

Water Management with New Tools in Geospatial Technologies

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4 July 2017



Every day, around the world, we are witnessing dramatic change ranging from urbanization to natural disasters.



We face some pretty big challenges in translating change to action.



Action requires information.
Understanding change requires data and content.



It's really that transformation that goes on from acquiring data to transforming information that we struggle in handling.



**A dynamic Earth of
constant change**

Every day, the world grows more complex, dynamic and dangerous

Robert Cardillo, Director, National Geospatial-Intelligence Agency



terrorism, extremism and instability



dysfunctional states, political conflict



scarce resources and under-development



crime, security and cyber threats



endemic disease, human rights



erosion of rules-based order



maritime and trade insecurity



impact of technology



WATER

- Need or threat
- Manage or Fail
- Control or Follow
- Plan or Respond



Big DATA



Big DATA

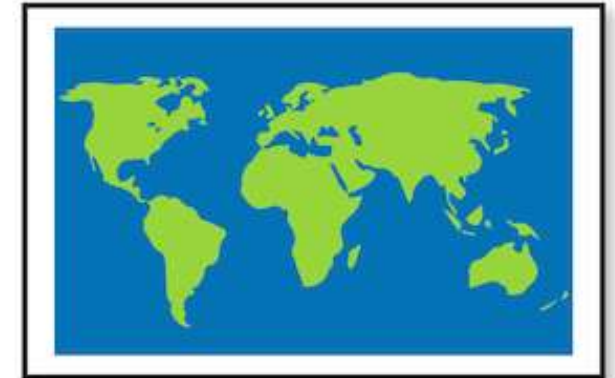
- Data vs. Actionable Information

- Information
 - easy to handle
 - easy to understand
 - fast
 - accurate
 - available
 - everywhere
 - to anyone

DATA

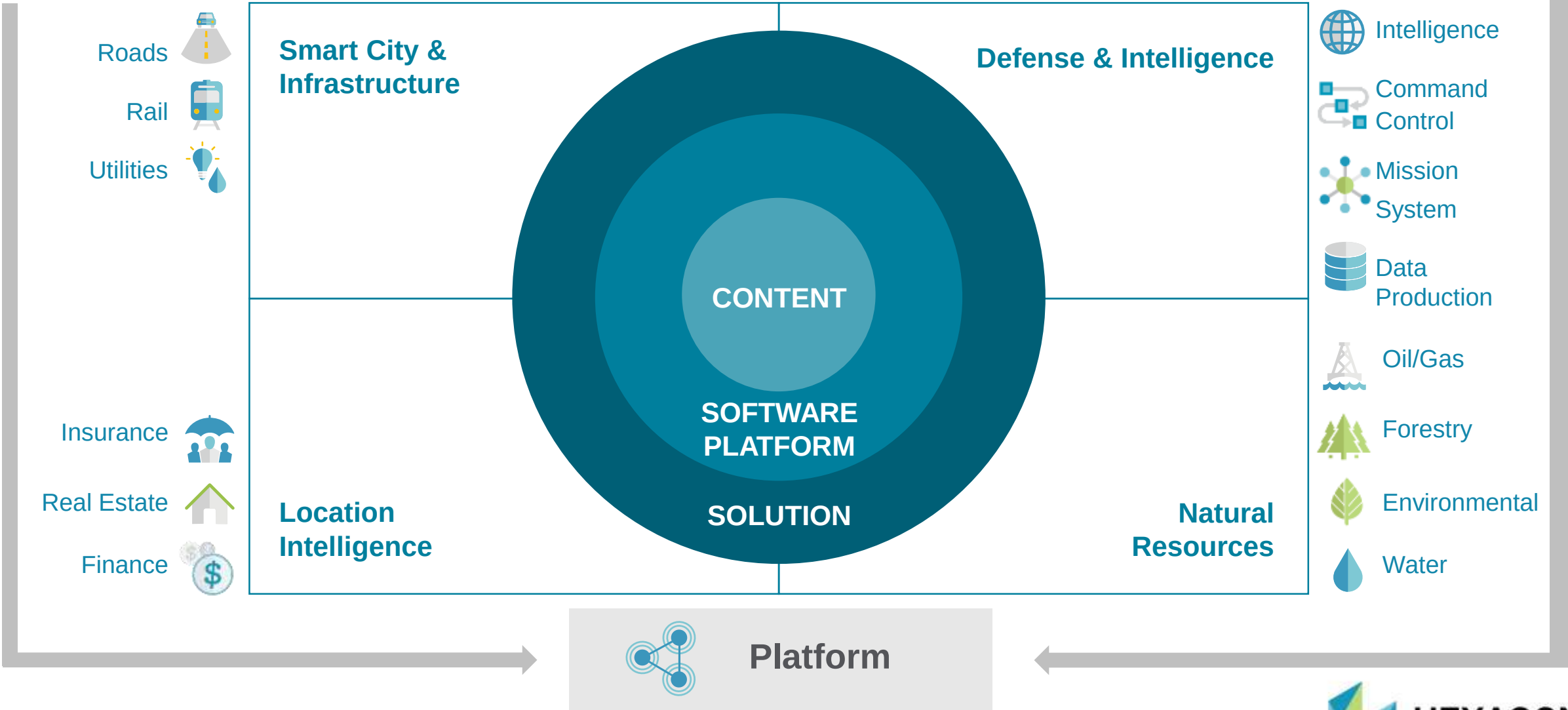


INFORMATION



Geospatial Market Trends

Market Landscape



Information Patterns & Decisions Viewed Through Place



Image via [Vadim Georgiev/Shutterstock.com](https://www.shutterstock.com/user/VadimGeorgiev)

Key Market Trends

Daily Content Updates



Over 100+ new micro-satellites launched in last 12 months, providing daily revisit rates.



Ground stations implemented GPU based processing chains to have **content available on the cloud within an hour of tasking and acquisition.**



APIs allow you to capture a content 'pipeline' for fresh data.

API Economy



Application programming interfaces (APIs) act as the digital glue that link web services, devices, applications and systems.



APIs make it easier to integrate and connect people, places, systems, data, things and algorithms, create new user experiences, share information, authenticate people and things, enable transactions and algorithms, and create new product/services and business models.

Information Design



Organizations are recruiting and contracting **designers to transform high volumes of complex and dynamic data** into information experiences.



Animation and CGI techniques are being incorporated into the design, display and communication of dynamic data.



Rich 3D cities have **integrated dynamic sensor feeds** enabling real-time analysis, visibility and speed management.

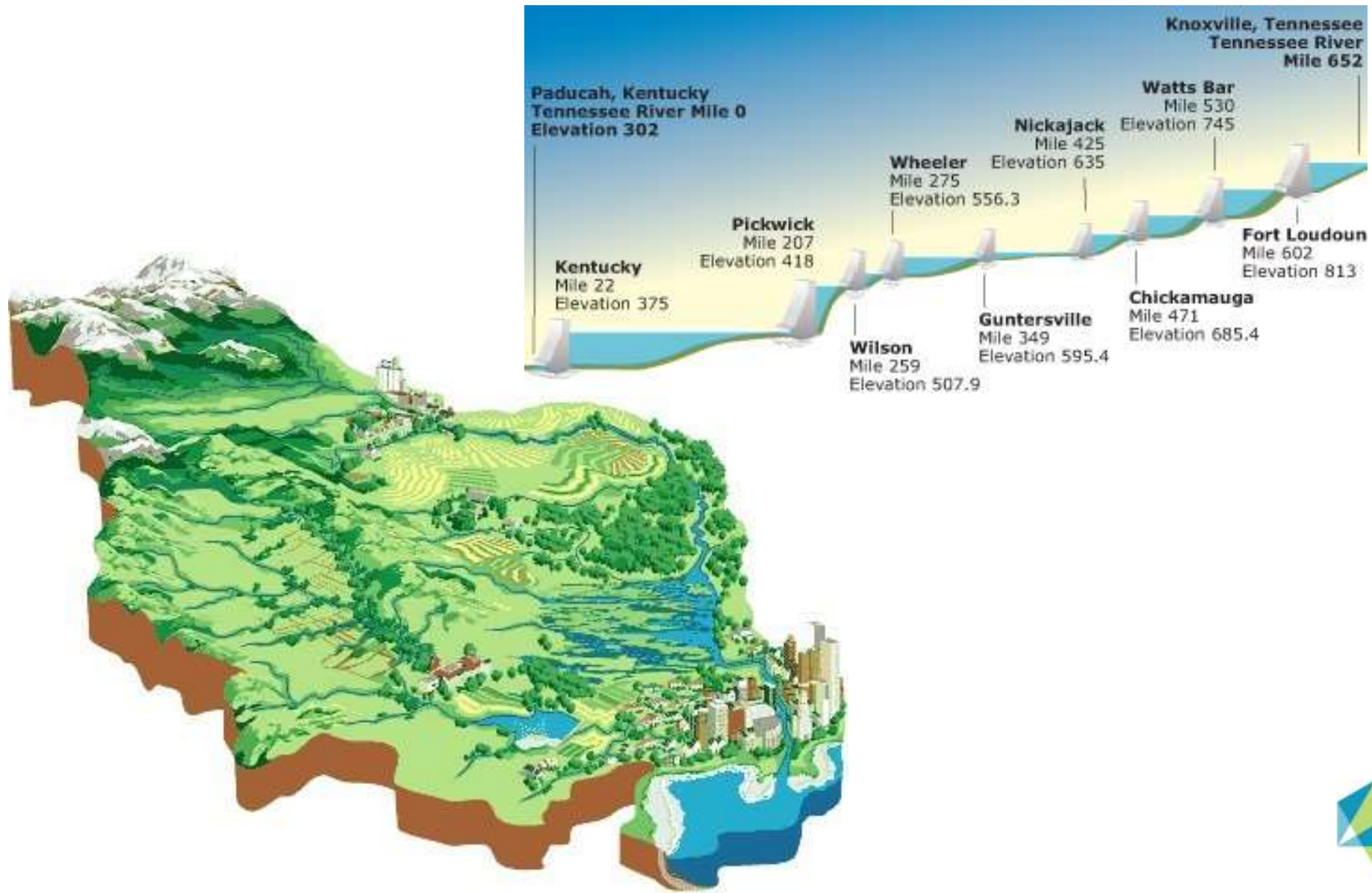
Water Management

- What do we mean by Water Management?
 - Water Network Asset Management
 - River Basin / Dam
 - Daily business
 - Disaster management – Floods, Tsunami
 - Municipality water pipes
 - Ocean wide / Continent wide global approach
- We mean ALL.

