



ACCESS POINT ANALYTICS

A Data Aggregation Platform for TCU Network Services

THE TEAM



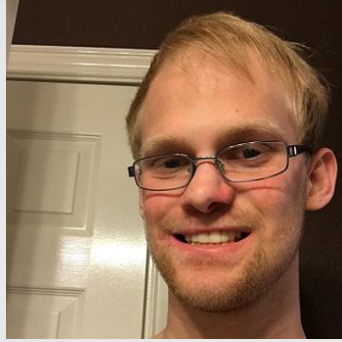
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INTRODUCTION & BACKGROUND

Access Points &
Key Performance Indicators

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THE PROJECT

Requirements & Vision

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THE SOLUTION

A High-Level View of the System

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01

Introduction & Background

Access Points and Key Performance Indicators

ACCESS POINTS



ACCESS POINTS

- +3,200 Access Points (APs) across the TCU campus
- Data Aggregated into Cisco Prime



THE CLIENTS & THE ISSUE



CRAIG BAUGH
TONY FLEMING

- Overwhelming Data in Cisco Prime
- Long Response & Remedy Times

OVERWHELMING DATA



KEY PERFORMANCE INDICATORS (KPIs)



**ANOMALY
DETECTION**



**ACCESS POINT
UTILIZATION**



**CHANNEL
UTILIZATION**



**CLIENT
COUNT**



**COVERAGE
HOLES**



**POWER/CHANNEL
UTILIZATION**



**ROGUE ACCESS
POINTS**



02

THE PROJECT

Requirements & Vision

REQUIREMENTS

USABILITY

All-In-One Dashboard
View

Customization

WEB APPLICATION

MAINTAINABLE

.NET Core based
Web Application
written in C#

FUNCTIONALITY

Isolated VM
Environment

Data Snapshots





THE VISION

Our platform aims to provide proactive and reactive insights to TCU Network Services that are summarized, and actionable. These snapshot insights will be extracted from the massive data stream collected by wireless Access Points all over TCU's campus, and then presented through an internal Web-Application Interface.





03

THE SOLUTION

A High-Level View of the System

SOLUTION FOCUSES



AUTOMATION

Automatically ingest, analyze, and clean data related to the KPIs on an adjustable schedule

Gather and filter pertinent information for each KPI, while simultaneously performing calculations in real-time to keep the data true and reusable

CONSOLIDATION



SIMPLIFICATION

Present the data to the user through information rich tables and clean data visualizations

