

Protect
FAST

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:

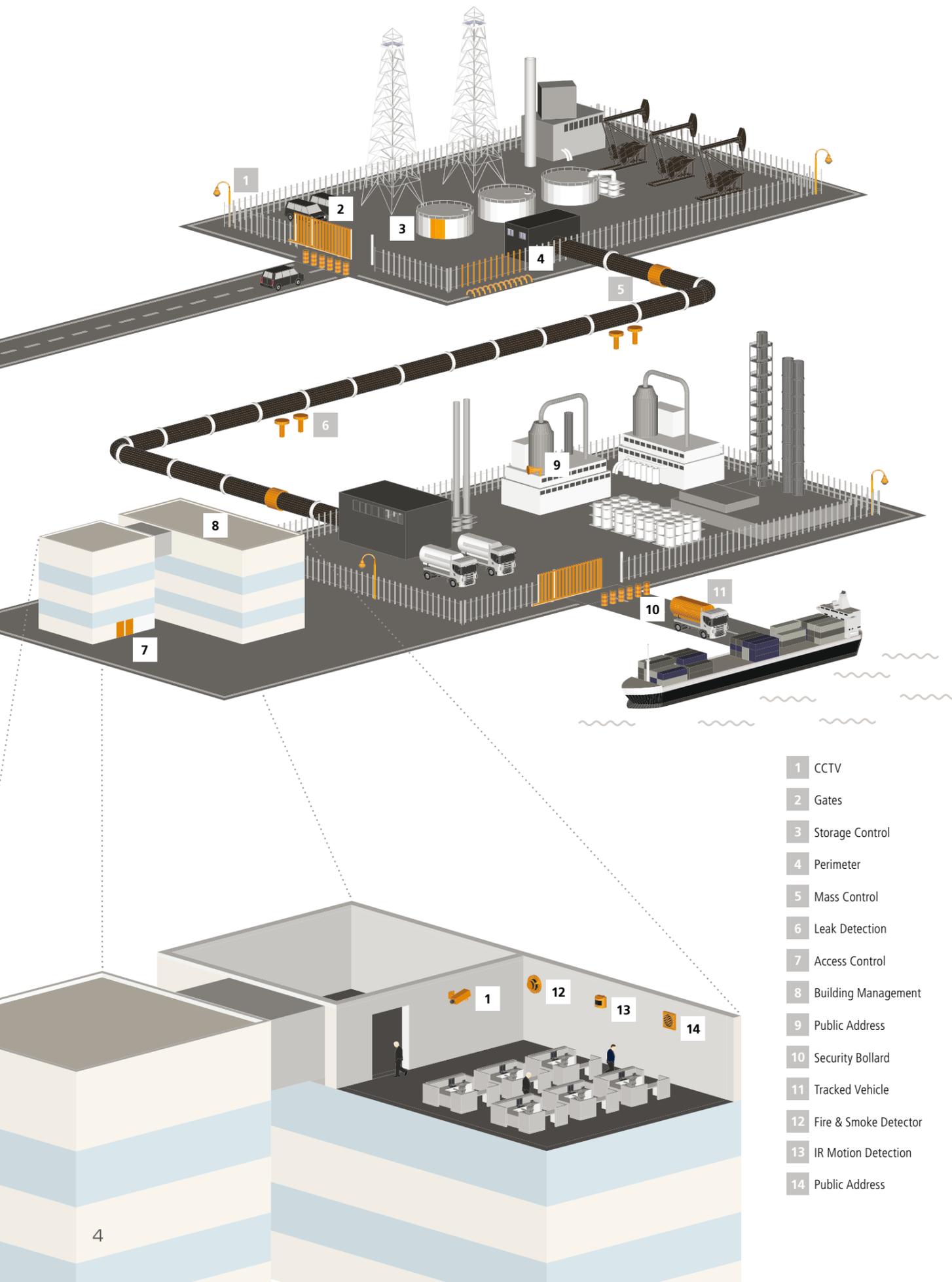
- Integrate operations applications into a single platform to manage complexity
- Improve situation response times and minimize risk
- Common operating picture enabling rapid situational awareness, management and real-time resolution
- Geo-reference and correlate data from multiple security and safety 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

