The Italian Infrastucture for EHR: the InFSE Project"

G. De Pietro
Istituto di Calcolo e Reti ad Alte Prestazioni- CNR

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Infrastruttura tecnologica del Fascicolo Sanitario Elettronico (InFSE)

Joint project between:

Presidency of the Council of Ministers

Department for the Digitization of the Public Administration and Technological Innovation

National Research Council(CNR)

ICT Department

- Istituto di Calcolo e Reti ad Alte Prestazioni (ICAR)
- Istituto di Informatica e Telematica (IIT)
- Unità di Ricerca presso Terzi del Dipartimento Sistemi di Produzione (URT-DSP)

EHR

- The Electronic Health Record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting.

- Included in this information are

  - patient demographics,

  - laboratory data and radiology reports,

  - progress notes,

  - problems,

  - medications,

  - vital signs,

  - past medical history,

  - Immunizations.

Fascicolo Sanitario Elettronico

- The Fascicolo Sanitario Elettronico (italian definition for Electronic Health Record) , is defined as a set of digital data and documents relating to health and social health clinical events generated by present and past, on the citizen

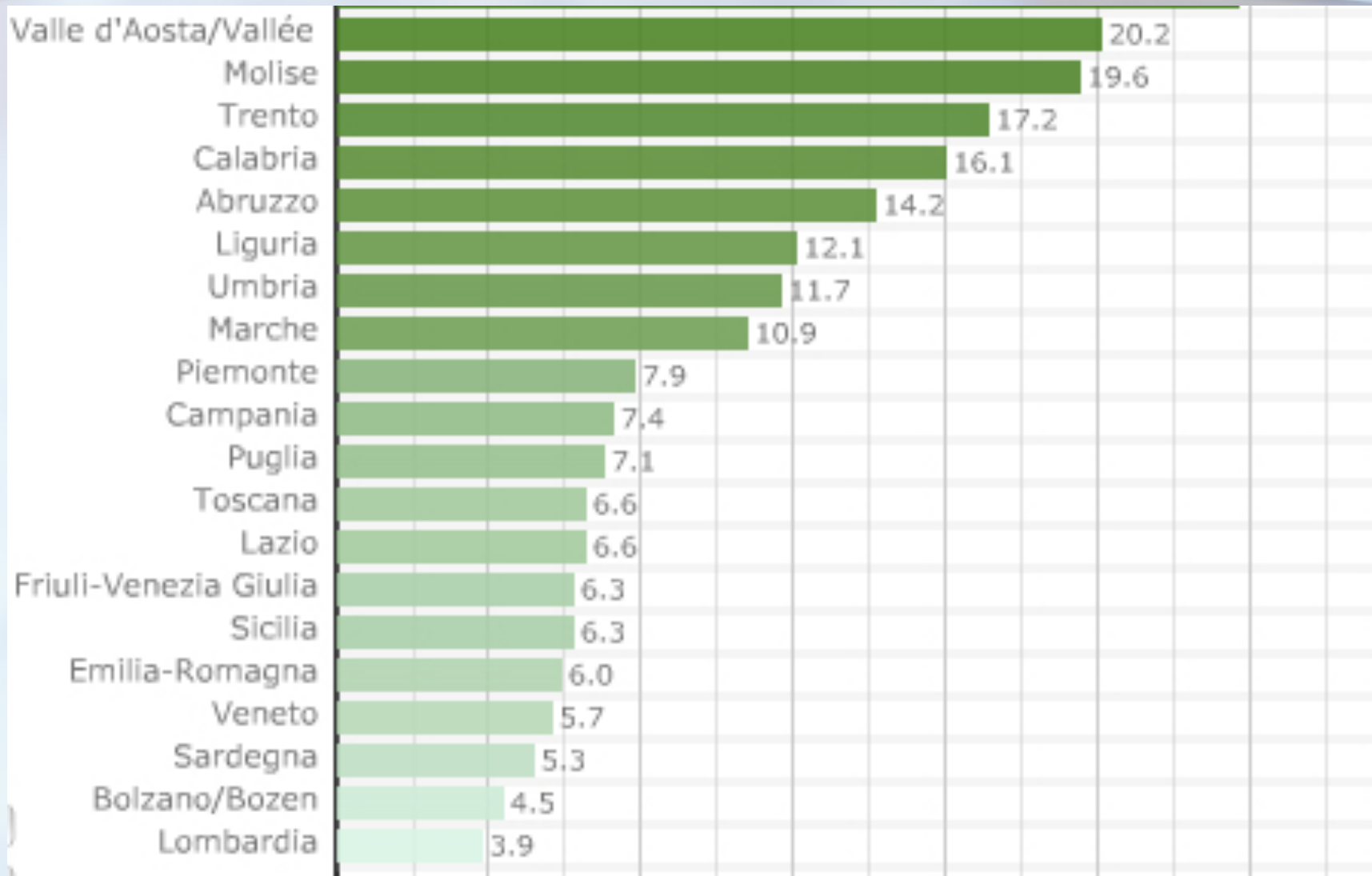- The current Italian FSE guideline, indicates that only documents can be stored into the FSE

The Italian Scenario

- 3 Regions have a working implementation of EHR

- 10 Regions are now implementing EHR

- 6 Regions are in the design phase for EHR

- 2 Regions have not activities on EHR

The Italian Scenario

Region	Migration Index
Valle d'Aosta/Vallée	20.2
Molise	19.6
Trento	17.2
Calabria	16.1
Abruzzo	14.2
Liguria	12.1
Umbria	11.7
Marche	10.9
Piemonte	7.9
Campania	7.4
Puglia	7.1
Toscana	6.6
Lazio	6.6
Friuli-Venezia Giulia	6.3
Sicilia	6.3
Emilia-Romagna	6.0
Veneto	5.7
Sardegna	5.3
Bolzano/Bozen	4.5
Lombardia	3.9

Migration Index

InFSE Motivations

- The main goal of the project is to sustain the building and the diffusion of a **federated infrastructure** for the Fascicolo Sanitario Elettronico (the Italian infrastructure for Electronic Health Record)

- This infrastructure has to be able to **integrate already developed local solutions of EHRs**, so enabling all citizens and health professionals to get access to clinical documents, **wherever they are located in the national territory**.

InFSE Requirements

- ✓ To be compliant with Regional solution already developed by using a "federated" approach

- ✓ To use federation mechanism and open standard and technologies used in the international context.

