UNIVERSITY OF CALIFORNIA SAN DIEGO.

UC San Diego
JACOBS SCHOOL OF ENGINEERING
Computer Science and Engineering

INTERNET OF THINGS AND AI CLOUD SPECIALIZATION

INTERNET OF THINGS: HOW DID WE GET HERE?

COURSE 1

Week 1 - Solutions

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coursera

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Contents

1 Introduction

1.1 Practical Quiz

1. What are the three technologies that had a huge impact on humanity in terms of information?

   - Telephone

     Allowed for rapid communication.

   - Internet

     Allowed for massive amounts of information available cheaply.

   - Fire
   - Printing press

     Huge impact on the spread of information.

   - Steam engine

2. Which of the following is not an IoT application found in the intro video?

   - Remote Monitoring
   - Home Automation
   - Healthcare
   - Self-driving automobiles
   - Machine Learning and AI

   Correct! This is huge in IoT, but is not one of those listed.

3. What does the right side of the video control about the audio?

   - Melody
   - Noise
   - Volume
   - Tempo
   - Beat

   Correct! This controls the melody of the audio.

1.2 Assignment for Intro

1. What is the oldest broadcast technology that you learned in this course?

   - Telephone
   - Television
   - Printing press
   - Internet
   - AM Radio

   Correct: A broadcast technology is make-once, distribute multiple times.

2. Which of the following is not an IoT application found in the intro video?

   - Home Automation
   - Machine Learning and AI
   - Healthcare
   - Remote Monitoring
   - Self-driving automobiles

3. What does the right side of the video control about the audio?

   - Tempo
   - Volume
   - Beat
   - Melody
   - Noise

4. What is the purpose of Physionet in Capstone 2?

   - Streams the data to the cloud
   - Act as the internet interface.
   - Store the data being streamed.
   - Visualize the data.
   - Provide medical data

   Correct! This is open source database of medical records.

5. What interactive resource is available once a week?

   - 96Boards YouTube
   - IRC
   - 96Boards newsletter
   - 96Boards Forum
   - OpenHours

   Correct! OpenHours is a great resource to ask questions and learn about what is happening in the 96Boards community.

2 Module 1

2.1 Lesson 1

2.1.1 Questions in videos

1. How is human language is unique

   - Human language is symbolic in nature, capable of expressing unlimited and complex thoughts.
   - Because there are many languages spoken by humans in the world.
   - Animals do not talk to each other.
   - Because we inherit our ability to speak mother tongue from our parents

Correct. No matter how eloquently a dog may bark, he cannot tell you that his parents were poor but honest – Bertrand Russell

   Lectures :

   - Project Gutenberg
   - Project Gutenberg - ebooks

2. Why was the star network a better scheme than having a data plane between each client?

   - Clients would not have paid for their own data plane
   - It was less expensive
   - It was harder to connect a call
   - It was harder to keep call records from the operator

Companies saved money on instaling landlines

3. Who was credited for an early version of a amplifier?

   - Gottlieb Daimler
   - Jhon Lloyd Wright
   - Graham Bell
   - Lee de Forest

Lee de Forest was credited for the invention of the amplifier

   Lecture : History of Bell Systems

2.1.2 Practical Quiz

1. Why did humans need language when we were hunting with tools?

   - It was just the natural way to communicate
   - We didn't need it
   - Their hands became full and we needed a way of communicating
   - We always used language.
   - We liked to talk about our lives while hunting.

   Correct! Tools occupied our hands, but we still needed a way of communicating.

2. What altruistic background did Alexander Graham Bell have in speech before he invented the Telephone?

   - Taught a class on giving speeches
   - Worked on audio amplifiers
   - Was a volunteer speech giver
   - Taught the deaf how to communicate in alternate ways
   - Worked on the telegraph lines

   Correct! He taught lip reading and sign language.

3. What system did ATT create to avoid having direct connections between all users and reduce the number?

   - A distributed network
   - A star network where users connect to a central hub
   - A hub that connected to everyone's computers
   - A network of directly connected users.
   - A network of inter-connected computers

   Correct! This reduced the number of connections needed.

4. What two changes did ATT need to make to De Forest's vacuum tube?

   - Allow it to work with higher voltages, remove the gas
   - Allow it to work with lower voltages, remove the gass
   - Allow it to work with higher voltages, add gas
   - Allow it to work with lower voltages, add gas

   Correct! It needed to work with telephone lines that had larger voltages and removing the gas so it became a flow of electrons in the device rather than gas ions.

