



# USE CASES

**VELOCITY5D**  
BY PRESAGIS

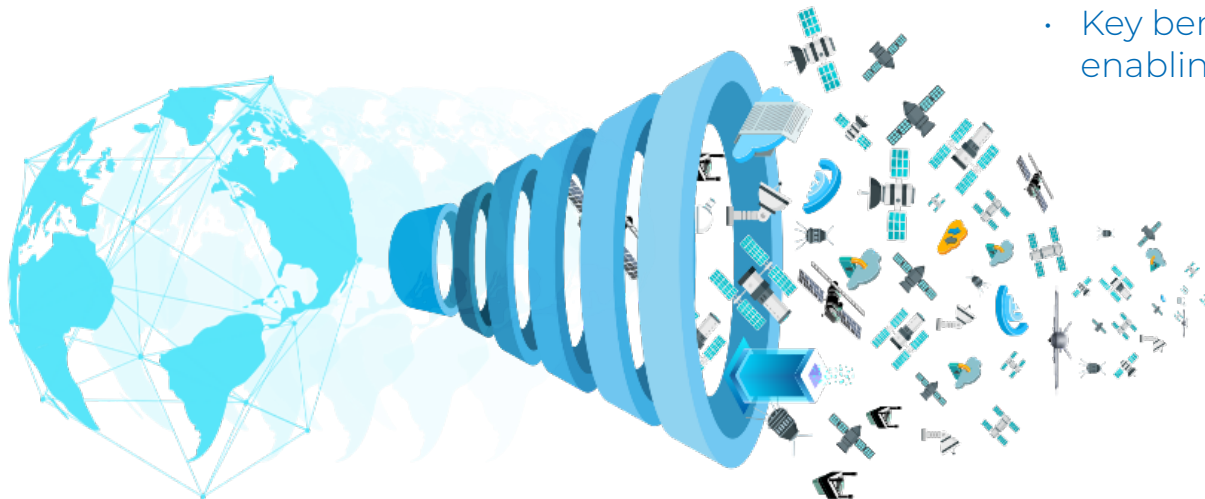
A COLLECTION OF USE CASES WITH PRESAGIS' VELOCITY 5D

# HOW PRESAGIS CAN HELP

**At this very moment, vast amounts of information are being relentlessly generated and collected from diverse sources – structured or unstructured.**

The Geospatial industry is witnessing demand growth from more and more sectors integrating geospatial solutions in their daily workflow management. In turn, geospatial information/ data has become vital for getting required, precise locations.

- Digital data overload requires **transformational decision making (AI)**
- **Enhanced** visualization, simulation and contextual analysis (3D/4D/5D)
- Velocity 5D is being engineered to **meet these requirements**
- **End-to-end** geospatial 3D content platform and pipeline
- Key benefits are **speed, realism and scale**, enabling simulation for critical decision making



Currently two separate industries have existed that cover individual process as well as serve different markets and needs: GIS and M&S. **And until now, nobody had covered the entire process.**

