



SSI

A Finmeccanica Company



Cooperative multiagent systems for integrated applications

SMART:

Space for Smart Resource Management for Disaster Early Warning

Sabino Cacucci

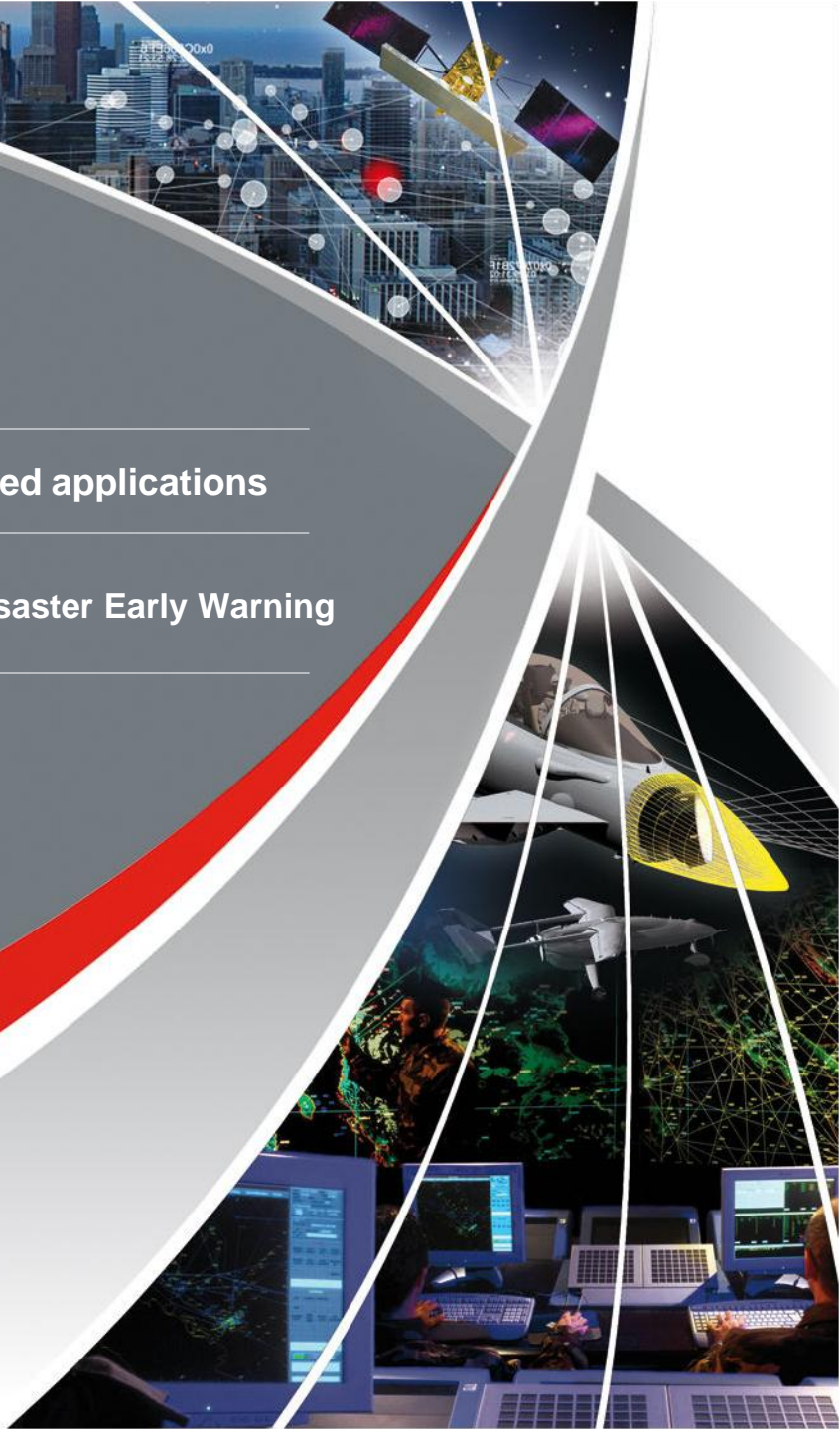
Bari 27 February 2014



**REGIONE
PUGLIA**



in collaboration with

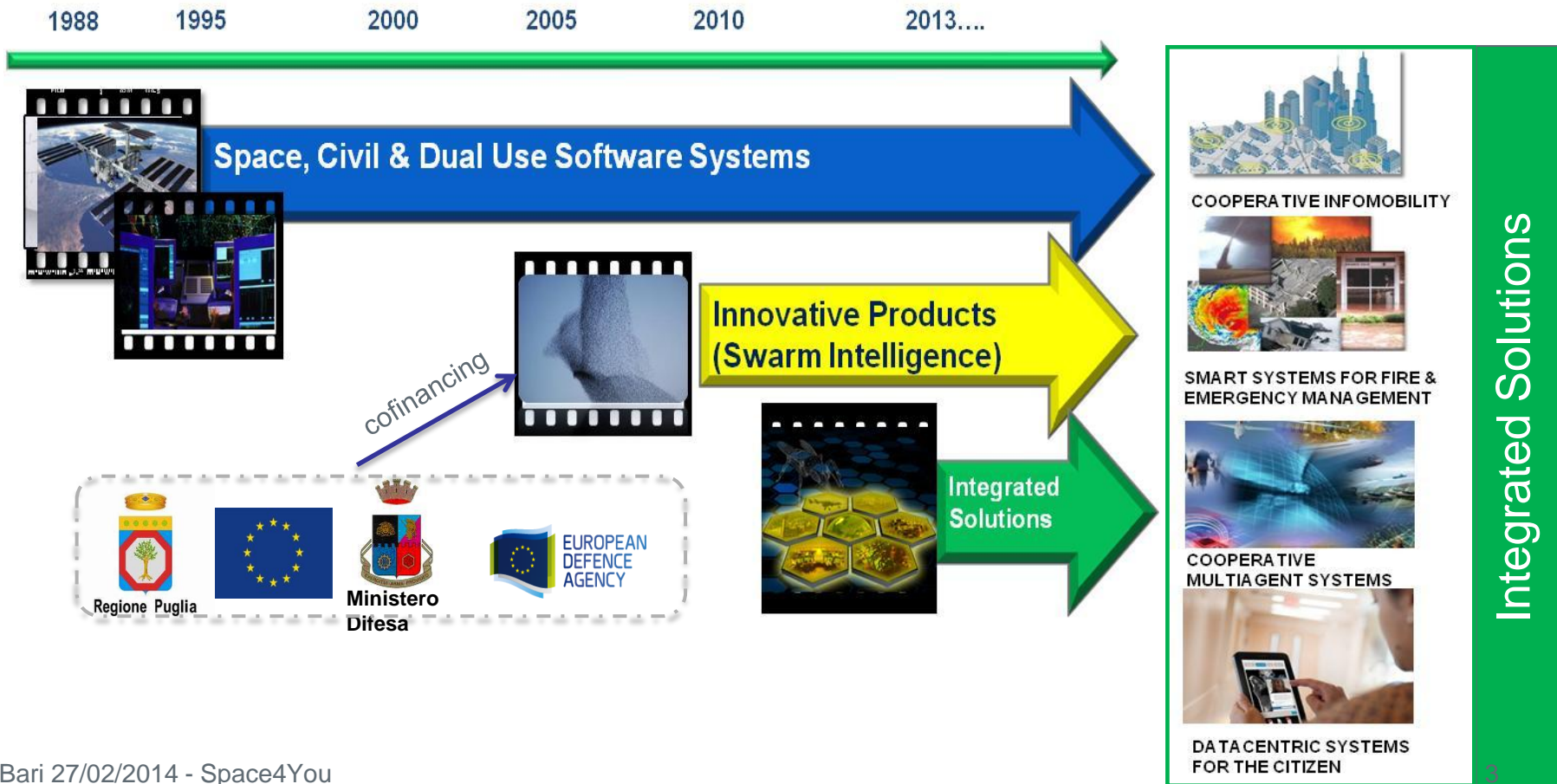


Cooperative multiagent systems for integrated applications SMART (Space for Smart Resource Management for Disaster Early Warning)

- ☛ How did the idea “SMART”?
- ☛ Complex scenario and Swarm intelligence solutions
- ☛ SMART: Innovation & Integration & User-centered application

- Founded in 1988, with headquarters in Taranto, SSI is a Finmeccanica company, owned by Selex ES S.p.A..
- SSI designs and develops **software systems** for highly critical **civil, military and dual use** applications, and it is strongly oriented to innovation based on *Swarm Intelligence* and *Cooperating multiagent systems*.

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How did the idea “SMART”?

