System Functions Definition Record (SyFD)

Cadence

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Introduction

This section introduces the System Functions Definition Record (SyFD) for Cadence. It discusses the purpose, scope and content of the document and provides an overview of the functionality that is addressed by the operations.

1.1 Purpose

The purpose of this project is to develop a toolset for rapid feedback to customers on IoT solution performance. The system will bring unique structure to identifying what is normal or abnormal for certain events that may occur as well as what system components cause those events.

The purpose of this document is to provide the system functions for Cadence along with a context to help the reader understand them.

1.2 Scope

The document addresses the system functions for the full scope of the Cadence project.

1.2.1 Assumptions

The following assumptions pertain to the contents of this document in general and to the requirements specifically:

- Resources:
    - Utilized programs such as PowerBI and ELK Stack will be accessible to the team, clients, and customers
    - Team members and the client will both allocate time towards the project each week
    - Dr. Bae, the advising professor, will be available to the team as requested
- Budget:
    - Project costs will stay the same as initially budgeted costs
    - Training will be conducted internally with no additional training costs incurred
- Scope of Delivery:
    - The scope of the project will not change once the stakeholders sign off on the scope statement (unless later signed off by the team members, client, and advising professor on a requirement update).
- Scheduling:
    - Tasking will be given with a reasonable amount of time for teammates to complete the assigned tasks
    - Tasking will be communicated well or fleshed out if not communicated well

- Tasking is not set and stone and will by dynamic based on the team members desire to change the scope of the task

1.3 References

This section lists the sources that were utilized during the refinement of the Cadence operations definition. It consists of two sub-sections, “Compliance” and “Guidance”. The documents listed under “Compliance” directly influenced the content of the system operations the documents listed under “Guidance” contain information pertinent to the system requirements but do not themselves contain requirements.

1.3.1 Compliance

1.3.1-1. Mission Statement.txt

1.3.1-2. Cadence arch concept.pdf

1.3.1-3. Cadence requirements, private.txt

1.3.1-4. Cadence requirements, public.txt

1.3.1-5. Engineering Capstone Project Form LU Engineering v3 notes markups.docx

1.3.1-6. Cadence Operations Flow Chart.vsdx

1.3.2 Guidance

1.3.2-1. *IEEE 1856-2017 - IEEE Standard Framework for Prognostics and Health Management of Electronic Systems* https://ieeexplore.ieee.org/document/8227036

1.3.2-2. *JA6268_201804 - Design & Run-Time Information Exchange for Health-Ready Components JA6268_201804* https://www.sae.org/standards/content/ja6268_201804/

1.3.2-3. ENGR 481 Syllabus

2 Business Abstract

This section introduces the Cadence project and describes its business context.

2.3 Business Purpose

The mission statement of the Cadence project is to develop a toolset for rapid feedback to customers on IoT solution performance. The main stakeholder organization is Essential IoT, LCC whose main goals are to increase the attractiveness of the company, establish a relationship with Liberty University for future projects, and to be a mentor to future Christian engineers.

2.4 Stakeholders

The Stakeholders that are relevant to the Cadence requirements are specified in Table 1.

Table 1: Stakeholders – Organizations

Organization	Type	Main Interests	Impact of Project
Essential IoT, LCC	Primary	Expand attractiveness of the company/Build a relationship with Liberty University for future work/Mentor future Christian engineers	Successfully increasing attractiveness of company/Establishing a good relationship with Liberty University in order to mentor future Christian engineers
Liberty University	Secondary	Successfully teach students how to work as a team to be “Creationeers”/Build a professional relationship with Essential IoT	The reputation of Liberty University will be increased

3 System Abstract

This section introduces the Cadence project and describes its system context.

1.3 System Purpose

The system is being developed in order to provide rapid feedback to customers on IoT solution performance. The customer will be able to understand what is “normal” for the various component events in their IoT structure. This information will be contained in a structured and well-documented configuration file that is generated by the system. The system will also provide the customer with more enlightening reports on observations and deviations of components within their IoT structure.

