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# A Proposal for Building the European Patient Summary using Triple Space Computing

E. Della Valle, D. Cerizza, R. Krummenacher,
L. J. B. Nixon, E. Paslaru-Bontas Simperl, d. foxvog

www.tripcom.org

Emanuele Della Valle
Semantic Web Activities group
CEFRIEL – Politecnico di Milano
email: dellavalle@cefriel.it
web: http://swa.cefriel.it

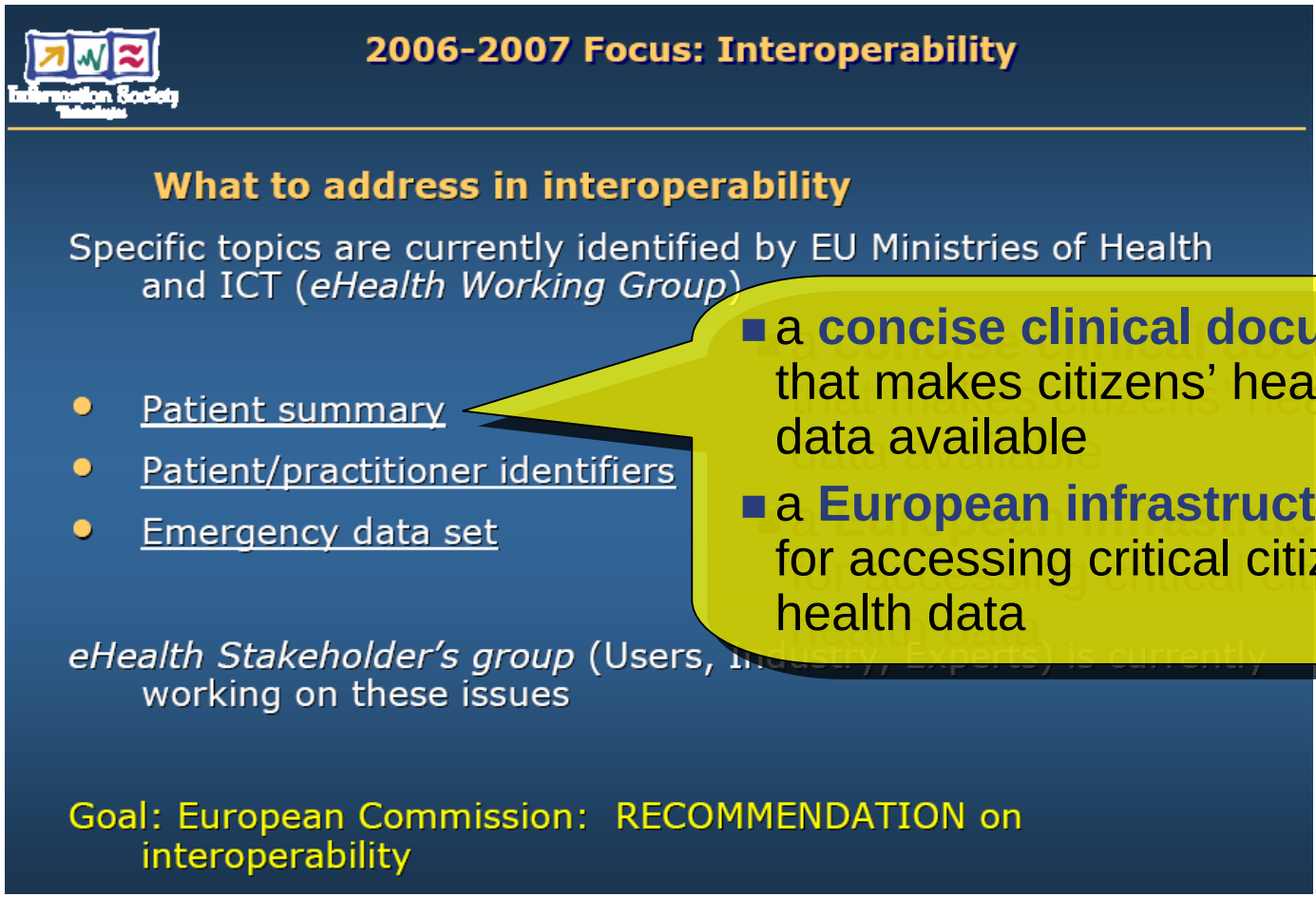
# Outline

- **eHealth** ongoing **challenges**
  - Interoperability and security for sharing clinical data
  - European strategies in eHealth
  - A ***Patient Summary*** at ***European level***
  - ***Requirements*** for a supporting infrastructure
- A trend towards **Triple Space Computing**
  - ***The Concept***
  - ***Semantic Web*** technologies for semantic interoperability
  - ***Web Services*** technologies for message exchange
  - ***Tuple Space*** technologies for persistent publishing and retrieval
- Building the European Patient Summary
  - Triple Space Computing and European Patient Summary
  - Emergency use case
- Conclusion
  - **TripCom** project work plan
  - Long term vision

