D4.1 System Integration Architecture (V1)

WP4: System Implementation and Test

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Statement of originality
This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.
Executive summary

This deliverable describes in detail the System Integration Architecture for each site. It targets mostly the first wave pilots, since their maturity level in terms of system build up and implementation is higher than the second wave pilots; however, where the latter is available and well documented, information is also included.

Each site has to report on the following aspects:

- Review of installed Infrastructure.
- Identification of new Components to be built.
- Development plan of new Components.

The report closes with a dedicated section with conclusions and further work where all lessons learned by site, depending on maturity of implementation, are discussed and conclusions are drawn.
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1. Introduction

1.1 Purpose of this document

This deliverable describes in detail the System Integration Architecture for each site. It targets mostly the first wave pilots, since their maturity level in terms of system build up and implementation is higher than the second wave pilots; however, where the latter is available and well documented, information is also included.

The Netherlands pilot site does not appear in this document. However, they are committed to participate; due to delays of an administration nature, they were not able to deliver their contribution on time. A second version of D4.1 will be circulated as soon as they provide the consortium the relevant material.

1.2 Structure of document

Section 2 reviews the existing infrastructure already in place in each site, either from participation in previous pilots, or even better from national / regional or local real life implementations. The first step towards the definition of a system integration architecture is to review the existing infrastructure for each site in as much detail as possible at a given time. Hints are also given for the overall perception of the SmartCare network of services by site, in order to have the means to compare what exists now with where we want to go.

Section 3 identifies the new components to be developed. These components represent the results of the comparison between the existing and the desired infrastructure. The number and complexity of components to be built is not always analogous to the state of deployment, as there may be other factors affecting the launch of pilot services, e.g. personnel recruitment processes, tenders, etc.

Section 4 is dedicated to the development plan, or more specifically how each site intends to have in place all the relevant infrastructure before the launch of the pilot. Resources to be committed in this process are of the utmost importance, as they usually balance the development plan. Again, the findings of this section reflect the sites’ maturity and ease of handling complex processes required for the successful operation of SmartCare.

Section 5 closes with conclusions, where future work such as maintenance of the new installed base and technical support throughout the pilot’s life cycle are also discussed.

1.3 Glossary

EHR  Electronic Healthcare Record
FVG  Friuli Venezia Giulia
GP   General Practitioner
HIS  Hospital management system
RSD  Region of Southern Denmark
2. Review of installed infrastructure per site

2.1 FVG

FVG Region decided to subcontract the whole service for the SmartCare integrated care related to the regional deployment site. The whole ICT system and service will be designed by the company that will be awarded the contract.

On 24th December 2013, the Dipartimento Servizi Condivisi (Department of Shared Services of the health regional system) of Santa Maria della Misericordia Hospital, and University Centre in Udine, Italy, issued a public invitation to tender (amounting to €500,000, plus €100,000 for additional options) relevant to a contract for the supply of systems and services (technology devices, call centre and data management platform) designed to provide integrated health and social care monitoring interventions for patients in home care (within FVG regional healthcare system). The tender was for the project ‘SmartCare - Joining up ICT and service processes for Quality Integrated Care in Europe’, Number 325158, involving Trieste’s A.S.S. Nr. 1 over a 24 months’ period.

The deadline for submitting proposals was 3rd February 2014. The evaluation process took several weeks, with the final evaluation taken at the end of March 2014. The decision statement must now be published. The indicated winner company should start working by the end of April 2014.

Requirements included in the tender mainly focused on the need to:

- Ensure person-centred coordinated development of health and social care interventions (GPs, specialists, nurses, psychologists, social care workers, and in general all professionals involved in patient care) with direct involvement of patients, families, formal and informal caregivers, including Third Sector.
- Remove organisational barriers.
- Meet individuals’ needs for cohesive information.
- Strengthen citizen involvement in decisions and activities concerning their healthcare and social care needs.
- Provide accessibility, empowerment, and security of access within an integrated ICT-platform.

Within the short-term (home support after hospital discharge) and long-term care support pathways, the main SmartCare intervention requirements were identified as follows:

- Direct access to platform-based information (both in reading and writing) through different profiles and security access. The SmartCare platform is required to provide timely multidimensional data management, including analysis and storage (clinical, healthcare, social and environmental data) both to care recipients and formal and informal carers.
- Option of videoconference set up needs to be allowed for.
- Availability of and accessibility to periodical reports. The system must also allow for statistical elaboration together with tracing of data trail (time/date of data acquisition, instrument, location, source of data, identification and role of stakeholder).
- Alert system with relevant subsequent action. Each alert process needs to be adjusted to patients’ situations and needs.
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- Devices will have to conform to European regulations (e.g. CEI 62-148, EN 62353, CEI 62-128, etc.).
- Adequate training will have to be provided to all stakeholders.
- Privacy regulations will have to be strictly enforced, and secure exchange of data provided for at any time according to Italian legislation.

2.2 Aragon

2.2.1 Healthcare IT Infrastructure

SALUD has put in place a very comprehensive ICT infrastructure in support of healthcare services and telemedicine services. Initially trialled in the framework of previous EU funded projects, these are now used on a regular basis in the Region which is characterised by a very sparse and ageing population.

The SALUD divides the Aragon territory into eight healthcare areas. SALUD has a technological network of 10 nodes (one for each healthcare area, one for emergencies and the central node CETEC) and 12 data centres that host clinical patient information, one for each node, and interconnected, with a total capacity of 137TB and 468 servers. These nodes host all departmental and corporate applications and databases for each sector. Each data centre centralises the clinical information for every patient in the sector; some of the information is replicated in the central node so that it is accessible by other sectors. All nodes are interconnected, and information can flow among all healthcare sectors achieving an ubiquitous and transparent access to patient records whichever sector the patient lives in.

![Aragon territory division into healthcare areas](image)

**Figure 1: Aragon territory division into healthcare areas**

The central node (CETEC) also hosts all servers where central applications reside that give support to other applications, such as the user database, teleformation, specialist election, digital images, etc.

A fibre optic line connects nodes, with a bit rate of 1GB - 100Mb between hospitals. All healthcare centres and hospitals are connected through this. 124 centres and 718 clinics have, in addition, ADSL lines.

This common ICT infrastructure and network is common for primary care, specialised care, and mental health units.

The clinical intranet gives access to all departmental corporate applications and databases for each healthcare sector. It is available for all staff within the healthcare sector. This
web portal gives access to the applications of each healthcare sector, enhancing professionals’ daily tasks, avoiding waiting times and the need to send documents. The intranet supports looking up patient data, health records and tests done. It also provides access to other tools, statistics, and files selection.

