

**MICHIGAN STATE**  
**UNIVERSITY**

# Project Plan

Profiling Manufacturing Plant Computer  
Network Traffic

The Capstone Experience

Team GM

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Fall 2019



*From Students...*  
*...to Professionals*

# Functional Specifications

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- Manufacturing plant networks are targets
- Large amounts of traffic
- Machine learning
- Dashboard



# Design Specifications

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- Machine learning
  - Search for anomalies
  - Continuous learning
- Dashboard
  - Web accessible
  - Highlight network anomalies



# Screen Mockup: Logs

254 hits
New Save Open Share Inspect 15 minutes Last 24 hours

Options Refresh

Add a filter +

kibana\_sample\_data\_flights

Selected fields

7 \_source

Available fields

Popular

# AvgTicketPrice

Cancelled

Carrier

DestAirportID

DestCityName

DestCountry

FlightDelay

FlightDelayType

FlightTimeMin

OriginAirportID

Dest

DestLocation

DestRegion

DestWeather

DistanceKilometers

DistanceMiles

FlightDelayMin

FlightNum

FlightTimeHour

Origin

OriginCityName

OriginCountry

OriginLocation

OriginRegion

OriginWeather

\_id

\_index

\_score

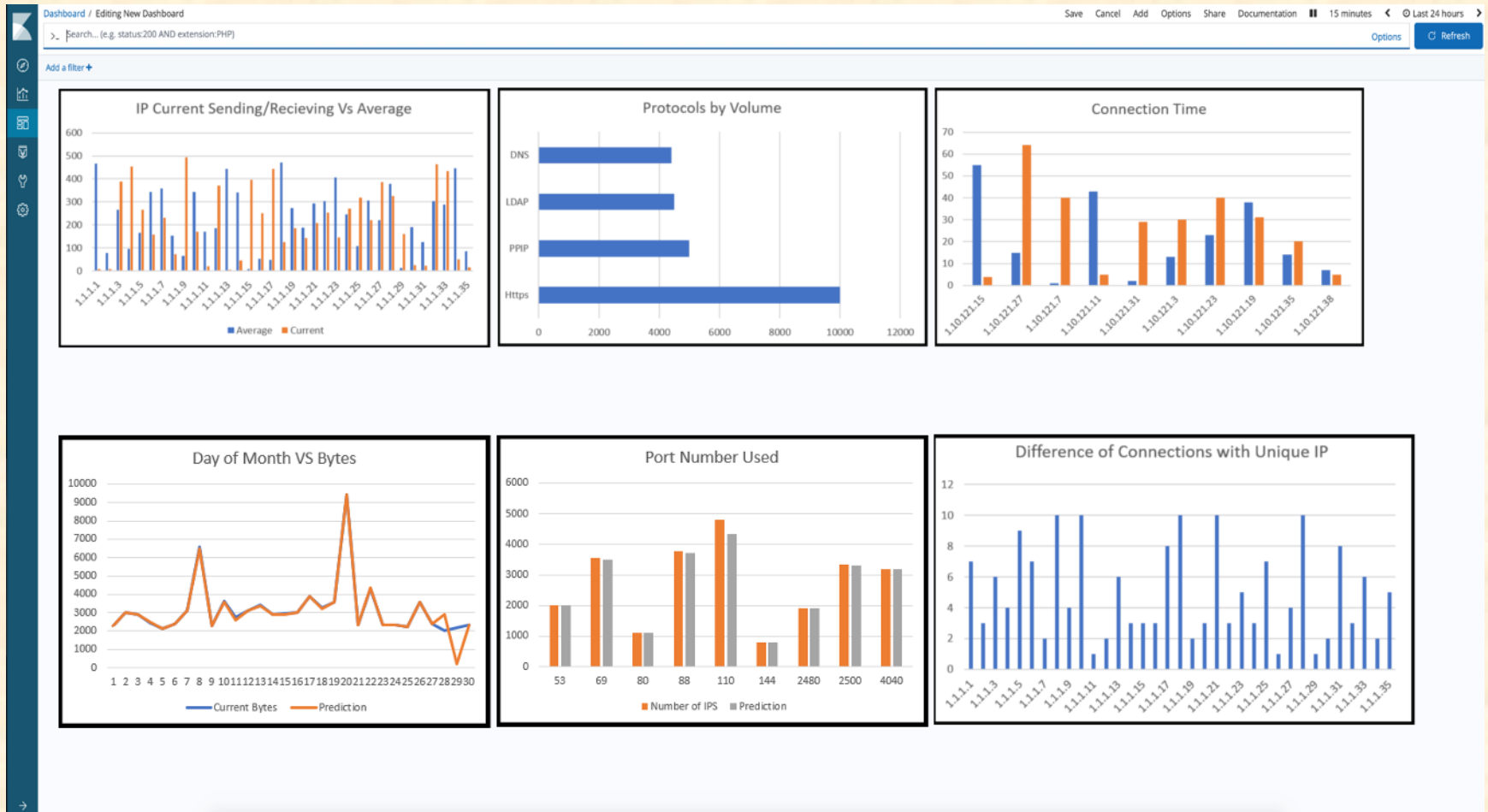
\_type

September 21st 2019, 15:52:40.801 - September 22nd 2019, 15:52:40.801 Auto

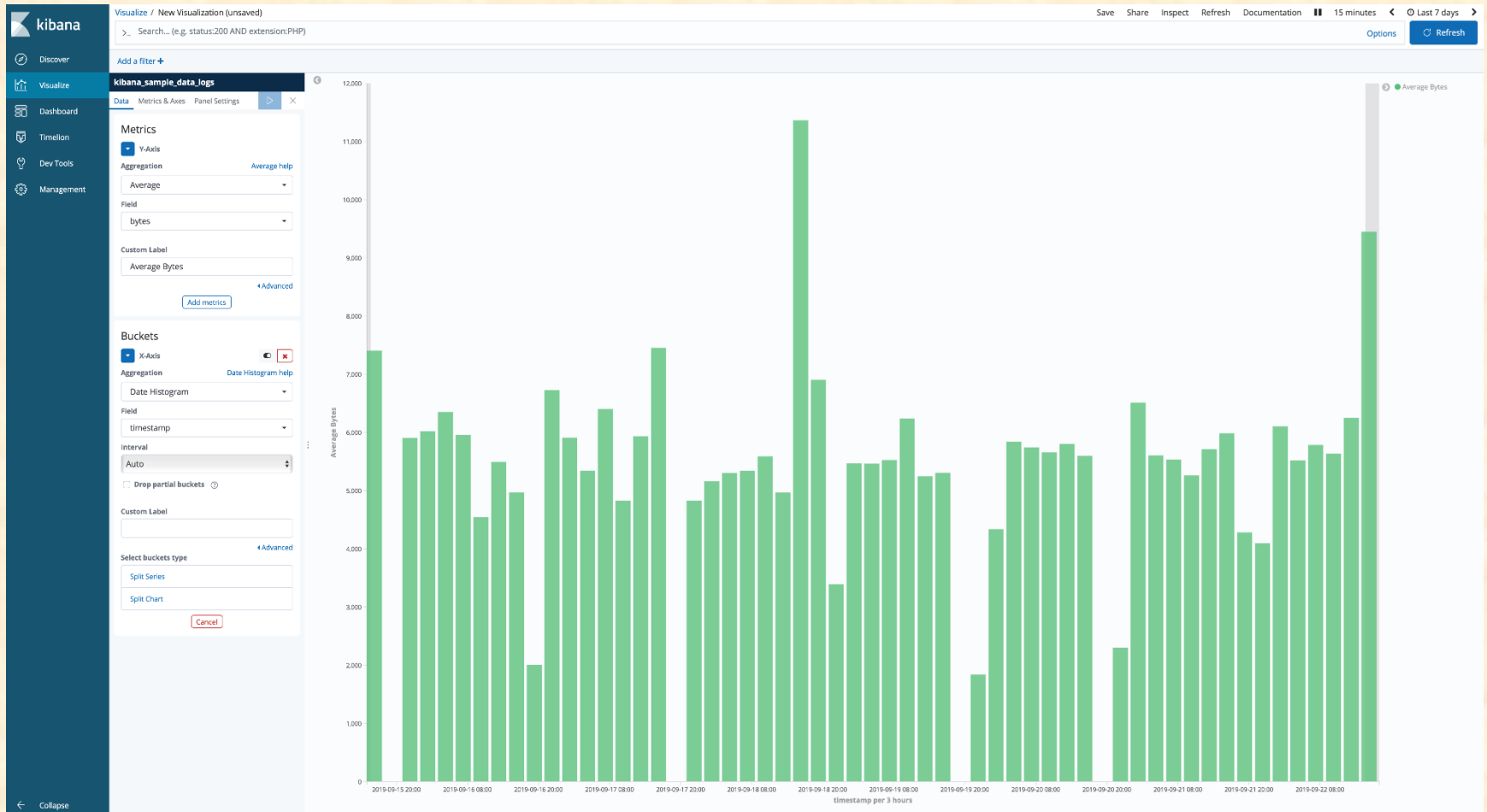
Time	_source
September 21st 2019, 18:24:04.000	FlightNum: HGASGBY DestCountry: KR OriginWeather: Thunder & Lightning OriginCityName: Helsinki AvgTicketPrice: 972.98 DistanceMiles: 4,388.776 FlightDelay: false DestWeather: Cloudy Dest: Incheon International Airport FlightDelayType: No Delay OriginCountry: FI dayOfWeek: 5 DistanceKilometers: 7,050.176 timestamp: September 21st 2019, 18:24:04.000 DestLocation: { "lat": "37.46910095", "lon": "126.4589964" } DestAirportID: ICN Carrier: Kibana AirLines Cancelled: false FlightTimeMin: 583.584 Origin: Helsinki Vantaa Airport OriginLocation: { "lat": "60.31719971", "lon": "24.9633007" } DestRegion: SE-80 OriginAirportID: HEL OriginRegion: FI-ES DestCityName: Seoul FlightTimeHour: 8.393067834939621 FlightDelayMin: 0 _id: v4_KbM8KkLbWJDLv3 _type: _doc _index: kibana_sample_data_flights _score: 2 hour_of_day: 22
September 21st 2019, 16:58:20.000	FlightNum: QXIEARK DestCountry: KR OriginWeather: Sunny OriginCityName: Copenhagen AvgTicketPrice: 896.09 DistanceMiles: 4,941.679 FlightDelay: false DestWeather: Rain Dest: Gimpo International Airport FlightDelayType: No Delay OriginCountry: DK dayOfWeek: 5 DistanceKilometers: 7,952.862 timestamp: September 21st 2019, 16:58:20.000 DestLocation: { "lat": "37.5583", "lon": "126.791" } DestAirportID: GMP Carrier: ES-Air Cancelled: false FlightTimeMin: 418.572 Origin: Copenhagen Kastrup Airport OriginLocation: { "lat": "55.61790885", "lon": "12.65600014" } DestRegion: SE-80 OriginAirportID: CPH OriginRegion: DK-84 DestCityName: Seoul FlightTimeHour: 6.9761947393514685 FlightDelayMin: 0 _id: v9_KbM8KkLbWJDLv3 _type: _doc _index: kibana_sample_data_flights _score: 2 hour_of_day: 20
September 21st 2019, 19:58:42.000	FlightNum: 6JLWZR DestCountry: CH OriginWeather: Sunny OriginCityName: Sydney AvgTicketPrice: 1,822.54 DistanceMiles: 10,293.209 FlightDelay: true DestWeather: Cloudy Dest: Zurich Airport FlightDelayType: MAS Delay OriginCountry: AU dayOfWeek: 5 DistanceKilometers: 16,565.314 timestamp: September 21st 2019, 19:58:42.000 DestLocation: { "lat": "47.464699", "lon": "8.54917" } DestAirportID: ZRH Carrier: Kibana AirLines Cancelled: false FlightTimeMin: 1,589.255 Origin: Sydney Kingsford Smith International Airport OriginLocation: { "lat": "-33.94609833", "lon": "151.177062" } DestRegion: CH-ZH OriginAirportID: SYD OriginRegion: SE-80 DestCityName: Zurich FlightTimeHour: 26.48758173294196 FlightDelayMin: 315 _id: y6_KbM8KkLbWJDLv3 _type: _doc _index: kibana_sample_data_flights _score: 2 hour_of_day: 23