# eHealth ongoing challenges

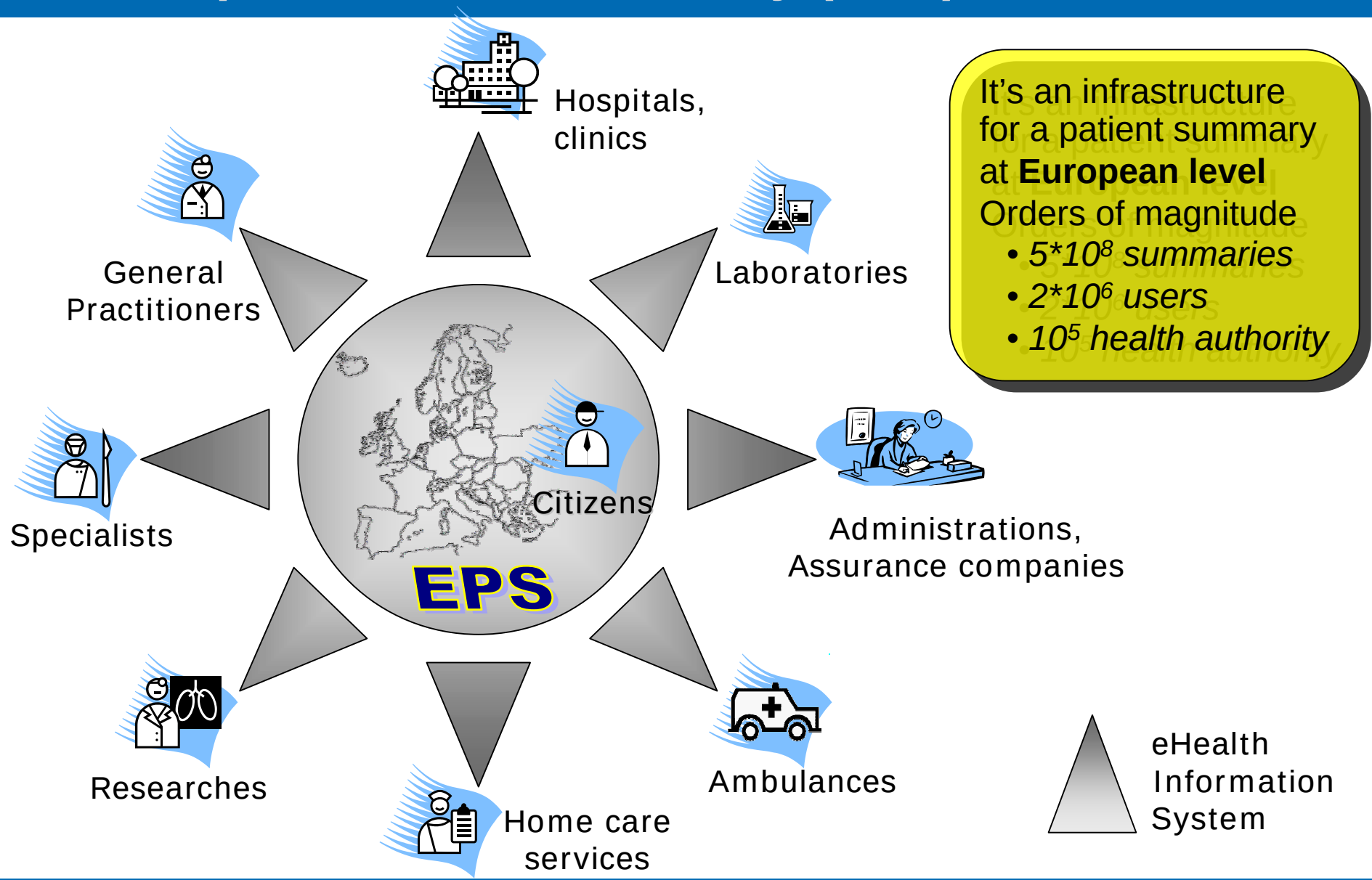
- **Integration problem in eHealth** is more complicated than in other sectors because
  - **complex domain**
    - Need to deal with the **intensive use of knowledge**
      - Archetypes of openEHR
      - Reference Information Model in HL7 v3
      - Medical terminologies: SNOMED, LOINC, ICD, UMLS, ...
  - **Privacy issues** for the treatment of citizen data
    - Need to deal with security aspects
  - **Life or Death implications**
    - Heavy social and organizational impact

# European strategies in eHealth




**Ilias Iakovidis** (Deputy Head of Unit – ICT for Health, DG INFOSO, EC) "*European Commission activities in eHealth: The achievements and future prospects."* Med-e-Tel Luxembourg, April 5, 2006

# A European Patient Summary (EPS)




It's an infrastructure for a patient summary at **European level**
Orders of magnitude
- *$5*10^8$ summaries*
- *$2*10^6$ users*
- *$10^5$ health authority*