From LARGE to small

- H2O

Watershed/Drainage, River Systems & Flood Control



Dams & Reservoirs



Flood Events



Flood Event by Dam Failure - Natural Disasters

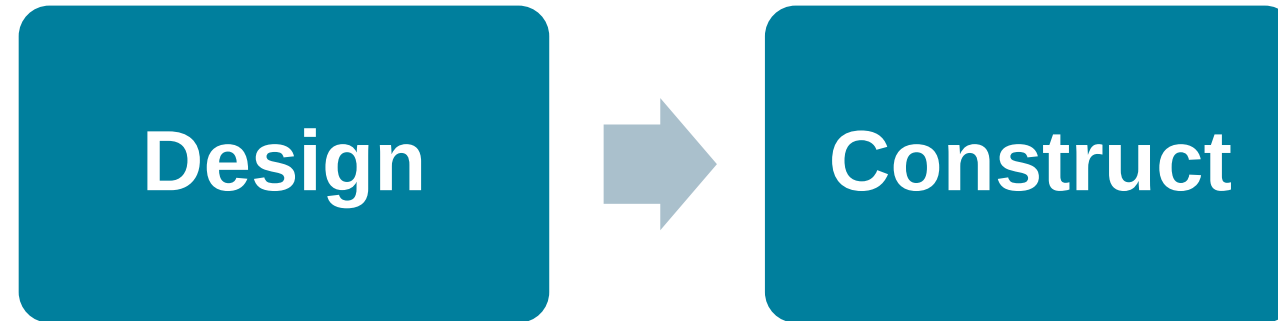


Flood Event by Dam Failure - Man-Made Disasters

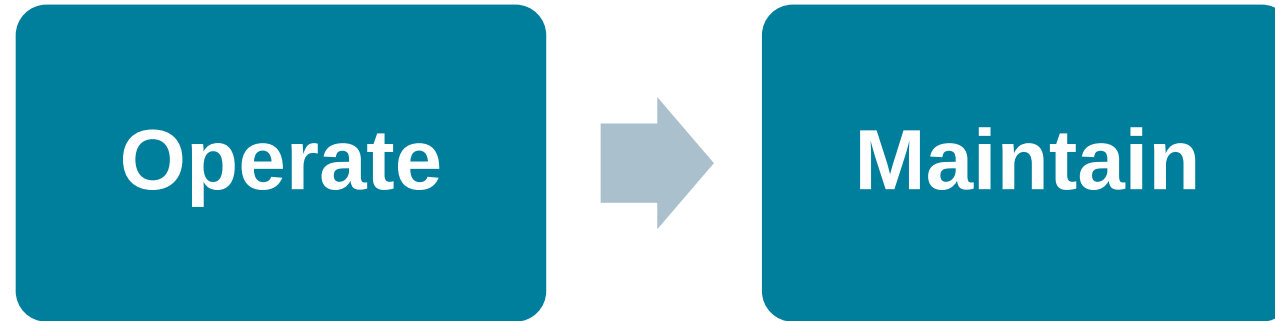


Addressable challenges

Design & Construct



Operate & Maintain

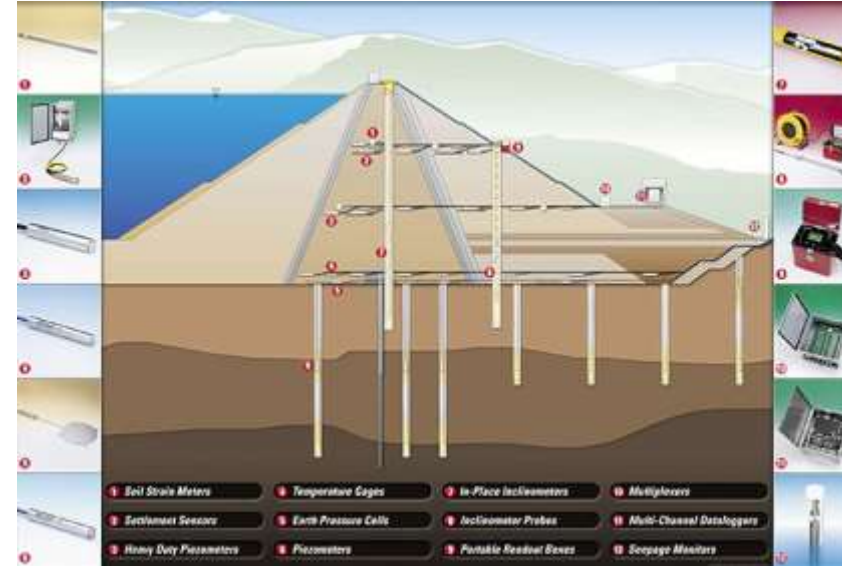


Secure & Monitor

Secure



Monitor



Prepare & Respond

Prepare

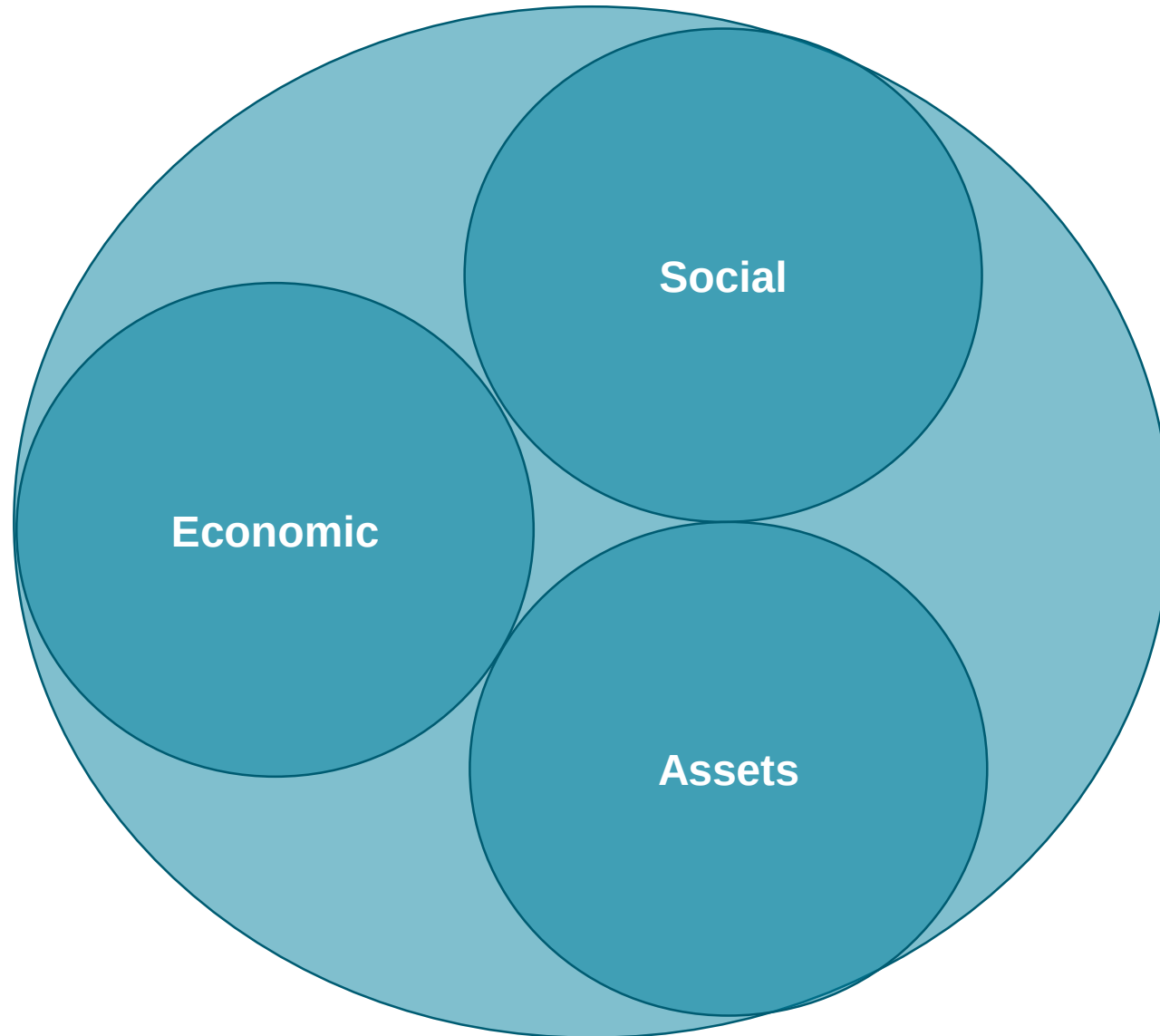


Respond



Drivers

Managing & Reducing Risk

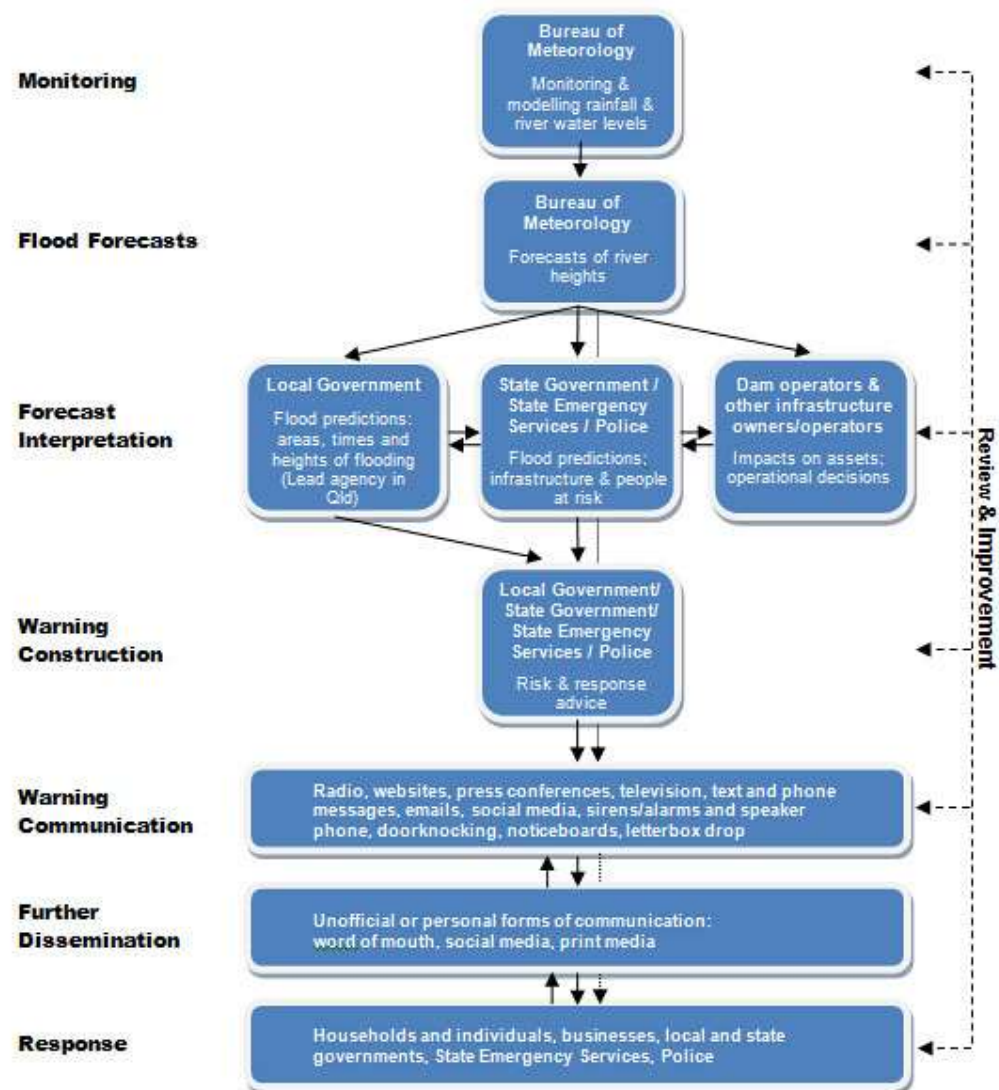


Safety Management

Dam Safety Action Class		Characteristics of this class	Actions for dams in this class
I URGENT AND COMPELLING (Unsafe)		CRITICALLY NEAR FAILURE Progression toward failure is confirmed to be taking place under normal operations. Almost certain to fail under normal operations from immediately to within a few years without intervention. OR EXTREMELY HIGH RISK Combination of life or economic consequences with probability of failure is extremely high.	Take immediate action to avoid failure. Validate classification through an external peer review for dams with life loss concerns. Implement interim risk reduction measures, including operational restrictions, ensure that emergency action plan is current, and functionally tested for initiating event. Conduct heightened monitoring and evaluation. Expedite investigations to support justification for remediation using all resources and funding necessary. Initiate intensive management and situation reports.
II URGENT (Unsafe or Potentially Unsafe)		FAILURE INITIATION FORESEEN For confirmed (unsafe) and unconfirmed (potentially unsafe) dam safety issues, failure could begin during normal operations or be initiated as the consequence of an event. The likelihood of failure from one of these occurrences, prior to remediation, is too high to assure public safety. OR VERY HIGH RISK The combination of life or economic consequences with probability of failure is very high.	Implement interim risk reduction measures, including operational restrictions as justified, and ensure that emergency action plan is current, and functionally tested for initiating event. Conduct heightened monitoring and evaluation. Expedite confirmation of classification. Give very high priority for investigations to support justification for remediation.
III HIGH PRIORITY (Conditionally Unsafe)		SIGNIFICANTLY INADEQUATE OR MODERATE TO HIGH RISK For confirmed and unconfirmed dam safety issues, the combination of life, economic, or environmental consequences with probability of failure is moderate to high.	Implement interim risk reduction measures, including operational restrictions as justified, ensure that emergency action plan is current, and functionally tested for initiating event. Conduct heightened monitoring and evaluation. Prioritize for investigations to support justification for remediation considering consequences and other factors.
IV PRIORITY (Marginally Safe)		INADEQUATE WITH LOW RISK For confirmed and unconfirmed dam safety issues, the combination of life, economic, or environmental consequences with probability of failure is low and may not meet all essential USACE guidelines.	Conduct elevated monitoring and evaluation. Give normal priority to investigations to validate classification, but no plan for risk reduction measures at this time.
V NORMAL (Adequately Safe)		ADEQUATELY SAFE Dam is considered adequately safe, meeting all essential USACE guidelines with no unconfirmed dam safety issues, AND RESIDUAL RISK IS CONSIDERED TOLERABLE.	Continue routine dam safety activities, normal operation, and maintenance.

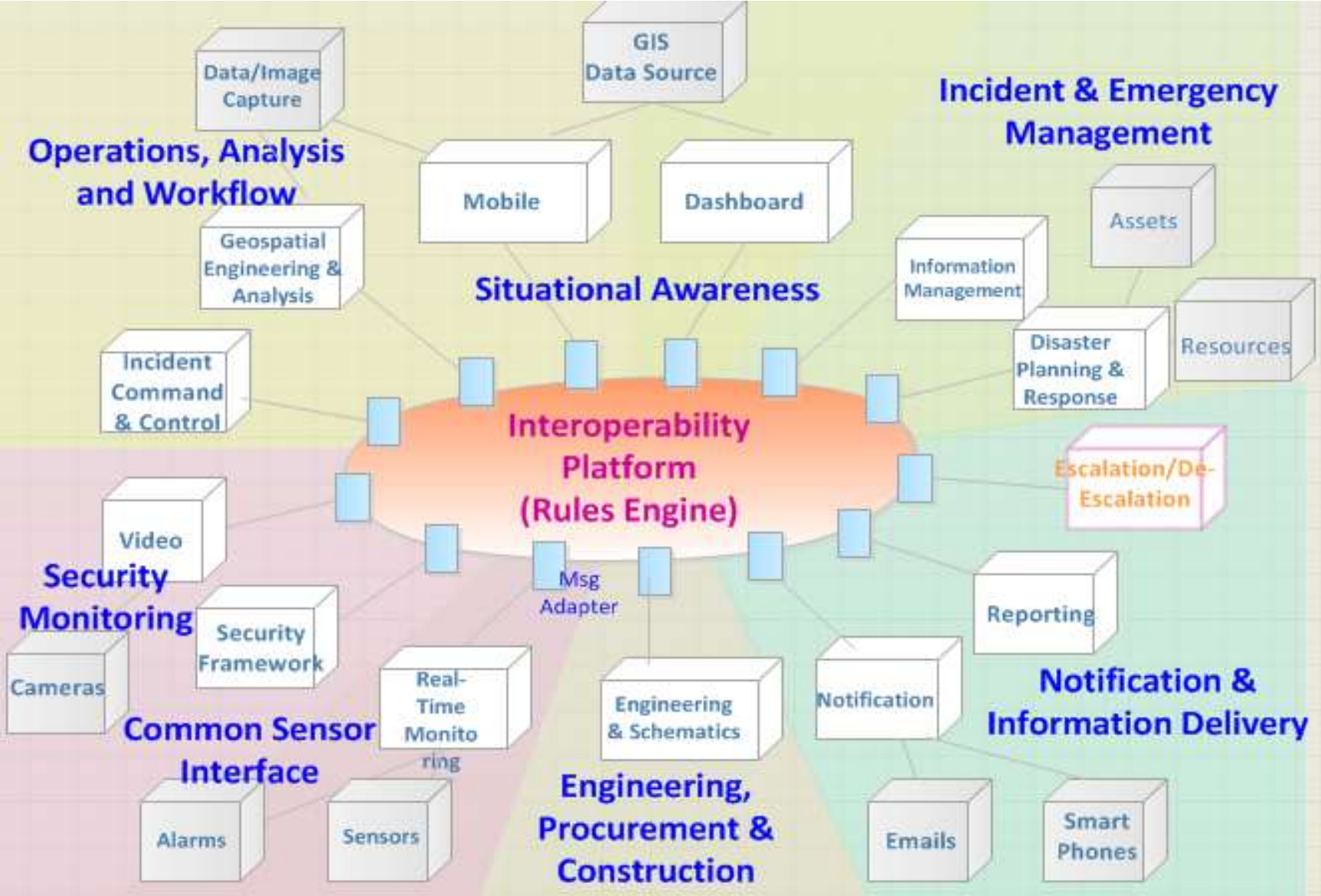
* At any time for specific events a dam, from any action class, can become an emergency requiring activation of the emergency plan

Early Warning/Emergency Response

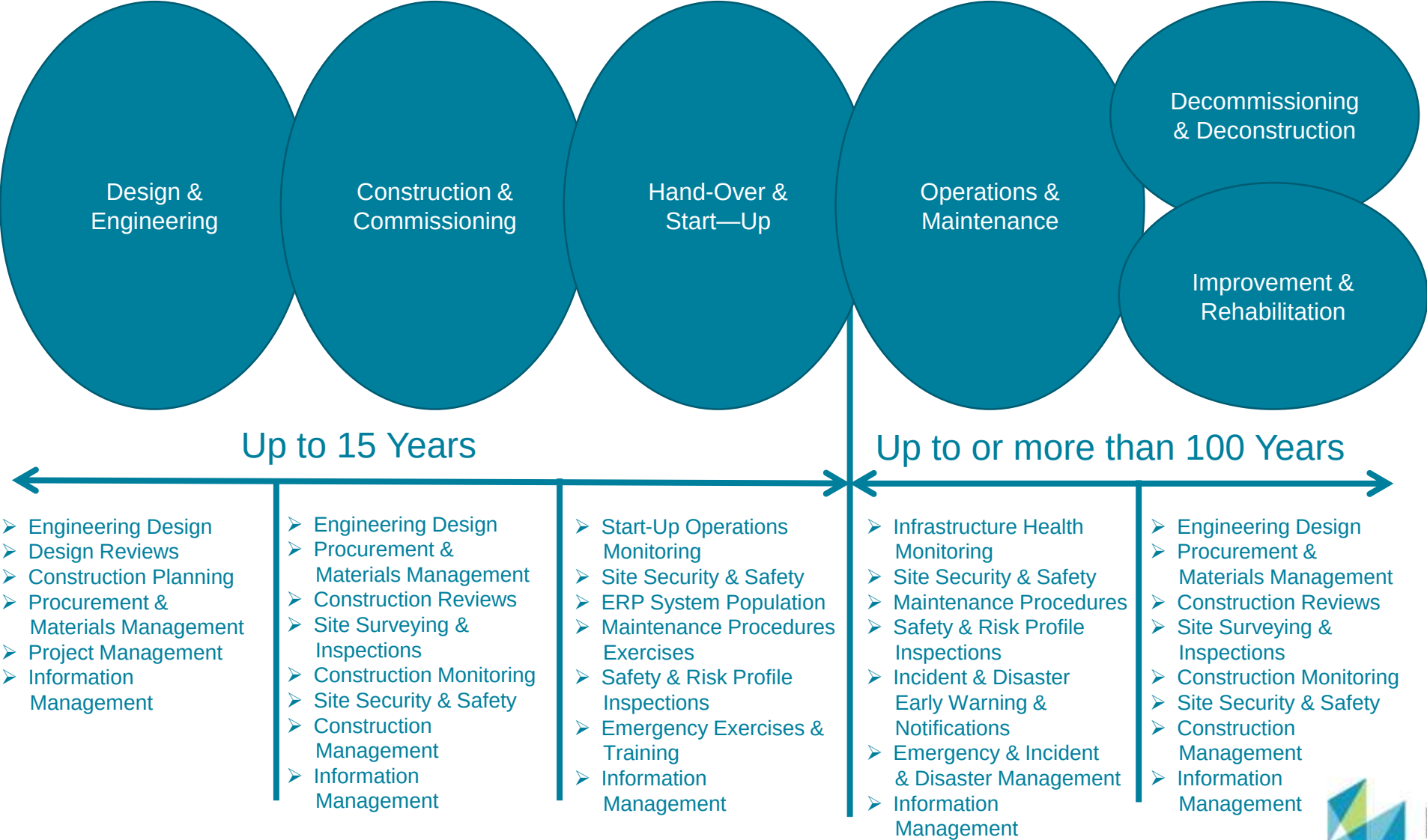


H²O solution highlights

H²O Solution Value



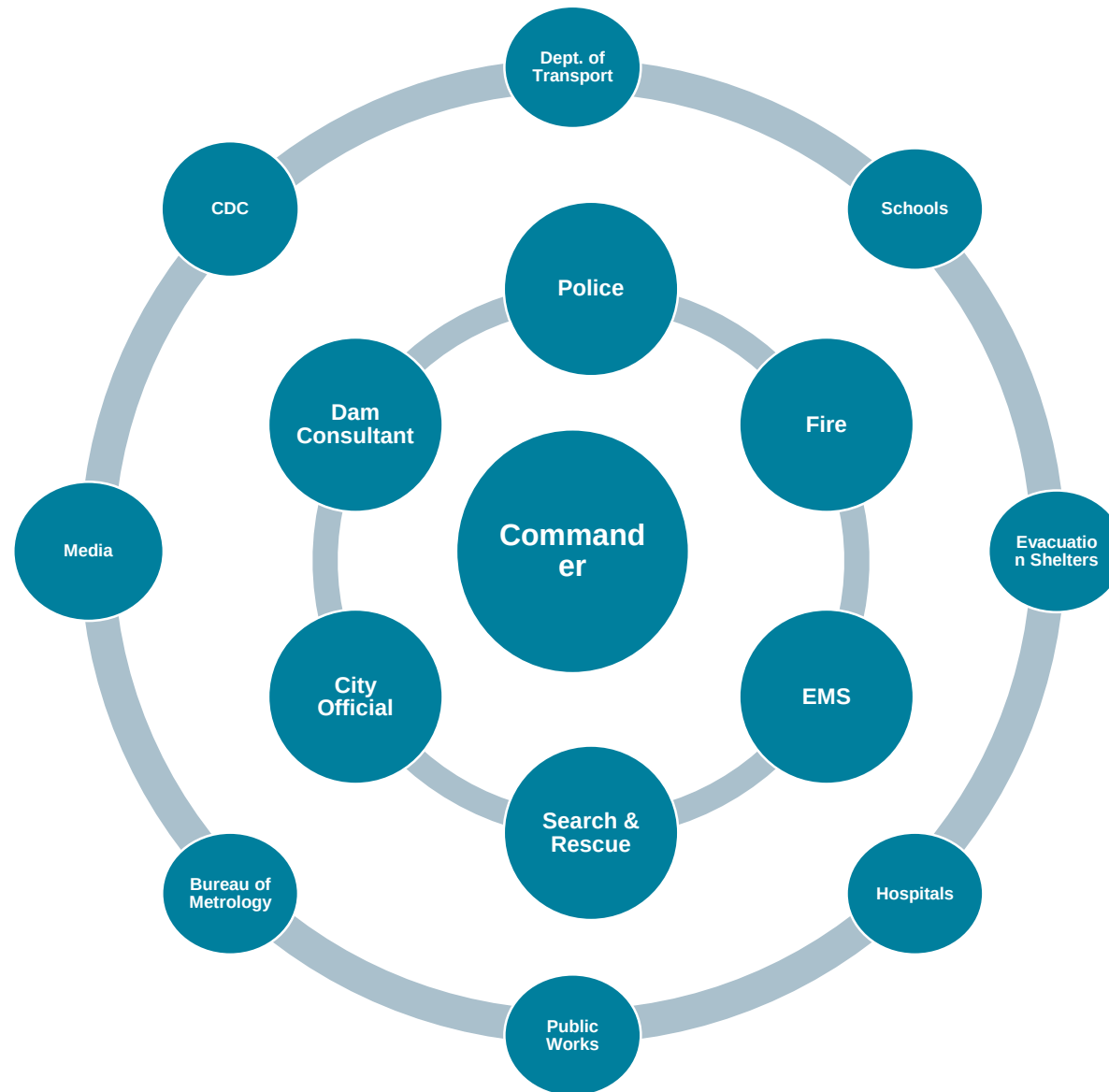
Engineering Life Cycle Integration



Operations & Maintenance Integration



Emergency Operations Integration

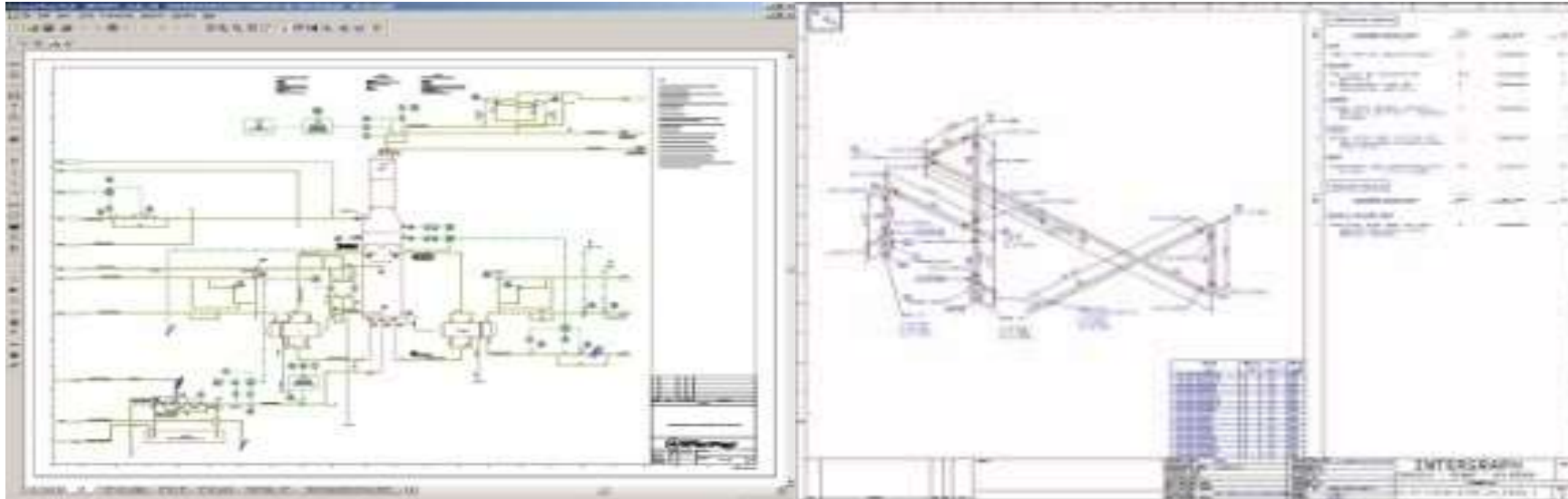


Design & Construct



H₂O Solution Modules

 H2O Design Engineering & Schematics



FOR MARIAN TASK TEAM

January 2006

PFP PN01CA1501

Piping Material Specification Line Class TCA1201

SERVICE:Process

TEMPERATURE LIMIT:-50F to 550F (Class 65)

