



Multi-agency Collaboration Platform for Building Disaster Resilience in the Local Context: MOBILISE Approach

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Cabinet Office



GREATER MANCHESTER



Environment Agency



GREATER MANCHESTER PREPARED



Current Situation

- ❖ Many organisations collect data (insitu and remote)
- ❖ Each organisation has their own GIS systems & experts
- ❖ GIS systems are too complex for decision makers
- ❖ Data are published for consumption by others, but the use of these data for supporting collaboration for building disaster resilience is still under developed
- ❖ Engagement with communities is still weak
- ❖ The use of real-time data for situation awareness can be enhanced
- ❖ Platforms for combining insitu data, space data and real-time data need further improvement

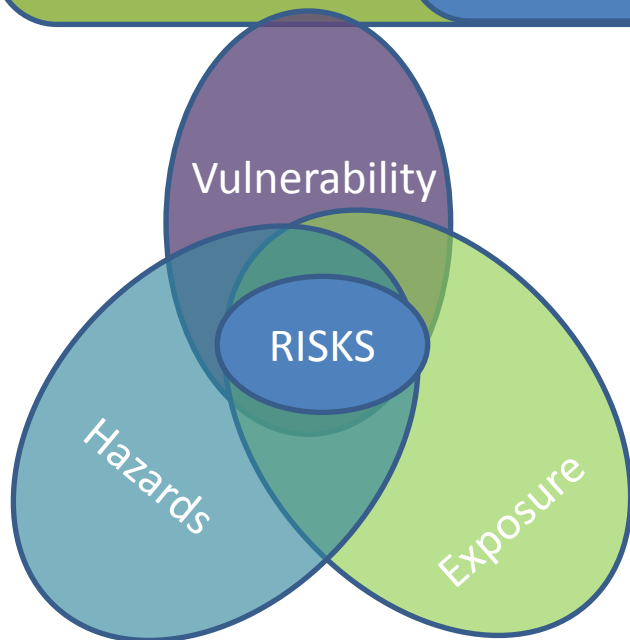
Collaboration Platform for Multi-Agency Collaboration

Priority 1:
Understanding
Risks

Priority 2:
Strengthening
disaster risk
governance to
manage
disaster risk

Priority 3:
Investing in
disaster risk
reduction

Priority 4
Enhancing disaster preparedness
for effective response, and to
“build Back Better” in recovery,
rehabilitation and reconstruction



Risk Sensitive Urban Development

Stakeholder Collaboration

Shared Data Driven Intelligence

City as a Complex System

Interdisciplinary Approach

Key Technical Objectives

- ❖ Assess the current multi-agency collaboration approaches and propose a collaboration model / approach that can promote better collaboration using digital technologies and co-ordination processes.
- ❖ Establish a digital platform that can combine both remote sensing data and in-situ data to assess vulnerabilities and build disaster resilience
- ❖ Establish a community engagement platform
- ❖ Use of real-time satellite data for disaster response (3D)
- ❖ Computer simulation model that can capture cascading affect of disaster that will allow the team to understand dependencies of vulnerabilities and decide how best to reduce them.

Challenge 1 : Extracting Value out of Data to Support Risk Sensitive Urban Development



Connect
development
help stakeholders
build com



Local risk



enhanced
stakeholder
engagement in
the design



response

training through "role Play"

Platform

connecting multi-agency data sets

Data for Identifying Risks

❖ Context & Vulnerability

- Social
- Infrastructure
- Environment

❖ Hazard & Exposure for slow onset disasters

- Simulation & Historical Data
- Slow onset disaster data derived from satellite & sensor data

❖ Remote & Real-time Data for rapid onset disaster

- Social Media
- Weather Data
- Sensor Data
- Satellite data

Data
Layer

Data Sources

Local Government Agencies

Center for International Earth Science
Information Network (CIESIN), Columbia
University

(ciesin.columbia.edu)

Copernicus Open Access Hub (ESA)
(scihub.copernicus.eu)

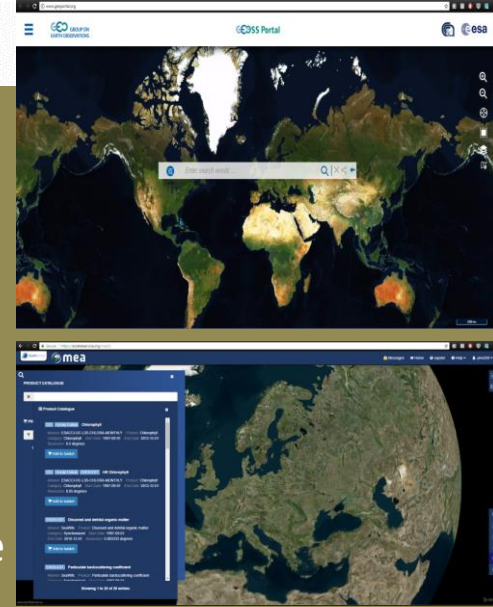
Global Partnership for Sustainable
Development Data
(www.data4sdg.org)

