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Abstract	The aim of this document is to present the progress obtained during the whole CAMI project.

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1 Project progress

CAMI is an integrated AAL architecture solution that provides support for the following functionalities: services for health monitoring, fall alarm, report and communication to health professionals, supervised physical exercises, personalized, intelligent and dynamic program management, mopbile robotic platform for comunication with caretaker, an intelligent personal assistant that is able to interact with the user through multi-modal interactions and vocal interface.

1.1 Technical achievements

CAMI architecture is developed as a **Core system component** with a set of APIs that can be used by several modules, offering different services to the user. All the modules are developed independently; however, they provide seamless integration to the CAMI core.
The architecture of the CAMI system is developed ensuring modularity and re-use. The CAMI system architecture (Figure 1) has three main modules: a) CAMI Gateway (running on the SNG-Gateway developed by the Eclexys Sagl partner, b) CAMI Cloud, and c) CAMI multi-modal user interface (e.g. the 3rd party health platforms (Linkwatch and OpenTele and vocal interaction with the CAMI Cloud).

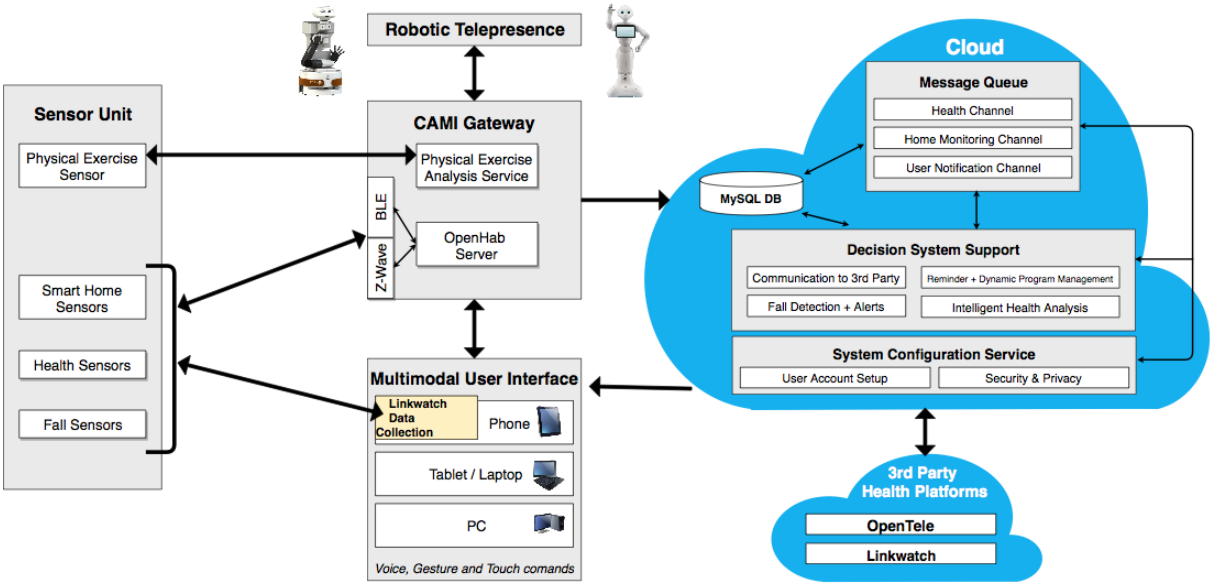

Figure 1. CAMI Block Architecture Diagram

The **CAMI Gateway** connects with a multitude of Bluetooth and Z-Wave compatible health measurement and home monitoring sensors (e.g. the A&D UA-651 BLE blood pressure meter, the Onyx II Model 9560 oxymeter, Fibaro Temperature and Motion Sensor FGMS-001, Z-Wave 3 in 1 Sensor (temperature, illumination, door) PHI_PSM01), Vibby fall detection sensor etc.

The **CAMI Cloud** allows the system to perform two other essential integrations:

- From the input perspective: the CAMI Cloud allows access to information from sensors that publish their data directly to the cloud service (e.g. Fitbit bracelet, WiFi weight scale, smartwatches etc.)

- From an output/sharing perspective: the CAMI Cloud allows dissemination/replication of data to other health monitoring platforms (e.g. Linkwatch, OpenTele). This type of integration allows end-users to monitor the health parameters collected through the CAMI system via web-accessible graphical interfaces.

The **CAMI Multi-Modal Interface** allows for user interaction with the system. This is achieved by smartphone application (implemented on iOS) and the CAMI Linkwatch web interface, and vocal interaction.
Fall detection: we have used the wearable fall detection sensor -Vibby Oak and its IoT gateway, Vibby Leaf [7] for accurate determination of fall and raising an alarm. In order to detect the falls flawlessly, Vibby Oak must be for 24 hours in a day by the user. Vibby Oak can be worn in wrist like a watch or as a pendant around the neck (can be configured according to technical specifications in each category).
Supervised physical exercises: An application as a serious game that aims to help elderly people to learn how to perform physical exercises in order to maintain a healthy lifestyle in their homes was developed. The application is implemented as a game with two avatars: user and trainer. The user avatar must reproduce the movements of the trainer's avatar. The user movements are captured using a Kinect sensor. The main parts of the game are: (1) animating a 3D avatar that will represent the user in the environment; (2) computing a distance between an exercise done by the user and the one done by the trainer; (3) displaying in a friendly manner the score calculated using the distance saving data in logs for each user to track its evolution.
Personalised Program Management comprises a set of functionalities ranging from the typical inspection of a calendar of daily events to the intelligent recommendation of activities or thoughtful rescheduling of postponed/missed events (e.g. rescheduling a physical exercise or a health measurement, taking into account future activities). The implementation is focused on building the common expected program management functionality, that is the ability to view/create/modify activities grouped into four categories:

- medication reminders
- physical exercises
- health measurement requests
- personal (i.e. other end-user activities such as visits to friends, various appointments, etc)

For each type of activity, the user has the option of defining either a one-time event, or a recurrent one. When defining a recurrent activity, the user can specify:

- an event that recurs several times a day (e.g. daily at 08:00 and 18:00)
- an event that recurs several times a week, specifying the given weekdays (e.g. every Monday, Wednesday and Friday at 12:00)

Integration of the CAMI Linkwatch - LinkWatch [2] is an intelligent platform for collecting of health related measurements data and environmental data. The platform is developed based on combination of internet of things solution (IoT) and cloud storage services to enable orchestrating of captured information's from wireless and wired protocols including Blutooth , Bluetooth LE, ZigBee, Z-wave , WiFi, RF, RFID and NFC. LinkWatch supports several messaging protocol like MQTT, RabbitMQ , Rest API. LinkWatch as a software gateway's

functionality connects the physical world (i.e. medical devices/sensors as well as light sensors, smoke sensor and fall sensor) to a the health digital world(personal profile health record as Health Kit or patient dashboard as an extended module of LinkWatch's API).
The integration of LinkWatch within CAMI allows for two functionalities:

- The CAMI LinkWatch web interface can be used to visualize health measurement data retrieved from the CAMI Cloud via the LinkWatch Cloud Platform
- The LinkWatch Cloud Platform is used to synchronize with 3rd party sensing services (e.g. Fitbit) and forward data to the CAMI Cloud, thus acting as an input mechanism

The integration in both functionalities is based on an API of the CAMI Cloud which allows for insertion of measurements and home monitoring events, as well as retrieval of data stored in the cloud. The aggregated data will be pushed further to CAMI cloud services
CAMI LinkWatch Web Interface. All visualized data for FitBit 's autonomous measurements relies on heart rate, step and sleep.

The CAMI-Linkwatch is feasible to be run on pc, tablet or smartphone. The API has multilingual functionalities that enables varieties of languages (i.e. Danish, Rumanian, Polish Swedish and English) on a very user-friendly GUI for end-user's. The patient dashboard synchronized with CAMI -Calendar component in CAMI BOX through LinkWatch API which will be visualised based on personal activities plans for exercises and doctor appointments (Figure 2).

Figure 2. Link Watch -patient dashboard interface

Web-based interface - We developed a web-based interface that works on any device and adapts itself to the screen size and orientation of the device (fully responsive). The interface was developed using HTML5, CSS3 and Javascript. It is accessing the CAMI data from the CAMI Cloud through JSON files. The interface is multilingual, it supports 7 languages: English, French, Romanian, Swedish, Danish, Polish and Italian. The user can easily switch between languages from the settings/profile page. The home-page of the interface displays the following info (Figure 3):

- values of the last health measurements of the user (blood pressure – Figure 4, heart-rate – Figure 5, weight);
- latest values of the sleeping time and number of steps;
- number of daily reminders (unacknowledged reminders) – Figure 6,
- daily appointments of the user and some smart notifications regarding the users' health based on the last health measurements and informations extracted from the users' profile (e.g. Users' Height, Health Condition) – Figure 7.

Each health parameter has an icon that is displayed above the measurement value and two smart notifications. The color of the icon and the notifications depend on the value of the measurement. If the value of the measurement is good (normal range), the color of the icon and the notifications is green, if the value of the measurement requires some attention the color is yellow and if the value is outside the normal range, the color is red. These colors can be customised by each user in the

settings/profile page. Also the range of normal/acceptable values for each type of measurement can be customized by the caregiver of the user.

Two icons are displayed next to each reminder and appointment. One icon to allow the user to acknowledge the reminder or appointment. The other icon displays the severity/importance of the appointment/reminder.

The rest of the web-based interface allows the user to visualize a history of his/her health records in format of a chart or a list, to visualize the appointments, to visualize the notifications and to adjust the system settings and his/her profile.