DERRIS CODE:ASME B31.3 - 1999

EXAMINATION:Per ASME B31.5

RATING CLASS:ISA, ASME B16.5-1999

MATERIAL:Import Treated Carbon Steel

STRESS RELIEF:None Required

CORROSION ALLOWANCE:0.001 in. (0.01 in. max)

PRESSURE-TEMPERATURE RATINGS

TEMP F	-50	100	200	300	400	500	600	700	800
TEMP C	-40	38	93	149	204	254	314	343	

For NPS 1/2 through NPS 24 (Full Range ratings per ASME B16.5 w/ ASME B16.42, Tables D-1.1 & D-1.2)

psi	1500	1000	750	500	350	250	150		
kPa	1035	1035	1725	1725	1725	1725	1725	1725	1725

For NPS 30 through 48 (Class 65)

psi	1060	1060	1060	1060	1060	1060	1060	1060	1060
kPa	7290	7290	7290	7290	7290	7290	7290	7290	7290

ITEM	NOTES	NPS	SCHEMATIC	ENDG.	DESCRIPTION	USER CODE
PIPE	136.01					
		10	-1-12	XS	ITCS, ISMLS, ASTM A334-A, (SP=140)	FPPASBPC0A7A
		2-24	STD		ITCS, ISMLS, ASTM A334-A, (SP=140)	FPPASBPC0A7A
		26-40	STD		ITCS, EPW, ASTM A471-COM, CLASS 15, S-S, (EP=140)	FPPASBPC0A7A
		42-48	C&C		ITCS, EPW, ASTM A471-COM, CLASS 15, S-S, (EP=140)	FPPASBPC0A7A
HTT0005	02					
Inch Weld		10	-1-12	Class 3000	Weld	FELI07W0.0300
Threading	03	10-12	Class 3000	Weld	ITCS, ASTM A554-F2 CL 1, MISS SP-67	FELI07W0.0300
Landed		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1	FELI07L0.0300
THRD	03	10-12	Class 3000	Weld	ITCS, ASTM A554-F2 CL 1	FELI07V0.0300
Landed		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1	FELI07L0.0300
Elbow		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1	FELI07E0.0300
THRD Elbow	03	10-12	Class 3000	Weld	ITCS, ASTM A554-F2 CL 1	FELI07V0.0300
90 deg Tee		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07T0.0300
Elbow		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07E0.0300
Tee		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07T0.0300
Tee (STD)		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07T0.0300
Flng	03	10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, nominal wall, ASME B16.11	FELI07A0.0300
Flng		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07A0.0300
Coupling (STD)		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07C0.0300
Flng	03	10-12	Class 3000	THRD	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07A0.0300
Coupling		10-12	Class 3000	THRD	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07C0.0300
Cap		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07H0.0300
Cap		10-12	Class 3000	THRD	ITCS, ASTM A554-F2 CL 1, ASME B16.11	FELI07H0.0300
Reducing Tee		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, MISS SP-79	FELI07R0.0300
Union (STD)		10-12	Class 3000	SPW	ITCS, ASTM A554-F2 CL 1, nominal wall, MISS SP-79	FELI07U0.0300
Endcock/CCK		2-24			ITCS, ASTM A420-WPLA-S, ASME B16.9	FPPAC0003A1AA
Endcock/CCK		26-48			ITCS, ASTM A420-WPLA-S, ASME B16.9	FPPAC0003A2AA

FOR MARIAN TASK TEAM

January 2006

PFP PN01CA1501

Piping Material Specification Line Class TCA1201

SP 0706 BRANCH CONNECTION

Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch	Run	Weld	Branch</
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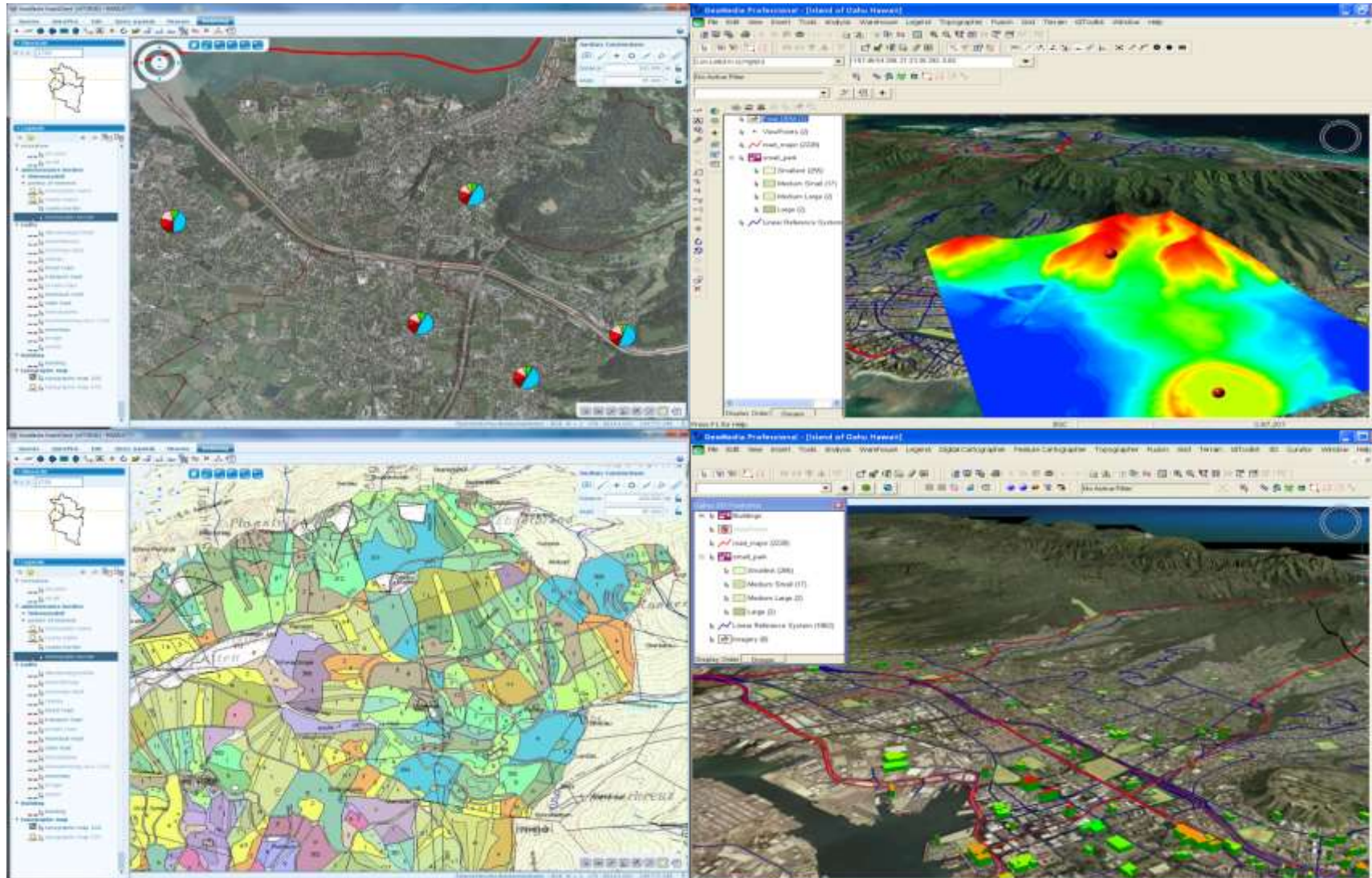
H²O Solution Modules

➤ H²O Image/Data Capture



H²O Solution Modules

➤ H²O Geospatial Engineering & Analysis



H₂O Solution Modules Related 3rd Party Products

➤ H₂O Flood Modeling – (Many Products on the Market)

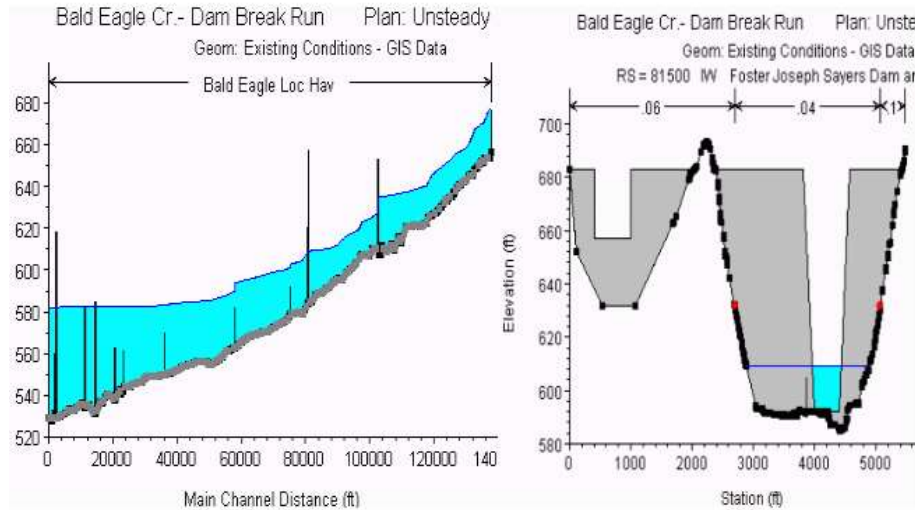
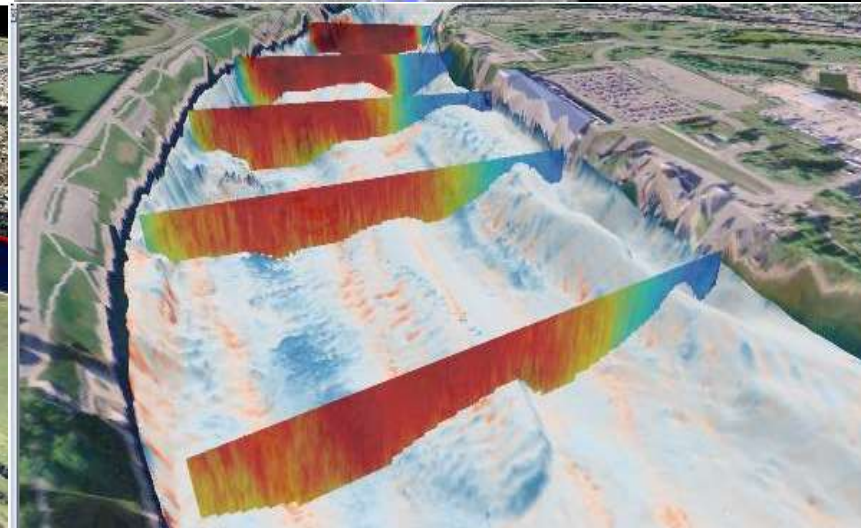
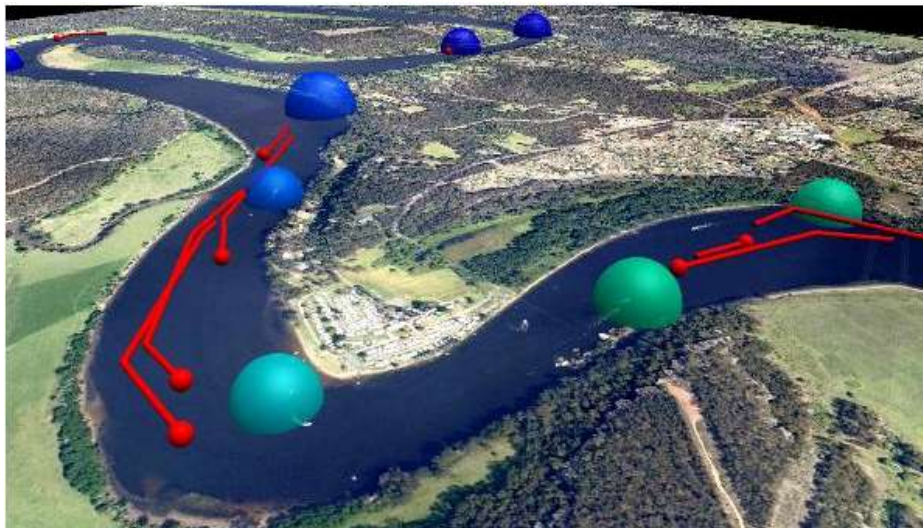
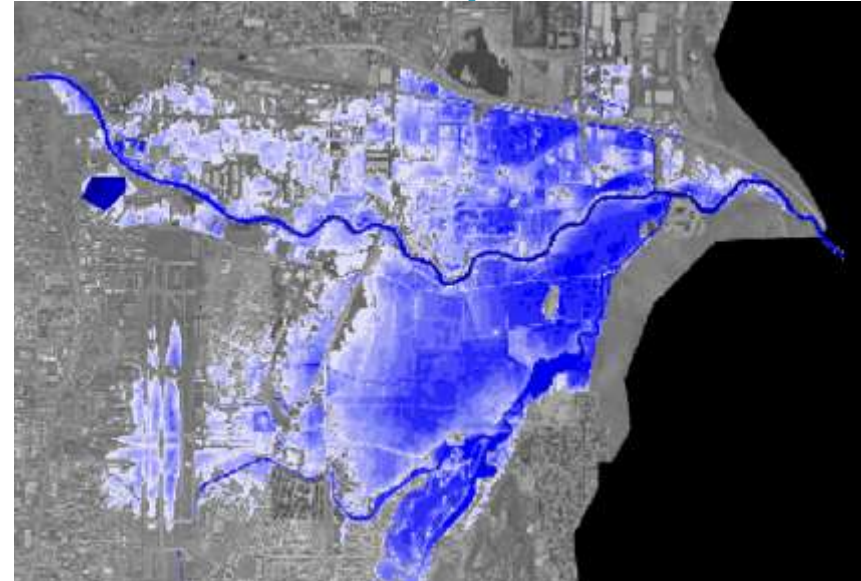
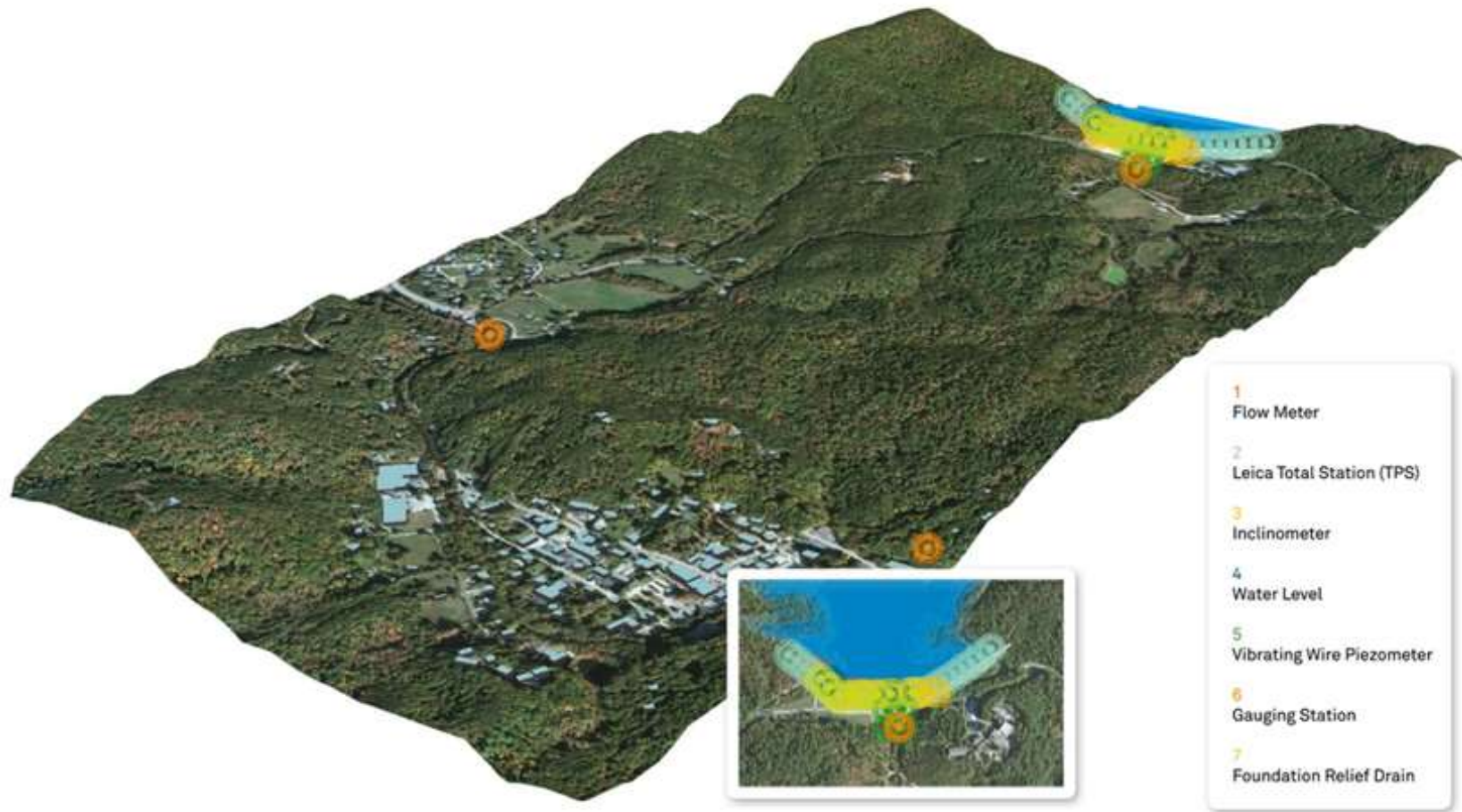


