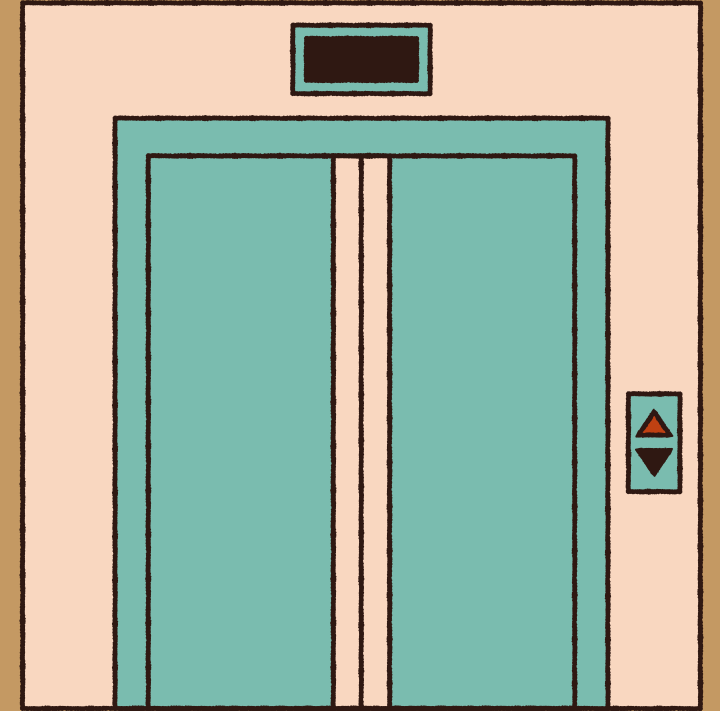


SesLab2023

Introducing an elevator digital twin system using oneM2M



Lee Jungmin

SesLab

Table of Contents

Overview

Digital Twin Server

Data Obtain Method

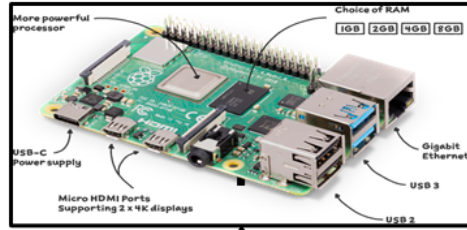
Data RETRIEVE Method

one2MResource
Tree

Visualization

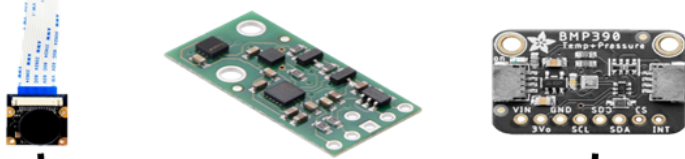
OVERVIEW

Physical Building



Altimeter

Image



oneM2M

Resource Tree Build Server

oneM2M Service Server

Building 1

Building 2

Building 3

Elevator 1

Elevator 2

...

Altimeter Sensor

Image Sensor

Digital Twins

Digital Twin Server

Algorithm Simulation

Energy Calculation

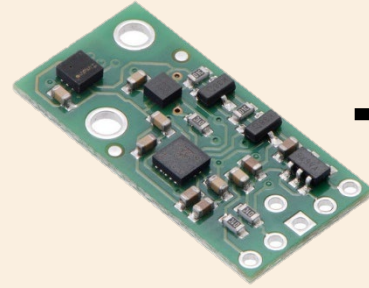
Visualization (UE5, Plotly)

