



Key Technologies

Enabling Achievement of Sustainable

Airport Owner Digital Twins



AIRPORT OPERATIONS & TECHNOLOGY SYMPOSIUM

AUGUST 22-24, 2023 // ATLANTA, GA

Hosted by Hartsfield-Jackson Atlanta International Airport

SPONSORED BY

www.AirportDigitalTwin.org

Panel Agenda

- Introductions
- Airport Digital Twin Roadmap
- Challenges & Solutions
 - 1st Business Intelligence (BI) Analytics
 - 2nd Merging Various Information
 - 3rd Limited Labor Resources
 - 4th Consolidating CAD-GIS-BIM
 - 5th Processing Incoming AEC Data



Panelists

Moderator

- David Tamir
AAAE Digital Twin Working Group Lead
AirportDigitalTwin.org Lead Director

Airports

- Haley Cerri
Charlotte Douglas Int'l Airport (CLT)
- Daniel Cinti
Miami Int'l Airport (MIA)
- Arisca Droog
Amsterdam Schiphol Int'l Airport (AMS)
- Brian Haren
Hartsfield-Jackson Atlanta Int'l Airport (ATL)



Panelists (cont')

Technology Solution Providers

- Dr. Prasad Chittaluru
EPIC / Simplify i3
- Ed Maghboul
x-Spatial / AEGIS
- Francesco Martinelli
Trimble / Applanix / TIMMS
- Don Murray
Safe Software / FME
- Udi Segall
Intell-Act



AIRPORT OWNER'S DIGITAL TWIN ROADMAP



May 16, 2023

Prepared by David Tamir

AAAE Digital Twin Working Group Lead

under the direction of AAAE Facilities and Technical Services Committee

This work product reflects the results of the AAAE Digital Twin Working Group's efforts spanning 2022-2023



Image courtesy of www.AirportDigitalTwin.org

Table of Contents

Introduction.....	3
Background.....	3
Executive Summary.....	4
Acronyms.....	7
1. Explanation of Airport Owner's Digital Twin.....	8
2. Value to Airport Owner.....	10
Top ARP-DT Use Cases.....	13
(1) Optimize Landside Arrivals Mode of Transportation & Capacities.....	14
(2) Optimize Shuttle Bus Wait Times vs. Terminal Congestion.....	15
(3) Optimize Security Checkpoints for Landside PAX Arrivals.....	16
(4) Optimize Digital Content Based on Terminal Activity.....	17
(5) Optimize APM Routing & Frequency Based on Terminal Activity.....	18
(6) Optimize Concessions for Flight Destination Gates.....	19
(7) Optimize Extra Connecting Flights/PAX Load Effects on Terminal Congestion.....	20
(8) Optimize Terminal Human Resource Planning.....	21
(9) Optimize Terminal Energy Management.....	22
(10) Optimize Terminal Cleaning for Flight Activity.....	23
(11) Optimize PAX Health Monitoring and Improvements.....	24
(12) Optimize Safety Management System (SMS).....	25
(13) Optimize Security & Emergency Situational Awareness.....	26
(14) Optimize Predictive Maintenance of Facilities & Infrastructure.....	27
(15) Optimize (Minimize) Work Scheduling Impacts.....	28
3. Implementation of Digital Twin.....	29
3.1 Components.....	29
3.2 Open System Architecture.....	29
3.3 Maturity Model.....	32
3.4 Phasing and Work Breakdown Structure.....	36
3.5 Implementation Management.....	36
3.6 Implementation Skillsets.....	37
4. Sustaining of Digital Twin through Governance.....	38
4.1 Airport Organization Lead Steward.....	38
4.2 Configuration Change Management.....	38
5. Funding Approaches.....	39
Acknowledgements.....	40
Appendix: AAAE Digital Twin Working Group Participants.....	41

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

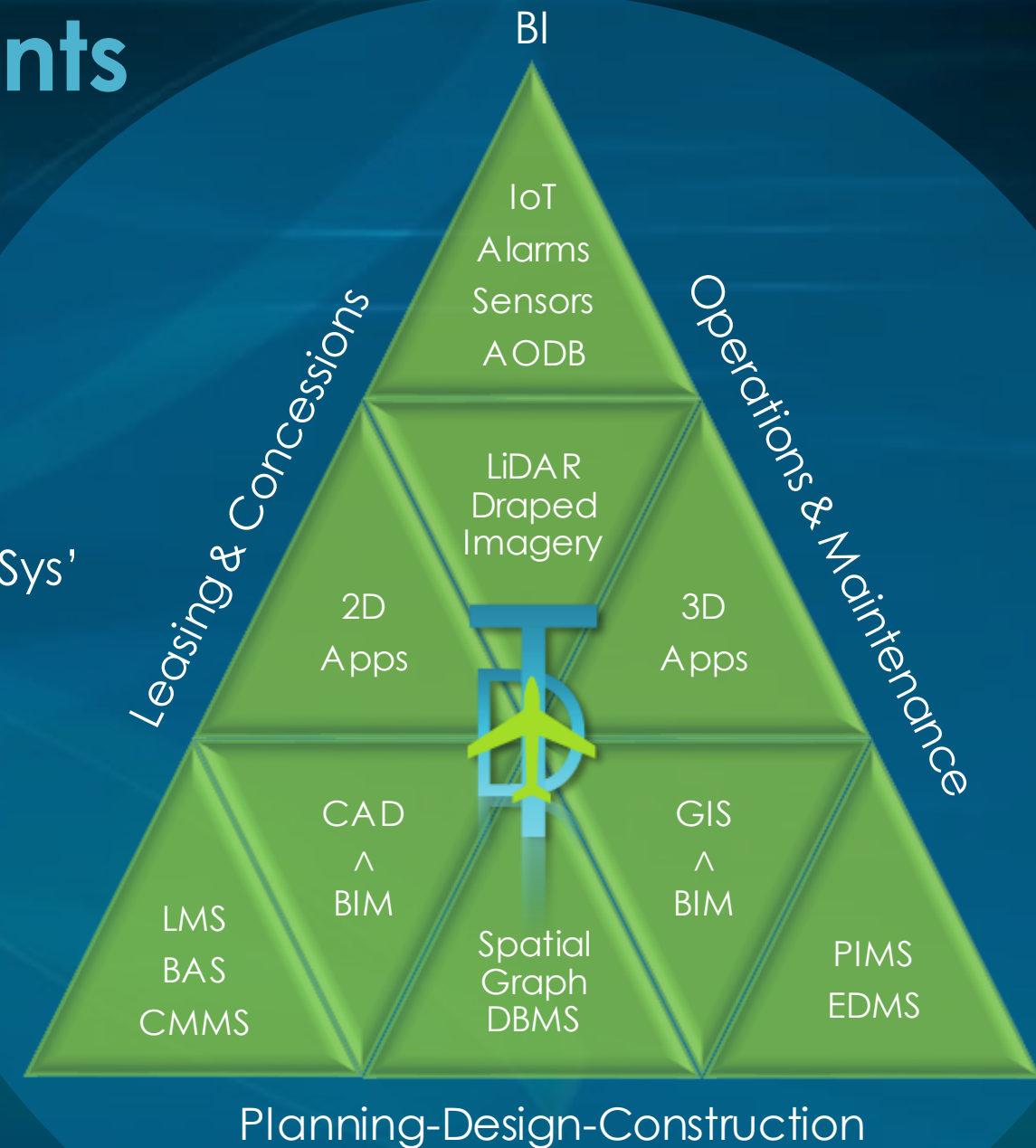


Digital representation of airport campus

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

Airport ARP-DT Components

- **AODB** – Airport Operations Database
- **BAS** – Building Automation System
- **BI** – Business Intelligence
- **BIM** – Building Information Modeling
- **CAD** – Computer Aided Design
- **CMMS** – Computerized Maintenance Mgm't Sys'
- **DBMS** – Database Mgm't Systems
- **EDMS** – Electronic Doc's Mgm't System
- **GIS** – Geospatial Information System
- **IoT** – Internet of Things
- **LiDAR** – Light Detection and Ranging
- **LMS** – Lease Management System
- **PIMS** – Project Info' Mgm't System

