

IOT-BASED PLATFORM AIR QUALITY (PM2.5) MONITORING SYSTEM

Big Data Tool with Apache Kylin



Project Members:

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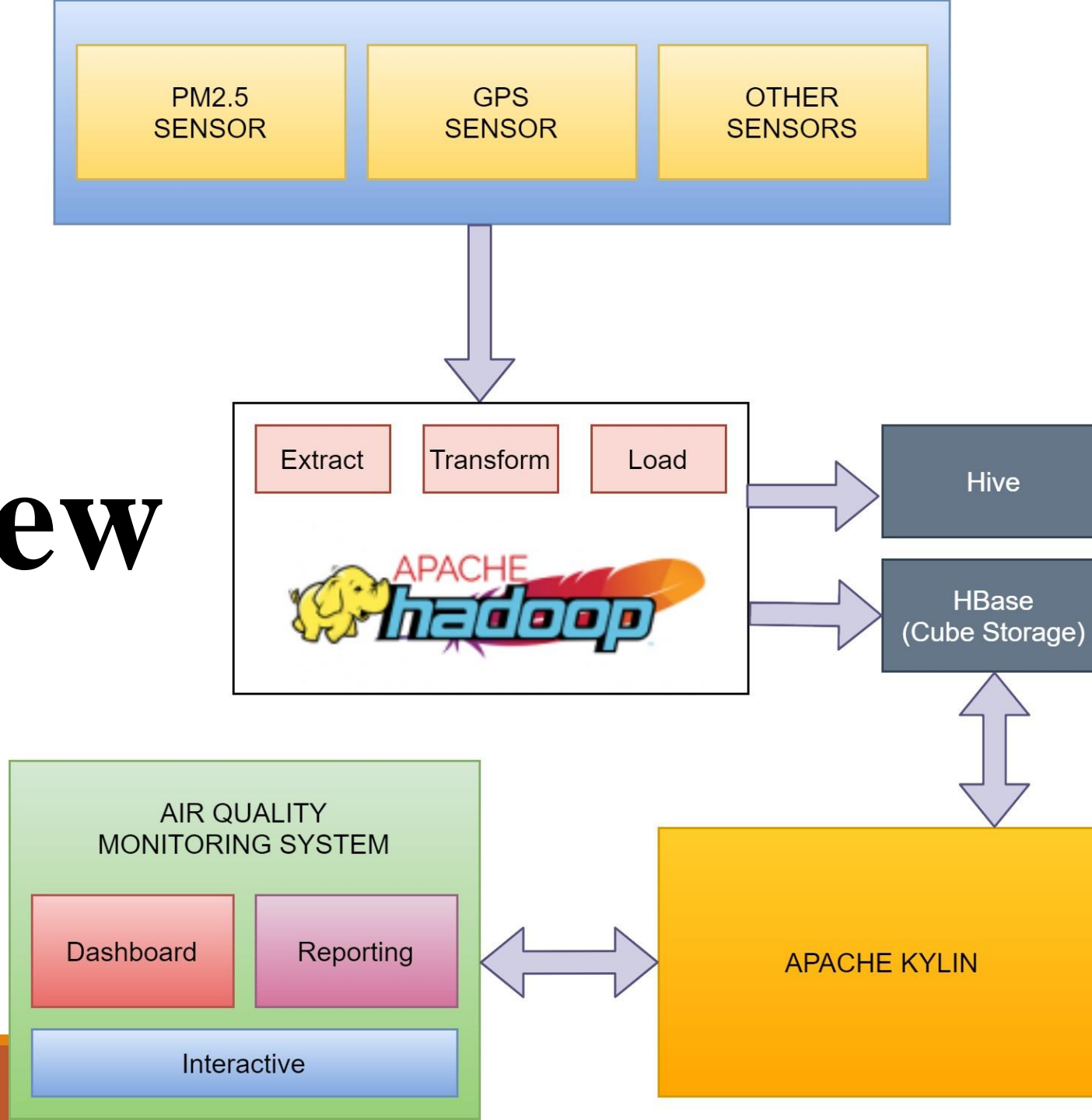
Outlines

1. Introduction
2. Software architecture
3. Design goals and trade-offs
4. Access Matrix
5. Framework/Library
6. User Acceptance Test Report
7. The status of the implementation
8. Real Demo

Introduction



Overview



Functional requirements

Visualization Module

- ❑ The end users should be able to **view** an interactive dashboard of air quality monitoring with different forecasts and insights.
- ❑ The system should be able to **stream** real-time data from different nodes and stations.

System Admin Module

- ❑ The admin should be able to **login, logout** to the system and **modify** the system parameters and toggle dashboard controls.
- ❑ The admin should be able to register new sensors and **manage** the sensors in system.
- ❑ The admin should be able to **generate** reports of specific time periods and export those in varies formats.

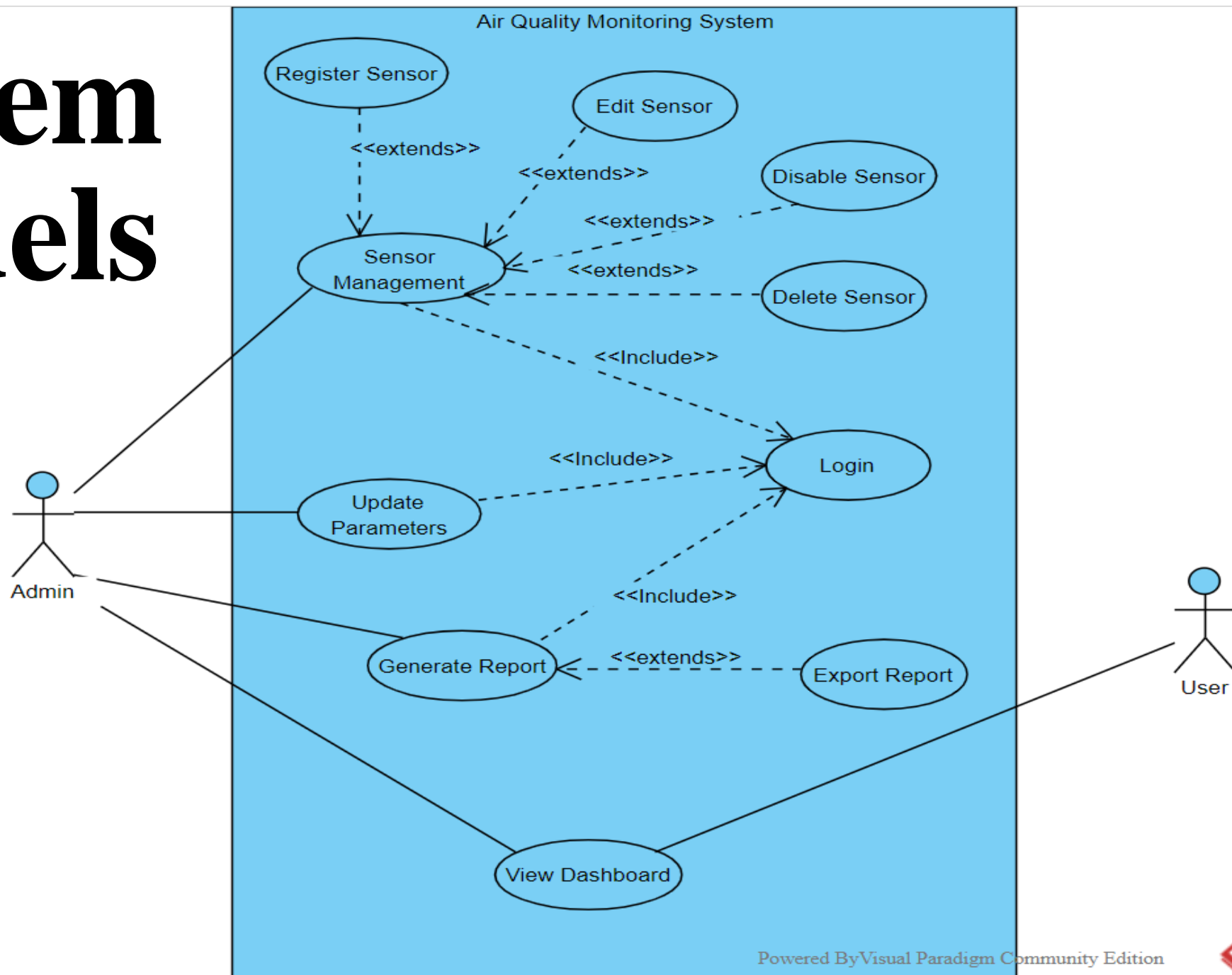
Data Collection Module

- ❑ Data will be extracted from sensors and stored in **Hadoop** which is acting as data warehouse using Hive.
- ❑ **Kylin** does aggregation functions on cube (HBase) and provide the required parameters to the system.

