

# C-IED

## Operational tools



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Luigia Nuzzo, IDS corporation, Italy

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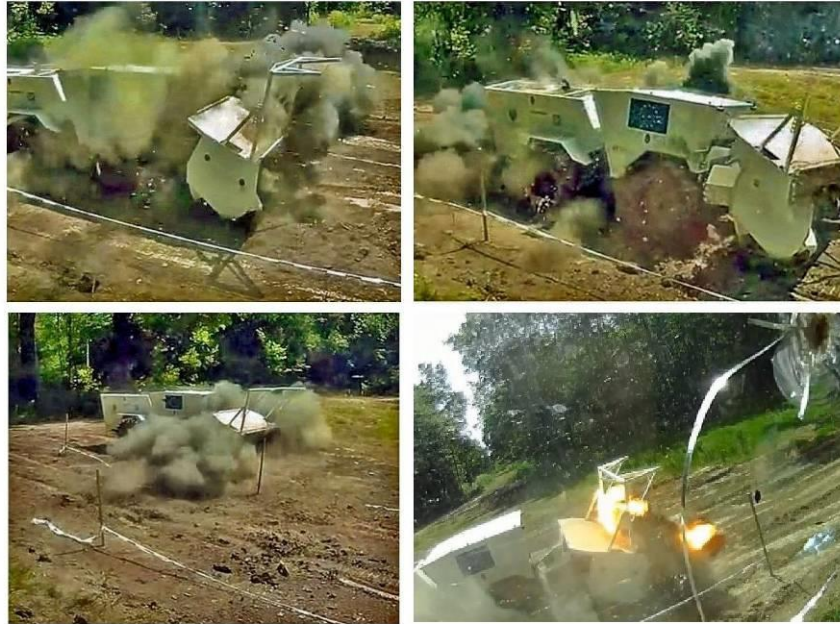
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Emanuela Cepolina, Snail Aid – Technology for Development, Italy

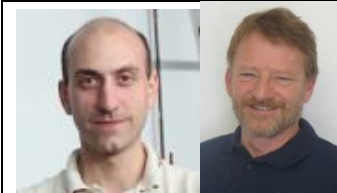


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MINERVA (IDS, Italy) (C-IED)	Operational, prototype	<a href="mailto:l.nuzzo@idscorporation.it">l.nuzzo@idscorporation.it</a>
<b>BILLY GOAT RADIO (Snail Aid, Italy) (risk education)</b>	Operational	<a href="mailto:patfordemining@gmail.com">patfordemining@gmail.com</a>
Hyperspectral Techniques for IED detection	Operational	<a href="mailto:Nikola.pavkovic@ctro.hr">Nikola.pavkovic@ctro.hr</a>
Neutralisation Set	Operational	<a href="mailto:Januszko@witi.wroc.pl">Januszko@witi.wroc.pl</a>
Mobile UXO/IED CONTAINER	Operational	<a href="mailto:Januszko@witi.wroc.pl">Januszko@witi.wroc.pl</a>
C-IED Risk Education for Adults	Operational (free)	<a href="mailto:patfordemining@gmail.com">patfordemining@gmail.com</a> <a href="mailto:A.maslowski@imm.org.pl">A.maslowski@imm.org.pl</a>
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# Area Preparation Tractor APT



The lead partner in the development of the CIED-APT is DIME at the University of Genova.



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# APT C-IED

- The C-IED APT is designed for use when responding to IED threats in an urban environment.
- The C-IED platform can simply replace the area preparation tool on a demining APT or it can be fitted to a dedicated C-IED APT with upgraded (rifle resistant) armour and refined CBRN decontamination features.
- The C-IED platform includes a dozer blade, large manipulator arm, small manipulator arm with disrupters, winch and extra cameras.



