A high-speed photograph of a water splash, showing a large central droplet with smaller droplets trailing off to the right, set against a plain white background.

SPARTACUS navigation and communication technologies in crisis management

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D • APPOLONIA

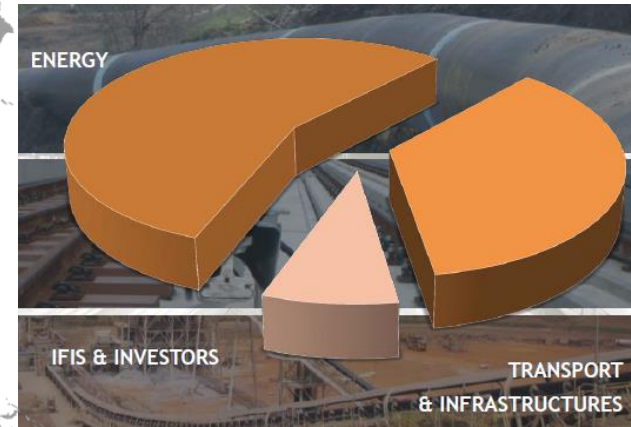
consulting, design, operation & maintenance engineering

D'Appolonia in brief

- Large (> 1400 employees) engineering company
- Headquarters in Genoa (Italy)
- Founded in 1956 - From 2011 part of the RINA group

OFFICES

- Washington DC
- Santiago
- Montevideo
- Bruxelles
- Rotterdam
- Saint Petersburg
- Milan
- Genoa
- Rome
- Cairo
- Maputo
- Durban
- Bucharest
- Istanbul
- Basra
- Abu Dhabi
- Mumbai
- Beijing
- Seoul
- Jakarta
- Accra



Outlines



SPARTACUS



SATELLITE BASED ASSET TRACKING FOR SUPPORTING
EMERGENCY MANAGEMENT IN CRISIS OPERATIONS

- Satellite Technologies as Enabler
- Needs and challenges in crisis management
- SPARTACUS as support to crisis management
- Application domains and SPARTACUS System
- Communication network
- Conclusions