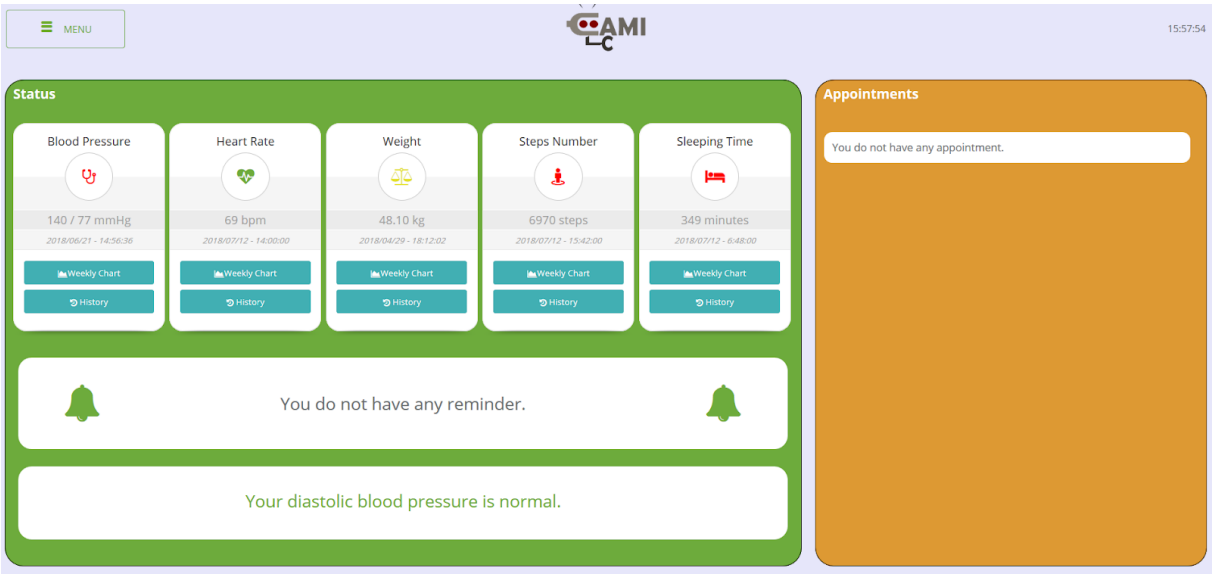

Figure 3. Home Page of the Web-based Interface

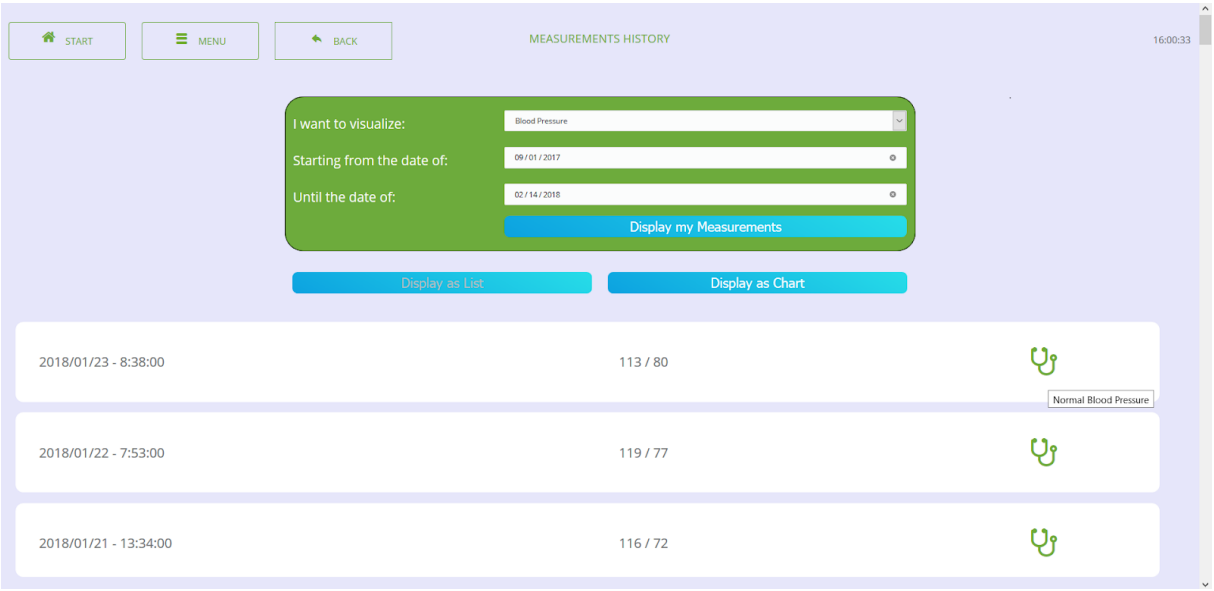

Figure 4. Web-based Interface - Blood Pressure List Preview.

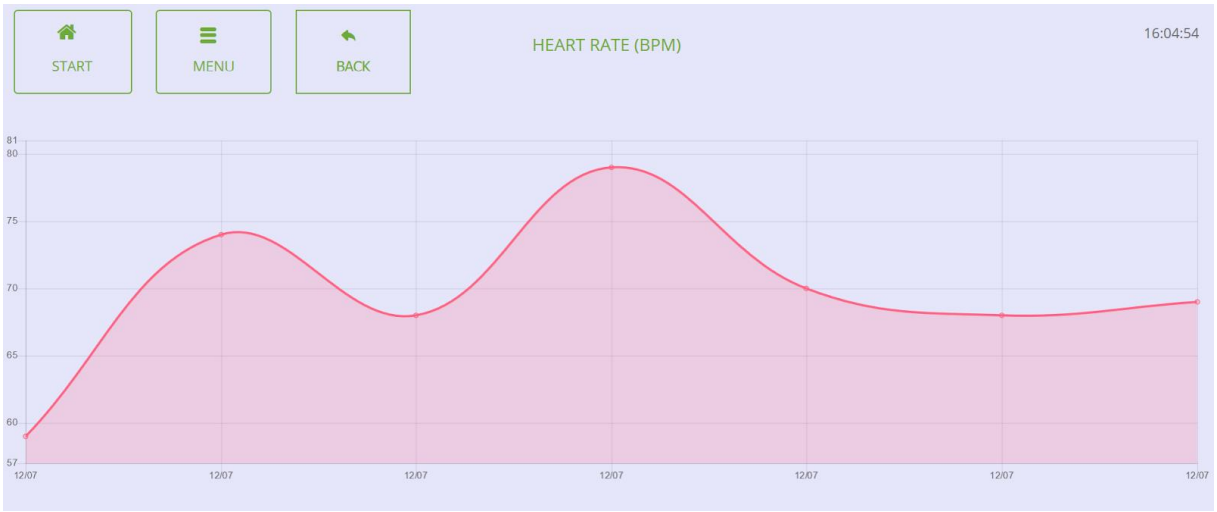

Figure 5. Web-based Interface - Heart Rate Chart Preview.

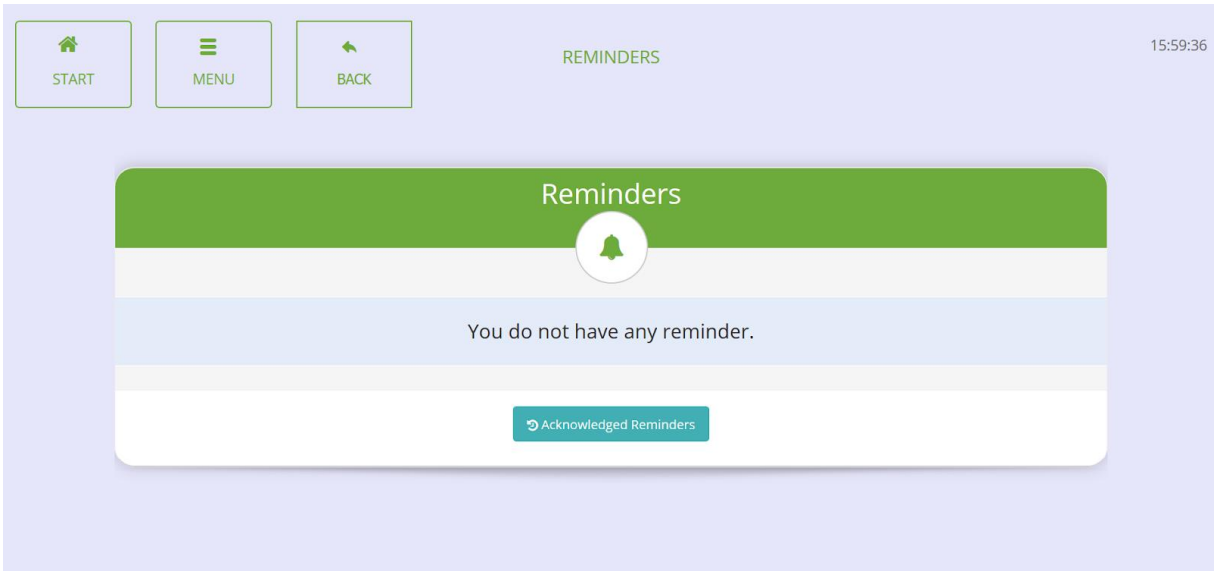

Figure 6. Reminders Page of the Web-based Interface.

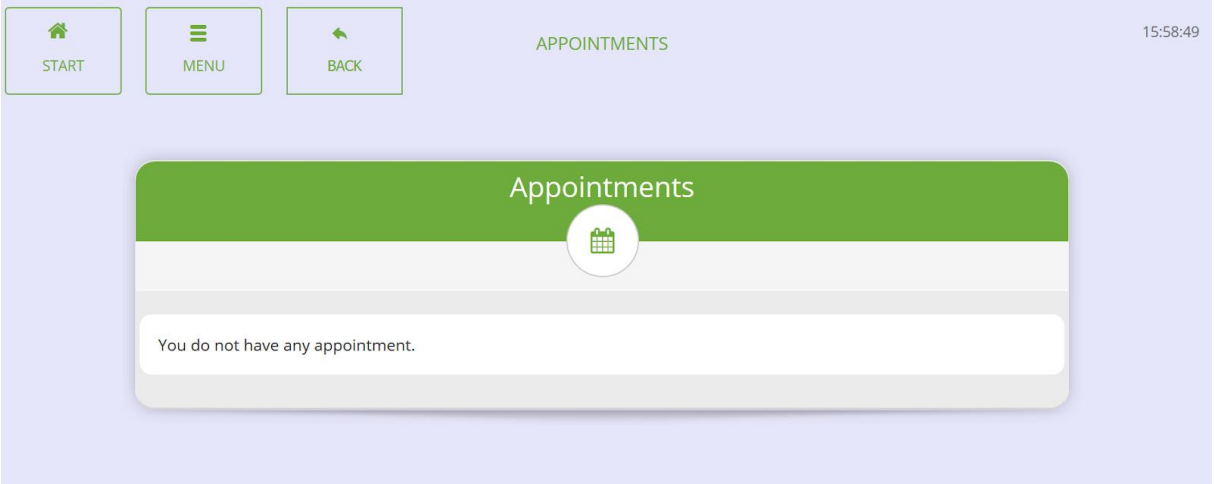

Figure 7. Appointments Page of the Web-based Interface.

Vocal interaction with the user - The Vocal interaction allows vocal interactions between the CAMI system and its users. The user has access to different components of the systems through speech commands along with the capability of the system to generate vocal outputs. Figure 8 shows the start screen of the application, Figures 9 to 13 show some interactions between the system the user: the first box represents the spoken command of the user while the second box represents the spoken output of the system.

