**Ximan Liu**

**Total Word Count: 3,077**

**CSC 435 Study Log**

**Twenty Concepts**

1)

**Distributed Administration:**

People assign unique authorities and power to others with distributed administration.

It is always being ignored but the most difficult challenge, because algorithm can always change in that case all the investment is in vain.

E.g.:

Artificial intelligence can also be related to distributed administration, because people can utilize computational resources on a wide scale to process very broad data.

2)

**Inter Process Communication (IPC):**

It's a system that helps processes to interact and synchronize their behavior with each other. Contact between such systems may be used as a form of inter-cooperation. Sharing memory will be the way processes may interact.

E.g.:

Data transfer or send message through pipes. It is like a group of data being processing, connected, and passing by in a tube.

3)

**Process:**

A program is executing and being operated on system. It is different compared to thread.

E.g.:

When the programs are running, different tasks have different processes. For example, just like different processes in JokeServer program evoke different functions.

4)

**Middleware:**

A kind of software that offers functional features more than operating systems can basically provide.

E.g.:

Database middleware is a specific type of middleware that provides database service. It can help with updating database workload, mostly focusing on the back-end in a large system.

5)

**Universally Unique Identifier (UUID):**

A number of 128 bits. To clarify the information in computing systems.

E.g.:

In Blockchain program, we will use UUID as unique ID in unverified block. Also we can add random number in UUID for hashing.

6)

**Virtual Machine Monitor:**

A kind of device can build up and operate virtual machines. The host controls one or more machines. It may accommodate several instances for systems on a hardware case.

E.g.:

Virtual machine monitor supported lots of apps, which can help with analyzing the performance of system and improving the planning on usage of capacity.

7)

**Socket:**

An endpoint for transmitting or receiving information within a computer network node. It can connect with processes, get messages and process data.

E.g.:

In Network lab, we use app Wireshark to check out the port for different IP address or specific website page. In JokeServer program, we use different port to connect with servers and execute commands.

8)

**Distributed Hash Table (DHT):**

A very important distributed system. It is similar to hash table due to lookup checkout way. In DHT, pairs consist of key-value which are extremely efficient if we want to search for any value associated to each pair.

E.g.:

DHT can be used in search engine. BTDigg is the first search engine for BitTorrent.

9)

**BitTorrent (BT):**

The most powerful peer-to-peer sharing system. It can share files and store nodes. People have to keep good behavior or will get punished.

E.g.:

When you download large files, sometimes it will end with “.torrent” form. Can be used a lot when people share huge contents like videos online.

10)

**Transmission Control Protocol (TCP):**

It is a specification which specifies how a network connection can be developed and sustained through which apps could exchange data. Always cooperates with Internet Protocol.

E.g.:

Can be found almost everything related to transmitting data. Like web, sending email and receiving email.

11)

**Jitter:**

Periodicity shift, or frequency, with a signal or recurring occurrence from its endpoint. Could be attributed to electromagnetic interaction and crosstalk with other signal carriers.

E.g.:

Delay may happen after packets have all been sent. Jitter may cause data loss and cannot work on all incoming data.

12)

**JavaScript Object Notation (JSON):**

It is open source file system and can exchange by its format. It utilizes test to save and transfer data items composed of pairs of attribute-value and data forms of arrays. Always be external of data format. Can marshal information in string and save in files.

E.g.:

In Blockchain program, we used JSON as a tool to marshal data and save them in string. After that when we would use the data, can still use JSON to un-marshal information and put them into a linked list.

13)

**Bully Algorithm:**

An algorithm for dynamically selecting a supervisor or representative from a community of distributed processes for computers. The machine with the maximum machine ID number is chosen as a coordinator from non-failed systems.

E.g.:

Apply on distributed system and work on process for sending messages.

14)

**Network Time Protocol (NTP):**

It is a mechanism for the propagation of synchronized uniform time by synchronizing the computer device clocks through IP networks.

E.g.:

ntp.pool.org is a server of NTP. It is a collection of servers of NTP so that lots of system devices can use to coordinate clocks.