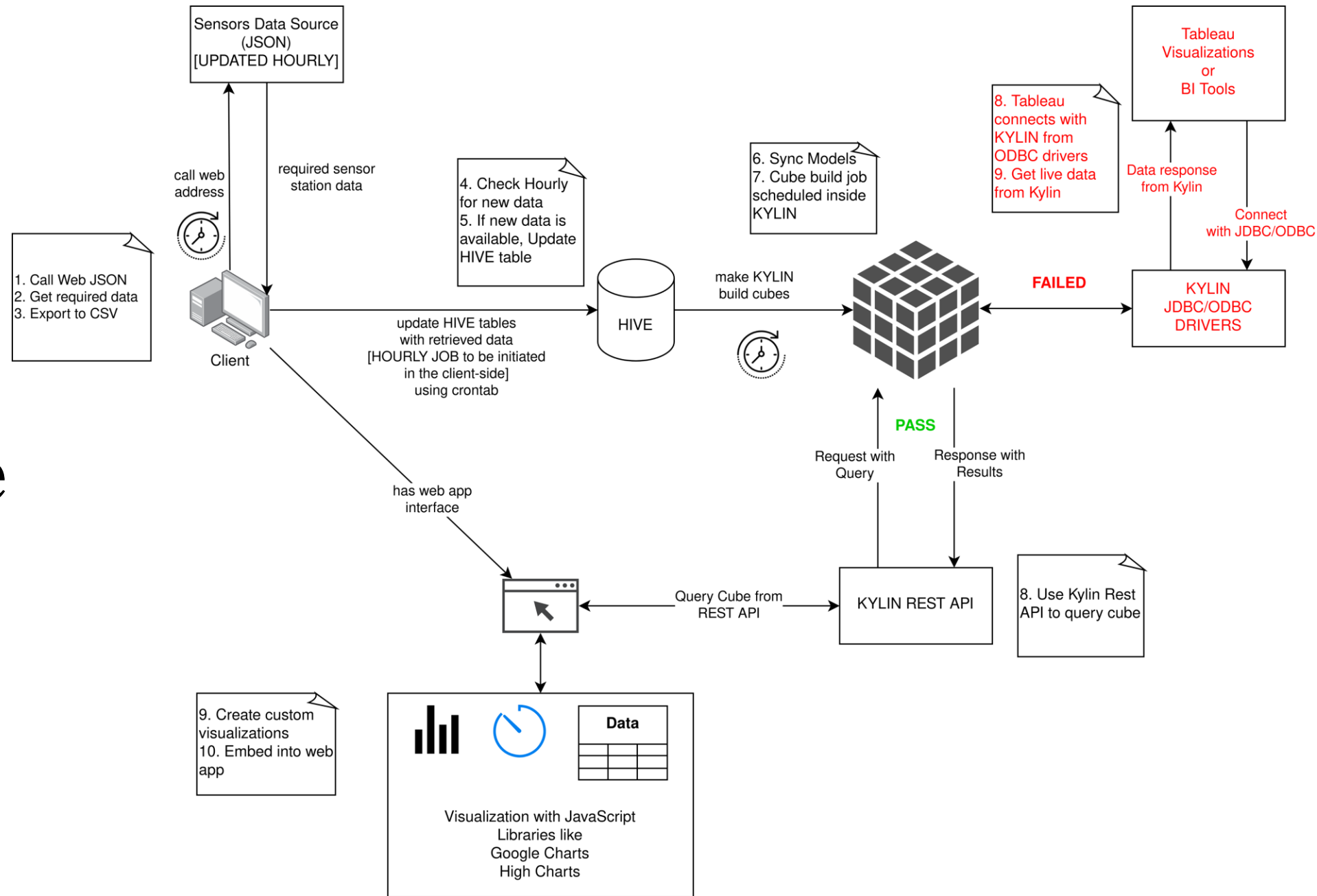
Nonfunctional requirements

- Performance
- Reliability
- Interoperability
- Portability
- Scalability
- Reusability