Figure1. Dam Break

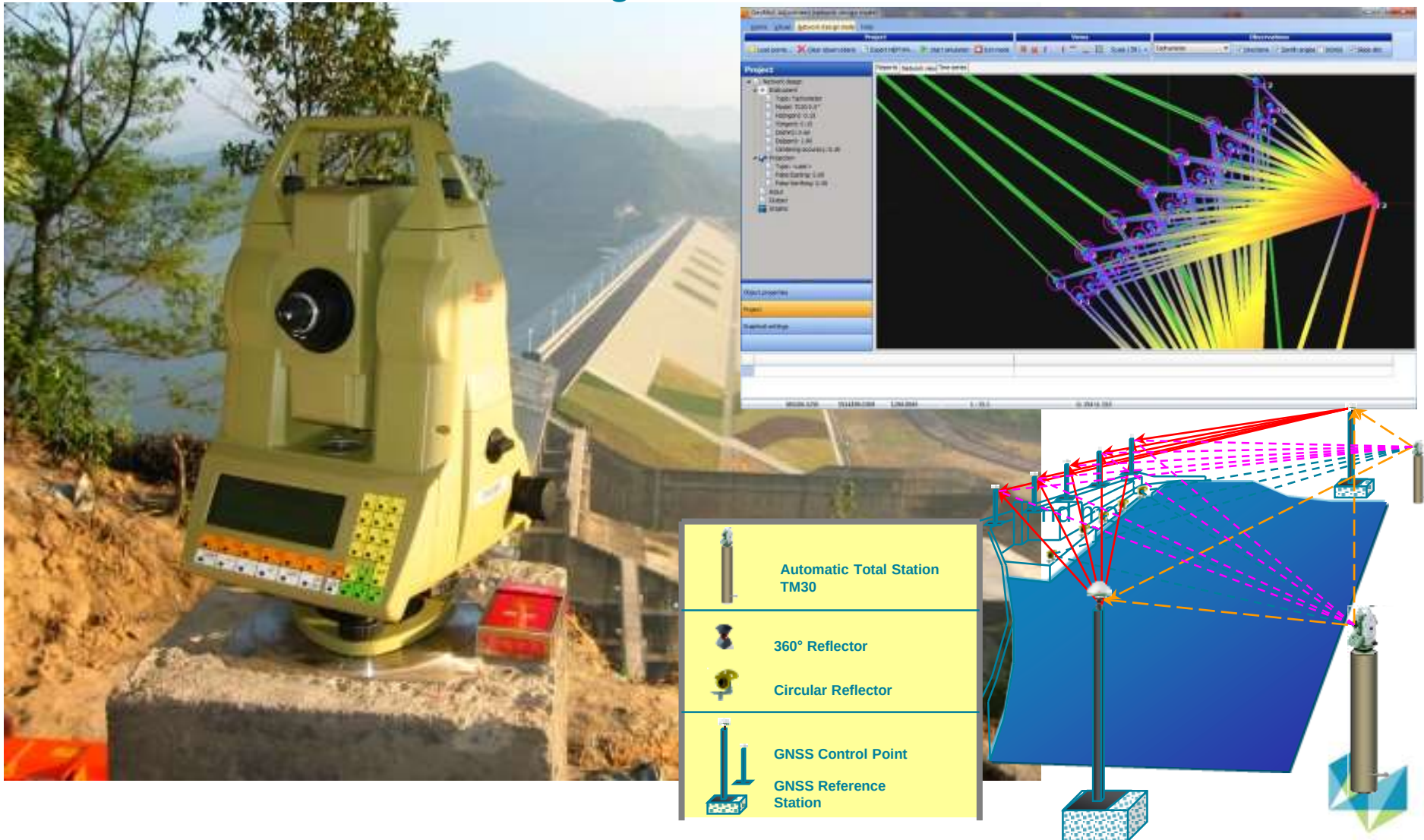


Operate & Maintain



H²O Solution Modules

➤ H²O Real-Time Monitoring



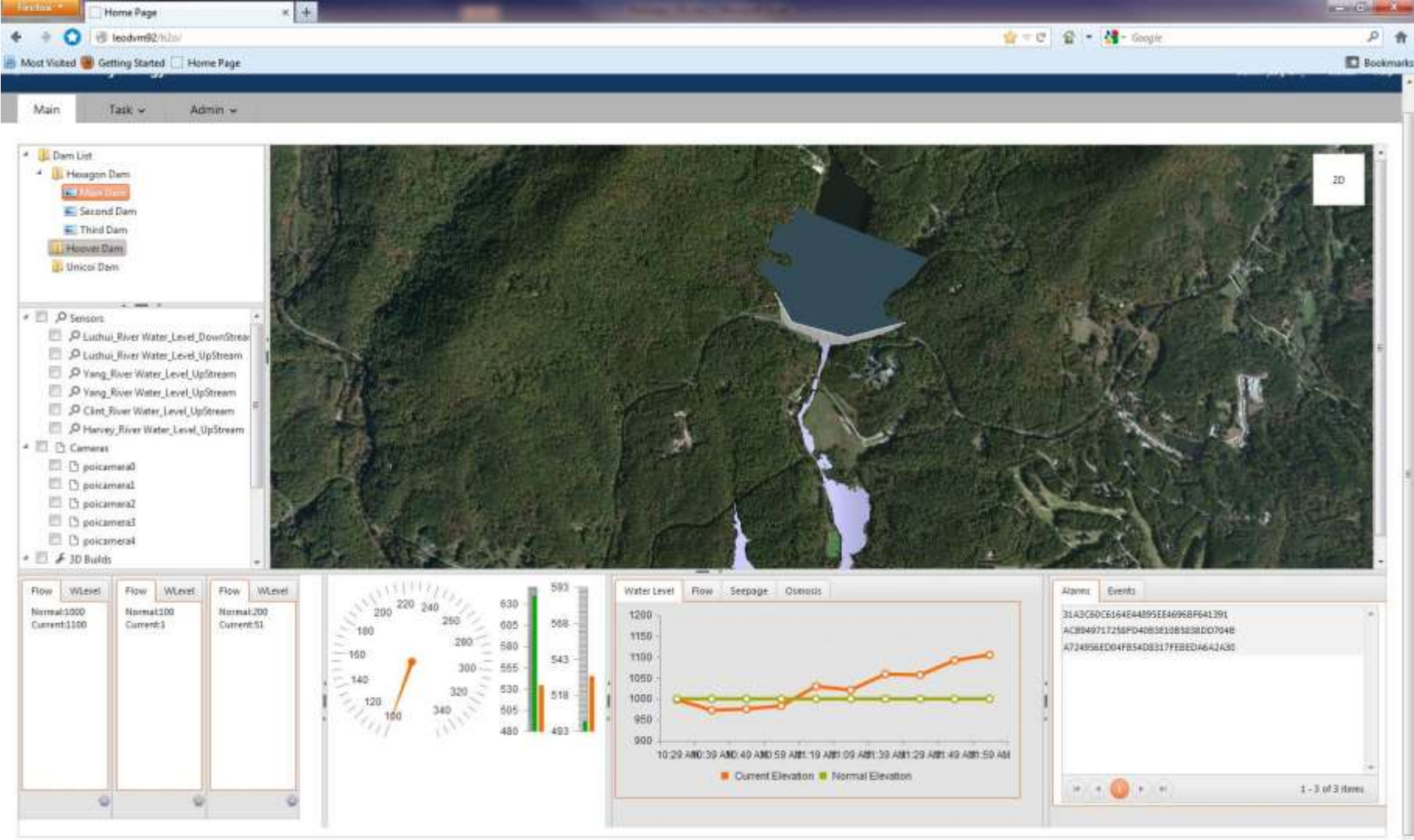
H²O Solution Modules

➤ H²O Information Management



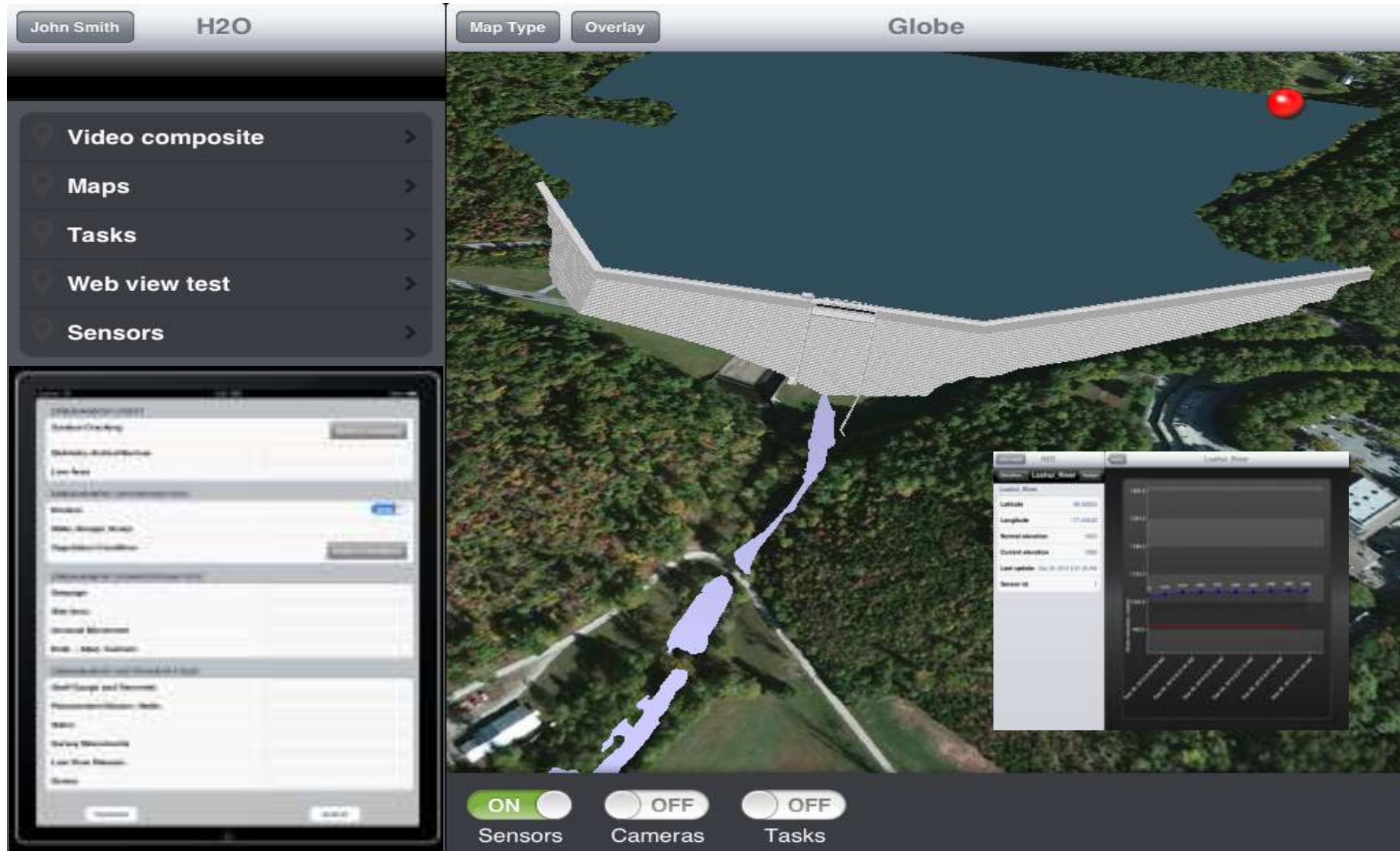
H²O Solution Modules

➤ H²O Dashboard

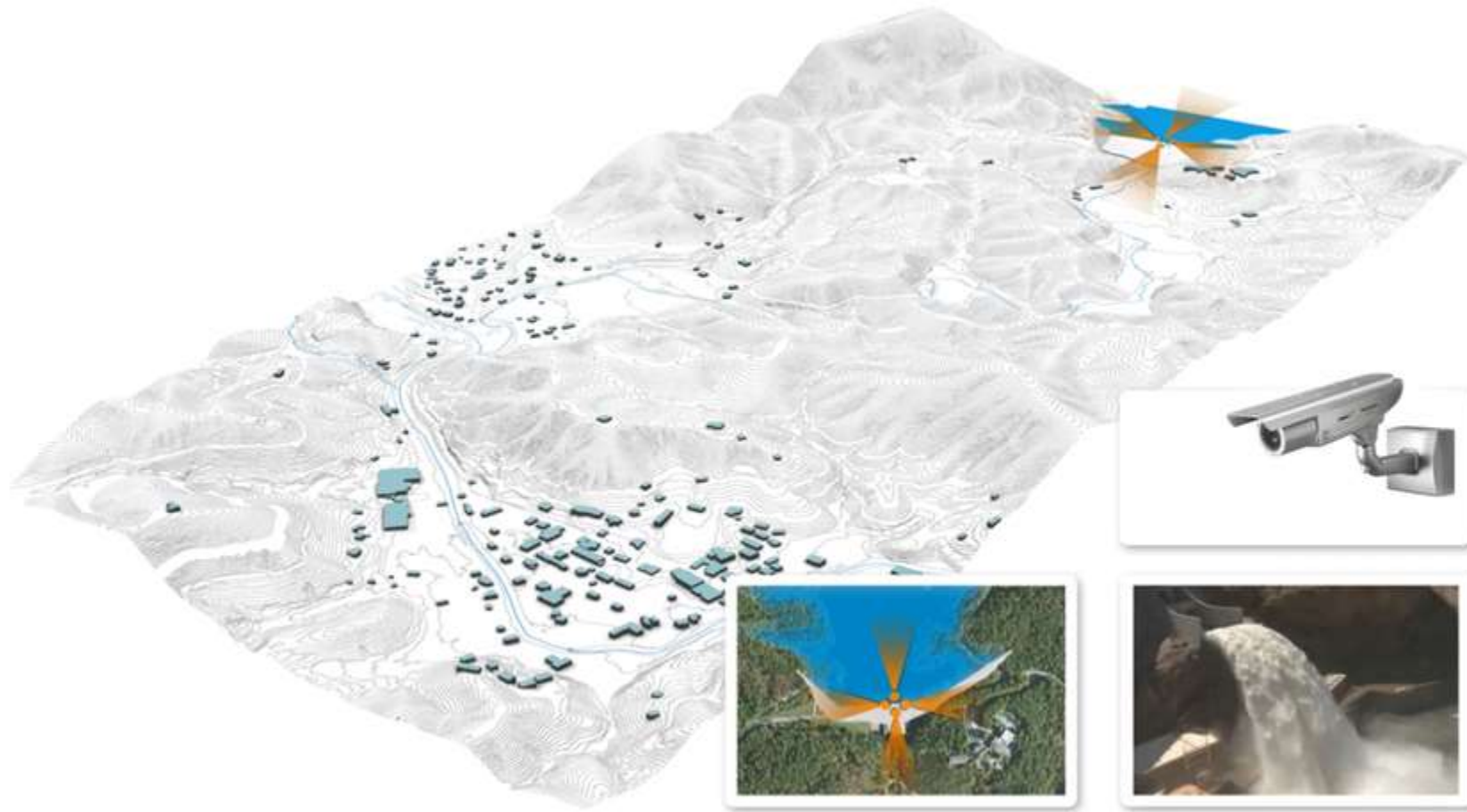


H²O Solution Modules

➤ H²O Mobile



Secure & Monitor



H²O Solution Modules

➤ H²O Security Framework

The screenshot displays the H²O Security Framework software interface, which is divided into four main modules:

- Video Surveillance Monitor:** Shows a live video feed from a camera. The interface includes a menu bar (File, View, Tools, Window, Help), a toolbar, and a sidebar with a 'Video/Touring Tree' and a 'Request Control' button. The main video area shows a camera view of a building interior.
- Tracking Monitor:** Displays a map with a yellow line indicating a tracked path. The interface includes a menu bar (View, Tools, Commands, Window, Help) and a toolbar. The map shows a geographical area with a yellow line and several yellow markers.
- Device Monitor:** Shows a list of devices in a table. The interface includes a menu bar (View, Tools, Window, Help) and a sidebar with a 'Device Tree' and a 'Zone' dropdown. The table lists devices with columns for Auth, Suppressed, ID, Alias, Type, Latitude (dms), Longitude (dms), and Altitude.
- Alarm Monitor:** Displays a list of active alarms in a table. The interface includes a menu bar (View, Tools, Commands, Window, Help) and a toolbar. The table lists alarms with columns for Auth, Priority, Priority Text, Video, Alias, Type, Location, Level, First Reported (UTC), Last Reported (UTC), Alarm Description, Ack, #, and Operat.

