

# Benefits of Cloud Computing in EHR implementation

The solution of Dedalus for application  
interoperability in the eHealth sector

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**SHAPING A CONNECTED DIGITAL FUTURE**  
*Tuesday 13<sup>th</sup> November 2012, Stockholm*

**Dedalus**  
HEALTHCARE SYSTEMS GROUP

# What can we do for Healthcare structures... and for citizens/patients?

In the last decade Dedalus has focused on **EHR**

“A **digitally stored health care information** about an individual's **lifetime** with the purpose of supporting continuity of care, education and research, and ensuring confidentiality at all times”

It is not EMR: Enterprise Electronic medical records - restructures and optimizes the records of a specific Department

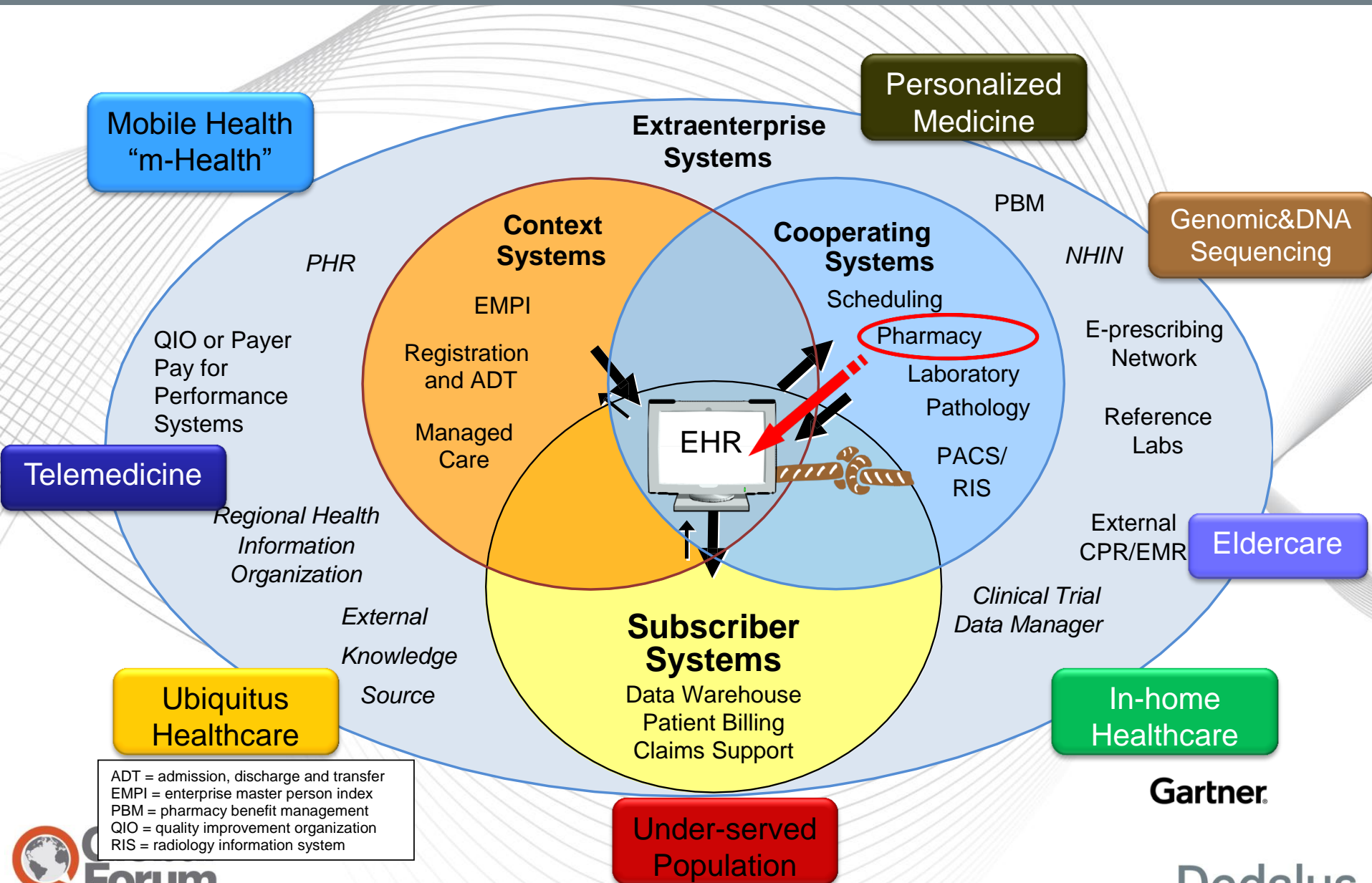
It is not EPR: Patient-centered medical records with information from multiple institutions or Departments.

