HEARTFAID

D10 – 3rd Quarterly Managerial Report

(MB and STAB meeting minutes)
Submission date: 14/12/06
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HEARTFAID

A KNOWLEDGE BASED PLATFORM OF SERVICES FOR SUPPORTING MEDICAL-CLINICAL MANAGEMENT OF THE HEART FAILURE WITHIN THE ELDERLY POPULATION

Project summary	
Project acronym:	HEARTFAID
Project identifier:	IST – 2005 – 027107
Duration of the Project:	01/02/2006 – 31/01/2009
Project Co-ordinator Name:	Domenico Conforti
Project Co-ordinator Organisation:	UNICAL University of Calabria (Italy)
Thematic Priority:	Information Society Technology-ICT for Health
Instrument:	Specific Targeted Research Project

Consortium

- UNICAL- Università della Calabria (Italy)
- UNICZ- Università degli studi Magna Graecia di Catanzaro (Italy)
- UNIMIB- Università degli studi di Milano Bicocca (Italy)
- JUMC- Jagiellonian University Medical College (Poland)
- VMWS- Virtual Medical World Solutions Ltd (United Kingdom)
- FORTHNET S. A.- Hellenic Telecommunications and Telematic Applications Company S. A. (Greece)
- SYNAP- Synapsis s.r.l. (Italy)
- CNR- Consiglio Nazionale delle Ricerche (Italy)
- FORTH-Foundation for Research and Technology Hellas (Greece)
- RBI- Rudjer Boskovic Institute (Croatia)
- AUXOL- Istituto Auxologico Italiano (Italy)

D10 – 3rd Quarterly Managerial Report
MB and STAB meeting minutes

Document summary	
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Report Version:	1.2

Short Description
This document describes the activities of the Consortium during the third quarterly of HEARTFAID project and its future activities.

Change Record		
Version Number	Changes	Release date
1.0 1.1 1.2	First draft of the Document Contribution from WPs Minor changes	17/11/06 30/11/06 14/12/06

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Executive Summary

The third Quarterly Managerial Report describes the activities and the objectives reached by Heartfaid Consortium during the period August 1 October 31 2006.
In short the following WPs have been involved in the work:

- WP0: Management: Coordination and assistance for the Deliverables sent in the period : D5/ D6 and D7 (further revised on November 11), collection of 6 months internal cost statement, joint coordination with SYNAP and CNR for next MB & STAB meeting, amendment for clause 9.2, start of coordination for the 1st reporting period
- WP1: closing of activities (30 September), finalization and submission of D5, further development and completion of D8.
- WP2: Towards definition of D9: the activities in this period are related to
    1. The finalisation of definition of the biomedical data, signs and symptoms relevant to HF pathology an activity which was carried out by VMWS, UNICAL, UNIMIB, UNICZ, JUMC and AUXOL.
    2. The progress in the design and development of the Data Acquisition and Transmission infrastructure (VMWS, FORTHNET, SYNAP).
- WP3: towards definition of D11, the main results achieved during the reporting period concern the analysis of the functional specifications of the middleware.
  This activity was carried out in a strong cooperation between SYNAPSIS, VMW, CNR, FORTHNET and FORTH,
- WP4: start of activities September 1, the work of WP4 started with tasks T4.1 – Design and development of a suitable data warehouse for knowledge discovery and T4.4 - Ontologies and medical knowledge representation in the domain**.**
- WP5: Activities focused on the following main aspects of 5.1 and 5.3 Tasks, respectively:
    1. signals and images acquisition and processing, features assessment and extraction, preliminary study case development.
    2. DSS, platform *core* and relationships ontologies vs. knowledge base vs. *brain*, i.e. that part of the DSS endowed with reasoning capabilities
- WP8: deliverable D6 and dissemination activities carried out by UNICAL, FORTH, RBI and CNR.

At the end of the description of each WP the objectives for the following quarter have been set and can be summarised as follows:

- WP0: coordination of Consortium management activities towards the first periodic period, coordination of future deliverables D8, D9 , D10 and D11, continuous assistance to the Consortium and communication with the Commission, coordination of next MB & STAB meeting prior to revision with UNIMIB and AUXOL, practical coordination towards the 1st revision period and deliverables D12 to D17.
- WP2: towards Milestone 2.1: the functional specifications of the data acquisition and transmission infrastructure will be completed on time. Furthermore, based on these specifications, the first mock-ups will have been built.

- WP3: towards Milestone 3.1: the partners will have defined completely the functional specifications of the data acquisition and transmission infrastructure, and the task Identification of the clinical standards is expected to be completed in the next 3 months after the standards for data representation and communication will be established by the technical partners.
- WP4: understanding of the case report form for HF patients, preparation of HF ontology in the OWL form.
- WP5: design of algorithms and methods for image feature extraction will be defined
- WP6: start November 1, Start of the design and development of the web-based front-end of the HeartFAID platform
- WP8: further dissemination activities, as internal initiatives, participation to conferences, publication of the current results, improvement of the project web site.