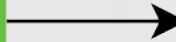
PROCESS OVERVIEW



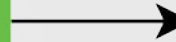
**CISCO
PRIME**



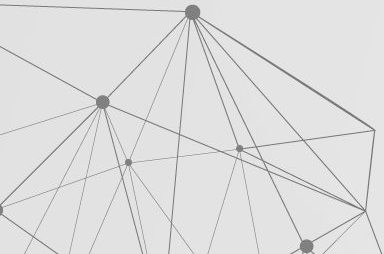
**SFTP
SERVER**



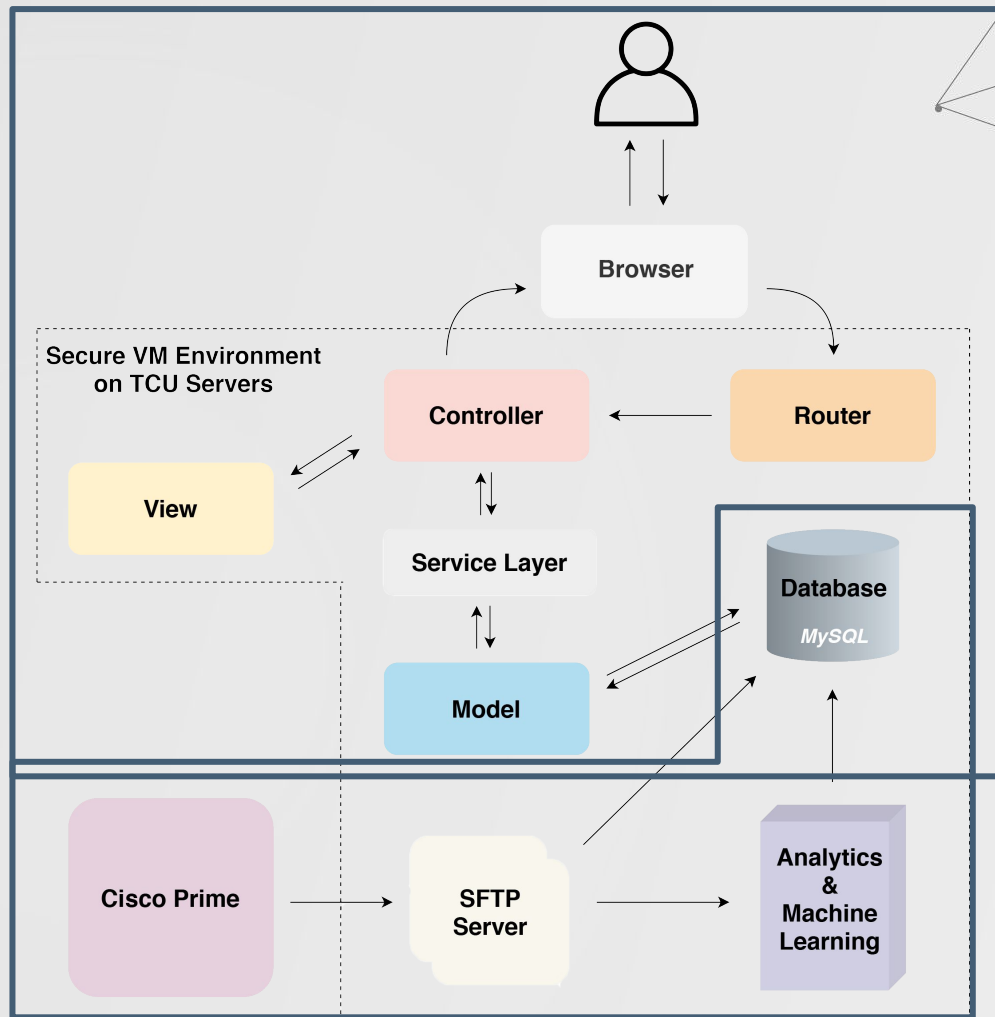
**DATA
ANALYSIS**



**WEB
APPLICATION**



SYSTEM ARCHITECTURE



TECHNOLOGY STACK



C#



.NET Core



Cisco Prime



GitLab



MySQL



JavaScript

04

PROJECT DEMO

The Web Application In Action

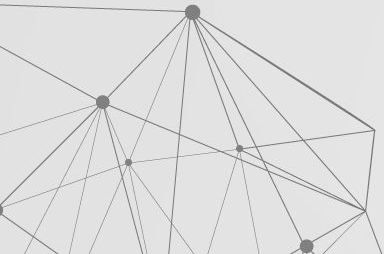


DEMO OUTLINE

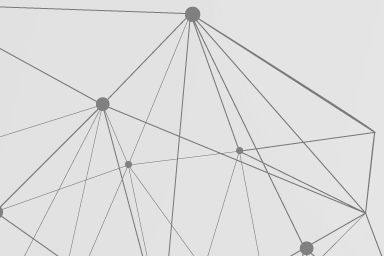
1 The Dashboard

2 The KPI Pages

3 The User System



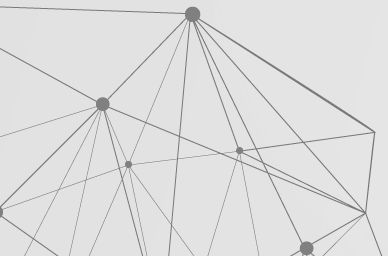
DEMO - DASHBOARD OVERVIEW

A login form for TCU NETWORKS. At the top is the logo 'TCU NETWORKS' in purple. Below it are two input fields: 'Username' and 'Password'. To the right of the 'Username' field is a small circular icon with a downward arrow. Below the input fields is a blue button labeled 'Login'.

DEMO - ANOMALY DETECTION



The screenshot shows a web browser window displaying a web application titled "Anomaly Detection". The browser's address bar shows a URL starting with "https://localhost:3000/". The application interface includes a search bar at the top right with the placeholder text "Search by IP Name". Below the search bar is a table with a blue header row containing the following columns: "IP Name", "Map Location", "Local Origin From", and "Percent Probability". The table body is currently empty. The browser's status bar at the bottom shows the time "10:40:40".