Worldpop
(www.worldpop.org.uk)

UN-GGIM
(<http://ggim.un.org>)

Earth Observation Data Service
(<https://eodataservice.org>)

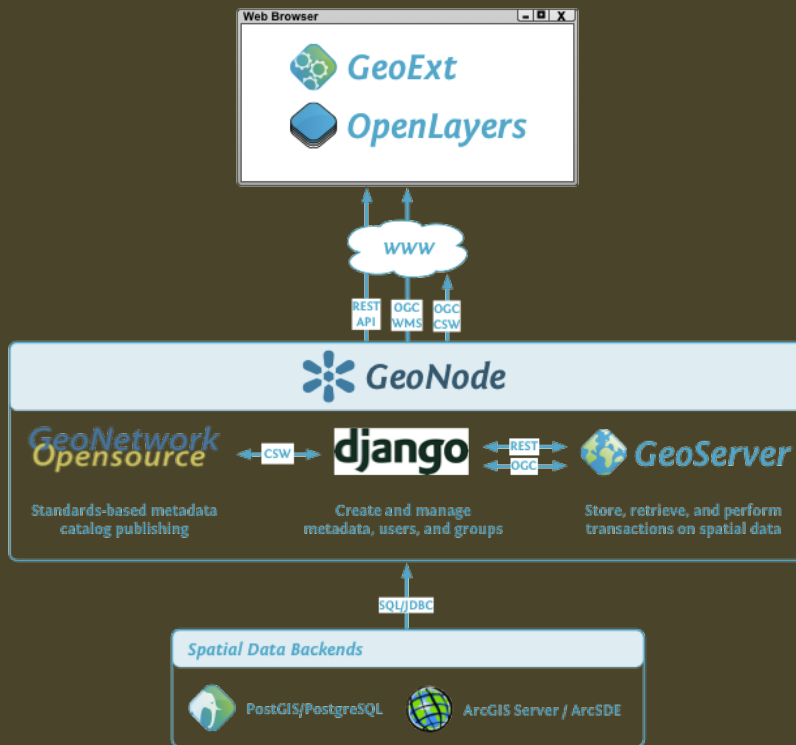
Group on Earth Observations (GEO)
(www.earthobservations.org)



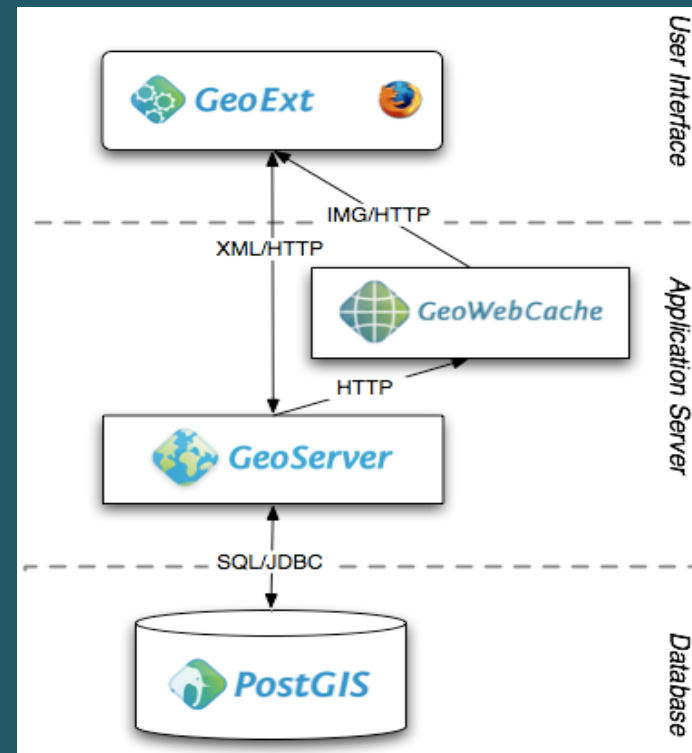
Platforms for Bringing Data Together



GeoNode



OpenGeo / Boundless



Our Assessment

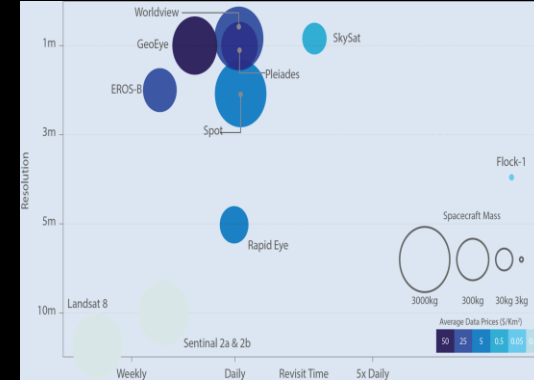
- ❖ Current systems provide a basis for combining different spatial data and Visualise through a browser
 - Eg. RiskInfo based on GeoNode
- ❖ Initiatives such as Open Data for Resilience Initiative (OpenDRI) promotes evidence-based methods to better plan for, mitigate, and respond to natural disasters.
- ❖ Room for Improvement
 - Inter-organisational collaboration support
 - Connecting distributed spatial data platforms
 - Real-time data access (satellite, sensors, mobile apps, webservice)
 - Exploit the power of VR based on gaming technology