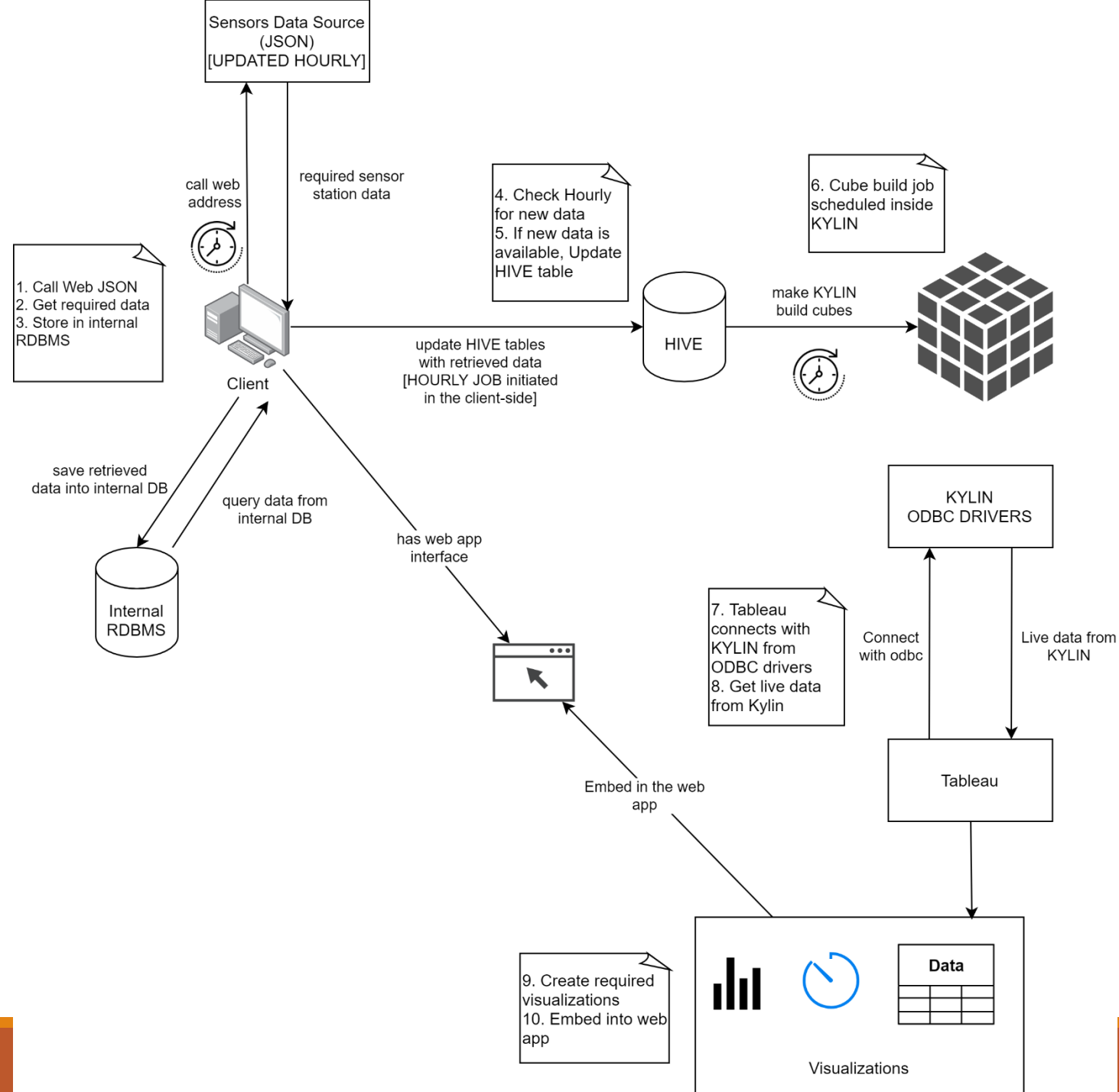
System models



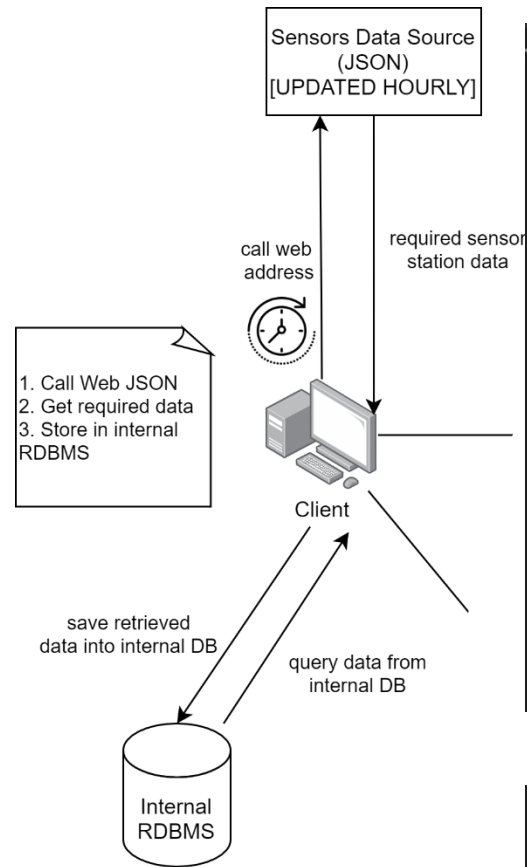
New Software Architecture



Software Architecture



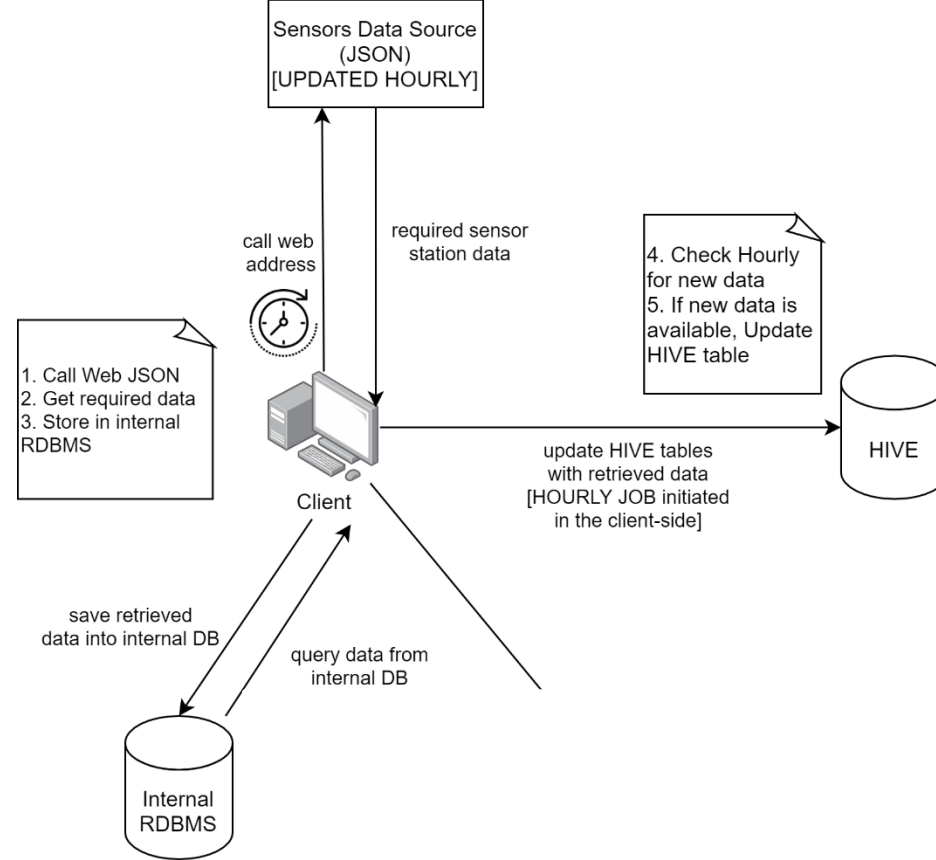
Data retrieval



```
home > srt > Documents > PythonTests > import.py > ...
1  import csv, json, urllib, sys
2  from datetime import datetime
3  import os
4
5  # Fetch JSON from URL
6  url = "http://www.air4thai.com/services/getNewAQI_JSON.php"
7  response = urllib.urlopen(url)
8  web_data = json.loads(response.read())
9  web_data = web_data["stations"]
10
11
12 # Create our custom dictionary
13 data = []
14 for wd in web_data:
```

```
41
42 # output.writerow(data[0].keys()) # Header row
43
44 for row in data:
45     output.writerow(row.values()) # Values row
46
47
48 # Run shell script to run this file
49 os.system("echo CSV file created. Listing all ...")
50 os.system("ls -l aqms*")
51 os.system("Its time to connect to hive and copy this file into it")
52
53 # Load data into HIVE
54 os.system("Trying to load this generated file into HIVE TABLE")
55 os.system("hive -f load_aqms.sql")
56 os.system("hive")
```

Data Loading and Transformation



```

CREATE TABLE IF NOT EXISTS aqmsdb.tmp (
    last_updated STRING,
    station_type STRING,
    longitude FLOAT,
    station_ID STRING,
    latitude FLOAT,
    PM25_value INT,
    AQI INT,
    AQI_level INT
)
ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
LINES TERMINATED BY '\n'
STORED AS TEXTFILE;

describe aqmsdb.tmp;

load data local inpath '/home/admin/test_data.csv' overwrite into table aqmsdb.tmp;

CREATE TABLE IF NOT EXISTS aqmsdb.aqms (
    last_updated TIMESTAMP,
    station_type STRING,
    longitude FLOAT,
    station_ID STRING,
    latitude FLOAT,
    PM25_value INT,
    AQI INT,
    AQI_level INT
);

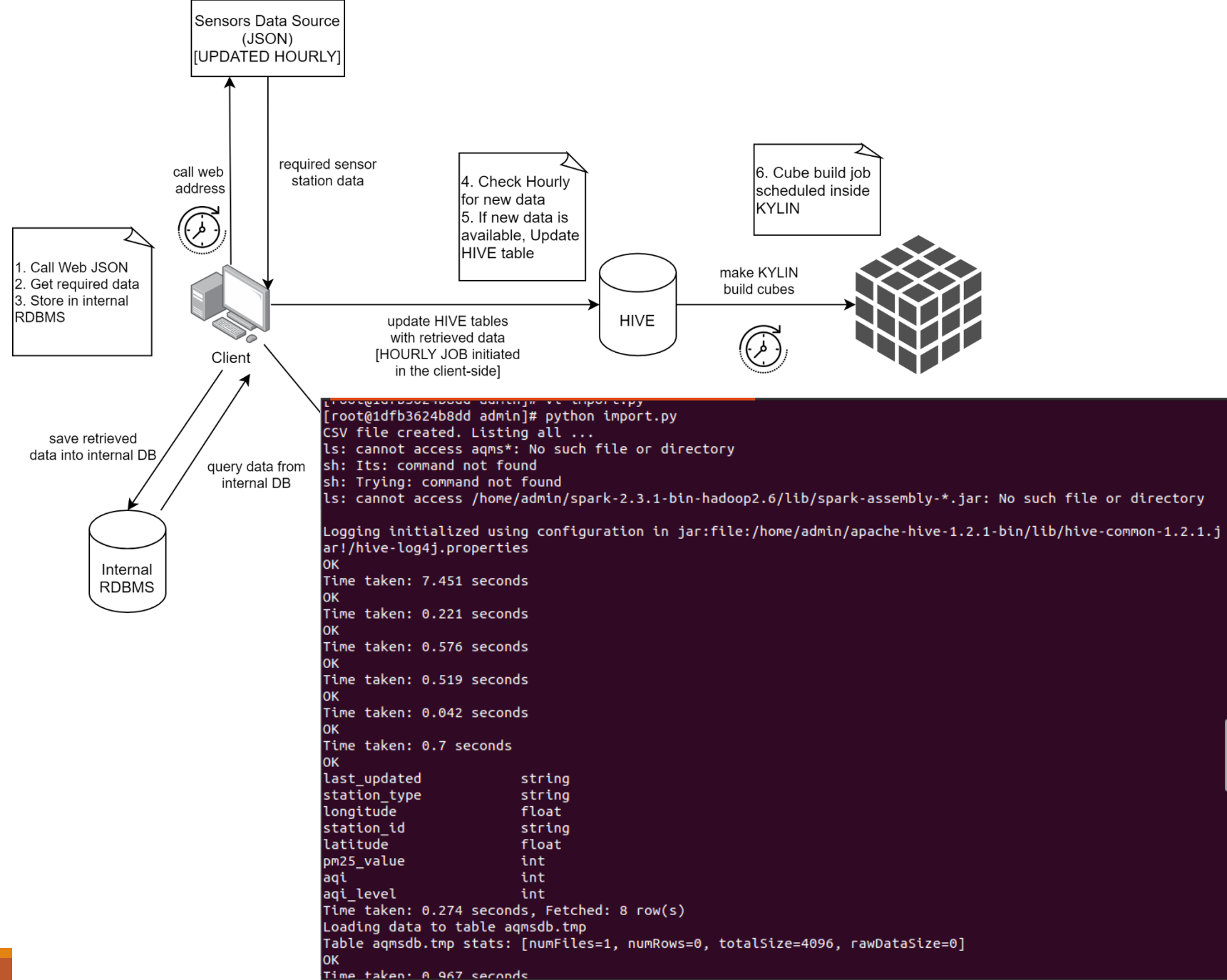
describe aqmsdb.aqms;

INSERT INTO TABLE aqmsdb.aqms
SELECT from_unixtime(unix_timestamp(last_updated, 'yyyy-MM-dd HH:mm')), station_type, longitude, s

select * from aqmsdb.aqms LIMIT 5;

```

Building Cube



Search hive tables and view permissions

127.0.0.1:50070/explorer.html#/user/hive/warehouse/aqmsdb.db

HadoopOverviewDatanodesSnapshotStartup ProgressUtilities

Browse Directory

/user/hive/warehouse/aqmsdb.db

Go!

Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
drwxr-xr-x	root	supergroup	0 B	4/29/2021, 12:48:21 PM	0	0 B	aqms
drwxr-xr-x	root	supergroup	0 B	4/29/2021, 12:47:41 PM	0	0 B	tmp

Hadoop, 2014.

