Smart and Healthy Ageing through People Engaging in Supportive Systems

SHAPES

Grant agreement ID: 857159

SHAPES-OC1-Enablers Technical Details

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- VICOMTECH
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SHAPES Platform: Technical Details

The SHAPES Architecture

The SHAPES architecture is built around a layered IoT stack connecting various devices (sensors, actuators and IoT gateways) within Smart Spaces with the Cloud. Smart Spaces share the available local resources (connectivity, computing and storage), while platform services running in the Cloud will enable IoT Platform Federations (associations between two platforms) and open up the Interworking Interface to third parties.
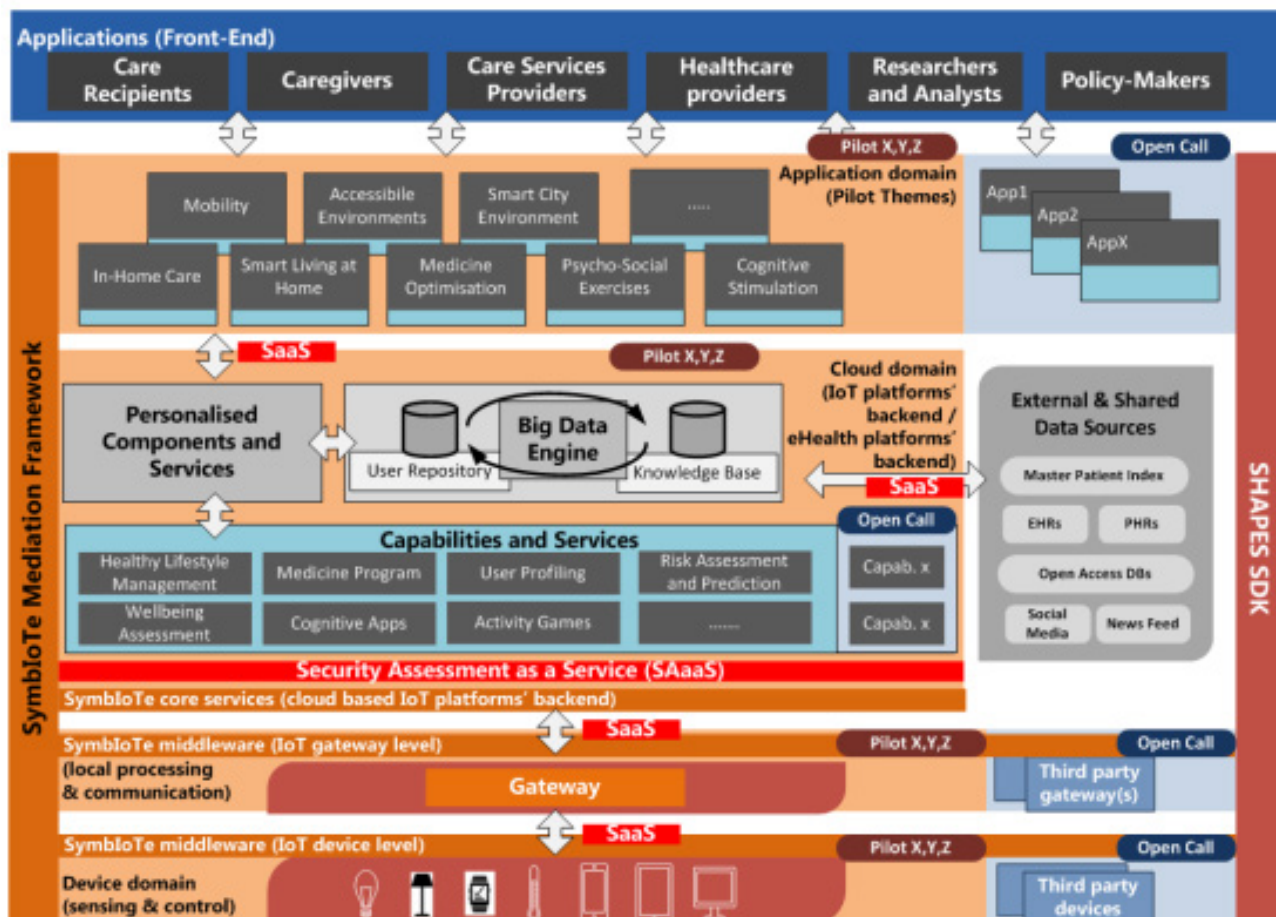
The architecture comprises four layered domains:
1) Application Domain
2) Cloud Domain
3) Smart Space Domain
4) Device Domain

Hereafter we list the main functional objectives for each of these domains:

- **Application Domain (APP):** enables platforms to register IoT devices which they want to advertise and make accessible via SHAPES to third parties, while SHAPES provide the means for discovery of IoT devices across platforms by its Core Services. Domain-specific back-end services (called 'Domain Enablers') are envisioned to be placed in APP: they utilize the infrastructure provided by the underlying platforms to offer value-added services, e.g., data analytics on top of sensor data acquired from different platforms, which can ease the process of cross-platform and domain-specific application development (specifically for mobile and web applications).

- **Cloud Domain (CLD):** provides a uniform and secure access to virtualized IoT devices exposed by platforms to third parties through an open API (Interworking Interface). In addition, it builds services for IoT Platform Federations enabling direct platform collaboration, in accordance with platform-specific business rules.

- **Smart Space Domain (SSP):** provides services for discovery and registration of new IoT devices in dynamic local smart spaces, dynamic configuration of devices in accordance with predefined policies in those environments, and well-documented interfaces for devices available in smart spaces.

- **Smart Device Domain (SDEV):** relates to smart devices and their roaming capabilities. We assume that devices have the capabilities to blend with a surrounding smart space while they are on the move. In other words, smart devices can interact with devices in a visited smart space, which are managed by a visited platform, in accordance with predefined access policies.