Consortium Management: WP0

WORK PACKAGE: 0
TITLE: MANAGEMENT
START DATE: MONTH 1
WORK PACKAGE LEADER:UNICAL
PARTNERS INVOLVED:UNICZ, UNIMIB , VMWS ,FORTHNET, SYNAPSIS , CNR,RBI

STATUS OF DELIVERABLES DUE IN THIS PERIOD

		DATE DUE	COMMENTS
DELIVERABLE	N°		
2nd Quarterly Managerial Report	D 7	31-07- 2006	After the submission, the document has been revised with further information from WPs and delivered on November 11/2006
3rd Quarterly Managerial Report	D10	31-10-2006	The document has been drawn with the active support of each Partner and WP leaders and will be sent by the foreseen deadline

FORECAST STATUS OF DELIVERABLES &MILESTONES DUE IN THE NEXT 3 MONTHS

		DATE DUE	COMMENTS
MILESTONE	N°		
1ST PERIODIC REPORT	MS 0.1	31/01/07	UNICAL staff is currently working to plan ahead for this important project milestone, cooperation with the all Consortium and especially with experienced EU projects partners is envisaged in order to facilitate the smooth running of the milestone
DELIVERABLE	N°		
1ST Periodic Report on the distribution of the Community contribution among contractors	D 12	31/01/07	The report will be drawn by UNICAL on the basis of the received prefinancing
1st Periodic Report (activity and management)	D 13	31/01/07	Two reports will be sent to the Commission, one explaining the necessity of costs and the other explaining financial data on the basis of the Form C which will be provided and commented by each partner
4th Quarterly Managerial report	D 17	31/01/07	The report will follow the structure in use for Quarterly reports with the contribution of all WP leaders and partners and will contain any additional information asked by the Commission Project Officer

Description of the activities.

- T 0.1 Overall management of the Consortium: during this quarter management activities have focused on the following issues
    1. Coordination with WP1, WP8 for delivering D5 and D6 and with all WPs for D7 and its further revision.

  Thanks to a strong cooperation and contribution of the entire Consortium through WP leaders it has been possible to forward the due documents to the Commission in due time.

2. Joint coordination with SYNAP and CNR for the organisation of next MB & STAB meeting, Pisa 7/10 November 2006
3. Permanent communication with the Consortium for all enquiries and information Commission and Consortium related
4. Start of preparation for the 1st reporting period towards HeartFAID 1st revision period

- T 0.2: Co-ordination of the Consortium technical activities: during the related period, a better tuning and consolidation of the procedures for the coordination of the scientific and technical activities, especially inside each WP, has been carried out, by involving the WP leaders.

- T 0.3:Management of contractual, legal, financial and administrative procedure of the consortium:

1. amendment for clause 9.2: after a favourable opinion from Commission Project Officer and the agreement of HeartFAID Consortium , an amendment request for Article 9.2 of the contract to remove the clause of non-prefinancing for the contractor Synapsis, has been sent on October 30th to the Commission.
2. collection of 6 months internal cost statement: as stated in HeartFAID Contract the coordinator has collected the above mentioned form from each contractor to monitor the expenses from the start of the project

- T 0.4: Internal Communication infrastructure: the communication infrastructure for supporting the overall project management has been further established by the improvement and extension of the services and functionalities provided by the project web site.

Ongoing workpackages progress: WP1

WORK PACKAGE: 1
TITLE: HEART FAILURE DOMAIN ANALYSIS
START DATE: MONTH 1
WORK PACKAGE LEADER: UNICZ
PARTNERS INVOLVED:UNICAL,UNIMIB, JUMC, AUXOL

STATUS OF TASKS and MILESTONES DUE IN THIS PERIOD

TASK		COMMENTS
T 1.3	Organization and management models for the healthcare delivery	The task has been completed and has allowed defining and formulating deliverable D8.
M.S.1.2	Definition of new models for healthcare delivery processes	This milestone has been achieved with D 8.

STATUS OF DELIVERABLES DUE IN THIS PERIOD

		DATE DUE	COMMENTS
DELIVERABLE	N°		
Definition and formulation of the organization and management models for the healthcare Delivery	D8	30/09/06	It has been achieved on time for submission on November 11

Description of the activities

During this period, the activities of WP1 have been completed and finalized in the deliverables D5 and D8.
In particular, all the activities of this period have been carried out and coordinated among the clinical partners (UNICZ, UNIMIB, AUXOL, and JUMC) and UNICAL, by a strong interaction and continuous e-mail contacts.
The months of August and September have been mostly characterized by the development and completion of the activities of the Task 1.3, concerning the devising and development of new organization and management models, on the basis of which define more effective and efficient heart failure care programs. These models are related to the organization of the care programs on a given territory, the coordination and collaboration of all the health care operators involved (practitioners, professional nurses, hospital physicians, geriatrics, cardiologists), the integration of health care environments (home, primary ambulatory, territorial ambulatory, hospital).
This task has been fully completed and it has allowed defining and formulating the deliverable ***D8: Definition and formulation of the organization and management models for the healthcare delivery***.
This document describes the proposal of an innovative health care management program for patients with heart failure. The aim is to give a complete and detailed description of the management care programs related to heart failure. Starting from a deep analysis of the literature and the currently implemented Heart Failure Care Programs, all clinical partners and UNICAL have identified and formulated the most important information relevant to the organization and management models for the heath care delivery within Heart failure context. The final version of this deliverable will be discussed and approved during Pisa steering meeting.