ML

USER

Data Obtain Method

Gyro, and Pressure Sensor



Sensor Library Code



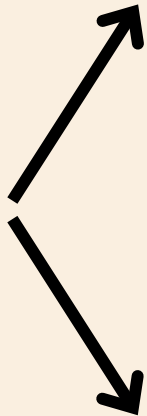
Gyro

Altimeter

Temperature

Image

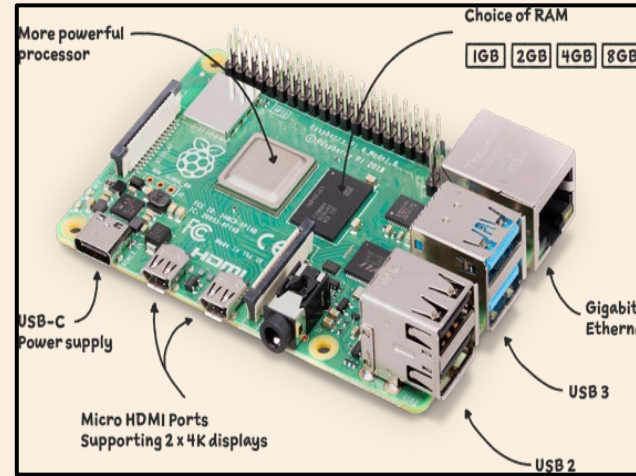
Detected
Button List

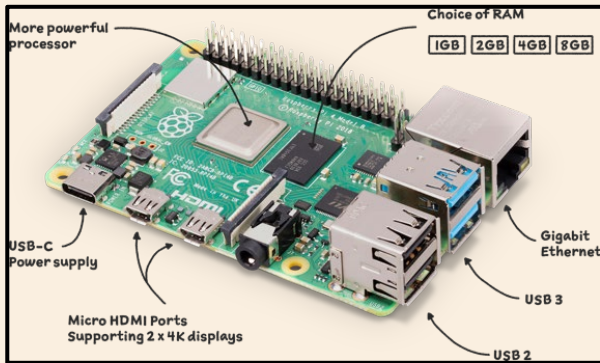


Camera Sensor



OpenCV
Image Detection





Send Data

Resource Tree
Build Server

Make URI for destination address

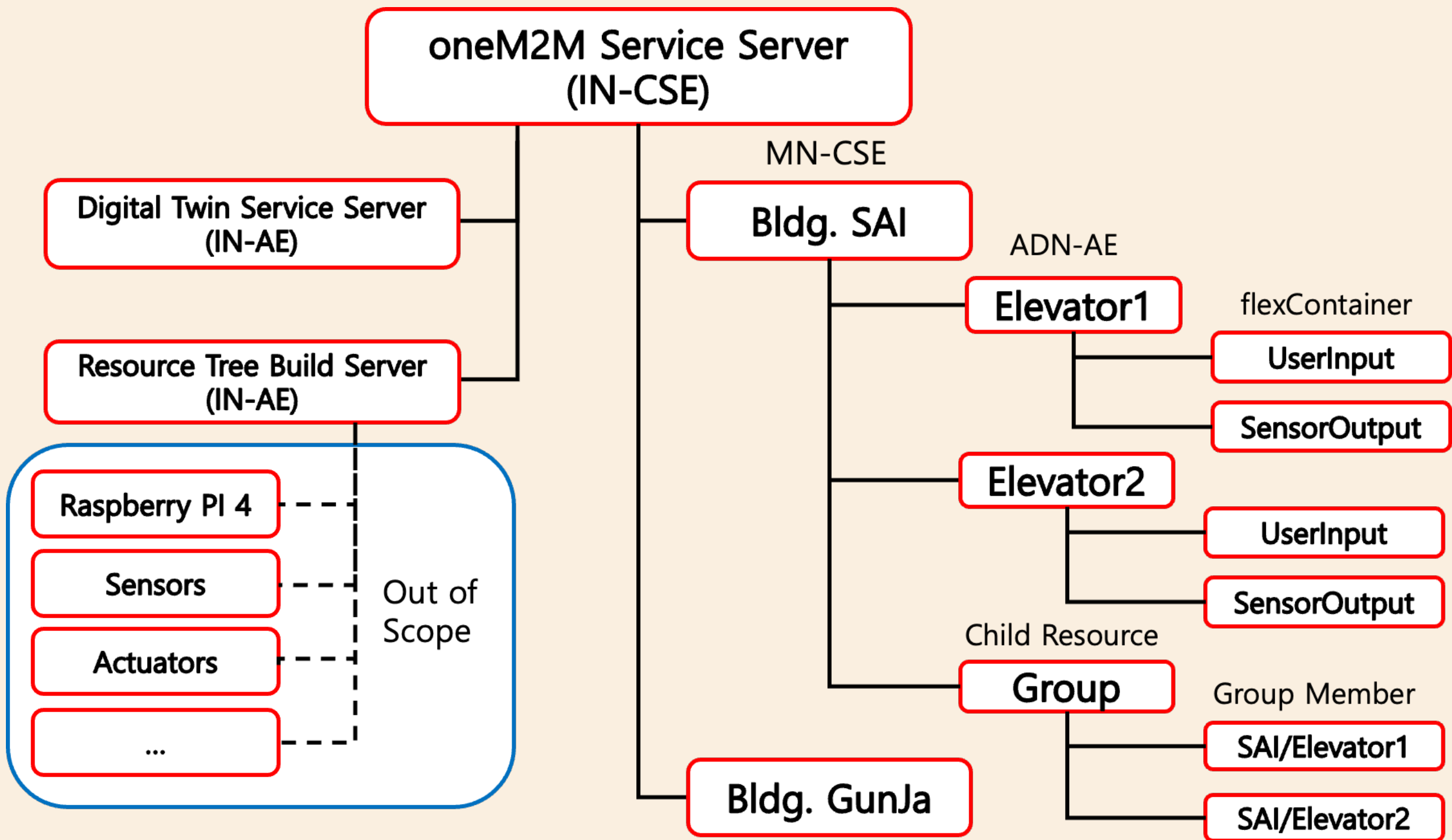
/~/id-mn/buildingSAI/Elevator1/UserInput

