

Project title: Sistemul Informational de Programare a Pacientilor

Document: System Concept Design

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Acronyms

Acronym	Description
AMP	Asistenta Medicala Primara/ Primary healthcare
AT CNAM	Agentia Teritoriala a Companiei Nationale de Asigurari in Medicina/ Territorial Agency of the National Center of Health Insurance
AMU	Serviciul asistenta medicala de urgenta/ Emergency care service
AMS	Serviciul asistenta medicala spitaliceasca/ Hospital care service
APL	Administratia Publica Locala/ Local Public Administration
CNAM	Compania Nationala de Asigurari in Medicina/ National Center of Health Insurance
CNMS	Centrul National de Management in Sanatate/ National Center of Management in Healthcare
CRDM	Centrul Republican de Diagnostica Medicala/ Family Doctors Center
DS	Directia sanatatii/ Healthcare Department
FME	Fişa Medicala Electronica/ Patient electronic medical record
INN	Institutul de Neurologie și Neurochirurgie/ Institute of Neurology and Neurosurgery
IMSP ATM	Institutia Medico - Sanitara Publica Asociatia Medicala Teritoriala/ Public healthcare institution Territorial Medical Association
MS	Ministerul Sanatatii/ Ministry of Healthcare
PU	Programul unic/ Unique program
RM	Republica Moldova/ Republic of Moldova
UE	Uniunea Europeana/ European Union
SIMI	Sistem Informational Medical Integrat/ Integrated Medical Information System

1. Introduction

1.1 Purpose of the document

This document is submitted as fulfillment of the requirements for the delivery of the System Concept in "Sistemul Informational de Programare a Pacientilor" project, Code Name: SIPP. The document provides an overview of the S.I.P.P System Concept Design. Conception is the initial document, prepared as foundation for the system to be developed and implemented, which contains the results of our research and collection of relevant information; it is the basis for further development of technical documentation.

The status of this document is draft and should be considered accordingly.

1.2 Overview

In Republic of Moldova, there are currently 142 hospitals under the jurisdiction of the governmental sector, and 11 hospitals in the private sector. All medical facilities benefit from having computers on site, while 75% own a local area network.

Territorially, it is mentionable that the highest degree of medical facilities owning a local area network is in the Southern area of the country – 100%, while a lower degree is in the Central area – 63%.

Of the medical specialists in the system, only 13% use computer at work. This percent is higher in the Southern area – 18%, and only 9% of the specialists in the Northern area use computer at work.

Most often, computers owned by the medical facilities are used for accounting purposes – 90%, document flow – 85%, and personnel administration – 72%.

Segmenting even further the various computer operations in medical facilities, 70% of the institutions use computers to record patient details, 67% for other operational activities, 63% for prescription of drugs, and 25% for statistical purposes.

Territorially, electronic records are mostly used in the Central area – 78%, while 86% of the medical facilities in the Northern area use computers mainly for personnel administration, which is the highest degree in the Republic. Also, in the Southern area 93% of the institutions use computers for operational activities, significantly higher than in the Northern area.

76% of the doctors use computer in their work activities. Territorially, this percent is the highest in the Central area – 84%, while the lowest is in the South – 62%.

97% of the institutions have Internet connection, this percent reaching 100% in the Southern area while the lowest degree of connectivity is in the North – 93%.

Only 25% of the doctors have access to an Internet connected computer at work. Territorially, this degree is significantly higher in the Southern area – 59%, while the lowest is in the Northern area – 12%.

Considering all the above, an information system represents an useful tool within the hospital for increasing performance, efficiency, service quality improvement process, activity and hospital structure modeling, and also for developing a management system based on results not on resources or processes.

These are some of the advantages of the Information Technology solution, which once implemented can support doctors and medical personnel. This system will represent an important tool for the medical services with respect to improving the quality of the services delivered to the patients.

Taking into account the hospitals that are already computerized, it has been observed that real-time easy access to information provide accuracy of the reported data towards state central institutions but also of information reaching doctors and patients.

The E-Health project bridges the gap between the actual offer of medical services and the expectation of the beneficiaries, namely the population of the Republic of Moldova .

Living in a highly dynamic society and in an environment dominated by change and innovation, individuals need information and quality services which respond rapidly and efficiently to their demands.

Improved quality of the medical activity offered to the individual is the main objective of the medical services providers. This can be achieved by creating a powerful IT infrastructure which sustains the development and optimization of all activities within a hospital.