AFCEA 2010-2012; 2013 Italian Civil Protection

“SMART” (Space for Smart Resource Management for Disaster Early Warning)



AFCEA 2010 Event
Università L’Aquila



AFCEA 2012 Event
Confindustria L’Aquila

2013: meetings with Italian Civil Protection

major user needs: more accurate and up-to-date information about hydro-geological distress and alert data distribution



Complex Scenario and Swarm Intelligence Solutions

Management and Protection of the Territory: actual needs

Plan

- *Heterogeneous resources and procedures*

Foresee

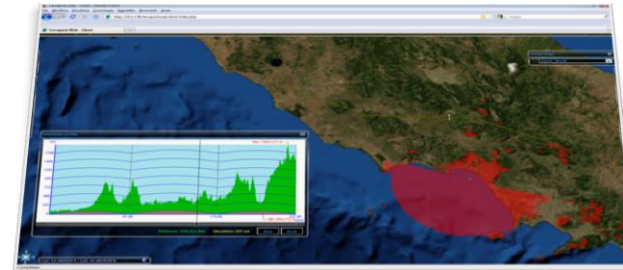
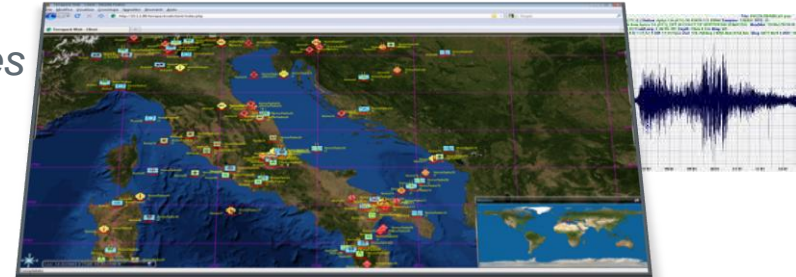
- *Critical situations and asymmetric events*

Monitor

- *Resources and sensitive sites*

Act

- *Managing the complexity*
- *Integrating advanced tools*



The model of *swarm intelligence*, studied and adopted by SSI also thanks to the Apulia Region co-funding, is well suited to handle the complexity of such a scenario based on properties such as "multitude" and "autonomous behaviors".

Complex Scenario and Swarm Intelligence Solutions



Any attempt to design algorithms or distributed problem-solving devices inspired by the collective behavior of social insect colonies and other animal societies.“

[Bonabeau et al., 1999]

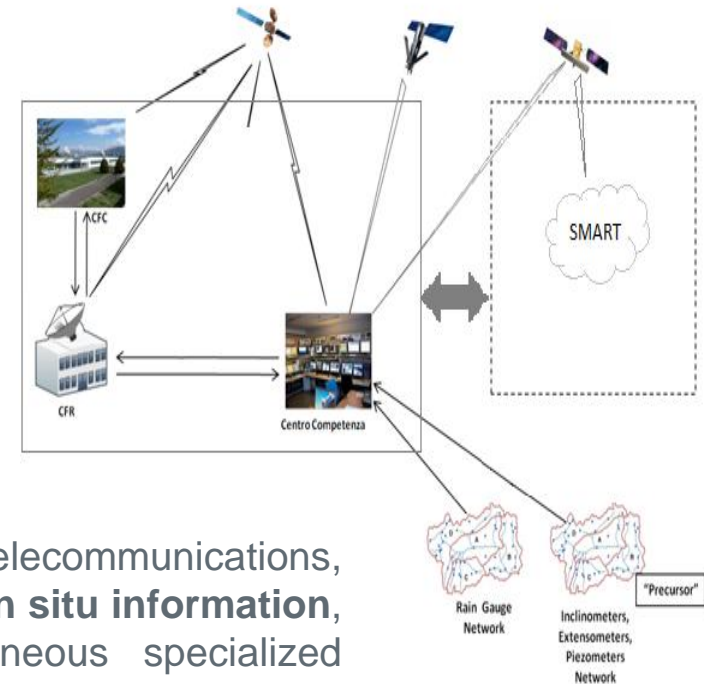
- ✦ Relationships among phenomena are more and more complex
- ✦ Our new vision of the problems is based on an ecological awareness
- ✦ Systems are viewed as ecological communities, where entities are related to each other by a network of interdependencies
- ✦ New architectural paradigms for SW systems:
 - *Net-centric; Self-organized*
 - *Cooperative; Adaptive*



SMART: Innovation & Integration & User-centered application Space for Smart Resource Management for Disaster Early Warning

