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Heinz College

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Data Management System Implementation Project

Final Presentation

Team Introduction

Jeeranat Sithivaraporn - *Project Manager*

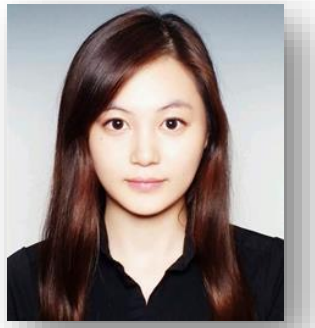
MISM

Eleanor Kenny - *Financial Manager*

MISM

Daniel Ohara

MISM



Min-Ji Huh

MISM – BIDA

Anshu Agrawal

MISM – BIDA

Agenda

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1. Overview and Scope
2. Front-end
3. Back-End and Demo
4. Documentation
5. Challenges and Future Work

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OVERVIEW AND SCOPE

Eden Hall Campus
Falk School of Sustainability

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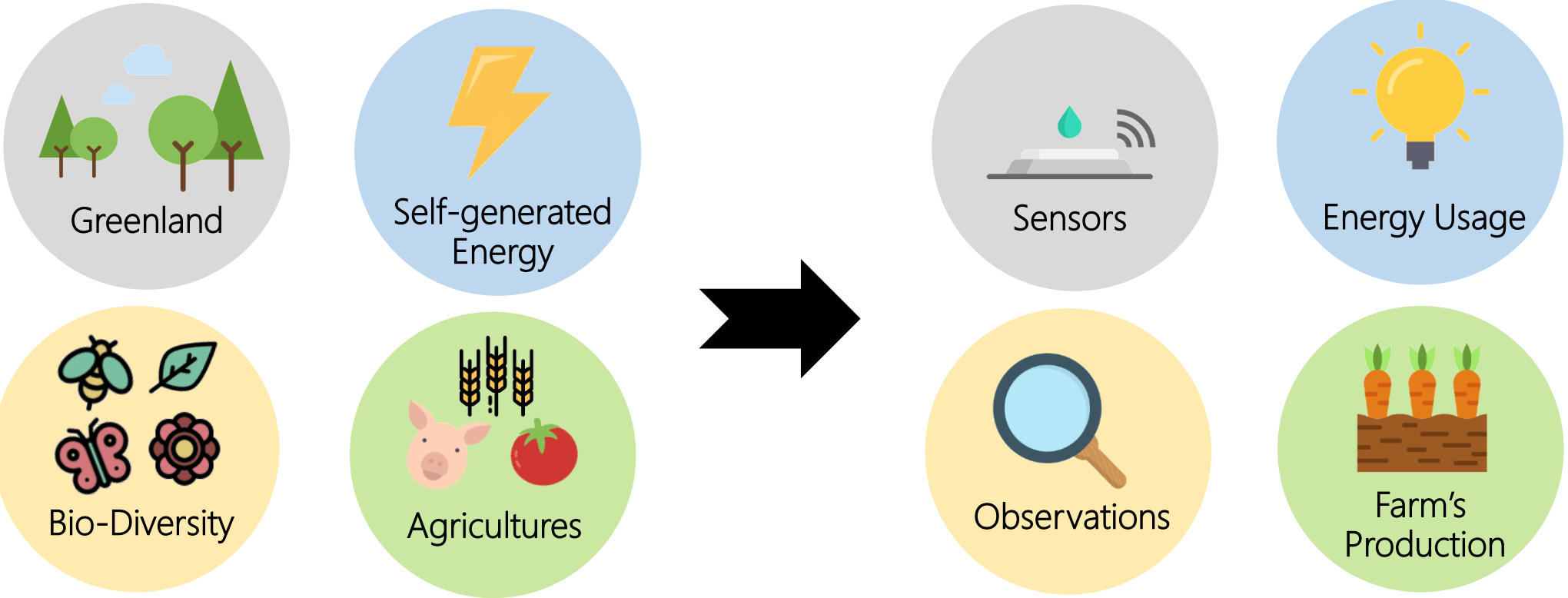

"Eden Hall Campus is seeking solutions to manage and centralize the growing amount of data, and provide data access to researchers and students."

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Complications

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No data management system

- Data is scattered in non-uniform platforms
- No centralized data access point

Variability of the data

- Different sources
- Different formats
- Different collection processes/intervals

Limited technical resources

- Development and maintenance is difficult
- No user-friendly interface

Objective and Deliverables

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Objective

The Heinz College will work with Chatham University Eden Hall Campus to design and implement a centralized and scalable information management system for faculties and students to store and analyze the data.