Make Request Header, and Body

```
{  
  "Acceleration" : "",  
  "Gyro" : "",  
  "Altimeter" : 51.7,  
  "Temperature" : 21,  
  "Button Panel Status" : ""  
}
```

Choose protocol to
communicate

oneM2M Resource Tree



flexContainer Attributes

ADN-AE

Elevator1

flexContainer

UserInput

SensorOutput

<resourceName>

Elevator1UI2

<Acceleration>

[X, Y, Z]

<Gyro>

[X, Y, Z]

<Timestamp>

Datetime.datetime

<Altimeter>

Altimeter
float32

<Temperature>

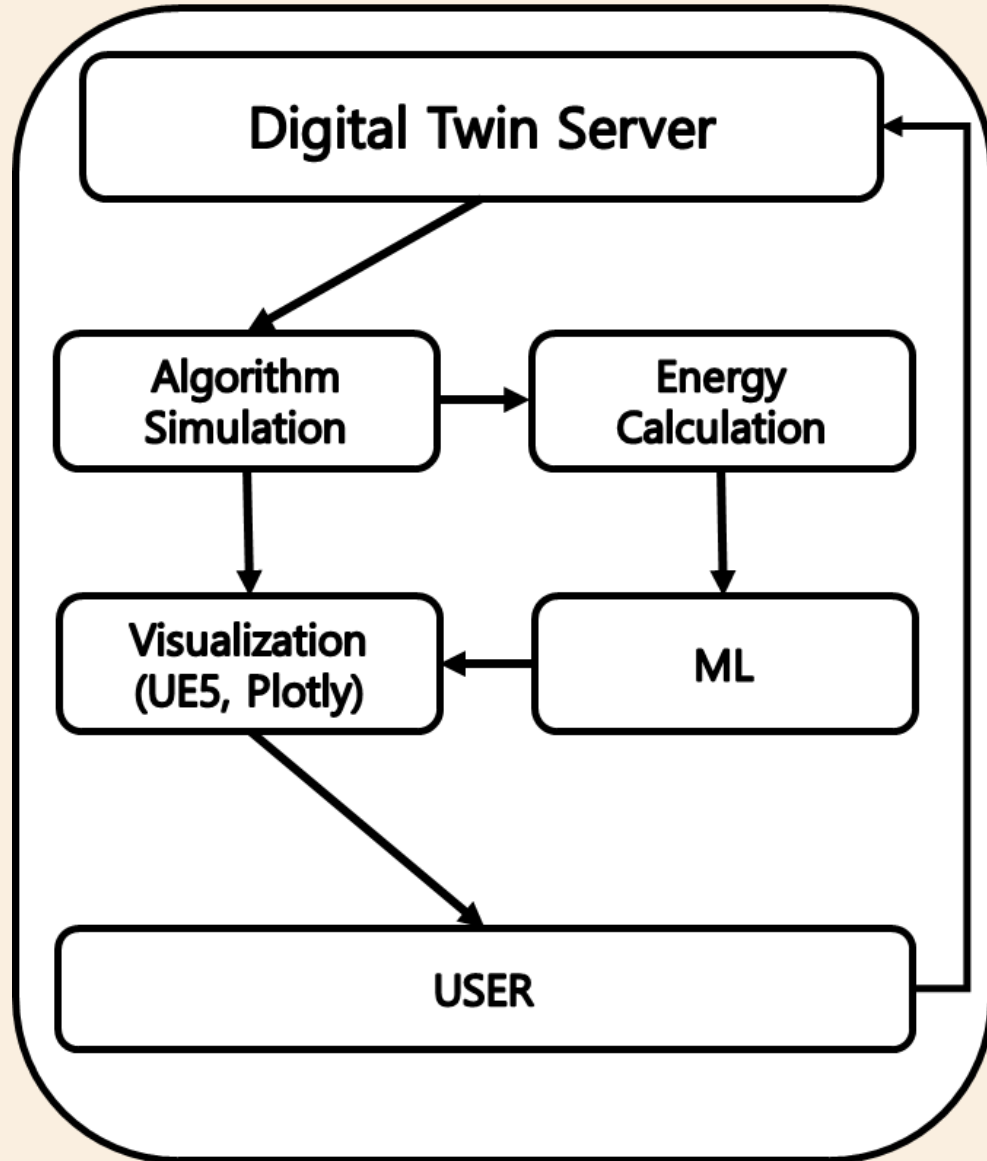
Temperature
float32

<Button Panel Status>

[B1, 1, 5..]