5. With regard to the "Early Days" part of the "History of Bell Systems" reading, which of the following is false?

   - Visual telegraph systems were instituted in England and America as well when it was found how well they worked in France
   - C.M. described an electric telegraph based on static electricity.
   - The eletric telegraph never caught up to the Chappe System.
   - The electric telegraph developed slowly between 1753 and 1838.
   - The reason for the silence in response to C.M. was that static electricity is too limited to be effective in telegraphy

2.2 Lesson 2

2.2.1 Questions in videos

1. What did Lee Forest get an Oscar for?

   - Lee de Forest never got an Oscar
   - Putting sound on motion pictures
   - Making sound come out of the radio
   - Being the self proclaimed father of the radio

   > In 1960, the Honorary Academy Award was presented in his name for his inventions which brought sound to motion picture.

2. What do all TV networks rely on?

   - RCA's cable and landline network
   - AT&T's radio business
   - AT&T's cable and landline network
   - RCA's network

   > AT&T placed cables and landlines that TV's depend on

3. What innovation in technology had a major effect in sport entertainment?

   - CGI
   - Image quality
   - Action replay
   - Sound quality

   > Viewers originally believed that the team had scored a second time, until the anouncer clarified. Viewers could enjoy a moment in the game more than once

Lecture : AT&T System in 1953

Videos :

- Lee de Forest
- Lee deForest, This is your Life 1957
- The father of electronics

2.2.2 Practical Quiz

1. Which of the following is false?

   - de Forect earned an oscar award for putting sound in movies.
   - de Forest had a pension for legal battles.
   - In 1914, de Forest, he sold the all rights to the vacuum tube for another $90,000 to ATT.
   - de Forest is the self-proclaimed father of radio.
   - In 1913, de Forest sold the patent rights to the triode to ATT for $50,000.

   Correct! He sold some rights in 1914, later selling all rights in 1917.

2. What caused de Forest and E.H. Armstrong to both be ruined financially?

   - medical problems
   - fraud
   - depression
   - continual lawsuits
   - constant failed inventions

   Correct! Their constant lawsuits against each other caused them to lose much of their money.

3. What major modern news network did RCA continue to create?

   - FOX
   - NBC
   - CBS
   - CNN
   - ABC

4. In the entertainment industry what is king?

   content

   Correct! The cliche is that "Content is King!"

5. In 1953, ATT described their system using this. What was its name?

   - The Magic of Communication
   - How ATT Networks Work
   - The Magic of ATT NetworksHow ATT
   - Works
   - Communication

2.3 Lesson 3

2.3.1 Questions in videos

1. What is the spectrum in speech?
   - 50Hz to 4KHz
   - 300Hz to 3KHz
   - 3.3KHz to 50Hz
   - 100Hz to 2KHz
2. What did Harvey Fletcher contribute to?
   - Bishnu Atal's Linear Predictive Coding
   - The Perceptual Audio Coder
   - Finding the Masking Threshold in audio coding
   - The theory of articultion index
3. What does the M-coder do?
   - Recognizes the frequency of sound
   - Recognizes and focuses on the tone of voice
   - Adds more redundancy in a known manner to the data stream
   - Filters out the sound and focuses on the greater volume
4. What did the transistor contribute to?
   - The convergence of technologies
   - The creation of wireless telephony
   - Further in the field of computers
   - Proving Shannon's information theory
5. What language is Unix written in?
   - PHP
   - Python
   - C
   - Javascript

   Lectures:
   - Proceedings of the American Philosophical Society
   - A Mathematical Theory of Communication

2.3.2 Practical Quiz

1. According to Nyquist, at what KHz frequency do we need to properly sample a signal with a bandwidth of 4KHz?

   8

   Correct! According to Nyquist you must sample at twice the signal bandwidth to faithfully recover the signal.

2. What is the significance of simultaeneous masking?

   - Some data points do not need to represented.
   - Speech signals must be larger than normal.
   - More data points need to be represented.
   - We can transfer data at lower voltages.
   - We can transfer data at higher voltages.

   Correct! Because some data points completely mask other data points, humans cannot perceive that data point.