# Requirements for such EU infrastructure

- **Multilingualism**
  - requires that information is **captured in a linguistically neutral manner** (e.g., by resorting to *one or more* coding systems), and to be **presented** to the user in the suitable natural language.
- **A multilateral solution**
  - imposes the requirement for a **virtual common IT infrastructure that is distributed among healthcare organizations**, while still guaranteeing the (*authorized*) access to citizens' critical health data anytime and anywhere in Europe.
- **The principle of subsidiarity**
  - requires the **underlying infrastructure to be able to cope with the heterogeneity of data, protocols, and processes** among existing systems and established eHealth standards.
- **Privacy**
  - Assure EU citizens that only authorized care givers are able to access their data

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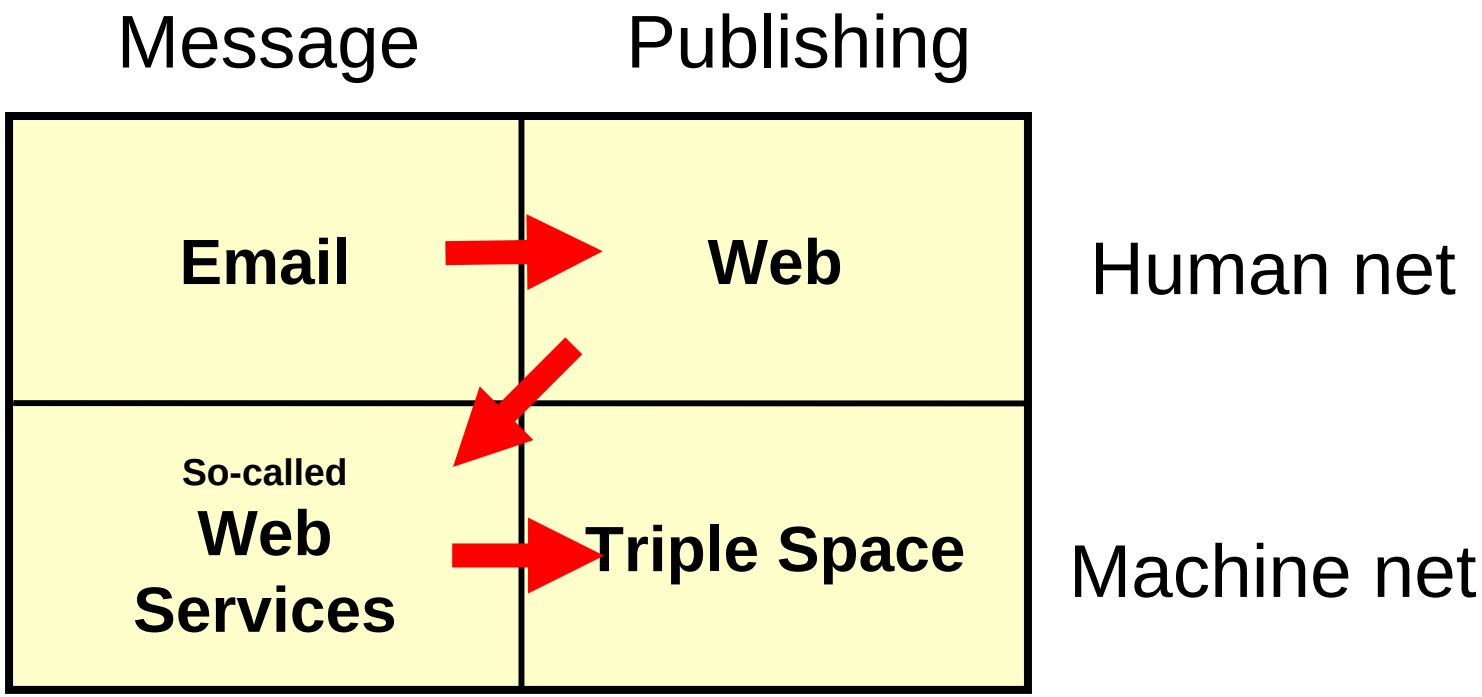
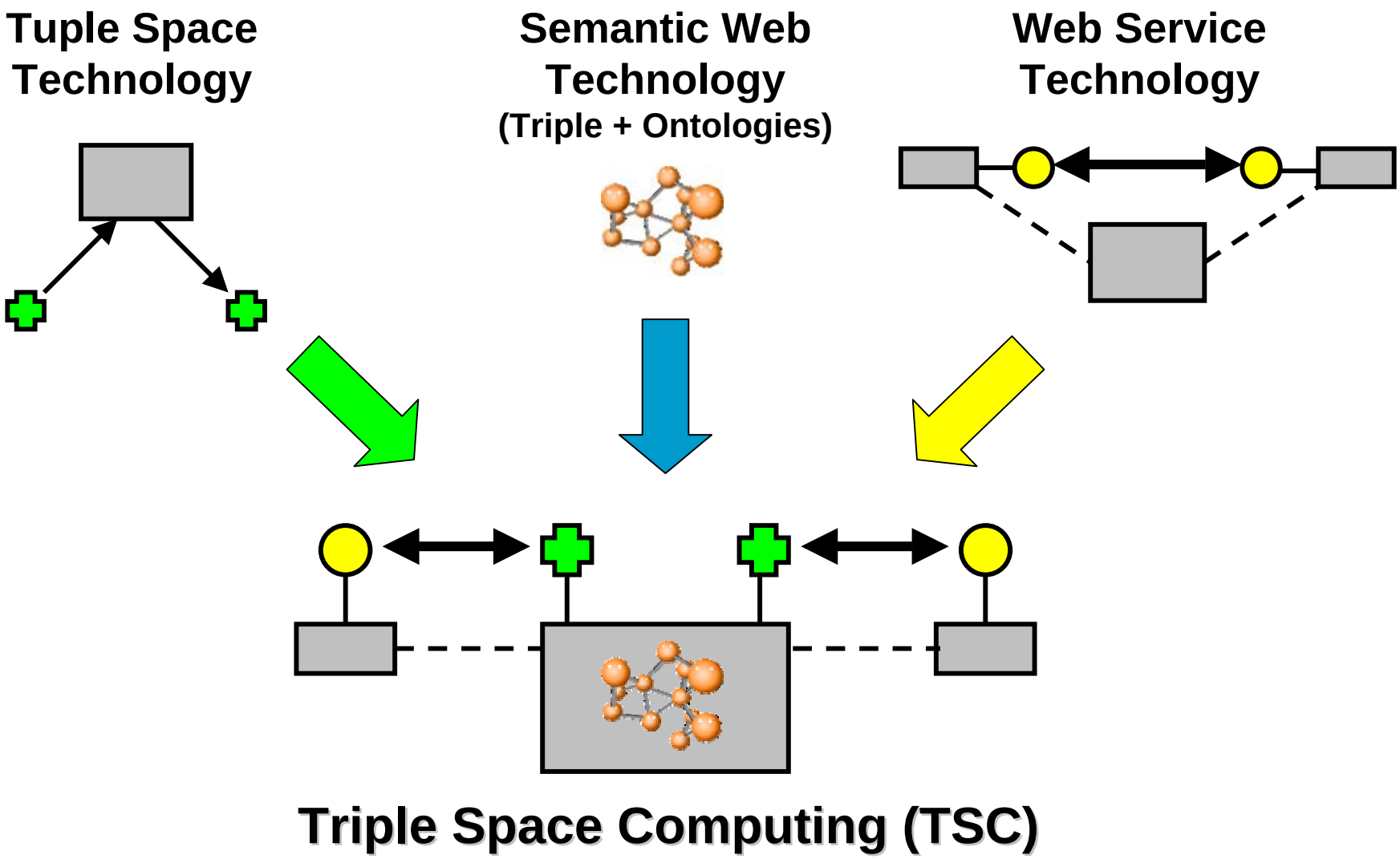
# The publishing paradigm for the machine net




