

# ECE 671 – Lecture 1

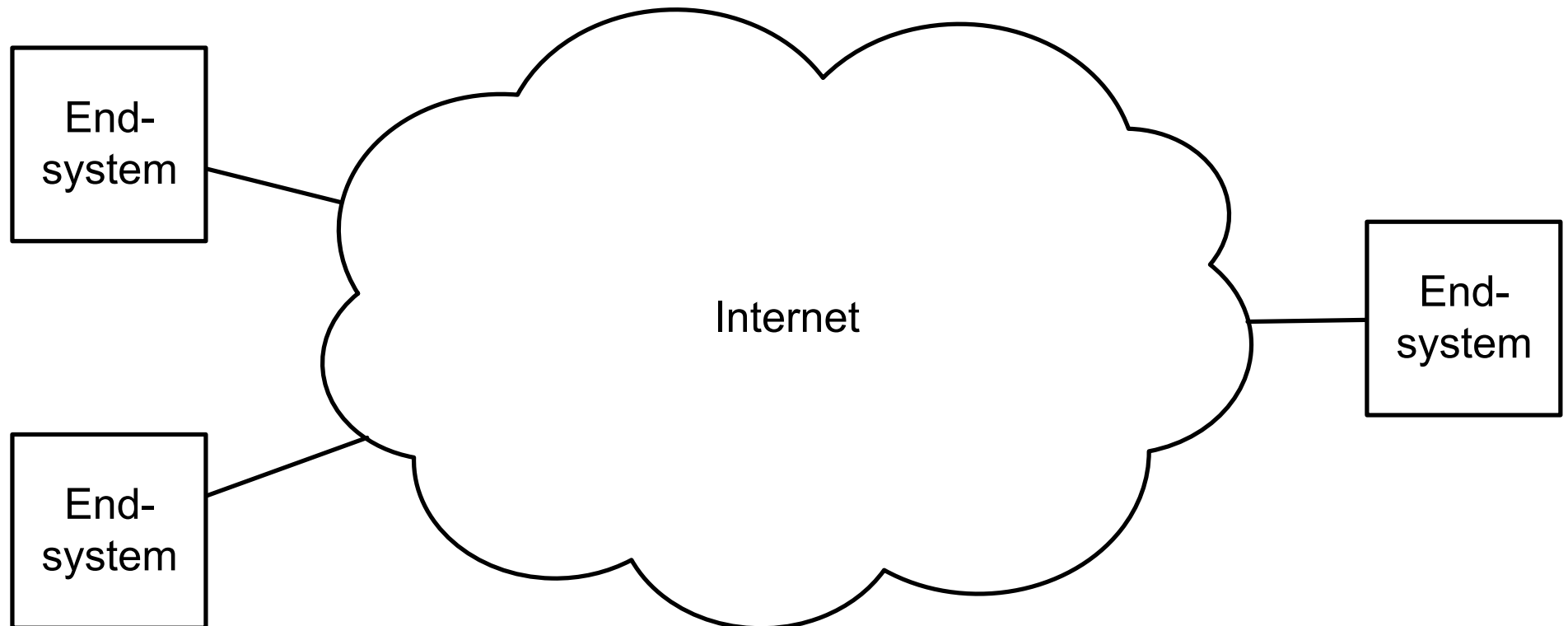
## Introduction

# What is a computer network?

# Why study computer networks?

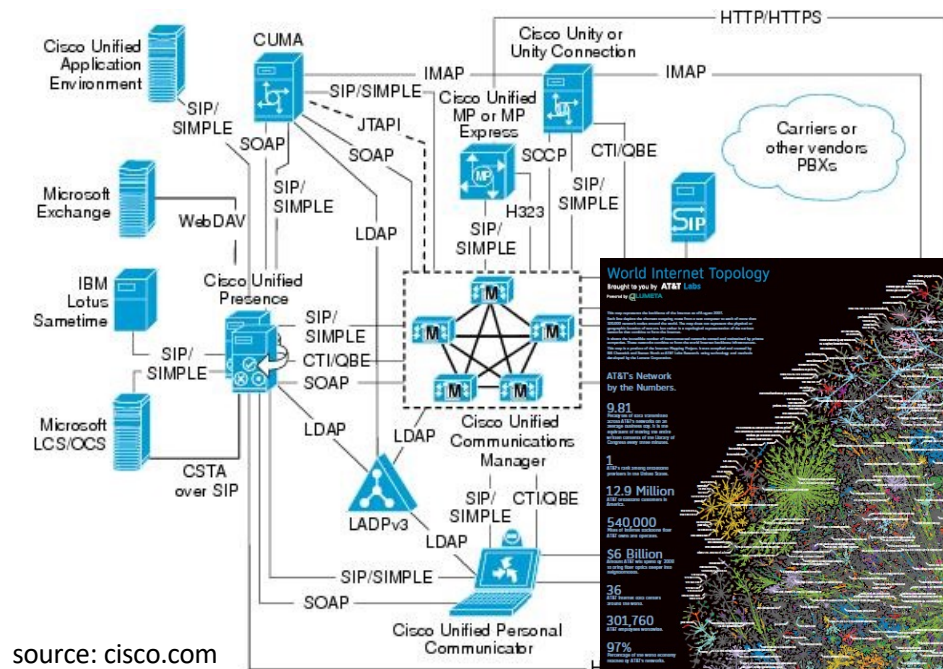
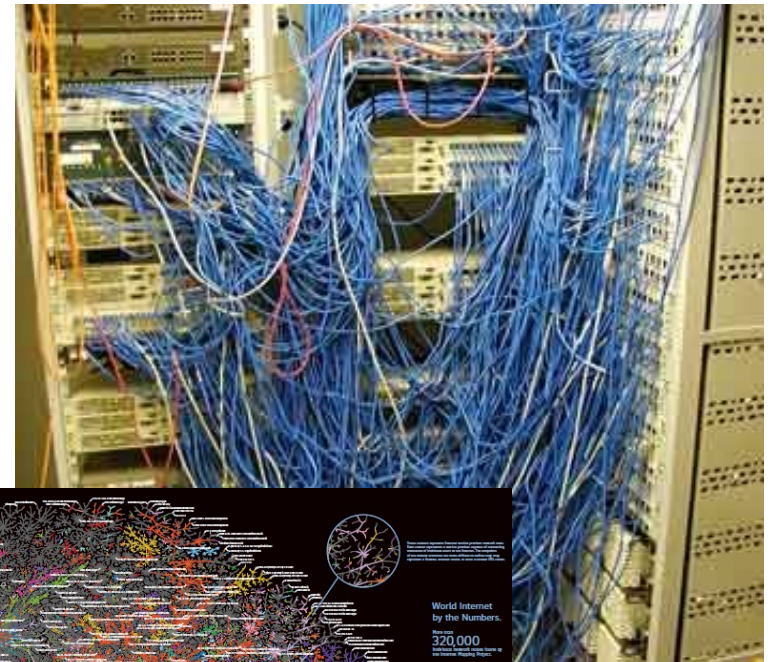
# The “pretty” picture