Auth	Suppressed	ID	Alias	Type	Latitude (dms)	Longitude (dms)	Altitude
✓		Lushu	Lushu	Genet...	0° 0' 0"	0° 0' 0"	0
✓		TFS	TFS	Genet...	0° 0' 0"	0° 0' 0"	0
✓		FCU	FCU	Genet...	29° 41' 47.75"	113° 53' 31.3"	3
✓		Portabl	Portabl	Genet...	29° 42' 7.58"	113° 52' 31.3"	0

Auth	Priority	Priority Text	Video	Alias	Type	Location	Level	First Reported (UTC)	Last Reported (UTC)	Alarm Description	Ack	#	Operat
✓	5	Priority 5		Lushu	Genet...	Water Level 18-S		2011/12/13 T+00:22:31	2011/12/13 T+04:21:07	Service Water Level 18-S		54	
✓	7	Priority 7		Lushu	Genet...	Water Level 18-S		2011/12/13 T+00:22:41	2011/12/13 T+04:21:08	Warning alarm from the		112	
✓	1	Priority 1		Lushu	Genet...	Water Level 18-S		2011/12/13 T+00:27:52	2011/12/13 T+04:20:14	A Multiple Emergency al		13	
✓	3	Priority 3		Lushu	Genet...	Water Level 18-S		2011/12/13 T+00:22:01	2011/12/13 T+04:21:08	A Multiple Warning alar		24	

Early Warning



H²O Solution Modules Related 3rd Party Products

➤ H²O Notification - MIR3 Intelligent Notification System



Prepare & Respond



H₂O Solution Modules

➤ H₂O Emergency Operations Center



H²O Solution Modules

➤ H²O Incident Command & Control

The screenshot displays the Intergraph I/Dispatcher software interface, which is used for incident command and control. The interface is divided into several panels:

- Dispatcher Event Information:** This panel contains fields for Loc, Type, Subtype, Name, Address, Phone, Call Src, and Remarks. It also includes buttons for Create, Update, Select, and a Stacked list. A table below shows columns for Unit, R, Disposition(s), and Case Number(s).
- Map View (8.30 mi) - [Total 21]:** This panel shows a map of the incident area with various markers and labels.
- Events - [Count: 7]:** This panel displays a table of events with columns for S, A, P, Time, Event Number, Event Type, and Location.
- Unit/Event Status - [Count: 14]:** This panel displays a table of unit and event status with columns for Unit, Info, Type, St, Time, Event Number, Event Type, and Location.

Events - [Count: 7]

S	A	P	Time	Event Number	Event Type	Location
P	0		1:54	P00000006	FLOOD	DUPONT RD
P	4		1:54:02	P00000001	T4-001	LL-83-43-47.9638,34-44-42.2450
P	2		1:53:24	P00000004	T4-0013	DUPONT HWY
P	2		1:53:56	P00000005	T4-0013	LL-83-43-21.6719,34-44-15.7330
P	0		1:13	P00000007	T4-002	KITTS HUMMOCK RD
P	2		1:53:26	P00000002	T4-005	LL-83-43-12.2061,34-44-19.0348
P	2		1:10	P00000005	T4-004	WOODYARD RD

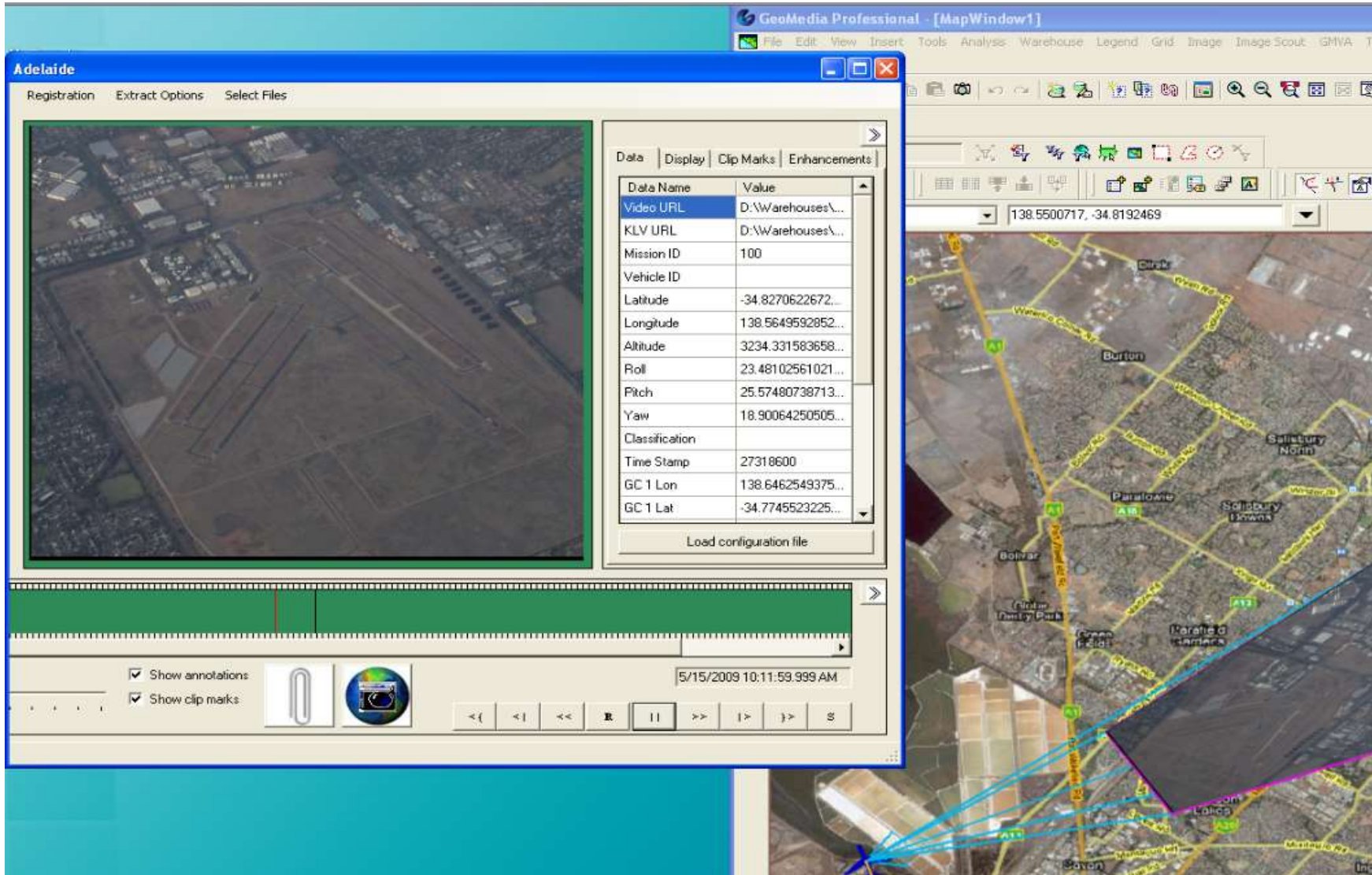
Unit/Event Status - [Count: 14]

Unit	Info	Type	St	Time	Event Number	Event Type	Location
AQICE	Mon	AV		1030:48			
GCBWK	Mon	AV		1030:49			
GCK	Mon	AV		1030:49			
lpast	Mon	AV		1030:51			DUPON...
KDCX	Mon	AV		1030:48			
ZXBGS	Mon	AV		1030:48			
DBGLK	Rescue	AV		1030:48			
GCOXD	Rescue	AV		1030:48			
JDQXD	Rescue	AV		1030:48			
QKED	Rescue	AV		1030:48			
QXSAD	Rescue	AV		1030:48			
QKZYD	Rescue	AV		1030:48			
SEYXK	Rescue	AV		1030:48			
YLHMD	Rescue	AV		1030:48			

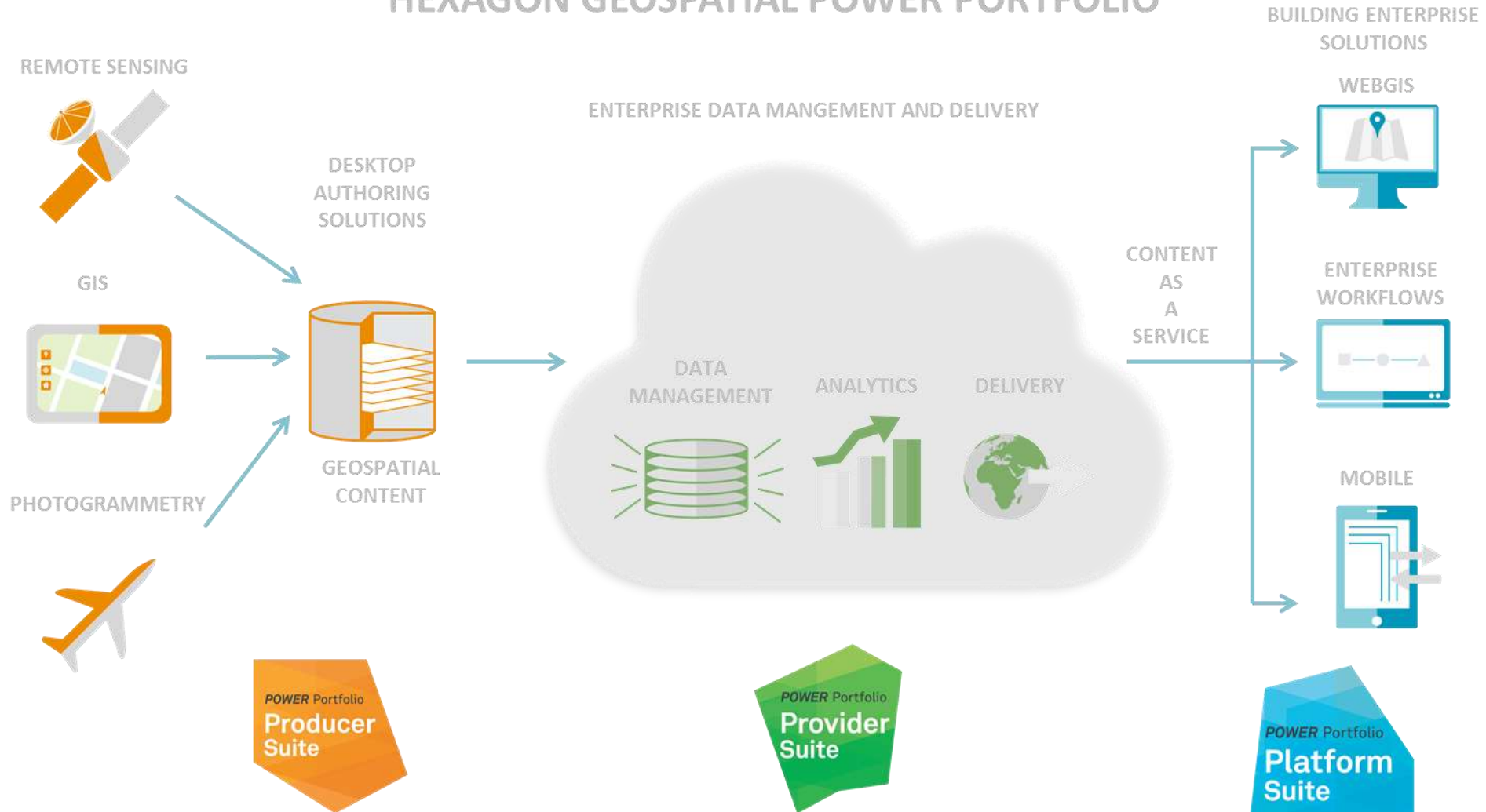
H₂O Solution Modules



H²O Real-Time Video Arial Assessment



HEXAGON GEOSPATIAL POWER PORTFOLIO



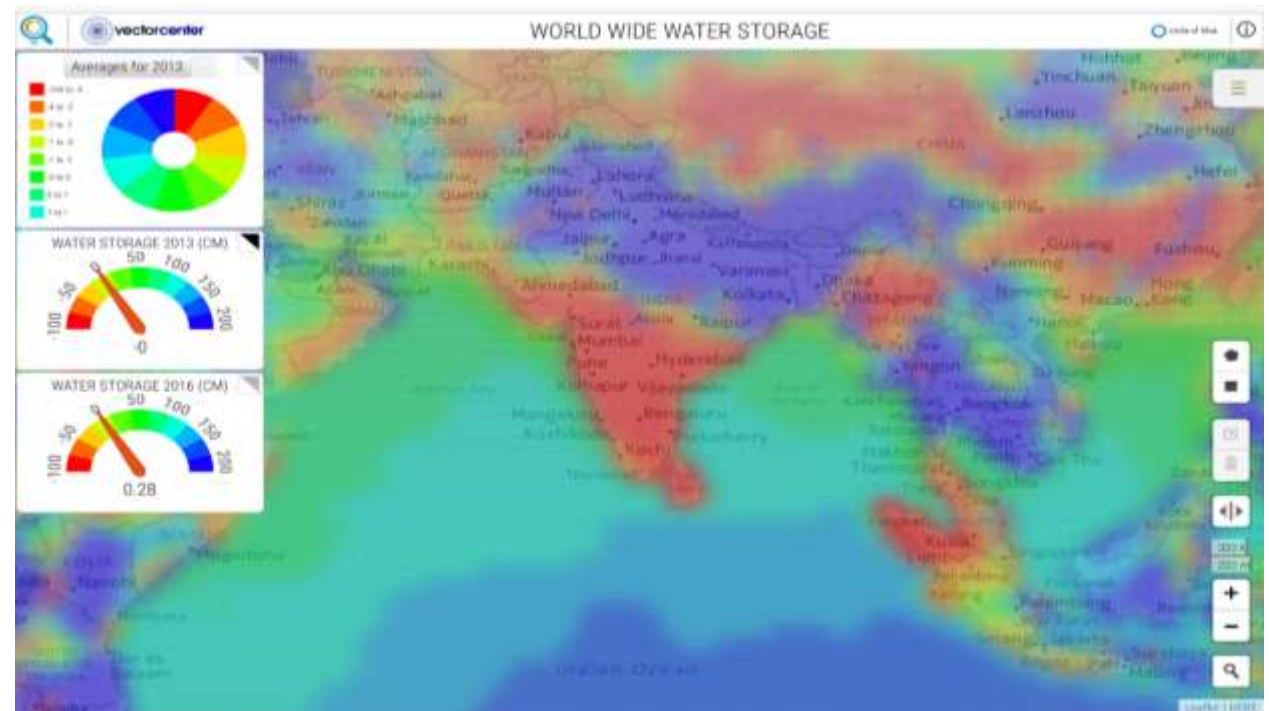
World Wide Water Conditions

Challenge

- Water is sustenance
- Consumption vs. availability

Incident Analyzer

- Understand water table conditions
- Make informed decisions
- View results on portable devices



Social Media Sentiment

Challenge

- Explore and understand the overall sentiment of topics from sources such as:
 - Tweets
 - Blogs
 - News sites