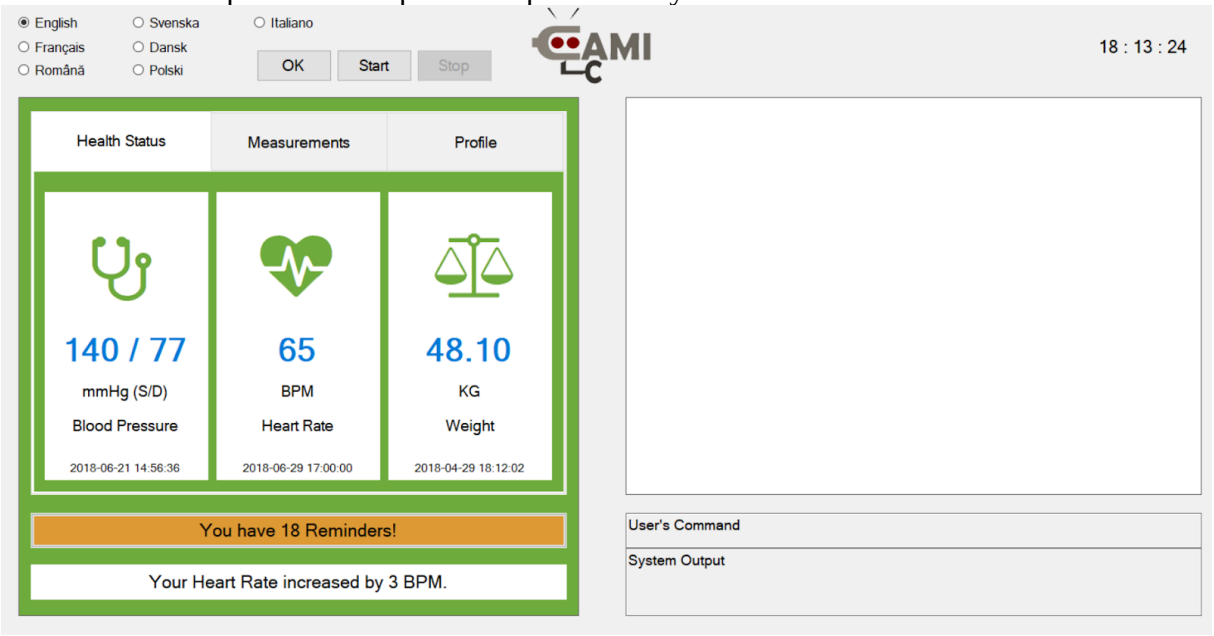

Figure 8. Home Screen of Voice Interface.

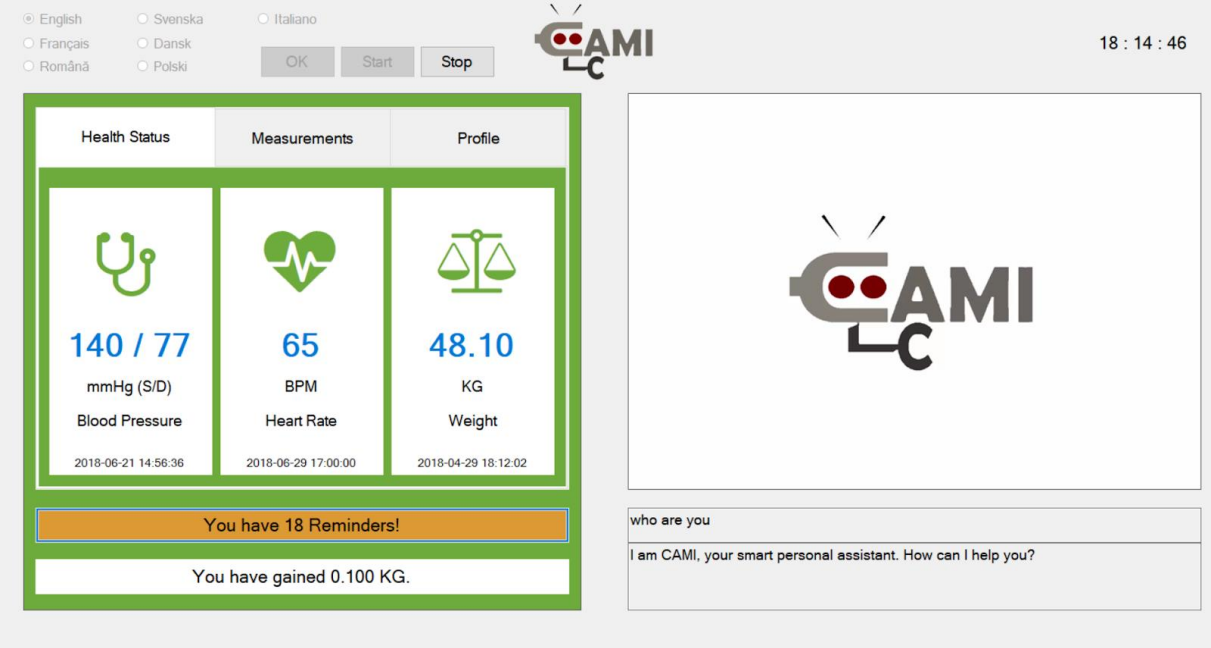

Figure 9. Voice recognition example 1 - Who are you?

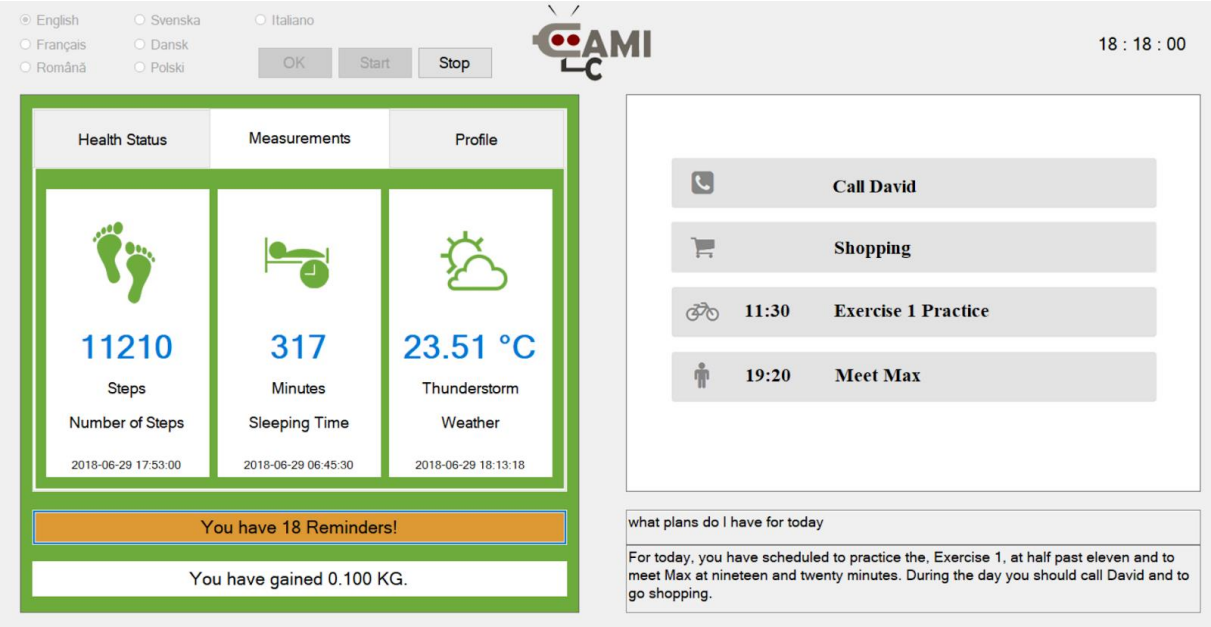

Figure 10. Voice Recognition example 2 - What plans do I have for today?

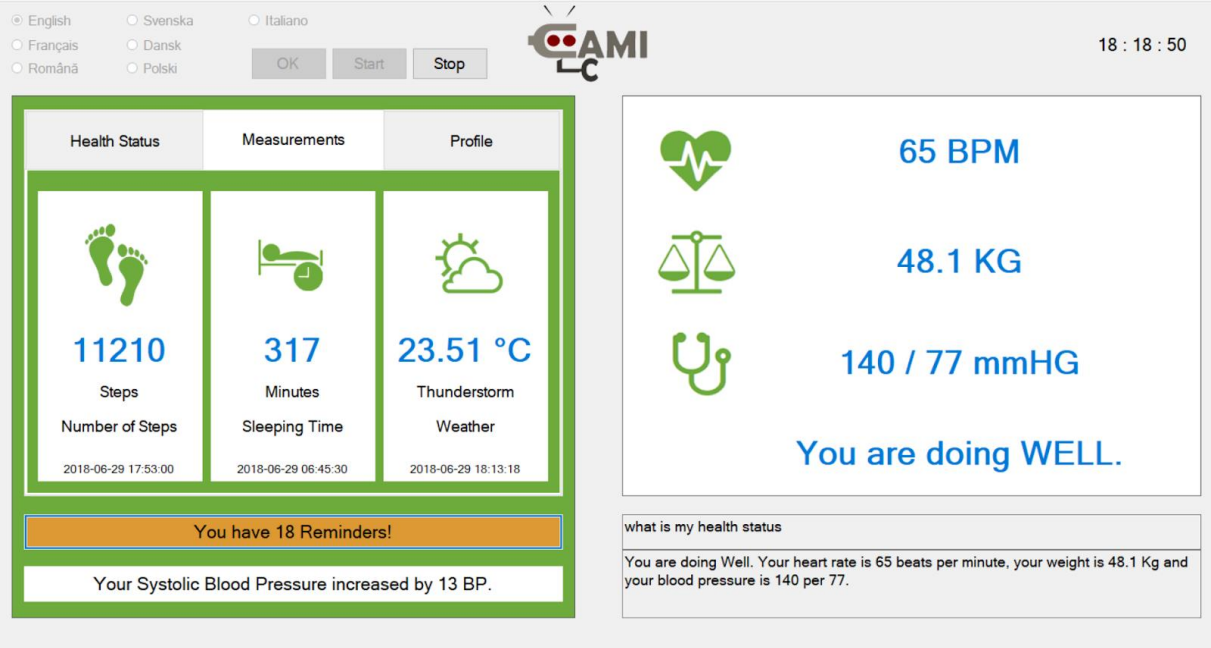

Figure 11. Voice Recognition example 3 - What is my health status?

