Operations Data Analysis & Management System

with Boeing

Team Leader: Jesus Mendoza
Server development: Richard Balbuena
UI/UX: Maximilian Orozco
Data Graphing: Nathan Lee

Liaisons: Sen Yao
          Ray Hogan

Advisors: Prof. Russ Abbott
          Prof. Soo Lim
What is **ODAS**? What will it be used for?

- Monitoring the Health and Status of thousands of Satellites
- Current C2 systems only send/receive telemetry
- ODAS will provide:
  - Predictive analysis with Machine Learning
  - Storage solutions millions of telemetry data points
  - Graphical playback and data visualization
  - Generative Reports
## Technologies

### Frontend
- React.js
- Plotly.js

### Backend
- Django
- MySql

### Machine Learning
- Tensorflow
- Keras
- Sci Kit Learn

### Remote
- AWS RDS
- AWS EC2
- Docker

---

Jesus Mendoza
User Interface (UI) / User Experience (UX)

• Make everything look pretty
• Create a fluid and simple interface
• Create an intermediary for the user to the backend
ReactJS

- Modular code structure
  - Very object oriented
- Highly scalable
  - Netflix, Instagram, and PayPal
- Quick development
Design process

• Mock ups (AdobeXD)
  • Spacing and alignment
• Flow charts (draw.io)
  • User Experience (UX)
Front End Features

• Display data served by our report generator
  • Users to send custom queries to the database
• Provide machine learning analyses
• Allow sign in with email
Graphing: Introduction

Subset of UI

Large Data -> Simple Graph

Time Plot with Limits

Tabular Chart below

Data → Graphs, User Interface
Graphing: Design: JSON in APIs

Data: Backend APIs from Database

Specific Points, Satellite or Recent, Any Satellite

Fetching from endpoints -> Object.

JSON Format

Parsing.

Key-Value Pairs, Unique Sets Meas/Names

Specify/Separate Data Points for Graph

User Request (ex. Main CPU 2, GHz)
Graphing: Results/Conclusion

Plotly

- Matched Component/Units
- Ordered Time Point Taken
- Interval, Time based Updating
- Functions
- Multiple Traces
- User Interface
- Dynamically Interpret/Interact
ODAS Backend

• Developed using Django Web Framework
• Quick project startup and file management
• Libraries vital to project
  • Emails, file functionality, user authentication and login systems
Report Generator

- Reports developed in conjunction with machine learning module
- Generate a report for a structured, easy to read format
  - TLE and CSV formats can be hard to read
  - Includes data
- Send through email or to a file server
Exportable Options

• Access files any time through ODAS
• Different available formats for download
  • .txt, .pdf, html
• Emails are one time or can be recurring
  • Sign up for emails to be monthly or weekly
Accessing the Backend

• Frontend send requests to specific API endpoints
• Several different endpoints allow access to different data
• Hosted on Remote Linux VM on AWS EC2
• Database hosted on Remote MySql DB on AWS RDS
Database

• Will continue to evolve as we receive more data

Satellite:  Component:  Measurement:

  id       id       id
  name     name     sat id
  mission  sat id   comp id

value

timestamp
Containerization

- Docker
- Separation of Concerns
- Frontend & Backend are isolated
- Tested and run in consistent environment
- Easy integration, deployment, scalability
Upcoming

• Once we receive data, the Data analytics will begin
• We’ve completed almost all of the backbones for ODAS
• Plan on using Neural Networks and other ML algorithms
Thank you