For a medical institution, optimizing the services provided to the individual is an area of high interest, and within that there is a need of an integrated solution. At the same time, such a solution will offer the opportunity to align to the newest standards in medical services.

Once having an IT solution implemented at hand, the medical personnel will benefit from owning a tool which will provide added value to their activity, at the same time this being a mean for providing access for even more individuals to high quality medical services.

2. General

2.1 Project Identification

Full Name	Sistemul Informational de Programare a Pacientilor		
Acronym (short title or abbreviation)	S.I.P.P		
Key Area of Intervention	Development of e-Medical Appointment Scheduler		
Indicative Operation	Supporting the development of Medical Appointment Scheduler for Chisinau and Balti		
Implementig Authority	CNMS		
Lead Partner	UNDP		
Project start date	../../2011	Project end date	../../2011

2.2 System Definition

The main goal of the system is to grant patients a transparent, cost-efficient and permanent access to most sophisticated consultative and diagnostic services upon family doctors and specialists online scheduling. This will contribute to an increased number of correct diagnoses at the earliest stage of disease.

The increase in access of the population of the Republic of Moldova, especially of vulnerable and poor population from rural regions to most advanced medical services available in big municipalities like Chisinau and Balti will be realized through setting up an efficient way of electronic scheduling.

e-Medical Appointment Scheduler (S.I.P.P) must be developed to handle online appointments for Patients, by Medical entities. It will be an online application appointment scheduler for Special Consulting Procedures. This system will provide a more interactive solution for Medical entities to make appointments between Medical Institution through an online system. By usage of this system, patients will avoid wasting their time and unnecessary costs.

Among the benefits of using e-Medical Appointment Scheduler, there are:

- Mitigation of the travelling costs for patients
- Provide Medical entities with a convenient and easy way to make appointments
- Elimination of scheduling mistakes, minimizing no-shows
- Getting instant notifications on all new appointments by e-mail.
- Accessibility of schedule at anytime, from a computer connected to the Internet

2.3 System role in Unique Informational Space

S.I.P.P will handle medical appointments for Hospitals located in Chisinau and Balti and other cities in Moldova. The MS and all medical institutions part of this project will have access to transparent activities and data. The system will offer the possibility to be integrated with other Governmental Components in future projects.

S.I.P.P will be implemented in two stages. In the first stage, named Pilot Project, the system will be available for a limited number of counties (i.e. 3) few medical institutions providing specialized medical services and only for some specific services. After the first stage is completed, in the second stage the integration with the remaining Medical Institutions part of this project will follow. The final goal is to integrate all Medical Institutions from Republic Moldova.

2.4 System Purpose

e-Medical Appointment Scheduler (S.I.P.P) implemented at central level of medical institutions will be supported in two ways:

- By using the Internet as the connection interface for medical services involved, but also for gathering feedback from medical entities / users along with various other information about themselves or e-service that can be deployed quicker and in a much more convenient way to citizens.
- By creating a powerful tool for conducting internal business scheduling, data processing and management of consulting expertise.

Motivations that determine the implementation of e-Medical Appointment Scheduler:

- the need for improvement of the quality and accessibility of information;
- increased quality of care;
- the necessity to integrate all activities of the institution operational activity flows
- the need to increase productivity of medical staff;
- the need to improve response times to citizen requests;
- the need to reduce the bureaucratic flow;
- the need to reduce the costs;
- degree of satisfaction;
- the need for more efficient resource planning of the institution.

Consequently, the implementation of of e-Medical Appointment Scheduler is a necessity because it:

- provides free access to information and exchange of information;
- improves the service offered to citizens;
- provides support for decision-making and preventive measures on the state population health
- provides a way for information to be obtained in real time
- optimizes costs and resources (money, time, personnel) - both at citizen and institution level.

3. Normative reference

Informational system will be developed as a part of e-Health infrastructure and have to be designed according with existing legal base, implemented at to the present ministerial and interdepartmental projects, informational and telecommunication components of e-Health infrastructure in Moldova.

