**How is your project architecture related to the theory taught in the lecture?**

According to our project, it actually uses the cloud computing technology and like a small distributed system which through the network to achieve sharing of hardware resources, file, database, information and so on. The distributed system is the one which hardware and software components located at networked computers then communicate and coordinate their actions by message passing such as API. As for our project, we push our project code in the Heroku cloud computing platform as a service which can register and run our project code in the cloud by using virtual hardware and software components. Moreover, in our project, we also use some API to connect with several servers and databases in order to get some services form them. Those reflect the concept of distributed system and cloud computing technology. For example, in this project, we use linebot API which is provided by the official Line to create a program on the server to receive messages, process messages, and return messages. In this way, we cannot to design and develop our own chatbot server but use cloud to connect other existing server which have already created good software for using. For another thing, we use redis API to connect with this database so that we can achieve the function of recording user’s news reading. The redis might contains many networked computers to achieve its various services but we can simply use cloud to make use of those services. Furthermore, in the project, we also use GoogleMap API to connect with Google system to make use of its map function for receiving some hospital location directly and automatically.

Take GoogleMap API as a example to illustrate the distributed system models. For instance, GoogleMap API uses HTTP requests to access driving, cycling, walking and public transportation routes, which represents the communication entities that are web services in the architecture model in the distributed system. Normally, form a system perspective, the entities that communicate in a distributed system are typically process, but from a programming perspective, more problem-oriented abstractions have been proposed such as web services that use web standards to represent and discover services.

As for the concurrency and synchronous problems, our project uses redis to address these two things to achieve high concurrency and non-blocking. The Redis server is single-threaded for command processing, but at the I/O level it can simultaneously provide services to multiple clients concurrently, and the conversion from concurrent to internal single-threading is achieved through a multiplexing framework. I/O multiplexing is actually managing multiple I/O streams by recording and tracking the status of each socket (I/O stream) in a single thread.

**Can you identify if you bot is one of the examples of PaaS, IaaS, SaaS?**

Our bot is one of the examples of SaaS. In our chatbot, it can provide some services for users such as searching latest news service, providing popular science service and getting hospital location in map service. For instance, in the main-services box, when users click “popular science”, the chatbot will return another menu which precaution and more knowledge options. And when user click them respectively, user will receive some information automatically. Moreover, when user send their location to the chatbot, it will immediately search the nearest hospital location and show them in google map then return this to the user. In this way, user can easily and conveniently get a nearest hospital location without searching by themselves. In this way, our bot is a sample of SaaS.