CSE 473S:Introduction to Computer Networks

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Audio/Video recordings of this lecture are available on-line at:

http://www.cse.wustl.edu/~jain/cse473-22/

Overview

□ Why Study Computer Networking?

□ Goal of This Course

□ Instructor

□ Grading

□ Contents of the course

□ Tentative Schedule

Student Questions

Networking = "Plumbing"

❑ Networking is the "plumbing" of computing

❑ Almost all areas of computing are network-based.

> Distributed computing

> Big Data

> Cloud Computing

> Internet of Things

> Smart Cities

❑ Networking is the backbone of computing.

We are in the Internet Age.

Student Questions

❑ What is the internet of things?

Non-computer devices, such as thermostats, cameras connected to the Internet are called "Things."

❑ How are all the fields related to each other? Only through networks or by other means as well? Does one impact the other?

One enables the other. Cloud computing will not be possible without the Internet. Distributed computing will not be possible without networking.

❑ Which network-based areas of computing make the most money?

It depends. Apple is currently the most valued company. It makes money by selling network-based communication devices.

Networking is Fueling All Sectors of Economy

❑ Networking companies are among the most valued companies: Apple, AT&T, Samsung, Verizon, Microsoft, China Mobile, Alphabet, Comcast, NTT, IBM, Intel, Cisco, Amazon, Facebook, …

⇒ All tech companies that are hiring currently are networking companies

❑ Note: Apple became highly valued only after it switched from computing to communications (iPhone)

Networking = Economic Indicator

Student Questions
❑ What are some examples of networking related job roles that someone would apply for?
Networking Researcher, Network administrator, Datacenter Support, Cloud App developer, ...

Selecting the Right Field

❑ Important question for **students**, academics, entrepreneurs, and companies

❑ Goal: To impact

❑ Follow the **paradigm shifts**:
  ➢ 1980: Ethernet
  ➢ 1990: ATM Networks
  ➢ 2000: Optical Networks
  ➢ 2005: Wireless Networks
  ➢ 2008: Next Generation Internet/SDN
  ➢ …
  ➢ 2022: Whatever is being **hyped** this year?

> Industries adapt by necessity.
> Academics continue to develop deeper expertise on what they already know.

Student Questions

❑ Is Ethereum built based on Ethernet? Any relationships between them?

All cryptocurrencies are possible only because of the Internet. Without the Internet, you cannot have any virtual currencies, virtual shopping, virtual education, ...
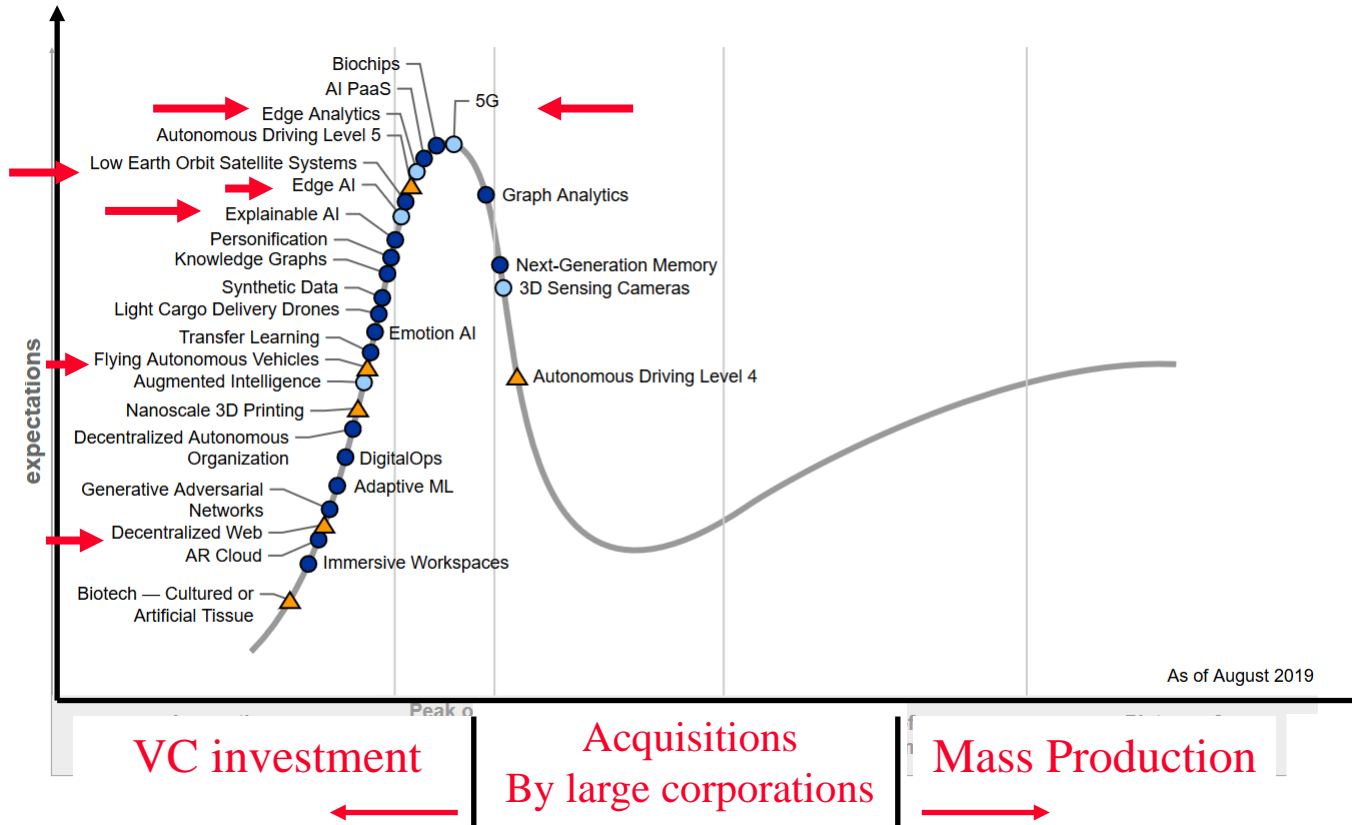
❑ What do you think are the limitations of the current network paradigm? The hardware, software, or even politics? How can we get breakthrough them?

All of the above.

❑ Why did you use the word "adapt" during your lecture? It sounds like a passive word. Why can a company not create/invent a new paradigm but only adapt to it?

Yes, industries invent "new areas" by necessity. Academics invent by "their interests." This means some academics don't switch to the latest/relevant issues.