**Communication platform** for Semantic Web services **based on Web principles**:

*"Persistently publish and read semantic data that is denoted by unique identifiers"*

# Triple Space Computing vision



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# Semantic Web Technology

- The proposals for **eHealth standards** similarly **address interoperability** by:
  - Defining a **shared conceptual model** (e.g. HL7 RIM)
  - **Deriving message structure** from such conceptual model
  - Coding the information carried by messages **using medical terminologies** (e.g. SNOMED or ICD)
  - ***Binding*** the resulting messages ***to "the technology of the day"*** meaning EDI in the '90s, XML and Web Services today

- This is very similar to the Semantic Web approach in which **interoperability** is achieved by
  - **modelling the domain knowledge** at conceptual level
  - **interconnect applications** using the modelled concepts

# Triple Space Computing capabilities

- **Decentralization** and **Distribution**
  - **Each** healthcare party **provides a node of the shared space**
  - Healthcare parties can *communicate by publishing and retrieving* patient information in the shared triple space
  - Ensure a good level of **fault-tolerance**
- Support for **asynchronous interactions**
  - **Decouple** interactions in time, location and reference among healthcare institutions
- **Data** and **application interoperability**
  - Use **semantic interoperability** to cope with heterogeneity among eHealth systems
- **Security** and **Trust** mechanisms
  - Comply with the **privacy** regulations for the treatment of **citizens'** data