QUICK VIEW - ACCESS POINT UTILIZATION

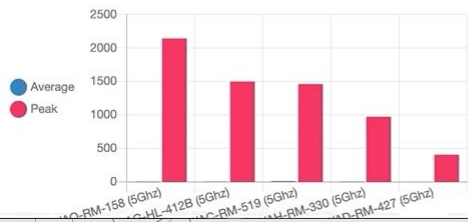
Access Point Utilization

🕒: Past Day 📶: 2.4 GHz 🔍 Search by AP Name..

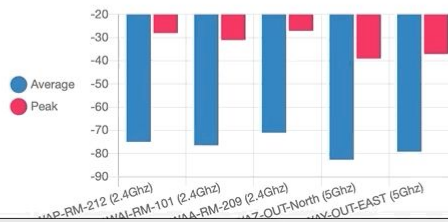
AP Name	Radio Type	Avg Clients	Peak Throughput	Avg Throughput	Peak RSSI	Avg RSSI	Peak SNR	Avg SNR	Ignore
MMA1WAC-HL-106	XOR (2.4GHz)	9.66	22.8	1.1400	-54	-70.6000	90	17.9000	🗑️
LUP2WAC-RM-205	XOR (2.4GHz)	8.01	0.11	0.0100	-36	-36.8500	61	58.1200	🗑️
PAL2WAD-RM-226	802.11b/g/n	7.22	4.29	0.0900	-31	-44.7600	65	47.8700	🗑️
SHE3WAI-RM-312	XOR (2.4GHz)	5.9	0.12	0.0300	-46	-58.9100	42	23.0000	🗑️
MON4WAC-RM-416	XOR (2.4GHz)	5.75	2.51	0.2100	-29	-39.7200	61	47.1800	🗑️
SWR4WAH-RM-420	XOR (2.4GHz)	4.56	0.31	0.0200	-48	-67.3300	40	24.6300	🗑️
LIB3WAF-HL-3141	802.11b/g/n	4.05	0.02	0.0100	-50	-53.7500	43	35.5000	🗑️
MUL2WAA-RM-210	XOR (2.4GHz)	3.98	0	0.0000	-55	-55.0000	39	37.0000	🗑️
LIB2WAI-RM-2230	802.11b/g/n	3.81	1.08	0.0500	-33	-51.9000	55	34.2300	🗑️
CLA3WAB-RM-312	XOR (2.4GHz)	3.73	0	0.0000	-54	-54.0000	36	36.0000	🗑️

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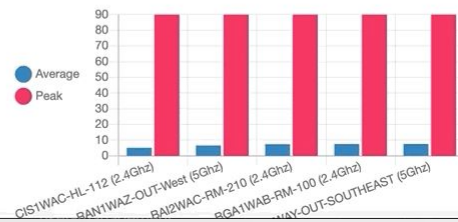
Top 5 Avg. vs. Max Throughput Differences



Top 5 Avg. vs. Max RSSI Differences



Top 5 Avg. vs. Max SNR Differences



QUICK VIEW - CHANNEL UTILIZATION

Channel Utilization

🕒: Past Day 📶: Wireless Access Points 📡: 2.4 GHz 🔍 Search Channel Utilization...