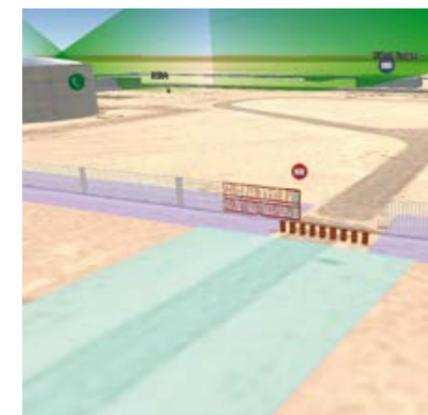
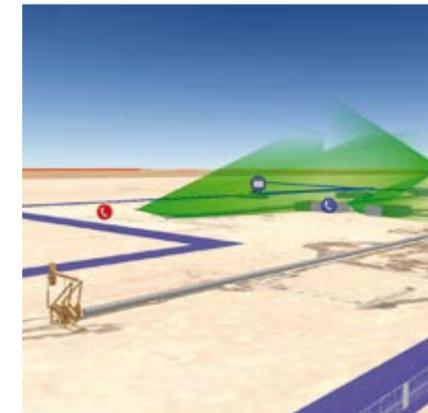
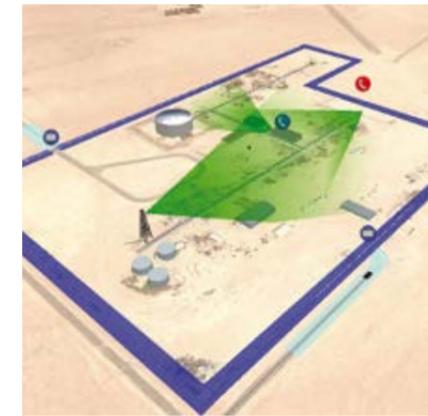
TERRA 4D ensures that everyone in the operational chain is correctly informed and knows the appropriate action to take. Intelligence can be accessed and shared, subject to relevant authorisation levels and privileges to information.

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.

