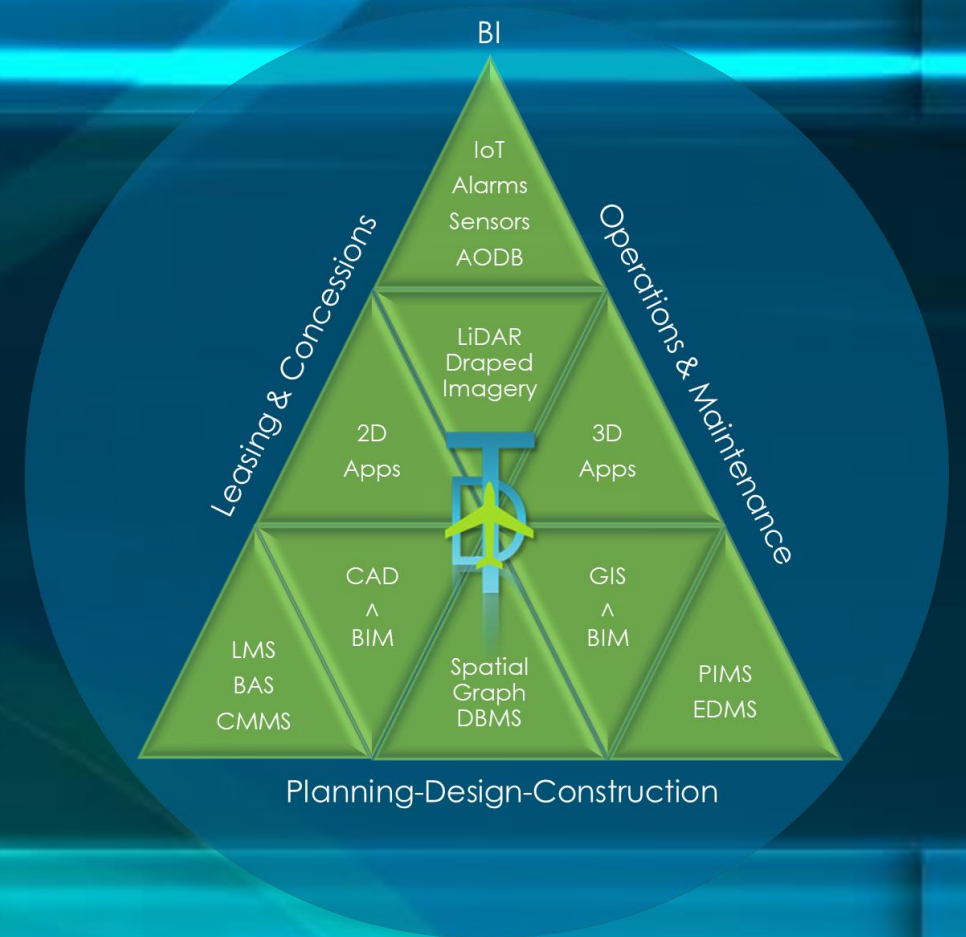


9 AUGUST 2023

Digital Twin Holistic Business Intelligence (BI)



www.AirportDigitalTwin.org Webinar Series

By: David Tamir, Lead Director, AirportDigitalTwin.org
Dr. Ali Diba, x-Spatial / Spatial Wave

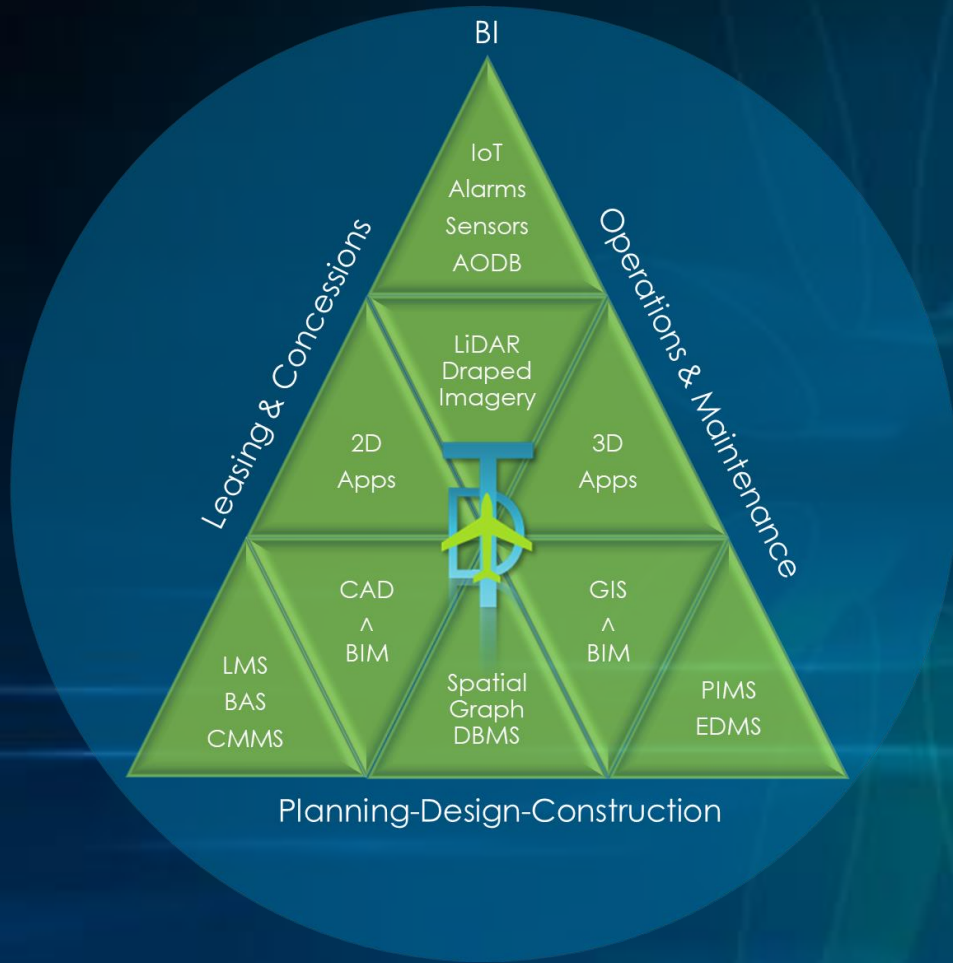
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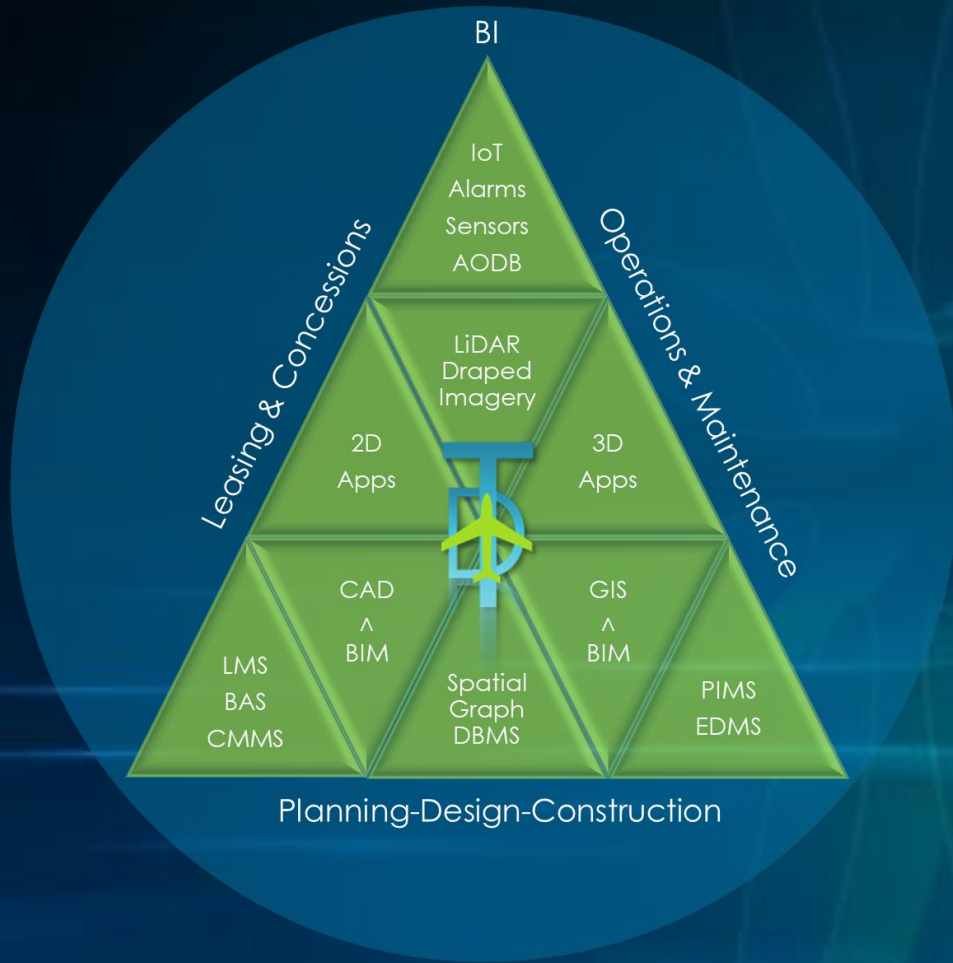
Webinar Series



1. Jul 19: BIM Processing
2. Jul 26: Information Integration
3. Aug 2: Enabling Integrated SMS
4. Aug 9: Holistic Business Intelligence
5. TBD: Leveraging Video Analytics
6. TBD: Predictive Modeling

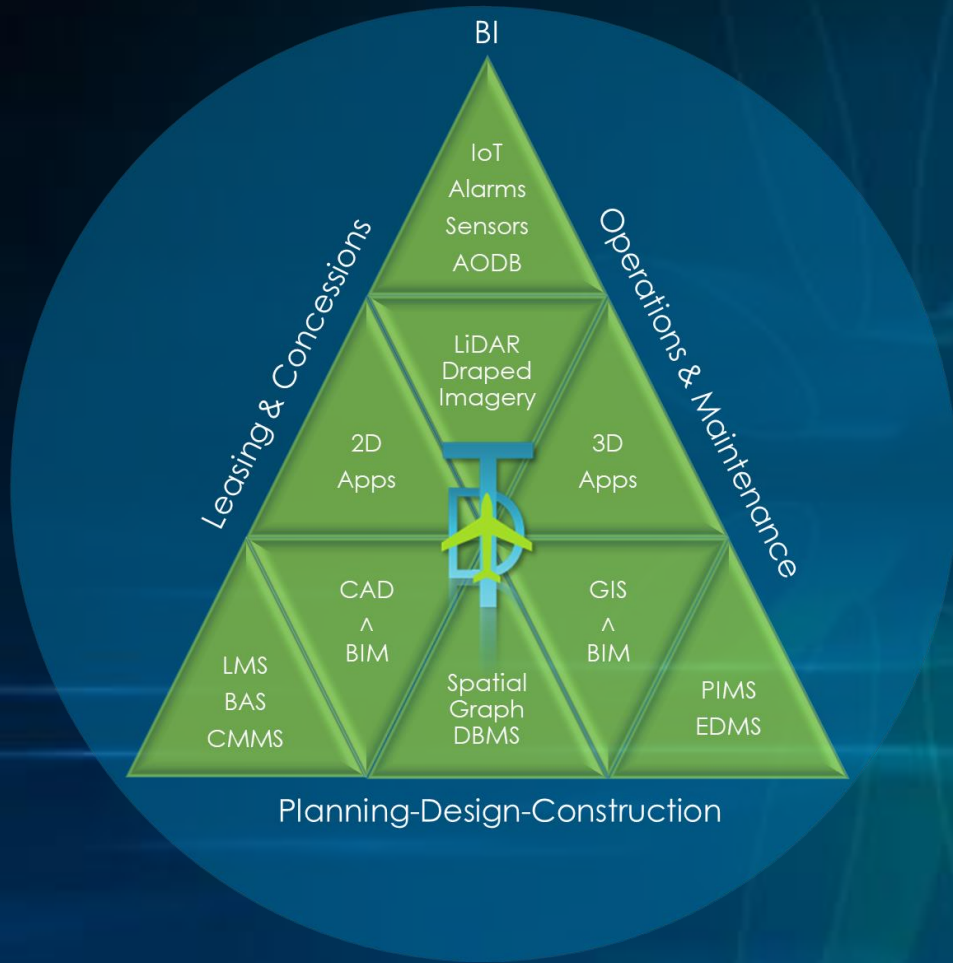
Webinar Outline

4. Aug 9: Holistic Business Intelligence



- ➔ Objective / Background / Introductions
- ➔ Review Top 15 Airport Use Cases for Airport Digital Twin Business Intelligence (BI)
- ➔ Review BI Analytics Options, Examples, and Recommendations
 - ➔ Microsoft PowerBI
 - ➔ Salesforce Tableau
 - ➔ Esri ArcGIS
 - ➔ Dashboards
 - ➔ Insights
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Objective



