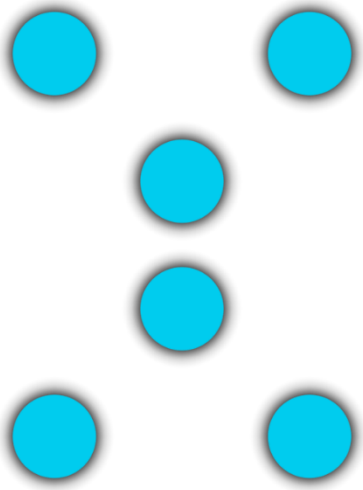
Institiúid Teicneolaíochta Cheatharlach

INSTITUTE of TECHNOLOGY CARLOW

PiLYNK

Home Automation System



Design Document

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Class Group:	Software Development
Supervisor:	Joseph Kehoe
Document:	Design Document
Date:	15/04/2016

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1. Introduction

This document contains all of the design stages and modelling artefacts for the PiLYNK. The design of the project began in late November 2015 after scope analysis and initial feasibility tests. This document is critical in the development process as it is an active reference to the total construction of the software from iteration one through to iteration three and then to final release stages.

The breakdown of this document is as follows:

1. Description on the design pattern proposed for development.
2. System sequence diagrams for each use case detailed in the Functional Specification.
3. Sequence diagrams detailing internal mechanics and problem breakdowns.
4. All data design artefacts, including MVC pattern diagrams, LYNK data model and model level design artefacts.

2. System Design Strategy

As the nature of the PiLYNK is to be accessible via a remote server connection user a graphical medium, Model View Controller (MVC) is the preferred solution as it is a powerful design pattern if obeyed correctly, and suited for this purpose rather well.

This design pattern is structured in the following fashion:

Model (Represents Knowledge):

The class or data structure for the data used by the system, ready for creation or manipulation. Typically stored in a database or some form of persistent storage.

View (Visual Representation of a Model):

This layer of the pattern represents the graphical user interface portion of a system of this nature. In this case, HTML templates and design markup. The view essentially allows users to see the model in a preferred way, rather than raw data in a database table.

Controller (User – System Link):

The controller in MVC serves as a link between the user and the system. It provides the user with the views they wish to view and occupation of data within the views themselves. The controller is essentially the brains of the pattern.

The below diagram is a high level illustration of the MVC layer interact within the system.

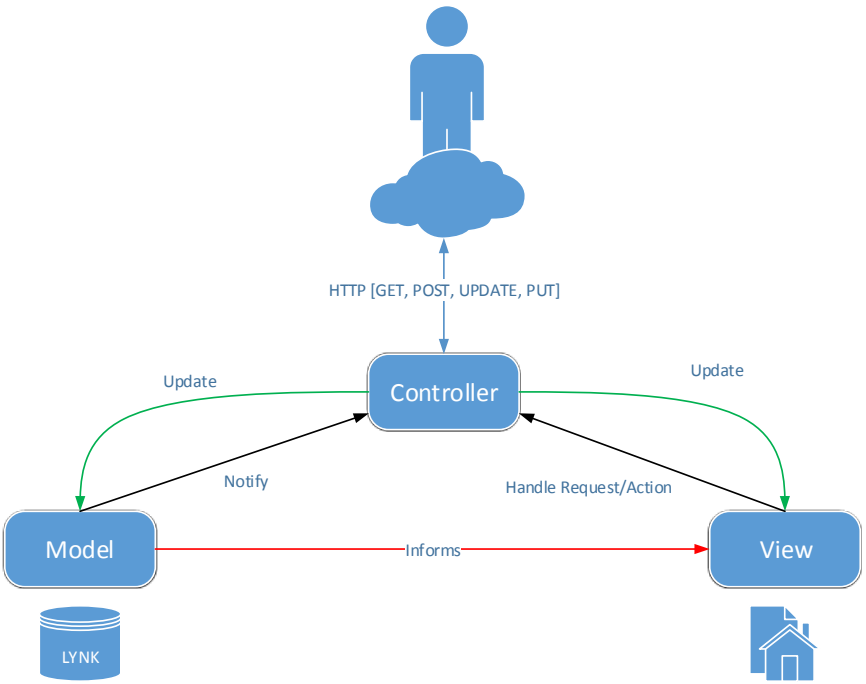
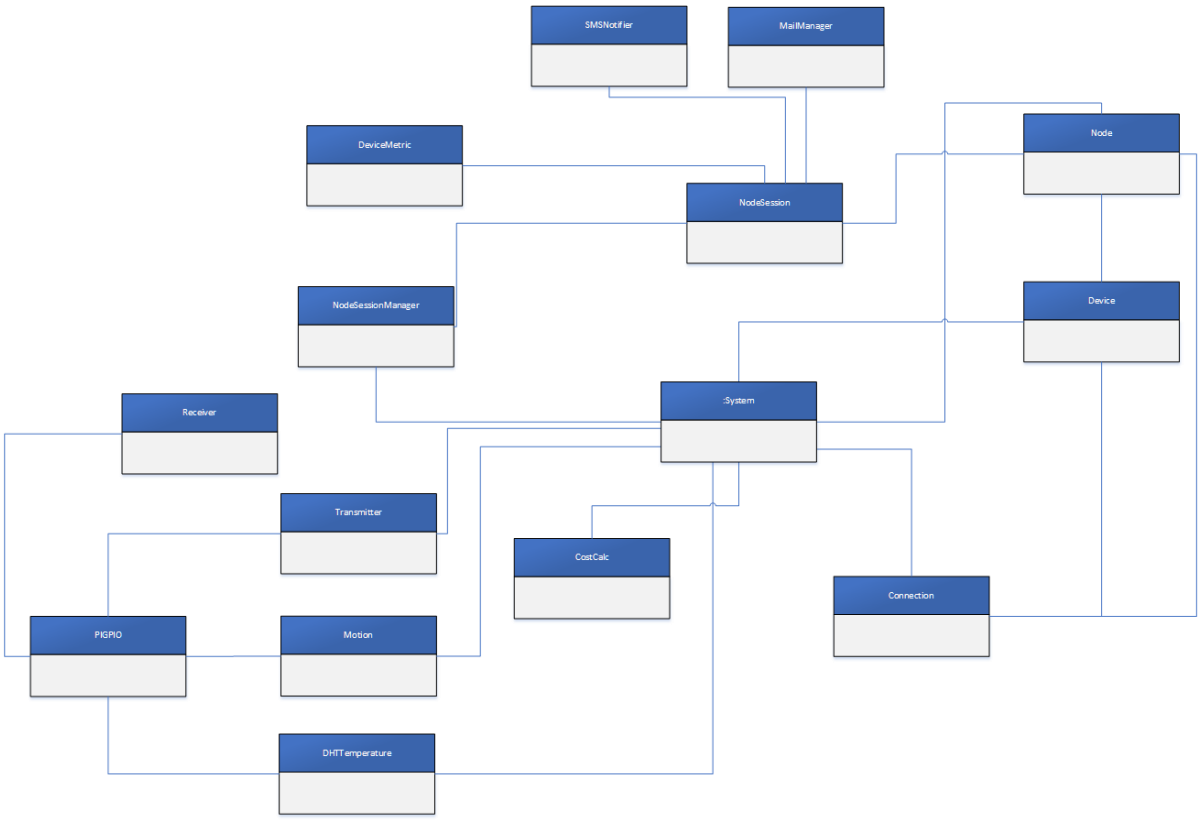


Figure 1 - MVC Illustrated

3. System Object Models

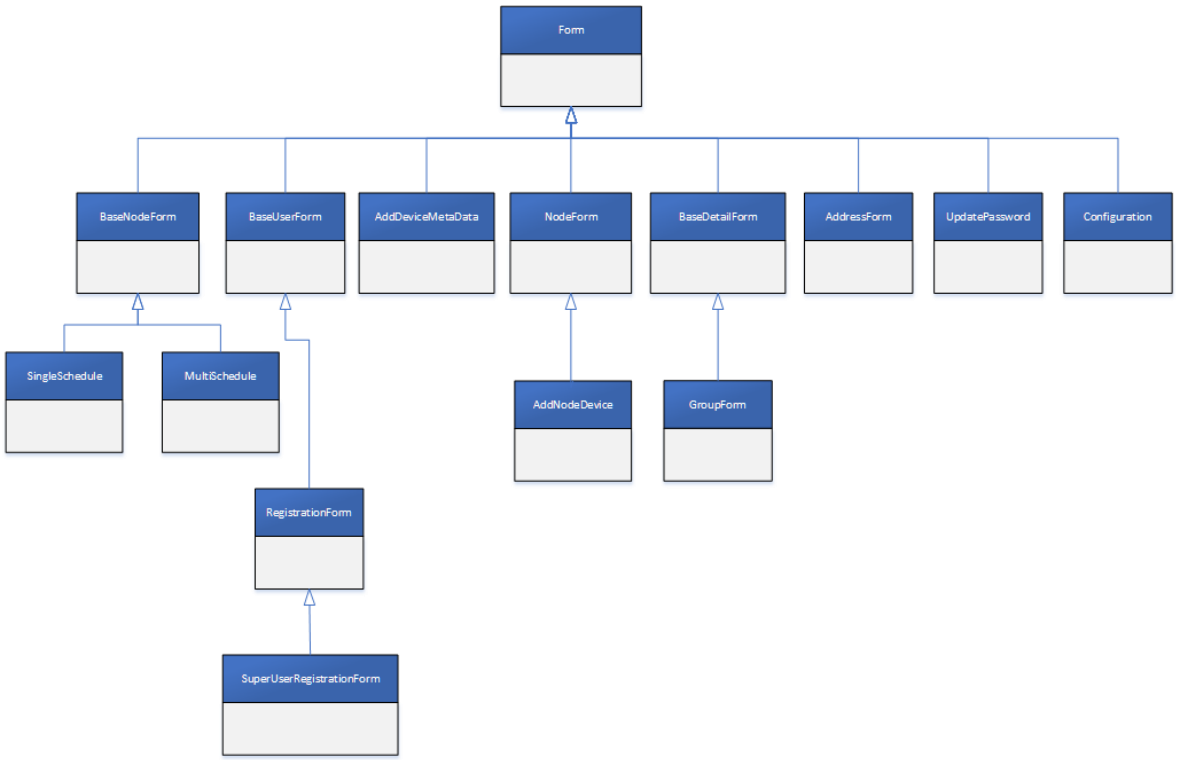
3.1 Core Domain Model Diagram

The Core Domain Model diagram represents the object model describing the class structure within the PiLYNK system.



3.2 Core Model View Taxonomy Diagram

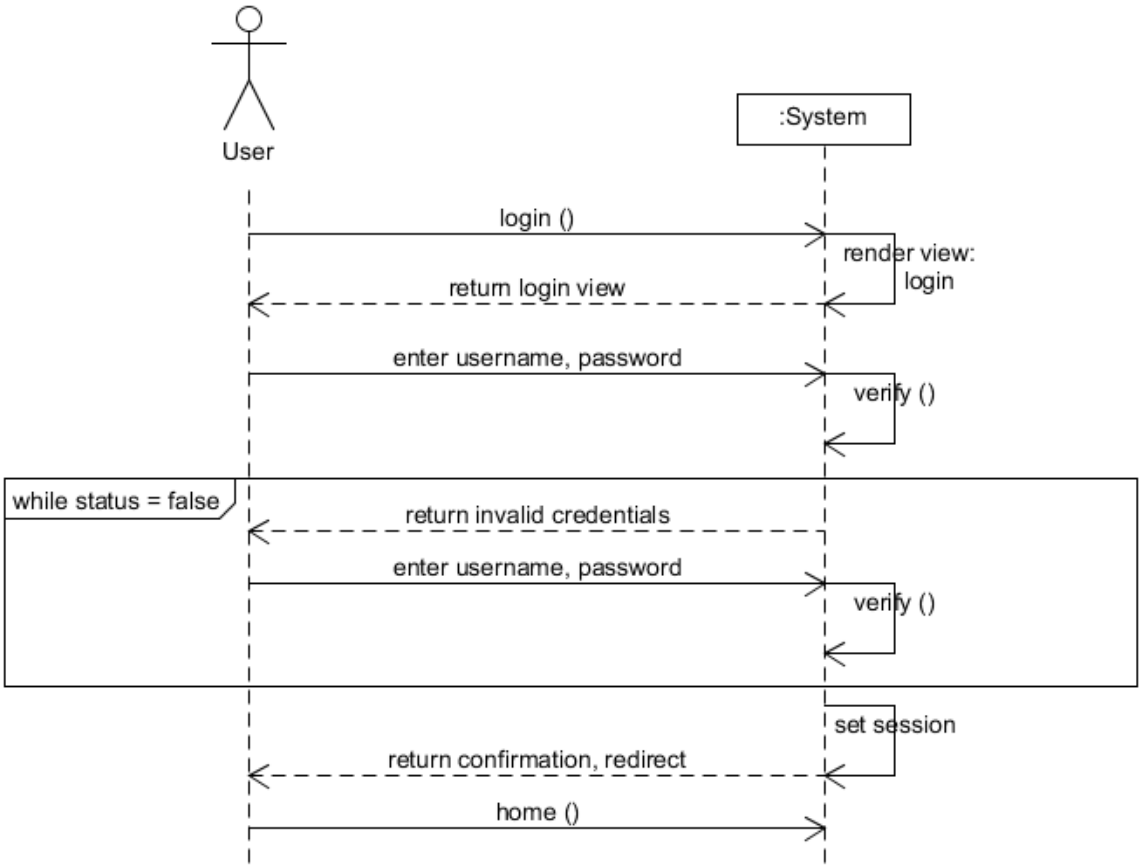
The Core Model View Taxonomy Diagram shows the hierarchal relationship of view interaction objects (represented as forms using WTForms) for manipulation of the model, and strictly required for maintaining data integrity in the LYNK database. The objects themselves are constructed and maintained in direct association with the database. This provides a relief in the workload required for manual validation testing.



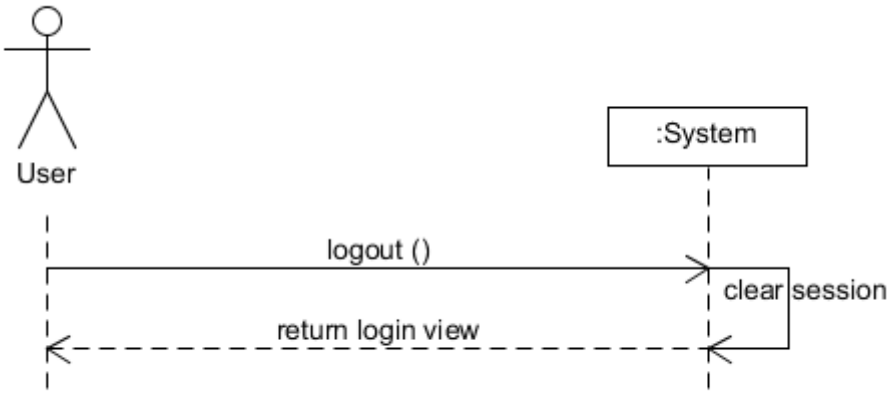
4. System Sequence Diagrams

The following section will include the System Sequence Diagram (SSD) of the PiLYNK design process. The diagrams included will reflect primary functionality relating to the Control, Metrics and Security branches from the design philosophy.