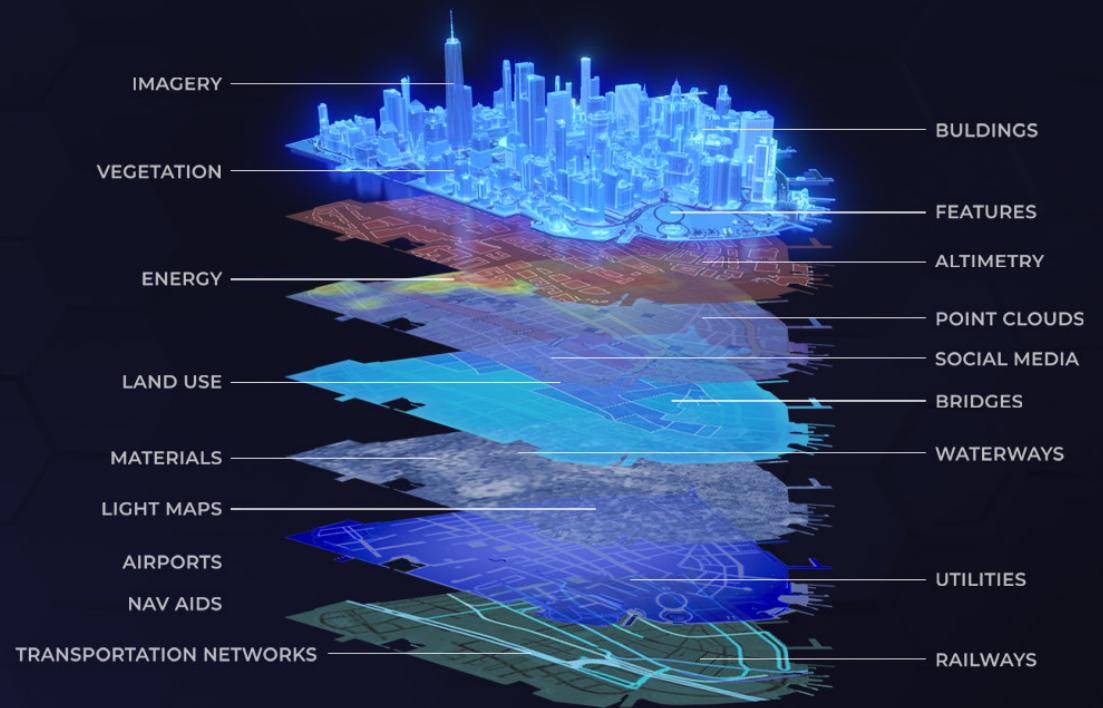
An aerial photograph of a city, likely a university campus, with a large blue rectangular overlay in the center. The overlay contains the text '5D TECHNOLOGY SOLVING REAL-WORLD PROBLEMS' in white, bold, sans-serif font. The city below shows a mix of residential and institutional buildings, green spaces, and a large body of water on the left side. The sky is filled with dramatic, grey and white clouds.

# 5D TECHNOLOGY SOLVING REAL-WORLD PROBLEMS

# VELOCITY5D OVERVIEW

**Velocity 5D (V5D) is a comprehensive geospatial Digital Twin platform that leverages high-performance and high-fidelity geospatial data to help users derive contextual information from their 3D content.**

By combining best-of-breed tools with next generation architecture, V5D provides breakthrough performance in geo-localized content management. From 2D to 3D, you can seamlessly transform diverse GIS data streams into rich, multispectral environments, complete with pattern of life, humans, crowds, traffic, interactions, and behaviors. The result is a digital twin that delivers more than area, space, and time – it delivers the fifth dimension: context.



