USC Viterbi
School of Engineering

EE 579 Final Presentation

Group 9

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Goals & Motivation

Goal: The goal of this project is to build a fast file sharing system between mobile devices, which include file detection, data transmission.
Our problem can be simply described as that when 2 mobile devices encounter with each other, one need to detect quickly whether the other one has the file it need and furthermore, we can divide files into chunks and use some algorithm to identify the existence of the chunks. In the real case, it could be multiple devices sharing files at the same time.

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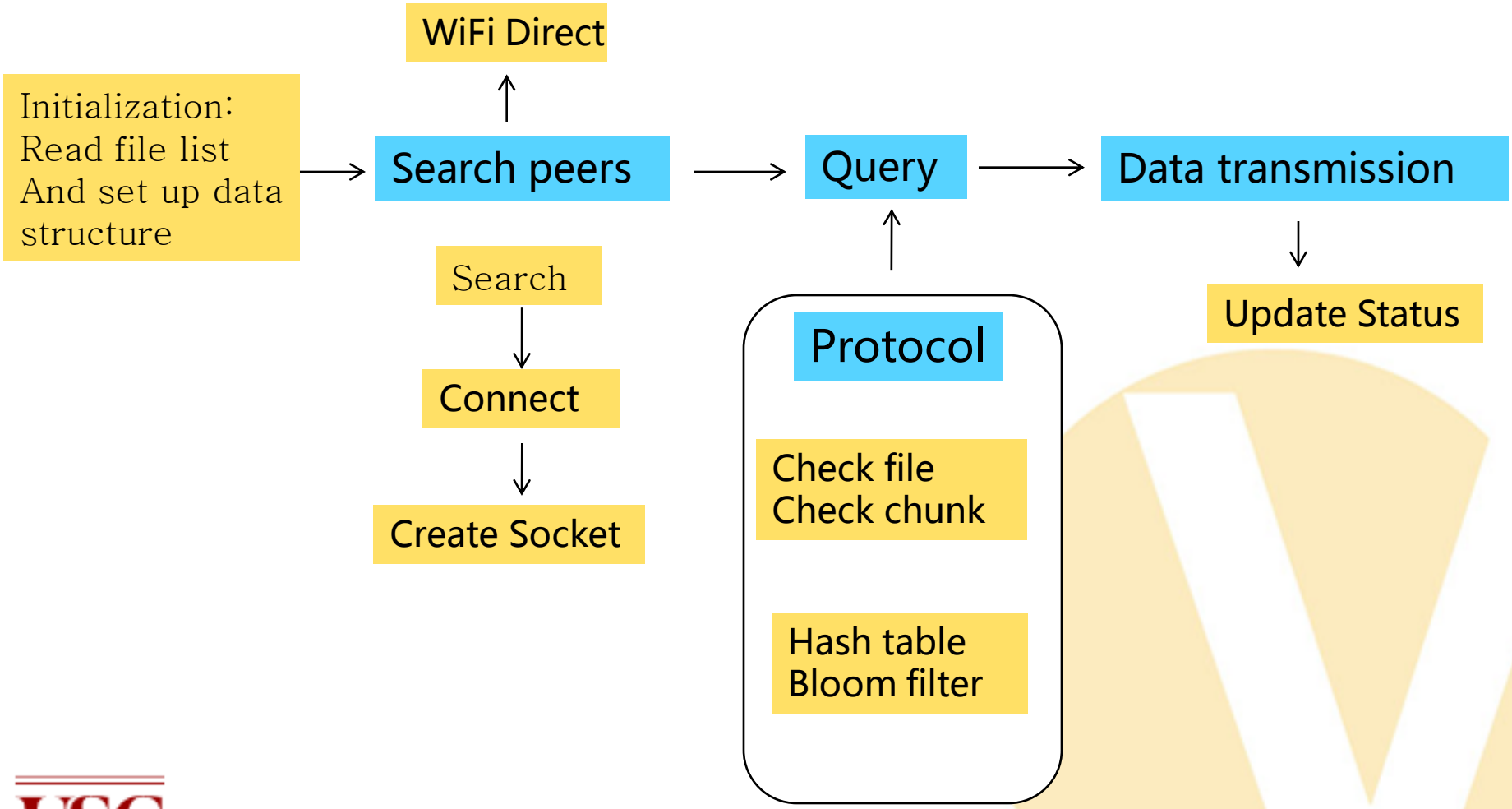
Architecture