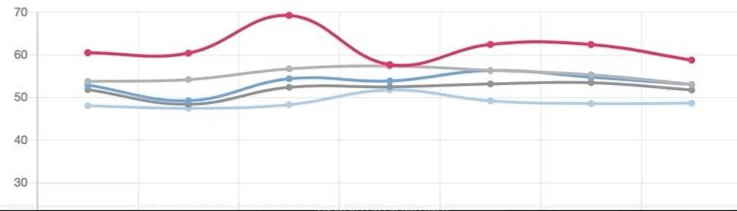
AP Name	Radio Type	Channel #'s	Channel Util	RX Util	TX Util	Time
FA21WAZ-OUT-North	802.11b/g/n	6	83.1818	0.0000	0.0909	4/27/2020 07:11 AM
KIN1WAZ-OUT-North	802.11b/g/n	6	69.4286	0.0260	4.9870	4/27/2020 07:11 AM
REC1WAY-OUT-North	802.11b/g/n	6	65.7368	0.0000	6.6711	4/27/2020 07:11 AM
SHE1WAZ-OUT-South	802.11b/g/n	6	62.4247	0.0000	5.2877	4/27/2020 07:11 AM
AVO1WAW	802.11b/g/n	6	61.8831	0.0000	0.0000	4/27/2020 07:11 AM
FOS1WAZ-OUT-North	802.11b/g/n	6	61.2466	0.0000	2.5616	4/27/2020 07:11 AM