Interoperability Aspects
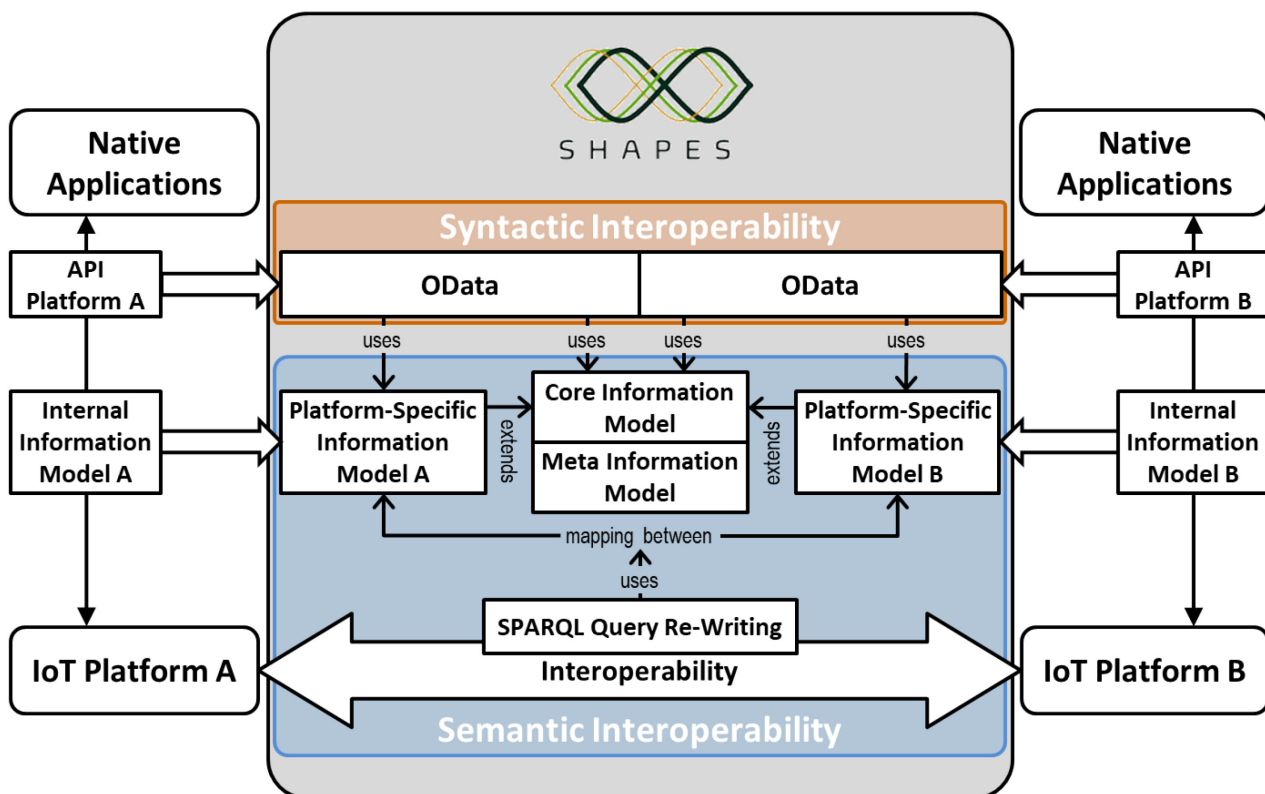
SHAPES allow for flexible interoperability mechanisms which can be achieved by introducing an incremental deployment of SHAPES functionality across the listed domains (APP, CLD, SSP and SDEV). This approach will enable platform providers to choose an appropriate level of integration of SHAPES-specific services within their platforms, which will, in effect, influence the level of platform collaboration and cooperation with other platforms within a SHAPES-enabled ecosystem. For example, a platform may only choose to expose its Interworking Interface and selected IoT services to third parties in order to advertise them by using the SHAPES Core Services, or it may opt for a closer collaboration with another platform by forming a platform federation. Platform federations require additional SHAPES components to be integrated within a platform space in CLD.

SHAPES-OC1-Enablers: Detailed description of topics

The sub-topics of the SHAPES-OC1-Enablers open call are summarized as follows:

Sub-topics Identifier	Targeted Applicants	Funding
SHAPES-OC1- Enablers-ST1	Urinalysis in home setting	Up to €50,000
SHAPES-OC1- Enablers-ST2	Monitoring of nutrition intake	Up to €50,000
SHAPES-OC1- Enablers-ST3	Monitoring hydration and quantity of fluid intake	Up to €50,000
SHAPES-OC1- Enablers-ST4	Smart Connectable for Health and Wellbeing	Up to €50,000
SHAPES-OC1- Enablers-ST5	Speech-enabled Chatbots	Up to €50,000
SHAPES-OC1-Enablers-ST6	Social support in local community	Up to €50,000
SHAPES-OC1-Enablers-ST7	Open Topic	Up to €50,000

The sub-topics will focus on making IoT platforms SHAPES-complaint. The fourth topic searches for application developers to build innovative mobile apps on top of SHAPES. The last topic looks for end users to support SHAPES's planned trials. In the pages that follow we provide a detailed description for each topic.

SHAPES-OC1-Enablers-ST1: Urinalysis in home setting

Topic Summary

Purpose: The device uses human urine which contain health-relevant information and is a mirror image of what man has ingested; especially how it was metabolized by the body. An easy-to-use and cost-effective urinalysis system is needed in the home-setting. The mission of this system is to promote prophylaxis and user self-care empowerment by providing information about ingested nutrients and especially how they have been metabolized by the body. We look for automatic systems/platforms that combine dedicated hardware and software to provide relevant information about nutrition assimilation and personal well-being, and that allows the early detection of diseases, in a secure, economic and un-obtrusive way for the users.

Lead SHAPES partner: EDGENEERING LDA (EDGE)

Commitment: Applicants should make their platforms and their resources available for a demo during the SHAPES Pilot Theme 2 trials (approx. August 2021 – April 2023).

Type of Applicants: We are looking forward to manufacturers of technical solutions that facilitate the urinalysis in the home-setting. Remarkably, manufacturer have to provide an API or similar interoperability mechanism in order to allow the automatic secure data transfer, storage and processing in the SHAPES Technology Platform.

Funding: up to €50,000

The expected component is planned to be used in the pilot theme 2 "*Improving In-Home and Community-based Care*" in the Use Case 1 "Remote monitoring of key health parameters" (UC-PT2-

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001). The UC-PT2-001 contains the remote monitoring of important key health parameters of older individuals with the aim of maintaining or possibly even improving their health status thanks to preventive health and care measures.

The monitoring of steps, exercises, sleep, intake of fluids, nutrition and wellbeing are defined as important key health parameters of older individuals in UC-PT2-001. During the SHAPES project, it was identified that the tracking of steps, exercises and sleep can be covered by fitness trackers. The status of wellbeing can be accessed via the eCare platform, whereas nutrition aspects are addressed by the DAPHNE app, within the SHAPES set of digital solutions.

Tracking the intake of fluids and food of older individuals is a challenge and no already available SHAPES component can deliver this information. Thus, an innovative digital solution that combines the monitoring of two key wellbeing parameters is of key relevance for the collection of essential information to the use case.

In the UC-PT2-001, the listed subsystems will be embedded in a tablet. Besides that, the older individual will be equipped with a fitness tracker for recording of steps, exercises and sleeps. The requested placement and interfacing with other SHAPES subsystems and components in UC-PT2-001 is detailed in the table below.

Technical partner	SHAPES Digital Solution	Task
EDGE	eCare	Smart ambient intelligence, health and wellness platform delivering remote monitoring of key health parameters of older individuals, including those with health problems needing periodic and/or permanent monitoring.
CH	Chatbot ROSA	The chatbot is a digital nurse that monitors users at home, communicating in natural language and chat ("how do you feel").
VICOM	Safe digital assistant	Friendly interaction mechanisms based on Automatic Speech Recognition & Natural Language Processing. Support the older people to remain independent and carry out with their daily activities at home.
TREE	DAPHNE	Uses information about anthropometrics, health markers, mental well-being, physical activity and nutritional data of the user and, using data processing and AI, creates personalised nutritional, activity and behavioural models, giving risks and recommendations for users and carers.
TREE, VICOM	Data analytics & predictive algorithms	Analysis of anomalies and alert generation based on the data gathered from the different sensors.

As a continuous monitoring of the key health parameters is essential, SHAPES is looking for further additional options to cover all aspects of UC-PT2-001.

Data on the intake of fluids and nutrition deliver information on key wellbeing parameters: first and foremost, and at a very basic level, they are essential to prevent life-threatening implications such as dehydration and malnutrition. Further, urine analyses e.g. are of particular relevance for kidney diseases or urinary tract infections. Even more detailed information can be acquired regarding sugar levels, acidification, drug use or protein levels.

In this sense, we are looking for solutions which could tackle the challenge described before.

