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Deliverable D1.2

Report on business drivers and barriers of IoT interoperability and value added services

Work Package:	**WP1 – VICINITY concept Requirements, Barriers, Specification and Architecture**
Task(s):	**T1.1 – Elicitation of user requirements and barriers related to IoT interoperability**
Lead Beneficiary:	**ATOS**
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[1] ***Deliverable Type:***
R: Document, report (excluding the periodic and final reports)
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DEC: Websites, patents filing, press & media actions, videos, etc.
OTHER: Software, technical diagram, etc.

[2] ***Dissemination level:***
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List of Definitions & Abbreviations

Abbreviation	Definition
AIOTI	Alliance for Internet of Things Innovation
AMI	Advanced Metering Infrastructure
API	Application Programming Interface
BM	Building Management
BMS	Building Management System
CIP	Common Industrial Protocol
COAP	Constrained Application Protocol
DDoS	Distributed Denial of Service
DER	Distributed Energy Resources
DNA	Deoxyribonucleic acid
DoA	Description of Action
DSM	Digital Single Market
EC	European Commission
EU	European Union
EV	Electric Vehicle
FTC	Federal Trade Commission
GDPR	European General Data Protection Regulation
GSN	Global Sensor Network
HTTP	HyperText Transfer Protocol
HVAC	Heating, ventilation and air conditioning
ICT	Information and Communications Technology
IdP	Entities Impacted by the Project
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IoT	Internet of Things
IIoT	Industrial Internet of Things
ImP	Entities Impacting the project
IP	Internet Protocol
ISO	International Organization for Standardization
ITIL	Information Technology Information Library

JSON	JavaScript Object Notation
M2M	Machine-to-Machine
MQTT	Message Queue Telemetry Transport protocol
OASIS	Organization for the Advancement of Structured Information Standards
ODVA	Open DeviceNet Vendors Association
OGC	Open Geospatial Consortium
OM	Opinion Makers
RES	Renewable Energy Systems
REST	Representational State Transfer protocol
ROI	Return of Investment
SoA	Service Oriented Architecture
SoC	System on a chip
SotA	State of the Art
SUMO	Suggested Upper Merged Ontology
UCD	User-centred design
VIN	Vehicle Identification Number
VC	Venture Capital Company
WAN	Wide Area Network
WP	Work Package
WP1	Requirements capture Framework
WP2	Standardization Analysis and VICINITY platform conformity
WP3	VICINITY Server Implementation
WP4	VICINITY Client Infrastructures Implementation
WP5	Value-Added Services Implementation
WP6	VICINITY Framework Integration & Lab Testing
WP7	On-site Deployment and Pilot Installations
WP8	Pilot Demonstration and Overall Evaluation
WSN	Wireless Sensor Network
XML	Extensible Mark-up Language

1. Executive Summary

This report is a deliverable of the VICINITY [1] project, funded by the European Commission's Directorate-General for Research and Innovation (DG RTD), under its Horizon 2020 Research and Innovation Programme (H2020).

This deliverable reports on the elicitation, collection and analysis of business drivers and barriers to IoT interoperability. For this process, a survey and questionnaire approach has been used to interact with stakeholders, the results of which allowed the extraction of the key information and which was consolidated and analysed afterwards.

The results of this process show that stakeholders perceive the main strengths in VICINITY systems are in the integration of various standards and protocols, allowing innovation and offering a product which will be efficient, time and cost saving and which will minimize environmental impact and provide better quality of life.

The main barriers or inhibitors identified are: resistance to change from market players with existing products; loss of privacy and security; and compatibility and complexity of the potential solution developed.

The main results of this process are as follows:

- **Cross domain data-driven services offered to B2C and B2B end-users.** In field of energy consumption stakeholders identified the need for Demand Side Management (DSM) including Renewable Energy Sources (RES) and innovative energy storages (see 5.1 and 5.2). Cross-domain benefits were identified in buildings environment where health assistance services (see 5.1 and 5.4) and advanced parking services could together take account of driver profiles to give priority to patients or cares (see 5.3 and 5.4);
- **Interoperability in IoT opens potential to use clean energy and further optimization of resources.** Understanding how energy and resources (energy, water, heat, rooms occupancy, parking space) are produced and consumed or used creates potential for dynamic pricing, better invoicing and optimal usage or resources (see 5.1, 5.2, 5.3 and 5.4);
- **Data related issues at the data management level are on the forefront of the stakeholders' minds.** It is recognised that data ownership and regulation are the starting points for smooth interoperable services delivery (see 5.2 and 5.6).
- **Consumers are concerned about potential loss of privacy, security, service complexity and intrusion into their daily life** (see 5.4, 5.5 and 5.6). Consumers have concerns regarding "big brother" phenomena (mostly elder people in health assistance) or collection of aggregated information (mostly employees in commercial buildings). Moreover, end-users prefer simple, easy-to-use services and devices which hide the complexity of the scenarios (see 5.3).
- **Regulatory compliance, bureaucratic obstacles and invisible barriers of institutions integration.** These topics have great importance if the infrastructure is to be made interoperable both within and across domains. Technical challenges were identified especially in transport, energy and health domains (see 5.2, 5.6).

These are key aspects to be considered in the development, testing and deployment of the VICINITY neighbourhood.

2. Introduction

IoT ecosystems generate data that can be harvested to provide novel commercial services, or services for the benefit of society. This review was designed to identify benefits and issues relating to data sharing both within a single domain and across domains.

According to the Project Proposal Document this Deliverable will cover

"…the engagement of stakeholder communities exploiting their relationships with end-user communities. The outcome of the task will be documented in D1.2 - Report on business drivers and barriers of IoT interoperability and value added services. Preliminary versions of the report will be refined and validated at consultations with the panel of stakeholders. These requirements review activities will not be restricted to prospective users of the VICINITY technologies but will also involve experts capable of providing insights on IoT platforms as well as legal, societal and ethical issues."

This deliverable therefore reports on 'the business drivers and barriers of IoT interoperability and value added services' from the perspectives of the project partners and users and from the results of contacting different external stakeholders through meetings, surveys and questionnaires.

Generally, for example in telecommunications, '**interoperability**' means that devices from different manufacturers may communicate with each other using a common protocol, but in the context of VICINITY, **interoperability** is the ability of a system or a product to work with other systems or products without special effort on the part of the customer.

2.1. Relation to other Tasks and Deliverables

During the first phase of VICINITY (WP1 and WP2), the aim is to establish as early as possible the main foundation for the project on which the rest of the project will be based.

The requirements extracted and analysed in WP1 – VICINITY concept Requirements, Barriers, Specification and Architecture, along with WP2- Standardization Analysis and VICINITY Platform Conformity, will provide the basis upon which the detailed system architectural framework will be:

- **Built** (WP3 - VICINITY Server Implementation, WP4 - VICINITY Client Infrastructures Implementation and WP5 Value-Added Services Implementation);
- **Tested** (WP6 - VICINITY Framework Integration & Lab Testing); and
- **Deployed** (WP7 - On-site Deployment and Pilot Installations) for final
- **Demonstration** (WP8 - Pilot Demonstration and Overall Evaluation).

2.2. Deliverable Structure

The results of the work performed for the deliverable is organized in the following chapters:

Chapter 2 – Introduction summarises the purpose of this document and its relation with other VICINITY tasks and deliverables.

Chapter 3 – Background details the research objectives and how they were met.

Chapter 4 – Methodology describes how the stakeholders were: selected; surveyed; and how the data collected was analysed.

Chapter 5 – Barriers and drivers presents the results obtained. These are grouped in vertical domains (energy, health, transport and building) and horizontal domains (legal & ethics, security & privacy and technical domain).

Chapter 6 – Conclusions details the deductions resulting from this deliverable.

Annexes – The annexes includes the VICINITY questionnaires (for interviews and on-line surveys) as used for the activity and the consolidation of answers received from interviewees.

3. Background

Requirement elicitation process is the first phase of the project and the results of this will directly influence the outcome of the project. Collection, analysis and requirement maintenance within the VICINITY is thoroughly covered by the deliverable D1.1 "VICINITY Requirement Capture Framework" [2]. This describes the type of requirements and the means to collect, analyse and maintain them, whereas, this document focuses only on elicitation, collection, analysis of business drivers and barriers using a survey and questionnaire approach.

3.1. Introduction to survey and questionnaire research

The business, user and system requirements shape the behaviour and characteristics of the resulting solution. This solution should fulfil business requirements (such as the business objectives, scope of the project and sponsor point of view) at the higher level whilst system requirements (to provide functionality with certain quality) are at lower level of the standard OSI model. On top of these requirements are drivers and barriers which can accelerate or inhibit the adoption of the particular solution. Identifying such drivers and barriers is the objective of the research described in this document. The research focuses on the domains: buildings, energy, transport and health; and cross-domain themes such as security & privacy, legal & ethics and the technical field.

3.2. Research objectives

The survey and related questionnaire were designed to gather stakeholders' opinion in a common and structured way. The partners, involved in the requirement capture process, used these questionnaires as guidelines for interacting with stakeholders in the requirement capture process. The stakeholders were not intended to provide immediate answers to the questions but to initiate a discussion on the relevant topic where they could freely express their opinions. The answers to the questions were filled in by the partner organizing the interactions with stakeholders as a summary of the discussion on the topic.

Questions focused on validating: VICINITY objectives and concepts planned VICINITY pilots, envisioned products of the VICINITY project; and to identify any existing state-of-the-art solutions. The questions were grouped in on separate pages (Excel tabs) entitled: 'buildings', 'energy', 'health', 'transportation', 'security & privacy', 'legal & ethics' and 'technology'. Questionnaires were filled-out during workshops with stakeholders, informal meetings or common project meetings. The answers collected were collated per questionnaire groups (e.g. buildings technical, legal & ethics, etc.). Drivers and barriers were then extracted summarized in Chapter 5.

4. Methodology

This chapter details the activities performed to carry out the research for this Deliverable, with details of how they were conducted such as: online, paper, telephone survey, or talking to people face-to-face (F2F). In addition, details are given of how many people participated, response rates, and the time it took to conduct this research.

4.1. Stakeholders selection

A list of relevant stakeholders was collected but for privacy reasons this is kept separately from this report.

4.2. Survey Methodology

Workshops and/or F2F meetings were organised in order to present VICINITY to potential stakeholders, make them aware of VICINITY use cases and to let them present their relevant use-cases related to buildings, energy, transport, eHealth, etc. VICINITY partners contributed to the design of the Questionnaire. This formed the basis for collecting information and ideas from stakeholders. The detailed view of the resulting questionnaire as the main tool to conduct this survey with stakeholders can be found in the Annex I.

The interviewer wrote the answers and distributed it to the respondents after the meeting. A lot of respondents would not permit their name to be published in this report, but would allow their names to be available to the Project partners and the European Commission.

The detailed description of the methodology is available in VICINITY's deliverable VICINITY_D1.1_Requirements capture Framework_v1.0 [2].

4.3. Analysis Methodology

The team leaders for each domain (Buildings, Energy, Transport, eHealth, Security …) extracted from the results general conclusions for their specific domain. These conclusions identified barriers and drivers for the domain (along with any cross-domain barriers and drivers, if any).

From there, the information was consolidated and contrasted with some existing surveys and information (See references in each domain). This information led to the extraction of the final barriers and drivers presented in this report which should be used in further steps of the project such as development, test, deployment and demonstration.

4.4. General classification of stakeholders interviewed

Figure 1 Quantity of Stakeholders selected for interviews shows the amount of stakeholders per type of organization they are working for represent.

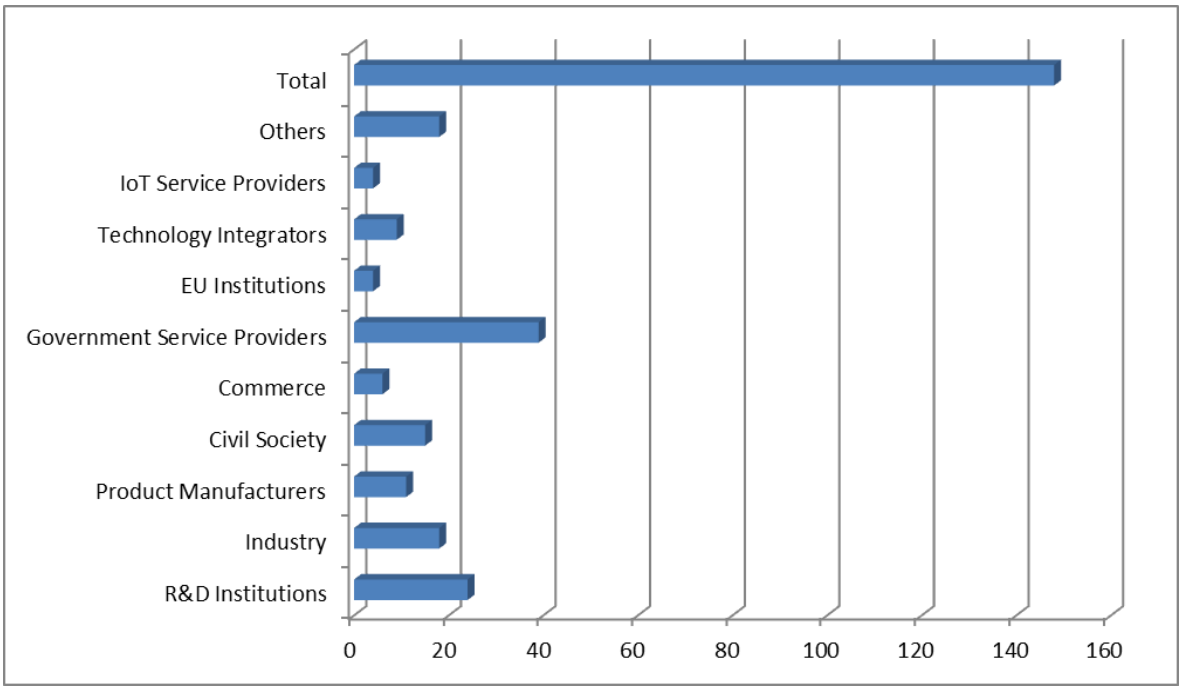

Figure 1 Quantity of Stakeholders selected for interviews

Figure 2 Stakeholders grouped per Domain details the classification of the selected stakeholders per domain of responsibility.

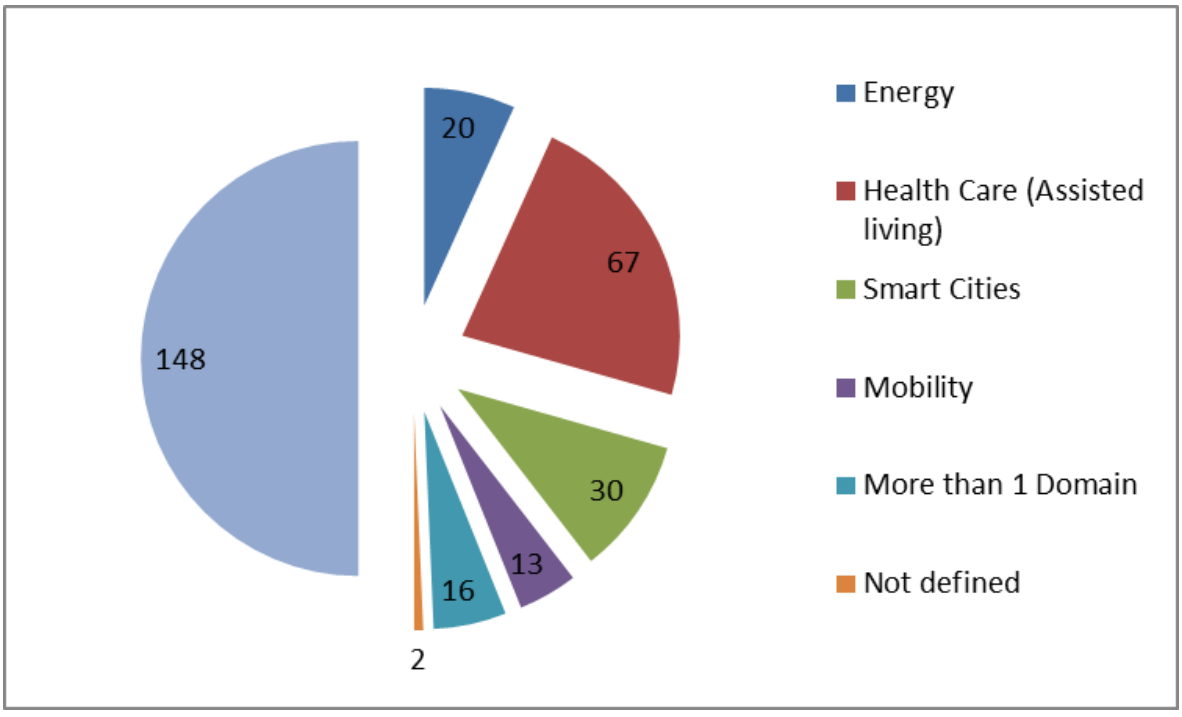

Figure 2 Stakeholders grouped per Domain

Figure 3 Relation with the VICINITY project shows stakeholders' expectations (according to the impact of the answers provided by them) with the results of the VICINITY project or how the project might impact them.