Integrating Information / Data

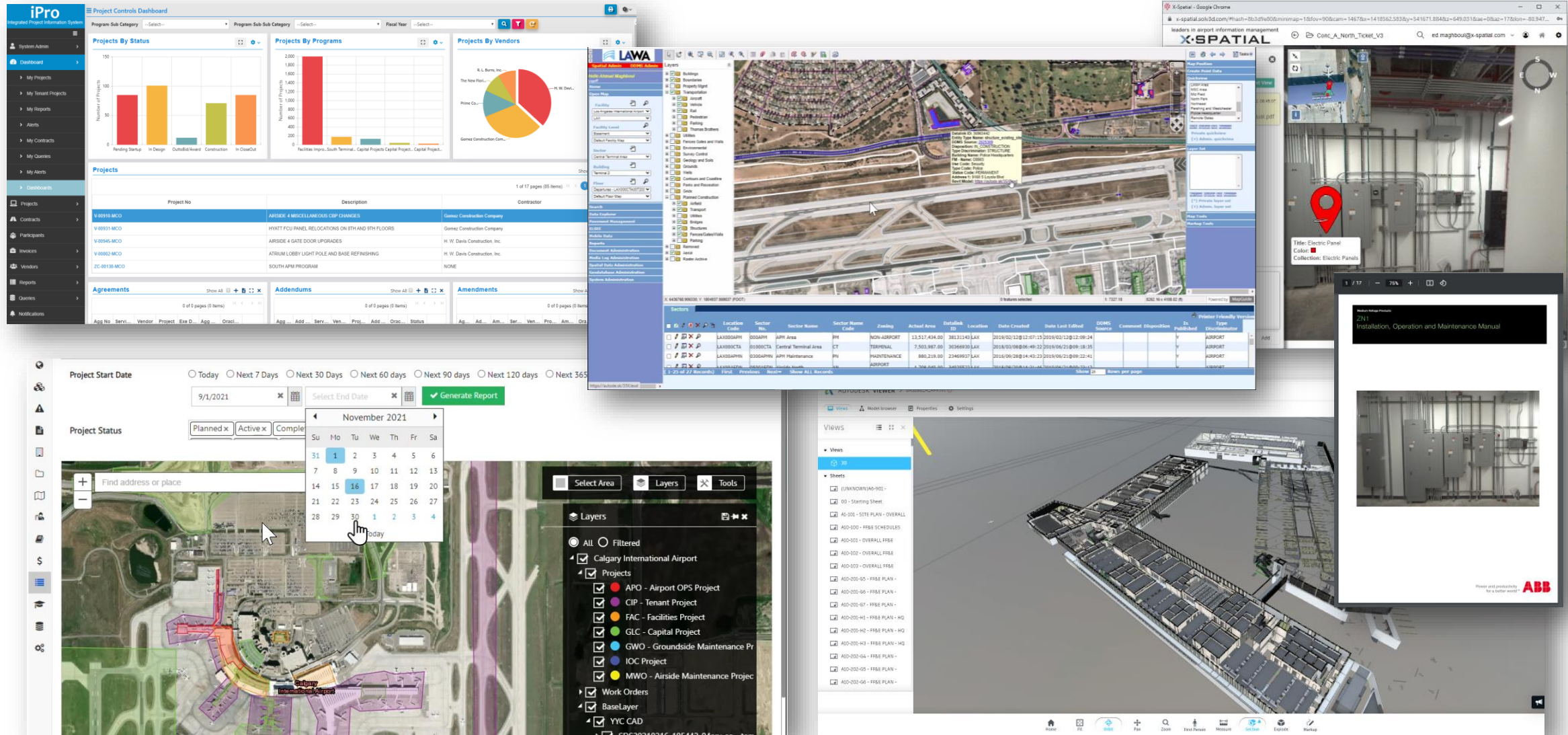
to Enable Business Intelligence (BI) Analytics

via AiRPport Owner's Digital Twin (ARP-DT)

Team of Integrated Solution Providers Enabling Airport Owner Digital Twins




Holistic Airports Digital Twin Solution



Introductions

[Welcome](#) [About Us](#) [Q&A](#) [Solution](#) [Webinars](#)


[Our Subject Matter Experts \(SME\)s](#)



David Tamir

Brings 4 decades of systems engineering and business process improvement experience from the Space Shuttle Program and over 30 airports; Including airport owner's perspective at Orlando. Founded and led the AAAE Airport Digital Twin Working Group in development of the Digital Twin Roadmap for Airport Owners. Leads this AirportDigitalTwin.org Team in helping airport owners succeed.

[Linked-In Profile](#)




Dr. Prasad Chittaluru

Brings 4 decades of experience in infrastructure data management. Awarded a prestigious National Academy of Science Small Business Innovation Research (SBIR) grant to invent and develop Simplify i3. Specializes in infrastructure owner business process improvement through digital twin technologies. Has served airports including at Orlan

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[Linked-In Profile](#)




Ed Maghbol

Brings 4 decades of spatial information technology experience including airports at Los Angeles, Boston, San Francisco, Charlotte, and others. Leads x-Spatial and its development of the Airport Enterprise Geospatial Information System (AEGIS), achieving industry leading interoperability between Autodesk and Esri for airport enterprise ma

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Dr. Behzad Mohammadi

Brings 4 decades of spatial information technology experience including airports at Los Angeles, Boston, San Francisco, Charlotte, and others. Chief architect and developer of the x-Spatial Airport Enterprise Geospatial Information System (AEGIS), achieving industry leading interoperability between Autodesk and Esri for airport enterprise management.

[Linked-In Profile](#)




Dr. Ali Diba

Brings 3 decades of experience implementing Esri's technologies with many awards and recognitions. His expertise are especially key to airport digital twins by leveraging Esri's Business Intelligence (BI) analytics solutions for correlating various disparate information over the spatial common denominator. He is x-Spatial's Esri techn

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John White

Brings 3 decades of experience in effective infrastructure project and full lifecycle data management. Has proven airport owner experience from Brussels, as well as airport consulting experience leveraging x-Spatial's solutions at Los Angeles, Boston, and Charlotte. Has developed best practices for sustaining airport terminal LIDAR sc

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Jorge Quiroz

Brings over 2 decades of experience in helping multiple domestic and international airports adopt BIM as a tool for design and construction, so the data captured during these phases can be leveraged to feed airport enterprise asset management system, including Digital Twin. Jorge served as the BIM Director on the airport owner's side for


[+ Show More](#)



Don Murray

Brings 4 decades of data processing automation experience. Co-founder of Safe Software, the inventors of the data Feature Manipulation Engine (FME) – an industry leader for data integration middleware used in the AEC, airports, and other industries.


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Hans Dorries

Brings over 2 decades of experience converging on airport business process modeling and simulation, which are keys to achieving predictive analytics via digital twins. Leads Simatron Solutions, leveraging state of the art modeling and simulation tools and methods.

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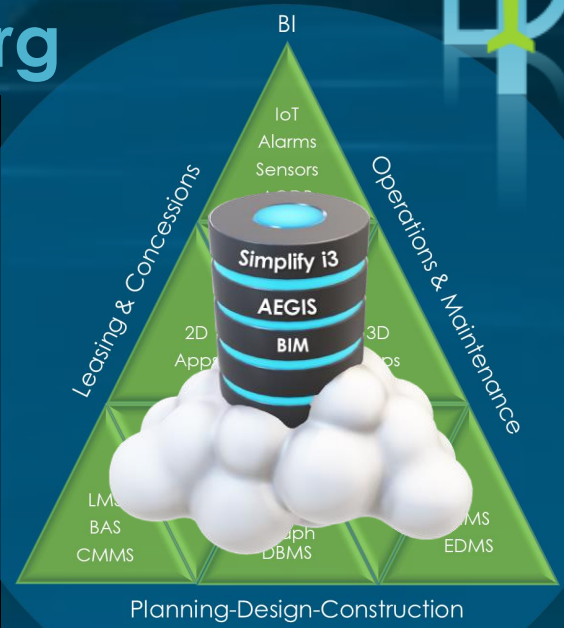


Suresh Sanka

Brings over 2 decades of progressive experience in digital twin technology development including applications for airports at Orlando, Harlingen, Buckeye, and Boca Raton. Leads the Simplify i3 product development. Brings hands-on experience in web, mobile, cloud, and standalone applications leveraging .NET, Java, low code platforms, and databases such as SQL Server, Oracle, and PostgreSQL.

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www.AirportDigitalTwin.org





Your Work, Simplified.®









Qualifications



→ **Ali Diba, Ph.D., P.E.**

→ Business Intelligence (BI) Subject Matter Expert (SME)

→ Microsoft Partner – PowerBI Developer

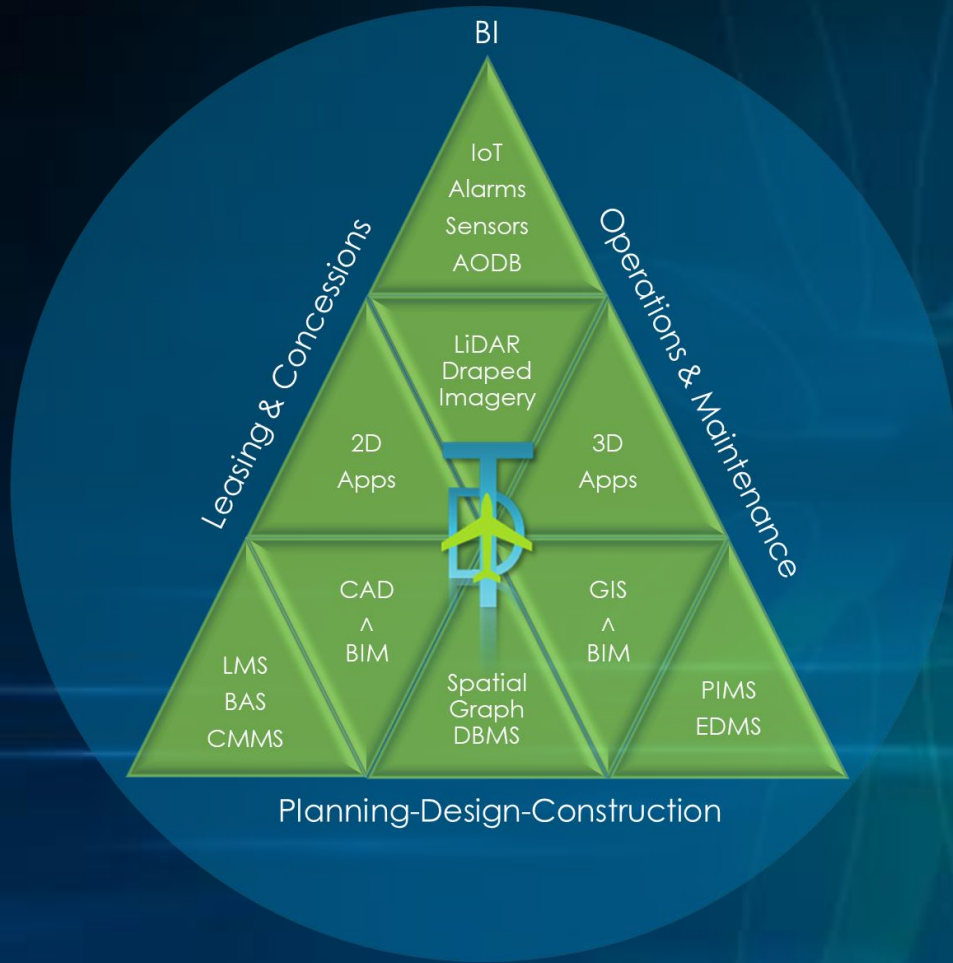
→ Salesforce Partner – Tableau

→ Esri Partner – over 25 years
with many awards and recognitions

→ Airport Experience from LAX, CLT, BOS...



