

protect!on

Petrochemical Solution

extend your view **4+**
T E R R A





Managing complexity and maximising operational efficiency, safety and security. TERRA 4D is tailor-made to address these requirements and provides its clients with an integrated geo-spatial command and control center solution.

The new challenges for the oil and gas industry have far-reaching consequences for operators of exploration, processing and transportation including sea vessels, trucks and pipelines. To adapt to these changes, operators need a knowledge based approach to achieve greater operational efficiency, improve environmental performance and address security vulnerabilities. TERRA 4D Physical Security Information Management (PSIM) software platform helps oil and gas companies:

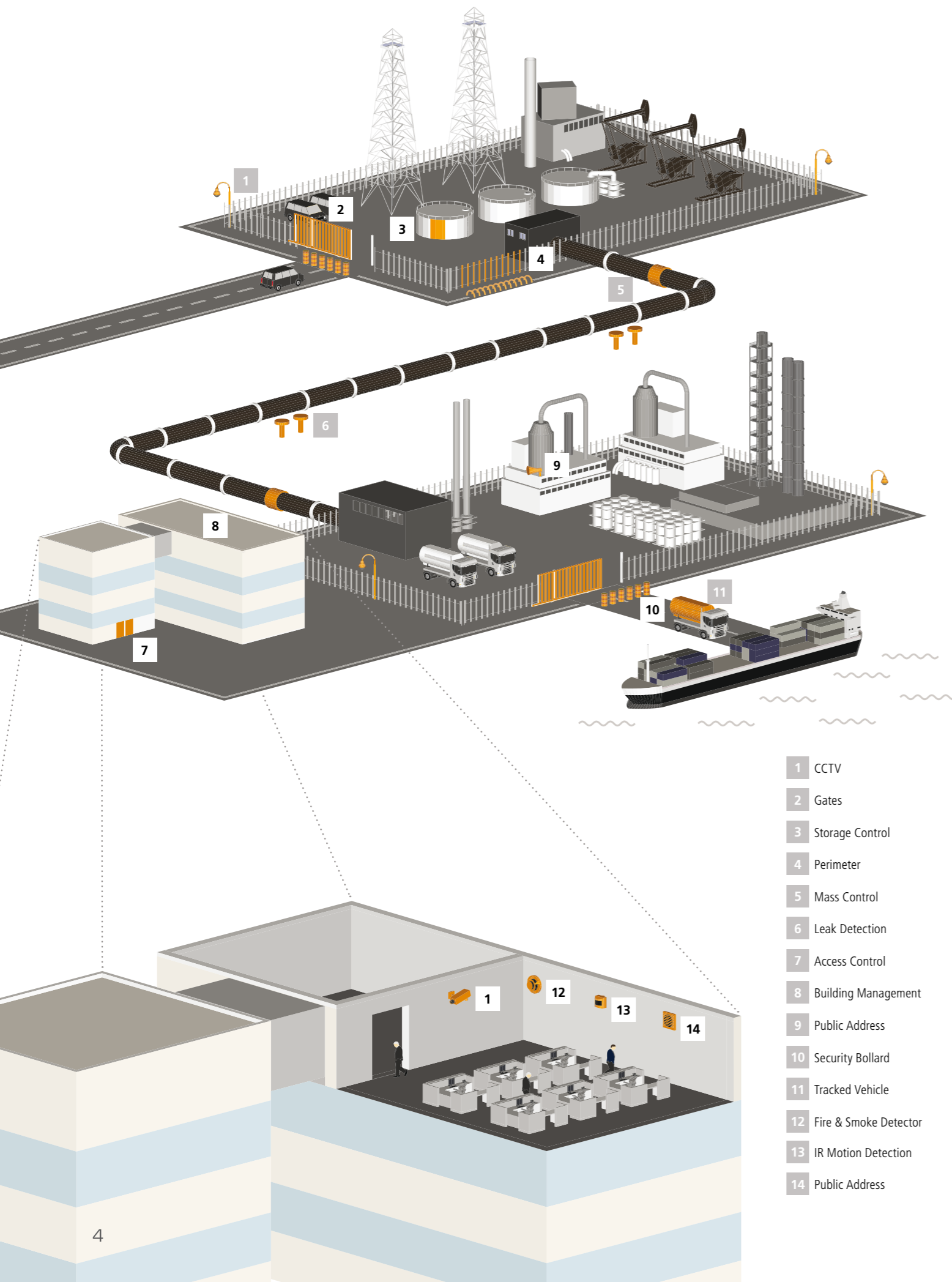
- Integrate operations applications into a single platform to manage complexity
- Improve situation response times and minimize risk
- Common operating picture enabling rapid situational awareness, management and real-time resolution
- Geo-reference and correlate data from multiple security and safety subsystems and other systems to resolve a situation
- Intuitive workflows remove operator randomness, reduce stress for the user during an incident and enforce compliance of company guidelines