# The new healthcare context

- The new healthcare contexts involve **larger and larger realities**:
  - Local Healthcare Units
  - Regions
  - Nations
  - ...
- IHE defines these contexts as “**Affinity Domains**”
- Within these contexts the EHR involves:
  - Different **care environments**
  - Different **actors**
  - Different **domains**
- We are progressively moving from a need of health towards a need of **wellbeing**



# Emerging Healthcare IT Systems Landscape



# Healthcare Enterprise





# Convergence of major technologies: New ICT modalities



# This implies new needs and new requirements

- Define, deploy, maintain, evolve **distributed and heterogeneous environments**
- Guarantee resource **scalability** and **dynamicity**
- Provide adequate **capacities** and **performances**
- Implement new policies to guarantee **security of data** and **control of access**

# Can Cloud Computing be useful for EHR?

## ■ Three service models

- *Software as a Service (SaaS).*
- *Platform as a Service (PaaS).*
- *Infrastructure as a Service (IaaS).*

## ■ Four deployment models.

- *Private cloud.*
- *Community cloud.*
- *Public cloud.*
- *Hybrid cloud.*

## ■ Five essential characteristics

- *On-demand self-service* → *DEFINE, DEPLOY... HETEROGENEOUS ENV.*
- *Broad network access* → *PERFORMANCES*
- *Resource pooling* → *DYNAMICITY*
- *Rapid elasticity* → *SCALABILITY*
- *Measured service* → *MONITORING, CONTROL*

**Sounds promising!!**





## Cloud-based Interoperability and cooperation platform

The solution of Dedalus for EHR and application interoperability in the eHealth sector