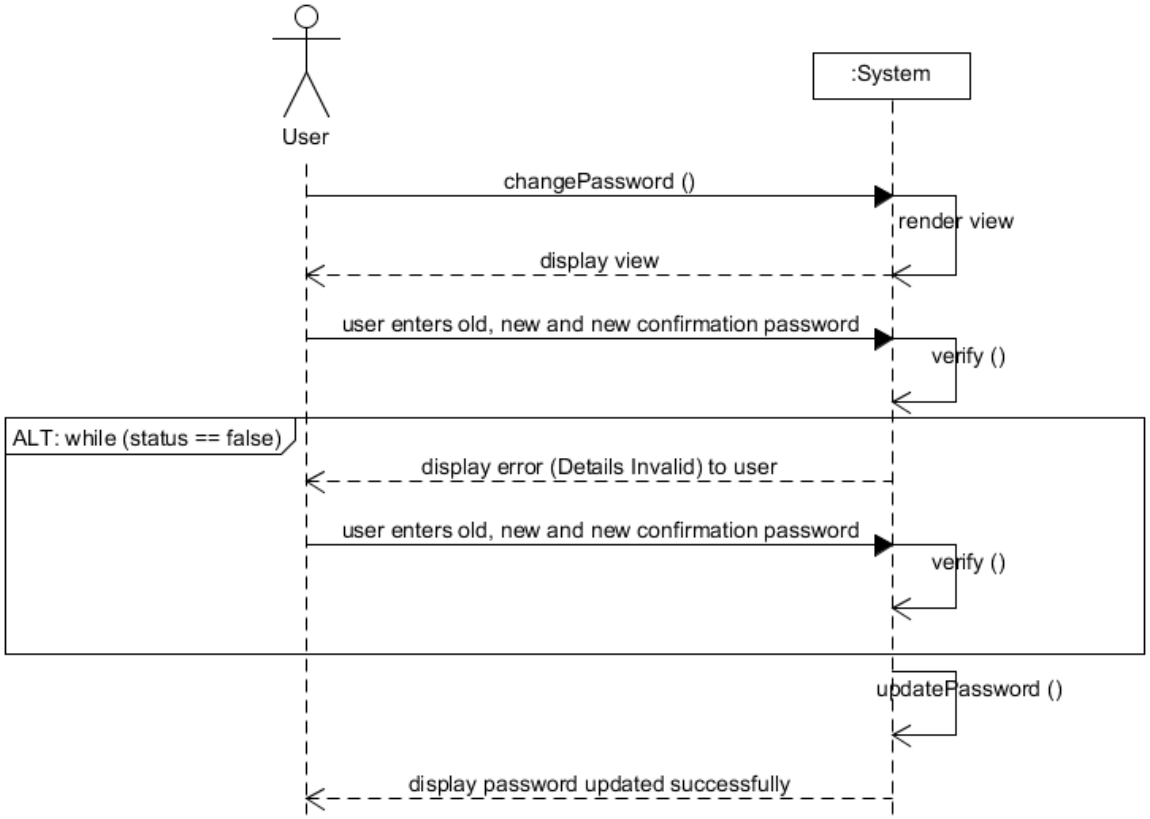
4.1 Login



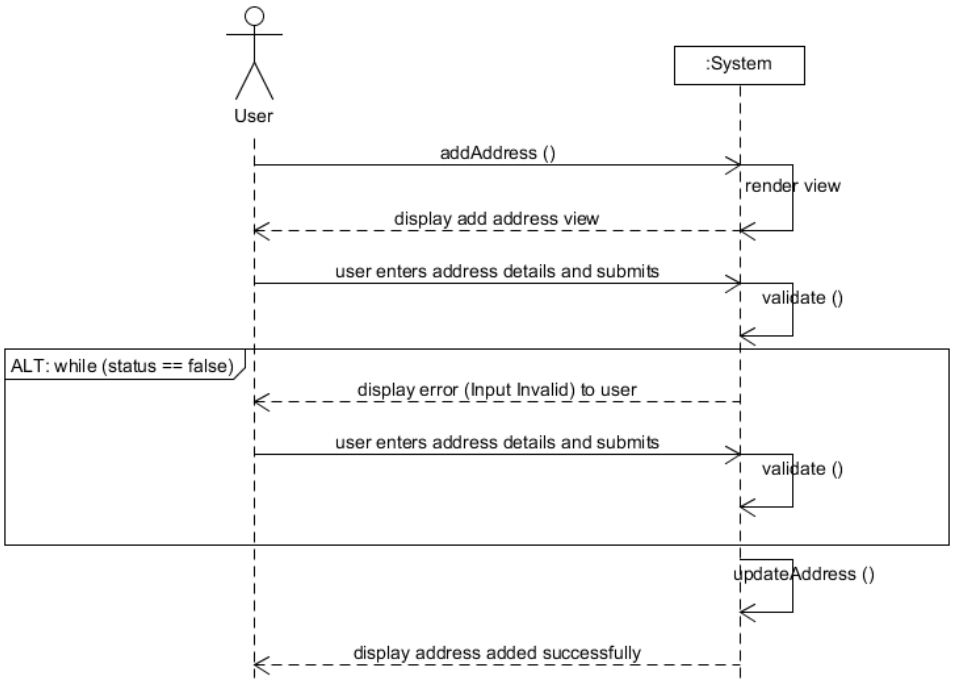
4.2 Logout



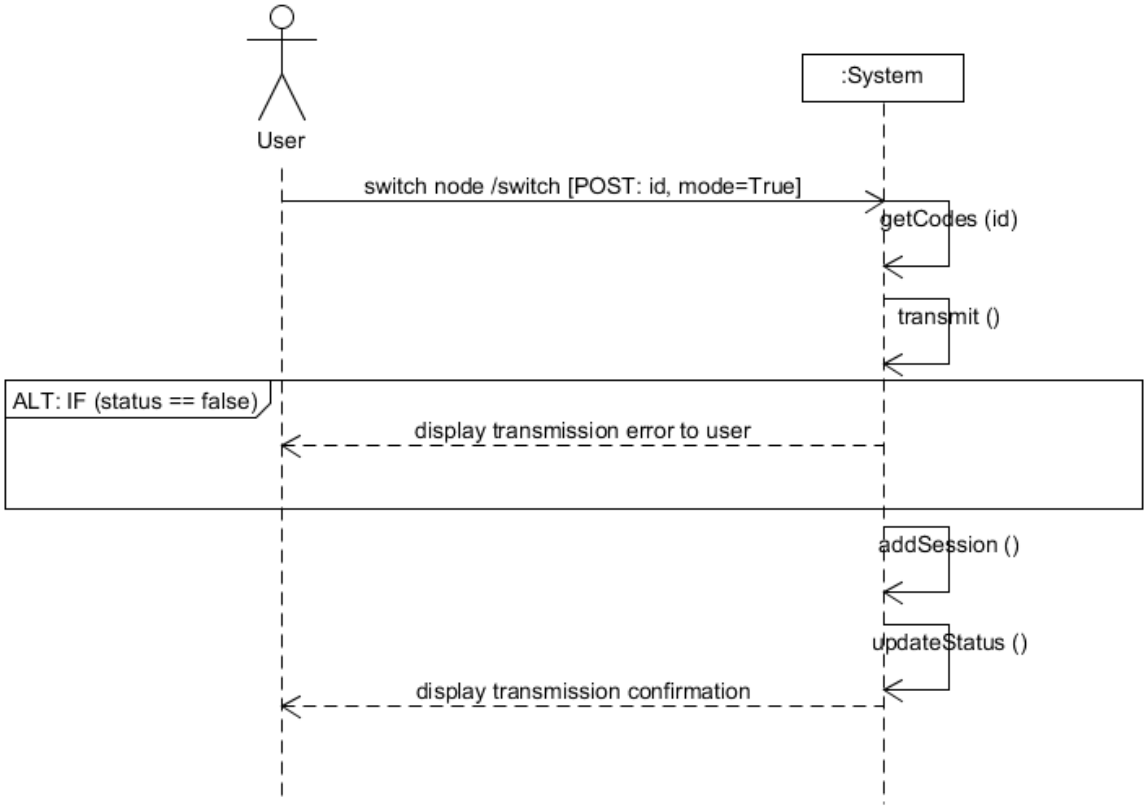
4.3 Change Password



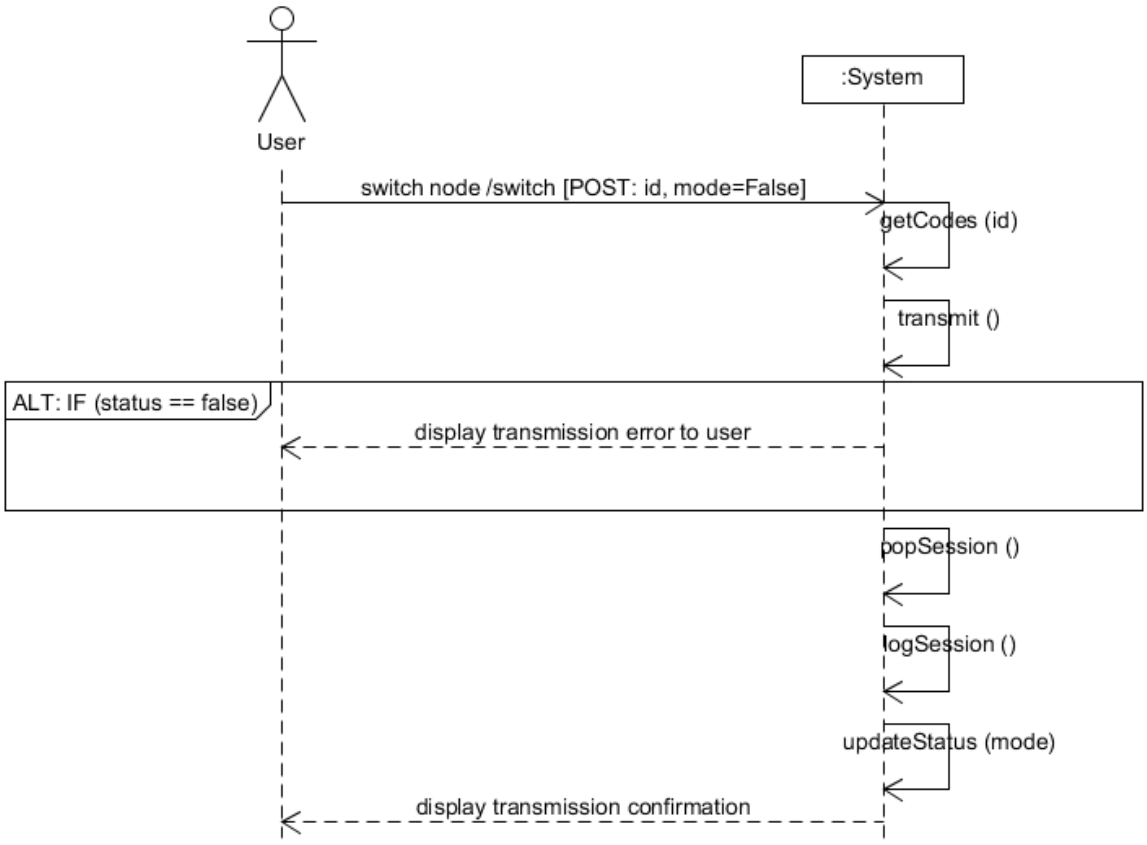
4.4 Add Address



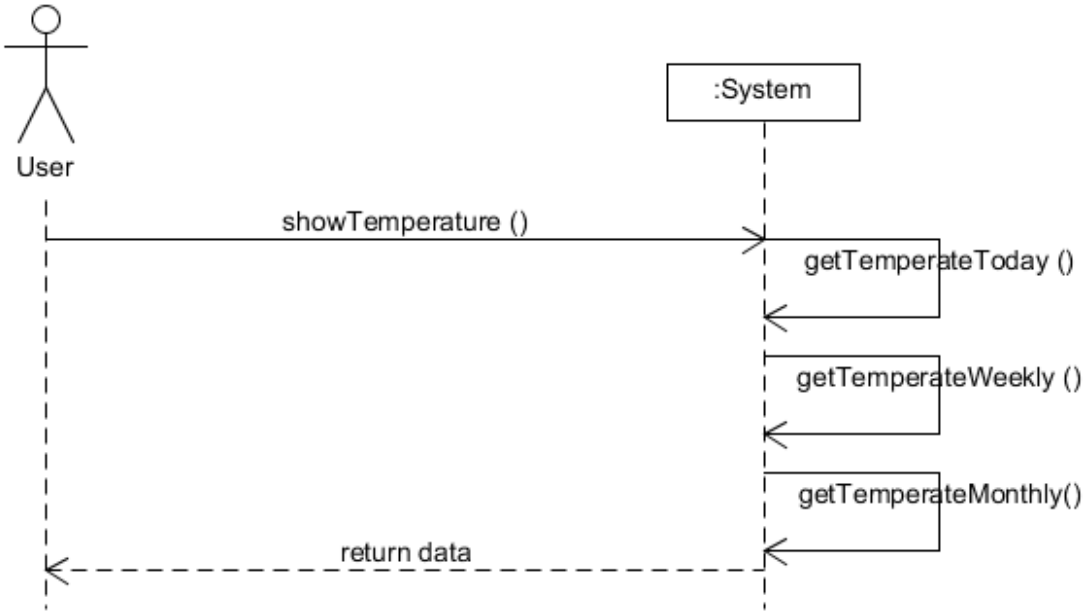
4.5 Switch Node On



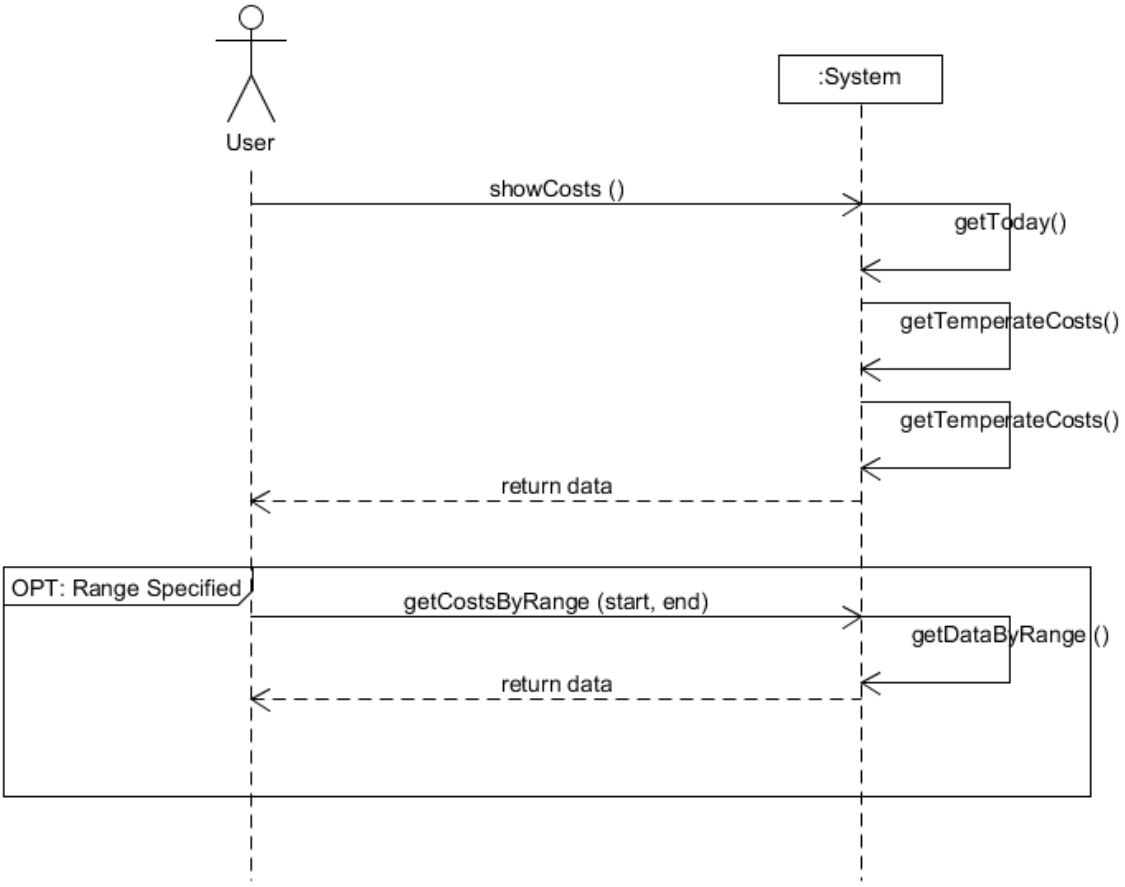
4.6 Switch Node Off



