
AP Analytica

Access Point Analytics Software Requirements Specification

Version 1.2

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Software Requirements Specification	Date: 4/11/2020

Revision History

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		First Draft section 4	
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Software Requirements Specification

1. Introduction

1.1 Purpose

This document contains the functional and nonfunctional requirements for release 1.0 of the Access Point Analytics management site. This document is intended for TCU Network Services users to fully utilize the system. An additional User Manual and Developer's Manual will be released and should be referred to for all further functionality and development needs, respectively. Unless otherwise noted, all requirements specified here are committed for release 1.0.

1.2 Intended Audience and Reading Suggestions

- TCU Network Services users who want more information about the design and behavior of the system
- Database Administrators who want to know more about how the user interfaces with the system without needing access to the UI itself
- Software development teams who intend to implement new features/refactor code and need to know about original design requirements

1.3 Product Scope

The TCU Network Services Department currently utilizes Cisco Prime to manage the 3,200+ wireless access points campus-wide. Cisco Prime is primarily used to consolidate network data from wireless controllers, visualize data, and run reports. However, the provided visualizations are not all encompassing, and the reports are neither intuitive to generate nor simple to analyze. In turn, the current process leads to longer response times and remedies for network issues. The answer to this problem is to create an automated solution that will routinely fetch Cisco Prime reports, analyze the data and create specific key performance indicators (KPIs), and aggregate and display the data through a web-application.

1.4 Definitions, Acronyms, and Abbreviations

See Glossary provided as a separate document for all project definitions.

1.5 References

Glossary:

<https://drive.google.com/open?id=1Gei7OouYNgt6AkryCEMw2jo0FsC0MPde>

Software Development Plan:

<https://drive.google.com/open?id=10chPZWY3lDF43PLXKTzdzwnCVyEJI-F>

System Architecture:

<https://drive.google.com/open?id=1dp36CUzih3lYImoflS4aTsPCO5-LX1lz>

Vision Document:

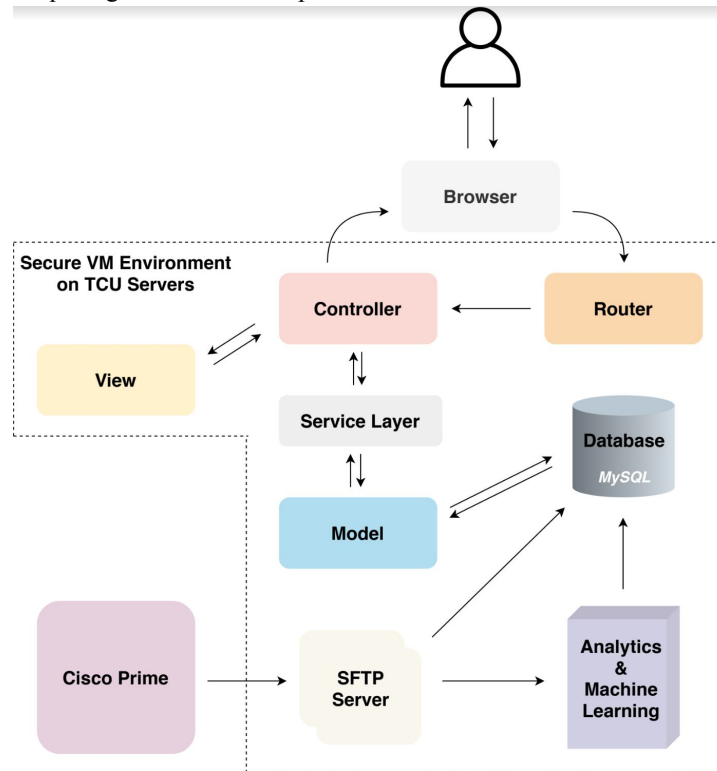
https://drive.google.com/open?id=1IEw6DaiEjMlJYm6in_E0cW4Gy08cx7q

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2. Overall Description

2.1 Product Perspective

This system is an independent system that takes reports from Cisco Prime Infrastructure via a one-way SFTP transfer of CSV files. The data import process populates the database, then that model/service layer of the web-application acts as the middle-man and pulls and aggregates data for display by the front-end. The system can only be viewed by approved workstations located in the Pond Data Center Office in the Faculty/Staff VLAN. The system is further protected by a user system requiring a username and password for access.