Ongoing workpackages progress: WP2

WORK PACKAGE: 2
TITLE: BIOMEDICAL DATA IDENTIFICATION AND COLLECTION
START DATE: MONTH 3
WORK PACKAGE LEADER: VMWS
PARTNERS INVOLVED: UNICAL, UNICZ, UNIMIB, JUMC , FORTHNET, SYNAP, AUXOL

STATUS OF TASKS DUE IN THIS PERIOD

TASK		COMMENTS
T 2.1	Identification of all BM data, signs and symptoms relevant to the heart failure pathology	The activities of Task 2.1 started at M3 and were completed at M7, inline with the Gantt Chart of the project. T2.1 gives a general overview of the most relevant biomedical signs, symptoms and data in the heart failure domain with specification of the environments in which they could be collected.
T 2.2	Design and development of the data Acquisition and Transmission infrastructure	Task 2.2 has started at M3, inline with the Gantt Chart of the project and the design and development of the data acquisition and transmission infrastructure is progressing as expected. The development of software modules to support data acquisition and transmission is progressing as expected. Finally, the selection of the set of sensors which will be integrated in HEARTFAID is expected to progress significantly by combining the output of T2.1 the discussions which will be carried out in the General Assembly meeting in Pisa.

STATUS OF DELIVERABLES DUE IN THIS PERIOD

		DATE	COMMENTS
DELIVERABLE	N°		
Specifications of all biomedical data, signs and symptoms relevant to the heart failure	D9	30/09/06	Deliverable D9, based on the most recent ESC 2005 CHF guidelines, in line with the HEARTFAID deliverable D5 and medical partners' clinical experience in heart failure domain, describes the biomedical data, signs and symptoms grouped in a logical fashion. They are listed according to their relevance to the diagnosis, management and research in the field of HF. Deliverable D9, is jointly prepared by WP2 Partners and will be submitted after the conclusion of the HEARTFAID STAB meeting in Pisa.

FORECAST STATUS TASKS, MILESTONES AND DELIVERABLES OF THE NEXT 3 MONTHS

TASK	N°		COMMENTS
Design and development of the data Acquisition and Transmission infrastructure	T 2.2		In the next 3 months it is expected that the partners will have defined the specifications of the data acquisition and transmission infrastructure. Furthermore, it is expected that the process of integrating the medical devices/sensors to the HEARTFAID platform will progress well and some first mock-ups will be ready.

MILESTONE	N°	DATE	
Functional Specifications of the Data acquisition and transmission infrastructure	M.S. 2.1	31/01/07	It is expected that the functional specifications of the data acquisition and transmission infrastructure will be completed on time. Furthermore, based on these specifications, the first mock-ups will have been built.
DELIVERABLE	N°	DATE	
Specifications of the Data acquisition and transmission infrastructure	D14	31/01/07	Foreseen to be completed on time

Description of the activities

According to the HEARTFAID Technical Annex, Task 2.1 ended in the first month of this reporting period, while the activities of T2.2 which started at M3 are still in progress. Consequently, the activities in this period are related to

a) The finalisation of definition of the biomedical data, signs and symptoms relevant to HF pathology an activity which was carried out by VMWS, UNICAL, UNIMIB, UNICZ, JUMC and AUXOL.
b) The progress in the design and development of the Data Acquisition and Transmission infrastructure (VMWS, FORTHNET, SYNAP).

T2.1: Identification of all biomedical data Identification of all biomedical data, signs and symptoms relevant to the hearth failure pathology

Task 2.1 was completed as scheduled. All kinds of biomedical data relevant to the chronic heart failure management were defined by this task. The summary of all kind of biomedical data which could have a potential influence on the chronic heart failure management collected through various medical environments is provided in deliverable D9 prepared jointly by WP2 Partners.

T2.2: Design and development of the data Acquisition and Transmission infrastructure

The activities related to the design and development of the Data Acquisition and Transmission infrastructure can be divided as follows:

a) EHR for data organization and visualization (SYNAP)

Goal of this task is to design and develop an Electronic Health Record, that is a web-based application that enables users to both access and the insert easily (via Internet) the cardiovascular related data, as well as to allow a suitable data organization and visualization.

This tool should provide a filtering on the data stored in the repository with two main goals:

– Organise the patients' data according to active pathologies and past medical history, in order to highlight the open problems of the patients;

– Permit the access to a subset of the patients' data according to the authoring credentials and the profile of the user.

According to the Medical Records Institute, five levels of an Electronic HealthCare Record (EHCR) can be distinguished in the follow stages:

– Stage 1 (AMR) - Automated medical record system: a paper-based record with some computer-generated documents.
– Stage 2 (CPR) - Computerised medical record system: makes the documents of level 1 electronically available.
– Stage 3 (EMR) - Enterprise electronic medical record system: restructures and optimizes the documents of the previous levels ensuring inter-operability of all documentation systems.
– Stage 4 (EPR) - Electronic patient record system: patient-centred record with information from multiple institutions.
– Stage 5 (EHR) - Electronic health record: adds general health-related information to the EPR that is not necessarily related to a disease.