3. What does the encoder add more of that compression strips away?

   - Voltage
   - Entropy
   - Clarity
   - Redundancy
   - Quality

   Correct! Because every bit that much more important extra redundancy helps when the transmission channel is noisy, which it always will be to some extent.

4. Who of the following were awarded a Nobel Prize in Physics for the invention of the transistor?

   - Claude Shannon
   - Lee de Forest
   - John Bardeen
   - William Shockley
   - Walter Brattain

5. Which of the following are based on Unix?

   - OSX
   - Android
   - Windows
   - Linux
   - IOS

2.4 Lesson 4

2.4.1 Questions in videos

1. What is NOT part of AT&T's long distance call?
   - Bell labs
   - Independent Exchanges
   - Western Electric
   - Eastern Electric
2. In 1949, what stopped AT&T from getting into the computer business?
   - The monopolization of the telephone industry
   - Justice Department lawsuit on western electric
   - Justice deparment lawsuit on Bell Labs
   - AT&T managed to get into the computer business
3. What is murphy's law?
   - One buisiness cannot buy out the rest of the competition
   - The success of a project is inversely proportional to the funds
   - Murphy's law rejects the Kingsbury agreement
   - A policy that rejects the monopolization of AT&T

2.4.2 Practical Quiz

1. Which of the following companies became part of ATT when Theodore Vail went on in his buying spree?
   - Independent Exchanges

     Correct! This is expand long distance.
   - Comcast
   - Bell Labs

     Correct! This helped with research and development.
   - Verizon
   - Western Electric

     Correct! This was for manufacturing.

2. Which of the following is false?

   - In 1989, the lawsuit on Western Electric forces ATT to agrre not to get into computer business.
   - In 1984, ATT does not break up.
   - In 1921, the Willis Graham Act allows ATT to acquire more local companies.
   - In 1968, the FCC rules in favor of Carterfone and attaching a wireless transceiver.
   - In 1914, ATT agrees to lease long distance networks to independent exchanges

   Correct! ATT was broken up into many smaller companies.

3. Even though Bell Labs was part of a much larger bureaucratic monopolistic company, they were able to have a huge impact on research. Is this true or false?

   - True
   - False

4. According to the network effect, if a network has a cost of 10, what is its value?

   100

   Correct! The value is squared that of the cost.

5. What is the name of the device that ATT sued a man in Texas for in 1968?

   carterfone

   Correct! The FCC ruled in favor of Carter and paved the way for other devices to connect to the ATT network.

2.5 Assignment

1. With regard to the "Early Days" part of the "History of Bell Systems" reading, in 1852, when the electric telegraph caught up with the Chappe system in France, about how many miles did the old system cover?

   3000

2. The invention of which of the following won a Nobel prize in physics in 1956?

   - FM Radio
   - Dragonboard 410c
   - PDP-11
   - Transistor

3. What was the weakness of manual control plane?

   - Phone operators were irresponsible and rude.
   - Switch operators were not reliable.
   - Hardware was expensive.
   - Phone operators could not be hired fast enough.

4. Early on, what did AT&T realize would be a crucial aspect of their business?

   - Automated Switch Networks
   - Phone operators
   - Mobile Phones
   - Long distance calling

5. Which of the programming language is one of the most popular for embedded and scientific programming?

   - PHP
   - JavaScript
   - C
   - HTML & CSS

6. What system did ATT create to avoid having direct connections between all users and reduce the number?

   - A hub that connected to everyone's computers.
   - A star network where users connect to a central hub.
   - A network of inter-connected computers.
   - A distributed network.
   - A network of directly connected users.

7. What two changes did ATT need to make to De Forest's vacuum tube?
   - Allow it to work with lower voltages, add gas.
   - Allow it to work with lower voltages, remove the gas.
   - Allow it to work with higher voltages, remove the gas.
   - Allow it to work with higher voltages, add gas.
   - None are correct.
8. With regard to the "Early Days" part of the "History of Bell Systems" reading, which of the following is false?
   - Visual telegraph systems were instituted in England and America as well when itwas found how well they worked in France
   - The eletric telegraph never caught up to the Chappe System.
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   - The reason for the silence in response to C.M. was that static electricity is too limitedto be effective in telegraphy.
   - The electric telegraph developed slowly between 1753 and 1838.
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   - de Forect earned an oscar award for putting sound in movies.
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    - Bell Labs.
    - Independent Exchanges.
    - Verizon.
    - Comcast
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    - In 1968, the FCC rules in favor of Carterfone and attaching a wireless transceiver.
    - In 1914, ATT agrees to lease long distance networks to independent exchanges.
    - In 1989, the lawsuit on Western Electric forces ATT to agrre not to get into computer business.
    - In 1984, ATT does not break up.