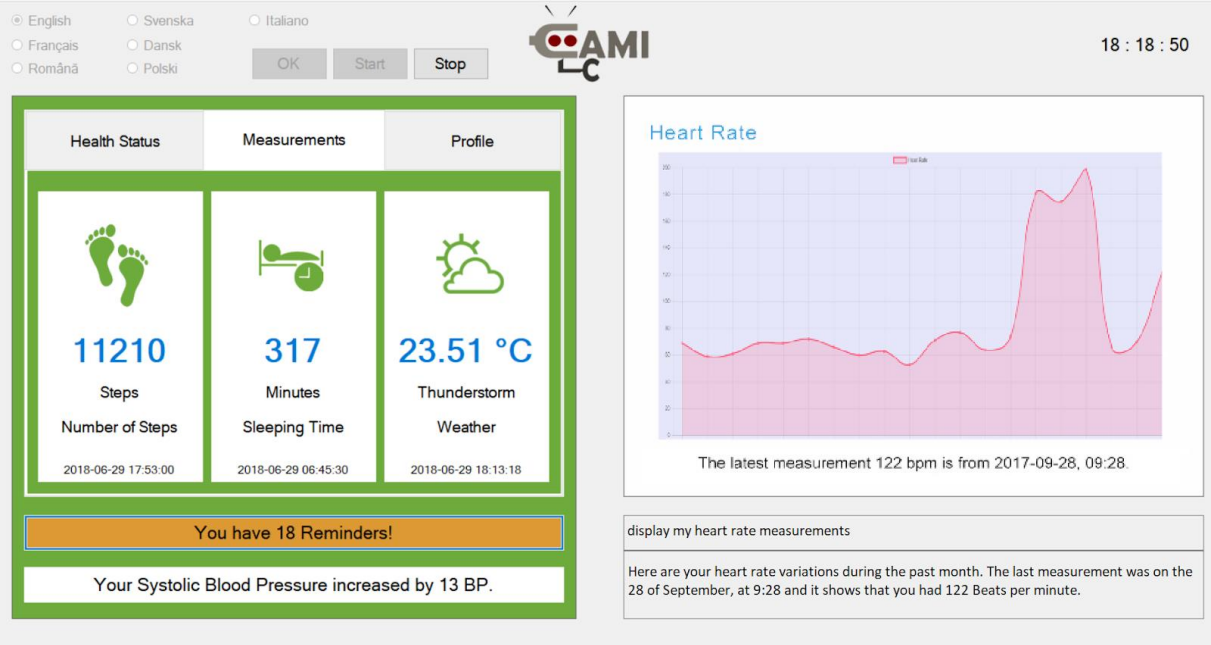

Figure 12. Voice Recognition example 4 - Display my heart rate measurements.

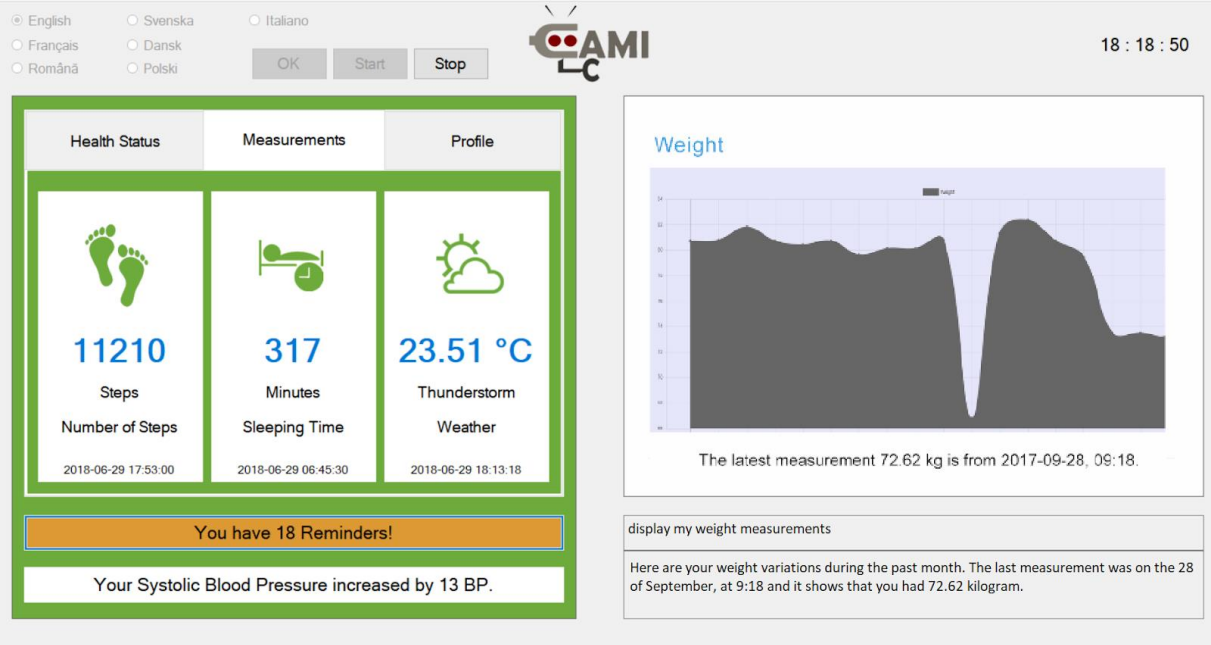

Figure 13. Voice Recognition example 5 - Display my weight measurements.

CAMINO interface - the Danish company ALIVIATE together with Ecotopias have developed a touch screen application targeting permanent and "always on" installations in the home of the end-users, a product called CAMINO. CAMINO is meant to run on 21" and 15" large touch computers that are "always on", Figure 14.

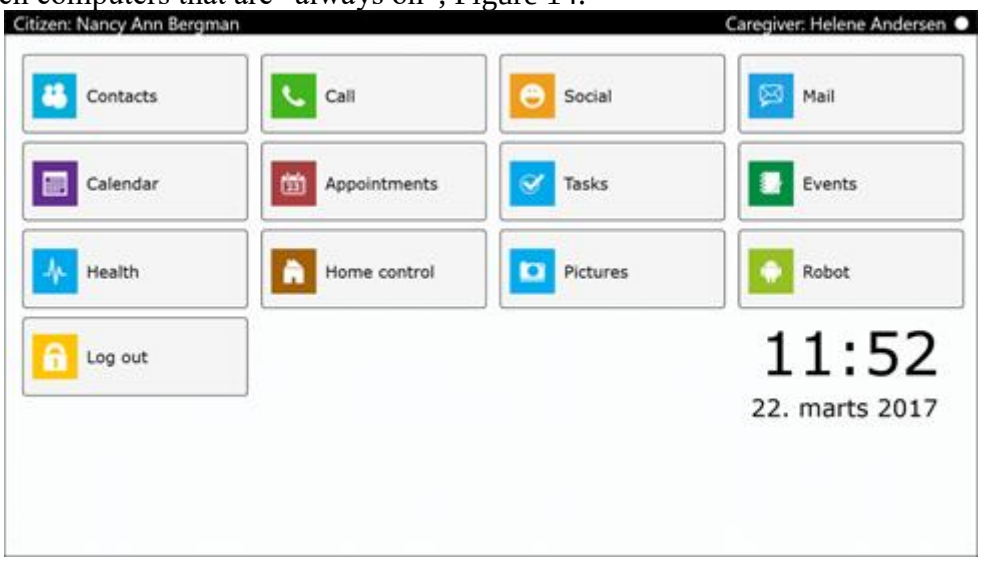

Figure 14. Main screen of the CAMINO, Aliviate's Danish large screen application

Here, a range of different apps may be installed on the CAMINO. For now, the Pictures, Health, Calendar, and Task apps has been completed, including integration to the CAMI gateway and cloud (to the extent that the services and interface have been completed in that part of the project), while the Home Control, Robot, Mail, Social, Contact, Calls, and Events, are still being developed, awaiting that the CAMI cloud exposes relevant services to integrate with.

OpenTele is an open source telemedicine ecosystem developed in Denmark. It covers healthcare professional to patient communication in terms of questionnaire response data and measurement data from personal health devices. It has become National Reference standard and it was CE certified in 2016. More than 4.000 patients have already used it across Denmark, and the platform is moving into several markets at present. The platform allows gathering, storing and use/sharing of the collected health data. The OpenTele platform are standards based, such as OIOXML, Continua Health Alliance and HL7.
In the CAMI project, OpenTele is used as the main channel for communication with healthcare professionals. Usage includes both measurement data, as well as a simple asynchronous communication system. Full integration with OpenTele on measurement data has been implemented as part of work package 2. This include allowing to synchronize any user measurements taken through the CAMI platform (e.g. weight from Withings scale, pulse data from LG watch, measurements from A&D blood pressure and weight devices) with the OpenTele platform. This CAMI system push centric integration pattern are preferred to allow for seamless integration with 3rd party services developed by the other CAMI project partners.

Decision support system - The CAMI DSS is an expert system based on NRules inference engine and it acts as the central integration point for CAMI. At the present stage of implementation, the DSS is a dockerized container that is deployed in the CAMI cloud. The DSS communicates directly with the RabbitMQ message broker and the CAMI data store.
The following cases are handled by the CAMI DSS:

1. Weight measurement analysis - informs caregiver and user with different messages in the corresponding language if there are any increase/decrease from the current weight by 2kg.
2. Steps data analysis - Done once per day at 7 pm (based on the number of steps that user has taken, informs caregiver or user with different messages in the corresponding language)
3. Motion sensor data analysis -indicating that the user has woken up and is active in the morning.
4. Analysing health parameters like pulse (can result in four different states- Low, Mid Low, Mid High and High, classified depending upon the range of pulse values and considering that pulse lowers at night time) and generating a notification to user and caregiver if the pulse measurement is outside the normal range.
5. Generation of various kind of reminders for notifying user or caregiver, for e.g, taking the weight measurement as soon as the motion sensor detects some activity.
6. Fall event processing and notifying the caregiver.