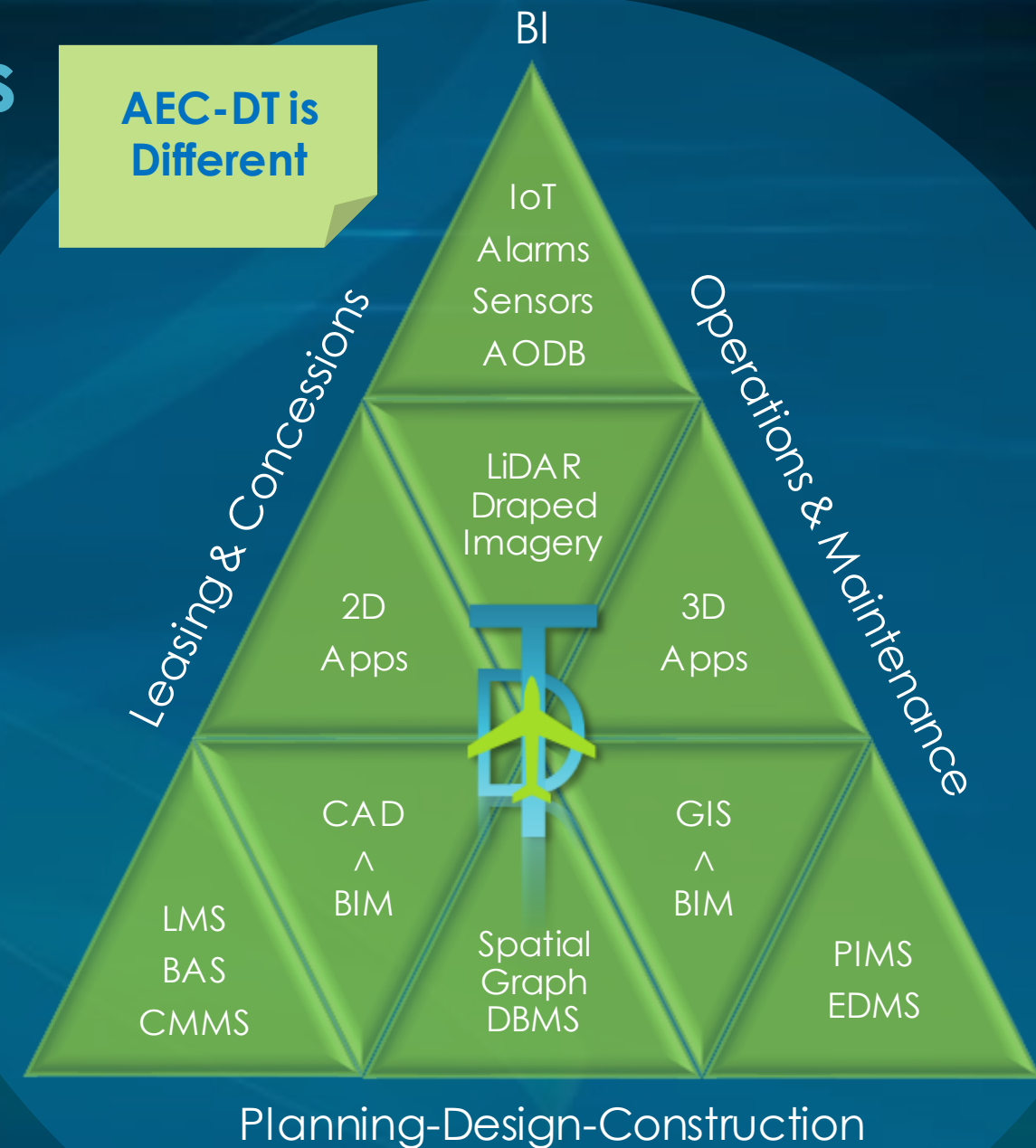


Holistic ARP-DT Stakeholders

Airport Owner-Side ----->

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

AEC-DT is Different



DT Foundation

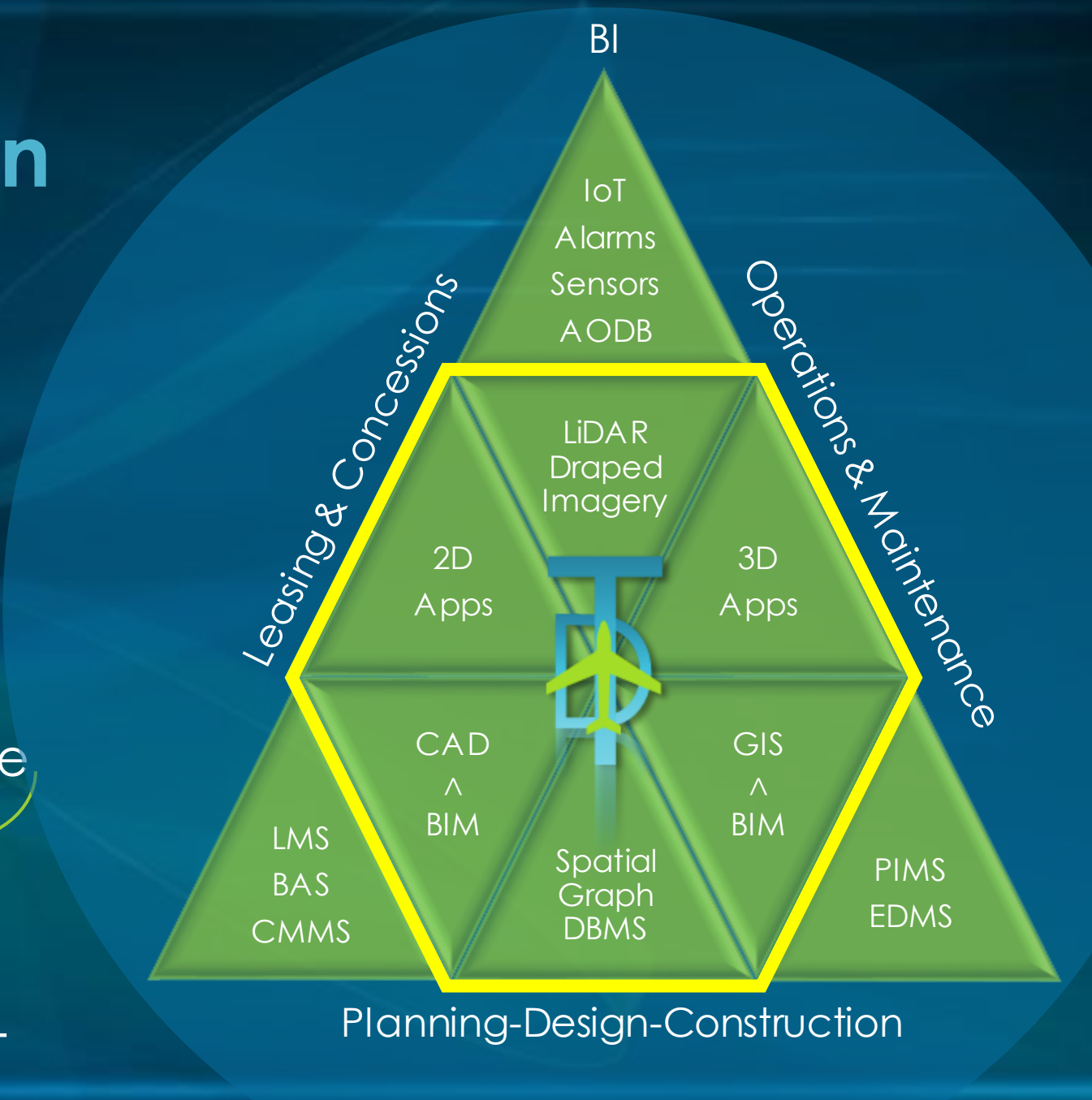


“Skeleton”
correlates DT
components
together
via common
denominator

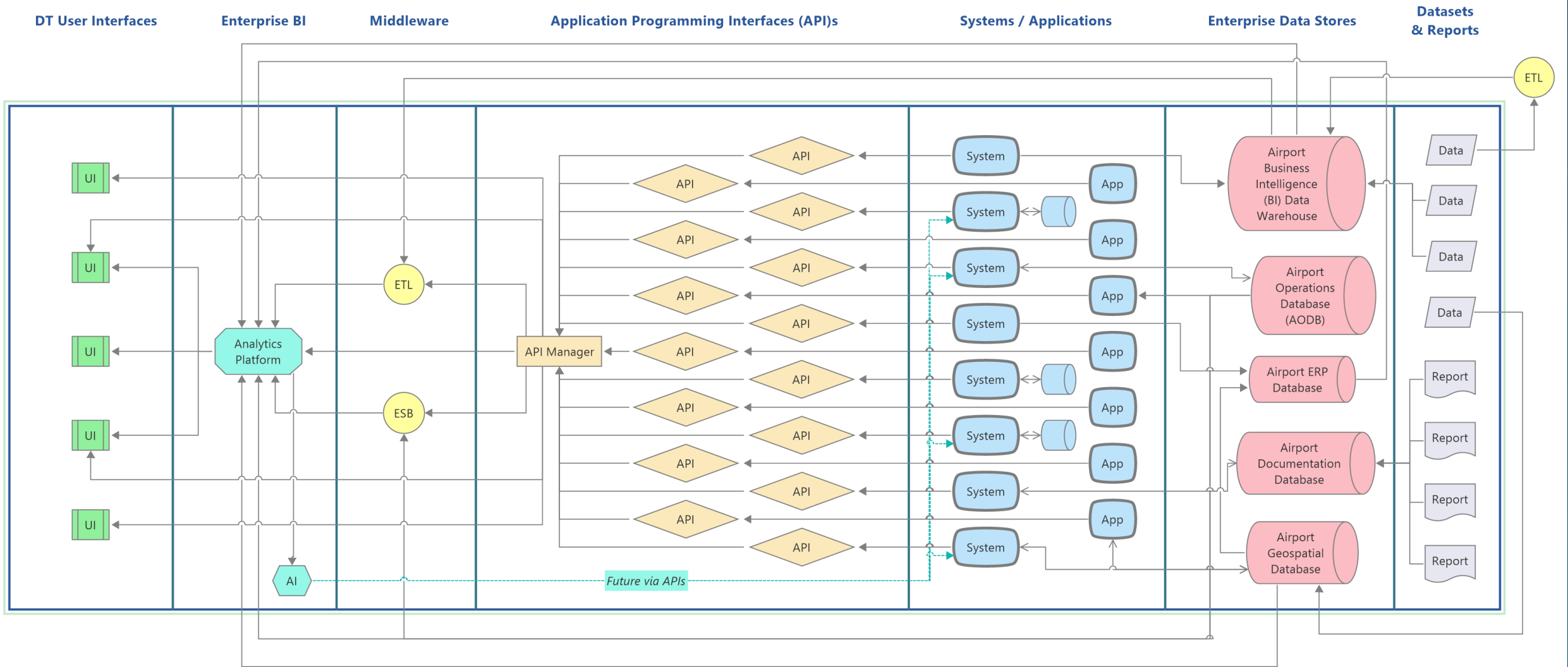
Spatial Database

key

to achieving DT

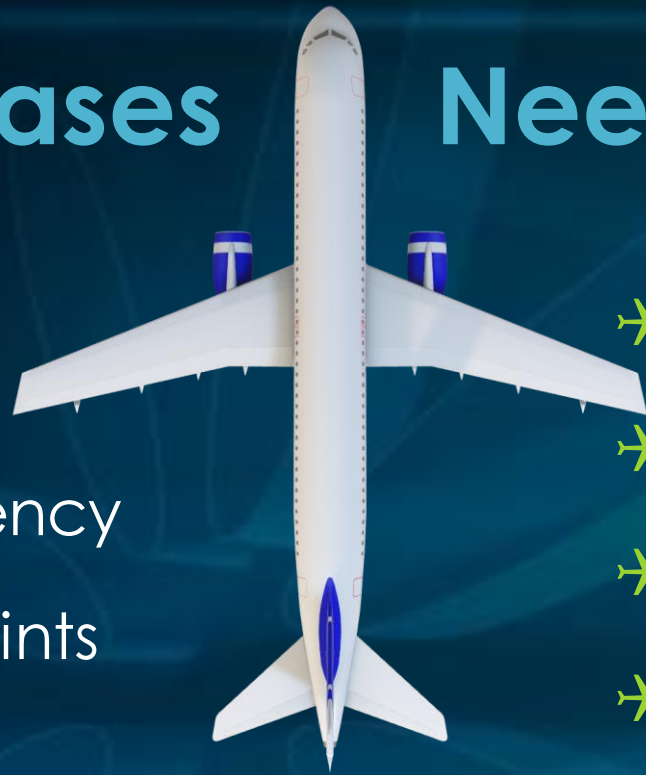


DT Open System Architecture Approach



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)

Path to Achieving ARP-DT



Maturity Model

- Staffing
- Business Processes
- Data Housing
- Metrics & Analytics
- Data Flow
- Spatial Correlation
- Systems Integration
- Predictive Simulation

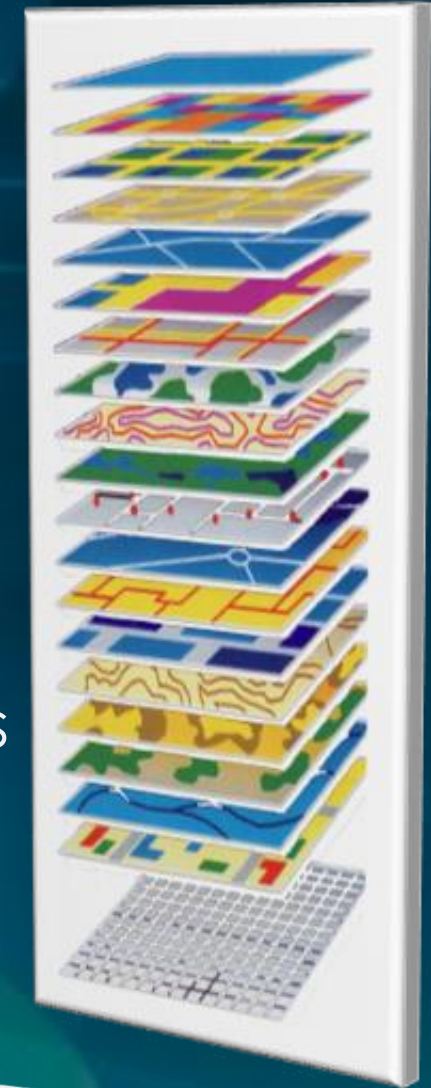
AAAE Airport Digital Twin Maturity Model						
	Lowest	>	>	>	>	Highest
	Entry Level					Utopia
Level	1	2	3	4	5	6
Staffing	Self motivated individual division staff conducting analysis	Division designated dedicated analyst	Proactive centralized Business Intelligence (BI) organizational function			
			Understaffed	Adequately staffed	Some machine learning automation reducing needed staff levels	Full machine learning automation
Business Processes	Not documented	Few documented	Few mapped with some workflow automation	Mostly mapped with some workflow automation	Completely mapped with some workflow automation	Completely mapped with full workflow automation
Data Housing	Siloed	Combination of siloed and centralized	Mostly centralized data hub/warehouse	Centralized & integrated data warehouse	Mostly aligned data	Full accessibility & alignment
Metrics & Analytics	Defining DT Vision & Path Forward					
	Measuring available data	Developing division metrics for key priorities	Developing centralized universal metrics	Build alignment of organizational measures into employee work tasks	Calibrate alignment of metrics to improve performance	Fully aligned enterprise with on-demand metrics
Data Flow	No automated data sharing flow (i.e., manual batch loading, not real time via API)	Manual and automated data sharing flow	Manual and automated data sharing flow	Priority external and all internal data flows automated	All data feeds automated with self reported validated	All data feeds automated (no self reporting)
	Some IoT device data flow within proprietary disparate systems	Some internal airport systems with automated data sharing	External partners data is partially manual (e.g., airlines, concessions, etc.)	Automated PAX demographics, POS, concessions data, airline activity overlay		
		Manual shared CAD/GIS maps	Common basemap automated web services			

1st ARP-DT Challenge

Limitations of spatial analytics with traditional Business Intelligence (BI) analytics platforms

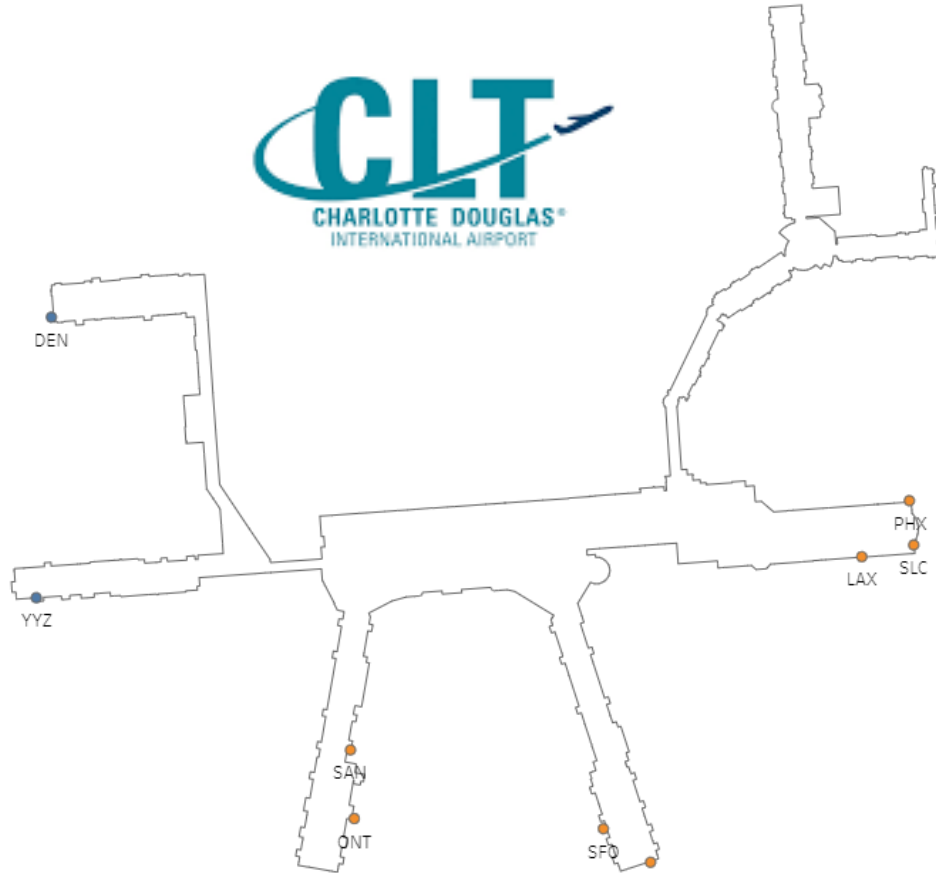
Power BI and Tableau are limited to only 2 spatial layers;
Need many more such as:

- Floor Plan Levels
- Aircraft Gates
- Tenants & Concessions
- Sensors & Alarms
- Doors
- Resources
- Work Orders
- Projects
- Etc.



Limited Spatial BI via Tableau

Currently Active Gates For - 6:00:00 AM



Month, Day, Year of Actual

June 29, 2023

Arrival Or Departure

A

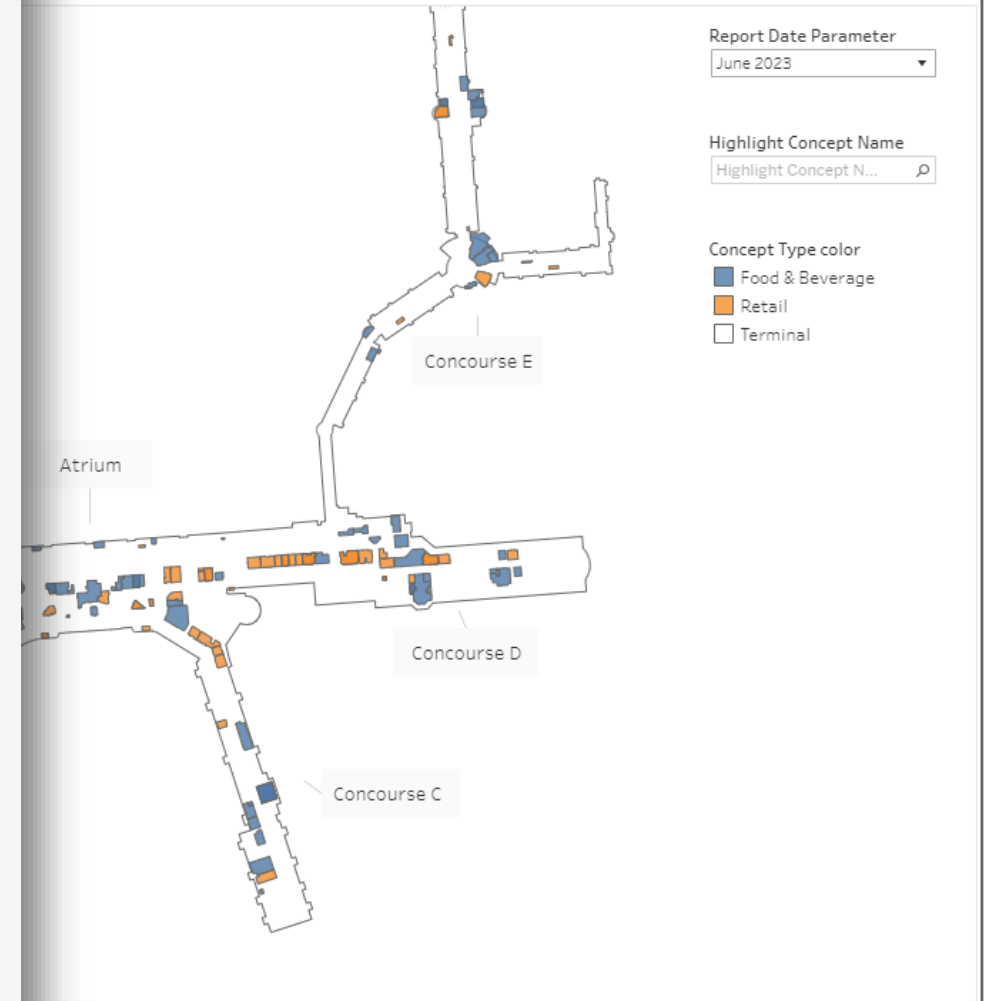
D

Actual Time Period

6:00:00 AM



Concessions Map



Spatial BI Analytics Leading Software Options



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

Esri Dashboards Example

Rooms at CLT Operations Das... Tenant: Description: Concourse: Expire:     

Total Room Area:
230,554.4 ft²

Last update: a minute ago



Leases to Expire

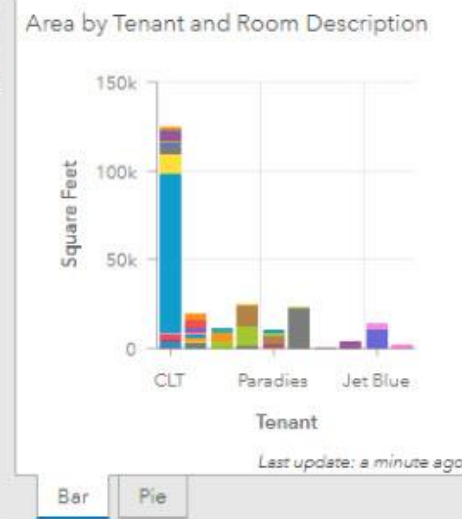
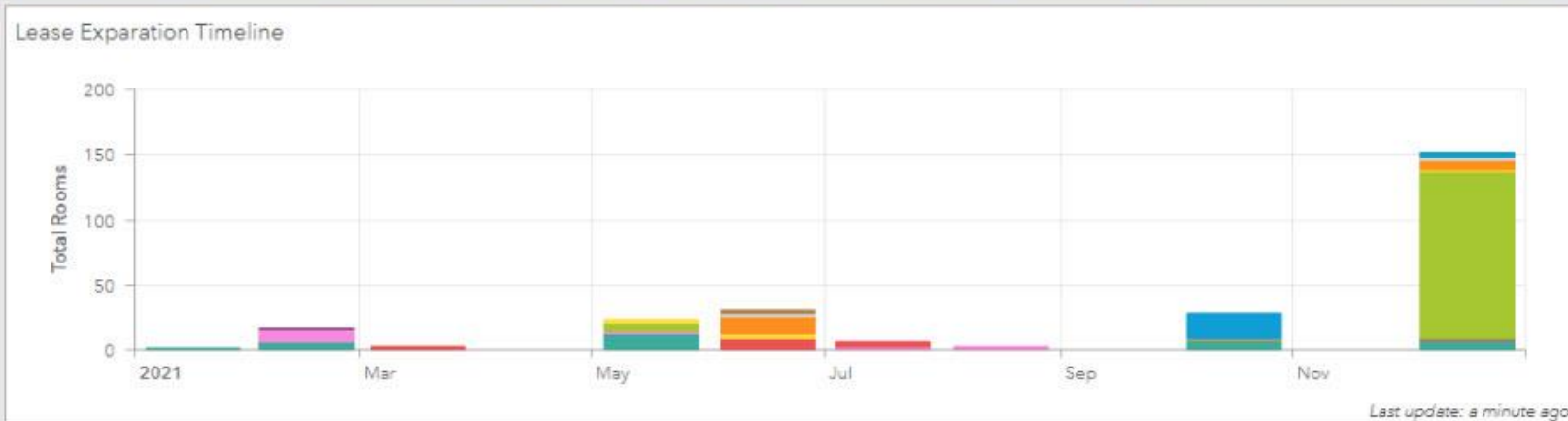
This Quarter:
 **21**

Next Quarter: 53

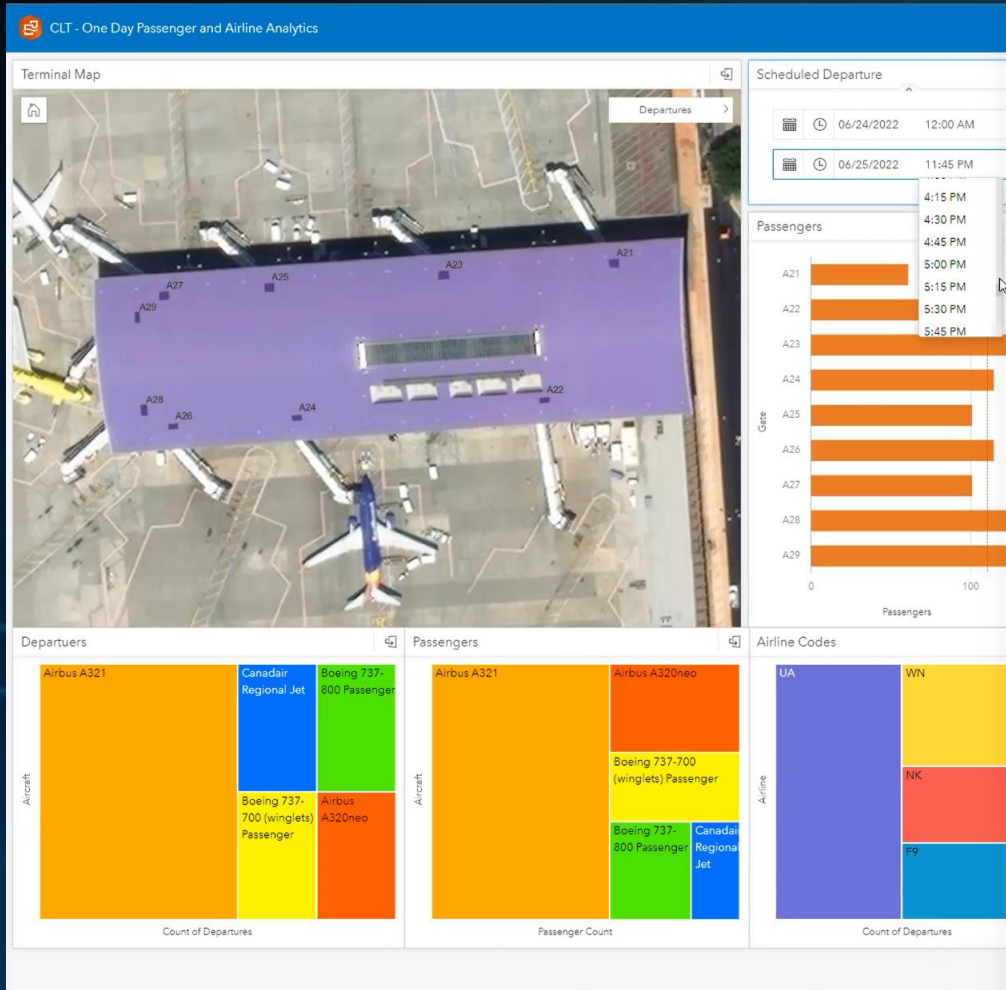
Last update: a minute ago

1/4 Year

- Map Legend
- FloorPlan
- Rooms
- <Null>
 - Air Canada
 - CLT
 - Common Use
 - Delta