SALUD provides multiple systems and services to their patients and professionals; the most important information systems are:

- The users database (BDU), which identify all users in the region.
- Primary care electronic health record (OMI AP) in all centres and medical offices.
- Aragon Electronic Digital Healthcare record: Integrates the EHR from primary care (OMI AP) + specialised care). It integrates all data from actions performed at any healthcare sector in Aragon, and a summary of the actions performed in some of the other regions in Spain that provide information.
- Hospital management system (HIS): Application that hosts all clinical activity, scheduling & monitoring information applications at the healthcare centres and provision units in the SALUD.
- Departmental applications:
  - Emergencies services information system (PCH) deployed in all sectors.
  - LIS: Laboratory records information systems.
  - RIS: Radiology images digitisation: an image storage and management system (PACS) and an information system (RIS) deployed in seven out of the eight sectors.
  - Telemonitoring portal: storing information from telemonitoring programs and integrated with the primary care EHR (Omi-AP)
  - Patient’s surveys.
  - e-prescription: to manage prescriptions, their dispensing, financing and regulation.
  - Videoconferencing systems.
- Help desk: there is a technical contact centre to manage and support the Systems Centre.
- HCP users call centre in place for telemonitoring purposes.
- Intranets: Every healthcare sector has a corporative intranet for professional use which gives access to corporative departmental applications.
- Salud Informa: A webpage oriented to citizens where, among other services, users have free GP election, booking consultation services, etc.
- HCDSNS: Digital Electronic health record. The HCDSNS is a web portal oriented to patients which provides a summary of the Aragon Electronic Digital Healthcare record. It gives users a point of access to e-health services such as downloading reports, printing drugs prescriptions, masking information, consulting audit trail, etc. The HCDSNS framework is defined by the Spanish Ministry of Health; Aragon’s HCDSNS development has been approved by the Ministry.
- Telemedicine solutions:
  - Tele-retinography: storing images coming from diabetic retinopathy screening at the corporate PACS, and access through the PACS proprietary visor.
  - Tele-dermatology: asynchronous consultations between primary care and dermatology deployed in five out of eight sectors.
o Tele-electrocardiology: to integrate electrocardiograms in the patient’s electronic health record deployed five out of eight sectors.

o Tele-ictus: to decrease the mortality rate in these patients. Deployed in six out of eight sectors.

Figure 2: SALUD IT Infrastructure

There are further solutions and information systems, such as telemedicine solutions, nursing care information systems, data warehouse and business intelligence systems, patients manager (to help in the clinical management and coordination of all health agents - under development), knowledge portal, online training tool, user’s call centre, management and support to systems centre, pathological anatomy information system, intensive care management systems, etc..

There is also an alert management information system with alerts, prompts & reminders configuration and handling, protocols and escalation procedures, and generation of passive alarms.

The clinic intranet is able to integrate data coming from primary care, specialised and social records collected mainly from specialised care and from hospital admissions. The main goal of these records is the prevention of inadequate hospital stays caused by an extension of the stay due to social reasons.
Furthermore, SALUD has a home telemonitoring platform that collects notifications and where the alarms generated are centralised and managed. At the same time, the solution integrates the other departmental applications with the EHR systems and with the hospital activity systems.

2.2.2 Social providers IT Infrastructure

On the social services side, corporate information systems from the public social services providers are almost non-existent; the actual work is among the unique citizen identification. As the regional office holds the user identification health database, it is under consideration to extend it to the whole of the information from the social sector.

Local associations and third parties own legacy proprietary systems, if they have them; in many cases, they do not have a register of services provided.
On the other hand, the Red Cross enjoys a nation-wide technological infrastructure; some of the following applications are available for SmartCare project:

- **Intervention**: Register of the services requested by the person and previous step to the assessment.
- **Common Data Repository**: Stores the more general personal data.
- **Social intervention (AIS)**:
  - Record of the programmes and projects from the basket of services that the person enjoys.
  - Activities performed by/with that person.
  - Follow up agenda plan (outgoing calls) to perform by the Contact Centre.
  - Social report collection.
- **Contact Centre (Proximidad Local)**:
  - Agenda Campaigns: record of outgoing calls made to users programmed for its activation according to a defined pattern on the AIS application.
  - Attention to Requested Services Campaign: through the incoming calls, collection of requests for services from the basket of services by users already registered on the AIS database.
  - Demands follow-up: follow-up of the provision of services requested by the Contact Centre.

**Figure 5: Red Cross Infrastructure**

### 2.2.3 ICT infrastructure for SmartCare

For further information on the Aragon ICT Infrastructure for SmartCare pilot, refer to D3.1. Pilot Level Service Specification from Workpackage WP3 - Integration Infrastructure Architecture and Service Specification
2.3 South Denmark

The Danish SmartCare service consists of both the existing system of electronic messages provided by MedCom as well as the Shared Care platform that is meant to supplement the existing communication. See the illustration below of the entire service.

The history of MedCom - the Danish Health Data Network (DHDN) - goes back to the late 1980s, when interest in electronic communication among healthcare providers grew. It is a long-term project that enables effective data transfer between several actors of the health service, including stakeholders of the community-based social care system. This national network allows fast information flow in the form of reliable data exchange of EDIFACT or XML-based messages among the respective software systems of the participating healthcare providers. Agreements on interface specifications as well as certification of software compliance with agreed upon standards and syntax allow for optimal interoperability. Data transfer begins at the point of care for patients and GPs. From there, services that citizens may need access to include pharmacists, diagnostic services and specialist consultation at hospitals, referral to and discharge from a hospital,
and transfer to home care and residential care services. Effective access to these by citizens depends on the efficient exchange of messages between health and social care providers and other actors.

It began with electronic exchange of messages between healthcare professionals via MedCom nationally agreed standards (www.medcom.dk). Communications such as prescriptions, referrals, laboratory orders and responses, etc., are exchanged daily. In January 2010, more than 5 million communications were exchanged. Over the years, the repertoire of communications has expanded considerably, and the infrastructure has been extended to include more and more aspects of healthcare services. Concurrent with this, Internet technology has been adopted, so now communication also includes web services, while telemedicine solutions are rapidly being developed. Throughout the development process, efforts have remained focused on giving healthcare professionals access to flexible knowledge searches and internal communications, and, at the same time, enhancing the quality of the services that the healthcare sector is able to offer to citizens.

The Shared Care platform is building on top of this existing infrastructure, enabling care providers and patients to have access to relevant information in a shared care record at any given time. The Shared Care platform will need to accommodate existing standards, integration to existing systems and databases, and be both fast and reliable on the DHDN.

The Shared Care platform is a web application built on these requirements:

- Function inter-regionally and across-sectors, and not be tied by specific systems. The solution supports a lot of different stakeholders by providing data to be fed into and across a lot of different systems.
- Support a multiple supplier strategy when it is controlled by a third party. In the same way, maintenance and development of new modules can be done by another supplier.
- Focus on the fact that a lot of different actors need to be able to access the platform. This is something that cannot be done to the same extend when using a client-server system.
- To avoid double registrations, and to make it is possible for the involved parties to work within their own systems as much as possible, a system for synchronising all the relevant systems involved is a necessary part of the solution, to ensure that all
the systems have the relevant information regardless of where the data originally comes from.

- To be flexible, configurable, scalable and portable:
  - Flexibility means that the data in the interface is based on roles and the specific course of disease. The solution can also support a multiple channel strategy and mobility. The view of the data has to be configured to specific units - both static and mobile units.
  - Configurability means that the view of the data should be configurable to fit specific roles through a portlet-technology. Furthermore, it will be possible to configure the rules and the patient pathways.
  - Scalability means that the solution has to be able to be scaled when the number of patients rises. The solution is based in components that enable development over time, e.g. if a simple module has to be changed to a more advanced module to support new needs. The supplier has developed a wide range of standard components to support flexible patient pathways, modelling processes, rule based engine and integration that have been well-proven through tests and can function on a large scale.
  - Portability means that the solution can function on several IT platforms, and, for example, be moved from Linux to UNIX or Windows with little effort.