# Triple Space Computing as a middleware for EPS

- TSC infrastructure can address the requirements of the EPS

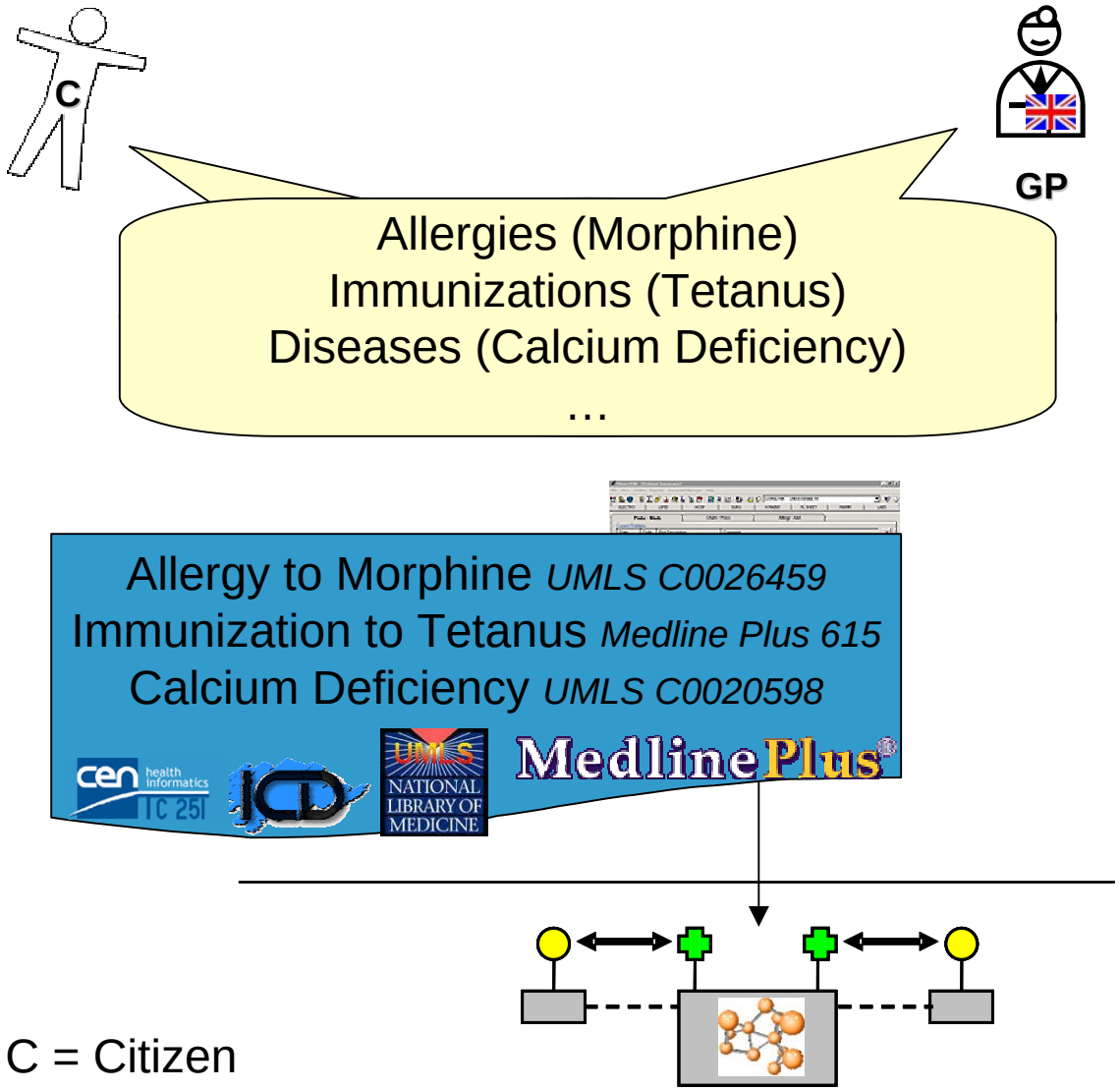
| EPS requirements | TSC capabilities |
|---|---|
| Multi-laterality | Decentralization and Distribution |
| Subsidiarity | Data and application interoperability<br>Decentralization and Distribution |
| Multi-lingualism | Data interoperability |
| Privacy | Security mechanisms |

- **The EPS over TSC enables *asynchronous*, *reliable* and *meaningful communication* among heterogeneous eHealth systems**