Load the table in Kylin from HIVE by navigating to data source

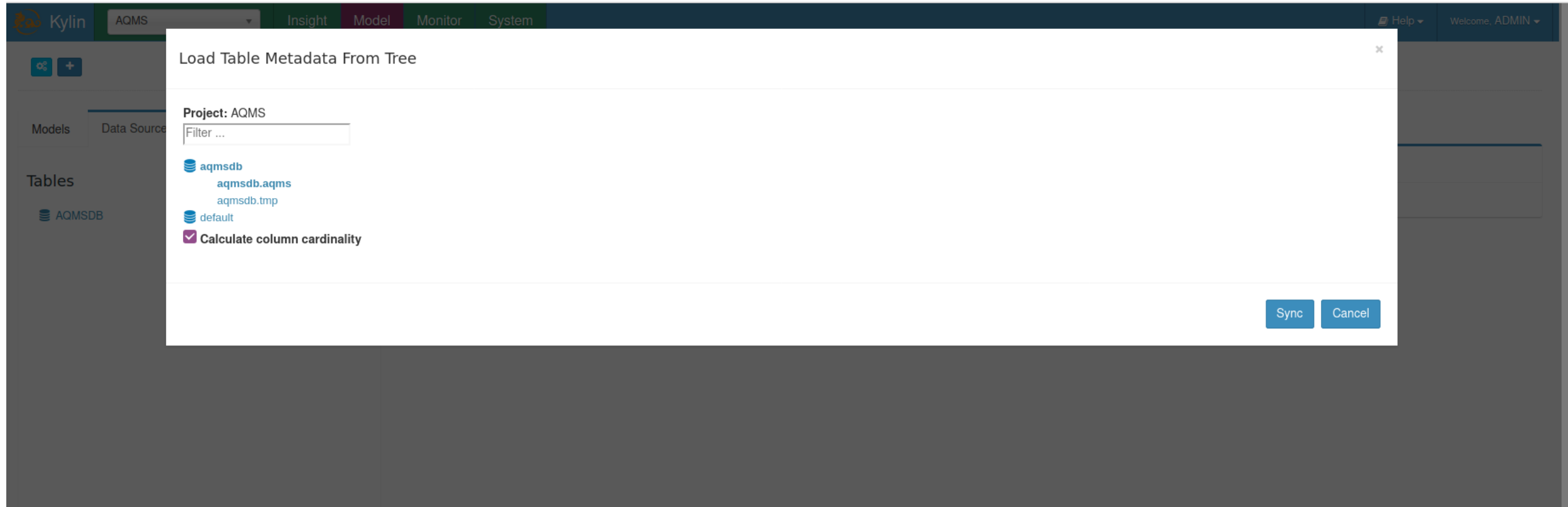


Table Schema displayed after the table is synced from HIVE

Kylin

AQMS

Insight

Model

Monitor

System

Help

Welcome, ADMIN

Models

Data Source

Tables

AQMSDB

AQMS

LAST_UPDATED(timestamp)

STATION_TYPE(varchar(256))

LONGITUDE(double)

STATION_ID(varchar(256))

LATITUDE(double)

PM25_VALUE(integer)

AQI(integer)

AQI_LEVEL(integer)

Table Schema:AQMS

Columns

Extend Information

Access

Snapshot

Columns

Cardinality


Reload Table

Unload Table

Filter ...

ID ^	Name ⇅	Data Type ⇅	Cardinality ⇅	Comment ⇅
1	LAST_UPDATED	timestamp		
2	STATION_TYPE	varchar(256)		
3	LONGITUDE	double		
4	STATION_ID	varchar(256)		
5	LATITUDE	double		
6	PM25_VALUE	integer		
7	AQI	integer		
8	AQI_LEVEL	integer		

Create new Model

 Kylin

AQMS ▾

Insight



Model

Monitor

System


Help ▾

Welcome, ADMIN ▾





Models

Data Source


 New ▾

★ New Model


 New Cube

 New Hybrid

No Result.




Cubes

Search by name 

No Cube.

Enter model info

 Kylin

AQMS ▾

Insight

Model

Monitor

System

Help ▾

Welcome, ADMIN ▾

Model Designer

✓

Model Info

2

Data Model

3

Dimensions

4

Measures

5

Settings

Model Name ⓘ *

AQMS_MODEL

Description

Tables from AQMS DB |

Next →

Add the fact table or base table from where all the dimension and measures are set

Kylin

AQMS

Insight

Model

Monitor

System

Help

Welcome, ADMIN

Model Designer

1

Model Info

2

Data Model

3

Dimensions

4

Measures

5

Settings

Fact Table *

+ Add Lookup Table

AQMSDB.AQMS


-- Select Fact Table --

AQMSDB.AQMS

Prev

Next

Set dimensions for the model

 Kylin

AQMS

Insight

Model

Monitor

System

Help

Welcome, ADMIN

Model Designer

✓

Model Info

✓

Data Model

✓

Dimensions

4

Measures

5

Settings

Select dimension columns

← Prev

Next →

Set measure columns for the model

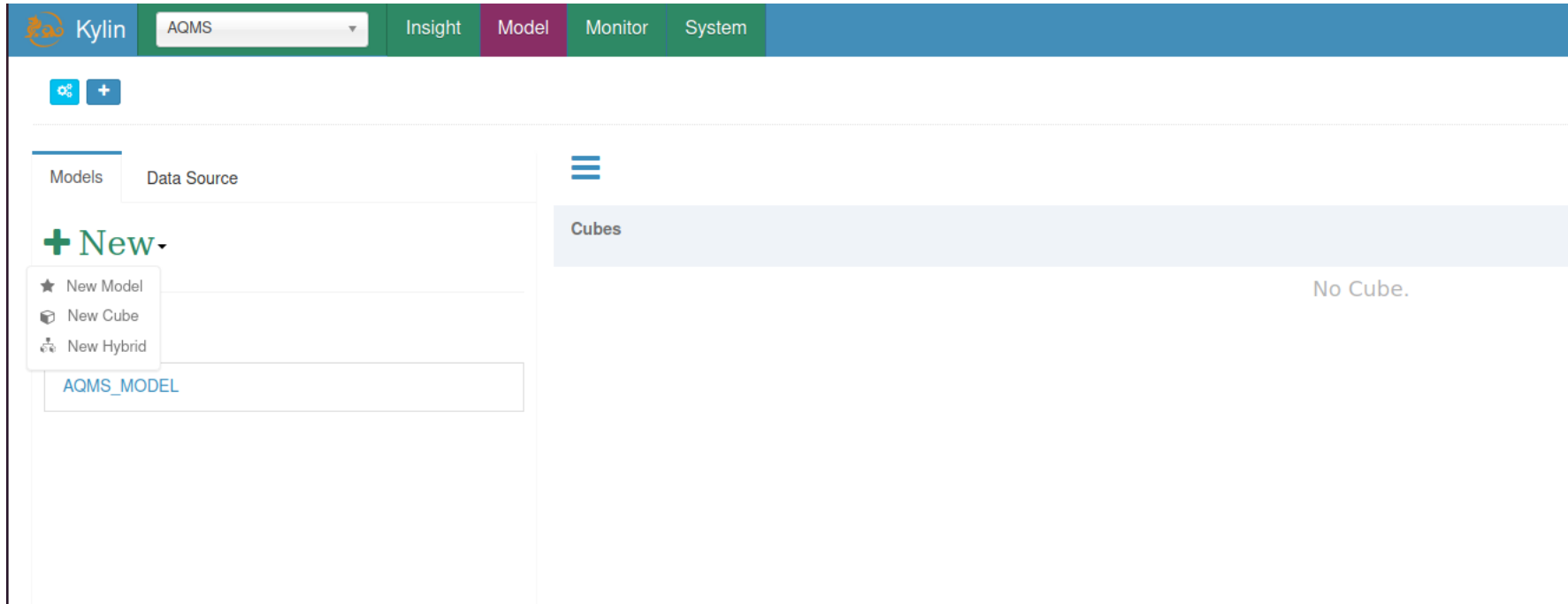
Model Designer




Select measure columns

ID	Table Alias	Columns
1	AQMS	PM25_VALUE AQI AQI_LEVEL

Create a new cube once the model is created



Set cube info

 Kylin

AQMS ▾

Insight

Model

Monitor

System

Help ▾

Welcome, ADMIN ▾

+ New ▾

Models (1)

AQMS_MODEL

Hybrids (0)

No Result.

Cube Designer

1

2

3

4

5

6

7

Cube Info

Dimensions

Measures

Refresh Setting

Advanced Setting

Configuration Overwrites

Overview

Model Name *

AQMS_MODEL ▾

Cube Name ⓘ *

AQMS_CUBE

Notification Email List

st121473@ait.ac.th


Notification Events ⓘ

ERROR ✕ DISCARDED ✕ SUCCEED ✕

Description

Next →

Select the dimension from the set dimension of the model

 Kylin

AQMS

Insight

Model

Monitor

System

Help

Welcome, ADMIN

+ New

Models (1)

AQMS_MODEL

Hybrids (0)

No Result.

Cube Designer

1

2

3

4

5

6

7

Cube Info

Dimensions

Measures

Refresh Setting











Advanced Setting

Configuration Overwrites

Overview

Add Dimensions

Filter ...

ID	Name	Table Alias	Type	Column	Actions
1	LAST_UPDATED	AQMS	normal	LAST_UPDATED	 
2	STATION_TYPE	AQMS	normal	STATION_TYPE	 
3	LONGITUDE	AQMS	normal	LONGITUDE	 
4	STATION_ID	AQMS	normal	STATION_ID	 
5	LATITUDE	AQMS	normal	LATITUDE	 

← Prev

Next →

Select bulk measure for the measures

Kylin

AQMS

Insight

Model

Monitor

System

Help

Welcome, ADMIN

+ New

Models (1)

AQMS_MODEL

Hybrids (0)

No Result.

Cube Designer

1

Cube Info

2

Dimensions

3

Measures

4

Refresh Setting

5

Advanced Setting

6

Configuration Overwrites

7

Overview

Bulk Add Measures


Name	Expression	Parameters	Return Type	Actions
COUNT	COUNT	<div>Value:1, Type:constant</div>	bigint	<div><div></div><div></div></div>
MAX_PM25_VALUE	MAX	<div>Value:AQMS.PM25_VALUE, Type:column</div>	integer	<div><div></div><div></div></div>
MIN_PM25_VALUE	MIN	<div>Value:AQMS.PM25_VALUE, Type:column</div>	integer	<div><div></div><div></div></div>

+ Measure

Prev

Next

Select cube engine for the cube data

 Kylin

AQMS ▾

Insight

Model

Monitor

System

Help ▾

Welcome, ADMIN ▾

Mandatory Cuboids

Cuboids

Select Dimension... 