2.2 User Classes and Characteristics

User Class	Description
TCU Network Services user	A TCU Network Services user has a user account registered with the system and has access to the view. They do not have access to the backend.
Database Administrator	A Database Administrator has access to the database and not the view. Access to the database is for maintenance purposes.

2.3 Operating Environment

Officially Supported Specs:

- Web Server: Microsoft IIS & Kestrel
- OS: Windows Server 2016
- Browser: Google Chrome, Firefox

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2.4 Design and Implementation Constraints

- The system must be build in C# and utilize the .NET Core Framework
- The system must have all dependencies packaged so no internet connection is required
- The database chosen must be MySQL or Microsoft SQL Server (MySQL chosen)

2.5 Assumptions and Dependencies

- Cisco Prime Infrastructure must send reports regularly for the data to be populated in the system
- SFTP port 22 must be open to one way traffic from Cisco Prime Infrastructure to this system to allow for reports to be sent to this system
- A pre-existing user must be created in the database for initial set-up
- HTML port 80 must be accessible from approved workstations

3. Specific Requirements

3.1 Use Case 1: Accessing the Analytics Dashboard

Brief Description:

Accessing to the analytics dashboard will be the primary activity for all users. This dashboard will act as the main view when a user accesses the web application and will display summaries of the data analysis, and top ten KPI views.

Primary Actor: All TCU IT Network Engineers with access to the application.

Level: User Goals

Stakeholders and Interests:

- Craig Baugh: The primary user of this web-application, TCU Network Engineer, listed the KPI's for us to analyze.
- Tony Flemming: Head of network services; not a primary user, but still an important client.
- TCU Network Engineers: Able to use the web-application, view the KPI's when desired.

Preconditions:

- Employee of the TCU I.T. Department with access to the port that the web application is hosted on.
- User is logged in.
- Current data snapshot is preprocessed and analyzed.

Postconditions:

- The user will have knowledge of the current Top 10 KPIs, the date range of the data presented, the input reports, and where they can access further analysis if they so wish.

Trigger:

The user indicates they would like to access the system to view the current snapshot of the network analytics.

Main Success Scenario:

1. The user indicates they want to view the summary of the snapshot of the current data landscape.
2. The system presents the summaries on load.

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3. The user navigates to the web application.
4. Once granted access, the user is free to study at the presented data visualizations and summaries.
5. The system has displayed all of the viable and useful information to the user.
6. The user analyzes the summaries and decides to get more information on a particular KPI.
7. The system allows the user to navigate to a specific KPI page that will hold more detailed information.

Extensions:

- 1a. The snapshot will be predefined and preprocessed, as this is not a live feed. The user will define the snapshot period/dataset they would like to see.
 - 1aa. The user can adjust the snapshot data range by time and respective filter options.
- 3a. The system cannot be accessed if the user doesn't have their IP whitelisted/authorized for the port the web application is running on.
- 6a. The user is satisfied with the summaries, and there is no need to continue further.
- 7a. The user can access more detailed KPI information.

Priority:

This use case is the end goal, and will likely be the last accomplished. Each KPI must be analyzed and have their respective page. That being said, this is the highest priority, because this is the primary feature the client has requested.

Secondary Actors: System

Special Requirements:

1. The webpage will only be accessible from a specified subnet for confidentiality purposes.
2. Potential to edit the different summaries (ignore certain devices, etc.), customize the KPIs being shown, graph views and table views

Open Issues: None

3.2 Use Case 2: Accessing a KPI Page

Brief Description:

After checking the Top 10 Dashboard, the user finds out a deadzone or some AP's with fluctuation in TX Power Levels, or any other noticeable entry for a KPI on the dashboard. The user will then use the navigation bar to click on the KPI page where the access point of interest resides. From this page, the user can view more records, a more in depth table, view visualization comparisons, or navigate to a page with all information about the access point for the KPIs that have details page.

Primary Actor: All TCU IT Network Engineers with access to the application.