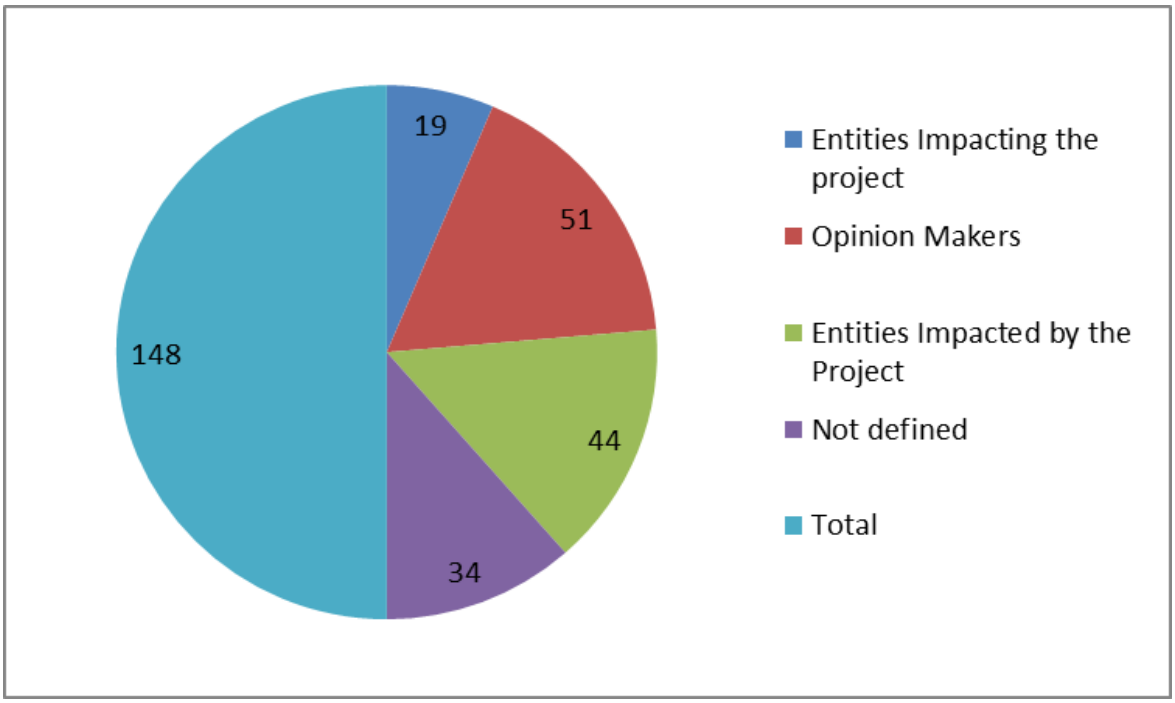

Figure 3 Relation with the VICINITY project

Figure 4 Type of organization vs. Impact on VICINITY shows stakeholders' relationship between the stakeholder's organizational type of organization together with their expected impact of the VICINITY project.

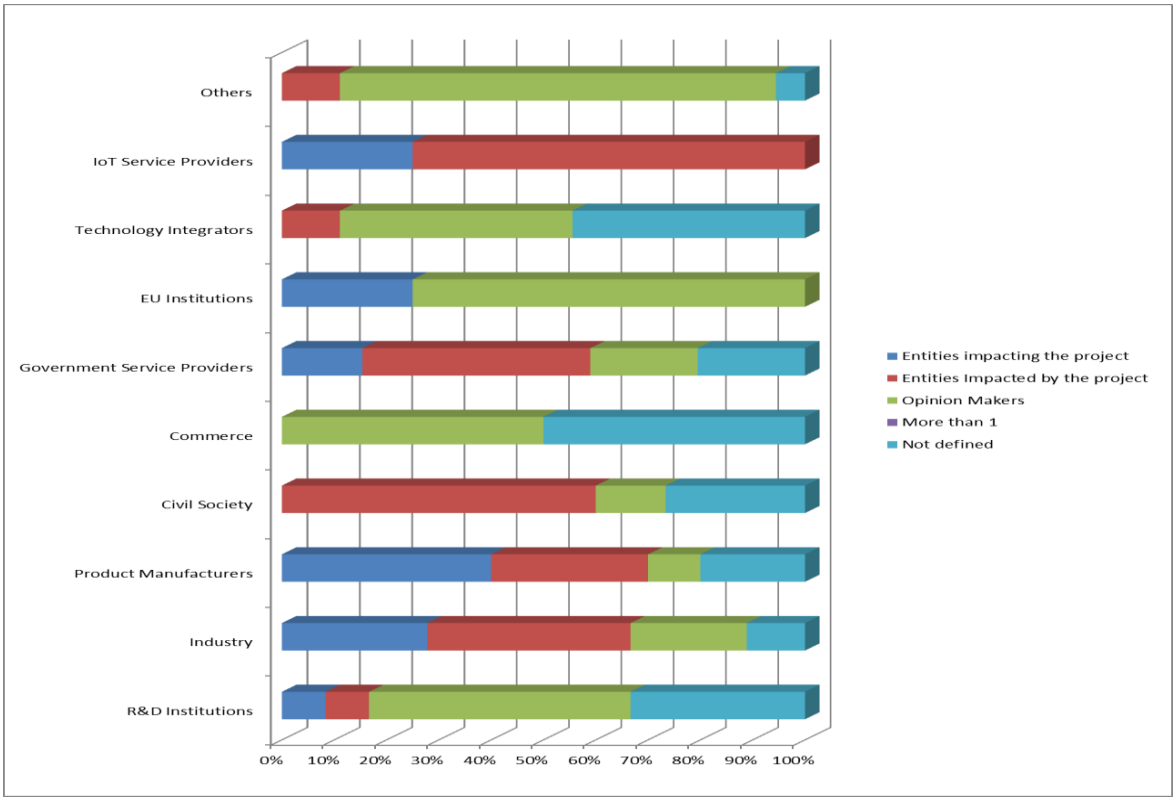

Figure 4 Type of organization vs. Impact on VICINITY

Figure *5 Type of organization vs.* Domain shows the number of stakeholders with an organizational classification along with their relationship to VICINITY Domains. This gives an indication of the stakeholders' organization and their domain of expertise.

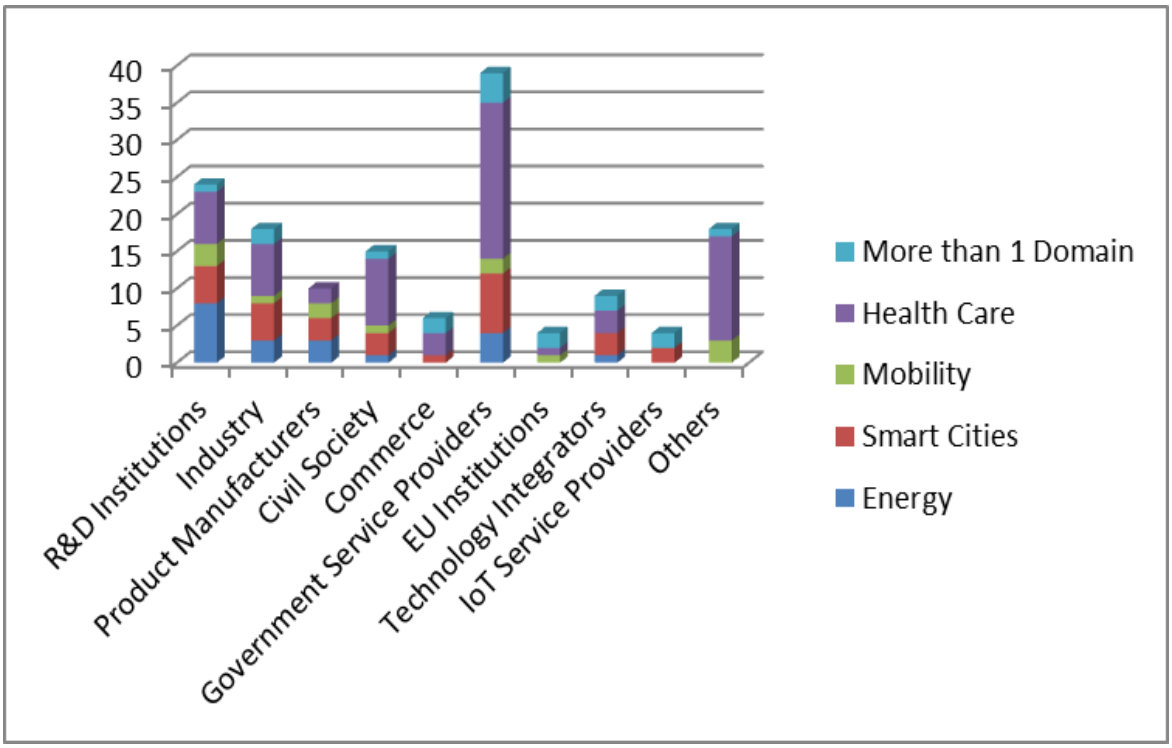

Figure 5 Type of organization vs. Domain

Figure 6 Questions per Domain shows the quantity of questions provided for each of the domains included in the Questionnaire.

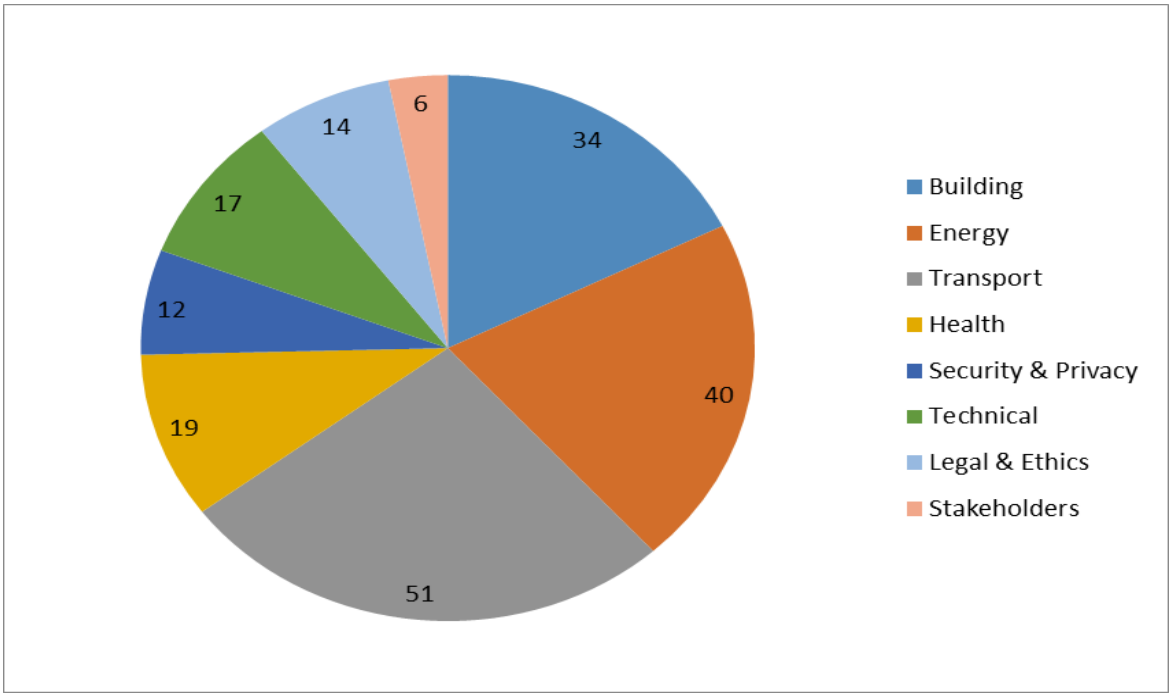

Figure 6 Questions per Domain

Following figures shows the detail for those domains (Buildings, Energy, and Transport) that included sub-domains questions.

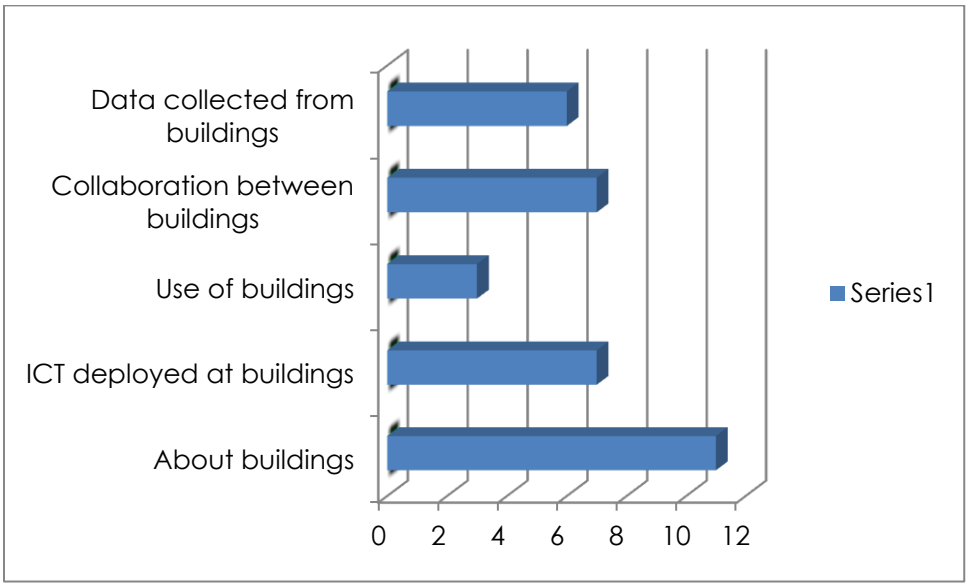

Figure 7 Building sub-domains

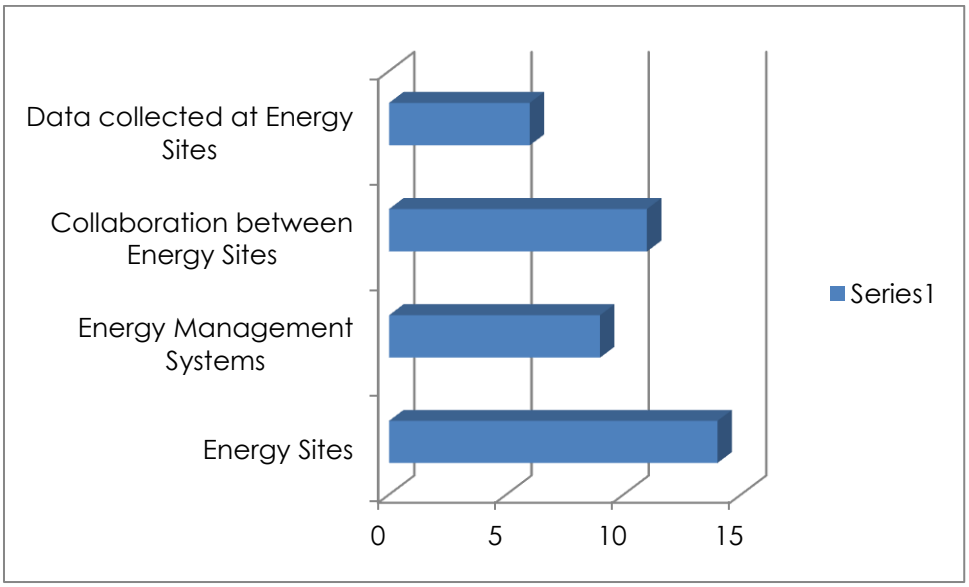

Figure 8 Energy sub-domain

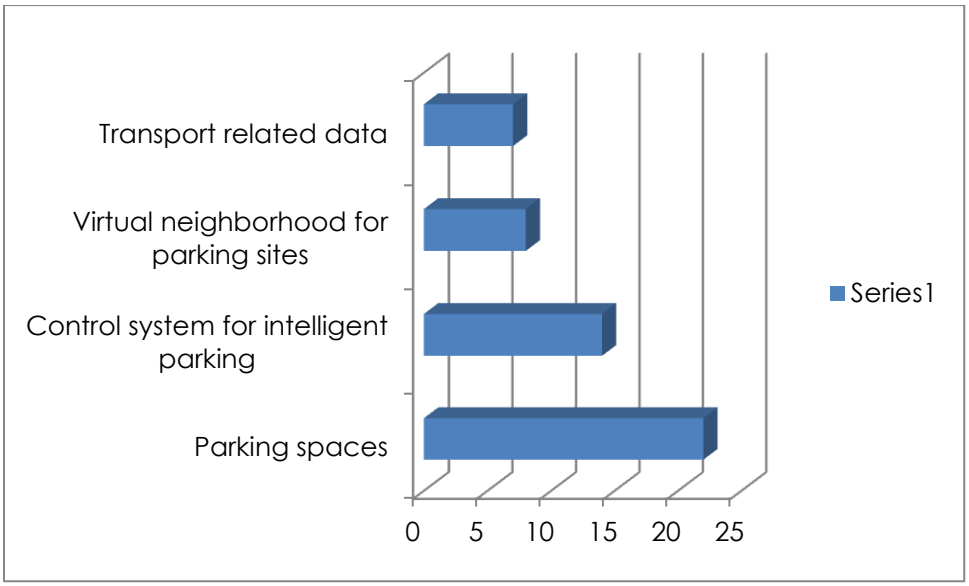

Figure 9 Transport sub-domain

The last figure of these series shows the amount of answers received vs. the questions that haven't received any answer.

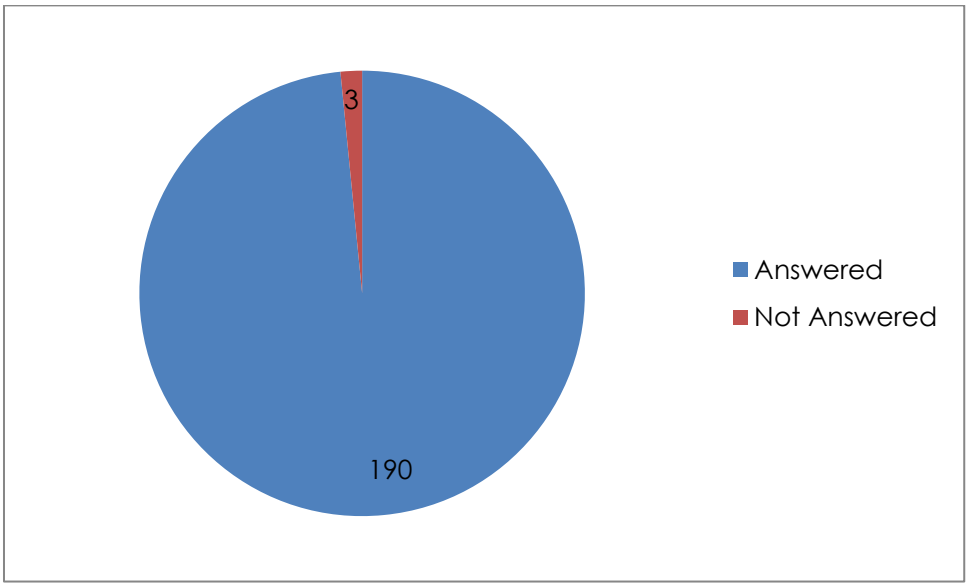

Figure 10 Questions answered

5. Barriers and Drivers

According to the Project Proposal, the VICINITY virtual neighbourhood is expected to be efficient, time saving, minimizing environmental impact, yielding cost savings and as result, provide better quality of life.

At this stage of VICINITY project development, stakeholders have perceived its strengths as follows: "Allowing rapid innovation across a broad range of services by integration of standards and protocols and interoperability".

Among weaknesses, 'resistance to change' can be expected from strong market players with existing proprietary products. On consumer side, potential loss of privacy and security, compatibility, complexity and legislation are voiced as potential weaknesses.