Technical partner	Subsystem component	Task
External third party	App + digital measuring device at the outer rim of the toilet. Alternative configurations can be provided as well.	Third party has to offer the possibility of measuring a number of relevant health parameters such as the ones listed next: • ph value • glucose • Blood temperature • Ascorbic acid (vitamin C) • Proteins • Ketone These variables could be grouped together in sets of 3-4 parameters to match the individual needs of the final users.

The following diagram shows the needed urinalysis solution and the expected compliance level to interoperate with the SHAPES platform. As it can be seen in the diagram, a measuring device that is placed at the outer rim of the toilet and that sends the measurement to a wellbeing app is needed. Additionally, Level 1 (L1) compliance level is requested as a minimum to ensure interoperability with the SHAPES Platform. In this sense an API must be provided to transfer the collected health data from the urinalysis device to the SHAPES Platform. The health data uploaded to the SHAPES Technology Platform will be aggregated and processed in the data analytics modules, and the results will be presented to the user via eCare system / personal chatbot / safe digital assistant.

Figure 1. Urinalysis components and L1 interoperability schema with SHAPES platform.

To ensure Level 1 Compliance Level for the interoperability with the SHAPES Platform the following connectivity requirements are preferred:

(1)   D2S (device to server) communications over Wi-Fi, using technologies like HTTP REST, OAuth 2.0 and JSON formatted data.

and/or:

(2)   D2D (device to device) communications supporting device discovery, configuration and data exchange in a local LAN, using (a) Wi-Fi communication and/or (b) Bluetooth (or Bluetooth Low Energy (BLE)).

Other formats are also possible and can be discussed separately.

Regarding the formal technical validation of compliance of the system, different tests will have to be defined. Among these, calibrated samples will be used to test the accuracy of the measurements of the system.

Additionally, technical support from the urinalysis manufacturer may be required during the piloting of the urinalysis solution in the SHAPES pilots.

Finally, the funding amount must cover all the technical adaptation works needed from the manufacturer to connect their urinalysis system to the SHAPES platform and to provide at least 10 units to be installed at the homes of the users, and the cartridges or other types of consumables needed for the proper functioning of the system during an expected time of 6 months.

SHAPES-OC1-Enablers-ST2: Monitoring of nutrition intake

Topic Summary

Purpose: Many older individuals are vulnerable to malnutrition. The process of ageing affect nutrients needs and the overall wellbeing of the health status. When it comes to the topic of nutrition, measuring is not quite as easy. We look for solutions and services that assist the older users to nourish themselves properly and that measure in a reliable and quantified manner the nutrients intake at each meal.

Lead SHAPES partner: GNOMON Informatics S. A. (GNO)

Commitment: Applicants should make their platforms and their resources available for a demo during the SHAPES Pilot Theme 2 trials (approx. August 2021 – April 2023)

Type of Applicants: we are looking forward to manufacturers of technical solutions or to nutrition service providers that facilitate and quantify nutrition intake of the older people in the home-setting. Remarkably, an API or similar interoperability mechanism has to be provided in order to allow the automatic secure data transfer, storage and processing in the SHAPES Technology Platform.

Funding: up to €50,000

The expected component is planned to be used in the pilot theme 2 "Improving In-Home and Community-based Care" in the Use Case 1 "Remote monitoring of key health parameters". The UC-PT2-001 contains the remote monitoring of important key health parameters of older individuals with the aim of maintaining or possibly even improving their health status thanks to preventive health and care measures.

The monitoring of steps, exercises, sleep, intake of fluids, nutrition and wellbeing are defined as important key health parameters of older individuals in UC-PT2-001. During the SHAPES project, it was identified that the tracking of steps, exercises and sleep can be covered by fitness trackers. The status of wellbeing can be accessed via the eCare platform, whereas nutrition aspects are addressed by the DAPHNE app, within the SHAPES set of digital solutions.

Tracking the intake of food of older individuals is a challenge and no already available SHAPES component can deliver this information. Thus, an innovative digital solution that has the possibility to monitor food intake and eating patterns is of key relevance for the collection of essential information to the use case.

In the UC-PT2-001, the listed subsystems will be embedded in a tablet. Besides that, the older individual will be equipped with a fitness tracker for recording of steps, exercises and sleeps. The requested placement and interfacing with other SHAPES subsystems and components in UC-PT2-001 is detailed in the table below:

Technical partner	SHAPES Digital Solution	Task
EDGE	eCare	A smart ambient intelligence, health and wellness platform delivering remote monitoring of key health parameters of older individuals, incl. those with health problems requiring periodic or permanent monitoring.
CH	Chatbot ROSA	The chatbot is a digital nurse that monitors users at home, communicating in natural language and chat ("how do you feel").
VICOM	Safe digital assistant	Friendly interaction mechanisms based on Automatic Speech Recognition & Natural Language Processing. Support the older people to remain independent and carry out with their daily activities at home.
TREE	DAPHNE	Uses information about anthropometrics, health markers, mental well-being, physical activity and nutritional data of the user and, using data processing and AI, creates personalised nutritional, activity and behavioural models, giving risks and recommendations for users and carers.
TREE, VICOM	Data analytics & predictive algorithms	Analysis of anomalies and alert generation based on the data gathered from the different sensors.

As a continuous monitoring of the key health parameters is essential, we are looking for further additional options to cover all aspects of UC-PT2-001.

When it comes to the topic of nutrition, measuring is not quite as easy as with the other points described above. Tracking the meals is very complex and requires a lot of discipline, which makes the implementation massively more difficult. Since the test persons are in home care, one could assume that many at least get their lunch from external delivery services such as "meals on wheels". Together with these providers, a system could be designed in which the older persons could simply scan a barcode with their cell phone and the nutritional information from the delivery services would be taken over immediately. The system needs to allow the individuals to indicate whether everything was eaten or only partially / saved for later / shared with others. For many, breakfast and dinner are part of a fixed routine, which means that ready-made standard meals to choose from a "menu" can be provided, making tracking much easier (such as: porridge / white bread with jelly / yoghurt / etc..).

Such documentation can be used to check whether all nutrients are supplied in sufficient quantities and whether there is a connection between certain foods and an increased or decreased well-being. Tips can then be given as to whether certain foods should rather be avoided or others should be consumed to a greater extent.

One problem frequently associated to tracking is that banning certain foods (e.g. the routinely consumed piece of cake in the afternoon or similar) can lead to frustration, which would not increase but rather worsen the well-being. An idea to solve this would not be to give the test persons a detailed

overview of the nutritional values eaten, but rather a summary of the day in the form of a traffic light system with the recommendation to eat more fruit and vegetables the next day.

From the technical point of view the nutrition product manufacturer / service provider must provide at least a Level 1 Compliance Level with the SHAPES platform. In this sense an API must be provided to transfer the collected nutrition data to the SHAPES Platform. Then, the collected nutrition data will be aggregated and processed in the data analytics modules, and the results will be presented to the user via eCare system / personal chatbot / safe digital assistant or other SHAPES components.

To ensure Level 1 Compliance Level for the interoperability with the SHAPES Platform the following connectivity requirements are preferred:

(1) D2S (device to server) communications over Wi-Fi, using technologies like HTTP REST, OAuth 2.0 and JSON formatted data.

and/or:

(2) D2D (device to device) communications supporting device discovery, configuration and data exchange in a local LAN, using (a) Wi-Fi communication and/or (b) Bluetooth (or Bluetooth Low Energy (BLE)).

Other formats are also possible and can be discussed separately.

Additionally, technical support from the nutrition product manufacturer / service provider may be required during the execution of the SHAPES pilots.