Level: User Goals

Stakeholders and Interests:

- Craig Baugh
- Tony Flemming

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- TCU IT Network Engineers with permission.

Preconditions:

- Employee of the TCU IT Department with access to the port that the web application is hosted on.

Postconditions:

- The user will gather more detailed information and comparisons from the KPI page, or details page where applicable.

Trigger:

The user is checking the Top 10 KPIs dashboard and sees an entry they'd like more information on, or they want to check the status of a KPI with information beyond the dashboard.

Main Success Scenario:

1. The user check the Top 10 KPIs dashboard to check the summary of the current data landscape
2. The user sees the entry on the dashboard.
3. The user navigates to the specific KPI page.
4. The system responds to the user with more information about the KPI.
5. The system allows the user to search for the specific entry.
6. The system shows the user all of the information regarding that specific entry.

Extensions:

- 3a. Some KPIs have details pages, which will have a direct link on the dashboard to view more information
- 6a. This may exist in the current table, or the KPI details page mentioned in 3a.

Priority: High priority

Secondary Actors: The system.

Special Requirements: None

Open Issues: None

3.3 Use Case 3: Login

Brief Description:

User goes to the website and lands on a login page. The user is always redirected to this login page if they are not logged into the system. They are prompted for their username and password. If the credentials are correct, they are logged in and can navigate freely.

Primary Actor: All TCU Network Services employees

Level: User Goals

Stakeholders and Interests:

- Craig Baugh
- Tony Flemming
- TCU IT Network Engineers with permission.

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Preconditions:

- Employee of the TCU IT Department with access to the port that the web application is hosted on.
- User is not already logged into a session.

Postconditions:

- The user is allowed access to all pages allocated to the user.

Trigger:

User tries to navigate to any page on the website without already being logged into a session.

Main Success Scenario:

1. User navigates to the system and is not already in a session.
2. System brings the user to the login page regardless of the path indicated and is prompted for username and password.
3. User enters their username and password.
4. System loads the homepage or path specified in the URL.

Extensions:

- 4a. If credentials are incorrect, system prompts again for username and password.

Priority: High

Secondary Actors: System

Special Requirements: Password will not be transmitted or stored in plain-text.

Open Issues: None

3.4 **Use Case 4: Logout**

Brief Description:

The User clicks “Logout” and their session is terminated and the user must go through the Login Case #3 to use the application again.

Primary Actor: All TCU Network Services employees

Level: User Goals

Stakeholders and Interests:

- Craig Baugh
- Tony Flemming
- TCU IT Network Engineers with permission.

Preconditions:

- User is logged in and no longer wants to be logged in.

Postconditions:

- User is logged out and session is terminated

Trigger: The user indicates they are done using the web application.

Main Success Scenario:

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1. User is done using the web application
2. User clicks logout button
3. System logs the user out and invalidates the session
4. System redirects to the login page

Priority: High

Secondary Actors: Not possible, all actors will have the same role level and access.

Special Requirements: None

Extension: None

Open Issues: None

3.5 Use Case 5: User Settings

Brief Description:

User is logged into the system. When the User enters the User Settings page there are several areas to change the functionality of the program.

Primary Actor: All TCU Network Services employees

Level: User Goals

Stakeholders and Interests:

- Craig Baugh
- Tony Flemming
- TCU IT Network Engineers with permission.

Preconditions:

- User is logged into a session.

Postconditions:

- The changes made on the User Settings page are reflected back onto the website.

Trigger: User changes a setting on the User Settings Page.

Main Success Scenario:

1. User is logged in and navigates to User Settings Page
2. System brings the user to the User Settings page
3. Users are allowed to change their passwords
4. System loads the User Settings that the User has changed.
5. User is able to go back to the home page and see the settings changed.

Extensions:

- 4a. If credentials are wrong for the Password change and Verification then the System will ask again.

Priority: Low

Secondary Actors: System

Special Requirements: None

Open Issues: None

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3.6 Use Case 6: User Management

Brief Description:

When the Admin enters the User Management page there are several areas to change the functionality of the program for the different users, such as adding or deleting users.