These strengths and weaknesses, as they are identified from stakeholders' interactions, are also considered to be "drivers and barriers". These are analysed in the following sections according to the vertical domains as: 'energy', 'health', 'transport' (mobility) and 'buildings' and horizontal domains as: 'legal & ethics', 'security' & 'privacy' and 'technical'.

5.1. Building domain

Buildings are some of the most expensive assets to operate and maintain used in our cities and urban centres. It was found that building owners and managers see economic value through a potential improvement in efficient usage of resources and optimization of building maintenance as facilitated by IoT and VICINITY. Building efficiency includes not only how and when the resources are used but also how many users need the same resource within the buildings neighbourhood. A recently conducted study in collaboration with Statsbygg, the Norwegian State Property owner, reports that a standard university-building has an average energy cost optimization potential of about 15 – 20 % of the total energy cost [3]. However a lack of visualisation of consumption of resources and lack of accountability prevents these savings to be made. IoT gives the property-owner a high resolution multichannel information-window, making possible to optimize the use of considerable resources inside the building as well as between buildings (cross assets) within a neighbourhood both virtually and physically.

Building owners raised concerns regarding ethical issues arising from the potential monitoring of building users' activities even when based on aggregated data. These issues are covered in detail by 'legal & ethics' domain.

VICINITY-B&D-BLD01	**Building energy efficiency as key business driver for IoT**
The building owners and managers interviewed see future interoperable IoT as a tool allowing them to measure properties of buildings' performance automatically and seamlessly. For example, this would allow them to monitor the spend on resources usually provided by different utility distributors such as electrical energy, water, gas, heating; or measure the quality of the environment in each room owned by different owners or tenants through CO2, NO, humidity and temperature measurements. Building owners also anticipate positive advantageous spill-over effects to tenants. For example, tenants would also be able to monitor and spend utility resources in more measured and responsible manner, to respond better to dynamic utility pricing and to identify whether energy in the building is spent efficiently. Building owners managing a large portfolio of built assets see the potential to optimize their maintenance activities in small repetitive tasks that could be signalled periodically and would be recorded and visualised, ready to be shared with outsourced service providers.	

VICINITY-B&D-BLD02	**The potential for cross-domain synergies**
Interoperability in IoT enabled facilities could allow the reuse of information across various domains, most notably between building – energy – parking domains. For example, Electric Vehicle (EV) charging can be used for energy demand and response management to smooth out positive and negative peaks in the electrical energy consumption of buildings, and so reduce the demand on the energy sector. Another example would be to utilize the thermal inertia of buildings by automatic load-shedding when needed by energy utilities. In addition to the above, buildings may be linked to health. For example, they may facilitate the monitoring of the behaviour of senior citizens, patients or people with disabilities. The resultant profiles could be used to identify the onset of particular disease symptoms or deviation from an existing treatment plan, and to identify any adverse qualities in their living environment. Moreover, IoT systems installed in buildings have great potential to function as communication backbones for other IoT domains. Sensor units and gateways used for collecting building data could double as data routers and gateways. Equipment such as safety alarms may contribute to both communication and safety.	

VICINITY-B&D-BLD03	**Monitoring of people behaviour and intrusion into daily life**
The building owners' major concerns in IoT deployments are the ethical issues of collecting building data and using this to deduce information about people's behaviour. For example, from the levels of CO2 and room-use efficiency, it is possible to derive the number of persons in the room. Aggregation of data may help to reduce the risk to individuals but the risk of intrusion by hackers may remain an issue for some individuals. Such concerns are also important for commercial environments when aggregated data are used to measure usage of meeting rooms or occupancy assigned offices. The type of data collected has strong impact on the degree of intrusion: CO2 or temperature sensors would be less intrusive than cameras or microphones. Moreover, how the data is collected, stored and treated after collection is also of great importance. The type of data will influence the necessary degree of anonymization, access control and encryption. For example, personal health data is more sensitive than temperature data from buildings, and would thus require added security. These are issues raised by stakeholders that need to be considered in the VICINITY implementation.	

VICINITY-B&D-BLD04	**Interoperability to deal with complexity**
Operations managers have partial experience with Building Management Systems (BMS) installation and components of RES production in various areas. Although they have a vision of interconnected systems, they lack practical experience in BMS and the related technological solutions. There is low penetration of such technologies on public buildings level. The stakeholders did not identify clear paths as to investment strategies and choices of technologies. Nevertheless, seamless interoperability of system components and merging of data from multiple systems could yield efficiency gains in daily and long-term operations. For example, system operators have communicated frustration over having to log into and check multiple (more than ten in some cases) systems daily to get the HVAC status for the buildings they manage. System interoperability holds great potential to reduce the workload by aggregating and presenting data from a range of systems in a common database or dashboard. This approach would make it easier to draw general conclusions about operations and maintenance across multiple buildings or building domains and devise strategies for future operations, retrofitting and new systems solutions. Moreover, correlations and statistics employed on data from multiple domains would facilitate resource optimization beyond building or system level.	

VICINITY-B&D-BLD05	**Incentives to share buildings' data**
Building owners and/or managers need to be incentivised to share building capabilities such as e.g. energy consumption, peak loads, load management options, parking spaces or EV charging availability with other owners/managers. The stakeholders identified a few aspects that they would consider relevant incentives. The main feedback was the prospect of improving maintenance operations, offering better and more flexible and dynamic conditions for tenants along with coordination and cost reduction across many facilities under management. Direct economic profits resulting from the cooperation would be considered a valuable incentive according to the respondents both on public and private facilities management level. One of the stakeholders brought up the idea of friendly competition between neighbouring buildings to be considered the most energy efficient on a daily basis to incentivize improved operations. In summary, the most attractive incentives identified are those with cost optimisation potential and/or direct impact on the bottom line. Greater coordination efforts between clusters of buildings and facilities to e.g. reduce peak loads and/or improve the utilization of locally produced energy (such as roof-top photovoltaic systems) would yield cost reduction, thus implicitly larger profits.	

VICINITY-B&D-BLD06	**Shared data and collaboration vision**
The majority of respondents have indicated that they would be interested in sharing some data within a neighbourhood with other market actors as well as share medical and behaviour sensor data with municipality care centre for elderly and people with disabilities. These could include, but are not limited to, energy load control options, parking space, medical care options as well as spaces sharing or renting out spare area when the load on the premises is limited. By utilizing the flexibility in demand for parking, load-shedding or building capacity, cost reduction or increased value generation could be achieved without increasing the total pool of resources utilised and deployed for delivery of such services.	

VICINITY-B&D-BLD07	Buildings: expected impact
Lack of systematic data capture and missing tools for handling such complex data structures has been a general problem for building owners and users. IoT is expected to change this situation, although as yet it lacks a clearly understood and communicated roadmap. Data collection processes with high spatial and temporal resolution at very affordable prices are the desired outcome. Big Data analytic approaches are applicable to environmental and energy management, although they are at early stages of development in both public and private sectors. These implementations are important from not only from a costs management perspective but also from an environmental and climate perspective. 40% of our energy consumption is related to buildings in the overall balance[1]. Availability of IoT based tools with simple management would change how facility management as a service would be delivered. Dynamic systems are expected to replace legacy systems.	

5.2. Energy domain

Overall, in the conducted interviews, stakeholders expressed high expectations about the potential impact of the IoT in the Energy sector. This indicates high strategical value of the subject matter and shows that it is transversally relevant for most of the energy sector domains.

IoT overall and VICINITY as one of the particular solutions is expected to help in achieving RES energy penetration targets, energy efficiency goals and decarbonisation of economies on the high level, while increasing visibility of processes and improving quality of data resulting in higher quality of services. The Energy ecosystem approach on the municipal level adapted by VICINITY is expected to facilitate data sharing and visualisation of impact on various stakeholder entities.

Data and all the ramifications of its use are the core of concerns and challenges. The consumer, both at the B2B and B2C approach is the centre of systems requirements and design and at core of adaptation success criteria.

VICINITY-B&D- ENR01	Novel data-driven cross domain B2B and B2C energy services
Open end assessment of strategic opportunities in order to identify areas relevant for business cases quickly reveals many drivers and high hopes related to the impact of the IoT in the Energy sector as well as the magnitude of such impact. The variety of the expected contributions is wide and ranges from a need to shaving the local peak periods of energy consumption to a system approach and integration with other energy sources and building environment. The nature of energy systems, being data-driven systems, applications and services make them prone to evolve and make use of the data, which is available and sharable. The impact is assessed as a potential positive contribution in the optimization of the overall sector, and consequently, to reach renewable energy targets for 2020 and 2030. The impact is expected to be both on the B2B or B2C spectrum of services and specifically in monitoring and control areas. The transport sector linked to electric vehicles is expected to be facilitated by IoT: EVs, buses, municipal services and public transport will be impacted.	

[1] United Nations Environment Programme (UNEP) - SBCI
http://www.unep.org/sbci/AboutSBCI/Background.asp

"Energy is beyond simple electricity", it is perceived as a much broader sector and touches upon consumption, production, storage and beyond, extending towards all the services for grid operation, including anticipation of adverse events impacts. In summary, a significant impact is anticipated.

VICINITY-B&D- ENR02	***Managing intermittent energy sources***
In the European Union (EU), renewables are expected to represent 35% of electricity production by 2020 and are expected to reach 50% by 2030. Yet already today (2016), at peak moments, renewables make up for over 50% of production. According to the renewable energy association in Portugal, APREN, large hydro- and new renewables were supplying 55% of total electricity consumption in 2015. In 2016 Portugal´s Electricity Consumption in the country was fully covered by RES for the duration of 107 hours (from 6.45 am on Saturday 7 May until 5.45 pm the following Wednesday). Renewable energy is by nature intermittent. This poses the problem of managing the various sources and sinks to meet demand as smoothly and sustainably as possible. This is a challenge for network operators, policy makers and regulators. Stakeholders noted that it is important to identify the sources of flexibility in electricity systems at the most granular level including possible synergies and trade-offs between energy supply and demand. Nevertheless, through VICINITY, the process of managing a wide range of intermittent supplies and sinks will create new business opportunities and add flexibility to the use of electricity.	

VICINITY-B&D- ENR03	***IoT solutions as building blocks of demand response systems***
Interoperable and secure IoT systems are expected to facilitate and form the building blocks of supply and demand management systems, including: in-home communication between smart appliances and energy management systems; and integration to grid operators as well as auxiliary service providers. Synergies with other systems in buildings were identified and could incorporate in the energy management system (e.g. water). Energy self–production is expected to undergo further optimization and integration into the overall energy system. New business models and payments for services at consumer level are required. Stakeholder experts anticipate that users, while requiring flexibility of systems use and transparency of charges, would not want to be involved in any energy-related day-to-day decisions. Hence, a fully integrated and automated approach would be necessary to meet the requirements. Consumers with a B2C relationship will require "a system which should learn the user's preferences and optimize automatically without the need of user interaction." To achieve this, hybrid fully-automated systems enabled by IoT solutions should be designed and tested.	

VICINITY-B&D- ENR04	***Behaviour influence on use of energy resources***
Real time data and monitoring facilitated by VICINITY and IoT overall promises a greater impact on consumers´ energy-resource use-patterns (behaviour and consumption). "User´s behaviour could be affected by continuous data visibility and consumption patterns." Consumers' behaviour could be changed as a function of valuable feedback such as this. As a result, consumers in both sectors, businesses and households, are expected to become much more engaged in the ways they use, manage, produce and store energy and other	

available resources. Simple, reliably operating and seamlessly integrated systems are necessary to enable these processes. "Make data useful for citizens and make it readable" is a mandate from stakeholders. The approach should match user needs. Optimization arising from the integration of multiple technology systems at multiple locations will lead to energy efficiency gains. The resultant cost reductions and reductions in the environmental impact (GHG emissions avoided) will be also analysed and presented as VICINITY results.

VICINITY-B&D- ENR05	***Data ownership, data management***
Data ownership, data management are on the forefront of the stakeholders' minds. It is recognised that data ownership and regulation are starting points of smooth interoperable services delivery. It is widely recognised that more data should be shared, both related to the energy production as well as consumption processes. This is expected to lead towards an understanding of the real time mix of energy sources. From the residential point of view, each appliance consumption is measured at the socket level could have a big impact on energy efficiency and demand control services. VICINITY is not expected to solve data ownership, security of transmission and archiving issues, but is viewed as being impacted by these issues. More issues related to overall data management cross-domain of VICINITY are covered in the following sections.	

VICINITY-B&D- ENR06	***Transparency needs in granting access to service providers***
Energy consumers will be anticipating potential economic gains, while transitioning from passive to active energy monitoring. They are willing to give data access to service suppliers and intermediaries but have concerns as to: their privacy, level of data protection that can be guaranteed and the security of their data.	

VICINITY-B&D- ENR07	***Data protection and security***
It is recognized by stakeholders that the overall approach towards sharing more data via VICINITY would increase visibility of processes, and improve quality of data resulting in higher quality of services. This approach, in return, is expected to yield potential financial returns "even if takes a longer period of time". Knowledge sharing and transfer within the municipal environment, as well as increased competitiveness within organizations through deployment of innovative systems, are viewed positively by stakeholders and hence signal a large pool of early adopters. Lack of adequate internal resources, organizational impact of such systems, leadership buy in, and regulatory compliance issues are mentioned as obstacles of such systems and approach adaptations. Training and Network opportunities are listed as ways to deal with such barriers. On the other side of the spectrum, the soft factors are mentioned along with legal: "Bureaucratic barriers and invisible barriers of integration of institutions, more on the institutions level vs technology". Financial considerations of such implementation and new systems adaptations are a concern. "Lack of means" in the public sector is mentioned as an obstacle to systems integrations overall.	

5.3. Transport domain

One of the most important issues in the transport domain is parking. Bringing the IoT to the transport domain opens the door to new parking sharing services, which benefits visitors, parking place owners and building owners/management. Sharing information about parking has strong potential in cross-domain applications such as booking parking for health assistance, building energy demand and efficiency (e.g. EV charging or weekend use) and response management (e.g. emergency services access).

However, there are barriers such as: complex ownership, security issues regarding access to indoor parking sites and its authorization. This is the aspect of mobility that is of greatest interest in directing the work of the pilot trials in VICINITY. There was also feedback on the use of the wider set of data that is produced within vehicles which together form a massive mobile sensor network.

VICINITY-B&D- TRN01	***Parking space, sharing and optimisation.***
Penetration of IoT technology in transport brings a new business model for indoor garage parking space, making it possible to share spaces when not used and so have additional earnings. Owners with numerous different parking spaces are good candidates for parking space occupancy optimisation. Parking space rental can be optimized based on the type of the vehicle (EV charger needs), size of the vehicle (parking places can have different size) or special priorities (people with disabilities places).	

VICINITY-B&D- TRN02	***Smart parking can offer benefits to other sectors***
Building owners see potential in cross-domain services, where services such as estimating a building's occupancy (building domain) and EV charging (transport domain), may synthesize in one complex service offering. Example of such complex service offering might be energy consumption peak management using EV charging where visitors of the parking space can benefit from booking a EV charging place in parking house, building owner can use EV capacity for reducing positive or negative peak of energy consumption. Linking of such services from different domain brings different stakeholders together, which might results in higher added value.	

VICINITY-B&D- TRN03	***Different payment options based on needs of visitors and owners.***
Parking place owners are expecting compensations for sharing their valuable resources. There are several possible payment methods such as pre-payment or pay-as-you-go (paying with credit cards). Another payment option might be Corporate or "frequent-flyer" programs, where specific parking places are prepaid upfront and used when needed. The price for the parking can be added to other payments or fees such as the price of the tickets for entertainment. With smart parking, prices can change dynamically based on time (peak with higher prices) or purpose of the parking (health assistance parking, based on discounts).	

VICINITY-B&D- TRN04	Access to indoor parking imposes security risks.
Rental companies have concerns about access control through the garage door to inside building. Sensors will keep the entrance open as long as there are moving vehicles or persons around the gate. Intruders may gain access to the lifts and corridors. This is a special threat during nights and weekends when the guard is low. For outdoor parking an issue is how to leave without your credit card, which may be with another passenger, since some toll stations only accept the same payment card for entrance and for leaving.	

VICINITY-B&D- TRN05	Complex ownership relationships, responsibility assignment in parking site can inhibit deployment of parking solutions
Even if the ownership of each parking spot in parking site is clear, customization of the parking site to allow sharing might be complex or even impossible, because • Not all owners are involved in park sharing, thus is it is hard to determine who should pay for investments in smart systems and its maintenance; • Owner has the intention to participate in parking, however usually they do not have decision or execution responsibility; • Payments methods need to be compatible with building owner or manager payment systems.	

VICINITY-B&D- TRN06	Gaining access to the Big Data set that could be collected from the various sensors in vehicles
• Access to data on emissions, temperature, precipitation, instances where the electronic stabilisation or anti-lock braking operates, etc, with the precise time and location associated with the information is recognised as an enabler for a whole range of services. A new capability might be to use real-time traffic management to re-optimise vehicle movements to protect inhabitants of urban areas when air quality is becoming unacceptable, based on real-time assessment of air-quality. Many of the services that could be developed are perceived to be of benefit to society, rather than services sold to the vehicle user. • The ownership of in-vehicle information is subject to debate. Vehicle manufacturers consider it is their property, and do not allow the vehicle owner to access the data. They may be motivated to make these data available in some way, if data users were willing to pay for the data. • Governments would be the consumer of these services, but would be reluctant to pay a great deal for the information. They may be able to legislate that this information should be made available, but currently have no plans to do this. • Assuming that access to the data would be allowed, there remains an issue over the amount of radio spectrum that would be needed to collect the data in real-time. It may be necessary that the data are transferred once to a fixed hub from which users with the necessary access rights could extract the required data.	

5.4. Health domain

As was expected, the stakeholders in the health domain are focused on extending health services to a growing elderly population and on the wellbeing of all citizens. Health domain end-users are users need easy to use, low cost devices with marginal intrusion into their daily life.

Stakeholders show strong concerns regarding privacy and trust from an end-user point of view. Information exchange prioritization is also an issue. The results of the stakeholder questionnaires are analysed here and in Legal & Ethics section and the section on the technical domain.