- ✓ To acknowledge infrastructure requirements necessary for functional and semantic interoperability as in the national project IPSE and european project EPSOS

- ✓ Scalability and modularity, to allow an incremental and distribured development

- ✓ To use the Italian Connectivity Public System (SPC)
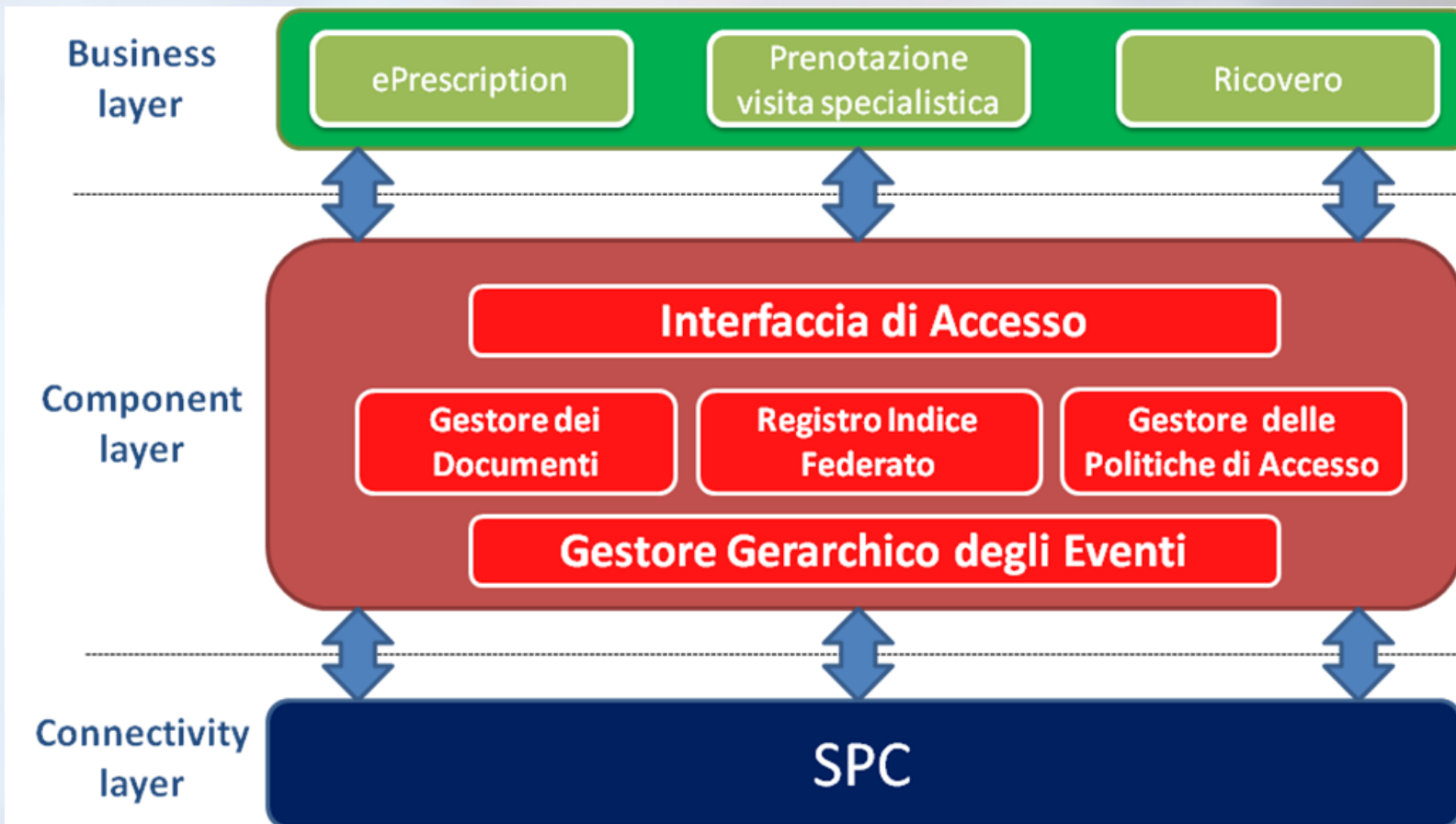
InFSE Components

InFSE Components

- **Interfaccia di Accesso (IA)** - This is the business interface that enables the access to the services of the infrastructure.

- This interface is the "entry point " for all users (doctors, patients, other InFSE components): no one can directly access to the InFSE services.

- Among the others, the IA allows to access services for

  - authentication
  - accessing and registering documents,
  - handling logic federations of InFSE nodes,
  - handling clinical events and hierarchies of events (if available).

InFSE Components

- **Gestore dei Documenti (GD)** - This is the component that interacts with a local document repository. It hides the heterogeneity of all kinds of repositories deployed and supports basic services like those for registering and retrieving a document.

- **Gestore delle Politiche di Accesso (GA)** - This is the component that implements security policies and authorizes any entity that requires services of the infrastructure. This components is also in charge of mapping and matching roles and credentials defined and adopted by the different regions.

Registro Indice Federato

- **Registro Indice Federato (RIF)** – This component maintains clinical documents metadata which specify information for document retrieval (i.e. the document owner, the repository address, etc)

- The metadata structure is defined by a reference information model (RIM) properly adapted for the healthcare domain

- Each time a health document is generated (ors its state change), the Federated Index Registry is automatically updated.

- The federation of registries offers a number of advantages such as scalability, reliability, ability to perform federated queries and get higher quality performance.

Indexing

- The RIF is a federated and distributed component according to a hybrid peer-to-peer logic .

- Each super peer is responsible for the indexing of documents related to the Region X citizens (both present in the repository of Region X of all other regions)

- Each peer can be responsible for the indexing of documents relatede to the citizens referring to a particular health facility (eg. ASL)
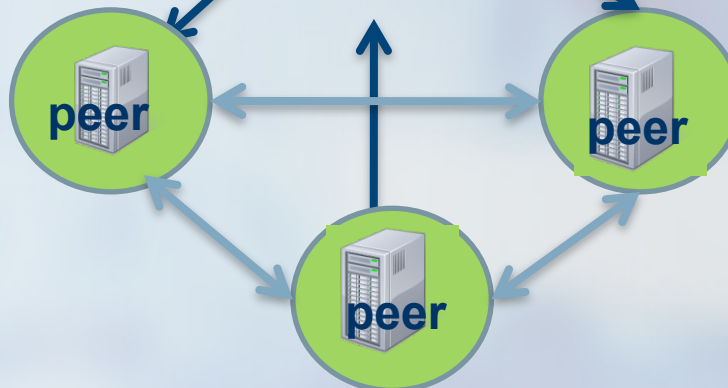
Federations