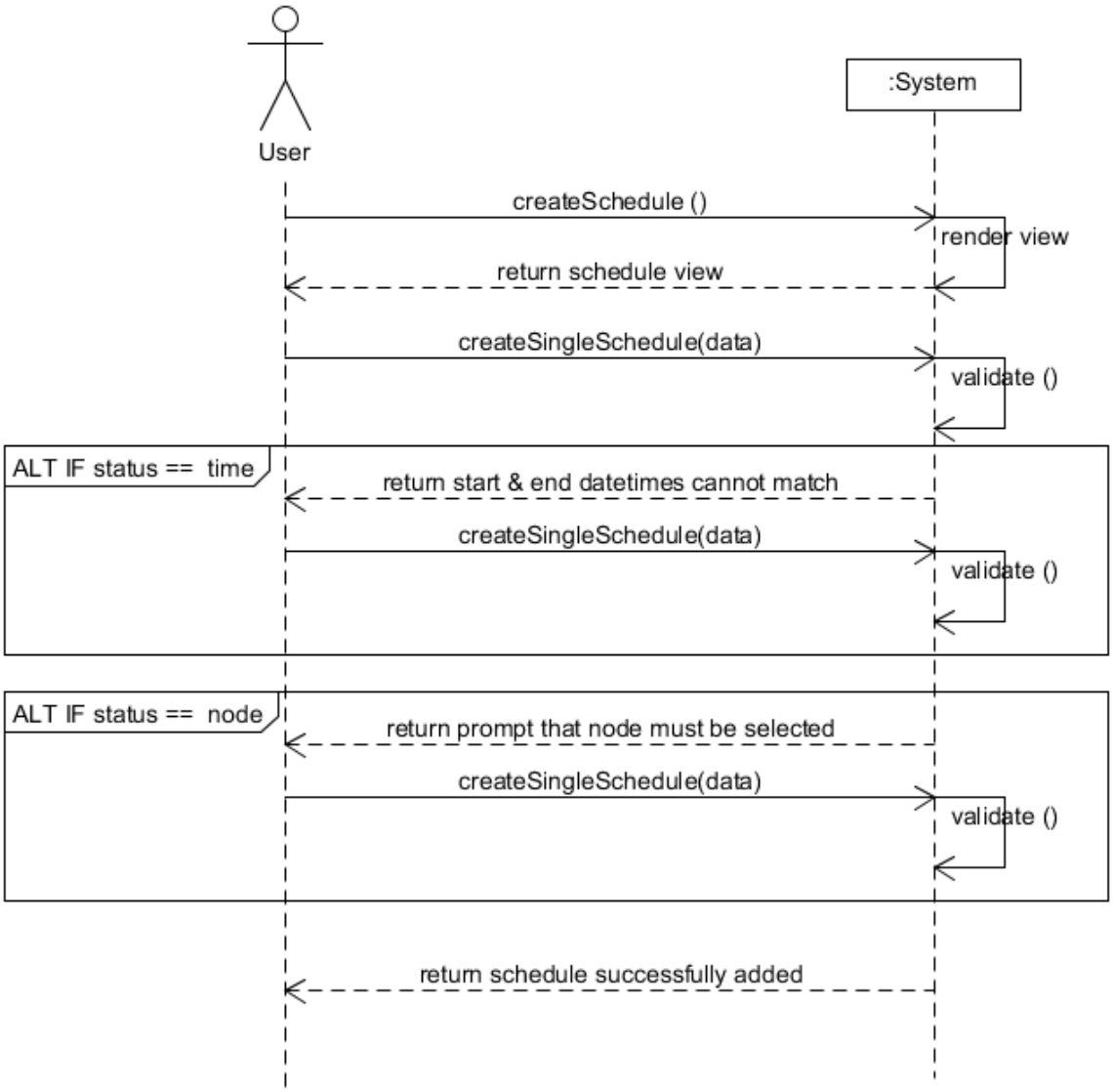
4.7 View Climate Metrics



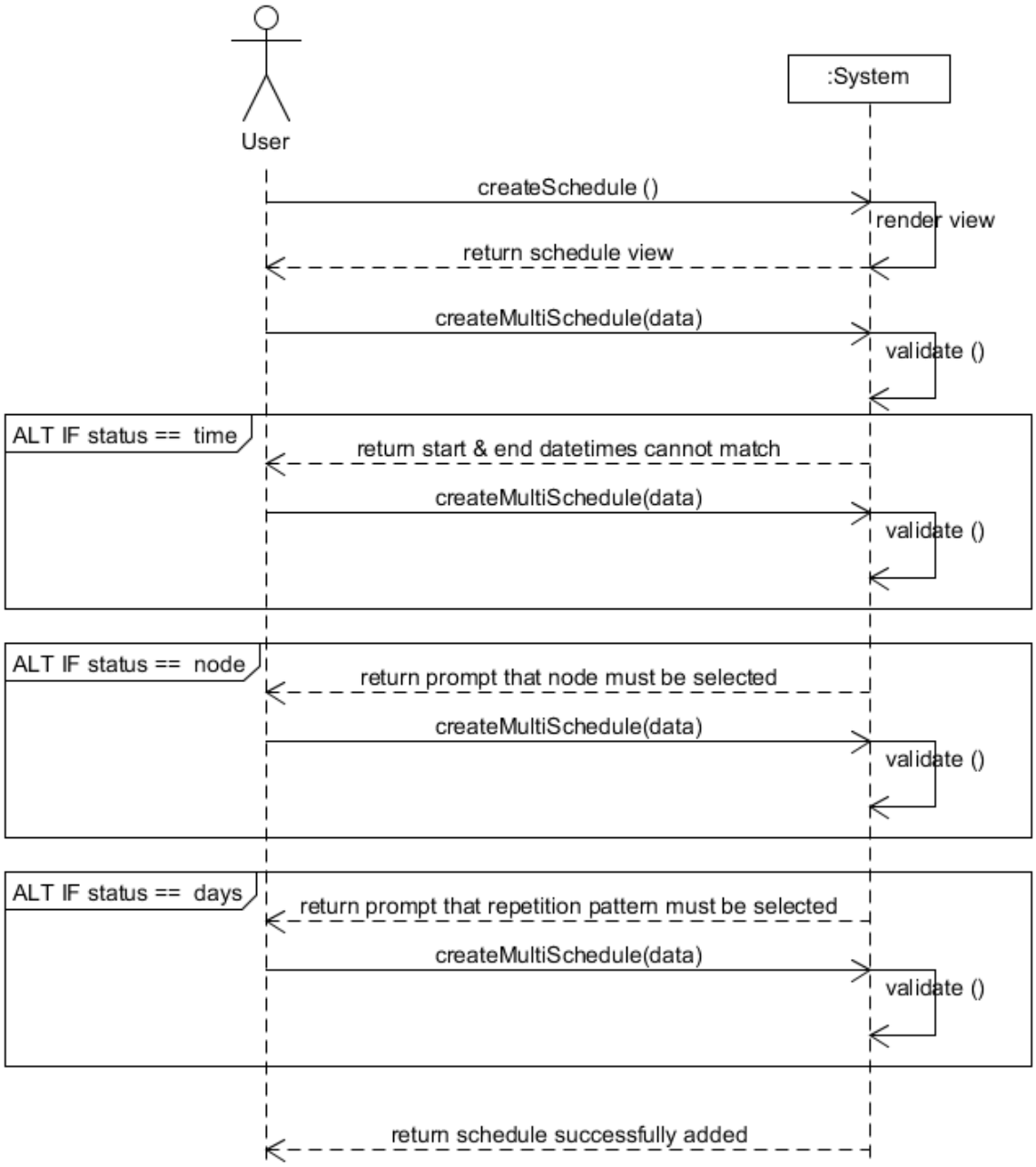
4.8 View Cost Metrics



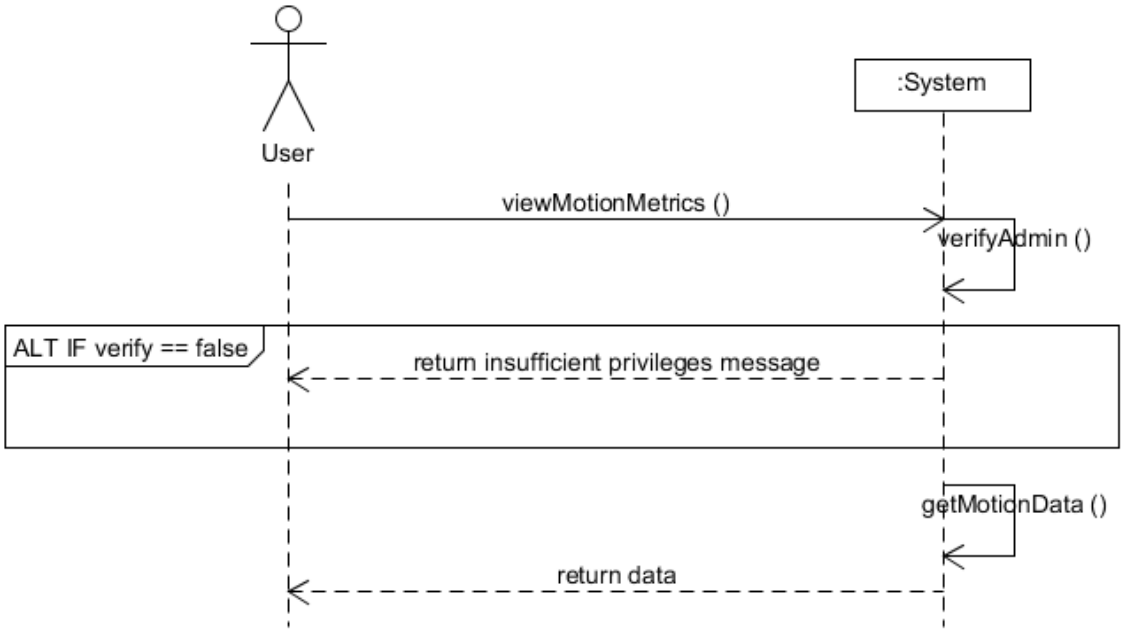
4.9 Create Single Schedule



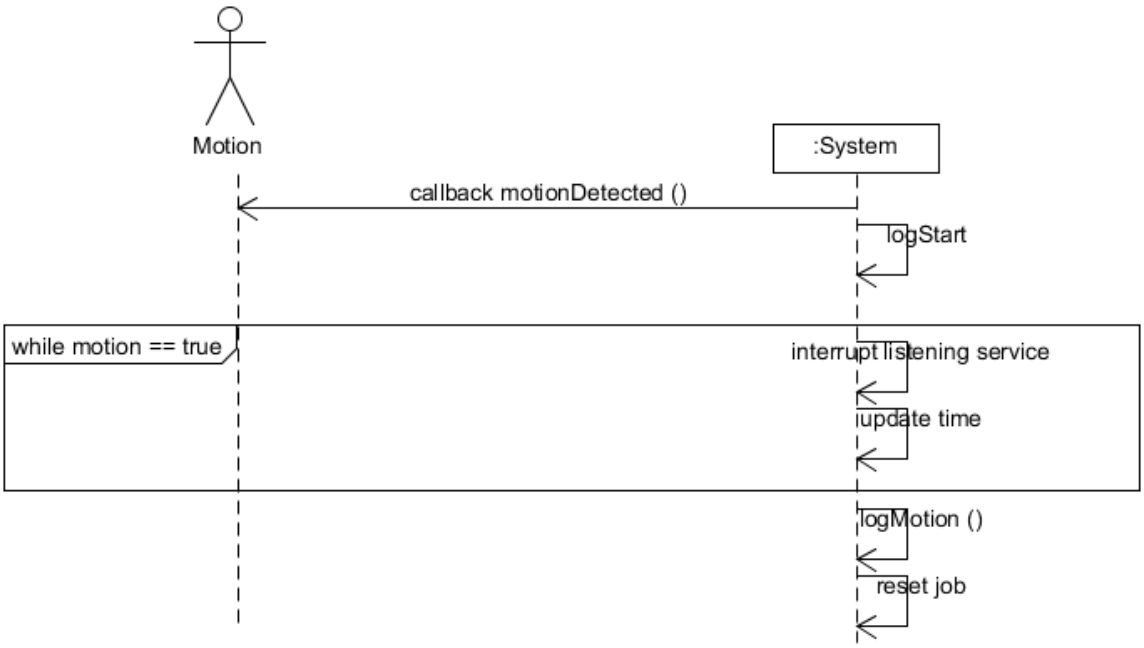
4.10 Create Reoccurring Schedule



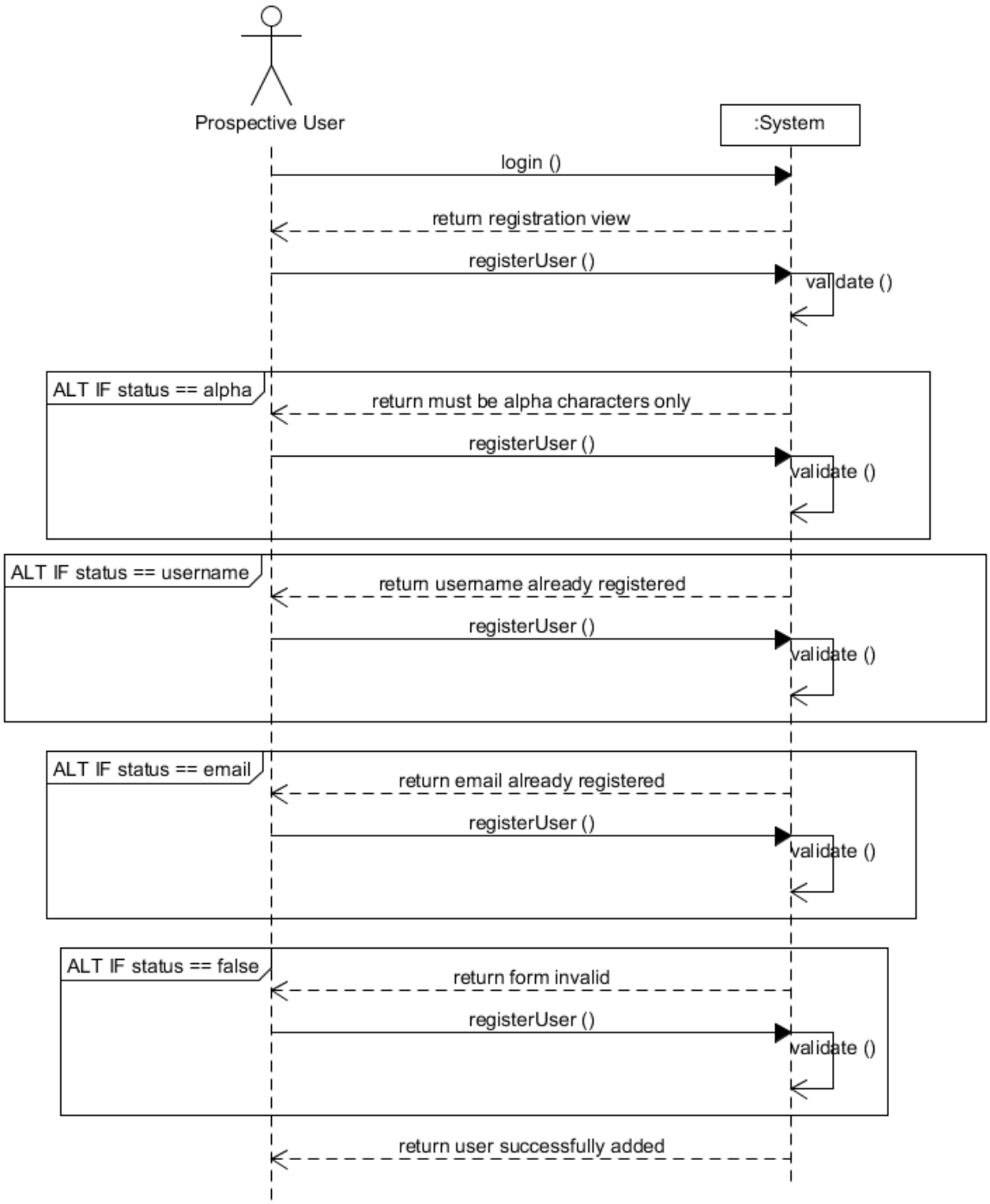
4.11 View Motion Metrics