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Initialization

1. File list table

1	a.txt
2	b.mp3
3	c.mp4
…	…

1,a.txt,4096
2,b.mp3,3833856
3,c.mp4,19954812

2. Chunk number table

1	1
2	39
3	200
…	…

Data Structure

Available chunk table

1	Bitmap1
2	Bitmap2
3	Bitmap3
…	…

Bitmap

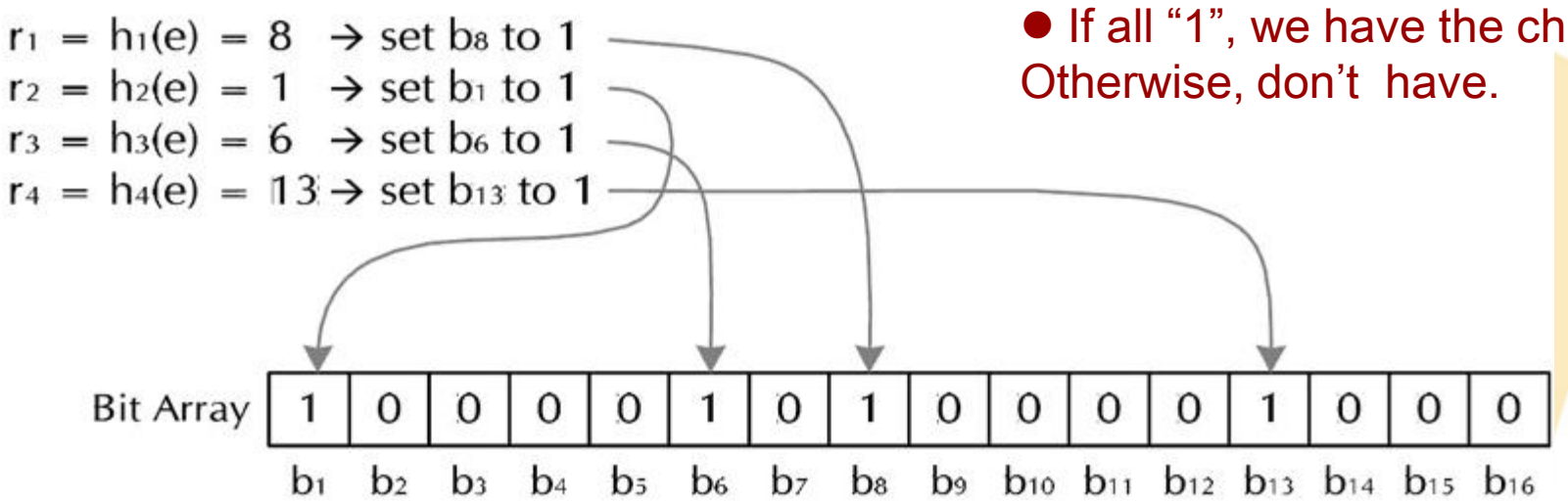
0	1	1	1	1	0	0	1	…

Bloom Filter

- Use several Hash Function.
- For a certain “filenum-chunknum” string, calculate several hash value.
- Set the bit correspond to the value to 1.
- Ex. “2-31” has hash value 1,6,8,13.

Check:

- For “2-31”, calculate the hash values again.
- Check each bit correspond with the values.
- If all “1”, we have the chunk. Otherwise, don’t have.



Data Structure

Bloom Filter

0	1	1	1	1	0	0	0	0	0	1	0	1	1	1	…

- Choose the number of bits for the map.
- Choose good hash functions.
- Has certain “false positive” possibility.
- Better than single bitmap especially when the set of data is extremely large.

WiFi Direct Connection

- Initial Setup
- Discovering Peers
- Connecting to Peers
- Transferring Data

http://developer.android.com/guide/topics/wireless/wifip2p.html

WiFi Direct

Main activity

- WiFi Direct State
- discoverPeers()
- Connect()

Broadcast Receiver

- WIFI_P2P_STATE_CHANGED_ACTION
- WIFI_P2P_PEERS_CHANGED_ACTION
  onPeerInfoAvailable()
- WIFI_P2P_CONNECTION_CHANGED_ACTION
  onConnectionInfoAvailable()

Client And Server

- Use the IP address get from WifiP2pInfo. groupOwnerAddress
- The group owner will become the server and the other one the client
- Use AsycTask to run in background thread and Use Handler to communicate with UI thread
- Use certain protocol to transmit data

Protocol

Message Type	File num	Chunk num	Data

Request Message

1	0	0	Filenum+bitmap

Data Message

2	Ex.2	Ex.31	Byte stream

Control Message

7	0	0	Exit, None,etc..

Query and Transmission

- Get the bitmap from the other side.
- Compare with the map of its own.
- Get the list of chunks available to transmit.

Build an ArrayList like this:

1-0	2-0	2-1	2-12	2-31	...

- Transmit the chunks in a random order to prevent all devices end up with only the first half of the file.
- Get the file number and chunk number.
- Read from the files and chunks and transmit.
- Server and Client can both transmit if the connection is not lost.

Post Transmission Process

- Update data structure when received a new chunk.
- Log the chunk in a temporary file.
- When we have all the chunks, combine the chunks into a single file.

Miscellaneous

- Build a simple File Browser to display and execute several type of files
- Implemented both the hash table plus bitmap and Bloom Filter algorithm to do the query
- Bloom Filter is better if the set of files in the application is very large. Don’ t have advantage if the data set is small.

Limitations

- Connection function limited by WiFi Direct
- Need a configuration file which contains info about all the files

  - have a central control server

  - set the config file to be the first file to transmit every time

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Work Division

- Fan Yang
  WiFi Direct Connection, Client / Server and Protocol
  Hashtable/Bitmap and Query Algorithm
  File operation and file browser

- Hanli Guo
  Bloom Filter Implementation
  Interface Design

- Shusen Zhu
  Initialization process
  File/Data Transfer

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Video Demo

Case 1: Ideal case

- Two mobile devices, each have one complete & different file.
- After a non stop connection. both device have 2 complete files.

Video Demo

Case 2: Reconnect case

- Two mobile devices, each have one complete & different file.
- Connect, stop and then reconnect. Both device have 2 complete file.

Video Demo

Case 3:Incomplete files case

- Two mobile devices, only one has part of the file.
- After the transmission, the other one still get the part of the file.