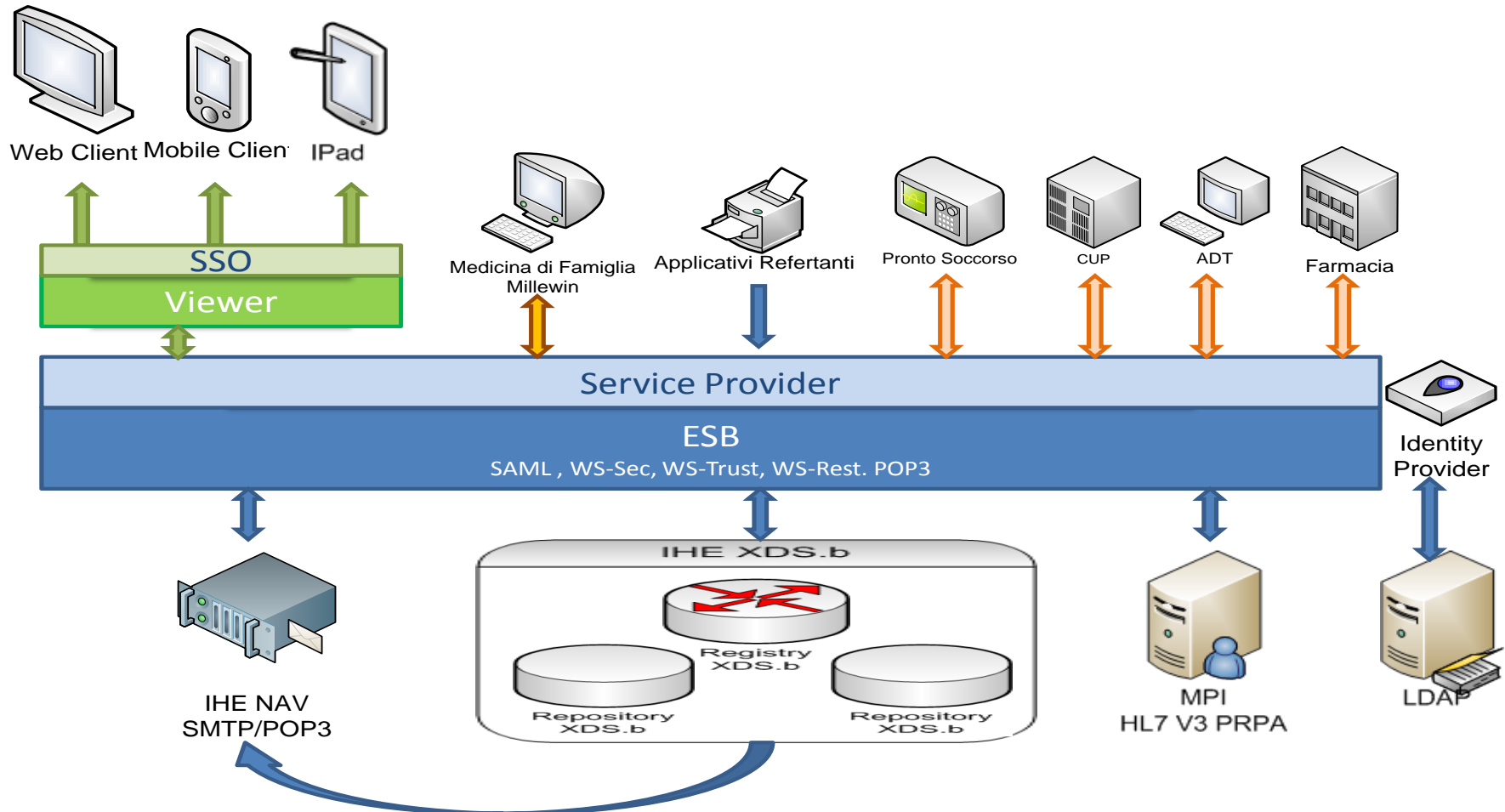
# What the platform is ...

## ■ It is the enabling tool for the implementation of:

- EHR – Electronic Health Record. One-stop-shop to access both **health information** related to the patient, and an umbrella of **health services** for the citizens. It provides an **index of (digitally signed) electronic documents** for the patient. It is accessible by citizens and authorized health operators, everywhere and any time. It collects cross-enterprise and health professionals information. The EHR stores information for primary (assistance, emergency, etc.) as well as secondary uses (administrative, governance, etc.);
- EPR – Electronic Patient Record. Similar to EHR, positioned at enterprise level;
- PHR – Personal Health Record. An overview of the patient clinical history, directly personalized and customized by

citizens.