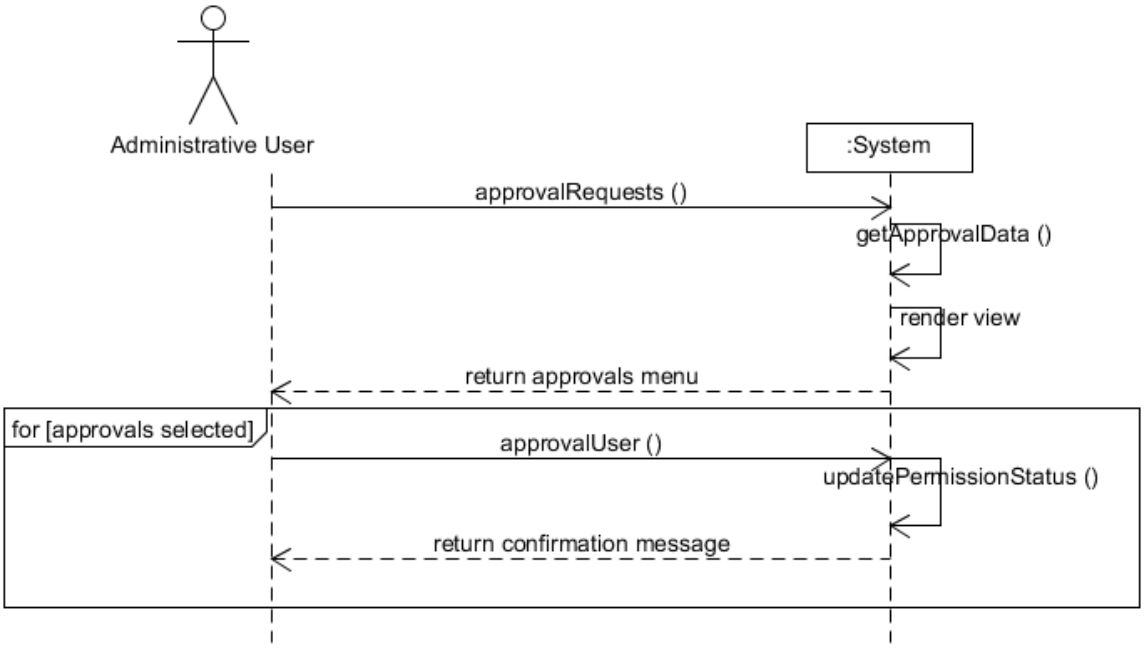
4.12 Log Motion Data



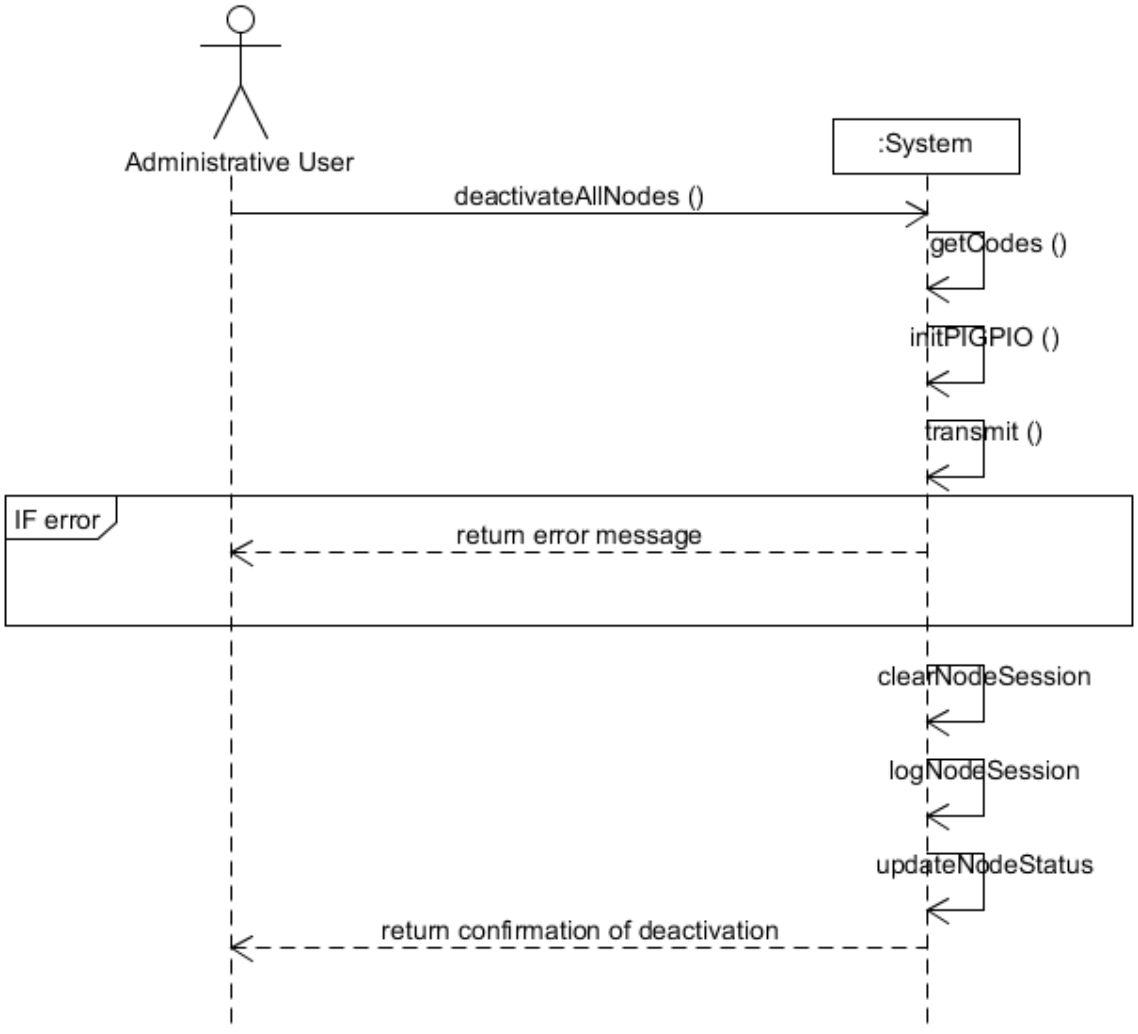
4.13 Register



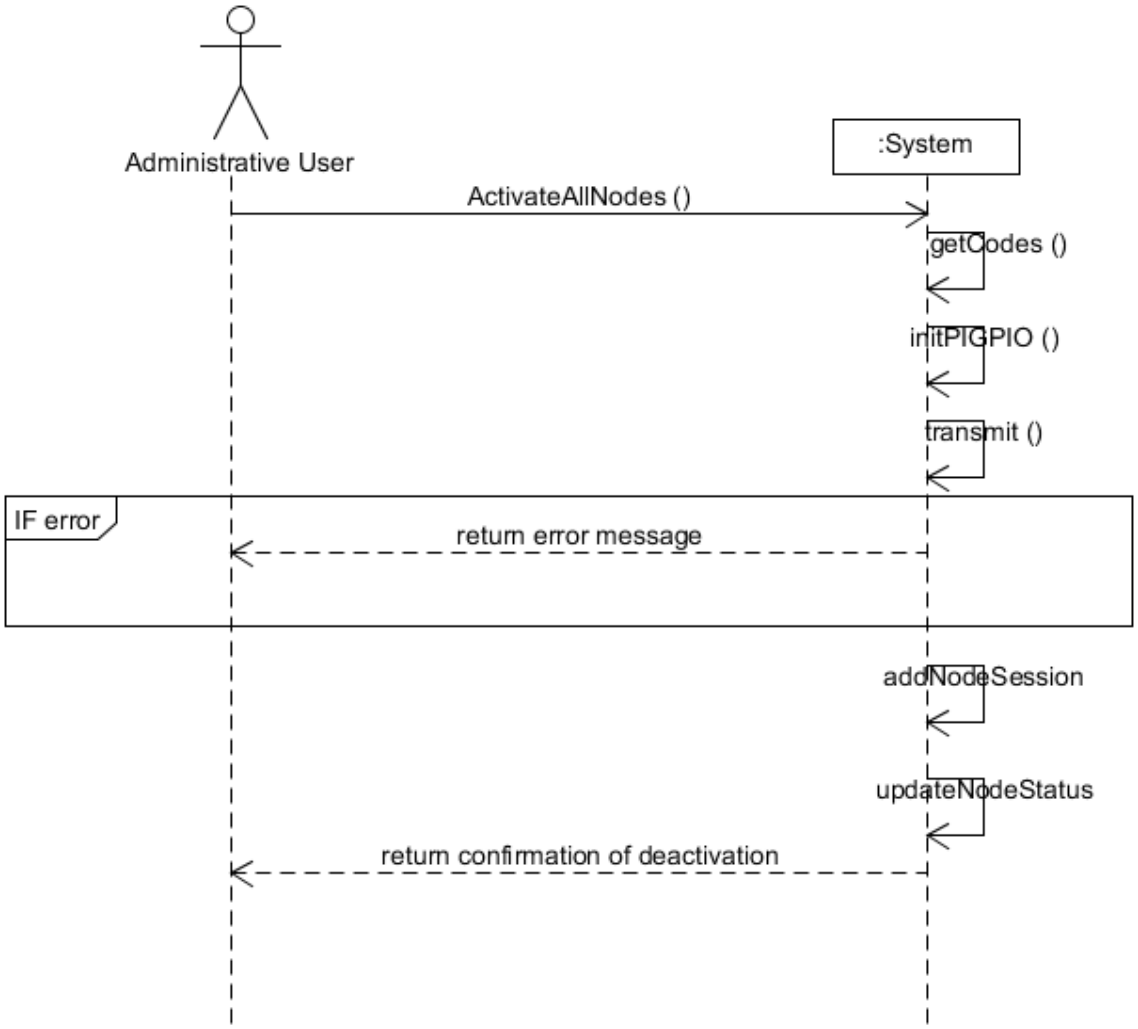
4.14 Approve Request



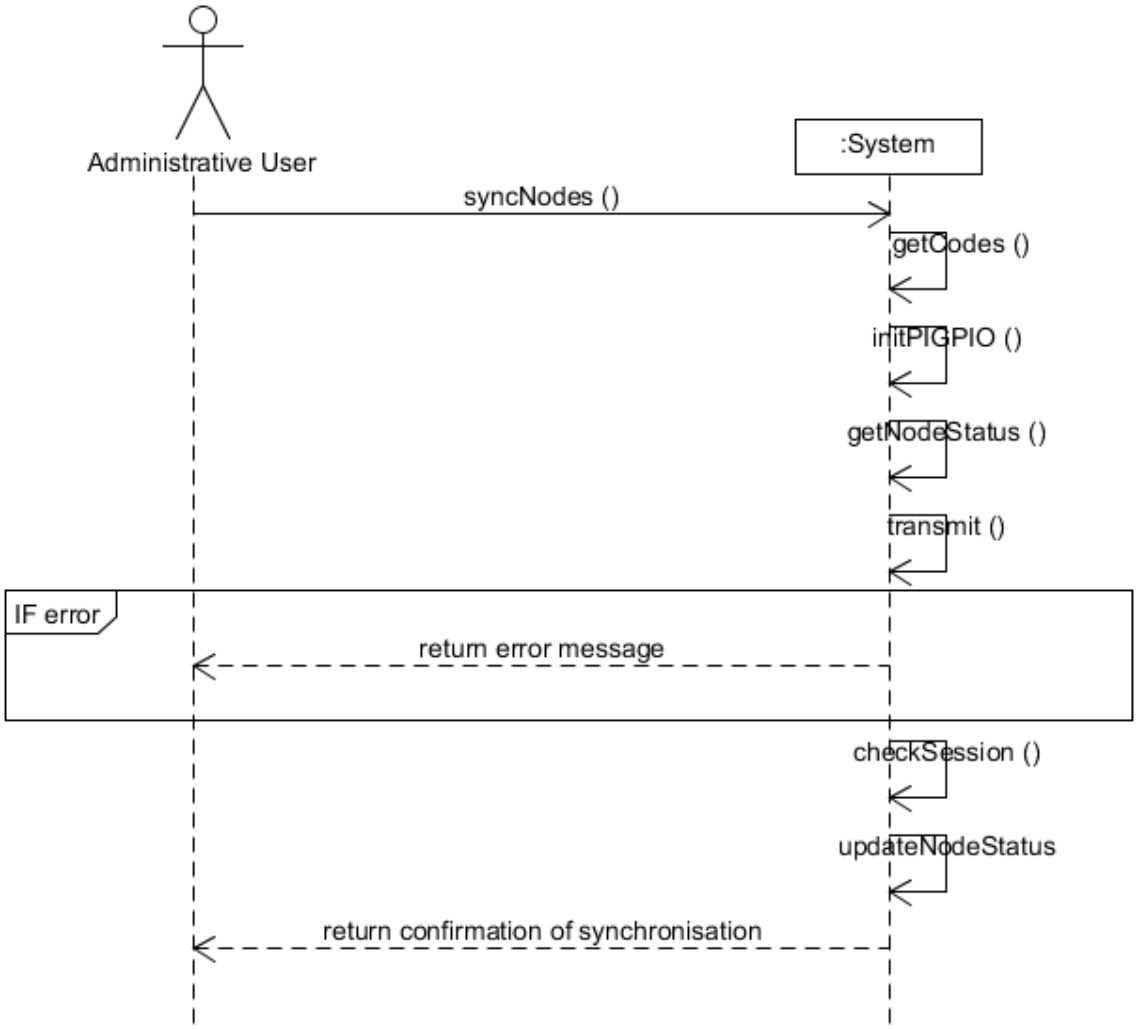
4.15 Deactivate All Nodes



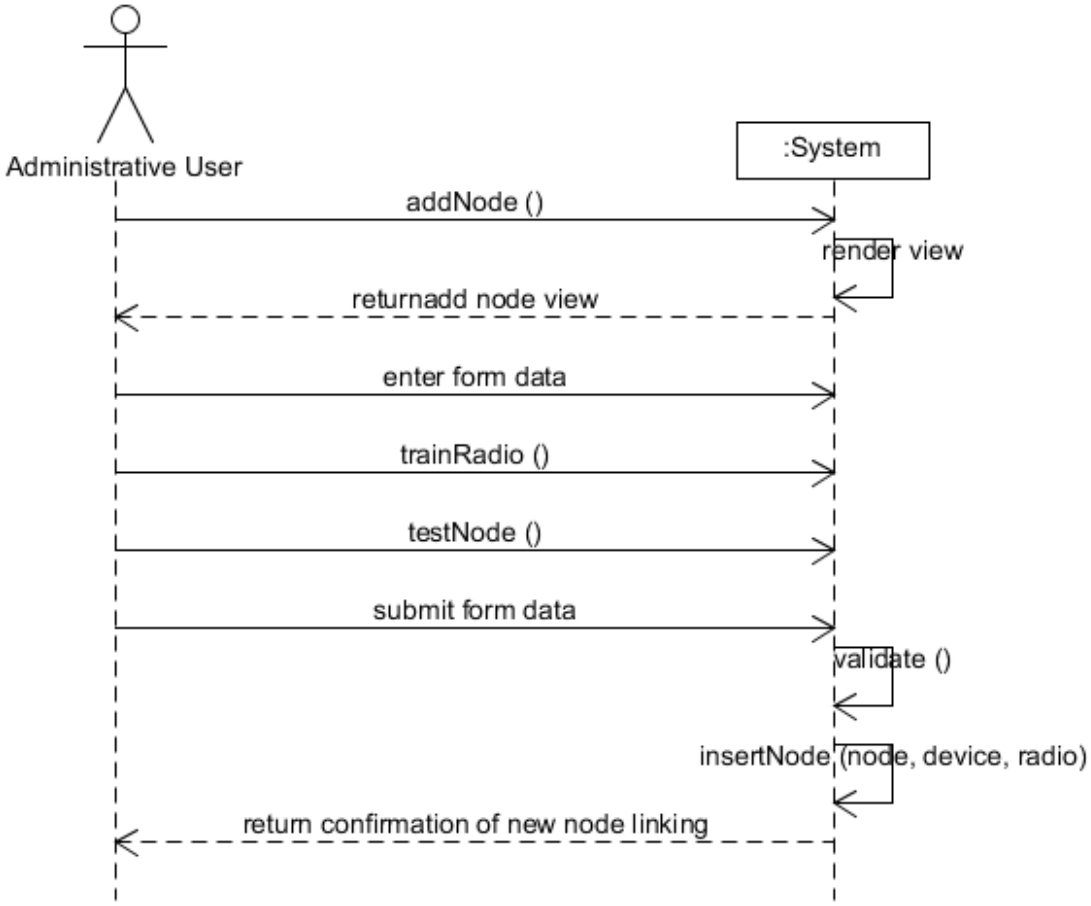
4.16 Activate All Nodes



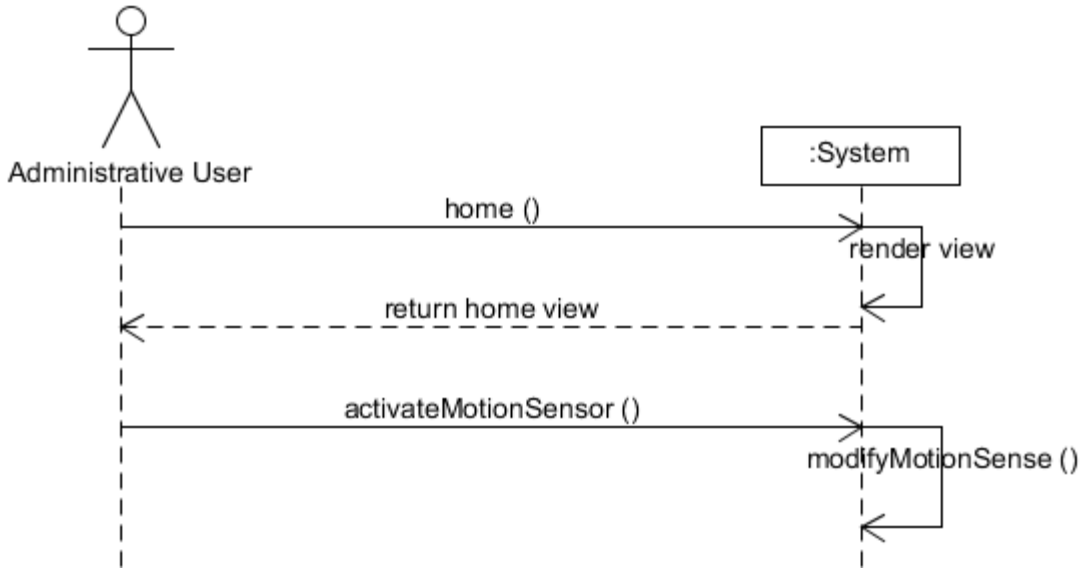