Home & Health sensors integration - In the frame of the CAMI project, the Data Collector Unit functionalities are performed by the EXYS9200-SNG Enhanced Data Collector, which CAMI Gateway. The EXYS9200-SNG Enhanced Data Collector is an enhanced version of the EXYS9200-SNG with added capabilities in terms of communication protocols, sensors supporting and functionalities in general. The main task of the EXYS9200-SNG in CAMI is to gather raw data coming from the Home Automation sensors' network. Moreover, it integrates inside itself the AdCAMI BLE Health Data Collector module, in order to being able

to collect data coming from e-health devices (through the BLE=Bluetooth Low Energy protocol) as well as Continua certified Bluetooth medico devices. The EXYS9200-SNG Gateway implements the openHAB (v.2) framework as a data integrator and manager. Furthermore, an openHAB ROS-compliant customized binding enables easy communication with the CAMI robot. Finally, the EXYS9200-SNG Gateway implements a module, the CAMI Cloud Forwarding Service, enabling bidirectional data communication with the CAMI Cloud by the mean of a set of dedicated (Swagger) APIs.
The EXYS9200-SNG offers the following relevant features:

- Home Automation: The EXYS9000–SNG allows to design, configure and manage domotic sensor networks, based on state of the art protocols like Z-Wave and ZigBee. The system supports bidirectional communication, enabling data gathering from sensors as well as activation of actuators. Several network topologies are supported, enabling the user to create effective Home Automation ecosystems.
- e-Health: The EXYS9000–SNG is compliant with the Bluetooth Health Device profile (HDP-BT), which supports the vast majority of existing e-Health equipments. The BT 4 LE (Low Energy), implemented by means of the AdCAMI BLE module, is particularly adapted to applications where wearable devices are needed. Encrypted communication guarantees secured data communication between the gateway and the devices.
- Robotics and Internet of Thing: The EXYS9000–SNG supports the widespread openHAB 2 automation platform and uses the openHAB iot-bridge plugin to establish a bidirectional communication with IoT systems. The same module enables the gateway to talk with the Robot Operating System. The EXYS9000–SNG fully supports ROS, which is a de facto standard in modern personal robotics.
- Security: Communication at all levels is securized: from sensors to the gateway and from the gateway to users and to IoT systems (httpds, VPN). Personal information is encrypted, assuring privacy, and user authentication is supported.
- Layered architecture and Component modules: The EXYS9000–SNG adopts a rigorous layered architecture, assuring system integrity and availability.

The EXYS9200-SNG Enhanced Data Collector's event manager module gathers raw data coming from HA sensors network (essentially Z-Wave) and, through the AdCAMI BLE module, from BLE Health sensors. It then passes these data to the openHAB framework through specific software bindings. These information can be displayed locally on the EXYS9200-SNG/openHAB management interface (which is a Web GUI). The communication is bidirectional, so the operator can also act on the EXYS9200-SNG (openHAB based) interface to send configuration commands to HA devices (switches, other appliances). Finally, the EXYS9200-SNG provides the binding between the CAMI Robot and the rest of the CAMI system. The user can also interact with the Robot through the EXYS9200-SNG Web interface.

Robotic platforms
A robotic platform in CAMI is dedicated to provide assistance for people who have difficulties in moving or are incapable of doing so, or even to provide psychological wellbeing.

The functionalities we developed for the robotic platforms are based on advanced artificial intelligence algorithms and techniques, and have the advantages that can be installed and configured on several robotic platforms, including semi-humanoid ones or telepresence.

These functionalities refer mainly to:

- people detection - the robot needs to know where the person is in the room
- people recognition - the robot has to be able to recognize the person so as to provide him/her with the information specific to the user, by accessing this information in the CAMI cloud
- navigation in the environment – once the person is detected, the robot has to navigate to approach the person, display relevant information, allow interaction of that person with the robot, both touch and voice interaction; in order to go near the detected person, the robot has to do a mapping of the environment, localizing itself in the environment and then navigate between its present location and the location of the detected person.

Although Pepper, the robot we used for our implementation, is claimed to have detection and navigation capabilities, these capabilities are extremely restricted and dependent on user position (the user must stand exactly in front of the robot – assumption not easily conceivable for the CAMI purposes), on lightning (perfect light), and the navigation capabilities advertised are often affected by significant positioning errors.

Consequently, we developed our own solutions for the 3 main problems quoted above, by testing with different AI techniques and technologies (convolutional neural networks, 3D scene reconstruction, improved SLAM algorithm, etc.). The approach we took has also the advantage of being independent of the robotic platform and its capabilities.
We have also developed our own solution for voice interaction and integrated it with Pepper. The voice interaction solution is also available for other functionalities of CAMI, and it is not merely restricted to robotic platforms.

In CAMI we consider two robotic platforms: Pepper and Tiago: people detection and recognition, autonomous navigation, manipulation, etc.
For the **Pepper robot** we present speech interaction approaches (pipeline, implementation, testing with CAMI specific commands), computer vision capabilities (people detection, face detection and recognition) including testing and implementation, mapping and navigation approaches.

For **Tiago robot** we performed various simulations done in the Gazebo and Construct environments, testing of functionalities such as remote manipulation, voice, etc, as well as connection to Matlab and testing of navigation algorithms developed for navigation in crowded environments.

The integration of the Pepper robot with CAMI have followed the goal of obtaining an additional, more natural and pleasant means of interacting with the CAMI system. The interaction with the CAMI system that are facilitated by the robotic interface are those related to on-demand health status information and proactive notification. In CAMI, an elderly person can receive notifications from the system. These can be important updates related to

their health status, medication reminders or notifications to perform certain health measurements.

When notifications sent to the CAMI mobile application on a smartphone are ignored for more than 15 minutes, the robot becomes pro-active and searches for the person in their apartment, starting from the last known position. When the robot finds the person, it will list the notifications on a tablet. The user can visualize and navigate through the notifications and then acknowledge them, either through voice commands or by interacting with the tablet.
Apart from actively informing the user, the robot is capable of answering questions - given as voice commands - about the elderly person's health status - e.g. heart rate, pulse trend, weight information, step counting.

Two types of interactions have been tested with the Pepper robot: one passive and one active.

In the passive scenario, Pepper has to display on-demand information related to the health status of the elderly user. The listening service is always on, trying to match the set of trigger sentences for which an interpretation via the wit.ai service has been defined.
For example, the sentences of the form: "Pepper, display <health information type>", where <health information type> can be filled in with weight, heart rate, blood pressure, sleep or steps, trigger the launch of a Display task, whereby the information is retrieved from the CAMI Store, via the REST API.
The Display task uses a-priori configuration to have access to the user ID for which the request needs to be made.
By default, the Display task corresponding to one of the health status reports listed previously shows the last seven measurements registered for a user (see the heart rate example in Figure 8). The charts display on the robot tablet. While the chart shows the trend of the last seven measurements, the user can click on each individual one to view the value in detail.
The user can then acknowledge having read the chart with a vocal command, such as "Thanks" or "Thank you Pepper".
It is worthwhile to note, that the developed vocal command module allows for variations of the trigger sentences, leading to a more natural type of request interaction. For example, the request for weight information can be triggered by sentences such as: "Display weight", "Show weight", "Show weight information", "Show me my weight measurements". Consequently, the elderly user is not required to remember a strict trigger sentence.

In the proactive scenario, a ROS node is created on the server machine managing the robot life cycle. The ROS node uses the CAMI Store REST API to inquire information about the latest unacknowledged notifications of the configured user.
If node caches the notifications locally and waits for a configured time interval (by default 15 minutes), before it triggers the proactive *look-for-and-inform* behavior.
The tasks that make up the behavior are similar to those described in Figure 7. The difference is, that once the person is found, the *Say* task is complemented by a *Display* task that shows the unacknowledged reminders, Figure 15.

Figure 15. Pepper approaching a person (up) and displaying unacknowledged reminders (down).

The robot starts a Listen task by which it awaits commands of type “Show next”, “Show previous”, “Acknowledge this”, or “Thank you” to browse through the reminders and acknowledge them. The user can do the same via touch interaction with the robot tablet.

The integration of the Tiago robot - The development for Tiago has focused on its manipulation capabilities and in particular on developing and evaluating algorithms for the identification of gripping household objects. We have started by testing various manipulation actions with the Tiago model in the Gazebo simulator. The conducted experiments identified some of the limitations encounter when a grasp is computed for a given pose of the object and applied to different conditions. We have evaluated the impact of RGB image features and the additional information that can be extracted from RGB images to improve the ability to distinguish between valid and invalid grasping rectangles. Our results show that, in most of the cases, the feature addition leads to lower classification accuracy on the validation set, but better generalizes to new objects. The neural network classifier gains precious discriminative

information from the HOG and FFT features, obtaining the best overall results on both the validation and unseen sets. One of the shortcomings of this approach is that feature extraction must be performed on a lot of candidate rectangles. Therefore, we have worked to reduce the number of candidate rectangles by using the region of interest selection methods.

In addition, to working on exploiting the manipulation capabilities of the Tiago robot, we have also developed and integrated in ROS a module for audio monitoring of the environment. The aim is twofold. On one hand, we want to reduce the privacy issues involved with visual observation of the elderly users. On the other hand, audio monitoring will allow Tiago to monitor the user's environment also when it is not in its line of vision.

1.2 Business plan

A project exploitation strategy and business plan were reviewed according to the AAL Central Management Unit (CMU) comments and refined to fit the current market environment and meet older adults wishes and needs. The exploitation plan does consider the project results, novel techniques, competition, services and prototyping aiming for entering the market. The Deliverable D4.2 represents the final business plan for the CAMI products issued at the end of the CAMI project. Its main achievements can be summarized as:

- Investigation of the expected CAMI products scenarios/use cases,
- Specification of the CAMI exploitable outcomes.
- Study of the CAMI market segments: market opportunities, competitors to the CAMI solution, customers and beneficiaries, partnership that can be envisaged.
- Elaboration of the initial CAMI business plan: business scenarios, business models and business canvas, initial costs & revenue modelling and a scalable SWOT analysis.
- Derivation of a "Financial and Sustainability plan" for the CAMI solution: initial pricing for the CAMI products, first trial of the Return Over Investment that can be obtained from the CAMI products exploitation.

The CAMI consortium received two letters of interest from two European robots manufacturers, Pal Robotics from Spain and BLUE FROG ROBOTICS from France, where their express their conviction about the market potential of the CAMI solution and more importantly their willingness to be part of its exploitation picture by integrating it in their lines of business. An example of the Pal Robotics interest is: "We are particularly interested in the integration of the TIAGO robotic platform within CAMI and are looking to increase the number of AAL applications and services involving TIAGO. We believe that CAMI's results will be valuable for the robotic community and we envisage that these can be exploited in our line of business". BLUE FROG ROBOTICS goes also in the same direction of interest as they mentioned in their letter of interest: "We are particularly interested in the integration of robotic platforms within CAMI and are looking forward to Buddy becoming part of the platform." The CAMI consortium partners are continuing their efforts to approach other robots manufacturers and vendors in order to diversify the envisaged market alliances. In this context, the robots vendor, SoftBank Robotics Corp. from Japan, was contacted. Soft Bank Robotics declared their interest in the CAMI project and they will send us their letter of support, as they mention in their email: "I'm glad to tell you that our R&D and innovation team have decided to support CAMI project."

1.3 End users

All tasks and deliverables of WP1 were successfully completed despite the initial problems with the Polish partner SSW. After having STOCZNIA joining the CAMI consortium by replacing SSW, we were able to efficiently finalize all tasks which were delayed at the midterm review.

Analytical methods such as shadowing and self-documentation were used to involve primary end-users. The goal was to make a rough identification of the ICT technologies used or needed by the users in their daily life and to identify obstacles used in accepting or using certain technologies. This task has also lead to the identification of persona for the end-users which were described with persona cards. Persona is a model of the user in the form of persuasive description of the qualities, skills, experiences, needs and objectives. Three personas, that differ in their attitude towards ICT as well as in their ICT experience and needs have been identified among the primary users of CAMI.

