internet
- Why should I care?

Internet fundamentals

Black box view

- The internet is an *infrastructure* that supports *applications* such as:
  - Web, VoIP, email, games, e-commerce, social networks, …
- There's a *programming interface* that offers access to this infrastructure by such applications
  - "Hooks" that allow sending/receiving applications to "connect" to the Internet
  - Provides various service options



Internet fundamentals

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- The Internet comprises three main types of basic component:

- Hosts
  - Billions of connected computing devices/ "end-systems"
  - Each runs one or more *networked applications*
- Communication links
  - Fibre, copper, radio, satellite
  - Key charcteristics of transmission rate and delay: cf. *bandwidth, latency*

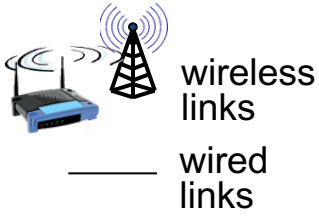
- Packet switches
  - Used to forward *packets* (chunks of data) down links
  - *Routers* and *switches*

Internet infrastructure

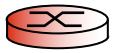
An Overview

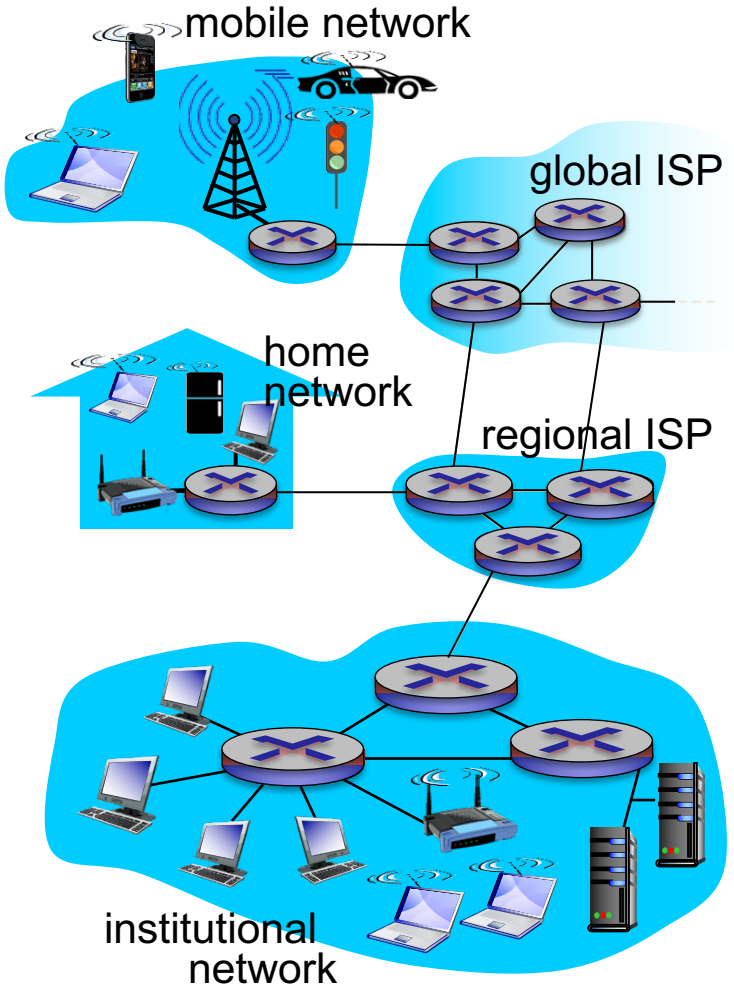
Hosts

Communication Links



Packet Switches

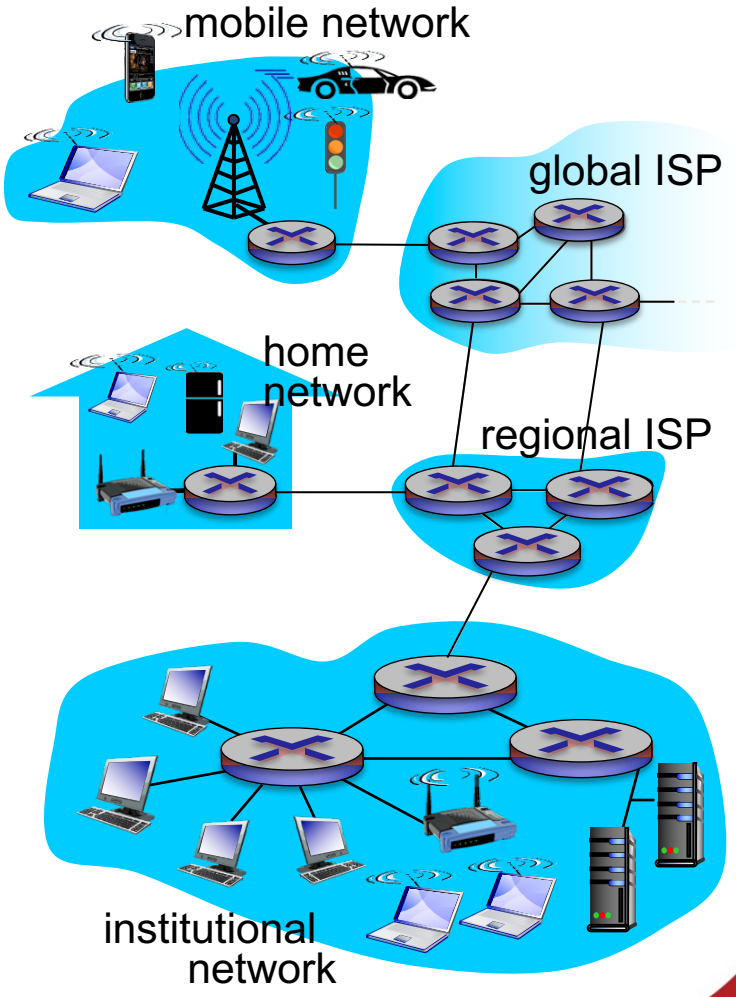




Internet infrastructure

A more detailed view

- *Internet:* "network of networks"
  - Interconnected ISPs (and other neworks)
- *Protocols* structure the sending and receiving of data messages
  - e.g., TCP, IP, HTTP, Skype, 802.11
- *Internet standards*
  - Deliver standardised protocols that the world can use
  - IETF: Internet Engineering Task Force
    - RFC: "Request for comments"documents



What's a Protocol?

Definition

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Protocols define

- the format of messages sent and received among network entities (e.g., hosts, routers),
- actions to be taken on message transmission/receipt/non-receipt

What's a Protocol?

Human vs. Network protocols

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Human protocols:

- "what's the time?"
- "I have a question"
- Introductions

… specific messages sent

… specific actions taken when messages (or other events) are received

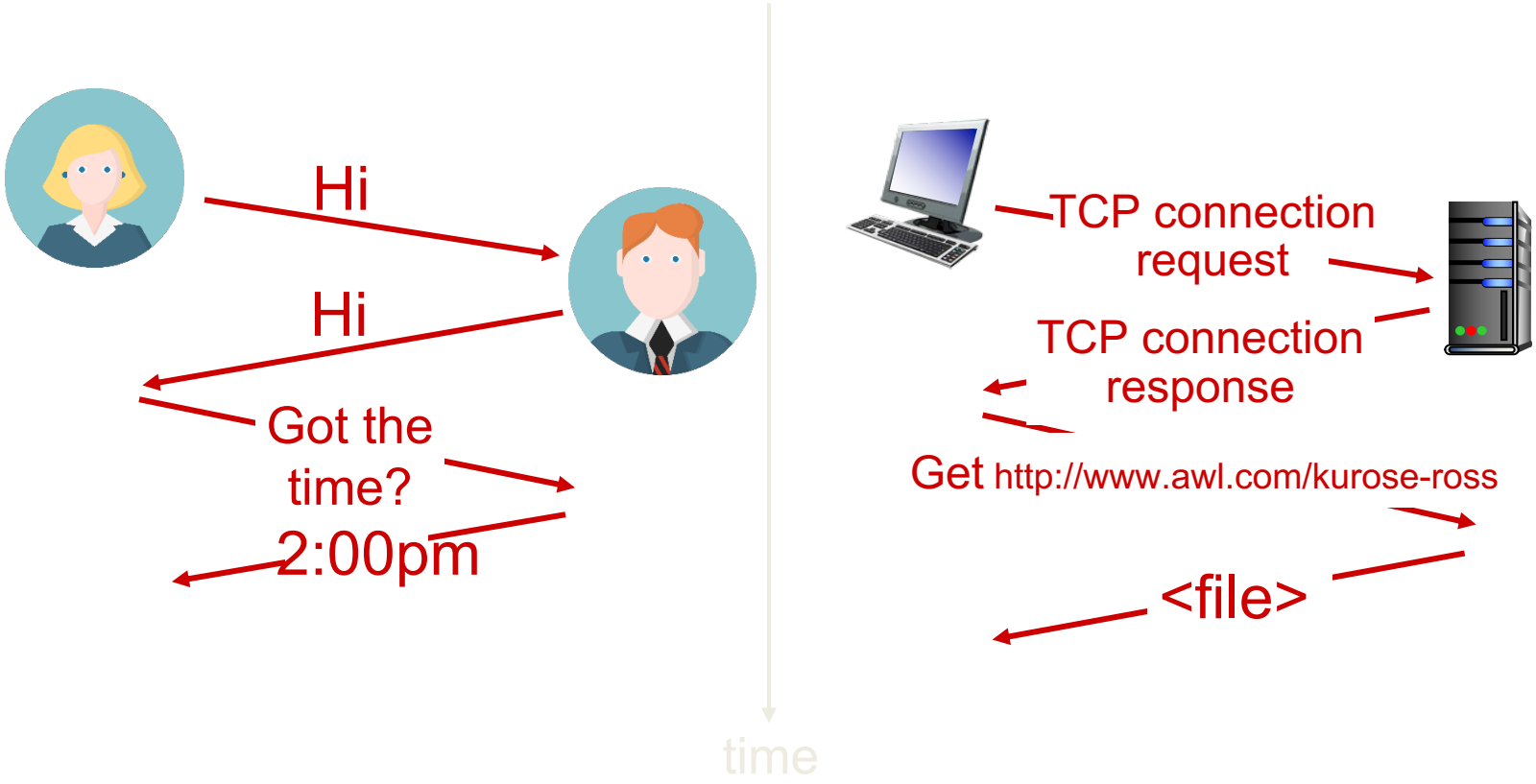
Network protocols:

- Analogous, but mediated by machines rather than humans (obviously)
- All communication activity in the Internet is governed by protocols

What's a Protocol?

Comparison

A human protocol and a computer network protocol:



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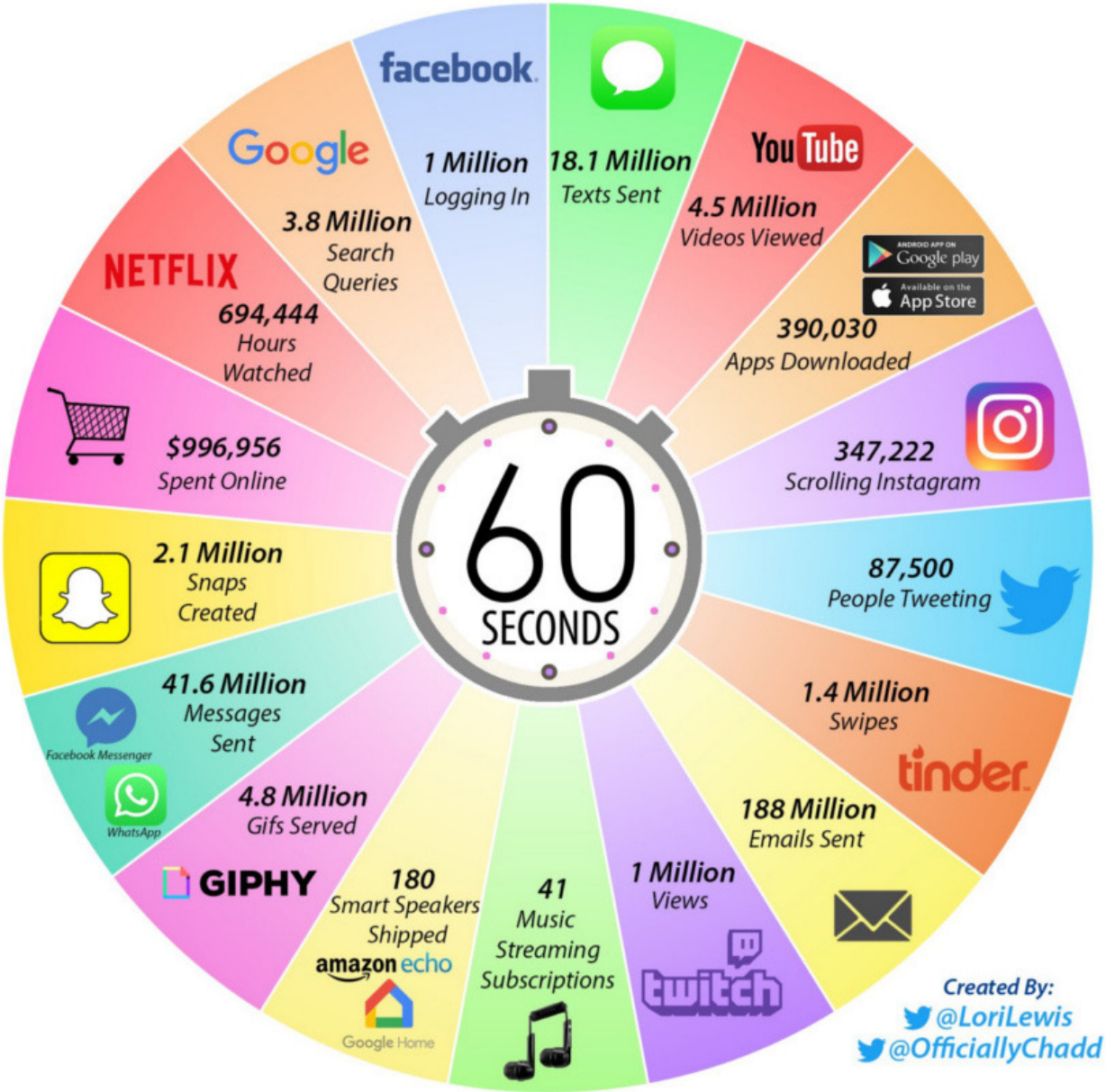