- Law on telecommunications no. 241-XVI of 15.11.2007;
- Law on access to information no. 982-XIV of 11.05.2000;
- Law on information and state information resources no. 467-XV of 21.11.2003;
- Law on electronic document and digital signature no. 264-XV of 15.07.2004;

- Decision of the Government of the Republic Of Moldova on special telecommunication systems of the Republic of Moldova no. 735 of June 11, 2002;
- Decision of the Government of the Republic Of Moldova about some measures on laying the telecommunication systems for the Public Authorities no. 256 on March 9, 2005;
- Decision of the Government of the Republic Of Moldova about the laying of the telecommunication system for the Public Authorities no. 840 on July 26, 2004;
- Decision of the Government of the Republic Of Moldova about some measures on execution of the Decision of the Government no.735 on June 11, 2002 no. 1487 on December 12, 2003.
- Decision of the Government of the Republic Of Moldova on approving the Concept of Governmental telecommunications system no. 183-17 of 16.02.2005;
- Decision of the Government of the Republic Of Moldova about centers of public keys certification no. 945 of 05.09.2005;

4. Stakeholders

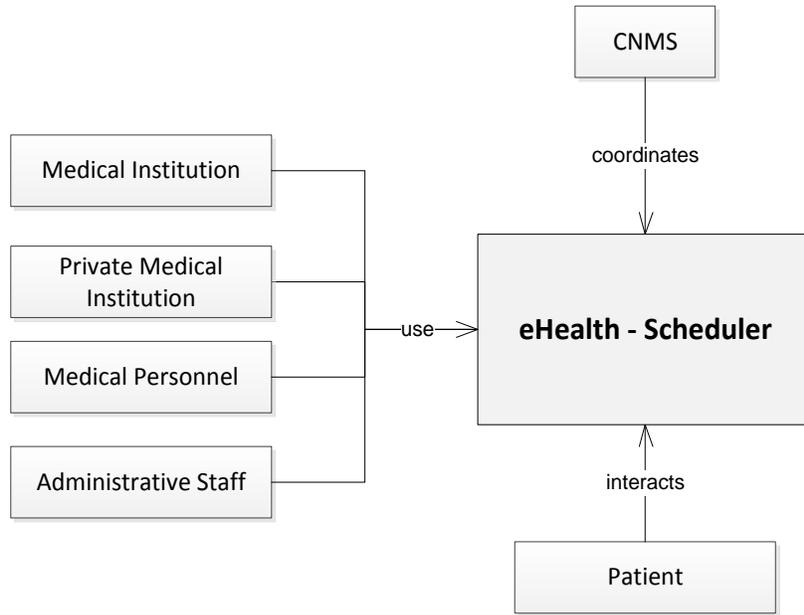
The e-Medical Appointment Scheduler is intended to facilitate real-time access to medical services. Beneficiaries of this project, considering the advantages it offers are represented by each entity in this process of medical services:

- Patient
- Medical Personnel
- Administrative Staff
- Public Medical institutions in Moldova

The number of key beneficiaries of the project exceeds 3,500,000 - the number of resident citizens who may have access to health services, directly or indirectly.

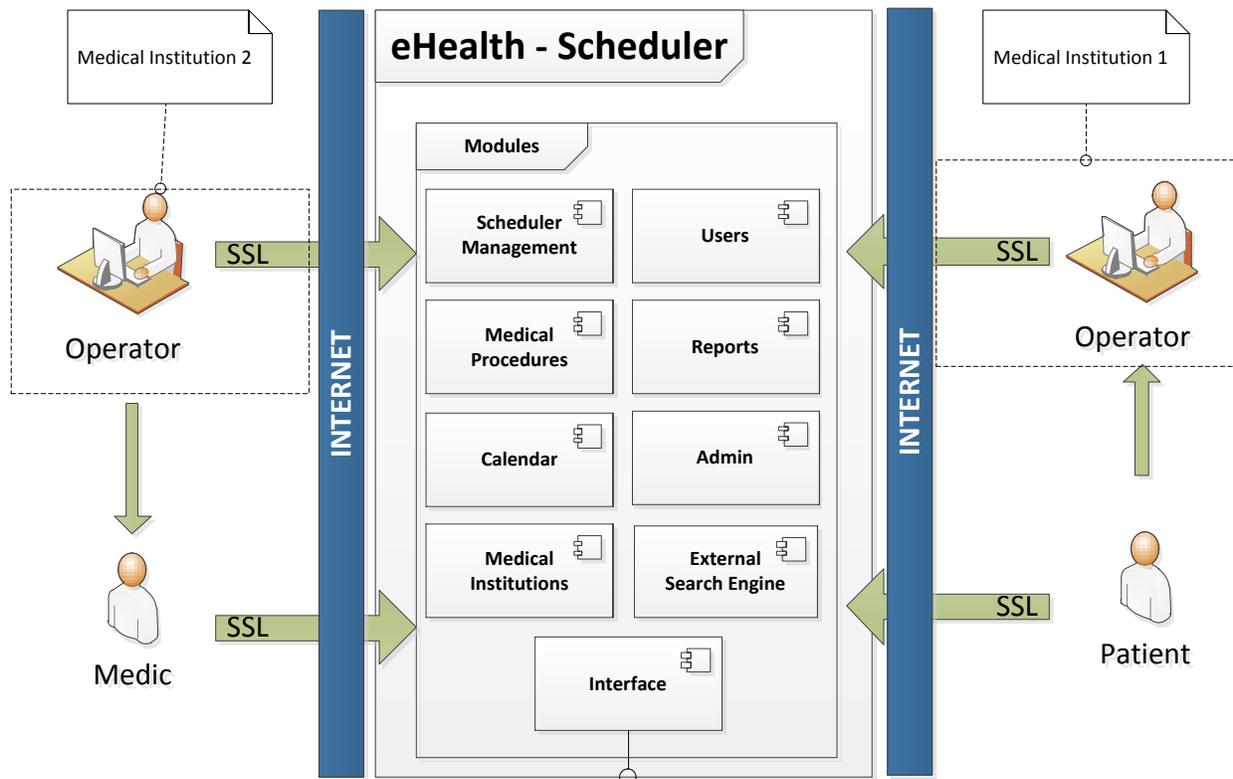
For citizens, improving the efficiency of health services is a way of increasing their life standard.