1.4 System Overview

1.4.1 System Context

The system will ingest data from three main sources: log input, carrier connection reports (csv format), and other reports (csv format). This data will then be formatted appropriately and recorded. The data then goes to the log shipper abstraction layer where it is followed by the visualization layer to allow the customer to easily understand the health and performance of their IoT devices and components. A more detailed depiction of the system architecture and data flow can be seen in the attached pdf below.

Cadence arch concept.pdf

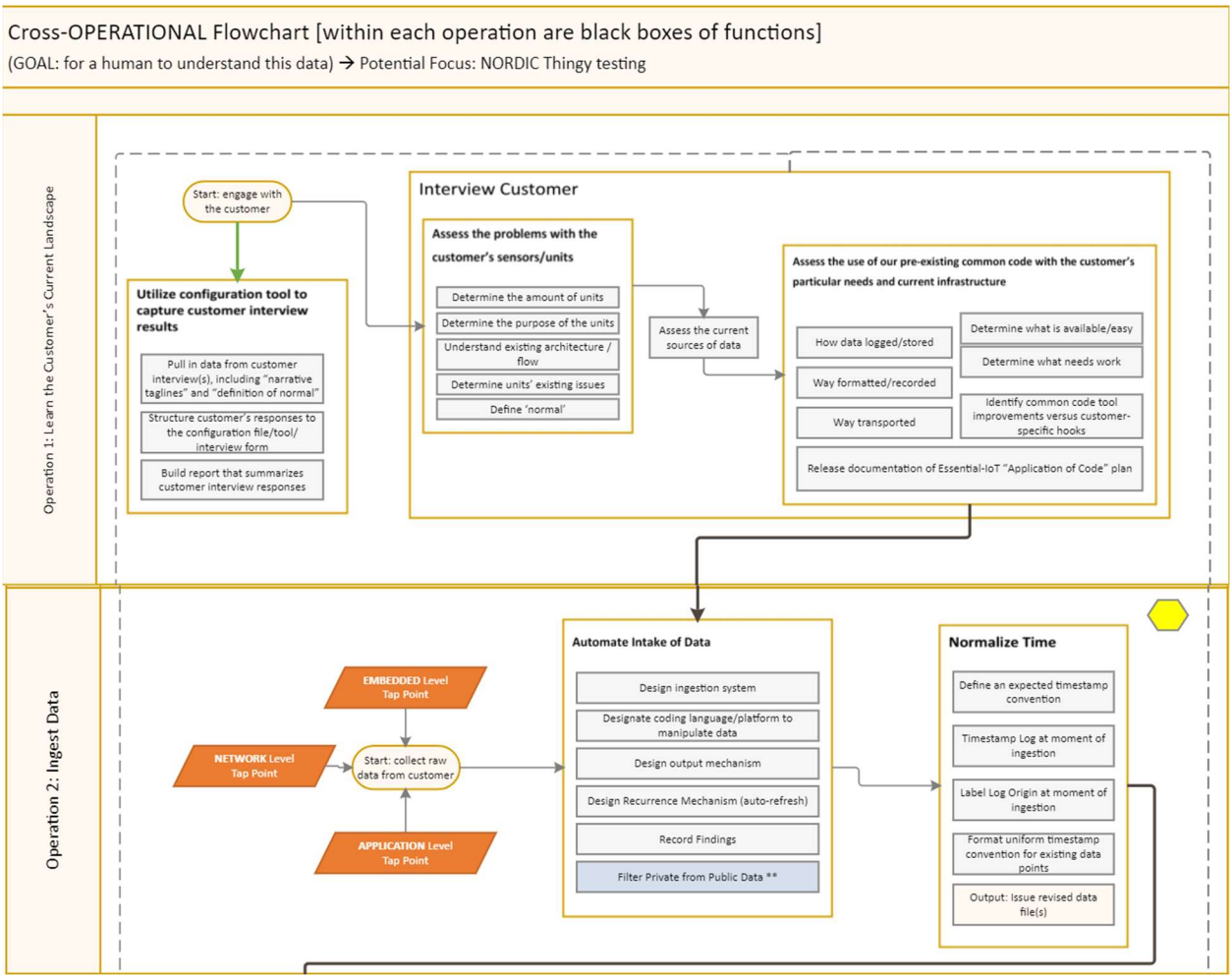
↑ double-click to open ↑

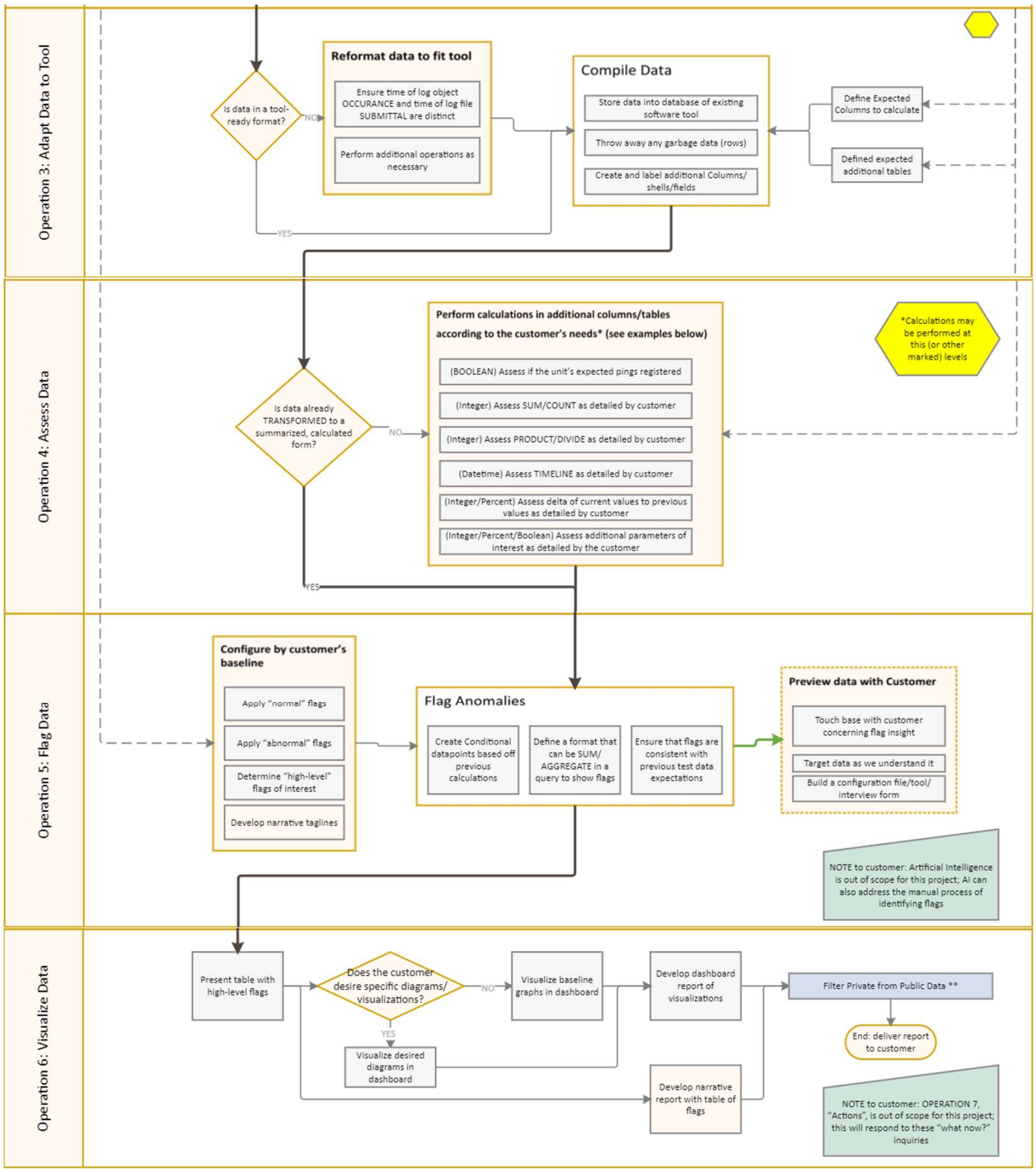
4 System Functions

This section describes how the Cadence system functions are organized and provides access to the system functions via an embedded Microsoft Excel object.

1.5 Functions

In order to better organize and visualize the Cadence system functions, the team decided to create a flowchart in Microsoft Visio. This flowchart has six different "swim lanes" that correspond to each system operation. Within each "swim lane" are all of the corresponding system functions. This flowchart can be seen below:




Operation 3: Adapt Data to Tool
Is data in a tool-ready format?
NO
YES
Reformat data to fit tool
Ensure time of log object OCCURANCE and time of log file SUBMITTAL are distinct
Perform additional operations as necessary
Compile Data
Store data into database of existing software tool
Throw away any garbage data (rows)