15)

**User Datagram Protocol (UDP):**

It is a main character for collections of Internet Protocol. Computer programs may transmit messages to other places on IP network. It does not need any communications to build up specific data routes or transfer channels.

E.g.:

BitTorrent use UDP to share files by peer-to-peer.

16)

**Internet Protocol (IP):**

Very import for Internet communication protocols. It builds up Internet. Data will be exchanged through network frontiers. We could treat IP like the mail address for our home.

E.g.:

In Network lab, we use Wireshark app to search the IP address for certain MIT websites. It helps us well-known how IP works and how import it is in nowadays Internet.

17)

**Dynamic Host Configuration Protocol (DHCP):**

It is related to network and computers. DHCP connects computers with each other through network with IP. Data can also be collected through DHCP. It is quite complex among all the protocols.

E.g.:

Router manages and assigns IP addresses for each devices through DHCP.

18)

**Superserver:**

It wakes up other servers if needed, and access them with TCP. It won't take much space when not active. An ideal tool for developments.

E.g.:

In JokeServer, it can store as much as the statement of the conversation for each client like a quite large space.

19)

**Virtual Private Network (VPN):**

Link devices to build up a private network. Other network will take the encryped data, check the routed data packets. Seems like devices linked by VPN are connected.

E.g.:

In the United States, you can obtain an IP address in Europe through a VPN. In some certain circumstances, it can protect the user's personal privacy and also protect the IP security of third parties.

20)

**Vector Clock:**

An algorithm to produce a partial sequence of events in a distributed network, and to identify breaches of causality. Interprocess communications include the status of the logical clock in the receiving process.

E.g.:

In distributed systems, it is widely used as commanding records across computers with conflict.

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**Forum Posting**

1) **Bio Information**

Hello everyone,

I'm Ximan Liu. I'm very glad to take this course with you guys and meet some new people here.

I got my bachelor degree in Economics in Beijing, China. And also finished part of my college life in Florida in the past. I'd say since then moving to Chicago is quite a challenging thing lol.

Up to now I'm pursuing master degree in Computer Science in DePaul and I did learn a lot things since I switched my background from a non-technical area. I hope can graduate successfully in the future and hope can find job related to web application or mobile application development, I'm quite interested into these field.

I used to work in Beijing as a marketing analyst in an accounting firm and since then I figured I'm quite attracted to work related to tech and hope can learn something about coding.

In my spare time, I like exploring the city, visiting museums and playing ice skating. I'd say skiing and ice skating are my recent sporty hobbies. I do love lofi citypop, vaporwave type of music, also I deeply love Bach's masterpieces.

My family members are all living in Beijing. And I'm currently living in Chicago.

I am looking forward to a great semester with all of you!

Bests,

Ximan

2) **Three Hello Replies**

Hello Mouhamad!

I really like Bach's masterpieces too! What's your favorite song of his work?

Bests,

Ximan

Hello Hongli!

I'm Ximan, and I'm also interested in mobile development. Would you recommend any resources or courses you feel the most help?

Thanks!

Ximan

Hello Ying!

We have lots of things in common from background! Let's work hard and cheers to our new quarter!

Bests,

Ximan

3) **Five Expert Talks**

Hi!

I had LockDown Browser exam last quarter. And basically it locks your screen to a certain exam page so you won't be able to open any other sources or files.

Hello Professor,

I was wondering the final score of a quiz is the average score of three attempts, or the highest score of three attempts?

Thanks for answering,

Ximan

Hello Professor,

Does that mean the "maintenance mode" can be unnecessarily? Like in that case the program can guarantee that even after changing the mode, it will still affect all conversations immediately without maintenance mode.

Thanks for your answering.

Thanks! Also another way is to use random method and switch statement. It works fine on me.

Hello everyone,

When I click on Turnitin to check out JokeServerTII, when I click on "Turnitin Similarity", it always shows that "your session has expired" and the feedback is always loading. Does anyone have the same problem with me?

I met question when working on DNS Lab Question 3. The question is "Run nslookup so that one of the DNS servers obtained in Question 2 is queried for the mail servers for Yahoo! mail. What is its IP address?"

