2021 FALL COEN6311 Assignment 1 Report

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I. Deliverable Specification

D1-User Stories and Use Cases

According to the project description, the user stories of the system can be listed as follow:

1) The user wants to track the GPS data of the bike which represent on a digital map, so he can know the real-time location of it.
2) The user wants to know the speed of the bike, so he can know if he can catch the moving stolen bike.
3) The user wants to set a **Parked** state to the bike, so the chip(micro-controller) would treat the any swing as a threat of stealing.
4) The user wants to set the **Unparked** state to the bike, so the chip would not treat the swing perform by the user as a threat of stealing.
5) The user wants to know if the bike was swinging or not, so he can know if someone was attempting to move his bike or to break his lock.
6) The user wants to get the real-time notifications which described above, so he can know the state of the bike immediately.

The use cases diagram is shown in Fig. 1.

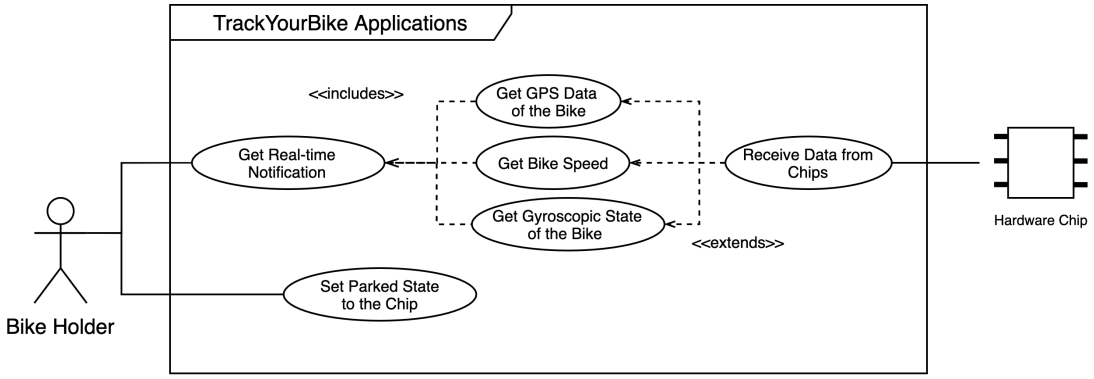


Fig. 1. System Use Cases

D2-Software Requirement Specification

Based on the user scenairo and the use cases, the software shall have the following software requirement specifications and their sub-requirements.

To fulfill the described software product, the overall product should contain at least 3 software systems:

- *Software on the Tracker Chip*: which will be installed in the hardware chip to perform tracking features and send sensor data to the remote server.
- *Cloud Server System*: which will be deployed on the cloud server and receive data from users' chips then forwarding those data to users' applications.
- *Client Application*: which will be installed on users' mobile devices then receive and display the data or notification from the server, and also will send instructions to the corresponding chips.

This report will focus on the *Software on the Tracker Chip* but also present part of the *Cloud Server System* which is just for supplementary notes. The *Client Application* will not be presented. More information of the system context architecture is shown in Fig. 2.