Challenge

Crude oil theft, potential terrorist attacks or sabotage, illegal refining and also dealing with spills and leakage have become increasingly serious problems, with long-term social, economic and far reaching environment consequences at installations around the world. More often than not, the necessary information related to a particular incident is not properly charted, and also the geographical region affected is not correlated and marked as high priority area!

Solution

TERRA 4D PSIM translates unstructured sensor and system data into structured data and shows it in geographical context offering superior real-time situational awareness. Gather enough data and patterns emerge. Patterns lead to new insights and content analytics to faster correlations, assisting safety officials make informed decisions on following protocol, the availability of resources, and where and if they should be deployed. Operators can fly through time and space having a virtual "birds eye view" from a remote location.



- 1 CCTV
- 2 Gates
- 3 Storage Control
- 4 Perimeter
- 5 Mass Control
- 6 Leak Detection
- 7 Access Control
- 8 Building Management
- 9 Public Address
- 10 Security Bollard
- 11 Tracked Vehicle
- 12 Fire & Smoke Detector
- 13 IR Motion Detection
- 14 Public Address

Seeing is believing

Sensors including video surveillance cameras and avatars, representing known and unknown objects detected by any available method are shown in geospatial context in real-time, in a 3 dimensional GIS model.

Flying through time and space

Pause real-time viewing, rewind and replay history showing time synchronized video, camera orientation, object positions and their historical tracks in the 3D model. Find out where an object has actually come from!

Cross sensor & system intelligence

TERRA 4D geo-references and correlates information from access control, fire detection, intrusion detection, CCTV systems, radar, AIS (Automatic Identification System for vessels) and others in real-time. Continuous rule based live data analysis generates an alarm if any exceptional situation appears.

Selective intelligence sharing

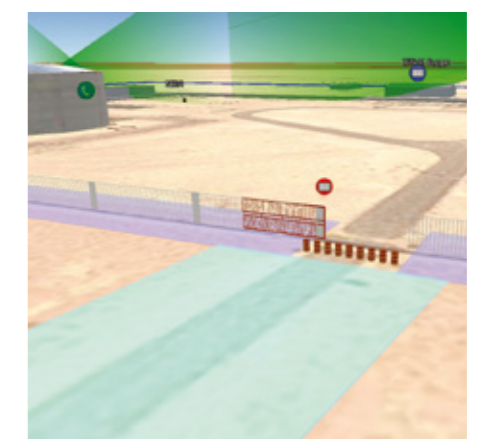
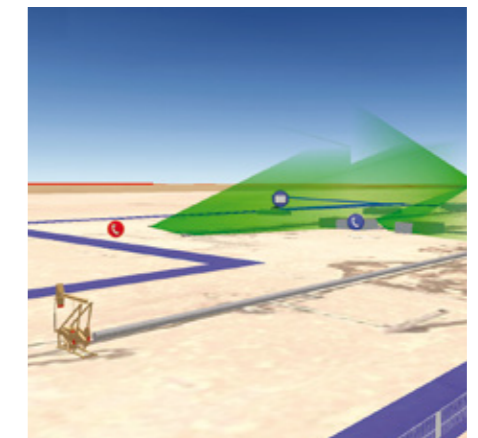
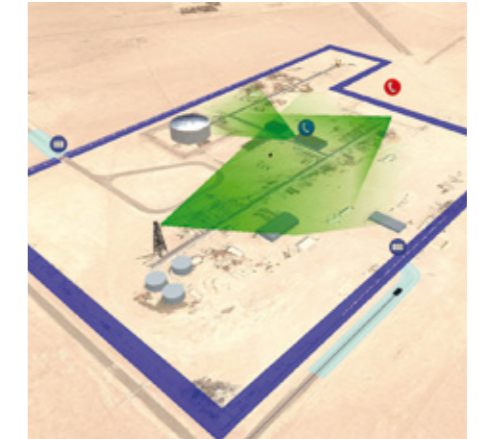
TERRA 4D ensures that everyone in the operational chain is correctly informed and knows the appropriate action to take. Intelligence can be accessed and shared, subject to relevant authorisation levels and privileges to information.