Import cuboids from file: No file selected.

Cube Engine


Engine Type :

Advanced Dictionaries

Column	Builder Class	Reuse	Actions
<div> Dictionaries</div>			

Advanced Snapshot Table

Cube info preview

 Kylin

AQMS

▼

Insight

Model

Monitor

System

Help ▼

Welcome, ADMIN ▼

NEW

Models (1)

AQMS_MODEL

Hybrids (0)

No Result.

Cube Designer

✓

✓

✓

✓

✓

✓

7

Cube Info

Dimensions

Measures

Refresh Setting

Advanced Setting

Configuration Overwrites

Overview

Model Name	AQMS_MODEL
Cube Name	AQMS_CUBE
Fact Table	AQMSDB.AQMS
Lookup Table	0
Dimensions	5
Measures	3

Description

← Prev

Save

Cube is created and is in disabled status

Kylin

AQMS

Insight

Model

Monitor

System

Help

Welcome, ADMIN

Models

Data Source

+ New

Models (1)

AQMS_MODEL

Hybrids (0)

No Result.

Cubes

Search by name

Name	Status	Project	Cube Size	Source Records	Last Build Time	Owner	Create Time	Actions	Admins
AQMS_CUBE	DISABLED	AQMS	0 KB	0		ADMIN	2021-04-29 07:55:32 UTC	Action	Action

Total: 1

Storage: 0 KB

Success

Created the cube successfully.

Apache Kylin

Apache Kylin Community

Start build process for cube and track in monitor tab

Kylin

AQMS

Insight

Model

Monitor

System

Help

Welcome, ADMIN

Jobs

Slow Queries

Cube Name:

Jobs in:

LAST ONE DAY

ALL

NEW(0)

PENDING(1)

RUNNING(0)

STOPPED(0)

FINISHED(0)

ERROR(0)

DISCARDED(0)

Job Name ↕	Cube ↕	Progress ↕	Last Modified Time ▼	Duration ↕	Actions	
BUILD CUBE - AQMS_CUBE - FULL_BUILD - UTC 2021-04-29 07:56:04	AQMS_CUBE	<div>P</div>	2021-04-29 07:56:06 UTC	0.00 mins	<div>Action ▼</div>	<div></div>

Total: 1

Once the cube is building is completed it's in ready status

Models

Data Source

+ New

Models (2)

aqms_model_2

aqms_model

Models (2)

Cubes

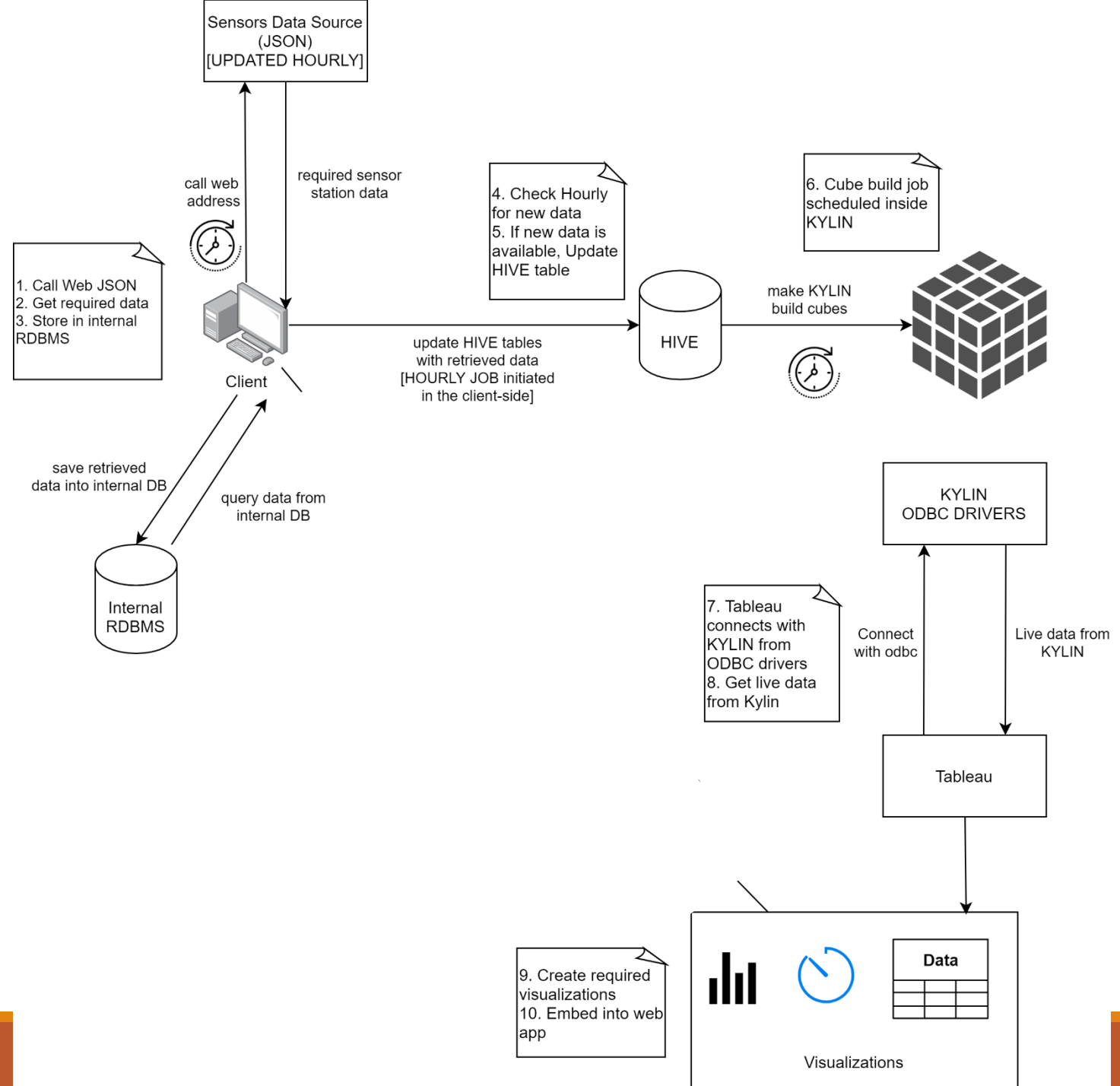
Search by name

Name	Status	Project	Cube Size	Source Records	Last Build Time	Owner	Create Time	Actions	Admins
<div>aqms_cube_2</div>	READY	aqms	63.00 KB	71	2021-04-25 08:41:23 UTC	ADMIN	2021-04-25 08:38:46 UTC	Action	Action
<div>aqms_cube</div>	READY	aqms	6.00 KB	71	2021-04-25 08:26:32 UTC	ADMIN	2021-04-25 08:23:20 UTC	Action	Action

Total: 2

Storage: 69.00 KB

Connecting Kylin and Tableau



```
shubhi@shubhi-VirtualBox:~$ docker exec -it ts bash
[root@da9a4c6d8313 /]# ls
anaconda-post.log  dev  home  lib64  mnt  proc  run  srv  tmp  var
bin                etc  lib   media  opt  root  sbin  sys  usr
[root@da9a4c6d8313 /]# cd opt
[root@da9a4c6d8313 opt]# ls
tableau
[root@da9a4c6d8313 opt]# cd tableau
[root@da9a4c6d8313 tableau]# ls
docker_build  tableau_driver  tableau_server
[root@da9a4c6d8313 tableau]# cd tableau_driver
[root@da9a4c6d8313 tableau_driver]# ll
bash: ll: command not found
[root@da9a4c6d8313 tableau_driver]# ls
jdbc  postgresql-odbc
[root@da9a4c6d8313 tableau_driver]# cd jdbc
[root@da9a4c6d8313 jdbc]# ls
kylin-jdbc-3.1.0.jar
[root@da9a4c6d8313 jdbc]#
```

Other Databases (JDBC)

jdbc:kylin://192.41.170.144:7070/learn_kylin

URL:

Dialect:

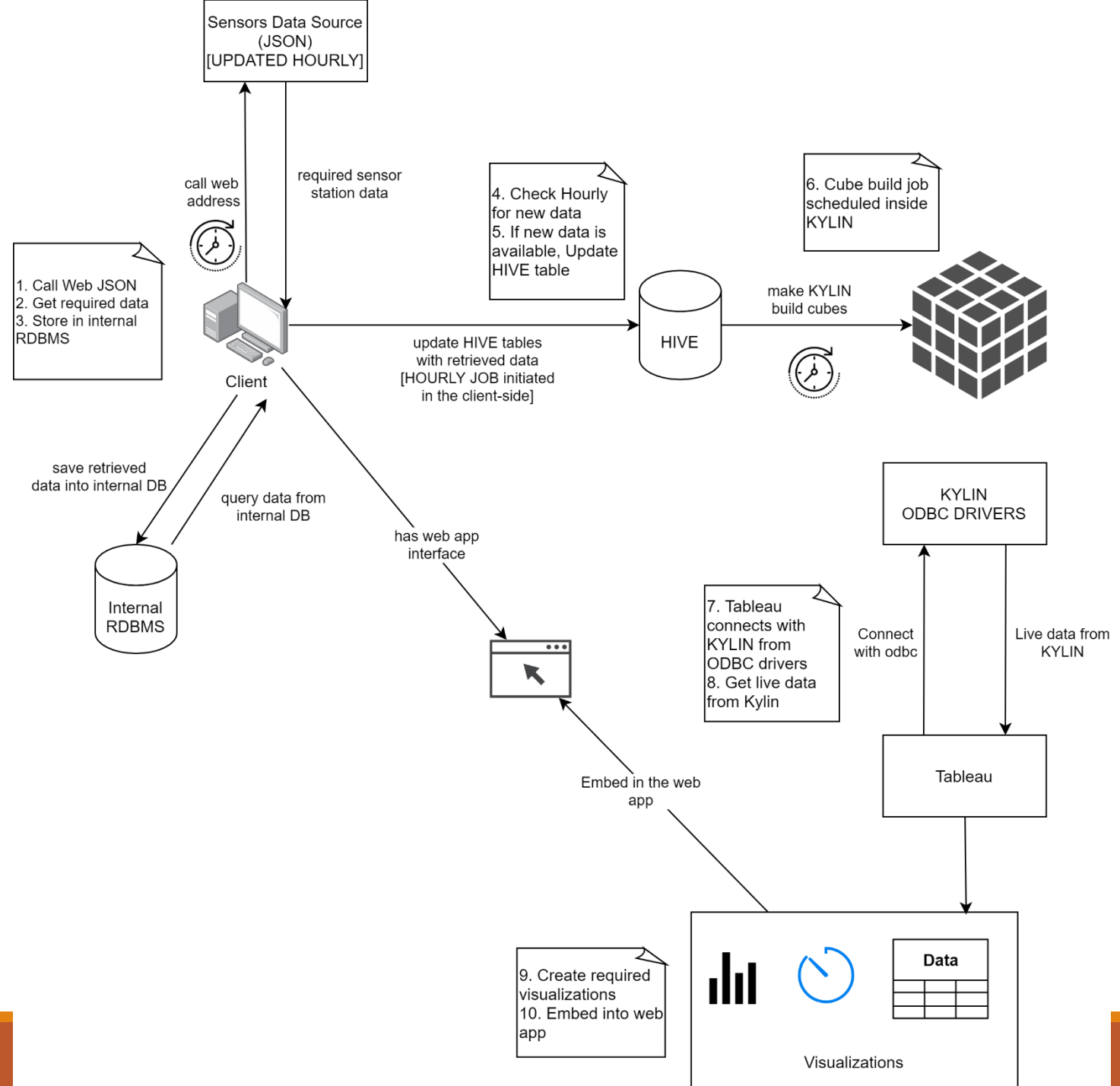
Enter information to log on to the server:

Username:

Password:

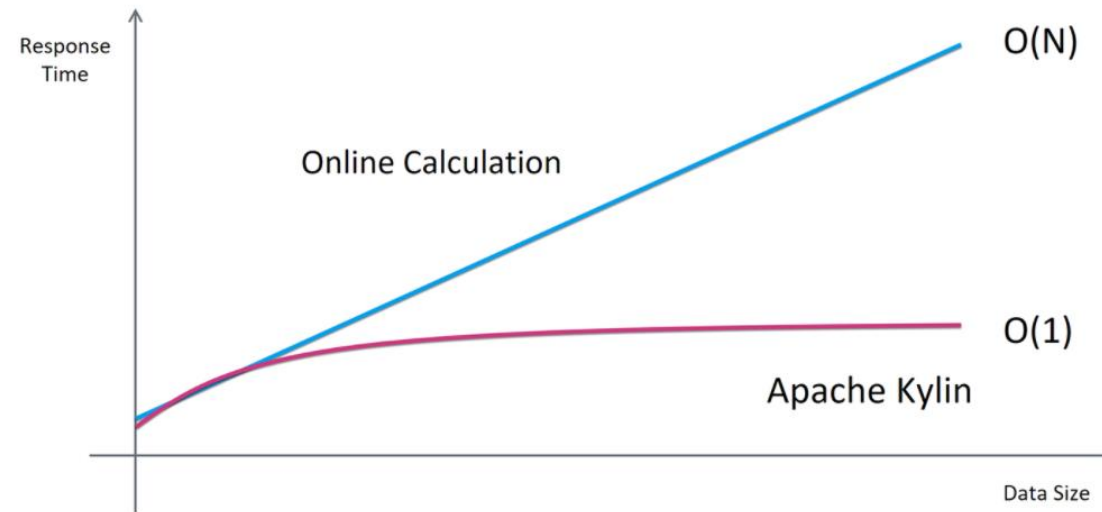
Properties File:

Software Architecture

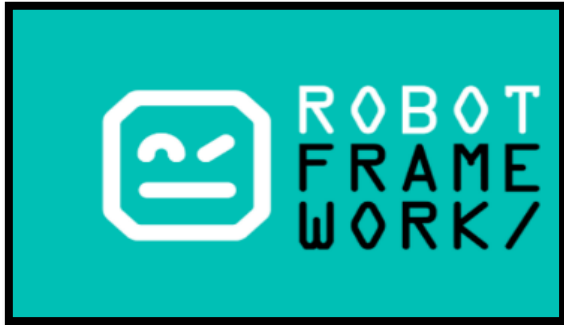


Apache Kylin

- Run Kylin with Docker
- Connecting Tableau Desktop and Tableau Server with Apache Kylin



Framework/Library



Design goals and trade-offs

Quality attributes	Priority Rating (L, M, H)	Priority Justification
Performance	H	<p>The system shall be designed with high performance level to handle concurrent or multiple information from sensors which are placed at different locations in real time. Large numbers of data collected from the sensor should be displayed on the responsive web application and we need to focus on concurrency, response time and block time.</p> <ul style="list-style-type: none">✓ The application should respond to a user within 2 seconds.✓ The application should be able to handle 100 transactions per second in the peak load time.
Usability	H	<p>Once the system is deployed, the maintenance of the system including tasks such as monitoring the system, repairing problems that arise, updating or upgrading software components, should be easy to be sufficiently performed by any person with a basic understanding of the dashboard system.</p> <ul style="list-style-type: none">✓ The web app should be easy to operate by users with a certain navigation menu or option. <p>No need for a user manual.</p>

Design goals and trade-offs

Portability	M	<p>The system shall be designed in a way that allows it to be run on multiple computers with different browsers. As it is a web application, mobile phone web browsers can also access the application.</p> <ul style="list-style-type: none">✓ The web app must support latest Web browsers for any OS.✓ The web app should be responsive.
Reliability	M	<p>Reliability is one of the key attributes of the system. Back-ups will be made regularly so that restoration with minimal data loss is possible in the event of unforeseen events. The system will also be thoroughly tested to ensure reliability.</p> <ul style="list-style-type: none">✓ The system should be able to restore backward data of 24 hours (maximum 3 Days) within 2 hours as a recovery function.
Scalability	L	<p>With data, the storage size will increase but can be managed with time. This app can be made horizontally scalable when there are issues of memory storage.</p>

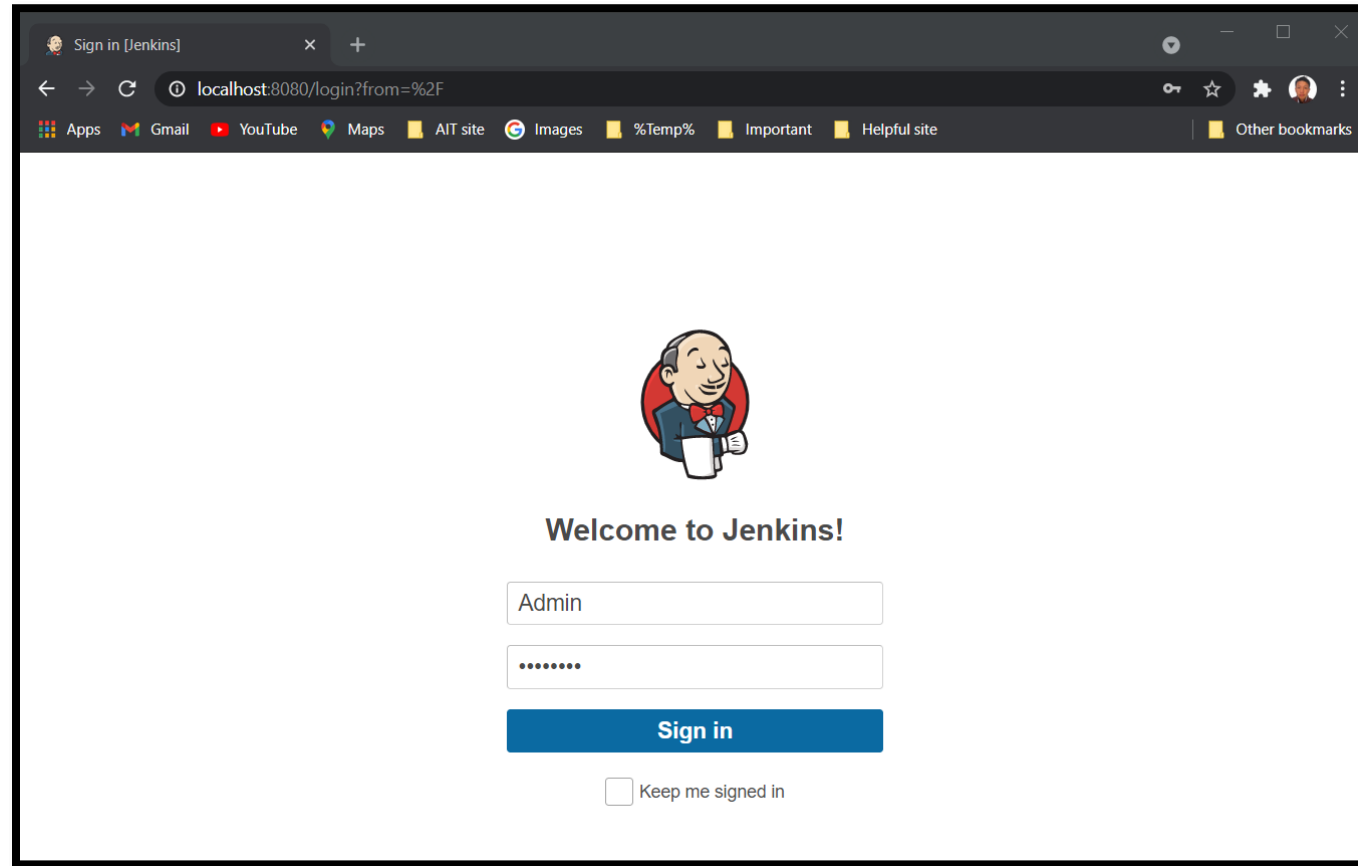
Access Matrix

Table 1. Access Matrix

The diagram illustrates an Access Matrix. A callout bubble labeled 'Actors' points to the first column of the table. A callout bubble labeled 'Classes' points to the first row of the table. A callout bubble labeled 'Access Rights' points to the cells containing method names in the table.