In the multinational survey, a number of 105 primary end-users from Romania, Poland and Denmark took part along with 58 secondary end-users. The primary users were between 55 and 75 years old, which was the only eligibility criterion applied in their selection. The second group of the survey participants consisted of 22 professional (37.9%) and 36 informal (62.1 %) caregivers. The main achievements of the survey was to have been able to identify the technologies mostly appreciated and also accepted by the end-users. Additionally, we have also identified the interest/acceptance level for new technologies. Out of the senior respondents, 33% are very often interested in new scientific discoveries and thus, by extension, also interested in new technologies. Additionally, also among the caregivers 58% participants declare to be familiar with robotic house appliances. More than half of the primary users think that a mobile device features might be useful (60%). Almost all respondents (95%) like this idea. More than half think that such a solution is at least useful (57%), while in the opinion of 38% such device is very useful. This is the solution that is highly rated by the respondents. On the other hand, the reminder ideas interestingly received low scores. There might be few different explanations for this. One is because the respondents already use mobile devices (smartphones and mobile phones) that might remind them of the activities. The respondents might also be used to the traditional way of remembering of their activities (the paper calendar). Finally, it could be caused by a lack of understanding of the benefits such a feature could bring. The idea of sharing the calendar with the members of the family gained the smallest score, the reason might be that the respondents value the privacy and do not see the need to share their daily schedule with the loved ones.

Financial issues have been also addressed to some extend and these represent valuable input for the business model which will be developed within WP4. The respondents would rather purchase the devices foreseen for the integration in the CAMI platform instead of renting them. In particular, the respondents are ready to buy the home appliances. The senior respondents also would rather buy the health monitoring devices, as they are rather intimate and private devices. Both primary and secondary users' respondents would prefer the rented devices to be provided by the public sector.

A conjoint analysis was performed. A total of 57 CAMI users from three countries were involved: 25 Romanians (11 female, 14 male), 20 Polish (13 female, 7 male), and 12 Danish (6 female, 6 male) respondents. The mean age was 60.36 y.o, with females slightly older, 60.96 yr., than males, 59.67 (minimum age was 45, maximum age was 85). The collected data was used for: 1) for prioritizing technology development and implementation, as well as for 2) for marketing purposes, to promote variants of CAMI services according to selected demographic groups. The results indicate that the functionalities "basic health parameters monitoring", "smart house with various sensors, such as smoke, temperature, open doors, etc." and "computer supervised physical exercise and training program" were ranked the three most preferred, whereas functionalities "fall detection alert-able floor", "socialization via forums", and "have the system-acquired data stored in the cloud" were ranked least preferred. Among the robotic devices, the preferences hierarchy for robotic-home appliances, telepresence, and service robot indicate that respondents have in general a rather 'utilitarian' take on robotic services.

In "Functionalities and service concepts report", all CAMI functionalities were presented as UML diagrams and use-cases along with screenshots of existing implementations or mockups. While priority will be given to the implementation and integration of the functionalities ranked highest in T1.4, the rest of the CAMI functionalities presented were also included in order to offer to the users an integrated and adaptable platform. Health monitoring at home; smart house with various sensors, such as smoke, temperature, open doors, etc.; computer supervised physical exercise and training program are ranked by the end-users as the most preferred functionalities and are presented in section 2. For health monitoring CAMI end-users will have access to both LinkWatch and OpenTele which will be integrated in CAMI along with an own CAMI health monitoring module. LinkWatch is allowing remote health monitoring while OpenTele is dedicated to the communication with health professionals. Home monitoring and automation is collecting and integrate data not only from the user environment but also from other sensors in the CAMI platform. Physical exercises in CAMI are computer supervised. The caregiver can create and subsequently edit the end-user profile. Alert messages are sent to the caregiver in case of abnormal health parameters measured during physical exercises. Reminders end scores are presented to the elderly for the physical exercises. Also use-cases and UML diagrams for the rest of CAMI's functionalities, not top ranked by users, are presented.

CAMI's functionalities and associated services have been presented and discussed with the end-users within the focus groups. Two focus groups sessions were organized in each end-user country. FG1 was comprised of elderly (primary stakeholders) while the participants in FG2 were mostly secondary and tertiary users (stakeholders). Two focus groups sessions were organized in each end-user country. FG1 was comprised of elderly (primary stakeholders) while the participants in FG2 were mostly secondary and tertiary users (stakeholders).

Danish FG1 comprised 5 primary stakeholders. Four in the age group 55-75 and one relative, representing an "informal caregiver" in the age group 30-40. Romanian FG1 comprised 6 elderly (primary stakeholders) and 1 informal caregiver. All elderly were 55-75 years old and all should be considered "lead users", meaning they have experience with using technology,

such as smart phones, iPads, computers, and internet technologies (web and more), as stated in the WP1 task descriptions.

The Danish FG2 comprised 4 nurses, 4 doctors, 3 patients, 1 relative, 1 home nurse, 1 municipal health and care department manager, 1 hospital professor (department leader), and 2 health technology engineers as technical representatives. The Romanian FG2 comprised 5 stakeholders of which: 2 doctors, 1 insurance company broker and 2 representatives from the telecom and IT sector.

Overall, the Danish FG1 participants were highly interested in the technologies presented. Especially being able to track blood pressure and weight automatically as well as using service robots and simple messages and video communication was deemed relevant. To a lesser extent, calendar and task overview were considered relevant. While the participants did not see themselves in need of any support technologies yet (fall detection and alert buttons and similar), they could see the relevance in monitoring their own parents during the last years of their lives, especially in the "very old" age group. Also, for the tracking of activity (e.g. using the FitBit wearable sensor prototype) they found that it could be a good tool for self-care, and even a good tool for remote monitoring of their "very old" relatives – e.g. those that were experiencing a decline in actual functional status and were living alone. Thus, the original CAMI target age group of 55-75 seemed to be completely off as the actual target group, at least in a Danish context.

Also the Romanian participants were highly interested in the presented technologies. They were especially interested in the health monitoring modules and communication with health professionals. The elderly participants were not so much interested in the fall detection module mostly because they found the proposed implementations not very suitable. Also in the context of maintaining or even improving their health the Romanian elderly expressed a non-negligible degree of interest in the computer supervised exercises. Especially if these were to be coupled with a device for tracking their activity or with communication with other users involved in exercises. Related to the calendar and reminder functionalities, the Romanian elderly were less interested in the calendar and reminder functionalities outside the health aspect. One single elderly expressed interest in having reminders for various TV programs. As opposed to the Danish users, Romanian users were generally less concerned with data privacy. Also, they were enthusiastic about robotic telepresence platforms and were also interested in testing more advanced robotic platforms like Tiago with the understanding that such platforms are now in their research and development stage. Robotic home appliances were well perceived by the users who were already familiar with intelligent vacuum cleaners.

In general, Polish participants were highly interested in the presented solutions especially in health related functionalities. Polish seniors generally have the feeling that they do not receive medical care as much as they need. One of the main national health system obstacles for the Poles is poor access to the doctors. Waiting lists are lengthy (they often have to wait several months for an appointment) and usually doctor's visits are short. Polish seniors find possibility to stay in touch with relatives highly relevant. They would use CAMI to contact their families in case of any potential danger. As opposed to the Danish seniors, Polish users

are keen on using CAMI to increase physical activity. The majority of them believe CAMI would make them more active and it would also provide entertainment. However, they stress the fact that exercises must be safe for their health. The participants enjoyed CAMI's home management functionalities but they didn't find them as important as the ones related to health protection. The possibility to integrate the system with a robotic device was definitely polarizing. Polish seniors, similarly to Romanian users, were not that concerned about data privacy in terms of using CAMI.

The field trials with the CAMI MVP platform were performed in two stages in the three end-user countries involved in the project. Several problems with both the interface and the devices were reported during the first stage. This lead to a change in the CAMI app which was implemented for Android platforms and also to a repair of the GW which was sent to the Danish partners.

The second stage of the trials has revealed less problems but the CAMI app for the seniors needs further improvement. Also the implementation of the reminders and notifications functionality needs to be improved. Similar, comments were received also from the demo sessions held in each country. Nevertheless, there is a clear interest in a platform with the functionalities tested in CAMI and therefore there is a market potential for the improved CAMI version.

Regarding willingness to pay, the expectations are different from country to country. In Denmark, users are interested in a one-time fee partially covered by the Danish insurance. In Poland and Romania, a monthly fee in the range of 5-7 Euros is favored.
The second round of trials performed in ***Poland*** has involved the CAMI MPV system which was tested by 6 users (seniors and caregivers) in their home environment. The testing period ranged from 7 to 15 days. System deployment did not cause any major problems. To secure stable internet connection, the router with mobile internet was used. System installation at user's home was followed by 1.5h meeting of organizational and instructional nature. The meeting included presentation of exit strategy and obtaining informed consent form users. Senior and caregiver were using a CAMI system on everyday basis according to prepared scenarios. After each trial, the in-depth interview was carried out with both users.
CAMI system turned out to be rather comprehensible and intuitive for users. They did not report any major difficulties using it. Nevertheless, it should be marked that all users had at least fair digital skills. Users agreed that being accustomed to touch devices is crucial to handle such system.
I
n general, users positively assessed the experience of using CAMI. They found it as a useful solution that facilitates the care and increases the sense of security of both senior and the caregiver. Nevertheless, not all functions of CAMI solution were perceived as equally useful. Reminders and automatic recording of results were found as the most valuable functions of CAMI solution. The least useful function was monitoring the sleep time. Neither the seniors nor the caregivers saw the use for this feature.

User remarks mainly concerned: the history of measurements with exact time of each should be available in the app, personalization of the displayed data, consistency of the interface

among devices, sound of notification should be more audible, notifications to caregivers should be sent only in case of potential danger, etc.

Seniors and caregivers agreed that monthly subscription is the best form of acquiring such solution. The price should not exceed 5-7 Euros per month. The subscription should entail all the necessary equipment and a service supporting the use of the system.