Esri Insights Example



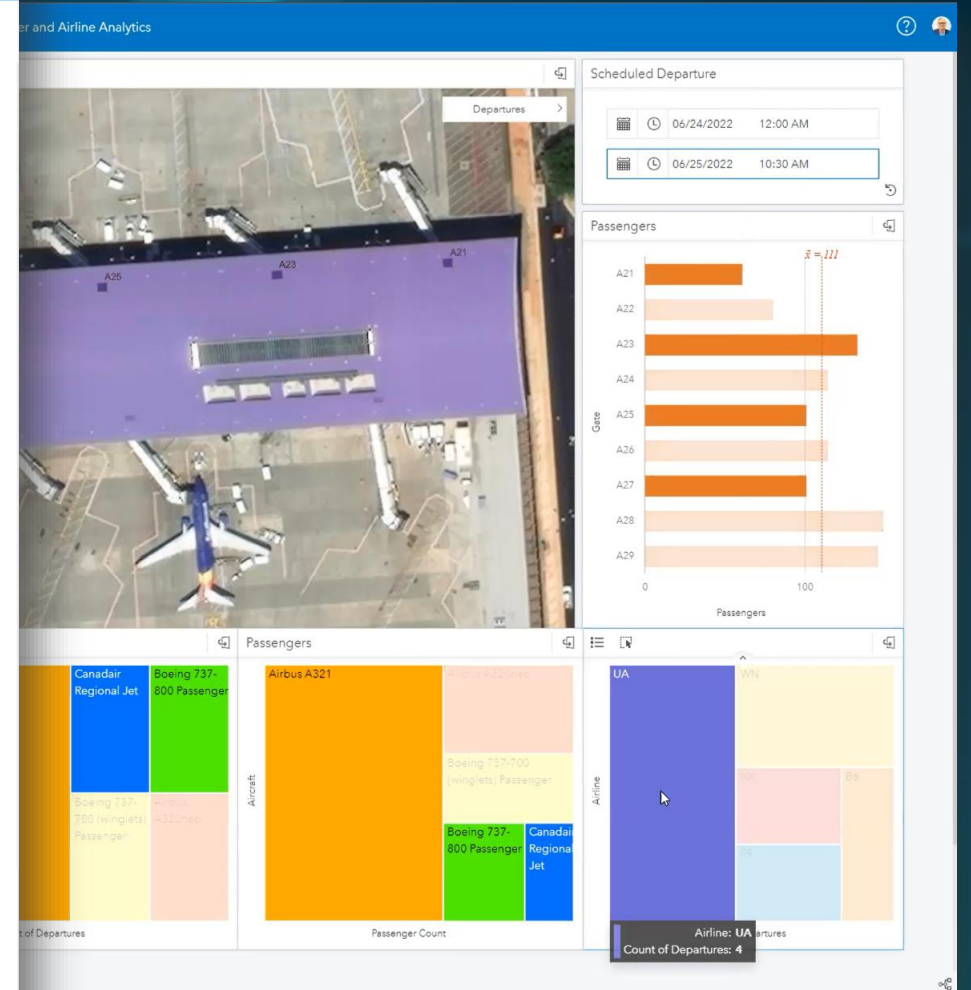
Analytics

Find answers

- Buffer/ Drive Times
- Spatial Filter
- Find Nearest
- Calculate Density
- Spatial Mean

Spatial analysis

- Spatial Aggregation
- Enrich Data
- K-Means Clusters
- Calculate Density Ratio



2nd ARP-DT Challenge

Merging dynamic information from across airport campus

onto single “page” or “map” for analytical correlation

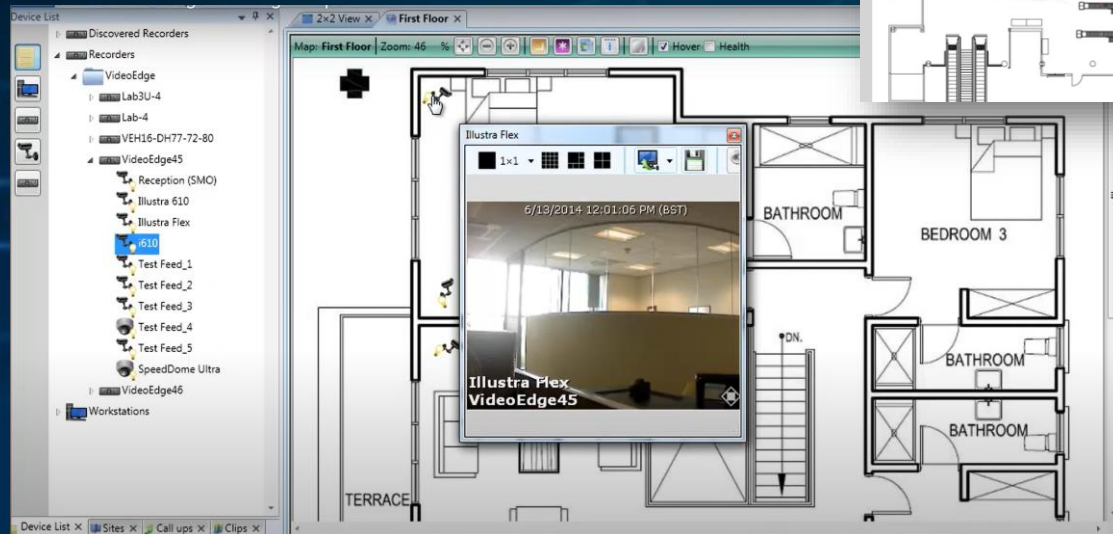
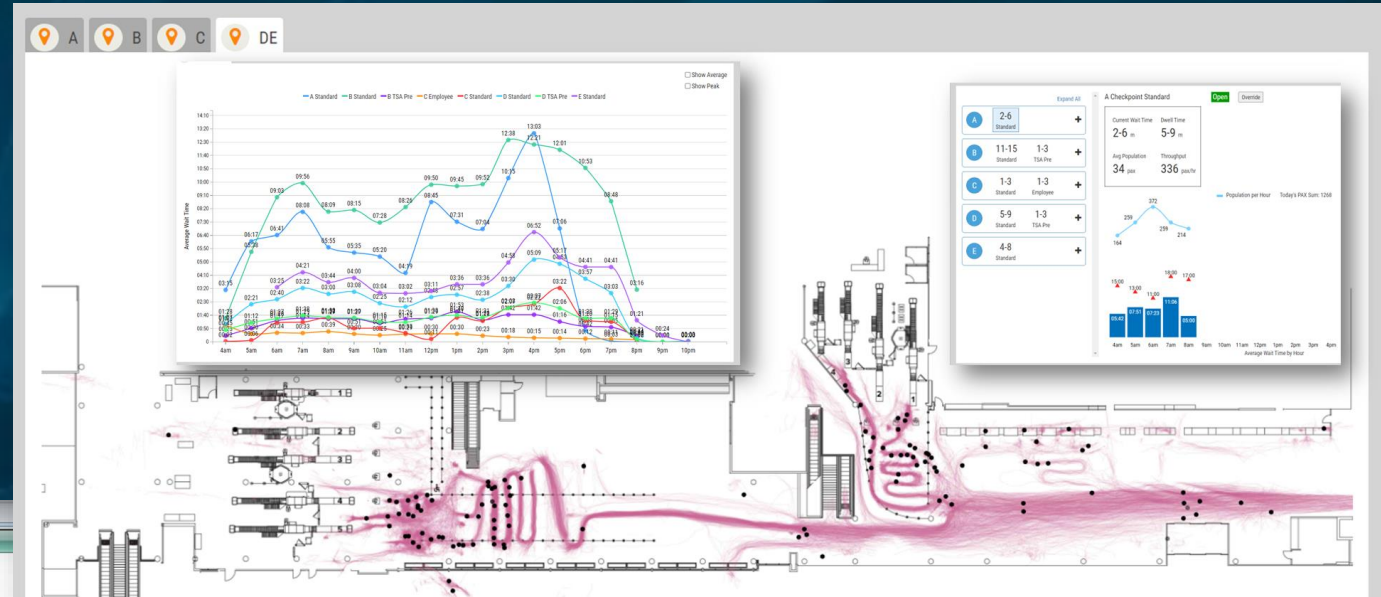
- Issues
- Inspections
- Work orders
- Passenger counts
- Processing times
- Sensor feeds
- Video analytics
- etc.



2nd ARP-DT Challenge



Merging various dynamic information from across the airport campus



Real-Time Sensors Overlay

X·SPATIAL



https://airports.x-spatial.com/UMSCLT/cfscripts/main_frame.cfm

CLT
Spatial Admin DDMS Admin

Hello Ed Maghbool
Logoff

Home

Open Map

Facility
Charlotte Douglas International A

[AdminOnly] CLT

Facility Level
Level 01

Default Facility Map

Sector
Terminal

Building
Main

Floor
Floor 2 - CLT_TERM000202

Checkpoint Status

Layers

- Floor Features
 - building_room_area
 - Doors
 - Floorplan_STD
 - building_moving_sides
 - Space
- Safety
 - Security Checkpoint
 - Closed
 - Less Than 4 min
 - Between 4-10 min
 - Between 10-20 min
 - More than 20 min
 - Unknown
 - Fire Alarm
 - bg_fire_extinguishers
- Building Equipment
- Cadastre
- Grids
- Aerial

Map Position

Create Point Data

Quickview

- Concourse A
- Concourse A North
- Concourse B and C
- Concourse D
- Concourse E
- Terminal Area

Go To Update Add Remove

Private quickview
(+) Admin. quickview

Layer Set

(*)Property

Re-Load Update Add Remove

(*) Private layer set
(+) Admin. layer set

Map Tools

Markup Tools

0 features selected 1: 965.62 1088.00 x 561.60 (ft) Powered by MapGuide

Checkpoint Status

Checkpoint	Status	Accessibility	Area	Exhibit J	Exhibit K	Join	Old Short Name	Older Short Name	New Short Name	Cleaning Responsibility	Exclude Area	Datalink ID	Loca
M2036	Active	Private	27.80	Mechanical	9999	0	M2036		M2-MC02			2468	CLT
M2231	Active	Private	72.05	Mechanical	9999	313	M2231		M2-MC10			2469	CLT

Real-time sensor overlay visualization:

The visualization shows a detailed floor plan of the airport terminal with various sensor locations marked. A line graph displays 'Average Walk Time' (min) over a 24-hour period for different checkpoints (A, B, C, D, E). A 'Checkpoint Standard' panel shows current walk times (2-6 min) and employee counts (34 employees, 336 passengers). A 'Population per Hour' bar chart shows passenger volume throughout the day. A heatmap overlay on the floor plan indicates areas of high passenger density in shades of pink and red.

Real-Time Spatial Analytics



Min Checkpoint Wait Time for all Checkpoints



Average Checkpoint Wait Time for all Checkpoints



Max Checkpoint Wait Time for all Checkpoints



Security Checkpoint Wait Time Status

Zoom to Pan 1 of 3

BUILDING_SPACE_AREA: 3140

AEGIS Room No	0355
Interior Space Identifier	1002M2-2220
Floor ID	911.00
Short Name	M2-2220
Full Name	100-M2-2220
Description	Open Space
Concourse	M
Room Type	Open Space
CommRoom	
Tenant	HMS Host
Status	Active
Accessibility	Public
Area	5,807.20
Exhibit J	Rentable Other-C
Exhibit J Area	8590
Exhibit K Join	330
Old Short Name	M2222
Older Short Name	
New Short Name	M2-2500