Deliverables

Front-end
(Web Portal)

Back-end
(Data Management System)

Documentation

Functionality Scope

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Functionalities	Use cases	Faculty	Granted Student	Others
Authorization and Authentication	Log-in	✓	✓	-
	Create Access	✓	-	-
	Manage Access	✓	-	-
Create New Tables	Add new data stream	✓	-	-
	Add Validation Rules	✓	-	-
	Manage Validation Rules	✓	-	-
Upload	Batch Files	✓	✓	-
	Observation Records	✓	✓	-
Download/ Query	Query Observation Data	✓	✓	✓
	Query By Type	✓	✓	✓
	Query By Site	✓	✓	✓
	Preview Data	✓	✓	✓
	Download as CSV	✓	✓	✓

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FRONT-END

Site Map

Main

Jeeranat

localhost:8080/InterestingPicture1/index2.jsp

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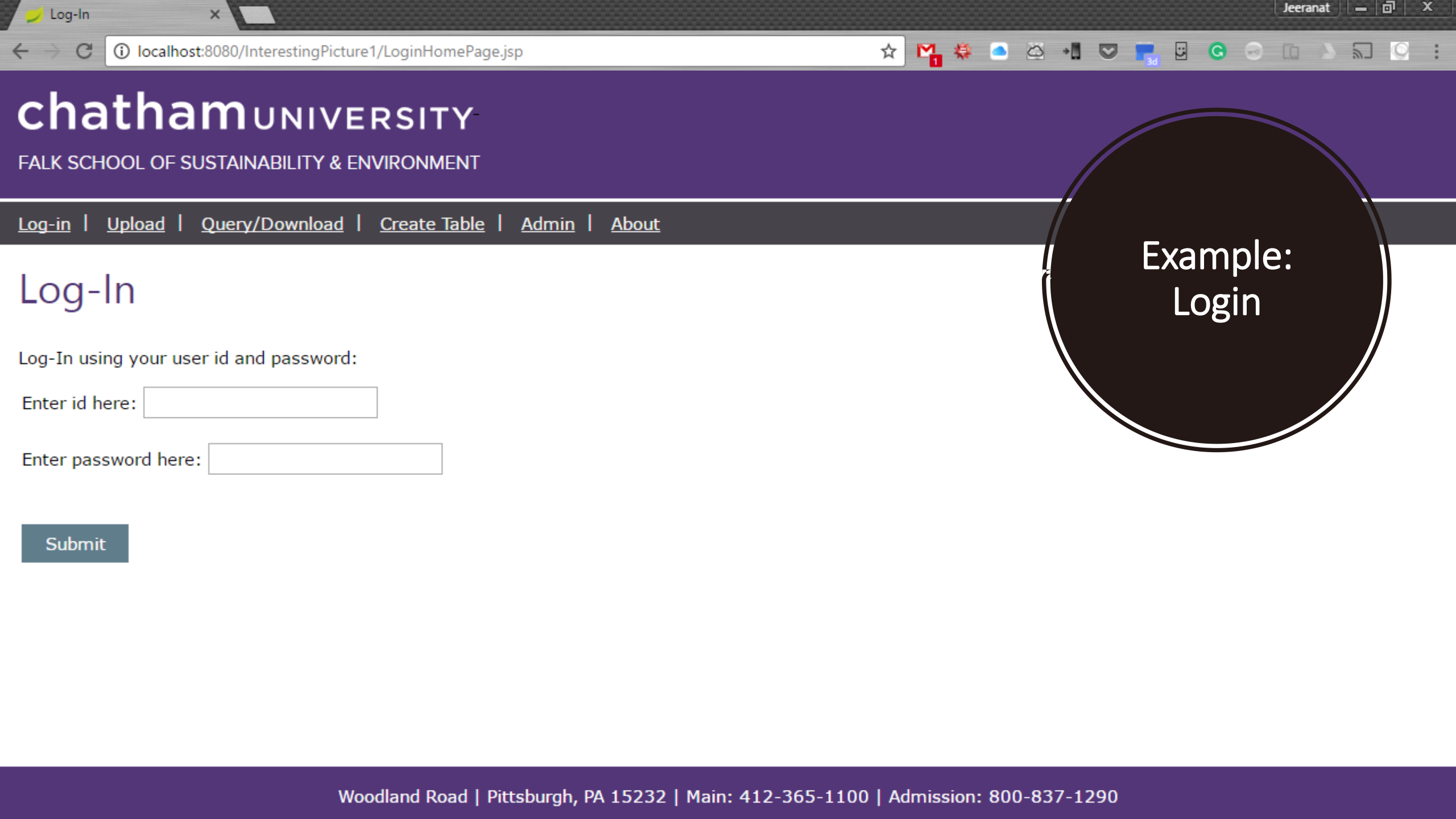
FALK SCHOOL OF SUSTAINABILITY & ENVIRONMENT

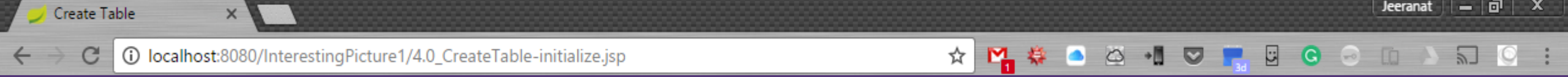
Log-in | Upload | Query/Download | Create Table | Admin | About

Example:
Main Page

Woodland Road | Pittsburgh, PA 15232 | Main: 412-365-1100 | Admission: 800-837-1290



Example: Login



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FALK SCHOOL OF SUSTAINABILITY & ENVIRONMENT

Log-in | Upload | Query/Download | Create Table | Admin | About

Example: Create Table

Create Table

Welcome to create table page. Please fill in the fields below to create your table.