Digital Twins Server

Digital Twins

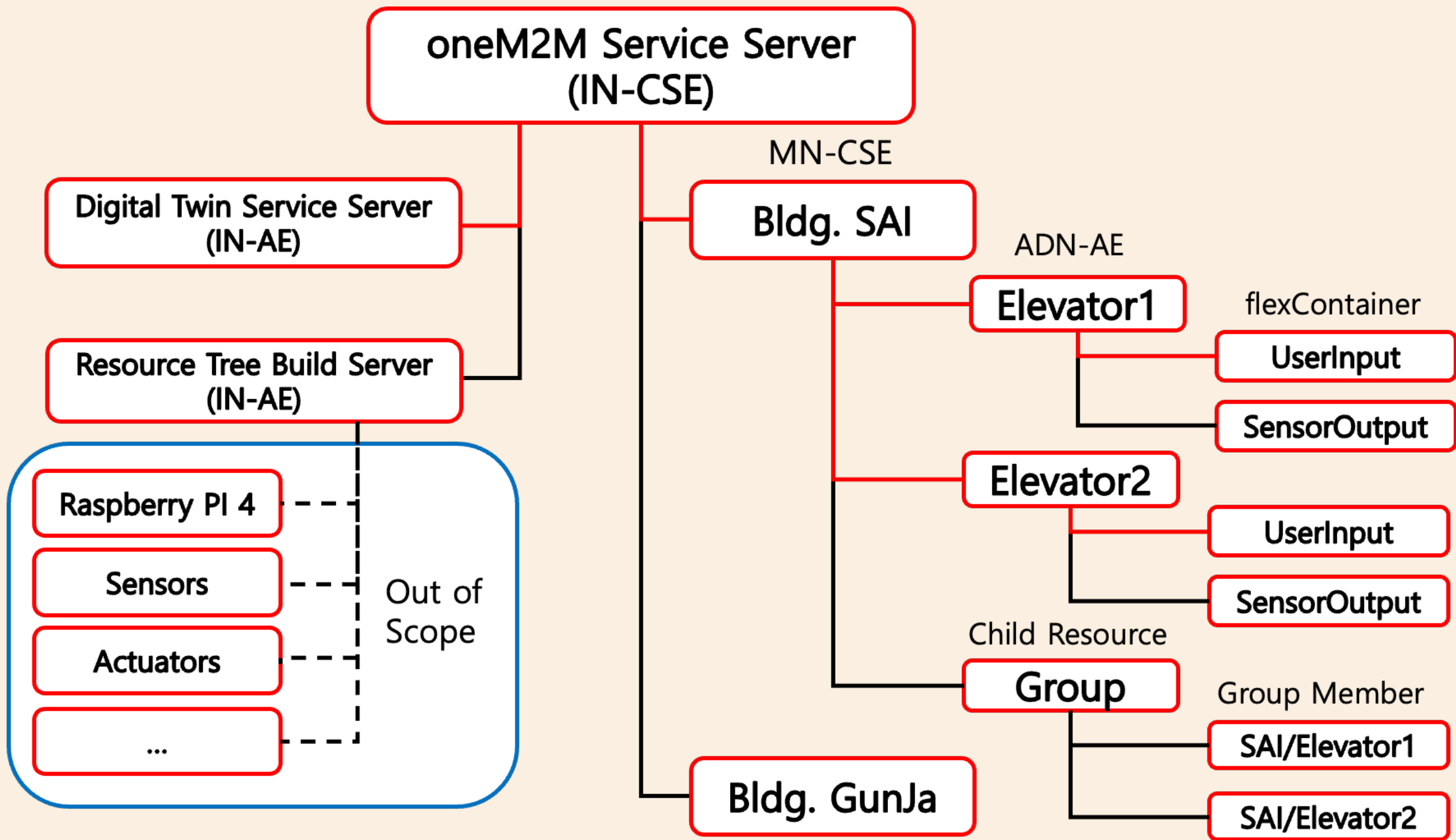


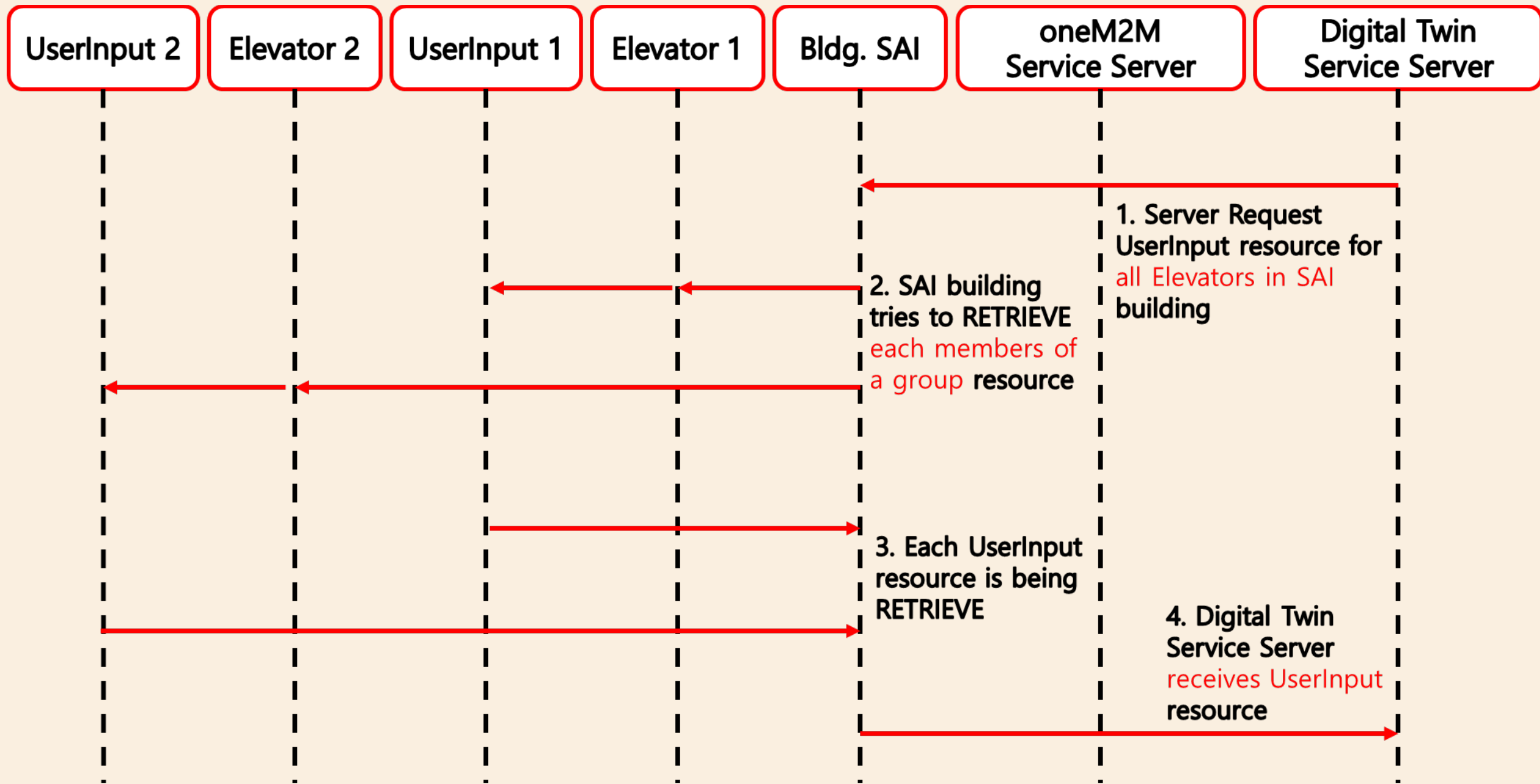
The Digital Twin Server periodically collects flexConatiner data from the oneM2Mresource tree