Finally, funding amount will cover all technical adaptation works needed from the manufacturer / service provider to connect their systems to the SHAPES platform and to provide at least 10 units/licenses to install and run their systems at the homes of the users during an expected time of 6 months.

SHAPES-OC1-Enablers-ST3:
Monitoring hydration and quantity of fluid intake

Topic Summary

Purpose: Many older people no longer feel thirsty or do take notice of their need much too late. As a result, older people are frequently dehydrated, which is in turn a source of many illnesses and general malaise. The frequent intake of medication also makes it necessary to drink enough fluids. To counteract forgetting to drink, a smart drinking bottle can help. We look for smart water bottles that can inform the SHAPES platform in an automatic way about the water intake carried out of the user.

Lead SHAPES partner: Intracom Telecom (ICOM)

Commitment: Applicants should make their platforms and their resources available for a demo during the SHAPES Pilot Theme 2 trials (approx. August 2021 – April 2023)

Type of Applicants: we look for manufacturers of smart water bottles that provide an API or similar interoperability mechanism in order to allow the automatic and secure water intake data transfer, storage and processing in the SHAPES Technology Platform.

Funding: up to €50,000

The requested component is planned to be used in the pilot theme 2 "Improving In-Home and Community-based Care" in the Use Case 1 "Remote monitoring of key health parameters". The UC-PT2-001 contains the remote monitoring of important key health parameters of older individuals with the aim of maintaining or possibly even improving their health status thanks to preventive health and care measures.

The monitoring of steps, exercises, sleep, intake of fluids, nutrition and wellbeing are defined as important key health parameters of older individuals in UC-PT2-001. During the SHAPES project, it was identified that the tracking of steps, exercises and sleep can be covered by fitness trackers. The status of wellbeing can be accessed via the eCare platform within the SHAPES set of digital solutions.

Tracking the intake of fluids of older individuals is a challenge and no already available SHAPES component can deliver this information. Thus, an innovative digital solution that supports the monitoring of continuous fluid intake and provides information about drinking patterns is of key relevance for the collection of essential information to the use case.

In the UC-PT2-001, the listed subsystems will be embedded in a tablet. Besides that, the older individual will be equipped with a fitness tracker for recording of steps, exercises and sleeps. The requested placement and interfacing with other SHAPES subsystems and components in UC-PT2-001 is detailed in the table below.

Technical partner	SHAPES Digital Solution	Task
EDGE	eCare	A smart ambient intelligence, health and wellness platform delivering remote monitoring of key health parameters of older individuals, incl. those with health problems requiring periodic or permanent monitoring.
CH	Chatbot ROSA	The chatbot is a digital nurse that monitors users at home, communicating in natural language and chat ("how do you feel").
VICOM	Safe digital assistant	Friendly interaction mechanisms based on Automatic Speech Recognition & Natural Language Processing. Support the older people to remain independent and carry out with their daily activities at home.
TREE	DAPHNE	Uses information about anthropometrics, health markers, mental well-being, physical activity and nutritional data of the user and, using data processing and AI, creates personalised nutritional, activity and behavioural models, giving risks and recommendations for users and carers.
TREE VICOM	Data analytics and predictive algorithms	Analysis of anomalies and alert generation based on the data gathered from the different sensors.

As a continuous monitoring of the key health parameters is essential, we are looking for further additional options to cover all aspects of UC-PT2-001.

Data on the intake of fluids informs on key health parameters: first and foremost, and at a very basic level, data measuring fluid intake is essential to prevent life-threatening implications such as dehydration. The frequent intake of medication also makes it necessary to drink enough fluids. The German Society for Nutrition gives a reference value of 1.5L/day, which is increased to 2L/day in summer. To encourage the regular intake of fluid, the use case is looking for an innovative digital solution. The device should measure how much liquid has been drunk from e.g. a bottle and report this to the SHAPES system. In addition, the SHAPES system will support manual entries (e.g., if the older person has been increasing his/her intake of fluid outside his/her home or alternating between water and tea for instance). According to documented daily intake of fluid intake, reminders are given if the person does not drink

enough according to the following guidelines:

- a glass of water immediately after waking up (stimulates digestion and circulation)
- 3 hours into the day: drink at least 0.5L
- 6 hours into the day: min. 0.75L
- 9 hours into the day: min. 1 L
- 12 hours into the day: min. 1.3 L
- 15 hours into the day: min. 1.5L
- Cap drinking 2 hours before bedtime in order not to interrupt the night's sleep

In this sense, we are looking for solutions which could tackle the challenge described before.

Technical partner	SHAPES Digital Solution	Task
External third party	Smart monitoring hydration solution measuring fluid intake. Alternative configurations can be provided too.	Smart solution monitoring the person's hydration providing the fluid intake measurements with the corresponding timestamps to the SHAPES platform through a dedicated secure API. Alternatively, in the case the provider of such a smart monitoring hydration solution currently uses a dedicated cloud to store the data, a platform federation approach can be established with the SHAPES platform.
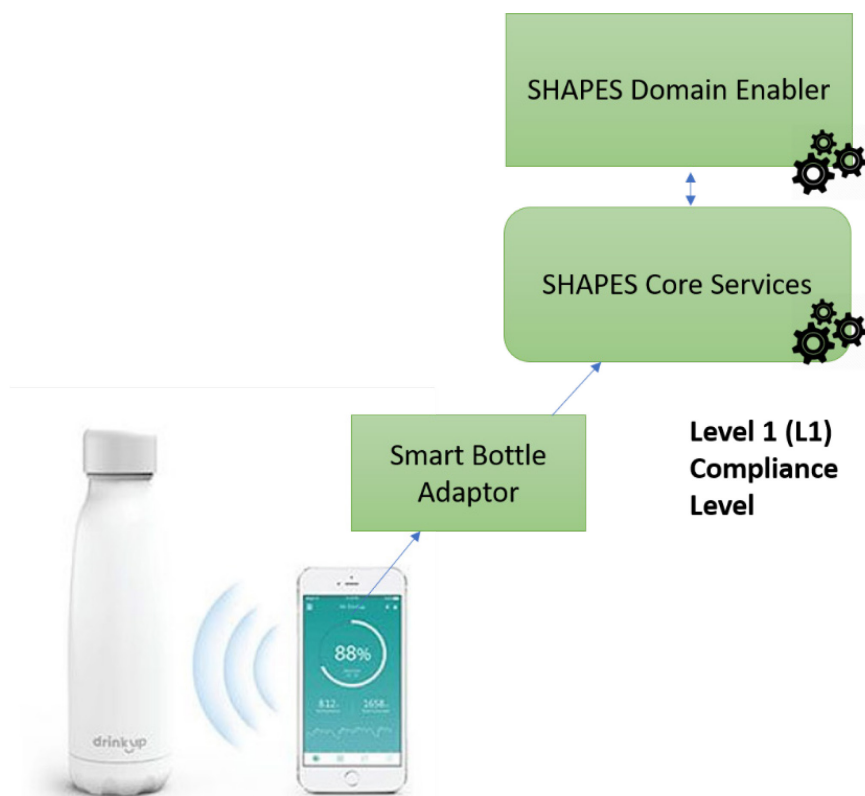
Figure 2. Smart bottle as an example of an innovative smart and digital solution to monitor dehydration and quantify of fluid intake, app and L1 interoperability schema with SHAPES platform.

From the technical point of view the manufacturer of technical solutions or hydration service providers must present at least a Level 1 Compliance Level interoperability solution with the SHAPES platform. In this sense an API is needed to transfer the collected fluid intake data to the SHAPES Platform. Then, the collected data will be aggregated and processed in the data analytics modules, and the results will

be presented to the user via eCare system / personal chatbot / safe digital assistant or other SHAPES components.