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    - False
    - True

13. According to the network effect, if a network has a cost of 10, what is its value?

    100

14. What is the name of the device that ATT sued a man in Texas for in 1968?

    carterfone

15. According to Nyquist, at what KHz frequency do we need to properly sample a signal with a bandwidth of 4KHz?

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    - More data points need to be represented.
    - We can transfer data at lower voltages.
    - We can transfer data at higher voltages.
    - Speech signals must be larger than normal.

17. What does the encoder add more of that compression strips away?

    - Quality
    - Entropy
    - Voltage
    - Clarity
    - Redundancy

18. Who of the following were awarded a Nobel Prize in Physics for the invention of the transistor?

    - John Bardeen
    - Claude Shannon
    - Lee de Forest
    - Walter Brattain
    - William Shocley

19. Which of the following are based on Unix?

    - OSX
    - Android
    - iOS
    - Windows
    - Linux

3 Module 2

3.1 Lesson 1

3.1.1 Questions in videos

1. What is the difference between CS and PS?
   - CS has a physical connection and PS has no central connection
   - CS has no central control and PS has a physcial connection
   - CS is WIFI dependent while PS is landline dependent
   - There is no difference
2. Why was the internet made?
   - To make a new business that can provide a constant profit
   - To have a more sustainable way to find information
   - To intercept attacks during the Cold War
   - During the cold war people need a reliable and survivable command and control system

Sending of messages after attacks was important because the current form of messaging was unreliable

3. What is the purpose of the Header Checksum?
   - Have a checkpoint where one can check a specific line of code
   - To make sure the data is not corrupted
   - Provide a specific section of code
   - Makes the TCP/ IP Protocol function

The purpose of the Header Checksum is to make sure the data is not corrupted

4. What is IETF responsible for?
   - Providing URLs for websites
   - Making websites accessible to the public
   - Translating a coding language to HTML
   - Developing the incomplete bits and pieces of the internet

3.1.2 Practical Quiz

1. Which of the statements are false?

   - One of the media access control methods that might be used in circuit switching include frequency-division multiple access.
   - The primary use of packet switching is cell phone service.
   - A packet is defined by a frame with the network layer header prepended to it.
   - The forwarding mechanism that is used in packet switching is store-and-forward, in which the packets are stored until it is fully processed and then forwarded to the next hop.
   - None of the above.

2. Select the correct protocol data unit and protocol pair.

   - xpacket - Internet Protocol
   - segment - User Datagram Protocol
   - packet - Address Resolution Protocol
   - segment - Tranport Control Protocol
   - xframe - Ethernet

3. What is the argument that states that completeness and correctness must be satisfied for functionality to be implemented at a lower layer? Give one word with hyphens.

   end-to-end

4. Because IP is in the center of the Internet architecture, what shape is commonly associated with the Internet? A hint is that there are many protocols in the link layer and the application layer. There are less protocols in the transport layer, but there is only IP in the network layer.

   Hourglass

5. Which of these statements are true?

   - The two things that the IETF look for in new software are "rough consensus and running code."
   - xOne of the features of UDP is reliability.
   - An advantage of wireless communication over Ethernet is that communication can be full duplex meaning that communication can happen in both directions simultaneously.
   - The 4-layer model for connecting computers is called the OSI architecture.
   - None of the above

3.2 Lesson 2

3.2.1 Questions in videos

1. What makes email useful?

   - SMTP
   - IMAP
   - PHP
   - MIME

Extends the format of email support

2. What was the greatest disadvantage of HTML?

   - Spam
   - Cross-Site Scripting made the website vulnerable
   - HTML code injection
   - Nothing HTML is perfect

when a website is vulnerable the intruder is able to access all your information

3.2.2 Practical Quiz

1. An important document concerning email was written in September 1973. Which of the following information is contained or implied in this document?