Webinar Outline



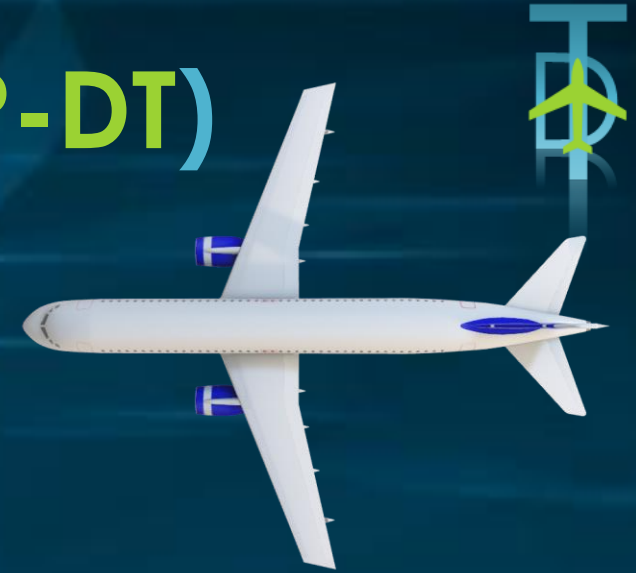
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What's an **AiRPort Digital Twin (ARP-DT)**

Digital representation of airport campus

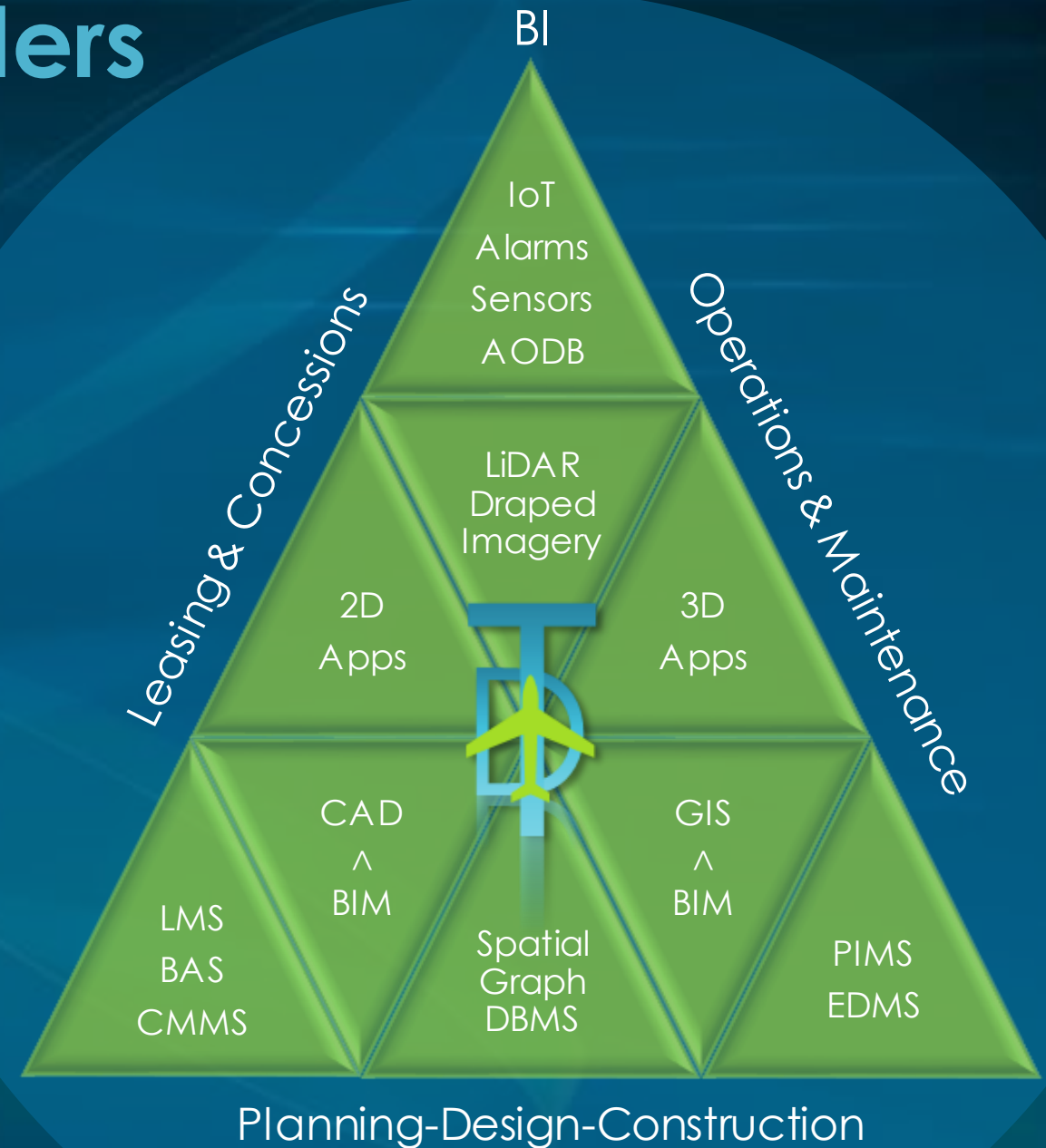
- ➔ **integrating data** from disparate systems / sources
- ➔ to enable **safe, secure,** and **efficient** airport functions
- ➔ with **past, present,** and **predicted** views



Holistic ARP-DT Stakeholders

Airport Owner-Side

- Planning & Environmental
- Engineering & Construction
- Operations & Security
- Facilities Maintenance
- IT Systems & Infrastructure
- Leasing & Concessions (Revenues)
- Finance & Procurement
- Legal & Administration



Enterprise BI Analytics

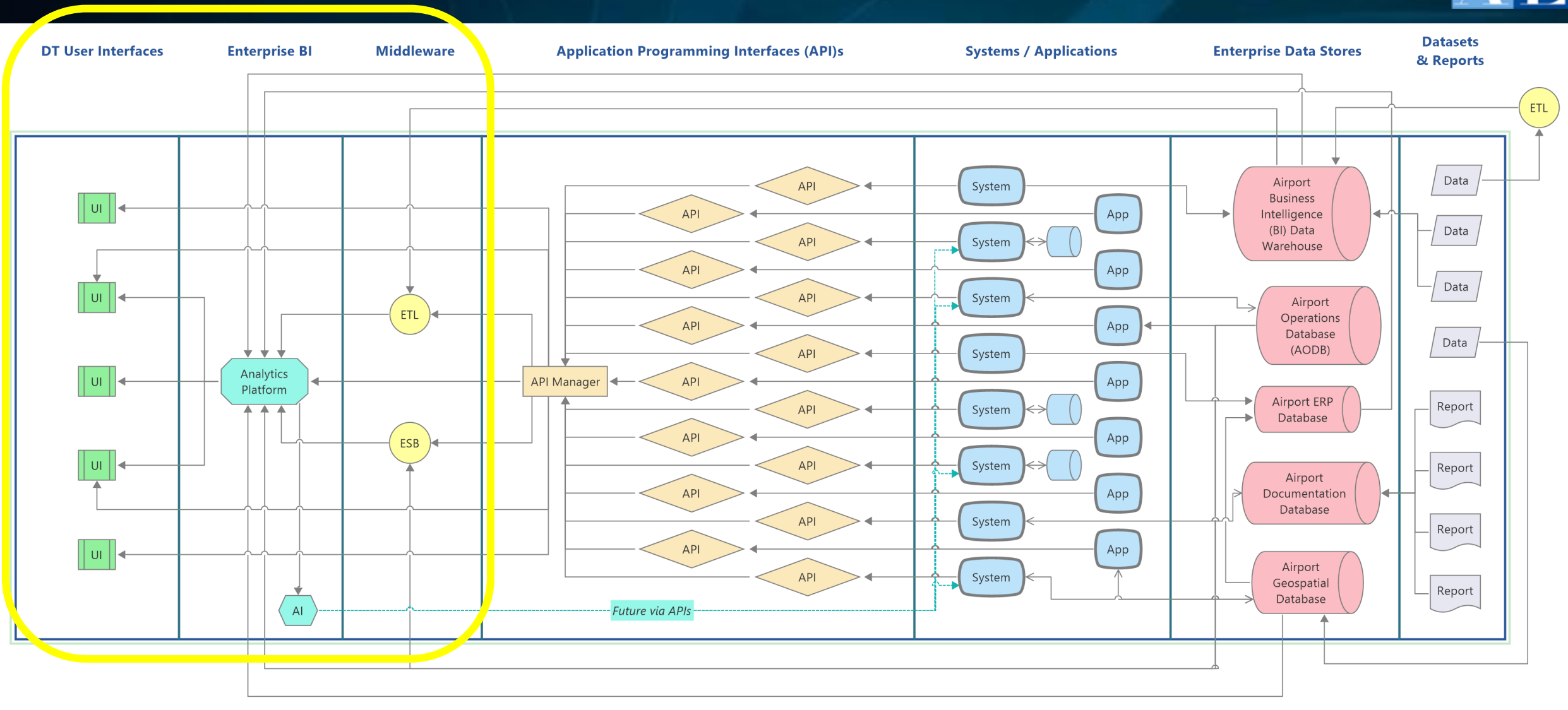


- Airport Digital Twin Rolls Up to Provide Business Intelligence (BI)
- Airport Enterprise BI Requires various Analytics Correlation via Spatial Common Denominator
- Strong Spatial Analytics Tools Needed



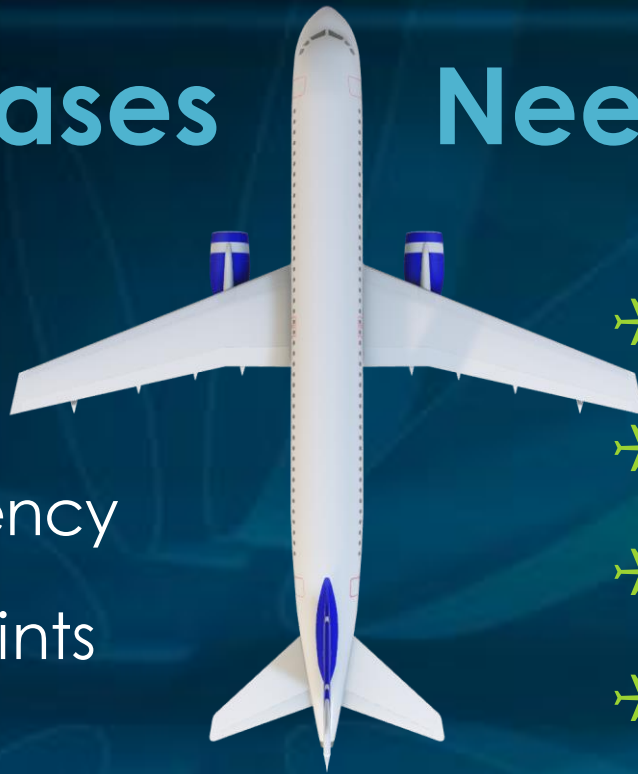
BI

ARP-DT Open System Architecture



DT Top Use Cases

Needed @ Airports



- Landside Arrivals
- Shuttle Bus Frequency
- Security Checkpoints
- Digital Content
- APM Frequency
- Concessions
- Connecting Flights/PAX Loads