# European Patient Summary Use Case

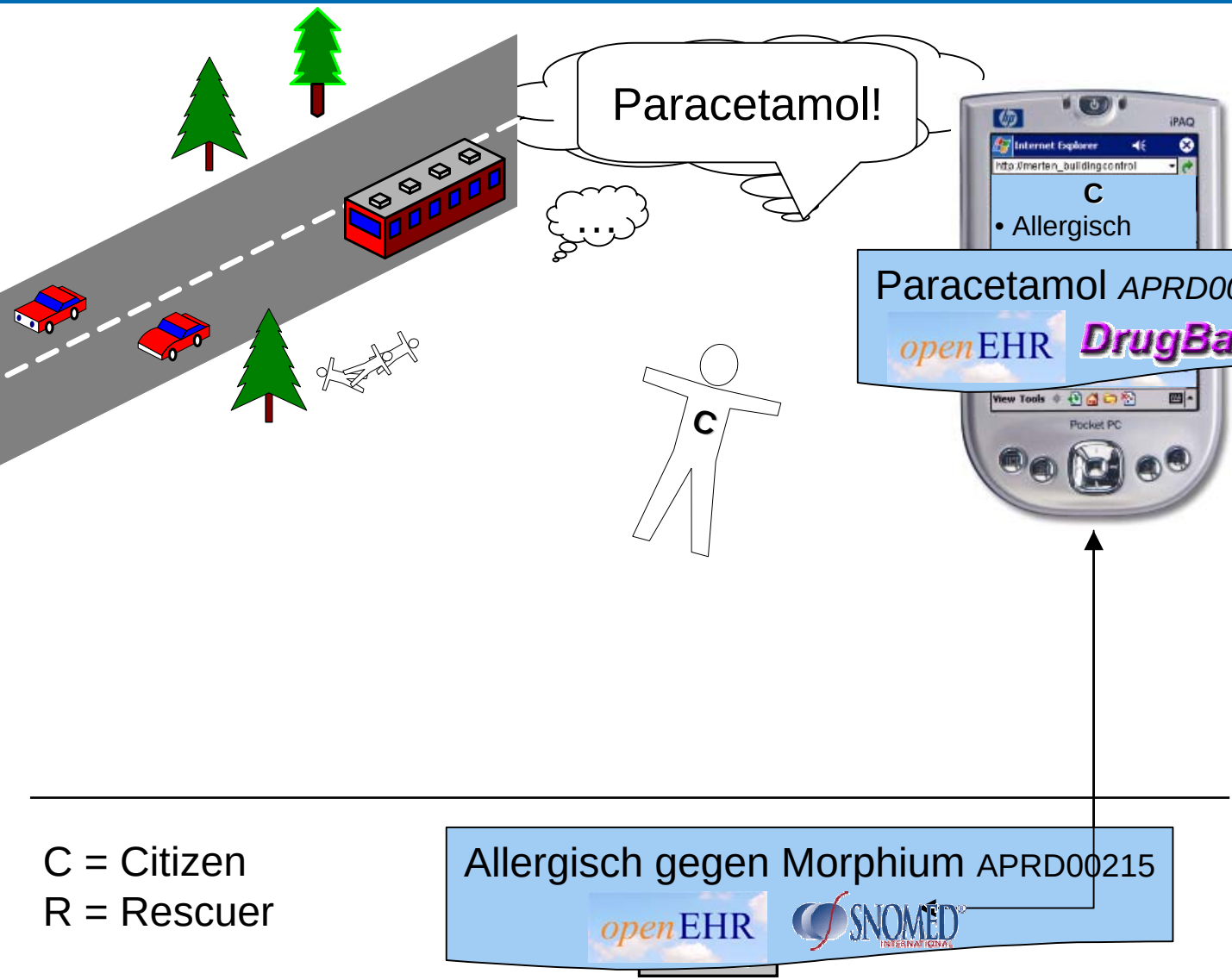
An English citizen asks his General Practitioner to **initialize** his **summary** in the EPS

The GP publishes the citizen's clinical information into the EPS **through the electronic Health Record**