VICINITY-B&D- HLT01	***Smart monitoring for health and fitness.***
Health services are needed by all citizens including: the aging senior population, patients with chronic diseases, and even people looking for better wellbeing. Health services provide advice based upon diagnosis and/or recognition of important events (such as fall detection, lost-person detection). Other activities include regular check-ups, reminders, drugs supply for chronic conditions, etc. Health or care service providers have a particular interest in disease prevention and maintenance of a healthy population. This saves costs spending on service provision. Metrics such as KPI's (e.g. focusing on cost per home, number of unnecessary visits, number of early problem detection, patient satisfaction, trust and comfort) are needed to minimise the costs of treatment and maximise overall health. To do this health service providers are interested in monitoring patients' and customers' behaviour 24x7. They see the potential of identifying the early warning of signs of a particular disease, possible deviations from disease treatment plans or other potential improvements in wellbeing. Health condition measurements include: drug adherence, vital signs (e.g. blood pressure, glucose level), patient and activity tracking (e.g. location, steps/day, sleep management) and dietary habits (e.g. calorie intake/day, eating frequency), etc.	

VICINITY-B&D- HLT02	***Ease of use and cost-benefit should be the main criteria for selecting devices.***
Devices need to be as easy and straightforward to use as possible – ideally completely autonomous (e.g. wearables). Based on our experience, easy-to-use devices (e.g. panic button) are more frequently used because they just work with a click of a button – or even automatically after an event. This contrasts with apps in smart phones that are more complex to use, especially for the elderly. The cost of devices has to be low, if possible, yet they should also be effective. Therefore, the right balance between cost and effectiveness is desired.	

VICINITY-B&D- HLT03	Emergency access to data on personal health.
For emergencies, where the user might not be able to grant access for his/her data to authorised third parties, an override mechanism should exist, noticing though that it has to follow "break the glass" principles. The latter can be achieved either by offering a "break the glass" option as part of the Account Settings of the user or by incorporating it as default functionality. In any case, a user should always be able to check on full detail of who accessed his/her data (audit management), even if authorized.	

VICINITY-B&D- HLT04	Managing data access to authorized third parties.
One of the major concerns of stakeholders is the support of a user consent revocation mechanism, thus the user should have the option to stop sharing his/her data for a specific time period.	

VICINITY-B&D- HLT05	Adopting a common language
It is a fact that terminologies are not common nowadays. A common terminology is desirable but is unrealistic as different countries with different linguistic backgrounds are involved. To overcome this processes with discrete steps should be followed. This is very important in the health domain where a common interoperability "language" is needed. The most common integration profiles are IHE (an initiative to improve the way computer systems in healthcare share information, HL7 (standards for data transfer between software applications used by various healthcare providers), DICOM (digital imaging) and Continua (enabling end-to-end, plug-and-play connectivity of devices and services for personal health management.	

5.5. Security and Privacy domain

Stakeholders in domain of security and privacy have concern about three aspects: secure and managed access, managing private data and trust in interoperability. These aspects are covered by the following barriers. The privacy concerns are also considered under section 5.6 of this report "legal and ethics domain". To avoid duplication privacy is considered mainly in that section.

VICINITY-B&D-SEC01	Access to devices and services should be secure and managed at the organization or group level.
Access should be secure during the transport of data by end-to-end encryption between integrated infrastructures. Only in the highly-untrusted environment such as a proximity network, should transported data be encrypted (encryption of the payload). Moreover, access to devices or services should be managed primarily at the partner or partners' group level.	

VICINITY-B&D-SEC02	Data integrity, accountability and trustworthiness.
One of the security objectives already mentioned is accountability, thus any organization cannot deny the responsibility for any action performed and its effects. In the light of accountability, organizations need to trust each other to cooperate. This is a critical facilitator. Unresolved trusts between organizations influence the trust to data origin and their usage or to services provided by the organizations. In particular, questions about trustworthiness, are likely to be raised, "Does provide data represent the real physical entity?" or "Are the data used only for the original purpose?" or "Does service provide correct results?"	

VICINITY-B&D-SEC03	Collecting auditable information about important events in VICINITY
The auditing of important events is required in VICINITY. This is a basic tool for non-repudiation (proving absence of denial) and accountability by providing evidence that a certain event really happened and was performed on behalf of the certain organization.	

VICINITY-B&D- SEC04	Use of Security certification with active labelling
Some IoT eco-systems provide services that must be secure against unauthorised access typically because they are safety critical or manage physical access or movement of funds. All subsystems that are attached to such an IoT system must meet strict security requirements. However, some other IoT systems are provided for entertainment of convenience and would not suffer serious consequences if these suffered unauthorised access. Subsystems developed for such IoT systems need to be designed by minimum cost and power consumption, so security on these systems is less robust. The challenge is when a subsystem with a lower level of security attaches to a system that requires very tight security. Whilst VICINITY wishes to enable easy sharing of data, where this has been approved, we must also ensure that security can be protected. Some form of security certification is required to ensure that only subsystems that meet the security requirements of the system to which they are to attach. This security certificate needs to be electronically readable to enable automatic verification.	

5.6. Legal & Ethics domain

The key concerns are about the protection of the Data Subject's privacy, clarification of who owns data generated within a system, and the commercial relationship in licensing use of the data in terms of cost and responsibility for accuracy. Further challenges lie in understanding how to implement the Data Subject's "right to be forgotten". There is also possible liability for losses if a flawed design allows hackers to enter an otherwise secure system, or if a software agent that negotiates consent on behalf of the Data Subject accidentally allows a use which works against the best interests of the Data Subject.

VICINITY-B&D-LEG01	The data provided by the device ownership and usage by third parties.
The European General Data Protection Regulation (GDPR) became law in May 2016 and comes into force in May 2018. This gives more rights to the Data Subject. The Data Controller and the Data Subject may both claim to own the data in their IoT system. The Data Controller is responsible for the cost of collecting, holding and releasing the data. The data may be held for the direct benefit of the Data Subjects, or may simply be for the Data Controller's benefit. Currently they do not appear to be obliged to share the data held about the Data Subject – but the GDPR may change that. The Data Controller will only be able to use personal data with the Data Subject's permission. GDPR is clear about what is included as personal data. But the changes introduced by GDPR may not yet be understood by the Data Controller. If the data set does not contain the data subject's identification, but it does contain other identification or behaviours that could be used to identify the Data Subject by combining the data set with another data set, then all that data is considered to be personal data. Consider a modern car with hundreds of sensors. The data set will not identify the driver, but will identify the Vehicle Identification Number (VIN). The VIN can be correlated to a licence plate and the licence plate to the registered owner. If the owner is the only person to use the vehicle, then all the data is associated with that owner. The Data Subject may not have the right to access or to sell their data, but they will have the right to set limits on what the Data Controller can do with the data. Both have a role in agreeing the way that the data can be used and what value accrues to each party.	

VICINITY-B&D-LEG02	Negotiating Data Subjects consent to use personal data
The GDPR introduces a strong requirement that the Data Controller obtains the informed consent that their personal data may be used. However, "Informed Consent" of the Data Subject needs to shift from Black & White; such as "accept these terms or we shall not allow you to use the service"; towards shades of grey "if you allow us to send marketing material we shall offer you a discount" or "if you upload your movement information, we can use this to model traffic speeds, in return we shall provide you with a more accurate traffic model so your sat-nav application will give better optimised routes". So the consenting process should involve more flexibility, if this is wanted (accepting standard conditions would still be possible as a single tick in a box). The complexity of the sign-up process might affect adoption – so that people would either just sign up for the standard terms or decide it was all too much trouble and decide not to enter into an agreement and not use the service. This is where a software agent might be used to understand the Data Subject's generic preferences and limits, and then apply these to negotiate agreements automatically on the Data Subject's behalf. The interpretation of the flexibility required by GDPR is still needed.	

VICINITY-B&D-LEG03	Obligation on Data Controller to share data
Legislation may be needed to require manufacturers to develop IoT that are designed for interoperability and to provide reasonable access to their data. The Data Controller is responsible for the cost of collecting, holding and releasing the data. The data may be held for the direct benefit of the data subjects, or may simply be for the Data Controller's benefit. Making these data available to third parties may bring significant benefits for society or commercial gains for the third parties. However, there is currently no obligation on Data Controllers to make these data available. Data Controllers may be motivated to make the data available because the third parties are prepared to pay for the data. There are also potential benefits for society where the government may not be willing to pay a commercial rate. Currently most implementers of IoT systems (rather than components) wish to see closed systems so that information about the performance of their systems is kept private for commercial reasons. A good example in the communications of sensor information to the manufacturer. Each manufacturer collects data using their proprietary protocols with no common taxonomy. For example, there would be value in sharing information about emissions from each individual vehicle, with its location, so that accurate real-time air quality could be modelled and used to re-optimise traffic flow. It is unlikely that this would be available from the manufacturers because they will not be collecting the required data. Nor could the information be obtained directly from vehicles because the standards have not been written to support direct access to these data. If direct access is required, then legislation will have to be passed which will motivate the updating of standards to support this requirement.	

VICINITY-B&D-LEG04	Deletion of current and historical personal data
GDPR requires that the Data Controller and Data Processors must delete all historical personal data relating to an individual, at any time after they have given their initial consent to use the data. How this is to be done is unclear. It may be sufficient to delete all personal data from the records, including identification, contact numbers, location etc. A concern is what 'powers of attorney' should operate if an individual is not able to understand the benefits and negative consequences, e.g. for a young child or for an older person – perhaps with dementia.	

VICINITY-B&D-LEG05	Obligations to collect and record metadata to prove compliance with the Data Subject's consent.
If a Data Subject is compromised because their personal data has been shared with an unauthorised user, is it possible to identify which Data Controller of Data Processor was responsible for breaking the agreement? How much metadata needs to be stored? Legislation also requires metadata to be kept for the law enforcement and security services use. However, such data is to be collected and stored by the Communications Service Provider. Where does this obligation sit when ad-hoc communications are used? How will the metadata be protected from unauthorised inspection? Unauthorised access to this could seriously compromise a Data Subject's privacy.	

VICINITY-B&D-LEG06	Liability for losses caused by providing a device that allows hackers to enter an otherwise robust system.
A user's IoT device may provide advanced functionality, which could result in serious losses to the owner if the system were to be hacked. AIOTI is proposing a hierarchy of trust levels that IoT devices should comply with. Certification to the higher levels of trust will require third party evaluation. Such systems will also need to be updated by the manufacturer during their life, and as new threats emerge, they will need new defences. Are the failure modes adequately understood? Might there be a liability if a manufacturer of an IoT connected component makes a mistake that creates a backdoor to the network to which it is attached, and which allows other parts of the network to be compromised with the potential for significant financial losses.	

5.7. Technical domain

The stakeholders (mostly on the management level) understand technical domain as user channel to their devices, data and services. Thus besides the technical requirements such as usage of Representational state transfer protocol (REST), Message queue Telemetry transport protocol (MQTT), JavaScript Object Notation (JSON) and Extensible mark-up language (XML) found in questionnaire answers from technical oriented stakeholders, the user experience inhibiting the adoption of the new technology and complexity of the communication standards between building blocks slowing down integration activities are the major technology barriers. Another major barrier is interoperability without information exchange prioritization in case of safety situations.

VICINITY-B&D-TEC01	Bad user experience is barrier to the adoption of new technology.
Good user experience is enabled by simple, intuitive, adaptive and accessible design of user interaction with technology[2] [3]. Based on stakeholders' understanding of user experience, failing to excel in user experience, especially when experience is limited and without prior training is usually show-stopper in the adoption of new technology. Due to stakeholders' different opinions on good user experience, finding a 'holy grail' in the context of VICINITY will be a challenge. However, what stakeholders agreed upon is that user experience should need to take user characteristics and context of experience into account. For example, elderly people prefer cheap one-purpose application / devices in eHealth usage; whereas in wellness usage, where the younger population is more active, tools can be more complex and more expensive.	

[2] Hassenzahl, Marc. "User experience (UX): towards an experiential perspective on product quality." Proceedings of the 20th Conference on l'Interaction Homme-Machine. ACM, 2008.
[3] M Hassenzahl, N Tractinsky - User experience-a research agenda - Behaviour & information technology, 2006 - Taylor & Francis

VICINITY-B&D- TEC02	Data prioritization for safety or emergency situations.
Healthcare professionals seek information representing levels of vital symptoms (e.g. heart pulse rate, blood pressure, etc.). These should be top priority for exchange of data between interoperable infrastructures to enable safety countermeasures (e.g. Immediate help must be provided). This information should be prioritized against any other information regardless domain. The origin of such information can be any domain such as Energy, Building and/or Transport.	

VICINITY-B&D-TEC03	Different communication standards lead to complex and inefficient in domain and cross domain communication.
Regarding the building, transport and energy professional is usual practice to have several IoT infrastructures serving one domain. Stakeholders see the potential in integration of these infrastructures mainly in reducing manual or semi-automatic data exchange. However, activities to integrate them into interoperable infrastructure will result in complex and cost-ineffective solutions due to: incompatible communication standards on different communication level, different level of the communication security or proprietary protocols.	

VICINITY-B&D-TEC04	Usage of specialized local services
While value-added services may span several domains and geolocations, it is necessary to adapt to local end-user specifics. For example, in the transport domain local specifics are: usage of local ticketing services. However, applications also need to be connected to a user payment service.	

VICINITY-B&D-TEC05	Use of cloud technologies in case service provision reduce maintenance costs and complexity
Services provided to end-users are usually deployed in cloud services, which enable to offer 'software as service' with 'infrastructure maintenance' and so achieve cost reduction for the end-user. Based on stakeholders' opinions (their IT departments and customers), there might be constraints for selection of cloud service providers based specialist requirements such as: location of data storage (usually data should not leave region or EU), data confidentiality (gathering, processing) and guaranteed data removal.	

5.8. Process conclusions

The main conclusions after this process or elicitation, collection and analysis of business drivers and barriers of the IoT interoperability, along with some potential cross-domain synergies, are as follows:

- **Cross domain data-driven services offered to B2C and B2B end-users.** In field of energy consumption stakeholders identified the need for Demand Side Management (DSM) including Renewable Energy Sources (RES) and innovative energy storages (see 5.1 and 5.2). Cross-domain benefits were identified in buildings environment where

health assistance services (see 5.1 and 5.4) and advanced parking services could together take account of driver profiles to give priority to patients or cares (see 5.3 and 5.4);

- **Interoperability in IoT opens potential to use clean energy and further optimization of resources.** Understanding how energy and resources (energy, water, heat, rooms occupancy, parking space) are produced and consumed or used creates potential for dynamic pricing, better invoicing and optimal usage or resources (see 5.1, 5.2, 5.3 and 5.4);
- **Data related issues at the data management level are on the forefront of the stakeholders' minds.** It is recognised that data ownership and regulation are the starting points for smooth interoperable services delivery (see 5.2 and 5.6).
- **Consumers are concerned about potential loss of privacy, security, service complexity and intrusion into their daily life** (see 5.4, 5.5 and 5.6). Consumers have concerns regarding "big brother" phenomena (mostly elder people in health assistance) or collection of aggregated information (mostly employees in commercial buildings). Moreover, end-users prefer simple, easy-to-use services and devices which hide the complexity of the scenarios (see 5.3).
- **Regulatory compliance, bureaucratic obstacles and invisible barriers of institutions integration.** These topics have great importance if the infrastructure is to be made interoperable both within and across domains. Technical challenges were identified especially in transport, energy and health domains (see 5.2, 5.6).

6. Conclusions

IoT ecosystems generate data that can be harvested to provide novel commercial services, or services for the benefit of society. This review was designed to identify benefits and issues relating to data sharing both within a single domain and across domains.

Achieving interoperability across domains is a key objective of VICINITY. In the context of VICINITY, interoperability is the ability of a system or a product to work with other systems or products without special effort on the part of the customer.

In order to collect and analyse business drivers and barriers in the context of IoT interoperability, a survey was conducted using a questionnaire to interact with stakeholders.

The scope of the survey included several separate vertical domains (energy, health, transport and buildings) and several horizontal cross-domains (legal & ethics, security & privacy and the technical domain). Some barriers were identified which are similar across domains, along with some more domain-specific ones. The potential for cross-domain synergies was identified which could maximise the use of clean energy and/or optimise the management of resources.

According to several stakeholder studies, security and privacy are some of the most common barriers to the interoperability of IoT. Other barriers identified are lack of standards or the technology not being mature enough.

There are IoT ecosystems which generate big data that could be harvested to provide novel commercial services, or services for the benefit of society. In many case the owners of these data sources are unwilling to share access to their data, especially if they do not have a business case which enables them to benefit directly from the new services derived from their data.

Stakeholders perceive VICINITY as a project, which has the potential to integrate various disparate standards and protocols. This in turn could save time and costs across a number of domains whilst minimising the environmental impact and providing a better quality of life.

This report constitutes one of the foundations of the VICINITY project. The solution being developed will take into consideration stakeholders' opinions in order to build solutions focused on meeting their requirements whilst tackling issues they have identified.

The deliverable uses information derived from the represent set of stakeholders. It is accepted that there will be other views that have not been captured here. However, there is sufficient alignment of thinking across stakeholders so the information derived it can be considered to be a good indication of the requirements that VICINITY must accommodate. It is possible that further stakeholder views will emerge and these can be captured in later project deliverables.

Further deliverables in this WP (D1.3, D1.4 and D1.5) will identify pilot requirements, business requirements and technical requirements, thus completing the knowledge base upon the VICINITY solution will be developed, tested, deployed and demonstrated.

7. References

[1] http://www.vicinity-h2020.eu

[2] D1.1 VICINITY Requirements capture framework

[3] Usage measurements, empiric and analysis for energy efficiency and introduction to the market: https://tiny-mesh.com/wireless-mesh-network/pdf/wireless-mesh-network-Rapport-Statsbygg-Bruk-og-Forbruk-F1-2.pdf

ANNEX I: Questionnaires

Annex I is dedicated to the description of each of the questionnaires developed to obtain the information needed to identify VICINITY's Drivers and Barriers –the questionnaires – as well as enable the participation of any person – with an on-line survey - that will share its opinions with the project.

Both questionnaires will be used during the all the research activities to be performed by VICINITY and, specifically the on-line questionnaire, has the additional purpose of allowing regular updating of results as a consequence of the evaluation of the responses received.

I. Questionnaire

The questionnaire developed for the identification of Drivers and Barriers that will guide the VICINITY Project has been developed using an Excel worksheet that includes specific questions based on the following domains:

- Buildings
- Energy
- Transport
- Health
- Security & Privacy
- Technical
- Legal & Ethics

The questionnaire also includes a "Stakeholder" sheet to allow stakeholders to provide specific information about their organization and expertise.

ANNEX II: Questionnaire and interviews' results presents all questions and their answers, Figure 11 Example of the Questionnaire shows a small example of the "Building" domain questions.