The proposed project has also indirect beneficiaries that are represented by institutions / local government and national authorities, but also companies (suppliers of consumables for the medical industry). This type of beneficiaries have access to information provided through interaction within the institutions directly involved in the project, but also through contact with citizens who are the ultimate target of this system.



5. System functional area

The model outlined in this document will be created to meet patient needs. In this idea, it integrates these functions generally described at higher level:



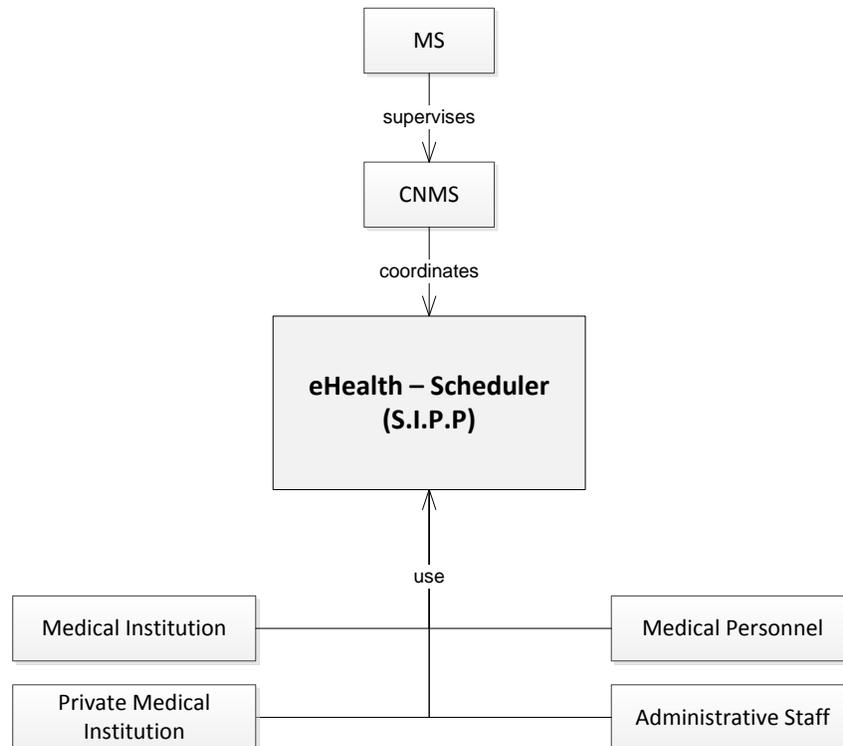
The system will be the principal mechanism for processing electronic scheduling between medical institutions.