My laptop is macOS systems, and when I run "nslookup www.unibo.it mail.yahoo.com" on terminal, it said that ";; connection timed out; no servers could be reached".

Does anybody meet the same problem as mine?

Thanks.

**——————————————————————————————————————————————————————————————————————————————————————**

**Study / Research Log**

**【Chapter 1】**

1) 2 Themes:

Compromise:

Once you have enough preparations, you would know designing distributed systems was founded on compromise.

Global Clock:

No way. Has adverse effect on algorithm.

2)

Scale-up:

Not only the problem of size and resources, but need to focus more on changes based on system design.

Administration:

Being neglected in scale-up discussions, not focused on conventional algorithm.

3) Compromise? Yes, we need asynchronous!

It’s brand-new, caller will be more efficient as known as no more waiting, and two threads will run as parallel method.

Synchronous:

Blocking call + local.

Procedure caller and called in one are working in one move.

Only one.

Asynchronous:

Non-blocking call.

Many kinds.

4) Transactions:

Critical Section: Protect and keep resources by locking on as code segments.

Properties: Atomic (individual), Consistent (unchanged), Isolated, Durable (forever).

Application: Bank account

 Distributed Transactions:

Complicated then local transactions.

Transmission is not reliable, could be lost.

No assistance for internal support of critical section.

Application: Database

 Support:

HW: local system + signal

SW: distributed system + message

**【Chap 2】**

1)

Referential decoupling: procedures do not meet one another.

Temporal decoupling: related to time, the occurrences will be preserved in some permanent manners.

2) Client:

Thick: More revealing code + old + unsafe

Pros:

Less activity

Fast responsive solution

Manage cases from local

Much safer

Client matters

Cons:

Terrible update

Not handy management

Code Everywhere

Hard to code

Client is responsible for errors

Thin: More packages + visible + analysis

Pros:

Less allocate update

Manageable

Easy to code

Much safer

Deal with problem at certain place

Cons:

Unproductive

Slow reaction

Add too much workload on server

Massive volumes of data

Risky for sensitive data

3) DHT (Distributed Hash Tables): Dynamic

(key, value) retrives + node insert / delete

Distributed + hash table

Mighty and versatile

4) Bit torrent: P2P + diffusion

**【Chap 3】**

1) Migration: Fix together. Help build migration management plan. Restrict unrealistic plans.

Heterogeneous:

Resource: uncommitted, toggled, settled

Bind: identifier, value, type.

Push + Stop + Pull

Code migration

2)

Table assists in the development of resource migration strategies.

It may also restrict blue-sky design.

3)

UDP: affordable, quick, and well-organized.

Also it is maybe what you are looking for.

Can build up features.

**【Chap 4】**

1) UDP (Universal Datagram Protocol): API. Forward from one to another. Well-behaved. Constructive. All in one.

2) RPC (remote procedure call):

R: cost-effective

RR: get response

RRA: delete + pricey + == RR

3) Classic RPC：

Client calls remote procedure and sends request to server

Server calls local procedure and returns results and reply to client

Client gets results from server

4) Digital sound signal delivery:

As several sound channels are transmitted, disruption to each of the individual signals, and mistakes in the timing transmission will drastically reduce the critical information inherent in the signal.

It will affect the semantic quality of the echo.

5) Multi-channel delivery:

Multiple streaming channels:

Pros:

Achievable

Drop + replace data

Can work with data

Cons:

Complex while ending

Multiplexing: multiplex networks together, specific data preserved in same packet with all the others

Pros:

Requires strong and methodical coordination

Cons:

Cannot get rid of sync

6) QoS (Quality of Service): larger buffers

Receive buffer: minimize shaking errors

Buffer —> interweave packets —> lower effects of network bugs and errors

7) Application-level Multicast:

Traverse router & network + limited efficiency + tree-like + build up certain network + net-like while error happens

Application: DHT

8) Overlay networks: build over on network

9)

Epidemic protocols: distribution of rumors

Powerful + locally + infected node

Algorithms measure average value & size

**【Chap 5】**

Blockchain:

Shared ledger: peer shares significant transaction data.