A picture is worth a thousand words

Continuous vessel positioning is monitored based on satellite and AIS open source information. In case of any course deviation, AIS failure or a manual "quiet alarm" is initiated and satellite tracking takes over and delivers vessels coordinates and live images to head quarter.

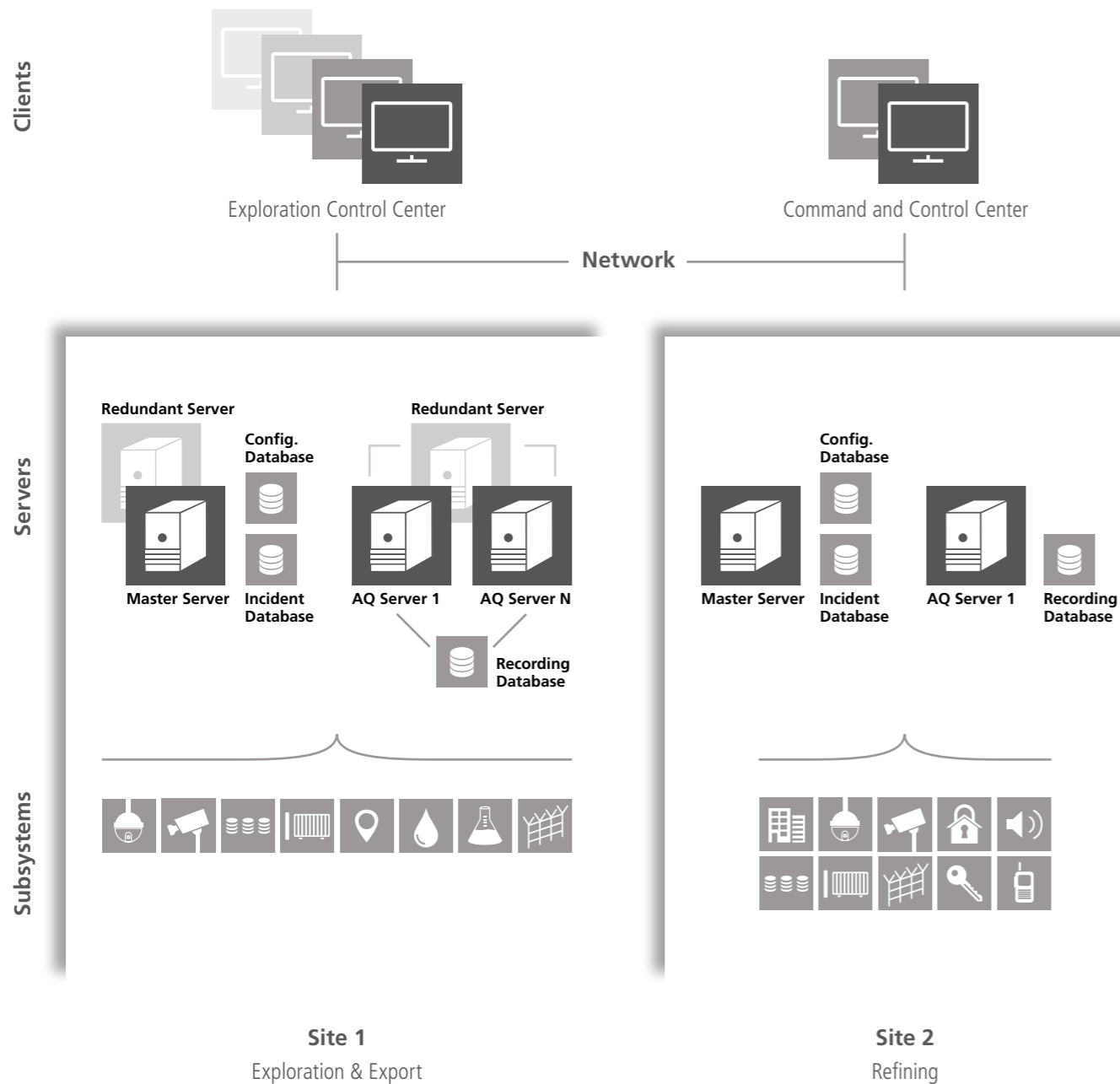
Multiple Sensors

By combining multiple sensors into one intuitive enterprise view operators can identify and track object and events while maintaining a global view of their entire site, rather than watching video screens from any single camera. Operators have selective access to live video from a multitude of CCTV cameras, giving operators a "bird's eye view" of the incident location.



Screenshots TERRA 4D Interface

An example of system architecture for a Petrochemical site



Distributed Architecture

Typically installations of petrochemical companies are distributed over larger areas and are divided into different groups, exploration, refining, transportation and distribution. In TERRA 4D PSIM all installations and types of production or processing plants are inseparably linked to each other. The integration and unification of all subsystems on the TERRA 4D platform enables acquisition and analysis of all information as one central entity facilitating a fast and precise response to any incidents while maintaining thorough and comprehensive protection.

Exploration