Challenge 2 : Dynamic City Models for Offering Sustainable City Services (eg. Disaster Response)

Live
operational
data from IoT
Sensors



Low orbit
Nano
Satellite
Real-time
Data



Semantic City
Model with
Social, Economic
and Environment
Data

Realistic Virtual
Representation of
the City

Disaster
Response

Big Data Platform &
City Data Analytics

Big Data - 3 Dimensional Span

❖ Three main Big data spans
in three dimensions V^3 :

❖ **Volume** (Amount of data)

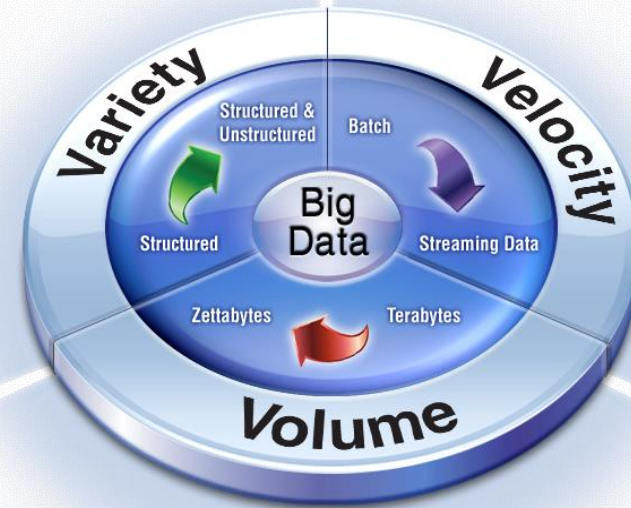
❖ **Velocity** (Collection Speed)

❖ **Variety** (Types of data)

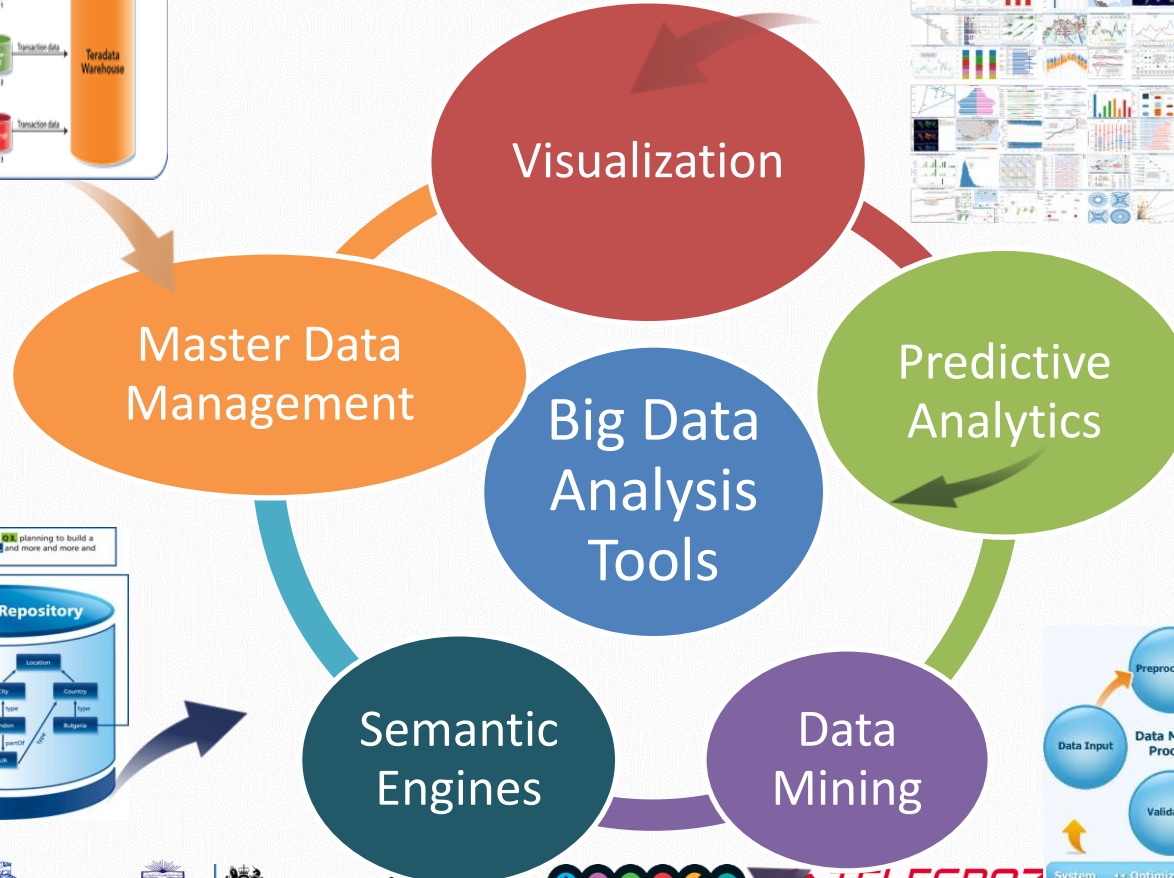
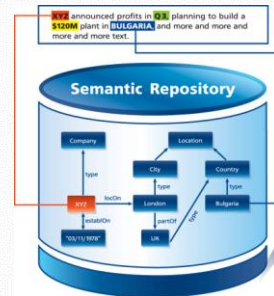
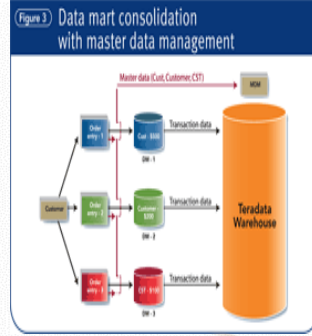
❖ **Volatility** (How long valid for)