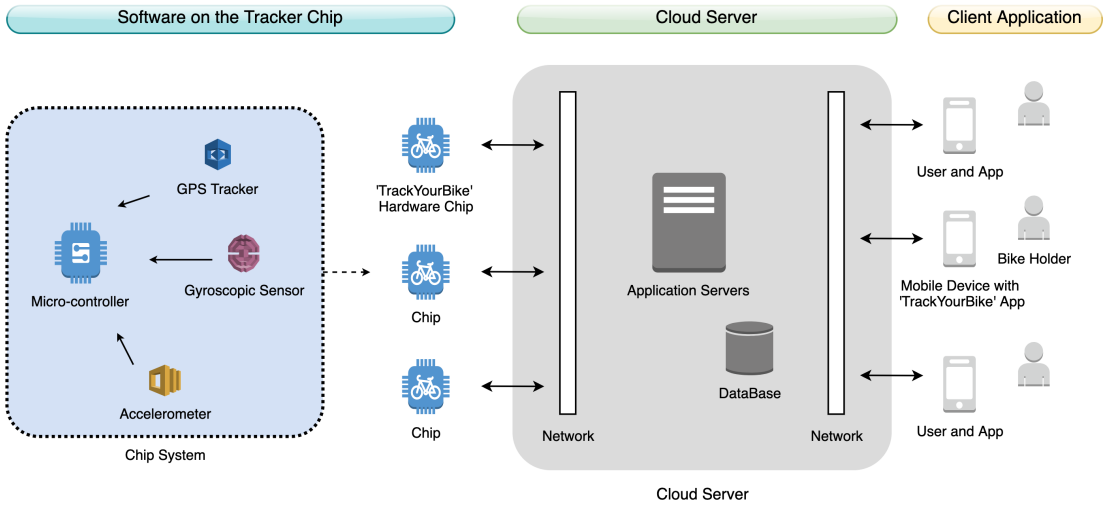


Fig. 2. System Context Architecture

SRS for the Software on the Tracker Chip

Total of 4 SRS are defined for the *Software on the Tracker Chip*. In the scope of the assignment report, SRS 1, 2 and 3 are expanded with sub-requirements.

- *SRS 1.* The chip system shall receive the raw data sent from other sensors and adapt those raw data into more structured data and send all structured data to the cloud server.
  - *1.1 Data Process Module:* this module shall handle the message construction part. The module shall collect the raw data from 3 hardware components and build them into a json format data.
  - *1.2 Cloud Server Communication Module:* this module shall handle the communication part. The module shall be able to receive message from the cloud server and send json data described above to the server.
- *SRS 2.* The chip system shall be able to receive a state data sent from the cloud server which represents a state of *Parked* and *Unparked* and store this state into the memory of the micro-controller.
  - *2.1 State Management Module:* this module shall set the states described above into the chip.
- *SRS 3.* The chip system shall be able to detect whether the bike is under the risk of stealing based on the gyroscopic data.
  - *3.1 Risk Detection Module:* this module shall be able to estimate the risk level based on the gyroscopic data.
- *SRS 4.* The chip system shall sent a warning message to the cloud server to inform the user that their bike is under the risk of stealing when the state is at *Parked*.

SRS for the Cloud Server System

- *S-SRS 1.* The server system shall receive http request and maintain socket connection with multiple clent-end.
- *S-SRS 2.* The system shall maintain the relationship between client-ends or hardware chips.
- *S-SRS 3.* The system shall receive chips data instantly and organize them into database, and those data shall be analysed and pushed to the corresponding clent-end device.
- *S-SRS 4.* The system shall receive 'Parked' and 'Unparked' commands sent from a certain client-end and associate them with the ressorted hardware chip instance.

D3-System Design

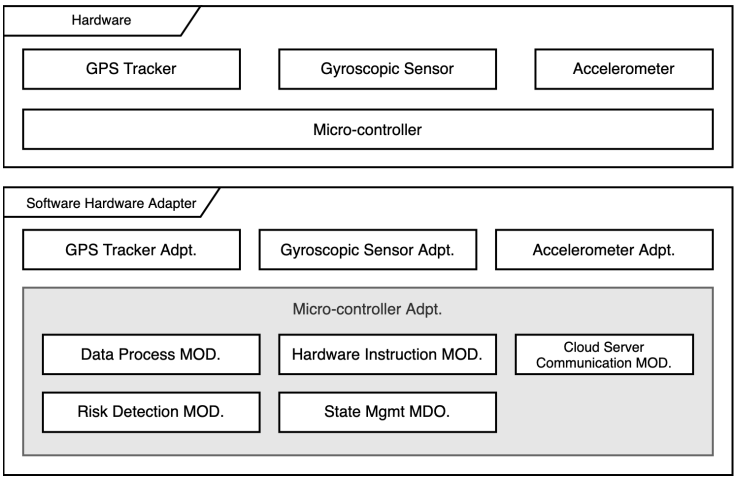
System Architectures

A top-down layer system architecture of the *Software on the Tracker Chip* is shown in Fig. I. The objects with vertical layer position mean that the top layer depends on the bottom layer. Notice that the obejcts in the gray box mean that they do not have hierarchy or layer relationship, they are in the same architecture level.