- Conceptual view of Internet:

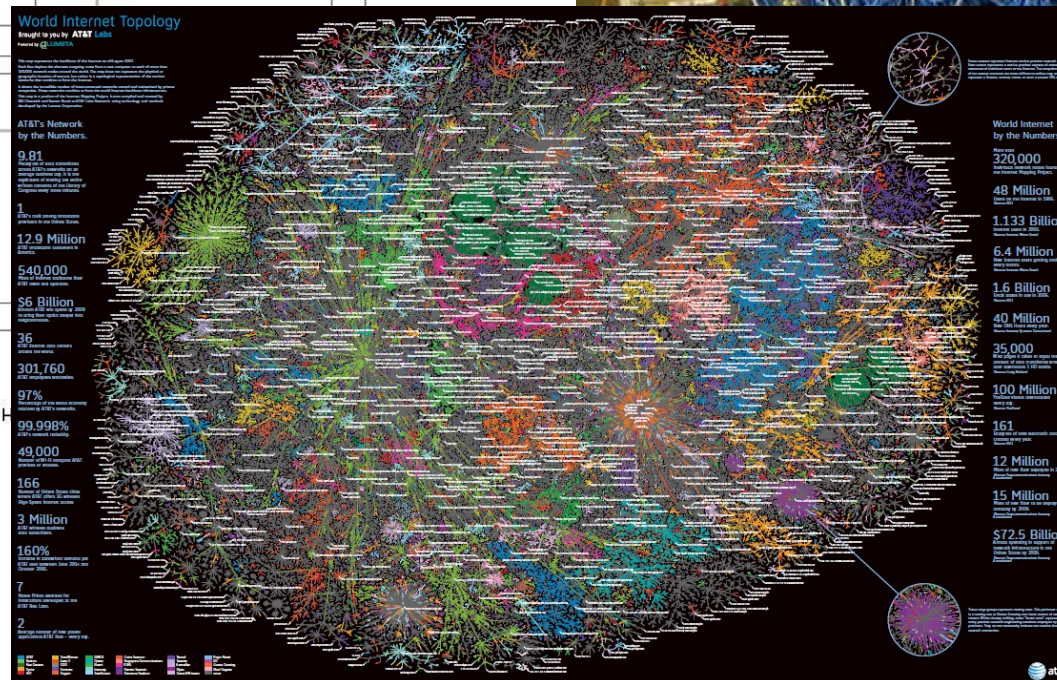


# The “ugly” picture

- There are lots of details...