Primary Actor: Network Services Admins

Level: User Goals

Stakeholders and Interests:

- Craig Baugh
- Tony Flemming
- TCU IT Network Engineers with permission.

Preconditions:

- User Admin is logged into a session.

Postconditions:

- The changes made on the User Management page are reflected back onto the website as well as the User's pages.

Trigger: Admin requests changing a setting on the User Management Page.

Main Success Scenario:

1. Admin is logged in and navigates to User Management Page
2. System brings Admin to the User Management page.
3. Admin is allowed to change settings such as adding a user or deleting a user.
4. System loads the settings that the Admin has changed.

Extensions:

- 4a. If Admin tries to create a User with the same name. An error will be displayed.
- 4b. If Admin deletes a User that is currently logged in. Their session will be terminated.

Priority: Low

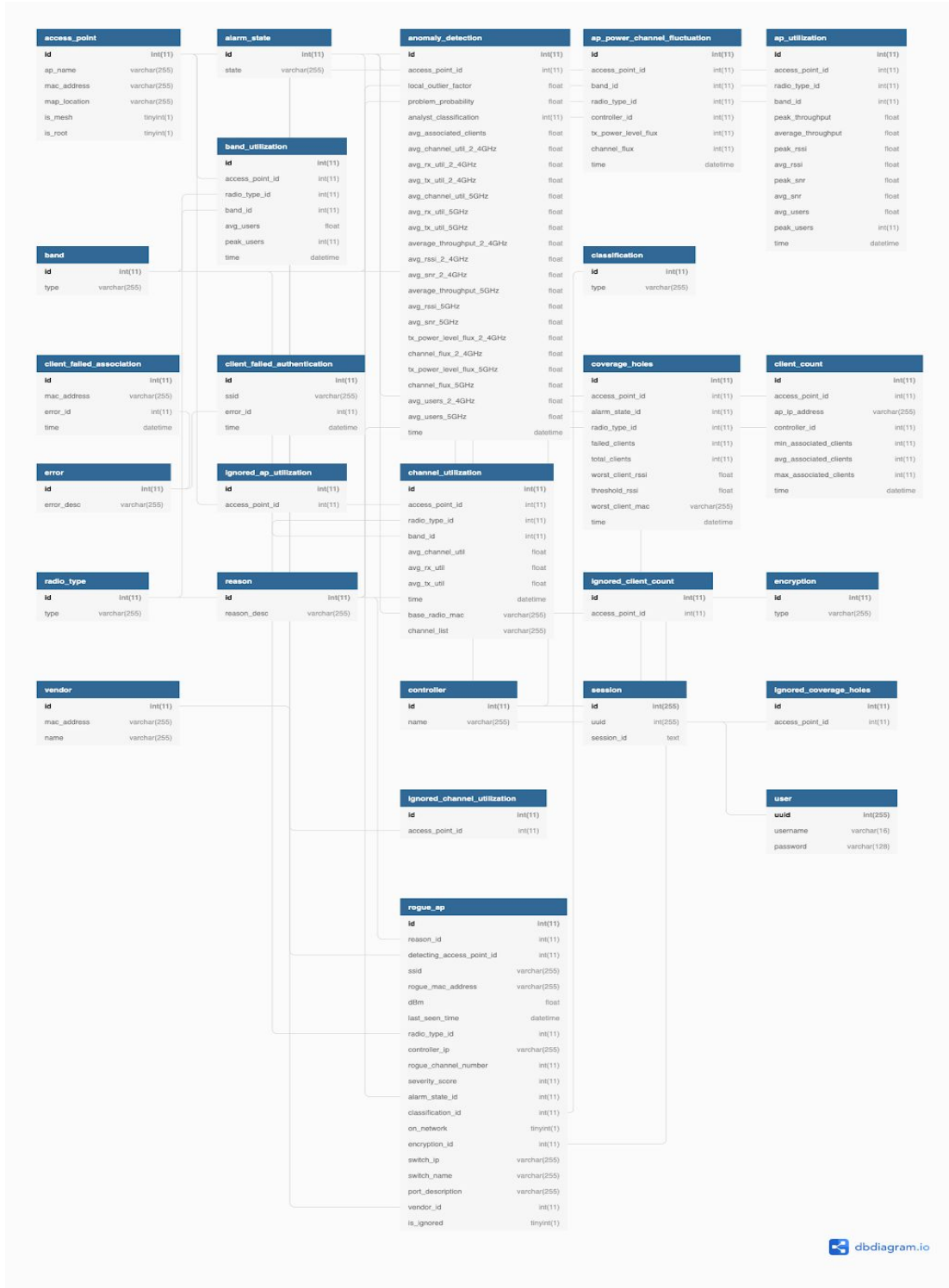
Secondary Actors: System

Special Requirements: None

Open Issues: None

4. Data Requirements

4.1 Logical Data Model



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4.2 Reports

The following columns are shown on each KPI page, and configurable by certain options:

Anomaly Detection

AP Name	Map Location	Local Outlier Factor	Problem Probability
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AP Utilization

AP Name	Radio Type	Avg Clients	Peak Throughput	Avg Throughput	Peak RSSI	Avg RSSI	Peak SNR	Avg SNR
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Options:

Aggregation by Time: Past Day, Past Week, Past Month

- Increasing the time frame will recalculate all of the respective peaks and averages for each column grouped by access point

Filtering by Access Point Band: 2.4 GHz, 5 GHz

Channel Utilization

AP Name	Radio Type	Channel #'s	Channel Util	RX Util	TX Util	Time
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Options:

Aggregation by Time: Past Day, Past Week, Past Month

- Increasing the time frame will recalculate all of the respective averages for each column grouped by access point

Filtering by Type of Access Point: Mesh, Wireless

Filtering by Access Point Band: 2.4 GHz, 5 GHz

Client Count

AP Name	AP IP Address	Average Associated Client	Maximum Associated Client	Time
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Aggregation by Time: Past Day, Past Week, Past Month

- Increasing the time frame will recalculate all of the respective peaks and averages for each column grouped by access point

Coverage Holes

Time Last Seen	State	AP Name	Radio Type	Failed Clients	Total Clients	Worst Client RSSI	Threshold RSSI