September 21st 2019, 18:40:19.000	FlightNum: 4LJLJ6 DestCountry: CH OriginWeather: Hail OriginCityName: Ottawa AvgTicketPrice: 6643.42 DistanceMiles: 3,019.376 FlightDelay: true DestWeather: Sunny Dest: Zurich Airport FlightDelayType: Carrier Delay OriginCountry: CA dayOfWeek: 5 DistanceKilometers: 6,146.69 timestamp: September 21st 2019, 18:40:19.000 DestLocation: { "lat": "47.464699", "lon": "8.54917" } DestAirportID: ZRH Carrier: Kibana AirLines Cancelled: true FlightTimeMin: 677.224 Origin: Ottawa Macdonald-Carrier International Airport OriginLocation: { "lat": "45.32249832", "lon": "-75.66919788" } DestRegion: CH-ZH OriginAirportID: YOW OriginRegion: CA-ON DestCityName: Zurich FlightTimeHour: 11.287869368018473 FlightDelayMin: 165 _id: x2_KbM8KkLbWJDLv3 _type: _doc _index: kibana_sample_data_flights _score: 2 hour_of_day: 22
September 21st 2019, 19:48:33.000	FlightNum: 6WDSOV DestCountry: IT OriginWeather: Heavy Fog OriginCityName: Santiago AvgTicketPrice: 879.85 DistanceMiles: 7,376.722 FlightDelay: true DestWeather: Rain Dest: Milano Linate Airport FlightDelayType: Carrier Delay OriginCountry: CL dayOfWeek: 5 DistanceKilometers: 11,871.683 timestamp: September 21st 2019, 19:48:33.000 DestLocation: { "lat": "45.445699", "lon": "9.27674" } DestAirportID: MLI Carrier: Kibana AirLines Cancelled: false FlightTimeMin: 1,199.244 Origin: Comodoro Arturo Merino Benitez International Airport OriginLocation: { "lat": "-33.39380156", "lon": "-70.78579712" } DestRegion: IT-25 OriginAirportID: SCL OriginRegion: SE-80 DestCityName: Milan FlightTimeHour: 19.87398039516684 FlightDelayMin: 120 _id: mU_KbM8KkLbWJDLv3 _type: _doc _index: kibana_sample_data_flights _score: 2 hour_of_day: 23