source: cisco.com

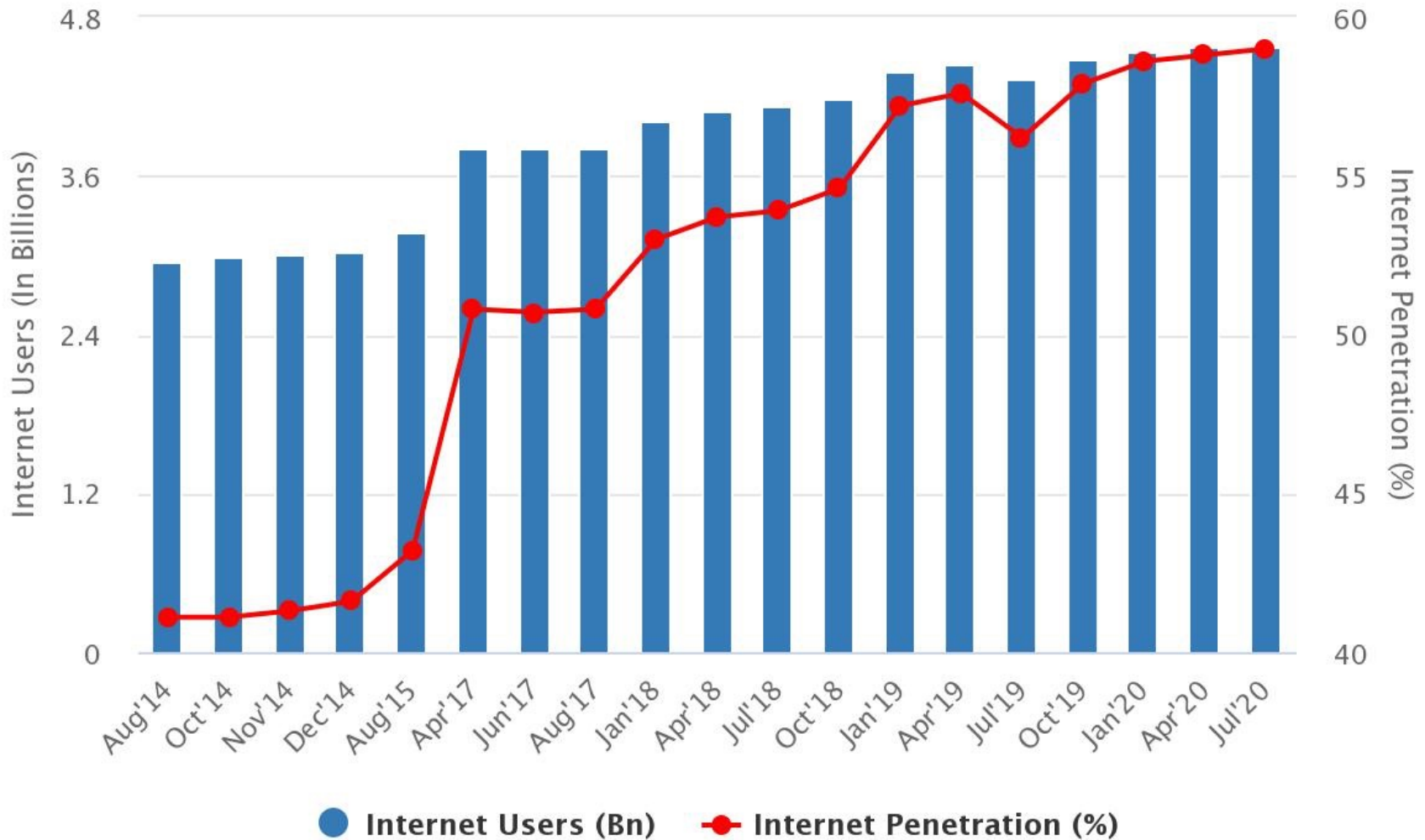


source: att.com

source: aatechnet.com

# Scale of Internet

## Number of Internet Users Worldwide

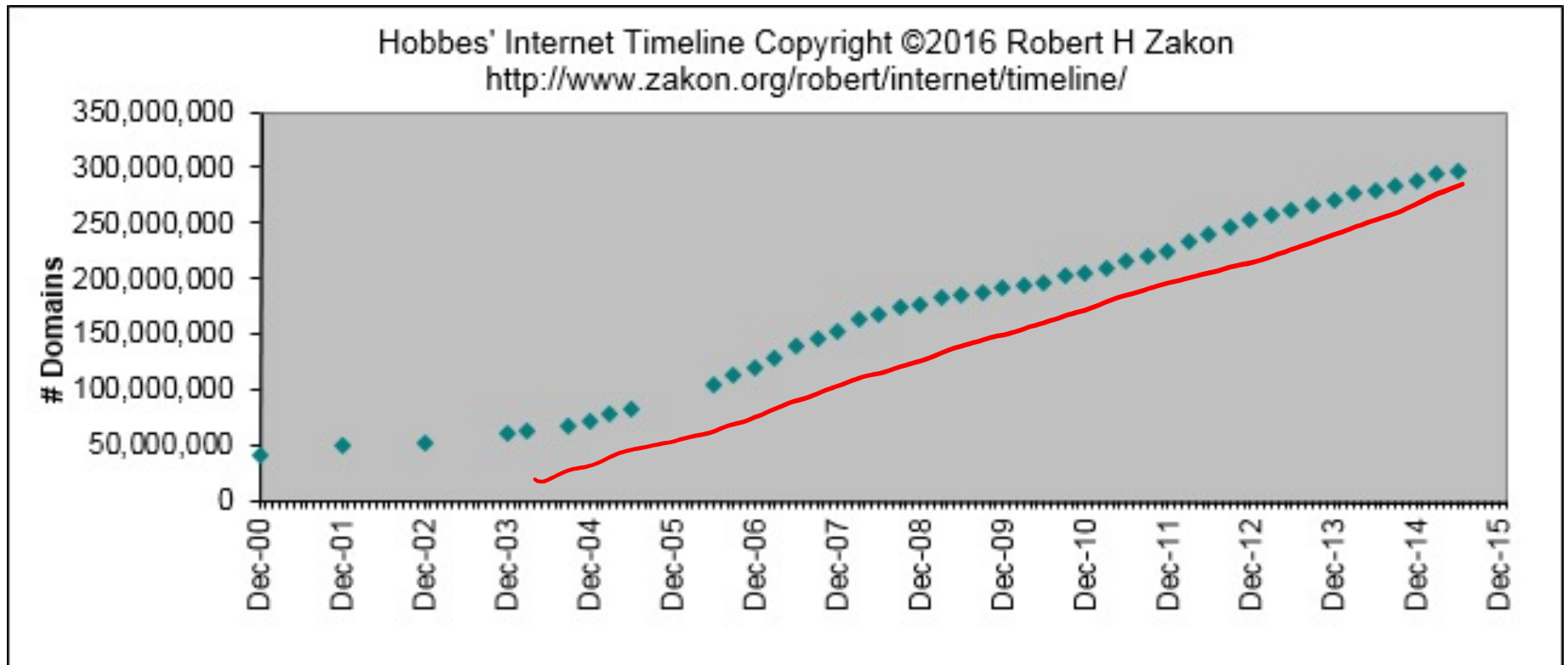


© Dazeinfo / Data Source: Hootsuite, We Are Social

<https://dazeinfo.com/2020/06/11/number-of-internet-users-penetration-worldwide-graphfarm/>