The Digital Twin Server runs a simulation based on the data

As the simulation runs, the Digital Twin measures the energy consumption of the elevator.

Data RETRIEVE





Visualization

Resource	Requests
<ul style="list-style-type: none">cse-mn<ul style="list-style-type: none">acpCreateACPsCAdminEV1<ul style="list-style-type: none">userinput1userinput2userinput3userinput4EV2	<pre>{ "m2m:fcnt_userinput": "acclr": 1.25, "btn_in": [], "btn_out": 3, "ord": "" }</pre>
<ul style="list-style-type: none">userinput1userinput2userinput3userinput4 EV2	<pre>{ "m2m:fcnt_userinput": "acclr": 1.25, "btn_in": [], "btn_out": 8, "ord": "" }</pre>
<ul style="list-style-type: none">userinput2userinput3userinput4 EV2	<pre>{ "m2m:fcnt_userinput": "acclr": 1.25, "btn_in": [], "btn_out": 10, "ord": "" }</pre>
<ul style="list-style-type: none">userinput2userinput3userinput4 EV2	<pre>{ "m2m:fcnt_userinput": "acclr": 1.25, "btn_in": [], "btn_out": 1, "ord": "" }</pre>



**Digital Twin
Service Server
(IN-AE)**

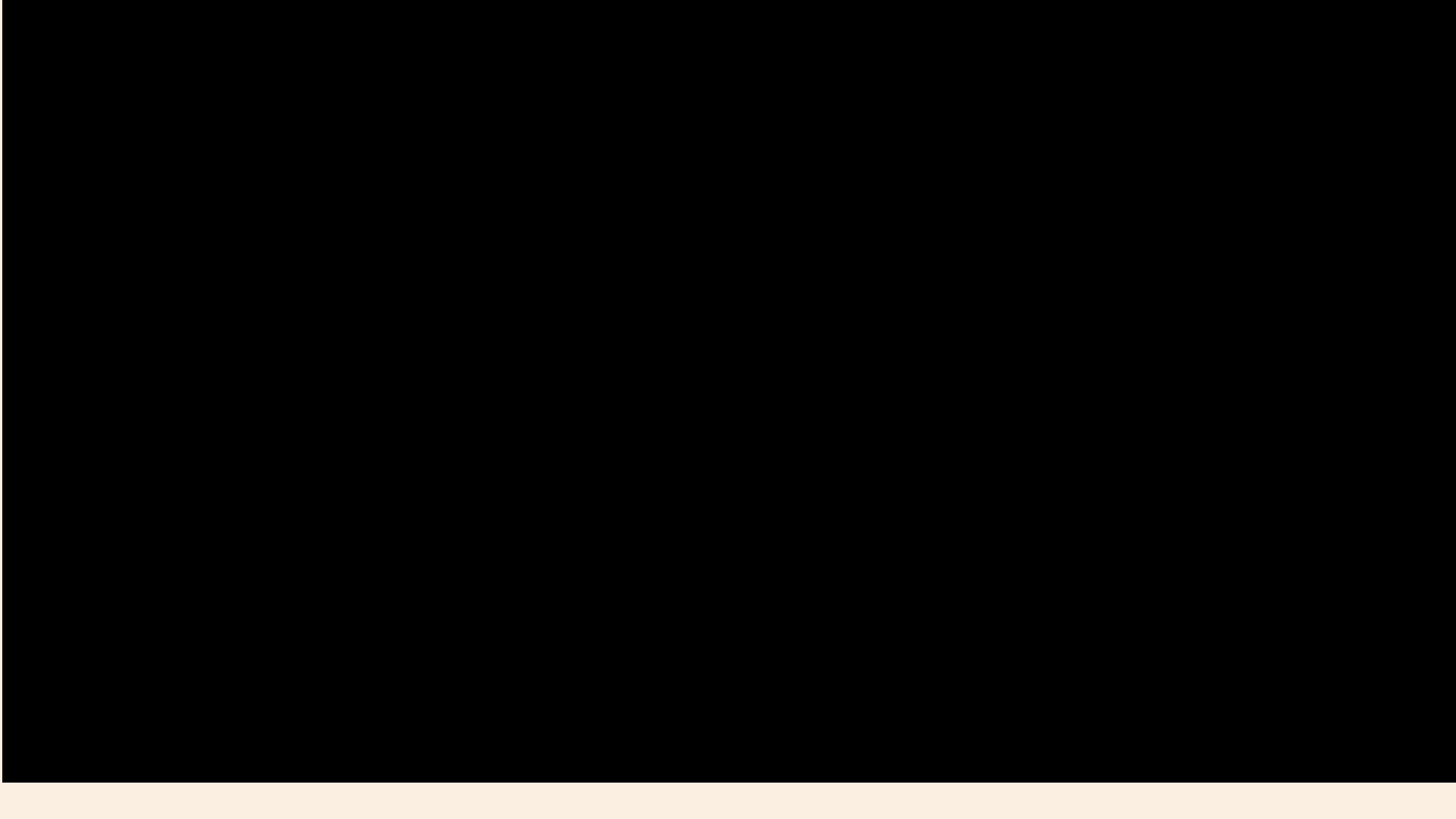
**Elevator
Moving Algorithm**



Simulation Data



	A	B	C	D	E	F	G
1	Number	Current Time	Trip Time	Velocity	Altimeter	Closest Upper Floor	Closest Lower Floor
2	1	11:00:05.100	00:00.1	0.125	-54.99375	B4	B5
3	2	11:00:05.200	00:00.2	0.25	-54.975	B4	B5
4	3	11:00:05.300	00:00.3	0.375	-54.94375	B4	B5
127	126	11:00:17.600	00:12.6	0.25	-28.025	3	2
128	127	11:00:17.700	00:12.7	0.125	-28.00625	3	2
129	128	11:00:17.800	00:12.8	0	-28	3	3
207	206	11:00:28.700	00:07.8	0.25	-13.025	8	7
208	207	11:00:28.800	00:07.9	0.125	-13.00625	8	7
209	208	11:00:28.900	0:00:08	0	-13	8	8
251	250	11:00:36.200	00:04.2	0.25	-7.025	10	9
252	251	11:00:36.300	00:04.3	0.125	-7.00625	10	9
253	252	11:00:36.400	00:04.4	0	-7	10	10
395	394	11:00:53.700	00:14.2	-0.25	-37.975	2	1
396	395	11:00:53.800	00:14.3	-0.125	-37.99375	2	1
397	396	11:00:53.900	00:14.4	0	-38	1	1