The starting point to define the HEARTFAID EHR should have been the specific EPR of the clinical partners involved in the project, however, during the early stages of this task it was established that no suitable EPR are actually in use by the cardiovascular centre where the HF platform will be validated. Therefore preliminary studies have been started aimed at extending an existing general purpose EPR developed by Synapsis towards the following two objectives:

- Adapt the existing EPR to the needs of the cardiovascular experts in order to become the reference HEARTFAID Electronic Patient Record;
- Integrate the new HF-EPR with the platform of services; this way it will possible for the medical experts to select from the data acquired by the remote sensor networks, the relevant information that will be automatically stored into the EPR itself.

b) Definition of the set of sensors which will be integrated in the HEARTFAID (VMWS, FORTHNET)

Based on the study of the enabling technologies and the survey on sensors that the partners had already carried out in the period between M3 and M6, this activity progressed in parallel with T2.1. By taking into account the results of T2.1 the partners have limited the set of sensors to the ones that are relevant only to the biomedical data defined in T2.1. This set includes sensors which could potentially be integrated into HEARTFAID. The filtering of this set is expected to take place in the forthcoming HEARTFAID STAB meeting, which will be held in Pisa. After the filtering, the clinical partners will suggest the sensors to be integrated according to their expertise.

c) Development of software modules for data acquisition (VMWS, FORTHNET)

Regarding the "On-the-move" scenario, the functionality of software modules for data acquisition, the bluetooth connectivity, bluetooth service

discovery as well as client and server bluetooth modules was tested with success, by generating dummy data and transmitting it over bluetooth to a Java enabled mobile phone that supports the JSR-82 specification for J2ME (Java 2 Micro Edition).
In the "In-Home" scenario, the information from the sensors will be acquired, mainly through Bluetooth connection, by a client device, in this case a desktop PC, running Java applications.

d) Development of software modules for data transmission (VMWS, FORTHNET, SYNAP)

Regarding the data transmission, the appropriate Java classes which implement the connectivity to a remote host in order to upload the biomedical data were tested in Java (In-Home scenario) and J2ME (On-the-move scenario) environments. Furthermore, the interfaces and data formats related to data transmission are almost defined and only some fine tuning is expected, once the actual sensors are integrated into HEARTFAID.
More specifically, in the On-the-move case, raw data and other relative information (e.g. units, timestamp information, user information etc) are transferred to an intermediate server (via GPRS/3G connection), which executes ASPX (Active Server Pages) components. These server components will be responsible to construct the XML messages, called observations, which are subsequently sent to the HEARTFAID platform. The proper functionality of the aforementioned transmission process was initially tested using dummy data. Finally, in the In-Home scenario, after the collection of data, XML messages will be generated on the client device and transmitted, through a stable landline connection (ADSL), to the HEARTFAID platform, where they will be stored to the main database for further processing.

Possible deviation from planning

Regarding WP2 activities, a possible deviation from planning can be identified in the activity of sensors integration into HEARTFAID. Currently, the partners have concluded to a list of sensors, which are related to the biomedical data identified in T2.1. This list will be filtered by the consortium in the next STAB meeting, in Pisa. After the discussions of this meeting, the involved clinical partners are expected to suggest a list of sensors which, according to their expertise, is suitable and adequate for the provision of biomedical data to HEARTFAID.
However, the integration of a sensor involves several aspects (e.g. knowledge of possible handshaking mechanisms, low level data transmission protocols, raw data format etc), which may/may not be available to HEARTFAID consortium by the corresponding vendors, or may be available under certain conditions (e.g. signing Non Disclosure Agreements with vendors). Consequently, the duration of the above mechanism, includes transaction with sensor vendors and cannot be estimated with accuracy.
The HEARTFAID consortium has identified this possible deviation and for this reason:

- The sensor integration activity will start with sensors for which communication details are already known, while in parallel the partners will focus on obtaining this information for the rest of the sensors.
- The design of the data acquisition modules is general enough, exploiting the capabilities offered by Java (abstract classes, interfaces, inheritance and polymorphism). By following this approach, the creation of a new data acquisition module to support the communication with a sensor, when the communication details are available, will be made easier.

Ongoing workpackages progress: WP 3

WORK PACKAGE: 3
TITLE: MIDDLEWARE,INTEROPERABILITY AND INTEGRATION
START DATE: MONTH 2
WORK PACKAGE LEADER: SYNAPSIS
PARTNERS INVOLVED: VMWS, FORTHNET, CNR, FORTH

STATUS OF TASKS DUE IN THIS PERIOD

TASK		COMMENTS
T 3.1	Middleware requirements and functional specifications	The activities of this Task, stated at M2, continued during this quarterly and are expected to end within M10, in line with the Gantt of the Project. The requirements and functional specification identified so far represent already a significant input to the activities of the connected Task T3.3. Meeting with CNR both in Pisa and Livorno supported the identification of critical aspects concerning the distribution of source data, which might arise during the subsequent stages of the project activities. These aspects will be discussed during the forthcoming General Assembly to be held in Pisa.
T 3.2	Identification of the clinical standards for representation and communication of data	The activities of this task started at month M8, as expected from the Gantt of the Project. This task is at a very early stage, however preliminary results have already been achieved, and it is expected to end by M12, in line with the Gantt of the Project.
T 3.3.1	Early mock up prototype implementation	The subtask 3.3.1 has been started at month M6, inline with the Gantt of the Project. Early results are expected after the first year of the project lifetime.
T 3.4	Interoperability Middleware	Task T3.4 started at month M8, as expected from the Gantt of the Project. The activities of this task and the results expected will be discussed during the Assembly Meeting to be held in Pisa. Early results are expected after the first year of the project lifetime.