# Scale of Internet

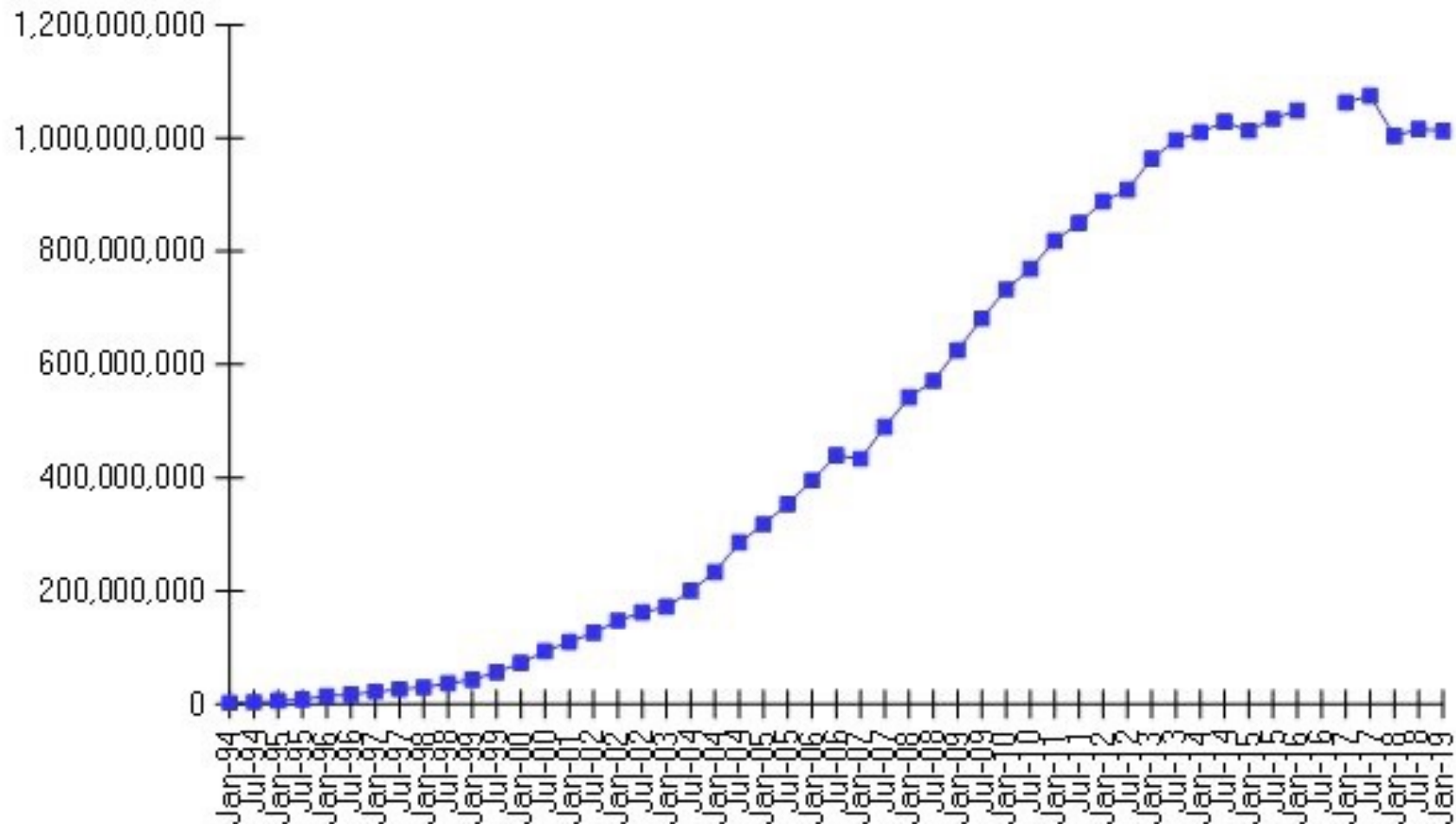
- Number of domains:





# Scale of Internet

Internet Domain Survey Host Count



Source: Internet Systems Consortium ([www.isc.org](http://www.isc.org))



JAN  
2020

# DIGITAL AROUND THE WORLD IN 2020

THE ESSENTIAL HEADLINE DATA YOU NEED TO UNDERSTAND MOBILE, INTERNET, AND SOCIAL MEDIA USE

TOTAL  
POPULATION



**7.75**  
BILLION

URBANISATION:

**55%**

UNIQUE MOBILE  
PHONE USERS



**5.19**  
BILLION

PENETRATION:

**67%**

INTERNET  
USERS



**4.54**  
BILLION

PENETRATION:

**59%**

ACTIVE SOCIAL  
MEDIA USERS



**3.80**  
BILLION

PENETRATION:

**49%**



we  
are  
social



KEPIOS

8

**SOURCES:** POPULATION: UNITED NATIONS; LOCAL GOVERNMENT BODIES; MOBILE: GSMA INTELLIGENCE; INTERNET: ITU; GLOBALWEBINDEX; GSMA INTELLIGENCE; LOCAL TELECOMS REGULATORY AUTHORITIES AND GOVERNMENT BODIES; APJII; KEPIOS ANALYSIS; SOCIAL MEDIA: PLATFORMS' SELF-SERVICE ADVERTISING TOOLS; COMPANY ANNOUNCEMENTS AND EARNINGS REPORTS; CAFEBAZAAR; KEPIOS ANALYSIS. ALL LATEST AVAILABLE DATA IN JANUARY 2020. **COMPARABILITY ADVISORY:** SOURCE AND BASE CHANGES.

