**SERIS**

Solar Energy Research Institute Singapore



Cloud Based Real-time Analytical Monitoring of Photovoltaic Systems

Use Case Model Survey (UCMS)

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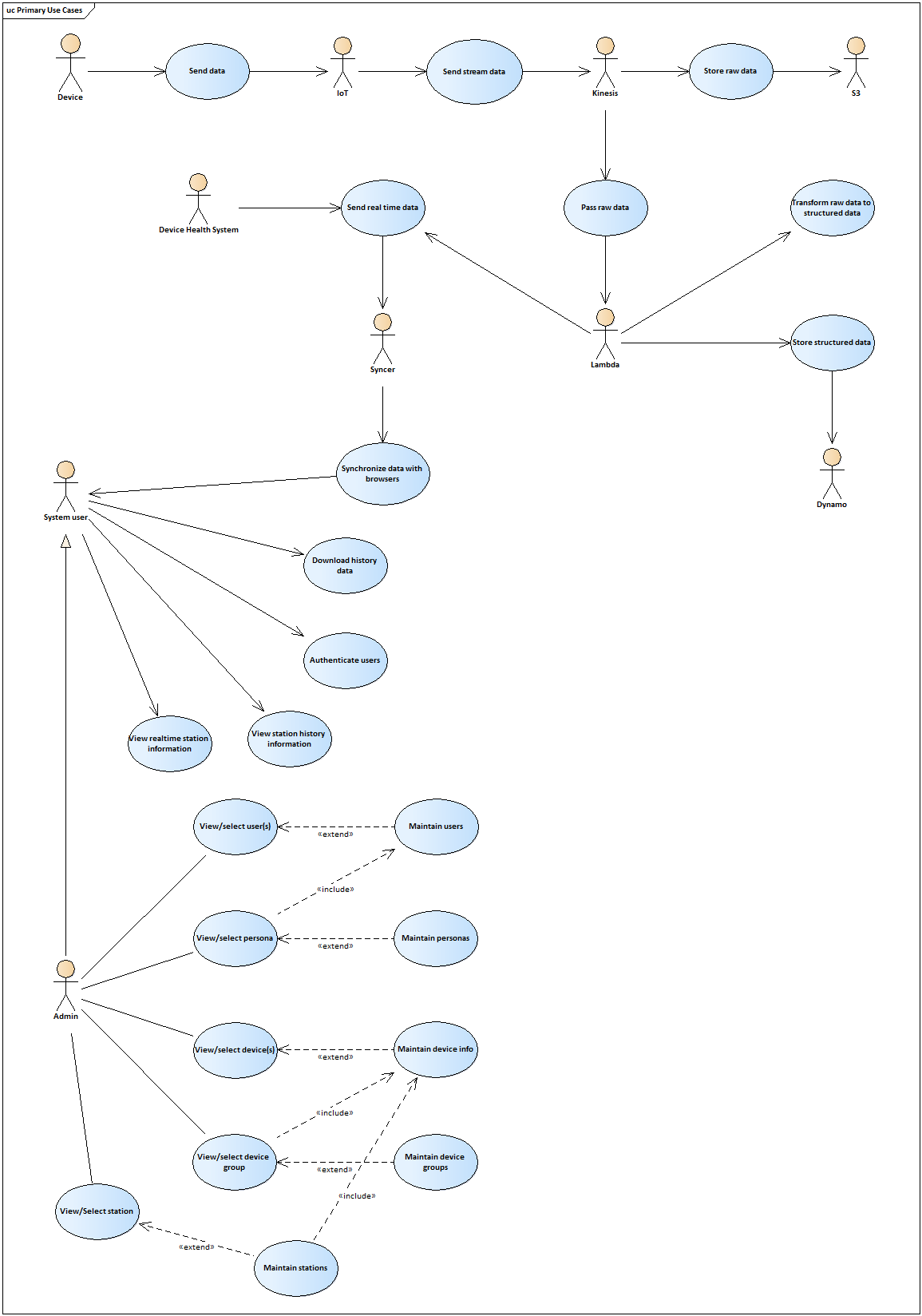
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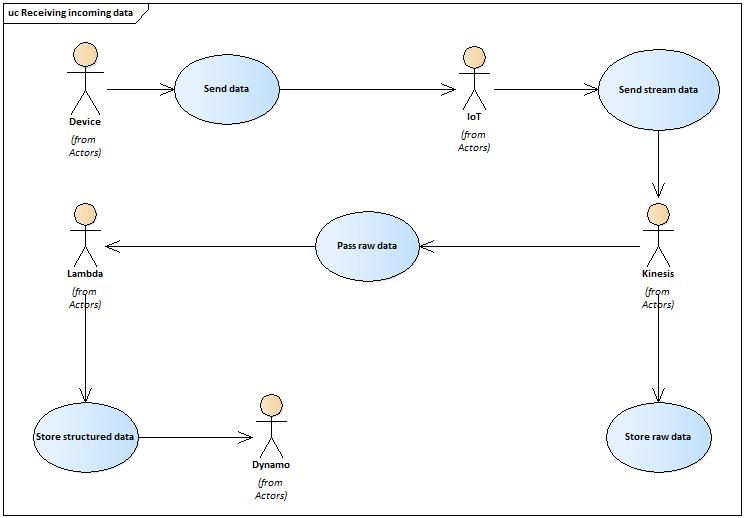
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# Use case diagrams