To ensure Level 1 Compliance Level for the interoperability with the SHAPES Platform the following connectivity requirements are preferred:

(1) D2S (device to server) communications over Wi-Fi, using technologies like HTTP REST, OAuth 2.0 and JSON formatted data.

  and/or:

(2) D2D (device to device) communications supporting device discovery, configuration and data exchange in a local LAN, using (a) Wi-Fi communication and/or (b) Bluetooth (or Bluetooth Low Energy (BLE)).

Other formats are also possible and can be discussed separately.

Additionally, technical support from the manufacturer of technical solutions or hydration service provider may be required during the execution of the SHAPES pilots.

Finally, the funding amount will cover all the technical adaptation works needed from the manufacturer to connect its system to the SHAPES platform and to provide at least 10 units of digital solutions and the corresponding licenses to be used during the pilots at the homes of the users during an expected time of 6 months.

SHAPES-OC1-Enablers-ST4: Smart Connectable for Health and Wellbeing

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Topic Summary

Purpose: Mobile and connected devices at an affordable cost are bringing numerous applications to various fields, including in health and wellbeing. In particular, devices capable of continuously measuring and sharing information may bring unprecedented and detailed insight and visibility enabling the application of advanced data analytics and artificial intelligence that, in turn, is expected to allow the prompt detection of abnormalities or incidents, identifying early signs of complications and even predicting the occurrence of serious decompensation episodes.

We are looking for connectable innovative devices that gather information relevant for determining the health and wellbeing condition, based on a person's health and wellbeing parameters. These devices can be worn by users (at all times), used at specific times or have a fixed installation. The devices should be easy-to-use, comfortable, affordable and highly automated.

Lead SHAPES partner: EDGENEERING LDA (EDGE)

Commitment: Applicants should make their platforms and their resources available for a demo during the SHAPES Pilot Themes 1, 2 and 3 trials (approx. August 2021 – April 2023).

Type of Applicants: Manufacturers of technical solutions capable of measuring parameters related with health and wellbeing of persons in home or care settings. Preferably, measurements should be performed in a continuous, automatic and non-obtrusive way (for example, via a wearable device). The manufacturer shall provide mechanisms (via an API or similar) allowing automatic secure data transfer, storage and processing in the SHAPES Technology Platform.

Funding: up to €50,000

The expected component is planned to be used in the pilot theme 1 "*Smart Living Environment for Healthy Ageing at Home*", in pilot theme 2 "Improving In-Home and Community-based Care" and in pilot theme 3 "*Medicine Control and Optimisation*". The aim is to provide automatic and non-obtrusive monitoring of measurements related with the health and wellbeing of its user.

Measurements of interest include: vital signs (temperature, blood pressure, heart rate and respiratory rate), oxygen saturation, blood glucose, physical activity, sleep quality and indoor and outdoor environmental parameters (particulate matter, gases, dust, pollution).

There is a special interest in innovative devices for measuring blood oxygen saturation.

All measurements shall be provided in time series.

For all involved pilot themes, the innovative devices are expected to be CE marked and provide information to the user's smartphone or tablet, running SHAPES components.

Technical partner	SHAPES Digital Solution	Task
EDGE	eCare	Smart ambient intelligence, health and wellness platform delivering remote monitoring of key health parameters of older individuals, including those with health problems needing periodic and/or permanent monitoring.
CH	Chatbot ROSA	The chatbot is a digital nurse that monitors users at home, communicating in natural language and chat ("how do you feel").
VICOM	Safe digital assistant	Friendly interaction mechanisms based on Automatic Speech Recognition & Natural Language Processing. Support the older people to remain independent and carry out with their daily activities at home.
TREE	DAPHNE	Uses information about anthropometrics, health markers, mental well-being, physical activity and nutritional data of the user and, using data processing and AI, creates personalised nutritional, activity and behavioural models, giving risks and recommendations for users and carers.
TREE, VICOM	Data analytics & predictive algorithms	Analysis of anomalies and alert generation based on the data gathered from the different sensors.

As monitoring of the key health and wellbeing parameters is essential, we are looking for devices allowing to cover requirements of pilot themes 1, 2 and 3.

In this sense, we are looking for solutions which could tackle the challenge described before. Solutions may target **one or more measurements**, as presented below.

| Technical partner	SHAPES Digital Solution	Task
External third party	Device allowing monitoring health and wellbeing related parameters of users.	**Vitals**: temperature, blood pressure, pulse or heart rate, breathing rate, oxygen saturation, blood glucose levels. **Frequency**: every minute
		Physical activity: number of steps, distance covered, type of exercise (e.g., resting, walking, running), intensity of activity. **Frequency**: every minute.

		Sleep quality: number of sleep hours, number of deep sleep hours, number of light sleep hours, number of naps, rest levels.
		Frequency: every minute.
		Air quality: temperature and humidity, smoke, presence of gases (e.g., CO, Radon, volatiles) or dangerous substances, coarse and fine particle levels (ppm). **Water quality**: pH level, salinity level, oxygen level, turbidity, conductance, hardness, chloride level, presence of dangerous chemicals.
		Frequency: every minute.

The following diagram illustrates the positioning of the third-party device with the applicable SHAPES solutions for personal and home use. The solution can be a wearable to be used at all times (thus collecting measurements in a continuous way), a device to be used when a measurement is to be taken (thus collecting measurements upon user request) or installed at fixed locations (thus collecting measurements in a continuous way).

The solutions shall send measurements to a smartphone (or table) and/or to the SHAPES platform (using Internet access or via the SHAPES gateway).

The data uploaded to the SHAPES Technology Platform will be aggregated and processed in the data analytics modules, and the results will be presented to the user via eCare system / personal chatbot / safe digital assistant.
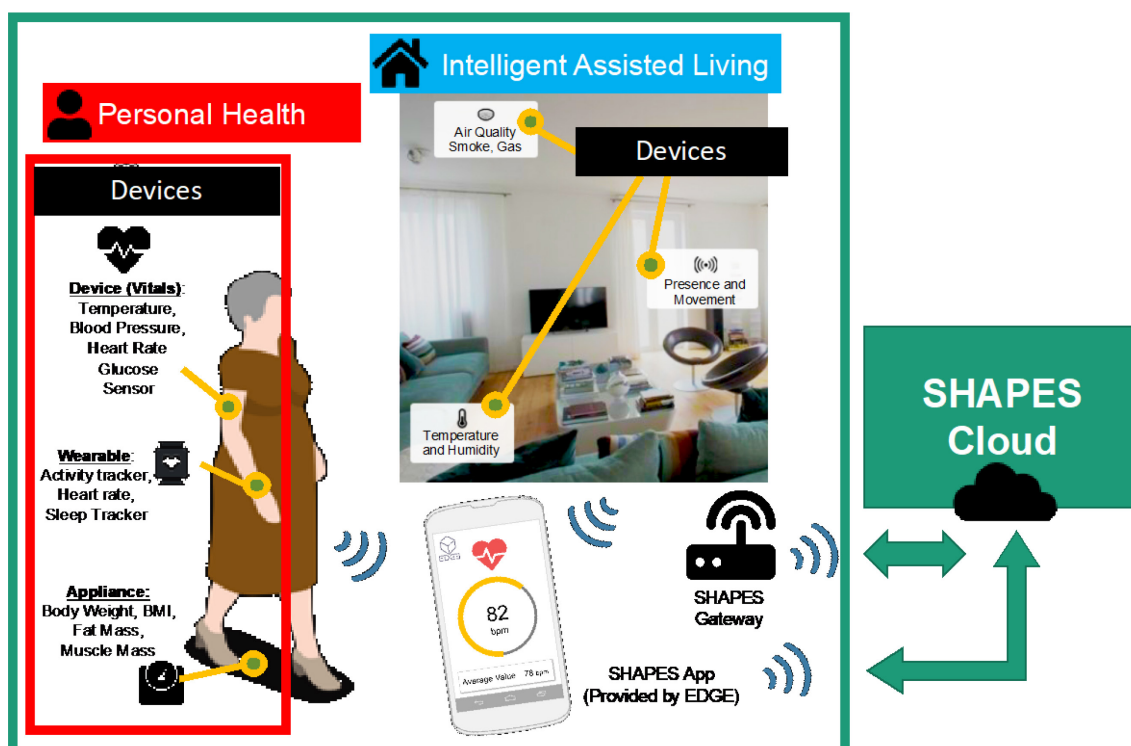
From the technical point of view the device manufacturer must provide at least a Level 1 Compliance Level interoperability solution with the SHAPES platform, via a SHAPES App or SHAPES Gateway. In this sense an API is needed to transfer the collected data.