AVO1WAV	802.11b/g/n	1	59.7403	0.0000	0.0000	4/27/2020 07:11 AM
AVO1WAZ	802.11b/g/n	6	58.7792	0.0000	0.0000	4/27/2020 07:11 AM
GMS6WAQ-RM-613	XOR (2.4GHz)	11	57.6364	0.0130	0.3896	4/27/2020 07:11 AM
CLA1WAZ-OUT-West	802.11b/g/n	6	56.7143	0.0000	6.9481	4/27/2020 07:11 AM

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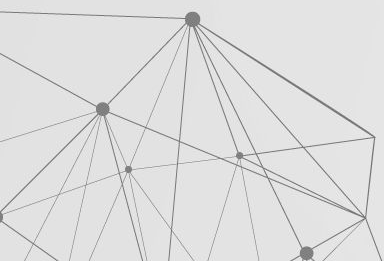
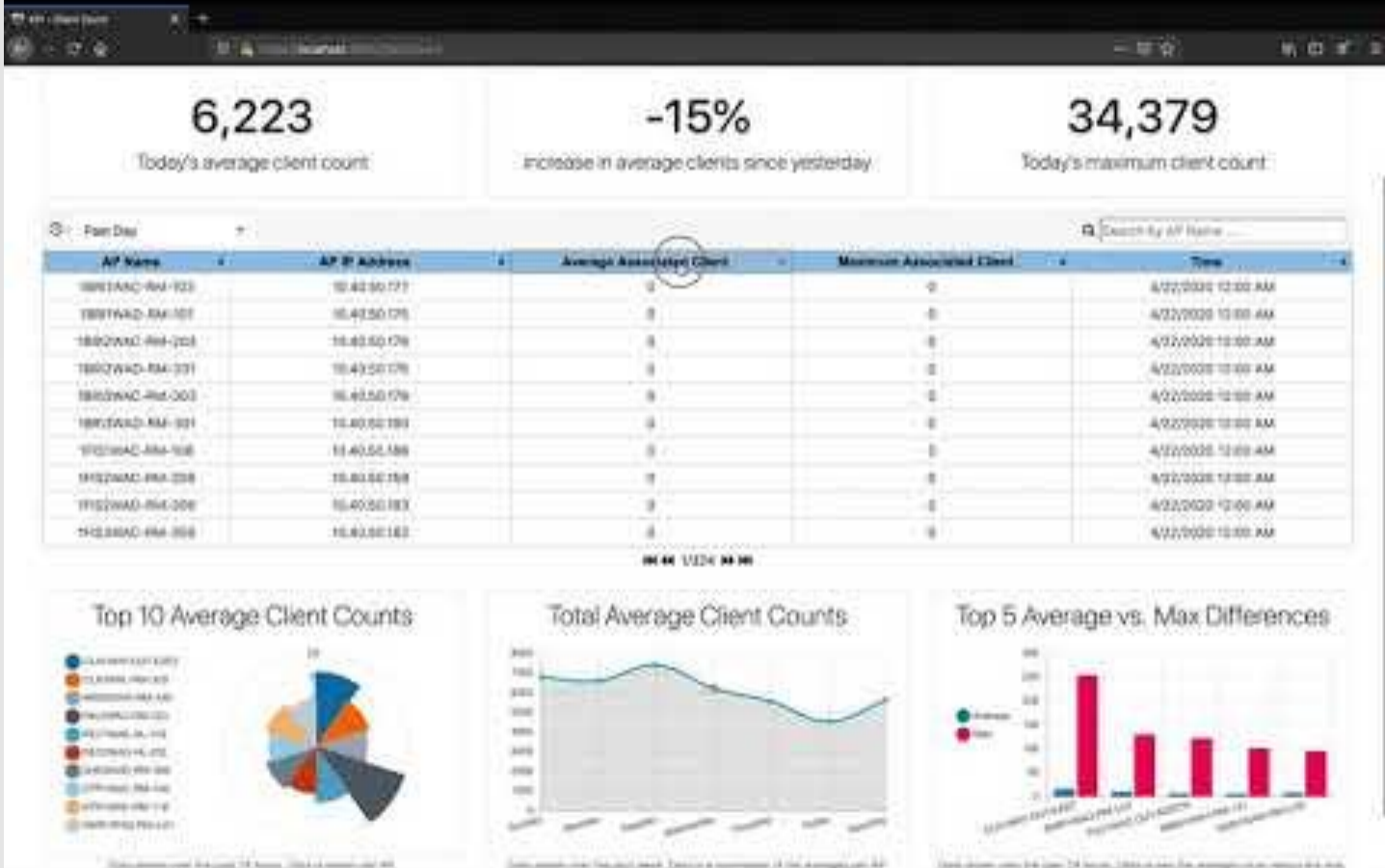
2.4GHz Daily Maxes vs. the Daily Average (Wireless APs)