Gartner Hype Cycle of Emerging Tech 2019

Biochips
AI PaaS
Edge Analytics
Autonomous Driving Level 5
Low Earth Orbit Satellite Systems
Edge AI
Explainable AI
Personification
Knowledge Graphs
Synthetic Data
Light Cargo Delivery Drones
Transfer Learning
Flying Autonomous Vehicles
Augmented Intelligence
Nanoscale 3D Printing
Decentralized Autonomous Organization
Generative Adversarial Networks
Decentralized Web
AR Cloud
Biotech — Cultured or Artificial Tissue

5G
Graph Analytics
Next-Generation Memory
3D Sensing Cameras
Emotion AI
Autonomous Driving Level 4
DigitalOps
Adaptive ML
Immersive Workspaces

expectations

As of August 2019

VC investment
Acquisitions By large corporations
Mass Production

Ref: B. Burke, D. Smith, "Hype Cycle for Emerging Technologies, 2019," Gartner Report G00370466, 6 Aug. 2019, 68 pp.

Student Questions

❑ Are there technologies (in networking or anything else) that are vital but since they don't bear economic interest and thus don't get any funding from VC?
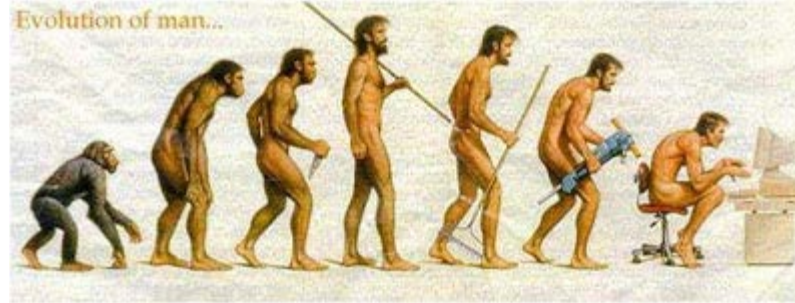
One example is networking for the least developed nations. Humanitarian organizations rather than VCs handle such issues.

❑ How could we get involved in these hot topics as a student or a worker in the industry? Or how to improve ourselves after graduation?

Keep aware of the latest developments. Choose your fields carefully. Reevaluate your directions every year.

Internet Age

Evolution of man...

- Distributed Computing

- Cloud Computing

- Mobile Computing $\Rightarrow$ Smart Phones

- Streaming Video $\Rightarrow$ YouTube

- Social Networking $\Rightarrow$ FaceBook

- Big Data

- Machine Learning $\Rightarrow$ Artificial Intelligence

- Online Shopping $\Rightarrow$ Amazon, Ebay, Google

- Most fields today – Education, Health, Environment – are advancing simply because of advances in networking

Student Questions

- What do you think will be age after Internet Age? Cyborg Age?

Future is everyone's guess. I don't know the future. I try to keep at the leading edge of the "present." Also, I think only about issues that I can impact.

Current Hot Topics in Networking

1. Internet of Things (IoT)
2. Cybersecurity
3. Cloud Computing
4. Software Defined Networking
5. Wireless Networking
6. Streaming Media

Student Questions

❑ What would the future hot topics in networking look like?

We are working on applying AI and Blockchains for Cybersecurity.

Trend: Smart Everything

|		
Smart Watch	Smart TV	Smart Car
Smart Health	Smart Home	Smart Kegs
Smart Space	Smart Industries	Smart Cities

Student Questions

❑ It has been a long time since auto-driving had been invented. But people like us are still seems far away from it. Why is it not so common everywhere in the world? What are the limitations to that? Will it be possible to be the manufacturer or something else?

❑ Old habits die hard. We have been talking about virtualization for the last 40 years. COVID forced the world to virtualize in one year. No more need for travel to attend conferences.

❑ How long do you think it takes from a new theory to manufacturing, which can be used around most people worldwide? For example, 6G.

Necessity and cost are often the obstacles.

What's Smart?

❑ Old: Smart = Can think $\Rightarrow$ Computation

= Can Recall $\Rightarrow$ Storage

❑ Now: Smart = Can find quickly, Can Delegate

$\Rightarrow$ Communicate = Networking

❑ Smart Grid, Smart Meters, Smart Cars, Smart homes, Smart Cities, Smart Factories, Smart Smoke Detectors, …
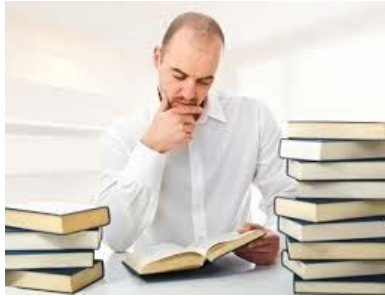
Not-Smart   Smart

❑ Smart = Apply the latest **technology** to solve problems

http://www.cse.wustl.edu/~jain/cse473-22/

Student Questions

Trend: Smart to Intelligent

Intelligent Clock	Intelligent TV	Intelligent Car
Intelligent Health	Intelligent Home Security	Intelligent Microwave
Intelligent Light	Amazon Alexa	Google Assistant

Student Questions

❑ Is being a smart device a pre-requisite to being an intelligent device?

No. You can have AI without networking.

❑ Does the shift from smart to intelligent require any additional improvements in networking?

Networking is benefitting from AI.

❖ Could you review the difference between smart and intelligent?

Smart = Internet
Intelligent = AI

Trend: Security & Cyber Warfare

❑ Security of computers, companies, smart grid, and nations

❑ Nation States are penetrating other nations computers
   5th domain of warfare (after land, sea, air, space)

❑ In 2010, US set up US Cyber Command

❑ UK, China, Russia, Israel, North Korea have similar centers

❑ Many cyber wars: North Korea vs. USA, Israel vs. Syria, South Korea vs. North Korea, India vs. Pakistan, …

Old

New

Student Questions

❑ Do you ever foresee soldiers fighting in the battlefield being obsolete and warfare being fought entirely remotely via drones, missiles, cyber warfare, etc.?

It is happening now.

Ref: http://en.wikipedia.org/wiki/Cyber_war

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Internet of Harmful Things

Researchers at DEFCON 3, hacked a smart toilet, making it flush incessantly and closing the lid repeatedly and unexpectedly. Causing a **Denial of Service** Attack.

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Student Questions

❑ Do you think hackers will become more prevalent as smart technologies/cloud computing becomes more widely used? What steps can/should companies and users take to prevent this in the future?

Hackers are intelligent people. They exploit weaknesses and help improve the technology.

❑ Do you personally use a lot of smart devices? I have met people who work in the security space who will not use them due to the possibility of these attacks occurring.

I am an "early adapter." But, use technology wisely to avoid security pitfalls. Such as cloud-based applications.