WWW.SPARTACUS-PROJECT.EU

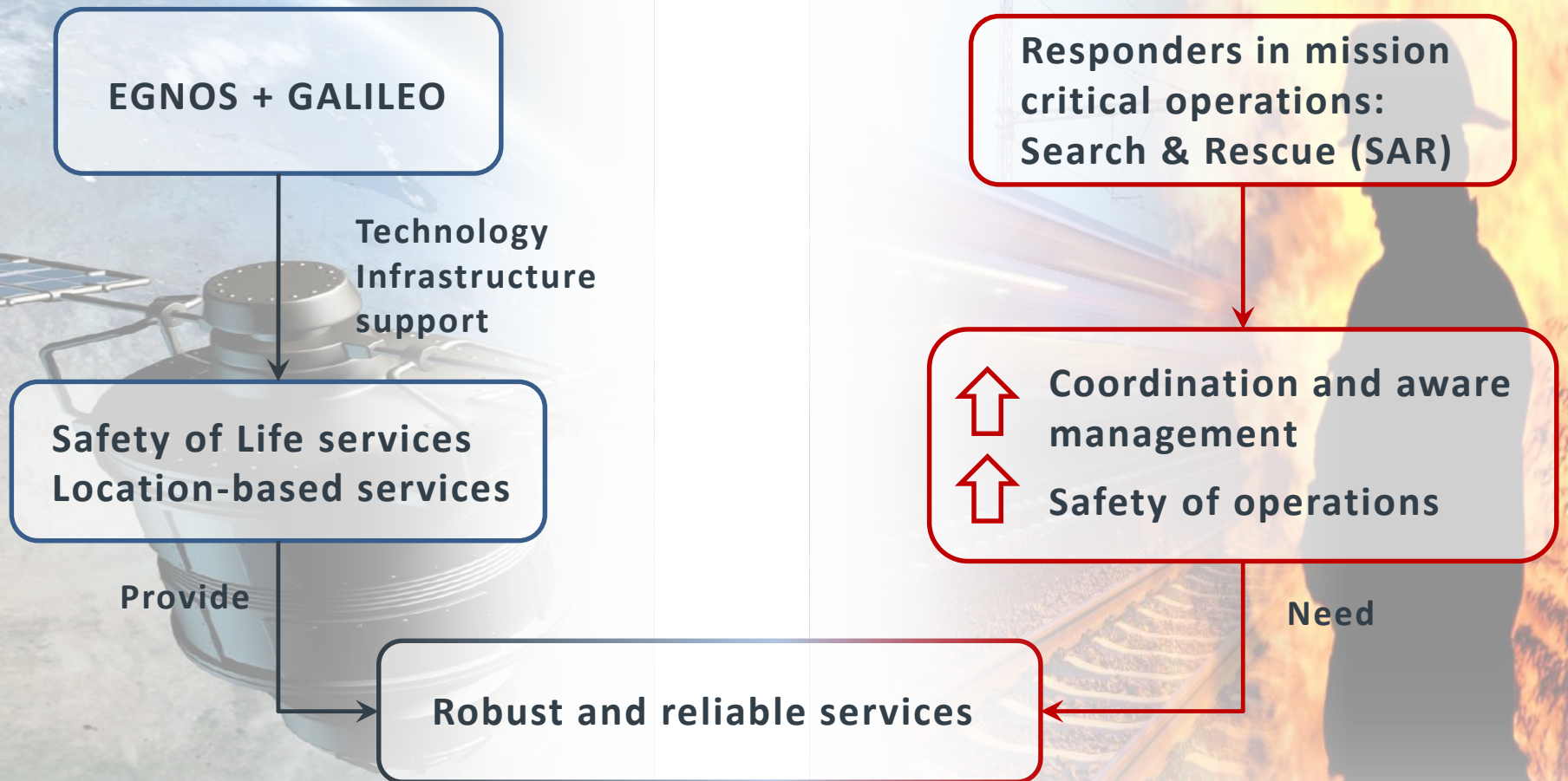


Satellite technology as enabler

- Satellite Navigation and Communication technologies as key enabling solutions to support response and operations in the aftermath of an event
- Satellite Navigation Technologies used (or enabled) by Spartacus:
 - GNSS (e.g. GPS, Glonass, Beidou) are a consolidated technology for positioning and tracking
 - SBAS (e.g. ENGOS) are nowadays used and consolidated (more and more used in aviation application) and GALILEO

As EU Space Infrastructure GALILEO (launching phase almost completed; operative soon) together with EGNOS will provide more robust positioning capability useful especially in applications where signal continuity and signal integrity are required

Satellite technology as enabler



Needs and challenges in crisis management

- **Positioning and Navigation challenges**
 - Vital to know the exact geographical **location** (of affected people and rescue teams) **with high accuracy** in disaster areas
- **Data transfer and communication challenges**
 - Data need to be transferred in a secure and trusted way **independently** by the condition of local communication infrastructures
- **Data visualization and mapping**
 - Knowing in almost **real-time what is happening, where and when** remains one of the central challenge in the decision-making process during crisis management

Kristalina Georgieva, European Commissioner for International Cooperation, Humanitarian Aid and Crisis Response, speech on November 2011· Brussels

SPARTACUS as support to crisis management

Small to Medium Enterprise (SME): 4

Large Enterprise (LE): 3

Research and Academia (RES): 5

Project full title: *Satellite Based Asset Tracking for Supporting Emergency Management in Crisis Operations*