- Will be based on confidentiality and security regarding patient related data.

- Include a number of integrations from the CPR register (Register of Social Security Numbers) to the systems in the hospitals and the systems used by specialists, GPs, and also a home monitoring database. Therefore it is a solution with a great deal of integration. This integration will most likely have to follow the MedCom standards, including "the good webservice", that are essential to get a solution that can be used cross-sectoral, regional and national.

- Deliver IT support to the patient pathways with focus on chronic conditions.

- Give access to a common set of data when having cross-sectoral and cross-disciplinary patient pathways.

- Be a common tool for health professionals in the different sectors, for patients and for management.

- Support the coordination of the individual pathways starting with the patient pathways and the support of the decision makers.

- Give the patient the opportunity to become an active participant in his/her own pathway, including the possibility of home monitoring.

- Be able to integrate with existing and future relevant systems e.g. Electronic Patient Record systems (EPR), systems used by GPs and specialists, Electronic Care Record systems (ECR), laboratory systems, etc.

- Has to function as both an integrated tool for the existing EPR, existing GP systems, specialist systems, ECR systems and as an individual system for that actor who does not use another relevant IT-system, e.g. the patient.

- Use the existing open standards.

- Offer a high level of accessibility.

- Support a multi-supplier strategy.

- Finally the system must support the regulatory requirements in handling personal data.
The model below illustrates the architecture of the Shared Care platform.

The platform is highly focused on integration with existing systems and databases, and the following systems are to be included:

- Integration with Cosmic via CloverLeaf (not an individual module, because the integration is made through standard integration in a basic module).
- Integration with the systems used by GPs and specialists through Sentinel data gathering.
- Integration with the laboratory portal.
- Integration with data provided by home monitoring.
- Integration with Shared Medication Record.
- Integration with the client’s CPR component.
- Integration with NemLog-in (a secure and personal access for all individuals).

The model below illustrates the integration architecture.
The following model illustrates the set-up of the solution.

The Shared Care platform consists of different elements illustrated in the model below. There are five different user types, a range of functionality, a range of possible disease areas in addition to heart disease, which is the current focus of SmartCare, as well as a list of integration options.
In the model below, the elements are depicted in a more coherent way.

The following use case scenarios show two examples of how the data is created by users. They log into the system either via their individual systems and existing log-ins, or by using their digital signature (for professionals) or Nem-ID (patients and relatives).
Figure 14: Use case scenario 1

An activity for a patient may be to complete a questionnaire as preparation to the visitation conversation. This can be completed online by the patient in the Activity list in Shared Care.

Figure 15: Use case scenario 2

Below you can see an example of view from the web-interface.
Figure 16: Example view from the web-interface

Below you can see an example of view from a mobile device - developed for the patients.

Figure 17: Example view from a mobile device

2.4 Scotland

The strategy of the project in Scotland is to leverage existing IT assets, and add incremental developments to support the interventions of the SmartCare service.

Assets to be re-used are specifically the Living it Up (LiU) platform, and existing installations of systems that are used in health and social care, including telehealth and telecare.

At a very high level, the architecture is as shown in the following diagram.
The remainder of this section describes:

- The LiU architecture as deployed.
- Local statutory systems as deployed.

2.4.1 The LiU architecture as deployed

The LiU platform consists of a public presence on the web, management applications, and underlying infrastructure. It is hosted on a cloud-based infrastructure, and utilises a number of third-party internet services.

LiU Solution Overview as deployed with V2

![Diagram showing LiU ecosystem and infrastructure](image)

**Figure 18: Current relevant installed infrastructure in Scotland**

**Figure 19: Living it Up platform as deployed**
LiU is designed to be an ecosystem of applications that can exist in their own right. The applications are bound together by adhering to a common set of interoperability approaches.

Individuals choose a toolset for their journey through LiU, to make connections with other people, find information, and choose products and services. This set of tools can change through time as the person’s preferences and circumstances change.

Some of the tools are applications designed around a specific purpose, for example, a SmartCare application that specialises on the Person Held File, Care Plan and Diary Tool. Some are generic, for example, the access device (Bring Your own Device) and a user account (Bring Your Own Account).

The LiU platform offers a range of APIs; some of these are presented by the infrastructure, and some are presented by the participating core applications.

A central part of interoperability in LiU is the provision of a trust framework to support a common login (and SSO) and to assure the exchange of information between applications.

1 http://openidentityexchange.org/what-is-a-trust-framework
2.4.1.1 Features of the LiU Profile Application

- A place for people to store information about themselves.
  o Avoids setting preferences and providing information repeatedly.
- Applications can store and retrieve information.
  o When an application learns something about a person, this can be stored to be shared.
  o Applications can personalise the user experience based on what they can get from the profile.
- Access supported from mainstream browsers on desktop PC or mobile devices.
  o Can use existing devices to work with the profile.
- Profile editor.
  o Transparency and control over what information is held.
- User account
  o A login account for people who need or want a new internet account.
- Flexible data model
  o Can adopt new fields dynamically, instead of being constrained to a particular dataset.
- Secure.
  o Hosted in EU data centre (Microsoft Azure in Dublin).
  o Encrypted connectivity.
  o Adopting security good practice.

2.4.1.2 Features of the LiU Authentication and Authorisation Application

- Can trigger a user login from a range of identity providers - Bring Your Own Account.
  o Instead of building your own login mechanism, you can delegate to a range of approved external providers. For users, this means that they can re-use an internet account instead of remembering yet another username and password.
  o A token will be returned that acts as a permission by the user to access information.
  o Currently supporting Google, Facebook and LiU’s own account.
  o Can support WS-Federation, WS-Trust and Open ID Identity Providers.
- Can act as IdP towards ecosystem applications.
  o Applications delegate user authentication to the LiU platform which in turn acts as a façade to the range of approved IdPs. The application can then support these IdPs for the price of a single integration.
- Can check if an application is a member of your approved list.
  o Ensures that only approved applications get access to information. Allows the list to be maintained centrally rather than duplicated within each application.
- Secure.
  o Hosted in EU data centre (Microsoft Azure in Dublin).
  o Uses Microsoft Access Control Services in the global cloud.
  o Encrypted connectivity.
  o Adopting security good practice.
2.4.1.3 Features of the Business Intelligence Application

- Event-based data collection.
  - Applications submit events for storage in the database - anonymised data.
  - API support for server-side submission and client-side submission.

- Flexible data model.
  - Can adopt new event types dynamically, instead of being constrained to a particular dataset.

- End-user application.
  - For use by managers without a dependency on specialists in management information systems.

- Cloud based.
  - Database and end-user application hosted in EU data centre (Microsoft Azure in Dublin).

2.5 Tallinn

For cared recipient, an Android based SmartCare app is going to be developed. The main functions of the application are:

- Entering and displaying person’s measurements done with installed equipment:
  - Display weight scale data;
  - Display blood pressure data.

- Entering and displaying additional information about the person’s medical and social condition:
  - Displaying reminders of medical events such as taking medications, visiting doctor, etc.
  - Entering the activities data of home nurses and home care assistant (relatives).

