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Virtual & Augmented Reality as Enablers for Improving the Service on Distributed Assets

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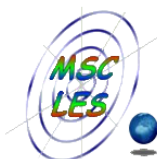**Agostino G. Bruzzone, Marina Massei**
www.itim.unige.it
{agostino, massei}@itim.unige.it

Simulation Team
www.simulationteam.com

M.Maglione, M.Agresta, G.Franzinetti
www.simulationteam.com
{maglione, agresta, franzinetti}@simulationteam.com

MSC LES

Antonio Padovano
www.msc-les.org
antonio.padovano@unical.it

DIME Università di Genova

www.liophant.org

Fusion People BNB

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FuelFx

Objectives

The evolution of <u>Augment</u> (AR) and <u>Virtual Reality</u> (VR) is enabling new solutions. So this Research is devoted to:

- **Investigate Service & Maintenance of Distributed Assets**
- **Rethink Distributed Assets as Distributed Systems by:**
  - o **Identifying Service Requirements**
  - o **Evaluating Enabling Technologies**
  - o **Definying new Architecture**
  - o **Designing new Embedded Devices**

Eurasia Industries R&D DT

- **Evaluate Capabilities in Industrial and Individual Use in terms of remote control & service, operator training,**
- **Develop a specific case study devoted to lead the introduction of these innovative solutions in industrial and health care system.**

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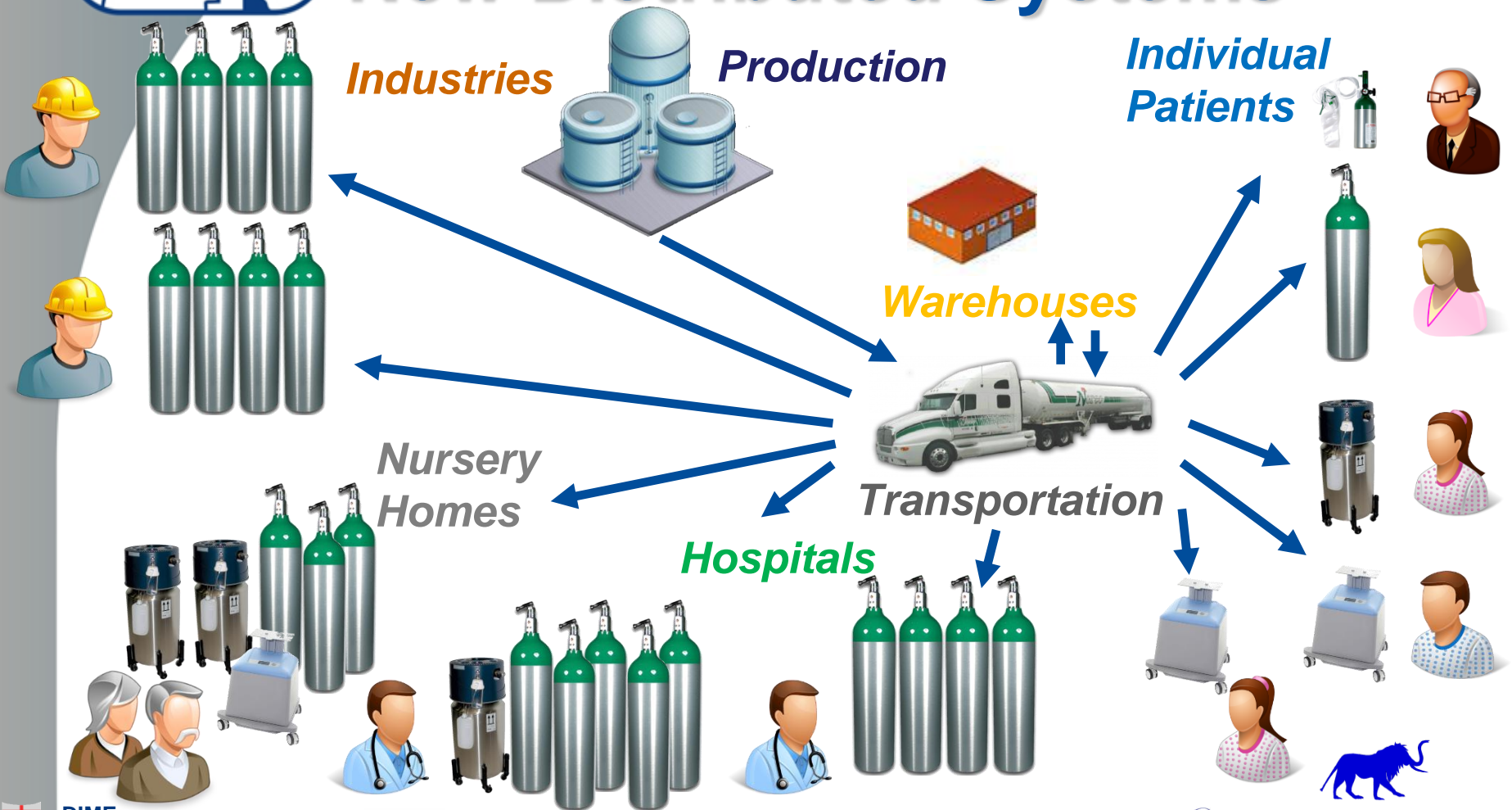
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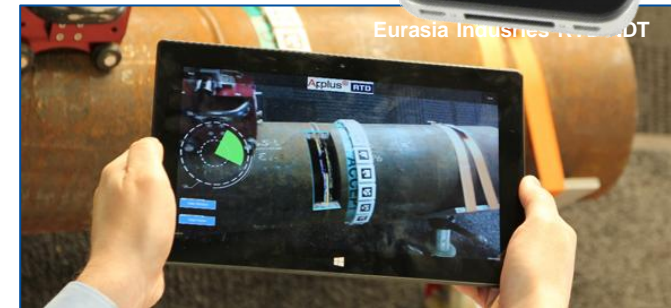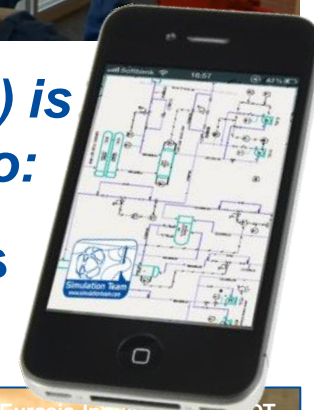
AR & VR for Autonomous System Maintenance

