Analysis of Alternatives

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Purpose:

Purpose of this assignment is to decide which platform is suitable of preferred for future uses.

Criteria:

- The server needs to able to connect with Arduino board and reads motion data from motion sensor and prints the timestamp on the console.
- Server needs to be able to send data to client
- The client needs to be able to receive the data and calculate the time taken for the data to be sent from server to client which labeled as response time. Once it is done, the motion status, timestamp of server and response time will be displayed on the client side.

Options:

- Socket.io and Johnny Five
- Firebase and Socket.io
- Serial Port and Socket.io

Socket.io and Johnny Five:

Socket.io is a Javascript library for us to utilize and proceed the program with instructions whereas Johnny Five is a platform of Javascript robotics and Internet of thing. For this platform, Socket.io handles the bidirectional communication between the client and server while Johnny five acts as a communication platform between Arduino board and the server. A device has been used while testing this spike which is an Arduino board. Arduino board is able to perform some functions which are switching the LED or motion sensor on and off. The motion sensor will function whenever it senses small motions within its parameter. The platform will be connected to an Arduino board in order for us to implement the criteria and test which is the best. Once the Arduino board has been connected using Johnny five, motion sensor can be used and if there is a motion, server will send data such as the status of the motion sensor, server's timestamp to the client using Socket.io. The client side will calculate what is the response time for the server to send data to the client side.

Johnny Five and Firebase:

Johnny Five is a platform of Javascript robotics and Internet of thing. Besides, it is a library of Javascript that allow to connect with Arduino board through the “Firmata” protocol. Whereas Firebase is a third party web application platform that provides tools for us to utilize and help us to store data. For this platform, Johnny Five acts as a communication platform between Arduino board and the server. Firebase acts as a real-time communication database that allows use to store data and handle the interaction between the server and the client. A device has been used while testing this spike which is an Arduino board. The motion sensor will function whenever it senses small motions within its parameter. The platform will be connected to an Arduino board in order for us to implement the criteria and test which is the best. Once the Arduino board has been connected using Johnny five, motion sensor can be used and if there is a motion, server will send data such as the status of the motion sensor, server’s timestamp to the client to Firebase. One the other hand, firebaseWebApi.js helps in updating and displaying the value of the client interface and also calculate what is the response time for the server to send data to the client side.

Socket.io and Serial Port:

Socket.io is a Javascript library for us to utilize and proceed the program with instructions whereas Serial port is a connector between the device, Arduino board, and the server. For this platform, Socket.io handles the bidirectional communication between the client and server while Serial port handles the interaction between the device and the server which gave us the control on the devices we have. Serial port is used to connect the Arduino board and the server, ino file and a js file are needed. Mainly, the functions will be implemented in the ino file and the results will be sent to the js file, server side. After that, the server will send data such as the status of the motion sensor, server’s timestamp to the client using Socket.io. The client side will calculate what is the response time for the server to send data to the client side.

Decisions:

For all the platforms or spikes, each of them meet all of the criteria that are mention above. All platforms are able to sense motion using the motion sensor connected to the Arduino board, send motion data from Arduino board to the server using Johnny five or Serial port, calculate the timestamp of the server side, client side able to retrieve data that send from the sever using Socket.io or Firebase, client side able to display data to the interface and finally, calculate the response time by subtracting the client time with the server time.

Socket.io and Johnny Five:

For the platform Socket.io and Johnny Five, it meets the criteria pretty well because it is able to directly give out the signal from the server to the client. The time taken for the data to send from the server to the client is shorter and instant. The evidence is given below that show the response time of the spike. Based on the table below, this platform was tested 10 times and gave us similar results.

Motion	Response time
1st motion	0.001
2nd motion	0.001
3rd motion	0.002
4th motion	0.002
5th motion	0.001
6th motion	0.002
7th motion	0.001
8th motion	0.001
9th motion	0.002
10th motion	0.001

Average Time = the total response time/number of motions

Hence, it took an average time of 0.001 seconds for data to travel from the server to the client. This shows that his platform is quite efficient.

Johnny Five and Firebase:

For the platform Johnny Five and Firebase, it met the criteria but it took a longer time for the data to be sent from server to client because the data needs to be sent to the Firebase platform before being able to be received from the client side. One of the evidence can be shown is the average time.

Motion	Response time
1st motion	0.211
2nd motion	0.254
3rd motion	0.214
4th motion	0.210
5th motion	0.214
6th motion	0.223
7th motion	0.228
8th motion	0.222
9th motion	0.284
10th motion	0.220

Hence it took an average time of 0.228 seconds. It can be concluded that it took a longer time than Socket.io and Johnny Five platform.

Socket.io and Serial Port:

For the platform Socket.io and Serial port, it met the criteria same as the platform Socket.io and Johnny Five. It took a short amount of time for the data to travel from the server to the client compared to using Firebase to pass data from server to client. One of the evidence can be proven for this is the average time of the motion data.

Motion	Response time
1st motion	0.001
2nd motion	0.002
3rd motion	0.002
4th motion	0.001
5th motion	0.001
6th motion	0.002
7th motion	0.002
8th motion	0.001
9th motion	0.001
10th motion	0.001

Hence, there is an average time of 0.001 seconds for the client to receive data from the server.

Using Socket.io allow us to pass data from server to client in a very short amount of time. This will not affect if Johnny five or Serial port is used as the communication platform between the Arduino board and the server. This is because response time is only calculated by subtracting the server time and client time. Server time is calculated before the motion data is passed from the server to client and client time is calculated after the motion data has been passed to the client side. After that, the response time will be displayed in the client interface.

Recommended decision:

In conclusion, the best option that we have decided is Socket.io and Johnny Five. Although it achieved similar results as the platform of Socket.io and Serial Port, due to the complexity of using the Serial port and Johnny Five, we are able to understand Johnny Five more as examples can be easily searched from the internet. Besides that, by only running StandardFirmata on the Arduino sketch, we are able to use Johnny Five. This is one of the reasons of us selecting Johnny Five to connect the Arduino board to the server as we do not have to worry about implementing functions in the ino file but just to implement all the functions in the server file. Therefore, Chuen Wern and I, Kin Seng, had made a decision to choose or recommend Socket.io and Johnny Five as the best option out of the all the options.