Incident Analyzer

- Use data from a social media aggregator
- Process social events as incidents



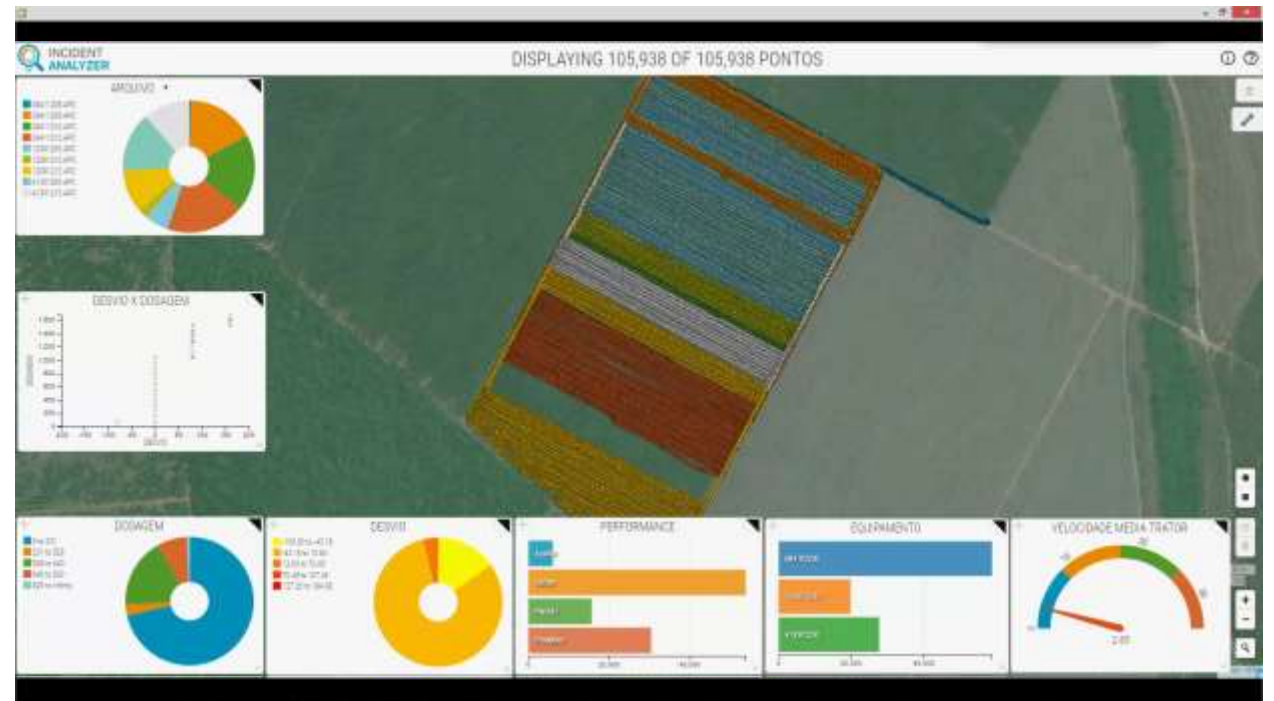
Precision Agriculture

Challenge

- Optimize costs and improve productivity

Incident Analyzer

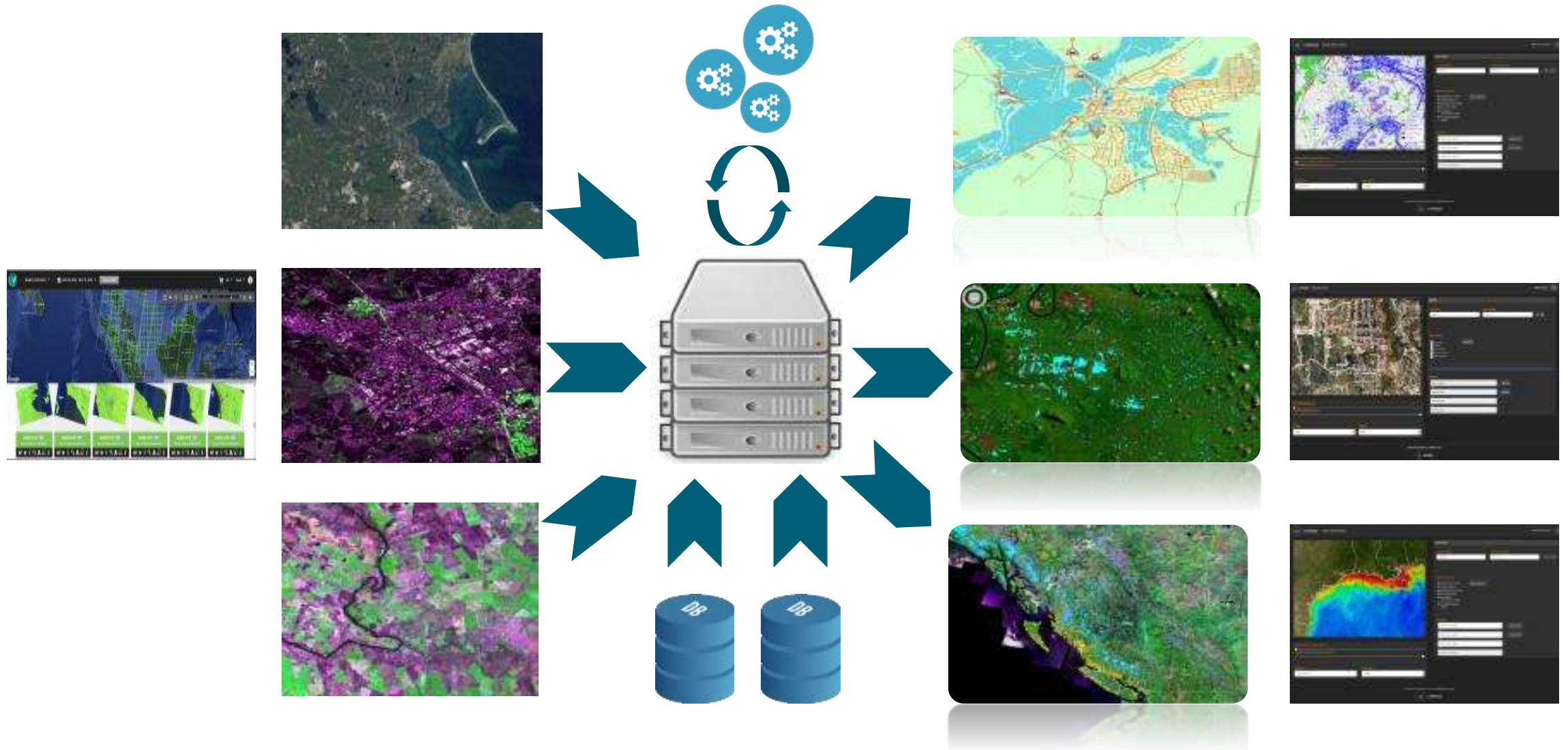
- Visualize and explore data to uncover additional insights



EASOS – Earth, Air and Sea Observation System

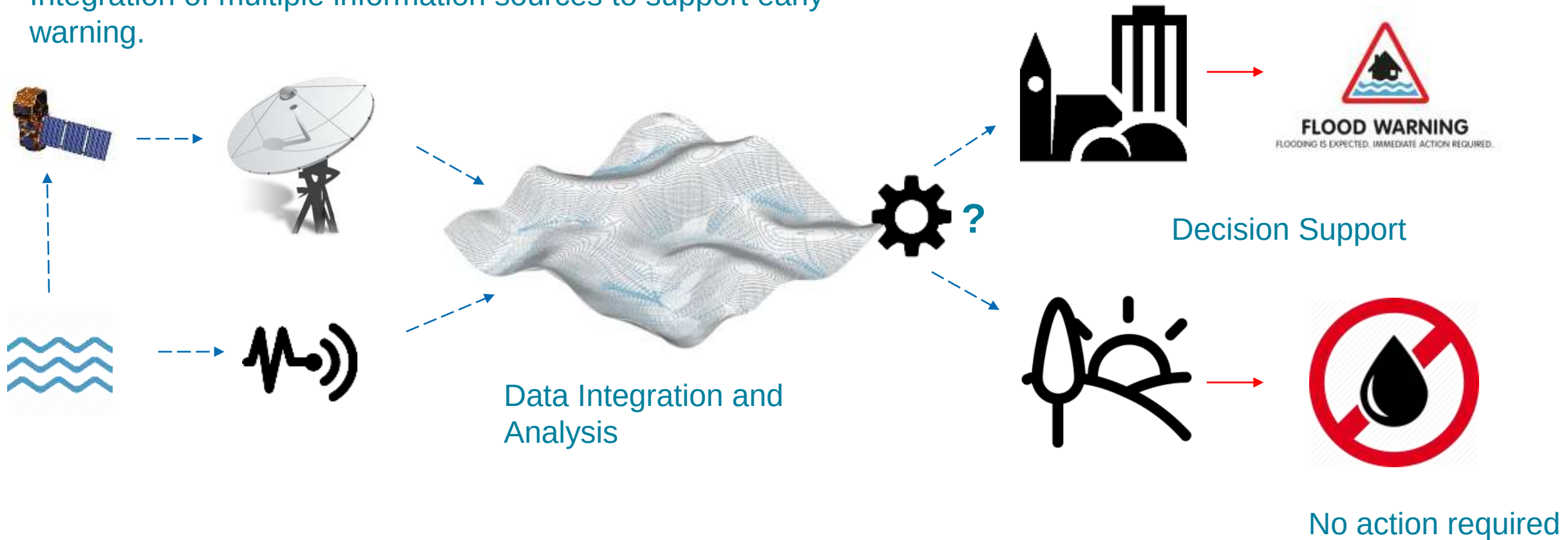


Powered by Hexagon Geospatial



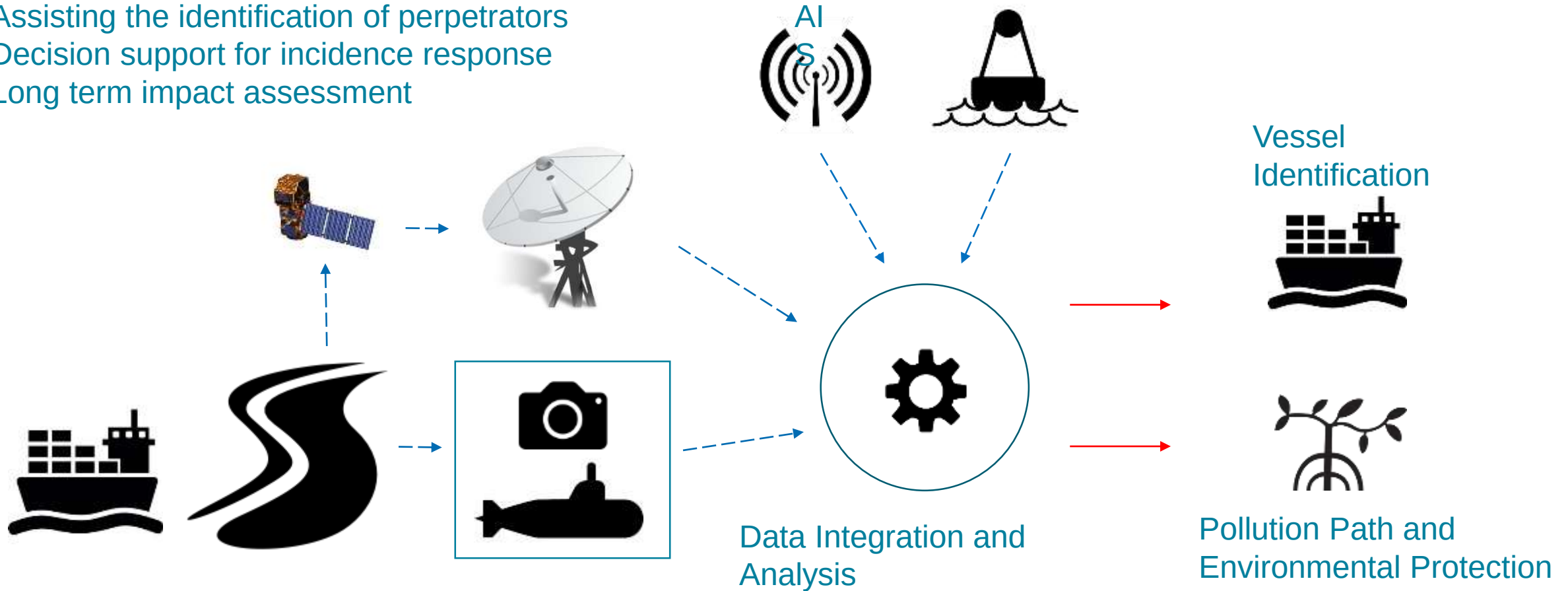
Solution Space Flood

- Long term risk identification
- Resilience
- Integration of multiple information sources to support early warning.



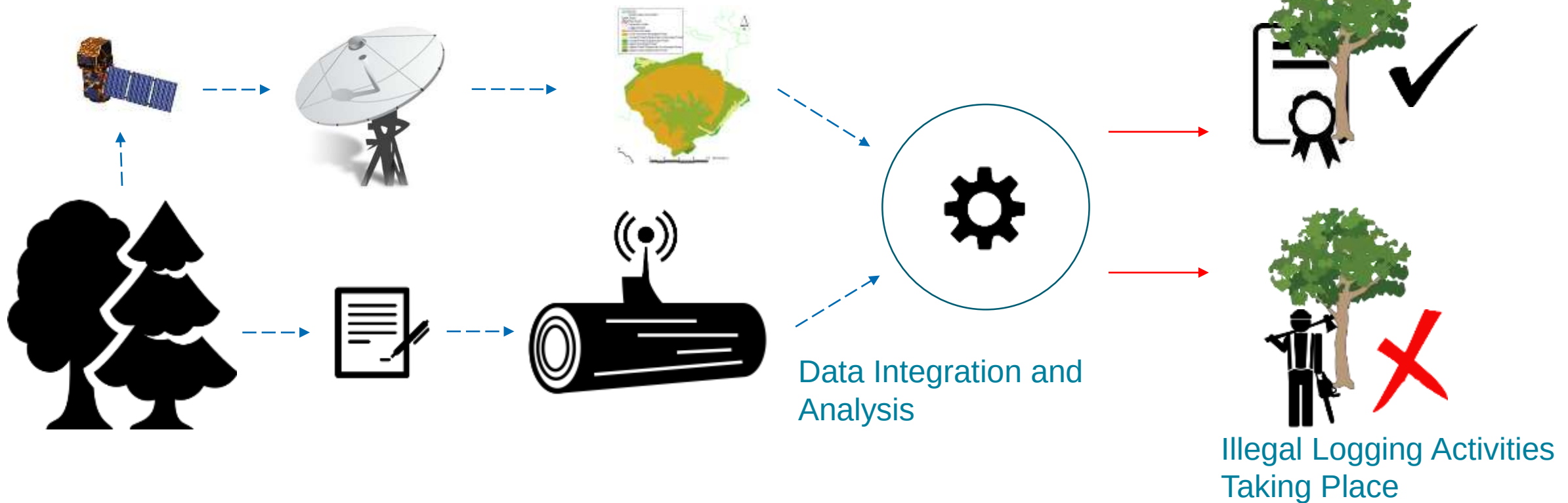
Solution Space Maritime Pollution

- Identifying potential pollution incidence
- Assisting the identification of perpetrators
- Decision support for incidence response
- Long term impact assessment



Solution Space Deforestation

- Identification of potential illegal logging incidence
- Assisting the management of licenced logging activities
- Long term national deforestation impact assessment



What is Rheticus®



- Cloud-based platform
- Satellite data
- (Geo) Open Data
- Continuous delivery of information
- Indicators, maps, reports
- Subscription-based
- M2M Connectors
- «Fuel» of Smart M.Apps and IMAGINE

Smart M.App for utilities and water network managers

Satellite data



Rheticus® is able to continuously process RADAR and Optical data from multiple satellite data sources (like Copernicus' Sentinels, Landsat, DigitalGlobe, Planet, Airbus DS and many others)

Automatic selection & download Automatic processing



1. TS-DInSAR processing of 18 months of SAR data collected over the AOI (~ 100 scenes)
2. Spatial Analysis of Sewer Network with Rethicus measurements
3. Data preparation and fusion with GeoMedia Professional workflows
4. Output posted on M.App Chest

Geoanalytics as a Service



Network Alert Smart M.App

- Dynamic selection of network segments by status:
 - Everything OK
 - Warning
 - Alarm
- Dynamic report with the addresses for field inspections and priorities in network maintenance

Water Management with New Tools in Geospatial Technologies

Robert H.Nagy

4 July 2017

Introduction to Smart M.App

Smart M.App

A [Hexagon Smart M.App](#) is a

- targeted,
- lightweight map application that
- solves specific business problems.

Each Hexagon Smart M.App fuses multi-source content, sophisticated analytics, and tailored workflows into a dynamic user experience. Hexagon Smart M.Apps simplify your geospatial experience by providing you with answers when it matters most.

Hexagon Smart M.Apps

Hexagon Smart M.App is a culmination of:



CONTENT



WORKFLOW



ANALYTICS



EXPERIENCE

- Simple to use, lightweight map applications that solve your business problems
- These targeted information services combine fresh geospatial content and workflows to deliver an interactive experience that includes the map and an engaging dashboard of insightful analytics
- For business leaders in a variety of industries, this is a completely new way to solve real world issues in a smart, fresh way
- Reside on the cloud, providing you with real-time answers, whenever you need them, wherever you need them
- Present the information in a visual and compelling way, utilizing targeted workflows, flexible design, and powerful visualization to provide answers
- Take real-world change and synchronize it with your app in a way that is natural, streamlined, and informative

Our Challenges

Customers



- Products are **HEAVYWEIGHT**



- Development requires **SPECIALIZED EXPERTISE**



- Maps don't understand **MY SPECIFIC PROBLEM**



- Maps are **OUTDATED** by the time I get them

Development Partners



- **REQUIRE SOFTWARE AND DATA** to build useful solutions



- **HUGE GAP** between software and data providers



- Technology is **COMPLEX**



- **LIMITED** applicability

M.App Portfolio: A Powerful New Ecosystem



Software components established
in a cloud-based environment to build
and use progressive
geospatial applications



M.App Foundation



Hosting platform for
Hexagon Smart M.Apps and
core geospatial web services for
building geospatial cloud applications



M.App Studio



Interactive web-based workroom
for designing, building, and publishing
Hexagon Smart M.Apps



M.App Exchange



Online marketplace
to publish, discover, and buy
Hexagon Smart M.Apps



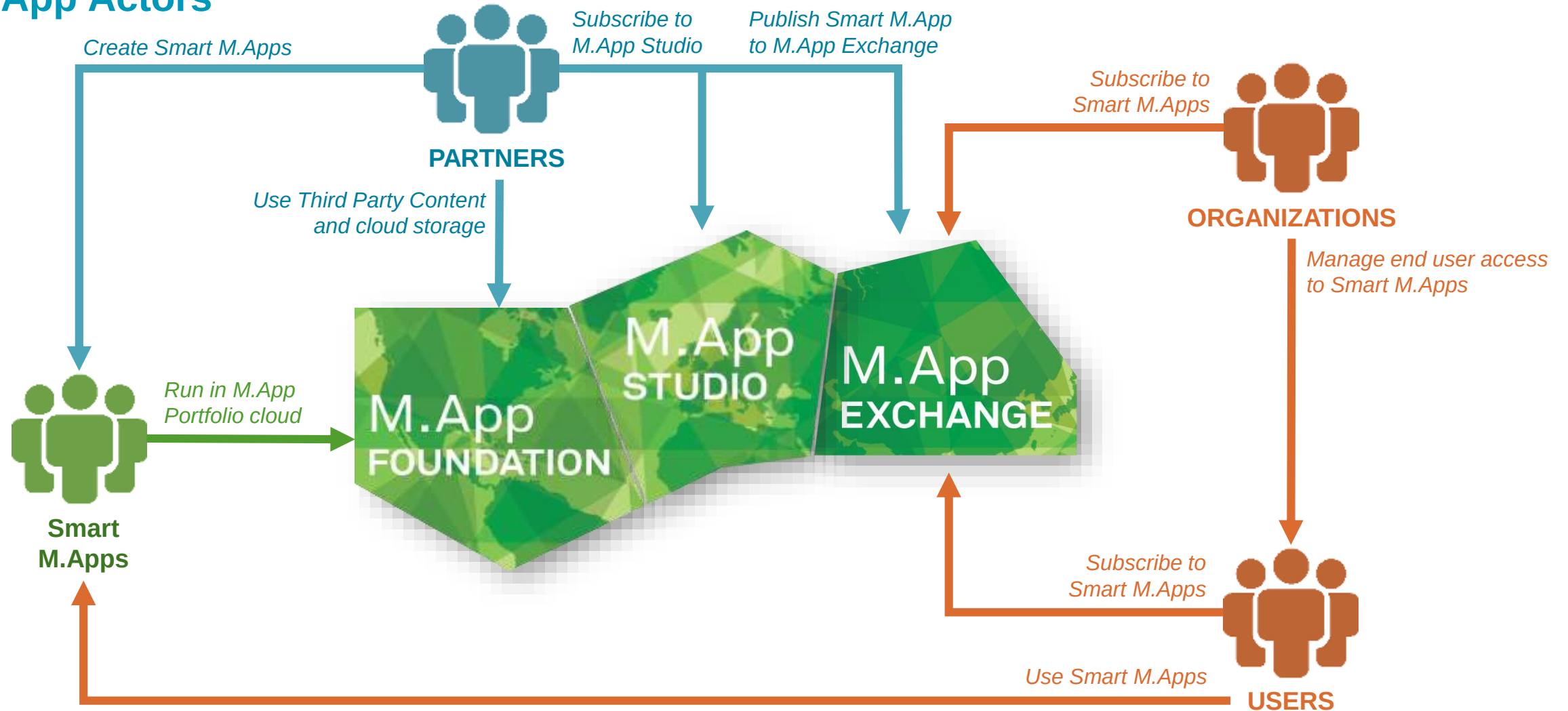
Fourth Element – Content



- Content fuels Hexagon Smart M.Apps
- Content is hosted on the cloud in M.App Chest – ‘geospatial dropbox’
- Content can be uploaded to the cloud
- Content can be ordered from third party Content Providers