## Dedalus EHR



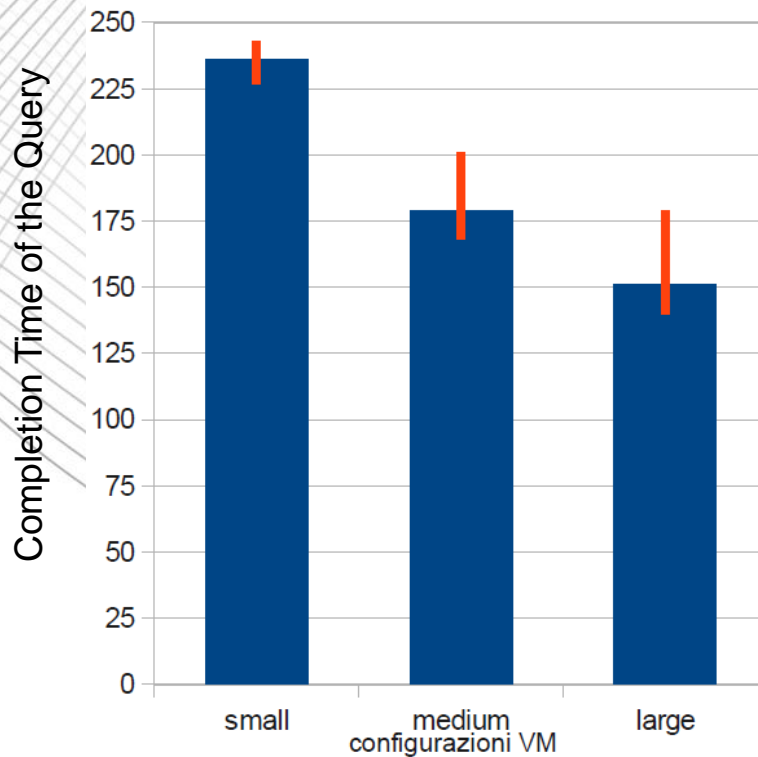


# DEDALUS Experience in Infrastructure as a Service

- Virtualization of EHR in order to improve **scalability** and/or **reliability** of the system
  - X1.V1 is deployed as a set of virtual machines. We are testing cloud mechanisms (Opennebula) for configuring them in order to automatically optimize the resources (*performance*) and to guarantee the continuity of services (*reliability*)
  - Scenario: In the operative time the application level of X1.V1 needs most of the resources for interacting with document consumer and document producer actors and for efficiently manage these procedures. In the NON operative time (e.g. in the night) the DB of X1.V1 needs more resources for supporting data warehousing procedures

# DEDALUS Experience in Infrastructure as a Service

- Through personalized and easy scheduled configuration of Opennebula, we are testing procedures to allocate different resources to the different VMs of X1.V1 in the different times.



*With static allocation of the resources to the VMs of X1.V1, the completion time of the queries for datawarehousing could be very long and sometimes not executable*

# DEDALUS Experience in Platform as a Service

- The blackbox (or greybox) testing of services architectures is a very challenging issue for deploying reliable, secure and efficient systems in healthcare as well as in other critical domain
- Dedalus is coordinator of a STREP R&D project, co-funded by the EC in the FP7:
  - **MIDAS** “Model and Inference Driven - Automated testing of Services architectures” aims to implement an integrated framework for the automation and intelligent management of SOA testing as a Platform as a Service for supporting all the testing activities – test generation, execution, result analysis, planning and scheduling
  - By adopting eHealth standards (HSSP, IHE) Dedalus will contribute to provide mechanisms for effectively writing test cases of complex services applications and efficiently perform test campaigns of services architectures



# Benefits and advantages of cloud based-EHR

## Cost reduction

- Enormous economies of scale
- Efficiencies in scale, buying power, infrastructure, power consumption
- Help bring the cost of healthcare under control

## Agility

- Automate workflows to enable consistency, agility and elasticity
- Improve provisioning time from days to hours; pay as you go
- Adapt quickly to changing models of collaborative care

## Availability

- Deliver high availability for critical healthcare applications
- Protect IP, data and differentiated business processes
- Provide secure, broad network access on authenticated devices

## Healthcare utility & value add services

- Effective allocation of resources and expertise
- Accelerate standard adoption
- Build the network value model of exchange
- **TESTING**

# Major concerns of cloud-based EHR

## Security & privacy

- Must protect PHI in transit and at rest
- Costs associated with data breach are rising
- Cloud services and virtualization break traditional security techniques

## Data sovereignty

- Where is my citizen's health information?
- Regulatory and statutory requirements may prevent sensitive information from being hosted in a different country