The system will manage the following operational areas:

- Real time medical appointments
- Access to all schedules for medical institutions part of this project
- Calendar view
- Administration component for CNMS
- Administration component for Medical Institutions
- The system will support compatibility with national programs, when needed, and facilitate proper integration of medical and financial data
- The system will ensure that anyone in the medical institutions to be able to access any existing information at different levels in the institution, according to rights and permissions granted by the system administrator
- The system will provide an opportunity to monitor the status of each appointment at any time by authorized users.
- The system will enable printing in a quick and easy way of the appointment made by the medical staff
- The system solution will be constructed in such a manner that to be able to quickly and easily change the user interface, so to be consistent with existing and potential future Web standards
- The system will provide a Web interface for patients, where they can visualize their appointment status
- The system will generate e-mail alerts
- Appointments status, including verified, checked-in, checked-out
- Recall notices, with the ability to send letters or reminders
- Appointment search engines
- Diagnostic master file (list)
- Procedures master file (list)
- Procedures prices by institution master file (list)

6. Organizational structure of the system

In the organizational structure of the system the main coordinator of the system is CNMS. CNMS denotes and validates the participating entities in this project by granting rights in application use.



7. System documents

Within S.I.P.P the following categories of documents are used:

- input documents, which are the basis for entering data into the system
- output documents, obtained as a result of system operation

The input documents are meant to validate the patient personal data, if the patient is insured or not, and the diagnosis based on which an appointment is required.

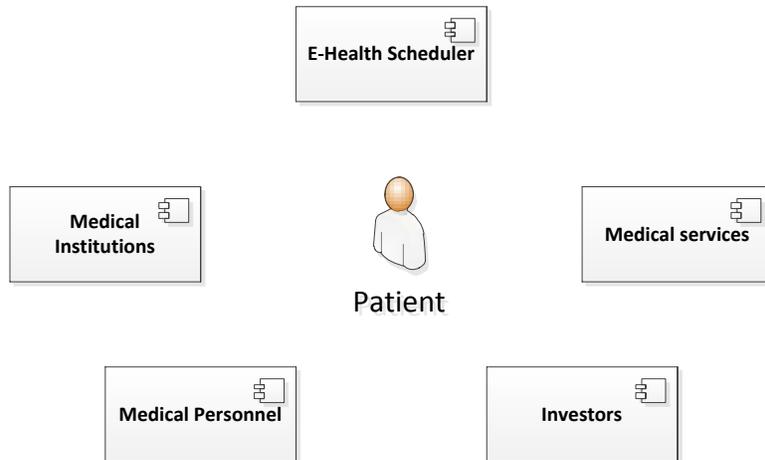
The output documents are meant to inform the patient and the medical entities of the appointments made. The output document will include:

- Location of the Medical Institution
- Date and Time
- The requested medical special procedure
- The operator designated by the medical unit where the appointment was made.

8. System informational area

Architecture of system informational area will be designed taking into account the peculiarities of internal business processes of medical institutions, the actual sphere of activity spared into business objects.

Following a review carried out internally, the following business objects (classes of business entities) have been identified:



Medical Institutions - where the patient benefits of medical care (services), they are: hospitals, laboratories, pharmacies, clinics, etc.

Medical Services – health care provided to a patient (hospital treatment, prescription receipts, medical analysis, etc.)

Medical personnel - personnel specialized in designing health services for patients (doctors, nurses)

Institutions and / or organizations entitled to support and finance the medical work of medical institutions (MS, CNMS, CNAM, etc.)

e-Appointment Scheduler (S.I.P.P) handles appointments for Medical Institutions and patients. The schedules are based on the timetable and medical activities.

8.1 Conceptual Data Model

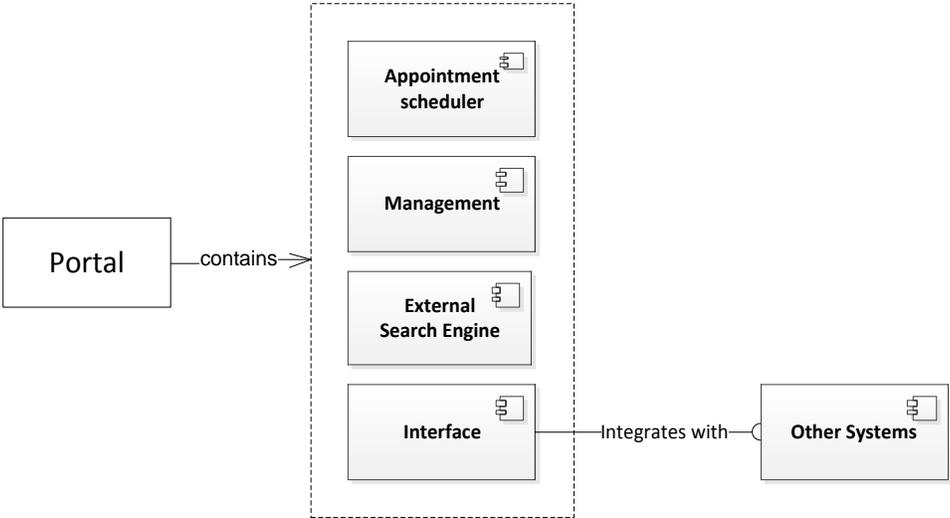
The conceptual data modeling aims at building a data model to ensure accurate implementation of the logical flow defined in business analysis.