Registro Regionale B

Registro Regionale A

Super peer

Super peer

National Federation

Super peer

Registro Regionale C
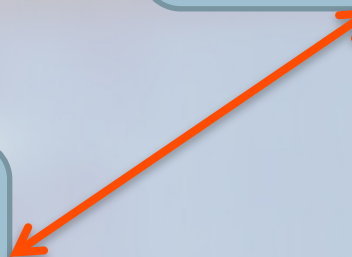
Regional Federation

peer

peer

Registro Locale X

peer

Metadata

- **What kind of metadata?**

  - "**basic**": only essential information for document retrivial are stored into registry

  - "**extended**": in addition to "basic" metadata, information related to document content are stored

- **Why and Where?:**

  - Basic metadata into *superpeer*: this allows fast queries

  - Extended metadata into *peer* : "heavy" queries but it can avoid the access to documents (very useful for perfomance optimization in case of secondary use, i.e. statistical surveys)

Data Recovery

- Data Redundancy into super peer with clustering techniques

Nodo Regionale

Super peer

Sito 1

Super peer

Sito 2
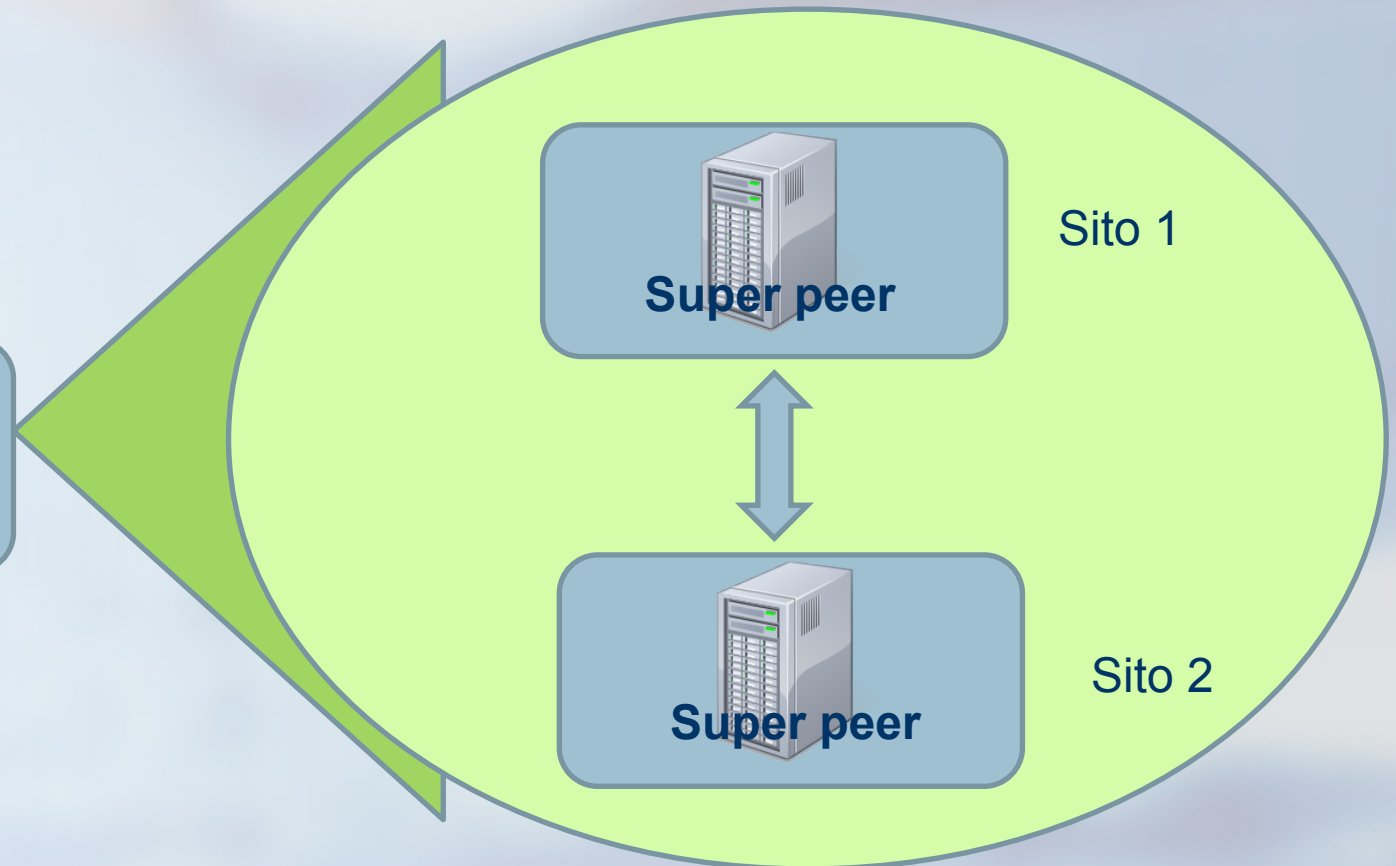
Super peer

Data Recovery

■ Data redundancy between *peer* and *super-peer*

Basic Metadata

XY

Nodo regionale B

Super peer

Extended Metadata

XY

peer

peer

peer

Nodo Locale X
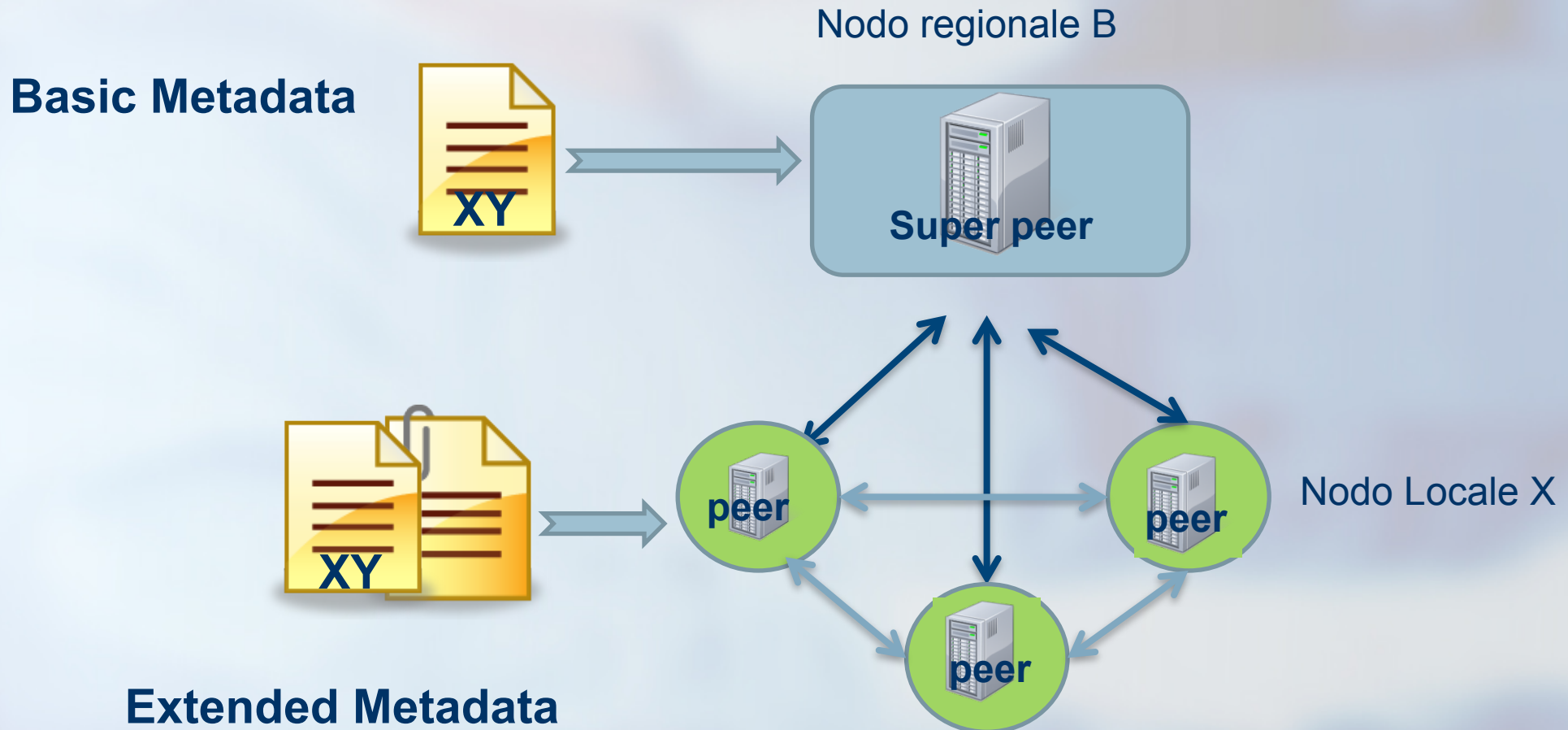
InFSE Components

- **Gestore Gerachico degli Eventi (GGE)** – This component allows to implement a federation of event managers that support the Web Services Notification specifications for basic notifications

- It also provides innovative mechanisms (and the related services) for handling complex structures of clinical events (class hierarchies).

- This permits to overcome the limit of the "documental approach", giving the user the possibility to handle a "**clinical episode**" instead of single documents

The "document oriented" approach
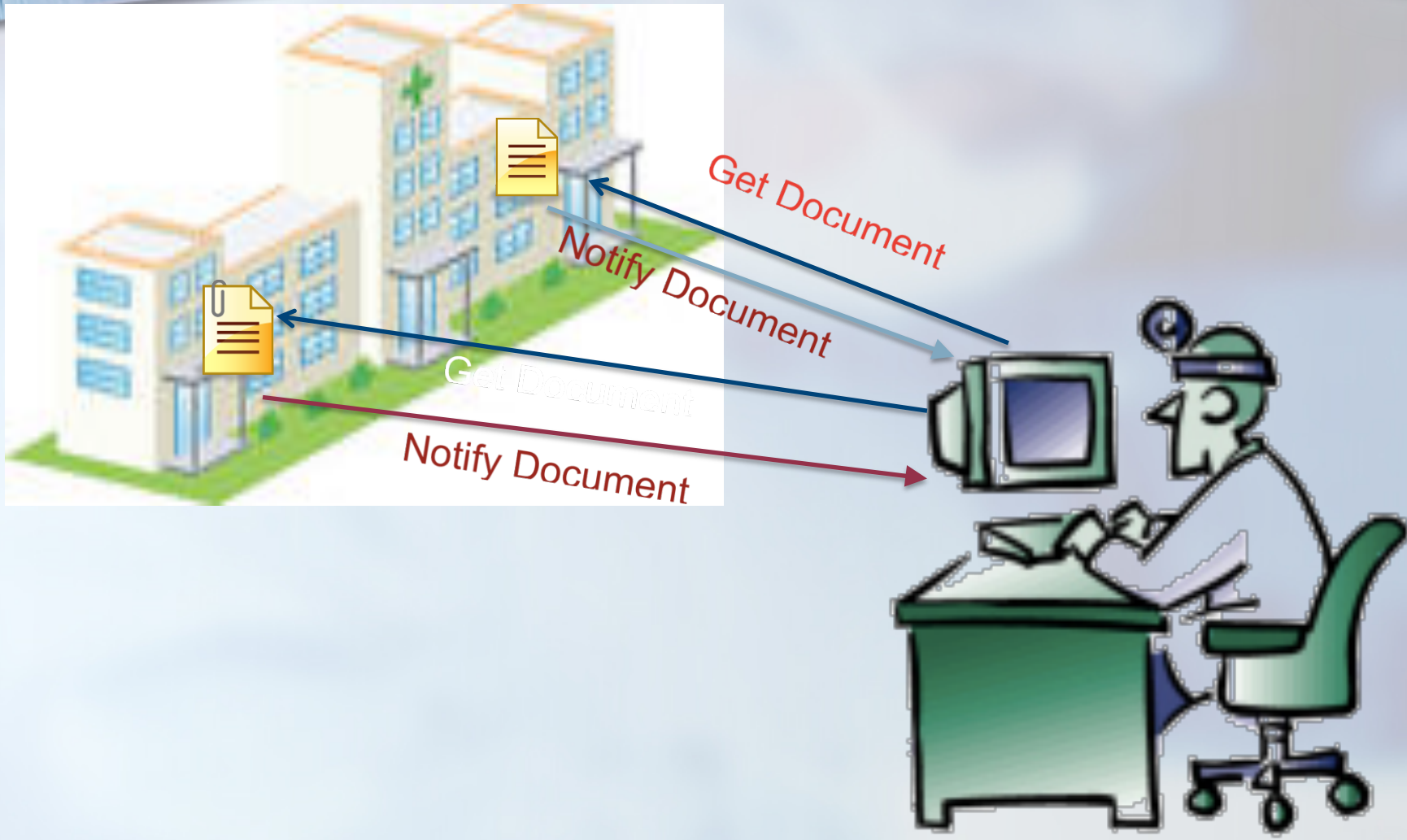
Gestore Gerarchico degli eventi