- Terminal Resources
- Terminal Energy Management
- Terminal Cleaning
- PAX Health
- Safety Management System (SMS)
- Security/Emergency Situational Awareness
- Predictive Maintenance
- Work Scheduling (e.g., O&M, CIP)

Sample Questions for Airport BI Group



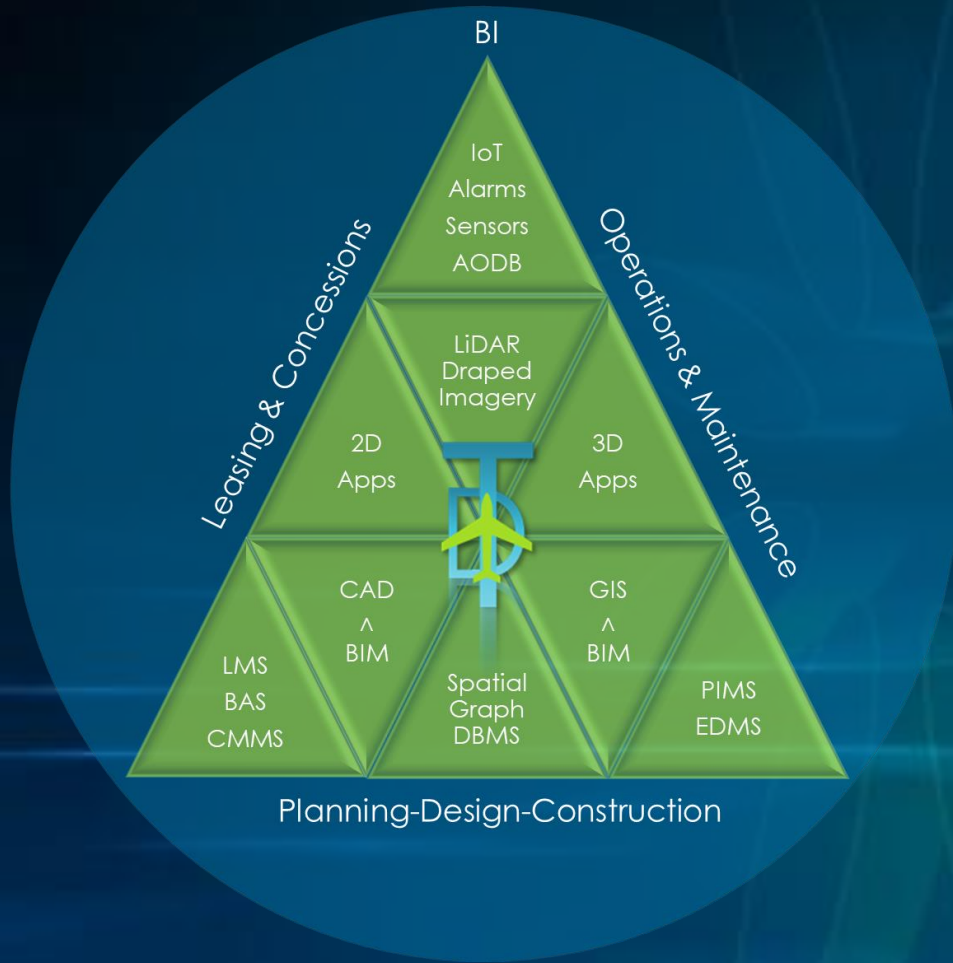
- ➔ Where are **levels of service impacted** across the terminal in terms of congestion, queue lengths, wait times, elevator/escalator outage etc.?
- ➔ What does **passenger journey** look like in one continuous view from terminal entrance to exit (e.g., timing, shopping, dining, restroom, etc.)?
- ➔ Which **concessions** are **most desired** by passengers based on transactions, location, and flow levels?
- ➔ Which airport concessions and corresponding locations are producing **more or less revenue than expected** and why?
- ➔ How gate changes, aircraft sizes per gate, irregular ops, etc influence **concessions performance**?

Sample Questions for Airport BI Group (cont')



- ➔ When should HVAC and lighting be minimized at which parts of the facility based on scheduled activity?
- ➔ Which airport assets and corresponding locations are costing more or less than expected and why?
- ➔ Which assets should be budgeted and when for renewal and replacement due to "traffic" levels (i.e., due to flux of aircraft, vehicles, passengers, baggage)?
- ➔ What are the risk exposures and levels? Where is safety mitigation needed due to frequency and type of issues?

Webinar Outline



4. Aug 9: Holistic Business Intelligence

- ➔ Objective / Background / Introductions
- ➔ Review Top 15 Airport Use Cases for Airport Digital Twin Business Intelligence (BI)

➔ Review BI Analytics Options, Examples, and Recommendations

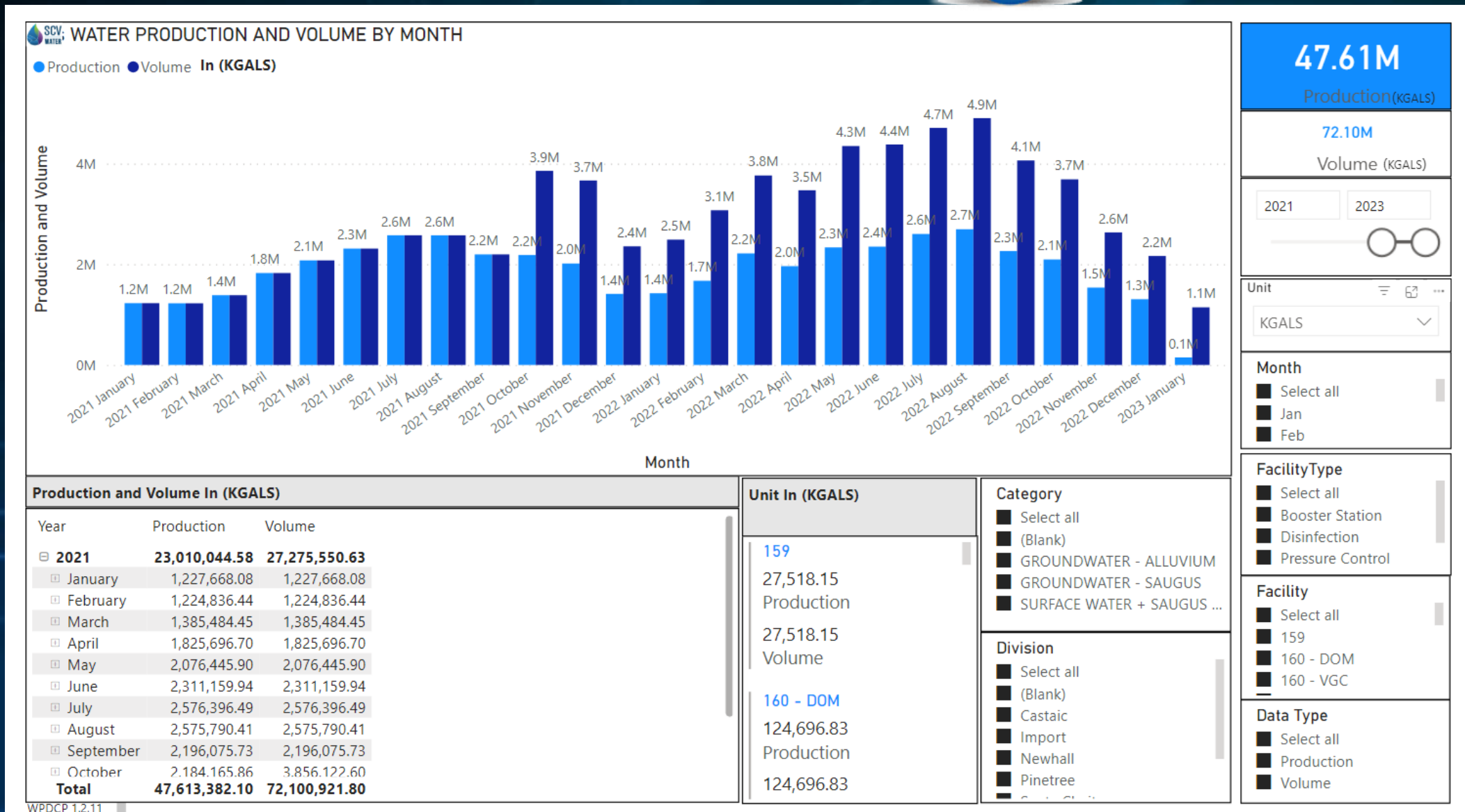
- ➔ Microsoft PowerBI
- ➔ Salesforce Tableau
- ➔ Esri ArcGIS
 - ➔ Dashboards
 - ➔ Insights
 - ➔ Web Applications

Spatial BI Analytics Leading Software Options



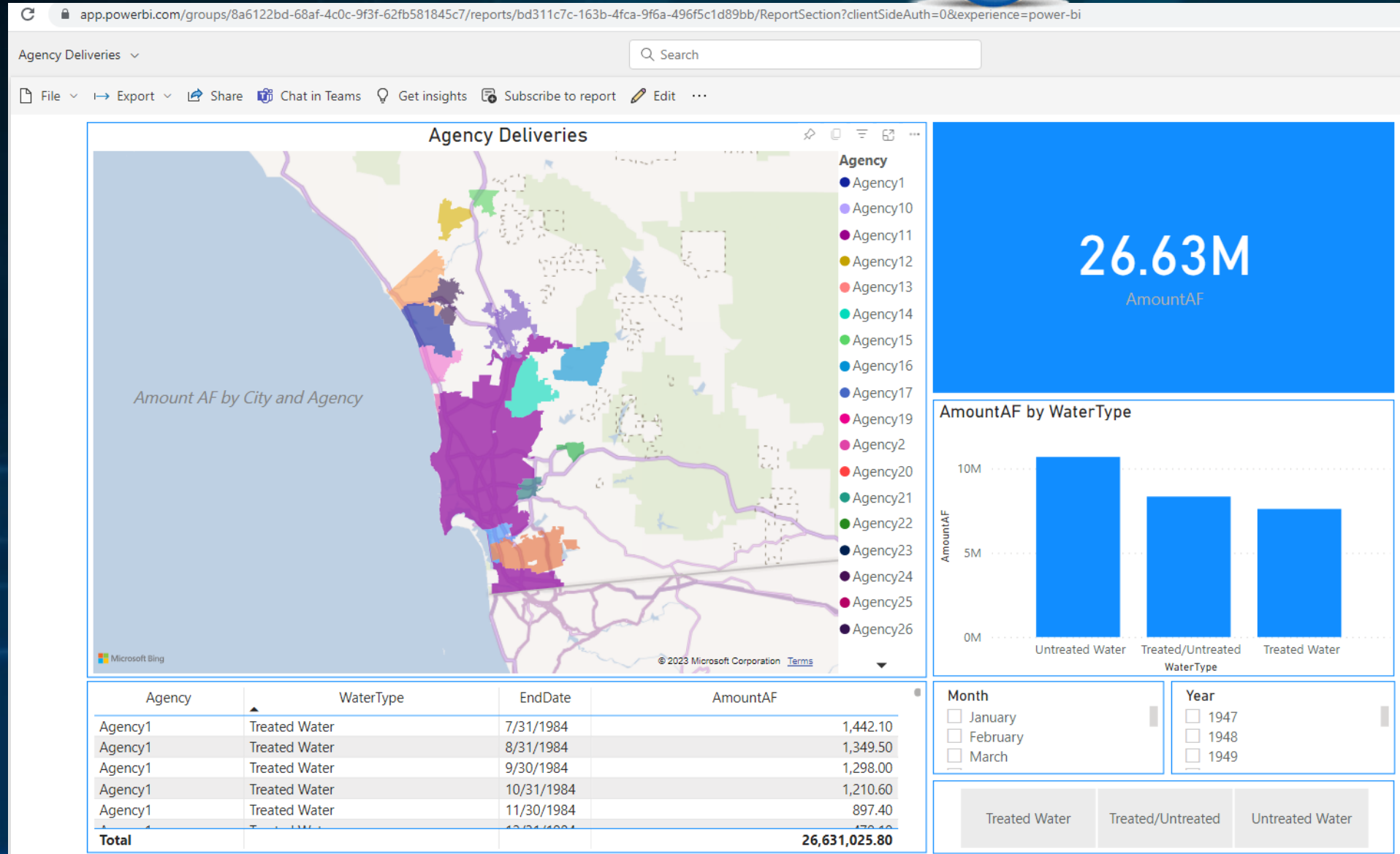
- PowerBI with Embedded Esri Maps
- Tableau with Embedded Esri Maps
- Esri ArcGIS:
 - Dashboards
 - Insights
 - Web Applications