## Auditability & Compliance

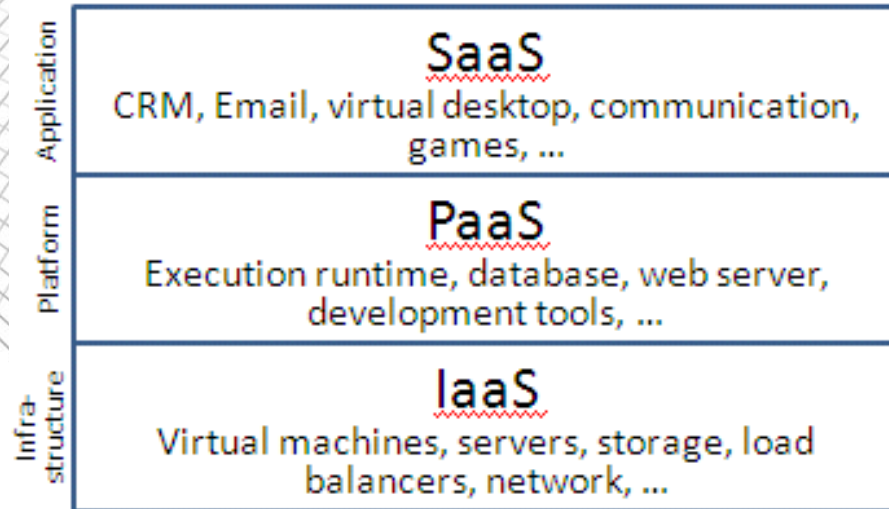
- Data center audits may be impractical for public cloud provider
- National vs international data protection and privacy regulations (certifications)

## Vendor lock-in

- Service model dependent
- Provisioning & automation software built against proprietary APIs
- Cost of entry may be low, cost of exit may be high

## Cloud Clients

Web browser, mobile app, thin client, terminal emulator, ...



??? Challenging opportunities!!

*ON\_DEMAND approach*

- **Testing Facilities**
- *Configuration*
- *Resources*
- *Storage*
- *Pay what you need*
- *Pay-as-you-go*

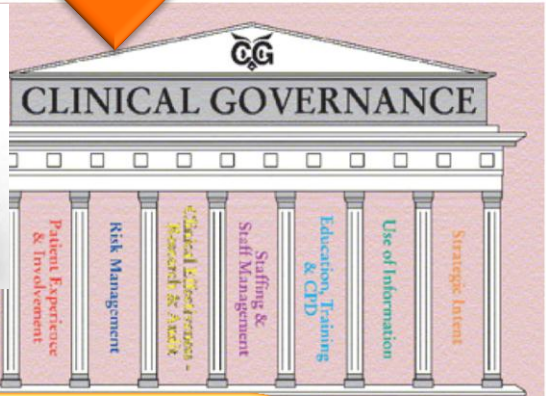


# New vision: entrepreneurial approach

## Cloud providers



- Regional healthcare bodies rely on external Cloud-based EHR providers
- Adopting either Public or Private deploy models



## New vision

- The Reg. Healthcare Bodies become cloud-based add-value service provider
- Completely new approach to Cloud-based EHR
- SaaS model from HC bodies to citizens
- Entrepreneurial model

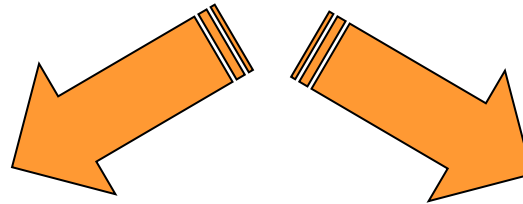


# New opportunities of this vision

- In European Countries, governmental bodies are progressively **reducing** the financial support to Regional Healthcare bodies;
- Considering also the crisis effects, healthcare structures have less and less support, thus **affecting the QoS**
- Italy-Censis March 15<sup>th</sup>, 2012: 2007-2010, 30.6 bil € of private spending (**+8%**) – in 2017 about **17 bil € gap** between needed and provided funding