Exploration and drilling activities increasingly move into remote and hostile locations, therefore warranting the need for complete security and safety measures. TERRA 4D offers this solution with a common command and control interface for intruder alarm, access control, fire and gas detection, building management, production control, safety and security systems. Access to sensitive zones must be highly scrutinized and controlled to ensure safety, albeit allowing company personnel the freedom of movement for effective day to day operations. By streamlining the analysis of situation data and the corresponding responses, TERRA 4D PSIM delivers significant benefits to the organization, raising overall operational efficiency.

Transportation & Distribution

TERRA 4D transportation module allows tracking of vessels and trucks based on systems installed on satellite platforms. The system is sabotage resistant since there is no tracking device installed. Geofencing, course observation, quiet alarming and designated tracking are incorporated in our system. Any abnormality, like AIS inactive, delayed carrier, course deviation or quiet alarm causes an automatic track of the vehicle. Nearby satellites will capture images of the vessel whenever possible and send it to the ground console. A designated pipeline surveillance solution supporting UAV (Unmanned Aerial Vehicle) surveillance is available.

Refining

The advanced physical security information management software, TERRA 4D PSIM, addresses all specific challenges in a comprehensive manner, drastically improving security and production operations through unification of all systems into a 3 dimensional common operating picture. TERRA 4D PSIM facilitates situation planning, response and analysis for production security, safety and emergency incidents where the risk of human error can lead to financial loss, injury and loss of trust.