## VELOCITY5D CAPABILITIES

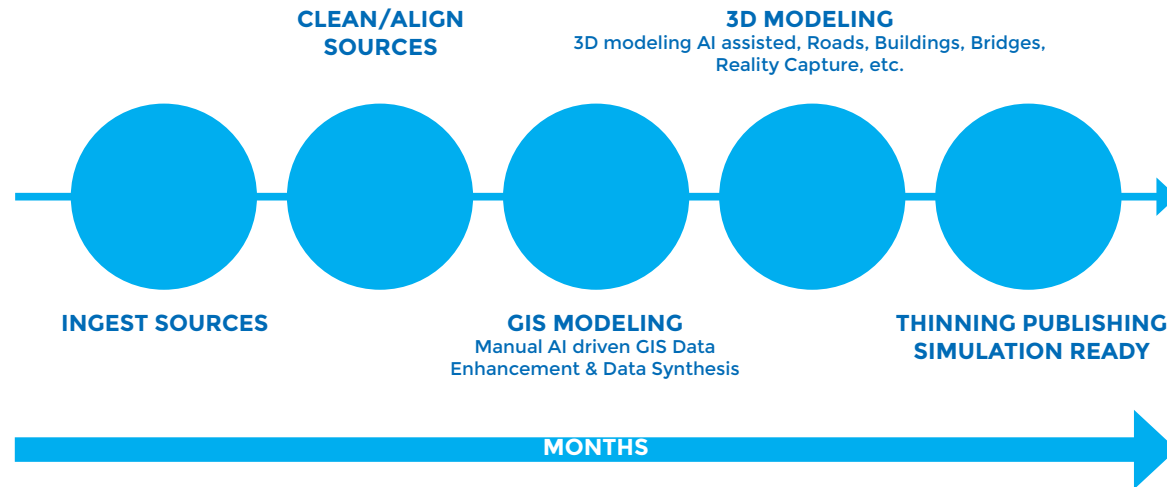
- **Rapid generation of Digital Twins**
  - Scalable cloud solution allows users to process and generate country-size geospatial Digital Twins in a matter of hours
- **Increased realism of Digital Twins with high fidelity 3D content**
  - Taking advantage of Presagis AI/ML algorithms for blending multiple sources including 2D or reality capture, to increase realism and accuracy to 3D content
- **Leverage investments**
  - Reduced time to production taking advantage of automated workflows based on users' needs



# A NEW PRODUCTION PIPELINE

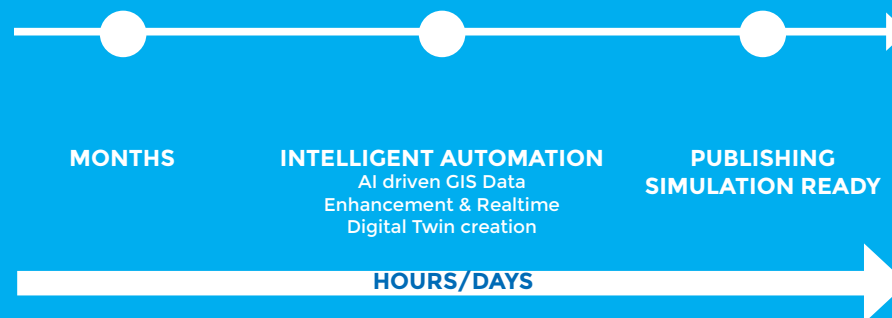
## TRADITIONAL PRODUCTION PIPELINE

 **Bubble size** = Effort level & Technical Competence required



## V5D PRODUCTION PIPELINE

 **Bubble size** = Effort level & Technical Competence required



# DATA AS A SERVICE (DaaS) PIPELINE

## INPUT



- GIS
- Road network
- Lots and footprints
- Imagery
- Elevation
- 3D
- Models
- Point Clouds
- 3D DSM

## AUTOMATION



- AI
- Automation
- Realtime
- Cloud
- Hybrid
- On-premise
- Geo Typical
- Geo Specific
- Digital Twin
- 3D Live editing

## OUTPUT



- Mapping & Visualization
- Intelligence Analysis
- Decision Support
- Training
- Gaming Engines integration