DEFCON

- ❑ Hacker's conference
- ❑ Held in Las Vegas every July
- ❑ 20,000+ attendees
- ❑ All anonymous

Ref: https://www.ethicalhacker.net/features/opinions/first-timers-experience-black-hat-defcon

http://www.cse.wustl.edu/~jain/cse473-22/

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Recent DEFCON Topics

- Hacking voting machines
- Hack connected vehicles
- Hacking the cloud
- Hacking travel routers
- Clone RFID in real time
- Breaking the Uber badge ciphers
- Counterfeit hardware security devices, RSA tokens
- Fool antivirus software using AI
- How to track government spy planes
- Break bitcoin hardware wallets
- DARPA Cyber Grand Challenge (2015, 2016)
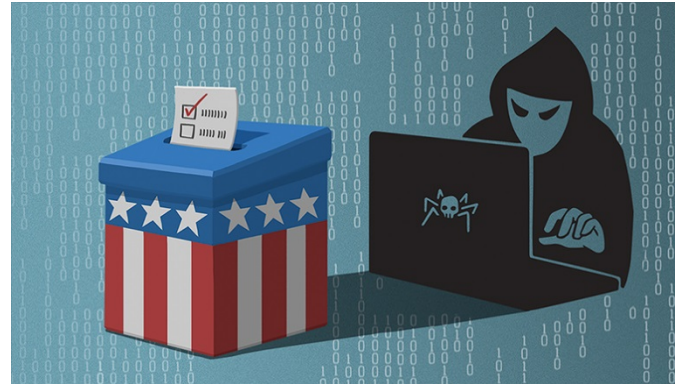
Student Questions

- How is the Hacker's Conference not illegal if hackers are informed on the ways in which to cause corruption?

In these conferences, they talk about weaknesses in the current world. It is suitable for society.

- Have you ever hacked anything for fun?

We teach it in our network security course.

- Just curious, what topics did you participate in at the conference?

All of the above. The halls were packed. Difficult to get in.

- Can you teach us how to hack the cloud in the network security chapter?

Take the network security course(s).

- Is the U.S. Government/CIA using DEFCON as outreach to hire top hackers?

Yes. We need hackers to fight with our enemies.

- Out of curiosity, how vulnerable do you think voting machines are given the recent controversies?

More secure than manual voting.

Trend: Cloud Computing

- August 25, 2006: Amazon announced EC2 ⇒ Birth of Cloud Computing in reality (Prior theoretical concepts of computing as a utility) $10 B in 2016, a growth rate of 49% with 17% margins, much higher than the overall Amazon business

- Cloud Computing:
  - Applications through Internet (Google Docs)
  - Computing through Internet (Amazon EC3)
  - Storage and backup through Internet (iCloud, Google Drive)

Student Questions
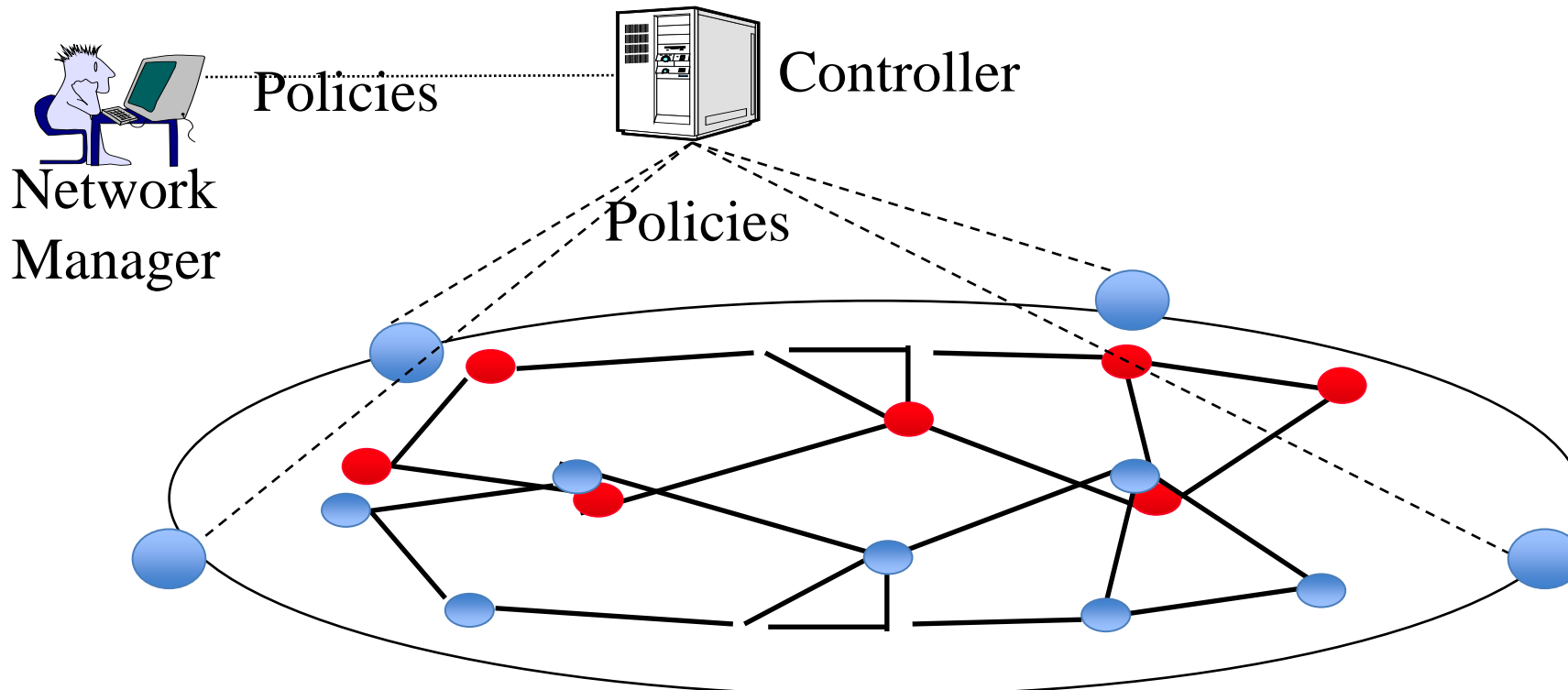- Will we learn more in depth about cloud computing during this class?

No. More in "CSE 570: Recent Advances in Networking."

- I am not sure about the relationship between cloud computing and the Internet.

You can't reach a cloud without the Internet.

Software Defined Networking

❑ Using standard networking hardware
⇒ Allows managing large networks using software

Policies

Controller

Network Manager

Policies

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Goal of This Course

❑ First course in networking

❑ Fundamentals

❑ Broad coverage of key areas of networking

❑ Networking background for networking applications in other areas of computing

❑ This is a course on Networking Architecture

❑ This is not a course on network building or usage

❑ You will be able to understand protocols

❑ An example of the difference between architecture and implementation is the computer architecture course and a course on Intel Pentium Chip.