- Data exchange with SmartCare Contact Centre:
  - Exchanging environmental sensors data;
  - Exchanging health measurements data;
  - Exchanging social alarm button activation data;
  - Exchanging emergency situation data.

- Videoconferencing:
  - with SmartCare Contact centre;
  - with social care provider;
  - with GP;
  - with speciality doctor;
  - with relatives.

- Keeping a diary log of every action taken.

For medical and social care providers, a web based SmartCare portal is going to be developed. The main functions of the portal are:

- Providing access to information about the care recipient for stakeholders, if access is granted by the SmartCare helpdesk and service receiver; the information includes:
  - Personal data.
  - Medical and social interventions.
• Environmental sensors data.
• Health measurements data.
• Social alarm button activation.
• Emergencies.

• Generating regular integrated care reports of medical and social data for GP, social alarm services, relatives and social worker, if allocated by the municipalities.

• Generating an emergency report to all stakeholders when emergency situation occurs and the results of it, for example if the cared-for person is hospitalised after a social alarm button activation.

The SmartCare portal with the main components of social and medical care is shown in Figure 22.

Figure 22: SmartCare portal with main social and medical care components

In Estonia, the national database for health care is E-Tervis - Estonian National Health Information System. According to the Health Information System Statute, the processor of the Estonian National Health Information System is the Ministry of Social Affairs and the authorised processor is the Estonian eHealth Foundation. The healthcare service providers have to conclude a contract with the Estonian eHealth Foundation in order to interface to the Estonian National Health Information System. The view from the E-Tervis webpage can be seen in Figure 23.
The health information system is a database that is a part of the state information system. Healthcare related data is processed in this database in order to conclude and execute the healthcare services provision contract, ensure patients’ rights, protect public health and quality of health care services, maintain the registers of health conditions, as well as manage health care².

The cornerstone for successful Estonian e-solutions is a modern e-state infrastructure, commonly known as “X-Road”³. X-Road is an environment that allows the nation’s various e-services databases, both in the public and private sector, to link up and operate together. X-Road is the all-important connection between these databases, the tool that allows them to work together for maximum impact. All of the Estonian e-solutions that use multiple databases use X-Road. The X-Road scheme is represented in Figure 24.

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² The Health Services Organization Act and Associated Acts Amendment Act, §59¹ section 1
In Estonia, the national database for social care is STAR. STAR stands for the Data Registry of Social Services and Benefits. This is an information system and central state database. STAR is mainly used by local government social workers and social service providers. Today STAR has approximately 850 everyday users. The aim of STAR’s implementation is to assist case work, administer and exchange information on client, and also collect statistical data about the social sphere.

Local governments are the main users of STAR. In longer term, all provided social services and paid allowances must be registered in STAR, since this is essential to give a better understanding about the help the person / family has received, and collect statistical information on provided services and benefits. STAR is connected with several other state databases via X-Road. This facilitates data exchange and reduces the need for clients to present documents, and the administrative load of other institutions to issue these documents.

Summary: Until now the E-Tervis does not include personal home monitoring data. Also there is no active data exchange between different stakeholders for care organisation (social, medical and informal). With SmartCare, it is possible to provide integrated care to the elderly, because SmartCare connects different stakeholders (Figure 25).
The end users can access the portal using the Android tablet provided by the SmartCare contact centre. Using the tablet, information about measurements, medications, medical and social care plans can be easily obtained. The SmartCare tablet is a beneficial helper for older citizens to have an overview of vital health statistics and tasks to be done, such as making measurements and taking medications. The tablet can also be used for social care involvement. A draft version of the possible functions on the end users tablet can be seen in Figure 26.
The security of the web based SmartCare software is based on national ID-card solution which is mandatory for all Estonian citizens. Using this, all users can securely access SmartCare portal through the web. The information seen by relatives is determined beforehand in collaboration with the care recipient.

Formal health and social care givers can access the portal through the web via personal ID-card or through a tablet specially designed for SmartCare.

2.6 South Karelia

2.6.1 Entry Point

When an elderly or other new client is in need of home care help, contact to assessment team will be done via phone, email or personally by the client him/herself, a relative, or in some cases other social and health care professionals. Over three days, the assessment team will contact the client and make an assessment of the services needed. Based on the assessment, the client will be directed either to the private sector, or there will be a public sector observation / rehabilitation period for the next four weeks. At the end of this period, the assessment team will make a decision to start home care. The SmartCare service will be free for the clients of home care, but regular home care is not. The fee for home care will be determined by the income and property of the client.

2.6.2 Electronic Health Record

In Finland, there are three major providers of EHRs. South Karelia Health and Social District uses a patient data record system called Effica, which is provided by Tieto Oy. All the patient data provided by EHRs will be stored in the National eArchive of Health Information (Kanta Services), which will include the electronic prescription, pharmaceutical database, My Kanta pages, and Patient Data Repository. The services are deployed in phases throughout Finland. The first to be introduced are the electronic prescription, pharmaceutical database, and My Health Information. These services are being introduced between 2010 and 2016.

The EHR (Effica) includes care documentation, patient management, decision support, order management, medication management, reporting, scheduling, pricing & billing, homecare documentation & management, digital dictation and eHealth services. In order to improve information access across organisational boundaries, the same electronic patient record system (Effica) is used in the healthcare centres and hospitals of all eight communities. Nurses can send messages to GPs, and GPs to specialists. This supports continuity in the care process, and saves time for both patients and healthcare personnel. In addition, social work professionals use the same electronic information record. Based on the Finland laws, these records cannot be integrated. But home care is the exception, where both social and health related data will be stored in same information record.

2.6.3 Resident Assessment Instrument

The Resident Assessment Instrument (RAI) has been used at South Karelia Social and Health Care District since 2004. There are versions of RAI for home care and long term care. Both versions have been integrated with patient health record, and are available via PHR. Minimum Data Set (MDS) reassessment has to be done every six months or if there are any changes in patient’s health status or living conditions. RAI is one of the most important assessment tools during care needs assessment period.
2.6.4 eService Platform

South Karelia Social and Health Care District has developed, together with four other districts, a local eService Platform called Hyvis.fi. The Hyvis.fi portal functions as the interface for the electronic services on the Internet. It allows citizens to obtain reliable health information, assess and monitor their own health, as well as use online services. In addition to providing reliable health information, the service includes risk tests, health history forms, a secure dialogue between a professional and a customer, as well as appointment, self-care and SMS services. The portal supports citizens' responsibility for their own health, and encourages choices that enhance wellbeing in everyday life. Hyvis.fi for professionals supports professional decision-making, and functions as a communication channel with customers. The Hyvis.fi services will be used to implement national and regional objectives and strategies for the promotion of health and well-being. The services will be integrated to form a single, functional and secure entity from the point of view of citizens, customers and professionals alike.

2.6.5 Home care's mobile Enterprise Resource Planning system (ERP)

Home care's mobile ERP has been integrated with the electronic health record, and it allows the use of real-time patient data information during professionals' home visits. This is very important for formal care givers during their work shift. ERP automates the process of home visits statistics, and generates drive logs of nursing staff via GPS which release immediate work time for clients of home care. ERP is also used to optimise the resource of home care, and the needs of home care's clients. ERP system has been developed in South Karelia Health and Social District during 2010-2013. The system also includes an electronic locking system which has been installed on the doors of all the regular clients of home care.