**REALTIME - SPEED - SCALABLE - ANY SOURCE - ANY OUTPUT - MULTIUSER**



V5D  
BY PRESAGIS





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# V5D USE CASES

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A COLLECTION OF USE CASES  
WITH PRESAGIS' VELOCITY 5D



# MAPPING AGENCY

<b>PROBLEM</b>	<b>Customer requirements:</b> <ul style="list-style-type: none"><li>• Generation of a country-sized digital twin</li><li>• The country of Lithuania (5 geocells ~ 65,300 km<sup>2</sup>)</li><li>• Time target 72 hours</li><li>• Source data provided by the customer</li><li>• 1 TB of GIS source data, Satellite Imagery, SRTM Terrain</li></ul>
<b>PRESAGIS ROLE</b>	<b>Generate output from two use cases for all of Lithuania:</b> <p><i>Use Case 1:</i> Extraction of building footprints from OSM data</p> <ul style="list-style-type: none"><li>• Extracted 1,285,799 building footprints</li></ul> <p><i>Use Case 2:</i> Extraction of building footprints using Presagis AI algorithm and multi-spectral satellite imagery</p> <ul style="list-style-type: none"><li>• Extracted 1,341,227 building footprints</li></ul>
<b>BENEFIT</b>	<ul style="list-style-type: none"><li>• Speed: CDB creation took 7+ hours</li><li>• Scale: Lithuania country-wide 3D database</li><li>• Simulation: Simulation-ready 3D Database (OGC-CDB)</li><li>• Visualization: V5D in Unreal Engine</li></ul>



# SMART CITY – TRANSPORTATION

<b>PROBLEM</b>	<b>Rapidly create custom 3D visualizations for</b> <ul style="list-style-type: none"><li>• Urban mobility planning</li><li>• Traffic flow impacts on the environment</li><li>• Disaster management such as evacuation routes</li></ul>
<b>PRESAGIS ROLE</b>	Presagis worked with Esri (ArcGIS Maps SDK) and EPIC Games (Unreal Engine), to rapidly create custom futuristic 3D visualizations with authoritative GIS data to improve decision making and analysis
<b>BENEFIT</b>	<p>Presagis' agent-based simulation leverages road network information to simulate each vehicle's navigation in real-time.</p> <p>The entities are pathfinding toward a destination while obeying traffic rules including multi-lane usage and behavior at intersections with stops signs or traffic light cycles.</p> <p>A heat map overlay was created to represent real-time traffic simulation analytics using color coded blocks representing traffic density and average speed within a city block.</p> <p>Support for visual analytics cues as well as an overview of the simulated traffic flow in a geo-spatially accurate setting.</p>



# DISASTER PREPAREDNESS – FLOODING

<p><b>PROBLEM</b></p>	<p><b>Customer requirements:</b></p> <ul style="list-style-type: none"> <li>• Rescue teams need to know the current situation on the ground</li> <li>• This information is best used if affected areas are reported in real time</li> <li>• Risk reduction and rapid flood mapping</li> <li>• Minimize loss of life and reduction of property damage from flooding</li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Data collection to bring together IoT, LiDAR, satellite images, etc.</li> <li>• Creation of a Digital Twin</li> <li>• Predictive AI models for flood and drought conditions with historical data, IoT metrics and environmental data</li> <li>• Simulation of flood and drought conditions</li> <li>• Monitoring and reporting</li> <li>• Communication infrastructure to send information and alerts</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Reduction of false alarms, avoidance of mass panic situations and unnecessary evacuations</li> <li>• Machine learning to improve accuracy, reduce computation time and lower model development costs</li> <li>• Monitoring and reporting to enable the design and development of sophisticated web tools</li> </ul>



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# DISASTER PREPAREDNESS – 1ST RESPONDER DISPATCH / EMS

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• Ottawa’s current dispatch system is based on individuals knowledge and experience of the current conditions – this brings inconsistency, a significant learning curve, high turnover, and poor situational awareness</li> <li>• The objectives are to minimize response times while maintaining operational efficiency, improve working conditions, and reduce Communication Officers’ cognitive work-load and stress level</li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Integrate Ottawa EMS historical data – GIS, Ambulance GPS, Hospital emergency level of occupation etc., traffic level 24/7/365 etc.</li> <li>• Create a Digital Twin of Ottawa’s road network and hospital locations</li> <li>• Simulate traffic load and time to travel for ambulances</li> <li>• Integrate prediction models of probable location for next incident, then rebalance ambulance location to response within 5 minutes of any location in the city</li> <li>• Optimize ambulance fuel consumption; ambulance downtime locked at a hospital; First Responder over-time; spread incidents evenly across responders</li> <li>• Provide easy to use decision-making tools</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• System benefits: reduced response time; reduced fuel consumption; increased employee satisfaction; positive financial impact</li> <li>• Communication benefits: dispatch consistency; improved situational awareness; reduced cognitive load/training time/attrition</li> <li>• Operational Benefits: human factors such as break periods; equitable workload distribution; reduced time at mobile posts and drive time</li> </ul>