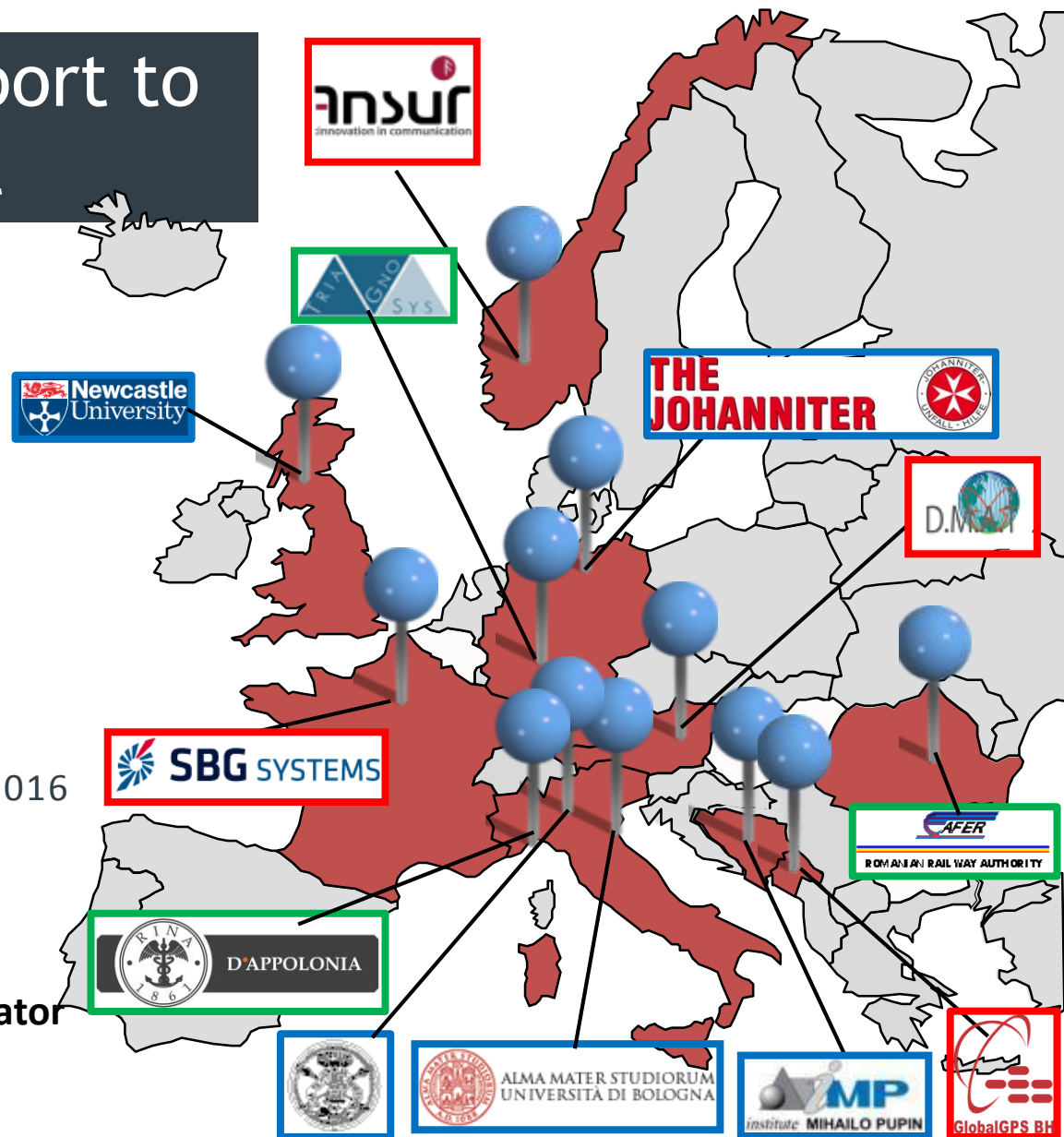
Project Acronym: SPARTACUS

Period: November 2013 – October 2016

Partners: 12

Website: www.spartacus-project.eu

Project coordinator



SPARTACUS as support to crisis management

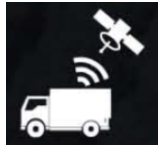
Solutions for **location awareness** in the context of **crisis management** based on existing (GPS, EGNOS, EDAS) and incoming (GALILEO) **satellite** services and **technologies** providing precise **tracking/positioning**, ensuring **no lacks of communication and no gaps of information**