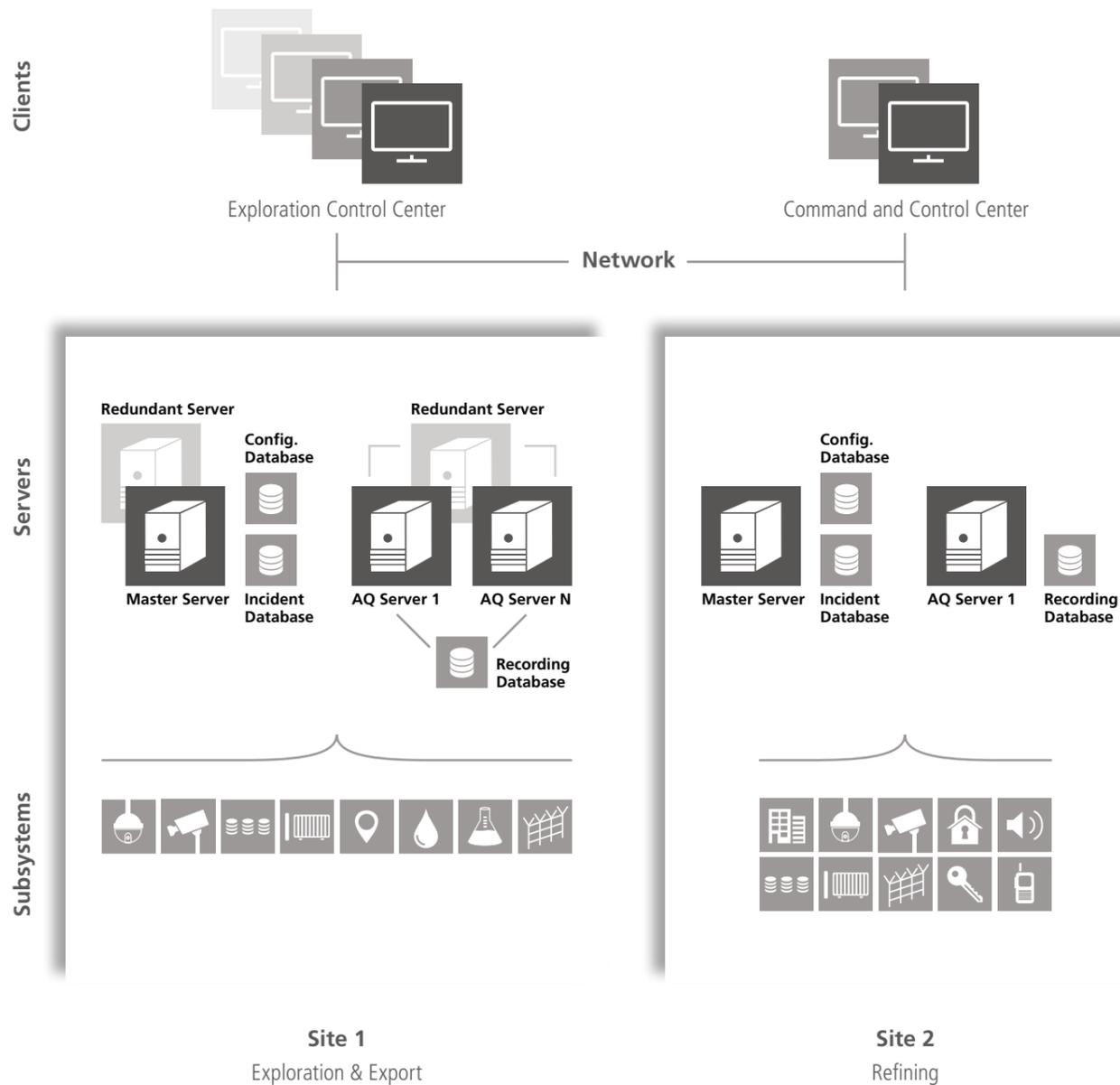
Multiple Sensors

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	Use the player control to navigate through space and time and see all recorded data (video, tracked objects, PTZ positions, ...) time-synchronized.
Workflow and incident reporting	The intuitive workflows remove operator randomness, reduce stress for the user during an incident and enforce company's compliance guidelines.
Locate, Dispatch & Intercept (Engage)	The coordinates of any object seen on video or from a location in 3D GIS model can be converted into a target waypoint and sent to "closest" intervention team to target position.
Spatial data correlation	Any sensor can be used to control additional sensors. Example: A radar detects an object. TERRA 4D allocates the closest cameras with line of sight to the target and initiates automated multi camera tracking.
Geospatial rules engine	Defines rules and methods enabling auto-respond to incidents.
Layout Independent Program (LIPO)	Keep system maintenance up to date: removing, adding or moving a sensor needs only a deletion, add on or correction of sensor coordinates. No system reprogramming required!

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.
In- and outdoor visualization	3D buildings and man made constructions are shown in the 3D GIS model. 2D CAD floor plans can be imported to visualize indoor environments.
Geospatial document library	Enables practical organisation of the document library (document is placed at geographical location) and easy access to relevant files according to user privileges.
Object track visualization	Trace the start of an object's movement. Complete historical track is visualized in 3D GIS model.
Video wall	Live or time synchronized playback video is "projected" on virtual video walls in 3D GIS model. Sensor orientation and view area is also 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. Example: AIS delivers unique vessel ID - TERRA 4D shows last captured image of the vessel and its AIS data.

Video

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 device fast and precise.
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 from video image.
Meta data recording	PTZ head data are recorded.
Multi camera tracking	Follow a moving "tagged"(GPS, RFID, AIS, ADS-B) or "untagged" object even in crowded environments using one or more fix or PTZ cameras simultaneously. If altitude information is available even airborne objects can be tracked from the ground or an airborne position.
Augmented reality	Augmented reality layer on top of video image display including context sensitive interactions.

Mobile Interception & Tracking

Panther for iPhone	GPS tracker and target interception app. Target waypoint is received and independent target interception based on bearing and distance is possible.
Dispatching	Get current positions of all units in the field and send units to target coordinates.
Geo fencing	Define geographical alarm or warning zones to receive alarms when tracked objects enter or leave such zones.

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