4.17 Sync Nodes



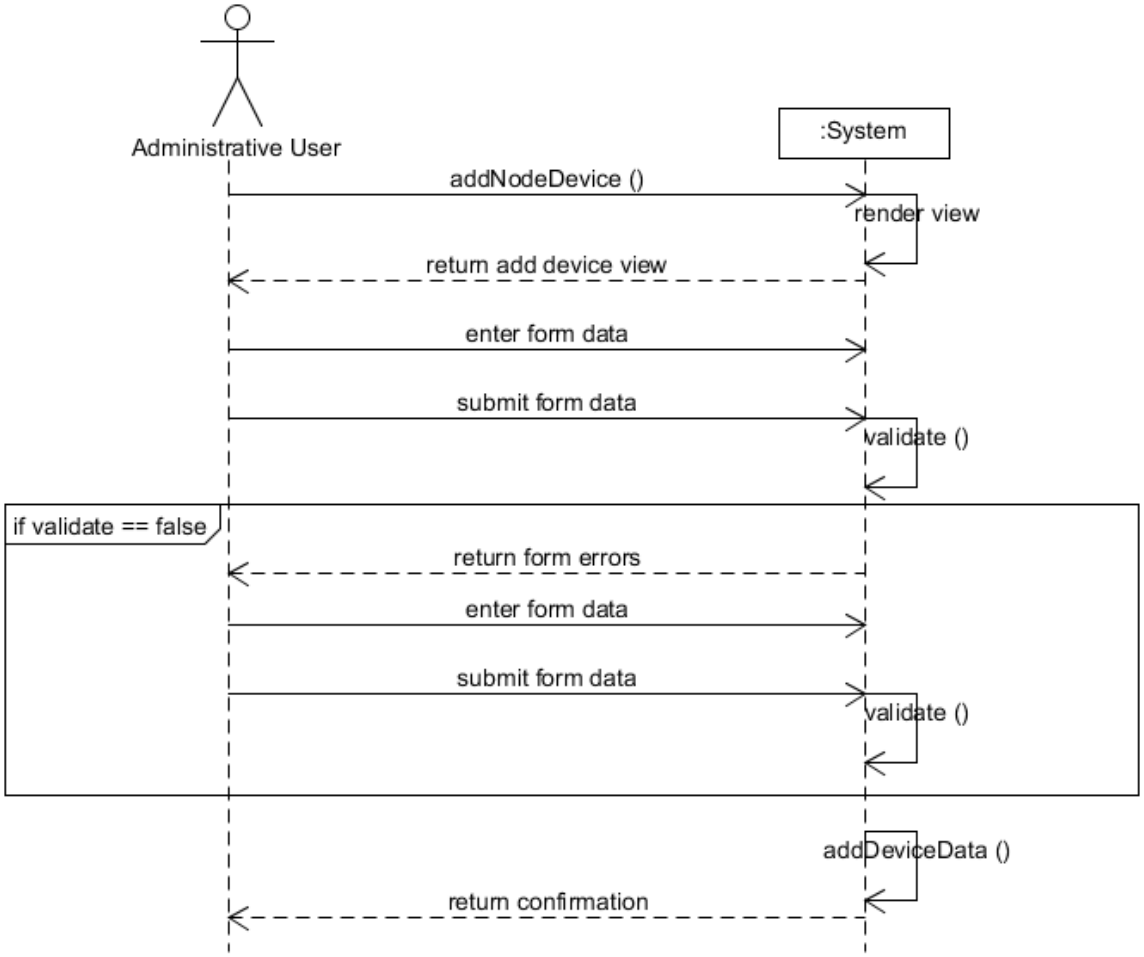
4.18 Add Node



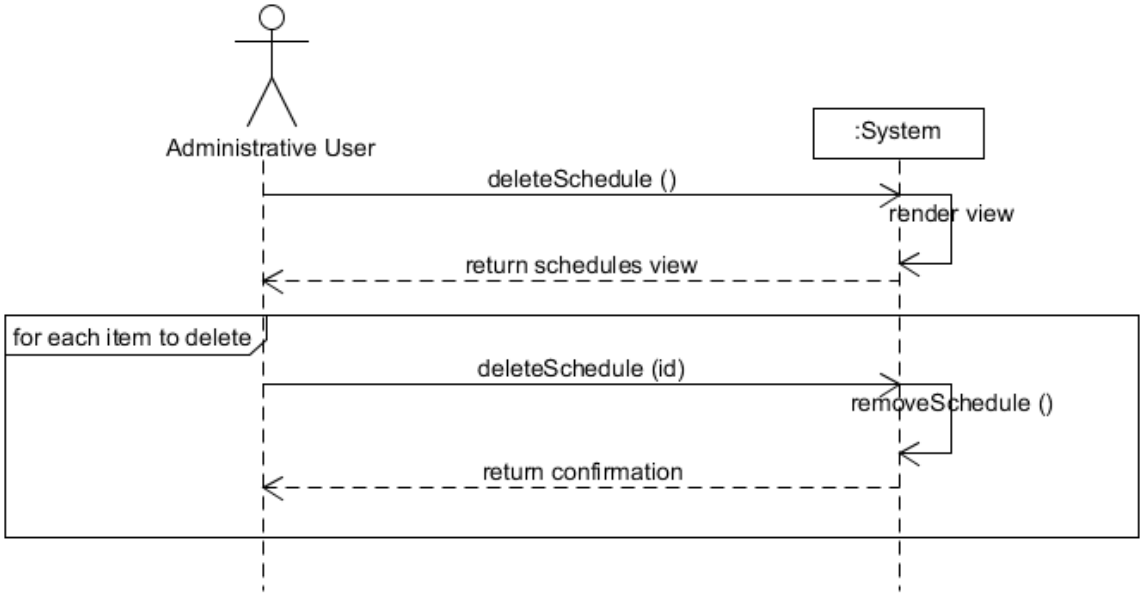
4.19 Activate Motion Sense



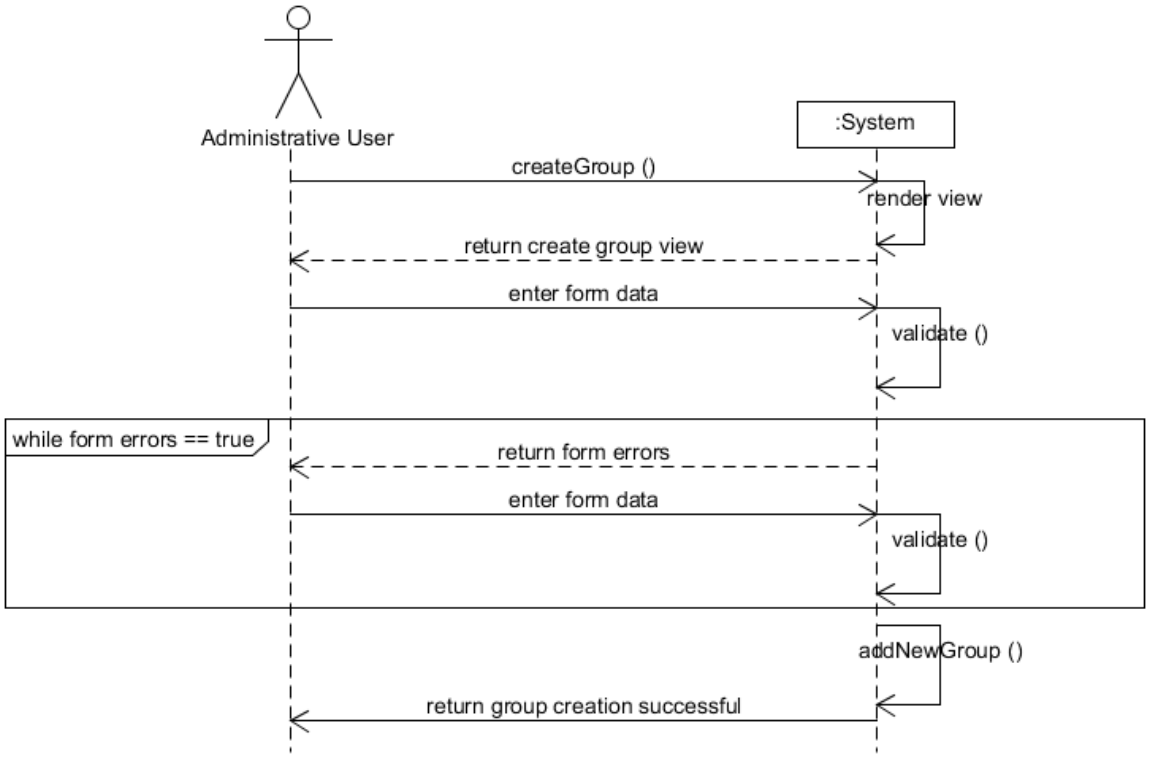
4.20 Add Node Device



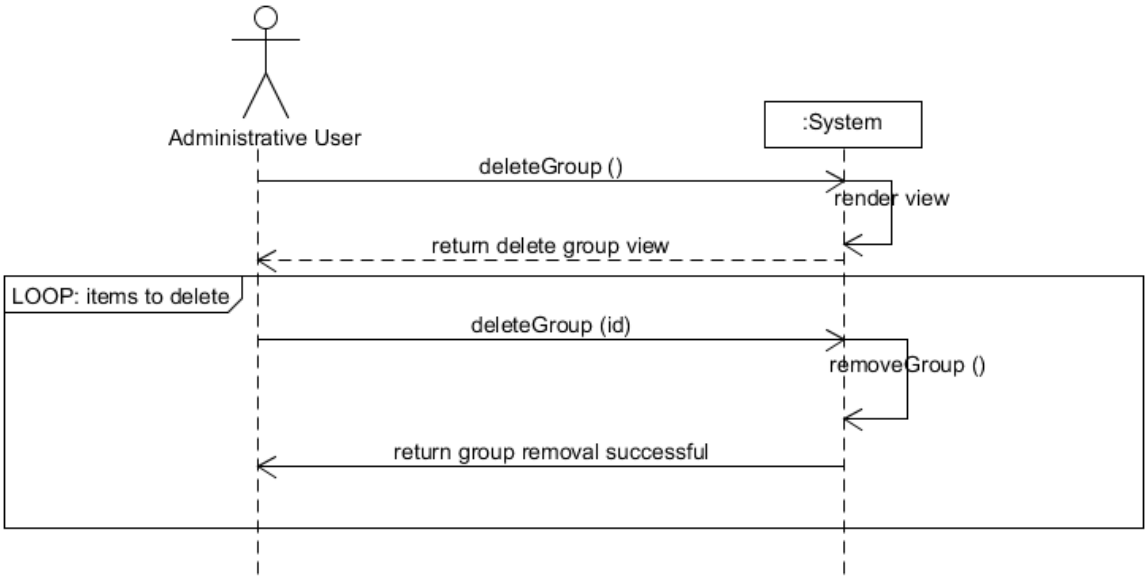
4.21 Delete Schedule



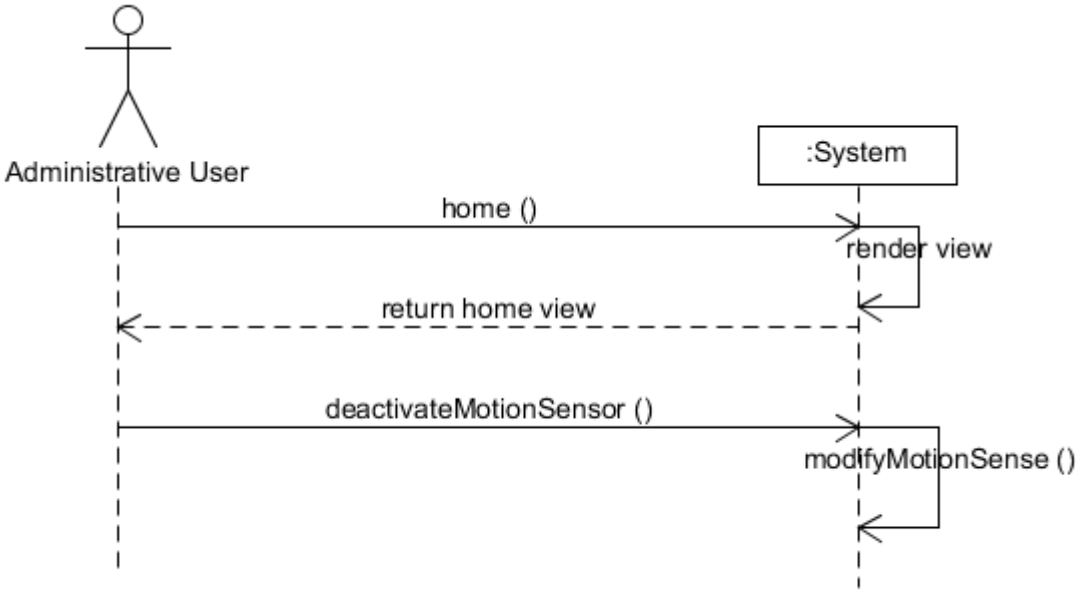
4.22 Create Group