Number of Columns:

Type of Delimeter:

Comment Line Signifier:

Number of header lines to skip:

Data generation frequency:

Type of Sensor:

Site Prefix:

Sensor Model:

Sensor Manufacturer:

Location:

Next

Upload

localhost:8080/Capstone/2.5.1_Upload-Epidoptera.jsp

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Log-in | Upload | Query/Download | Create Table | Admin | About

Example: Upload

Epidoptera(Moth) Upload Observation.

Fill in appropriate observation form.

Genus:

Species:

Common Name:

Family: Arctiidae

Sex: Unknown

Time of Sampling: Morning

Date of Reference Image: mm/dd/yyyy

Identified by:

Native Status: Unknown

Collected and Pinned: Yes

Submit

Query/Download

localhost:8080/Capstone/3.1_Query-ChooseType.jsp

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FALK SCHOOL OF SUSTAINABILITY & ENVIRONMENT

Log-in | Upload | Query/Download | Create Table | Admin | About

Example: Query/ Download

Query Type.

Choose a type of query you wish to make

Please choose one of the following options.

- (•) By Site
- ( ) By Sensor
- ( ) Observations

Next Before

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BACK-END

Solutions

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No data management system

Variability of the data

1. Data Storage

- ✓ Table Mapping
- ✓ Column Mapping
- ✓ Rules Mapping

2. Data Engineering

- ✓ Validation Rules
- ✓ ETL Model

3. Data Aggregation

- ✓ Horizontal Join
- ✓ Vertical Join

1. Data Storage

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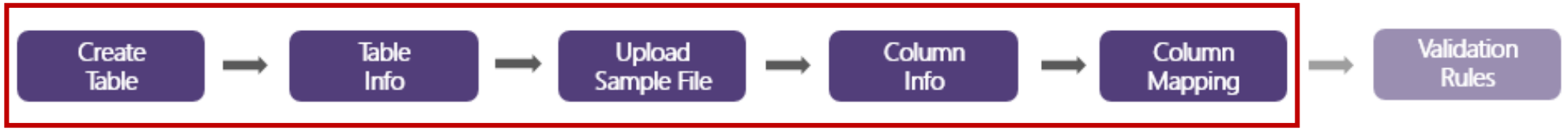
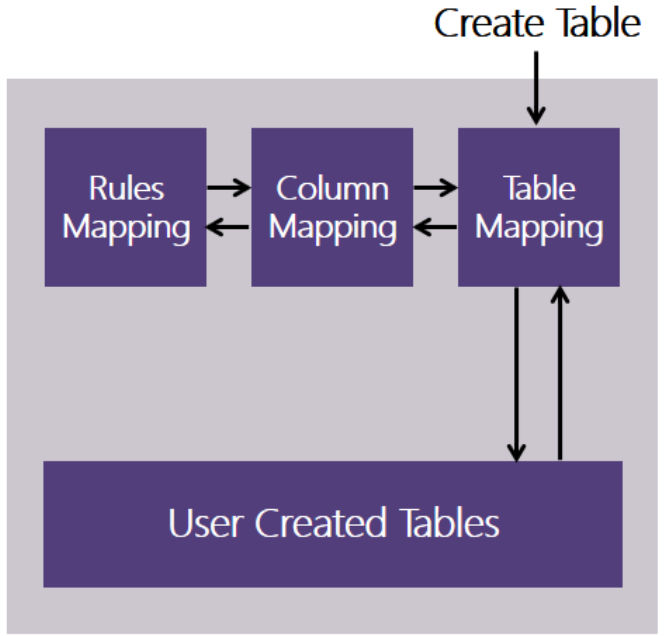
FRONT



BACK

Data Storage Solution manages variety and scalability of the data using **Table Mapping**, and **Column Mapping** tables. The metadata of all tables are stored in these 2 tables that provide the mapping between tables. Therefore, tables of any size and format can be joined together in the future.



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2. Data Engineering – Validation Rules

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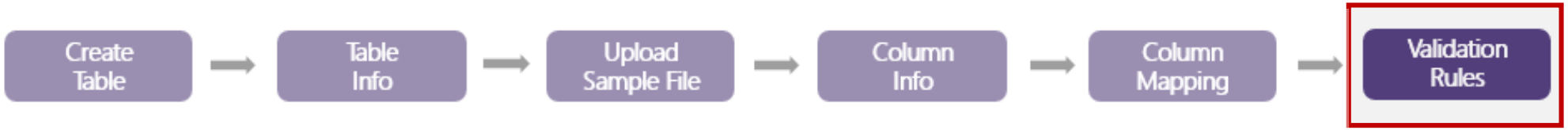
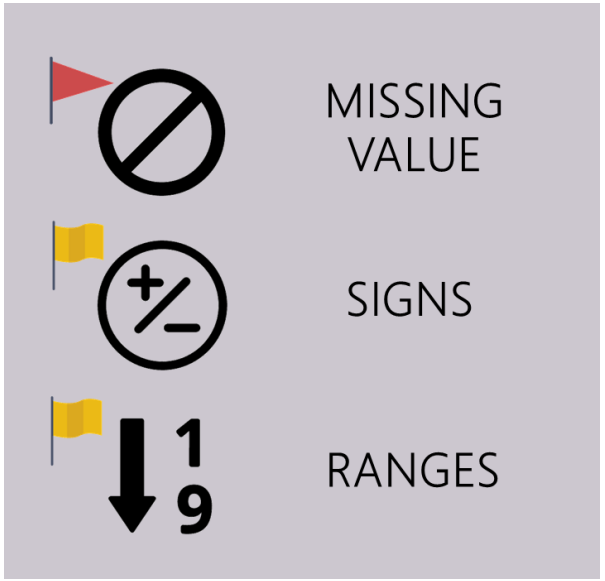


BACK



Validation Rules allows users select criteria to assign "RED" or "YELLOW" flags to the data, to eliminate or mark as "Flagged".