Machine Vision & Video Analytics

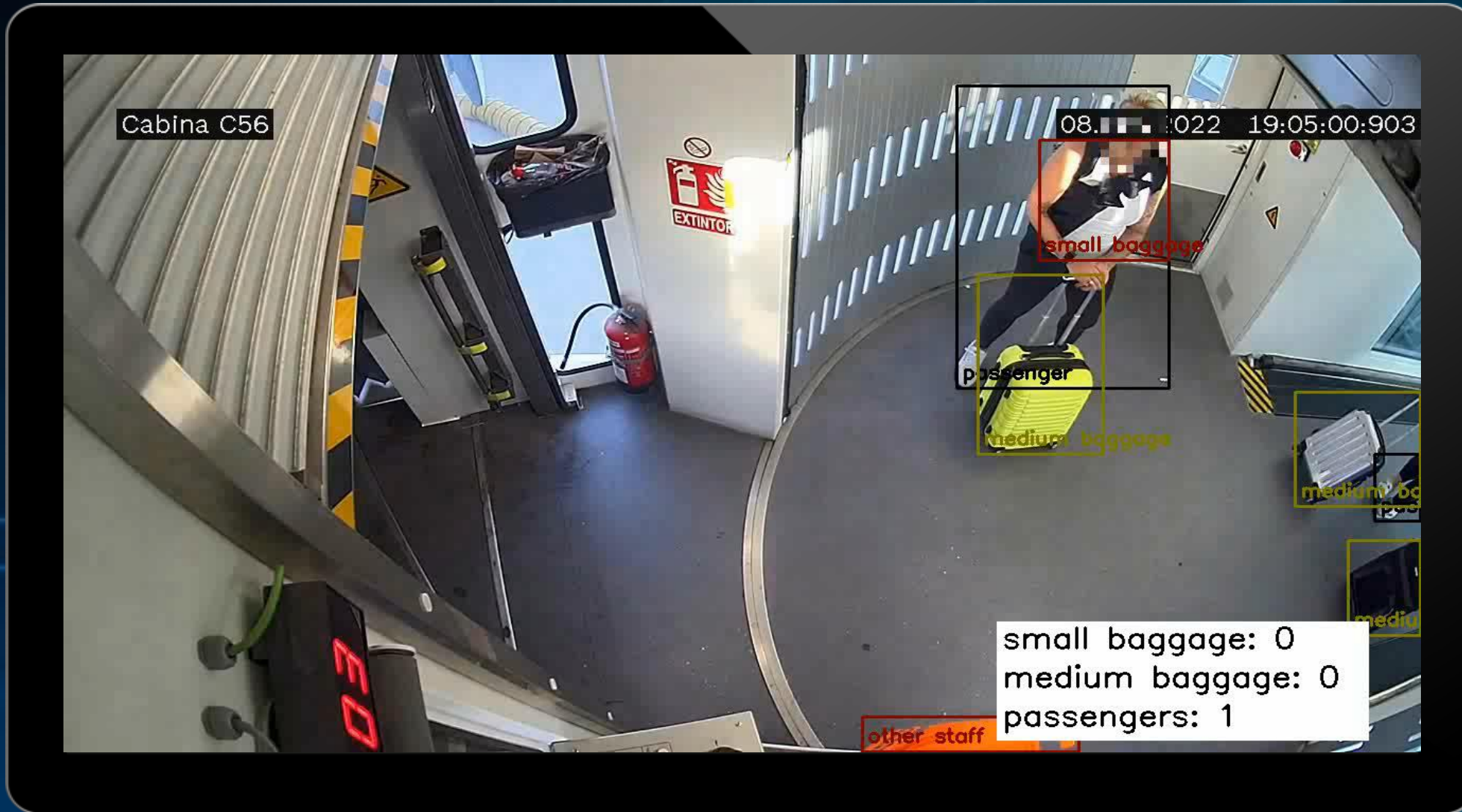
IntellAct



Aircraft
Turn-
Around
Processing

Machine Vision & Video Analytics

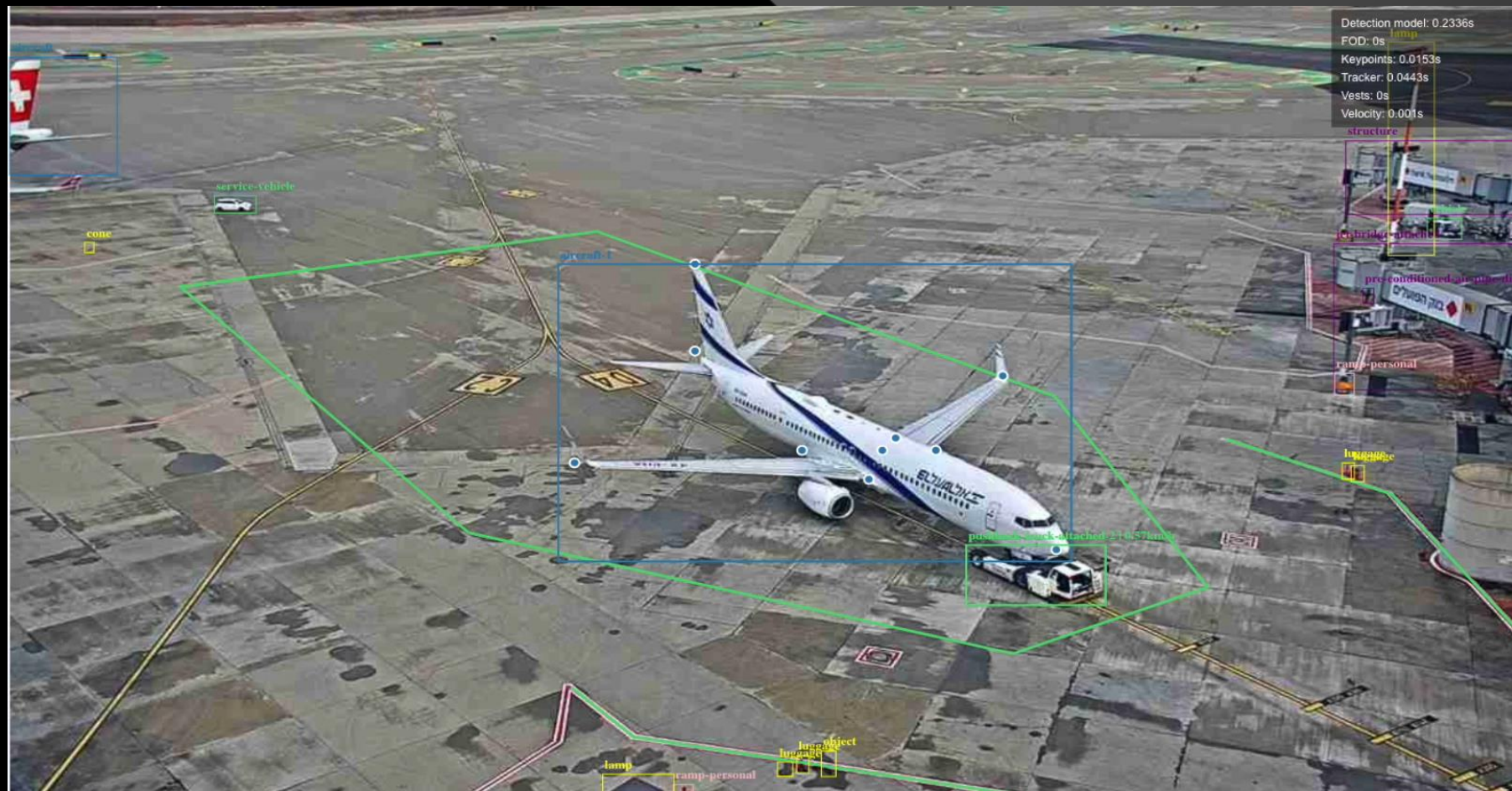
IntellAct



Passenger
Counting

Machine Vision & Video Analytics

IntellAct



Ramp
Safety
Hazard
Detection

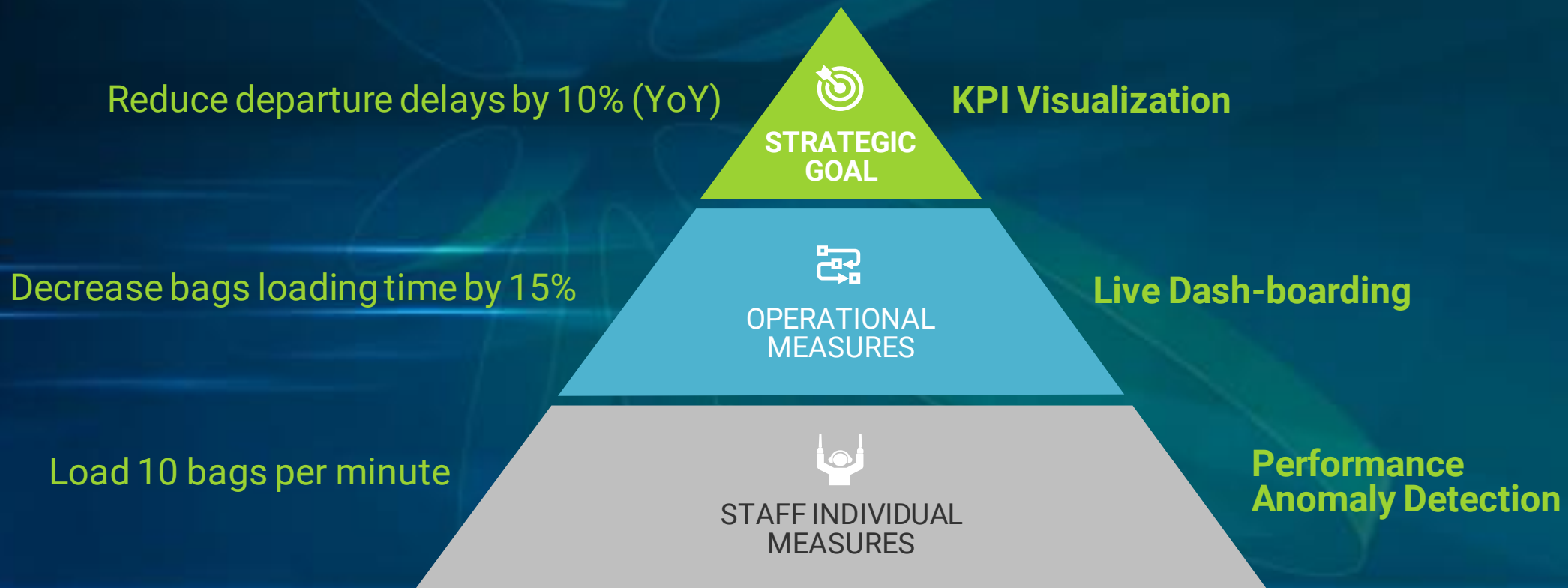
Machine Vision & Video Analytics

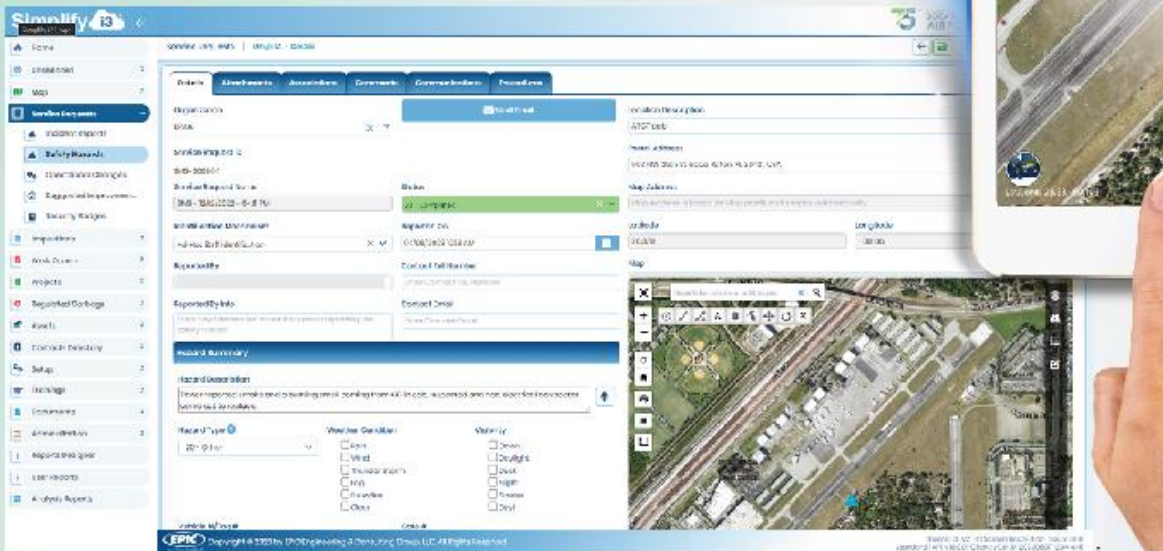
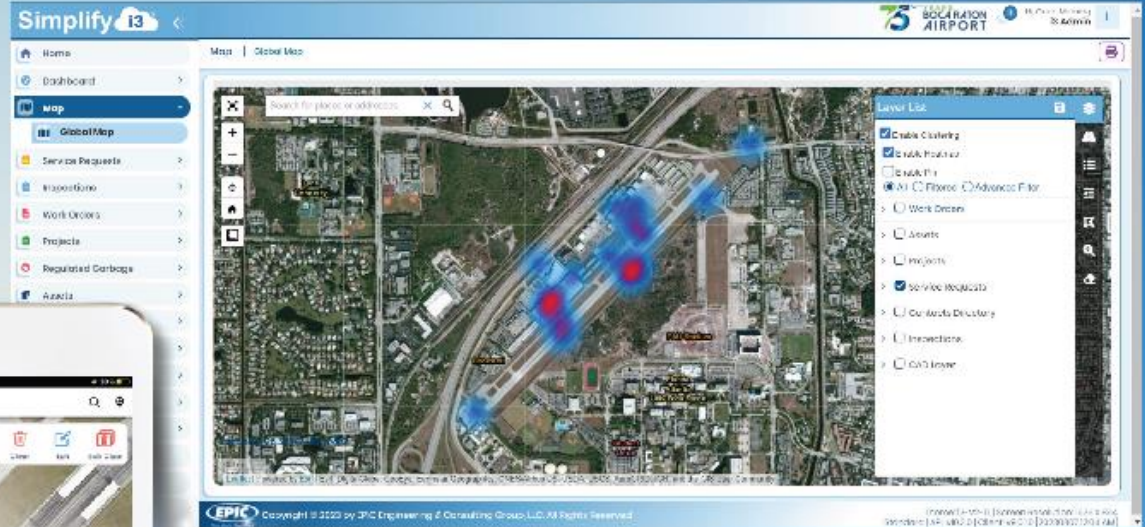
IntellAct



IntellAct's video analytics middleware with API used for aircraft gate turn-around, passenger counts, and safety applications

IMPROVE AIRPORT ON TIME PERFORMANCE (OTP) BY 5%





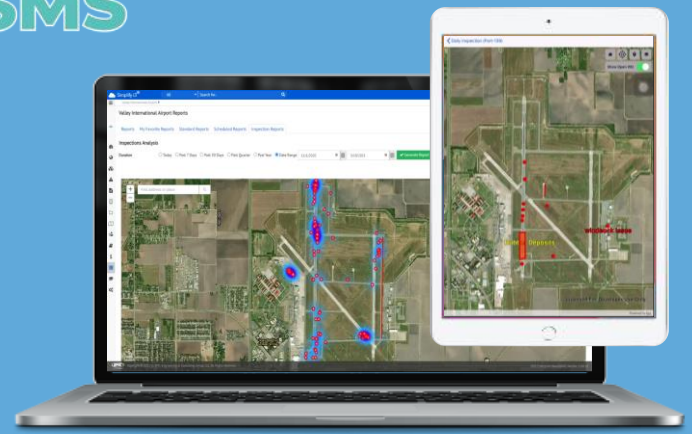
Digital Twin Transformation Platform



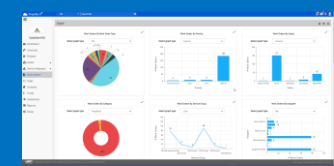
- IoT Devices
- Field Data
- GIS
- Operations
- Projects
- Funds
- Budgets



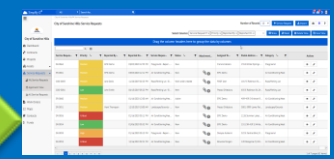
SMS



Dashboards



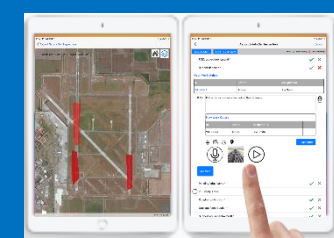
Spreadsheets



Reports



Maps



Photos

Documents

Data Sources

Data Transformation

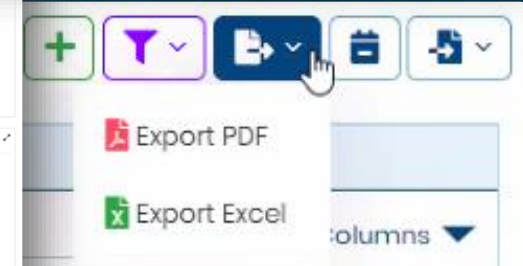
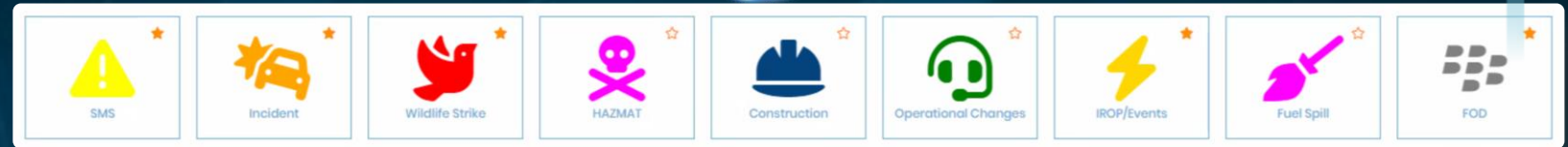
Data Fusion Outputs

Merging Information



User Configurable

- ✈ Icons & Colors
- ✈ Tool Tips
- ✈ Procedure Checklists
- ✈ Workflows
- ✈ Form Templates
- ✈ List/Table Views
- ✈ Map Views
- ✈ Reports & PDFs
- ✈ Dashboards



Search for places or addresses

Worst-Case Scenario Out
Aircraft may Extremely
in 10 to 100
Extremely
once in ev
Severity ?
Likelihood Remote: P
less than
Risk Probable: P
month; re
Explanation Frequent:
week; con

Job Steps

- Identify Hazard Completed
- Initiate SMS Service Request Completed
- Verify SMS Service Request Validity Completed
- Initiate Corrective Action Work Order(s) as Needed Completed
- Perform Safety Risk Assessment Completed
- Initiate Safety Hazard Mitigation Project as Needed Completed
- Review & Closeout of SMS Service Request Completed

Lat/Long: 26.38322,-80.10362

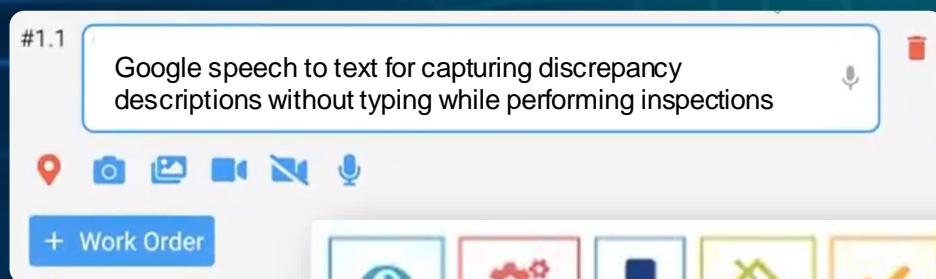
10 m

Leaflet | Powered by Esri | Esri Community Maps Contributors, State of Florida, Maxar

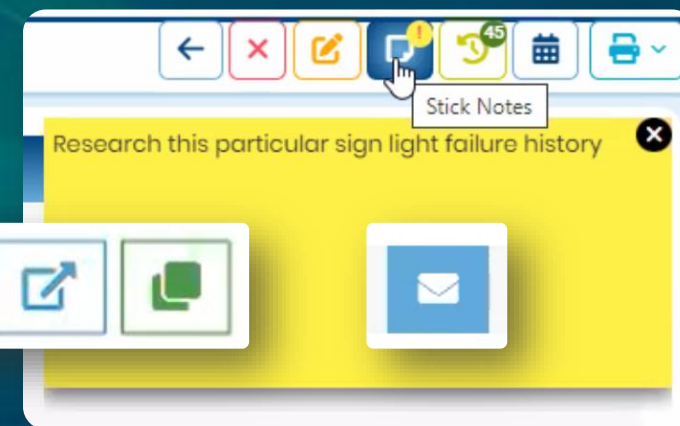
Merging Information



- Speech to Text
- Photo-Video-Audio Capture
- Record Documents
- Association Links
- Sticky Note Reminders
- Collaboration Comments
- e-Mail & Text Communication
- Calendar Scheduling
- Change Tracking



Embedded



Form View



Simplify i3
simplifyi3.com

powered by EPIC
Your Work, Simplified



Hi, Good Morning
Felipe Bergano

Simplify i3

- Home
- Map
- Dashboard
- Service Requests**
- Incident Reports
- Safety Hazards
- Other
- Inspections
- Work Orders
- Projects
- Assets
- Contacts Directory
- Setup
- Trainings
- Documents
- Administration
- Reports Designer
- User Reports