# C-IED utility

- The C-IED APT is able to:
  1. move rubble and obstructions aside (delicately when appropriate);
  2. conduct a rapid camera survey of an area, producing accurate map records;
  3. investigate suspicious objects either robustly or delicately;
  4. collect ordnance that may not be safe to move by hand;
  5. disrupt potential IEDs with a water charge, an EFP, or a solid projectile;





# C-IED utility

6. place explosive charges to disrupt or destroy targets;
7. attach hooks and a winch cable to drag heavy items to another place;
8. deploy cutting equipment able to cut an entry into a vehicle/container;
9. deploy a freeze neutralising kit;
10. gain safe entry to a vehicle for internal camera inspection;
11. carry a multi-channel (selective) wireless signal jammer.





The background of the approach is a use of the hyperspectral (HS), the forward looking longwave infrared (FLIR), the forward looking ground penetrating radar (FLGPR), the harmonic radar for detection of non-linear components in non-explosive parts of IED (NLJD), the command line-wire detection (CLWD), the situational awareness decision support system for convoy. All considered follows: "forward detection is a must, and not when vehicle is on top of the IED".



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# MINERVA: a vehicle mounted ground penetrating radar system for IED and mine detection



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# MINERVA C-IED GPR: Specifications



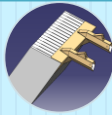
MINERVA C-IED GPR installed on Humvee vehicle

Dimensions (1 antenna module)	~ 80x80x40 cm
Weight (1 antenna module)	< 15 kg
Nominal Antenna stand off	40 cm
Targets	IED laid on surface or buried down to 30-50 cm
Detection width transversal to track	80 cm each module (max. 4 modules = 320 cm)
Typical Speed	> 15 kph

# MINERVA C-IED GPR: Key features

- **High quality data** for improved clutter rejection
- **Low weight antenna array** reduces the overhang payload for the mechanical support, simplifying installation and mobility issues

Closely packed antenna array



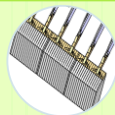
- Radar performances is guaranteed with **variable antenna stand off** from ground;
- This allows **greater mobility** without the need to mechanically adjust the antenna height to track the ground surface

Optimal performance with variable stand off



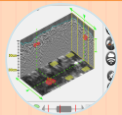
- **Flexible architecture** to configure the system depending on the specific platform (manned or unmanned) and mission profile

Modular architecture



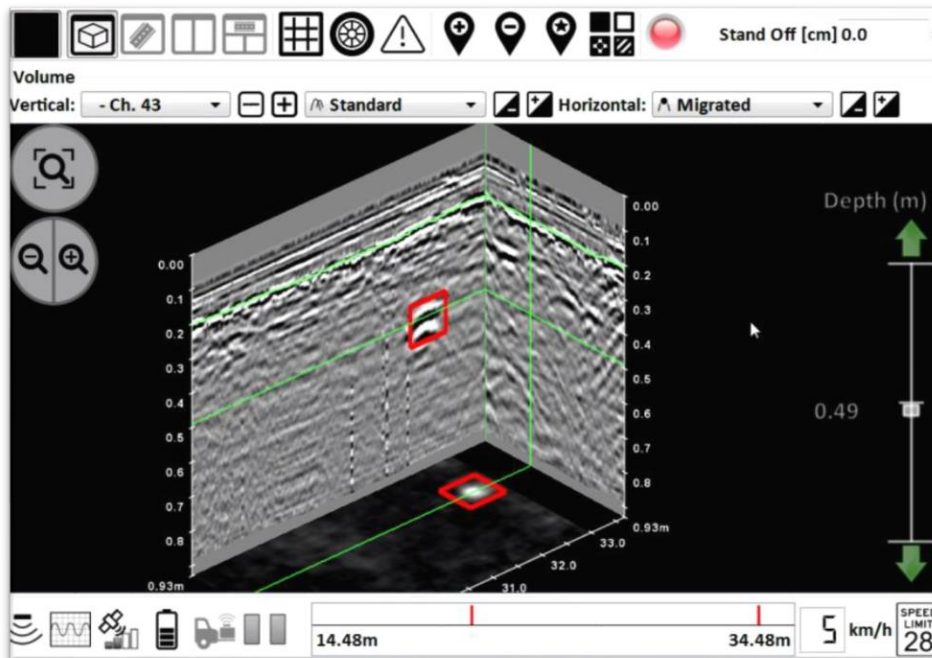
- Based on **automatic** extraction of the object geometry and electromagnetic signature
- Target **database for training** can be improved by the operator