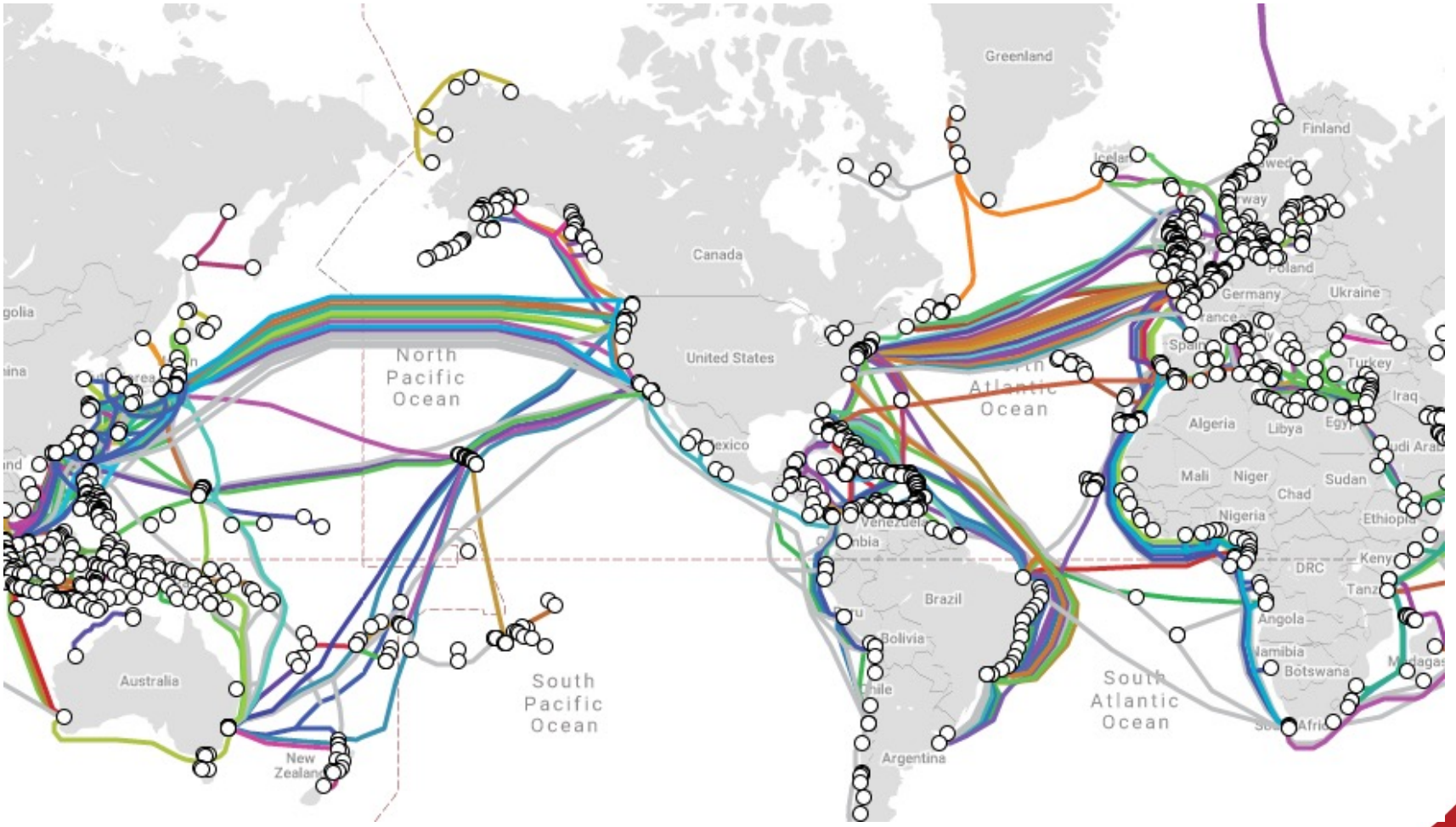
Why is the Internet so important?

