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GEOSPATIAL WORLD FORUM

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#GWF2024



**GWF**  
GEOSPATIAL WORLD FORUM  
13-16 May 2024, Rotterdam



*Geospatial Transition*  
**POWERING THE  
WORLD ECONOMY**

**ESG & CLIMATE  
RESILIENCE  
SUMMIT**

Theme: Geospatial Technology for  
Climate: Accelerating the Transition  
to A Sustainable Green Economy

15-16 May 2024

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# Large-Scale Spatial Data Infrastructure to accelerate Resilient Urban cities

Session 7.0 | 13.30pm | 16 May 2024

# Agenda



## Introduction

Overview, Challenge



## Technology

Data Lakehouse as a  
scalable storage systems

Apache SPARK as a  
scalable, distributed data  
processing systems



## Deep Dive



## Conclusion



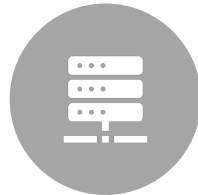
# Introduction

Complexity and Challenge of Data Management & Analytic

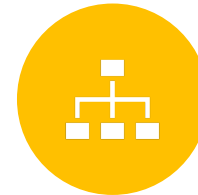
# Challenge of Spatial Data



**Large Dataset**, resolution plays an important role in determining the size and accuracy of data



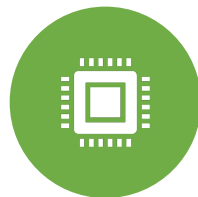
**Constantly changing**, delta & data freshness directly impact the value



**Structured, Semi-Structured, Unstructured**



**Multiple cartographic** projections and format



**Large computation** resources for vector and raster format, just to find a point within a 500+ million vector data requires computational resources beyond the capability of typical RDBMS systems

# Challenge Before Big Data

1. The need for a platform to store all of customers data, indefinitely, and yet accessible (able to query)
  - Current enterprise technology is expensive to own and operate for customers
  - RDBMS + SAN Storage + Proprietary Framework is unsustainable
2. The need for a platform to process all data, and sometimes simultaneously
  - Parallel execution at lower cost, with commodity hardware
3. The need for a platform to enable all stakeholders to reach for right data, at the right time
  - Multiple data users (owners, analyst, apps, warehouse, public)
  - Smart cities initiative is starting everywhere



SOLUTIONS

## GEOSPATIAL SOLUTIONS

- Govt Solution
- Utilities Solution
- Mobility Solution
- Disaster Management
- Oil & Gas solution

## MD ANALYTIC

- Data Management
- Data Integration Pipeline
- Data Exploration & Analytic
- Data Visualization

## MYWORK PORTAL

- Project Management
- Business Development
- Financial Management
- HR & Admin Management

TOOLS

Tools for Data Acquisition



RECEIVER



LASER SCANNER



UAV SYSTEM



AUGMENTED REALITY APP

PLATFORM



TECHNOLOGY



MOBILE LASER SCANNING TECHNOLOGY



MOBILITY SOLUTION



AI TECHNOLOGY



TRACKING TECHNOLOGY



CLOUD TECHNOLOGY

BIG DATA ANALYTICS

ARTIFICIAL INTELLIGENCE

AUGMENTED REALITY

BLOCKCHAIN

# Malaysia Urban Observatory Use Case

## GOAL

Spatial Analytic for sustainable future to support urban planning by providing big data analytic platform through an integrated services capabilities.

Develop an automatic system capabilities by collecting, generating and analyzing the urban observatory requirement

Develop a IMUO BigData Analytic Platform

Consolidate urban and rural planning information from various data sources based on big data technology

01

02

03

04

05

06


Monitoring Sustainability Development based on the achievement of national and international implementation agenda

Focus on the implementation of innovative technology solutions through appropriate geo-analytics

Develop a network of information exchange and capacity building (Capacity Building)



# Malaysia Water Operator Use Case



**RESILIENCY**

- Water resources
- Water related disaster risk
- vulnerabilities

**The Resiliency Sub-Index Includes:**

- Water stress
- Green space
- Water-related disaster risk
- Flood risk
- Water balance
- Water reserves



**EFFICIENCY**

- Leakage
- Metering water reuse
- Continuity coverage
- Charges

**The Efficiency Sub-Index Includes:**

- Leakage
- Water charges
- Services continuity
- Wastewater reuse
- Metered water
- Drinking water
- Sanitation




**QUALITY**

- Health
- Sanitation
- Environmental effects
- Pollution

**The Quality Sub-Index Includes:**

- Drinking water
- Sanitation
- Treated wastewater
- Water-related disease
- Water pollution
- Threatened freshwater species