- **Missing Values**: Include/exclude null values from the data set
- **Signs**: Include/Exclude positive and negative values from the data set
- **Ranges**: Include/Exclude specific ranges of values from each column

2. Data Engineering – ETL Model

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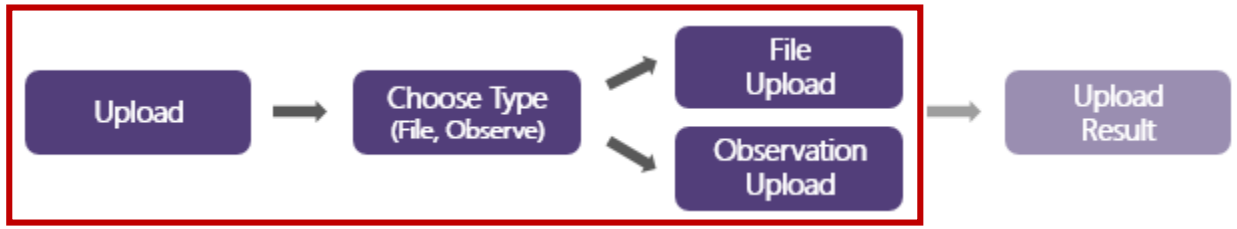
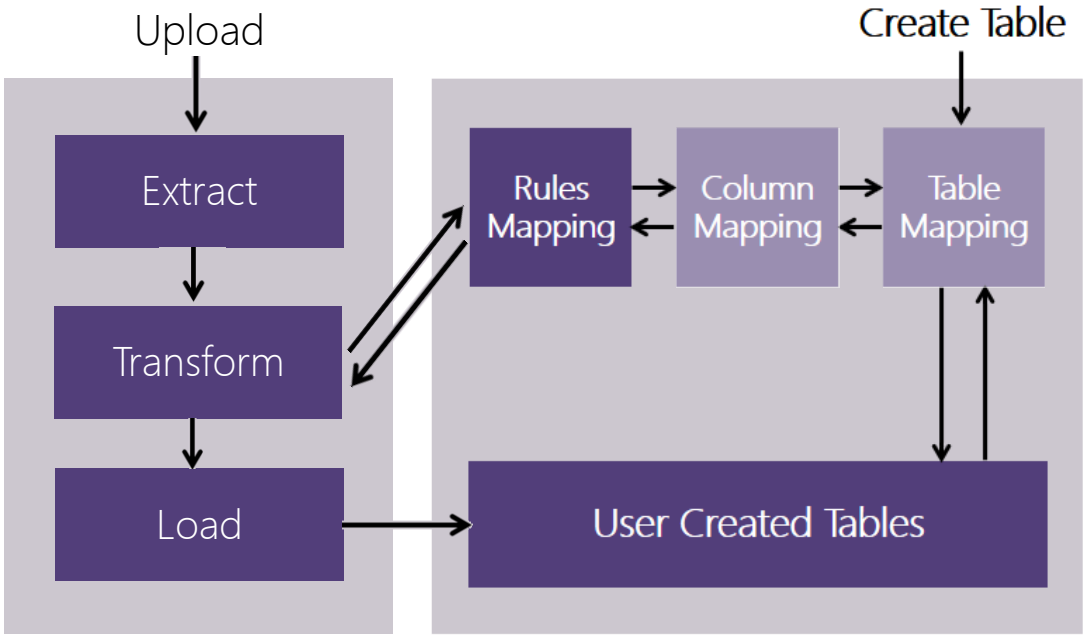
FRONT



BACK

Extract-Transform-Load (ETL)

provides logic to filter the source file, by fetching the information from "Table Mapping" table, and insert the right data to the selected table.