Aircraft Damage | Service Requests - Aircraft Damage - Details

Details | Attachments | Associations | Comments | Communications

Organization: Operations

Service Request ID: AIRCRFT-DMG-000001

Service Request Name: Aircraft Damage - 12/14/2022 - 04:40 PM

Initiated By: Felipe Bergano

Date / Time of Incident: 12/14/2022 11:49 PM

Incident Reported By: Tenant

Location of Incident: Airfield

BRAA Notified Via: Notification Not Needed

Priority: 2 - High

Aircraft Issue: During transit there was wheel damage and aircraft collapsed

Aircraft Damage: Wheels, underneath cockpit

Shift: Morning Evening Overnight

Date / Time Reported: 12/14/2022 12:30 AM

Airfield Location: Runway Taxiway Other

BRAA Staff Notified: Robert Pratt

Status: New

Initiate SMS

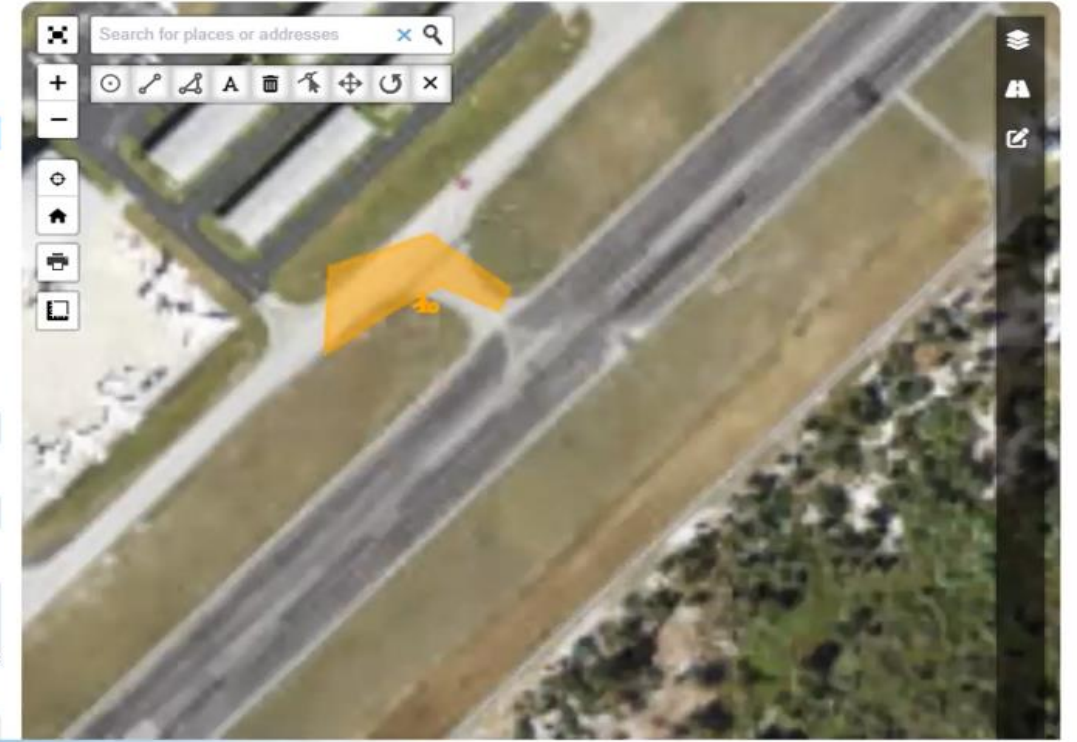
Initiate Corrective Action Work Order

Send Email

Location Description: Near taxiway by the T hangars

Postal Address: Boca Raton Airport, 3700 Airport Rd, Boca Raton, FL, 33431, USA

Latitude: 26.37887 Longitude: -80.1077



List View



Simplify i3
simplifyi3.com

powered by EPIC
Your Work. Simplified.



Hi, Good Morning
i3 Admin

Simplify i3

- Home
- Dashboard
- Map
- Service Requests**
 - Incident Reports**
 - Safety Hazards
 - Other
- Inspections
- Work Orders
- Projects
- Assets
- Contacts Directory
- Security Badges
- Setup
- Trainings
- Documents
- Administration
- Reports Designer
- User Reports
- Analysis Reports

Incident Reports | Service Requests - Incident Reports

SMS

+ [Filter] [Map] [Calendar] [Location] [Download]

Priority	Status	Auto Fit	Select Template	Select View	David-view	Search	Columns	
Actions	Service Request ID	Service Request Name	Priority	Date / Time of Incide	Updated On	Status	Hazard Type	Incident Reported By
▼ Priority: Critical - 1 item								
▼ Status: New - 1 item								
[Edit] [List] [Add] [Delete] [Refresh]	AIRCFT-DMG-000014	Aircraft Damage - 03/17/2023 - 09:03 AM	Critical			New	01 - Paved Areas	
▼ Priority: High - 1 item								
▼ Status: New - 5 items								
[Edit] [List] [Add] [Delete] [Refresh]	AIRCFT-DMG-000017	Aircraft Damage - 03/21/2023 - 06:16 AM	High	03/21/2023 12:00 PM		New	03 - Safety Areas	App
[Edit] [List] [Add] [Delete] [Refresh]	AIRCFT-DMG-000012	Aircraft Damage - 03/17/2023 - 04:43 AM	High	03/17/2023 04:47 AM		New	01 - Paved Areas	App
[Edit] [List] [Add] [Delete] [Refresh]	BRKNG-THFT-000004	Break-In/Theft - 03/15/2023 - 05:15 PM	High		03/15/2023	New	03 - Safety Areas	
[Edit] [List] [Add] [Delete] [Refresh]	DSBLD-ACRFT-000003	Disabled Aircraft - 03/15/2023 - 06:08 PM	High	03/30/2023 12:00 PM		New	11 - NAVAIDs	Admin
[Edit] [List] [Add] [Delete] [Refresh]	ALERT2-000005	Alert 2 - 03/15/2023 - 07:06 AM	High	03/15/2023 12:00 PM	03/16/2023	New	11 - NAVAIDs	Anand
▼ Priority: Low - 4 items								
▼ Status: Closed - 2 items								
[Edit] [List] [Add] [Delete] [Refresh]	WDLDF-STRK-000003	Wildlife Strike - 03/13/2023 - 01:14 PM	Low	03/13/2023 12:00 PM		Closed		Alfredo Mercado
[Edit] [List] [Add] [Delete] [Refresh]	AIRCFT-DMG-000009	Aircraft Damage - 03/16/2023 - 04:05 PM	Low	03/10/2023 12:00 PM	03/16/2023	Closed	02 - Unpaved Areas	Craig Nyarumbu
▼ Status: Completed - 3 items								
[Edit] [List] [Add] [Delete] [Refresh]	GNRL-INCNT-000001	General Incident - 01/27/2023 - 02:42 PM	Low	01/27/2023 01:26 PM	01/30/2023	Completed	Handling And Storing Of Hazardous Substances And Materials (Fueling Operations)	Robert Pratt

1 2 > > 50 Items per page

1 of 2 pages (63 items)

Dashboard View



Simplify i3
simplifyi3.com

powered by **EPIC**
Your Work, Simplified™



SMS

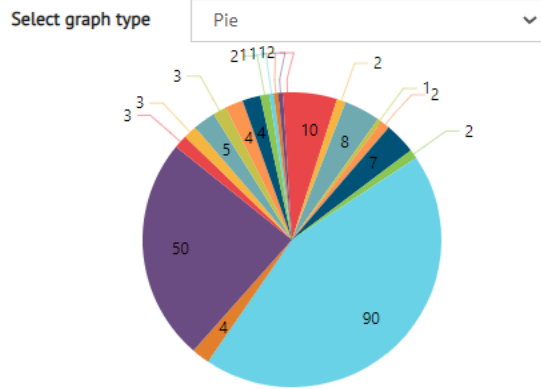


Sunshine Hill

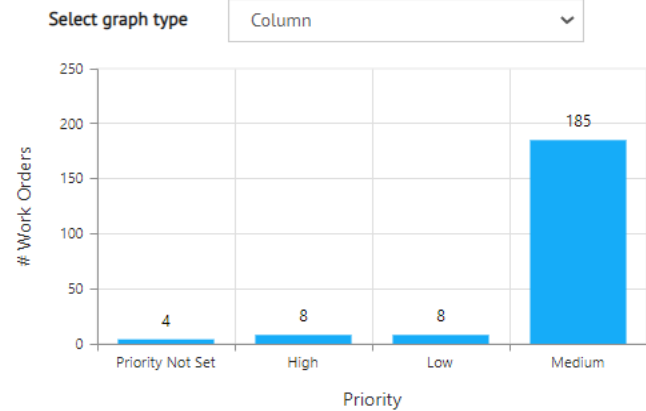
- Dashboard
- Contracts
- Projects
- Assets
- Service Requests
- Work Orders**
- Maps
- Contacts
- Funds
- Inspections
- Reports
- Setup

Graph

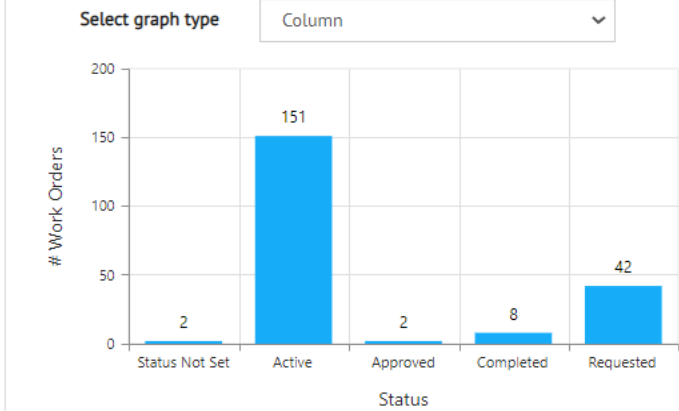
Work Orders By Work Order Type



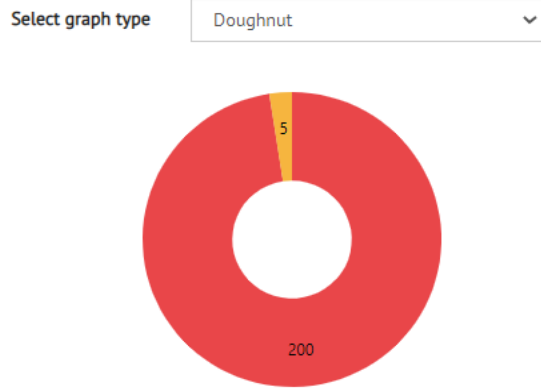
Work Orders By Priority



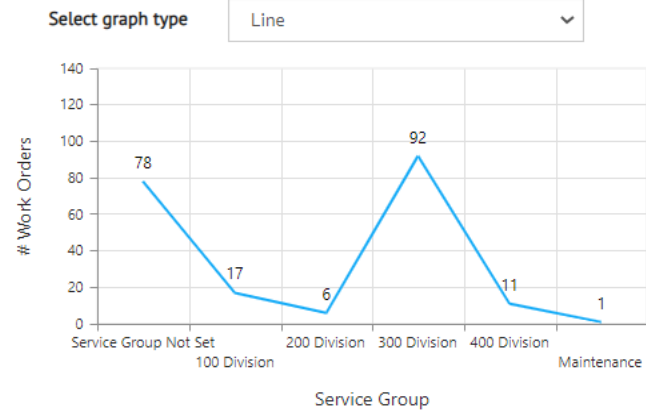
Work Orders By Status



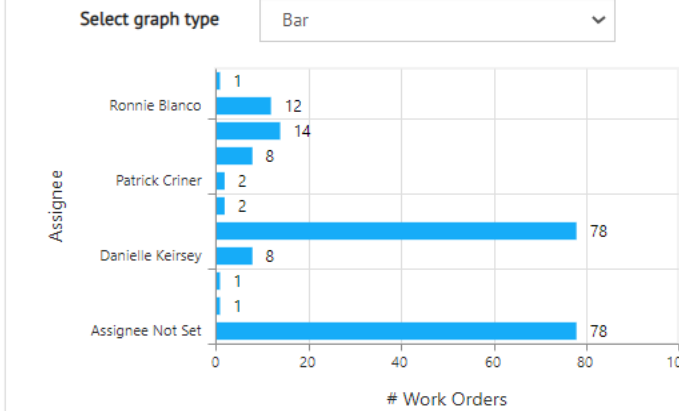
Work Orders By Category



Work Orders By Service Group



Work Orders By Assignee



Map View



Simplify i3

simplifyi3.com

powered by



Your Work, Simplified™



BOCA RATON AIRPORT

Hi, Good Afternoon
Hannah Oakland



Simplify i3

- Dashboard >
- Map >
 - Global Map
- Service Requests >
- Inspections >
- Work Orders >
- Projects >
- Contacts Directory >
- Security Badges >
- Trainings >
- Documents >

Global Map | Map • Global Map

Search for places or addresses

Location of Incident	Other
Airfield Location	Runway
Bird/Other Wildlife Species	Unk
Number of Birds Struck	
Shift	Overnight
Service Request Name	Wildlife Strike - 03/13/2023 - 01:14 PM
Priority	Low
Status	Closed

Legend

i3 Data Layers

- Work Orders
 - Corrective Action
 - Preventive Maintenance
 - Safety Hazard Mitigation
- Projects
 - Airport Project
 - Safety Mitigation Project
- Service Requests
 - Aircraft Damage
 - Aircraft Incident
 - Alert 2
 - Alert 3
 - Auto Accident
 - Break-In/Theft
 - Disabled Aircraft
 - Fuel Spill
 - General Incident
 - Hazard Identification
 - Incident Template
 - Injury
 - Operational Changes
 - Property Damage
 - Research Tasks & Studies
 - SMS
 - Suggested Improvements
 - Trespassing
 - Vandalism

Contributors, State of Florida, Maxar, FDEP, © OpenStreetMap, Microsoft, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA



Copyright © 2023 by EPIC Engineering & Consulting Group, LLC. All Rights Reserved

Theme: i3-V2-T1 | Screen Resolution: 1536 x 864
Standard | API: v10.3.0 | Client: v9.0.10 [20230323 4:20 PM]

Map View (Analytical)



Simplify i3

simplifyi3.com

powered by



Project Start Date

Today Next 7 Days Next 30 Days Next 60 days Next 90 days Next 120 days Next 365 days Date Range

9/1/2021

Select End Date

Generate Report

Project Status

Planned x Active x Complete

November 2021

Su	Mo	Tu	We	Th	Fr	Sa
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	1	2	3	4

today

Find address or place

Select Area Layers Tools

Layers

ALL Filtered

- Calgary International Airport
 - Projects
 - APO - Airport OPS Project
 - CIP - Tenant Project
 - FAC - Facilities Project
 - GLC - Capital Project
 - GWO - Groundside Maintenance Pr
 - IOC Project
 - MWO - Airside Maintenance Projec
 - Work Orders
 - BaseLayer
 - YYC CAD

Associations View



Simplify i3
simplifyi3.com

powered by



Hi, Good Afternoon
i3 Admin

Simplify i3

- Home
- Dashboard
- Map
- Service Requests**
 - Incident Reports
 - Safety Hazards**
 - Operational Changes
 - Suggested Improve...
 - Security Badges
- Inspections
- Work Orders
- Projects
- Assets
- Contacts Directory
- Setup
- Garbage Log
- Leases
- Contacts
- Trainings
- Documents
- Administration
- Reports Designer
- User Reports
- Analysis Reports

SMS | Service Requests | SMS | Associations

SMS



Details Attachments **Associations** Comments Communications Procedures

All Service Requests Inspections Work Orders Projects Contacts Leases Assets

+ Inspections Association + Projects Association + Service Requests Association + Work Orders Association

Drag a column header here to group its column

Select columns Actions +6

Search

<input type="checkbox"/>	Actions	Entity Type	Template Name	Created By	Created On	Updated On	Updated By
<input type="checkbox"/>		Work Orders	Corrective Action	Shekhar Deshmukh	03/23/2023	03/23/2023	Anand Rathod
<input type="checkbox"/>		Work Orders	Safety Hazard Mitigation	i3 Admin	04/04/2023		
<input type="checkbox"/>		Projects	Safety Mitigation Project	i3 Admin	04/04/2023		
<input type="checkbox"/>		Service Requests	Wildlife Harassment	Hannah Oakland	02/09/2023	03/27/2023	i3 Admin
<input type="checkbox"/>		Inspections	Facility Inspection (Daily)	Shekhar Deshmukh	03/24/2023	03/30/2023	Shekhar Deshmukh
<input type="checkbox"/>		Inspections	Facility Inspection (Daily)	Anand Rathod	03/22/2023	03/24/2023	Shekhar Deshmukh
<input type="checkbox"/>		Projects	Safety Mitigation Project	i3 Admin	04/04/2023		

10 Items per page

1 of 1 pages (7 items)

3rd ARP-DT Challenge

Limited labor resources to maintain updated digital twin spatial “skeleton” (i.e., floor plans and basemaps)

including locations of objects, assets, sensors, CCTV, etc.

- Budget Constraints
- Data Flow Issues
- Dynamic Priorities
- Lag Time



LiDAR Vision via Vehicle

 **Trimble**. Applanix

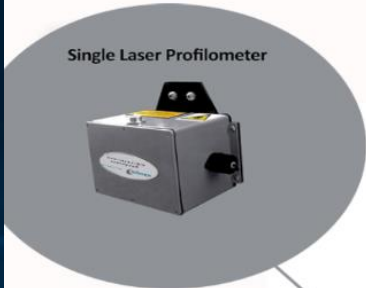


LiDAR Vision via Vehicle

Inside The Vehicle



Software Included



LiDAR Vision via Vehicle



LiDAR Vision via Robots

 **Trimble**. Applanix



LiDAR Vision via Cart



The image is a composite of three parts illustrating LiDAR vision via a cart in an airport terminal:

- Top Left:** A screenshot of the IMTG Spatial Admin web interface. It shows a sidebar with navigation options like 'Home', 'Open Map', 'Search', and 'Reports'. The main area displays a 'Layers' panel with categories such as 'AED, Fire Ex', 'Equipment', 'Interior Features', 'Floorplan', 'Access Points', 'Room Information', 'Leasehold Information', 'Cleaning Resp', 'Leaseholder', 'Space Class', 'Space Descrip', 'Space Numbers', 'Base Map', and 'Aerial'. The user is logged in as 'Helo Ahmad Maghbool'.
- Top Center:** A photograph of a Trimble LiDAR cart in an airport terminal. The cart is a blue and white mobile robot with a sensor mast. A person is standing next to it. In the background, there are American Airlines check-in counters and a 'BAG DROP' sign.
- Top Right:** A screenshot of a software interface showing a 2D floor plan of an airport terminal. The map is overlaid with 'Paking Position' labels (e.g., 30, 30A, 30B, 31A, 31B, 37B). A blue sensor beam is shown originating from a point on the map. The interface includes a 'Map Position' panel with 'PopUp' and 'Docked' options, and a 'Create Point Data' panel with options for 'Add Point(s)', 'Multi-Point Mode', and 'Point Classification'. The status bar at the bottom indicates '0 features selected', a scale of '1: 1582.42', and a bounding box of '1776.10 x 677.20 (R)'. It is powered by 'Infrastructure Mini-Server'.
- Bottom:** A 3D point cloud view of a hallway. A red vertical line with a yellow cube at the top and a blue circle at the base is used for measurement. A text box shows the measurement: '2.655 m'. A 'Point height to horizontal reference plane' dialog box is open, displaying the following data:

Point	X	Y	Z	Distance
	6438169.844	1802759.563	-1.047	2.655 m

The dialog also includes 'Copy to Clipboard', 'Clear', and 'Copy to Feature' buttons, and a 'Measure Preferences' checkbox.