## Hybrid model

- Public funding guarantees a **minimal quality** of the healthcare assistance
- Entrepreneurial approach: provide **paying add-value services** to demanding citizens, willing to pay for advanced services
- Healthcare → Wellbeing
- New funds → improved QoS for all the citizens



## Towards PRIVATE healthcare model



Quality of health assistance depends on the class of the assurance contract

# What could the Healthcare structures get and offer?

## ■ Authentication

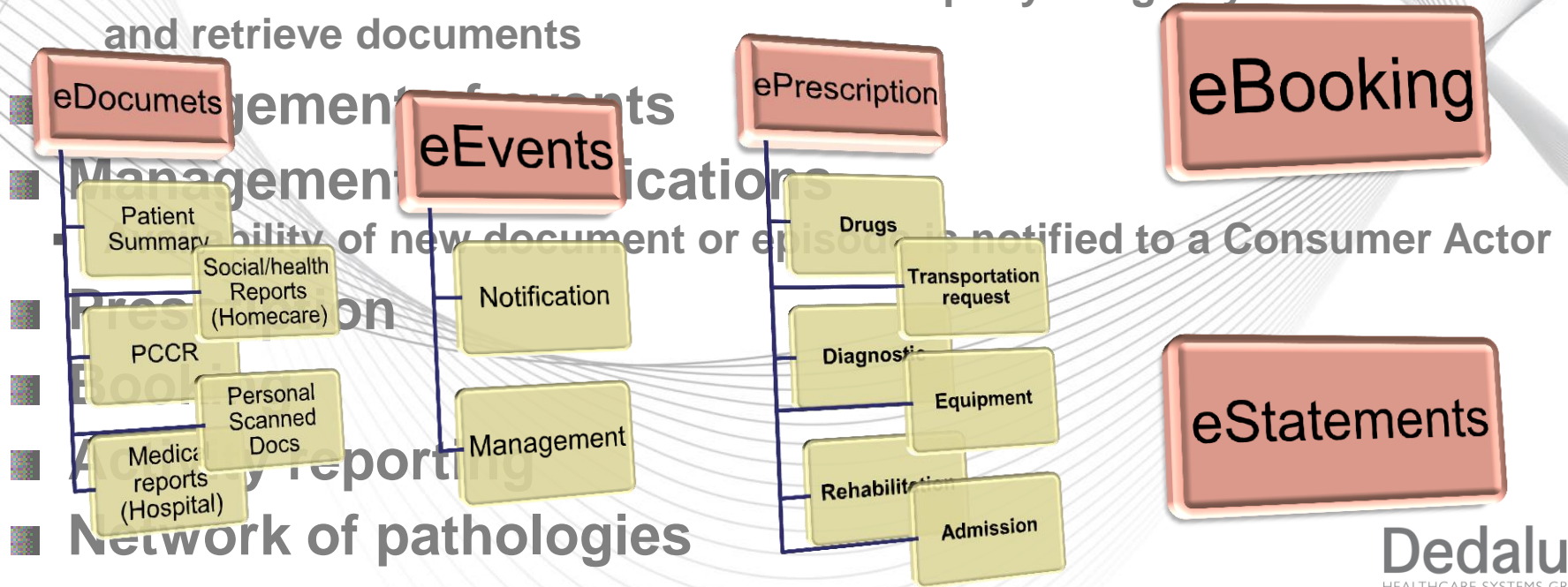
- Authorized user is granted with access rights compliant with its role and capabilities

## ■ Demographic integration

- Integration of the users' demographic details

## ■ Documents integration

- Document Sources are responsible to produce and publish both documents and metadata
- Document Consumers should be able to query a registry and retrieve documents







# Thank you for your attention

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