Flexible solution for interoperable cloud healthcare systems

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**Objective:**

- improving the interoperability in healthcare information systems

**Benefits for:**

- **Software developers** – for future suitable healthcare informatics systems which will connect more easily and exchange data at the right time
- **Patients** - can access systems where available information is more adequate and the trust in treatment will be higher
- **Doctors** - information about the patient is gathered from many locations and the decision will be qualitatively better.
Why cloud computing?

- Doctors need, in critical moments, the medical history of patients in real time;

Patients are sent to various investigations - high rate data exchange between medical units departments;

Doctors need complete medical information of the patients to provide a complete and accurate treatment;

- Technology supporting improvement of healthcare services - cloud computing.
Architecture and characteristics of cloud computing

Development models

Public Cloud

Hybrid Clouds

Private Cloud

Community Cloud

Organization 1

Organization 2

Organization 3

Organization 4

Services models

Software as a Service (SaaS)

Platform as a Service (PaaS)

Infrastructure as a Service (IaaS)

General features

Scalability

Homogeneity

Virtualization

Low-cost software

Elasticity into computation

Geographical distribution

Service-oriented

Essential features

On-demand services

Wide access to the network

Pooling resources

Elasticity

Measured services
Cloud computing in healthcare

• Cloud computing offers great potential for quick access to medical information

• Quick access to medical history of each person

• Cloud computing can help patients to gain access to their medical history from anywhere in the world via the Internet

• Benefits of cloud computing in healthcare:
  ◦ storing medical data
  ◦ offers remote access
  ◦ allows data sharing between authorized units
  ◦ the updates for the medical history of the patient
Cloud computing as a solution supporting information systems in a hospital (1)

Cloud-based model in hospital
Cloud computing as a solution supporting information systems in a hospital (2)

Architecture and communication for two departments
System architecture for romanian healthcare
Database configuration control for toolbox (1)
Database configuration control for toolbox (2)
Advantages and disadvantages of cloud computing in healthcare

- Scalable infrastructure
- Collaboration
- Access details of insurance in the cloud
- Quick and easy access
- Poor security (implements of Health Insurance Portability and Accountability Act (HIPAA) Standard)
Practical advantages of our prototype (1)

- **Flexibility** – the physician can access all the information of the patient from anywhere and anytime; when registering a new baby, pediatrics physician can access the data from neonatology or ob-gyn physician for all needed data.

- **Portability** – it can be accessed from any operating system throw the Internet; the physician access the Internet throw any web browser to access her/his application with the patients.

- **Information transfer** – all medical information can be accessed from any department through HL7 CDA or CCD standards; if cardiology physician need data from pediatrics department, he/she can request that data throw HL7 Standards.)
Practical advantages of our prototype (2)

- Construction of medical record through the life – meeting all the medical information of the patient from all departments where he/she goes; pediatrics physician can access all information of the child from different departments and can begin his/her long life medical record that after 18 years goes to GP
- Lower costs – all hardware equipment are maintained by cloud computing providers
- Increase the power of computation – all applications can communicate and make decisions quickly; if a child goes to cardiology physician and he/she need an urgent treatment, the physician can access the medical data of the child from pediatrics to give fair treatment
- Accessing the information uses IDs not names of patients – to overcome security issues as an initial phase
Pediatrics application with the interoperability control on the azure cloud
Conclusions and future work (1)

- Using the cloud computing technology in the clinical process may considerably improve the access to information, which can be done much easier;

- The scalability of cloud computing offers more resources needed for certain operation at any time;

- The collaboration between medical units is an opportunity offered by cloud computing for healthcare staff;

- Patients can be guided to appropriate persons or units where they can find what they need;
Conclusions and future works (2)

- The costs of the IT infrastructure will be cheaper because the medical units will only rent the infrastructure to store medical data and manage medical data;

- Using HL7 CDA and CCD standards will improve the interoperability between healthcare information systems

- The toolbox control indicates the tables and fields for a selection of databases - SQL Server, Access or Oracle

- Future work - the user will have the possibility to select the fields name from where the data will be extracted to create the XML in HL7 CDA or CCD format.
Thank you for your attention!