M.App Actors



Community

→ **Developer Network**

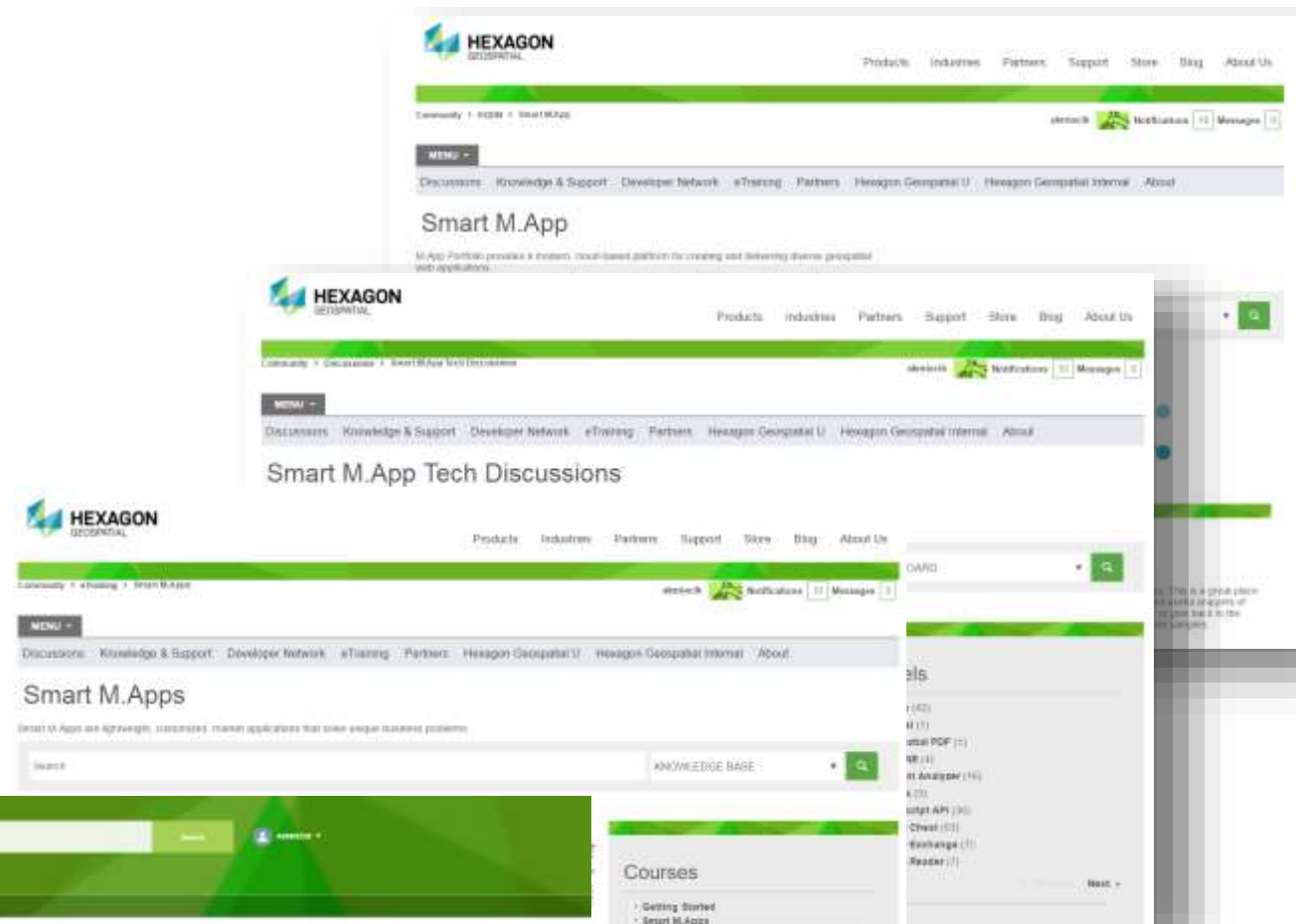
→ Smart M.App

→ Smart M.App Tech Discussions

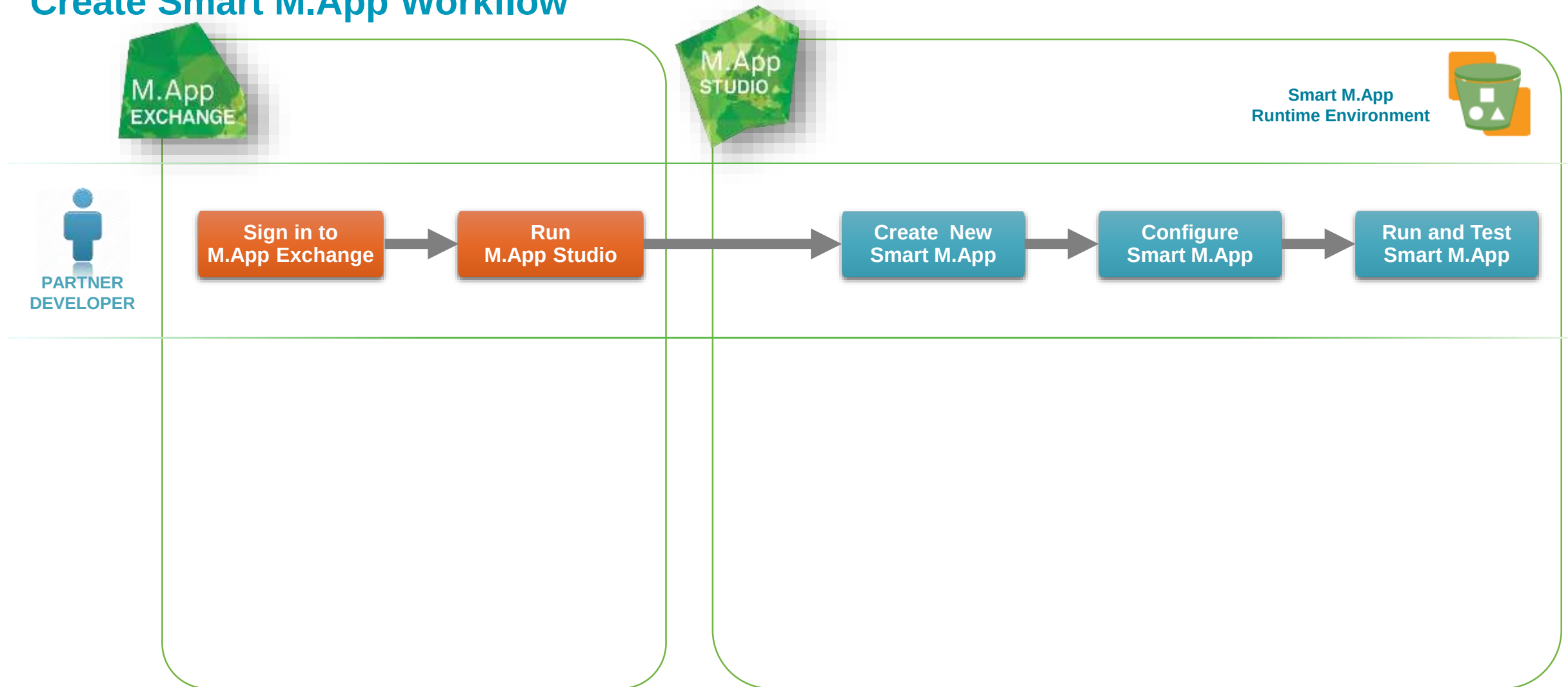
eTraining

→ Smart M.App

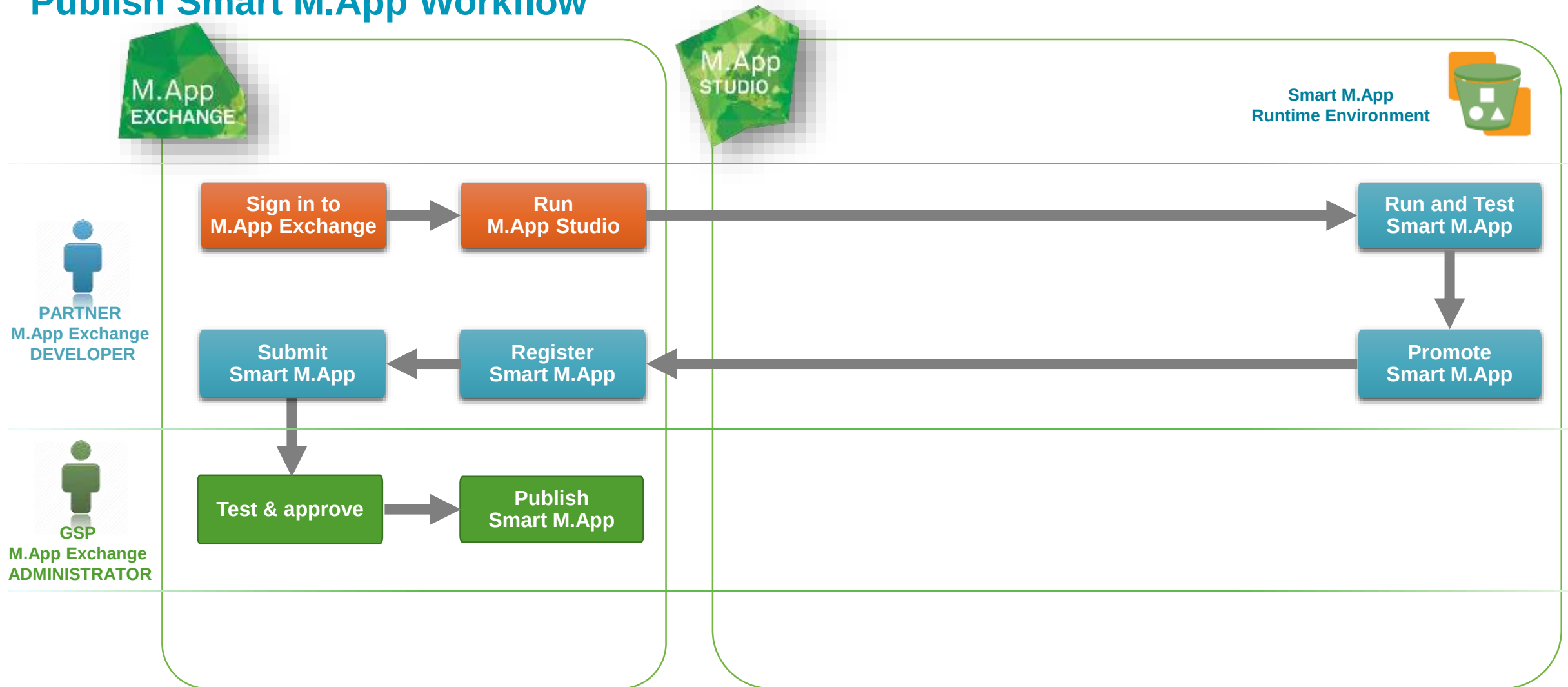
<https://hexagongeospatial.force.com/supportportal/s/>



Create Smart M.App Workflow



Publish Smart M.App Workflow



M.App Foundation

Smart M.App API



Authentication API

- OAuth2
- OAuth2 Client Registration



Data Services API

- Uploads
- Downloads
- Compressions
- Transfers
- Dataset Ops
- Publications
- Third Party Content



Resource Catalog API

- My Content
 - *Search*
 - *All Items*
 - *Images*
 - *Features*
 - *Point Clouds*
 - *Business Data*
 - *Folders*
 - *App Defns*
 - *Map Defns*
 - *Workflow Defns*
- Licensed Content
 - *Search*
 - *Order*
 - *Cost Calculator*



Analytics API

- Geoprocesses
- Spatial Model Editor



Metrics API

- Compute Usage
- Maps Usage
- Storage Usage

M.App Studio

M.App Studio



Allows rapid prototyping with no programming skills needed



Automatically deploys your Smart M.App to the cloud and promotes it to M.App Exchange



Automatically takes care of the Smart M.App security



Offers a wide range of configuration options so that a Smart M.App can be created with no or little programming



Offers a wide range of Java Script APIs for developers who need to customize or develop their own parts of Smart M.App



M.App Studio – What Users Can Do

Log in to M.App Studio

- User gets access to:
- Smart M.Apps created by User or shared by others within User's Organization
 - Content added by User from M.App Chest
 - Spatial Recipes created by User or shared with User by others within User's Organization
 - Workflows created by Users
 - Maps created by User or shared by others within User's Organization

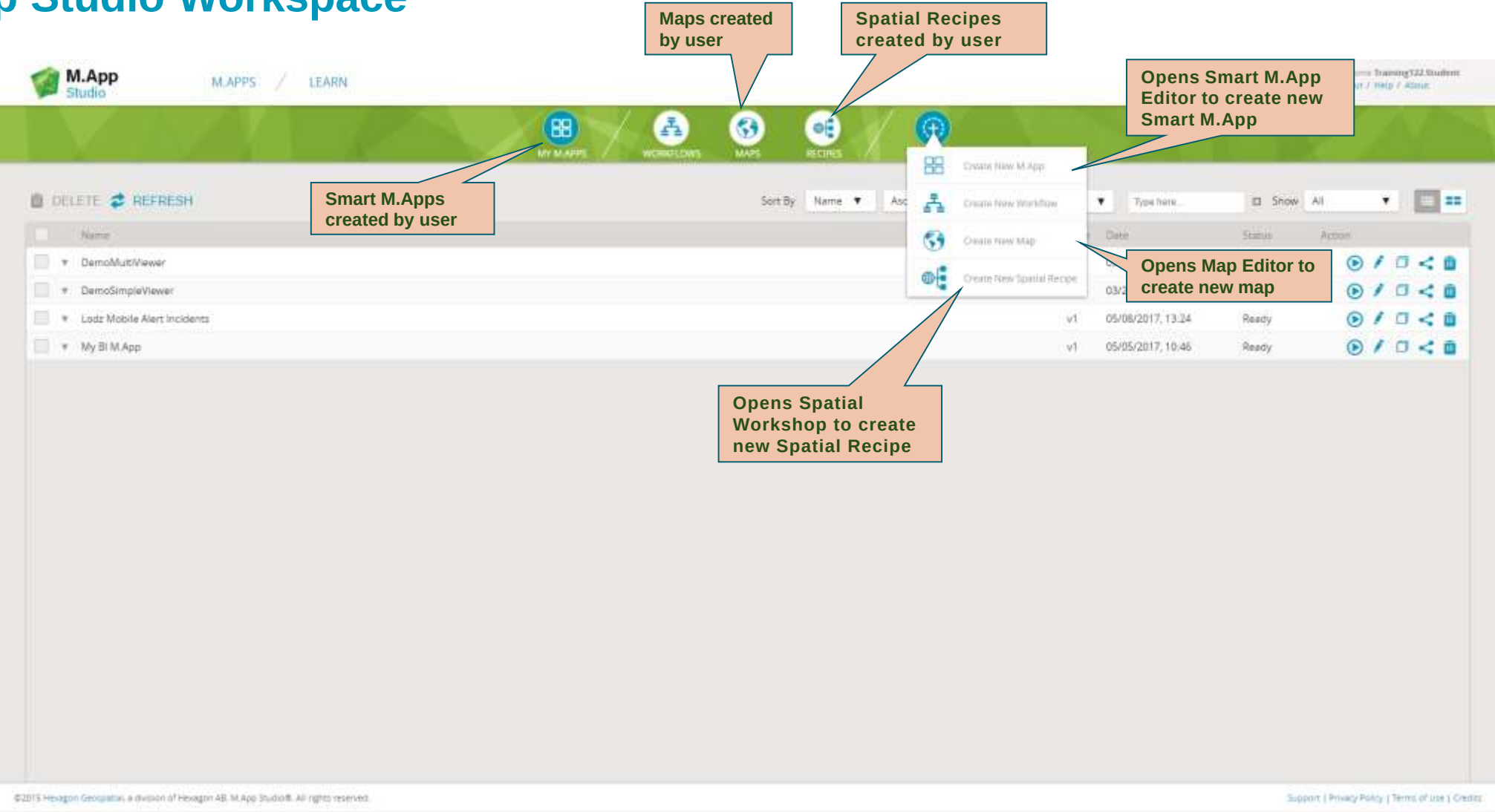
Create Smart M.Apps

- User can:
- Create new or edit existing **Smart M.Apps**
 - Create new or edit existing **maps**
 - Add new **content** from M.App Chest (partner or third party provider)
 - Create new or edit existing **spatial recipes** for analytics
 - Create new or edit existing **workflows**

Run Smart M.Apps

- User can:
- Execute Smart M.Apps in the runtime environment for testing purposes
 - Promote Smart M.Apps in order to publish them on M.App Exchange