**RESILIENCY**

- Water resources
- Water related disaster risk
- vulnerabilities



**EFFICIENCY**

- Leakage
- Metering water reuse
- Continuity coverage
- Charges



**QUALITY**

- Health
- Sanitation
- Environmental effects
- Pollution

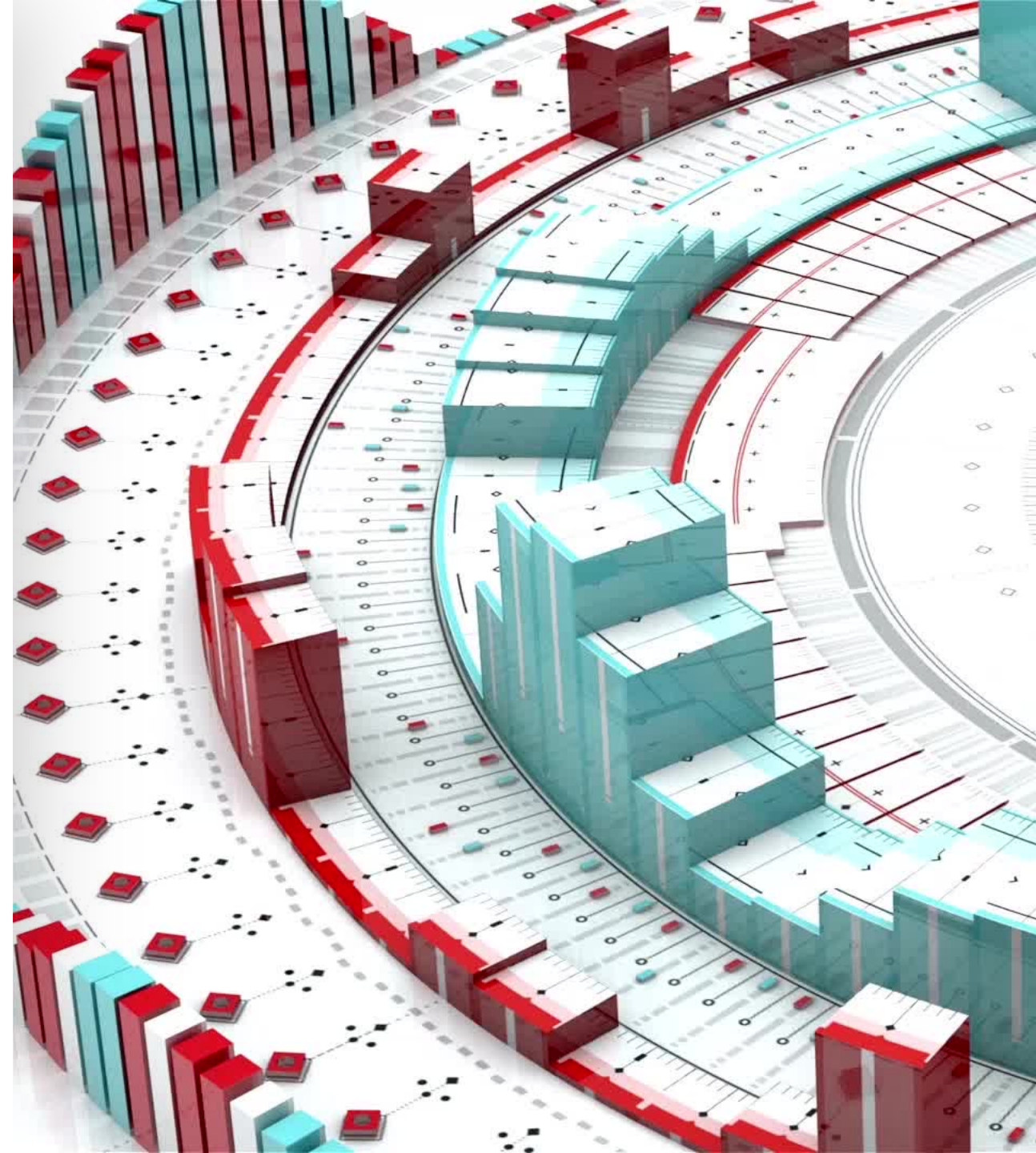


# Technology

Core technology to implement scalable spatial solution using Data Lakehouse

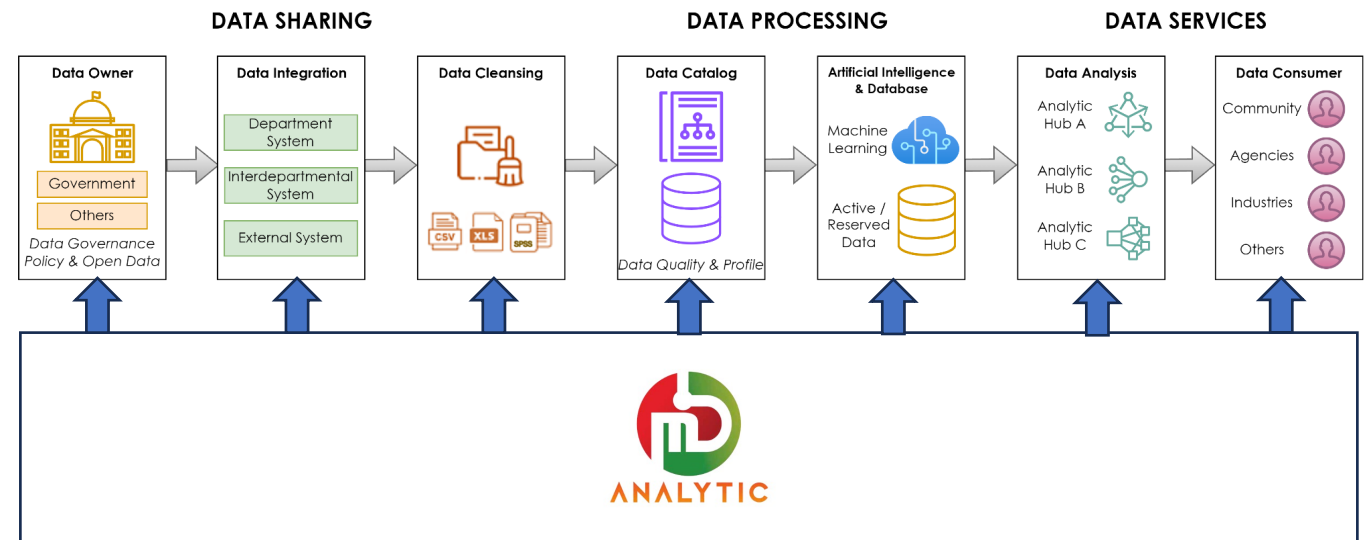
# Common Data Infrastructure

1. Database
  - RDBMS = 100s Tb
  - Oracle, IBM-DB2, PostgreSQL
2. Data Warehouse
  - On-Premise, Cloud = Petabytes
  - Vertica, Redshift, Terradata, Snowflake
3. Data Lake
  - Huge data > Petabytes
  - HADOOP