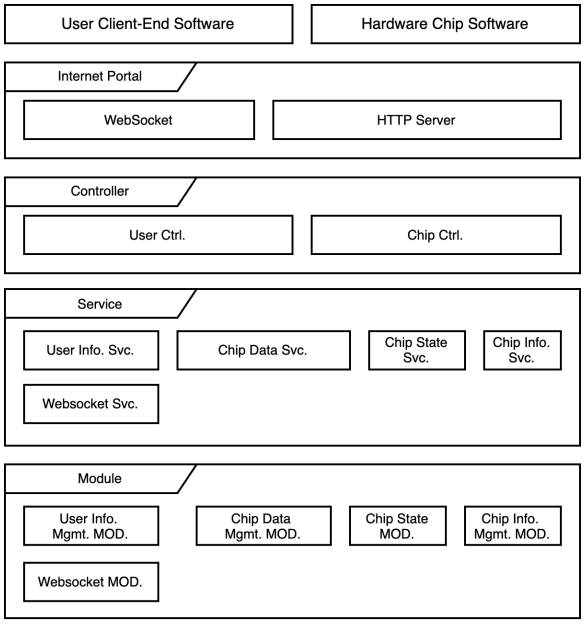
Then a same top-down layer system architecture of the *Cloud Server System* is shown in Fig 3b.

Activitiy Diagram of Some Key Processes on the Software on the Tracker Chip

The activity diagrems can be shown in Fig. 4.

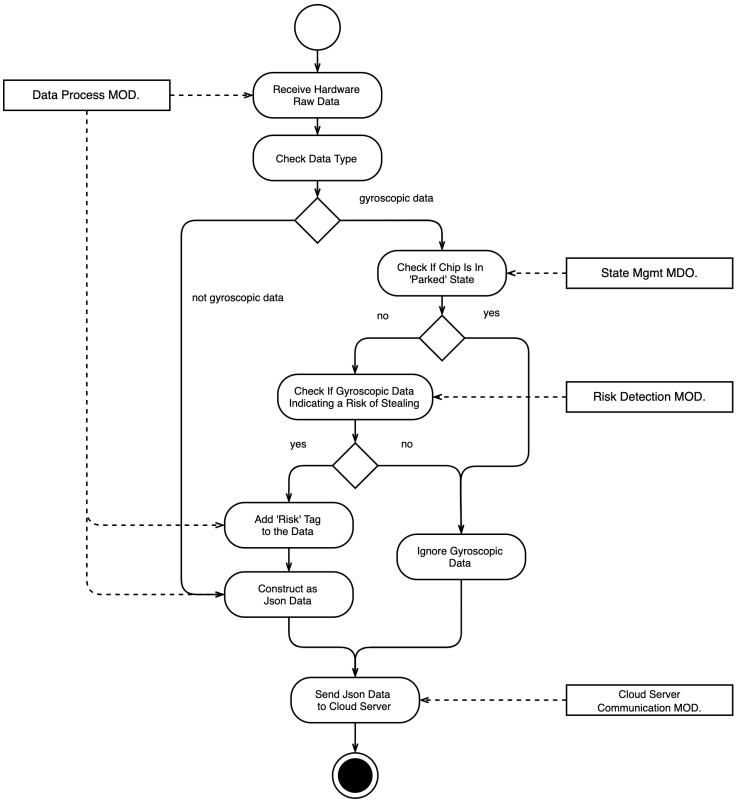


(a) Architecture of the *Software on the Tracker Chip*

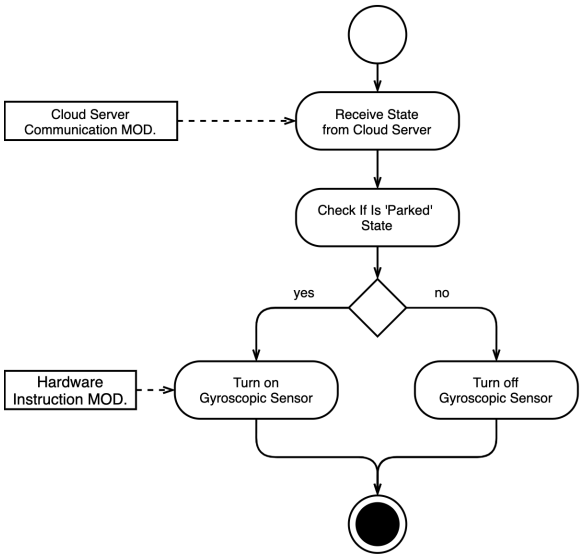


(b) Architecture of the *Cloud Server System*

Fig. 3. Simulation results for the network.