# DISASTER PREPAREDNESS – CBRN – EVENT RESPONSE & PLANNING

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• Conduct ‘what if scenarios’ analysis at Technical Level (assets level)             <ul style="list-style-type: none"> <li>- Specific features of equipment used in detection, protection and decontamination</li> <li>- Specific procedures to be used</li> </ul> </li> <li>• Conduct ‘what if scenarios’ analysis at Tactical Level (site level)             <ul style="list-style-type: none"> <li>- ‘At Scene’ visualization of event</li> <li>- Simulate interaction between CBRN agent release &amp; propagation, first responders and civilian population.</li> </ul> </li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Provide the M&amp;S tools for the ‘what if’ simulation and scenarios</li> <li>• CBRN Doctrines for first responders and civilian population behaviors</li> <li>• Development of the CBRN release models with integration of Gov. HPAC (Hazard Prediction &amp; Assessment Capabilities) Models. Adapt these models for real-time simulation.</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Provides government agencies Defense Research &amp; Development Canada (DRDC) and CBRN Research and Technology Initiative (CRTI) with simulation solutions and tools to strengthen Canada’s preparedness for prevention and response to a CBRN attack.</li> <li>• Develop, test and refine Operational Response Procedures</li> <li>• Evaluate cost/benefit of different configurations of detection sensors, protection equipment, decontamination and procedures</li> <li>• Refine and update Response Plan with simulation for a better preparedness to CBRN events</li> </ul>



# INFRASTRUCTURE –

## OIL & GAS – DIGITAL TWIN & ASSET TRACKING

<b>PROBLEM</b>	<b>Evaluate the benefits of Digital twin for system monitoring and analysis of data to:</b> <ul style="list-style-type: none"><li>• Improve operations</li><li>• Reduce maintenance costs</li><li>• Accelerate production</li><li>• Reduce operating expenses</li><li>• Prevent downtime</li><li>• Increase lifecycle of assets</li><li>• Optimize assets and ensure process improvement</li><li>• Enhance information management and collaboration throughout assets' life cycle</li></ul>
<b>PRESAGIS ROLE</b>	<ul style="list-style-type: none"><li>• Presagis generated real-time GIS management and a Digital Twin with 3D representation for pipelines (above and below water) and terrain based on cloud architecture</li><li>• The project also included a display of real-time metadata from the 3D models (link asset)</li></ul>
<b>BENEFIT</b>	<ul style="list-style-type: none"><li>• Presagis was able to ingest GIS vector data and generate a 3D Digital Twin for large extension of pipelines</li><li>• Accuracy and original GIS data is preserved while information can be viewed in 3D game engine</li><li>• Produced digital twin is compatible with GIS tools as well as ready for AI and Simulation analysis</li></ul>



# INFRASTRUCTURE –

## PORTS – DIGITAL TWIN, ASSET TRACKING & SECURITY

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• Tracking and optimization of container locations within a port leveraging a swarm of autonomous drones</li> <li>• Keeping track in near-real-time of containers movement and location from drone</li> <li>• Homeland/Border Security:             <ul style="list-style-type: none"> <li>- Detection, tracking and identification of illegal goods</li> <li>- Detection of Hazardous materials in containers (CBRN) via drones equipped with 'chemicals sniffers'</li> </ul> </li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• CRIAQ R&amp;D project</li> <li>• Provide ports digital twin with near real-time updates of containers movements from live feeds (drones EO and sensors)</li> <li>• Provide drone simulation environment for drone AI training (autonomous navigation and swarm collaborative tasks)</li> <li>• Provide live 3d monitoring situational awareness of the port based on continuous digital twin update and drone information sensors inputs</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Logistics - Fast localization of containers; Stacking optimization of containers in transit</li> <li>• Security – Match container ID with departure/arrival ports, Bill of Shipping, expected weight and chemical signature for potential anomalies, content or illegal goods.</li> <li>• Scan/sniff containers for potential Hazardous material and leaks during shipping. Early detection and preventive incidents management.</li> </ul>