FORECAST STATUS OF TASKS, DELIVERABLES, MILESTONES DUE IN THE NEXT 3 MONTHS

TASK	N°		COMMENTS
Middleware requirements and functional specifications	T3.1		In the next 3 months it is expected that the partners will have defined completely the functional specifications of the data acquisition and transmission infrastructure.
Identification of the clinical standards for representation and communication of data	T3.2		In the next 3 months this task is expected to be completed after the standards for data representation and communication will be established by the technical partners.
DELIVERABLE	N°	DATE DUE	
Functional specifications of the middleware	D11	30/11/06	The required contributions for the Deliverable D11 and the outline of the table of content will be defined at the Assembly Meeting to be held in Pisa on November 2006. In that occasion also the roadmap for writing and revising the document will the established in such a way as

			to have the final version ready for M12.
MILESTONE	N°		
Functional specifications of Middleware and identification of the clinical standards	MS 3.1	31/01/07	This milestone is expected to be achieved by M12, in line with the Gantt of the Project.

Description of the activities

During the reporting period, according to the Technical Annex of the project, Tasks T3.2 and T3.4 have started, both at month M8. The activities of task T3.1 and T3.3.1, started at month M3 and M6 respectively, continued during this quarterly.
The main results achieved during the reporting period concern the analysis of the functional specifications of the middleware. This activity was carried out in a strong cooperation between SYNAPSIS, VMW, CNR, FORTHNET and FORTH, and the preliminary results obtained will be discussed and consolidated during the General Assembly to be held in Pisa on November 2006.

The progress of the work carried out during the reporting period is described in more details in the following paragraphs.

T3.1: Middleware requirements and functional specifications
In accordance with the goals on Task T3.1, the activity of identifying and formalising the requirements of the core system that guarantees the interaction and interoperability among the software modules of the entire platform has been carried on.
The document on the user scenarios was further extended and refined and it has been considered the reference document for the identification of the functional specifications of the platform of services.
During regular meetings with CNR held both in Pisa and Livorno, some critical points concerning location, safety and accessibility to data repository/repositories have risen. These aspects, which might become critical during the subsequent phased of the project lifetime, and the proposed solutions, will be shared and discussed among the other partners, both technical and medical, during the Assembly Meeting of Pisa.

This task will end within month M10, as expected from the Project Gantt, and the Deliverable D11 – "Functional Specifications of the middleware" that resumes the results achieved and the choices performed, will be produced by the partners involved in due time.

T3.2: Identification of the clinical standards for representation and communication of data
This task was started according to the schedule on September 1, 2006 and it will finish on January 31, 2007 producing together with T3.1 the milestone MS3.1 "Functional specification of the middleware and identification of the clinical standards".
In these first two months of activity, the state of the art of the most common standards for clinical data encoding and communication was studied and examined. In particular, the data exchange among the sub-systems of the platform has been investigated and the solutions of HL7 and HL7 Clinical Document

Architecture (CDA) were recommended specially for the exchange of clinical documents such as discharge summaries and progress notes. HL7 is a standards-setting organization accredited by the American National Standards Institute (ANSI) and the HL7 Clinical Document Architecture (CDA) is an XML-based document mark-up standard that specifies the structure and semantics of clinical documents for the purpose of exchange.
These standards are recommended for the information exchange among subsystems of the platform and between the platform and any clinical third-party system.
Furthermore, the standards related to the information exchange between medical devices and the HEARTFAID platform were studied and examined. Dividing the world of medical devices between imaging and non-imaging medical devices, the adoption of DICOM for imaging medical devices was recommended, while various different standards were identified for non-imaging medical devices. Considering the high cost in terms of time or money for the implementation of proprietary protocols for communication/data format with medical devices that do not implement any information exchange standard, integration of such devices in the HEARTFAID platform was discouraged and should be evaluated on a case-by-case base.

T3.3: Integration Middleware

T3.3.1: Early mock up prototype implementation

This Task, started at month M6, has the goal to design and develop a Data Management System that is responsible to guarantee the following features:

- all the data flowing within the entire platform is compliant with the standards identified in Task 3.2
- management of the heterogeneous repository allowing the organization of raw data, laboratory data, structured information (EPR, data entry services, and so on), multimedia/other data (reports, images, ultrasound signals, and so on).

During the studies carried out so far, the following technologies have been identified as the most suitable for the project goals, and will be adopted during the next staged of the project activities to develop an adequate Integration Middleware:

- Service Oriented Architectures (SOA): software architectures based on the definition of networks of entities, where each node makes resources available to other participants in the network as independent services that the participants' access in a standardized way. This way, it is possible to define a collection of services, able to communicate with each other. The communication can involve either simple data passing or it could involve two or more services coordinating some activity.
- Enterprise Service Bus (ESB): ESB appear to be the solution to finding a meaningful large-scale architecture that is capable of spanning a global enterprise. Rather than conform to the hub-and-spoke architecture of traditional enterprise application integration products, ESB provides a highly distributed approach to integration, with unique capabilities that allow individual departments or business units to build out their integration projects in incremental, digestible chunks, maintaining their

own local control and autonomy, while still being able to connect together each integration project into a larger, more global integration fabric, or grid.