# The Customer Challenge

1. Difficulty acting on transactions in real-time.
2. Handling massive amounts of data efficiently.
3. Integrating various data sources into a unified system.





The **MD Analytic Platform** enables organizations to act in real-time across billions of transactions using massive parallelism and a unified storage model to ensure the smallest possible server footprint. It ingests and acts on streaming data at the edge and can combine edge data with data from systems of record, third party sources, data warehouses, or data lakes for operational, transactional, or analytical workloads – all in real-time.

**MD Analytic Platform** is about combining data and knowledge to create an integrated spatial platform for government and industry anywhere in the world

# What MD Analytic Platform?



MD Analytic is delivering a **Data Analytics Service** to an enterprise supporting its Business Intelligence, Data Lakehouse, Analytics and Data Science requirements. At the core it is a modern, agile way of designing and building efficient, effective Data Lakehouse.



Foundation for **Large-Scale GIS-Based Initiatives** to provide end to end solution for Smart City, Urban Observatory and other data management and analytic at scale

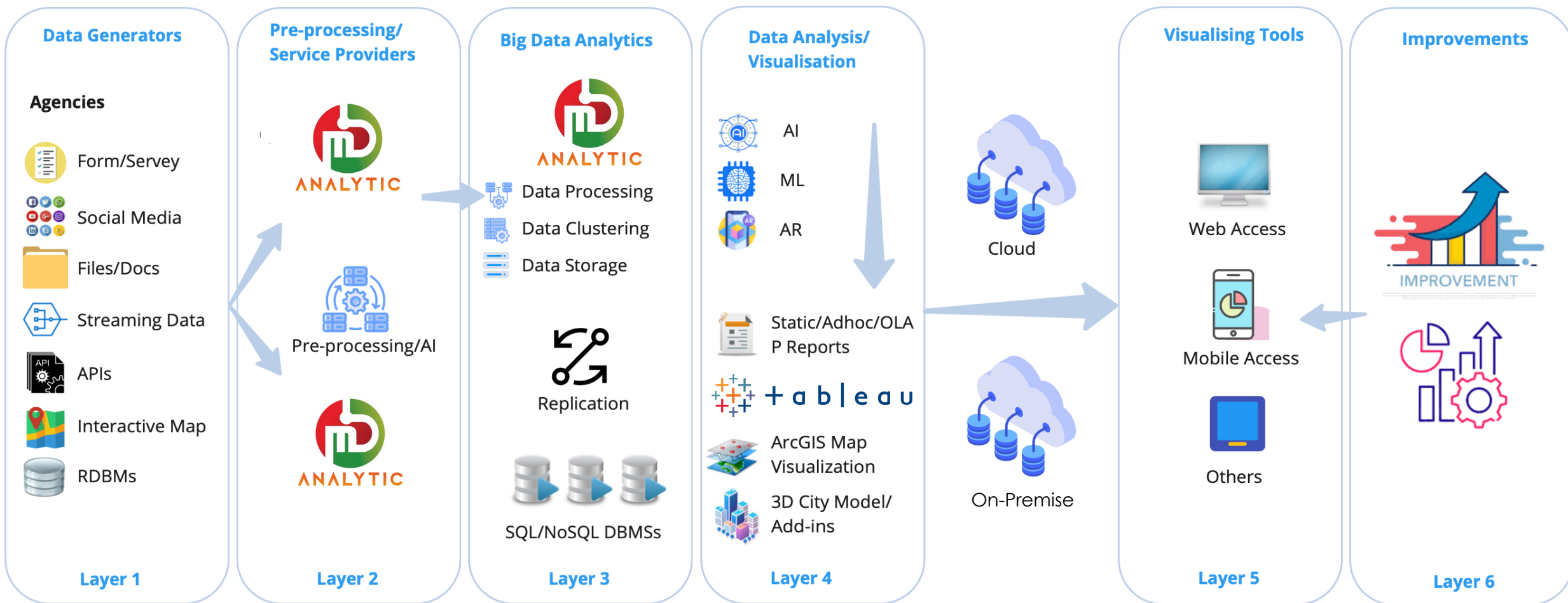


**The architectures are scalable.** Some users are running multi-petabyte scale implementations of a MD Analytic architecture.



MD Analytic design standards deliver an **efficient system at any scale** regardless from any data domain. It design to start with small and grow to the very largest scale without the need to re-engineer your system.

# DATA FLOW ARCHITECTURE



# The Benefit

1. **Speed:** Provide the real-time data processing capabilities.
2. **Efficiency:** Able the reduced server footprint and cost savings.
3. **Scalability:** Platform's ability to scale for handling massive datasets.
4. **Versatility:** Support multiple range of workloads and applications by the platform.