To ensure Level 1 Compliance Level for the interoperability with the SHAPES Platform the following connectivity requirements are preferred:

(1)   D2S (device to server) communications over Wi-Fi, using technologies like HTTP REST,

OAuth 2.0 and JSON formatted data.

and/or:

(2) D2D (device to device) communications supporting device discovery, configuration and data exchange in a local LAN, using (a) Wi-Fi communication and/or (b) Bluetooth (or Bluetooth Low Energy (BLE)).

Other formats are also possible and can be discussed separately.

Additionally, technical support from the manufacturer may be required during the execution of the SHAPES pilots. Finally, the funding amount will cover all the technical adaptation works needed from the manufacturer to connect its system to the SHAPES platform and to provide at least 20 smart devices and the corresponding licenses to be used during the pilots at the homes of the users during an expected time of 12 months.

SHAPES-OC1-Enablers-ST5: Speech-enabled Chatbots

Topic Summary
Purpose: To provide a multilingual natural speech enabled chatbot service with vocabulary geared to Medical and Wellbeing applications with language translations options for the range of languages required for running SHAPES pilot trials.
Lead SHAPES partner: Fundacion Centro De Tecnologias de Interaccion Visual y Comunicaciones VICOMTECH (VICOM)
Commitment: Applicants should make their platforms and their resources available for a demo during the SHAPES Pilot Theme trials (February 2021 to April 2023, inclusive).
Type of Applicants: legal entities established in EU Member States. For details refer to the "Eligibility Criteria" document.
Funding: up to €50,000

Chatbots have emerged as one of the key aspects of this AI-driven customer service. The strong and growing interest in chatbots is driven by the promise of intelligent digital assistants always available to resolve customer requests cheaply, quickly and consistently. Chatbots are not intended to replace humans, but act as co-pilots. They have the potential to bridge the gap between brands and consumers in ways that no other tool has been able to do before - increasing automation and availability so humans can focus on multiple customers at once, leading to greater efficiency.

Due to the increasing popularity of the Virtual Assistants and due to their interesting applications within the medical domain, several members of the SHAPES consortium are interested in implementing these solutions in their own pilots and use cases, thus to relief human participants from common interactions with users, related to informing older persons about their health status and specify symptoms, reminding older persons to go to appointments or to stick to a medication plan, to motivate the user to engage in games and cognitive tasks or engage in social activities or to guide patients through a rehabilitation exercise. Such services need to be also geared to dealing with Medical Vocabularies and so Artificial Intelligence approaches prove to offer added advantage in such communications. Certainly, natural interfacing between human and machines (HMI) means inherent capability of voice-based communication.

The goal is to add a novel service to the SHAPES platform that would ease interactions between users and SHAPES services/applications using natural speech user interface. Multilingual interaction is an essential requirement for such a solution, such that to offer capabilities for SHAPES to operate across borders. As an added advantage voice transcription and speech synthesis options are expected to

ease also multilingual interaction among human actors as well.

These services should be consumed via HTTP REST API using a cloud-based service. Applicants should make their platforms and their resources available during the SHAPES Pilot Theme trials.

The list of SHAPES Digital Solutions expected to integrate results of such projects include:

Technical partner	SHAPES Digital Solution	Task
CH	Chatbot ROSA	The chatbot is a digital nurse that monitors users at home, communicating in natural language and chat ("how do you feel").
VICOM	Safe digital assistant	Friendly interaction mechanisms based on Automatic Speech Recognition & Natural Language Processing. Support the older people to remain independent and carry out with their daily activities at home.
FINT	FINoT	A smart IoT-based living platform that leverages on the smart neighborhood, smart community, and smart city paradigms to deliver relevant information on weather, air quality, pollution, local public works, local transportation, and local activities.
AELTD	Access Earth	Access Earth is a global platform that uses smart and crowd sourced data gathering methods to provide the world with details on the levels of accessibility local bars, restaurants, shops and other businesses have.
PAL	ARI TIAGo robots	ARI and TIAGo social robots will make use of natural language interaction in order to guide users through cognitive games, provide feedback, reminders, suggestions and to understand the different requests from the end-users.

The following requirements need to be met for technical validation:

Criteria	Description
Languages	The following list of languages is expected to be supported, in order of importance: German, Greek, Italian, Portuguese, Greek, Italian, and Czech
Delay - STT	The delay of the transcriptions' decoding should enable real-time communication with Voice Assistants in chat-style fashion.
HTTP REST API	The model functionalities can be accessed via an HTTP REST API
STT - Handle up to 50 concurrent petitions	The max peak usage of the STT service is estimated to be around 50 concurrent users, although usually will be lesser, the service needs to handle these number of petitions.
Supports sociosanitary domain terminology	As the STT model will be used in the sociosanitary domain, it is expected to handle the associated terminology. If this is not the case, the provided solution needs to handle Language Model adaptation so it can be fine-tuned to the required domain.

Language Model Adaptation	The Language Model of the STT module can be adjusted using the provided API to obtain better results with the terminology of the sociosanitary domain.
Dialogue Adaptation	The resulting Virtual Assistants/Chatbots need to be geared to deal with Medical Vocabularies and interactions scenarios of the SHAPES use cases.
Audio Format	The audio format that is needed to send to the model needs to be an open and well-known format which can be easily captured/encoded in the SHAPES front-ends (preferably .wav).
Delay - TTS	As the system will be used for Voice Assistants, it needs to synthesise text fast enough when it comes to short utterances (<=10 words).
Allows to cache content	The licensing needs to allow to store the output of the TTS module in the SHAPES servers and/or front-end devices to allow real-time consumption of long answers from the Digital Assistant. The stored audios will be only used within the scope of the SHAPES project.
Voice type	A female voice is preferred. Having both Male and Female voices is considered a plus.
Parameter Adaptation	If the voice can be adjusted via parametrization (speed, pitch, etc.) is considered a plus

Deliverables

Name	Description	Type
API documentation	Documentation on how to use the API of the STT and TTS services	Report
Language Model Adaptation guide	Documentation on how to adapt the Language Model of the STT module	Report

During the use and exploitation of the STT module, the following technical support will be required:

- Support at performing the communications using the provided API
- Support at adapting the Language Model of the STT service.
- Support at adjusting the parameters of the TTS service.
- Troubleshooting

Technical support may be required at any time over service period defined in a Commitment section.