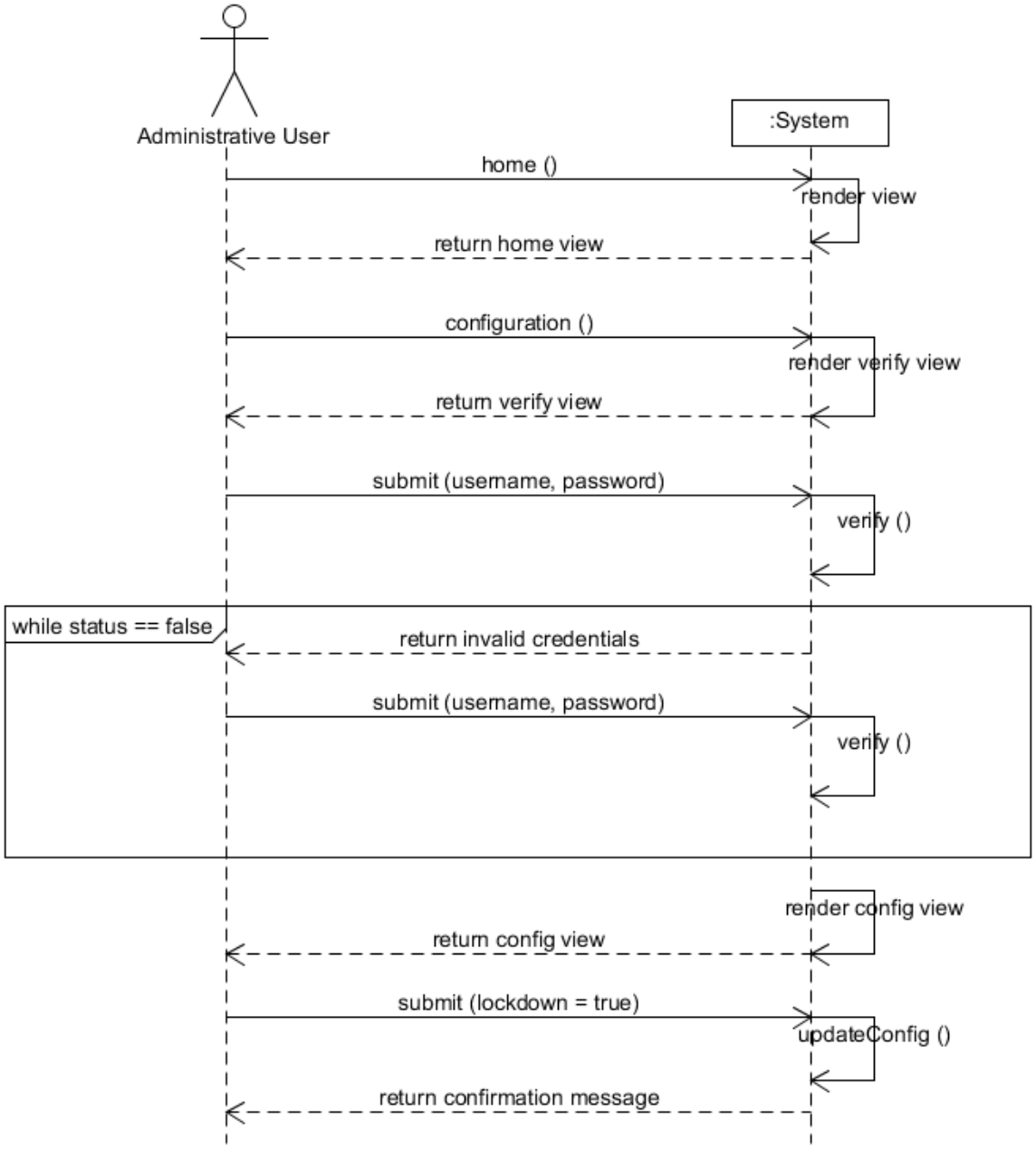
4.23 Delete Group



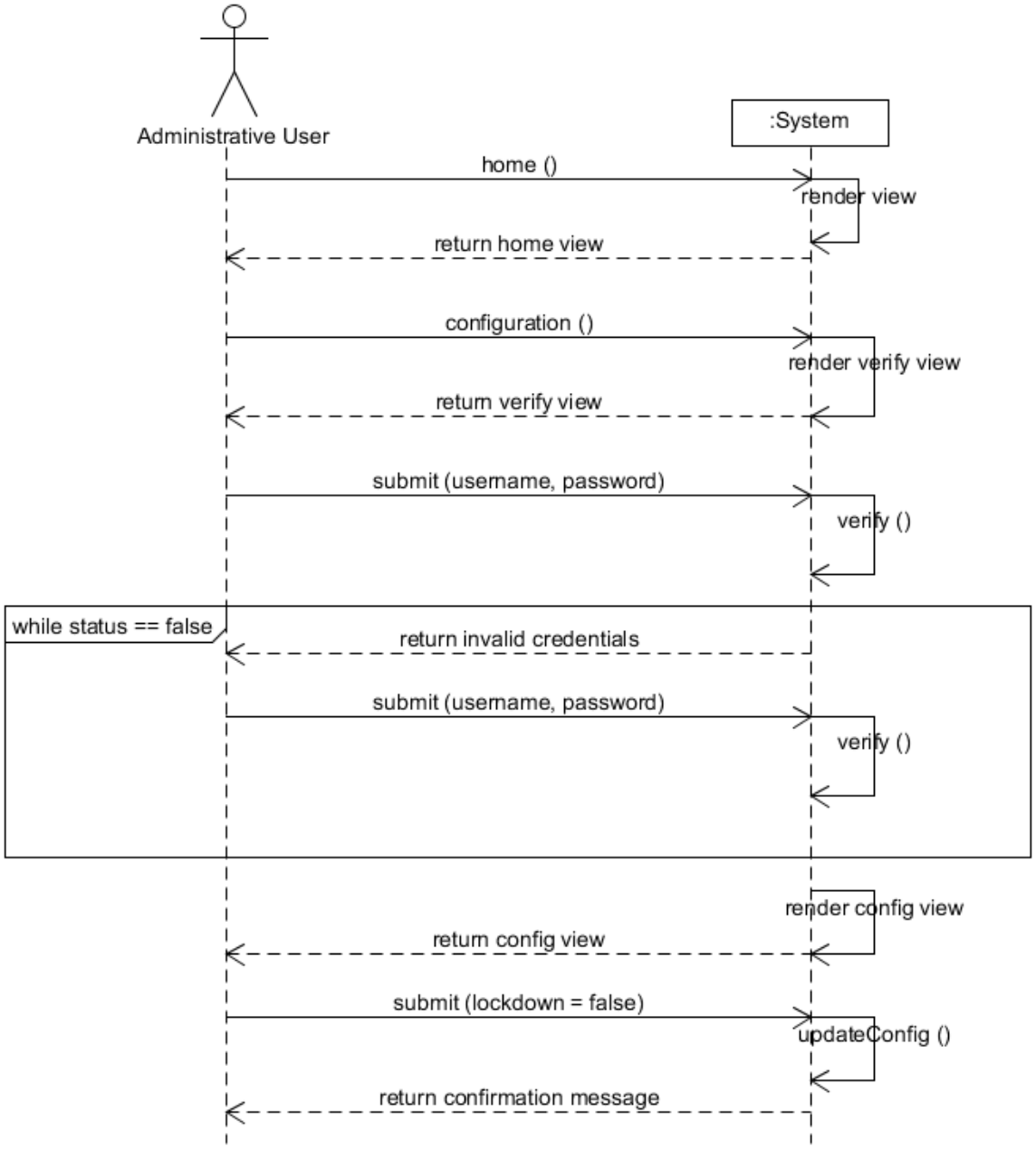
4.24 Deactivate Motion Sense



4.25 Enable Lockdown Mode



4.26 Disable Lockdown Mode



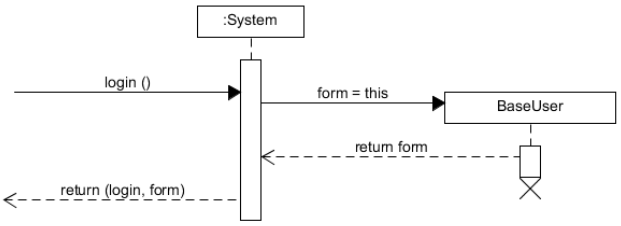
5. Sequence Diagrams

The following section will include the relevant object interaction sequence diagrams for the PiLYNK system.