LiDAR Integrated with GIS



The screenshot displays the X-Spatial web application interface. On the left, a navigation menu includes options like Measurements, Layers, Folders, Bookmarks, Data Export, Print Screen, Jump to Location, Management, and Settings. The main view is split into two panels: a 3D perspective view of an airport terminal interior on the left and a 2D floor plan on the right. A red arrow points from a red pin on the 3D view to a corresponding area on the 2D floor plan. Another red arrow points from a red circle around the '3D Project View' option in the right-hand toolbar to the 3D view. The bottom of the interface features a data table with columns for various attributes including Location Code, AEGIS Room No, Interior Space Identifier, Short Name, Full Name, Description, Concourse, Room Type, CommRoom, Tenant, Status, Accessibility, Area, Exhibit J, Exhibit J Area, Exhibit K Join, Old Short Name, Older Short Name, New Short Name, Cleaning Responsibility, and Exhibit A.

	Location Code	AEGIS Room No	Interior Space Identifier	Short Name	Full Name	Description	Concourse	Room Type	CommRoom	Tenant	Status	Accessibility	Area	Exhibit J	Exhibit J Area	Exhibit K Join	Old Short Name	Older Short Name	New Short Name	Cleaning Responsibility	Exhibit A
<input type="checkbox"/>	CLT_TERM000302030061	0061	1002A2-0110	A2-0110	100-A2-0110	Corridor	A	Corridor		CLT		Public	11,843.30			0					

Additional interface elements include a '3D Project View' option circled in red in the toolbar, a 'SOLV3D' logo at the bottom center, and a 'Remote Desktop Connection' bar at the very bottom.

LiDAR Integrated with GIS



Entity Attribute - Personal - Microsoft Edge

airports.x-spatial.com/UMSCLT/cfscrip...type_view.cfm?RecordID=87801...

Edit: 878013, buildings, buildings_equipment, bldg_generators, bgutgen

Location	CLT
Created By	ed
Date Created	2022/02/10@10:06:10
Last Edited By	ed
Date Last Edited	2022/02/10@10:13:15
Asset ID	90001
Quality Level	A
DDMS Source	
Comment	
Disposition	
Is Published	N
Type Discriminator	GENERATOR

Documents (1)

Bar Code No.	Project Title	Sheet No	Sheet Title	Alias	Document Type
2020001	Elec Panel Documentation				Manual

SOLV3D

Electric Panel
Color: ■
Collection: Electric Panels

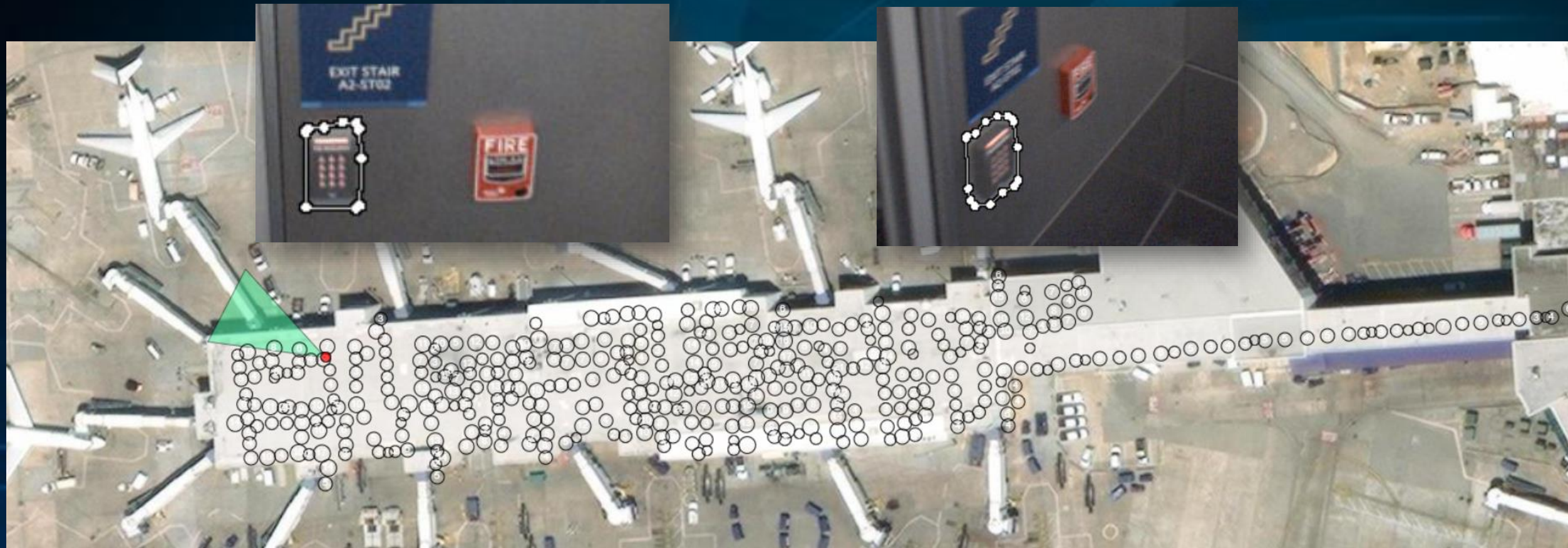
ZN1
Installation, Operation and Maintenance Manual

ABB
Power and productivity for a better world

In-door Imagery Draped over LiDAR Integrated with GIS

Machine Vision Feature Extraction

X·SPATIAL

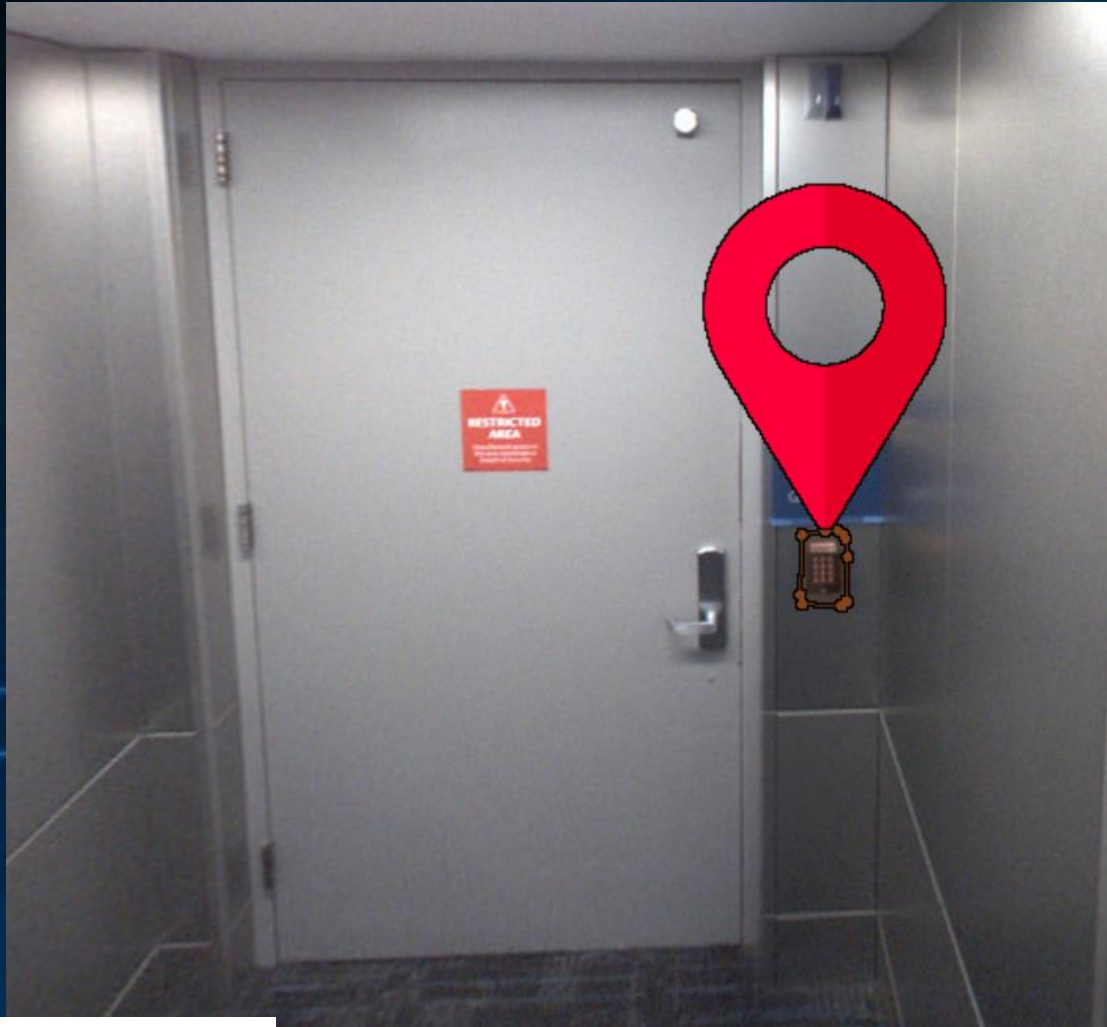


Leveraging LiDAR Draped Imagery from Across Terminal
for Feature Extraction (e.g., Badge Reader)
via Artificial Intelligence (AI) Machine Vision



Machine Vision Feature Extraction

X·SPATIAL



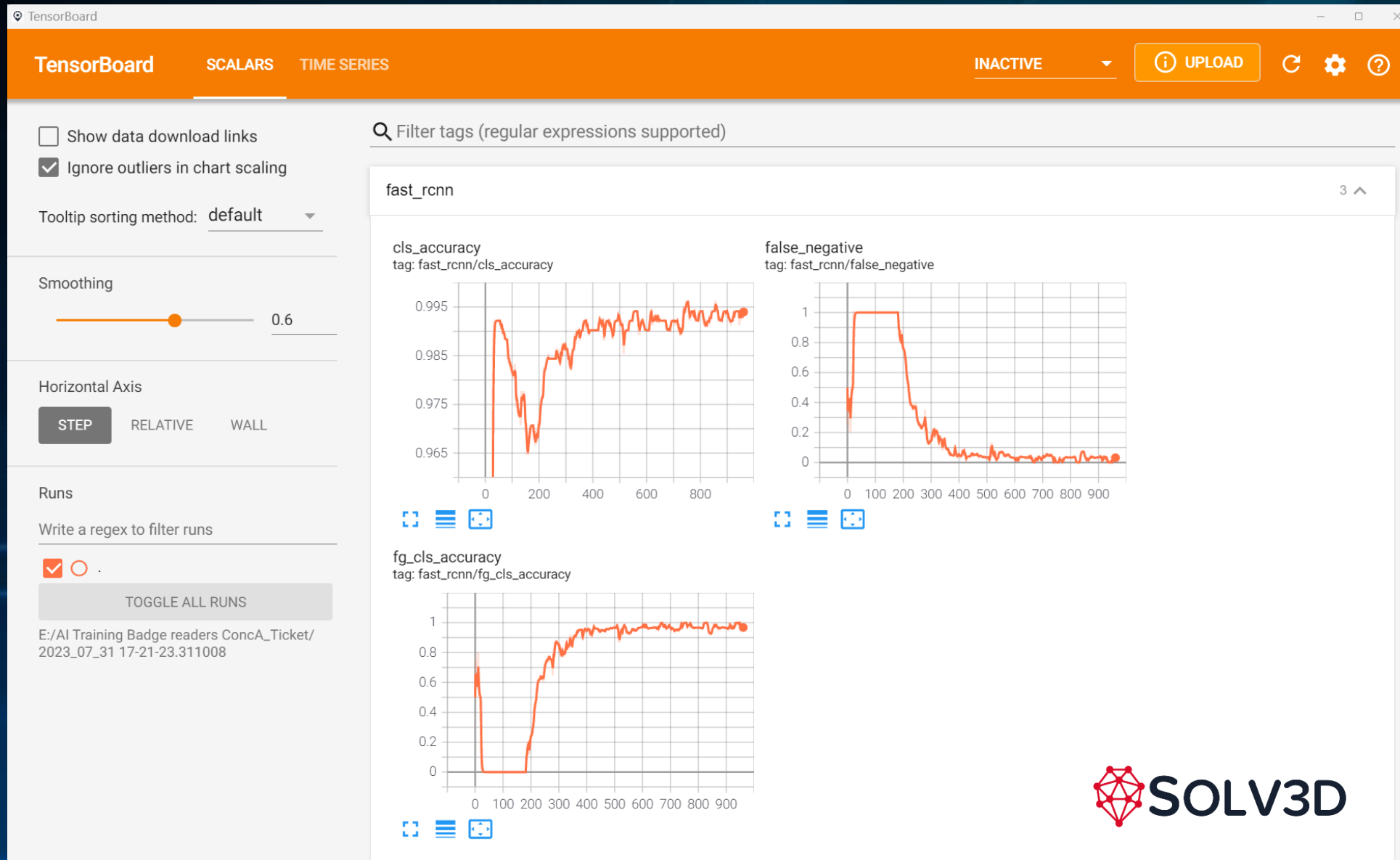
True Positive

False Positive



Machine Vision Feature Extraction

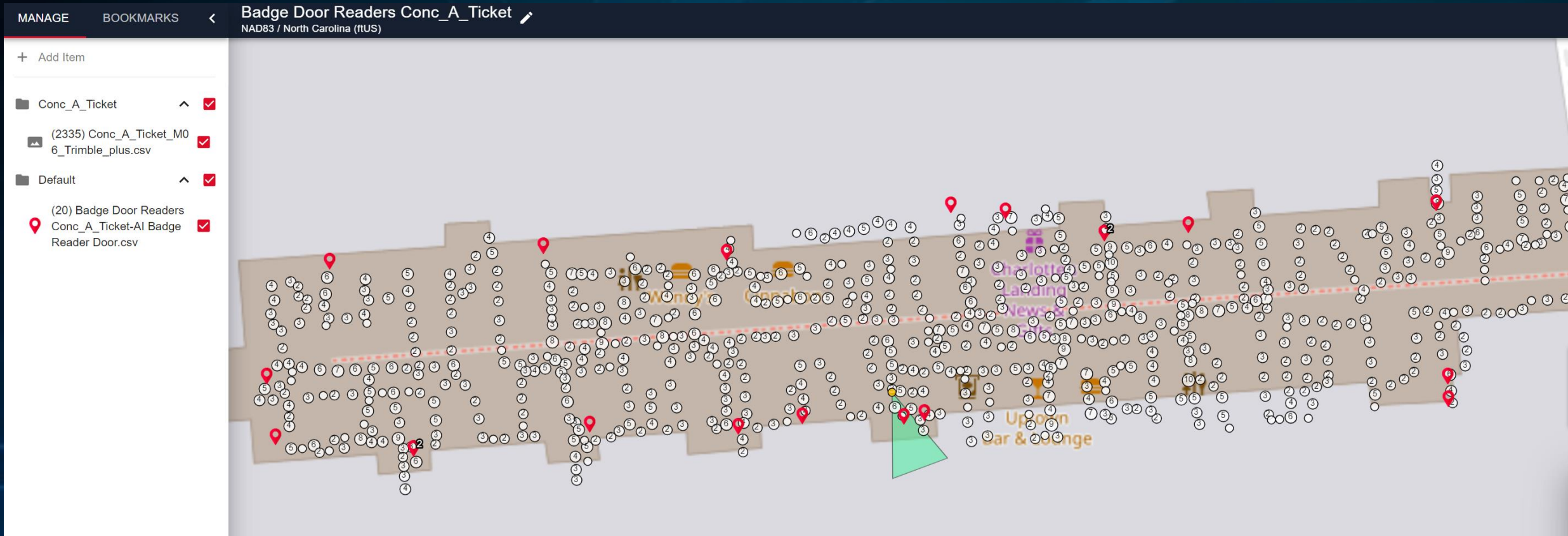
X·SPATIAL



Machine
Vision
Learning
Curves

Machine Vision Feature Extraction

X·SPATIAL



Auto-Extracted Badge Readers with X-Y-Z Coordinates
via Artificial Intelligence (AI) Machine Vision



CAD to GIS Automation Tools

X·SPATIAL



The screenshot displays the Autodesk AutoCAD Map 3D 2014 interface. The main window shows a 3D visualization of a utility network with various colored lines and points. The interface includes several panels and toolbars:

- Task Pane:** Shows the current display map (Default) and a list of layers under the SDSFEATURES group. The layers include: DOMESTIC_FIRE, EMERG_CONN_LINE, EMERG_CONN_VALVE, FAUCET, FIRE, FIRE_CONNECT, FIRE_HYDRANT, FIRE_PROP, FIRE_REMV, FITTING, GATE, GLOBE, HYDRANT, and IRR_CONTROL_BOX.
- Properties Panel:** Shows the properties for the selected object (No selection). The General section includes: Color (ByLayer), Layer (0), Linetype (ByLayer), Linetype scale (1.0000), Lineweight (ByLayer), Transparency (ByLayer), and Thickness (0.0000). The 3D Visualization section includes: Material (ByLayer) and Shadow display (Casts and Receives Shadows).
- Entity Attribute Panel:** Shows the attributes for the selected entity (2732403, utilities, utilities_water_system, water_line, MAIN, utwatpip). The attributes include: Location (LAX), Created By (axmelikyan), Date Created (2008/11/06@15:12:42), Last Edited By (axmelikyan), Date Last Edited (2008/11/07@13:53:15), Reason Code, Quality Level, Ddms Source (0026514), Qa Status (1 - GEOMETRY ONLY), Owner Operator, Leaseholder Name, Comment (1982/09/08), Disposition, and Is Published (Y).
- Map Explorer:** Shows the current map and the layers loaded in the map.
- Map Book:** Shows the current map book and the layers loaded in the map book.
- Survey:** Shows the current survey and the layers loaded in the survey.
- Design:** Shows the current design and the layers loaded in the design.
- Object Class:** Shows the current object class and the layers loaded in the object class.
- Display:** Shows the current display and the layers loaded in the display.