The background is a grayscale aerial photograph of a city, overlaid with a white grid. Numerous small, dark circular markers are scattered across the map, representing data points. The text 'Deep Dive' is prominently displayed in red on the left side of the image.

# Deep Dive

Showcase



PLATFORM FOR URBAN OBSERVATORY AND SMART CITIES

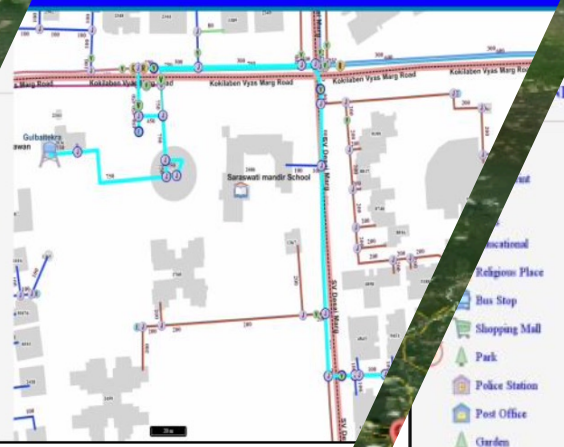
# Building the future with Data

Explore Cities

Observe city vitals and engage communities through an integrated data analytic platform designed for building smarter and sustainable human habitats

als and engage communities through an integrated data orm designed for building sustainable human habitats

## WATER UTILITY NETWORK SYSTEM



## WATER UTILITY NETWORK SYSTEM



Asahan (WTP Asahan)

Durian Tunggal

Sg. Batang Melaka (WTP Gadek)

Bunded Storage 1 (WTP Sebukor), Sg. Melaka

Sg. Muar (WTP Bertam), Sg. Melaka

Sg. Muar (WTP Merlimau), Sg. Kersang (WTP Merlimau)

Jus (WTP Jus)

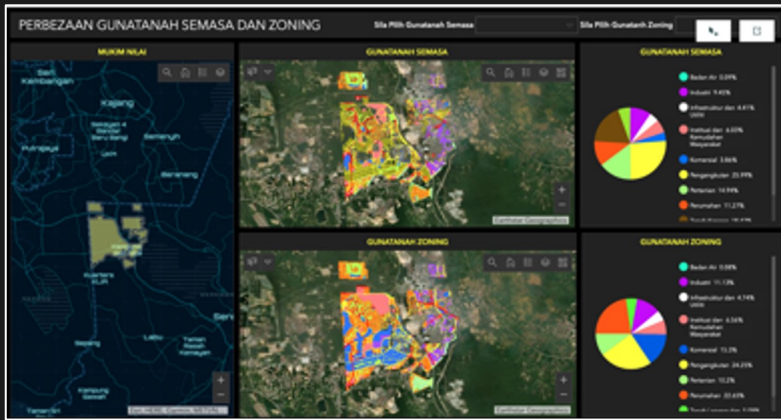
WTP: M001

Pipeline	No. of Valve	Balancing Reservoir	Active Service Reservoir	Fire
0	17	4	4	

### Treated Water Quality Status



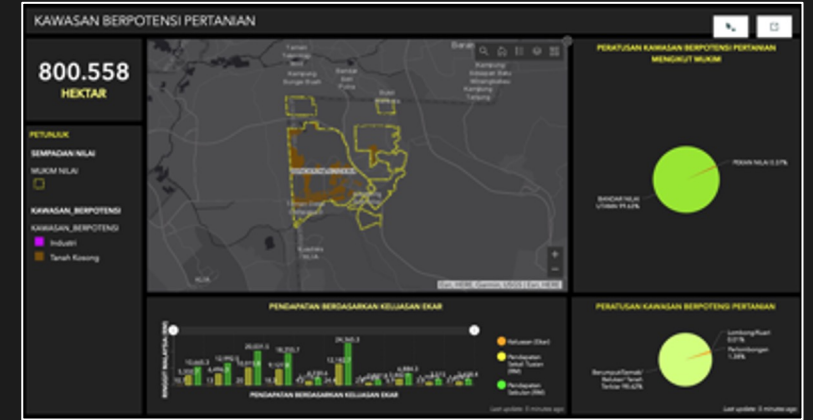
# DASHBOARD TOOLS



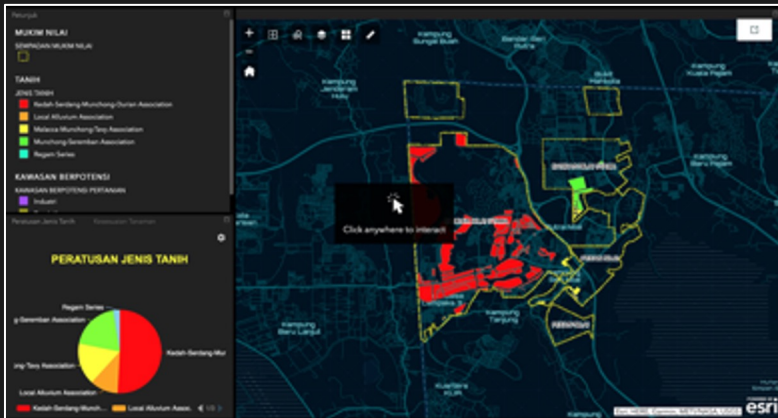
Agriculture Development



Agriculture Development vs Zoning (Nilai)