Automatic target classification



# MINERVA C-IED GPR: User Interface

- ▶ The user interface provides intuitive and reliable information during real time acquisition (“RUN” mode)
- ▶ “PAUSE” mode allows deeper analysis of data to confirm automatically generated alarms



## RUN mode

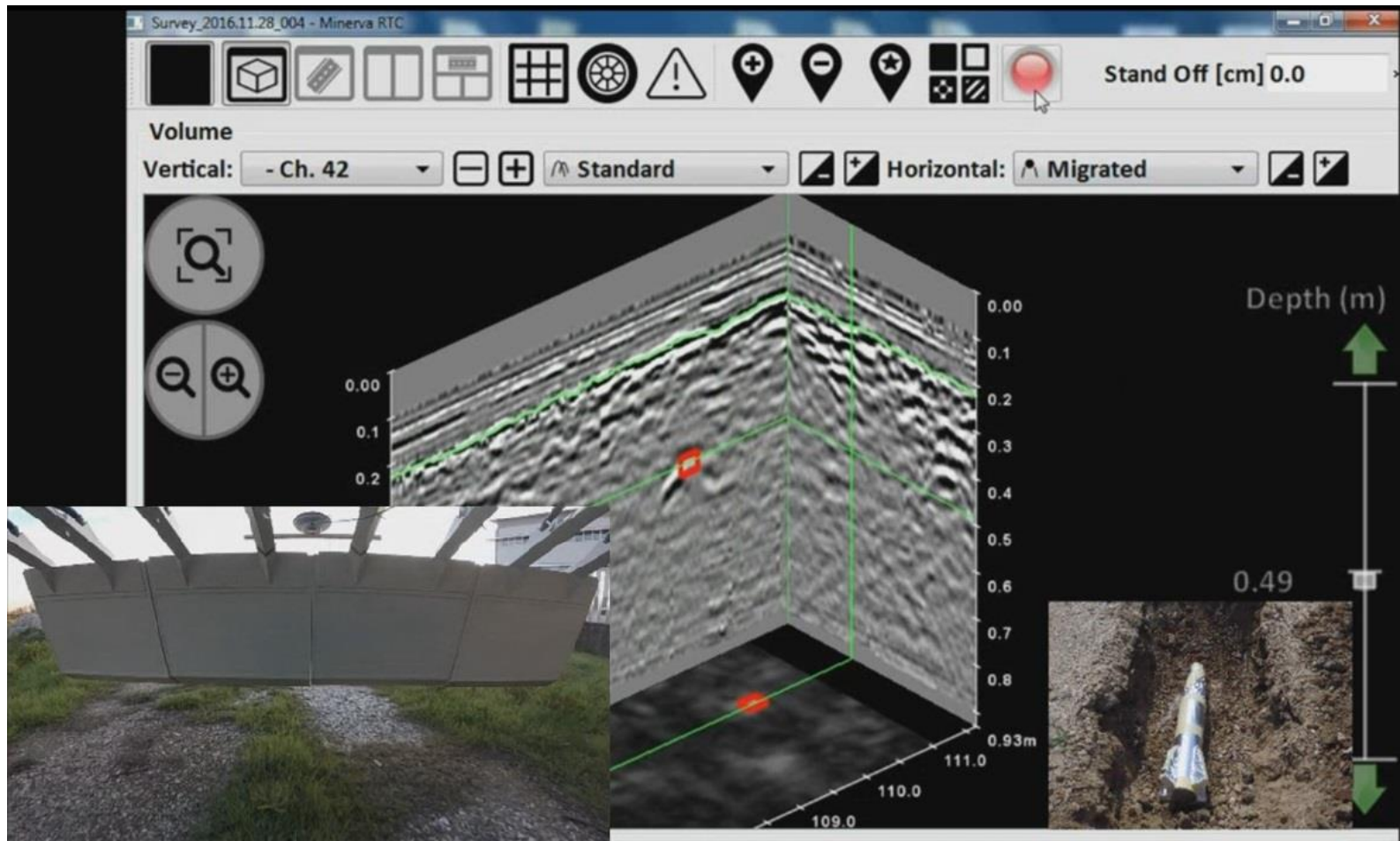
- Data acquisition mode on the run
- Automatic detection and alarm generation