Floorplan GIS Polygon Automation

X·SPATIAL



The screenshot displays the Autodesk AutoCAD Map 3D 2022 interface. The main window shows a floorplan of a terminal level. A context menu is open over the floorplan, with the 'Publish' option selected, and a sub-menu showing 'Create Lease Boundaries' as the active option. The 'TASK PANE' on the right shows the 'Export - Connection: Oracle_1.FeatureSource' dialog box, which is used for exporting the floorplan data to a GIS system. The dialog box includes options for selecting objects to export, filtering selection, and selecting polygon topology to export. The 'Saved profiles' section shows a profile named 'CUMS_LeaseBoundary.apf'. The command line at the bottom shows an error message: 'ERROR: Missing Text style(s) for display of schedule. Schedule Display Process was aborted.'

Example: CLT's Main Terminal Ticketing Level Floor Plan (491 rooms)

Reduces CAD to GIS Conversion Time from 94 hrs. to 15 sec.

4th ARP-DT Challenge

Consolidating CAD-GIS-BIM
into single source of truth

- Redundant spatial models
- Separate / duplicate CAD, GIS, & BIM versions to be synchronized
- Which version is more up-to-date becomes illusive



Spatial DBMS Interoperability

X·SPATIAL



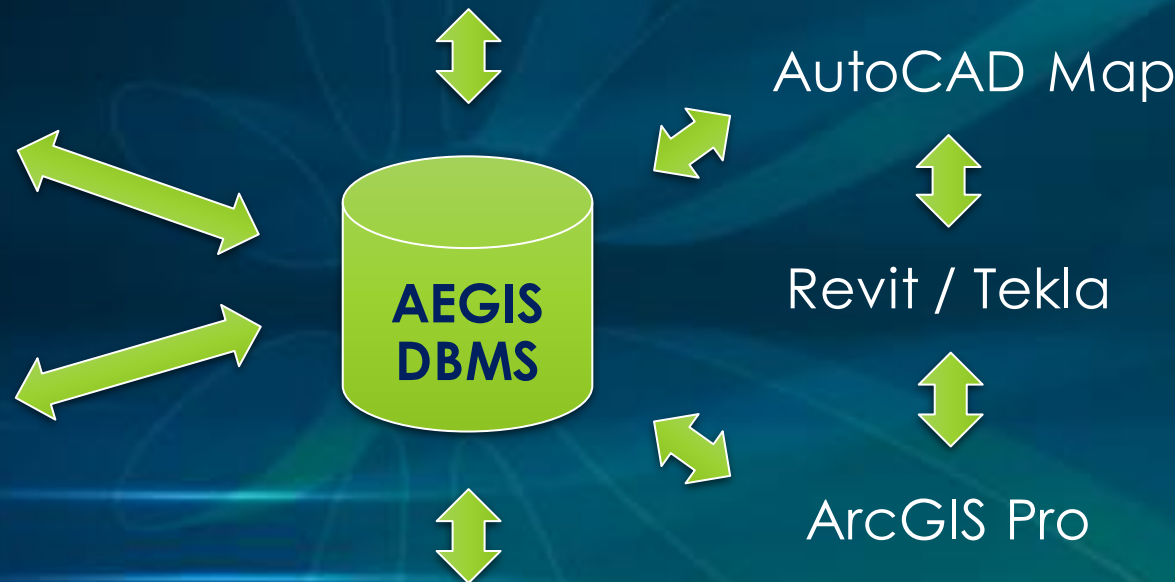
x-Spatial Apps

Web & Mobile
User Interfaces

“Glue” between



Auto-Export of
Standardized
CAD-GIS Files
(e.g., NCS, ANSI)



AutoCAD Map

Revit / Tekla

ArcGIS Pro

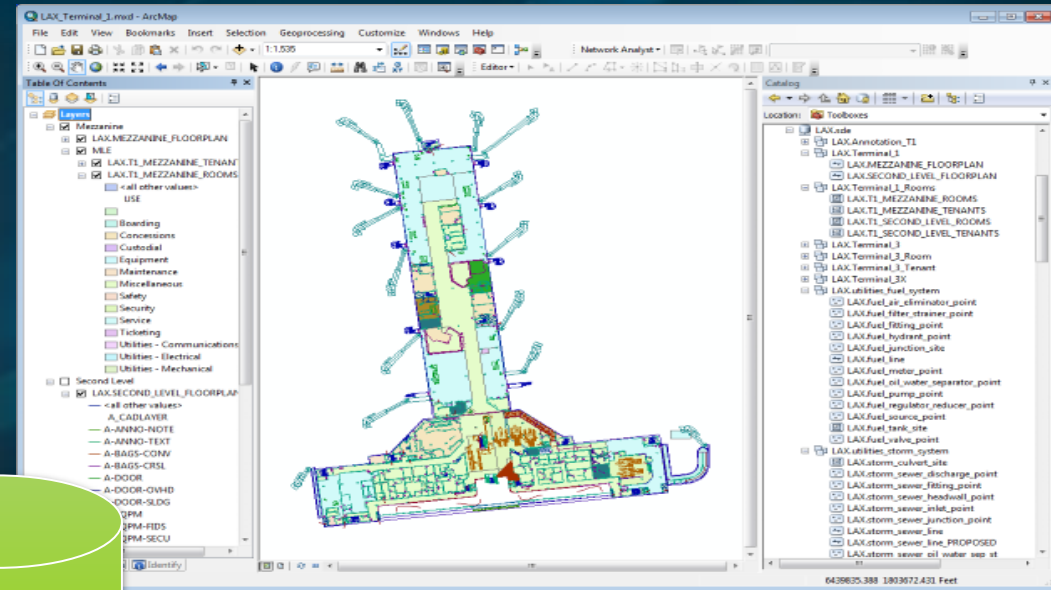
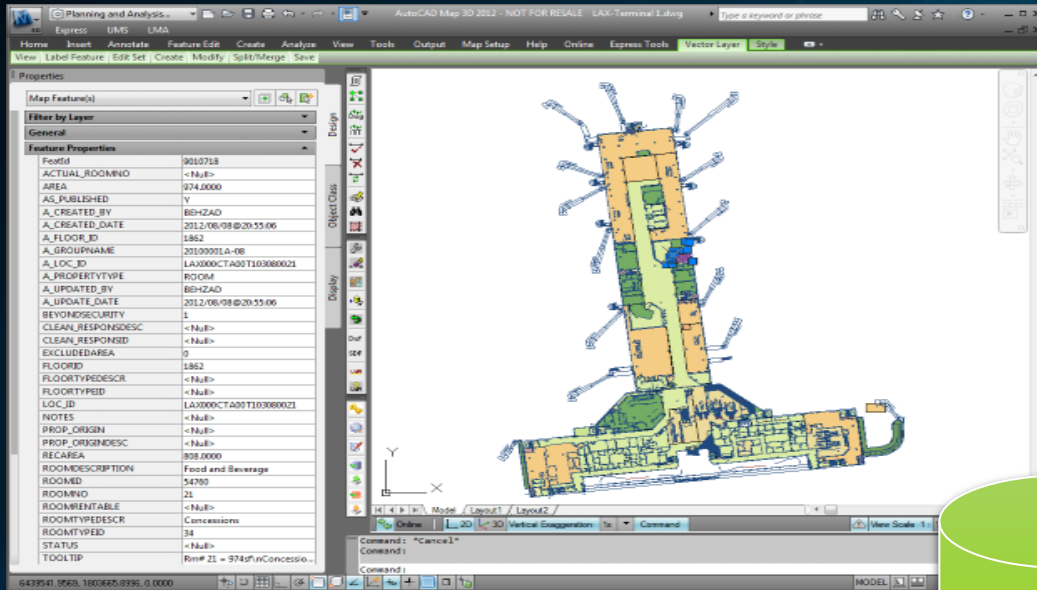


Seamless Export of Geodatabase
Supporting 3rd Party Products & Apps

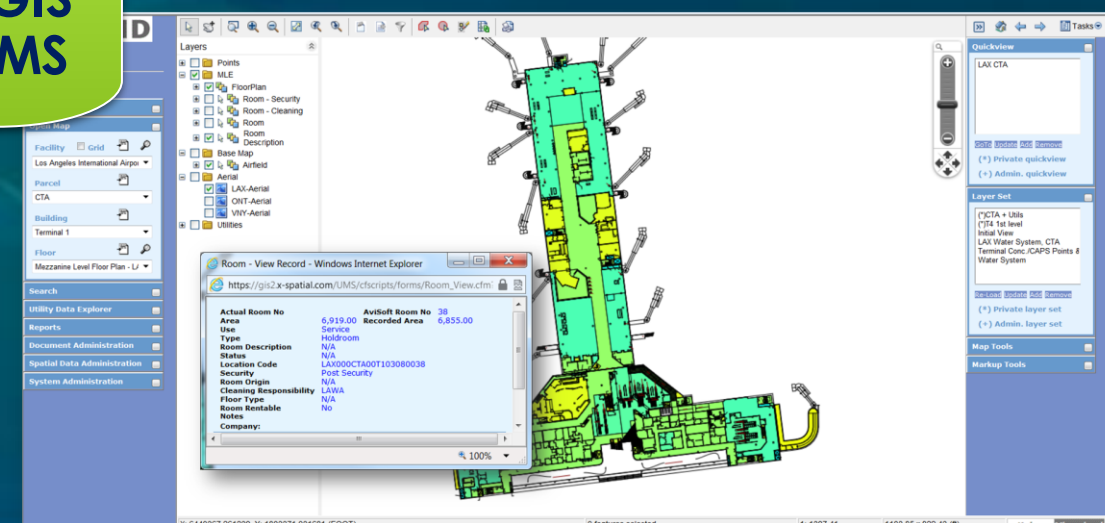
- ArcGIS Portal / Online
- ArcGIS Dashboards
- Maximo / Infor / Cityworks
- Simplify i3
- etc...

Spatial DBMS Serving Multiple

X·SPATIAL



AEGIS
DBMS



Leveraging Autodesk Construction Cloud

X·SPATIAL



Design Collaboration



Automated Clash Detection



Aggregated Model Coordination



Issues Management



Document Control



Document Versioning



Document Approvals

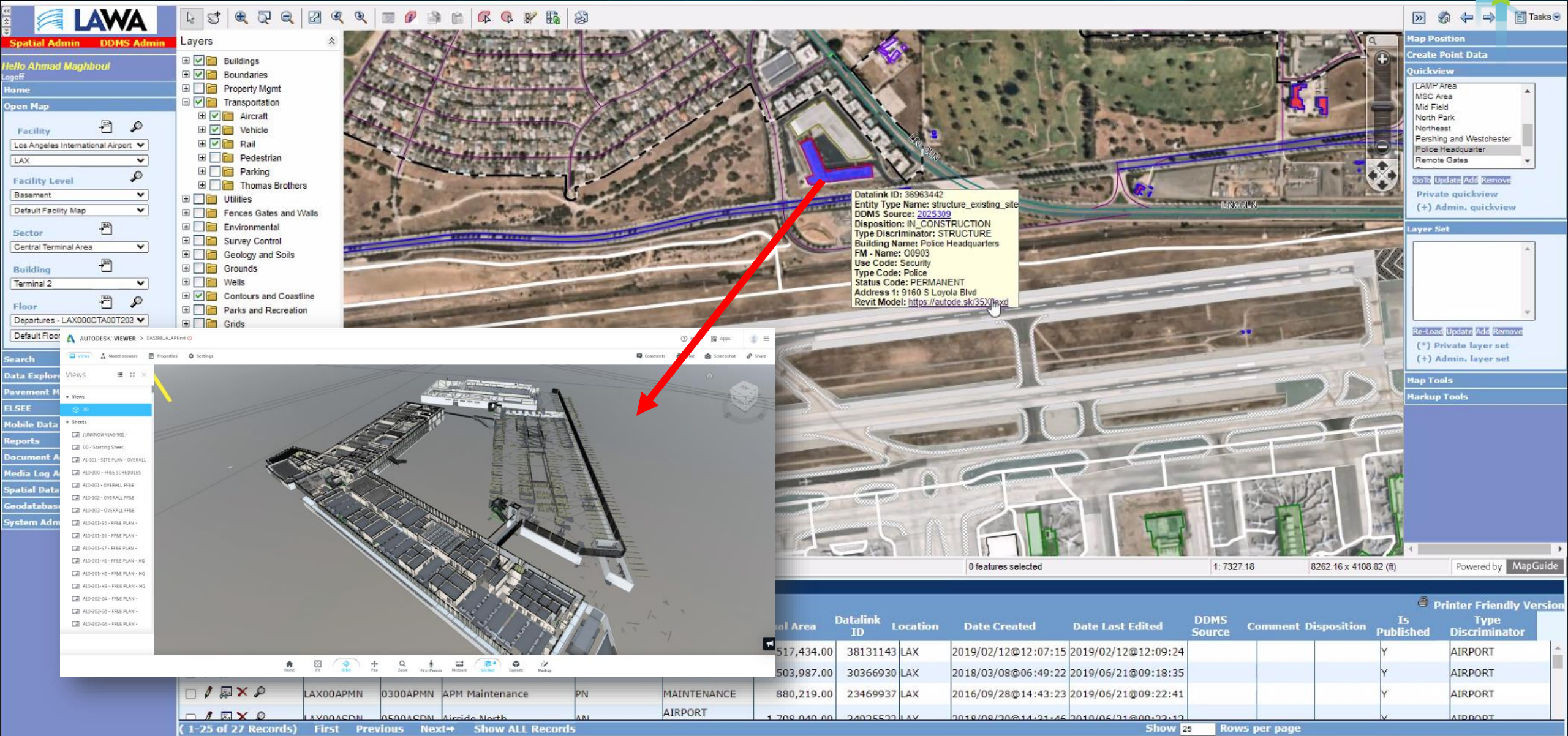
The screenshot displays the Autodesk Construction Cloud interface. On the left, a 'Folders' tree shows project organization. The top right features a 'Reviews' section for '#1 - Initial Review' with buttons for 'Start review', 'Void entire review', and 'Export Excel Report'. Below this is a table with columns for Name, Comments, Description, and Version. The main area shows a 3D model of a building with a 'Levels' list on the left and a 'Window-Awning-Variable' properties panel on the right. The 3D model includes a red awning and green structural elements.

Name	Comments	Description	Version
09 5100 Tech Specs.docx	No comments yet.	--	V1

Name	Type Name	Image	Comments	Mark	Keynote	Model	Manufacturer	URL	Description	Cost	OmniClass TL	Type Comment	Assembly De...	Assembly Co...	Type Mark
G-Roof	72" x 53"			10		Windows				0.00	Windows		Windows	B0000100	A

AUTODESK CONSTRUCTION CLOUD

Integrated BIM Records



The screenshot displays the X·SPATIAL software interface, which integrates BIM data with a geographic information system (GIS). The interface is divided into several key sections:

- Left Panel (Spatial Admin):** Contains user information (Hello Ahmad Maghoub), navigation options (Home, Open Map), and filters for Facility (Los Angeles International Airport), Facility Level (Basement), Sector (Central Terminal Area), Building (Terminal 2), and Floor (Departures - LAX000CTA00T203).
- Layers Panel:** Lists various data layers such as Buildings, Boundaries, Property Mgmt, Transportation, Aircraft, Vehicle, Rail, Pedestrian, Parking, Thomas Brothers, Utilities, Fences Gates and Walls, Environmental, Survey Control, Geology and Soils, Grounds, Wells, Contours and Coastline, Parks and Recreation, and Grids.
- Map View:** Shows an aerial view of the airport site with a 3D BIM model overlaid. A red arrow points from a specific structure in the 3D model to a corresponding structure in the 2D map. A tooltip for the selected structure provides the following details:
 - Datalink ID: 36963442
 - Entity Type Name: structure_existing_site
 - DDMS Source: 2025309
 - Disposition: IN_CONSTRUCTION
 - Type Discriminator: STRUCTURE
 - Building Name: Police Headquarters
 - FM - Name: 00903
 - Use Code: Security
 - Type Code: Police
 - Status Code: PERMANENT
 - Address 1: 9160 S Loyola Blvd
 - Revit Model: <https://autode.sk/35Xj1pxd>
- Right Panel (Map Position):** Includes options to Create Point Data, Quickview (listing areas like LAMP Area, MSC Area, Mid Field, North Park, Northeast, Pershing and Westchester, Police Headquarter, Remote Gates), Layer Set, and Map Tools.
- Bottom Panel (Data Table):** A table listing records with columns for Total Area, Datalink ID, Location, Date Created, Date Last Edited, DDMS Source, Comment, Disposition, Is Published, and Type Discriminator.