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Filtering by Time: Past Day, Past Week, Past Month

- This is different from aggregation, since the recurrence of a coverage hole is significant; therefore, these filters show all entries within the selected timeframe, there is no aggregation done.
- “-OUT” or outside access points are filtered out of this table.

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Power/Channel Fluctuation

AP Name	TX Power Level Flux	Channel Flux	Time
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Filtering by Time: Past Day, Past Week, Past Month

- This is different from aggregation, since the recurrence of a fluctuation is significant; therefore, these filters show all entries within the selected timeframe, there is no aggregation done.

Filtering by Access Point Band: 2.4 GHz, 5 GHz

Rogue APs

Reason	SSID	MAC Address	Detecting AP	Location	Time Last Seen	State	Ignore
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Filtering by Time: Past Day, Past Week, Past Month

- This is different from aggregation, since the recurrence of a rogue access point is significant; therefore, these filters show all entries within the selected timeframe, there is no aggregation done.

4.3 Data Acquisition, Integrity, Retention, and Disposal

- Data is received in the form of CSV reports sent from Cisco Prime Infrastructure via SFTP.
- Reports are imported by their own respective ingestion scripts that run on a schedule.
- Records older than a month are deleted by a schedule run script.
- CSV files that have been ingested are moved to the ‘archived’ subdirectory.

5. External Interface Requirements

5.1 User Interfaces

- The user is able to use the Access Point Analytics web application when they have an account registered to the TCU IT Department and a connection to the TCU IT network.
- After logging in, the user will be landed at a home page with a top 10 KPI dashboard. Each dashboard has a dropdown menu that the user can choose which KPI to view on that dashboard.
- A navigation bar appears on every screen of the user interface. The navigation bar includes links to the home page, the KPI pages, and user management settings.
- When a user is logged in, the login button will be displayed as a user profile link with dropdown options to go to their profile, edit their profile, and log out.
- Users can also access each individual KPI page via the navigation bar. These pages include configurable tables, graphs, and descriptions of the information.
 - Some KPI pages include details pages. Navigating to these details pages is done by clicking on entries that have links, and then more information will be displayed on these pages.