Verified blocks are set before shared ledger.

Solve puzzle —> verify block data

Unverified block (UB) has data and unique ID (UUID).

Nodes can see who validates the block first.

Work: a task. It will take a string, merge with data, hash with outcome, and search for results for a specific function.

Hash: give algorithm on string and have certain length bits.

Can turn the puzzle complexity level quickly.

Can substantially rising the effort required to crack the puzzle.

JSON: format external data, save disk record storage, and marshal.

Application: Bitcoin, health service, and research.

**【Chap 6】**

Security:

1)

Public key encryption: come together in pairs, encrypt and decrypt, public and private.

A letter using public key of a recipient can not be decrypted only with the private key of the recipient.

Can maintain secrecy.

Digital signatures:

Someone has public key from sender can verify a document signed with a private key from a sender.

After sender has signed the letter nothing will alter it.

Can get credibility.

Encryption 's efficacy depends on key duration.

2)

Certificate authority: Agency which offers digital certificates.

A digital certificate certifies designated recipient of credential holds a cryptographic key.

3)

Session: as reliable as usage of public key encryption, but more computational effective.

Public key handshaking: someone creates a specific session key, encrypts and pass it back.

Aiming at both having session key copies. Use and abandon it.

4)

Public key signature:

Key for encryption will be given to the public so anyone will send you encrypted messages, used just to deliver a hidden key.

Can be used to validate produced digital signatures using the correct private key.

Symmetric key signature:

Fast than public key signature.

Produce information by chance, by password, or through a hidden exchanging process.

Two signature forms are as safe as utilizing public key authentication to sign the document as a whole.

5)

Never store passwords on server, there will be many ways to cause the leak.

Correct way to set up a password:

Hash and comparison.

Password manager.

Random long string.

Code table.

Make key longer.

One-time.

**【Chap 7】**

1)

Time coordination algorithms:

Berkeley Algorithm: a clock synchronization method assumes no machine has a precise time source.

Bully Algorithm: It is a tool for dynamically selecting a supervisor or representative from a collection of processes of distributed computers. Among the non-failed procedures, the one with the lowest one ID number is chosen as coordinator.

2)

Each case is special, use method number please.

Can apply operation number after decimal point to any specified computer, for ensuring special events, and time ordering.

3)

Causually-ordered communication:

It implies same causal association occurs between the events transmitting messages and the events getting the corresponding message.

4)

Token ring:

In a distributed framework, it achieves reciprocal exclusion by building a bus network of processes.

With such procedures, a logical ring is built, and each process is allocated a place in the ring.

Each cycle decides for itself who is next in line.

5)

Coordinator election algorithms:

It is intended for selecting a coordinator, and also believes there is a particular priority number for any active phase in the method.

**【Chap 8】**

1)

HostServer:

It is working on some desktop, with purpose to set up Mobile Operators.

On several computers could have several HostServers.

**【Chap 9】**

1)

DHCP helps a company to accommodate far more machines than having IP addresses at any particular time, based on who wants an IP address.

Biggest advantage is not being needed to operate the program.

They customize themselves both modern computers and old devices.

2)

Remote clients use router IP address and specific channel.

Router of NAT can use port to relay all upcoming data to local at a separately assigned address for that network.

Local server is unable to choose DHCP because router of NAT must be well-known about the place to submit packets.

3)

Middleware: operate.

Both applications of server and client can set up communication in a stable network.

Middleware layer: work with IP translation and tunnel.

4)

Intelligent agents will be more common.

People may start focusing on relationships with both clients and other agents.

Humans are smart because of problem solving.

Agents are able to copy behaviors.

5)

VPN:

Privacy policy in Europe is better than the United States.

ISPs are selling information based on your own browsing history.

Can use VPN to a European server for web service.

6)

QoS: quality of service.

Max: 3 Mbit/s.

7)

Formulas about how to calculate Round Trip Time, Transfer Time and Throughput.

8)

Hadoop:

Cheap for data processing and hardware.

Written by Java.

Can be interfaces.

Come into JAR files.

Can add new nodes anytime.