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 Hootsuite

<https://dazeinfo.com/2018/07/27/facebook-internet-users-worldwide-online/>

APR  
2020

# COVID-19: PEOPLE SPENDING MORE TIME WITH DEVICES

PERCENTAGE OF INTERNET USERS AGED 16 TO 64 IN SELECT COUNTRIES\* WHO REPORT SPENDING MORE TIME USING EACH DEVICE IN RECENT WEEKS

SMARTPHONE OR  
MOBILE PHONE



76%



LAPTOP  
COMPUTER



45%



DESKTOP  
COMPUTER



32%



TABLET  
DEVICE



22%

SMART TV OR MEDIA  
STREAMING DEVICE



34%



GAMES  
CONSOLE



17%



SMART  
SPEAKER



11%



SMART  
WATCH



6.3%

9

**SOURCE:** GLOBALWEBINDEX'S CORONAVIRUS MULTI-MARKET STUDY (WAVE 2, APRIL 2020). **\*NOTE:** FIGURES REPRESENT THE FINDINGS OF A SURVEY OF INTERNET USERS AGED 16 TO 64 IN AUSTRALIA, BRAZIL, CANADA, CHINA, FRANCE, GERMANY, INDIA, IRELAND, ITALY, JAPAN, NEW ZEALAND, PHILIPPINES, SINGAPORE, SOUTH AFRICA, SPAIN, THE UNITED KINGDOM, AND THE UNITED STATES. DATA COLLECTION (FIELDWORK) TOOK PLACE BETWEEN MARCH 31 AND APRIL 02, 2020. SEE [GLOBALWEBINDEX.COM](https://www.globalwebindex.com) FOR MORE DETAILS.

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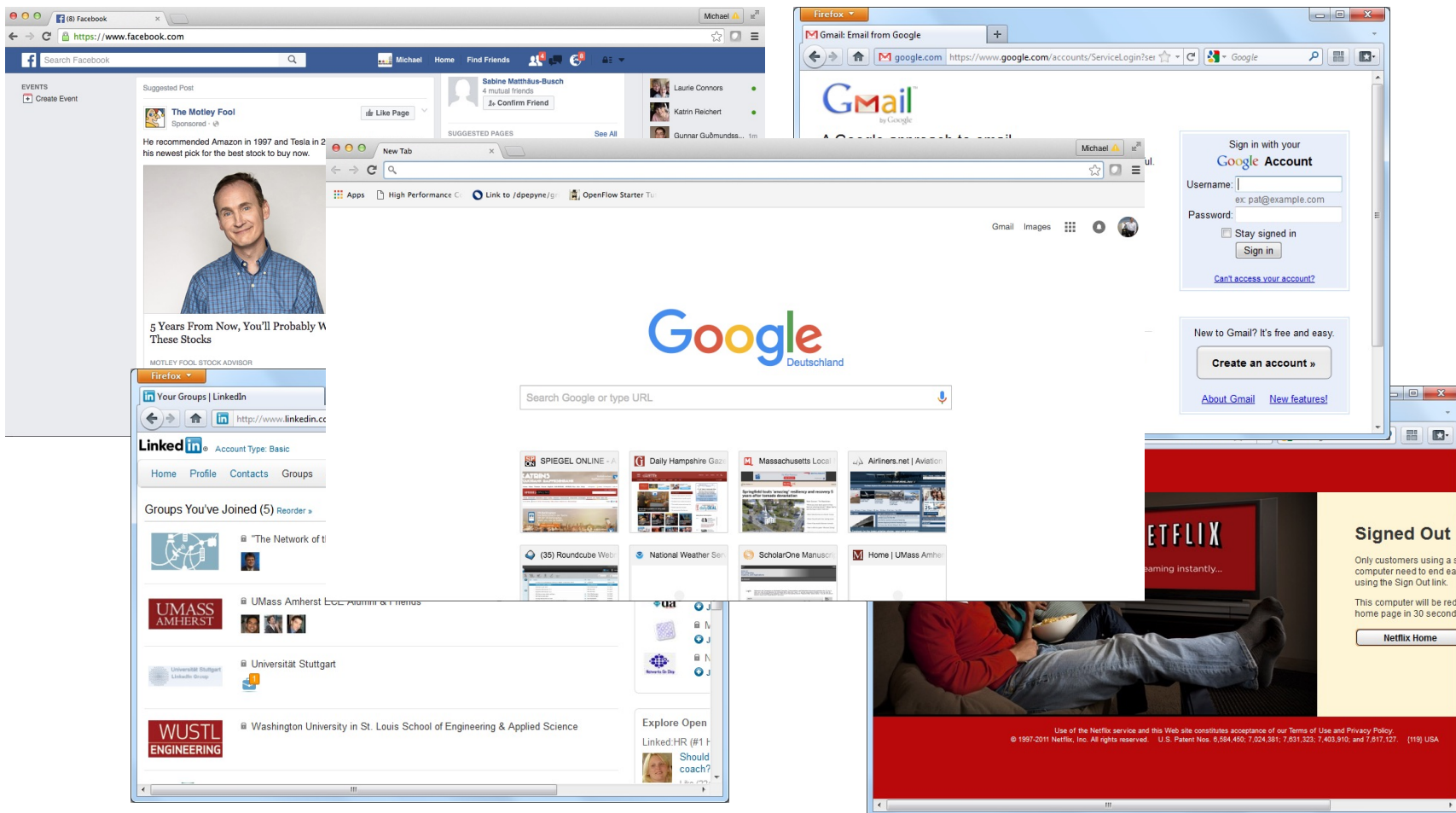
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<https://wearesocial-net.s3.amazonaws.com/uk/wp-content/uploads/sites/2/2020/04/>