Application areas

Assets Tracking



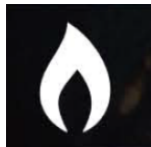
RAILWAY



LOGISTICS

Tracking, tracing and **localization** of **critical transport assets** even in case of major failure of existing networks from sending side to the receiving/end place

Crisis Management



Disaster Response

Support and **ensure** the **safety of first responders** in crisis management

SPARTACUS as support to crisis management

SPARTACUS enhances the use of **satellite and communication technologies** with the aim of becoming a de-facto standard in large-scale disasters during the management of the crisis

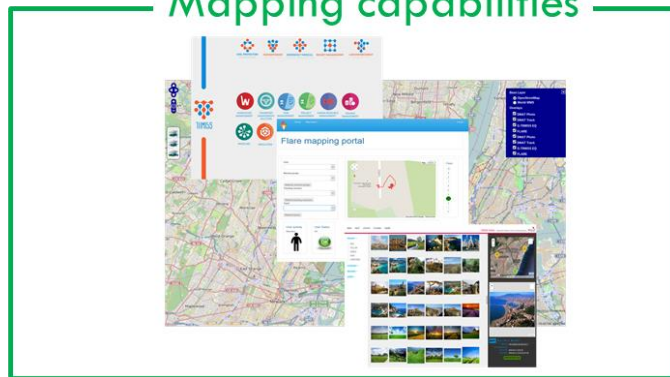
Tracking capabilities



Communication capabilities