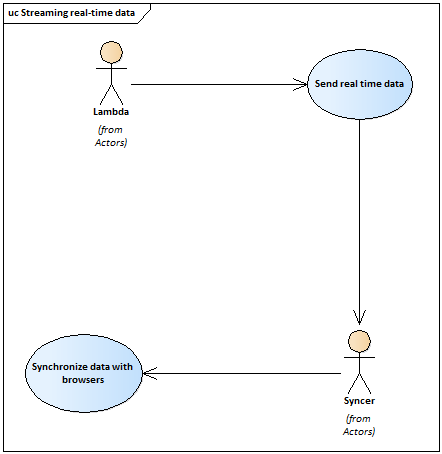
## Primary Use Cases Diagram



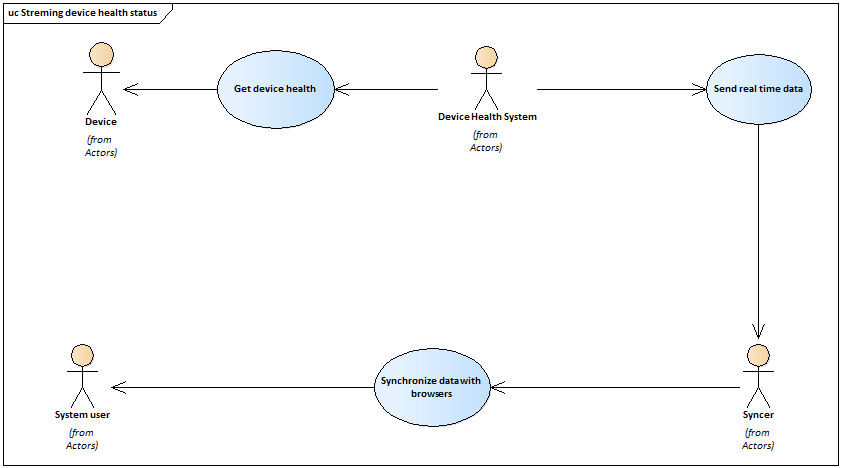
## Receiving incoming data



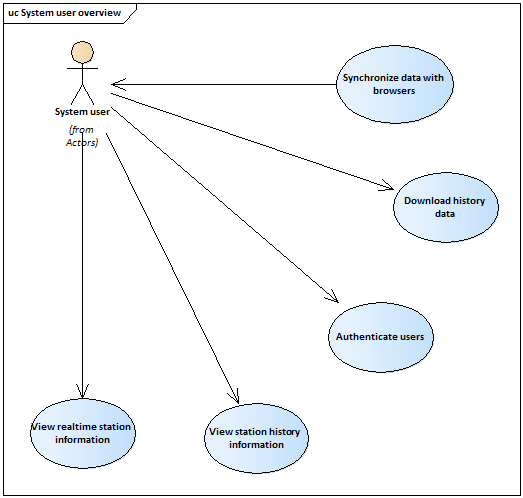
## Streaming real-time data



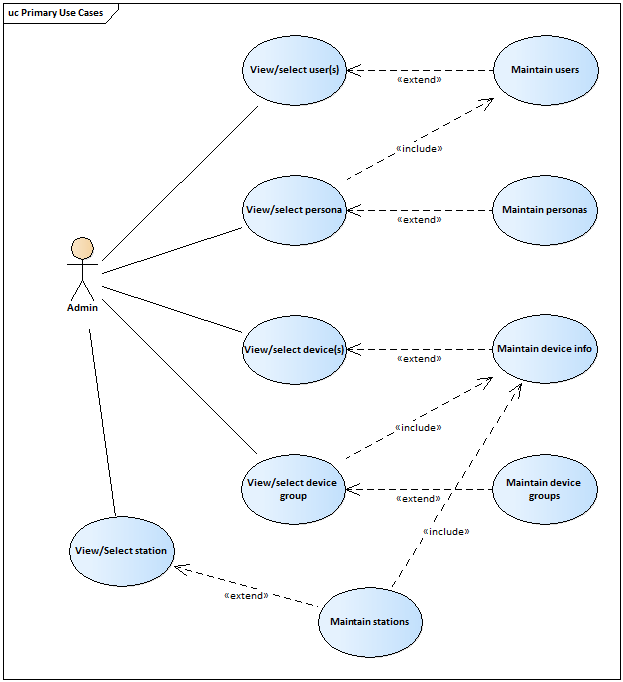
## Streaming device health status



## System user overview



## Admin user overview



# Actors

All Actors in the system are contained in this package. This is both as a way to organize the model, making it easier to understand, and to provide a way to manage the actors in a single configuration item. If different individuals are responsible for different actors and their related artifacts, the actors should be organized into their own packages and placed under separate configuration control.