2.7 Attica

The schema below (Figure 28) summarises graphically how the SmartCare pilot service infrastructure will be implemented in the deployment context prevailing in Attica. Here, the SmartCare pilot service addresses citizens suffering from diabetes type 2 who are aged 50 years and above.

The care recipient (CR) receives personalised information and guidelines in community settings from social and health care professionals in an integrated manner and in various
forms. This includes information on condition and status readily available in community settings (data in electronic format). These include a set of generic and personalised guidelines for the self-management of his/her condition.

The care recipient has access to the following data and information that are stored in electronic format in the Integrated Care Socio-Medical Electronic Record (ICSMER) and the ATTICA portal:

- Demographic profile.
- Family history.
- Absolute numbers and changes in basic biological indicators related to Diabetes, i.e. blood glucose levels, AP, HbA1c, body weight, height and BMI, other basic haematological and biochemical indicators.
- Medication related to diabetes.
- Referrals to specialists.
- Clinical follow up.
- Clinical alerts.
- Nutritional assessment.
- Nutritional diabetes education - cognitive nutritional therapy.
- Nutritional follow up.
- Anthropometrical alerts.
- Experiences and personal stories of peers.
- Entitlement to social benefits, allowances, medical devices and consumables.
- Possibilities for social inclusion activities within the pilot or at regional level.

The CR has access to ICSMER and the portal through tablets that use 3G/4G technology. Telecommunication fees for access to ICSMER and the portal are covered by the pilot’s budget. It is expected that the CR will benefit by engaging in a continuous learning process that aims to influence a change in their behaviour and habits (lifestyle related) related to self-management of the disease and empowerment.
A family member receives personalised information and guidelines in community settings from social and health care professionals in an integrated manner and in various forms. This includes information about the care recipient’s condition and status (readily available in community settings, data in electronic format). Also, a set of guidelines is available addressing the specific problems of the cared for person and how to better manage his/her condition in the community through a personalised care regime involving the family carer.

The family carer has access to the following information & data in the ICSMER and the ATTICA portal:

- Absolute numbers and changes in basic biological indicators related to diabetes, i.e. blood glucose levels, AP, HbA1c, body weight, height and BMI, other basic haematological and biochemical indicators.
- Medication related to diabetes.
- Referrals to specialists.
- Clinical follow up.
- Clinical alerts.
- Nutritional assessment.
- Nutritional diabetes education - cognitive nutritional therapy.
- Nutritional follow up.
- Anthropometrical alerts.
- Experiences and personal stories of other carers.

Figure 28: Graphical illustration of the SmartCare service infrastructure implementation
Entitlement to social benefits, allowances, medical devices and consumables for care recipients.

Possibilities for respite care within the pilot or at regional level.

The carer has access to ICSMER and the portal through tablets that are delivered to care recipient and use 3G/4G technology. Telecommunication fees for access to ICSMER and the portal are covered by the pilot’s budget.

It is expected that the family carer will benefit by being able to follow better the schedule of the care recipient, cooperate more effectively with him/her, but also with the multidisciplinary team and thus decrease the burden of caring.

Social care staff employed by the municipality provides guidance and support to the care recipient and/or the family carer regarding maximisation of social inclusion. More specifically, social workers will be involved in supporting the carer through posting continuous information on the portal about allowances, benefits, reimbursable devices and consumables, as well as information about social activities at the local level relevant to healthy eating, sports and culture. In addition, they will be engaged real time during work hours in chat rooms with carers and care recipients in order to discuss with them issues such as amelioration of burn out, empowerment etc. Social care staff can also veto decisions made by other parties involved in integrated care delivery, for example if during the enrolment phase the care recipient has no interest in engaging in social inclusion activities as mentioned above.

A diabetologist performs clinical assessment of the care recipient, provides prescriptions for medication, and recommends other therapeutic approaches (e.g. counselling), performs follow-up of the care recipient’s health status, and suggests referral to specialists when needed. The diabetologist has the right to veto the social carer’s decision. Through the SmartCare integration infrastructure, he accesses the care recipient’s demographic data, medical history, habits, activities of daily living, symptoms, diagnostic tests, medication, complications, etc., all describing his/her current condition as well as information on follow up. In addition, he receives automatic alerts when patterns in biological indicator measurements indicate deviation from normality, and hence require actions on his side. The diabetologist has access to ICSMER and the ATTICA SmartCare Portal through 3G/4G technology.

The existing infrastructure already running from national projects is quite rich, and includes:

- ATTICA portal dedicated to diabetes patients (http://www.likestinygeia.eu/).
- Blood glucose tele-monitoring application for smartphones / tablets to be used by patients while at home.
- Remote access to data by professionals (through the use of smartphones / tablets).
- Web based Electronic Health Record.

Below are some indicative examples of the modules already developed.
Figure 29: Professional’s remote access to data

Figure 30: Patient’s profile
Figure 31: Statistics on monitored data
Figure 32: Questionnaires on nutrition and life behaviour

All interfaces are in Greek but there is a forecast for further support in English to cater for the needs of citizens / residents who do not speak the language.

2.8 Netherlands

2.9 Kraljevo

2.9.1 Software in operation at Health Centre Studenica

- PHC - Primary Health Care information system.
- Helliant - Software for secondary health care.

2.9.1.1 PHC

PHC is based on comprehensive use of the International Classification of Primary Care - Second Revision (ICPC-2) concept of episode of care / continuity of care, and Health Information System Architecture (HISA) standard. The component provides measurements of key dimensions of the primary healthcare system, and supports its availability, quality, efficiency and sustainability for use by decision makers, health administrators and healthcare providers.

The main modules supported by PHC software are:

- General Practice department (GP).
- GP for preschool children.
- GP for school children.
- GP for occupational medicine.
- Healthcare for women at PHC level (gynaecology specialist).
- Polyvalent patronage service.
- Home care.
- Planning healthcare in the municipality/region.
Major functionalities implemented in PHC are:

- Scheduling patient appointments: create/update appointments schedule (not including eBooking).
- Patient admission: patient identification, proceeding demand of care, recording patients complaints.
- Patient registration: management of EPR, create/update EPR at least as defined by minimum dataset, except contact data.
- Choice of selected doctor: management of selected doctor data (create/update relation with selected doctor).
- Contact: Delivery of healthcare.
  - Create contact generic data at least as defined in minimum dataset.
  - Maintain the health issues (problem) list.
  - Maintain medication list.
  - View EHR.
  - Create/update health activities and procedures.
  - Create/update clinical information, recording diagnosis, prescriptions, diagnostic results, observations, opinions etc., not include e-prescriptions and online tracking referrals status.
  - Create various health status documents.
- Contact: administration:
  - Creating data connected to administrative finalisation of the contact.
  - Printing documentation, scheduling planned new appointment if necessary, and printing the note for patient.

2.9.2 PHC integration with other IT Systems

Sending contact data to EHR through IHIS (integration with National EHR system pilot project, not in operation because of end of pilot project).

Currently PHC is already integrated with national health insurance but does not have interoperability with secondary health care system.