❑ This is the first course on networking.

❑ Basis for more advanced networking courses

Student Questions

❑ How would you define a good networking architecture?

If it is good, it will be adapted.

❑ Is the course more theoretical or applicational? Could you explain more about what the course is designed to help us do? Will it help us build/design better computer programs?

This is a system (S) course. It is not a software /hardware /theory (T) course. It will help you efficiently use networks in your field, including programming.

What Will You Learn?

1. What messages and messages are exchanged when you fetch a web page?
2. What messages are used to send/receive emails?
3. How the names such as www.google.com gets translated to IP addresses such as 74.125.73.104?
4. What is done to avoid congestion under overload?
5. How is the path in the Internet determined?
6. What happens if bits in a packet get corrupted?
7. How WiFi or Ethernet works?
8. What is the difference between WiFi, Ethernet, IP, and TCP?
9. What is done to handle audio/video on the Internet?
10. How can you guarantee security on the Internet?

Student Questions

Networking Courses at WUSTL

1. **CSE 473: Introduction To Computer Networks** (Spring 2022) – Prerequisite for all other networking classes

2. CSE 521S: Wireless Sensor Networks

3. CSE 537S: Mobile Computing

4. **CSE 570S: Advanced Networking:** Clouds, Big Data, SDN, IoT (Fall 2021)

5. **CSE 574S**: **Wireless and Mobile Networking** (Fall 2020)

6. **CSE 571S: Network Security**

7. CSE 7700: Research Seminar On Networking and Communications

Student Questions

❑ It is valuable to design a new better email system? Will NSF support such kinds of projects?

You have to show the need and cost-to-benefit tradeoff of any idea you want to sell to anyone.

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Networking Foundation

CSE 521S: Wireless Sensor Networks

CSE 537S: Mobile Computing

CSE 570: Advanced Networking

CSE 571: Network Security

CSE 574S: Wireless and Mobile Networking

CSE 7700: Res Seminar On Networking

CSE 473S: Introduction to Networking

http://www.cse.wustl.edu/~jain/cse473-22/
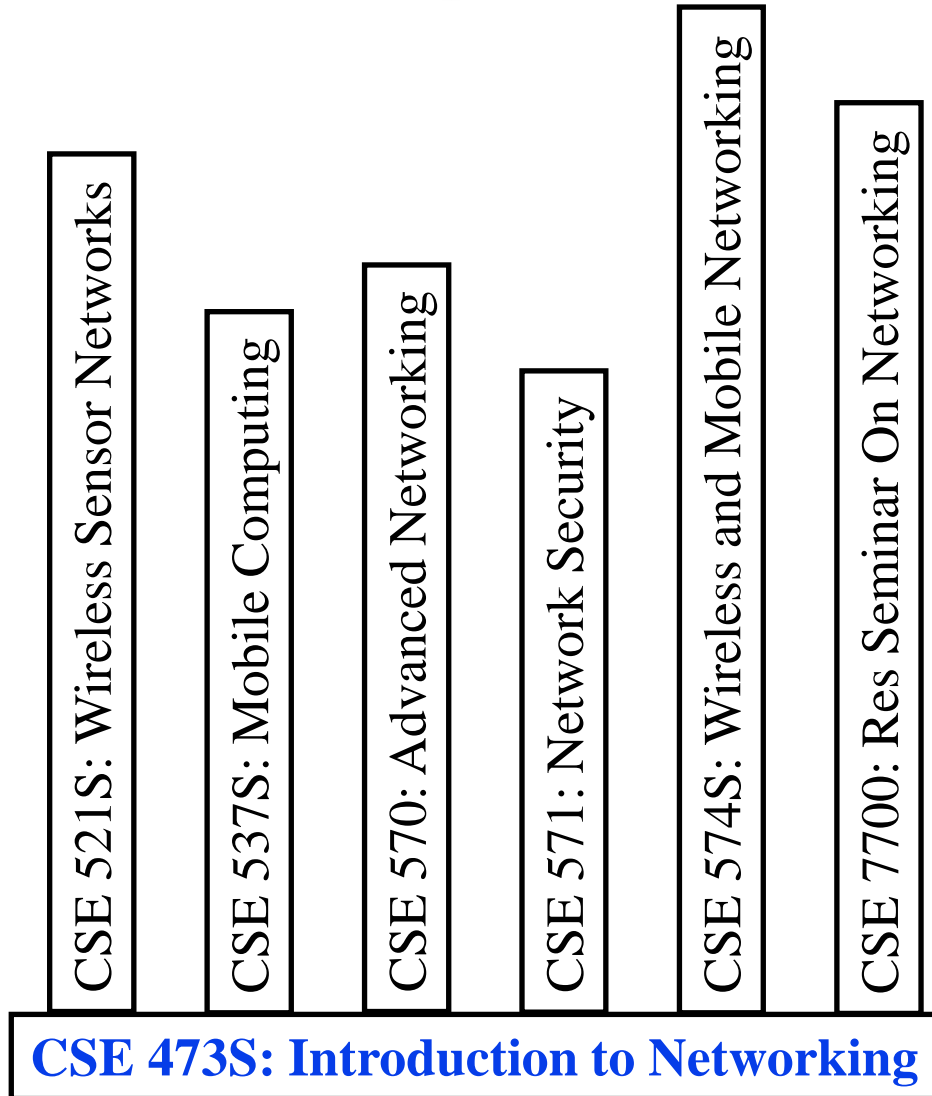
Textbook

❑ J.F. Kurose and K.W. Ross, "Computer Networking" **8th Edition**, Pearson, 2021, ISBN: 9780136681557, 764 pp. **Required**.