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3. Data Aggregation

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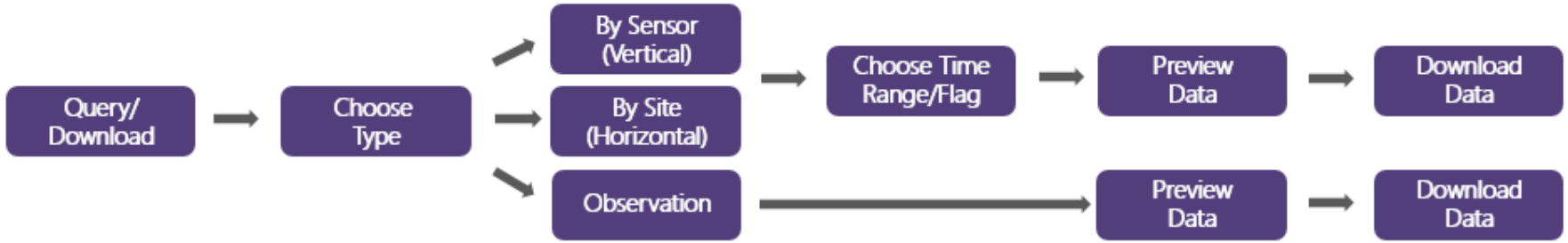
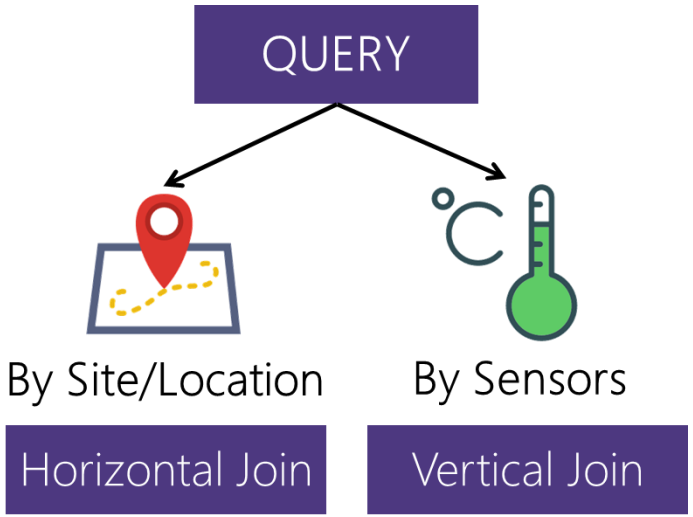
FRONT



BACK



Data Aggregation provides scalable joining logics which can handle the variability in the data.

- **Horizontal Join**: resolves differences in collection intervals for multiple sensors at the same site
- **Vertical Join:** provides a logic for joining differing data schemas from different sites or locations.

3. Data Aggregation – Horizontal Join

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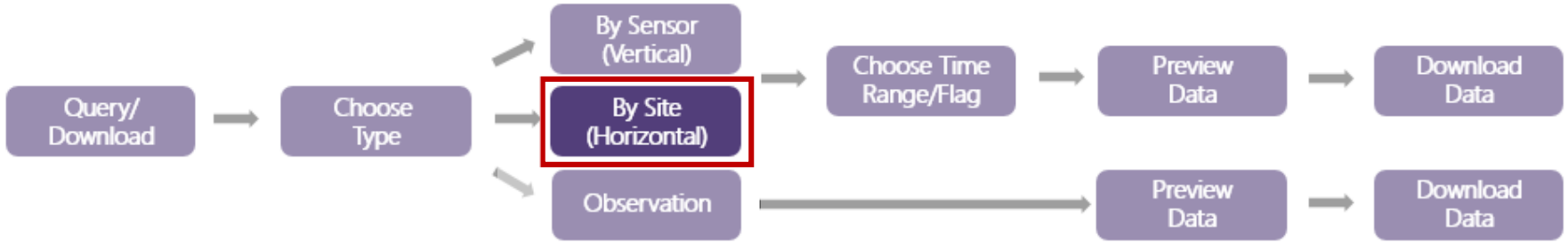

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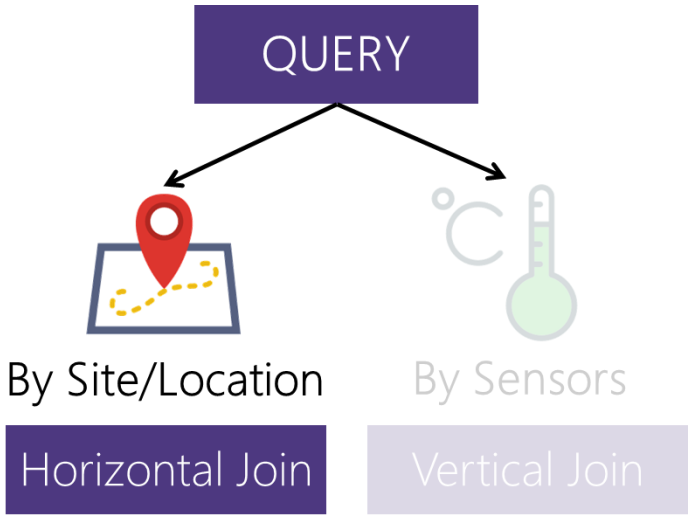

Example of join result from DO sensor and Temp sensor

Base Table (8 mins)

Time	DO
11/21/2015 0:08	430.82
11/21/2015 0:16	431.19
11/21/2015 0:24	431.19

Join Table (15 mins)

Time	Temp
11/21/2015 0:11	6.727
11/21/2015 0:26	8.747
11/21/2015 0:41	6.767

Time	DO	Temp
11/21/2015 0:08	430.82	6.727
11/21/2015 0:16	431.19	-
11/21/2015 0:24	431.19	8.747

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3. Data Aggregation – Vertical