❖ **Validity** (Accuracy)

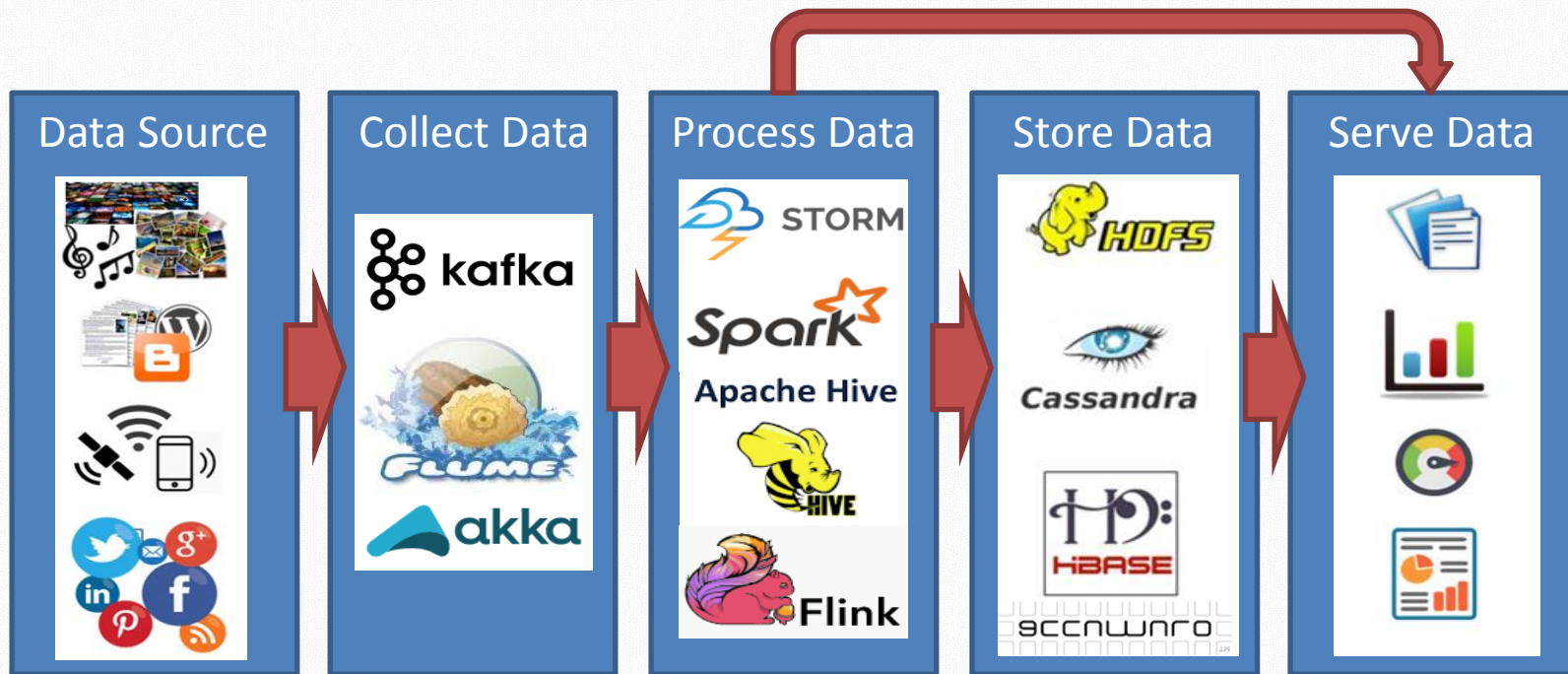
❖ **Veracity** (Bias, Noise)