Events may be dynamically organized in classes and hierarchies of classes. The subscription of a class of events enables the subscriber to receive not only the events of that class but also the ones belonging to "child" classes.
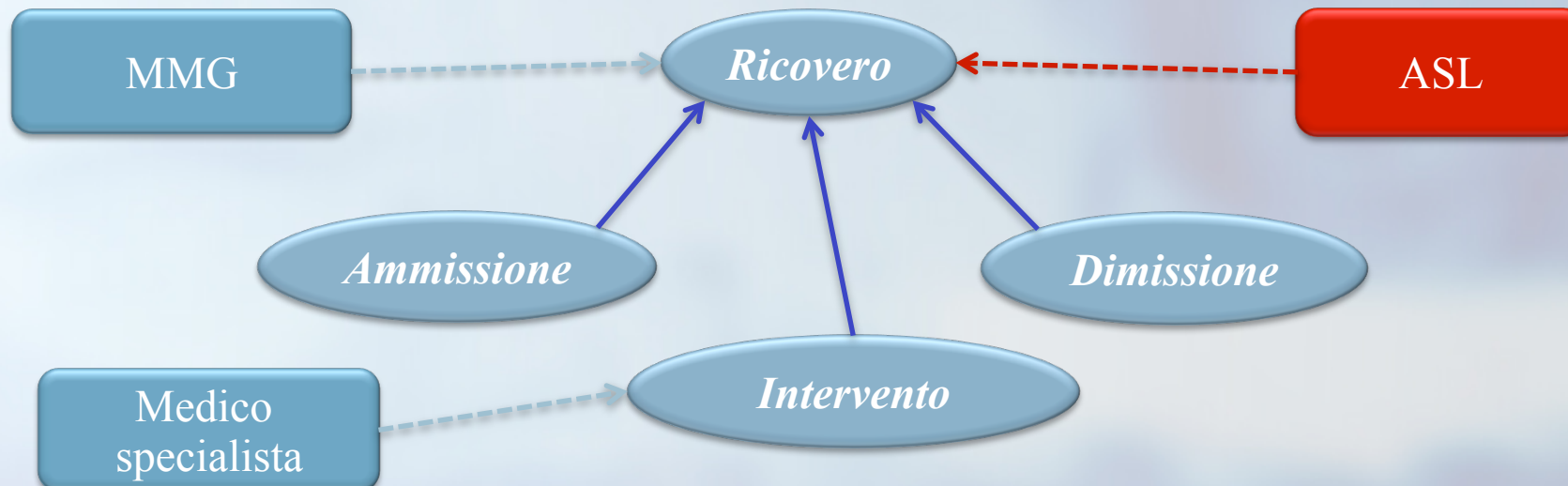
…handling with event hierarchy
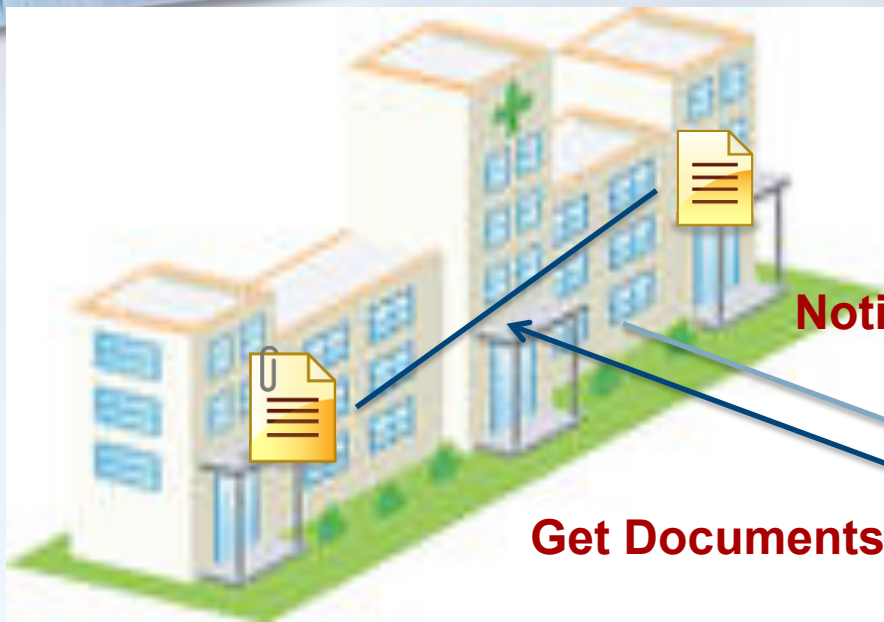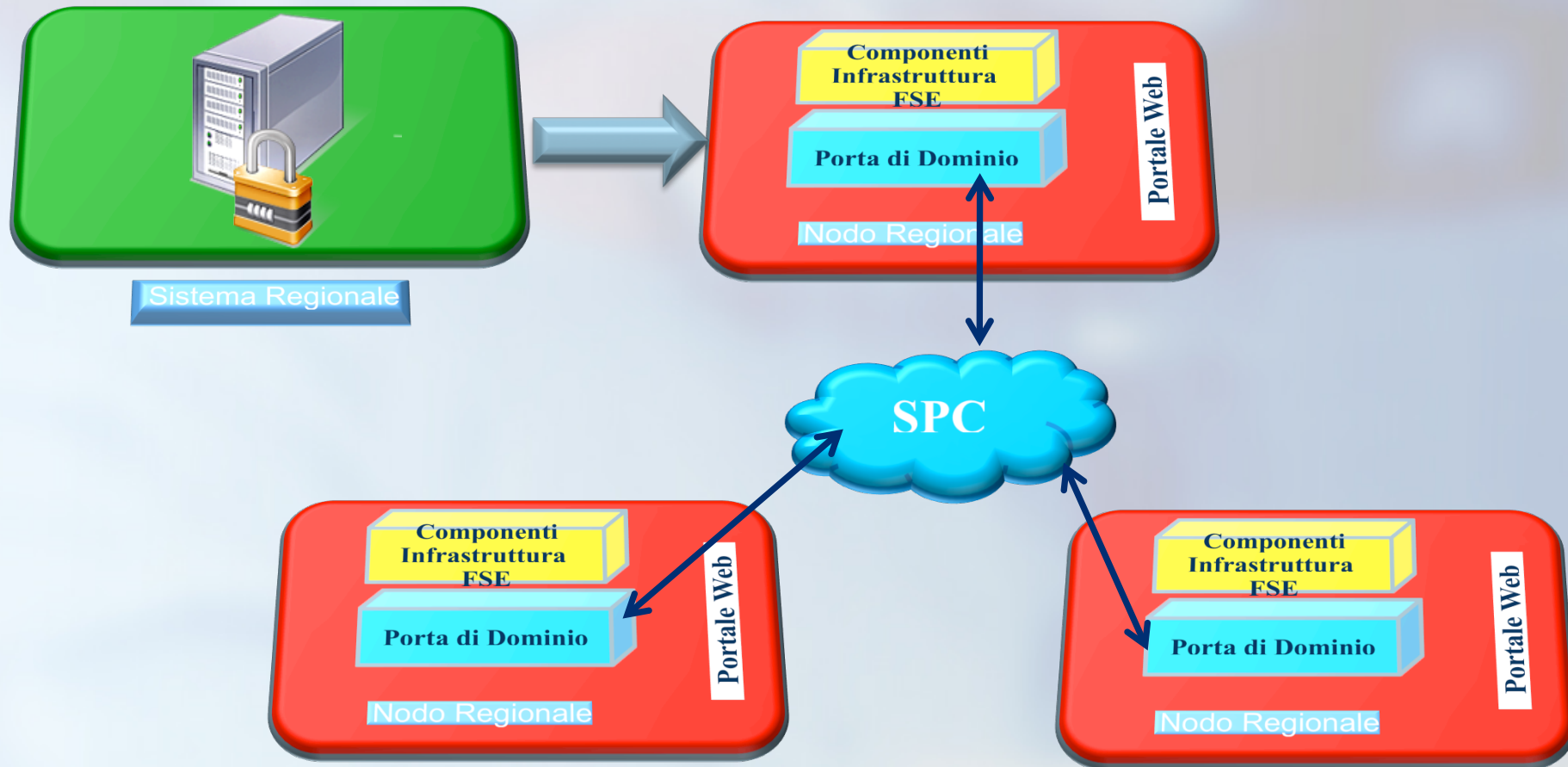
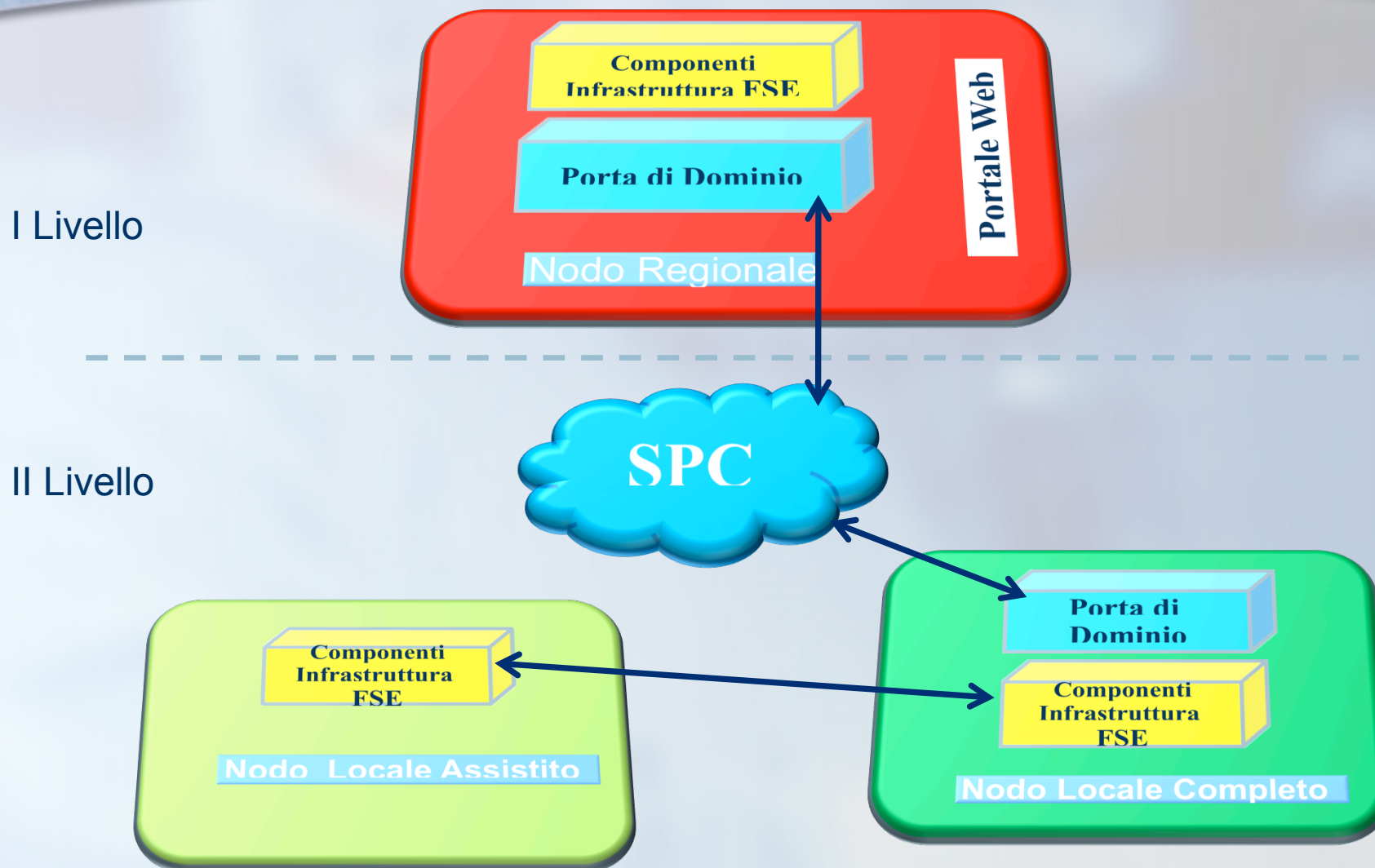**Notify hospitalization**