September 21st 2019, 19:30:22.000	FlightNum: YBNDIF DestCountry: IT OriginWeather: Cloudy OriginCityName: Rome AvgTicketPrice: 6424.35 DistanceMiles: 328.983 FlightDelay: false DestWeather: Heavy Fog Dest: Turin Airport FlightDelayType: No Delay OriginCountry: IT dayOfWeek: 5 DistanceKilometers: 529.446 timestamp: September 21st 2019, 19:30:22.000 DestLocation: { "lat": "45.200802", "lon": "7.64963" } DestAirportID: TO11 Carrier: JetBeats Cancelled: true FlightTimeMin: 27.866 Origin: Leonardo da Vinci - Fiumicino Airport OriginLocation: { "lat": "41.8002778", "lon": "12.2388889" } DestRegion: IT-21 OriginAirportID: FCO OriginRegion: SE-80 DestCityName: Torino FlightTimeHour: 0.4644265799195665 FlightDelayMin: 0 _id: t1_KbM8KkLbWJDLv3 _type: _doc _index: kibana_sample_data_flights _score: 2 hour_of_day: 23
September 21st 2019, 18:16:35.000	FlightNum: PVMHPY DestCountry: CN OriginWeather: Heavy Fog OriginCityName: Johannesburg AvgTicketPrice: 1,812.43 DistanceMiles: 7,295.91 FlightDelay: false DestWeather: Cloudy Dest: Shanghai Hongqiao International Airport FlightDelayType: No Delay OriginCountry: ZA dayOfWeek: 5 DistanceKilometers: 11,741.628 timestamp: September 21st 2019, 18:16:35.000 DestLocation: { "lat": "31.19790077", "lon": "121.3359985" } DestAirportID: SHA Carrier: Logstash Airways Cancelled: false FlightTimeMin: 838.688 Origin: OR Tambo International Airport OriginLocation: { "lat": "-26.1392", "lon": "28.246" } DestRegion: SE-80 OriginAirportID: JNB OriginRegion: SE-80 DestCityName: Shanghai FlightTimeHour: 13.978129091902803 FlightDelayMin: 0 _id: 3d_KbM8KkLbWJDLv3 _type: _doc _index: kibana_sample_data_flights _score: 2 hour_of_day: 22
September 21st 2019, 19:54:24.000	FlightNum: 7R0U615 DestCountry: AT OriginWeather: Cloudy OriginCityName: Buenos Aires AvgTicketPrice: 5589.6 DistanceMiles: 7,346.434 FlightDelay: false DestWeather: Rain Dest: Vienna International Airport FlightDelayType: No Delay OriginCountry: AR dayOfWeek: 5 DistanceKilometers: 11,922.939 timestamp: September 21st 2019, 19:54:24.000 DestLocation: { "lat": "48.11829816", "lon": "16.56970624" } DestAirportID: VIE Carrier: Kibana AirLines Cancelled: false



