ONESOURCE

Consultoria Informática Lda.

Sensorized Situational Awareness for PPDR Operations

Luís Cordeiro
cordeiro@onesource.pt
http://mobitrust.onesource.pt

Background

Working on broadband PPDR communications since 2012:

- 2012-2014: LiveCity Project (OTE, Deutsch Telecom, Telefonica O2…)
  Wearable, live HQ video communications for emergency medical services
  Best Demo Award - Future Internet Assembly 2014 (Athens)
- 2014-2016: SALUS Project (Airbus D&S, ALU/Nokia, Rohill, PSCE…)
  Scouting of new services enabled by broadband PPDR communications
  Security, 4G integration, integration of bio- and environmental sensors
  ICCA Award 2016 for Best Evolution to Future Broadband
- 2016-2019: Mobitrust Project (Gemalto, AIRBUS D&S, NXP Semiconductors…)
  Terminal security, enhanced and secure platform for bio- and environmental sensors, data processing toolkit, device management.
  2017 CATRENE Innovation Award

Broadband PPDR Communications

not just a faster pipe…

Moving from voice-oriented PPDR to data-oriented PPDR applications:

- Voice (still as important as in the past!)
- Video + live HQ video + live 2-way video + …
- Secure messaging apps
- Sensorized awareness of the operations scenario

plus a whole bunch of added bonuses, regarding security, usability, manageability, operations costs, etc.

In 2012…

2012-2014: LiveCity Project (OTE, Deutsch Telecom, Telefonica O2…)
Wearable, live HQ video communications for emergency medical services

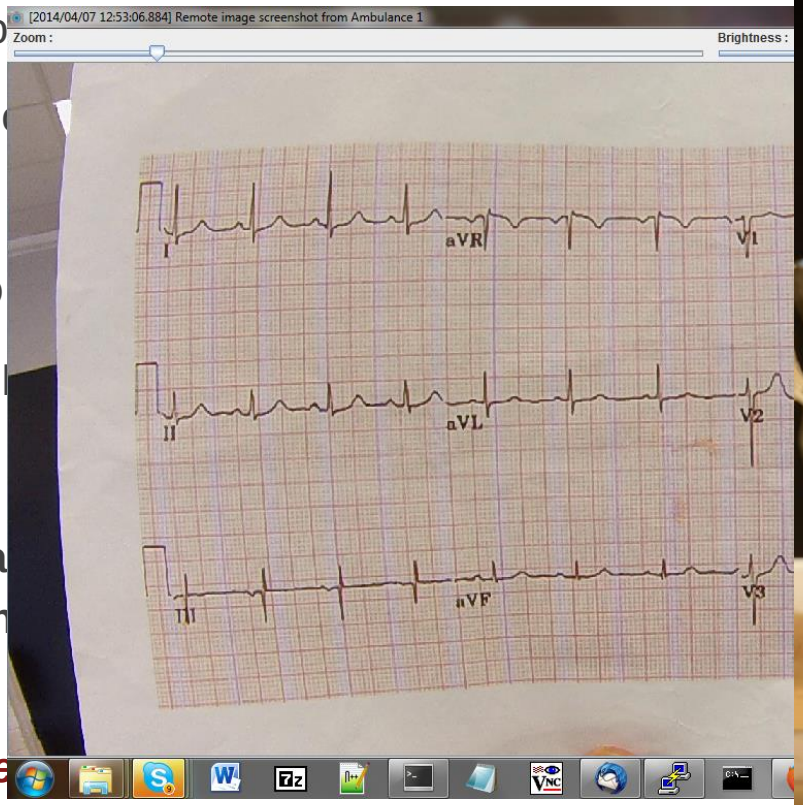
Objectives

- Send HQ video from the field to an emergency medical service
  1. Analyse the field situation
  2. Analyse a field patient status (eyes, face, etc.)
  3. Analyse a field printed ECG diagram at the medical service
- Wearable and robust
- Enough battery to support an emergency scenario

What we came up with…

- Pro
- 2 h
- 3G
- HD
- Still

Valida
Dublin



Future
Best Demo Award

Lessons learned

- 3G networks have limited bandwidth and poor resource management
  - Dropped connections
  - Limited connections inside buildings
- Image stability/quality/pixelization/delay
- Too many individual components to manage (batteries, buttons, etc.)
- Bulky and uncomfortable equipment
- Rugged equipment required
  - Broken connectors
  - Broken components
  - Heat, water, fire and crush resistant
- Real time physiological parameters streaming

Live video in PPDR scenarios

Not as simple as it looks, even in the era of Periscope and Facebook Live!