Technical Characteristics of a Big Data based Decision Making System



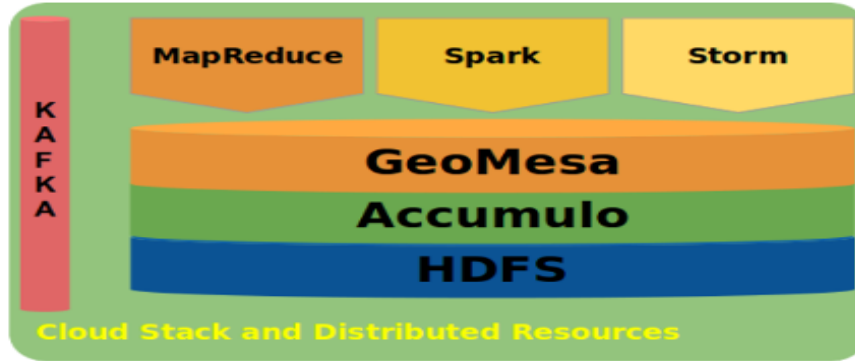
Big Data Pipeline Architecture



Examples of Big Data Platforms

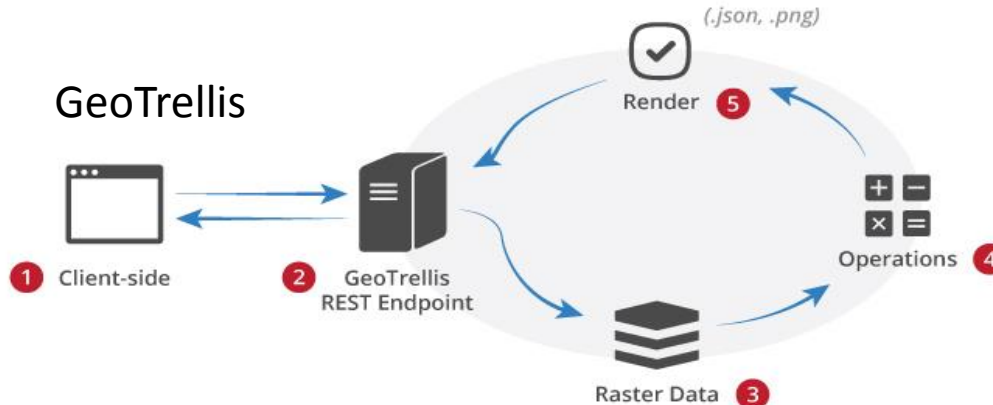


GeoMesa



- Store gigabytes to petabytes of spatial data (tens of billions of points or more)
- Serve up tens of millions of points in seconds.
- Ingest data faster than 10,000 records per second per node

GeoTrellis



- Can be used to do batch processing of large raster data (satellite data)

Our Assessment

- ❖ Provide a good foundation for handling large data sets, coming from sensors, social media & satellites.
- ❖ Room for Improvement
 - Application of big data technology to disaster resilience
 - Explore the creation of 3D environment of disaster environments