Complex Systems, such as Autonomous Underwater System (AUV) require sophisticated Maintenance and Continuous Service even operating at Sea, so the use of Augmented & Virtual Reality is very useful. AR & VR allow to support:
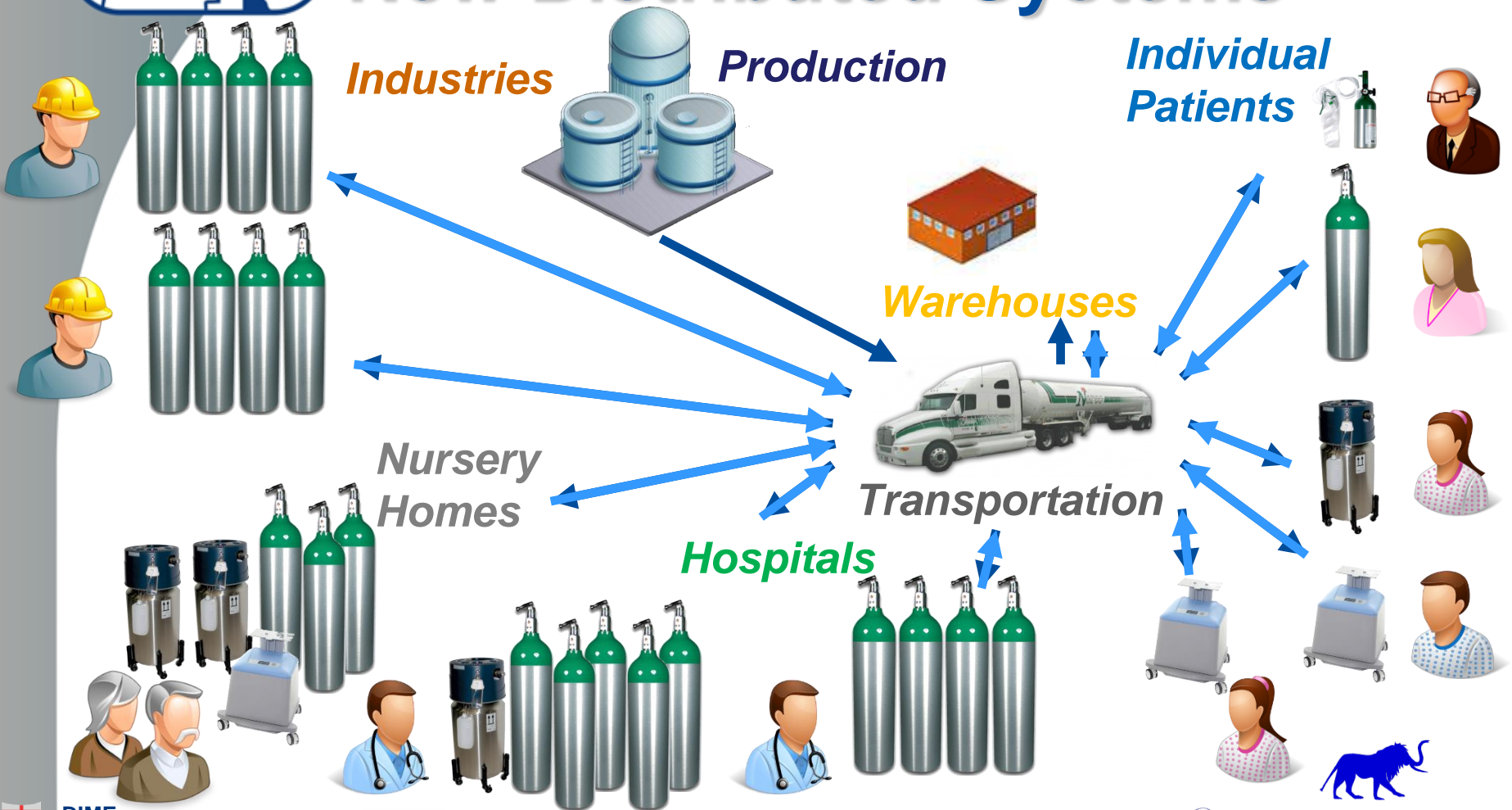
For Yours Eyes Only ☺