PowerBI Example

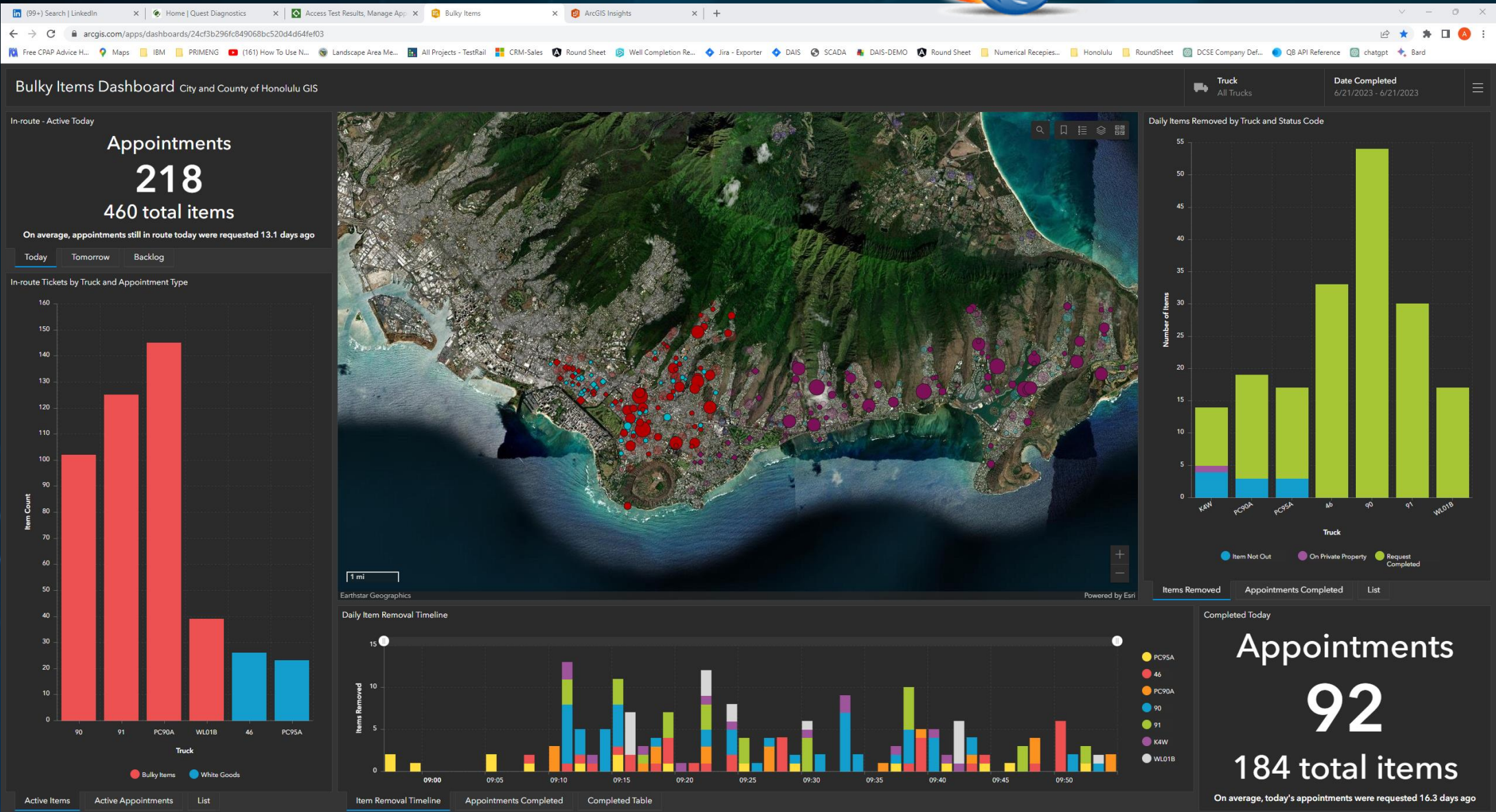


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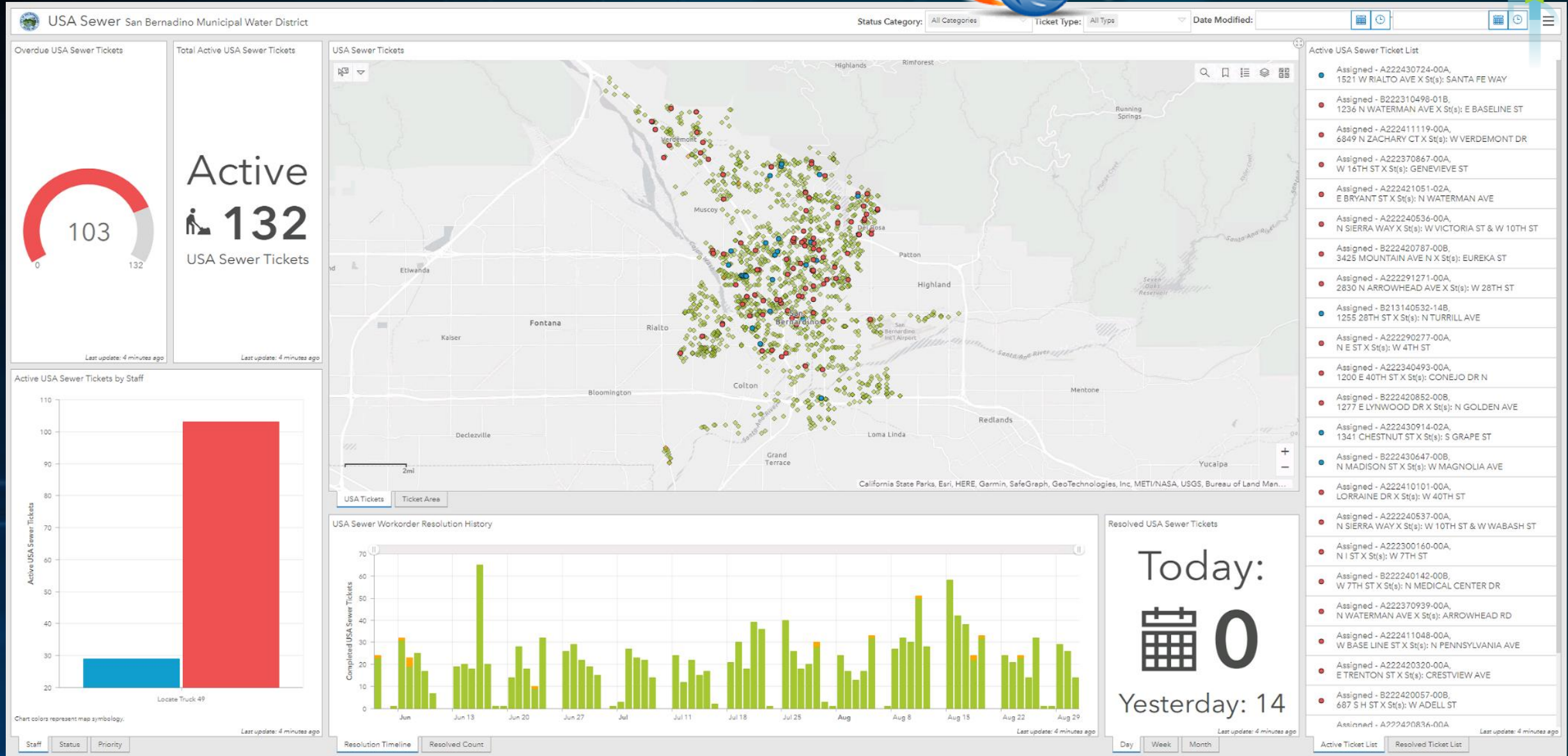
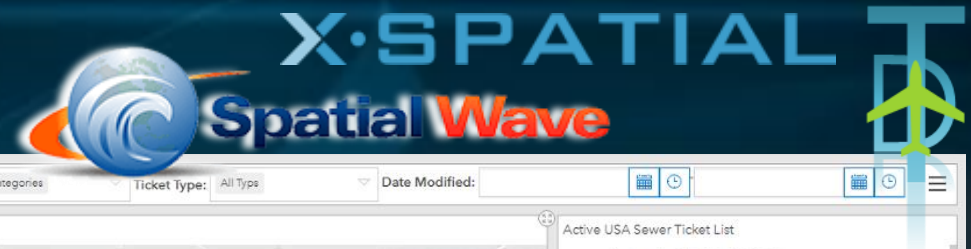
PowerBI Example