❑ Get the latest edition. Do not use older editions. If you use international edition, it should be dated later than 2020, should have 764 pages.
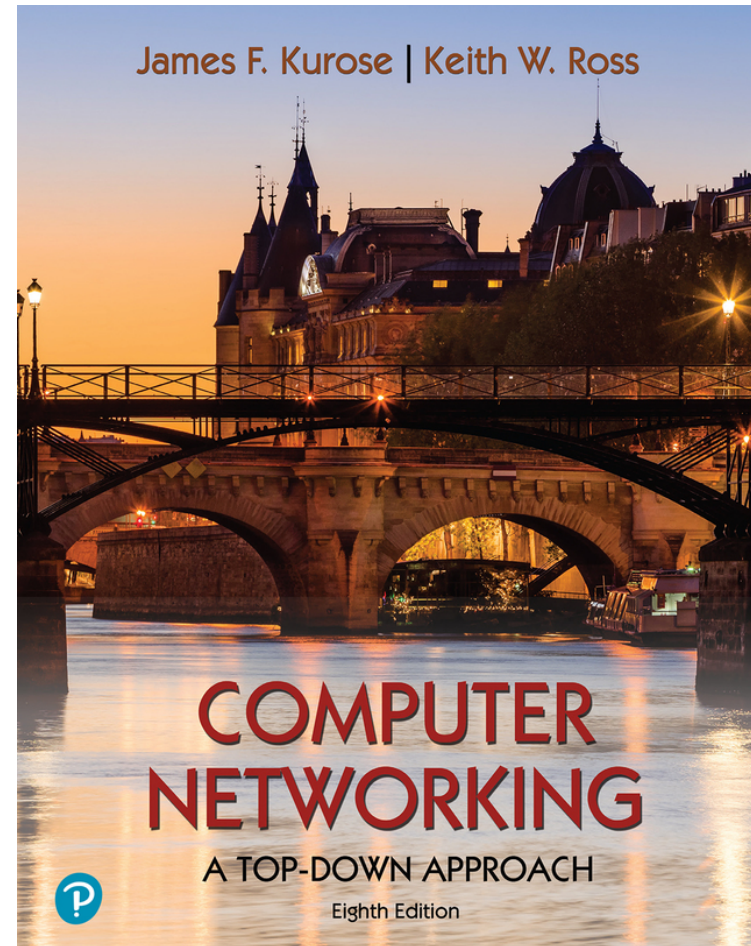
Student Questions

❑ When should we have the textbook by?

Today

❑ Is a digital copy of the textbook sufficient/okay?

Yes, as long as you get them legally.

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Textbook (Cont)

❑ It is recommended that you read the relevant chapter of the book chapter before coming to the class
$\Rightarrow$ Class time will be used for discussing and clarifying key concepts

❑ Only key concepts will be covered in the class.
You are expected to read the rest from the book.

❑ Please ask questions in the next class about any concepts that are not clear to you

❑ Material covered in the class will include some concepts from other textbooks. Please pay attention to the class lecture.

Student Questions
❑ When we return to in-person class will we still be required to watch videos before coming to lecture instead of reading the text?

Yes. Video is not "a substitute for" reading the text. Both are required. Videos provide an overview of the text.

Prerequisite

❑ General knowledge of computer systems organization
  ➢ Memory
  ➢ System bus
  ➢ Interrupt
  ➢ CPU
  ➢ Binary, decimal, hexadecimal representations
  ➢ Bits, bytes
  ➢ Storage: Memory and disk

❑ CSE 131: Computer Science I or equivalent

Student Questions

❑ I have learned the term System bus in a computer systems course, but it was used to described the transferring of data between CPU and memory, so how would it be connected to networking?

You read/write data to network devices just like the memory.

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Tentative Schedule

Date	Q&A Topic	Chpt.
1/19	Course Overview	
1/24	Computer Networks and the Internet (Part 1)	1
1/26	Computer Networks and the Internet (Part 2)	1
1/31	Application Layer (Part 1): HTTP	2
2/2	Application Layer (Part 2): SMTP, DNS, P2P	2
2/7	Transport Layer (Part 1): Design Issues	3
2/9	Transport Layer (Part 2): UDP, Flow Control	3
2/14	Transport Layer (Part 3): TCP, TCP Congestion Control	3
	The Network Layer: Data Plane (Part 1: Network Layer Basics)	4
2/16	Exam 1 Review	**1-3**
2/21	**Exam 1**	**1-3**

Student Questions

❑ Will the exams be offered only during class time? or will there be, say, a 24 hour window of time where we can begin the exam?

Fixed time 1:00PM to 1:50PM.

❑ The timing of the exams on the slides is different from what is said in the video (the video on the course website seems to be recorded in a previous semester), which is a little confusing to me since I joined the class after the first lecture. What is the expected timing of exams?

All recordings posted are live recordings of the previous lecture. Recordings take several days to prepare. Recordings of the class sometimes fail and so discussion recordings are not guaranteed. You have to attend the class to get the discussion and ask questions.

❑ Will exam papers in past few years be provided before exams?

No.

❑ Would we have in-person classes after the first two weeks or totally online?

Exams will be in-person.

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Tentative Schedule (Cont)

Date	Q&A Topic	Chpt.
2/23	Network Layer Data Plane (Part 2: IP Datagram, NAT, UPNP, DHCP)	4
2/28	Network Layer Data Plane (Part 3: SDN)	4
	The Network Layer: Control Plane (Part 1: Dijkstra's, Bellman-Ford Algorithms)	5
3/2	The Network Layer: Control Plane (Part 2: OSPF and BGP)	5
3/7	The Network Layer: Control Plane (Part 3: SDN Controller + ICMP + SNMP)	5
3/9	The Link Layer and LANs (Part 1): Functions	6
3/14	**Spring Break - No class**	
3/16	**Spring Break - No class**	
3/21	The Link Layer and LANs (Part 2): CRC	6
3/23	The Link Layer and LANs (Part 3): Multiple Access, Ethernet, VLANs, MPLS, Data Centers	6
3/28	Exam 2 Review	**4-6**
3/30	**Exam 2**	**4-6**

Student Questions

❑ Do I need to read all the content of chapters 1-8 in the textbook, even if some of the contents don't appear in the slides? In other words, does the exam only test the knowledge in the slides, or all the book content may be tested?

The sections you need to read are identified in the slides.

Tentative Schedule (Cont)

Date	Q&A Topic	Chpt.
4/4	Wireless and Mobile Networks (Part 1): Wireless Characteristics, LANs and PANs	7
4/6	Wireless and Mobile Networks (Part 2): Mobility Management	7
4/11	Wireless and Mobile Networks (Part 3): 4G+5G	7
4/13	Security in Computer Networks (Part 1): Cryptography	8
4/18	Security in Computer Networks (Part 2)	8
4/20	Security in Computer Networks (Part 3)	8
4/25	**Exam 3 Review**	7-8
4/27	**Exam 3**	7-8

- **Note that Exam 3 is on Wednesday, April 27, 2022.**
- **The dates for all exams are fixed. No substitute exams.**
- **Everyone has to take the first two exams.**

Student Questions

❑ The final exam on last day of class 4/22, now the same as the last year schedule in the slide 5/3 right?

Slides are updated regularly. Video recordings are static. Whenever there is a difference, slides take precedence.

❑ The webstac page states we have a time slot for a final exam on May 13, 2021, but the last exam is on May 3rd. Is there some other assignment tied to the date May 13, 2021?