(a) Activitiy Diagram for SRS 1, 3, and 4



(b) Activitiy Diagram for SRS 2

Fig. 4. Simulation results for the network.

D4-Define An Incremental Process

The defined incremental process is shon in Fig. 5. The process is consist of the techniques like “Incremental Planning” and “Test First Development” from the *Extreme Programming*.

The SRS 2 is chosen to practice the *Incremental Process* with XP techniques.

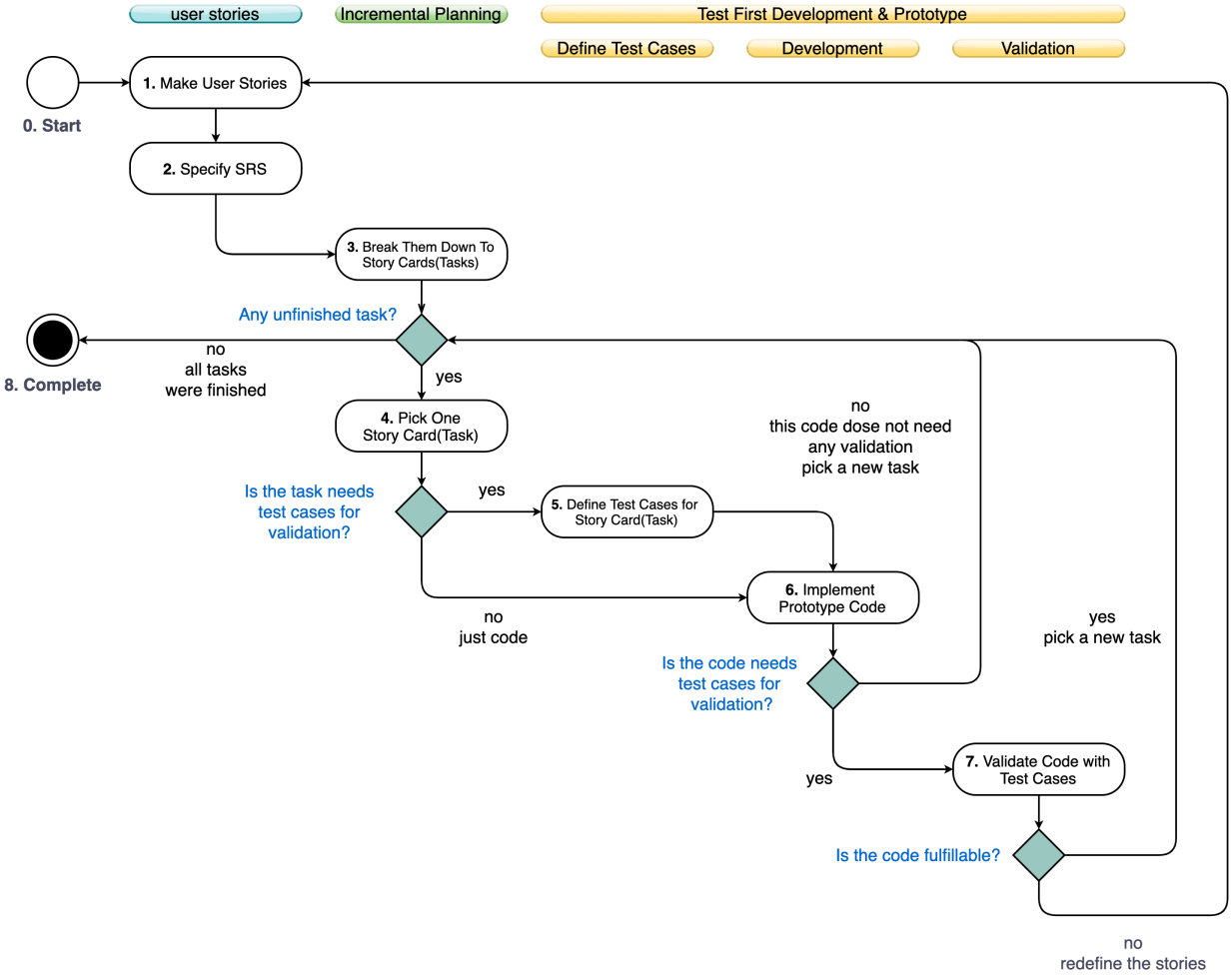


Fig. 5. Incremental Process

D5-Practice with the Extreme Programming