2019 This Is What Happens In An Internet Minute



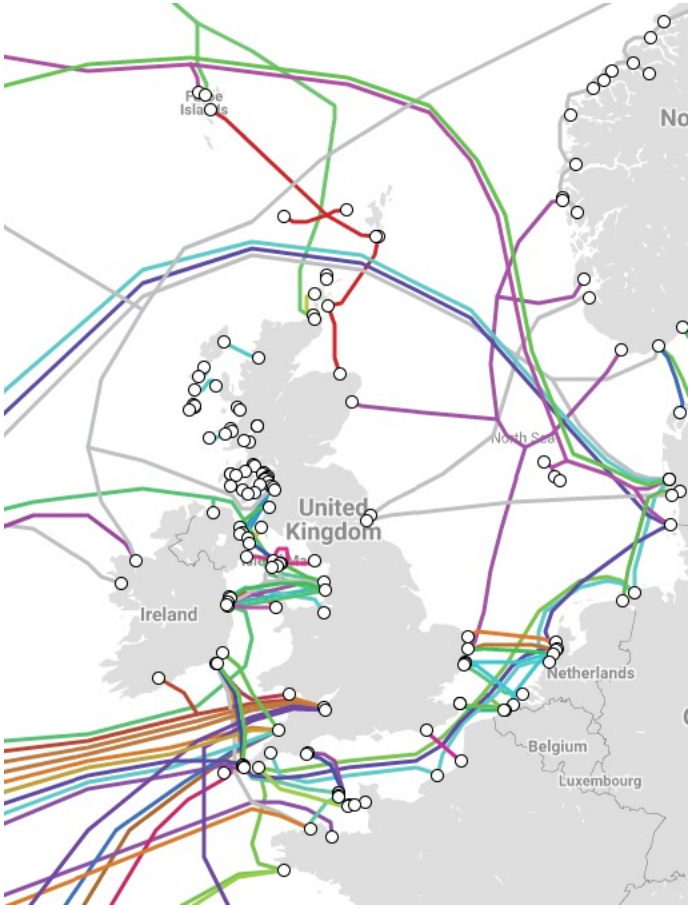
Created By:
@LoriLewis
@OfficiallyChadd

Global Sub-marine Cable Map
www.submarinecablemap.com/



Sub-marine Cable Map

UK



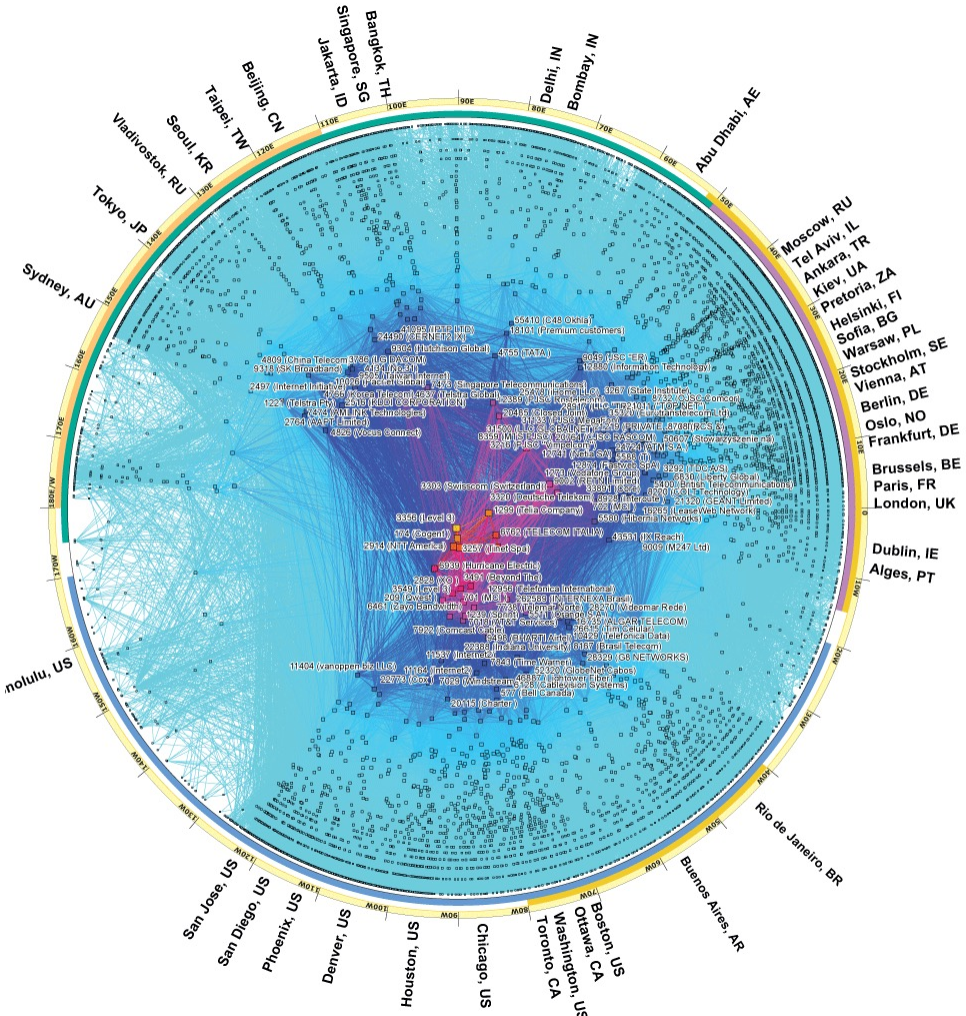
AS Core Visualisation

(next slide)

- Depicts the Internet's Autonomous Systems (ASes)
  - Each AS approximately corresponds to an Internet Service Provider (ISP)
    - British Telecom
    - Vodafone
    - Many others!
  - Much more on this later…
- Includes their geographic locations, numbers of customers, and interconnections

AS Core Visualisation

CAIDA (**Center for Applied Internet Data Analysis – U California)**



www.caida.org/projects/as-core/

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Why should we care about networking and the Internet?

What if we didn't have the Internet?

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- It is the unseen infrastructure behind much of our daily lives
- Imagine if it went away tomorrow - what would you miss?
  - Education
  - Banking
  - Commerce
  - Inter-personal and social communication
  - Entertainment
  - Transport control
  - Home control
  - Political discourse
  - ....??

What does it mean for your future career?

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- Thinking about your job prospects in a few years…
  - You *may or may not* become a network engineer
  - You *may well*, however, become a software developer
- It is easy to ignore the network, and treat it as a given commodity that is always there and always perfect
- But if you don't understand the underlying reality, it can easily:
  - Break the best-engineered application
  - Ruin the smoothest user interaction

What this course will and won't do…

- With this course, we are **not** suggesting that you should be able to go and fix the network when it malfunctions
  - Although that would be nice ☺️

- However, if you can at least understand *why* and *how* it might be having an effect on your software, then we have succeeded!

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Thanks for listening!
Any questions?

g.coulson@lancaster.ac.uk