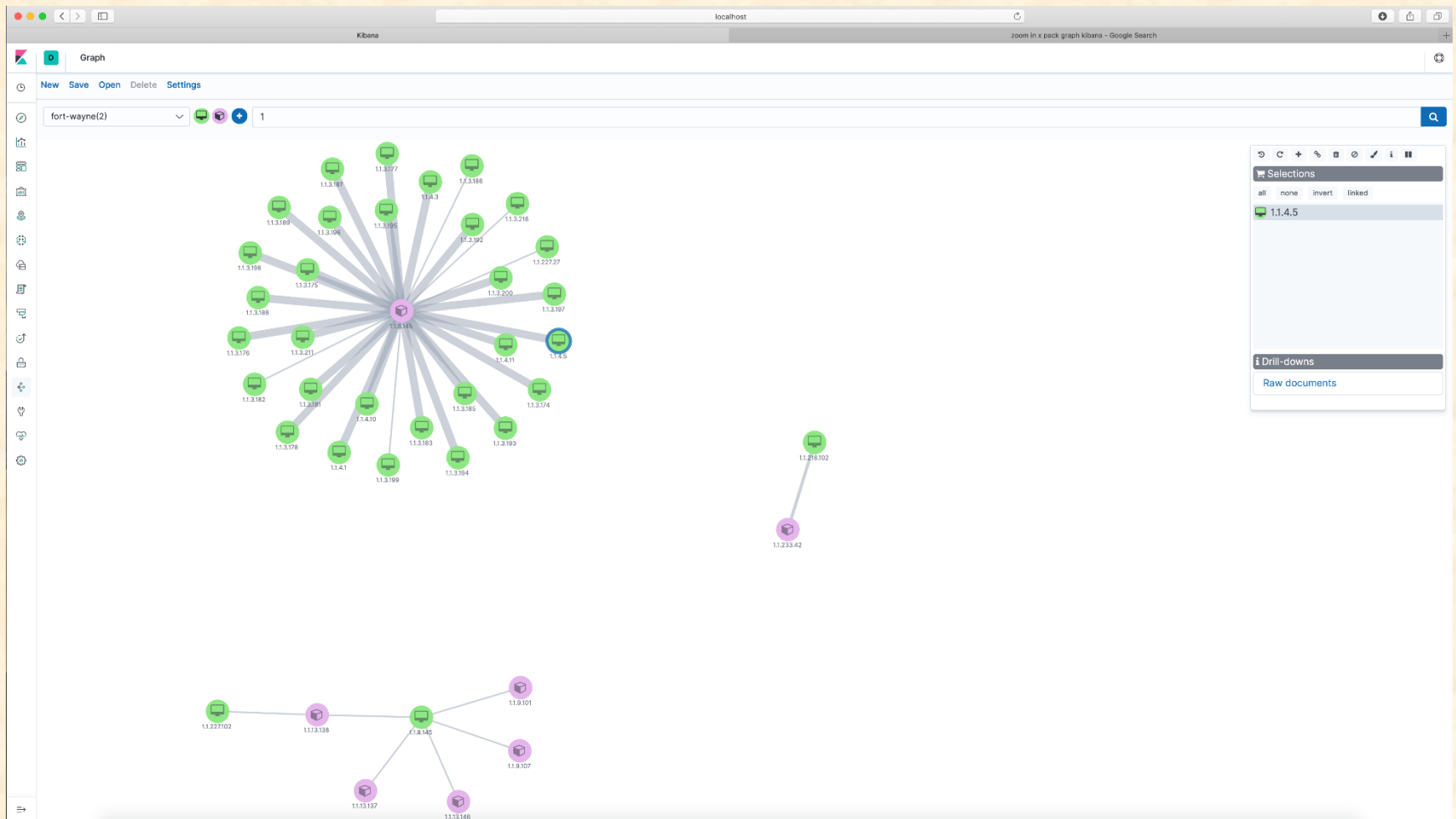
# Screen Mockup: Dashboard



# Screen Mockup: Visualize



# Screen Mockup: Machine Learning



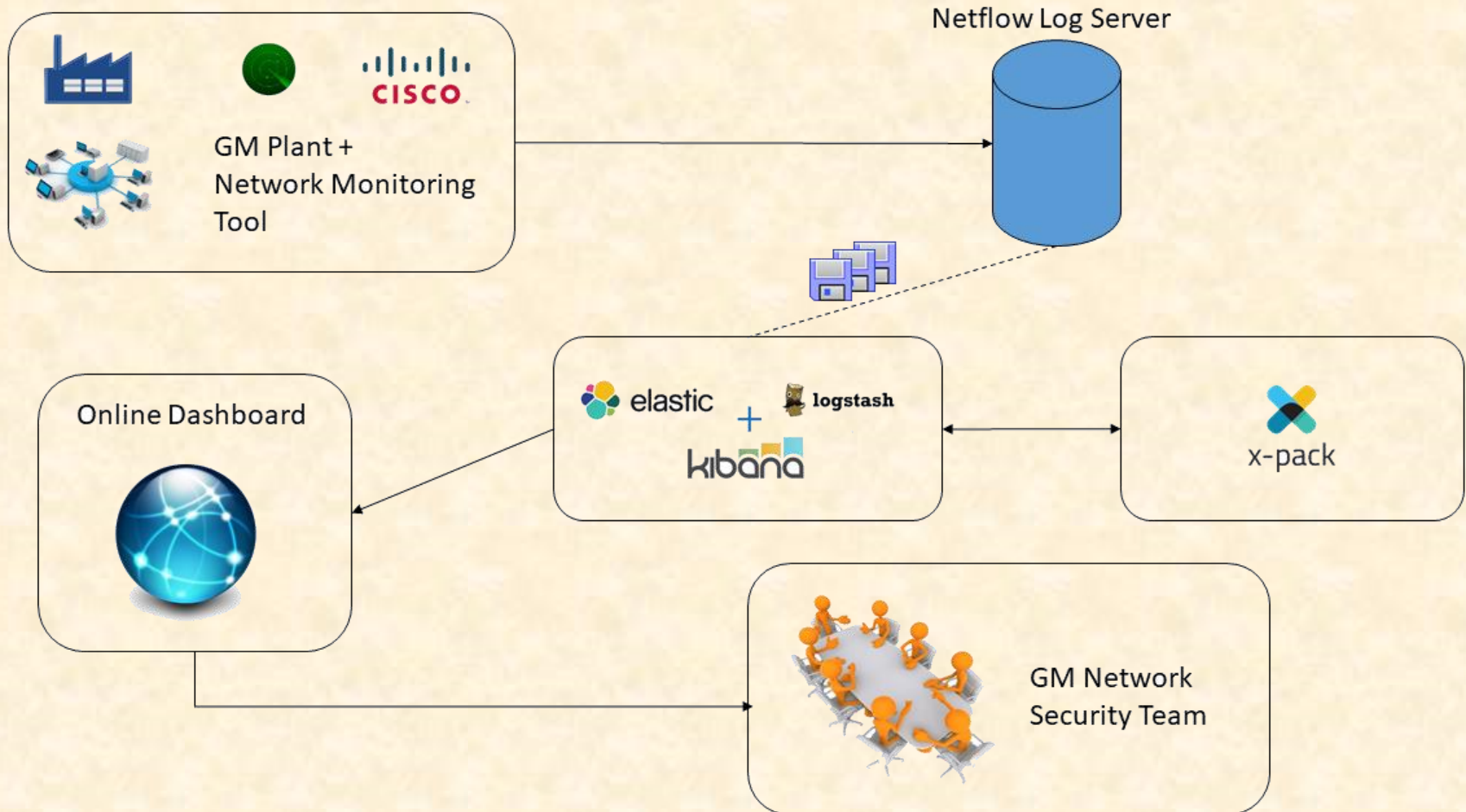
# Technical Specifications

- Front end of application built using ELK stack application suite.
  - Elasticsearch (search), Logstash (data storage), and Kibana (graphs & visuals)
- Hosted locally, would be implemented in GM production server environment.
- Machine learning model built using X-pack
  - Elastic Stack extension
  - Analyzes preprocessed datasets provided by GM





# System Architecture



# System Components

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- Hardware Platforms
  - iMac Desktop Computers
- Software Platforms / Technologies
  - ELK Stack
  - X-pack Extension
  - CSV files



# Risks

- Scalability of Product
  - Intake and process data in close to real time
  - Enable processing of real time data, time-efficient analysis
- Representative Data for Machine Learning Model
  - Organized and suggestive data input to model
  - Filter data feed before model processes it
- Machine Learning Model Access
  - Project is longer than what academic free trial can provide
  - Create open free trial, transfer progress when possible
- Data Visualization
  - Determine how to portray results effectively in dashboard
  - Provide frequent communication, mock-ups to receive feedback



# Questions?

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