Get Documents

The Architectural Model

- The InFSE architectural model is composed by first level nodes (**regional nodes**) and (optionally) second level nodes (**local nodes**)

- Regional nodes contain all INFSE infrastructure components and provide all functionalities to find and handle the requested information

- Local nodes can be functionally equivalent to the Regional ones (**complete local nodes**) or to provide only some of the components (**assisted local nodes**)

Example of National Federation with first level nodes

Example of National Federation
with first and second level nodes

I Livello

II Livello

Componenti Infrastruttura FSE

Porta di Dominio

Portale Web

Nodo Regionale

SPC

Componenti Infrastruttura FSE

Nodo Locale Assistito

Porta di Dominio

Componenti Infrastruttura FSE

Nodo Locale Completo

The evolution of InFSE : OpenInFSE

- OpenInFSE main goals

  - To implement the InFSE software components

  - To build a first stable infrastructure to support interoperability across existing local (i.e. regional) FSE systems

  - To develop models and services to supprt remote health monitoring and assistance

Experimental networks
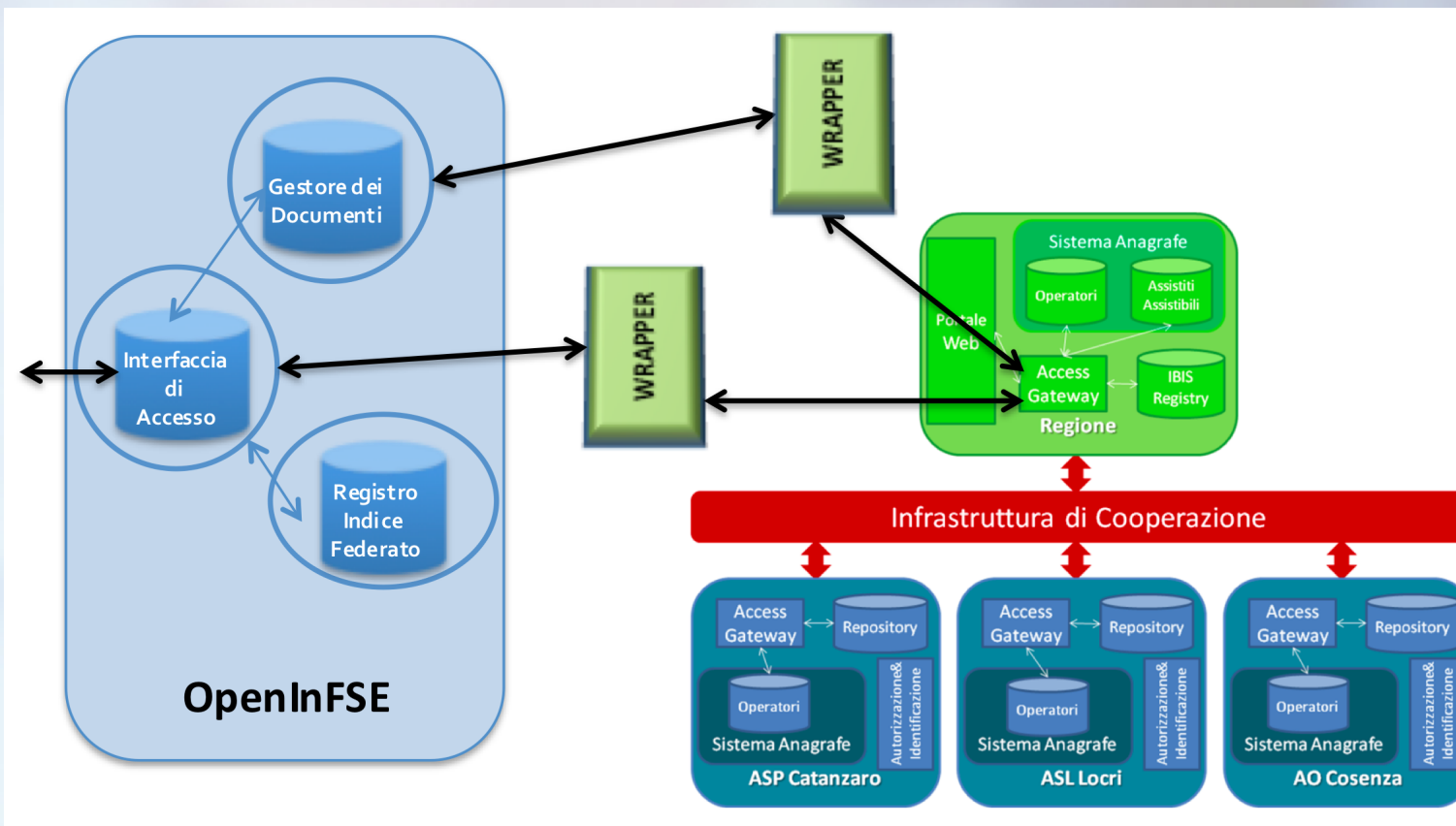
■ OpenInFSE

■ IPSE

Interregional network set-up
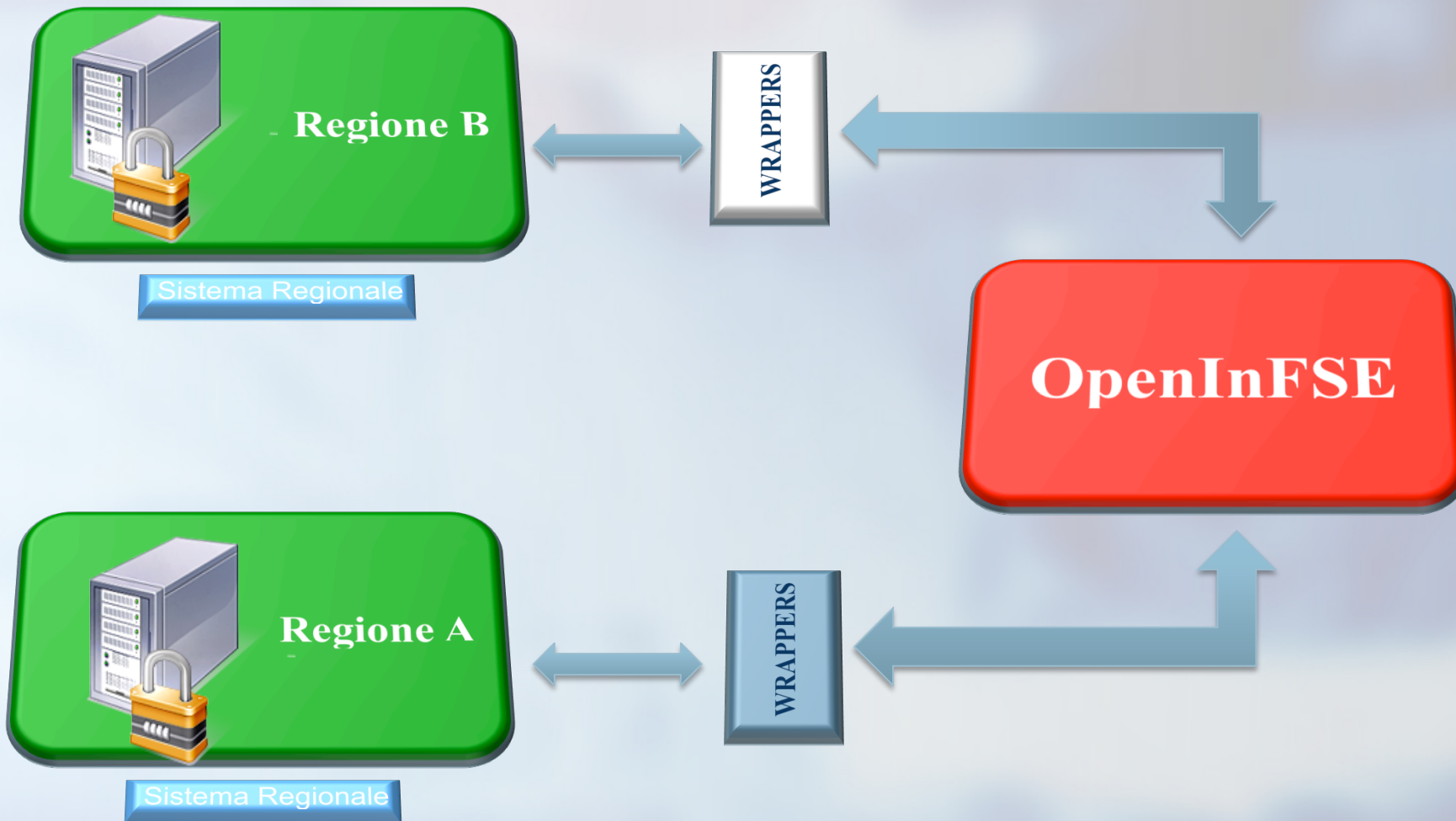
Es.: Regione Campania
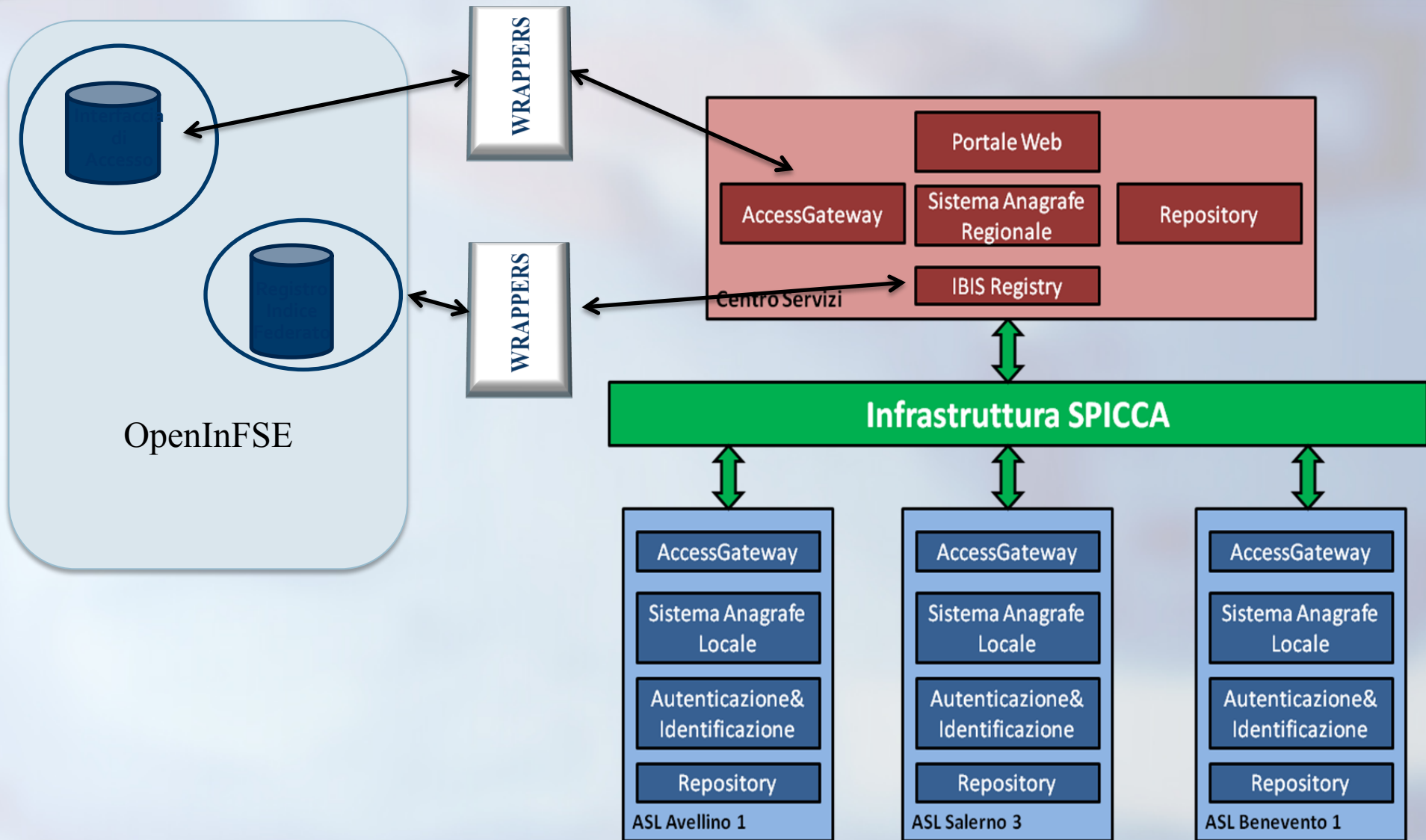
Es.: Regione Calabria

Towards InFSE 2.0...

- Many of patient's clinical data will be produced (in the near future) at home