In ***Denmark***, the second round of trials has involved three senior end-users and three caregivers who tested the MVP for a total of three days each. This pilot was performed at the senior (recipient of care) for 3 days (per senior/caregiver pair) by 3 seniors and 3 caregivers. As it happened also during the first trials, there were more issues reported by the Danish partners. This happened partly because the CAMI gateway still had some problems despite the repairs it underwent after the first trials. In addition, a prolonged trial (approx 1 yr) has involved a Danish female senior. She was the first user to start the field trials in 2017 and the trial equipment remained in her home until the end of the CAMI trials. This end-user has been equipped with: a EXYS CAMI Gateway (which was returned several times for repairs and never fully worked), a CAMINO large screen (which worked fine, but was not used for most of the year, due to the gateway not working), a weight scale, a blood pressure device, a Fitbit Charge HR (including heart rate), 2 PIR sensors, 1 robot vacuum cleaner, 1 iPad for running CAMI iOS APP and CAMI LinkWatch. Also, she used her personal smart phone, an Huawei P6 with Android operating system on. Being the first test participant, the end-user has experienced massive technical problems. Positive feedback was received for the Fitbit Activity Tracker (Fitbit Charge HR), mainly due to its heart rate monitoring. Also, taking blood pressure and keeping the history, seemed to be a very useful invention, due to her suffering from “hypertension” and taking blood lowering medications.

In ***Romania***, the CAMI MPV system was tested by 9 users (seniors and caregivers) in their home environment. The testing period ranged from couple of days to 2.5 weeks. After the installation of the system, the users were instructed about the CAMI functionalities and the usage of the system. Their informed consent was obtained and the exit strategy was presented to them. For the latter the users were informed that there are several options if they want to continue to use CAMI after the trials. In the end of the trial period this discussion was again brought up. Two of the senior users expressed their interest in continuing to use CAMI.

System deployment did not cause major problems except for internet availability and for large apartments. User instruction was easy. However, several users needed subsequent help during the trials despite the demo which they received in the beginning of the trials. Although the users did not have their own tablets or smartphones, the Android CAMI app proved to be a better option for the end-user organizations regarding system installation and availability. Also price wise, the Android app is a better option.
System usability proved to be greatly dependent on the IT and technical skill of the senior user. The ones with medium to good skills did not have problems in understanding and using the system despite the reported issues. The negative points which were raised concerned mostly the interface and the how the reminders were delivered to the senior user. While these can prevent the acceptance of the system, they don’t represent a huge problem for developers.

On the positive side, the caregiver web interface did not receive negative comments and the users appeared to be content with its layout and design.
Despite the reported shortcomings the CAMI MVP system was considered useful by the users in monitoring the health parameters and, if well implemented, for reminders and notifications.

Group testing and demo sessions were performed in all three end-user countries.
Two testing sessions were organized in Poland. In total 16 seniors (8 for each session) have tested the CAMI solution for 2 hours. The age of participants was 60 to 75. All of them needed to monitor their health parameters and take medicines on daily basis. The CAMI solution was received positively, some respondents expressed their interest in using it on a daily basis. In particular to keep track of their health data and receive remainders regarding taking medications. Various issues and possible improvements for the CAMI app interface were proposed by the seniors during these sessions. For example, the icons should look the same throughout the application, each icon should have its own distinct color, larger fonts, more distinct colors for the plots, the data presentation should also include norms etc. Almost all seniors agreed that the crucial function that is missing is a "call for help" button in case something suddenly happen. They would like to have it in form of physically present button (on bracelet like FitBit, or just placed somewhere at home). In general seniors found useful the sensors that are crucial for their security: gas, smoke, water. The ones for open door / window were evaluated as not very useful. Seniors would definitely prefer CAMI to be fully refunded from public money/ their health insurance. If they would have to pay for it, the most acceptable form seems to be a monthly fee. The fee should be ideally around 5-7 euro per month, the maximum declared amount was 11-12 euro per month. The price has to include all devices, set up and warranty service.

In Demark, a total of 17 seniors, 7 relatives, 3 IT professionals, and 5 healthcare professionals participated in focus group/workshop sessions where the CAMI solution was presented, tested, and discussed. The age of the senior participants was between 64 to 76 and gender balanced. The seniors have tested a large variety of devices, including three possible interfaces of the CAMI platform. Similar issues as the ones raised by the Polish end-users came up also during the demo sessions with the Danish users: larger fonts, consistent icons, no need to login, plots should contain numerical data, table format of the data instead of plots, etc. Participants found that health monitoring and activity tracking are relevant to have, and that the automatic registration of data is a good thing. Most participants found, that in the future, they would like a fall detection sensor as part of a solution, including e.g. a panic button for contact with a relative. Some found it interesting to combine motion and temperature and humidity. Also, some pointed to smoke sensors for added safety. Danish participants found CAMI to be somewhere between a publicly paid (in Denmark) Telemedicine solution, and a privately funded Burglary alarm. Thus, in case of disease, they found it would be a public paid service. On the other hand, as is the case with the burglar alarm system, it is also something you do for yourself, for your safety and wellness. Participants found that a gateway + health monitoring devices should be no more than EUR 199, and 99 EUR more for an activity tracker. Also, a fall detector at a similar price level was deemed relevant for some. Monthly fees were not ruled out, most would prefer to buy.

In Romania, several testing sessions with up to 4-5 end-users (both primary and secondary) were performed by CITST and UPB. The total number of users involved in these sessions was 20. Similar to the users involved in the field trials, the CAMI app has brought up several issues regarding its design: icons are not intuitive enough, buttons and icons get confused, plot colors are too pale, values of the measurements are desired, sleep duration given in minutes does not make sense. The CAMI web interface was much better received by the users. During the demo sessions, it turned out that also seniors were interested to use it. Several of the seniors did not find it difficult to use. Improvements were suggested but the overall feedback was positive. The end-users involved in the demo sessions have been interacting with Tiago and Pepper. In general, the users were interested about the robots but they were skeptical about using one in the near future. The Pepper robot was liked because it is empathic and cute and can act as companion. It can also act as a mobile platform for the CAMI interface and solve the problem of having to pay attention to the reminders and notifications. However, during the demo's Pepper several problems appeared like navigation, voice interaction, etc. Tiago was less popular in the beginning because it is more bulky and not so cute. Users wondered how heavy it is and what would happen if it would fall. The manipulation capabilities were appreciated especially for bedridden elderly. However, the space needed for the robot to move its arm might often exceed the one in Romanian apartments.

Romanian users showed an interest in purchasing the medical devices if they would be just a bit more expensive than the regular ones (not more than 20 Euros extra). At this point they would not pay to have an extra smartphone or tablet with the CAMI app on it. Caregivers however, would pay for a software to visualize their care-receiver's data on a computer. They would pay something like 20-30 Euro for such a software. All users would be interested in having the costs covered by medical or social insurance but nobody believed that this will be possible in the near future. The opinion on the FitBit devices was split. Caregivers were enthusiastic but seniors thought that they do not need them at their age and would therefore not pay for them.

2 Project reconfiguration

During the second year of the project we had problems with the Polish end-user, Knowledge Society Association (SSW), that left the CAMI consortium in August 2016. SSW has not received the second tranche from the Polish NCP and was forced to suspend its activities in the middle of 2016. SSW is not able to continue to fulfil its obligations and associated activities based on their financial situation. This situation is caused by the fact that SSW does not have enough resources to fulfil hedge of the financial protection in the CAMI project required by the NCBR, Poland. We received the acceptance from the AAL CMU to reconfigure the CAMI consortium with another Polish partner: The Unit for Social Innovation and Research "Shipyard". In May 2017 STOCZNIA signed the contract with the Polish NCP.
In March 2017 we had the mid-term review when we received the recomandation to apply for an extension. Thus on the 9th of May 2016 we applied on a 6 months extension and we received the approval on the 9th of June. The duration of the prject was extended to 43 months and we modify accordingly the timetable of the deliverables and milestones.

3 Project meetings

- Project kickoff meeting took place on the 25th of June 2015, Bucharest, Romania
- Project meeting, Bucharest Romania - all partners participated at the meeting on the 20th of June 2016.
- Project meeting, London, Great Britain - all partners participated at the meeting on the 31th of October 2016.
- Mid-term review took place on the 31st of March 2017, Bucharest, Romania
- Project meeting, Bucharest, Romania – all partners participated at the meeting on the 18th of September 2017.
- Additional midterm review took place on the 7th of December 2017, Bucharest, Romania.
- Online Skype meetings were held to establish different aspects regarding the designing and implementation of the project, the aspects regarding the end users and of the business plan.

4 Disemination

4.1 Project Presentation

CAMI project was presented at:

1) Senior Expo, Bucharest, Romania – 2.06.2016
2) Automatica 2016, 19-22 June, Munich, Germany. It is the leading exhibition of robotics and automation 19-22.06.2016
3) Participation and presentation at "Nattillsyn" workshop&forum in Stockholm Globe Arena – 8.09.2016 (Presentation at workshop for 14 municipalities, persons responsible of elderly care)
4) AAL forum, St. Gallen, Switzerland – 27.09.2016 (poster presentation)
5) Participation at Innovation workshop at Karolinska Institute – 7.10.2016
6) Participation and presentation at conference "IoT for Business", about IoT technologies for elderly care and remote patient monitoring. CNet organized conference together with Swedish Computer Society – 24.10.2016 (Presentation to mainly industrial audience with experts in various fields including social and health care)
7) Visits to Iran and presentation on CAMI, LinkWatch and other solutions for elderly care and remote patient monitoring – 9-19.12.2016 (Presentations about EU solutions and finding possibility the usage of these tools in another environment than they are developed)
   -Iranian Research Center on Aging
   - Research institute for endocrine sciences
   - Firoozgar hospital university
8) Presentation of CAMI solutions in Sweden to:
   Nortälje-Tiohundra healthcare organisation
   Stockholm-Swedish standards institute
   Örebero- Robotdalen
   Västerås-House of ideas
   on the 30th of May 2017