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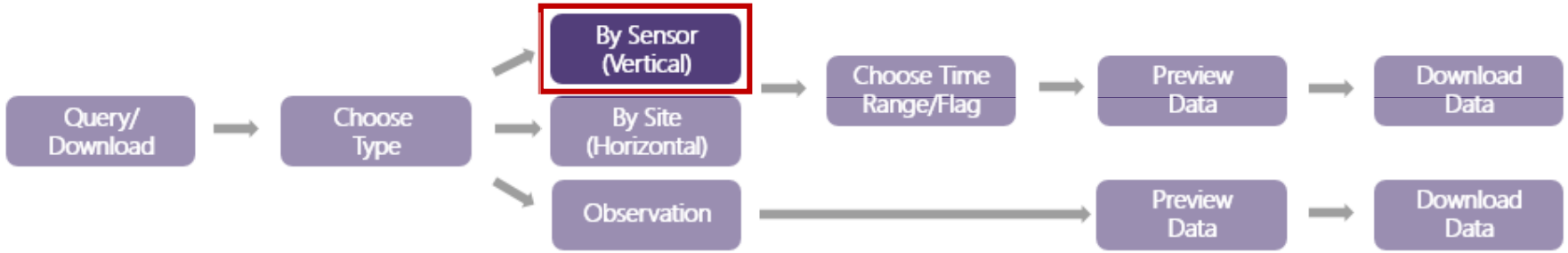
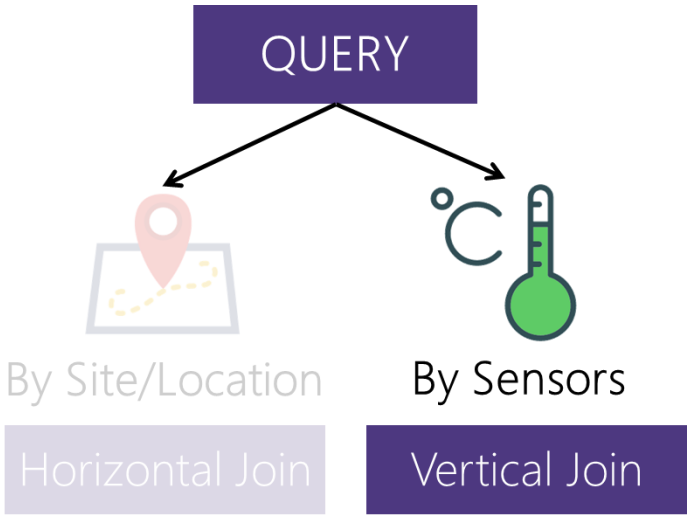