Total Area	Datalink ID	Location	Date Created	Date Last Edited	DDMS Source	Comment	Disposition	Is Published	Type Discriminator
517,434.00	38131143	LAX	2019/02/12@12:07:15	2019/02/12@12:09:24				Y	AIRPORT
503,987.00	30366930	LAX	2018/03/08@06:49:22	2019/06/21@09:18:35				Y	AIRPORT
880,219.00	23469937	LAX	2016/09/28@14:43:23	2019/06/21@09:22:41				Y	AIRPORT
1,708,040.00	24025522	LAX	2018/08/20@14:31:46	2019/06/21@09:22:41				Y	AIRPORT

Web-Enabled BIM Access

X·SPATIAL



AUTODESK VIEWER > DA5288_A_APF.rvt

Views | Model browser | Properties | Settings

Help | Apps | Comments | Print | Screenshot | Share

Views

- 3D
- Sheets
 - (UNKNOWN)A6-901 -
 - 00 - Starting Sheet
 - A1-101 - SITE PLAN - OVERALL
 - A10-100 - FF&E SCHEDULES
 - A10-101 - OVERALL FF&E
 - A10-102 - OVERALL FF&E
 - A10-103 - OVERALL FF&E
 - A10-201-G5 - FF&E PLAN -
 - A10-201-G6 - FF&E PLAN -
 - A10-201-G7 - FF&E PLAN -
 - A10-201-H1 - FF&E PLAN - HQ
 - A10-201-H2 - FF&E PLAN - HQ
 - A10-201-H3 - FF&E PLAN - HQ
 - A10-202-G4 - FF&E PLAN -
 - A10-202-G5 - FF&E PLAN -
 - A10-202-G6 - FF&E PLAN -
 - A10-202-G7 - FF&E PLAN -
 - A10-202-H1 - FF&E PLAN - HQ



BIM Exported Record Drawings

X·SPATIAL



AUTODESK VIEWER > DA5288_A_APF.rvt

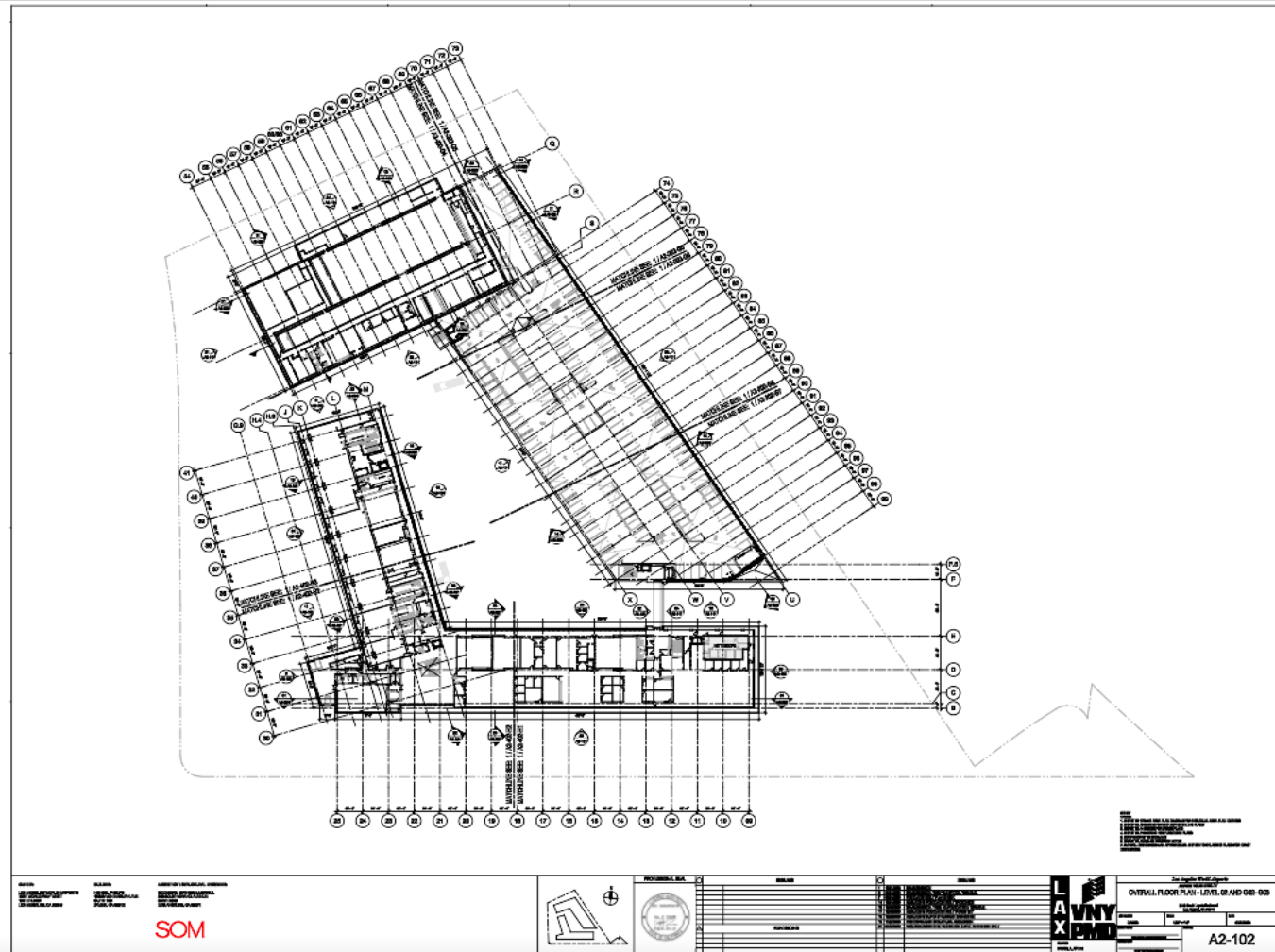
Help Apps

Views Properties Settings

Comments Print Screenshot Share

Views

- A2-044 - ENCLOSURE TYPE
- A2-045 - ENCLOSURE TYPE
- A2-051 - OPEN GARAGE
- A2-061 - HQ BUILDING AREA
- A2-062 - GARAGE AREA
- A2-063 - HQ BUILDING AREA
- A2-064 - GARAGE AREA
- A2-065 - HQ BUILDING AREA
- A2-066 - GARAGE AREA
- A2-067 - HQ BUILDING AREA
- A2-068 - GARAGE AREA
- A2-101 - OVERALL FLOOR
- A2-102 - OVERALL FLOOR**
- A2-103 - OVERALL FLOOR
- A2-104 - OVERALL FLOOR
- A2-201-G4 - FLOOR PLAN -
- A2-201-G5 - FLOOR PLAN -
- A2-201-G6 - FLOOR PLAN -
- A2-201-G7 - FLOOR PLAN -
- A2-201-H1 - FLOOR PLAN - HQ
- A2-201-H2 - FLOOR PLAN - HQ
- A2-201-H3 - FLOOR PLAN -



Home Fit Pan Zoom Measure Markup

5th ARP-DT Challenge

Processing incoming datasets from Architectural - Engineering - Construction (AEC) project deliverables to update digital twin

- ➔ Establishing Contractual Standards
- ➔ Compliance Audits
- ➔ Enforcement
- ➔ Converting Non-Compliant Data



BIM Standards

P D B M 

P D B M
CONSULTING
PROJECT LIFE CYCLE BIM SERVICES

Building Information Modeling (BIM) Contract Language
Design Phase

www.pdbmconsulting.com
info@pdbmconsulting.com



MIAMI-DADE GENERAL
AVIATION AIRPORTS



Miami-Dade Aviation Department
BIM Standards Manual

Developed by:

HNTB

HNTB Corporation
The HNTB Companies
Infrastructure Solutions

P D B M
CONSULTING
PROJECT LIFE CYCLE BIM SERVICES

www.pdbmconsulting.com
info@pdbmconsulting.com

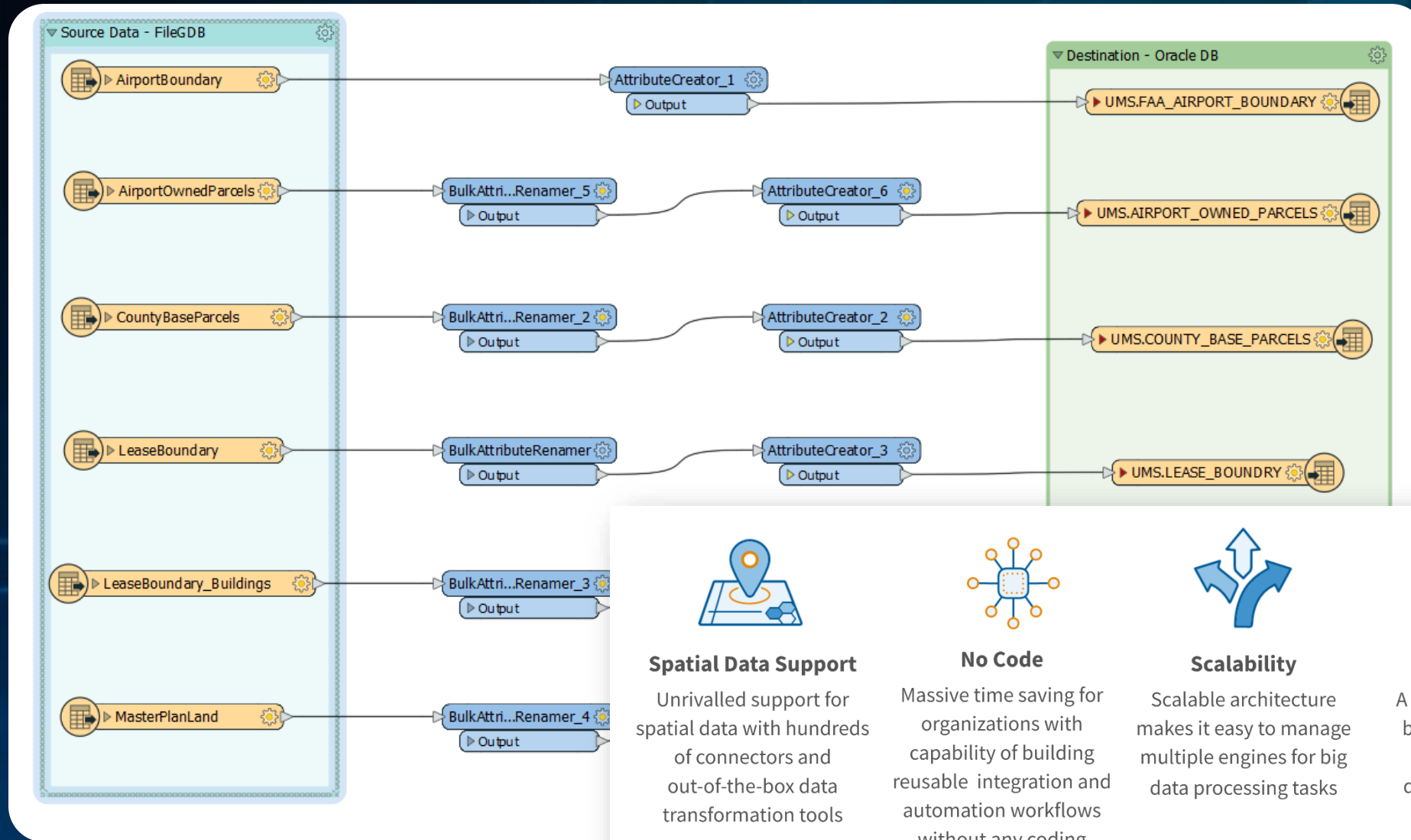
November 2022
v2

P D B M
CONSULTING
PROJECT LIFE CYCLE BIM SERVICES

Building Information Modeling (BIM) Contract Language
Construction Phase

www.pdbmconsulting.com
info@pdbmconsulting.com

Extract > Transform > Load (ETL) via FME



FME
by Safe Software



Spatial Data Support

Unrivalled support for spatial data with hundreds of connectors and out-of-the-box data transformation tools



No Code

Massive time saving for organizations with capability of building reusable integration and automation workflows without any coding



Scalability

Scalable architecture makes it easy to manage multiple engines for big data processing tasks



Flexibility

A solution for every budget, operating system, and deployment need

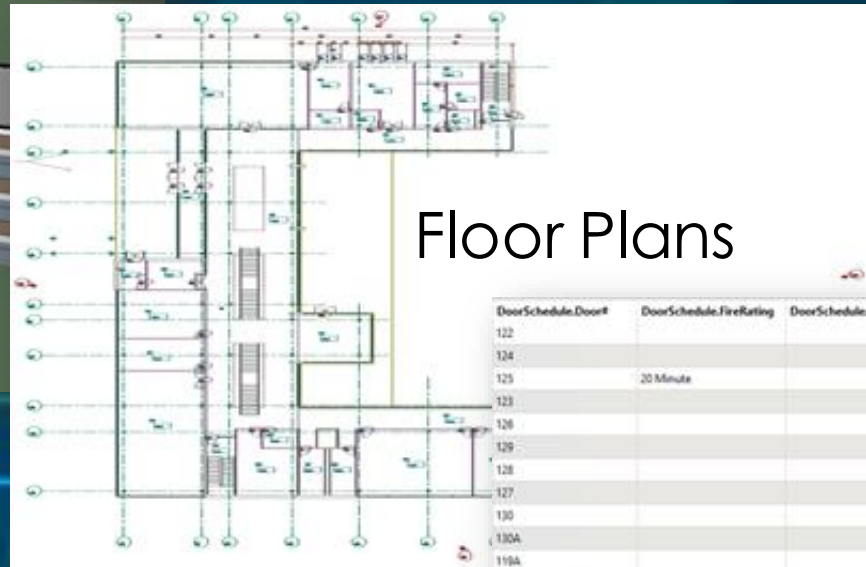


Customer Services

Top-rated customer support, comprehensive knowledge & training resources, and a dedicated community of 16,000+ users

Feature Manipulation Engine

Extracting Revit Data



DoorSchedule.Door#	DoorSchedule.FireRating	DoorSchedule.Height	DoorSchedule.Width	Element Type	Elevation	Family	Family Type	Function
122		2134		915 FamilyInstance		0_M_Single-Flush-Dbl Acting	0915 x 2134mm	Interior
124		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
125	20 Minute	2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm 20 Minute Rated	Interior
123		2134		1830 FamilyInstance		0_M_Double-Flush	1830 x 2134mm	Interior
126		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
129		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
128		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
127		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
130		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Exterior
130A				FamilyInstance		0_M_Curtain Wall Sgl Glass	M_Curtain Wall Sgl Glass	Exterior
119A		2134		1730 FamilyInstance		0_M_Double-Flush	1730 x 2134mm	Exterior
119B	20 Minute	2134		1730 FamilyInstance		0_M_Double-Flush	1730 x 2134mm 20 Minute Rated	Interior
118	20 Minute	2134		1730 FamilyInstance		0_M_Double-Flush	1730 x 2134mm 20 Minute Rated	Interior
117		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
116		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
115		2134		1830 FamilyInstance		0_M_Double-Flush	1830 x 2134mm	Interior
114				FamilyInstance		0_M_Curtain Wall Sgl Glass	M_Curtain Wall Sgl Glass	Exterior
111		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
112	20 Minute	2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm 20 Minute Rated	Interior
110		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
109		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior
108		2134		915 FamilyInstance		0_M_Single-Flush	0915 x 2134mm	Interior

Schedules

Feature Manipulation Engine

Validating Revit Files using Metadata



▶ Metadata.FamilyInformation	183
▶ Metadata.FileInformation	1
▶ Metadata.LevelInformation	6
▶ Metadata.LinkInformation	1
▶ Metadata.MaterialInformation	169
▶ Metadata.StyleInformation	6
▶ Metadata.ViewInformation	53
▶ Metadata.Warnings	10

Category	Has Instances	Is Host Based	Is Model Family	Loadable	Name	Path	Shared	User Created
Detail Items	No	No	Yes	Yes	Brick - UK Standard	D:\PF_Root\8.0\data\Metric\Library\Detail Components\Architectural\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Level Head - No Bubble	D:\PF_Root\8.0\data\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Keynote Tag	C:\pf_root\dev\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Material Tag	C:\pf_root\dev\Data\Platform\Metric\Library\Annotations\Architectural\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Area Tag	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Callout Head	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Centreline	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Door Tag	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\Architectural\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Grid Head - Circle	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Grid Head - No Bubble	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Level Head - Circle	C:\pf_root\dev\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_North Arrow-2	C:\pf_root\dev\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Room Tag	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Section Head - Filled	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Section Head - No Arrow	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Section Head - Open	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Section Tail - Filled	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Section Tail - Filled Horizontal	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Spot Elevation - Exterior Filled	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Spot Elevation - Target Filled	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_View Title	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Wall Tag	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\Architectural\	No	Yes
Annotation Symbols	No	No	No	Yes	M_Window Tag	C:\pf_root\9.0\Data\Platform\Metric\Library\Annotations\Architectural\	No	Yes
Columns	No	No	Yes	Yes	M_Rectangular Column	C:\pf_root\9.0\Data\Platform\Metric\Library\Architectural\Columns\	No	Yes
Doors	No	Yes	Yes	Yes	M_Single-Flush	C:\pf_root\9.0\Data\Platform\Metric\Library\Architectural\Doors\	No	Yes
Parking	No	No	Yes	Yes	M_Parking Space	C:\pf_root\9.0\Data\Platform\Metric\Library\Site\Parking\	No	Yes



Key Technologies

Enabling
Achievement
of Sustainable

Airport Owner
Digital Twins



AIRPORT OPERATIONS & TECHNOLOGY SYMPOSIUM

AUGUST 22-24, 2023 // ATLANTA, GA

Hosted by Hartsfield-Jackson
Atlanta International Airport

SPONSORED BY

www.AirportDigitalTwin.org

AirportDigitalTwin.org

Team of Integrated Solution Providers Enabling Airport Owner Digital Twins



Integrating Best of Breed Technologies



amadeus IntellAct