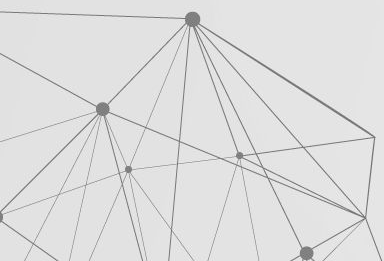
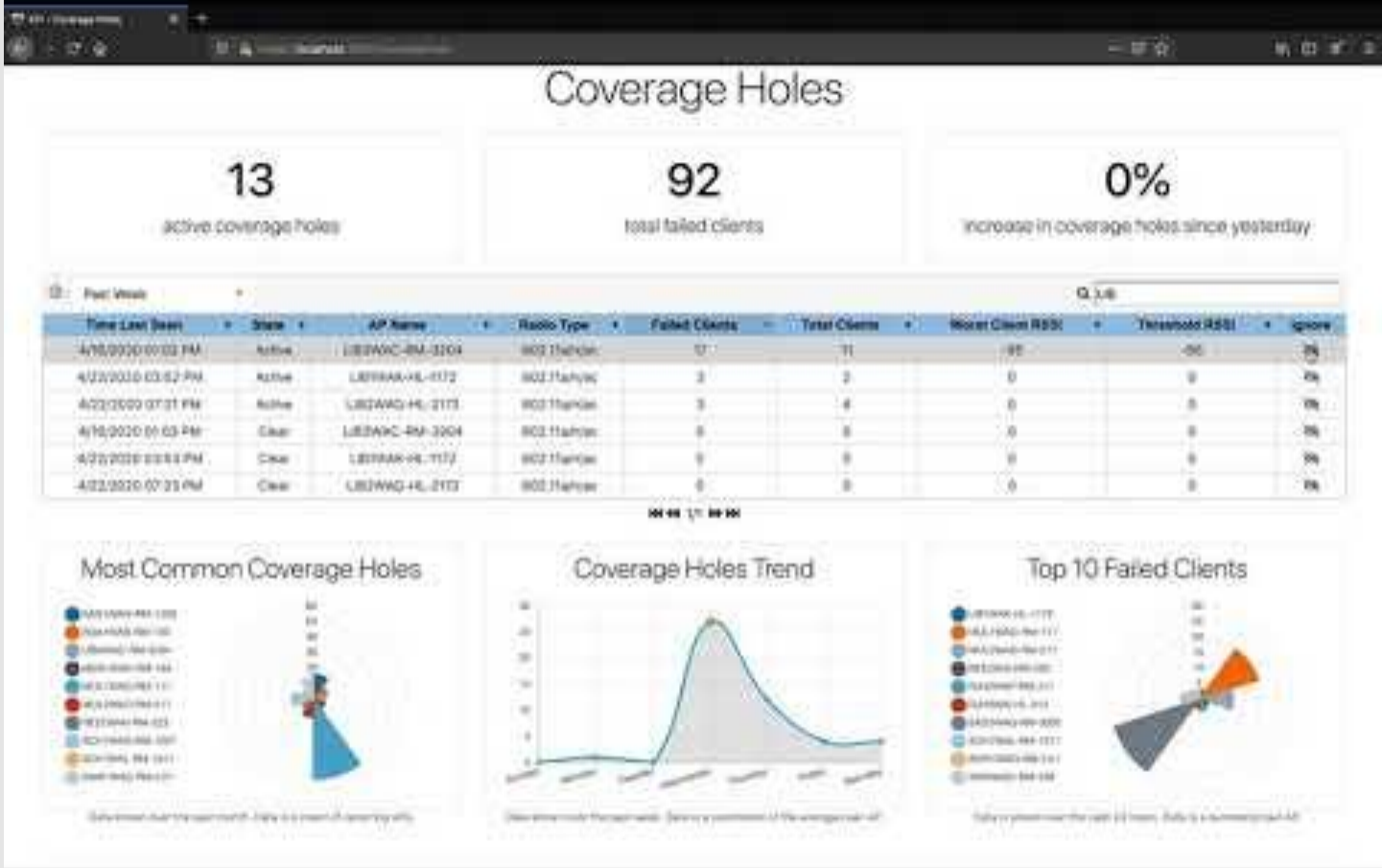
5GHz Daily Maxes vs. the Daily Average (Wireless APs)