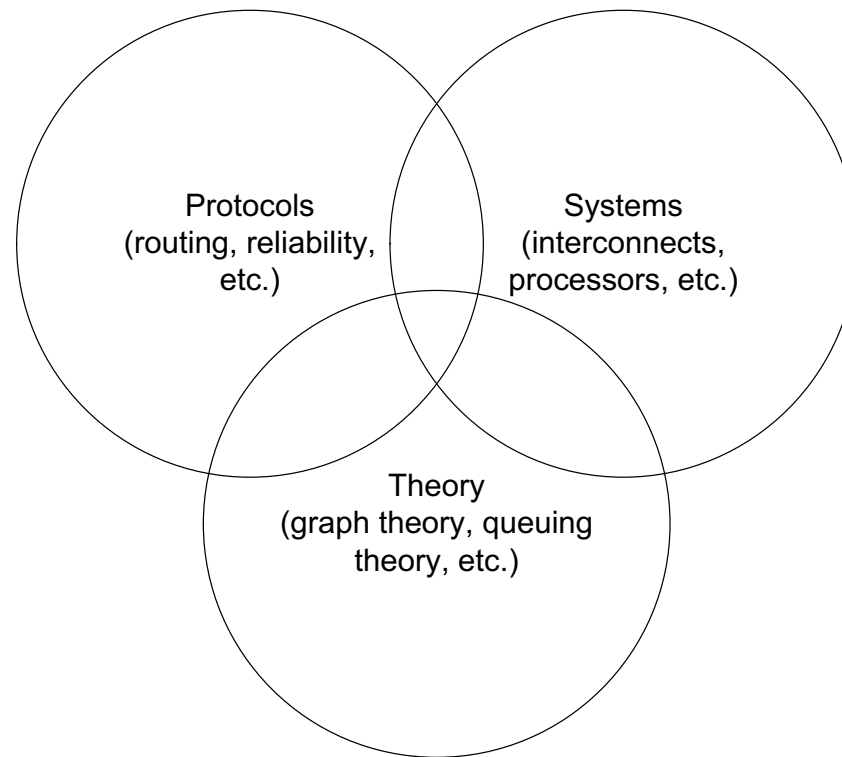
03-Device-Time-Increase-Overall-DataReportal-20200422-Digital-2020-April-Global-Statshot-Report-Slide-9.png

# Uses of Internet

- Web site access, mash-ups, social networking, Zoom, Zoom, Zoom, etc.



