P2.

SMS:

SMS means short messaging service. It is a protocol used for sending short messages over wireless networks. First, the SMS message has specific format. It typically consists of text messages, SMC number (short message center), sender number, time stamp and so on. This is detailly described by the PDU. The length of text messages are restricted to 160 characters (letters, numbers and symbols), or 70 for other alphabets such as Chinese. Second, if a SMS message is send out, it would first arrive at a central SMC. And the SMC would get the receipt’s location from the HLR. Then the MSC will transfer the message to the corresponding Base Station System(BSS). Finally the BSS will send this message to the recipient.

iMessage:

The protocols that iMessage uses is a proprietary, binary protocol. It is based on Apple push notifications (APNS). It sets up a Keep-Alive connection with the Apple servers. Every connection has its own unique token, which is used to identify the route that should be used to send a message to a specific device. The connection is encrypted with TLS using a client side certificate, that is requested by the device on the activation of iMessage. Since this protocol is similar to APNS, let’s look at how APNS works. 1. The app running on the device registers with IOS for push notifications. 2. The IOS would ask the APNS server for the push token designated to that app, then give the token to that app. 3. The App would send the its token to its server (content provider). 4. The app’s server would send the notification along with the specific token to the APNS server. 5. The APNS server send the notification to the device.

WhatsApp

WhatsApp employs the FunXMPP protocol which is a simplified version of XMPP. For example, All keywords in XMPP are assigned a byte to form the basis of FunXMPP. Except for those simplification, most of the functionality and operation of FunXMPP is similar to XMPP. XMPP is a communications protocol based on Extensible Markup Language (XML). The protocol supports multiple communication patterns, including Asynchronous Messaging, Publish/Subscribe and Request/Response. XMPP is essentially a streaming protocol that makes it possible to exchange XML fragments between any two network endpoints. Like HTTP, XMPP is an client-server protocol. But XMPP differs from HTTP by allowing either side to send data to the other asynchronously.

How they differ?

First, the SMS is totally based on an open protocol. While the iMessage and WhatsApp are based on proprietary protocols. Even Although the FunXMPP is actually based on XMPP which is an open protocol. Second, the SMS only allow the sending of text message, and the size of the text is constrained to 160 characters. The iMessage and FunXMPP allow the sending of text, photos, videos and so on. Third, these three protocols work in totally different ways. For the SMS, the message is first send to SMC, and the SMC will then try to find the recipient and forward the message to him/her. For iMessage, a message is like a notification sended by app. So the app send message to the provider first, then the provider send the message to APNS. And APNS will forward the message to the targeted device. For FunXMPP, it works like http, but it also allow the server to push message to the user.

P4.

1. gaia.cs.umass.edu/cs453/index.html
2. HTTP/1.1
3. Persistent connection
4. I don’t know
5. Mozilla/5.0. Because the server need to send the specific version of the object to the user agent according to the type of the user agent.

P8.

1. The host initiate a TCP connection with the server will consume , Then the process in which the host send a HTTP request and receive a response will consume . For 1 object, the client and server time is 2 . So, for 9 objects (1 HTML file and 8 objects), the client and server time is 18,and the DNS lookup time is . Because the host will have the cache of the server ip address. So the total time is
2. There are 5 parallel connection, so for the first session, the 1 objects(HTML file) will consume . For the second session, the 5 objects will consume .For the third session, the remained objects will consume . Such that the total consuming time is
3. Because the connection is persistent, the host first initiate a TCP connection with the server will consume , then each object (total 9 objects) will consume . So the total time is