Entity	Entity Description
Patient	Ill person
Medic	Individuals specialized and authorized in practicing medicine
Examination	Medical examination for addressing patient medical issues
Medical	Action by which a doctor (hospital) based on a document recommends

Scheduling (or "trimiter")	a patient for consultation, treatment at another doctor (clinics, hospital)
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Further details on the above entities will be explained in functional and technical specifications related to each module within the application.

8.2 Logical Model System Components



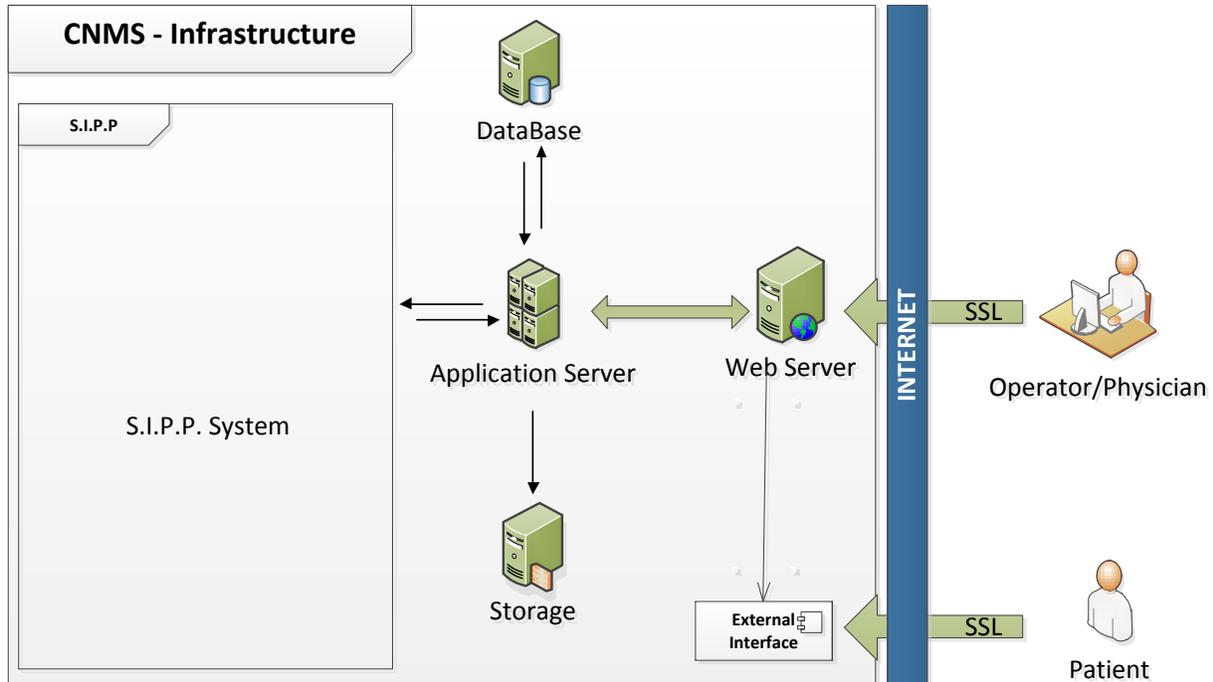
Module	Modules Description
Appointment Scheduler	<p>This module handles appointments according to date, department or medic involved.</p> <p>This module provides for the operator the functionality to get and set the appointment schedule of a patient according to the department's name, medical procedure, date and time, location.</p> <p>The Scheduler must have the possibility to: plan, view, update, edit, create or update the appointments.</p> <p>The Scheduler provides facilities to send e-mails within the various departments or patients personal e-mail.</p>
Management	<p>This module includes the sub modules like:</p> <ul style="list-style-type: none"> • Management users, roles and Access rights • Management Medical institutions, configuration functions etc. • Management registration of patient's basic personal data • Management history log
External Search engine	<p>This module provides an external interface for patients.</p> <p>The information displayed as a result in the external search engine will provide data among appointments status. (accepted, rejected, pending etc)</p>
Interface	<p>This module relates to the capability of the system to be integrated with other systems when needed.</p>

Further details on the above structure will be provided in the functional and technical specifications related to each module within the application.