About the buildings			
Issue-Id	**Priority (VICINITY)**	**Issue/question**	**Detailed description**
VCNT-ISS-BUILDINGS-001	Normal	What decision authority do you have for the buildings you represent?	1, Economic, 2 Technical, 3 Facility management
VCNT-ISS-BUILDINGS-002	Normal	What types of buildings in your portifolie do represent good examples for resource optimisation with intelligent solutions ? What type of tenant is in those buildings ?	Residential, office, industrial, public, heathcare related ? Which of these types gives what opportunities for resource optimisation ?
VCNT-ISS-BUILDINGS-003	High	Are there plans for investments or reorganisation that can realize some of this optimisation potential?	What optimisation is planned and what way is planned for its achievement ?
VCNT-ISS-BUILDINGS-004	High	What is the cost benefit for that investment? Who would have the greatest benefit of such an investment?	Building's owner, Facility management provider, Utility, Tenant
VCNT-ISS-BUILDINGS-005	High	Do these buildings dispose with own energy resources ? If yes, what kind of resources are considered ?	Heat or electricity. Renewable resources ? Diesel generators ? Energy storages (heat or electricity) ?
VCNT-ISS-BUILDINGS-006	Normal	Are there in place specific agreement with the utility companies providing energy through the appropriate networks ?	Are there special prices for on-peak and off-peak periods ? Special load-curves are negotiated ? What kind repression is used to penalise the deviations from the agreed parameters of energy load ?
VCNT-ISS-BUILDINGS-007	Normal	Are there some restrictions on what kind of sensors can be installed in the buildings and where they are placed?	Security and privacy reasons ? Other reasons ?
VCNT-ISS-BUILDINGS-008	Normal	Does the building have charging points for EV? How can be acessed ?	Will there exists restrictions on access - for instance security through code locks, biometric identification, special keys etc.?
VCNT-ISS-BUILDINGS-009	Normal	What is the business model for EV charging?	
VCNT-ISS-BUILDINGS-010	Low	What kind of alarm will be reported if a situation should arise (break in/burglary, fire etc.)?	
VCNT-ISS-BUILDINGS-011	Normal	Are there any health services located in the building(s) or services for eldering tenants ?	Type.. Hospital. apartments for home-based healthcare

Figure 11 Example of the Questionnaire

II. On-Line Questionnaire

The on-line questionnaire has been developed based on the Questionnaire previously described but its aim is enabling an on-line survey during a big part of the VICINITY project.

The objective of the on-line survey (questionnaire) is the following:

- Allowing VICINITY to compile additional views and opinions in an easier and more general manner enabling participation of public in general, but also to identify possible candidates for stakeholders with difficulties for face to face interviews because geographical location reasons.

The development of the on-line survey has been made using the free tool provided by the EC at https://ec.europa.eu/eusurvey. It will be published as soon as VICINITY's Consortium approves it and will be available at: https://ec.europa.eu/eusurvey/runner/VICINITYSurveyIoT

A small example of the on-line survey is shown in Figure 12 Snapshot of the on-line survey.

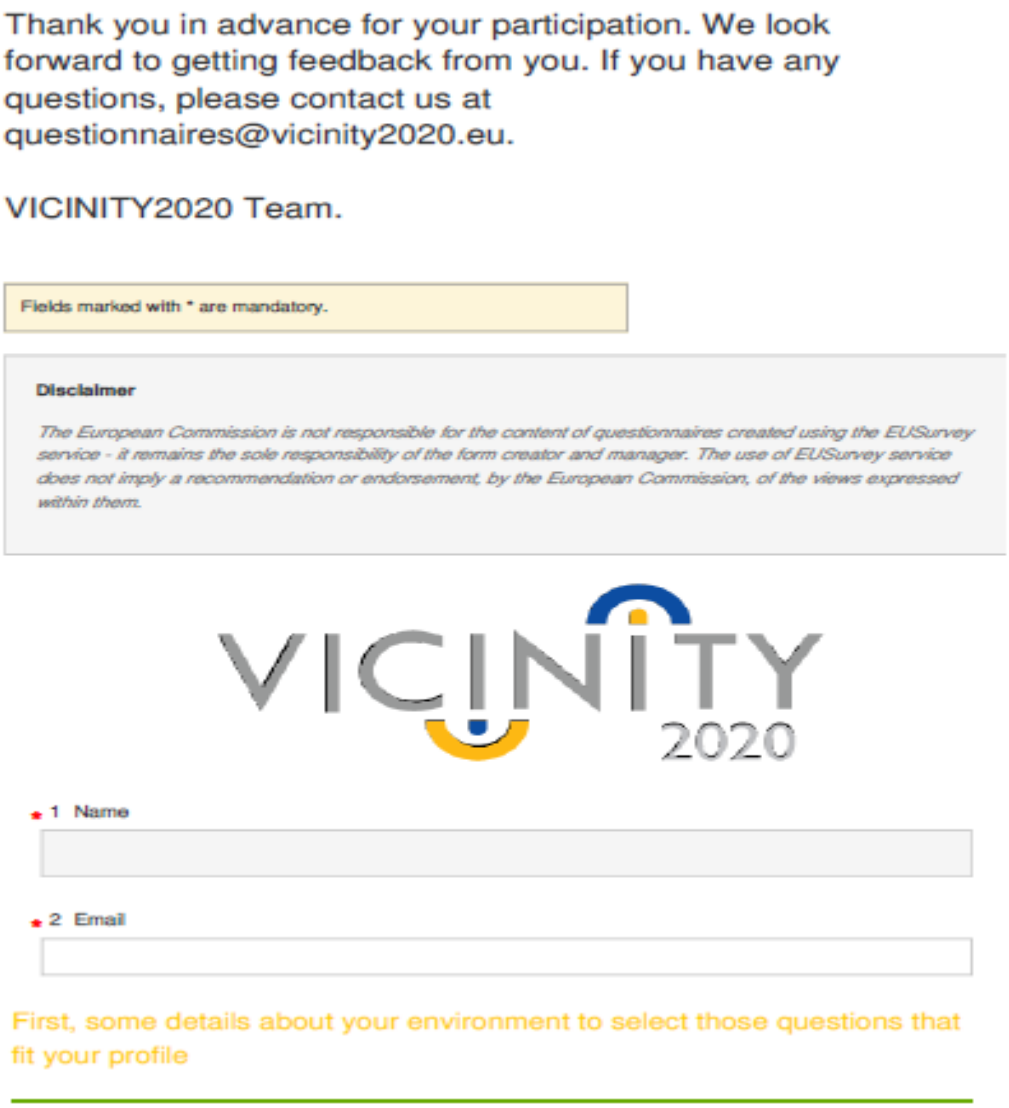

Figure 12 Snapshot of the on-line survey

ANNEX II: Questionnaire and interviews' results

Annex II details the questionnaire presented to stakeholders to obtain their opinions and answers for the different aspects covered. It also includes the responses received from stakeholders to the questions.

It is important to note that the respondents only answered the questions that were related to their domain expertise. Likewise they are listed the names of respondents and their organizations - consent - but the answers do not indicate who is responsible for them.

Notes!

- The lists of responses are displayed below the questions. Each bullet represents an answer.
- Some questions have an additional explanatory text annexed, to differentiate them the question is written in "blue" and the explanatory text in "black".

I. Stakeholders registration

VCNT-SH-INFO-001 - What is your affiliation?

- ✓ Professor at University
- ✓ Direction Clients et Territoires
- ✓ Direction of Interoperability.
- ✓ Municipalities
- ✓ Transport companies
- ✓ Attendees that answered the questionnaire during the Vicinity workshop held at GNOMON headquarters on July, 27 in collaboration with CERTH:
- ✓ Government Relations.
- ✓ Major national public transport provider in Slovakia.
- ✓ Integrating the Health Enterprise (IHE)
- ✓ Regional public agency providing transport and health administrative services. Interviewed in July 2016 in Banská Bystrica, Slovakia
- ✓ Regional innovation conference on Arctic challenges 25.5.2016
- ✓ Regional eHealth workshop in Tromsø, Norway 16.6.2016 [Welfare-Tromsø], follow-up in Tromsø 5.7.2016] and 16.8.2016
- ✓ APREN- Portuguese Renewable Energy Association
- ✓ Logica Societade Gestora de Parque Tecnologico de Moura, EM SA
- ✓ EasySensing – Intelligent Systems, Lda

VCNT-SH-INFO-002 - What domain your responsibility represent? (To preserve the privacy of those interviewed; only the role in the organization is indicated when applies).

- ✓ Division chief
- ✓ Environment Technician
- ✓ Chief Engineer
- ✓ Director of Business Development and Design of testing programs
- ✓ Engineer – CEO
- ✓ Engineer – Computer Science and telecommunication
- ✓ Chairman of the Board
- ✓ Leader Ingebjørg Riise
- ✓ Leader care centre
- ✓ Leader cluster management
- ✓ Management – Company management

- ✓ Professor, Department of Computer Science
- ✓ Director of Interoperability, IHE – Europe
- ✓ System Architect, University Hospitals
- ✓ Administrative personnel/Civil workers & IT personnel

VCNT-SH-INFO-003 - What is your position related to Vicinity project?

- ✓ N/A

VCNT-SH-INFO-005 - What is the size of the team/organisation?

- ✓ RWTH Aachen University: 43.700 students, 538 Professors, 5.230 other academic staff in 9 Faculties and 260 Institutes.
- ✓ Institute ACS (Automation of Complex Power Systems): 2 Professors, 4 Postdocs and about 30 PhD assistants.
- ✓ Four Board members for 37 apartments
- ✓ 200+ persons working in home care and nursing homes
- ✓ 60 member companies of Arctic Maritime Cluster
- ✓ APREN represents 49 ordinary members (power plants owners with 93% of all installed capacity of renewable energy sources in Portugal) and 22 extraordinary member (companies with business activities in the RES sector)
- ✓ 11 people; medium enterprise
- ✓ Micro Company
- ✓ University Hospitals of Geneva (originally Hôpitaux universitaires de Genève, HUG) is the largest of the five university hospitals in Switzerland. The HUG operates 8 hospitals in the Canton of Geneva plus 40 outpatient clinics.
- ✓ University of Cyprus: ~6500 undergraduates plus ~1500 postgraduates, 21 departments.
- ✓ Integrating the Health Enterprise (IHE): More than 175 member organizations globally with current active IHE domain being: Anatomic Pathology; Cardiology; Dental; Eye care; IT infrastructure; Laboratory; Patient Care Coordination; Patient Care Devices; Pharmacy; Quality, Research & Public Health; Radiation Oncology; Radiology.

II. Buildings Domain

About Buildings

VCNT-ISS-BUILDINGS-001 – What types of buildings do represent good examples for resource optimisation with intelligent solutions? What type of tenant is in those buildings?

- ✓ On the estate of an old steel industry and harbour area, 79 modern apartments appear with sizes up to 150 m2. The apartment block Teaterkvarteret is organised as joint ownership and built first on the land housing 37 apartments and parking area in the basement. In cooperation with Tromsø municipality, next in kin of eight youngsters with disabilities bought apartments on the ground floor supported by one apartment housing the public healthcare centre of the near-by district. The Teaterkvarteret energy-efficient building represents a good example of people with disabilities assisted by local care centre supported by a vehicle parking area designed for all inhabitants. There is a mix of tenants from families to alone-living persons without the needs of public care. See more: http://www.peab.no/Prosjekter/Byggprosjekter/Boliger/Teaterkvarteret-Tromso/
- ✓ Public pavilions and swimming pools use a lot of water and energy resource. Users are the inhabitants.
- ✓ Pavilion, Swimming pool, Schools, Elderly homes.
- ✓ Government buildings. Dependent of the government buildings but the most common are: Schools, County, Social Security Buildings and Elderly Care House

VCNT-ISS-BUILDINGS-002 - Are there plans for investments or reorganisation that can realize some of this optimisation potential?

- ✓ Tromsø municipality representing themselves and the next-in-kin of youngsters with disabilities saw the potential for joint investment in one floor of the building making it possible to establish the 24/7-care unit in the building as well.
- ✓ Areal made a pilot program. But not applied yet.
- ✓ No
- ✓ We are searching from them. All the Government buildings or huge private buildings are potential.

VCNT-ISS-BUILDINGS-003 - What is the cost benefit for that investment? Who would have the greatest benefit of such an investment?

- ✓ The apartments are privately owned and of similar size for alone-living youngsters with the need of care. Early sale of one floor is the benefit of the building company making it possible to realize the building complex and have a cash flow for the next buildings in the neighbourhood. Benefits of the municipality care unit are the early preparations for surveillance, cabling and sensors in each apartment easing the daily operations for 24/7-care service. The benefits for next in kin are the safety aspect and near-by support from care unit. The benefits for youngsters with disabilities are close support and care and the ability to have other youngsters in the same care position.
- ✓ Beneficiaries are always the inhabitants. Lower costs = lower taxes.
- ✓ Reducing energy consumption cost is always welcome and sometimes with few changes can be easy to reduce a lot of energy consumption.

VCNT-ISS-BUILDINGS-004 - Do these buildings have their own energy resources? If yes, what kinds of resources are considered?

- ✓ Energy is provided by publicly owned Troms Kraft net. However, solar panels are considered in one of the buildings for use especially in summertime period when we

have sun 24 hours for 4 months. District heating (hot water) is delivered through local operator Kvitebjørn Varme.
- ✓ Some (3). Solar thermal.
- ✓ Normally no. But must be implemented on the future. Some of then can have PV.

VCNT-ISS-BUILDINGS-005 - Are there in place any specific agreement with the utility companies providing energy through the appropriate networks?

- ✓ Agreements exist for public electricity network with Troms Kraft net and for district heating with Kvitebjørn Varme.
- ✓ Yes.
- ✓ Have some 400 electricity contracts. EDP has online platform but not very user friendly.
- ✓ No

VCNT-ISS-BUILDINGS-006 - Are there some restrictions on what kind of sensors can be installed in the buildings and where they are placed?

- ✓ No restrictions for sensors in private areas, like inside apartment and privately owned parking. The Board has to agree for public places inside the building. Building company PEAB have to agree outside building on walls and roof. Privacy rules have to be taken for sensors outside building.
- ✓ Legislative restrictions only.
- ✓ Not many known.
- ✓ Yes

VCNT-ISS-BUILDINGS-007 - Does the building have charging points for EV? How can be accessed?

- ✓ EV charging points in the garage on level 0 (3 lifts bring people around in the 3 blocks from the garage).
- ✓ No
- ✓ No
- ✓ No

VCNT-ISS-BUILDINGS-008 - What is the business model for EV charging?

- ✓ People with disabilities can use EV charging for free. Common fees cover these costs. The Board has to accept other people for using charging points on their parking.
- ✓ N/A

VCNT-ISS-BUILDINGS-009 - What kind of alarm will be reported if a situation should arise (break in/burglary, fire etc.)?

- ✓ The 3 blocks have fire alarm bell in each floor including the garage.
- ✓ Sound & Security Firm action
- ✓ Intrusion alarms, smoke detectors, by law required.
- ✓ SMS, Email, Sound

VCNT-ISS-BUILDINGS-010 - Are there any health services located in the building(s) or services for elderly tenants?

- ✓ One apartment on ground floor hosts the municipality public district health service for people with disabilities and elderly tenants. Also, private health service ULOBA offers their clients health service on workdays between 8am and 4pm. The municipality offers their 24/7-service outside these times.
- ✓ Yes
- ✓ Centro de Saude does not belong to MNCP
- ✓ Yes, Some buildings are specific for health services or eldering tenants

VCNT-ISS-BUILDINGS-011 - Is there any dedicated infrastructure (e.g. IoT) related to this health activity?

- ✓ Apartments for the 8 people with disabilities are equipped with dedicated infrastructure related to health activity with the surveillance by care centre on ground floor.
- ✓ No yet.
- ✓ No
- ✓ No

About the ICT infrastructures deployed in buildings

VCNT-ISS-BUILDINGS-012 - What types of building control systems are you familiar with?

- ✓ Robotic controls, security systems, renewable systems.
- ✓ Basic knowledge.
- ✓ Tac Vista, Vijeo Citect

VCNT-ISS-BUILDINGS-013 - Is there a quality system for the use and performance of the building that shall be achieved with the deployed control systems?

- ✓ Yes, system efficiency, but only in new building.
- ✓ No

VCNT-ISS-BUILDINGS-014 - Are services for operation and maintenance of the deployed systems purchased from external companies?

- ✓ Yes
- ✓ No
- ✓ No

VCNT-ISS-BUILDINGS-015 - Are the building control systems usually integrated with other systems for management services?

- ✓ No
- ✓ No. Most of the building did not have BMS and because of that is not easy do answer to this question.

VCNT-ISS-BUILDINGS-016 - Is it possible to integrate sensors from other systems into the particular building control systems?

- ✓ Probably
- ✓ Yes

VCNT-ISS-BUILDINGS-017 - Are the building control systems usually equipped with API to integrate third party applications and services?

- ✓ Not Sure
- ✓ If a new version of BMS, Yes because they have OPC servers instances. The old BMS systems only have DDE based servers and it is very limited for real time control proposes.

VCNT-ISS-BUILDINGS-018 - What kind of demands are put on support for protocols, standards and vendors?

- ✓ Only the legislative requirements
- ✓ All the protocols must be standard and gateways must exist to convert the data to another standard if needed. Data retrieve must be possible without problems

VCNT-ISS-BUILDINGS-019 - Are there any parking spaces included or connected to the facility?

- ✓ No
- ✓ A few MNCP parking places are reserved in the public street space.
- ✓ Yes

VCNT-ISS-BUILDINGS-020 - Are there any specific requirements at parking?

- ✓ No
- ✓ No

About the collaboration among owners/facility managers of different buildings

VCNT-ISS-BUILDINGS-21 - Do you operate more buildings that are sharing certain capacities? (Parking spaces, energy load controls, etc.)

- ✓ Parking space in a near-by building is shared by all tenants served by public company Tromsø Parking. We do not know about energy load controls yet.
- ✓ No
- ✓ No

VCNT-ISS-BUILDINGS-22 - Do you see it as realistic to share certain of your capacities with other actors? (Energy load control options, parking spaces, etc.)

- ✓ Sharing parking space is of special interest for those using their car to work and away between 8am and 4pm. Care centre, visitors and next in kin are interested to use the shared capacities.
- ✓ Yes
- ✓ Yes, if we make partnerships. Work together is always better that work alone.