- *Training*
- *Operator Support*
- *Remote Supervision*

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Distributed Assets & IoT:
New Distributed Systems

Industries

Production

Individual Patients

Warehouses

Nursery Homes

Transportation

Hospitals

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Distributed Assets & IoT: New Distributed Systems

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Distributed Assets & IoT: New Distributed Systems

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Distributed Assets & IoT: New Distributed Systems

Industries

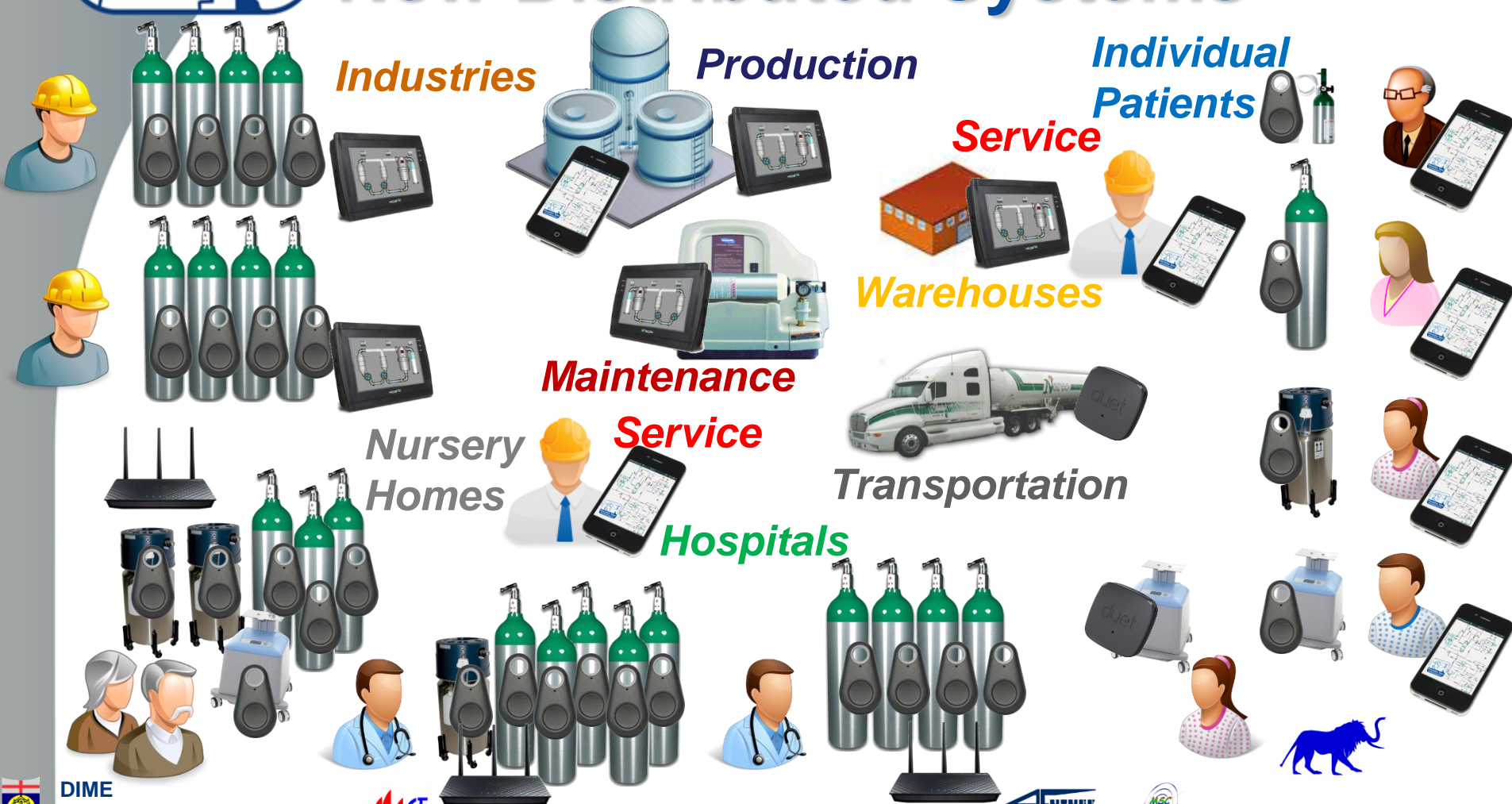**Production**

Individual Patients

Service
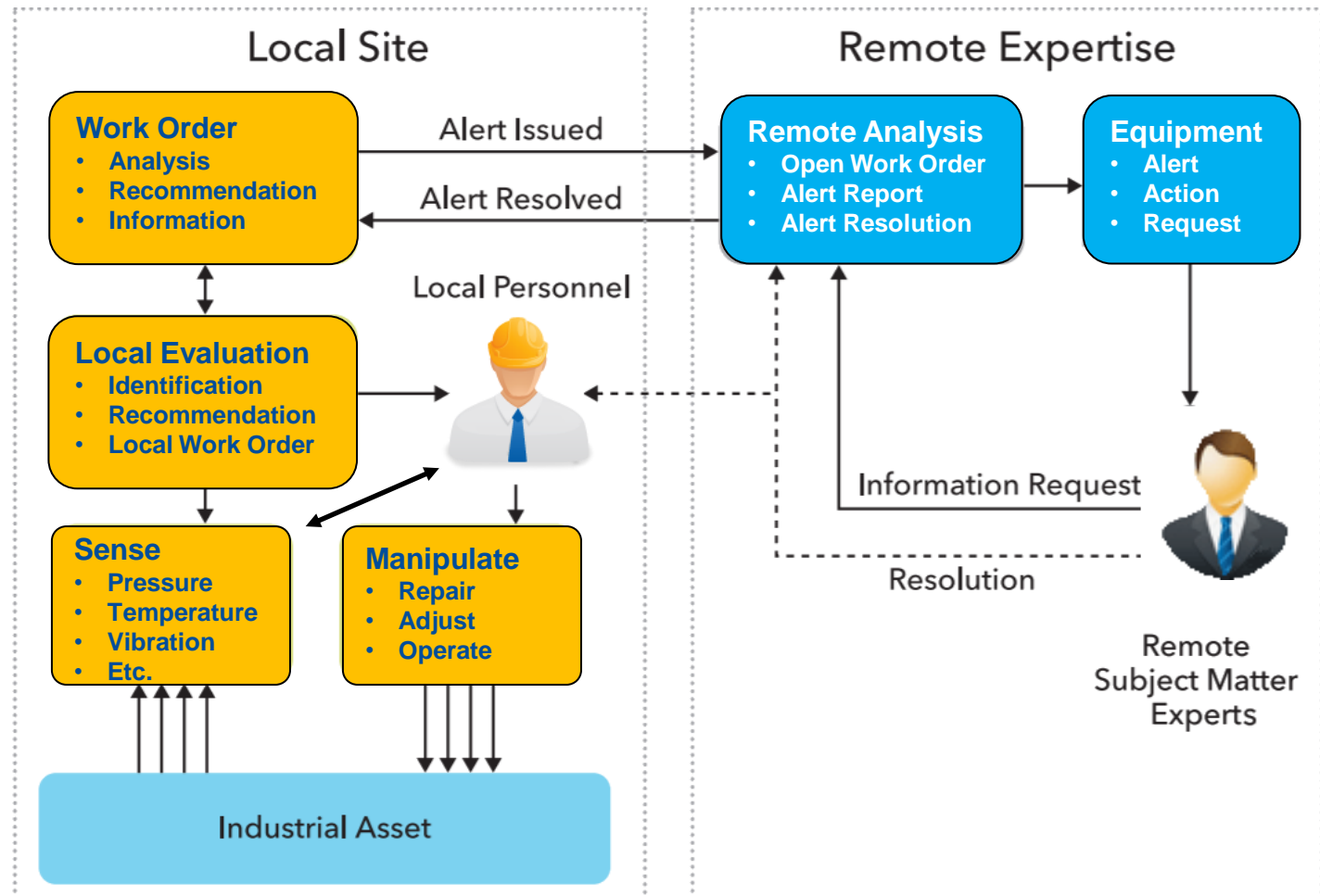
Warehouses

Maintenance Service

Nursery Homes

Transportation

Hospitals

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Example of Architecture

Local Site

Remote Expertise

Work Order
- **Analysis**
- **Recommendation**
- **Information**

Alert Issued

Alert Resolved

Remote Analysis
- **Open Work Order**
- **Alert Report**
- **Alert Resolution**

Equipment
- **Alert**
- **Action**
- **Request**

Local Personnel

Local Evaluation
- **Identification**
- **Recommendation**
- **Local Work Order**

Sense
- **Pressure**
- **Temperature**
- **Vibration**
- **Etc.**

Manipulate
- **Repair**
- **Adjust**
- **Operate**

Information Request

Resolution

Remote
Subject Matter
Experts

Industrial Asset

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Example of Architecture

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Industrial Asset

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Information Request

Resolution

Remote Subject Matter Experts

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Virtual Reality for Simulation & Augmented Reality as Benefit

The Use of Virtual Reality allow to Realize Virtual Prototypes of the Products and Processes and to test new Solutions.

Such Virtual Simulation support Design, Training and Management and the relative Virtual Worlds becomes available for Augmented Reality Applications

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Previous Project Examples: VIP-STRALO

Virtual Prototype by Simulation in Transportation and Logistics`

VIP-STRALO Goal is the creation of innovative solutions based on Interoperable Simulators for SBDVP (Simulation Based Design and Virtual Prototyping) applied to Logistics, Transportation and Automation Sector.