C = Citizen
GP = General Practitioner

# Emergency care path (e.g. South-Tyrol)



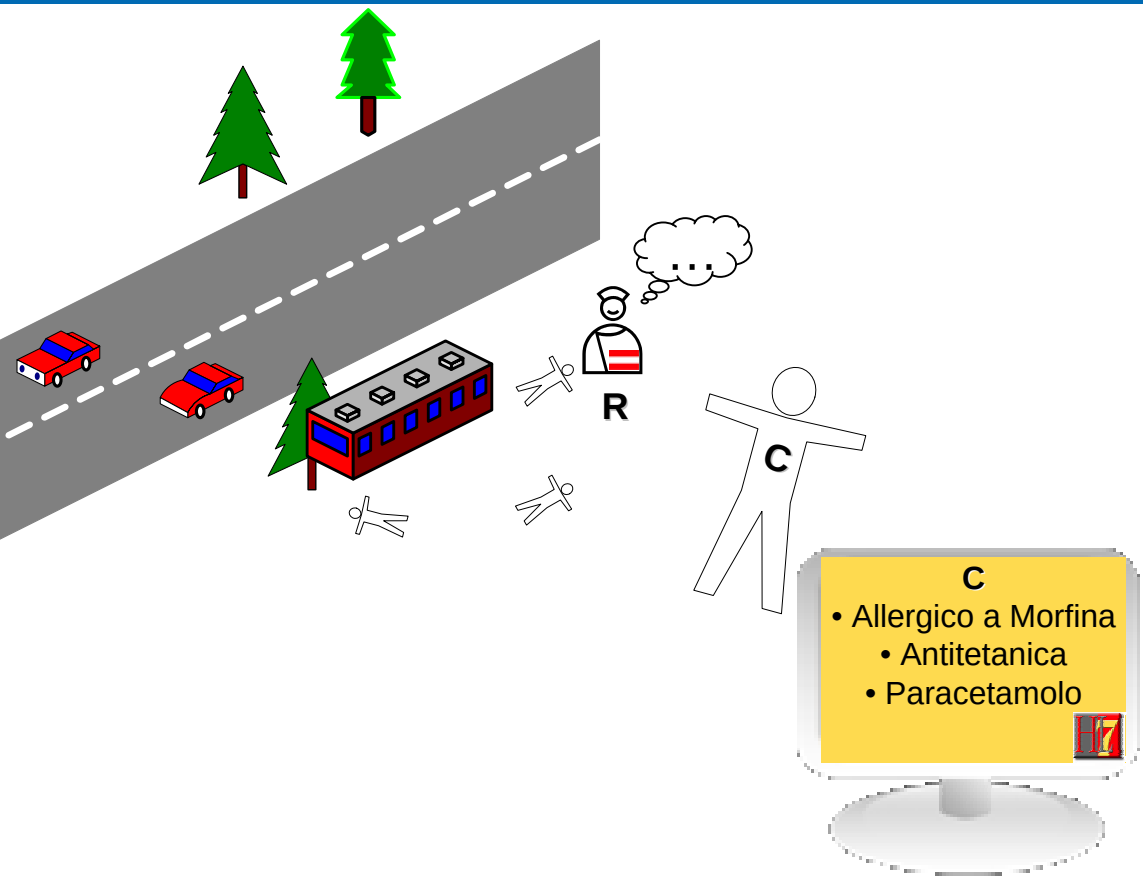

## Medical benefits

- Language understading
- Privacy respect
- Avoidance of administering a wrong drug

## TSC capabilities

- Data interoperability
- Application interoperability
- Security
- Time & Location autonomy

# Emergency care path




Allergico a Morfina *CAS 57-27-2*
Antitetanica *ICD A33*
Paracetamolo *CAS 103-90-2*

C = Citizen
R = Rescuer
A = Ambulance doc

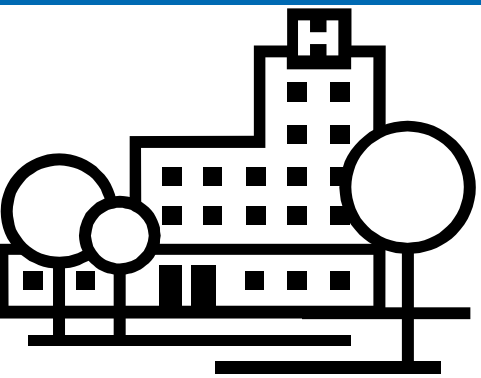
## Medical benefits

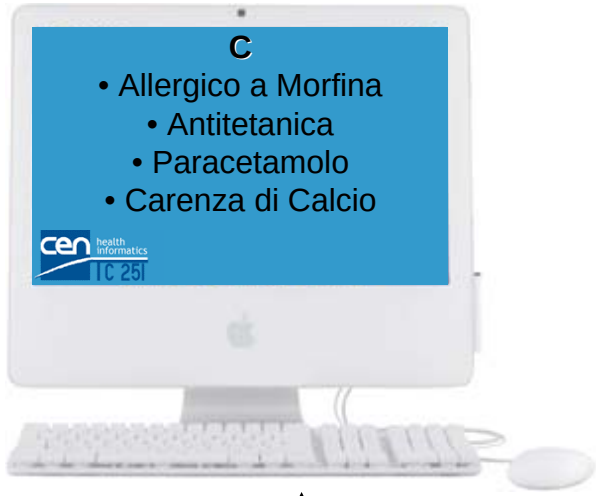
- **Awareness of patient clinical situation**
- **Support for interactions**
- Privacy compliancy

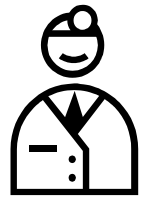
## TSC capabilities

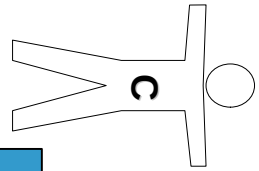
- Data interoperability
- Application interoperability
- Time & Location autonomy
- Security
- **Asynchronous messaging**

# Emergency care path






Allergico a Morfina *CAS 57-27-2*
Antitetanica *ICD Y58.4*
Paracetamolo *CAS 103-90-2*
Carenza di Calcio *ICD E58*