VCNT-ISS-BUILDINGS-23 - What motivators could enable sharing of certain building capacities (energy, load control options, parking spaces, etc.) with buildings that are operated by other actors?

- ✓ Incentives like special offerings, free coffee, free road tolling will motivate buildings operated by other actors. Might also be competitions between neighbouring buildings to the most energy efficient building on a day-by-day basis.
- ✓ Better offer conditions. Better for maintenance. Better coordination. Cost optimization.
- ✓ If the direct profit are good for both or if exists a indirect profit that can be exploited in the future.

VCNT-ISS-BUILDINGS-24 - What are the principal obstacles to sharing your capacities with other buildings, especially when they are operated by other actors?

- ✓ Obstacles of sharing capabilities will be on resources in public areas shared and paid by all residents living in the buildings. AirBnB apartment sharing will provide more people entering buildings, more traffic in corridors and less security when building key and codes are shared by tenants.
- ✓ Legislative barriers.
- ✓ Not know the entity or did not have any good reference. The lack of Professionalism when this fact is detected.

VCNT-ISS-BUILDINGS-25 - In your opinion the optimisation of which parameters should be addressed in a virtual neighbourhood of buildings where these buildings are sharing certain capacities?

- ✓ Optimize energy usage, parking space in different seasons, and sufficient space for people with disabilities.
- ✓ Energy efficiency, better air quality, less losses of air.
- ✓ Communication between all the system, energy load consumption between buildings. Duplicated parameters must be used to guaranty data acquisition. A mesh network between the buildings must be created to have multiple ways to transmit the data. Considering the energy price and the energy load needed at the time and the future energy prediction needs, the energy load must be optimized.

VCNT-ISS-BUILDINGS-26 - What are strengths and weaknesses of envisioned products of the VICINITY approach?

- ✓ Strengths are improved security and safety, improved capacity usage, better economy to be shared by the tenants, trusted solutions for next in kin. Weaknesses are complicated ICT infrastructure, tenants are different, no unified goal for tenants.
- ✓ N/A
- ✓ The strengths are related to the development of one platform that prepares all the environment make data acquisition and focus its operation on Interoperability of all system with the environment and the target of the services.
  The greatest weaknesses are the development needed to make all the things considered. In one structure like the one presented, if one component is not well developed/integrated the final goal can fail.

VCNT-ISS-BUILDINGS-27 - What should be the principal focus of the proof of concept at each pilot location?

- ✓ Start the proof of concept in a small area at each pilot location making the building has benefit in economy and trigger incentives to the users.
- ✓ Optimization results
- ✓ Data acquisition and minimal control in order to minimize energy consumption without creating a lot of new infrastructures. Create services to the community

About the data collected in buildings

VCNT-ISS-BUILDINGS-028 - What kind of data are collected in the system?

- ✓ Normal building data is collected in public areas like temperature, humidity, motion, energy usage in order to input data for air conditioning and climate control
- ✓ Consumption, expenditure, consumption patterns.
- ✓ Invoices, consumption (water)
- ✓ All the data needed by the client can be acquired. Depends only on the money that they want to spend, the conditions and infrastructure required by each sensor. Maybe some development need to be done:
  - temperature
  - humidity
  - movement
  - open and close
  - energy consumption

VCNT-ISS-BUILDINGS-029 - Are there standards for the format of the processing a storage of those data?

- ✓ The standards from Building Smart, Continua Alliance and other guidelines will be used according to the national eHealth scheme

- ✓ No
- ✓ Paper & Database.
- ✓ The data are stored in a relational database using sql. The data retrieve can be done in CSV format or over an API in JSON format.

VCNT-ISS-BUILDINGS-030 - Who owns the data from the control and sensor systems?

- ✓ The care centre owns control and sensor data.
- ✓ The standards from Building Smart, Continua Alliance and other guidelines will be used according to the national eHealth scheme.
- ✓ Data is owned by the client but we have free access after agreement. The main idea is to have data access agreement always.

VCNT-ISS-BUILDINGS-031 - Which of those data are stored in historical archives and how long are they stored?

- ✓ Medical data are stored in encrypted medical journals with strong access controls.
- ✓ The standards from Building Smart, Continua Alliance and other guidelines will be used according to the national eHealth scheme.
- ✓ 5 years by law. Sometimes longer.
- ✓ The data is saved forever. After 1 year an archive is created with the last year pass data but only a month each time. Resuming always can be found the last year of data on the database. After backup data, it is removed for the database but the system is planned to acquiring 3000 sensors minute by minute over 10 years.

VCNT-ISS-BUILDINGS-032 - What kind of requirements must be satisfied to share those data with third parties?

- ✓ No requirements have so far been allocated.
- ✓ The standards from Building Smart, Continua Alliance and other guidelines will be used according to the national eHealth scheme.
- ✓ Agreements.

VCNT-ISS-BUILDINGS-033 - Will medical official, police, insurance companies or other public or private enterprises be allowed access to all or parts of the usage data?

- ✓ Medical officials have access to parts of the usage data.
- ✓ Yes.
- ✓ No. Not obligatory. In some cases not allowed.
- ✓ Yes, if agreements are implemented. Some data sometimes is free.

III. Energy Domain

About the Energy sites

VCNT-ISS-ENERGY-001- What types of energy sites are you experienced with? For example, distributed energy sites, PV plants, wind turbines, etc.

- ✓ Medium size and small-distributed generation plants (PV, Wind turbines, etc.).
- ✓ All kinds of distributed energy sources (renewable and also CHP or heat pump).
- ✓ Solar panel sharing local energy with nearby buildings
- ✓ Renewables power plants
- ✓ Yes
- ✓ Renewables
- ✓ Residential, commercial, utility scale , off grid sites

- ✓ As consumers. Solar thermal at swimming pool facility
- ✓ Local Buildings PV sites
- ✓ Smart metering is applicable to all types of distributed energy sites.

VCNT-ISS-ENERGY-002 - How many autonomous units do you operate (buildings, DER locations, etc.)? Are they managed in a shared/centralized way or independently? Are they connected via physical networks or wireless networks? Are these units close to each other or are they remote? Are there operational capacities shared remotely? From the technical standpoint, it is important that we get a notion of space/distance between energy sinks and/or generation points, to account for costs and technical implications/limitations, but also for the ownership aspects, which demands to be tackled from the beginning. Motivations on information share, value drivers and prioritization of such drivers are important to understand. DEPENDENT ON USE-CASES Finalisation

- ✓ As distribution system operator, we do not operate generation plants.
- ✓ In our research projects, all kinds of constellations exist. Our preference for control is distributed intelligence (e.g. agent-based) or cloud connection.
- ✓ N/A.
- ✓ 23
- ✓ Between 50 and 60 energy sites that are being monitored. Outdoor platform, specific sites, connected via physical networks. Data is wireless.
- ✓ ALC - 15. Total 30. Payment is centralised. No centralised managed. Plus public lighting.
- ✓ Buildings
- ✓ There are a wide range of types and sizes of site. Metering is a highly regulated area and can't be used for ad-hoc IoT like networks at present. It is country-by-country specific at present. Measurement function must be identified to meet IoT requirements for managing devices/buildings. Need gateway or similar function.

VCNT-ISS-ENERGY-003 - Are there issues with curtailment of the energy yield by the distributor? If yes, in what percentage of the overall energy yield? E.g.: Potential losses in energy generation due to curtailment.

- ✓ The contract between the distribution system operator and the generation plant specifies the maximum curtailment time per year.
- ✓ N/A.
- ✓ No. Despite the large quantity of RES penetration there were never issues related with curtailment of the energy yield by the DSO or TSO.
- ✓ No

VCNT-ISS-ENERGY-004 - Are there storage facilities deployed? What kind of storages? E.g.: Energy storage function complementing energy production on site to deliver on and off peak power.

- ✓ Not yet on distribution grids, expected for some pilot projects. Anh Vu (ENEDIS)
- ✓ Both electrical (batteries) and thermal (water storage / building mass, geothermal…).
- ✓ No
- ✓ Yes
- ✓ No
- ✓ Yes - battery storage will become increasingly important and increasingly used by both households and businesses.

VCNT-ISS-ENERGY-005 - Are there any specific agreement with the utility companies?

- ✓ Yes

- ✓ Yes
- ✓ No
- ✓ Price will be increasingly used as a means of incentivising behaviour and control over energy usage.

VCNT-ISS-ENERGY-006 - Are there some restrictions on what kind of energy resources can be installed? For example: acceptability by the distributor, etc.

- ✓ Compliance with technical standards and administrative authorizations.
- ✓ N/A.
- ✓ Solar panels and heat from seawater used for water heating
- ✓ Y/N
- ✓ No. Depends on legislation.
- ✓ Not known
- ✓ Yes

VCNT-ISS-ENERGY-007 - Are there EV charging station installed and supplied by the site? Charging stations should meet the standards outlined in the EU's Clean Power for Transport package and may serve existing and future vehicles, primarily flexible chargers with 22 kW charging capacity and multi standard Speed loaders with 50 kW charging capacity.

- ✓ N/A.
- ✓ Only low capacity charging units are installed in the garage using 8 hours for charging the EV battery fully
- ✓ No
- ✓ No
- ✓ No, but exists some near
- ✓ Yes - there are emerging Governmental targets for different types of RES.

VCNT-ISS-ENERGY-008 - What is the business model for EV charging? Charging point for AC supply with minimum 22 kW powers that meets the standards IEC 61851-1: 2011 and IEC 61851-22: 2002. Charging point for DC CHAdeMO with minimum 50 kW output, based on protocol 1.0 or later and that meets the standard IEC 61851-23: 2014. Charging point for DC Combo with minimum 50 kW that meets the standard IEC 61851-23: 2014 IEC 61851-24: 2014

- ✓ N/A.
- ✓ No business model is defined for EV charging, only covering the energy costs by housing common fees
- ✓ N/A
- ✓ No
- ✓ Not applied

VCNT-ISS-ENERGY-009 - What kind of alarm will be reported if a situation should arise? What kind of safety and security messages can be generated? What kind of security system is in use?

- ✓ N/A
- ✓ Civil protection and Emergency Plans
- ✓ Only for emergencies (fire, etc.)
- ✓ Email, SMS and sound

VCNT-ISS-ENERGY-010 - Are there plans for investments that can realize some an optimisation potential? What optimisation is planned and what way are planned for its achievement?

- ✓ N/A.
- ✓ Via Areal, but not developed.

- ✓ There are a wide range of alerts from smart meters, ranging from physical tampering to data issues (e.g. unexpected values or data not available) + environmental issues (e.g. breaching of humidity/temperature thresholds).

VCNT-ISS-ENERGY-011 - What are your expectations of the IoT with respect to the Energy sector? Open end assessment of strategic expectations in order to identify areas relevant for business cases.

- ✓ Contribution to smooth the local peak periods.
- ✓ IoT plays mayor role and will even be more important in the future. The energy system is a data-driven system and applications as well as services will evolve making use of the data.
- ✓ Positive contribution for the optimization of the sector and consequently, to reach RES-E targets for 2020 and 2030
- ✓ Targets for 2020
- ✓ More data should be shared, both energy production and consumption; the real time mix of energy sources of energy production; From the residential point of view - each appliance consumption - internet running through the socket and could have a big impact on energy efficiency and demand control. Currently only B2B service are provided. Although I anticipate even bigger impact on B2C services facilitated by IoT (amount of entities). EVs; buses, municipalities, public transport will be impacted. Energy is beyond simple electricity, it is much broader: consumption, production, storage. All the services for grid operation. For more remote areas (black outs) to avoid such impacts. Anticipation of adverse events, voltage peaks - positive impact. I cannot predict if B2B or B2C will be more or less impacted, but impact will be significant.
- ✓ POSEUR
- ✓ Great. Monitoring and control is a great deal for IoT
- ✓ There are always plans to make things better.

VCNT-ISS-ENERGY-012 - How would you like to see the consumption of energy improved, from a user perspective? The question is aimed at identifying additional services that could be enabled by Vicinity.

- ✓ Demand Side Management.
- ✓ The user might want a kind of flat rate for heating/cooling on household level. Energy contracting schemes are thinkable. At the same time, the typical user will not want to be involved in any energy-related day-to-day decisions. A good system should learn the user's preferences and optimize automatically without the need of user interaction.
- ✓ The consumption of energy should be balanced through the day and night scheduling each charging unit to balance with each other avowing energy peaks during morning and afternoon
- ✓ Self-Production
- ✓ To facilitate their access to the individual consumption of each appliance. It should be an easy solution, microchip signal reader for real time consumption, internet running through the home grid. List of each appliance with real time consumption and have comparative usage. Real time data and monitoring. User influence behaviour could be affected by continuous visibility of data and consumption patterns. Positive or negative progress. Behaviour could be changed as a function of that.
- ✓ Intersection of renewables with emergence of IoT will create opportunities for innovation in energy management technology.

VCNT-ISS-ENERGY-013 - What is the cost benefit for that investment? Who would have the greatest benefit of such an investment? E.g. site owner, DSO, Consumer.

- ✓ Site owner, DSO, Consumer.
- ✓ To be developed case-by-case. Benefits are needed on all sides to allow for a business case.
- ✓ Clients and city will have the greatest benefit
- ✓ Good for all. Information moves faster.
- ✓ Saving are major driver in the first phase, additional benefits such as sustainability and other could be anticipated with proliferation of systems and greater use, which could lead to change of behaviour patterns.
- ✓ Social benefits are key.
- ✓ Optimisation around energy generation, consumption and storage by distributed prosumers. IoT will provide framework to enable ad-hoc energy management networks.

About the Energy management systems

VCNT-ISS-ENERGY-014 - What types of energy management systems are you familiar with? What types of energy sites are targeted by those systems? What are the advantages and disadvantages of those control systems?

- ✓ Research status: Agent-based control systems and Cloud based energy management systems.
- ✓ EMSs applied to industry, services and households. Nowadays, there are in the market several different EMSs, much of them allow customization according to the type of loads.
- ✓ None
- ✓ N/A
- ✓ N/A
- ✓ User. Integration of renewables will drive new business models. Main business model of utility company will no longer be selling power.

VCNT-ISS-ENERGY-015 - Is there a quality system for the use and performance of the building that shall be achieved with the deployed control systems? What kind of performance parameters is monitored to assess the benefits, brought by the energy management system? Why is one control system better than another one?

- ✓ Aspects to be considered: Cybersecurity and availability.
- ✓ Yes. Consumption monitoring - manual through invoices. AVAC control system in new building.
- ✓ There are Expectations, it should be better.
- ✓ Smoke detectors
- ✓ N/A

VCNT-ISS-ENERGY-016 - Are services for operation and maintenance of the deployed systems purchased from external companies? Are there planned any partnership/other kind of cooperation with other suppliers/vendors of hardware and software solutions?

- ✓ Yes
- ✓ Yes
- ✓ N/A

VCNT-ISS-ENERGY-017 - Are the energy management systems usually integrated with other systems? Compatibility to other systems is very beneficial. On research side, we provide solutions based on open specifications and defined APIs. Energy Management systems could be required to integrate with systems south-bound (e.g. building management systems), northbound (e.g. aggregators), but also towards parallel systems (other energy management systems).

- ✓ N/A.
- ✓ Yes, via LG.
- ✓ No
- ✓ No
- ✓ Yes in all cases. Integrated with business and security systems.

VCNT-ISS-ENERGY-018 - Is it possible to integrate devices from other systems into the particular energy management systems? If yes, how such integration is performed?

- ✓ Depends on implementation. In our standard/preferred solution, everything is modular and open.
- ✓ N/A.
- ✓ It is possible, it seems easy, but there may be barriers as to bureaucratic process linked to leadership adaptation.
- ✓ Maybe.
- ✓ All vendors recognise the existence of competitive suppliers and will allow other devices to be integrated.

VCNT-ISS-ENERGY-019 - Are the energy management systems and facilities usually equipped with API to integrate third party applications and services? Are those solutions fully vendor locked or dispose with certain level of openness to integrate third party components, software or services?

- ✓ Yes - we definitely want to avoid vendor lock-in because this slows down innovation.
- ✓ N/A.
- ✓ Meteo station does the rest of the equipment (Web cam, energy production and meteo station) as an integrated solution.
- ✓ Sometimes no.
- ✓ Usually, there are means for hardware and software integration.

VCNT-ISS-ENERGY-020 - What kind of demands are put on support for protocols, standards and vendors? The deployed sensors might be based on specific standards or protocols or can be delivered be by specific vendors. The same is true at the integration of energy management systems with other solutions.

- ✓ Conformity to well-accepted standards and protocols.
- ✓ N/A.
- ✓ Driven by international and de-facto standards. Standards and interoperability are an important enabler in this market and procurement checklists must be complied with.

VCNT-ISS-ENERGY-021 - Are there a communication interface to exchange data with the DSO? If yes, what data are provided for DSO? Does the DSO have specific rights to switch on/off certain resources?

- ✓ Only on research level: offering flexibility to DSO.
- ✓ N/A.
- ✓ 1. YES 2. Cannot answer that 3. NO Controlled by Logica.
- ✓ N/A.

VCNT-ISS-ENERGY-022 What standards and protocols are used at communication with the DSO?

- ✓ N/A.
- ✓ N/A.

About the collaboration of energy sites

VCNT-ISS-ENERGY-023 - What is the most important interoperability problem in your interaction with energy component of operations management? The question is aimed at identifying additional services that could be enabled by Vicinity.

- ✓ Allow various systems from different vendors to interoperate avoiding vendor lock-in.
- ✓ Being able to use the energy inside buildings is the most important asset. Rule is to sell to energy company and buy energy back from net provider with taxes 30% on top.
- ✓ Good via PC or Mobile.
- ✓ Quality of voltage peaks interfere with testing equipment, sensors etc., data acquisition systems. They would not fail, but they would read wrong data. Quality of data is at stake.
- ✓ N/A.

VCNT-ISS-ENERGY-024 - Do you see realistic ways to share certain parameters of your energy needs, loads, energy market info, with other actors within the Vicinity network? Vicinity framework implementation will necessarily make data transfer and communication open. From the energy standpoint, this will make information such as tariffs, energy overall costs, and loads themselves available to the network. These are details usually treated as confidential by many businesses. They are particularly sensitive in the case of state building owners/managers.

- ✓ Yes.
- ✓ Yes.
- ✓ Visibility of the company, visibility of quality of data, quality of services. Potential financial returns event if takes longer period of time.
- ✓ Yes.
- ✓ N/A.