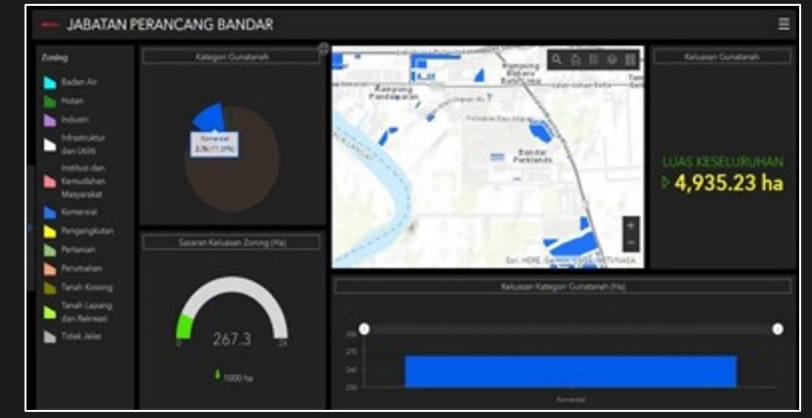
Agriculture Potential Development (Nilai)



Soil Type Comparison (Nilai)



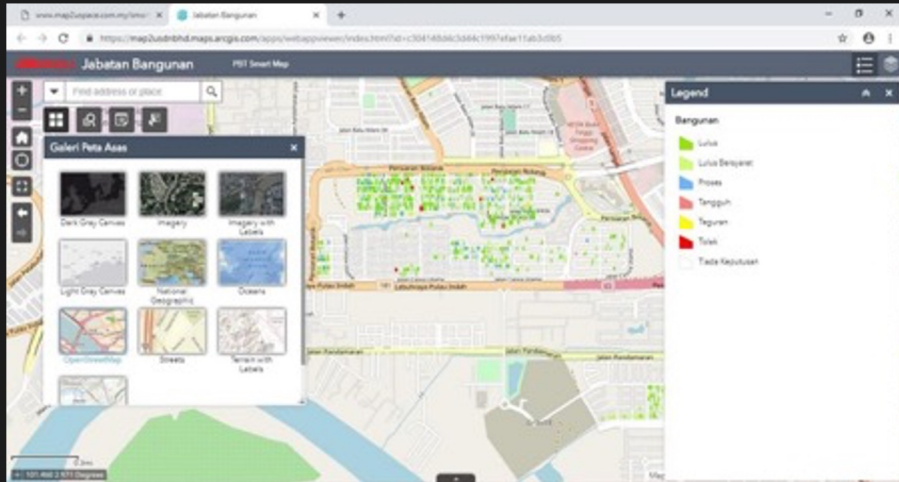
Landuse Development Progress (Klang)



Commercial Development Progress (Klang)



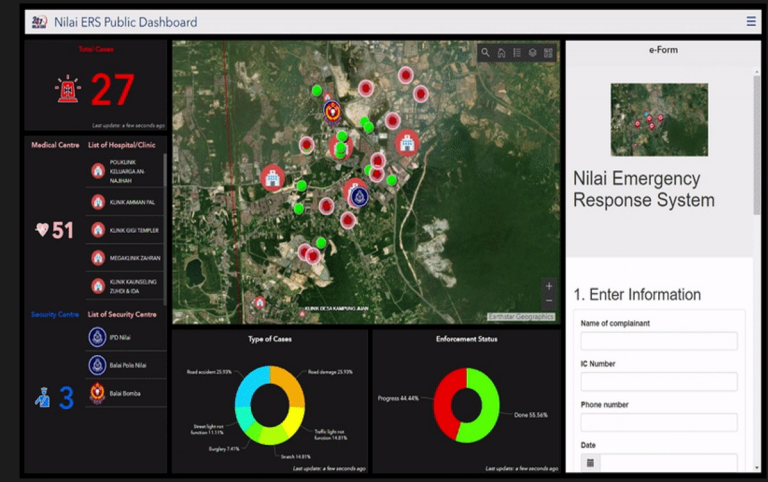
# DASHBOARD TOOLS



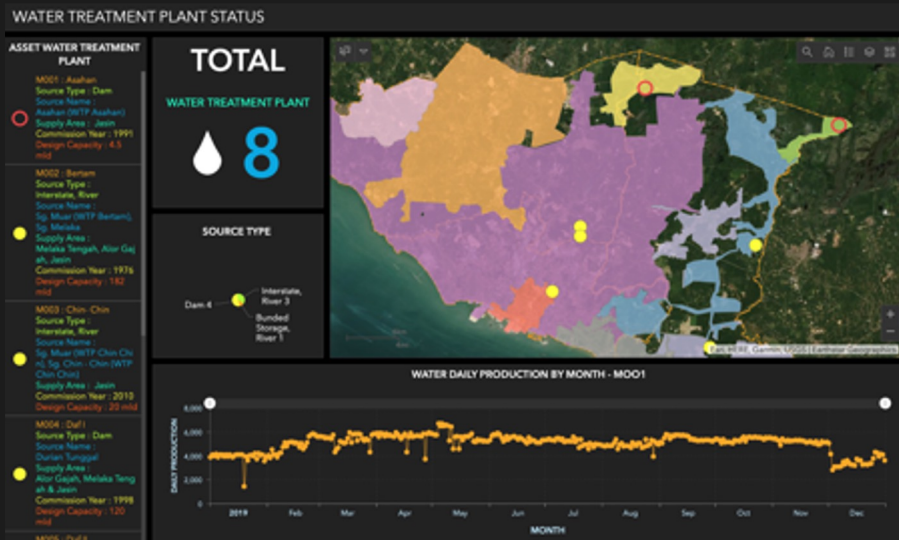
Building Development Control (Klang)