Conditions of formal acceptance:

Req.	Name	Description
1	**Technical Viability**	The solution can be integrated in the Shapes platform and meets the technical requirements abovementioned.
2	**Usability**	The Word Error Rate of the STT module is low enough to allow an interactive communication with a Virtual Assistant

3	**Naturalness**	The synthesized voices should be natural enough not to break the immersion of the end-users.
4	**Delay**	The delay associated to the services is low enough to allow an interactive communication with a Virtual Assistant

To ensure the usability requirements a quality-testing will be performed using native speakers of the language to transcribe. If the achieved results are not satisfactory due to domain-specific terminology, another test round will be performed after adapting the LM according to the providers' instructions previous to decision.

SHAPES-OC1-Enablers-ST6: Social support in local community

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Topic Summary

Purpose: Many older adults have the wish to be actively involved in social activities in their local community. They wish to know what social events, happenings, sport activities are going to happen in the next period close to their place of living and if interested to express the interest to participate. These events can be organized by public organizations or private institutions and companies targeting the involvement of older adults who stay at home to fight loneliness. For these individuals, it needs to be ensured that they have easy access to suitable opportunities according to their interests as well as to get into contact and exchange with others.

We look for solutions which counteract loneliness of older individuals living at home by gathering and providing the required information that can be easily assessed and understood by them. This information may come from related databased, social media and local websites that publish these events and are maintained by organizations, institutions and companies. The information received by the older individual should referred to events that are close to his/her place of living and accessible by foot or short drive/usage of public transport.

Lead SHAPES partner: Future Intelligence Limited (FINT)

Commitment: Applicants should make their platforms and their resources available for a demo during the SHAPES Pilot Theme 2 trials (approx. August 2021 – April 2022)

Type of Applicants: we are looking for service provider who can offer the end user an easy opportunity to interact with the local community. We expect that the solution will be provided in a form of mobile application that can work on phones and tables and various operational systems (e.g. IOS, Android) and is built on state-of-the-art technologies. Moreover, an API or similar interoperability mechanism has to be provided in order to allow the automatic secure data transfer, storage and processing of related information in the SHAPES Technology Platform.

Funding: up to €50,000

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The expected component is planned to be used in the pilot theme 2 "Improving In-Home and Community-based Care" in the Use Case 2 "Supporting the interaction of the individual with the community". The UC-PT2-002 approaches older individuals who suffer from loneliness and wish to be actively involved in social activities in community.

The causes leading to loneliness can be very different and they change with age. Unfortunately, however, all people who suffer from loneliness for longer periods of time have one thing in common: their health, both physical and mental, suffers.

This use case aims to support the interaction of the older individual with the community. If older individuals are already somewhat distanced from their community and they don't take part in day-to-day activities within the community, they also don't necessarily hear about new developments or opportunities for engagement, sports, educational or cultural events.

It needs to be ensured that they have easy access to suitable opportunities and developments in the community, such as specialized transport services, and are actively informed about e.g. weather conditions that allow for exercise outdoors but also activities such as readings, bingo, exhibitions and other opportunities to engage in activities taking place in local communities.

Based on an initial survey, only activities that align with the hobbies and interests of the older individual are suggested. The (machine) learning system notices which kinds of information and events are clicked on / not read or listened to entirely. Also, relevant news items should be included in the platform - a balanced mix of articles and news must be provided that does not focus too much on negative developments.

The older individual should be reminded about activities that are taking place and informed on how to get there and what to bring. If interested in participating in an event requiring the purchase of a ticket, an official registration or any other type of formal or financial transaction, the user should have the possibility to express his/her interest and this will be forwarded to the informal caregiver or a predefined person in charge of the older individual's financial/ administrative tasks. This person can then book a ticket and enter the information in the system.

Subsystems listed in the UC-PT2-001 will be embedded in a tablet (or smartphone). Desired location and interfacing with other SHAPES subsystems and components in UC-PT2-002 is provided in the following table.

Technical partner	Subsystem component	Task
FINT	FINoT	A smart IoT-based living platform that leverages on the smart neighborhood, smart community, and smart city paradigms to deliver relevant information on weather, air quality, pollution, local public works, local transportation, and local activities.
OMN	DigiRoom	A web-based, no-install communication tool for e.g. the communication with their informal caregivers or family members/friends who are not close by/able to meet physically
VICOM	Safe digital assistant	Friendly interaction mechanisms based on Automatic Speech Recognition & Natural Language Processing. Support the older people to remain independent and carry out with their daily activities at home.
SciFy	Newsum	News summarization mobile app that automatically summarizes information from many sources and combines them in a single text. It gives you the main points of all the different information that you would get if you read all the articles from the sources you visit. With the use of artificial intelligence technology, news are summarized and all repeated information is not duplicated.
TREE	Data analytics	Analysis of data and result generation of most relevant information to the care receiver, based on the data gathered from the different sources.
AELTD	Access Earth	Access Earth is a global platform that uses smart and crowd sourced data gathering methods to provide the world with details on the levels of accessibility local bars, restaurants, shops and other businesses have.

The above listed subsystems of SHAPES give the end user the opportunity to inform oneself about the news and condition of the days (e.g. weather, transport options, events) and provide an easy access to have a chat with their loved ones and people in charge of care.

Besides that, we are looking for a subsystem that provides an easy access to get to know people in the local community. Although there are well-known social networks on the market (i.e. Facebook,

Instagram), we would to emphasize the attempt to find people near you who are interested in same topics like football or discussing book as well as fellow human beings who might be on the same page as you. Whether diagnosing illness, loneliness, the desire for a good conversation or a cup of coffee is a simple but fundamental need of many elderly people. In times of Covid-19, possibilities to get in contact with others significantly dropped. Thereby the load for informal caregiver significantly raised accordingly.

During the pandemic, the needs of older individuals became more visible. Volunteer who could do grocery shopping or picking some medicines are more and more important and are big relief for people in care and the care givers.

The aim of the UC-PT2-002 is to create more community, more connectedness, and a stronger exchange among people with physical and mental stress. In this sense, we are looking for solutions which are able to provide an easy access to interact with people in the local community.

Technical partner	Form of solution	Functionalities
External third party	Mobile/Web Application	Third party should provide some of these options: • search for people in near location • selection of topics/ interests • matchmaking to find like-minded people in local community • possibility to get in touch with people that user like to get to know • newsfeed that informs about like-minded users close to end user • newsfeed that informs about volunteers • newsfeed of local events based on the profile and interests of the older individual