cen health informatics TC 251 CCS ICD

C = Citizen
A = Ambulance doct
E = Emergency doct

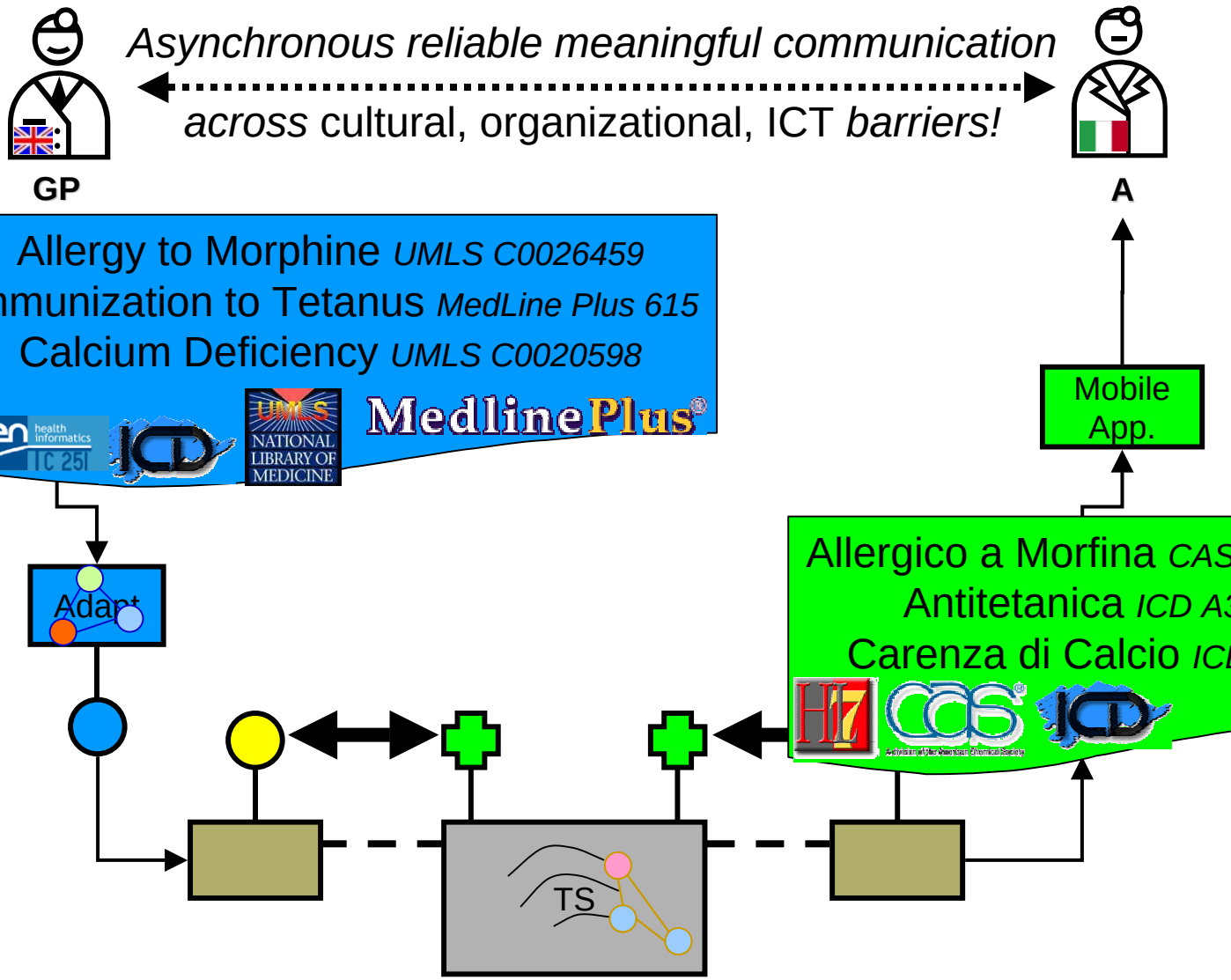
## Medical benefits

- Awareness of patient clinical situation
- Privacy compliancy
- **Foresee acceptance**
- **More efficient treatment**

## TSC capabilities

- Data interoperability
- Application interoperability
- Time & Location autonomy
- Security
- **Coordination**

# Semantic Interoperability in the TSC




## Scenario actions

- GP publishes the summary of a citizen using ICD, UMLS and Medline Plus in a CEN message
- A gets some information about the same patient, using CAS and ICD in an EHR message

## details

nages all the ation that refers ifferent medical coding systems

- **TS treats the mappings** among all medical coding systems and message structures

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# TripCom project work plan

- April 2006
  - Project start
- December 2006
  - **Detailed definition** of the European Patient Summary scenario
- February 2008
  - **First Prototype** of the European Patient Summary over Triple Space Computing
- March 2009
  - **Final Prototype** of the European Patient Summary over Triple Space Computing

# Long term Vision

- The European Patient Summary is a first step towards **a network of complementary healthcare centres**
- Such eHealth scenario emphasizes the needs of:
  - **Interoperability** among heterogeneous systems
  - **Coordination** among multiple and different actors
  - **Time** and **Location** autonomy
  - **Privacy** for the treatment of data
- If TSC would prove to be a suitable middleware for the EPS then it could also be adopted as a new technology to accomplish European challenges in eHealth

# Thank you very much for your attention

# Any question?


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Emanuele Della Valle
Semantic Web Activities group
CEFRIEL – Politecnico di Milano
email: dellavalle@cefriel.it
web: http://swa.cefriel.it

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