No. There are no activities after Exam 3. There is no final exam.

Grading

- Exams (Best 2 of 3)   60%
- Class participation   5%
- Video Reviews   10%
- Home works   15%
- Labs   10%
- Letter grade are assigned based on the entire class's performance. Breakpoints vary every year. Examples:
  - **2020:** 90+: A+, 85+: A, 80+: A-, 75+: B+, 70+: B, 65+: B-, 60+: C+, 55+: C, 50+: C-
  - **2019:** 90+:A+, 84-90:A, 78-84:A-, 72-78:B+, 66-72:B, 60-66:B-, 54-60:C+, 48-54:C, 42-48:C-
- **Pass/Fail:** Anyone getting over **66**% of the highest achieved grade in the course will pass. For example, if 96 is the highest score, the passing grade will be 67.2

Student Questions

- Can you explain how the class participation works?

Answering question. Attendance. Bringing up interesting issues in the class discussions.

- How many HWs/Labs do we have throughout the course of the semester? How long do you expect them to take?

26 home works and 12 labs. All home works are short but require reading/understanding. Labs may require programming.

- Is there a grade distribution scheme?

No. You get points for method and result.

Exams

❑ There are three exams.

❑ All exams are 50 minutes long.

❑ One note sheet of 8.5"x11" (both sides) is allowed along with a simple calculator (TI-30).

❑ Exams consist of numerical as well as multiple-choice (true-false) questions.

❑ There is a <u>negative</u> grading on incorrect multiple-choice questions. Grade: +1 for correct. -1/(n-1) for incorrect.

❑ All students including the graduating seniors are graded the same way.

❑ Your grade depends upon the performance of the rest of the class.

Student Questions

❑ It's said in the video that you receive zero points for not answering a quiz question. From class, my understanding was that we lose a point by not answering. What happens if we don't answer a quiz question?

For true/false questions, if you answer correctly, you get 1 point. If you answer incorrectly, you get -1 point. You get 0 points if you don't answer.

For all other questions, there is no negative grading. You get 0 points if you don't answer. The points depend upon the method and the final answer.

❑ Are exams during the normal class period?

Yes

❑ The PowerPoint says that there is a negative grading on incorrect multiple-choice questions. grade: +1 for correct -1/(n-1)for incorrect. What does the number n means? Is it the number of the selection?

Yes. n=# of choices in a multiple choice question. n=2 for true/false.

❑ Do exams involve programming?

No.

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Lab Exercises

❑ Most modules will have a lab component

❑ Some labs require writing a short program to do what the protocol would do

❑ You should be able to do most labs on your own computer

Student Questions

❑ Which language will the programming portion of the labs use?

Python and C.

❑ I don't have any experience with Python, it's never been required in any of my CS curricula. Should I learn Python for this class?

We follow the textbook as much as possible. Each chapter in the book has some lab exercises. Some exercises require programming. The author has selected common languages for those exercises.

❑ Are labs to be completed individually as well?

Yes.

❑ Can we work in groups of 2-3 for labs?

All labs are short programming or data analysis exercises.

❑ How in-depth is the programming? Does it go down to programming protocols or up to using the protocols? For example, using TCP to do Task A rather than programming TCP (or some part of it) itself.

Check out previous year's lectures.

❑ What programming language do we need to learn in order to finish the lab?

C and Python.

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Home Work Submission

❑ All home works are due on the following Monday at the beginning of the class unless specified otherwise.

❑ Any late submissions, if allowed, will *always* have a penalty.

❑ All home works should be submitted to Canvas unless specified otherwise

❑ All home works are identified by the class handout number.

❑ All home works should be on a separate sheet/file.
Your name should be on every page.

❑ Please write CSE473 in the subject field of all emails related to this course.

❑ Use the words "Home Work" in the subject field on emails related to home works. Also indicate the homework number.

Student Questions

❑ Will we need any software for the homework?
Yes. Only free network utilities. It will be indicated in the homework or lab.

❑ Will the homework be coding? or writing paragraphs, like answering questions? what about the lab
Most homeworks are paragraphs and calculations. Most labs are network activities. Only some labs have coding.

❑ Can we see the homework template to clarify the requirement?
Check out the previous years slides and recordings.

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Homework Grading

❑ Grading basis: Method + Correct answer

❑ Show how you got your answer

   ➤ Show intermediate calculations.

   ➤ Show equations or formulas used.

   ➤ If you use a spreadsheet, a statistical package, or write a program, print it out and turn it in with the homework.

   ➤ For Excel, set the print area and scale the page accordingly to fit to a page. (See Page Setup)

Student Questions

❑ If using code in the homework, does the whole code need to be included as well?

Yes.

❑ What format do homework questions take? Are they more free response or multiple choice/True-False?

Short calculations.

Academic Integrity

❑ Academic integrity is expected in homework's, quizzes, and exams.

❑ All solutions submitted are expected to be yours and not copied from others or from **solution manuals or from Internet**

❑ School requires us to report all integrity violations to the department
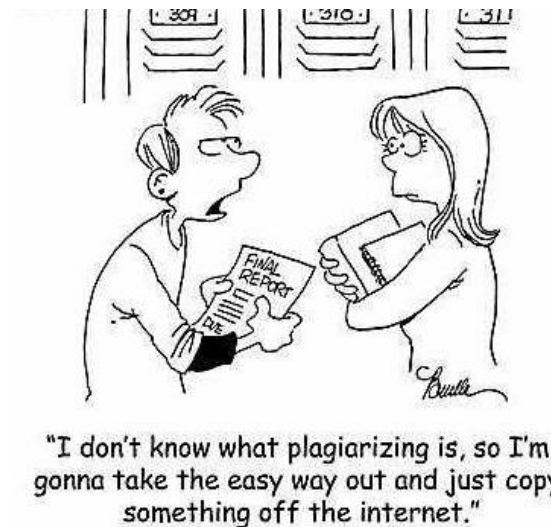
Student Questions

❑ So how will the solutions to the homeworks be posted?

When needed, I will discuss the solutions in the class.

"I don't know what plagiarizing is, so I'm gonna take the easy way out and just copy something off the internet."

Cartoon Source: https://www.tarleton.edu/stulife/judicial/integrity/index.html

http://www.cse.wustl.edu/~jain/cse473-22/

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Office Hours

❑ By Appointment: Office: Zoom

❑ Teaching Assistants:

➢ Zebo Yang

➢ Haneen Alfauri

➢ Saleh Alawaji

➢ Sangeetha Suresh

❑ TA Hours: Will be posted on Piazza

❑ All meetings with TA will be via zoom.

Link will be posted on Piazza or Canvas

Student Questions

❑ If the semester switches to in-person instruction as planned, will we have any in-person office hours?