Create and label additional Columns/ shells/fields
Define Expected Columns to calculate
Defined expected additional tables
Operation 4: Assess Data
Is data already TRANSFORMED to a summarized, calculated form?
NO
YES
Perform calculations in additional columns/tables according to the customer's needs* (see examples below)
(BOOLEAN) Assess if the unit's expected pings registered
(Integer) Assess SUM/COUNT as detailed by customer
(Integer) Assess PRODUCT/DIVIDE as detailed by customer
(Datetime) Assess TIMELINE as detailed by customer
(Integer/Percent) Assess delta of current values to previous values as detailed by customer
(Integer/Percent/Boolean) Assess additional parameters of interest as detailed by the customer
*Calculations may be performed at this (or other marked) levels
Operation 5: Flag Data
Configure by customer's baseline
Apply "normal" flags
Apply "abnormal" flags
Determine "high-level" flags of interest
Develop narrative taglines
Flag Anomalies
Create Conditional datapoints based off previous calculations
Define a format that can be SUM/ AGGREGATE in a query to show flags
Ensure that flags are consistent with previous test data expectations
Preview data with Customer
Touch base with customer concerning flag insight
Target data as we understand it
Build a configuration file/tool/ interview form
NOTE to customer: Artificial Intelligence is out of scope for this project; AI can also address the manual process of identifying flags
Operation 6: Visualize Data