DEMO - CLIENT COUNT



DEMO - COVERAGE HOLES



QUICK VIEW - POWER/CHANNEL FLUCTUATION

Power/Channel Fluctuation

🕒: Past Day

'A': 2.4 GHz

🔍 Search by AP Name ...

AP Name	TX Power Level Flux	Channel Flux	Time
LIB1WAX-OUT-South	67	1	4/27/2020 07:27 AM
HER1WAZ-OUT-North	58	0	4/27/2020 07:27 AM
BGA1-COSTUMESHOP-2	37	0	4/27/2020 07:27 AM
AVO1WAZ	31	0	4/27/2020 07:27 AM
LIB3WAG-HL-3209	30	0	4/27/2020 07:27 AM
NEE43WAF-RM-3402	30	1	4/27/2020 07:27 AM
MUL1WAZ-OUT-West	23	0	4/27/2020 07:27 AM
FOS1WAZ-OUT-North	22	0	4/27/2020 07:27 AM
SHE1WAZ-OUT-South	21	0	4/27/2020 07:27 AM
LMA3WAB-RM-710	19	2	4/27/2020 07:27 AM

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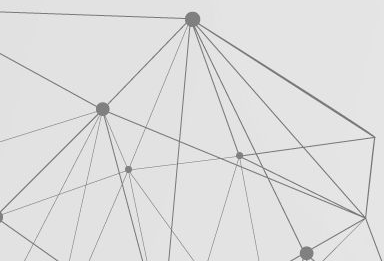
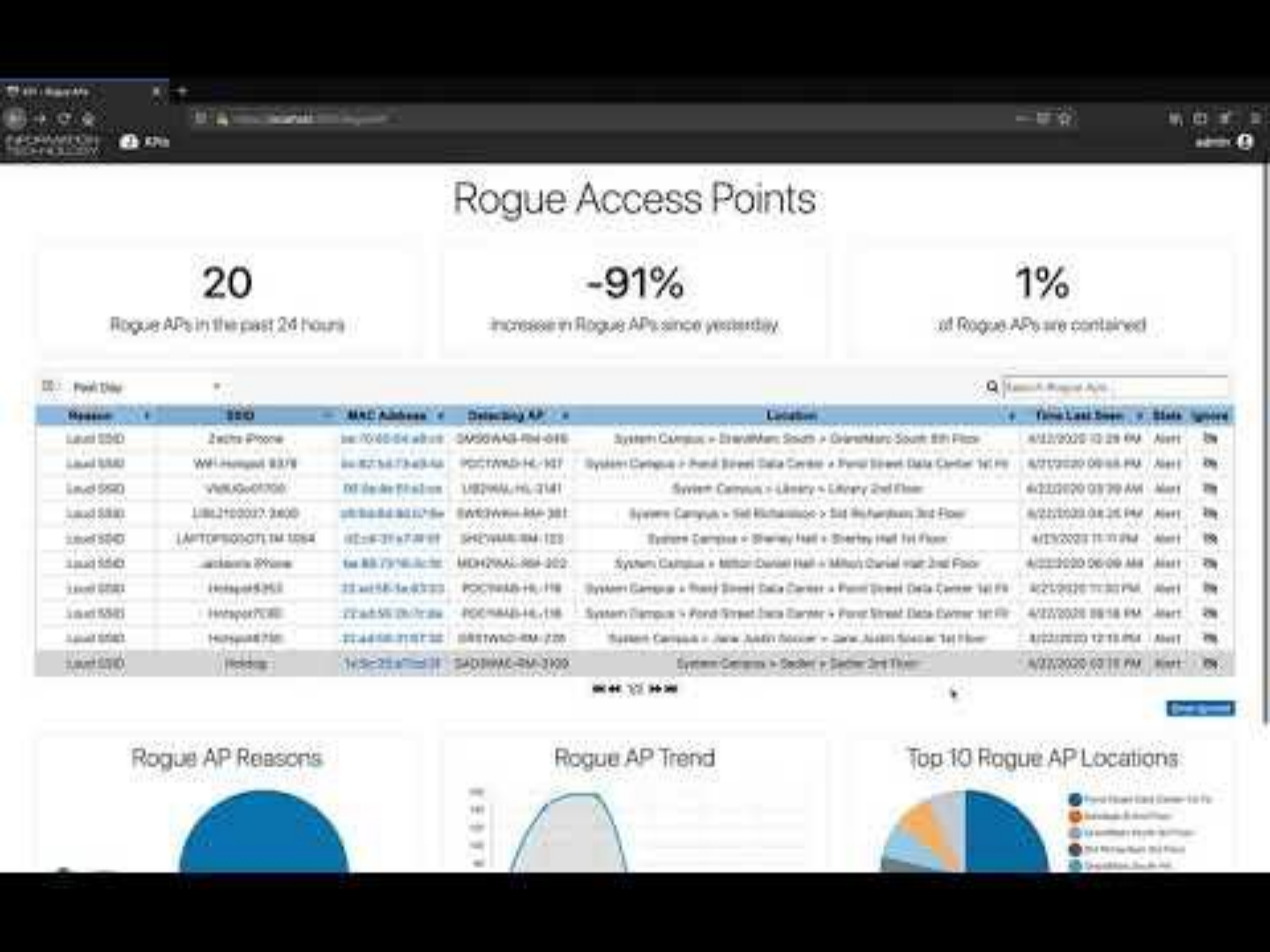
Top 10 TX Power Level Flux (2.4 GHz)



Top 10 Channel Flux (2.4 GHz)



DEMO - ROGUE ACCESS POINTS



QUICK VIEW - USER MANAGEMENT


Manage Users


Username
Username
Password
Password
Confirm Password
Confirm Password
Create User