	Classes	
	Dashboard	System Setting
Actors	viewDashboard () generateReport ()	registerSensor () updateParameter () activateSensor ()
	viewDashboard ()	

Continuous integration




Creating Pipeline

Dashboard [Jenkins]

localhost:9090

Apps Gmail YouTube Maps AIT site Images %Temp% Important Helpful site

Other bookmarks

 Jenkins

search

Younten log out

Dashboard

New Item

People

Build History

Manage Jenkins

My Views

Lockable Resources

New View







Build Queue

No builds in the queue.

Build Executor Status

1 Idle

All

S	W	Name ↓	Last Success	Last Failure	Last Duration	
		Combine	N/A	32 min - #2	3 ms	
		Jenkins_TRY	7 min 5 sec - #6	N/A	1.1 sec	

Icon: [S](#) [M](#) [L](#)

Legend

Atom feed for all

Atom feed for failures

Atom feed for just latest builds

add description

Build and Build History

All [Jenkins]

localhost:9090/view/all/builds

Apps Gmail YouTube Maps AIT site Images %Temp% Important Helpful site Other bookmark

Dashboard ▸ All ▸

New Item

People

Build History

Manage Jenkins

My Views

Lockable Resources

New View

Build Queue

No builds in the queue.

Build Executor Status

1 Idle

2 Idle

Build History of Jenkins

This history is not guaranteed to include all subtasks executed on the node, e.g. Jenkins Pipeline subtasks will not be displayed.

Apr 27

Apr 28

Apr 29

Apr 30

May 1

Ma

Jenkins_TRY #6

Jenkins_TRY #5

Combine #2

3hr









4hr

5hr

6hr

7hr

8hr

Build	Time Since ↑	Status
 Jenkins_TRY #6	2 min 11 sec	stable 
 Jenkins_TRY #5	2 min 38 sec	stable 
 Combine #2	27 min	broken since this build 
 Jenkins_TRY #4	4 days 11 hr	stable 

Result

The screenshot shows the Jenkins web interface in a browser window. The address bar indicates the URL is `localhost:8080/job/Jenkins_TRY/1/console`. The Jenkins logo and navigation bar are at the top. The left sidebar contains links to Dashboard, Jenkins_TRY, and #1. The main content area is titled "Console Output" and displays the following text:

```
Started by user Younten
Running as SYSTEM
Building in workspace
C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\Jenkins_TRY
[Jenkins_TRY] $ cmd /c call C:\WINDOWS\TEMP\jenkins527334089427550948.bat

C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\Jenkins_TRY>echo
"Hello.. this is my first Jenkins Demo : Wed 04/21/2021 : 3:14:02.84 "
"Hello.. this is my first Jenkins Demo : Wed 04/21/2021 : 3:14:02.84 "

C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\Jenkins_TRY>exit 0
Finished: SUCCESS
```

The bottom of the interface shows the "REST API" and "Jenkins 2.277.3" version information.

User Acceptance Test Report

- With **JMeter**, we can increase the number of concurrent users slowly or quickly throughout our test to record how performance is affected under continuous load.
- The idea behind concurrent user testing is to **identify the response of a web app for a specified number of concurrent users** making requests to our website. A concurrent user test is often used to identify bottlenecks in the performance of a website – *basically to find out how many concurrent users can make requests of a website until the performance of the site is significantly degraded.*
- **Robot Framework** is a **test automation framework** that is Python-based. Test Robot with simple webapp access by writing the script in VS Code with robot file extension and running will **show test case pass or fail.**

Test multiple access

File Edit Search Run Options Tools Help

00:00:13 0 0/5000

AQMS_MultipleAccess

- Thread Group
 - HTTP Request
 - View Results Tree
 - View Results in Table

View Results in Table

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename


Sample #	Start Time	Thread Name	Label	Status	Sample Time(...)
9976	23:35:19.713	Thread Group 1-4317	HTTP Request	✓	3022
9977	23:35:20.115	Thread Group 1-4972	HTTP Request	✓	3220
9978	23:35:19.724	Thread Group 1-4871	HTTP Request	✓	3611
9979	23:35:19.750	Thread Group 1-3834	HTTP Request	✓	3585
9980	23:35:19.784	Thread Group 1-4884	HTTP Request	✓	3552
9981	23:35:20.369	Thread Group 1-4791	HTTP Request	✓	2970
9982	23:35:19.710	Thread Group 1-4867	HTTP Request	✓	3629
9983	23:35:20.093	Thread Group 1-4904	HTTP Request	✓	3246
9984	23:35:20.406	Thread Group 1-4857	HTTP Request	✓	2934
9985	23:35:19.679	Thread Group 1-4852	HTTP Request	✓	3661
9986	23:35:19.818	Thread Group 1-3876	HTTP Request	✓	3523
9987	23:35:19.920	Thread Group 1-3883	HTTP Request	✓	3421
9988	23:35:19.836	Thread Group 1-3809	HTTP Request	✓	3506
9989	23:35:20.525	Thread Group 1-4970	HTTP Request	✓	2820
9990	23:35:19.743	Thread Group 1-3761	HTTP Request	✓	3603
9991	23:35:19.320	Thread Group 1-4706	HTTP Request	✓	4028
9992	23:35:19.675	Thread Group 1-4717	HTTP Request	✓	3674
9993	23:35:19.670	Thread Group 1-4327	HTTP Request	✓	3681
9994	23:35:20.379	Thread Group 1-4913	HTTP Request	✓	2972
9995	23:35:19.803	Thread Group 1-3685	HTTP Request	✓	3550
9996	23:35:19.754	Thread Group 1-3981	HTTP Request	✓	3601
9997	23:35:19.787	Thread Group 1-4682	HTTP Request	✓	3568
9998	23:35:20.330	Thread Group 1-4911	HTTP Request	✓	3027
9999	23:35:20.392	Thread Group 1-4886	HTTP Request	✓	2965
10000	23:35:19.931	Thread Group 1-4814	HTTP Request	✓	3428

☒ Scroll automatically? ☐ Child samples? No of Samples 10

localhost:8080/admin/login

Apps Gmail YouTube Maps AIT site Images %Temp%

Administrator Login



Air Quality Monitoring System

Username:

Password:

Login

File Edit Search Run Options Tools Help

00:06:50 0 0/100000

Multiple Access http request

100000 Users

HTTP Request

View Results in Table

View Results Tree

Comments:

-Write results to file / Read from file

Filename

Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status
399981	16:45:08.681	100000 Users 1-98691	HTTP Request	3856	✓
399982	16:45:09.051	100000 Users 1-98498	HTTP Request	3488	✓
399983	16:45:09.647	100000 Users 1-99251	HTTP Request	2893	✓
399984	16:45:10.633	100000 Users 1-99274	HTTP Request	1909	✓
399985	16:45:08.649	100000 Users 1-98501	HTTP Request	3897	✓
399986	16:45:10.643	100000 Users 1-99252	HTTP Request	1904	✓
399987	16:45:11.098	100000 Users 1-99255	HTTP Request	1453	✓
399988	16:45:11.041	100000 Users 1-99272	HTTP Request	1511	✓
399989	16:45:11.028	100000 Users 1-99673	HTTP Request	1526	✓
399990	16:45:11.111	100000 Users 1-99254	HTTP Request	1444	✓
399991	16:45:11.044	100000 Users 1-98892	HTTP Request	1512	✓
399992	16:45:11.121	100000 Users 1-99243	HTTP Request	1440	✓
399993	16:45:11.128	100000 Users 1-99276	HTTP Request	1435	✓
399994	16:45:11.491	100000 Users 1-99242	HTTP Request	1077	✓
399995	16:45:11.502	100000 Users 1-99253	HTTP Request	1067	✓
399996	16:45:11.517	100000 Users 1-99256	HTTP Request	1052	✓
399997	16:45:11.525	100000 Users 1-99300	HTTP Request	1047	✓
399998	16:45:11.552	100000 Users 1-99660	HTTP Request	1023	✓
399999	16:45:11.573	100000 Users 1-99235	HTTP Request	1003	✓
400000	16:45:11.583	100000 Users 1-99275	HTTP Request	994	✓