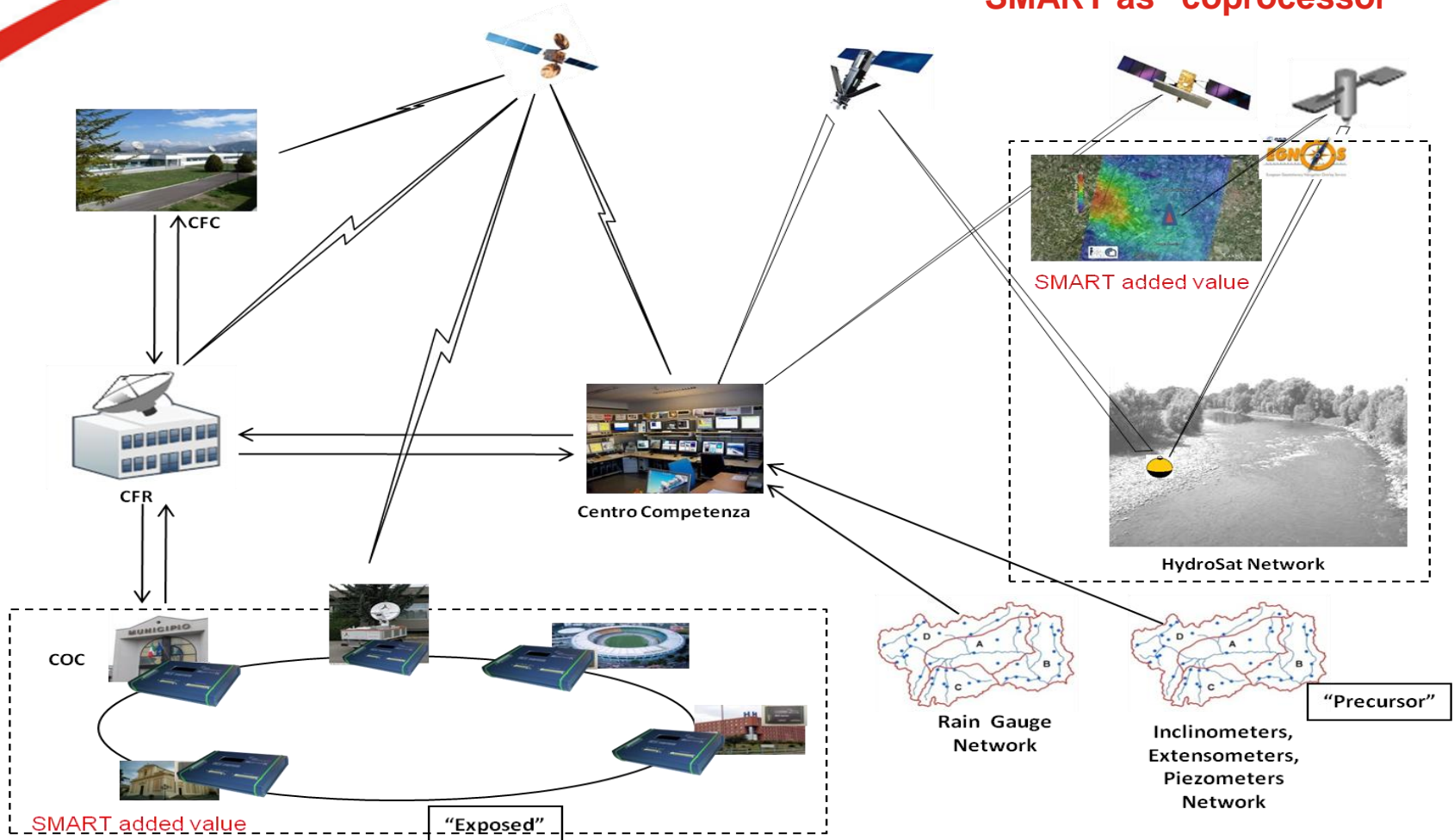
SMART

- solution to provide a decision support for the "early warning" of a disaster or critical event related to landslides and to improve the "first response" to event happened;
- great advantage of not interfering with but only strengthen the procedures used today by the Civil Protection to collect and manage the data "monitored";
- open to dual use purposes;
- based on the **integration of satellite data** (telecommunications, earth observation and satellite navigation) and **in situ information**, including *cooperative agents*, i.e., heterogeneous specialized entities (people, sensors, software agents, smart devices) which can *self-organize* and *cooperate adapting* to environmental changes.