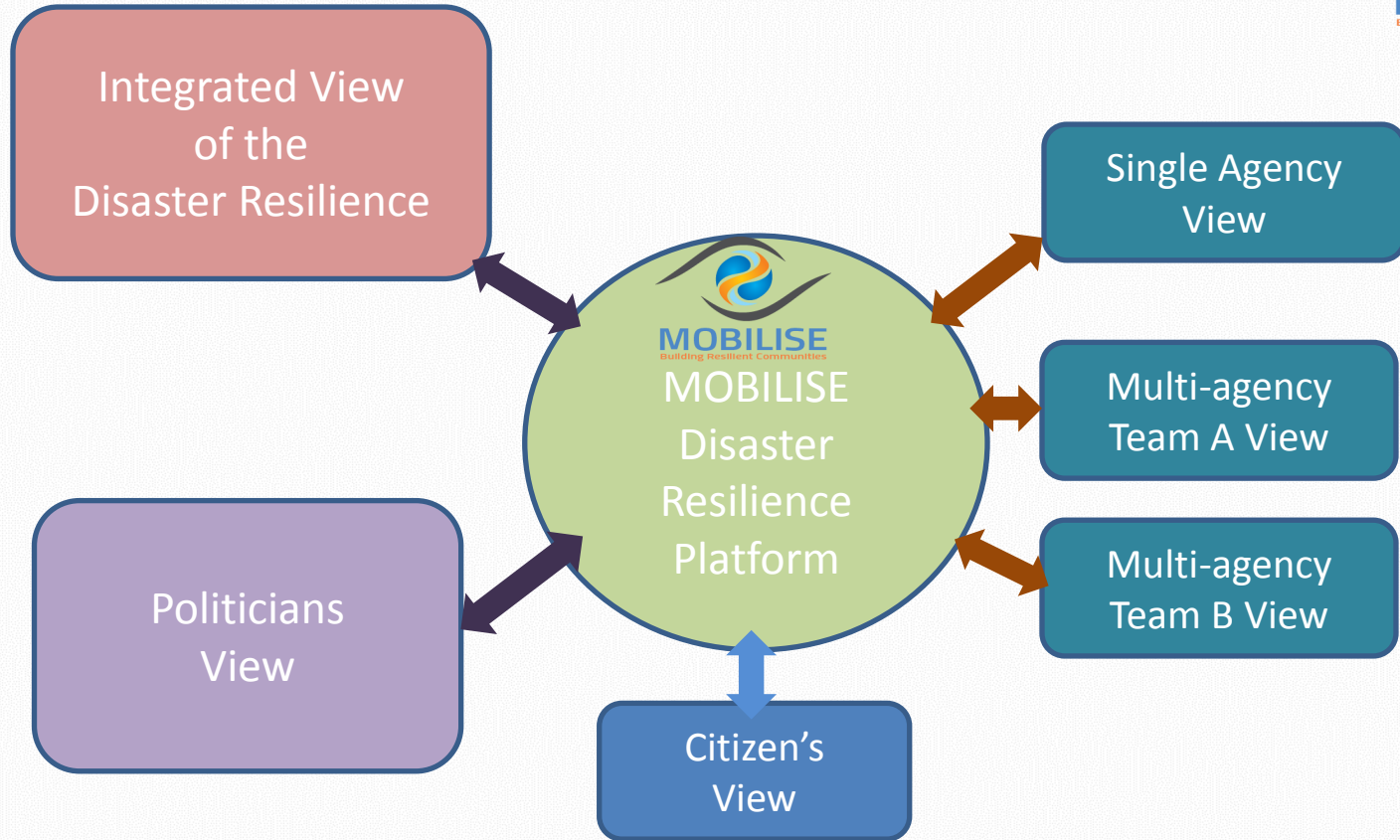


Web-based Collaboration Platform for Building Urban Resilience

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User Concept of MOBILISE Platform



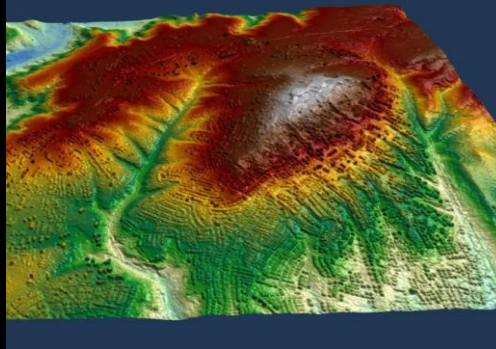
Challenge 3 : Exploitation of 3D Remote Sensing Data for Training and Disaster Response Planning

3D database building techniques

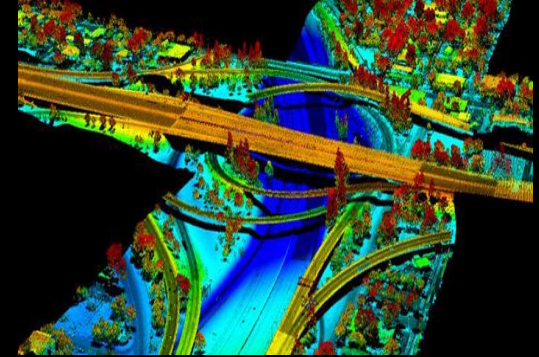
- Stereo photogrammetry
- LIDAR
- Interferometry
- Radargrammetry

Sources :