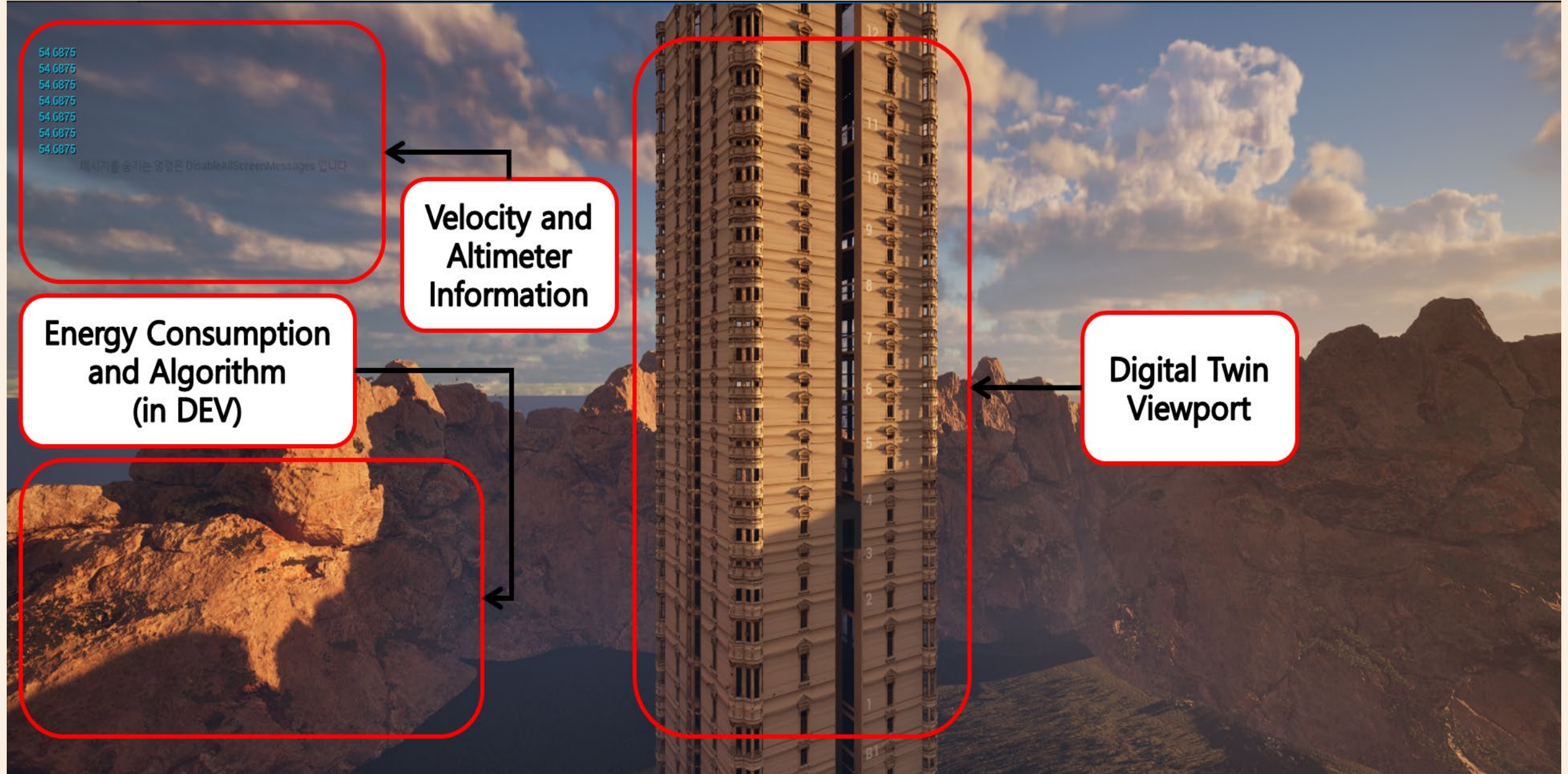
54,6875
54,6875
54,6875
54,6875
54,6875
54,6875
54,6875

메시지를 숨기는 영일은 DisableAllScreenMessages 입니다

**Velocity and
Altimeter
Information**

**Energy Consumption
and Algorithm
(in DEV)**

**Digital Twin
Viewport**



Thank You