- Open Geospatial Consortium specifications as reference information model for data modelling: the Sensor Mark-up Language (SensorML) to model and encode the Remote Data Acquisition (RDA) networks, and the Observation & Measurements specifications to encode the observations produced by RDA, both using the XML standard language.

These technologies are being accurately investigated and will be implemented shortly to define a prototypal middleware demonstrator able to integrate both real and simulated data acquired from two remote data acquisition networks located at VMWS and CNR sites respectively.

In addition, preliminary studies have been carried out on Workflow systems able to design and manage series of tasks states, events and actions. These systems should be handled by the HF platform since they will be strictly related with the activities and the functionalities provided by the Decision Support System.

T3.4: Interoperability Middleware

This task stared at month M8 and is at a very early stage. The Interoperability Middleware will be responsible of guaranteeing a seamless integration among the end-user services of the HEARTFAID Platform.
The functional specifications and the requirements of the Interoperability Middleware will be defined in accordance with the document on the user scenarios, as soon as the scenarios themselves will be validated by the medical partners.
Preliminary results are expected to be achieved after one year of the project lifetime.

Ongoing workpackages progress: WP 4

WORK PACKAGE: 4
TITLE: KNOWLEDGE, REPRESENTATION, DISCOVERY AND MANAGEMENT
START DATE: Month 8
WORK PACKAGE LEADER: RBI
PARTNERS INVOLVED: UNICAL, SYNAP, CNR, FORTH

STATUS OF TASKS DUE IN THIS PERIOD

TASK		COMMENTS
T 4.1	Implementation of a suitable data warehouse for knowledge discovery	Analysis of the activities required by the task. Interplay with other tasks, especially those in WP4. Identification of data sources and goals of knowledge discovery process. Search for historical data by medical partners and publicly available data related to HF.
T 4.4	Ontologies and medical knowledge representation in the domain	Overview of medical knowledge representation approaches, especially those for guideline implementation. Overview of ontological approaches for the knowledge conceptualization. Building the first HF ontology in Protégé frames form. Experimental construction of rules in JESS format.

FORECAST STATUS OF TASKS DUE IN THE NEXT 3 MONTHS

TASK	N°	COMMENTS
Implementation of a suitable data warehouse for knowledge discovery	T 4.1	Understanding of the case report form for HF patients. Preparation of the ontological definition of the case report form. Understanding of relevant decision problems in the HF domain. Analysis and definition of data warehousing tasks in medical domains in contrast to business domains. First experiment with historical data from UNICZ.
Data understanding and preparation	T 4.2	Understanding and preparation of historical data from UNICZ. Preparing the data transformation and data cleansing methodology. Analysis of the organization and management models for HF domain, as well as formal identification of decision making problems.
Ontologies and medical knowledge representation in the domain	T 4.4	Preparation of HF ontology in the OWL form. Development of the rule part of the knowledge base in the SWRL form. Integration and experiments with JESS based reasoning. Connecting JESS reasoning with an experimental database. Experiments with integration of the HF ontology with more general public ontologies. Experiments with distribution of the HF ontology in a distributed form.

Description of the Activities

The work on WP4 started with tasks T4.1 and T4.4 in parallel. In the next 3 months the work on T4.2 will start as well.

T4.1. – Design and development of a suitable data warehouse for knowledge discovery

The work started by identification and analysis of activities required by the task. Especially deliverable D5 is the source of information about relevant decision making problems in the HF domain. Among them relevant are predictors of HF worsening. It seems that medical experts are unique that advancements in the possibility to early detect worsening (i.e. early diagnosis of decompensation before clinically manifested) would be a major result both for the HF platform and the praxis of HF treatment in general.

In order to achieve this goal, implementation of the data driven knowledge discovery process is necessary. This can be done from the data collected by the platform, but also from the historical patient records already available in medical institutions about HF patients and from publicly available data. In respect to type of knowledge that is expected from the process, it is clear that the HF platform with the possibility of on-line data collection will be an ideal environment for collecting relevant data. Classically collected data by medical doctors present only a small part of information necessary to understand the dynamical processes (like decompensation, for example). It means that historical and publicly data can not be so useful for knowledge discovery of topics identified as relevant for the HF decision making support.
The future work on data warehousing will in parallel concentrate on two tracks. The case report form is the starting point for data warehousing that will be implemented inside HF platform for the purpose of the knowledge discovery from data collected by the platform. The attribute descriptors inside the data warehouse will be specified in accordance with definitions from the HF domain ontology. The goals of the analysis will be those extracted from deliverable D5. The work on historical and public data will concentrate on identification of data that can help in inducing some HF related knowledge and their transformation and formal presentation in the form appropriate for application of different off-line knowledge discovery methodologies.