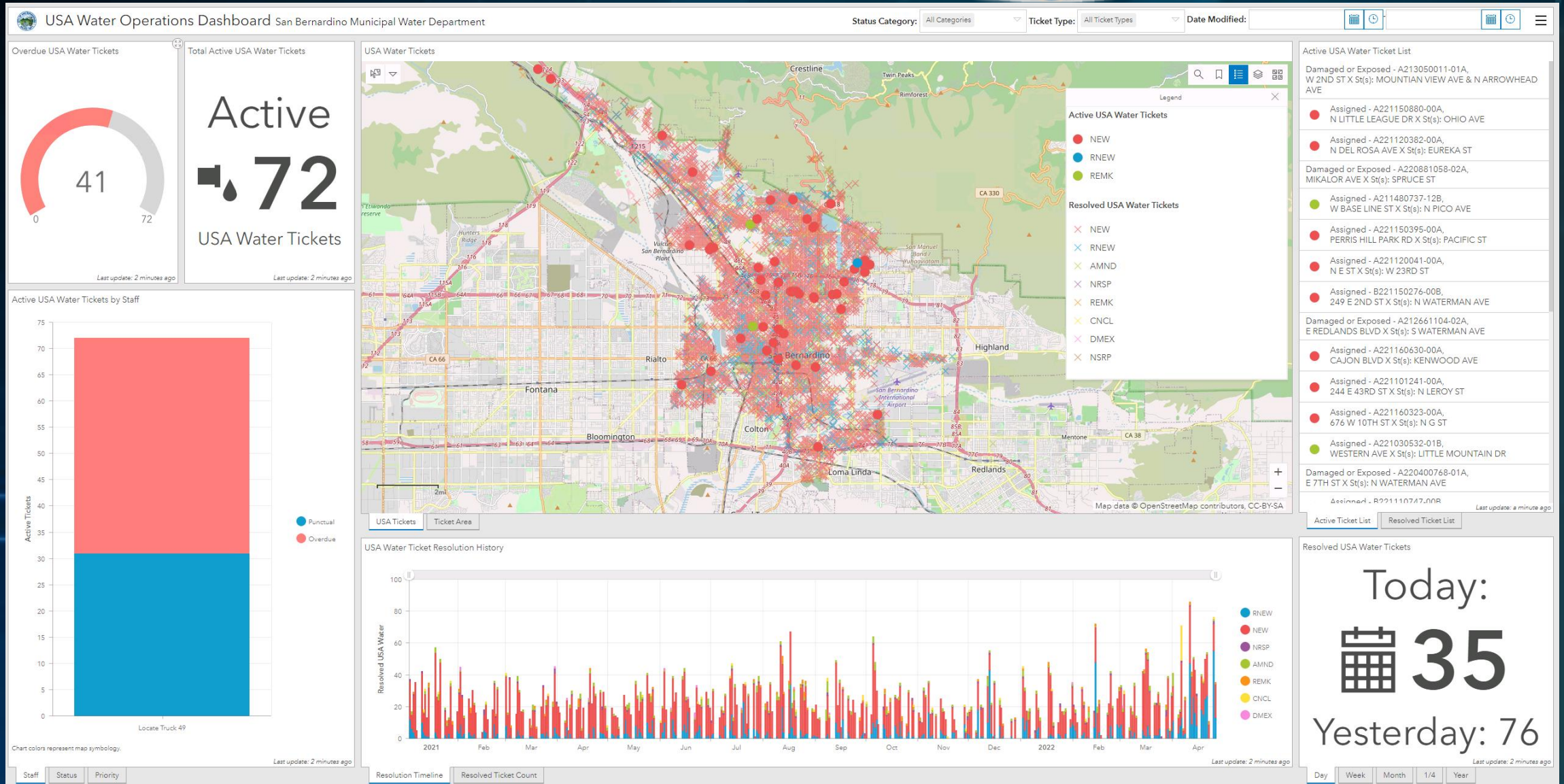
Esri Dashboards Example



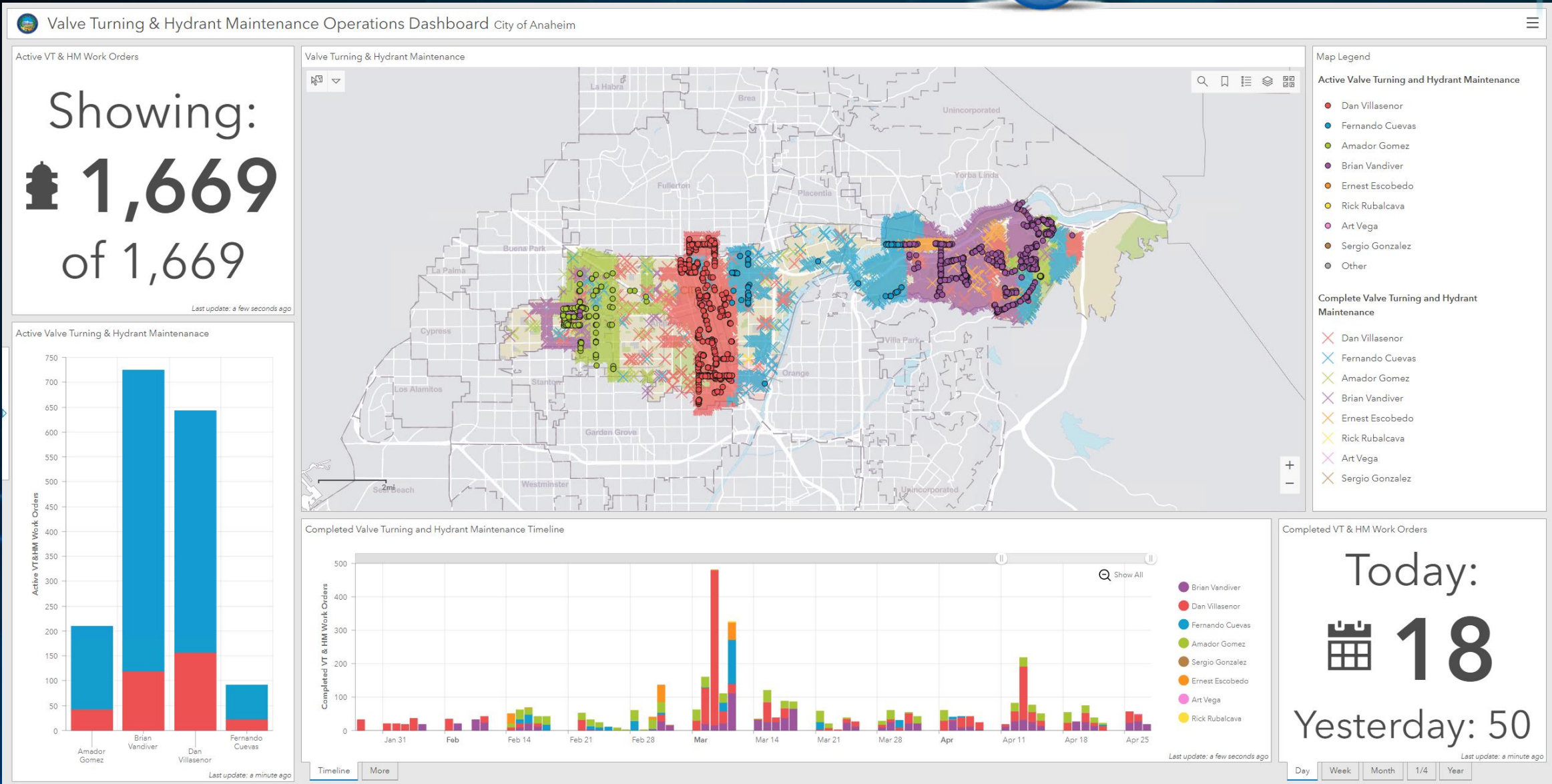
Esri Dashboards Example



Esri Dashboards Example



Esri Dashboards Example



Esri Dashboards Example



Rooms at CLT Operations Das...

X-Spatial

Tenant:

Description:

Concourse:

Expire:



Total Room Area:
230,554.4 ft²

Last update: a minute ago



Leases to Expire

This Quarter:

21

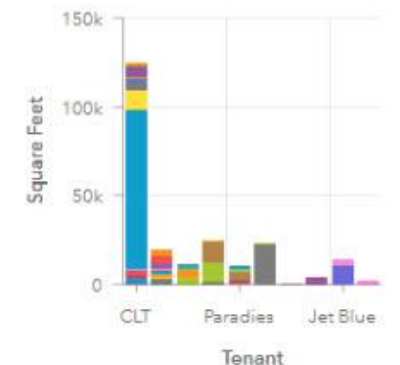
Next Quarter: 53

Last update: a minute ago

1/4

Year

Area by Tenant and Room Description

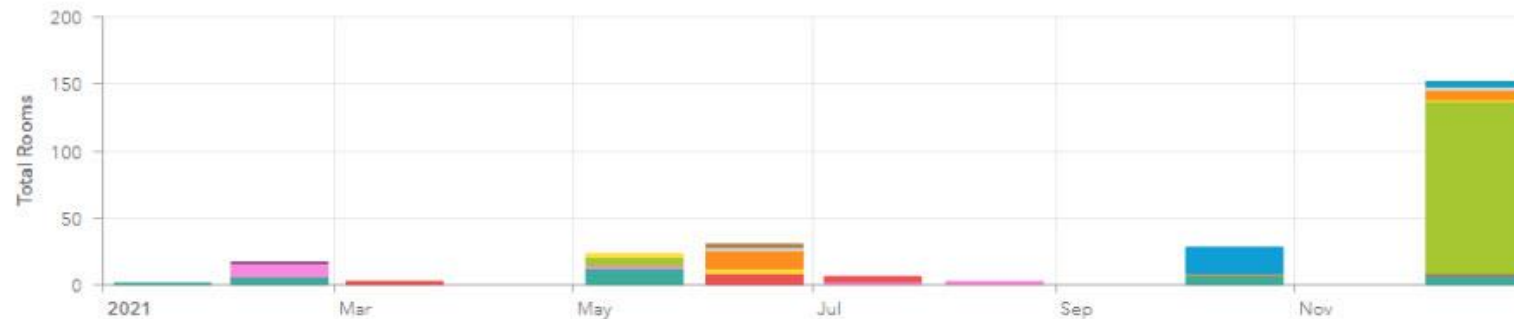


Last update: a minute ago

Bar

Pie

Lease Expiration Timeline



Last update: a minute ago

Map Legend

FloorPlan

Rooms

- <Null>
- Air Canada
- CLT
- Common Use
- Delta

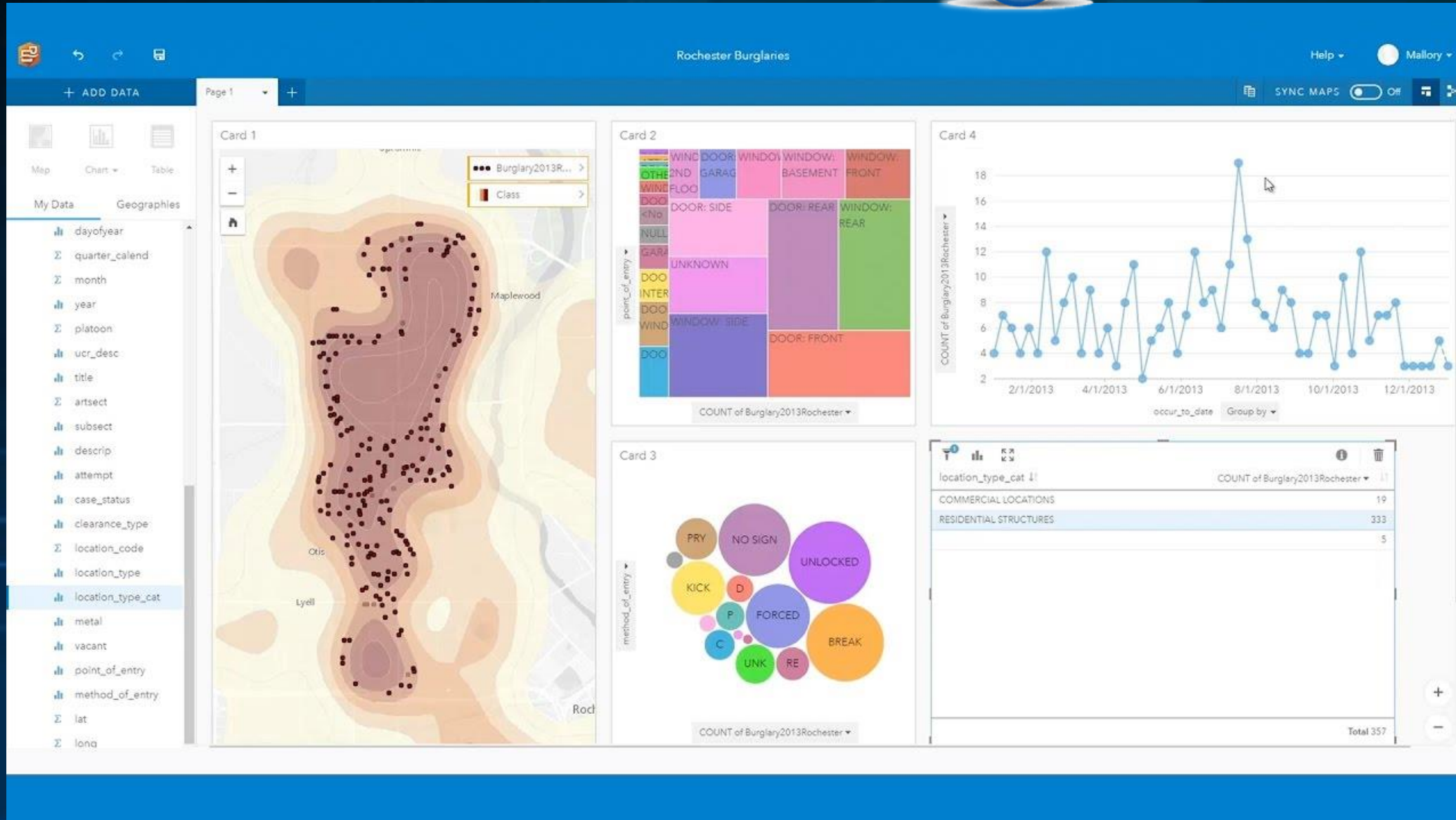


Displaying data on a map can give you insight into the patterns, distributions, and relationships inherent in your data. However, many patterns and relationships aren't obvious by looking at a map. Often, there's too much data to sift through and present coherently as raw data. The way you display the data on the map can change the patterns you see. Analysis allows you to quantify patterns and relationships in the data and display the results as maps, tables, and charts. Analysis also empowers you to answer questions and make important decisions using more than a visual analysis.