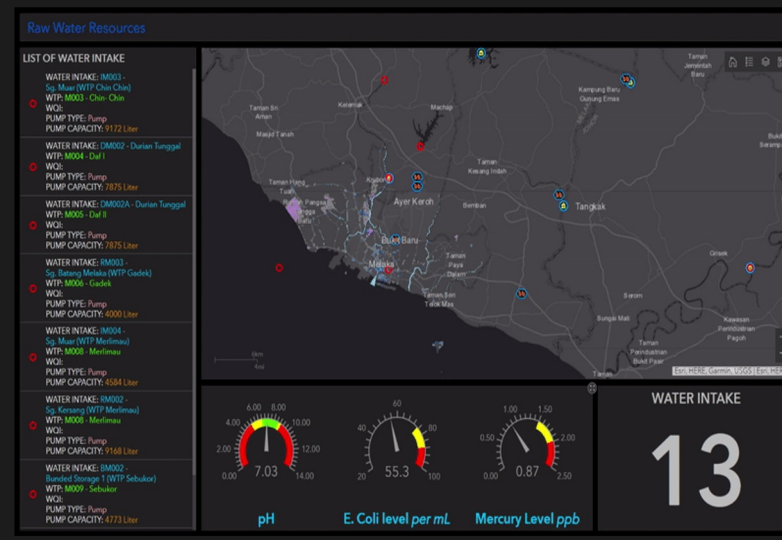
Building Inspection Status



Emergency Response (Nilai)



Water Treatment Plants Status (Melaka)



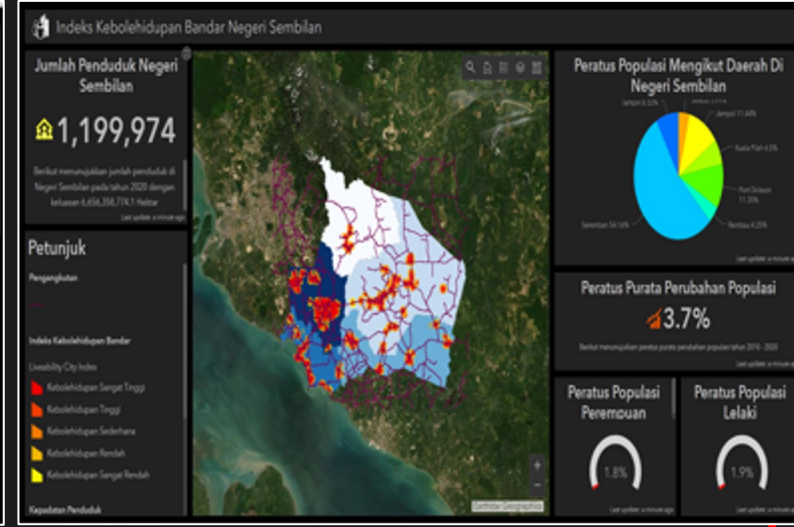
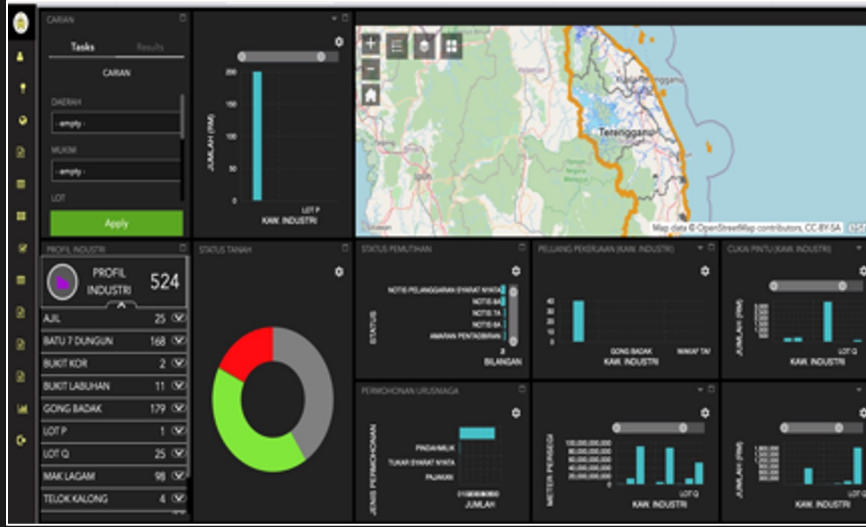
Raw Water Resources (Melaka)



Demand & Water Supply (Melaka)