9) AAL Forum 2017, Coimbra, Portugal - exhibition and intensive interaction with primary and tertiary stakeholders
10) Presentation of the CAMI results during the visit of Oussama Khatib, Director of the Robotics Laboratory at Stanford University, 19.03.2018, UPB - Romania
11) Presentation of the CAMI results during the visit of Francesco Ferro from Pal Robotics company, 14.05.2018, UPB, Romania
12) Presentation and consultation of Cami results with KAFOS (Silesian Forum of Non-Governmental Organizations), 30.01.2018, STOCZNIA, Poland
13) Presentation and consultation of CAMI results with Laboratorium EE – provider of technical solutions, 28.05.2018, STOCZNIA, Poland
14) Presentation and consultation of CAMI results with Social Welfare Center, 22.06.2018, STOCZNIA, POLAND
15) Booth at the HEALTH and REHAB SCANDINAVIA 2018 CONVENTION COPENHAGEN with professional caregivers, industry and decision makers from Denmark and the scandinavian countries, 15-17.05.2018, ALIVIATE, ECOTOPIAS, Denmark
16) SOSU EVENT 2018, 31.05.2018, ALIVIATE, ECOTOPIAS, Denmark
17) PERVASIVE HEALTH CONFERENCE NEW YORK, 21-24.05.2018, ALIVIATE, ECOTOPIAS, Denmark
18) Presentation of CAMI to Camanio Care, 15.03.2018, MDH, Sweeden
19) Following up previous meeting with Tiohundra (health care organization in Norrtälje), Karolinska institute, FRISQ AB (CEO), Swedish health council (SLL), Karolinska institute
20) Karolinska hospital university -Huddinge, 17.01.2018, 13.06.2018, CNET, Sweeden
21) Pain alliance European, 18.05.2018, CNET, Sweeden
22) Demonstration of the CAMI platform (health monitoring, exergames, home automation, calendar, voice interface, robotic platform) to the ERASMUS+ project Active "Development of a Training Program for the Improvement of Active and Healthy Ageing through the Exploitation of High-Tech Assistive Technologies", 4-5.06.2018, CITST, Romania
23) Presentation and consultation of Cami results with Social Welfare Center, 22.06.2018, STOCZIA, Poland
24) Presentation and consultation of Cami results with researcher of social policy and editorial team member of the "Senior Policy" magazine, 2.08.2018, STOCZIA, Poland
25) Presentation and consultation of Cami results with assistant professor at Warsaw University of Technology, social activist and author of Poland's first Model Apartment for seniors, 1.10.2018, STOCZIA, Poland
26) AAL Forum, Bilbao, Spain, 24-26 September 2018 (poster presentation)
27) Presentation to HORDALAND FYLKEKOMMUNE, Norway, Aliviate, Ecotopias, Denmark, 8-9.11.2018
28) CareWare Presentation Day - demonstration of CAMI and CARIOT, Aliviate, Ecotopias, Denmark, 1.11.2018
29) CAMI/CARIOT used in COPENHAGEN MUNICIPALITY in the apartments of 20 elderly users, Aliviate, Ecotopias, Denmark, 1.09.2018-1.12.2012
30) Joint Presentation with Medica Connect at CareWare Conference on Telehealth and Telecare, Aliviate, Ecotopias, Denmark, 17.01.2019

4.2 Dissemination

We published the following papers:

2019

1 Imad Alex Awada, Irina Mocanu, Alexandru Sorici and Adina Magda Florea, "An Integrated System for Improved Assitsted Living of Elderly People", Book chapter in Recent Advances in Intelligent Assistive Technologies: Paradigms and Applications, eds. H.N. Costin, B. Schuller, A.M. Florea, Springer (to be published in 2019).

2018

2 Irina Mocanu, Raluca Caciula, Lorena Gherman - Improving Physical Activity Through Exergames, The International Scientific Conference eLearning and Software for Education; Bucharest Vol. 2, pp. 225-232, 2018, DOI:10.12753/2066-026X-18-101.

3 Imad Alex Awada, Irina Mocanu, Adina Magda Florea - Exploiting Multimodal Interfaces in e-Learning Systems, The International Scientific Conference eLearning and Software for Education; Bucharest Vol. 2, pag. 174-181, DOI:10.12753/2066-026X-18-094.

4 I.A. Awada, O. Cramariuc, I. Mocanu, C. Seceleanu, A. Kunnappilly, A.M. Florea - An End -User Perspective on the CAMI Ambient and Assisted Living Project, INTED2018 Proceedings, pp. 6776-6785, 2018.

5 O. Balan, R. Taerel, I. Mocanu, A. Moldoveanu, F. Moldoveanu, O. Cramariuc, An Innovative Gamification Approach for Treating Acrophobia Using Virtual Reality and Gesture Recognition, INTED2018 Proceedings, pp. 6843-6848, 2018.

2017

6 Alexandru Sorici, Imad Alex Awada, Ashalatha Kunnappilly, Irina Mocanu, Oana Cramariuc, Lukasz Malicki, Cristina Seceleanu and Adina Magda Florea, "CAMI - An Integrated Architecture Solution for Improving Quality of Life of the Elderly", In: Ahmed M., Begum S., Raad W. (eds) Internet of Things Technologies for HealthCare (HealthyIoT 2016), Vasteras, Sweden, Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, Vol 187, Springer, Cham, 2016.

7 Ashalatha Kunnappilly, Cristina Seceleanu and Maria Linden, "Do we need an integrated framework for Ambient Assisted Living?", Ubiquitous Computing and Ambient Intelligence: 10th International Conference (UCAmI), San Bartolomé de Tirajana, Gran Canaria, Spain, November 29 – December 2, 2016, Part II 10. Springer International Publishing, 2016.

8 Kunnappilly, A., Legay, A., Margaria, T., Seceleanu, C., Steffen, B. & Traonouez, L. M., "Analyzing ambient assisted living solutions: A research perspective", In Design &

Technology of Integrated Systems In Nanoscale Era (DTIS), 12th International Conference on, pp. 1-7, 2017.

9 Imad Alex Awada, Andra Codreanu, Irina Mocanu, Adina Magda Florea and Mihaela Apostu, “An Adaptive Multimodal Interface to Improve Elderly People’s Rehabiliation Exercises“, In the 2017 eLearning & Software for Education Conference (eLSE), Bucharest, Romania, pp. 41-47, 2017.

10 Imad Alex Awada, Irina Mocanu, Adina Magda Florea and Bogdan Cramariuc, “Multimodal Interface for Elderly People”, In the 21st International Conference on Control Systems and Computer Science (CSCS), Bucharest, Romania, pp. 536-541, IEEE, 2017.

11 Alexandru Florin Gavril, Mihai Trascau and Irina Mocanu, "Multimodal Interface for Ambient Assisted Living", In the 21st International Conference on Control Systems and Computer Science (CSCS), Bucharest, Romania, pp. 223-230, IEEE, 2017.

12 B. Cramariuc, I. Mocanu, L. Malicki and A. M. Florea, “Barriers to Acceptance and Learning of ICT Technologies in an European Ambient Assisted Living Project”, In the 9th International Conference on Education and New Learning Technologies, Barcelona, Spain, pp. 2372-2381, 2017.

13 Ashalatha Kunnappilly, Alexandru Sorici, Imad Alex Awada, Irina Mocanu, Cristina Seceleanu and Adina Magda Florea, “A Novel Integrated Architecture for Ambient Assisted Living Systems”, In the 41st IEEE Computer Society International Conference on Computers, Software and Applications (COMPSAC), Turin, Italy, 2017.

2016

14 Press Release - Market Watch Journal (in Romanian), May-June 2015, Romania -26/05/2016

15 Andrei Olaru and Adina Magda Florea, “Extended Context Patterns - A Visual Language for Context-Aware Applications”, 10th International Symposium on Intelligent Distributed Computing (IDC), Paris, France, pp. 57-66, 2016.

16 A. Sorici, I. A. Awada, A. Kunnappilly, I. Mocanu, O. Cramariuc, L.Malicki, C. Seceleanu, A. Florea, “CAMI - An Integrated Architecture Solution for Improving Quality of Life of the Elderly”, The 3rd EAI International Conference on IoT Technologies for HealthCare, 18-19 OCTOBER 2016, VÄSTERÅS

17 Ashalatha Kunnappilly, Cristina Seceleanu and Maria Linden, “Do we need an integrated framework for Ambient Assisted Living?”, In Proc. of the 10the International Conference on Ubiquitous Computing and Ambient Intelligence, UCAmI 2016, Canary Islands, Spain, Dec. 2016, LNCS, Springer Verlag.

5 Deliverables and Milestones

During the project we achieved all the deliverables and milestones, as given bellow.

Deliverables

No.	Title	Delivery date	Achievement date	Remarks
D1.1	End-user requirements report	M4	M5	Longer time needed for best selecting end-users
D1.2	Designing and carrying out a multinational survey	M7	M8	Due to the winter holiday we had a delay in obtaining the questionnaires answers from the end-users
D1.3	Conjoint analysis report	M24	M24	
D1.4	Functionalities and service concepts report	M25	M25	
D1.5	Focus group report	M25	M25	
D2.1	Technology assessment and capabilities alignment	M4	M5	A delay due to the complexity of the assessment and the reiteration of the deliverable with new information from various partners.
D2.2	Report on the ecosystem architecture	M10	M10	
D2.3a	Report on the progress of system implementation	M18	M18	
D2.3b	Final report on the system implementation	M40	M40	
D2.4a	Report on progress of system element integration	M22	M22	We also included the current status of system integration into this deliverable (there is no other deliverable for describing the status of the system integration)
D2.4b	Final report on system element integration	M35	M37	Implementation was adapted for the devices that are used in field trials
D3.1a	Report on robotic platforms	M30	M30	

D3.1b	Report on the integration of the robotic platform	M39	M39	
D3.2	Report on target group and user classification	M26	M26	
D3.3	Report on the exit strategy	M40	M40	
D3.4	Report pilot testing	M40	M41	Because of the pilots being prolonged into October
D4.1	Draft Business plan/business model	M18	M18	
D4.2	Final business plan model	M42	M42	
D4.3a	Regular reports on stakeholder concerns and demonstrator sessions	M12	M12	
D4.3b	Regular reports on stakeholder concerns and demonstrator sessions	M30	M30	
D4.3c	Regular reports on stakeholder concerns and demonstrator sessions	M41	M41	
D4.4	Website of the project	M6	M6	
D4.5	Communication and marketing plan	M12	M12	
D4.6a	Demonstrator sessions	M12	M13	Demonstrator session was made during the CAMI consortium meeting on the 20th of June 2016.
D4.6b	Demonstrator sessions	M18	M18	Demonstrator session was made during the CAMI consortium meeting on the 31st of October 2016.
D4.6c	Demonstrator sessions	M34	M34	
D4.6d	Demonstrator sessions	M40	M40	
D5.1	Internal Communication Infrastructures	M2	M2	
D5.2	Quality Assurance Plan	M2	M2	

D5.3a	Calendar year report	M12	M12	
D5.3b	Calendar year report	M24	M24	
D5.3c	Calendar year report	M36	M36	
D5.4	Mid-term review questionnaire	M18	M22, M31	The mid-term took place on M22. Additional mid-term was in M31
D5.5	Final report	M42	M42	

Milestones

Milestone	**Due date**	**Achievement date**	**Remarks/Explanations**
D1.2	M7	M8	Due to the winter holiday we had a delay in obtaining the questionnaires answers from the end-users
D1.5	M25	M25	
D2.3a	M18	M18	
D2.4a	M22	M22	
D3.1a	M40	M40	
D3.4	M40	M41	Because of the pilots being prolonged into October
D4.1	M18	M18	
D4.2	M42	M42	
D5.3a, b, c	M12, M24, M36	M12, M24, M36	
D5.3	M42	M42	
D5.4	M18	M22, M31	The Review took place in March 2017 and December 2017