UC-PT2-002 Architecture
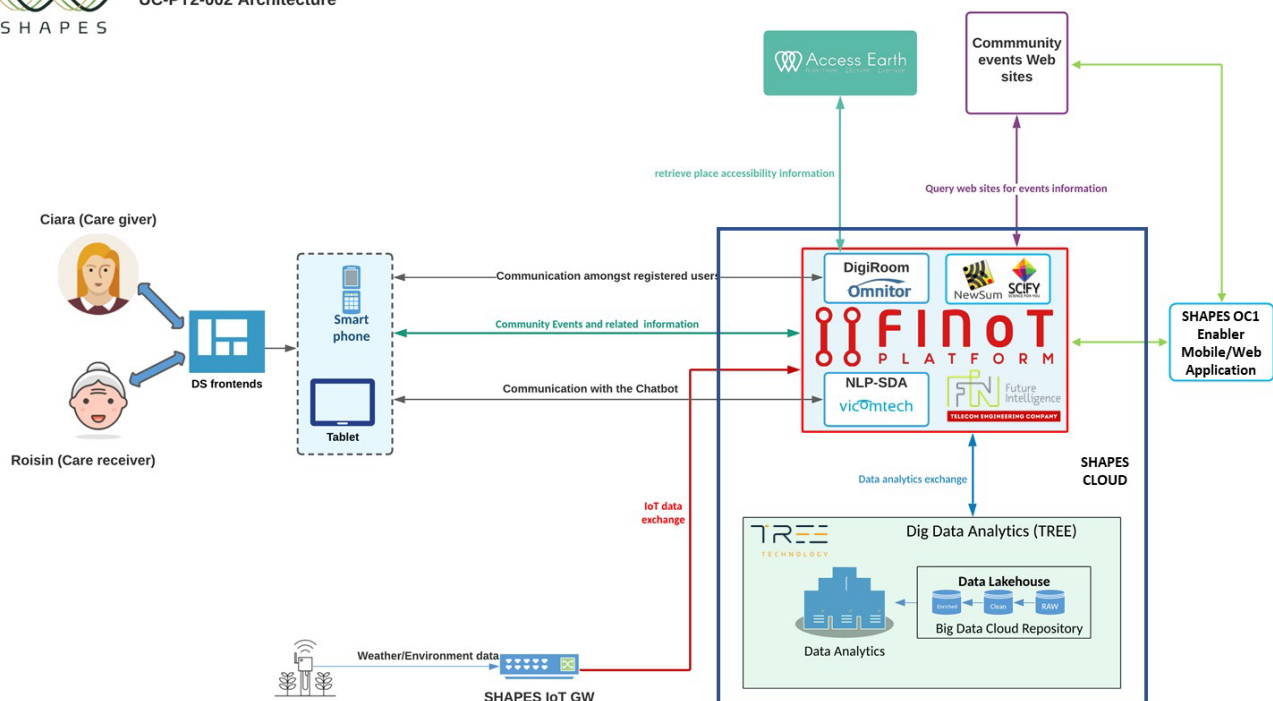
The diagram illustrates the positioning of the third-party mobile application with the applicable SHAPES solutions for enabling social support in local communities. The data uploaded to the SHAPES Technology Platform will be processed in the data analytics modules in order to understand which information is most related to a particular older individual and the results will be presented to the care receiver via a user friendly mobile application interface that will integrate the various information.

From the technical point of view the application provider must provide a solution fully interoperable with the SHAPES platform. In this sense an API is needed to transfer the collected information. The expected technologies include HTTP REST, OAuth 2.0 and JSON formatted data. Other ways of communication and exchange of data are also possible and can be discussed separately. Additionally, technical support from the manufacturer may be required during the execution of the SHAPES pilots. Finally, the funding amount will cover all the technical adaptation works needed from the developer to connect its system to the SHAPES platform. The following requirements need to be met for technical validation:

Criteria	Description
Community Events supported Languages	The Application must be able to discover and get community events from sites using various languages. The following list of languages is expected to be supported, in order of importance, for discovering the community events: German, Portuguese, Greek, Italian, and Czech
Authentication/Authoris ation (AA)	The application must be compatible with the SHAPES AA scheme.
HTTP REST API	The Application's services functionalities can be accessed via an HTTP REST API
Deployment	The application shall be in containerised (docker) form and accompanied with a Kubernetes deployment yaml file
Event Recommendation service	The application shall provide an event recommendation service based on the user's preferences and history.

Deliverables

Name	Description	Type
API documentation	Documentation on how to use the Applications services	Report
Dockerised Application	The dockerised application image	Binary package
Deployment file	The Kubernetes deployment yaml file	Yaml file
Event Recommendation model	The trained event recommendation model	Text or binary file

Application module, the following technical support will be required:
- Support at performing the communications using the provided API
- Support at adapting Recommendation Model (RM) of Applications event recommendation service.
- Troubleshooting

Technical support may be required at any time over service period defined in a Commitment section.

Conditions of formal acceptance:

Req.	Name	Description
1	Technical Viability	The solution can be integrated in the Shapes platform and meets the technical requirements abovementioned.
2	Delay	The delay associated to the consumption of the Application's services from the users' front-end application is low enough (does not degrade the overall user experience)

To ensure the usability requirements a quality-testing will be performed using community members. If the recommended events are not satisfactory due to being no relevant with the user's preferences and or history, another test round will be performed after adapting the RM according to the providers' instructions previous to decision.

SHAPES-OC1-Enablers-ST7: Open Topic

Topic Summary
Purpose: Novel solutions extending functionalities of the SHAPES platform, being either interfaces to IoT platforms and IoT/Medical devices, Digital Solutions adding and/or extending existing capabilities of the SHAPES platform etc.
Lead SHAPES partner: Intracom Telecom (ICOM)
Commitment: Applicants should make their platforms and their resources available for a demo during the SHAPES Pilot Theme trials – refer to "*D6.1 SHAPES Pan-European Pilot Campaign Plan*" deliverable.
Type of Applicants: legal entities established in EU Member States. For details refer to the "Eligibility Criteria" document.
Funding: up to €50,000 per Extension

The "Open Topic" offers opportunity for applicants to suggest innovative solutions extending current capabilities of the SHPES platform, for example:

- Integration of new types of Medical Devices (e.g., health sensors) and/or IoT devices (e.g., smart home sensors) offering added value to existing and future range of Digital Solutions, Pilot Themes and medical domains.

- Integration of 3rd-party IoT platforms into SHAPES

- New types of Digital Solutions targeting new types of medical applications

The list of SHAPES Digital Solutions expected to integrate results of such projects include:

Technical partner	SHAPES Digital Solution	Task
ICOM	SymbIoTe IoT interoperability Platform	SymbIoTe (symbiosis of smart objects across IoT environments) comes to resolve a problem of fragmentation of IoT market, whereby a series of vertical solutions exist today which, on the one hand, integrate connected objects within local environments using purpose-specific implementations and, on the other hand, connect smart spaces with a back-end cloud hosting dedicated often proprietary software components. To remedy this, SymbIoTe offers an abstraction layer for a "unified view" on various platforms and their resources so that platform resources are transparent to application designers and developers, in SHAPES extended to medical applications.

Support for new IoT devices and platforms will be expected to support SymbIoTe interoperability mechanisms. For more technical information about SymbIoTe platform refer to the GitHub repository at https://github.com/symbiote-h2020. New Digital Solutions are expected to be integrated into one or more of the existing SHAPES Digital Solutions. For more information refer to "*D5.2 SHAPES Digital Solutions*" deliverable. Special attention is paid to solutions supporting fight with COVID-19 outbreak.

References:

1. SHAPES project WEB portal: https://shapes2020.eu/
2. SHAPES Pilot Themes and Use Cases: https://shapes2020.eu/about-shapes/pilots/
3. SHAPES deliverable D3.7 "*Draft User Requirements for the SHAPES Platform V1*"
4. SHAPES deliverable D5.2 "*SHAPES Digital Solutions V.1*"
5. SHAPES deliverable D6.1 "*SHAPES Pan-European Pilot Campaign Plan*"
6. SymbIoTe project WEB portal: https://www.symbiote-h2020.eu/
7. SymbIoTe GitHub repository: https://github.com/symbiote-h2020