Use case

TERRA 4D can help to detect a possible oil leak and prevent it to become a major environmental disaster:

- A mass balance detection system measures quantity of liquid at the delivering and receiving sides. Any loss triggers an event which starts an incident alarm on TERRA 4D client
- The sonic leak detection system estimates the distance from the closest transducers and sends it to TERRA 4D PSIM
- TERRA 4D applies plausibility evaluation comparing sensor meta data assisting to determine any leak in the fastest possible time
- TERRA 4D translates the distance information into real world (GPS) coordinates and illustrates the location on the 3D GIS
- The operator is assisted by guided workflows and incident localization
- In case of an alarm the next available intervention personnel receives the alarm message by terrestrial radio, mobile phone or any other communication method available. Simultaneously the pumps are shut down and the valves on both ends of the pipeline are closed
- Based on multi sensor data analysis the next available cameras are aimed at the incident location. Operator can initiate an UAV observation where the aircraft is sent to incident location on predefined flight path to deliver live video to command and control room

Command and Control

Video wall	Support of video walls and multiple screens per desk.
Time machine	Navigate through space and time and see all recorded data (video, tracked objects, PTZ positions,...) time-synchronized.
Flexible GUI layouts	GUI layouts changing automatically or driven by operator. User and situation specific layouts are possible.
Chat messenger	Operators exchange information quick and simple.

Geospatial Data Management

Geospatial rules engine	Define rules and methods to auto-respond to incidents.
Geospatial data correlation	Any sensor can be used to control other sensors. Alarm verification utilizing multiple sensors.
Geo fencing	Define geographical alarm or warning zones to receive alarms when tracked objects enter or leave such zones.

Event and Alarm Management

Workflow automation	Intuitive workflows remove operator randomness and reduce stress.
Incident reporting	Support of interactive incident forms. Videos, map views and resources can be linked. Customized design supported via HTML forms.
Escalation and delegation	Escalate alarms to super visor user groups or delegate alarms to other operators for work balancing.
Procedure enforcement	Workflows enforce company's or legal compliance guidelines.
Audit trail	Logging of all user actions for every workflow step for later analysis
Alarm notifications	Sends alarm notifications to remote systems via SMS or Email
Operator alarm	Operator can select alarm templates and fire alarms at specific locations on the map or directly in the video

3D Visualization

Multi Layer GIS with real-time rendering engine	Digital Terrain Model (DTM), Ortho imagery (aerial or satellite images), Street map, 3D buildings.
Geocoder	Address search, Forward: type address and GIS shows location, Backward: show address for any clicked location in GIS model.
Indoor visualization	3D indoor building structures with floors and rooms. 2D CAD floor plans can be imported to visualize indoor environments in 3D.
Geospatial document library	Organization of the document library (document is placed at geographical location) and access according to user privileges.
Object track visualization	Trace object's movement including historical track in 3D GIS model.
Video wall	Live or playback video is "projected" on virtual video walls in 3D GIS model. Camera orientation and view area is shown.
Avatar	Represents a detected object and its class in the 3D space.
AIS, ADS-B, GPS meta data	Shows meta data attached to an Avatar.

Video

Video unification platform	Seamless integrated video streams from one or many different video sub-systems (live and playback).
Supported cameras	Analog (with encoder), IP, fixed, PTZ, 360, mobile or airborne.
Position dependent salvo	Shows closest cameras to a static or dynamic object location.
Direct PTZ control	Video latency compensating method to control any PTZ camera.
PTZ auto presets	Automatic configuration of all interesting locations in PTZ camera's field of view as PTZ preset positions.
Geo-referenced video	Determine object location (latitude, longitude, height), speed, direction and size directly from video image.
Meta data recording	PTZ head data are recorded.
Multi camera tracking	Follow a moving object even in crowded environments using one or more fix or PTZ cameras simultaneously.
Augmented reality	Augmented reality layer on top of video image display including context sensitive interactions.

Mobile Unit Dispatching

Android and iOS app	GPS tracker and target intervention application. Target waypoint navigation, instant messaging and alarm handling.
Dispatching	Get current positions of all units in the field, send units to target coordinates, keep track of ongoing interventions.

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