T4.4 – Ontologies and medical knowledge representation in the domain

In first two months of the activity, the state of the art of the main existing ontologies, terminologies and databases (OTD) for the medical domain and for the heart failure domain has been studied. The recommended approach was to select some relevant existing ontologies (free-of-charge including the tools for their management) and to insert the necessary specific classes for the heart failure diagnosis, prognosis and management of the patients. In particular, we faced the problems of developing ontologies for formalizing the medical knowledge, developing the rules which integrate such ontologies and use their terms to encode the diagnosis prognosis and monitoring processes, providing in this way our system with the necessary reasoning capabilities.
Medical knowledge has a strict relation with the DSS so that we considered a global unique framework where these components are connected and interacting. Ontologies, together with rules, are the main component of the KB, which in its turn is the fundamental supply for the DSS 'brain' that is that part of the DSS endowed with reasoning capabilities. Considering Deliverable D.5, our main source of knowledge, we then started to define our KB, and first of all our ontologies. Realizing the importance to list up all the significant terms of our knowledge, we have developed a glossary of terms related to HF which is meant to contain all the important terms we need to consider in our KB. Starting from it, we have then begun to structure our ontologies, based on identifying the concepts of our knowledge and translating them in classes, specifying their properties and their relations.
At the moment, there are four general concept classes: patient characteristics, testing, treatment, and HF concepts. These classes are the starting points for detailed conceptualization of HF terminology and relations among concepts. The fifth class containing instances of patients has been introduced for the purpose of reasoning,
In addition, some experiments with building a rule base with operational knowledge have been done. For the experiments we have used JESS type of rules.

In the period of next 3 months, we plan to change to the SWRL form of rules and to transform the ontology into the semantic web OWL standard representation. For the decision about the final form of the knowledge base decisive will be results of the task T5.3 that should give functional specification of the decision support system. Independently, we have to try to solve the problems of reasoning from ensembles of ontologies. If successful, it will enable us to distribute different HF concepts into independent ontologies and to integrate some more general public ontologies into the HF decision support system.
In parallel, some work has been done on the study of other medical knowledge representation approaches. Especially interesting are GLIF, as an ontology approach specially developed for medical guidelines, and Asbru, a system for time oriented system planning. The work will continue also in the next period.

Ongoing workpackages progress: WP 5

WORK PACKAGE: 5
TITLE: DATA PROCESSING AND DECISION SUPPORT DEVICES
START DATE: MONTH 5
WORK PACKAGE LEADER: CNR
PARTNERS INVOLVED: UNICAL,UNICZ, SYNAPSIS,FORTH, RBI

STATUS OF TASKS DUE IN THIS PERIOD

TASK		COMMENTS
T 5.1	Identification of representation features for signals and image processing	Refinement of the general task organization. Definition of the activities schedule. Research themes identification, in particular, 1D vs. 2D/3D signals and features assessment and extraction.
T 5.3	Requirements and functional specifications of the Decision Support System	Refinement of the general task organization. Specific research activities concerning global workflow vs. DSS architecture, methodologies vs. technologies. Deep investigation of the SOA from the point of view of the relationship between possible methods and available technology. Design issues assessment. Collection of the available instruments.

FORECAST STATUS OF TASKS AND DELIVERABLES DUE IN THE NEXT 3 MONTHS

TASK	N°		COMMENTS
Identification of representation features for signals and image processing	T 5.1		This Task will be concluded on 31st January 2007.
Design and development of models and methods for signals and images processing	T 5.2		This Task will start on 1st February 2007.
Requirements and functional specification of the Decision Support System	T 5.3		This Task will be concluded on 31st January 2007.
Implementation of the Decision Support System	T 5.4		This Task will start on 1st February 2007.
DELIVERABLE	N°	DATE DUE	
Functional Specifications of Data processing and Decision support Services	D 15	31/01/07	D15 will report the results of the studies carried out from Month 5. It will include all the details regarding signal and image features identification and representation useful to build suitable computational models for their detection in practice. Furthermore, D15 will also describe the DSS complete requirements for its implementation.

Description of the Activities

Activities focused on the following main aspects of 5.1 and 5.3 Tasks, respectively:

- signals and images acquisition and processing, features assessment and extraction, preliminary study case development.
- DSS, platform *core* and relationships ontologies vs. knowledge base vs. *brain*, i.e. that part of the DSS endowed with reasoning capabilities.

More details are given below.

Task 5.1

- As a general concern, in this Task we considered two main aspects when interpreting cardio-signals and -images, i.e. open problems assessment and correlation analysis and signal/image categorization. The first one refers to intra/inter-observer variability and should try to reduce instrumentation lacks and analysis subjectivity. The latter should aim at extending HEARTFAID knowledge through developing new methods for extracting *innovative representing features.*
- An analysis was carried out of the representation features for the signals acquired by the medical sensors (non-imaging devices) identified in WP2 and WP1. For each type of medical sensor candidate to be used in the platform, the relevant features (parameters) were identified. Still an evaluation of the capability of such sensors to transfer information (in a structured format or as raw data) to the HEARTFAID platform is not available. In order to cope with this problem amplified by the lack of communication/data format standards present in the medical devices used in the validation sites, some multipurpose basic algorithms were also identified.
- A study case was identified on image processing in echocardiography as paradigm and partially developed. We considered chamber and Doppler echocardiography quantification. Estimation of an automated analysis of an images sequence was based on structure border detection, volume assessment, regional LV function and dyssynchrony, through identification of segmental and global markers.