- Need for very rugged, wearable and specialized equipment (camera, microphone, coding and transmitting equipment, etc.)
- Equipment controls need to be accessible (e.g. when using specialized, rugged gloves) and may never distract the PPDR responder from his/her mission
- Live encoding and transmitting of high-quality video communications still imposes a small but perceptible lag in the video, which affects two-way communications.
- Video visualization on the first-responder side might be not simple (imagine asking a fireman to use Google Glass during a fire!). Fortunately, in many cases 2-way video is not necessary (or even desirable).
- Video streaming from various sources, in large PPDR operations, will quickly exhaust radio resources, requiring sophisticated resource management involving the CCC (which video streams have higher priority?), the network (how to reserve resources?) and the PPDR terminal (adjust video quality, suspend streaming, etc.).

The next step after video?

Since at the time we were focused on medical emergencies, the obvious next step was to **start diagnosing patients** onsite, before moving them to the ambulance…

- Send complete ECG data from the disaster scene to specialized medical staff (at the CCC or at the Hospital destination)
- Do the same for other medical emergency sensors
- Pre-process data locally for optimizing transmission (bandwidth, latency)

In 2014…

2014-2016: SALUS Project (Airbus D&S, ALU/Nokia, Rohill, PSCE…)
Scouting of new services enabled by broadband PPDR communications
Security, 4G integration, integration of bio- and environmental sensors

Objectives

- Evaluate 4G networks for advanced PPDR services
- Improve Situational Awareness at the CCC
- Support live High-Quality video
- Add live geolocation and biosensors-based monitoring of PPDR field teams (ECG, “man-down”, respiration rate, etc.)
- Wearable and robust


JSP

Lessons learned

- Simply providing more data at the CCC might actually make it more difficult to acquire proper situational awareness the CCC
  - Risk of information overload for CCC operators
  - Need to pre-process and prioritize provided information
    - Use filters and alarms to keep a clean, focused CCC dashboard (e.g. fatigue levels are relevant only above a certain threshold)
    - Use drill-down visualization for detailed view of specific data
- Even normal operations will produce a high number of event messages
  - Filter/pre-process events
- Limited connectivity inside buildings, elevators and basements
- Limited range of (actually useful) sensors available

Sensors in PPDR scenarios

When does *many* become *too many*?

The good and the not so good:

- Many of the useful types of sensors are already available, certified for medical operations, and routinely carried by the first responders
  – lower acceptance barriers.
- However, many of those sensors are still not rugged enough for longstanding field operations (though this has improved a lot in recent years)
- When applied to victims (e.g. medical emergencies), detailed sensor's data is often relevant only to paramedics and destination hospitals, not the CCC itself
  – it is necessary to devise ways to control access to data
  – need for appropriate routing of data streams to relevant recipients

The next step after sensors?

Managed and secure ecosystem of terminals, sensors and CCC applications

- Improve device, sensor and team management
- Improve the way sensors are added to the ecosystem
  (enable wireless connectivity between sensors and PPDR terminals, enhanced addition/removal of sensors to CCC apps, etc.)
- Improve Situational Awareness *also* for the field team
  (e.g. make subset of CCC applications available at their terminals)
- Improve overall security
- Improve forensics capabilities

In 2016…

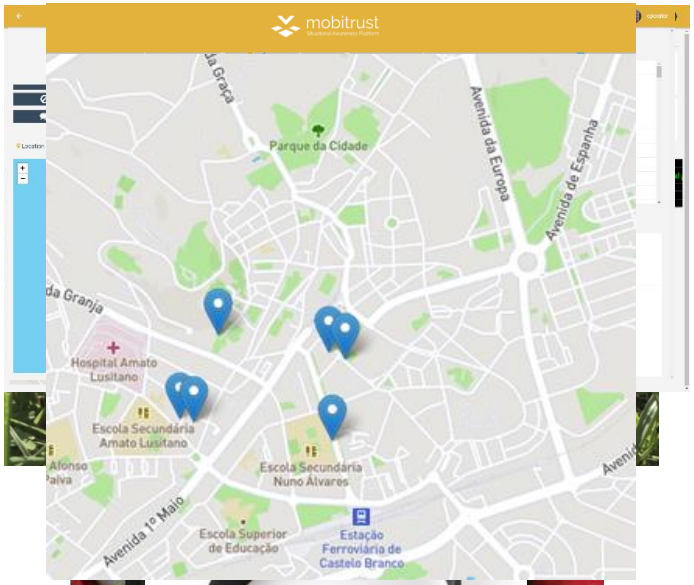
2016-2019: Mobitrust Project (Gemalto, AIRBUS D&S, NXP Semiconductors…)
Terminal security, enhanced and secure platform for bio- and environmental sensors, data processing toolkit, device management.