SMART: Innovation & Integration & User-centered application

SMART as "coprocessor"

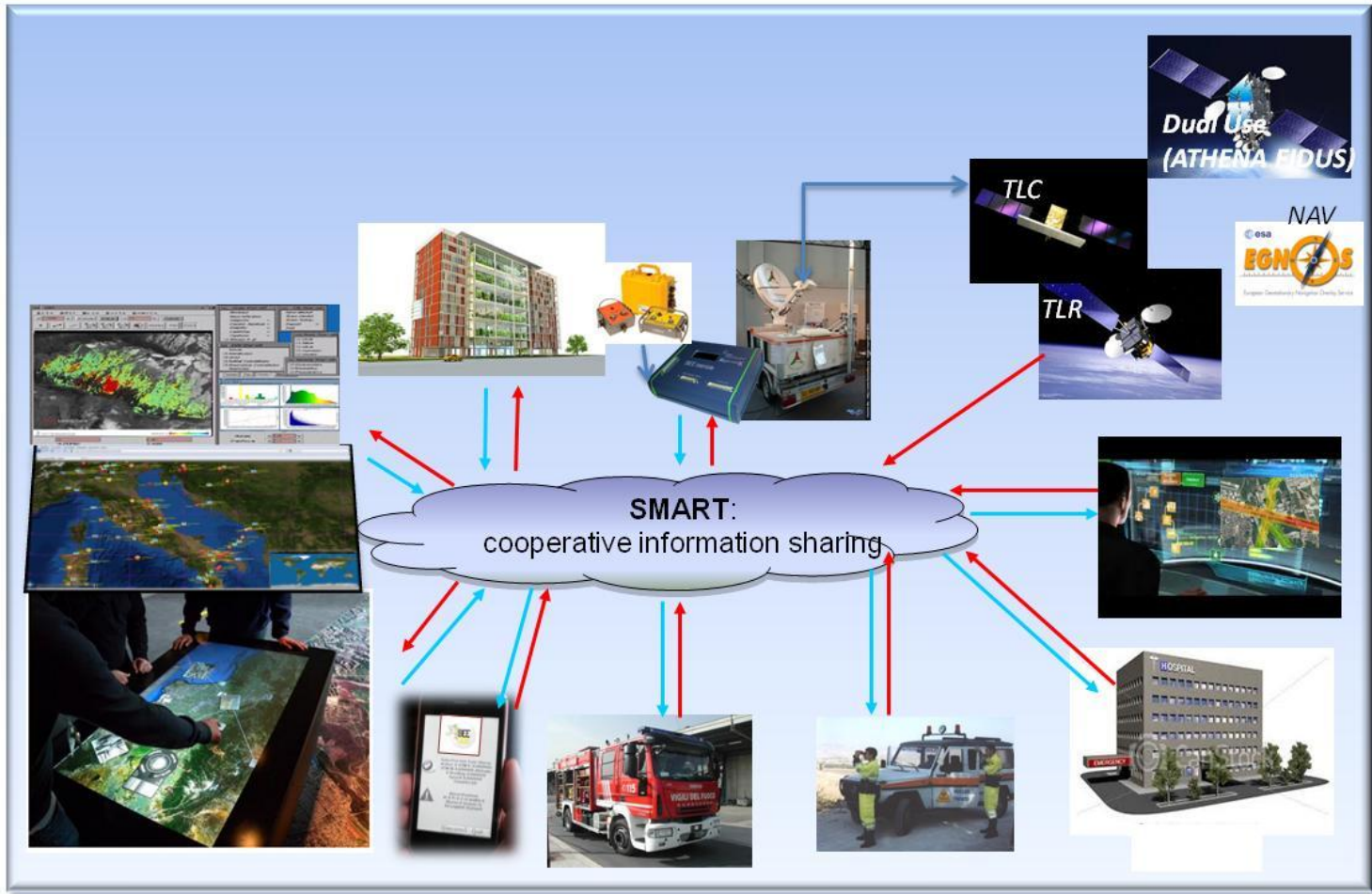


☄ New alarm broadcast to "exposed" accomplished with a **swarm approach**

- ☄ Landslide "precursors" using COSMO-SkyMed images
- ☄ Geo-reference images using EGNOS service
- ☄ New hydrometer using EGNOS and SAT-TLC

SMART: Innovation & Integration & User-centered application

Cooperative Information sharing



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“users in the loop”



“SMART” Resource Management
Integrated User Centered Application for Multiple use



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Avatar - Live Agents cooperating environment



Simulation & Training



Thank you for your attention

Any question?

please refer to:

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