VCNT-ISS-ENERGY-025 - What motivators could enable sharing of your capacities with other entities? New services definitions and discussion of potential benefactors for these services, e.g. more efficient operations management importance for the organisation; identification of barriers in communication within the organisation and dependent entities; improve use-case functions through added IoT capabilities and share of specific data/info. (Examples: health status elderly, occupation classroom, solar resource, pool water T, building energy load).

- ✓ Knowledge sharing and transfer. They are advantage factors to sustain and create competitiveness in organizations and moreover, to deploy innovation and disrupt technology barriers.
- ✓ Good via PC or Mobile.
- ✓ Knowledge management.
- ✓ N/A.

VCNT-ISS-ENERGY-026 - What are the principal obstacles to sharing your operational capacities? These can be institutional aspects related to privacy, management of information, could be intrinsically part of state entities management practices but also of private entities (for instance platform solar generation data).

- ✓ Misinformation and lack of knowledge about a new technology and how it should be used in organizations. In addition, legislation and regulation may be a barrier. These can be a barrier to the spread of specific technology, so training and networking are key factors to break these obstacles. These can be a barrier to the spread of specific technology, so training and networking are key factors to break these obstacles.
- ✓ People are closed minded. Legislative barriers.
- ✓ Accreditation system could be obstacles. Bureaucratic barriers and invisible barriers of integration of institutions, more on the institutions level vs technology.
- ✓ Lack of means
- ✓ N/A.

VCNT-ISS-ENERGY-027 - What kind of benefits might be sufficient to trigger collaboration with other entities in your neighbourhood, municipality, or city?

- ✓ First, communities must be engaged since the begging, in order to understand the benefits that can outcome for them. Moreover, training is fundamental so it can involve as many people as possible and of different levels of education and ages.
- ✓ As long as the population of the municipality is benefitted, there are no barriers. Shared transport system is a real example being studied. Resource optimization within and between municipalities.
- ✓ Data visibility.
- ✓ Reduction of fossil fuels and costs.
- ✓ N/A.

VCNT-ISS-ENERGY-028 - What are the expected timelines for realisation of such benefits? (Short, medium or long term)

- ✓ Medium term.
- ✓ Preferably short, but medium also fine.
- ✓ Medium term.
- ✓ N/A

VCNT-ISS-ENERGY-029 - What method of implementation is preferred: for example piloting or incremental introduction of services?

- ✓ Both.
- ✓ Piloting first preferred.
- ✓ Pilot first and then roll out.
- ✓ N/A.

VCNT-ISS-ENERGY-030 - What should be the principal focus of the proof of concept of to achieve success with IoT through VICINITY at each pilot location?

Provide integration of various protocols and devices.

- ✓ Optimization gains from integration of multiple technology systems, energy efficiency gains, environmental impact (GHG emissions avoided) and cost reductions. These factors should be analysed and presented as main results.
- ✓ Efficiency gains within the system.
- ✓ To facilitate data share. Make data useful both for citizens and make it readable. It is not a matter of change of decimal places, but to right readable and more acceptable. Translated to user needs.
- ✓ Facilitating the change to the participating partners.
- ✓ N/A.

VCNT-ISS-ENERGY-031 - What are strengths and weaknesses of the proposed VICINITY interoperability system?

- ✓ Strengths: Interoperability and integration of various standards and protocols allows for broad use of the product, allowing for rapid innovation.
  Weaknesses: Resistance can be met by strong players with existing proprietary products.
- ✓ Strengths: Efficient, time saving, minimizes environmental impact, cost saving and better quality of life.
  Weaknesses: Loss of privacy and security, compatibility, complexity and legislation
- ✓ Legislative barriers.
- ✓ Bureaucratic barriers and invisible barriers of integration of institutions, more on the institutions level vs technology.
- ✓ Political risk due to election changes.
- ✓ N/A.

VCNT-ISS-ENERGY-032 - Do you think there is a latent demand for envisioned VICINITY products and services among your stakeholder group?

- ✓ Yes.
- ✓ Yes.
- ✓ Yes, but it is not latent. Clear access to useful data (UV index). Public transport.
- ✓ Yes.
- ✓ N/A.

VCNT-ISS-ENERGY-033 - What program that is planned or running by your entity could benefit from anticipated VICINITY functionality or overall IoT enablement.

- ✓ Transport optimization. Water services. Emergency services in general. Health services especially since there is a lack of medics in the low populated areas.
- ✓ Energy, facility management, environment, finance.
- ✓ N/A.

About the data collected at energy sites

VCNT-ISS-ENERGY-033 - What kind of data are collected and communicated in the system?

- ✓ Depends on research project, mainly Electrical / Thermal Power flow measurements (depending on services with granularity between 15 min and 1 second).
- ✓ Consumption. Data base of public and private construction works is kept up to date. Energy performance report from LG in new building.
- ✓ Consumptions.
- ✓ Energy, Power and current for each phase.

VCNT-ISS-ENERGY-034 - Are there standards for the format of the processing a storage of those data?

- ✓ No, but nice to have.
- ✓ LG has its own, as do others.
- ✓ Consumption data stored on local server.
- ✓ Data is storage in SQL format. When data arrives, it arrives in Json format from modbus/ip protocol and it can be processed using many programming languages. Now is proceeded in python with C help, because of some speed requirements.

VCNT-ISS-ENERGY-035 - Who owns the data collected in energy site? How long is the result/statistics going be stored - and what kind of data will be stored alongside in the historical archive?

- ✓ Grid operator / house owner.

- ✓ Municipality has access to data, but likely data belongs to supplier. Not sure, requires legal review.
- ✓ Municipality and DSO
- ✓ University of the Algarve
- ✓ N/A.

VCNT-ISS-ENERGY-036 - Which of those data are stored in historical archives and how long are they stored?

- ✓ Up to 25 years. Needs to be checked.
- ✓ Forever but only exists on database 1 year. More than one year are saved in database dumps archives.
- ✓ N/A

VCNT-ISS-ENERGY-037 - What kind of requirements must be satisfied to share those data with third parties?

- ✓ Anonymization.
- ✓ Not sure.
- ✓ Data needs to be in the format that cannot be modified by third parties. Third party should be not be responsible for any modification by fourth party. Physical signature and copy that remains with us (digital corruptions).
- ✓ Agreements
- ✓ N/A.

VCNT-ISS-ENERGY-038 - Are these data audited or verified?

- ✓ Manually.
- ✓ Nothing is done. It's considered that all things are working well. One alarms system is implement do validate problems in data acquisition and threshold alarm values.
- ✓ N/A.

IV. Transport Domain

About the parking spaces

VCNT-ISS-TRANSPORT-001 - In what order will available parking space be prioritized? E.g.: Residents, capabilities, special needs for vehicle/passengers based on roles and urgency.

- ✓ Business parking area to optimise use of available parking space.
- ✓ Client parking in a garage rented specifically by the client himself.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-002 - Are all residents/end users assigned the same priority, or will users be ranked? E.g.: depending on urgency, disabilities, and vehicle type or financing/payment model.

- ✓ Priority to Scandic hotel guests having pre-booked 30 parking places, the rest 270 places are available for public use paying normal parking house price.
- ✓ Rental users have exclusively priority .
- ✓ not an issue for Standards. Standards may allow priority status to be communicated, but will not determine how this is priority field is used.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-003 – Do garage facilities currently have any agreements with blue light agencies or other specialists about access? (E.g. ambulance, police, repair personal)

- ✓ N/A
- ✓ N/A
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-004 - How much is known about the users and their preferences? E.g.: Age, needs, technical experience, mental and cognitive abilities, access to equipment, family relations, skills and other aspects that may influence on how they understand and use the parking sites

- ✓ Less information about end-users and their preference, but people with disabilities have prioritised parking space as well as electrical vehicles being connected to charging stations.
- ✓ The board knows the need of the rental users.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-005 – How much is known about the parking space owners travelling habits? (E.g. Do they use their vehicles available on regular and predictable intervals, is the occupancy rate high or low, do the parking space owners prefer public transport etc.)

- ✓ N/A.
- ✓ N/A.
- ✓ Probably not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-006 - Are you gathering feedback from users? If yes, how often will the feedback from users be evaluated? (E.g.: Yearly, monthly, more often).

- ✓ No user feedback from end-users, but daily statistics via eTicketing system SKIDATA.
- ✓ Feedback in annual meeting or direct inquiry.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-007 - What kind of access control systems to gain access to the garage facility and apartments have been implemented? E.g.: Code locks, biometric identification, special keys, cards, remote controls etc.

- ✓ Credit card and ticket give access to parking spaces, paying for the time used.
- ✓ Remote control to garage held by the residents.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-008 – What kind of form factors have been considered for providing information and access to the garage facility? E.g.: mobile phone, laptop, smart TV, digital signs etc.

- ✓ N/A.
- ✓ N/A.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-009 – What considerations have been made when evaluating and installing access control systems? E.g. ease of use, costs, security, support etc.

- ✓ N/A.

- ✓ N/A.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-010 – What other access control and authorisation systems have been evaluated? E.g. card readers, camera detection, QR code scanner etc.

- ✓ N/A.
- ✓ N/A.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-011 – How is verification of authorised and valid parking going to be upheld? E.g. sensors detecting occupancy, reading an RFID chip, manual verification, reporting etc.

- ✓ N/A.
- ✓ N/A.
- ✓ not an issue for Standards.
- ✓ Government wishes to see social inclusion and the impact of the Disability Discrimination Act should be carefully considered.

VCNT-ISS-TRANSPORT-012 - What kind of restrictions are implemented at the parking site? E.g.: Usage, dimensions, availability, sidewalk, nearby traffic, signs etc.?

- ✓ No restrictions apply to normal vehicles; trucks cannot enter the parking area.
- ✓ Only access control to garage door, but other vehicles and users may sneak into garage when door is open and a sensor will hold the door open for longer time in case of motion
- ✓ not an issue for Standards
- ✓ Government wishes to see social inclusion and the impact of the Disability Discrimination Act should be carefully considered.

VCNT-ISS-TRANSPORT-013 – What limitations are put on the vehicles allowed to enter the garage facilities? E.g.: size, weight, height, equipment, etc.

- ✓ N/A.
- ✓ N/A.
- ✓ Not an issue for standards.
- ✓ Concerned that this research project should make significant advances over the state of the art for intelligent parking systems. Systems to guide drivers to available / reserved parking spaces are already commercially available. However, there is scope for innovation by integrating the parking management data with other data, such as smart grid performance, special needs for people with disabilities, modal integration, or mobility as a service, smart buildings etc. Such developments should be encouraged.

VCNT-ISS-TRANSPORT-014 – How does vehicle size affect assignment of parking space?

- ✓ N/A.
- ✓ N/A.
- ✓ Not an issue for standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-015 - Are particular time slots allocated to parking or renting parking space? E.g.: daytime/night-time.

- ✓ More costly at daytime, hotel guest pays fixed overnight rate.

- ✓ No time slots are allocated
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-016 - What strategies have been defined for handling ownership of parking sites? E.g.: extending existing agreements, introducing new actors.

- ✓ Parking site is owned by building Narvikgården.
- ✓ Each rental client has ownership to their parking site due to upfront buy of their part of parking site
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-017 - What users outside of residents/employees will have access to dedicated parking space? E.g.: Electrical vehicles, autonomous cars, specialized vehicles for people with disabilities, ambulance/ health personnel, other public officials.

- ✓ EV, vehicles for people with disabilities and normal cars.
- ✓ Only rental clients with the remote control have access to dedicated parking space.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-018 - What the business model for parking site? E.g.: Parking included with tenants, annual/month subscription, rented by the day/hour, etc.

- ✓ Pay-as-you-go in city centre close to E6, possible to extend P-house.
- ✓ Upfront sale and common fee for buildings cover the costs.
- ✓ not an issue for Standards.
- ✓ concerned that this research project should make significant advances over the state of the art for intelligent parking systems. Systems to guide drivers to available / reserved parking spaces are already commercially available. However, there is scope for innovation by integrating the parking management data with other data. Such developments should be encouraged.

VCNT-ISS-TRANSPORT-019 - What type of stakeholders will decide functionality, properties and priority with the different parking sites?

- ✓ Owner of parking site decide.
- ✓ The board of buildings Theater Quartier decides on functionality, properties and priority.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-020 - Does public, private and commercial interests have the same access rights to the parking site?

- ✓ All have equal access if they pay, hotel has priority.
- ✓ Only residents to Teaterkvarteret 1.akt have equal access rights.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-021 - Are there planned multimodal access points nearby? E.g.: connection to public transportation.

- ✓ Currently bus station is 700m away, taxi nearby, railway is 1000m away.
- ✓ Car-pooling and car-sharing using electrical vehicle (eGolf) are planned as new services nearby for next year
- ✓ not an issue for Standards

- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-022 - If the parking site supports electrical vehicles, how many charging stations are available and what standard is being used? E.g.: Voltage, protocol.

- ✓ 4 EV charging points are planned if supportive funding by ENOVA.
- ✓ 5 EV slow charging points are offered for the clients of the building
- ✓ No new charging standards are being proposed here. However, it is note that there is already a divergent set of incompatible standards for charging stations and their connection to the vehicle.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-023 – How many simultaneous EV is the garage facility able to charge?

- ✓ No limitations are planned for the charging points.
- ✓ There are no restrictions as to how much power is being distributed to the charging points.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-024 – Are there plans for more EV outlets or charging stations?

- ✓ Not more than the current 4 charging points.
- ✓ It will be brought forth for the board if requested.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-025 – Do the garage facility support real time load balancing based on current demands?

- ✓ This has not been a topic yet.
- ✓ No – this has not been an issue.
- ✓ not an issue for Standards
- ✓ keen to see the innovation by integrating the parking management data with other data. Such developments should be encouraged.

VCNT-ISS-TRANSPORT-026 - What is the business model for EV charging?

- ✓ Free charging for EVs, hoping they are not occupying charging space all day.
- ✓ Common fees cover the costs of charging points.
- ✓ not an issue for Standards.
- ✓ UK Government encourages free use of all its transport related databases. Further information could be supplied if there were to be a trial in the UK.

VCNT-ISS-TRANSPORT-027 – What are the barriers for installing more charging stations? E.g. available space, cost/lack of funding, lack of support from owners, lack of standards etc.

- ✓ Lack of funding.
- ✓ It is up to the board to decide whether more charging points should be installed.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-028 - Who covers the cost if extra occupancy is needed?

- ✓ Visitors are free to purchase as much occupancies as they like after, but the hotel has priority.
- ✓ Short term parking can be discussed with the owner of the other parking spots in the facility, but long term parking will have to be discussed with the board as there are a limited number of parking spots per apartment.

- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-029 – What kind of documentation of garage facilities exist?

- ✓ Hotel guests are informed about garage facility by the receptionist and through the website.
- ✓ Information about the garage facility are provided through a handbook that all new residents receive.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-030 – Is the garage facility contemplating integrating behaviour analysis to avoid overload of electric system/fuse? E.g. redistributing charging from one vehicle to another if the battery level is within acceptable limits.

- ✓ This has not been a discussion topic.
- ✓ No – this has not been an issue.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-031 – How many entrances leads to the apartments?

- ✓ N/A
- ✓ 2 from the garage facility.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-032 – How are short-term demands for more parking spaces handled? E.g. contracts, requests, flexibility etc.

- ✓ Visitors are paying for how long they stay, the same goes for hotel guests.
- ✓ Visitors can discuss this with the owners of the parking spots.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-033 – How will long-term demands for more parking space be handled? E.g.: discussed at the board, private rental etc.

- ✓ This has to be discussed with the management.
- ✓ This is a topic that has to be brought forth for the board.
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-034 – How do the garage facility handle extreme weather conditions? E.g.: rain, snow, frost, heat etc.

- ✓ N/A.
- ✓ It is not affected by frost or heat, but build up on the ground during heavy rain.
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-035 – What concerns have been expressed from the residents in regards to access control solutions? E.g.: concerns about privacy, losing remote control etc.

- ✓ This has not been an issue.
- ✓ The board is representing the residents, and is restrictive about giving access to the facility with keys or remote controls.
- ✓ not an issue for Standards

- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-036 – Who has the blueprint of the garage facility? E.g.: overview of electric wires, pipes and other part of the internal infrastructure

- ✓ N/A.
- ✓ N/A.
- ✓ not an issue for Standards
- ✓ keen to see the innovation by integrating the parking management data with other data. Such developments should be encouraged.

VCNT-ISS-TRANSPORT-037 – What routines exists for emergencies? E.g. in case of fire, accidents, leaking and other situation that demands fast response

- ✓ N/A.
- ✓ N/A.
- ✓ not an issue for Standards.
- ✓ not an issue for Government.

VCNT-ISS-TRANSPORT-038 – How much customisation of a parking space is permitted? E.g.: installing sensors, smart lights, marks on the ground etc.

- ✓ The management is free to decide within a reasonable degree.
- ✓ It is up to the board to decide what installations should be installed as long as it follows guidelines from the municipality.
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-039 – What kind of financial model could be relevant if renting parking space? E.g.: a 10% cut of the income, subscription service etc.

- ✓ N/A.
- ✓ N/A.
- ✓ not an issue for Standards.
- ✓ keen to see the innovation by integrating the parking management data with other data. Such developments should be encouraged.

VCNT-ISS-TRANSPORT-040 – Are there specific demands or issues related to properties of the parking sites? E.g.: Roof, locked garage, lighting, charging station, etc.

- ✓ In the basement (garage) area of Narvikgården.
- ✓ People with disabilities have access to charging and have broader parking area than others
- ✓ Standards may exist for individual sensor types. The relevant Standards can be identified once the sensor type is known.
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-041 - Who is going to handle maintenance of the site? E.g. : Internal / external personnel.

- ✓ Narvikgården.
- ✓ Maintenance is handles by the board for inside parking. Outside parking is handled by public company Tromsø Parking.
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-042 - How will predictions and analysis influence on the service offered to the residents, visitors, health personal and other employees in the vicinity?

- ✓ Daily statistics on use of parking.
- ✓ No predictions or analysis are defined so far
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-043 - Are there restrictions as to where sensors can be installed? E.g.: ground, walls, roof, etc.

- ✓ If planned now, available in all basement.
- ✓ The board will decide for their public areas. Private legal agreement with owner of parking site
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-044 - Are there specifics that could influence installations? E.g.: cables, pipes, electrical inference, bad reception, faraday cages, etc.