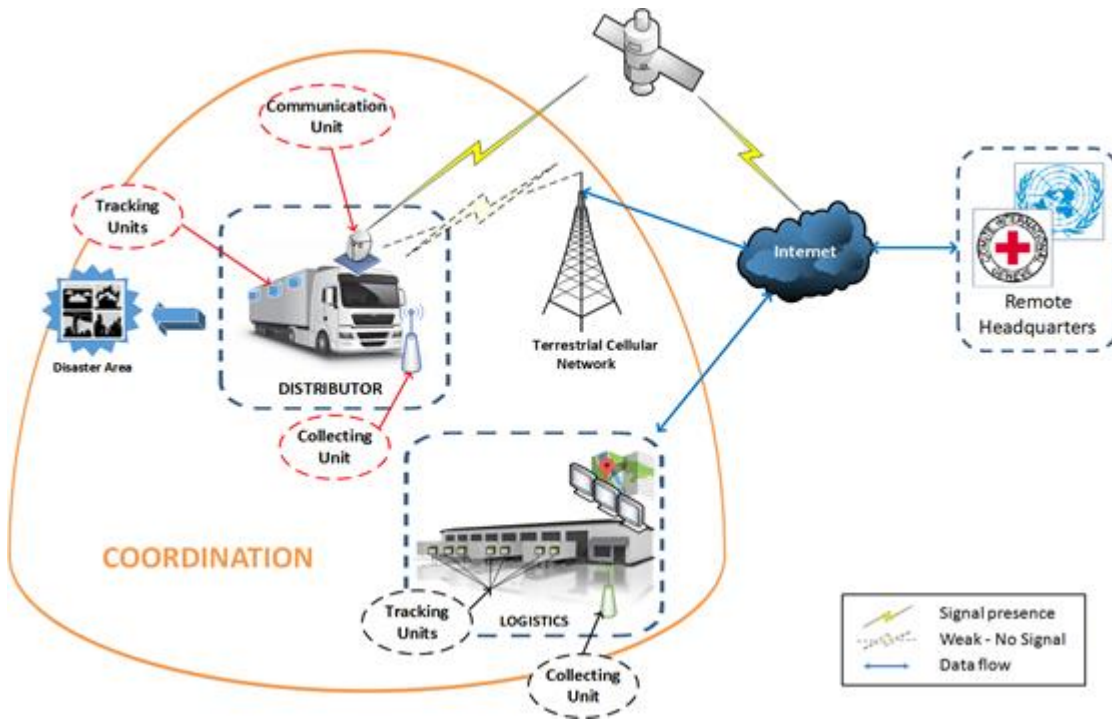


Mapping capabilities



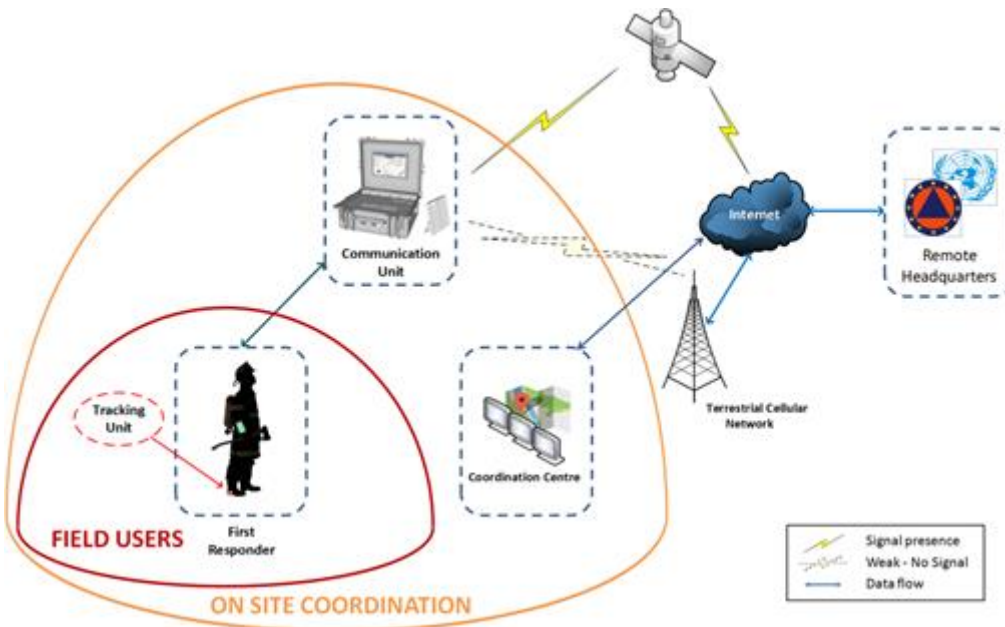
Application domains

ASSET TRACKING

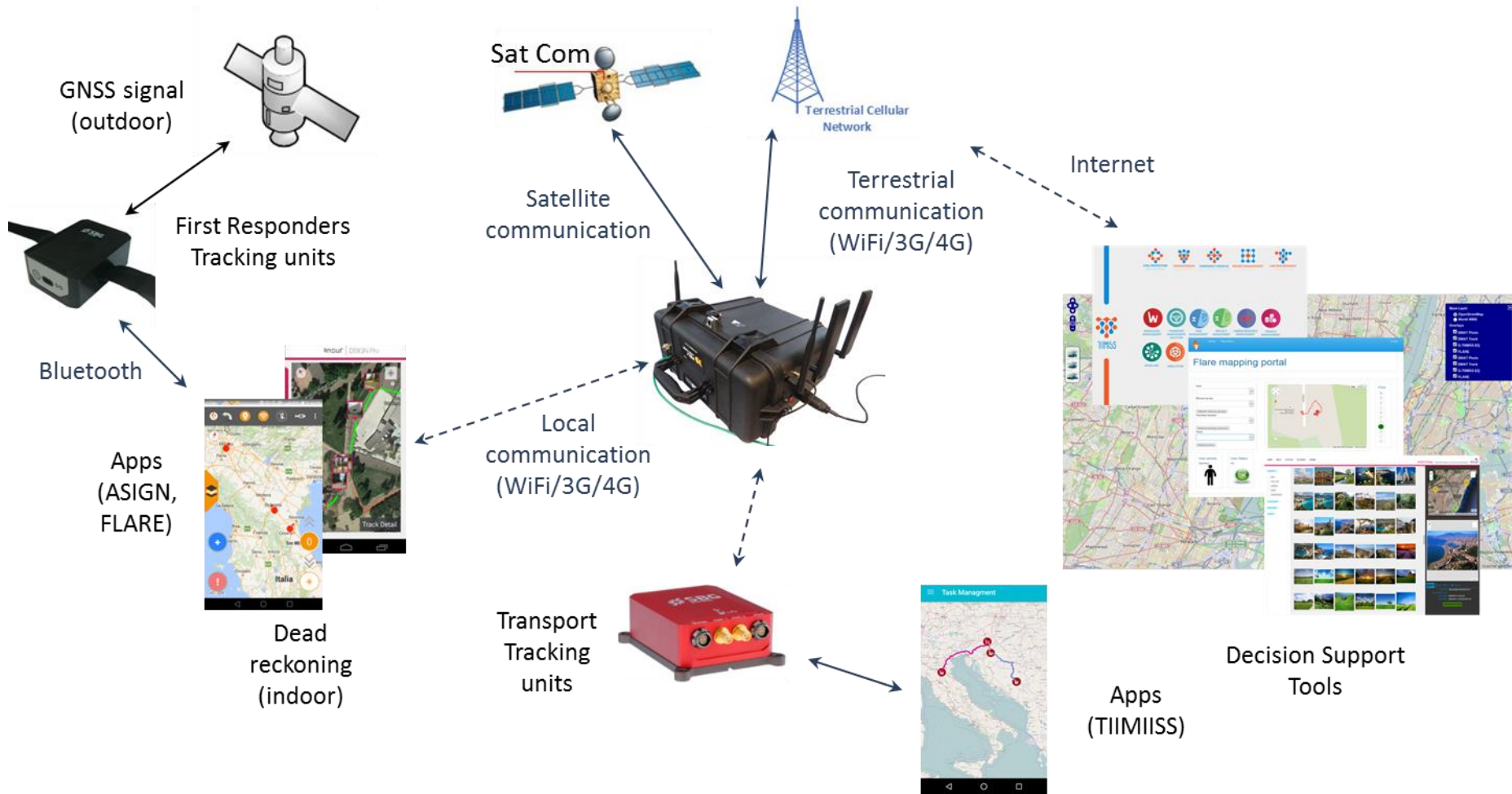


Application domains

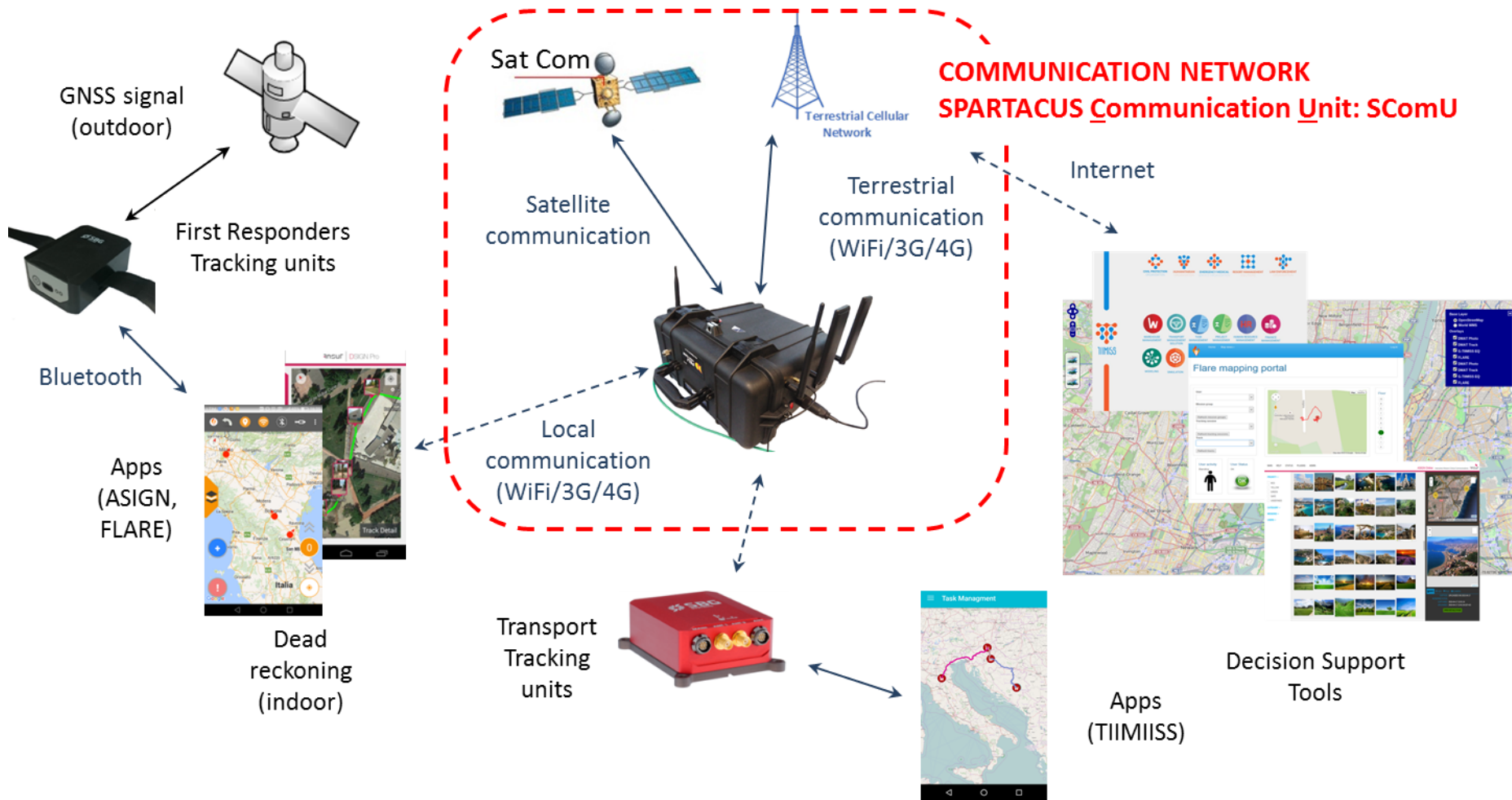
CRISIS MANAGEMENT



SPARTACUS system

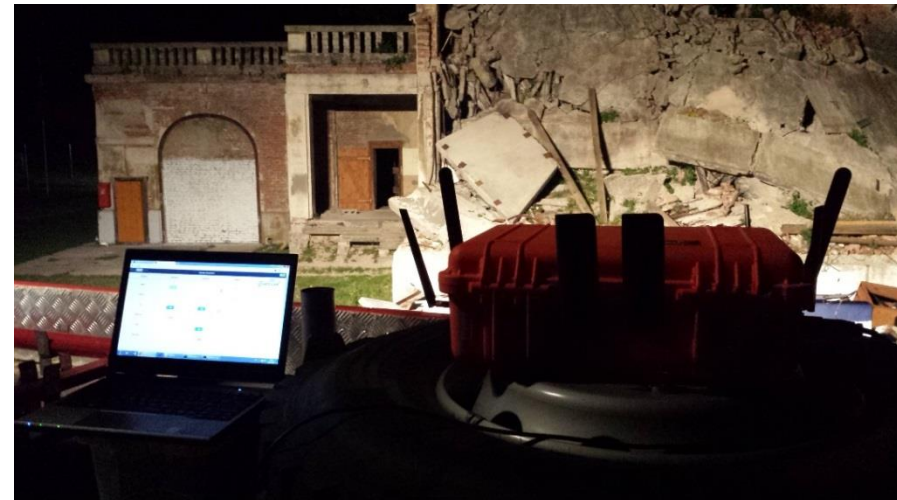


SPARTACUS system



Communication network

- **Aim:** Exploit satellite communication backhauling to restore the local communication OR to establish a dedicated communication in the aftermath of an event
- **Result:** Lightweight communication units that integrates
 - Terrestrial mobile radio network
 - Wi-fi
 - GSM
 - 3G, 4G
 - TETRA features
 - Satellite communication network
 - BGAN
 - DVB-RCS