VIP-STRALO involves the creation of two interoperable demonstrators:
- **LOCARS: Logistics Crane Simulator**
- **FEBO: Federation of Boats**

Virtual Simulation & Augmented Reality

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The Simulation Team is active in several initiative combining Virtual Simulation with Augmented Reality. These applications include the combining of Simulators with Virtual and Real Worlds
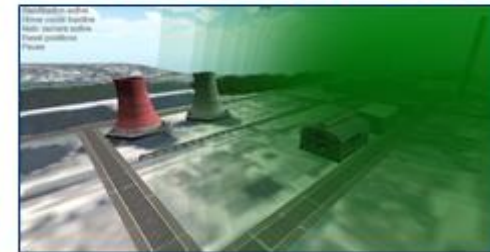
Human Body

Digestive System
Left Lung
Right Lung
Skeleton
Heart
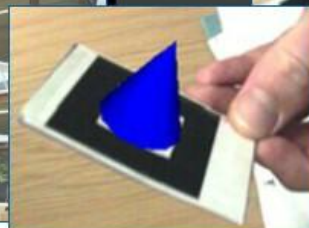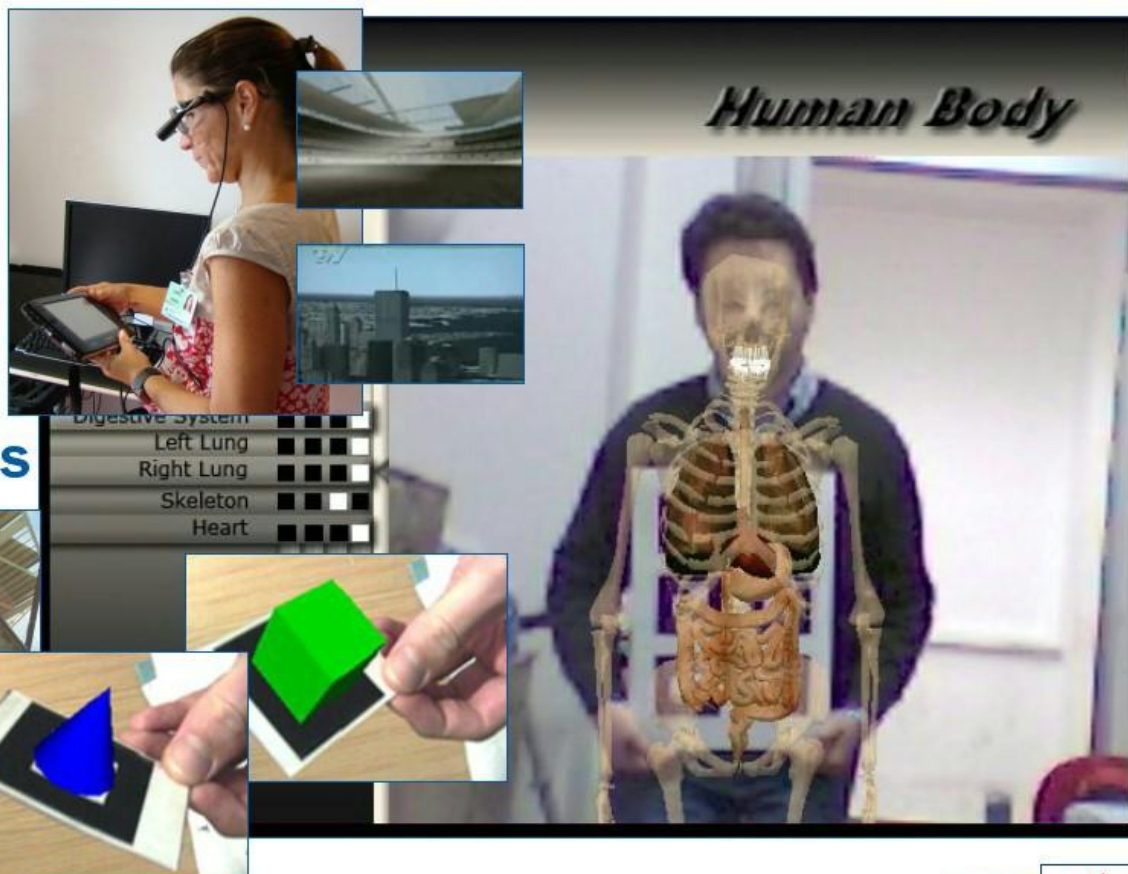
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ARTEM
Augmented Reality TErrain interoperable Module

ARTEM (Augmented Reality TErrain interoperable Module) is a Module integrated through High Level Architecture with MS2G (Modeling, interoperable Simulation & Serious Game) systems.