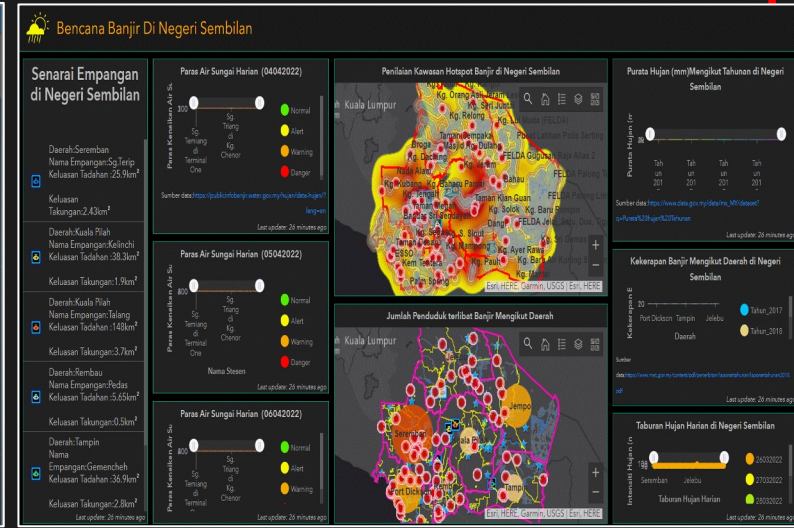
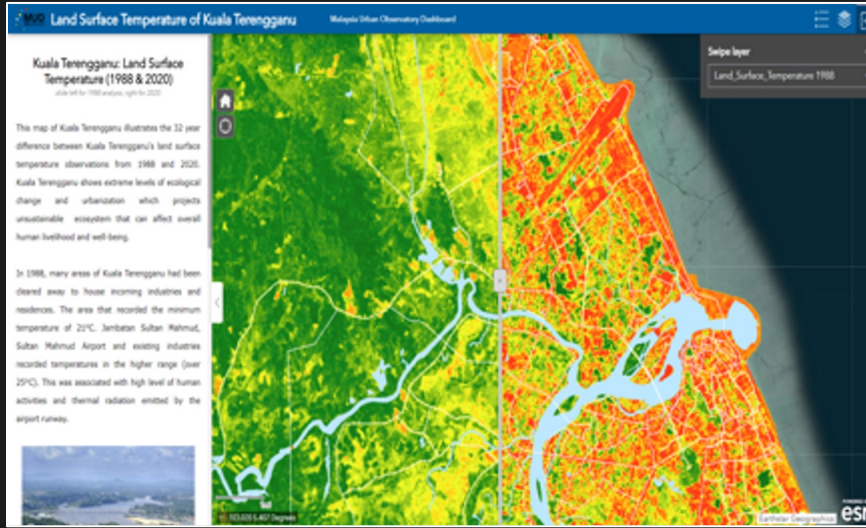
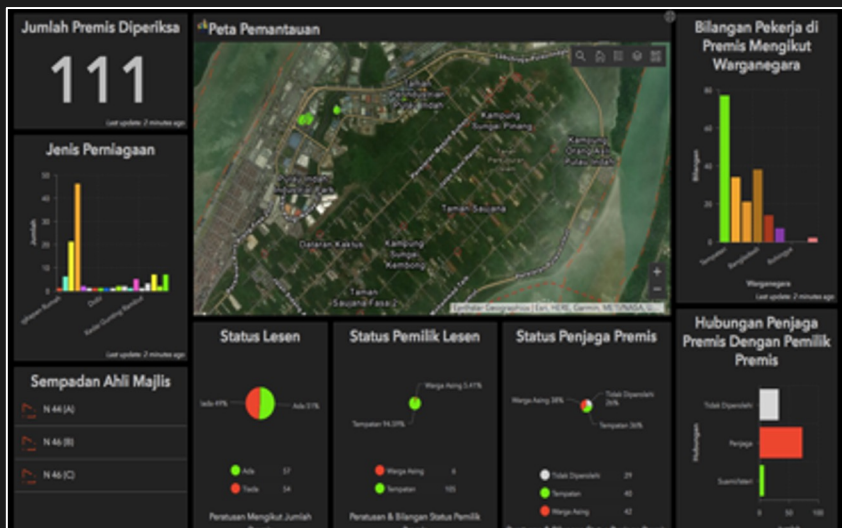
# DASHBOARD TOOLS



Traffic Flow Congestion (Bangsar)

Industrial Profiling (Terengganu)

Liveability City Index (Negeri Sembilan)



Foreign Worker Business Activities (Klang)

Comparison Land Surface Temperature (Kuala Terengganu)

Flood Disaster and Water Level (Negeri Sembilan)