Objectives

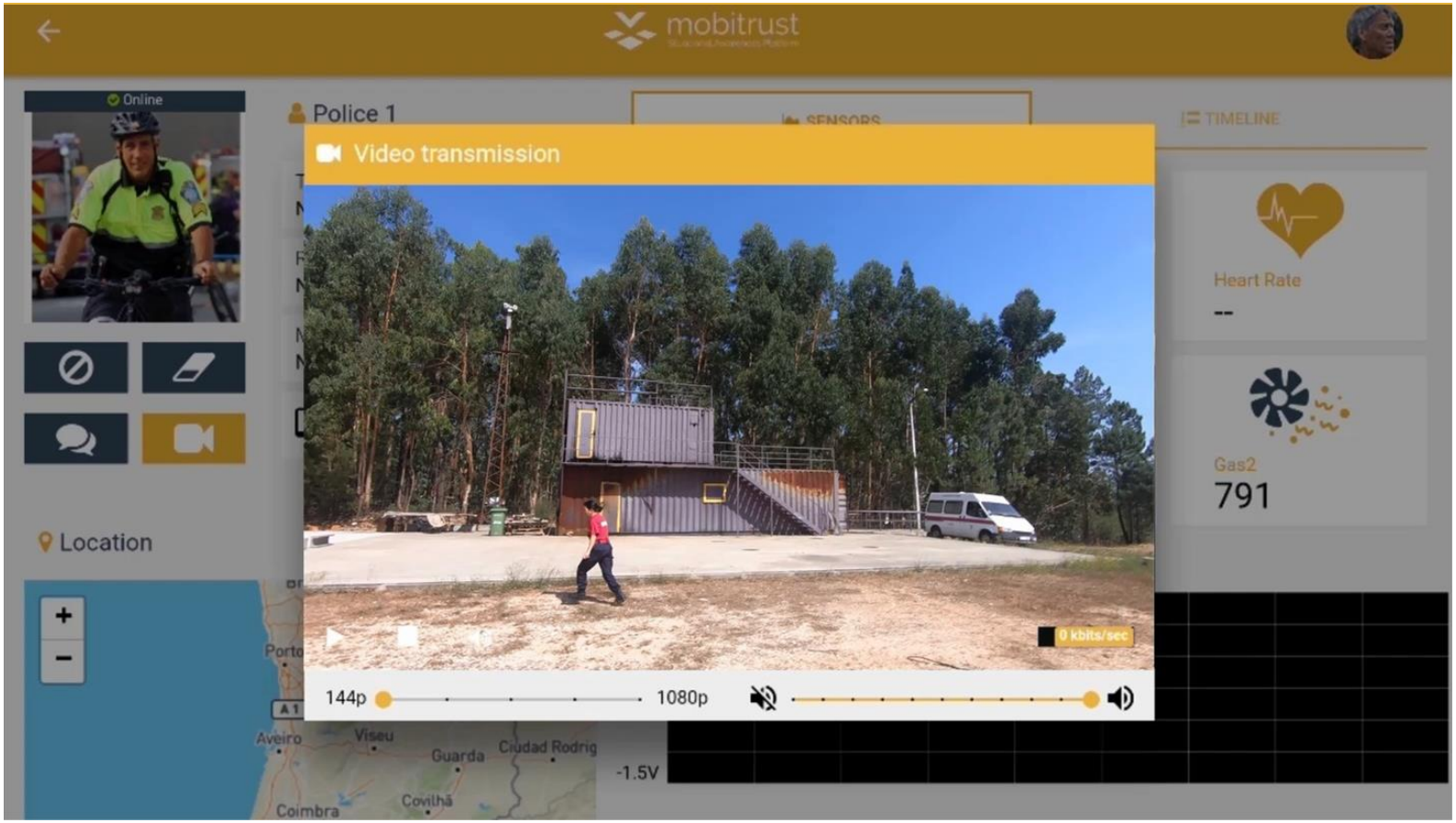
- Complete Situational Awareness for PPDR
- Mobile devices PPDR ecosystem
- Secure terminal devices
- Secure authentication