Screenshots of PHC:
D4.1 System Integration Architecture (V1)

Figure 33: PHC screenshots - 1

Figure 34: PHC screenshots - 2
D4.1 System Integration Architecture (V1)

Figure 35: PHC screenshots - 3

Figure 36: PHC screenshots - 4
2.9.2.1 Secondary healthcare information system

Helliant software is in operation at secondary healthcare of Studenica. Integration with currently PHC software does not exist.

2.9.3 Software in operation at Centre for Social Work

Centre for Social Work in Kraljevo is currently using legacy database software for their everyday work. They are in the process of acquiring a new software solution that will be implemented at national level. The SmartCare project will have to put additional attention to the migration process to the new system, and activities are scheduled to list all possibilities and scenarios for creating SmartCare functionalities best suited for either solution. At the moment, it is not possible to estimate how much time will be needed for the migration process in SCP, therefore Smart Care portal will have to accommodate any of those solutions.
3. Identification of new components to be built

3.1 FVG

FVG Region has to develop the following components that have been included in the tender:

- **Identification of user’s module:** Care recipient’s (CR’s) personal records to be uploaded to the SmartCare platform will be retrieved from the regional registry.

- **Integrated Care Shared EHR (Minimum social and clinic data set):** the minimum data to be shared among providers will be identified with a view to facilitating the provision of services to CRs and ensuring their security.

- **Integrated care portal**
  
  SmartCare will be designed as a person-centred integrated platform. The main focus of the platform will be the integrated management of data relevant to stakeholders’ individual and shared records and care plans. The platform will also automatically or manually record and process clinical and environmental data through on-line operational interfaces (questionnaires).

  End users’ interface will be accessible through a standard browser which will allow stakeholders to interact with the system according to specific levels of permitted security access. The platform will handle a large amount of different data (health, social, environmental, etc.), that will be elaborated in a multidimensional way; storage available will have to be defined according to quality, quantity and frequency of stored data. Reports will be created to integrate all data within the same database while retaining sufficient flexibility and usability (ease-of-use and learnability). The system uses secure bi-directional protocols. Moreover, all data are equipped with a CR’s identification tag which can be associated to the CR’s name only within the centralised, secure database. Should an unauthorised access take place, individual personal data will not be linked to CR. In fact, every CR’s identification will be associated to the devices only. Hence, any unprotected access to data would not jeopardise CR’s security or right to privacy. Username and password will be required in order to access the portal.

- **Integrated Care Record:** definition and set up of a database holding integrated care relevant records. A new database will be constructed to hold information about the planning of services, services provided, actions performed, agents, etc.

- **Common integrated care contact point:** the centralised platform and the call centre 24/7 team will act as a contact and referral station for formal and informal stakeholders (CRs, HC/SC professionals, caregivers and Third Sector).

Below is a sample description of SmartCare platform.
3.2 Aragon

Aragon will have to implement the following components:

- **Identification of user’s module:** The identification of users is critical to ensure the security of patients. Patients can access their summarised EHR through their digital certificate on their National Identification Card. Moreover, users are differently identified in the SALUD organisation (by the Healthcare Card) and in the social providers (by national identification number or name). Therefore, a user identification mapping will have to be constructed so as to properly identify users on the information systems.

- **Integrated Care Shared EHR (Minimum social and clinic data set):** The definition of the minimum data to be shared among providers will be identified so as to ease the provision of services to the care receivers and ensure the security of patients.
• **Integrated care portal:** The SmartCare portal is a website that will be the tool to look up information related to the care receiver, manage care provision, and consult the actions performed. This information is a minimum set of clinical and social information, clinical and social assessments, monitoring of vital signs data and procedures, the integrated care agenda, recommendations, etc. It also contains care information that will support the organisation of the service providers when performing the caring tasks. That is the care plan, agenda, services requested, services provided, and a history of actions and actors, etc.

The SmartCare portal is composed of information coming from the different service provider’s legacy systems, databases and records and information generated from the normal development of the SmartCare program. The website will have different views and roles for the different types of users.

• **Integrated Care Record:** definition and set up of a database holding records on the integrated care. A new database will be constructed to hold information about the provision of services; services provided, actions performed, agents, etc.

• **Common integrated care contact point:** Although there are several social and clinical contact centres, a common incoming contact centre for the SmartCare project should be established so as to ease communication between users and service providers.

Below is an example of one general view of the SmartCare integrated care web portal.

![Figure 40: SmartCare Integrated care portal example](image-url)
3.3 South Denmark

Elements still needing to be developed:

- Integration to Sentinel (the GPs' systems) in order to eliminate double registrations and ensure that relevant information is shared. Also to eliminate an additional log-in procedure.
- Integration to Cosmic (the hospital system) in order to eliminate double registrations now made by the secretary and to eliminate additional log-in.
- Integration to KMD Care (the municipality system) in order to eliminate double registrations and ensure that relevant information is shared. Also to eliminate an additional log-in procedure.
- Configuration and development to fit the social care provider’s workflow, to make sure that the platform supports the professionals' needs and current workflow with the citizens. See attached description and offer from IBM in Danish.
- Minor adjustments for the hospital staff after their early pilot testing; these adjustments include change of sorting in the data fields, additional information in the entry formulas, and adjustments in the printed version to make it more user friendly for the secretaries.
- Home monitoring integration - see attached offer from IBM in Danish.
- General development of the user interface and user friendliness, especially focusing on the patients’ view and use.

3.4 Scotland

A key element of new development will be a SmartCare application that offers a personally held tool to build an integrated record for care provision.

A number of other new developments will also take place on the LiU platform.
3.4.1 The approach to the SmartCare application

A working assumption is made that there will be a single new application in the LiU ecosystem that takes care of unique new functionality to support the SmartCare pathways.

The application is expected to be browser based, designed for use by the general public on consumer devices. It will include suitable security for holding sensitive personal information and for user authentication supported by the LiU infrastructure. It is also expected to support integration with systems in the statutory domain.

The Scottish SmartCare concept emphasises that this application contains information owned by the user, with access by other parties controlled by the user. This application will become the location of an integrated record to allow a more timely and informed response by professionals.

![Diagram of SmartCare application access controls]

**Figure 42: Concept of the SmartCare application**

3.4.1.1 Integration with existing local statutory systems

Integration with existing local statutory systems is intended to avoid duplicate data entry and timely availability of summary information.

As a general policy, SmartCare expects the application to natively support open interoperability standards.

Further analysis is needed to identify those standards because they depend on details of the summary messages to be exchanged and whether a fit-for-purpose standard is available. In the healthcare domain this may well lead to standards from the HL7 area. Equally we will need to consider relevant health and social care integration standards being developed in the UK (including Scotland) between the NHS and local authorities.

We may find some level of constraint around standards support by what is available from systems that are already deployed. In this case, we will seek to use integration technologies to build adapters rather than attempt to introduce bespoke extension into existing products. In the case of NHS Scotland, we will be able to build on the national investment in an integration product. For local authorities, the situation is unclear at the moment.
3.4.1.2 Integration with the LiU platform

In order to participate in the LiU ecosystem, the procurement will specify a number of non-functional requirements to ensure interoperability.

Some of these will require integration with the platform API. Some are policies that need to be reflected in the way the application is designed and delivered.

3.4.1.3 Cross-browser and cross-device support

The LiU policy is that applications are supported on mainstream consumer browsers and devices. Currently:

- On PC:
  - IE 8, 9, 10;
  - Chrome - latest;
  - Firefox - latest;
  - Safari - latest.