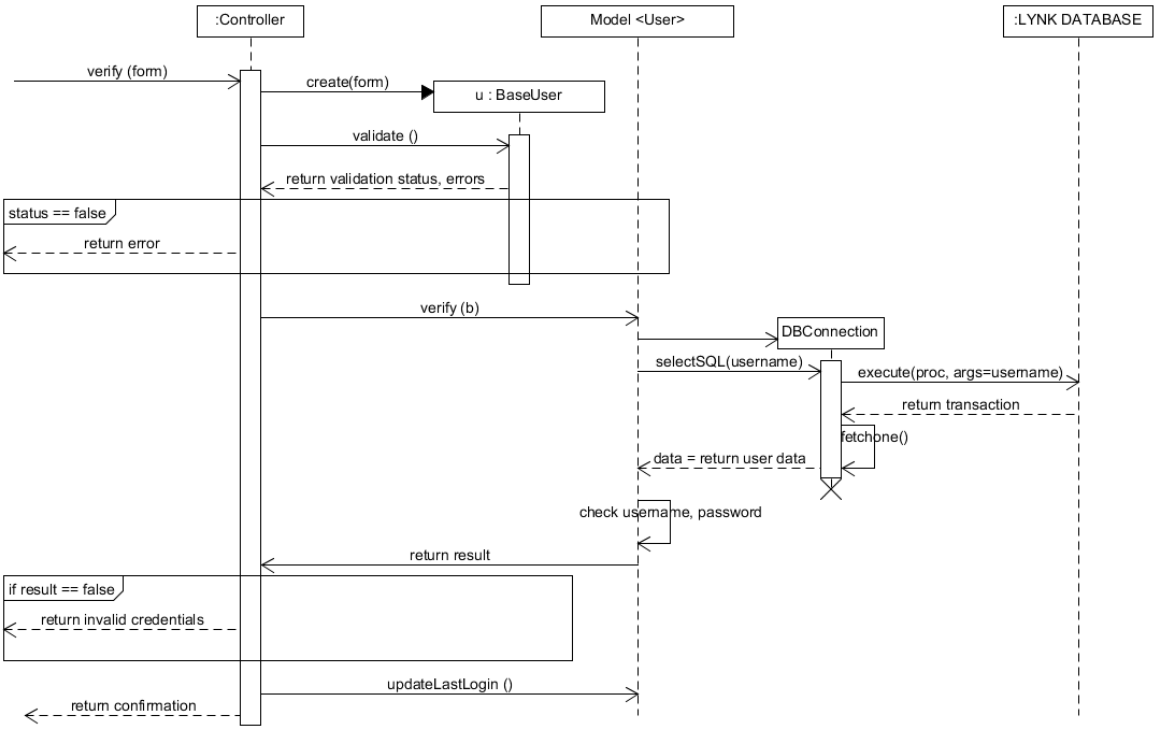
Note: *Some exclusions will be made from the main use case listing to focus on critical internal functionality, some CRUD operations are relatively arbitrary and will not be shown.*

5.1 Login

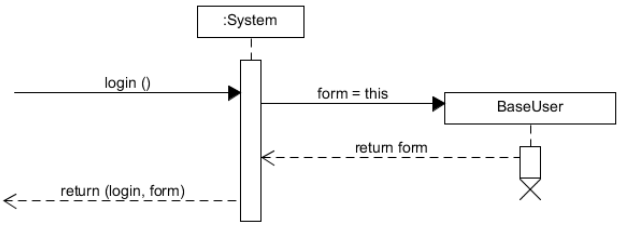
5.1.1 Render View (Common Example)