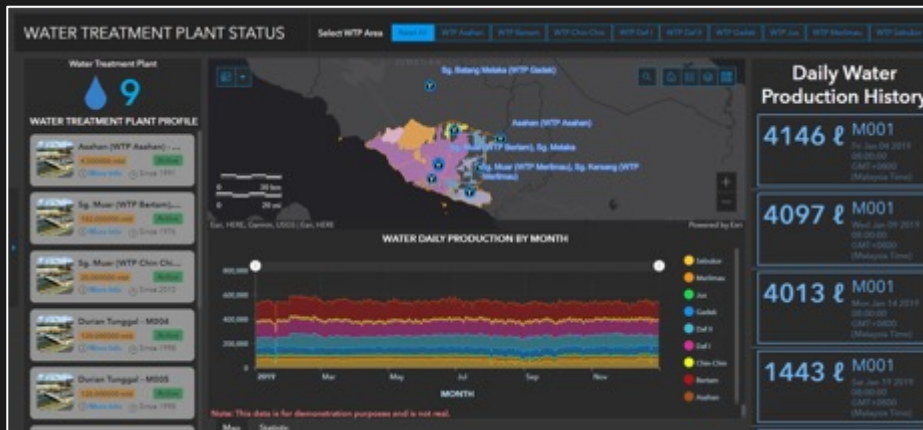
# DASHBOARD TOOLS



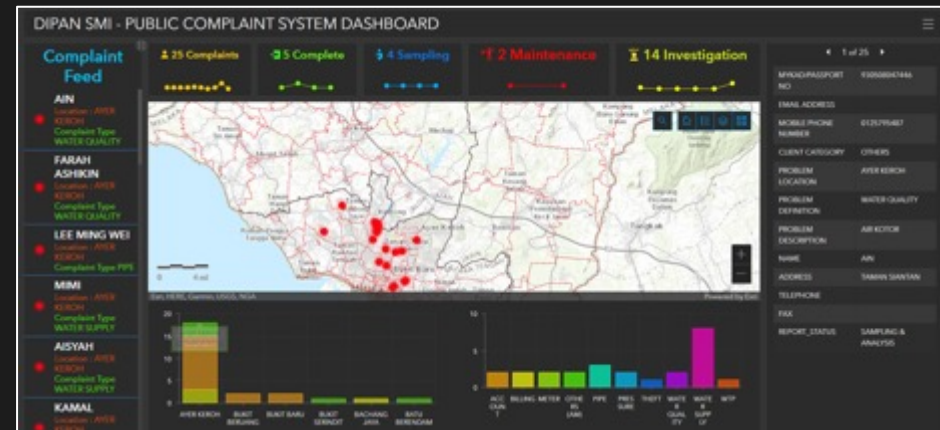
Water Demand and Supply (Melaka)



Water Quality Monitoring (Melaka)



Water Treatment Plant Status (Melaka)



Public Complaint





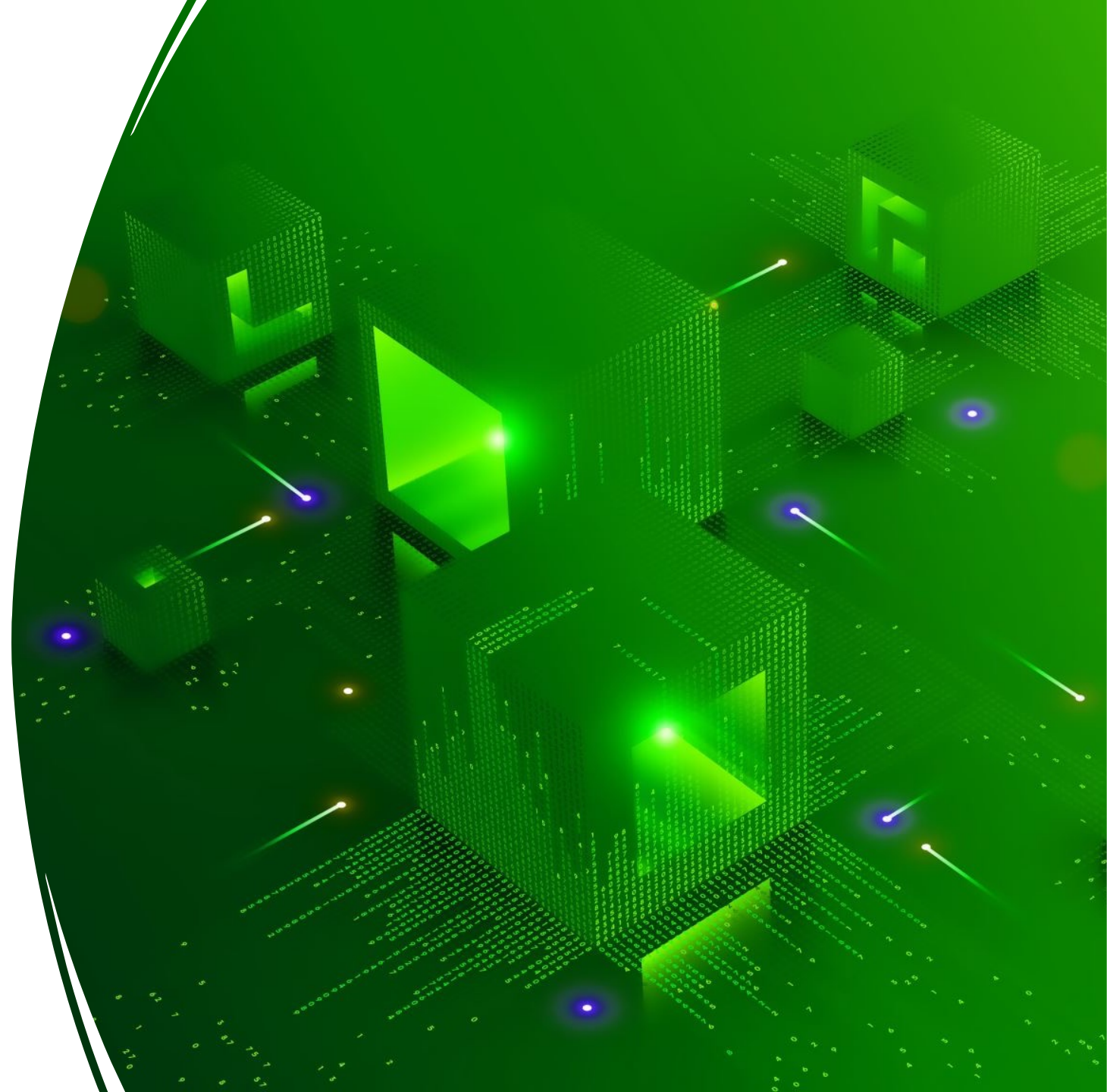
# Conclusion

Summary and Conclusion

# Recap

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- **Data Lakehouse** is a perfect choice for storing large spatial data, e.g. data generated by missions from any collecting devices, possibly running in autonomous mode
- **Modern Data Lakehouse** ecosystem comes with complete framework for performing spatial processing such as querying and analysis at scale using commodity hardware
- Nonetheless, it's a complex ecosystem for most organisation to operate and maintain





# Q & A