- Plus default browsers on iOS and Android handheld devices - latest versions of browsers on latest version of the OS.

Under normal circumstances, applications should be browser-based, written in HTML 5, and use an adaptive grid for rendering on a variety of form factors.

Detailed UX guidelines are available.

3.4.1.4 Common login and SSO

The application is expected to accept LiU as Identity Provider (in other words, users can use their existing LiU login). This requires support for the authentication protocols that LiU provides.

3.4.1.5 Common navigation

The application is expected to support movement across all applications of the ecosystem. This can take various forms, such as the inclusion of the LiU global nav bar in an IFrame, or adoption of other UI components in the page code.

3.4.1.6 Personalisation using the profile

The application is expected to utilise the LiU Profile in order to improve the overall user experience for an individual that moves between applications, such as:

- retrieve information to avoid duplicate questions (e.g. demographics when setting up the SmartCare application and person held file);
- store information that would be relevant for other applications (e.g. interests that other applications can use for content searches).

3.4.1.7 Common branding and UX, common domain URL

This is an area that will be driven by business needs and by end-user need for a straightforward user experience.

The current LiU applications demonstrate a very high level of adoption, but from a technical point of view it would be equally possible for an application to show a high degree of its own identity.
3.4.1.8 Business intelligence

The application is expected to provide management information via Google Analytics, and potentially by submitting additional information to the LiU infrastructure API.

3.4.2 Elements of development on LiU to support SmartCare

In order to support SmartCare, a number of related developments will take place on the LiU platform itself.

- Provision of content aimed at the SmartCare user population. This can take various forms:
  - Adding articles to the LiU Content Management systems (Drupal) which support Portal and Flourish.
  - Adding information on local services and events to third party sites (such as [http://www.aliss.org/](http://www.aliss.org/)) that are linked to LiU through web services. These support Shine and Discover to provide tailored information.
  - Messages and videos on social media (Twitter, Facebook, YouTube).
  - Adoption of SmartCare branding and hyperlinks.

- Adding support for SmartCare management information:
  - Picklist options to allow users to identify themselves as SmartCare participants.
  - Dataset extracts.
  - SmartCare reports.

- Development of the self-assessment tool:
  - This is likely to be a feature development in the Flourish application.

![Figure 43: LiU developments](image)

3.5 Tallinn

Elements in need of development.

2014, 1st - 2nd quarter:

- Development SmartCare web portal, different user profiles (nurse, social care giver, GP, informal carer, relative, etc).
- Develop an Android application for end users tablets.
- Integrate measuring devices to the android application.
- Integrate Tallinn City social alarm service reports and button to the portal.
- Development of different ICRs (red, yellow and green alert) in order to ensuring that relevant information is shared.
- Tender description for needed ICT components.
2014, 3rd quarter:
- Delivery and installation of backend servers and portal.

2014, 4th quarter:
- Test of the system.
- Minor adjustments after initial pilot testing.
- Set up at patient homes.
- Initiate a workgroup with E-Tervis to create data exchange dataset between STAR, HIS and ambulance.

3.6 South Karelia

One of the four viewpoints is use of technology. The increasing service needs require that information and service logistics are enhanced with technology. Technology will be used in enhancing the efficiency of processes, lightening of administrative procedures, and supporting home care and service housing.

The aim of South Karelia Social and Health Care District in the SmartCare project is to integrate social and health services more tightly together. This will be done to integrate SmartCare system as part of the home care services. The SmartCare system will implement home safety and videophone connection part of the home care supporting infrastructure. Figure 44 shows how data will be moved between different stakeholders.

Figure 44: Graphical presentation of the SmartCare architecture

The SmartCare system will include components such as: diary, reminders, home safety, panic button, GPS tracking and videoconferencing. After tendering, there will be only one service provider who is dealing with other service providers as subcontractors.
Karelia Social and Health Care district is purchasing the service as a full service. The plan in future is that there can also be other services on the SmartCare platform. These services can be integrated if the provider of the service has opened an interface. One of the innovations will be remodelling of home care processes. This will contain both social and health care, and also informal care givers processes. For example, the alarms will mostly be directed to ICG in future.

3.7 Attica

The comparison between the existing infrastructure and what we have perceived as the SmartCare vision to be implemented in the Attica pilot site has indicated what still needs to be developed.

The integration between health and social care professionals is largely missing. A list of the components to be developed includes:

- Nutritional assessment.
- Nutritional diabetes education - cognitive nutritional therapy.
- Nutritional follow up.
- Anthropometrical alerts.
- Experiences and personal stories of peers.
- Entitlement to social benefits, allowances, medical devices and consumables.
- Possibilities for social inclusion activities within the pilot or at regional Level.

The portal will have to be updated in order to accommodate SmartCare specific needs.

3.8 Netherlands

3.9 Kraljevo

Integration between PHC and Helliant (secondary healthcare) software in terms of exchanging necessary data and messages (that include trigger for patient admission / discharge) for Smart Care.

Define ICR (Integrated Care Record). What kind of data should be stored: minimal data set from HCP and SCP, and define plan for integrated care.

SmartCare Portal which will be used for exchange data, reviewing and creating activities, tasks, overview and create a care plan, collaboration between HCP, SCP, CR and I/FC. Used by users:

- Centre for Social Care.
- Care recipient & informal/family carer.
- Healthcare professionals.

The close integration of SmartCare portal with PHC software in order that doctor and nurses continue to work in the same environment in which they are usually used to work.

Message Dispatch Centre: reminder, alarm and notification which will be served to all users through the portal, e-mail and SMS.

Mobile application for alerts, reminders and notification.
Mobile input for social-health status and measurements integrated with SmartCare portal and Message Dispatch Centre.
4. Development plan of new components

4.1 FVG

As this is included in the tender, the development plan will be drafted jointly with the company that will be awarded of the contract (starting from April 2014).

4.2 Aragon

4.3 South Denmark

4.3.1 Status on development and plan

Elements still needing to be developed:

- Integration to Sentinel (the GPs system) is being tested at the moment, and is expected to be in place before the pilot launch in May.
- Integration to Cosmic (the hospital system) is being tested at the moment and is expected to be in place before the launch in May.
- Integration to KMD Care (the municipality system) is being defined before an offer is made from both IBM and KMD. The development is not yet planned. However this feature will not delay the pilot launch in May.
- Configuration and development to fit the social care provider’s workflow is currently being defined and developed. It is expected to be in place before the launch in May.
- Minor adjustments for the hospital staff are on-going and discussed in monthly meetings with both the pilot users and IBM - see attached list of adjustments in Danish.
- Home monitoring integration - see offer made by IBM in Danish. The offer is still being discussed internally before acceptance and development. This is not expected to be ready for pilot launch in May; however there are possibilities now to enter measurements directly into the platform.
- General development of the user interface is being discussed at a patient workshop on the 20th March. Afterwards a process of describing the requirements and development will begin, IBM will make an offer and after acceptance the development can begin. This is not expected to be ready for pilot launch in May; however, it does not delay the project and is considered to be an on-going part of the project.

The abovementioned elements are all developed by the IT provider IBM, and supervised by the project-team in the Region of Southern Denmark, which is also paying for the development.