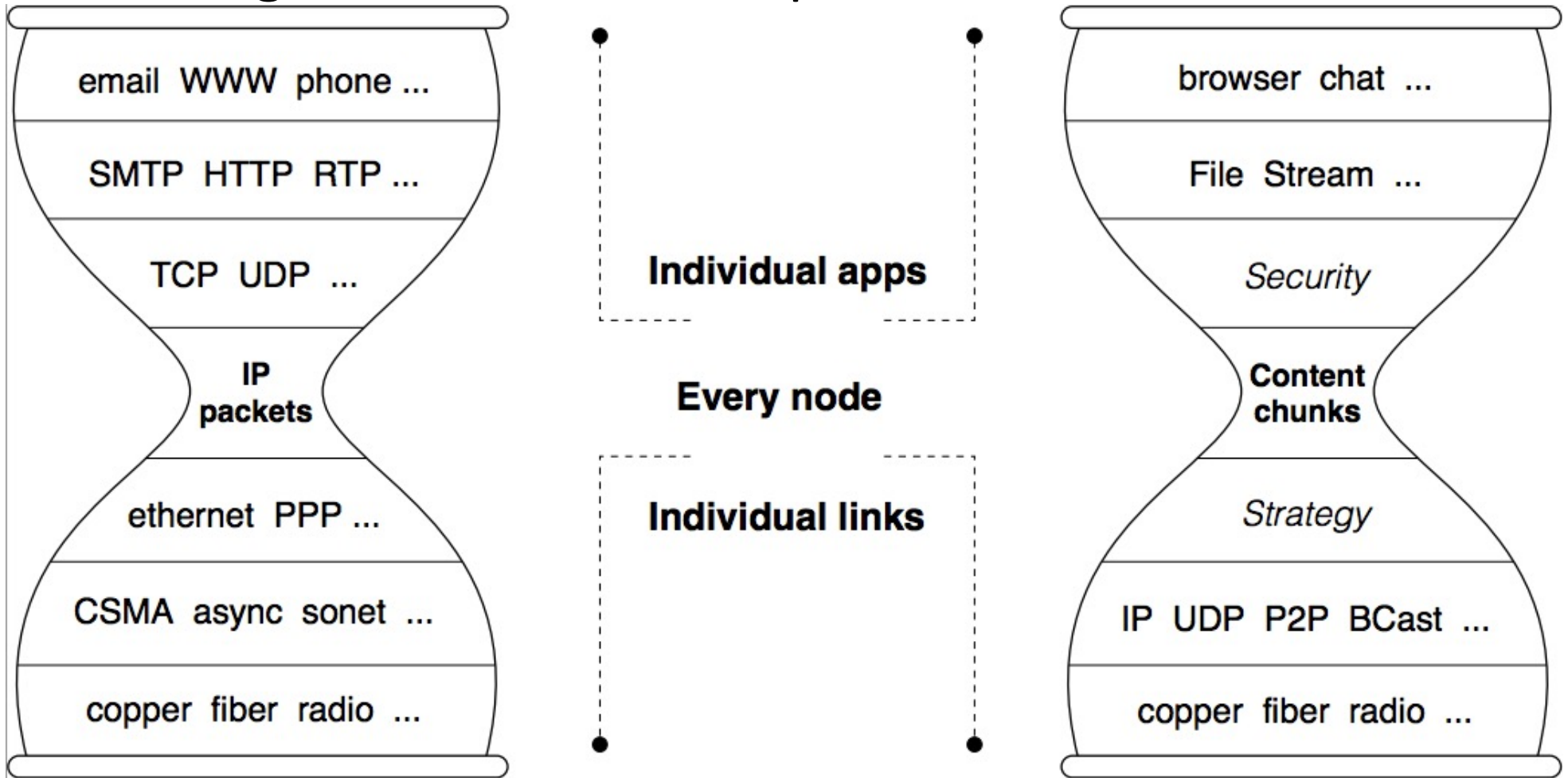
# Networking has many facets



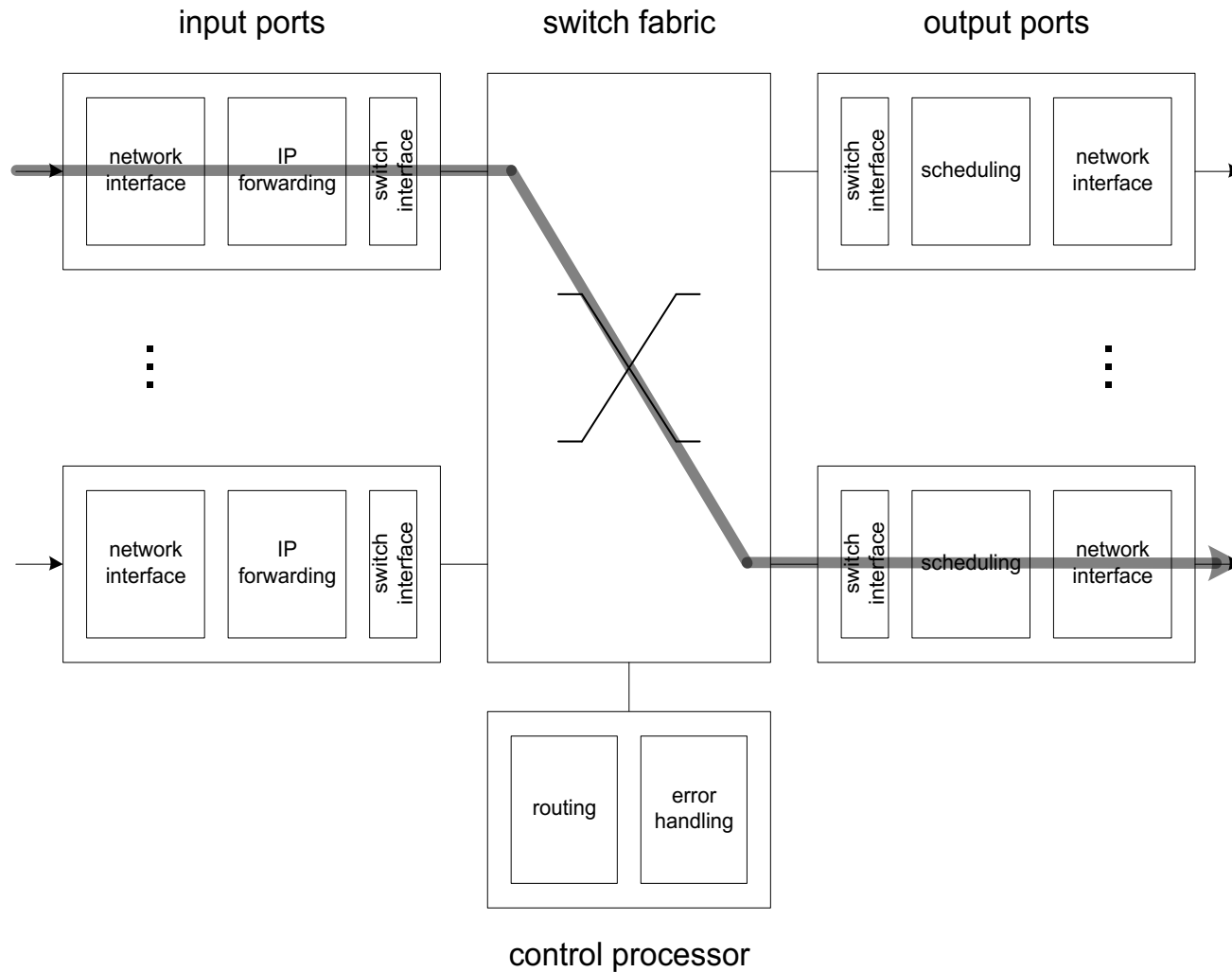
- Goals: functionality, scalability, throughput performance, security, power efficiency, manageability, etc.