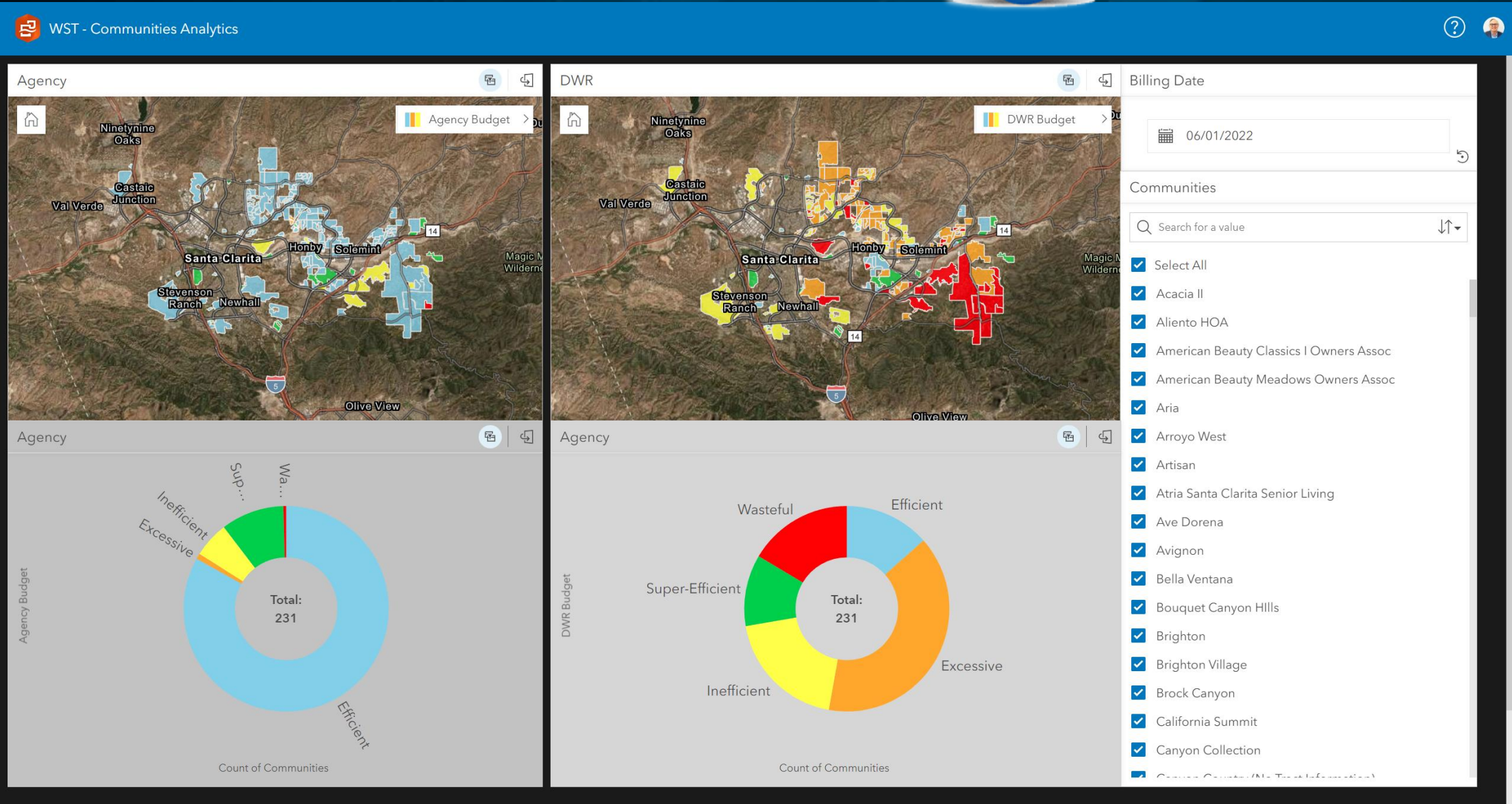
Esri Insights Example



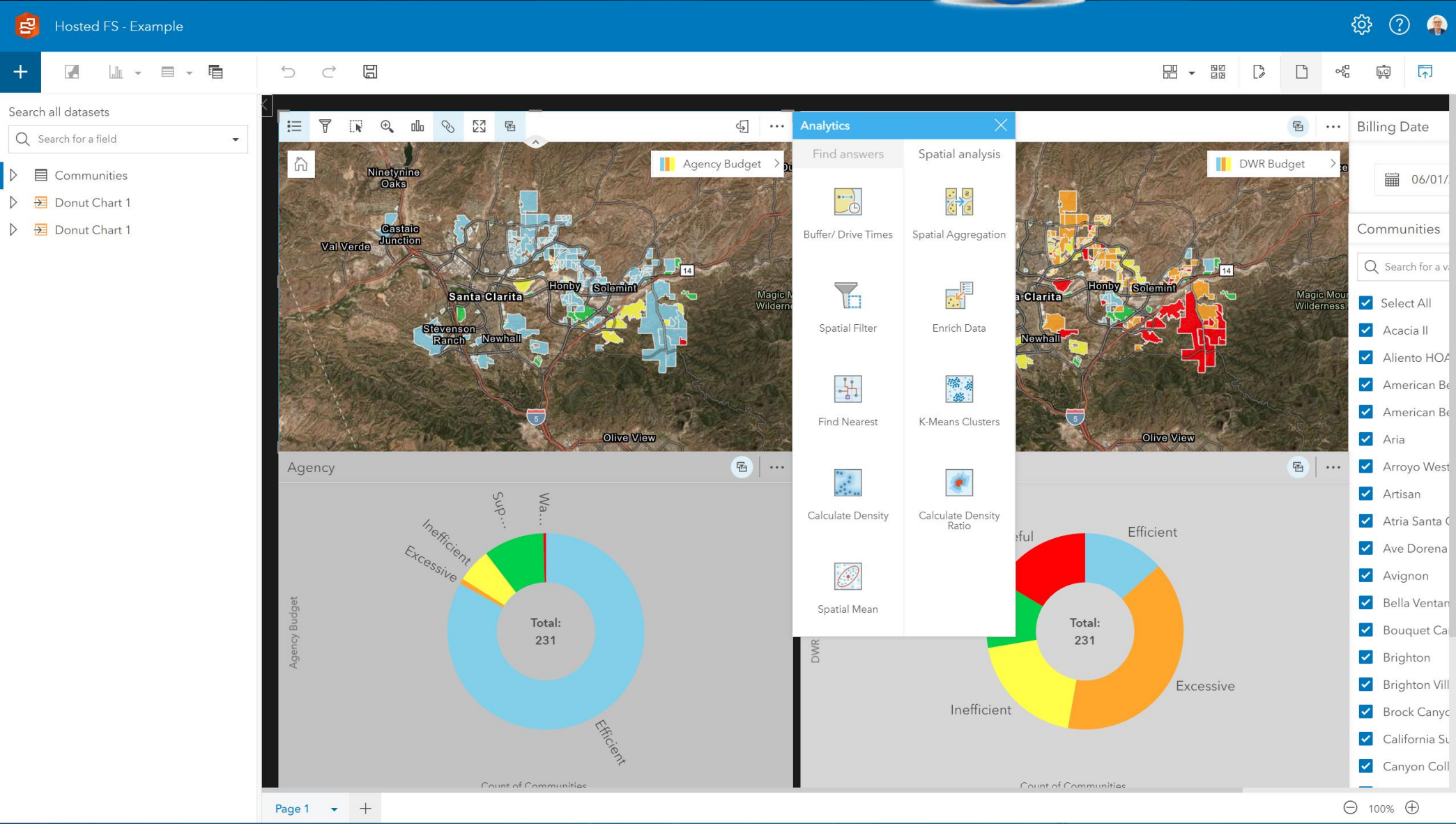
Esri Insights Example



Esri Insights Example



Esri Insights Example



Insights capabilities and deployment options

Most of the capabilities in Insights, such as creating maps, charts, and tables, performing spatial and nonspatial analysis, enabling location, creating relationships, and calculating fields, are available in all Insights deployments. The following capabilities and features are not available in all deployments:

Feature	Insights in ArcGIS Online	Insights in ArcGIS Enterprise	Insights desktop
Create database connections	Not supported	Supported	Supported
Create OneDrive connections	Supported	Supported	Not supported
Create SharePoint connections	Supported	Supported	Not supported
Use the scripting environment	Not supported	Supported	Supported
Publish data	Supported	Supported	Not supported
Schedule updates to published reports	Supported	Supported	Not supported
Save content	Not supported	Not supported	Supported
Access public workbooks, models, datasets, reports, and themes on the home page	Supported	Not supported	Not supported
Use data engineering	Not supported	Not supported	Supported



Esri Insights

Question	Sample questions	Analysis capability
How is it distributed?	Where are the largest camps of internally displaced people?	Spatial Aggregation
	Where are asthma hospitalizations most concentrated in the city?	Calculate Density
	Do obesity rates among adolescents show a normal distribution?	View Histogram
	How should graduated symbols or choropleth map features be distributed on the map?	Classification
	Which crime types and police districts have the highest crime frequency?	View Heat Chart
	How is the cost of car insurance distributed in each city?	View Box Plot
	How does the crime rate in a certain district compare to the mean?	Calculate Z-Score
	Where are the clusters of caribou habitat?	Find K-Means Clusters



Esri
Insights

Ask
Questions

How is it
distributed?

How is it related?	What are the habits and lifestyles of people who live in this area?	Enrich Data
	What is the relationship between the sales of men's apparel and the total sales for the year?	View Scatter Plot
	How do obesity rates differ between urban and rural residents?	Calculate Ratio
	How does the number of migrants to each state compare to the number of migrants from each state?	View Chord Diagram
	What is the rate of migration between countries?	View Link Chart
	Which variables have the most effect on the total sales at each store location?	Regression Model
	What are the expected future levels of carbon emissions based on trends in vehicle usage, renewable energy uptake, and economic growth?	Predict Variable
	Do certain neighborhoods have a higher occurrence of cancer than others, relative to their population?	Calculate Density Ratio

Esri
Insights

Ask
Questions

How is it
related?