## PAUSE mode

- Activated automatically when the vehicle stops (returns to RUN mode when the vehicle moves off)
- The acquisition systems are active but when the vehicle stops, no data are acquired
- Useful to analyze data in potentially hazardous situations

# MINERVA C-IED GPR: Examples

Deep, longitudinal dummy IED



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C-IED Protection

- ✓ EASY TO USE - Field ruggedized
- ✓ COMPREHENSIVE MATERIAL EVALUATION AND IDENTIFICATION
- ✓ PROVIDES THE CRITICAL SAFETY INFORMATION



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# Billy Goat Radio

an innovative tool for risk education



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# Billy Goat Radio: the system



Billy Goat radio is a Risk Education (RE) tool allowing operators living in mine and other explosive affected areas to produce

**short educational serial dramas**

which will be broadcast by **radio** and performed live by a team of local actors travelling through the interested region.

# Billy Goat Radio: key points



Tested successfully together with local NMAAs in two very different contexts: the Sahrawi refugee camps in south-west Algeria and in Pailin region, Cambodia.



Cost-efficient system, based on educational entertainment theory



Adaptable to different contexts and risks, including IEDs, landmines and UXOs. Easily adaptable to other risks



Designed to promote sustained behavioural change



Embedding impact assessment



# Information Management in mine action

## “It all starts in the field”



**Contact: Torsten Vikström, founder of SITE.**

He was project manager for the T-IMS development  
within the European Union's TIRAMISU-project.

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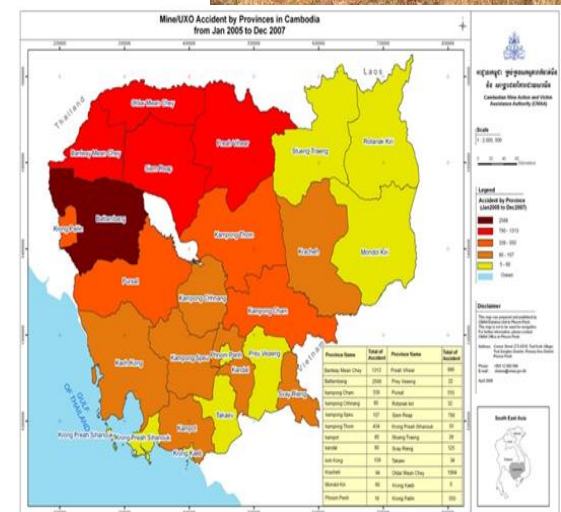
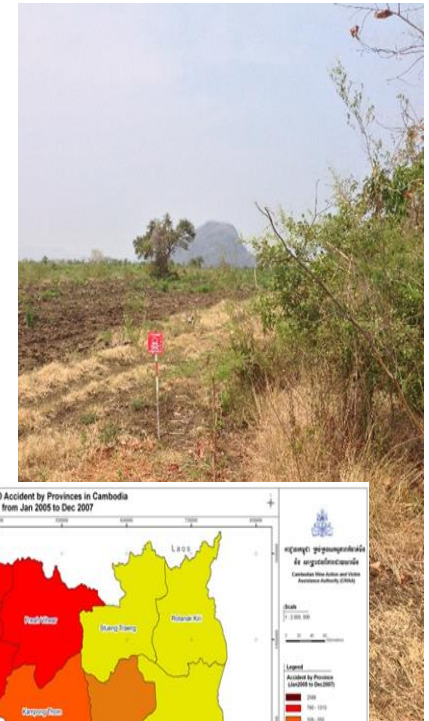
# T-IMS — SITE Information Management System