Task 5.3

- The following topics were faced: HF CDSS requirements, HF CDSS logical-functional vision and DSS *Brain*. At this stage we mainly considered workflows vs. platform states (data and process flows), in terms of patient's admission to the platform, prognosis/therapy formulation, follow-up monitoring, long-term research and available tools. A model was introduced composed of interacting components: an events monitor, an action manager and a reasoner. This model should be the base for further improvement of the DSS.
- Activity was carried out for tools pre-selection according to core issues, investigating on standards (HL7), ontologies (MeSH, UMLS) and DSS Brain (Arden Syntax, Jena).
- Preliminary meetings were organized between CNR and SYNAPSIS in order to discuss the relationship between middleware and DSS, particularly considering location, distribution, property and security of data on which the DSS will operate as the main critical points to be faced. The results of these discussions and the proposed solutions will be presented for debating at the General Assembly Meeting to be held on November in Pisa.

Future activities until next quarterly report month 12

FORTH	In the next three months FORTH will start the design of algorithms for ECG filtering, QRS detection and QRS classification that are basic algorithm for any ECG, Holter ECG or HRV processing and analysis.
CNR	Methods for image feature extraction will be defined. Echo cardio-images processing will be detailed. DSS design will be completed in terms of components, data and process flows, requirements.
UNICAL	Contribution to the completion of the activities related to the DSS design, in particular concerning the definition of the requirements and functional specifications.

Ongoing workpackages progress: WP8

WORK PACKAGE: 8
TITLE: DISSEMINATION AND EXPLOITATION
START DATE: MONTH 1
WORK PACKAGE LEADER: UNICAL
PARTNERS INVOLVED: ALL

STATUS OF TASKS DUE IN THIS PERIOD

TASK		COMMENTS
T 8.1	Dissemination Activities	Contribution from • UNICAL • CNR • RBI • FORTH (see prospect on next page for details) More details about all Consortium Planned Dissemination Activities available on Deliverable D6

Description of the Activities

The dissemination activities of this period of the project have been run according to the planning defined in the deliverable D6.
In particular, further internal dissemination activities have been carried out by the partners, the project web site has been further revised and improved, and HeartFAID project has been presented, by many partners, at new workshops, conferences and symposiums.

Finally, the publication of the first preliminary results of HeartFAID project has been accomplished, as follows:

D. Conforti, et al., "HEARTFAID: a knowledge based platform of services for supporting medical-clinical management of Heart Failure within elderly population", in: L. Bos, L. Roa, K. Yogesan, B. O'Connell, A. Marsh, B. Blobel, eds., ***Medical and Care Compunetics 3***, pp. 108 – 125, IOS Press, Amsterdam, 2006.

D. Conforti, et al., "HEARTFAID: A Knowledge Based Platform for Supporting the Clinical Management of Elderly Patients with Heart Failure", ***The Journal of Information Technology in Health Care*** 4(5) (2006) 283 – 300.

F. Chiarugi, et al., "Support for the Medical-Clinical Management of Heart Failure within Elderly Population: the HEARTFAID Platform", in: ***IEEE EMBS Int. Special Topic Conf. on Information Technology in Biomedicine***, Ioannina (Greece), October 2006.

USE AND DISSEMINATION

Date	Channel	Event	Place/ Country	Partner responsible	Nature and size of audience
Sep 06	Conference	Computers in Cardiology	Valencia/ Spain	FORTH	250 ; physicians engineers, physicists, biologists and computer scientists
Oct 06	Workshop	Marie Curie Workshop Zagreb & Belgrade Celebrating Nikola Tesla	Zagreb/Croatia; Belgrade/ Serbia	RBI	~ 100 researchers and students from technical domains and natural science domains
Oct 06	Symposium	Meeting on BioInformatics and Medical Informatics organized by the Academy of Athens, Foundation for Biomedical Research	Athens, Greece	FORTH	80; engineers, biologists, computer scientists and other scientists in the fields of bioinformatics and medical informatics .
Oct 06	Conference	The International Special Topic Conference on Information Technology in Biomedicine (ITAB 2006)	Ioannina, Greece	FORTH	150 ; physicians, engineers, physicists, biologists, computer scientists and others scientists.
Oct 06	Conference	Mednet 2006 11th Conf. on Internet in Medicine	Toronto, Canada	CNR	Internationally known leaders in e-Health. 500 attendants from 43 countries

Future activities until next quarterly report month 12

ACTIVITY	Partner Responsible	DATE/PLACE	COMMENTS
MB & STAB MEETING	CNR/SYNAPSIS	7/10 November 2006-Pisa (Italy)	Next MB & STAB meeting will help the Consortium to jointly set future objectives and discuss the distribution of responsibilities and future goals
START OF WP6	FORTHNET	Start Date Month 10	Start the design and development of the web-based front-end of the HeartFAID platform, according to user needs, as well as the available functionalities of the platform. Different security access levels will also be defined, regarding users' interaction with the medical and clinical HeartFAID services.
PAPER PUBLICATION	FORTH	Date to be scheduled, "IEEE Transactions on Biomedical Engineering"	Paper Acceptance:"Non-invasive ECG as a Tool for Predicting Termination of Paroxysmal Atrial Fibrillation"