To be determined.

After-Class Discussions

❑ We will use Piazza for in-between class **urgent** questions.

❑ No participation points for questions on Piazza.
Get points if you help by answering a question.

Help by pointing to the correct direction and not by giving the correct answer to be submitted.

Publishing an answer anywhere on the Internet including on Piazza is unethical.

❑ If a question is not urgent and can wait till the next class, please bring it up in the class or via Google forms ⇒ Get points

❑ Find our class page at:
https://piazza.com/class/kx7xq9kp7t973y

Student Questions

❑ Why is piazza not included in participation?
We want to encourage discussions in class as much as possible. Offline activities (such as Google forms) have specific marks assigned to them.

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Summary
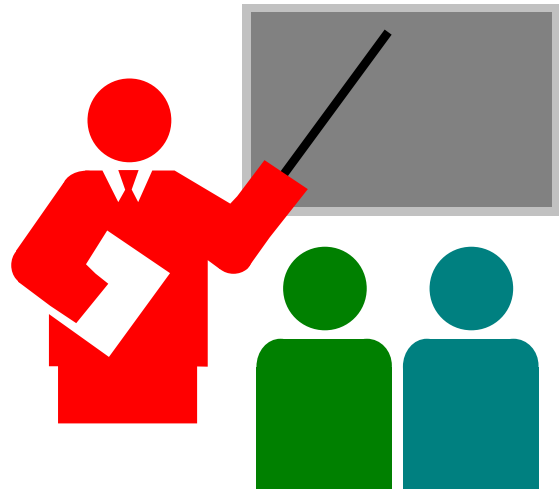
Student Questions

❑ Computer networking is important for all areas of computing

❑ First course in computer networking

❑ Goal: To prepare you for a career in networking

❑ Get ready to work hard

Reading

❑ Read Chapter 1 of Kurose and Ross

Student Questions

❑ Will some knowledge only appears in textbook and not be covered by lectures?

The textbooks covers material in more detail than the lectures. Some topics in the book will not be covered in the course or exams.

Quiz 0: Prerequisites

❑ True or False?

❑   T   F

1. ☐ ☐ Transmitting 100 bytes @ 800 bit/sec will take 1 sec.
2. ☐ ☐ A system with 32kB memory can hold only 16000 ASCII characters
3. ☐ ☐ A system with 2GB memory is same as that with 2GB disk.
4. ☐ ☐ Interrupts are used by CPU to stop an ongoing I/O.
5. ☐ ☐ Binary representation of 9 is 1001
6. ☐ ☐   0A in Hexadecimal is 11 in decimal system.
7. ☐ ☐ For $I = A \sin(2\pi ft + \phi)$, the frequency is f.
8. ☐ ☐   5 modulo 2 is 1
9. ☐ ☐   Two entries "P" and "Q" are pushed sequentially on a stack. A "pop" operation on the stack will produce P.
10. ☐ ☐ If x is 0, then after x++, x will be 1.
11. ☐ ☐ The sum of two vectors [1, 1] and [1, 2] is [1, 2].

Marks = Correct Answers _____ - Incorrect Answers _____ = _____

Student Questions
❑ Problem understanding problem 7
You need to know trigonometry.
❑ Would every video have such quizzes besides the video embedded quizzes?
No.
❑ Are we required to finish it and upload it to somewhere? Are these topics covered in exams?
No.

Remote Classes

❑ **All** Q&A sessions of this course throughout this semester will be remote using Zoom.

❑ The class is **flipped**: you review the material in the video before the class and submit your questions on a Google Form.

❑ Class time will be used to answer those questions and any additional ones that come up.

Student Questions

❑ Where can we view the uploaded lecture videos? I can't find it on Canvas now.

Videos are on the course webpage. The URL is on every slide. WUSTL students should watch videos on Canvas to get points. Q&A videos are on the website.

❑ Are most of the class resources through your website, canvas, or is it mixed?

Most resources are on the website. Reminders for assignments, home works, labs are on Canvas.

❑ When we return to in-person learning will any logistics of the class change?

No.

❑ If we were able to start in-person classes in February, will the question answering keeps on Zoom or will it be in-person?

Zoom

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Attending Classes via Zoom

- ~~Add your photo to your zoom profile.~~ ~~There is no need to start your video.~~ ~~Photo is sufficient.~~ Keep your microphone mute.

- All questions should be broadcast on the chat.
  All answers to my questions should be either private to me or broadcast to the class depending on the situation.

- Zoom report also shows when a student joined, when they left, and how much attention they were paying (probably based on your other activities on the same computer). ⇒ Please pay full attention

- Students should join with their full name and email. That way I can associate your participation.

- The class discussions are being recorded. Videos will be posted whenever possible.

Student Questions

- Will we lose points if we don't add a profile picture to Zoom?
  No.
- What if I switched windows to look up what the internet of things is? will it say I'm not paying attention?
  Yes.
- About Zoom's report on attention, what should I do if I want to look at some course-related materials? Is there any way to pull up the slides with zoom simultaneously which will not flag us for not paying attention?

Just look it up if urgent. But try to pay attention to the current discussion as much as possible.

- I have in person classes right before and after this class so it would be the most ideal for me to watch recordings later on.

Q&A sessions are mandatory. Many students join the classes from cafeteria, empty class rooms, or any open space. You can go to Lopata 101.

Video Features

❑ Our videos have embedded quizzes, table of contents, closed captions, and full screen capability.

  ➢ Click CC on the bottom of the video to enable or disable closed captions.

  ➢ Click on the menu symbol to see a table of contents. This allows you to jump to any particular slide.

  ➢ The square symbol allows you to switch to/from full-screen mode.

  ➢ When a quiz appears, answer it correctly. This gets you points that are used as your score for video review homework.

❑ Some of these features may not be available on some recordings. Quizzes are not included on the same video played from YouTube or course website.

ToC

Student Questions

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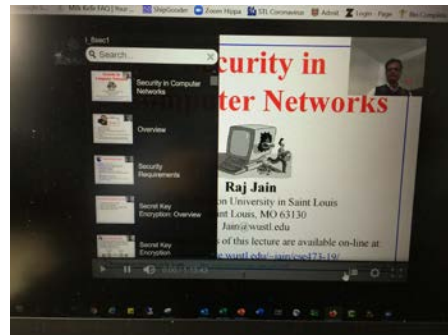
Video Review Task

❑ You are required to view the video and answer simple questions in the video.

   ➢ Google Form: To ask questions on each slide. If you do not have a question about a slide, leave the corresponding question on Google form blank.

   ➢ Both forms are due at midnight before the class day.