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# INFRASTRUCTURE –

## AIRPORTS – URBAN IMPACTS

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• Create digital twin of international airports</li> <li>• Urbanization development analysis around the airport</li> <li>• Traffic flow/congestions with current city road networks</li> <li>• Aircraft noise and pollution level impact on surroundings</li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Create digital twin of the airport and its urban surroundings</li> <li>• Simulation of various aircraft traffic and approaches to support the integration of noise and pollution analysis models</li> <li>• Simulate weather patterns typical to the airport locality</li> <li>• Simulation of road-traffic to support integration with road mobility analysis modules</li> <li>• Simulation of E-VTOL air traffic (air taxi) within various sections of the city</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Better urban planning decisions by using immersive POV (VR capabilities)</li> <li>• Planning and trial in simulation of various construction material or architecture layout for noise reductions</li> <li>• Understanding via AI localized weather patterns and dominant winds for pollution and noise propagations.</li> <li>• With AI-assisted recommendation for traffic flow integration to current city road network and its impacts</li> <li>• Analyze future benefits/impacts of air taxi on urban development</li> </ul>



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# INFRASTRUCTURE –

## RAILWAYS – PREVENTIVE MAINTENANCE

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• Keep updated/current digital twin of railway network</li> <li>• Smart preventive maintenance instead of scheduled maintenance (send maintenance crew when and where needed)</li> <li>• Based on train daily data collection and weather conditions, advise operators of railway segments that requires changes in weight or speed limits.</li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Recreate and maintain current digital twin of railways network with a corridor of 500m to 1km center on the railway, including railway powerlines. Fast updates from daily data captures from each train’s sensors (cameras, vibration, lidar, etc.) or stationary sensors along the railways. Advance terrain material composition and characteristics around the railways</li> <li>• AI based prediction/trending of weather effects in support to ground-composition/temperature/rail stability analysis modules</li> <li>• AI based analysis of train images/videos capture to alert/recommend operators of potential maintenance required (e.g. trees getting closer to train powerlines)</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Optimization of maintenance crew response, intervention where the need is required.</li> <li>• Decrease costs and improve service uptime.</li> <li>• Train Performance optimization (reduce delays) based on railway segments local conditions rather than blanket operation directives.</li> </ul>



# CRITICAL INFRASTRUCTURE – NUCLEAR PLANT – PROTECTION AND SECURITY

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• What-if simulation scenario to benchmark security of critical infrastructure</li> <li>• Costs optimization of # of guard vs weapons types vs security systems (camera EO/IR, fences, detection sensors)</li> <li>• Slowdown intruders long enough for larger contingent of remote law-enforcement to reach critical assets and assist local guards to neutralize intrusion</li> <li>• Prevent new threat from the air (small 1 person helicopters, attack drones)</li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Development in collaboration with Sandia National Laboratories (CRADA)</li> <li>• Creation of critical assets digital twin with all its perimeter's security systems, camera positions, sensors and guard posts.</li> <li>• Provides simulation of security systems, detections, red and blue forces behaviors, weapons vs weapons capabilities/effectiveness and time delays for evaluation of physical security layout and efficiency</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Correct and fix critical assets security system gaps and blind spots</li> <li>• Decrease overall costs of operation</li> <li>• Update response procedures to new scenarios and threats</li> <li>• Develop and test law-enforcement overall response times and level of intervention required based on various scenarios</li> </ul>