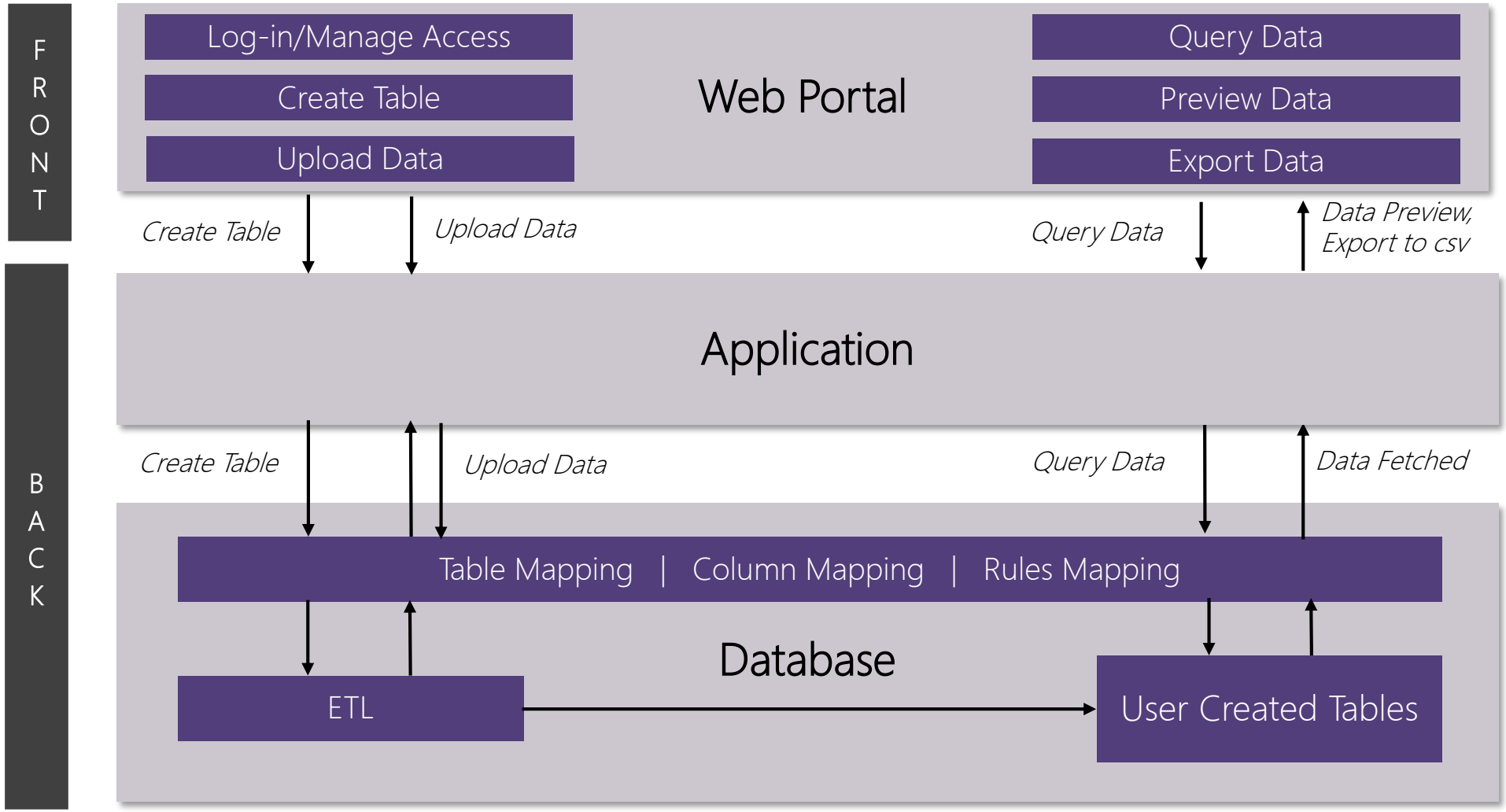
BACK



Example of join result from sites BRCR01 and BRCR02

Site	DO	Temp	Volt
BRCR01	421.25	7.527	-
BRCR01	418.16	8.347	-
BRCR01	419.49	6.467	-
BRCR01	425.32	6.788	-
BRCR01	420.54	7.321	-
BRCR02	399.54	5.253	4.3
BRCR02	386.34	6.123	4.4
BRCR02	401.67	5.795	4.3
BRCR02	396.79	5.367	4.4
BRCR02	370.55	6.032	4.5

System Diagram



Demonstration

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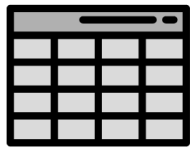
LOG-IN AND MANAGE ACCESS

- ✓ User **click create table**, the page **redirects to log-in** page
- ✓ User **log-in** using the incorrect and correct username and password
- ✓ User admin **add and delete access** to the student

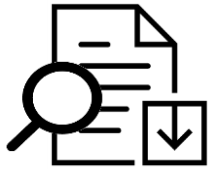


CREATE TABLE

- ✓ User **creates** table with **.txt file format** under **new** sensor type "DO_TEST"
- ✓ User **creates** table with **.txt file format** under **existing** sensor type "DO_TEST"
- ✓ User **creates** table with **.csv file format** under **new** sensor type "CON_TEST"

UPLOAD

- ✓ User **uploads** data from **Site 1** to the table under sensor type "DO_TEST" just created
- ✓ User **uploads** data from **Site 2** to the table under sensor type "DO_TEST" just created
- ✓ User **uploads observation data** to the existing form



QUERY/DOWNLOAD

- ✓ User **queries/downloads** the data **from 2 sites** under sensor type "DO_TEST"
- ✓ User **queries/downloads** the data **from different sensors** from Site 1
- ✓ User **queries/downloads** the data **from Observation Form**

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DOCUMENTATION

Documentation

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Limited Technical Resource

Technical Specification

- ✓ Introduction
- ✓ Functionality
- ✓ Architecture
- ✓ Design
- ✓ Code

User Manual

- ✓ Introduction
- ✓ Site Map
- ✓ Authorization & Authentication
- ✓ Create Table
- ✓ Upload
- ✓ Download