8.3 Logical system architecture

This chapter shows the logical architecture of the system as a whole, but also the logical level of decomposition layers.

The following figure shows the components of the integrated two levels. The main system components are present at the county level can be considered centralized.



Internal users will connect into the system via a standard Internet browser from workstations within hospitals, external users will connect to web services also via Internet browser. Communication will use the HTTPS protocol (secure HTTPS). The solution must support the interaction with the application from desktop PC, mobile (laptop) and mobile phones - at least the external engine designed for patients.

8.4 User Interface

The purpose of this chapter is to present the basics of user interface. This presentation is necessary to develop a guide to be followed by developers.

The system will use a web page layout that can be easily modified and adapted to future needs. Web pages that come from Portal will be developed according to current standards generally accepted in web-design, to minimize obsolescence of the system in time.

Page layout:

- Header - top of the GUI.

- Application logo
- Name of the application
- Version of the application
- Date and time

Toolbar - narrow area in the immediate vicinity of the header zone.

- Name of the user logged in

- Contextual help button
- Short messages or solicitations of application support manager or support team
- The message display area
- Close button

Application Menu - The proposal is to be displayed as a menu bar to enlarge the narrow area.

Work area - the central part of the window, the largest. It will be used by developers to create application screens. The tenderer may submit its own proposal graphical user interface, it is necessary to comply with the requirements of minimizing obsolescence of the system over time, ergonomics and ease of access to information. The solution must provide methods to upgrade and update with minimal effort.

8.5 Logical framework

The proposed system architecture must be modern and scalable solution, consisting of a centralized WEB-based 3-tier architecture (database server, application server, clients).

End users will access applications through web browsers.

Regarding the client part, it should be easily to configure and the possibility must exist to have application access through Internet / Browsers.

Taking into account this architecture, end-users of the solution should only require user manuals and helpdesk access.

IT department in Institutional level (national level) CNMS - will maintain the server part (Master Administration role is allocated at CNMS).

The framework used to develop the system is divided into three layers:

These requirements have to be completed with those related to the System Architecture in Specific Functional Requirements.

It is mandatory to provide draft architecture of the proposed solution according the above requirements. The architecture will be refined during the Analysis period of implementation. The ultimate architecture has to be based on open source systems and has to be a standardized, application vendor independent technology platform. The design architecture has to be flexible in order to allow for future developments.

1) Presentation layer

Represents the components which are directly related to the user (internal or external). The application's presentation layer is composed of graphical user interface parts (dynamic pages, static images, style sheets etc.) and ASP.NET MVC3 Application or equivalent

2) Application Layer

Represents the component which includes all application logic. Will consists of several components, framed by two levels of filtering. The first level of filtration is the security filter. It will apply to any operation that comes from the presentation layer. The second level of filtering is the logging. The entire application must be based on MVC 3 framework (Model-View-Controller) or equivalent, thus separating the data and business logic from user interface. Business Objects implemented in the application will not directly access the database, but will implement a persistence level that will ensure the removal / storage of objects in the database. The main purpose of the application layer is to provide a logical view of data and execution other processes implemented in the application.

3) Data Layer

It is represented by the database. This level will be based on Microsoft SQL Server. Also, this layer can provide data management system in several databases installed on different servers. This part of the application suite consists of libraries that contain business logic of the application and the external services implemented by integrating servers.

Other minimal requirements:

- The system must be built from modular systems,
- Except for operating system messages, the user interface shall completely be in the Moldavian language (including all help text);
- Relevant modules must be in accordance with Moldavian accounting laws and conventions in force;
- The system and each subsystem must guarantee confidentiality and security of data;
- The system have to allow the operation with historical data
- The system have to guarantee the limit of the users responsibilities - guarantee user access to data according to a single security profile assigned to that user;
- The system have to organize data storage in such manner that data items will be stored in one single location;
- The system have to allow the future functional adaptation of the application by the beneficiary, with the possibility to administer new functions as company specific functions.

Extension Possibility

The system should be opened to future extension and the connection of all institutions involved and their territorial entities.