ARTEM allows to present over smartphone and other mobile device the situation in real-time geo-referenced dynamically respect the on going simulation.

ARTEM provides the opportunity to train personnel directly on the field using details models and simulator that interact dynamically with personnel and assets during the exercises.

The system allows to visualize real and virtual assets as well as different effects on the terrain.

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SISOM

Simulation Solutions based on virtual & augmented reality for Maintenance

SISOM is a Solution based on Virtual and Augmented Reality for Maintenance in Vessels and Plants. SISOM uses simple Tablets, mobiles and/or laptop to represent the real skid/system with augmented information; by this approach, SISOM guarantees safe and intuitive procedural instruction interactively overlapped to the real equipment (e.g. trouble shooting, dismounting, emergency shutdown, etc.), as well as training procedures, remote dynamic supervision and testing. Indeed SISOM could be integrated with HLA Simulation to support training. SISOM supports both predictive, preventive and corrective maintenance.

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OUTSIDE REAL

Virtual & Augmented Reality, Speech Recognition & Simulation

OUTSIDE REAL : is an innovative HLA Simulator integrating real camera with Augmented Reality for providing additional information on the scene (e.g. dynamic data on the element detected by a camera). The system includes also interactive speech recognition solution, SOPHOS, for requesting additional information or changes in the representation mode.
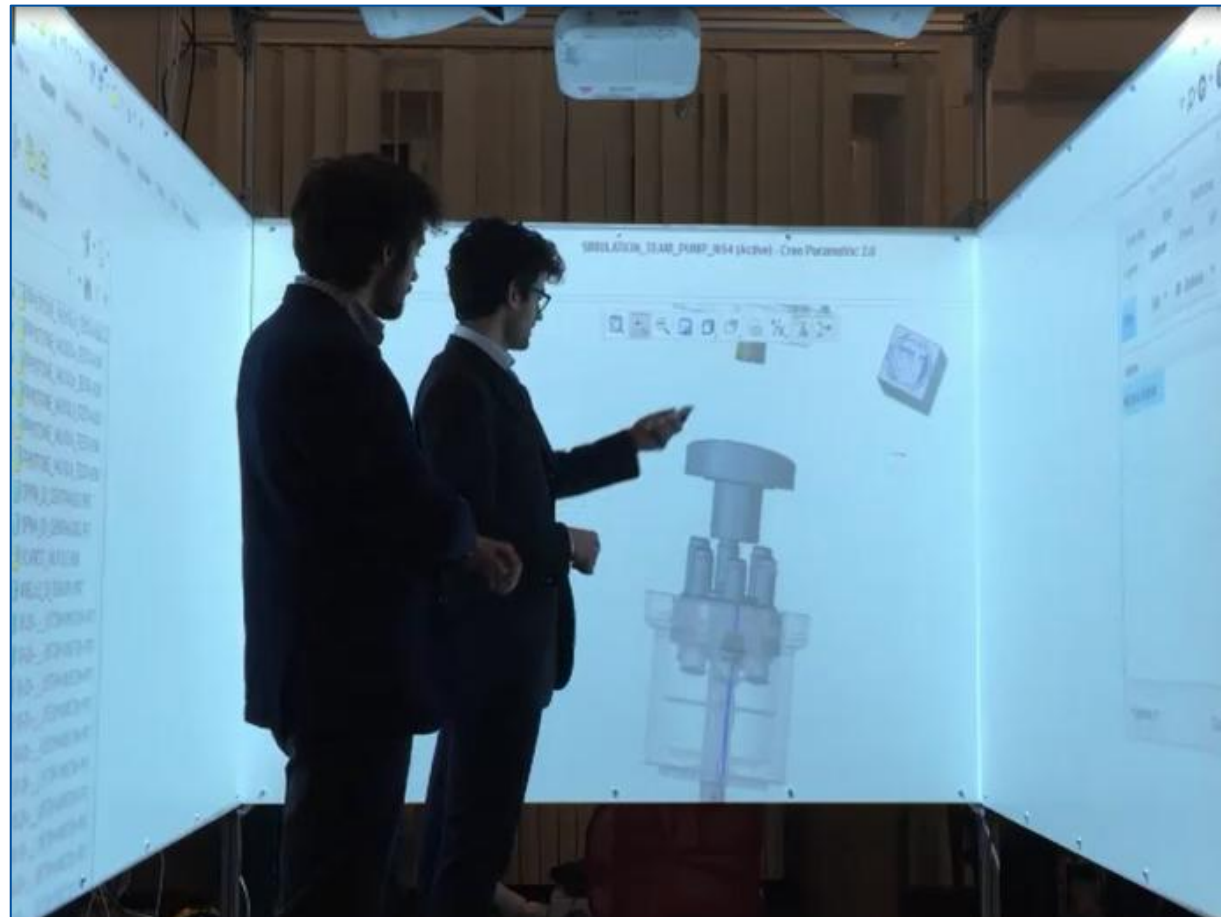
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Collaborative Remote Supervision & Service