- Operationally validated by HCR-CTRO (CROMAC-CTDT)
- User-friendly and intuitive field data collection tool built on touch technology, no need for a keyboard or a mouse
- Full compliance with international standards for land release (IMAS 7.11)
- Adaptable input forms for easy customization
- Runs with Esri map engine and supports all well established map formats and layering of data
- For use in the early stages of non-technical surveys through the phases of technical survey and mine clearance as well as quality assurance/quality control, reporting and analyses
- Any type of attachment — such as georeferenced photos, images, documents and voice recordings — can be attached to any activity
- Communicates with IMSMA NG and is a part of the new “IMSMA Core Eco-system”
- Optionally equipped with JMU's ordnance database — CORD, giving access to approximately 5 000 ordnance objects in T-IMS off-line
- Operates on Windows platform (tablet, laptop etc), with internal or external GPS connected
- Ability to use a rangefinder for positioning of objects in the map directly in the field situation
- Runs with 100% functionality off-line and does not require internet or WiFi connection
- Hosts a user and support program



# Experiences from the field, Battambang Province in Cambodia

- Case study of T-IMS together with GICHD and the Cambodian Mine Action and Victim Assistance Authority (CMAA) at three (3) minefields where the Cambodian Mine Action Centre (CMAC) were conducting clearance operations.
- Non-technical survey (NTS), technical survey (TS), quality assurance (QA) and quality control (QC).
- SHA, CHA, turning points, safe routes, benchmark, area cleared, findings (landmines), videos captured, photos taken, GPS-tracking made etc.
- Reports created.





# Experiences from the field, Battambang Province in Cambodia



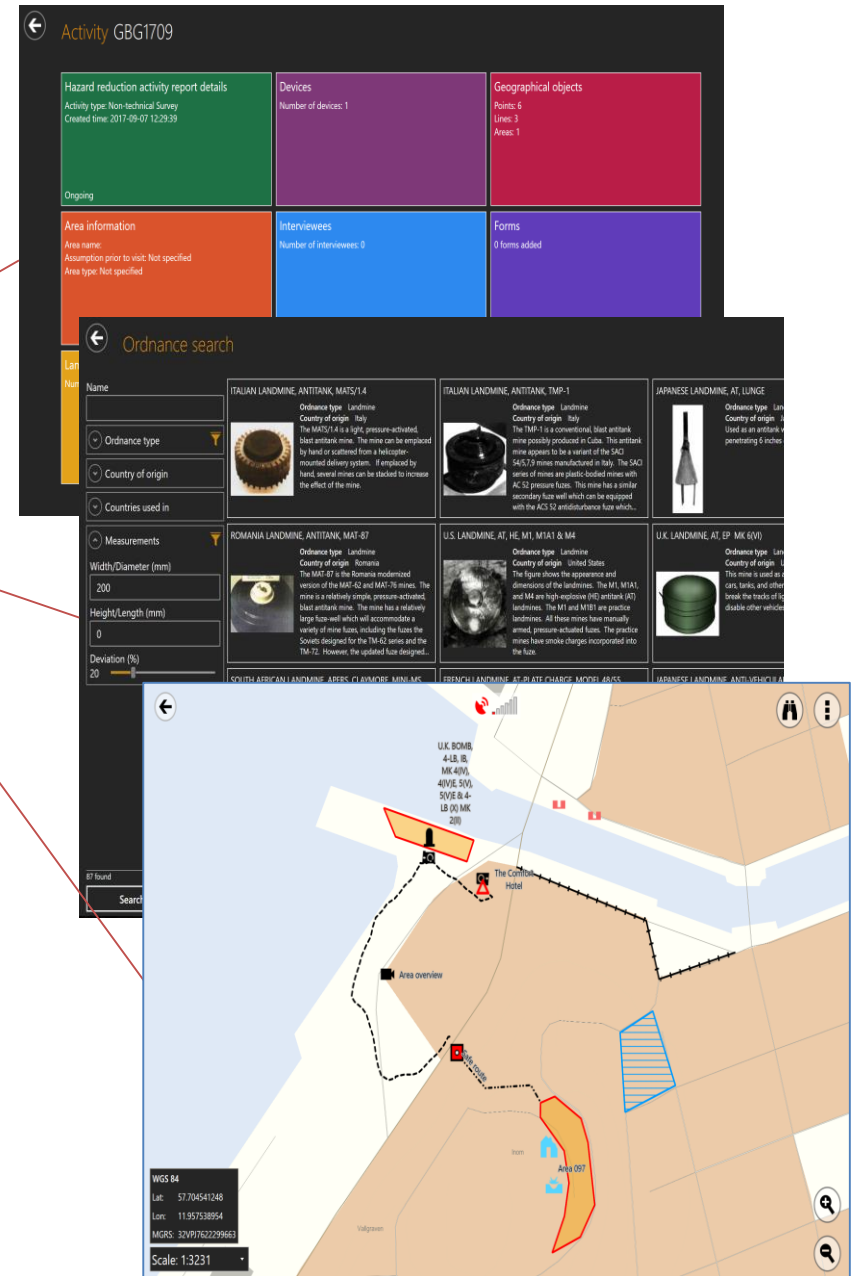
*More: Article of the Cambodian case study  
in the Journal of Conventional Weapons  
Destruction, issue 20.2.  
“From the field: Mobile technologies for  
Mine Action”*