Please note that the System extension and the following examples are not subject of the present tender, but the application software architecture and design must take into account the open system for further developments.

Please find below some examples of possible extensions required by each institution involved in the project:

- Local infrastructure extension
- Additional data for decision and reporting at national and County level
- Improve the integration of the local databases at institution level when needed

8.6 Technological Framework

In terms of technologies that can easily meet S.I.P.P specifications logical architecture, as we have seen above, the system must support the following:

- Use of Internet browser technology. Thus, by using an Internet connection, remote locations can access the entire set of functionalities offered by the system. The system must have SOA capabilities: services, connectivity between services, consumption of services, service composition and service management. The entire system must be designed so as to meet the standards SOA, XML, XML Web Services, HTML 5, CSS3, jQuery, JavaScript.

- The application must be installed without special plugins into the browser.
- The application must be supported by mobile devices (at least the external search engine)
- The application will support drag and drop functionality.
- The development framework must have an uncoupled architecture components, such as extensibility that allows a scalable system.
- The application must have at least WEB 2.0 design interface

The architecture must allow the integration of new systems without affecting the already developed components. The framework will use Microsoft .NET technology within Microsoft Visual Studio development environment or equivalent.

9. System Security

The system security must guarantee access to information and the desired functionality using a model based on roles, this security model must be implemented considering the internal organization of the Institution, allowing easy mapping of users to roles from the application. Access to specific data and functionality within each software module will be defined and managed using security model based on the identification, authentication and authorization of staff depending on the positions held by them and their duties. The system design must take into account Standards for Information Security - ISO 27001.

System security is provided from one end to another through the encryption mechanisms , as follows:

- transfer of information between the portal and the user must be done securely, using HTTPS
- transfer of information between the portal and the database will allow secure data encryption

The system will allow the possibility of securing the exchange of information between different organizations integrated with S.I.P.P, when needed.

10. Conclusion

The Tenderer shall execute a detailed design for the proposed system, in compliance with the provisions of this System Concept document and the Technical Requirements in accordance with good engineering practices in Information Technology.

The Tenderer should deliver all drawings, standards and/or specific documentation of all the products, hardware and software delivered. For the products customized specifically for the Project, in addition to any standard documentation necessary to fully understand the customized products, specific detailed documentation and/or drawings (diagrams) describing the function should be delivered.

10.1 The Tenderer should deliver at least the following

- Project management and execution staff
- Conclusions of analysis and the detailed description of the proposed system,
- Detailed description of network and communications facilities necessary to be provided by the Beneficiaries (i.e CNMS)
- Training program in two stages
- System Test Plan
- System Site Acceptance Program
- Support for 1 year
- Application development structure (source code)

10.2 Infrastructure, Database & Tools, Communication Requirements

The Tenderer will use the Infrastructure, DataBase and servers located at central level (i.e. CNMS).

10.3 Development of Application Software Documentation

The development of application software documentation is seen as a distinct service in this project due to the different types of documentation that are expected:

- Design documentation - to be used for the further development of the application software
- General use documentation - "User manual"
- System administration documentation

The tenders shall specify:

- The detailed set of documentation proposed;
- A summary description of the contents of each specific document
- The time schedule for the elaboration of each specific document (including translation into Moldavian language if the manual is first written in another language);
- The way the documentation will be distributed;

- What is the procedure followed by the Tenderer to ensure that the documentation corresponds to the latest version of the solution (before delivery and during the warranty period);
- What kind of interaction with the Implementing Authority and the Beneficiaries is necessary;
- All end-user documentation must be in Moldavian language.

10.4 Training

In order to ensure the proper utilization of the system, the Tenderer, as part of the offered solution, must provide the training for both system specialists as well as end-users.

The Tenderer must provide two different types of training:

- System specialists training
- End-users training
- Train the trainers – extended training for a user group (2-3 people), so that these could transfer the knowledge to the other colleagues
- Administrators training – extended training for a group of 3-5 intern/administrative
- Functions of the system and its components
- Users’ training – basic training to cover most of the Medical staff, regarding the basic characteristics of the system and the users’ roles. (2 groups of 8-10 persons).

10.5 Support

In order to ensure the proper utilization of the system, the Tenderer, as part of the offered solution, must provide a dedicate online application support.

- Focus on performance measures and continuous improvement besides Service Level Agreements (SLAs)
- Timely resolution of issues and root cause analysis of each issue
- Established support matrix offering Help Desk services
- Multi-level maintenance process