Present table with high-level flags
Does the customer desire specific diagrams/ visualizations?
NO
YES
Visualize baseline graphs in dashboard
Visualize desired diagrams in dashboard
Develop dashboard report of visualizations
Develop narrative report with table of flags
Filter Private from Public Data **
End: deliver report to customer
NOTE to customer: OPERATION 7, "Actions", is out of scope for this project; this will respond to these "what now?" inquiries

The Cadence system operations are maintained in a Microsoft Excel spreadsheet that is embedded in this document. To view the contents of this Microsoft Excel spreadsheet, double-click the following icon.

Functions%20Domain
.xlsx

↑ *double-click to open* ↑

The columns in the system functions worksheet are defined as follows:

- WBS

  A unique identifier for each requirement.

- Nickname

  A short name (3-5 words) for the requirement.

- Name

  A longer, more descriptive name for the requirement.

- Description

  A longer, more in depth description of the requirement.

- Rationale

  Explains the reasoning for why the requirement is needed.

- Originator

  The stakeholder that specified the requirement.

- Corresponding Operation

  The operations that are related to the function.

- Corresponding R.2.1 Requirements

  The “Build a Set of Tools” system requirement that the system operation corresponds with.

- Corresponding R.1.2 Requirements

  The “Combine Metric Data” system requirement that the system operation corresponds with.