**The complete documentation was made directly in the field, without any additional office work afterwards. Average time spent on reporting was between 15 and 30 minutes.**





# T-IMS, fundamentals

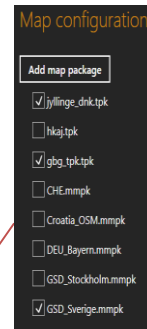




# T-IMS, GIS based

## The map module in focus

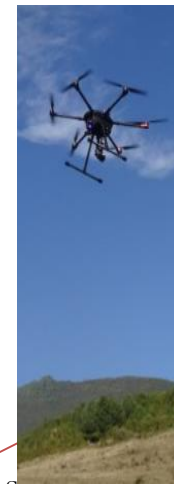
Map data & layers  
[Esri ArcGIS Pro]  
.TPK, .MMPK



Ordnance database  
[CORD (~5 000 objects)]  
.XML



UAV / UAS  
Geotiff



SMART Dog vest  
maXML



GPSTracker  
[Qstarz]

GPS (*unless built-in*)



Laser Rangefinder  
[Truepulse 360(R),  
Vector]



Videos



Photos



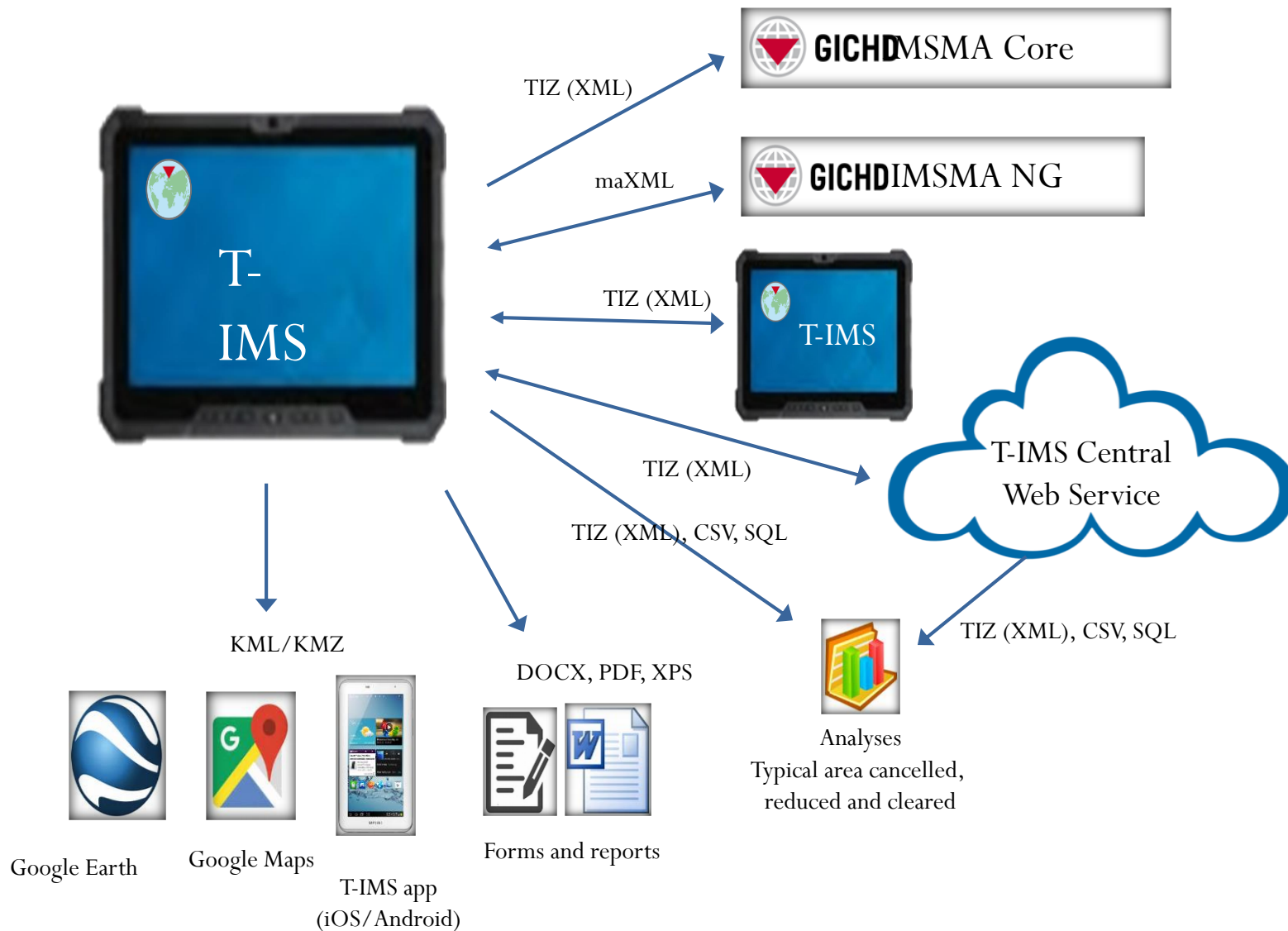
Voice  
recordings



Attachment  
of any type

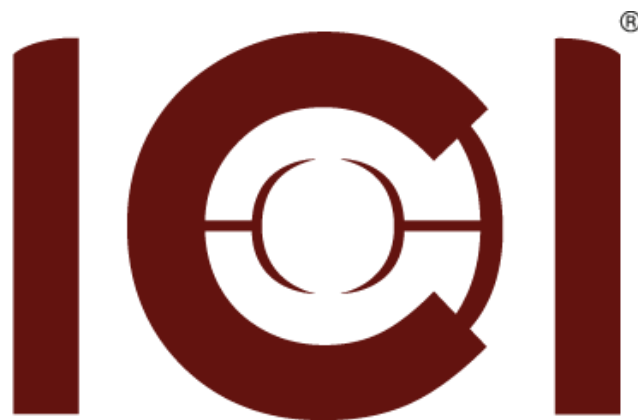


# T-IMS, share your data!



# Hazardous Substances Management Solutions





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