4.4 Scotland

The development plan takes an incremental approach to developing the new components.

The overall roadmap is shown below.
In the early stages, we will see content development and the ability to extract management information from the LiU platform whilst the procurement of the SmartCare application is under way.

Development of the self-assessment tool on the LiU platform is planned to follow after the launch in May 2014.

The initial deployment of the SmartCare application towards the end of 2014 is expected to have integration with the LiU platform, whilst integration with local systems will follow in future stages of development.

All new elements, once deployed as an initial release, will continue to be refined and expanded in response to requirements.

There will also be ongoing development of the LiU platform as part of its own lifecycle. SmartCare will be able to benefit from the additional capabilities, for example:

- Offer the Scottish Citizen Account as Identity Provider.
  - Improve login support for applications that do not sit in the LiU domain.
- APIs for applications that rely on oAuth2, Open ID, WS Federation.
- More UX components for common navigation and login status, especially for applications that do not sit in the LiU domain.

### 4.5 Tallinn

The development plan for new components.

**2014, 1st - 2nd quarter**

- Develop SmartCare web portal, different user profiles (nurse, social care giver, GP, informal carer, relative, etc).
  - Meetings have been held with subcontractor.
  - Workshops with users have been held in-order to start development.
- Develop an Android application for end users’ tablets.
  - Meetings have been held to choose the main components of the application that are going to be available for end-users.
• Integrate measuring devices with the Android application.
  o Comparison of different devices has been carried out, and suitable devices have been selected.
  o Integration of devices is going to be scheduled.

• Integrate Tallinn City Social Alarm Service reports and button with the portal.
  o Meetings with the Social Alarm Service technical support are going to be scheduled.

• Development of different ICRs (red, yellow and green alert) in order to ensure that relevant information is shared.
  o Meetings are planned with the different stakeholders in order to fix the minimum data information about the care recipient to be shared inside the SmartCare portal.
  o Different report data sets have been discussed, and suitable data sets will be finalised in 2nd quarter 2014.

• Tender description for ICT components.
  o The description of the ICT components needed can be done when the needs of the users and technical possibilities are evaluated.

2014, 3rd quarter:
• Delivery and installation of backend servers and portal.
  o Meetings with the subcontractor company will be scheduled.

2014, 4th quarter:
• Test the system.
  o Pilot testing will be done after the installation phase.

• Minor adjustments after initial pilot testing.
  o Adjustments will be made after pilot testing.

• Set-up at patient homes.
  o Set-up will be made after the final testing.

• Initiate a workgroup with E-Tervis to create data exchange dataset between STAR, HIS and ambulance.

4.6 South Karelia

In South Karelia, health and social services are closely integrated. The South Karelia Social and Health Care District (Eksote) combines primary and secondary healthcare, elderly care and social care in a totally new way. The goal of this new organisation is to ensure equal access to social and healthcare services to all citizens in the region, across the boundaries of municipalities. The effectiveness of service delivery will be enhanced thanks to better cooperation of different social and healthcare organisations. One of the goals in South Karelia is to emphasise the importance of preventive healthcare, and to empower citizens to take more responsibility for their own health and well-being. The responsibility of ourselves and each other will be one of the main theme in SmartCare project. The new architecture of work in elderly care will be developed in the SmartCare project. In South Karelia Social and health Care District, this means a new way to contact and communicate between formal care givers and home care clients.

Human resources for SmartCare have been reserved as follows:

• Three project persons.
4.1 System Integration Architecture (V1)

- Ten healthcare professionals.
- Two social care professionals.
- VTT for statistical purposes.
- Medi-IT (In-house company) for technical implementation.

4.7 Attica

A tender has been issued and it is expected to close by end of May. The objectives of the tender are:

- Purchase of blood glucose meters and consumables to be used during the pilot.
- Technical specifications for the development of the applications to conclude with the SmartCare vision.
- Existing portal revision.

According to the implementation plan, the infrastructure should be in place by end of September. Recruitment of personnel is expected to finish at approximately the same period (end of October). It has to be noted that the period before the professional’s recruitment will be spent in lab and prototype tests of the infrastructure. The patient recruitment phase is expected to start at November, having as a target field tests to be carried out in November and December and the pilot to be functional at 1\textsuperscript{st} January 2015.

4.8 Netherlands

4.9 Kraljevo

- Integration between PHC and secondary healthcare systems is underway; a meeting with the subcontractor (MNO) was held where the requirements for successful integrated services for hospital discharge pathway were assessed. Further steps were identified and several actions were agreed.

- A meeting is scheduled between HCP, SCP and family carer representatives to define final minimum data set to be shared between the institutions involved, that will be part of the future integrated care record.

- A meeting is scheduled to finalise role definition in the system in terms of what rights and access levels parties will have according to their role in the system. Level of rights will be set for all actors in the process: GP, social worker, family members, nurses etc. The data they will have access to will be defined, together with the data they can enter.

- A meeting is scheduled with subcontracting company MNO to create the SmartCare portal system that will be used as the basis for further development of SC portal. The main requirements are defined by Belit, Studenica and Social Centre KV.

- A meeting is scheduled with subcontracting company MNO to create close integration of integrated care record with PHC system. The main requirements are defined by Belit, Studenica and MNO.

- A meeting is scheduled with subcontracting company MNO to define types of alerts, reminders and notification messages, as well as to plan development of Message Dispatch Centre (MDC).

- A meeting is scheduled with subcontracting company MNO to create the mock-up application for ARN (alerts, reminders and notifications).
The above mentioned elements are all developed by Belit and subcontractor MNO, and will be supervised by Belit, Health Centre Studenica, and Centre for Social Work Kraljevo.
5. Conclusions and further work

The structure of this deliverable reflects the comparison between each site's SmartCare targets and the already installed infrastructure. One of the main criteria by which the pilot sites were selected was the maturity level of their existing infrastructure towards implemented fully compatible to the SmartCare “ideal” solutions.

The means to implement also vary. Some sites have opted for in-house development of applications (Aragon, NHS24 Scotland, EKSOTE) while others have either issued tenders with technical objectives (e.g. Attica) or they have welcomed on board subcontractors (e.g. FVG, Serbia), often longstanding collaborators (e.g. Southern Denmark with IBM).

Initially an iterative approach has been chosen for the full deployment of the pilot operation. However, due to various limitations and constraints, a more flexible model was adopted, allowing each site to decide on the optimum roadmap to implement the offered services. Only one site (NHS24 Scotland) has maintained the original iterative approach despite the time burden that this might entail.

Currently all pilot sites have a strictly defined work plan, and they are able to forecast completion times as well as launch of operations. Again, there is a differentiation on the percentage of services to be piloted from day one of operation. NHS Scotland will gradually pick up till full completion, while the other sites will start with all applications on board.

There seems to be a clear understanding between pilot sites that what is really important is internal communications and definition of common targets, especially in multi-entity schemas. Hence joint meetings and workshops between the various systems’ actors are forecast along with the development plan (Serbia, Attica, EKSOTE).

Despite the maturity level of implementations in the healthcare domain, what we see is that the majority of sites have a weak or non-existent ICT penetration in the social care domain. Hence before being able to integrate the two pathways requested to meet SmartCare’s targets, considerable effort should be made in order for the social care services to reach a similar if not identical level of digitalisation.