☒ Scroll automatically? ☐ Child samples? No of Samples 400000

Test Concurrent access

File Edit Search Run Options Tools Help

Concurrent_Access

- bzm - Concurrency Thread Group
- HTTP Request
- View Results in Table

View Results in Table

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename:

Sample...	Start Time	Thread Name	Label ↑	Status	Sample
2408	23:53:42.841	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2409	23:53:42.828	bzm - Concurrency Thread Group...	HTTP Request	✓	3
2410	23:53:42.843	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2411	23:53:42.838	bzm - Concurrency Thread Group...	HTTP Request	✓	2
2412	23:53:42.838	bzm - Concurrency Thread Group...	HTTP Request	✓	2
2413	23:53:42.843	bzm - Concurrency Thread Group...	HTTP Request	✓	2
2414	23:53:42.845	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2415	23:53:42.828	bzm - Concurrency Thread Group...	HTTP Request	✓	3
2416	23:53:42.854	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2417	23:53:42.828	bzm - Concurrency Thread Group...	HTTP Request	✓	3
2418	23:53:42.854	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2419	23:53:42.854	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2420	23:53:42.826	bzm - Concurrency Thread Group...	HTTP Request	✓	4
2421	23:53:42.854	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2422	23:53:42.843	bzm - Concurrency Thread Group...	HTTP Request	✓	2
2423	23:53:42.842	bzm - Concurrency Thread Group...	HTTP Request	✓	2
2424	23:53:42.828	bzm - Concurrency Thread Group...	HTTP Request	✓	3
2425	23:53:42.854	bzm - Concurrency Thread Group...	HTTP Request	✓	1
2426	23:53:42.843	bzm - Concurrency Thread Group...	HTTP Request	✓	2
2427	23:53:42.829	bzm - Concurrency Thread Group...	HTTP Request	✓	3
2428	23:53:42.826	bzm - Concurrency Thread Group...	HTTP Request	✓	4
2429	23:53:42.842	bzm - Concurrency Thread Group...	HTTP Request	✓	2
2430	23:53:42.827	bzm - Concurrency Thread Group...	HTTP Request	✓	4
2431	23:53:42.838	bzm - Concurrency Thread Group...	HTTP Request	✓	3
2432	23:53:42.839	bzm - Concurrency Thread Group...	HTTP Request	✓	3


☒ Scroll automatically? ☐ Child samples? No of Samples 2432

AQMS - Admin Login

localhost:8080/admin/login

Apps Gmail YouTube Maps AIT site Images %Temp% Other bookmarks

Administrator Login



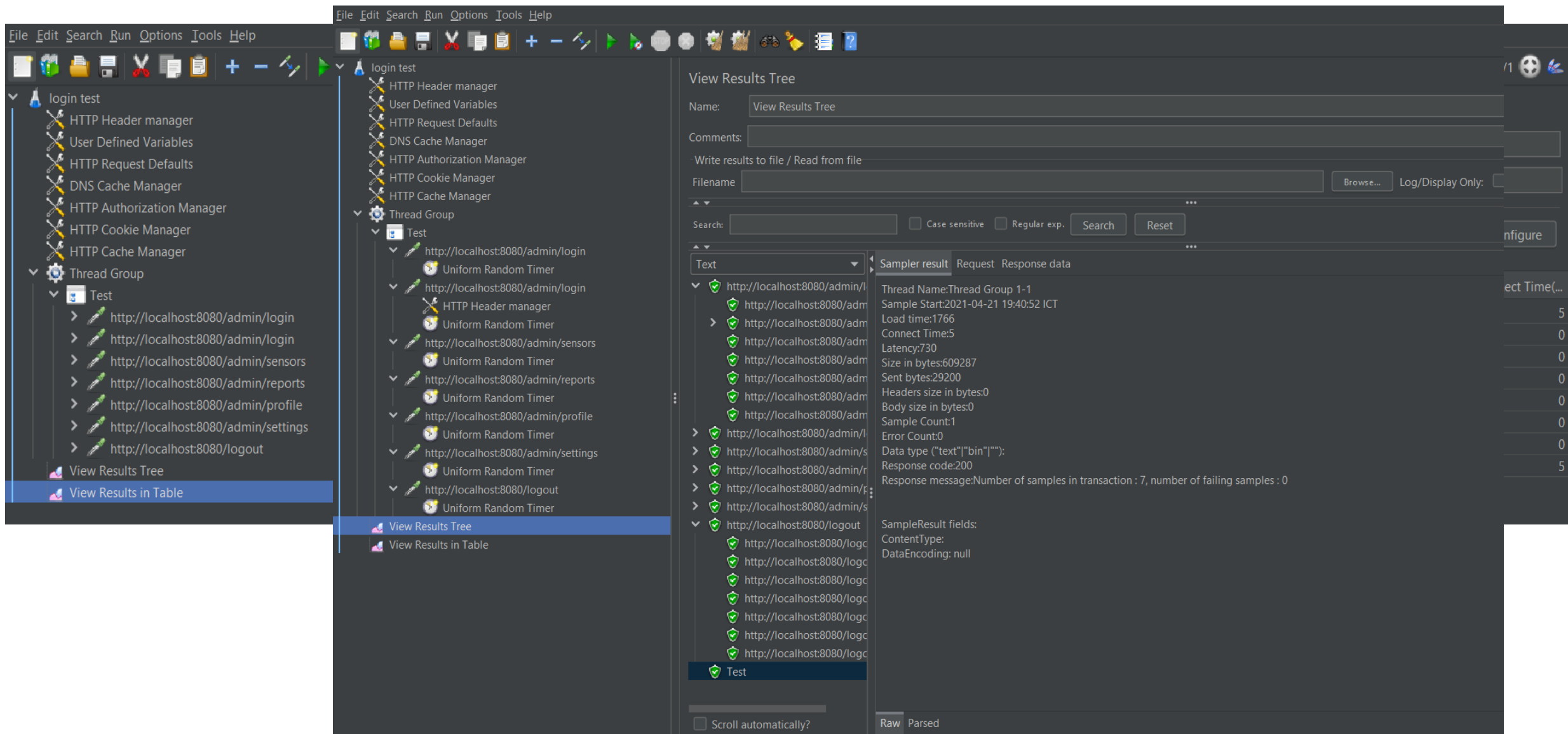
Air Quality Monitoring System

Username:

Password:

Login

Testing login and other options



Test using Robot Framework

```
≡ AQMS.robot M ●
AQMS > ≡ AQMS.robot > ...
100, seconds ago | 1 author (100)
1  *** Settings ***
2  Library    Selenium2Library
3
4  *** Variables ***
5  ${expect}  LocationMind
6  ${url}     http://localhost:8080
7  ${Browser} chrome
8  ${delay}   1
9
10 *** Test Cases ***
11 1. Open Website
12     Open Browser    ${url}    ${Browser}    options=add_experimental_option("excludeSwitches", ["enable-logging"])
13     Maximize Browser Window
14     Set Selenium Speed    0.5
15
16 2. Click on login link
17     Click Link    //a[contains(text(),'Login')]
18
19 3. Input username and password
20     Input Text    name=username    admin
21     Input Text    name=password    admin
22
23 4. Login
24     Click Button    name=submit
25
26 5. Check page info
27     Click Link    //a[contains(text(),'Sensors')]
28
29 6. Start and Stop service
30     Click Button    name=Stop
31     Click Button    name=Start
32     Click Link    //a[contains(text(),'Map View')]
33
34 7. Logout
35     Click Link    //a[contains(text(),'Logout')]
36
37 8. close Browser
38     Close Browser
```

Test using Robot Framework

```
PROBLEMS 9 OUTPUT DEBUG CONSOLE TERMINAL

PS C:\Users\Younten Tshering\Documents\GitHub\SDQI2021_G1\AQMS> robot .\AQMS.robot

=====
AQMS
=====
1. Open Website | PASS |
-----
2. Click on login link | PASS |
-----
3. Input username and password | PASS |
-----
4. Login | PASS |
-----
5. Check page info | PASS |
-----
6. Start and Stop service | PASS |
-----
7. Logout | PASS |
-----
8. close Browser | PASS |
-----
AQMS | PASS |
8 tests, 8 passed, 0 failed
=====
Output: C:\Users\Younten Tshering\Documents\GitHub\SDQI2021_G1\AQMS\output.xml
Log: C:\Users\Younten Tshering\Documents\GitHub\SDQI2021_G1\AQMS\log.html
Report: C:\Users\Younten Tshering\Documents\GitHub\SDQI2021_G1\AQMS\report.html
```

The status of the implementation

- ❑ Link to our GitHub with readme file about the project and status of the implementation.

https://github.com/shubhanginigon/SDQI2021_G1

- ❑ Link to our JIRA project with tasks and roadmap:

<https://sqdi2021g1.atlassian.net/jira/software/c/projects/AQMS/boards/4/roadmap>

- ❑ Link to folder having installation and usage instruction as System Documentation and User Documentation, respectively.

- ❑ Updated Software Requirement Specification and Design Documents(Final Document)

https://github.com/shubhanginigon/SDQI2021_G1/tree/main/Related%20Documents/Final%20Report%20Document

CONCLUSION

- ❑ The system 'Air Quality (PM2.5) Monitoring System' will be especially designed to be used by any user who are cautious about their health.



Future Scope:

1. Add more sensor data sources and test
2. Deploy in real servers

Real Demo

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Questions and Feedback