# Protocols: Internet architecture

- Hourglass architecture of protocol stack

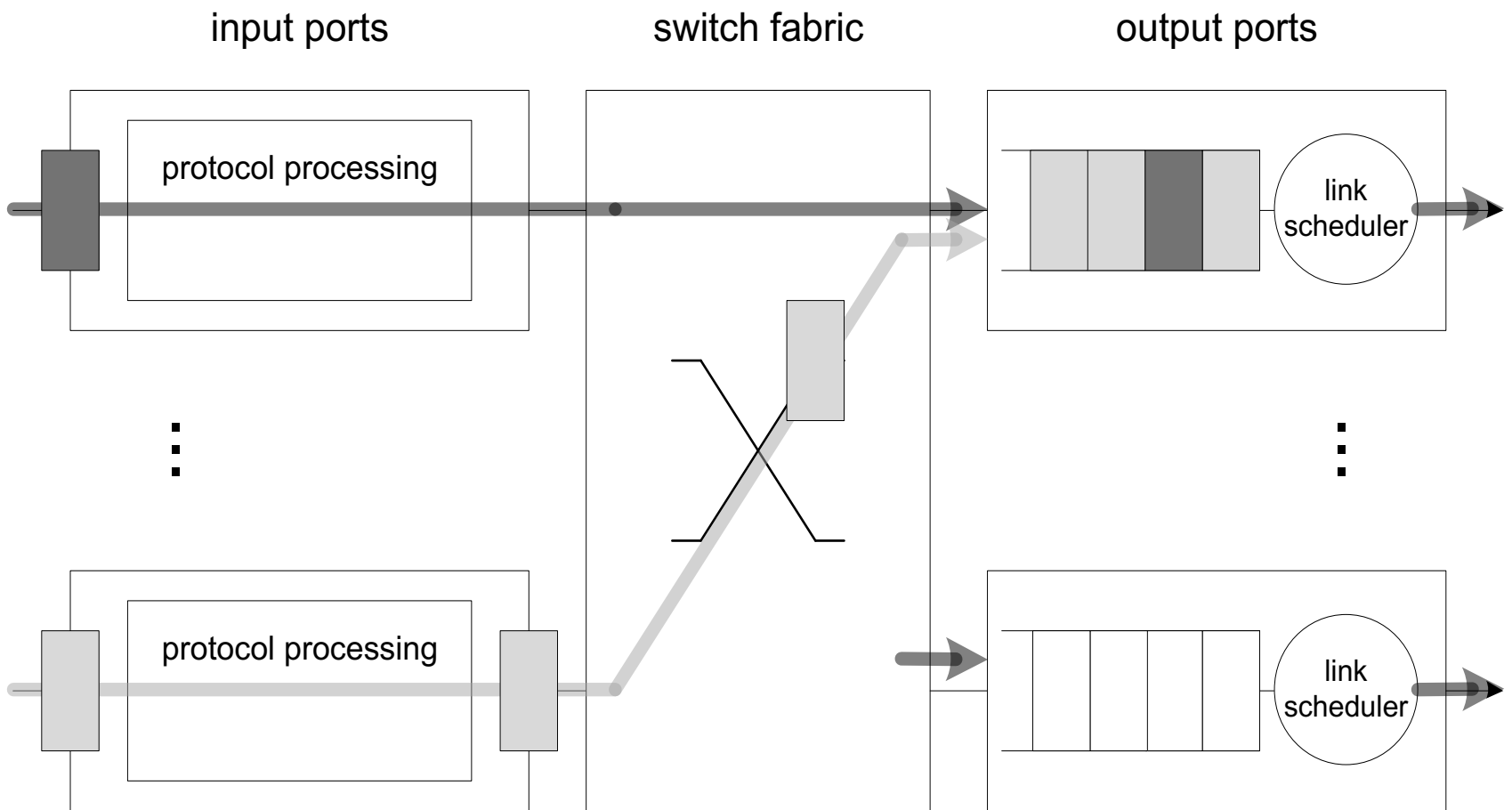


# Systems: generic router



# Theory: statistical multiplexing

- Operation of network without guarantees





# What are interesting new problems?

- Many interesting research problems in networking
  - Billions of users, machine-to-machine communication, applications (e.g., health-care), etc.
- Examples:
  - Protocols
    - Defining exchanges for new communication paradigms (e.g., peer-to-peer, content-centric networking, sensor networks, etc.)
  - Systems
    - Design of high-performance routers that can process packets in software
  - Theory
    - Network science and overlap with other “networks”
  - Many more...

# Structure of this course

<http://www.ecs.umass.edu/ece671/Schedule.html>

# Course information

- Read the syllabus
- Up-to-date information on course web site:
  - <http://www.ecs.umass.edu/ece671/>
  - Schedule, slides, etc.
- Course components:

– Exam I	15%
– Exam II	15%
– Exam III	15%
– Homework assignments	10%
– Lab assignments	20%
– Final project	25%

# Labs and assignments

- Labs
  - Four lab assignments
  - Details later in the semester
- Assignments
  - Check web site for reading assignments
    - Multiple lectures may cover single chapter