## Device

This actor represents PV system device which is responsible for sending data to the cloud service. It will also send the device health statistics to the application, which is deployed on the cloud, via Virtual Private Cloud.

## IoT

This actor represents a cloud IoT service which is to receive the data sent from devices in every second and every minute. And then this will pass the data to another cloud Lambda function to structure the unstructured data.

## Lambda

This actor represents a server-less cloud function which will receive the raw data stream from AWS Kinesis and transform the data into structured data. After data transformation, structured data will be passed the AWS Dynamo to store.

## System User

This actor represents the different type of users(personas) who will monitor the assigned real time data and device health statistics, which will be sent from various devices, in rich user interfaces.

## Admin

This actor represents the root user who can create and maintain users, roles, devices information, maintain device parameter config and maintain device record access. This user will have other common access that the system user has.

## Device Health System

This actor represents an application which will detect the devices and get the devices health statistics.

## AWS Dynamo

This actor represents a cloud-based database application.

## Syncer

This actor represents an application which will perform real-time data synchronization with browsers.

## KINESIS

This actor represents the AWS Kinesis Service which will receive data stream from AWS IoT and store the raw data into S3 and pass the raw data to transform structured data.

## S3

This actor represents the AWS S3 storage service which will store incoming raw data.

# Use cases

## Authenticate users

The aim of this use case is to enable users to log-in to the system using a unique username and password. Associated with each username is a system access level which is used to determine the system functions and records that can be accessed. This use case also enables the user to log-out from the system.

## Maintain personas

The aim of this use case is to enable the administrator to create, update, view and delete existing personas (user groups). The administrator shall also update the access control on the incoming data for the existing personas in this use case.

## Maintain users

The aim of this use case is to enable the administrator to create, update and view user information. Also, the use case enables the system administrator to reset passwords, change access rights and deactivate/activate accounts for the existing users.

## Maintain devices info

The aim of this use case is to enable the administrator to create, update, view and delete the existing device info in the system.

## View/select user(s)

The aim of this abstract use case is to enable the admin to view a list of existing users and select a user from the list.

## Select device(s)

The aim of this abstract use case is to enable the admin to view a list of existing devices information and select a device from the list.

## View/select persona

The aim of this abstract use case is to enable the admin to view a list of existing personas and select a persona from the list.

## Send data

The aim of this use case is to enable the PV system device to send the data the to the cloud service in every second and every minute.

## Transform raw data to structured data

The aim of this use case is to transform the incoming data (raw data) into the structured data based on the device parameters config which is created in the “Maintain device parameters config use case.

## Store structured data

The aim of this use case is to store both incoming data (raw data) and structured(transformed) data into the cloud database.

## Send real-time data

The aim of this use case is to send the structured data, after the data transformation in “Transform unstructured data to structured data”, to the “Synchronizer” application.

## Synchronize data with browsers

The aim of this use case is to show the incoming data, which will be sent from the “Synchronizer” application, in rich user interface.

## Get device health

The aim of this use case is to enable the Device Health System to get the device health statistics from the connected devices.

## Download history data

The aim of this use case is to enable the user to download the history data from the system for other purposes. The user shall download the data in CSV format from the system based on the date range and selected parameters.

## View real-time station information

The aim of this use case is to enable the user to view the real-time station information (weather and system health) on the Web Page.

## View station history information

The aim of this use case is to enable the user to view history record of the stations. The user shall view the history record in various Rich User Interfaces.

## Notify device status

The aim of this use case is to enable the system to send the notification to respective person in email or SMS format regarding device health information.

## Send stream data

The aim of this use case is to send the incoming data from AWS IoT to AWS Kinesis service.

## Store raw data

The aim of this use case is to store the incoming raw data as a backup.

## Pass raw data

The aim of this use case is to send raw data to Lambda for processing.

## Create device group

The aim of this use case is to create a group of devices which have same number and type of parameters.

## Maintain device group(s)

The aim of this use case is to enable the admin to update the existing device groups information.

## View/Select device group

The aim of this use case is to enable the admin user to select the existing device group.

## View/Select station

The aim of this use case is to enable the admin user to select the existing station.

## Maintain stations

The aim of this use case is to enable the admin user to create a new station.