3.3 Organizing Software

The software for the autonomous extraction and refuelling station will be organized into two layers. The business layer and the data layer. The data layer will perform the gathering of information and storage of the important data to be kept for later. The business layer will be in charge of processing the information, making decisions based on the information and acting upon the decisions.

For the data layer, the system needs a database to store data needed for later and the map of its surroundings. This could be an SQL database or any other database, but it should have options for storing laws and regulations, map of surroundings with history of changes, status of internal tank and history of previous movements and goals. This layer also needs some sort of data acquisition devices for gathering from sensors and sending data to database. The types of data acquisition devices would be decided from the types of sensors used but should all be capable of communication over the same protocol to simplify the system.

The Business layer must be able to request data from the data layer and give this on to the decision maker. Then it needs a logical part which will make decisions based upon the information in the data layer. This part could be a program with all problems possible during operation coded into it. More useful however is some AI which can be trained to solve the problems it faces on the fly. Finally, the layer needs a program which can act upon the decisions. This program needs to control the motion of the station, the docking sequence, and tank pump. This program could be a PLC program, or some other high- or low-level language program capable of running on the hardware in the station. How the actual hardware for the different actuators can be controlled could limit what types of software tool can be used for this part.

A constraint for future models of the station is that the software and data should be unreadable by someone trying to hack into the station directly by plugging into the system or remotely if communication equipment are installed in the future. This is not that relevant yet, since hacking attempts would be hard now, but if space travel becomes more common, this will be something to consider. However, sniffer satellites which move up to other satellites and try to spy on them are already a thing, so access to the software should at least be protected.

Business Layer

Actuator

Decision maker

Data Layer

Data Acquisition

Database

Layer Communication