Courtesy of TriaGnosSys GmbH: Use of SPARTACUS
Communication Unit during EU-ModEX exercise – June 2016

Communication network

COMMUNICATION SOLUTIONS SPARTACUS Communication Unit: SComU



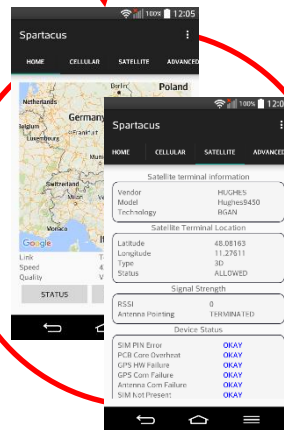
SComU for Transport Application (rail)



SComPU: Portable version



SComTU: Transportable version



Link Awareness System (Connection manager)



SENTINEL (HW/SW control, power and health monitoring)



Innovations

- **Communication Technologies in Portable Solutions**
 - Single access point exploiting more technologies
 - High data rates (4G)
 - Hundreds of users through Wi-Fi and terrestrial networks
 - Reduced weight and size, user and application customization
- **Use of Backhauling Links for Remote Communication**
 - Cellular and satellite backhauling links
 - Innovative Link Awareness System (LAS) with dedicated protocol
 - Cognitive Link Selection Algorithm
- **Users' Features / Provision of Services**
 - TETRA-like features (group call, push-to-talk, pre-emptive calls)
 - Support of live video streaming 1-to1 and 1-to-many
 - Text messaging
- **Interoperability and Supervision (health components monitoring)**

Summary and Conclusions

- SPARTACUS support Crisis Management by means of (Satellite) Navigation and Communication Technologies and Capabilities
- Communication Capabilities in SPARTACUS are exploited through different Units (3 types) copying with different needs featuring:
 - **Single access point for communication**
 - **Light and small form factor** making “communication” **portable**
 - **Independency from external infrastructures** and **ready to use** (standalone)
 - **Link Awareness functionalities** (smart use of communication channels) enabling **connectivity over different networks**
 - **Integrated SIP server for interoperability**
 - **TETRA features**
 - **User friendly interface**

More on SPARTACUS @

- Project Website: www.spartacus-project.eu
- D'Appolonia company website: www.dappolonia.it

SPARTACUS2
SATELLITE BASED ASSET TRACKING FOR SUPPORTING EMERGENCY-MANAGEMENT IN CRISIS OPERATIONS

WWW.SPARTACUS-PROJECT.EU

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Logos: D'APPOLONIA, D.M.A.T., newrail, Newcastle University, CAFER, ROMANIAN RAILWAY AUTHORITY, TRIA GNO SYS, ZODIAC AIRBORNE, ANSUR, SBG SYSTEMS, DIE JOHANNITER, ALMA MATER STUDIUM UNIVERSITA DI BUCURESTI

CRITICAL TRANSPORT ASSETS TRACKING

TIIMISS Applications
Goods tracking & Driver assistance
Delivery report & warehouse management

Tracking Unit
Multiple transport assets tracking

Communication Unit
Transportable unit
Local wireless access point & Satellite backhaul link

SPARTACUS Mapping Portal

Fleet Management | Decision Support Tool | Location Based Services

FIRST RESPONDERS TRACKING & GUIDANCE

FLARE Applications
Navigation and guidance (indoor and outdoor)

ASIGN Applications
Optimized observation collection (audio/video/text/pictures)

Tracking Unit
First responders tracking

Communication Unit
Portable unit
Local wireless access point & Satellite backhaul link

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TRIA GNO SYS



consulting, design, operation & maintenance engineering

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