M.App Studio Workspace



Key Aspects of the System

Smart M.App using on-premise Data

Configure local server

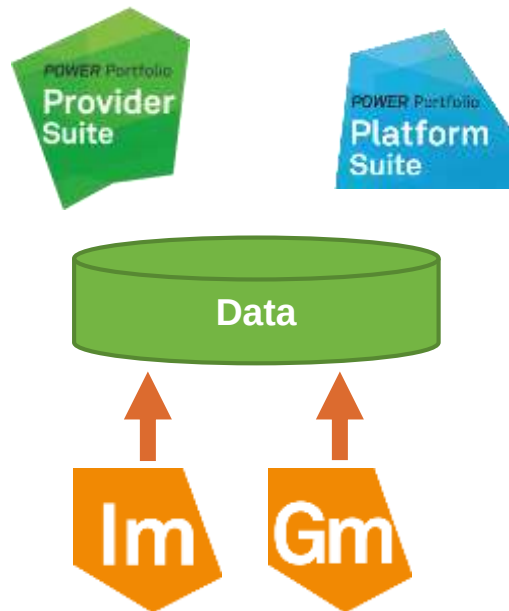
Create Smart M.App

Connect Smart M.App to local services

GeoMedia WebMap
ERDAS APOLLO
GeoMedia Smart Client

M.App Studio
Smart M.App Editor

M.App Studio
Smart M.App Editor

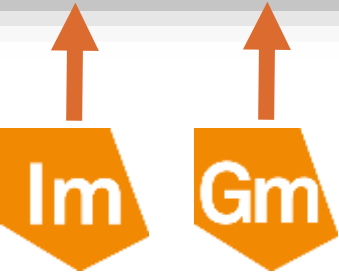


Layers from local secured services are connected to the Smart M.App

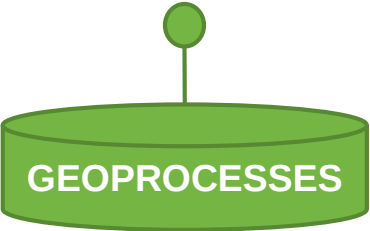
Smart M.App with Geoprocessing



Spatial Workshop
(M.App Studio)



Geoprocessing
Service



M.App Studio
Smart M.App Editor



Smart M.App

 GeoApp.UAS ★★★★★ Starting At \$49.00 Free Trial Available Compare	 Vegetation Health Index ★★★★★ Starting At \$15.00/Mo Free Trial Available Compare
 Tall Crop Health Index ★★★★★ Starting At \$15.00/Mo Free Trial Available Compare	 Incident Analyzer ★★★★★ Starting At \$2,400.00/yr Free Trial Available Compare
 Snow Cover Index ★★★★★ Starting At \$15.00 Free Trial Available Compare	 Burn Ratio Index ★★★★★ Starting At \$15.00 Free Trial Available Compare

Smart M.App with Business Intelligence GeoVisualization

Select Data

Create

Customize

Use

M.App Chest

M.App Editor
(M.App Studio)

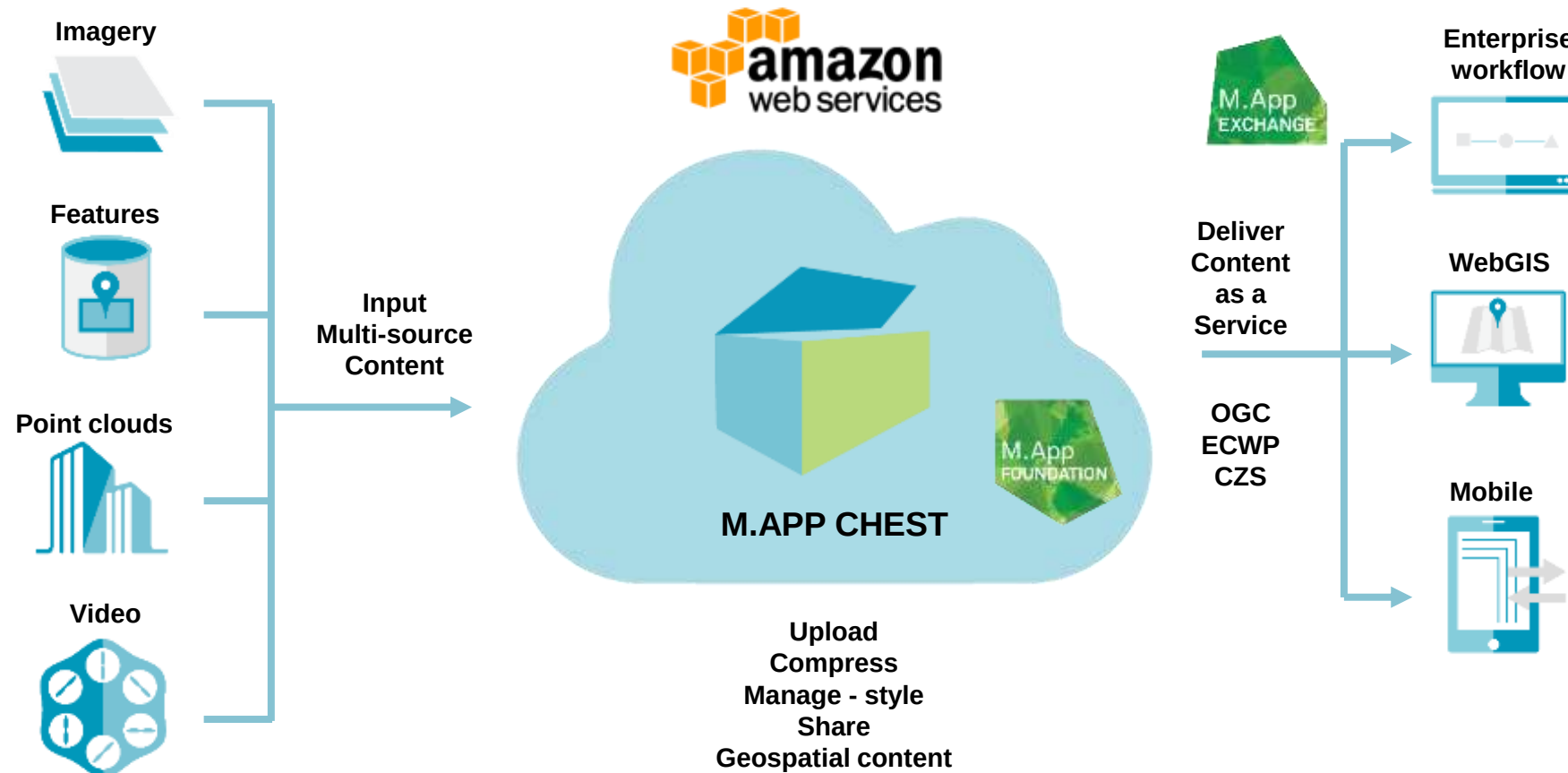
M.App Studio
Smart M.App Editor

Smart M.App



Content

M.App Chest – ‘Geospatial Dropbox’



Managing Content with M.App Chest

The screenshot displays the M.App Chest web interface. The top navigation bar includes the M.App Chest logo, a search bar, and tabs for 'ALL' and 'FOLDERS'. The current view is 'MAppStudioTraining'. On the left, a 'Properties' sidebar shows details for 'Las Vegas.tif', including its type (Image), description (Coverage Data), ID, tags, registration date (May 17, 2017 10:02:26 AM), folder (MAppStudioTraining), CRS (EPSG:4326), and footprint coordinates. The main content area shows a list of four items: 'world.geojson' (FEATURE), 'HxGN Live data.csv' (DOCUMENT), 'Las Vegas.tif' (IMAGE), and 'Landsat Rasters' (FOLDER). Each item card displays a thumbnail, the item name, type, folder, and registration date. The interface also includes a sidebar with navigation icons, a top right user profile section, and a bottom right view control section.

M.App Chest Search ALL FOLDERS MAppStudioTraining

Welcome Training122 Student
Logout / Help / About

Page 1 / 1 | 4 search results | Select All | Deselect All

Sort by: Registration Date Ascending View: 80

Properties

Las Vegas.tif

TYPE
Image

DESCRIPTION
Coverage Data

ID
7067d582-b565-411f-8403-f0209836a989_2c9180825be82a7b015c156df5e63edc

TAGS

REGISTRATION DATE
May 17, 2017 10:02:26 AM

FOLDER
MAppStudioTraining

CRS
EPSG:4326

FOOTPRINT
Native: [-115.4202636, 36.0416936, -114.9157551, 36.3667603]
WGS84: [-115.4202636, 36.0416936, -114.9157551, 36.3667603]

world.geojson
FEATURE Folder: MAppStudioT...
May 5, 2017 10:30:23 AM

HxGN Live data.csv
DOCUMENT Folder: MAppStudioT...
May 5, 2017 10:30:24 AM

Las Vegas.tif
IMAGE Folder: MAppStudioT...
May 17, 2017 10:02:26 AM

Landsat Rasters
FOLDER Folder: MAppStudioT...
May 17, 2017 11:54:12 AM

Managing User Content with M.App Chest

Upload

Download

Compress

Publish

Preview



File based data including:

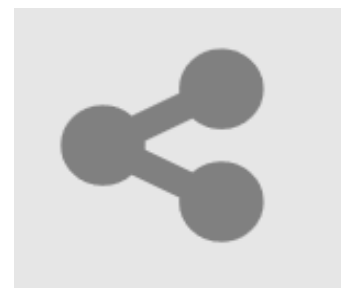
- Raster
- Vector
- Point Cloud
- Business Documents



Download the primary dataset along with all auxiliary files



- Compress images to ecw or jp2
- Compress point clouds to hpc



Publish to:

- WMS
- WMTS
- ECWP
- GeoServices
- ImageX



Image is displayed in a Leaflet window over an HERE Base Map display

Accessing Third Party Content

The screenshot displays the M.App Reader interface for accessing third-party content. The main map shows a region in Switzerland, with a large satellite image overlay. The interface includes a search bar at the top, a sidebar on the left for third-party content, and a filter panel on the right.

THIRD PARTY CONTENT

52A_MS1C_20170510T103031_...
Provider: sentinel
Creation date: 10/5/2017
Resolution: 10 m
Cloud cover: 62.6 %
Product: Sentinel-2
Data cover: 100 %
Hide Zoom Order

52A_MS1C_20170510T103031_...
Free

52A_MS1C_20170510T103031_...
Free

52A_MS1C_20170510T103031_...
Free

Provider
Sentinel

Filters
Products
☐ Sentinel-2
Bounding Box
47.702368466573716,11.4312744140625
Acquisition date
From: Start date... To: End date...
Dataset
ID
Maximum Cloud Cover
%
Minimum Data Cover
%
Sort By
Acquisition Date Search

Close

M.App Examples

Water Presence Index - WV

This Smart M.App takes advantage of the coastal band returned in WorldView 2 and WorldView 3 imagery to perform a Normalized Difference Water Index (NDWI) computation. This analysis identifies the presence of standing water but is also capable of detecting moisture in soil due to the use of the coastal band.

- Use this app to delineate open water features and detect the presence of moisture in soil. This analysis identifies the presence of standing water but can also detect moisture in soil using the coastal band.
- Use the coastal band returned in WorldView-2 and WorldView-3 imagery to perform a Normalized Difference Water Index (NDWI) computation.



<https://store.hexagongeospatial.com/apps/119232#!overview>

Snow Cover Index

The Snow Cover Index Smart M.App assesses snow cover in imagery using bands in the near infrared and middle infrared spectrum. The Snow Cover Index computes the Normalized Difference Snow Index (NDSI).

- Snow and clouds both are very bright in the visible spectrum, making them difficult to distinguish. In the infrared spectrum, however, snow appears dark, while clouds are bright. The NDSI Calculator uses this difference in reflectance to identify snow cover, distinguishing it from cloud cover.
- Assess snow cover in multispectral data using Near Infrared (NIR) and Middle Infrared spectrum bands. Normalized Difference Snow Index (NDSI) is a calculation commonly used to assess snow cover.

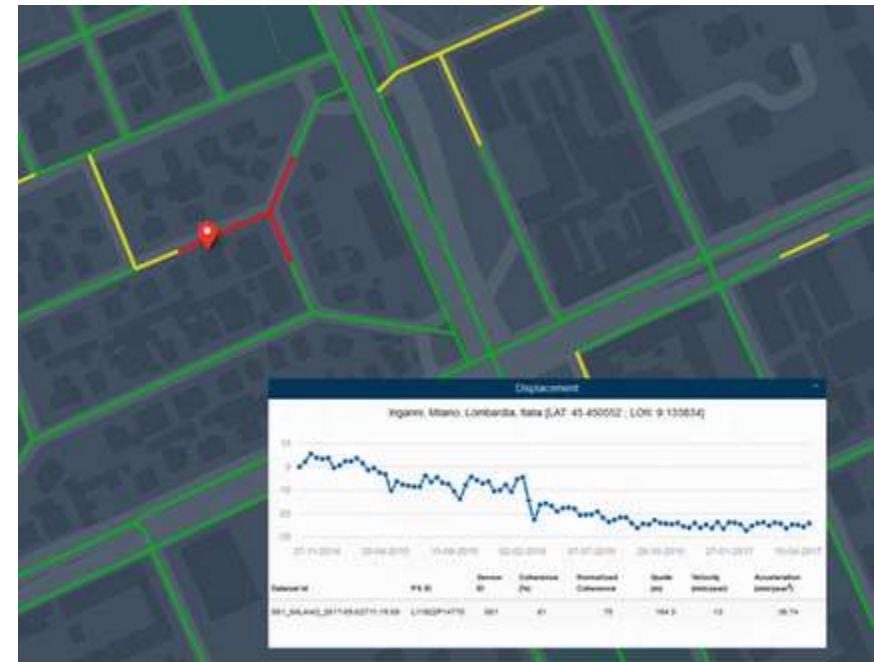


<https://store.hexagongeospatial.com/apps/119216#!overview>



Water and sewer network risks accurately identified

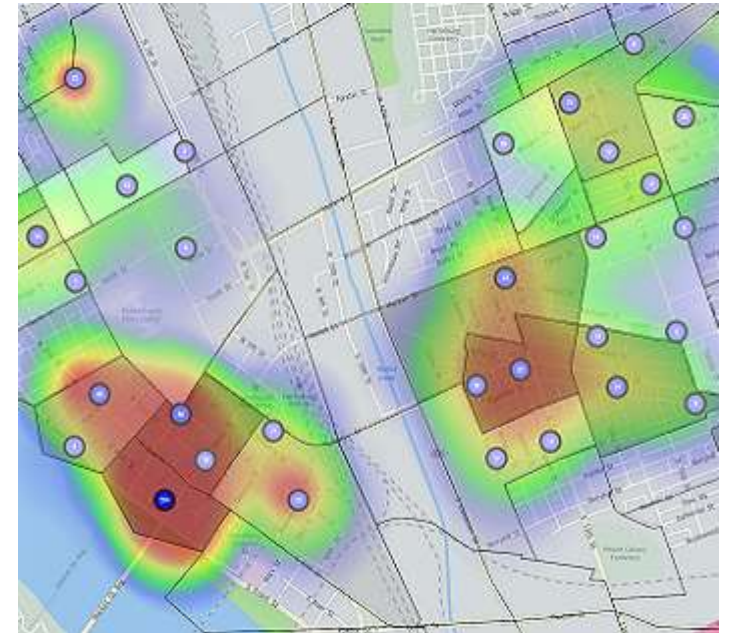
Network Alert identifies up-to-date risks in your network by using satellite data to identify areas of ground instability that could indicate leaking pipes. With Network Alert, you can quickly determine the locations of concern and act upon the information.



<https://store.hexagongeospatial.com/apps/167418#!overview>

Incident Analyzer Index

Incident Analyzer provides an intuitive user-friendly environment for consuming and analyzing any type of incident data. Incident Analyzer uses the position, frequency, and temporal characteristic within your incident data to locate areas where the frequency of incidents is abnormally high. With Incident Analyzer, and just the click of a few buttons, you can create, manage, share, and host dynamic intelligence reports that depict meaningful spatial patterns in an interactive fashion.



<https://store.hexagongeospatial.com/apps/112304#!overview>

Section 2: **M.App Studio Basics**

Exercise 1: **Get Familiar with M.App Studio**

Access M.App Exchange using training account

Access M.App Studio and view key functions

Configure your first Smart M.App with just few clicks

Add Content and Create a Custom Map

Learn how to access M.App Studio and examine its main functions. Learn how to use M.App Chest to provide content to M.App Studio. In M.App Studio, use the content from M.App Chest to compose a map.

- Access M.App Exchange using training account
- Access M.App Studio and walk through the M.App Studio functions
- Enjoy visual development of Smart M.Apps
- Create your first Smart M.App

Access

The Studio is available at our Store:

<https://store.hexagongeospatial.com>

<https://mapp.hexagongeospatial.com/mappstudio/>

USERNAME:

Trainingxxx@hexagongeospatial.com

PASSWORD:

Budapestxxx

Task 1: Review M.App Studio Functions

- Access M.App Exchange using training account
- Access M.App Studio and walk through the M.App Studio functions

Task 2: Create Your First Smart M.App

- Enjoy visual development of Smart M.Apps
- Create your first Smart M.App

Exercise 2: Add Content and Create a Custom Map

Upload file into M.App Chest and publish it as WMS/WMTS service

Create your map

Modify your Smart M.App to use new map

Add Content and Create a Custom Map

Learn how to discover your own content and upload it by getting familiar with M.App Chest application. Modify an existing Smart M.App to create a custom map.

- Upload GeoTIFF file of Las Vegas area to M.App Chest and publish it as WMS/WMTS service
- Configure a map using data from M.App Chest content
- Edit your Smart M.App
- Modify the map used in your Smart M.App

Task 1: Add Content using M.App Chest

- Get familiar with M.App Chest application
- Upload and publish raster files

Task 2: Create a Map using Uploaded Content

- Make use of an uploaded data
- Define a map using data from M.App Chest content
- Edit your Smart M.App

Task 3: Modify Your M.App to Display Your Map

- Apply your map in your Smart M.App

Exercise 3: Configure Business Intelligence

Get familiar with BI Wizard
Configure BI Choropleth Map
Configure BI widgets

Configure Business Intelligence

You create a simplified Smart M.App that displays an interactive thematic map showing the number of HxGN Live attendees categorized by years and regions. The data will be displayed on the map and on the BI widgets. You will configure a choropleth map layer with tooltips and three widgets:

- Time Bar Chart – Represents number of attendees per year
- Row Chart – Represents number of attendees per region
- Text Chart – Displays summary info

To create this Smart M.App you will:

- Upload GeoJSON and CSV file with HxGN Live data
- Create a new Smart M.App with one panel
- Configure BI widgets and map layer (geometries)

Task 1: Create a Smart M.App Layout and Upload BI Data

- Upload BI data into M.App Chest
- Start configuring the BI Smart M.App

Task 2: Define Visualization

- Get familiar with BI Wizard
- Configure BI Choropleth Map
- Configure BI widgets

Task 3: Name and Launch Your Smart M.App

- Enjoy the BI Smart M.App
- Play with BI widgets
- See map and widgets interaction

THANK YOU
