

## DICOM Network - Solution for Medical Imagistic Investigations Exchange

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**Abstract:** During last years IT sector and eHealth made a big progress in Moldova. Hospitals and other medical Institutions acquire modern digitized equipment. Medical institutions are connected to the Internet and high speed connections available not only in the cities but in the country regions too. Many medical institutions are developing and implementing different information systems. One of the directions of eHealth developing is implementation of instruments for processing and systematization of various images produced as a result of medical examinations. E.g. only limited number of medical institutions in Moldova possesses modern tomography equipment that can be used for complex images processing. It often happens that tomographic examinations' images are needed to be transferred from one hospital to another for their analyzing and future use. At present images transmission technologies mainly based on writing data on photo films, CD and DVD, but a few installations are equipped by DICOM Viewers for qualitative information visualization. Creation of integrated system of DICOM images collection, systematization and visualization in unified form is a very actual task.

**Keywords:** Medicine, DICOM, GRID, RENAM network, eHealth.

### 1 Introduction

All the health institutions need to append the results of investigations to the medical history according the legacy, also all the medical institutions need to save the archive of the investigations. The imagistic investigation could be saved as printed on special paper as on digital CD or DVD. For creating and supporting archives serious expenditures are necessary. Additional problem is that these archives should be stored for long term, but all traditional storage devices (paper, CD or DVD) can save quality images only for 1-2 years.

Currently even in framework of one medical institution the exchange of imagistic investigations typically is performing only by printing the images on the paper that is not comfortable for medical personal because they are limited in number of copies and quality. As a result at the surgery are presented only the pictures printed by the doctor specialist in imagistic but not the doctor who care of the patient. It is often happens in practice that doctors are waiting in operating room for images to be printed from existing investigation.

For transferring investigations to other medical institution, when patient is transferred or addressed to another medical institution or to another specialist, is also used printed version of investigation, because it is not always exist properly compatible DICOM Viewer with target investigation format. As a result a part of investigation is not printed and the treating specialist doesn't have all necessary information; usually it causes making again expensive investigation. If there appears a need to transfer the investigation to the other country, for obtaining recommendations from foreign colleagues nowadays medical institutions need to transfer these images via paper mail and it causes inexplicable delays.

As a result medical institutions have to spend many extra expenses for buying the needed materials for print and archive the results of investigations in non-convenient form.

## **2 DICOM Network concept**

As it was mentioned before medical institutions that offer imagistic investigations have a number of problems with saving and distributing the results of investigations:

- Sending the results to the patient's doctor
- Creating archive
- Consulting with other doctors and scientists
- Exchange of information with other medical institutions
- Collecting and calculating statistics

DICOM Network will offer the possibility to solve in unified manner all these problems and issues. Also it will increase the quality of offered service and reduce the price of medical investigations.

Elaboration and practical implementation of the software for collecting, storing, viewing and processing of DICOM images that will be

gathered using DICOM Network facilities will offer possibility to eliminate work with printed images and to offer full access in convenient and automated form to the images for authorized users (medical doctors).

Instrumental support of DICOM Network implementation is based on utilization of the modern technologies of distributing computing – GRID computing. All imagistic data will be saved on the secured GRID clusters and the access will be offered only for authorized users with individual digital certificate.

### **3 Aims of DICOM Network**

The main aim of the proposed Distributed Network for Secure Exchanging of DICOM Format Images is creation of united system of exchanging DICOM medical examinations using distributed GRID technologies. Creation of such network offers a possibility to realize unified approach for storing, processing and distributing of medical examination in DICOM format for all medical institutions of the country. The essence of the system can be fully achieved in case if this network will integrate all main institutions and hospitals that offer possibility of medical examinations in DICOM format (tomography, roentgen, photofluorography, ultrasonic, etc). There must be pointed that modern medical equipment produces and keeps examinations in DICOM format – it is a standard technology for images creation, storing and exchange in medicine. For old equipment that has no possibility to produce digital output format exists solution for transformation analog output signals to digital DICOM images. Connection to the network has to be organized to all medical staff that having enough access rights.

For friendly interaction with the elaborating DICOM Network it is assumed creation of a web environment providing intelligent assess to the network recourses as a part of national eHealth portal. Taking in account that almost all of medical establishments in Moldova are covered by high speed Internet each medical worker that has appropriate access rights, which are determined by his digital certificate will be able to receive the necessary data from the network in every connected medical center. Creation of united network with fast access to archived data will make a possibility to analyze precedent patient's examinations and compare different medical examinations with similar cases in the past. Creation of such network will allow also to make on line remote consultations when

examination is made somewhere in the peripheral region of country but medic from principal specialized center or from other country will be able to analyze images. It should be pointed that now for making such examination patient is transported by emergency service. In case of ability to get access to the full history of examinations doctor will be able from the one hand to tune his diagnosis using recent data and from another hand to check the previous diagnosis. DICOM Network facility will increase the quality of work both of experts carrying investigations and experts studying this inspection and as result will help to the patient.

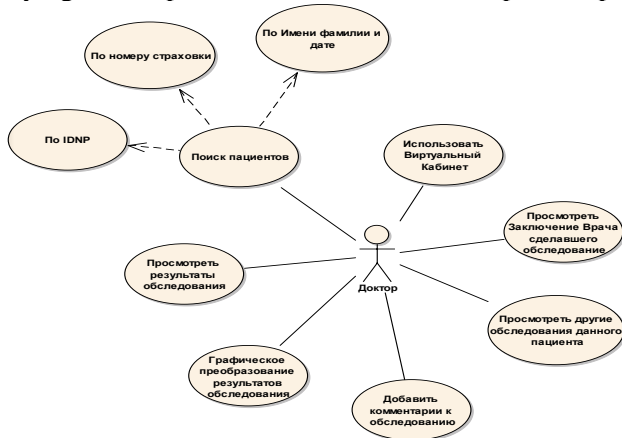


Figure 1. Functionality for Doctor.

## 4 Conclusions

The idea of system for collecting and visualization of medical investigations is not new, but implementation of this system at national level does not exist neither in Moldova nor in other countries. The elements of such approaches and networks are created in some EU countries and USA but they are focused on data exchange only between specialized institutions. The main advantage of the proposed system is utilization up to date distributed computing technologies for saving data and access organization and secure methods for authentication provided by GRID infrastructures.

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