- These information shoud be made available within the Fascicolo Sanitario Elettronico

- New advanced services for information gathering and processing need

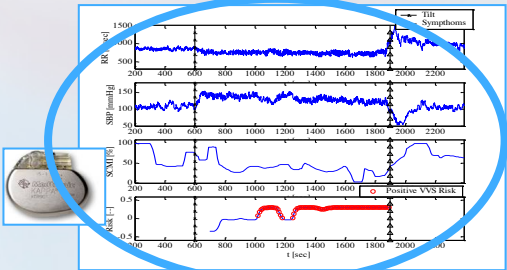# Personal Health Systems for remote monitoring

Data acquisition

Data processing & analysis

Health / call Centre

Sensors for multi-parametric monitoring

Other data: clinics, imaging, Igenomics

Intelligent Analisys

Medical Expertise

Hospital

Treatment, Rehabilitation

Diagnosis and therapy supporto

Data communication and feedback

Towards new services

- Services for rapid integration of a wide class of sensors for patient remote monitoring;

- Services for data pre-processing and analisys on mobile devices, also by using knowledge technologies;

- Services for transmission of generated data to remote monitoring stations;

- Services for full data analisys and remote storage.

InFSE 2.0

- GDP (Gestore Dati Persistente): provides services for data storing and retrieving

- GD (Generatore di documenti): provides functionalities for document creation starting (es HL7 CDA format) from stored data

- GDS (Gestore data stream): provides functionalities remote data trasmission in streaming modality

- GPD (Gestore Profili di Device): provides to developers the descriptions of vital parameters monitoring devices which are compatible with the infrastructure

Thank YOU

GIUSEPPE.DEPIETRO@NA.ICAR.CNR.IT

IHEALTHLAB.ICAR.CNR.IT