5.2 Software Interfaces

SI-1: *User Management System*

SI-1.1: If there are no existing accounts. An account must be manually added by the administrator via database interaction.

SI-1.2: Administrators can create a new account using the User Management page.

SI-1.3: Users can change their password by navigating to the User Settings page.

SI-1.3: Administrators can delete users in the system by navigating to the User

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Management page.

SI-1.4: Without a valid user and a respective session, users will not be able to access the system.

SI-2: *Database System*

SI-2.1: The application stores data in the local MySQL instance.

SI-2.2: Data is imported from CSVs sent to the system as seen in CI-1, below. These CSV are imported in scripts that run multiple times per day.

SI-3: *KPI / Data Visualization System*

The following responsibilities apply across all KPIs presented in the application:

SI-3.1: Responsible for displaying aggregated data to the user in the form of a table

SI-3.2: Responsible for displaying aggregated data to the user in the form of a graph

SI-3.3: Responsible for allowing configuration via searching, filtering, ignoring, and selection for both graphs and tables.

SI-3.4: If applicable, the system will generate details pages for each entry to provide further information for analysis.

5.3 **Hardware Interfaces**

There are no hardware interfaces in this project.

5.4 **Communications Interfaces**

CI-1: *Sending/Receiving Data for Ingestion*

CI-1.1: The web application receives reports from the Cisco Prime System defined in the Cisco Prime .xml configuration. These CSV files are configured to send via SFTP.

6. **Quality Attributes**

USE-1: Experienced users should not have to take more than 5 actions after logging in to retrieve the information they want.

6.1 **Usability**

Training Times:

- The training time of a normal user should be around 5 minutes to learn the functionalities and the different views of the KPI's
- The training time of a power user should take around 1 hour to explain things such as the user management settings, the database implementation, and turning the web app back online.

Estimated Workflows (with confirmation):

- Login to the system to view the dashboard: 10 seconds
- Change password and login: 1 minute
- Logout of the system: 3 seconds
- Open and load up one of the seven KPI pages: 25 seconds
- Navigate to a specific entries details page: 2 seconds
- Add an entry to the ignore table: 2 seconds
- Find and ignore/unignore an entry from the ignore table: 30 seconds
- Change a card on the dashboard: 5 seconds
- View graph mode on dashboard: 5 seconds
- Add a User: 30 seconds
- Delete a User: 5 seconds

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6.2 Reliability

- Availability:
 - 95% time available. Maintenance may be done as needed by TCU's Network department.
- Mean Time to Repair:
 - The system may be out of operation for any amount of time however it will not import the newest data if it is not running, ultimately resulting in less useful live data.
- Time to Restart:
 - Roughly 1 minute

6.3 Performance

- *View a KPI Page:*
The user should wait on average five seconds before the table is displayed, but on larger data KPI's allow the system to take up to a few minutes to properly aggregate the records. The larger KPI's like AP Utilization may take up to 750 pages of entries. Searching for specific values in the search table should take less than 15 seconds.
- *View Top 10 Dashboard Graphs:*
Viewing the dashboard and changing a graph should take on average 5 seconds (only loading top 10 entries). At maximum allow for a leniency of 10 seconds. The table will only display 10 entries per table. If graph view is selected the graph should appear in five seconds or less.

6.4 Security

SEC-1: Users must be assigned accounts from the Admin of the system.

SEC-2: Users must be logged into the system with a valid session to do any operations.

SEC-3: The system is running locally at the TCU IT Department and blocks outside contact.

6.5 Safety

- *Loss / Damage / Harm*
 - Since we are generating the reports from CISCO Prime there is no possible damage/loss to the data. The only harm that can incur is if the Safety Regulations and Safeguards are not followed.
- *Safeguards:*
 - The product must only be accessible by those deemed credible by the Admin.
 - If an User is no longer needed in the system. Delete that user.
 - Logout after the user is no longer using the product.
- *Safety Regulations:*
 - Must only be accessible by Users of the system.
 - Must only be accessible by TCU IT department.