What we came up with…

- Complete situational awareness solution
- Advanced sensors data from the field
- Continuous monitoring of field operations
- Integrated management for teams and terminals
- Secure user authentication and authorization
- Secure terminals



Situational awareness



mobitrust
Situational Awareness Platform

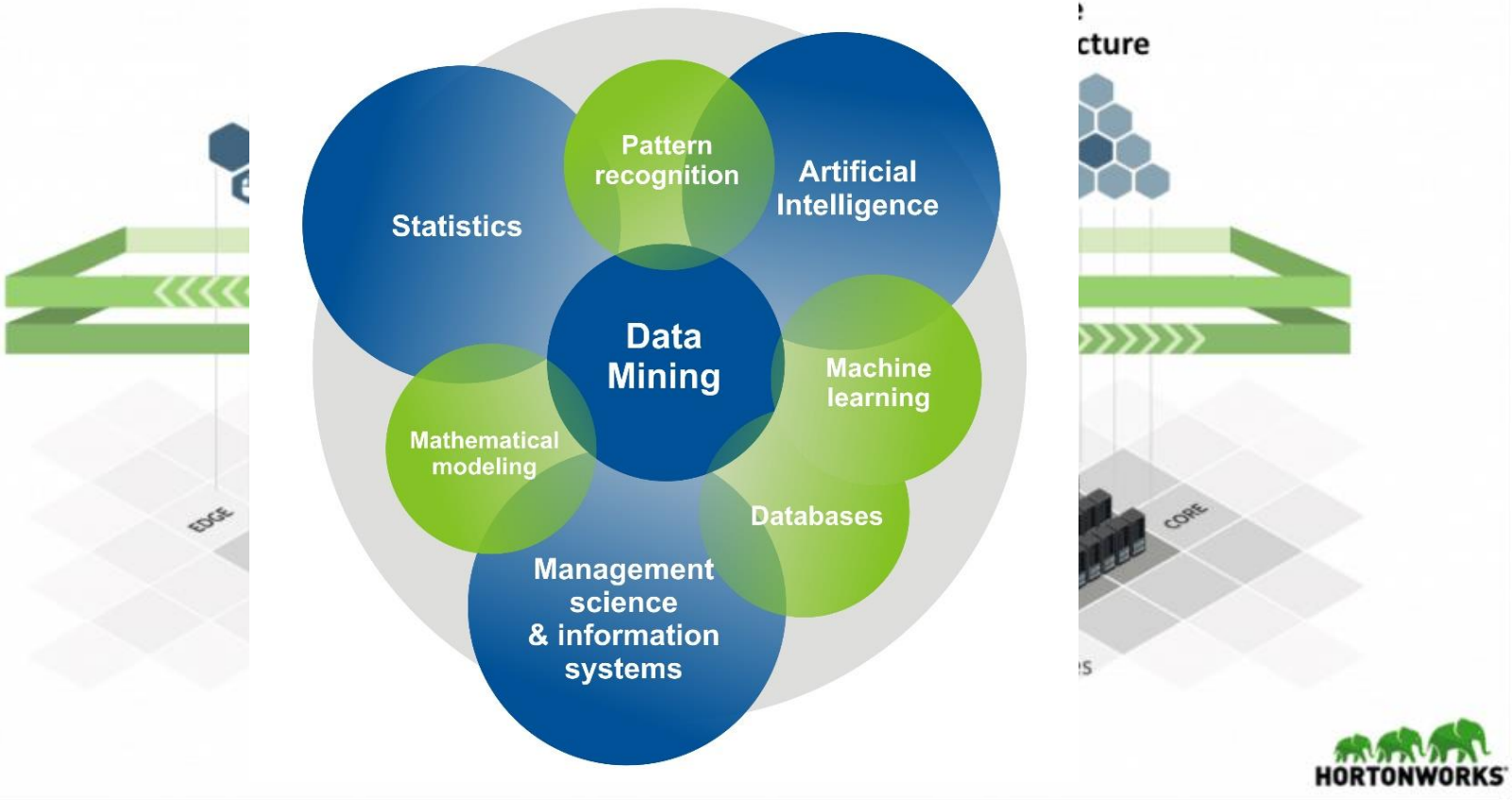
But all of this you can see in movies…

Where are we?