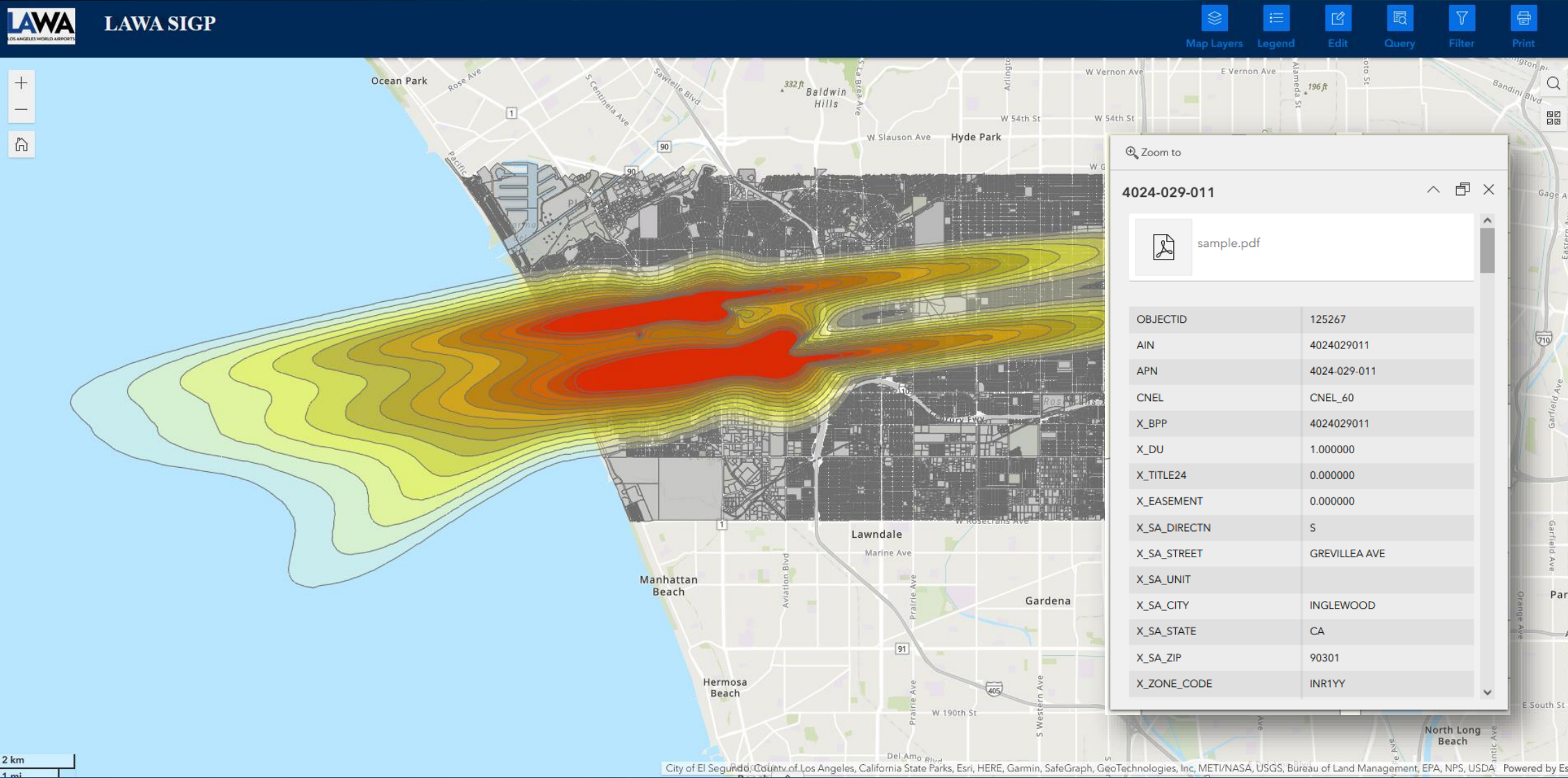
What's nearby?	Which rivers are within 10 miles of a pipeline?	Buffer/Drive Times
	What is the median household income for neighborhood residents over the age of 65?	Attribute Filter
	Which lakes in the region have the highest fish counts?	Spatial Filter
	What is the proximity of drug crimes to elementary and high schools?	Find Nearest
How has it changed?	Does the number of traffic accidents increase or decrease over time?	Time Series
	What is the percentage of losses or gains for each commodity?	Calculate % Change
	What is the number of sales for each month and year?	View Data Clock
	How does seasonality affect air quality?	Temporal Decomposition
	What are the predicted air quality values for the next two years?	Forecast

**Ask
Questions**

**What's
nearby?**

**How has it
changed?**

Esri Web Applications (via Experience Builder)



BI Tool Recommendations



- **PowerBI / Tableau** – Use it when tabular data exploration is center focus and spatial is secondary
- **ArcGIS Dashboards** – Share “light” spatially enabled analytics with external users
- **ArcGIS Insights** – Conduct discovery using spatially enabled BI data
 - ideal for analysts (via desktop)
 - share results with others (via ArcGIS Enterprise or Online)
- **ArcGIS Web Applications** – Custom application with ability to create complex functionalities (using custom widgets)
 - ideal for all or specific users using web interface

Takeaways

Q&A



- Business **use-case** driven
- Most airport use cases need **BI analytics correlated over GIS** spatial maps
- Need **Updated** floor plans and campus basemap (including sensor **data locations**)
- Need **Data warehouse** and **middleware** for processing and integrating data from multiple sources
- **ARP-DT stewardship** naturally fits in the Airport's **BI Group**



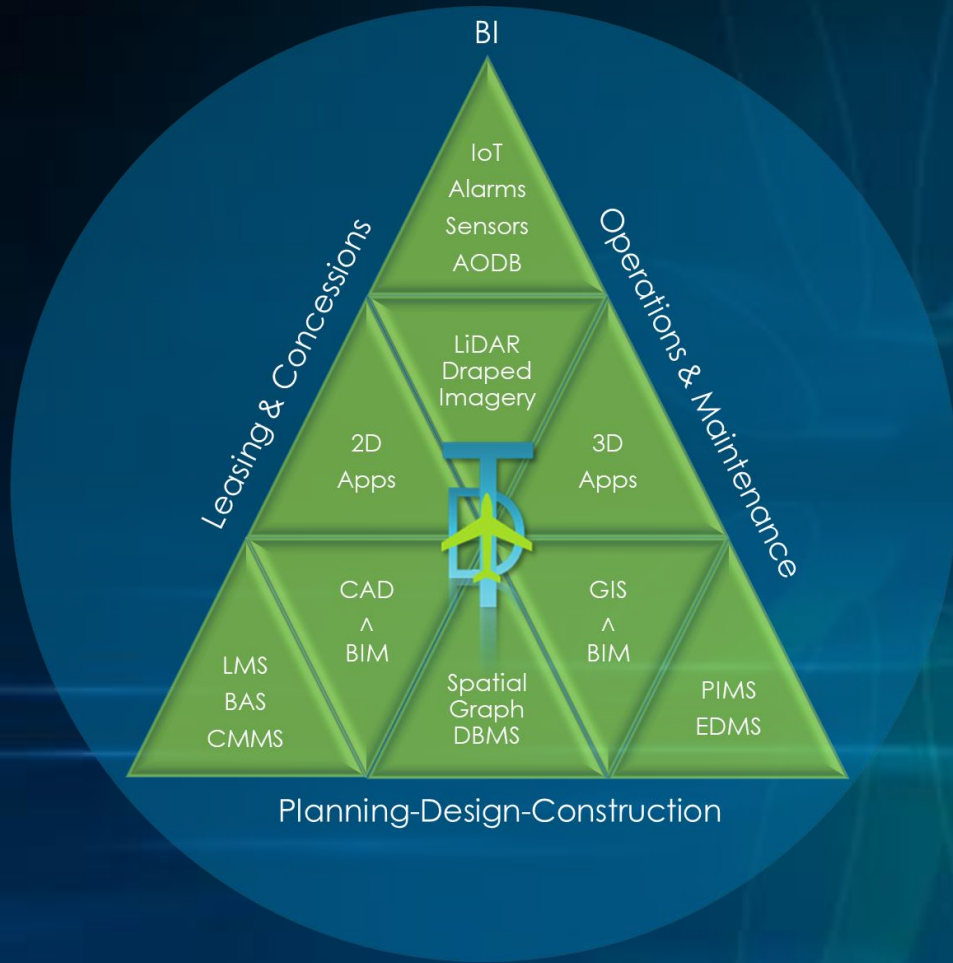
AAAE Operations & Technology Symposium August 22-24 in Atlanta



**Panel Session
on
Key Technologies Enabling
Achievement of Airport
Digital Twins**

Panelists include: AMS + ATL + CLT + MIA

Webinar Series



1. Jul 19: **BIM Processing**
2. Jul 26: **Information Integration**
3. Aug 2: **Enabling Integrated SMS**
4. Aug 9: **Holistic Business Intelligence**
5. TBD: **Leveraging Video Analytics**
6. TBD: **Predictive Modeling ...**

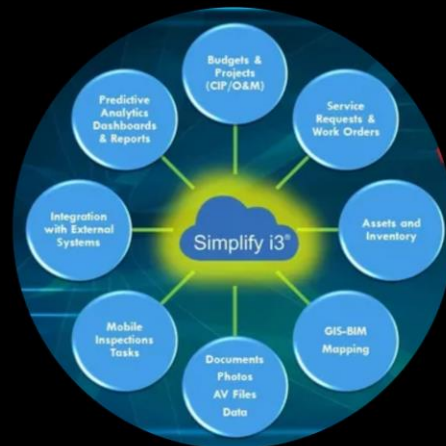
Thank You

AirportDigitalTwin.org



Welcome About Us Q&A Solution Webinars

INTEGRATED SOLUTION PLATFORM



Simplify i3

Airport Digital Twin Transformation Platform
by EPIC Engineering & Consulting Group

[Learn more](#)



AEGIS

Airport Enterprise Geospatial Information
System by x-Spatial

[Learn more](#)



BIM

Building Information Modeling Standardization
Harvesting and Integration by PDBM/x-Spatial

[Learn more](#)



Welcome About Us Q&A Solution Webinars

Simplify i3® is the top layer of our Airport Digital Twin Integrated Platform.

Simplify i3® is a cloud-based platform, which supports and optimizes the full lifecycle spectrum of airport business processes, including but not limited to:

- Master Planning
- Capital Improvement Programming (CIP)
- Project Management
- Part-139 Safety Compliant Operations
- Facilities Maintenance Management
- IT Asset Management
- Lease Management
- Environmental Management
- and more... see below

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AIRPORT DIGITAL TWIN ENABLING CAPABILITIES



Modular Building Blocks

Simplify i3's system architecture is modular and flexible, leveraging comprehensive digital transformation building blocks. These "Lego-like" components enable system configuration without programming to achieve the full spectrum of functionality required for airport enterprise management.

Simplify i3 leverages web-enabled forms and spreadsheets with a common database repository, integrated with documents and photos, geospatial mapping, business analytics dashboards, mobile phones/tablets, IoT sensors and devices, and various other airport business systems as needed.

Simplify i3 is a Commercial, Off-The-Shelf (COTS) Software as a Service (SaaS), offered by EPIC Engineering & Consulting Group. The Simplify i3 system is built on state-of-the-art Google user interface technology, Apple iOS and Android mobile technologies, Esri's GIS mapping technology, and Microsoft's Azure cloud.

Supporting Airport's Full Lifecycle

Simplify i3 is driven by airport enterprise business needs, over the full lifecycle starting with planning and budgeting for new airport assets, building and activating the assets, and then operating, leasing, and maintaining the assets. Various integrated applications (apps) are available for each lifecycle phase. Our Digital Twin approach is to Simplify Integrated Infrastructure Intelligence (i3).



User-Configurable Forms with Mapping

Simplify i3 provides the airport owner out-of-the-box forms supporting various business processes and functions listed below. The airport owner's system administrator can reconfigure these or configure new forms, without programming, using drag-drop functionality, for both web and mobile interfaces.

User-Configurable Spreadsheets

Simplify i3 provides "list view" spreadsheets, which are easily configurable by the user, who can save various views for different reporting/analysis needs. Spreadsheet list views are practical, therefore, Microsoft Excel is heavily used by airport managers. Simplify i3 enables the airport manager to import their spreadsheets into the platform and realize further benefits and powerful functions. Simplify i3's list views may be exported back to Excel or to PDF for off-line use.



User-Configurable Dashboards & Reports

Simplify i3's graphical and spatial dashboards and reports empower the airport owner with effective Business Intelligence (BI) capabilities to manage through analytical metrics, trends, and predictive Artificial Intelligence (AI).

User-Friendly

Simplify i3 provides airport owners with state-of-the-art, user-friendly