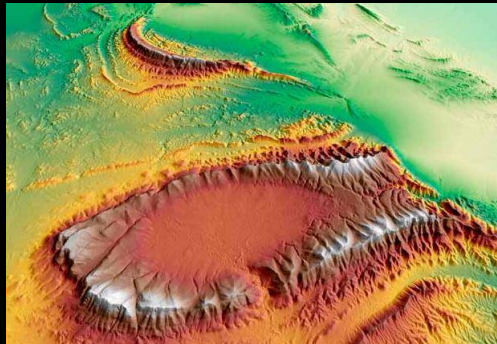
- Satellites
- Drones



Stereo Photogrammetry



LIDAR

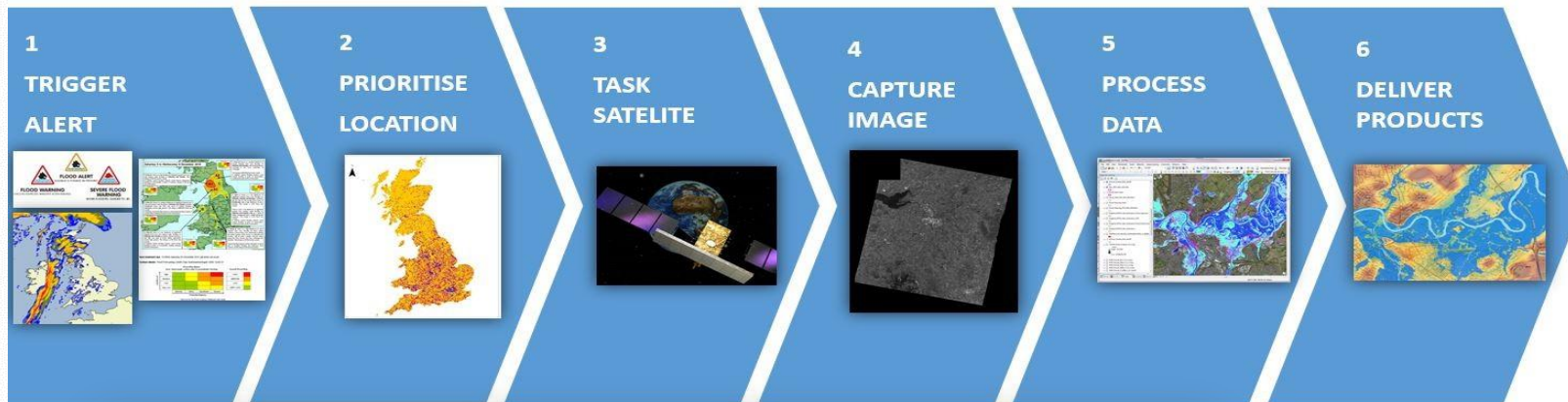


Interferometry



Radargrammetry

Capturing 3D Data from Satellites



Near real-time 3D VR Environment of Live Disaster Events



- ❖ Real-time data from satellites (+ drones)
- ❖ Implement a **novel 3D collaborative environment** that allows remote teams to get an accurate picture of a disaster event through near real-time **3D satellite data and analytics**