➡ ❑ You are supposed to read the book also and ask any relevant questions in the Google form as the last question on each form.

➡ ❑ If you do not have any questions on a slide, you should leave it blank. ~~You can leave the entire form (except your name and email) blank if there are no questions.~~ Every student is required to ask at least one question in every Google form.

❑ In each Google form, there is a place to ask any other questions related to the course.

❑ You can ask additional questions during the class via chat.

Student Questions

❑ Can you clarify what the "Video Reviews" are? Is that the google form to be filled out after viewing the lecture?

The quizzes during the video viewing count for 10 points for each video, and submitting the Google form counts for 4 points for that video.

❑ I found the google form for questions, but where are the video review form? I am having some trouble finding them.

In the past, the quiz questions were on canvas. This time, we tried and succeeded at the last minute in embedding the questions in the video itself. So we updated the Canvas Video Review form with nothing to submit.

❑ Should we just come up with a "silly" question if we genuinely don't have any?

To understand everything in a 80 minute class and not have a question is mostly due to laziness not smartness. Even idea of asking a silly question is laziness not smartness.

Exams

❑ All exams are **closed book**.

❑ You are permitted **one** cheat sheet of 8.5'x11" written or printed on both sides.

❑ ~~You should have several blank sheets of paper to write details of your answers. You email these right after the exam.~~

❑ ~~We use Respondus system to monitor the exam remotely.~~

❑ ~~You will need a webcam with a stand separate from the one in the laptop. Low-cost examples:
http://www.amazon.com/dp/B088829MV3
http://www.amazon.com/dp/B088BK488W~~

❑ No calculators, smart phones, smart pads allowed in the exam. ~~Respondus has a built in scientific calculator for your use.~~

Student Questions

❑ Are the exams in Spring 2022 will be in person? I see that Respondus section is crossed out.

Yes, in person.

❖ Will you please explain how negative grading works on the exam?

It applies only to True/False:
Correct answer =1
Incorrect answer=-1

❖ What types of questions there are in the exam?

See Sample Questions on Canvas

Scan This to Download These Slides

http://www.cse.wustl.edu/~jain/cse473-22/i_0int.htm

THANK YOU

Raj Jain

http://rajjain.com

Student Questions

❑ Will you share your industry experiences related to some Network topics?

Yes. Yes. Yes.

❑ In video you says we can take the quiz as many times as we want, but in my case after I fill in my answer and submit, the quiz just gone and I got nowhere to do it again. It that a updated policy?

No. If you play the video again, your previous score will be overridden.

❑ What is your favorite part (section, module, etc.) of this course to teach?

Entire course. Each topic builds on the previous. This course is the foundation for the next course.

❑ What makes software designed networking more secure than each company having their own hardware?

Security policies are consistently enforced on all devices from a central point.

Related Modules

CSE567M: Computer Systems Analysis (Spring 2013),

https://www.youtube.com/playlist?list=PLjGG94etKypJEKjNAa1n_1X0bWWNyZcof

CSE473S: Introduction to Computer Networks (Fall 2011),

https://www.youtube.com/playlist?list=PLjGG94etKypJWOSPMh8Azcgy5e_10TiDw

Wireless and Mobile Networking (Spring 2016),

https://www.youtube.com/playlist?list=PLjGG94etKypKeb0nzyN9tSs_HCd5c4wXF

CSE571S: Network Security (Fall 2011),

https://www.youtube.com/playlist?list=PLjGG94etKypKvzfVtutHcPFJXumyyg93u

Video Podcasts of Prof. Raj Jain's Lectures,

https://www.youtube.com/channel/UCN4-5wzNP9-ruOzQMs-8NUw

Student Questions

❑ Will it be possible for me to still get full points for Video Review 0? I joined the course on 1/19 after the first class.
There is always a small penalty for all late submissions.
❑ How can I know which page I need to read before next class and what extent I achieve after reading it?
Clearly marked in the slides
❑ The grading of exam is best 2 of 3 means that no matter what happened, we will always get the top2 grades as a result?
Yes.
❑ To what extent is DARPA involved in pushing forward new smart technologies that we will discuss in this class?
Internet was invented by DARPA. DARPA is funding latest technologies even now. But this is only a foundation course on Networking.
❑ How is the real-time cloud computing differ from the traditional computing in the network field?
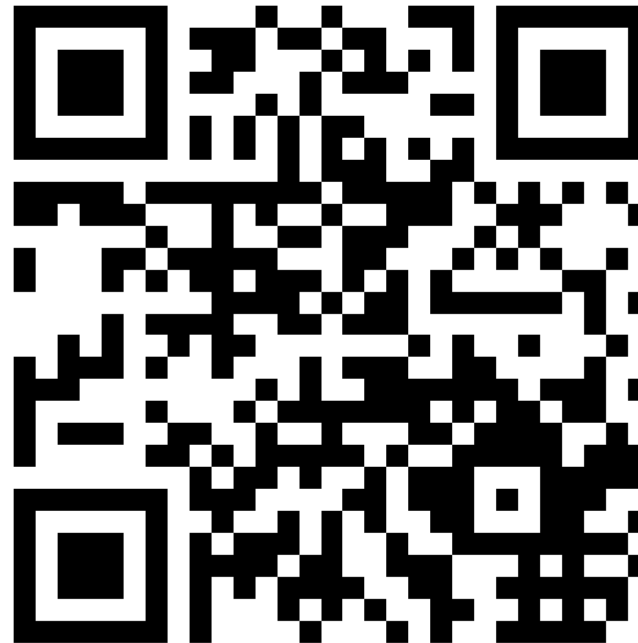*Unlimited computing power and other advantages of cloud computing.*

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Instructions for Watching Class Videos

❏ This video uses recordings from a live class in the recent past. However, the slides have been updated.

❏ The key advantage of using actual class recording is that the material is presented at the right speed.

❏ Whenever there is a difference in the audio and the text on the slides, the slides supersede the audio since they have been updated.

❏ In general, the changed text is shown in red.
Since we use red color for slide titles, new slides are shown with underlined red text (as in this slide).

❏ Most modules will include a few new slides at the end after the "related modules slide." These slides are not in the video and will be discussed during the Q&A session of the class.

Student Questions

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Instructions for Watching Class Videos (Cont)

❑ Flipping the class results in a very interactive class and students learn much more than in a normal class.

❑ We have been successfully using flipped classes for the last 3 semesters.

❑ Please download the slides pdf from the course website before watching the video. Use the soft/hard copy of the slides to write your own notes and questions.

❑ Scan the QR Code shown here to download the slides

❑ The course website URL is on every slide. All URLs on our pdfs are clickable.

Student Questions

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Video Features

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ToC

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