   - There are restrictions concerning the format of the day of the month. The day of the month must always be expressed as 2 decimal digits. Therefore, the 4th of any month must be represented as 04.
   - The keywords are case-sensitive.
   - In order to transmit network mail over the FTP connection, one must utilizethe MAIL command.
   - Greenwich Mean Time is one of the zones that can used within the network mail header.
   - Other than the month of May, all the months must be represented as 4 letters.

2. Which of the statements is false?

   - Raymond Tomlinson joined Bolt Beranek and Newman, which is now known as Raytheon BBN Technologies.
   - The Network Control Program is a transport layer protocol that was replaced by the Transmission Control Protocol.
   - DNS must be used in order to attain the record for the domain of the receiver, which is the part located to the right of the @ symbol.
   - One of the reasons that SMTP stopped using only ASCII characters was due to international emails, which demanded more characters.
   - None of the above.

3. What is the popular nickname for the person who wrote the first web client and server?

   TimBL

4. Name the three fundamental parts of the web from its creation to even now. Keep the answers separated by commas and answer the question in alphabetical order. For example, "IP, TCP, UDP" would be validly formatted, ignoring the quotations.

   HTML, HTTP, URI

3.3 Lesson 3

3.3.1 Questions in videos

1. What is the process of the circuit model?
   - Codec, RTP, UDP
   - MAC, Phy, IP
   - Codec, MAC, Phy
   - Phy, IP, Codec
2. What is the latest video can arrive before sound, before disparity is noticed?
   - 140 milliseconds
   - 80 milliseconds
   - 100 milliseconds
   - 200 milliseconds

This is the latest a video can arrive before sound

Lectures :

- DARPA and theInternet Revolution
- Brief History of the Internet

3.3.2 Practical Quiz

1. Before CIDR was announced, IP addresses were separated into different classes. What are the bits that represent a class E address in this class-based addressing scheme?

   - 10
   - 1110
   - 110
   - 111
   - None of the above

2. What is another name for the address equivalent to a mask that will return the IP address itself whenever used correctly? In order to use the mask, you have to use a bit operation between the mask and the IP address.

   broadcast

3. What is the minimum number of bits, for which the checksum from the IPv4 header will detect errors sucessfully every time?

   1

4. Which of these statements is true?

   - The first set of additional nodes on the ARPANET were to UC Santa Barbara and University of Utah.
   - DARPA supported UC Berkeley to make changes to the Unix OS because of the evolutions in different protocols such as TCP/IP.
   - The IAB also reformatted their infrastructure by combining the Task Forces in order to create the IRTF chaired by Leiner.
   - The Cerf/Kahn paper described a protocol called UDP, which would provide the transport layer for the Internet.
   - BGP is the short name for a protocol that provides intranetwork routing and is based on TCP.

3.4 Assignment

1. What was the Internet Host count in the year 2000?
    - 1000
    - 1e+6
    - 1e+8
    - 1e+3
2. What is SMTP?
    - A program that facilitates the use of email.
    - An internet standard that extends the format of email support.
    - Allows synchronization between a client and Zoho mail.
    - An internet standard for email transmissions.
3. What destination adress is 255.255.255.255 for?
    - Local Broadcast
    - Multicast
    - Unicast
    - Global Broadcast
4. What is NOT part of the user datagram header format?
    - Checksum
    - Header port
    - Destination port
    - Source port
5. Which of the statements are false?
    - One of the media access control methods that might be used in circuit switching include frequency-division multiple access.
    - The primary use of packet switching is cell phone service.
    - A packet is defined by a frame with the network layer header prepended to it.
    - The forwarding mechanism that is used in packet switching is store-and-forward, in which the packets are stored until it is fully processed and then forwarded to the next hop.
    - None of the above.

6. Because IP is in the center of the Internet architecture, what shape is commonly associated with the Internet? One hint is that there are many protocols in the link layer and the application layer. There are less protocols in the transport layer, but there is only IP in the network layer.

hourglass

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8. What is the minimum number of bits, for which the checksum from the IPv4 header will detect errors sucessfully every time?

1

9. Let's assume that I am sitting at Starbuck's with my laptop and I attempt to connect to the internet. Before I can connect to the Internet, I must be assigned an IP address. Which protocol is responsible for this assignment of IP address to a physical device? Give the abbreviated form of the answer.

DHCP

10. Because class-based addressing has caused a shortage of IP addresses, what was the method of addressing that solved this problem? Give the abbreviated form of the answer.

CIDR