# URBAN PLANNING –

## PROOF-OF-CONCEPT – MALTA ILLEGAL DUMP SITES

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• Malta Ministry of Tourism and Consumer Protection in conjunction with the Cleansing and Maintenance Division organized a Clean Malta AI Virtual Hackathon to develop a solution to detect litter in rural areas of Malta.</li> <li>• Develop an AI POC who will use satellite imagery data to detect and automatically identify illegal dump sites</li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Setup &amp; connect code to datasets (Microsoft Azure)</li> <li>• Implement &amp; train a model for classification(EfficientNetV2)</li> <li>• Increase original satellite imagery resolution with AI leading to higher detection accuracy</li> <li>• Distance map to closest road</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Provides automated detection of illegal dump sites</li> <li>• Target area to inspect, which optimizes time and costs of Cleansing and Maintenance division</li> <li>• Provide monitoring changes and alert when new satellite imagery is analyzed by the AI compared to last analysis</li> </ul>





# SMART CITY – GREEN CORRIDOR – JAIPUR, INDIA

<p><b>PROBLEM</b></p>	<ul style="list-style-type: none"> <li>• Road traffic infrastructure planning – City Planners need to make changes to the road network to forecast the effects on traffic flow in order to avoid congestion</li> <li>• City Planners must take into consideration the integration of major public infrastructure/ buildings such as airports, stations and stadiums into an existing road network and their impact on traffic flow</li> </ul>
<p><b>PRESAGIS ROLE</b></p>	<ul style="list-style-type: none"> <li>• Provide scenario creation capabilities to test different configurations of traffic lights, road networks and congestion level</li> <li>• Run traffic simulation scenarios, collect performance data of each scenario configuration for analysis and traffic light sequencing</li> </ul>
<p><b>BENEFIT</b></p>	<ul style="list-style-type: none"> <li>• Traffic light sequencing and timing study</li> <li>• Creating Green Corridor for emergency vehicle movement in busy traffic</li> <li>• Evaluate different road network and traffic light sequencing based on level of traffic congestion to optimize emergency green corridor</li> <li>• Simulate impact of adding additional traffic or modifying the road network due to urbanization expansion (new residential areas, stadium etc.)</li> </ul>



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# SMART CITY –

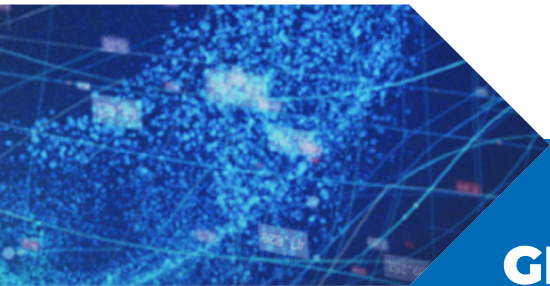
## CROWD MANAGEMENT – EVACUATION SCENARIOS

(JAIPUR, INDIA)

<b>PROBLEM</b>	<ul style="list-style-type: none"><li>• Capability to analyze crowd management for evacuation scenario of public event</li><li>• To be able to create scenarios for: rail stations, offices, sporting events in stadium, musical concerts, public exhibitions etc.</li></ul>
<b>PRESAGIS ROLE</b>	<ul style="list-style-type: none"><li>• Provide a 3D environment of the event location and create associated evacuation scenarios</li><li>• Simulate the events and provide information of areas/zones where crowd movements may encounter bottlenecks during the evacuation</li><li>• Provide problematic area information for the emergency services to evaluate and insert into their emergency response plan</li></ul>
<b>BENEFIT</b>	<ul style="list-style-type: none"><li>• Simulation highlights bottleneck areas with peak crowd (example 2000 people/ hrs)</li><li>• Crowd evacuation time study</li><li>• Provide information of public capacity, areas/zones where crowd movement may encounter bottlenecks</li><li>• Pre-planning with required emergency facilities which enables event organizers to handle crowds, avoid disaster situations and facilitate emergency evacuations</li></ul>

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