Username	Actions
admin	

QUICK VIEW - USER SETTINGS

Change Password

Current Password 

New Password 

Confirm New Password 



05

RETROSPECT

Reviewing the Process & Lessons Learned



TIMELINE HIGHLIGHTS

FIRST SEMESTER

Tech stack + system design finalized, development environment set up

User system functionality, UI/UX improvements, schema overhaul

AUG

SEP

OCT

NOV

DEC

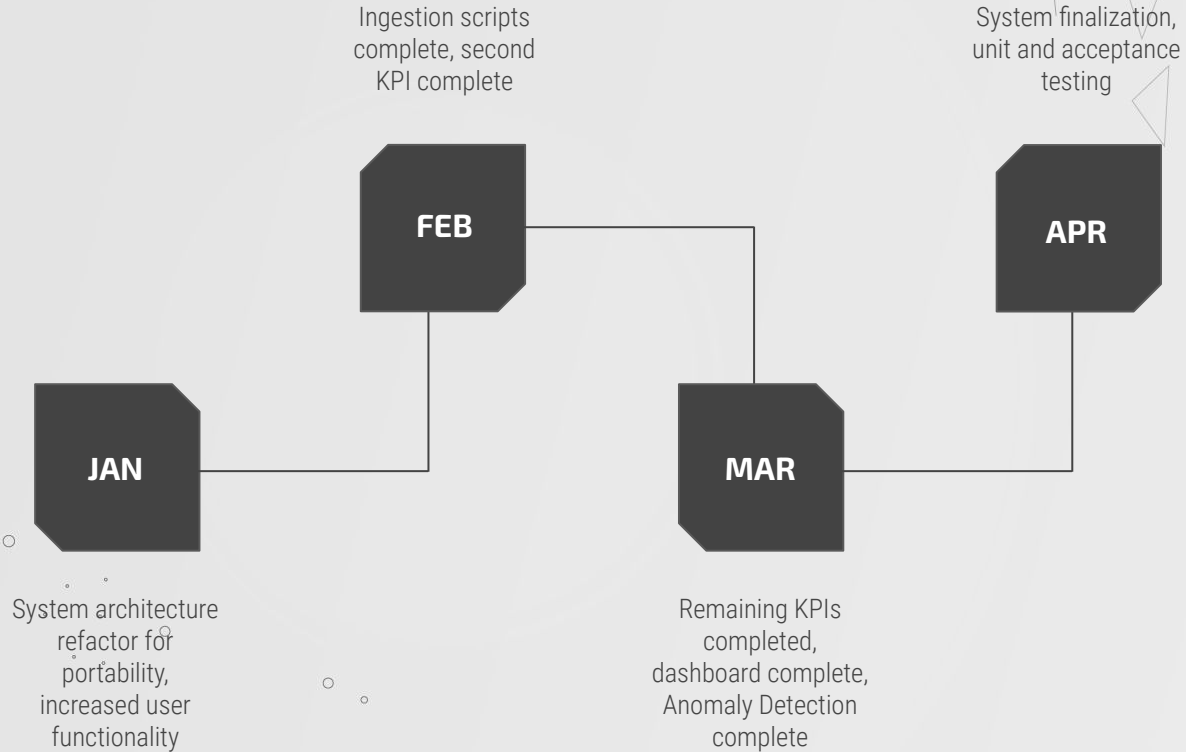
First meeting with all of the stakeholders present, system planning

First KPI page with arbitrary data, base data imports complete

KPI schemas/list finalized, aggregation and scalability improvements

TIMELINE HIGHLIGHTS

SECOND SEMESTER



PROJECT TAKEAWAYS



TECHNOLOGIES

.NET Core
C#
JavaScript/jQuery
Git

BEST PRACTICES

System design
Coding principles
Documentation
Testing

SOFT SKILLS

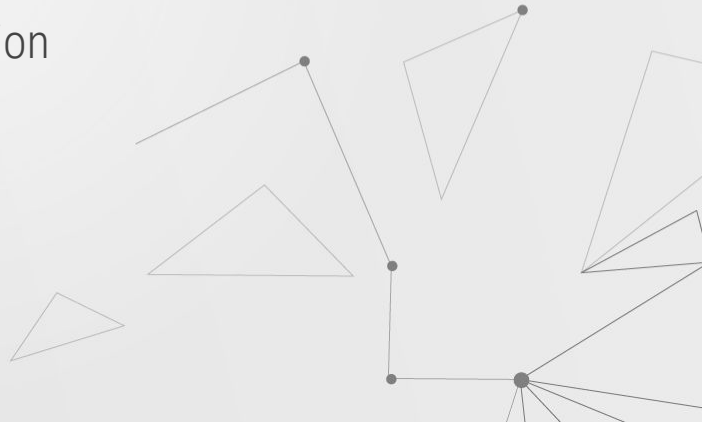
Time management
Adaptability
Communication

LESSONS LEARNED

Communication can be difficult
Strategic delegation
Visibility of work is key



THE FUTURE

- Transfer over to a TCU development team
 - Deployment on a production server
 - Ever-improving Anomaly Detection
-
- 



06

QUESTION & ANSWER

Concluding Thoughts

ACKNOWLEDGEMENTS

Our team would like to thank TCU Network Services, specifically Craig Baugh and Tony Fleming for letting us be creative and giving us the opportunity to develop this Web-Application.

We'd also like to thank Dr. Bingyang Wei for his dedication to our class and our team, even through the unorthodox final semester we've had, and the COSC & CITE Faculty for supporting us these past 4 years.



THANK YOU!