Field context

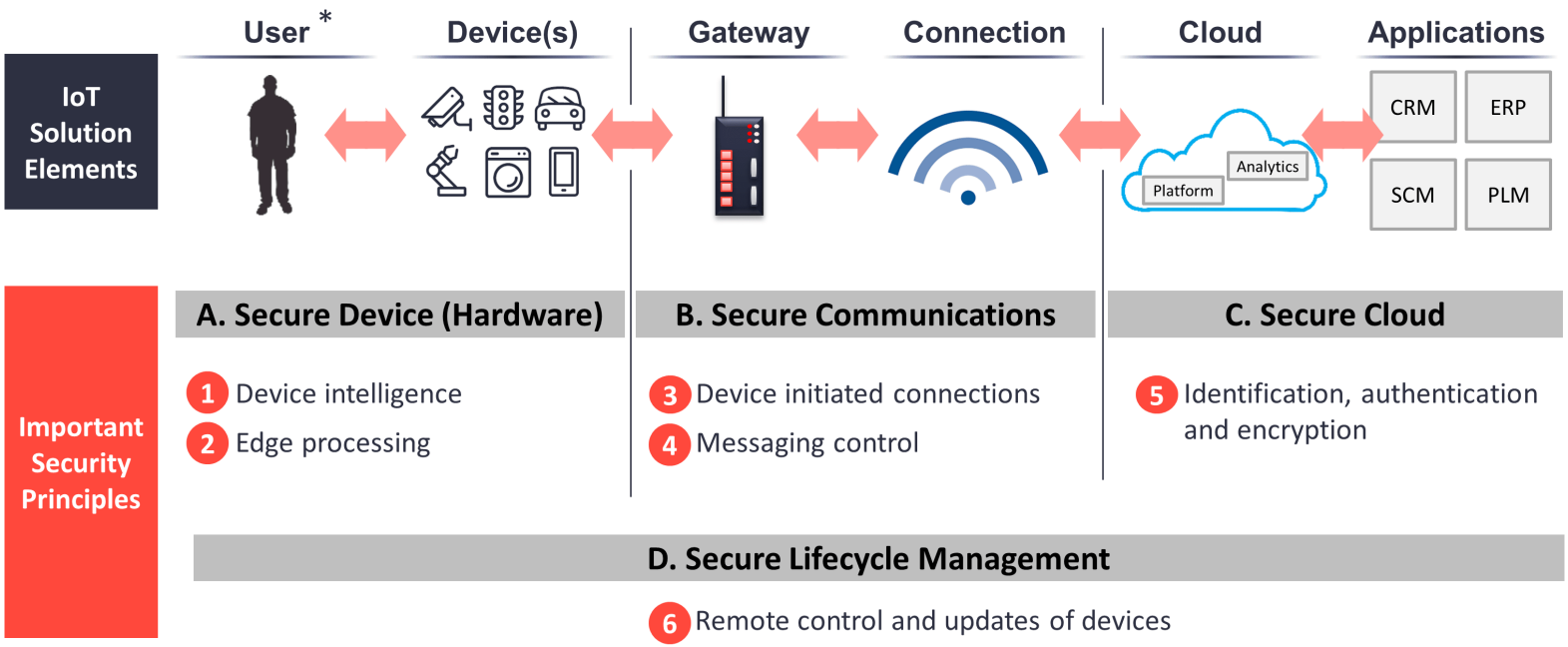
Communications

Data management and analysis



IOT ANALYTICS
MARKET INSIGHTS FOR THE INTERNET OF THINGS

Six principles of IoT Cyber Security across the stack



Source**: IoT Analytics* * User**: can represent a person, device, system, or application*

Insights that empower you to understand IoT markets

Post-mission

- **Auditing: what, when, who**
- **Training: learn by example**

- Comprehensive correlation of data
  - Location
  - Sensors
  - Communications
- Missions reconstruction for forensics analysis (auditable timeline)
- Analysis of data to improve data processing
- Assisted training with real mission data
- Statistics for future planning purposes

Thank you

Luís Cordeiro

cordeiro@onesource.pt

http://mobitrust.onesource.pt

mobitrust
Situational Awareness Platform