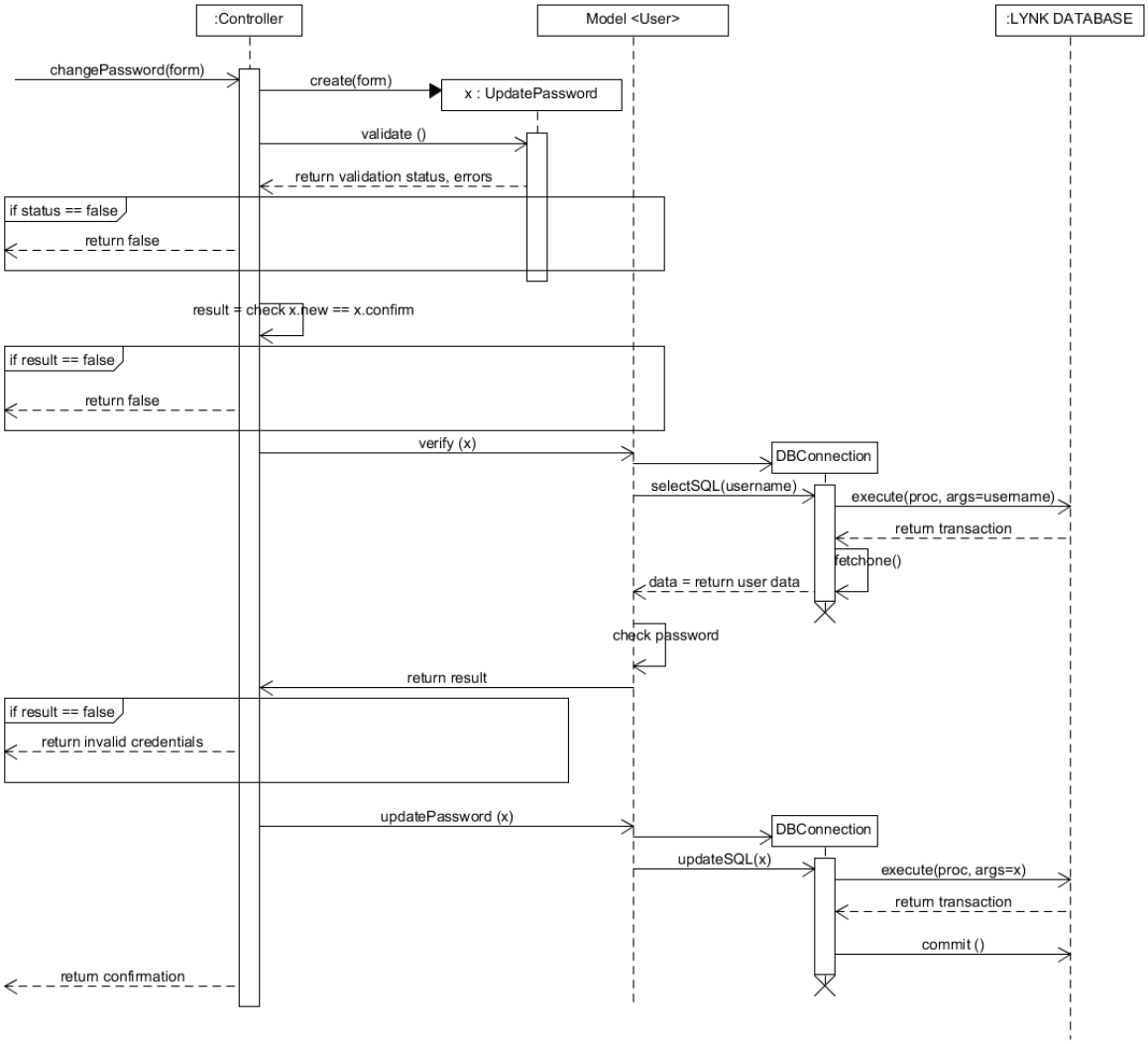
5.1.2 Verify



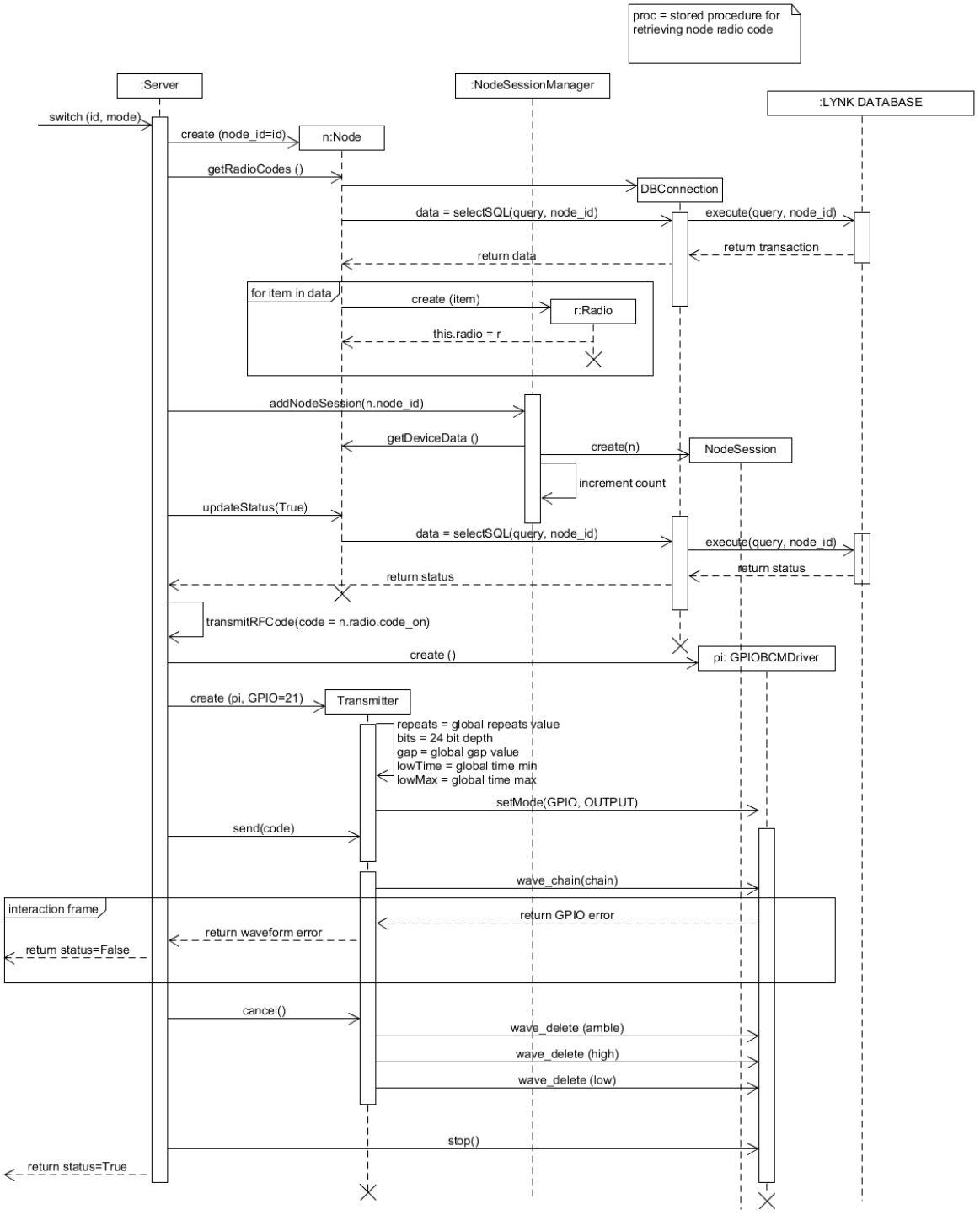
5.2 Logout



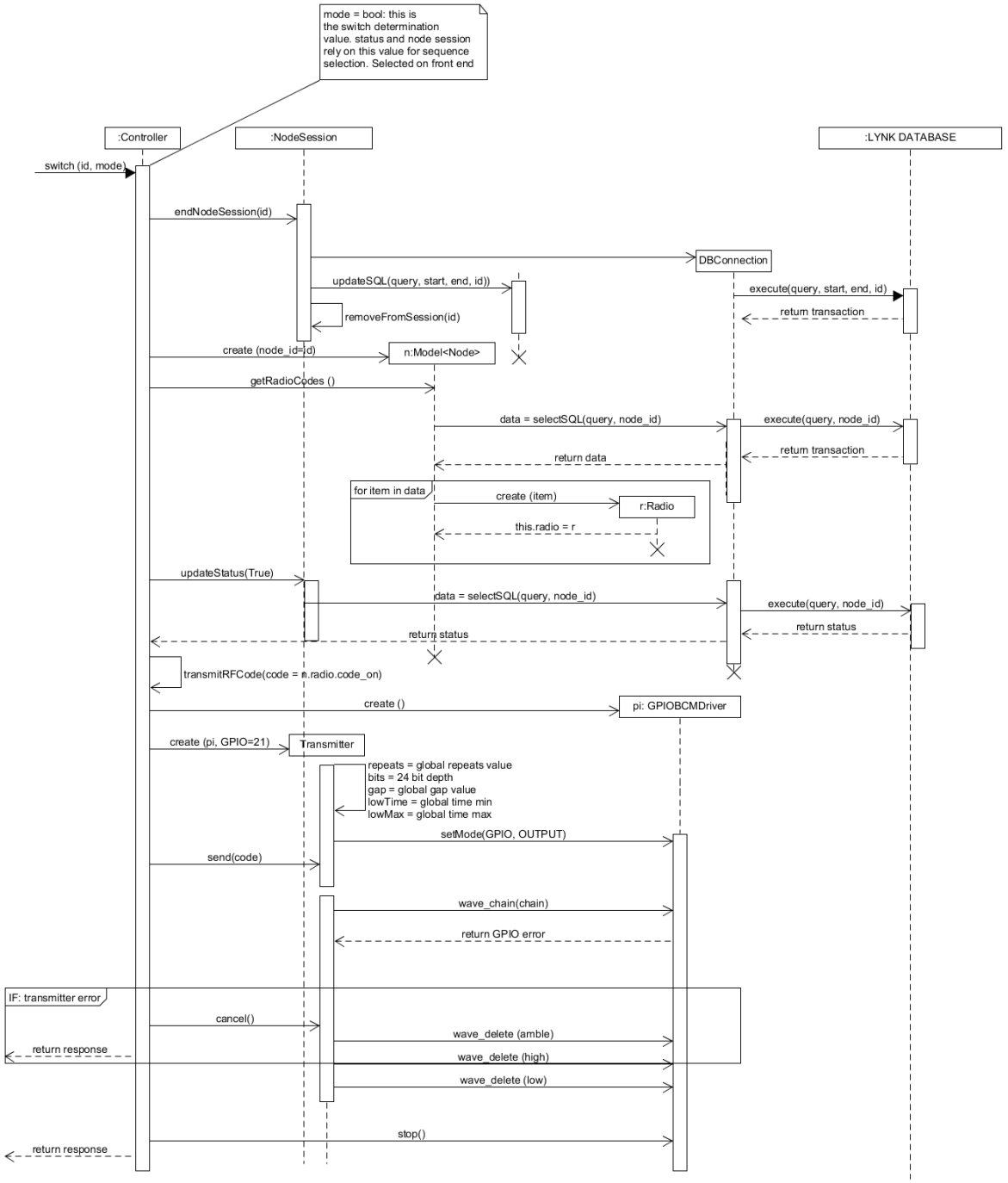
5.3 Change Password



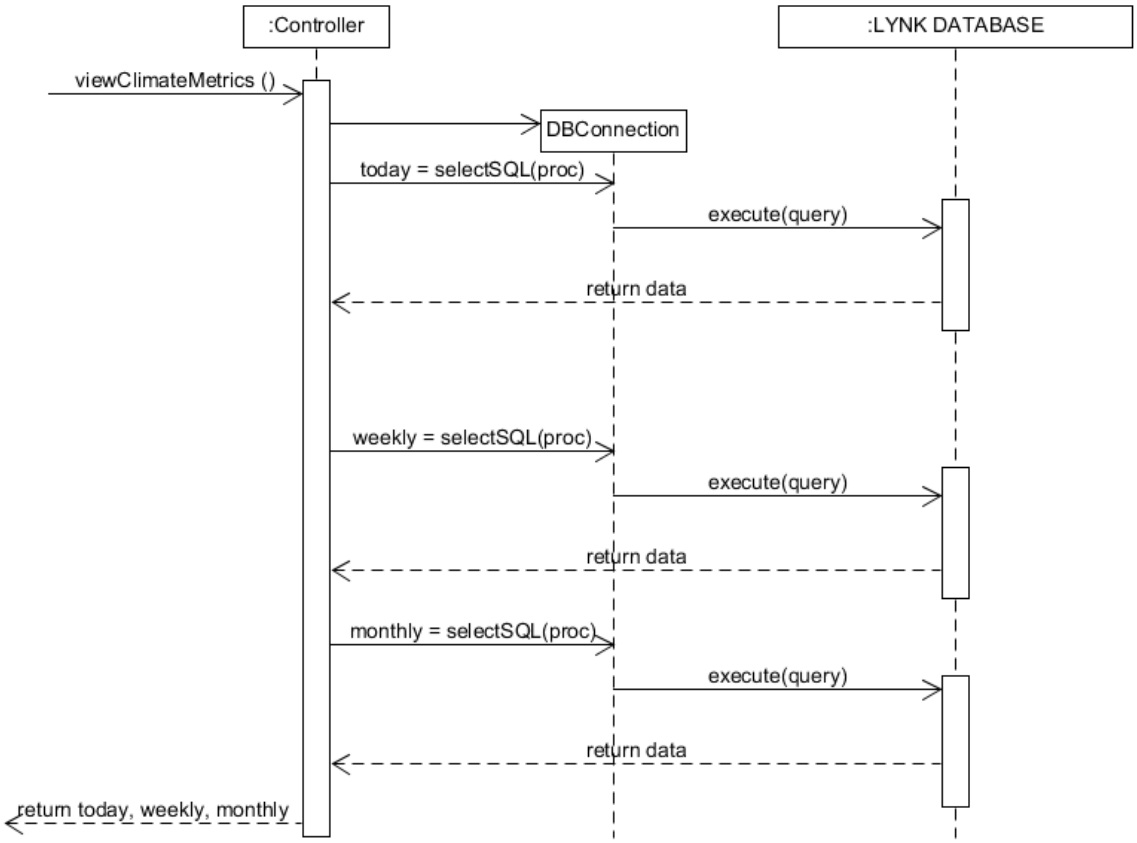
5.4 Switch Node On



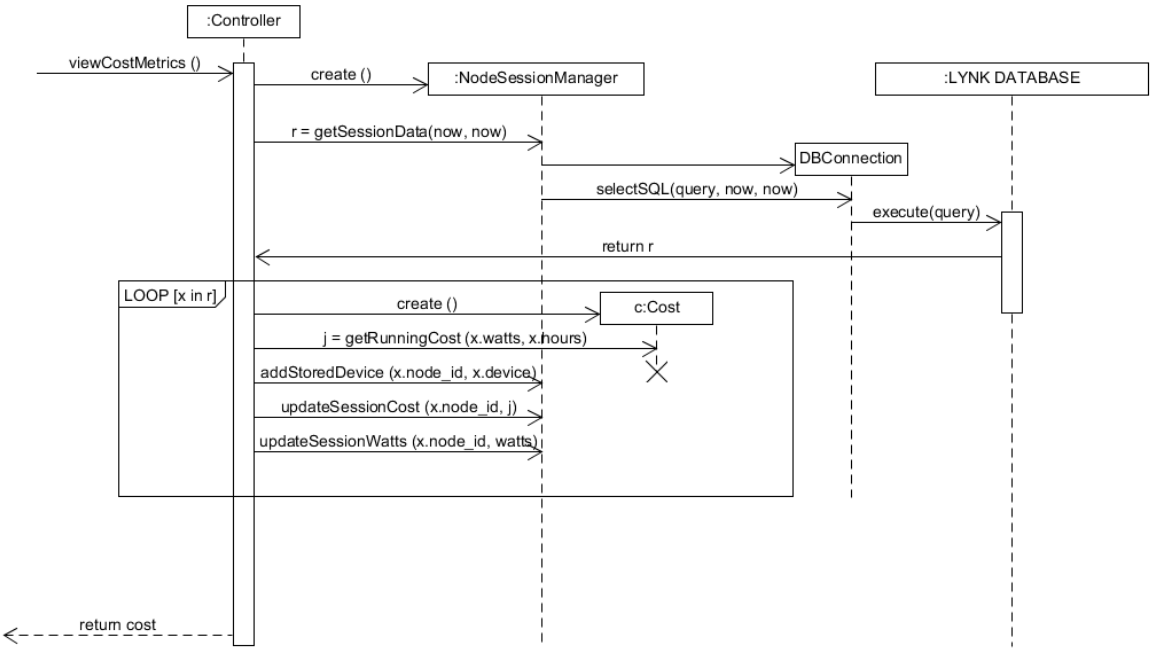
5.5 Switch Node Off



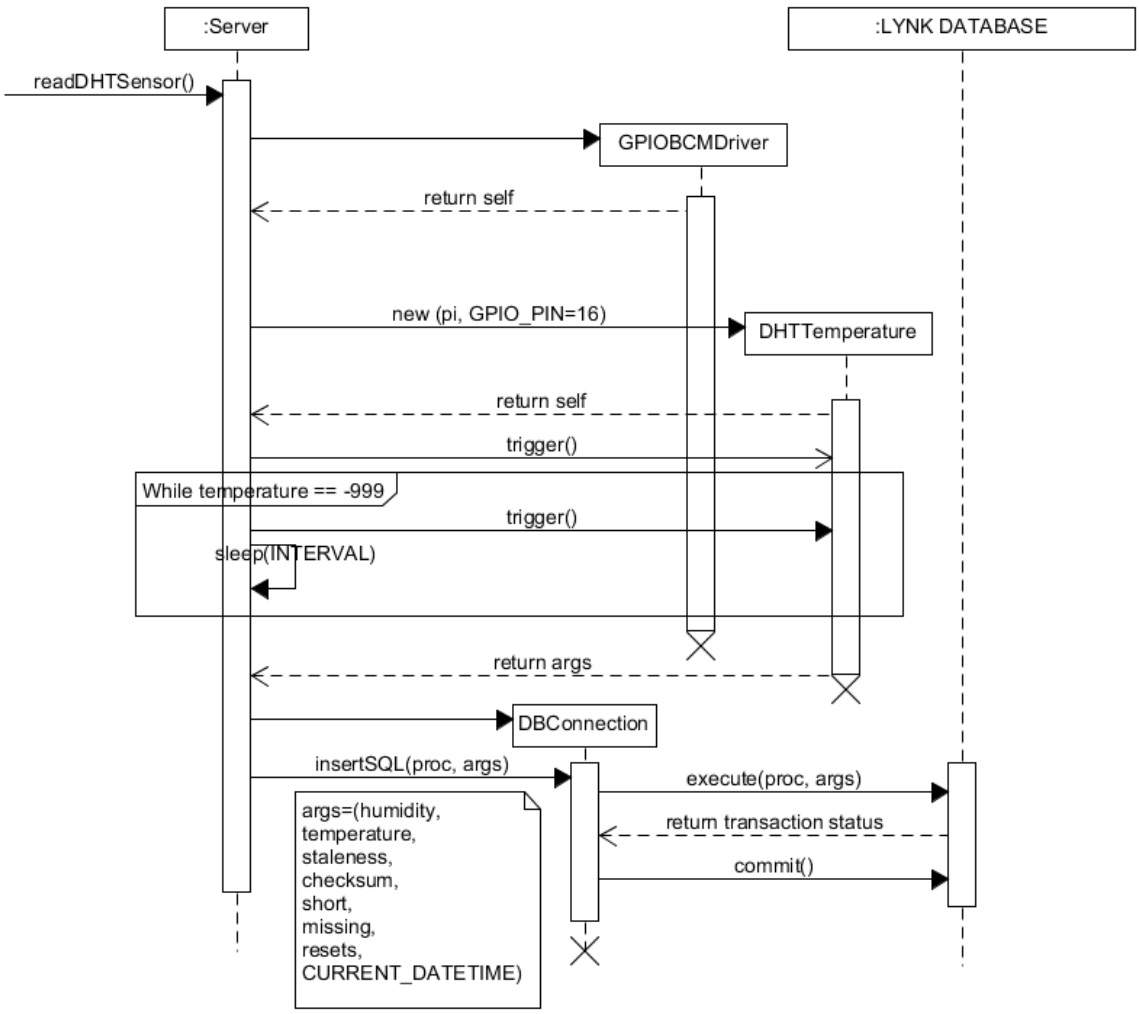
5.6 View Climate Metrics



5.7 View Cost Metrics



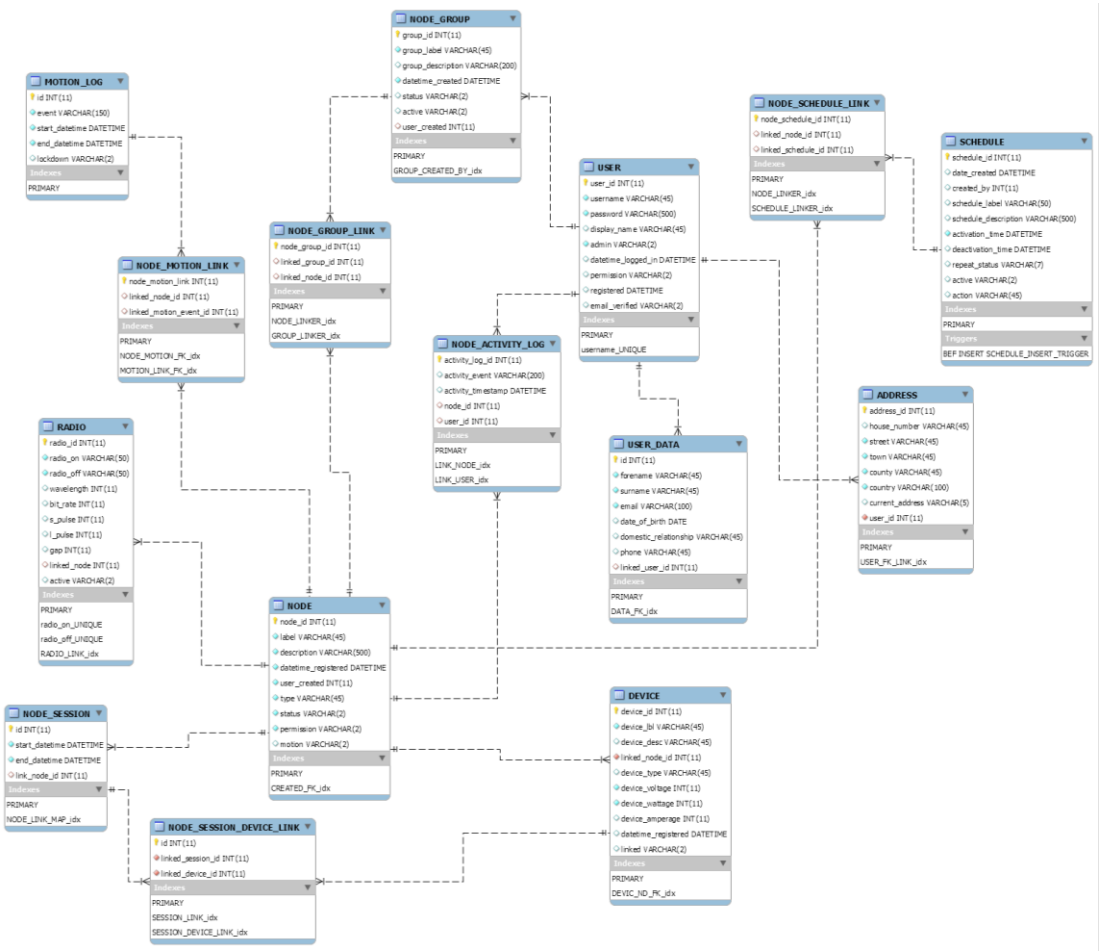
5.8 Read DHT Sensor



6. Database Models

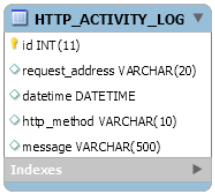
This section represents the end model of the project defined after data refined stages in iteration two. Small subsequent are expected to occur during iteration three and will be reflected in update diagrams as the project progresses.

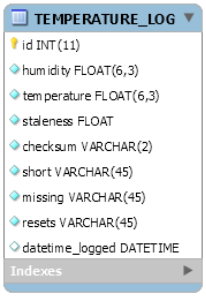
6.1 LYNK Model

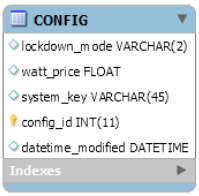


6.2 Utility Model

The simple model to the left contains utility tables for system configuration, logs and temperature records that have no logical link the main LYNK schema. They are however also located within the LYNK schema for simplicity. They do not affect the behaviours of the main model in any way.







7. Physical Design Detail

The following section will detail the physical design of the sensor network and radio transmitter. This is a relatively simply design but this setup should be approach with due care and caution as risks of shorting or otherwise damaging the Raspberry Pi itself are not entirely avoidable.