First Prototype : Disaster response training environment

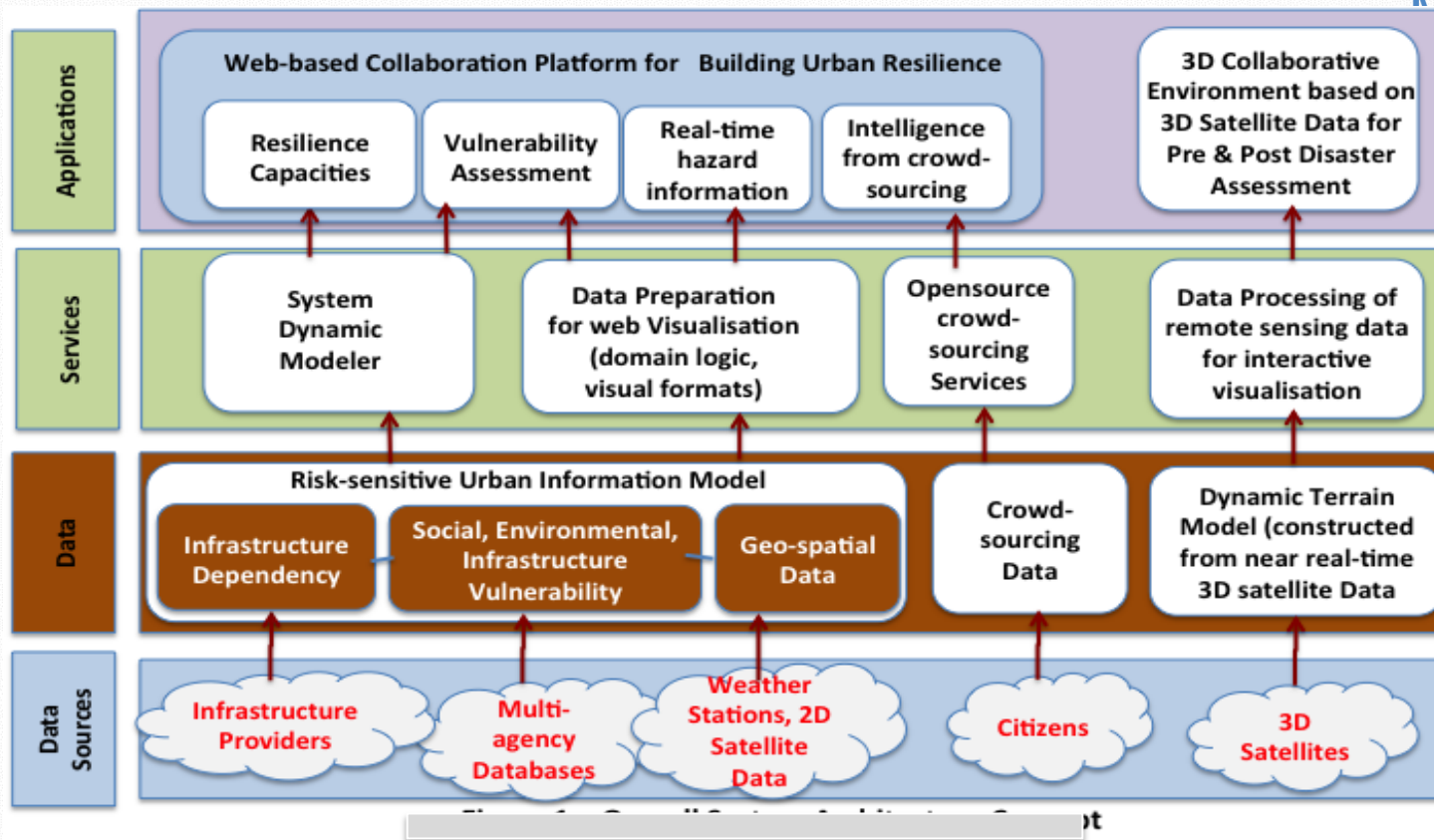


Virtual incident training environment

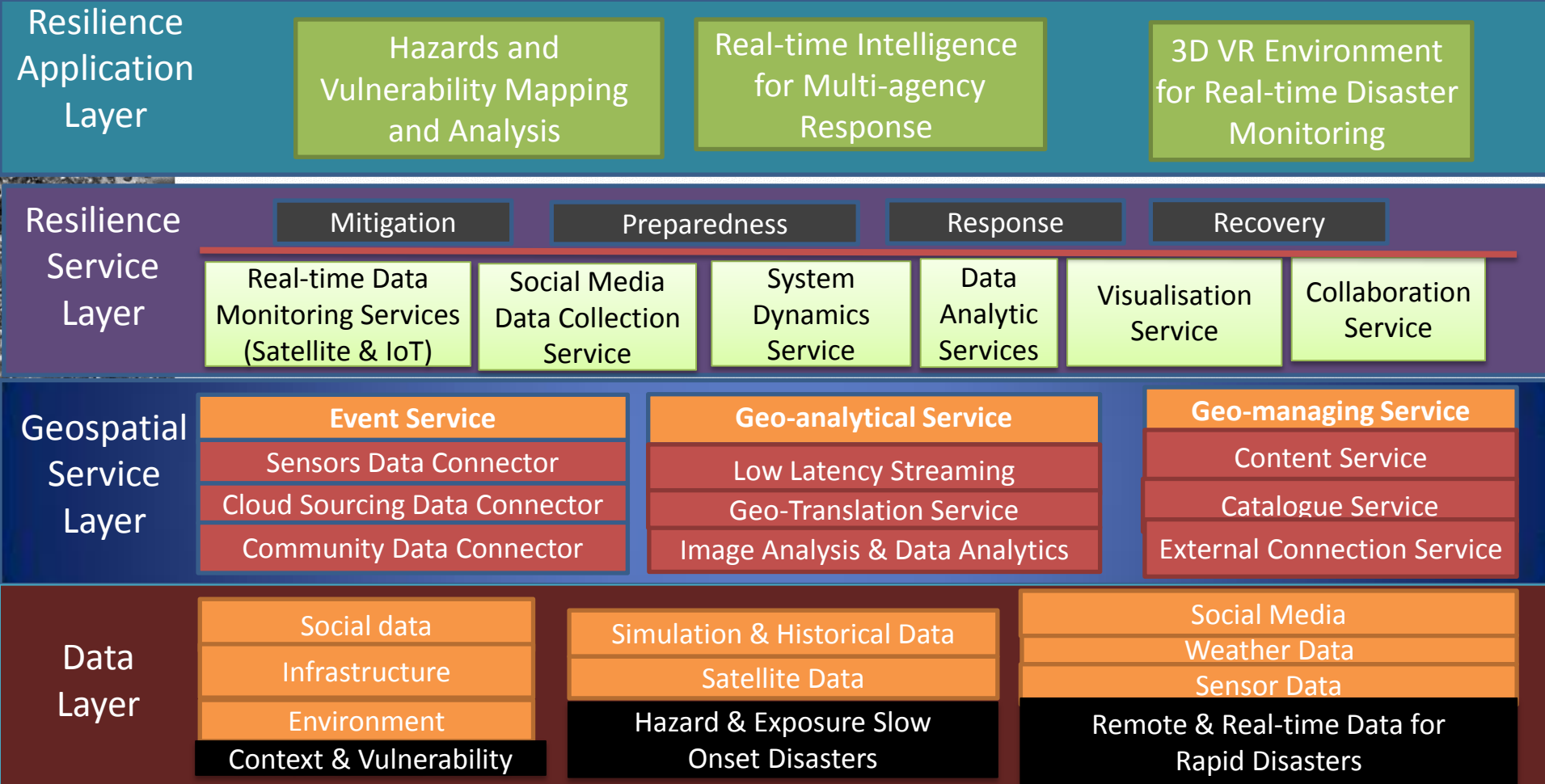
Point Cloud Visualisation Using GPUs



MOBILISE Technology Architecture



Mobilise Conceptual Architecture



Thank You !