The Central Subject Matter Experts (SMEs) become able to check remotely the Status of the Different Distribued Assets, to Track Them as well as to conduct Supervised Service Operation with the Service Operator or, directly, with final Users

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Many Different Solutions

In facts there are many different solutions that could be adopted to support VR and AR implementations some one are mostly seful for Training and Supervisions such as Head Mounted Displays.
Oculus is a basic and valuable example

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Tablets as Intuitive & Simple Approach for AR

Indeed sometime it is more effective to use basic Hardware solutions that result reliable and intuitive for potential users. From this point of view the tablets provide an interesting Man Machine Interface for supporting Service and Maintenance of Equipment and being operated by basic Operators.

Future Use and Innovative Interface

The architecture is designed to incorporate future technologies for continuous development. This R&D addresses especially:

- **Monitoring & Tracking**
- **Remote Test & Troubleshooting**
- **Supervision**
- **Remote Service Support**
- **Mobile Service Support**
- **Availability Improvements**
- **Reduction or Losses Robberies and Misuse**
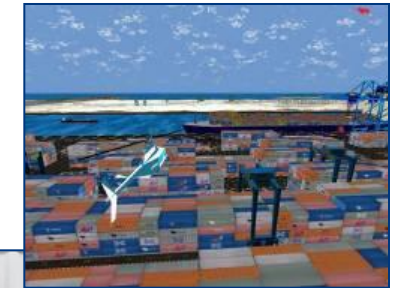
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Conclusions

This preliminary research investigates the use of Virtual and Augmented Reality for the Remote Service of Distributed Assets. The proposed architecture guarantees the possibility to support local operators as well as remote supervision. The approach provides a very effective framework for Training and Education for On Site & Remotely Assisted Service .

The R&D confirms the potential to reduce costs and to increase reliability; this is expected to lead to further reinforce the outsource services and the competitiveness in commodities outsource

The specific case related to the O_2 Assets and System is a good example to apply this approach.

The authors are working to develop a first pilot to demonstrate and promote this research track on the field in cooperation with a leading industry of the sector.
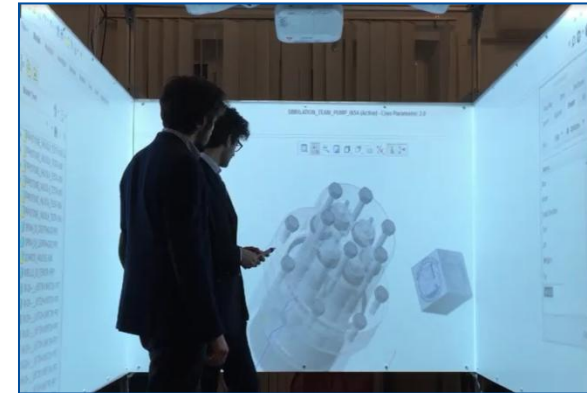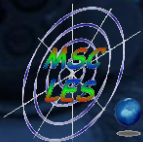
References

DIME Genoa University
www.itim.unige.it
Agostino Bruzzone
{agostino, massei}@itim.unige.it

DIME

Simulation Team
www.simulationteam.com
Matteo Agresta, G.L. Maglione, G.Franzinetti
{agresta, maglione}@simulationteam.com

www.msc-les.org
Antonio Padovano
antonio.padavona@msc-les.org

..... Questions?