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CHALLENGES & FUTURE WORK

Challenges

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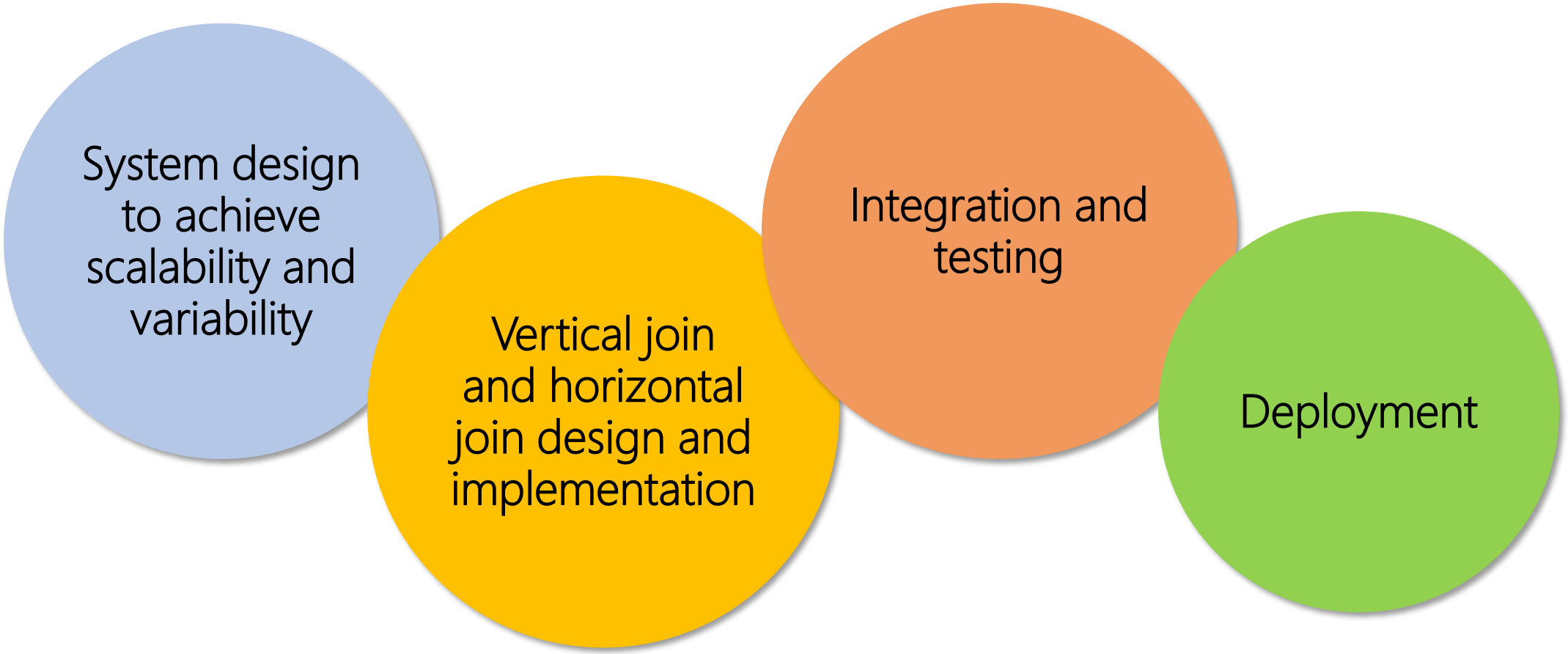
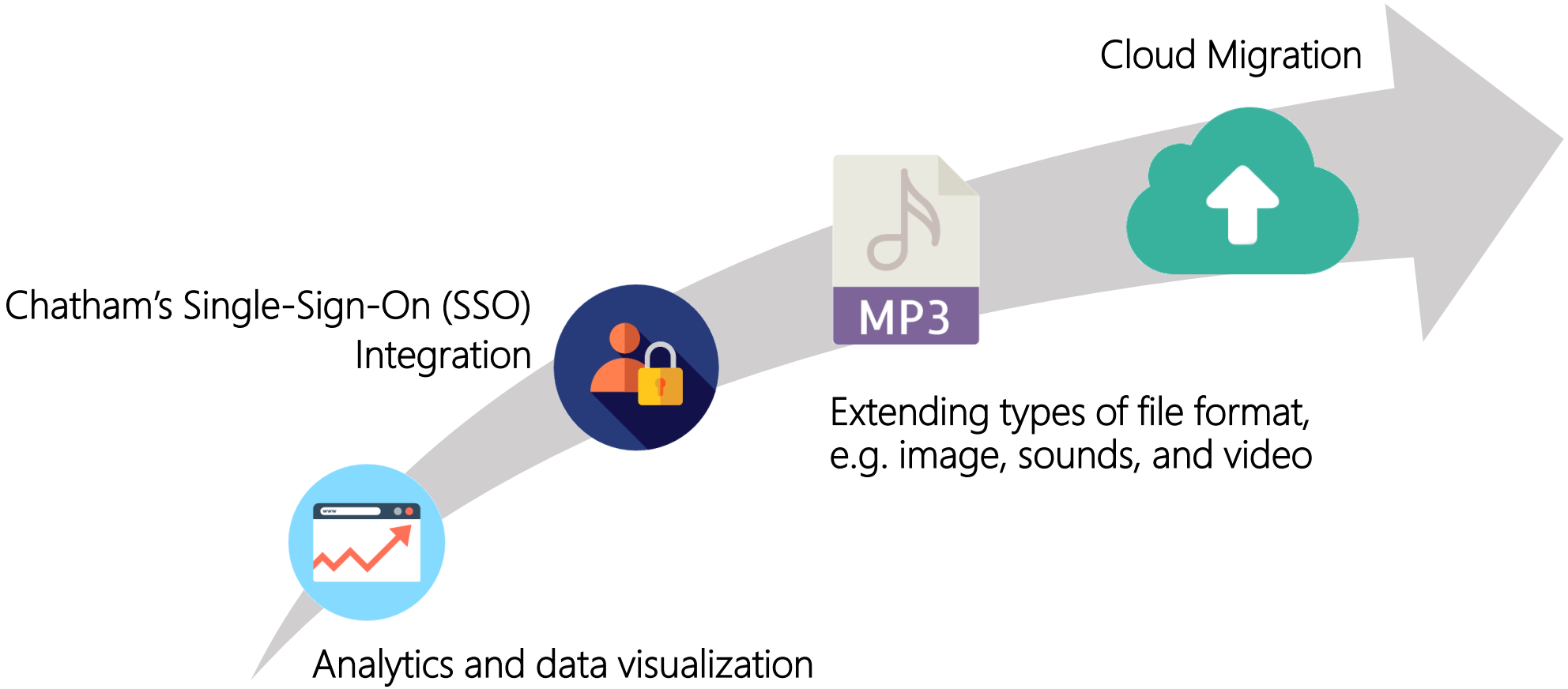


Future Work/Recommendations



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Thank You

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