- ✓ If planned now, cables and pipes might be built directly.
- ✓ The board will decide for installations.
- ✓ CEN 278 is in the process of establishing a new Working Group within the Technical Committee responsible for Intelligent Transport Systems (ITS). TC278 WG17 looking at Urban ITS.
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-045 - What challenges exists in regards to private or public ownership of the parking sites? E.g.: Legislation, jurisdiction, responsibility, sharing, etc.

- ✓ Parking site is owned by Narvikgården which is owned by city of Narvik.
- ✓ The board will coordinate challenges to be met.
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-046 - What kind of activities can the owner/authorized user engage in at the pilot site? E.g.: Override authorization, integrate new components, renegotiate contracts, rent or resell parking space, etc.

- ✓ Only payment system is installed.
- ✓ The board will decide which activities to be met on site.
- ✓ not an issue for Standards
- ✓ Government encourages enabling access to key databases and encourages collaboration in order to improve the value of the parking spaces.

About the control systems for intelligent parking

VCNT-ISS-TRANSPORT-047 - What is your experience/familiarity with other parking site control systems?

- ✓ Narvik city has great experience on control system.
- ✓ The board has experience and familiarity with other parking site control systems being used in the other buildings nearby.
- ✓ not an issue for Standards
- ✓ not an issue for Government

VCNT-ISS-TRANSPORT-048 - Is the control system integrated with other systems for management services?

- ✓ No.
- ✓ Only residents paying common fees is integrated
- ✓ not an issue for Standards

- ✓ DfT and many local authorities have extensive historical data relating to detected traffic flows.

VCNT-ISS-TRANSPORT-049 - Is it possible to integrate sensors from other systems into the control system?

- ✓ If planned now, then it is possible.
- ✓ The Board will handle when an inquiry arrives
- ✓ not an issue for Standards
- ✓ There may be some legal requirements relating to Data Retention regulations.

VCNT-ISS-TRANSPORT-050 - What kind integration with local and national road databases are being implemented? E.g.: automatic, manual, on-demand, open data, etc.

- ✓ No integration.
- ✓ No integration
- ✓ not an issue for Standards
- ✓ DfT has a national traffic model that can be accessed for experimental purposes and could be used to validate and calibrate any models that the project might produce. This model uses number plate recognition but information is anonymised and integrated. This produces origin / destination data as well as traffic density and speed information. There are also local transport models. Highways England have incident detection systems such as MIDAS; cameras are also used by HE and local authorities, police forces also have incident detection technology. The outputs from these sources should be available if the intention is to improve the way that people respond to the incident. Free parking spaces is of interest to local authorities especially where variable display signage is used.
- ✓ Air quality is owned by DEFRA (Dept for Environment, Food and Rural Affairs. Clearly most pollution is in dense urban areas and DfT also has a strong interest in the impact of traffic on air quality. Real time information is hard to obtain except where air quality monitoring stations have been set up. Precipitation and river levels, flood warning are of interest. Monitoring stations have been installed at vulnerable locations. BEIS is keen to explore the possibility of using sensors in vehicles to avoid the need for future investment in fixed infrastructure sensors.

VCNT-ISS-TRANSPORT-051 - Are there access points for integration with infrastructure? E.g.: traffic lights, intelligent road signs, traffic control central, etc.

- ✓ No integration.
- ✓ No integration
- ✓ not an issue for Standards
- ✓ Yes, and this can be made available to potential users.

VCNT-ISS-TRANSPORT-052 - What kind of APIs are made available for parking control systems? E.g.: proprietary, standardized, extendable.

- ✓ Might be planned based on SKIDATA.
- ✓ No APIs are available
- ✓ not an issue for Standards
- ✓ All of the sensors identified are used as well as water level sensors in rivers and potential locations of floods.

VCNT-ISS-TRANSPORT-053 - What kind of value-added services are available to be built on top of the installations?

- ✓ No idea yet.
- ✓ Parking space owners may contribute to those services

- ✓ not an issue for Standards
- ✓ All these applications should be supported. The key question is what would be the cost of such information? It would need to offer superior quality compared to the information obtained from current sources, or enable a significant cost saving. DfT would need to see a convincing business case if it were to buy into any information services derived from these sources. Trip planning and vehicle recharge planning for eVs could become important as the number of eVs increases.

VCNT-ISS-TRANSPORT-054 - What are the cost-benefit/value-added services with the installation? E.g.: Owners, users, district, others

- ✓ No idea yet.
- ✓ Benefit of clients is to share costs of their parking site investment
- ✓ not an issue for Standards
- ✓ Personal information would be needed to support Mobility as a service (MaaS), which DfT and BEIS would encourage.

VCNT-ISS-TRANSPORT-055 - Is there a limitation of where and how signalling data can be transferred to the buildings control central?

- ✓ If planned now, then it is possible.
- ✓ The Board will discuss when an inquiry arrives
- ✓ Not known
- ✓ Extensive records of traffic statistics are held by HE and Local Authorities. We could explore the details if there was to be a trial in England.

VCNT-ISS-TRANSPORT-056 - What kind of messages will be reported if an alarm or situation should arise? E.g.: break in/burglary, fire, accident, 911, etc.

- ✓ No message is planned yet.
- ✓ No messages is planned
- ✓ not an issue for Standards
- ✓ Not at the moment.

VCNT-ISS-TRANSPORT-057 - What channels will receive status of the parking site? E.g.: Open data, feeds to website, intelligent signs, user devices, screen, LED, phone message, report to home entertainment system, etc.

- ✓ Not planned yet.
- ✓ Not planned
- ✓ not an issue for Standards
- ✓ No. It is unclear, but manufacturers claim ownership of all information derived from the vehicle control electronic and the vehicle data bus. However, where the data subject might be identified the vehicle driver will also have rights on how data that relates to them is used.

VCNT-ISS-TRANSPORT-058 - What kind of demands are put on support for protocols, standards and vendors?

- ✓ No support other than SKIDATA.
- ✓ Vendor of garage door should be involved
- ✓ not an issue for Standards
- ✓ DfT would like this to be available

VCNT-ISS-TRANSPORT-059 - What kind of status will be available for other channels? E.g.: occupied, out of order, available, frozen, etc.

- ✓ Physical status by camera.

- ✓ No idea yet
- ✓ not known
- ✓ DfT would like this to be available, at the rate needed to support the application.

VCNT-ISS-TRANSPORT-060 - Are there planned any partnership/other kind of cooperation with other suppliers/vendors of hardware and software solutions?

- ✓ Not planned yet.
- ✓ Not planned
- ✓ not an issue for Standards
- ✓ government is keen to see more cooperation

About the virtual neighbourhood of parking sites

VCNT-ISS-TRANSPORT-061 - Are there similar parking spaces related to other facilities? Buildings in the neighbourhood for example with under dimensioned parking capacities.

- ✓ A lot of parking space in nearby areas operated by city of Narvik.
- ✓ Outdoor parking site in the neighbourhood with roof, no door and windy from outside
- ✓ not an issue for Standards
- ✓ government is keen to see more cooperation

VCNT-ISS-TRANSPORT-062 - Will it be possible to adopt/extend/rent available parking spot from nearby sites if necessary? This might mean a virtual extension of parking capacities.

- ✓ If you pay, you can extend.
- ✓ Yes, nearby parking spot is publicly available in case you rent a fixed spot or pay as you need
- ✓ not an issue for Standards
- ✓ government is keen to see more cooperation

VCNT-ISS-TRANSPORT-063 - Are there requirements for integration with other ICT systems in the transportation domain? E.g.: road occupancy, traffic lights, mass transportation ticketing etc.

- ✓ No requirements.
- ✓ No requirements.
- ✓ All these applications should be supported. Additional standardisation may be required for some of these applications.
- ✓ government is keen to see more cooperation

VCNT-ISS-TRANSPORT-064 - What motivators could enable to share your capacities with other entities?

- ✓ Economic motivation to fill parking house completely.
- ✓ Share the costs of investment in parking spot.
- ✓ Not an issue for Standards.
- ✓ Government is keen to see more cooperation.

VCNT-ISS-TRANSPORT-065 - What are the principal obstacles of sharing your capacities with other entities?

- ✓ No obstacles.
- ✓ Access control through the garage door.
- ✓ not an issue for Standards
- ✓ Dept. for Transport shares its data free of charge.

VCNT-ISS-TRANSPORT-066 - What incentives could be offered to facilitate collaboration with similar service providers in the neighbourhood?

- ✓ Same type of ticket can be used on several parking spaces.
- ✓ Same type of collaboration with other operating parking sites in the neighbourhood.
- ✓ not an issue for Standards
- ✓ government is keen to see more cooperation

VCNT-ISS-TRANSPORT-067 - What are strengths and weaknesses of envisioned products of the VICINITY?

- ✓ Don't know.
- ✓ New business model for sharing and capacity planning of available spots like in winter time.
- ✓ not an issue for Standards.
- ✓ N/A.

VCNT-ISS-TRANSPORT-068 - What should be the principal focus of the proof of concept at each pilot location?

- ✓ Easy to enter, easy to use, positive user experience.
- ✓ Secure access control, because access to the garage opens up access to the whole building area.
- ✓ not an issue for Standards
- ✓ Integration with data from other IoT systems to enable innovative, previously tried, services t be demonstrated.

Use of Transport Related Data

VCNT-ISS-TRANSPORT-069 - How is the ownership of parking data going to be handled?

- ✓ No plans.
- ✓ No idea yet.
- ✓ not an issue for Standards
- ✓ N/A.

VCNT-ISS-TRANSPORT-070 - Who will be allowed full access to all or parts of the usage data? E.g.: Residents, district/city, traffic control centre, medical official, police, insurance companies, public or private enterprises

- ✓ No plans.
- ✓ The Board and municipality of Tromsø should have access to all relevant data.
- ✓ not an issue for Standards.
- ✓ Dept. for Transport shares its data free of charge.

VCNT-ISS-TRANSPORT-071 - Should there be any limitations on the use of non-personal data?

- ✓ Open data to be shared in neighbourhood.
- ✓ Anonymous data can be shared in the neighbourhood.
- ✓ At the ITU Future Networked Car conference 3rd March 2016, Russ Shields - session moderator remarked that "seamless inter-modal operation and integration is needed e.g. through ticketing: A common Vocabulary needs to be harmonised between the modes"
- ✓ Dept. for Transport shares its data free of charge.

VCNT-ISS-TRANSPORT-072 - What kind of historical data records are already in place or are planned to be installed? E.g.: usage, booking, nearly traffic, requests, etc.

- ✓ Daily statistics about how many vehicles enter and how many leaves.
- ✓ No statistics are defined.
- ✓ Not a standards issue.
- ✓ Extensive traffic movement data is held as recorded by a variety of vehicle sensors.

VCNT-ISS-TRANSPORT-073 - How long will the result/statistics going be stored - and what kind of data will be stored alongside in the historical archive?

- ✓ Default SKIDATA storing period.
- ✓ No data is stored.
- ✓ Not a Standards issue.
- ✓ GDPR principles of minimum data storage should be used.

VCNT-ISS-TRANSPORT-074 - What uses could you find for Big Data gathered from the set of all vehicles on the road, assuming no personal data were included? This could include information from all vehicles of their speed, location, direction, emissions, outside temperature, activation of ADAS (e.g. ant-lock braking; electronic stabilisation).

- ✓ Share physical parking space data openly to optimise parking space.
- ✓ No idea yet.
- ✓ All these applications should be supported. Additional standardisation may be required for some of these applications.
- ✓ Big Data could lead to detection of poor air quality, Poor road surface condition, etc.

VCNT-ISS-TRANSPORT-075 - What uses could you find for Big Data gathered from the set of all vehicles on the road, assuming that personal data are included?

- ✓ If users return to parking space, they could be envisioned a positive user experience like welcome back.
- ✓ No idea yet.
- ✓ Standards will be needed to ensure that these requirements can be satisfied. ETSI ITS WG5 has produced a useful set of documents analysing Threats and Vulnerabilities and best practice to mitigate these issues. UNECE WP29 is running the World Forum for Vehicle Regulations which has as its top priority the key work item on "ITS / Automated Driving including taxonomy and cybersecurity".
- ✓ Any new service must comply with the GDPR to protect privacy. Security is critical if there is any potential for data corruption to cause any systems to run sub-optimally. See "the Italian job"!

V. Health domain

Health care

VCNT-ISS-HEALTH-001 - IoT can be beneficial to various scenarios in the eHealth sector (i.e. assisted living, wellness, telemedicine, integrated care, chronic care, rare diseases, or prevention). Can you verify that the above scenarios could benefit from the use of IoT under VICINITY?

- ✓ I believe that the scenarios mentioned in the "Detailed Description" section cover completely the eHealth sector.
- ✓ Yes, I can verify it. I would propose though to also add health care organization for specific care such as re-education (injured people, nervous, nervous degenerescence, etc.) and perhaps other usages that need to be investigated. An

additional scenario that could benefit is the education of patients and/or health care professional via simulators.

- ✓ Yes, I can verify it. Especially assisted living and integrated care require communication between different kind of "sensors" and intelligent home devices. So, if it was to provide a specific ranking, the latter two (i.e. assisted living and integrated care) would be on top and then the rest would follow as equally important.
- ✓ Scenario combining assisted living, wellness, telemedicine, integrated care, chronic care, rare diseases, prevention of sickness, energy optimisation, transport flexibility, buildings efficiency. 8 young people with disabilities living in modern neighbourhood apartment complex, including two persons with heart defects, two epilepsy patients, two compulsory persons not knowing where they are, two autistic children going to mountains without shoes etc. Register all indoor activities from the group in order to measure daily routines, planned activities, glucose level, low blood sugar, get high on narcotics, heart pulse rate, keys for entering building, access to parking area, electric vehicle charging, energy savings, solar panels energy distribution between 4 blocks, need for 24/7 monitoring by municipality health personnel. Health personnel need for multiple key schemes, supervision at nights, sleep monitoring, mastery and independence. End-user group and next in kin is positive to use new technologies, iPads and sensors.
- ✓ Assisted living – Chronic care – Prevention – Wellness – Telemedicine – Integrated care
- ✓ Assisted living – Chronic care - Integrated care – Prevention – Wellness – Telemedicine
- ✓ Prevention – Wellness – Chronic care – Telemedicine – Assisted living – integrated care
- ✓ Assisted living – Telemedicine – Integrated care – Prevention – Wellness
- ✓ Assisted living – Wellness – Telemedicine – Integrated care – Prevention
- ✓ Assisted living – Prevention – Wellness – Telemedicine – Chronic care
- ✓ Assisted living – Prevention – Wellness – Telemedicine – integrated care – Chronic care – Rare diseases
- ✓ Can't say about the scenarios although it seems reasonable that the mentioned scenarios could benefit from IoT. It would be beneficial though if, somehow, the aggregation of local data could be somewhere stashed to generate population health guidelines.

VCNT-ISS-HEALTH-002 (a) - Can you rank the above mentioned scenarios based on the importance of sharing information? A possible ranking could occur by using social interaction as sorting criteria. As a result, a plausible ranking would be:

- Wellness, where sharing of information has a notion of social interaction.
- Assisted Living, where a notion of virtual neighbourhood is supported.
- Telemedicine, where the VICINITY community is defined as the patient community.
- Integrated Care, where the VICINITY community is the HCP and the patient (smart hospital).

VCNT-ISS-HEALTH-002 (b) - Can you verify/correct the ranking based on the importance of sharing information?

- ✓ I would agree with the ranking of scenarios mentioned in the "Detailed Description" section.
- ✓ Perhaps a distinction between usages focusing strictly on health and other broader usages should be done before ranking. So, after the suggested distinction, a possible ranking could be: In eHealth: Integrated Care and Telemedicine; in Social Aspects: Wellness and Assisted Living.
- ✓ Agree for assisted living, telemedicine and integrated care. A possible ranking could consist of the same order (assisted living – telemedicine – integrated care). On the

other hand, wellness, depending on the involved users, can or cannot include social interactions.

- ✓ AssAssisted living in physical and virtual neighbourhood, telemedicine form nearby hospital, wellness and sharing of information, young people, integrated care 24/7. Very positive group to share information also with health personnel.
- ✓ Wellness – Assisted living – Telemedicine – Integrated care
- ✓ Wellness – Assisted living – Integrated care – Telemedicine
- ✓ Wellness – Telemedicine – Assisted living – Integrated care
- ✓ Assisted living – Integrated care – Telemedicine – Wellness
- ✓ Assisted living – Wellness – Telemedicine – Integrated care
- ✓ Assisted living – Wellness – Telemedicine – Integrated care
- ✓ Assisted living – Wellness – Telemedicine – Integrated care
- ✓ Based on the importance of sharing information, my ranking suggestion would be the reverse order:
  - Integrated Care, very high importance of sharing information.
  - Telemedicine, very high importance of sharing information.
  - Assisted Living, very high importance of sharing information.
  - Wellness, smaller importance of sharing information.

VCNT-ISS-HEALTH-003 - Can you identify the technical infrastructure requirements for each scenario? As technology evolves, a wide variety of devices could be characterized as an IoT device, from modern smartphones to other autonomous units. Obviously, the more scenarios and use cases are identified, the wider the variety of involved IoT devices gets. A reasonable technical infrastructure in health care consists of medical devices that can be connected, wearable and smart materials (already in use) plus implantable devices (pacemakers, smart pills, etc.). Is it important, under VICINITY, for a common technical infrastructure to exist? If yes, can you IoT devices that should be part of it?

- ✓ It would be helpful to have a common platform covering ECG (Electrocardiography), BP (Blood Pressure), weight, etc. Then additional sensors could be added based on the monitoring needs of each case.
- ✓ Broad question. Cannot answer with any clear vision of each use case that needs to be implemented. It also depends of the usage of the data. For example, medical data coming from materials and other devices should be connected with the health care IT through a specific and secured platform using IHE (Integrating the Healthcare Enterprise) profiles and standards before feeding health IT solutions of the health stakeholders.
- ✓ The key will be the way information under VICINITY is transferred / accessed. Obviously, several communication channels will coexist (Wi-Fi, Bluetooth, NFC, etc.). As a result, work will have to focus on the interoperability of data and common access means. A useful suggestion would be to develop/agree on a common toolkit for encoding, decoding and interpreting the data.
- ✓ Wireless communication infrastructure providing security, privacy and anonymity of identifiable objects measuring heart pulse rate, blood pressure, weight, steps per day, smart phones, fitness trackers, implants and wearable devices.
- ✓ N/A.

VCNT-ISS-HEALTH-004 - Can you identify the important stakeholders for each of the mentioned scenarios? The group of actors involved in the eHealth sector is formed by patients, health care practitioners, relatives and care givers. Is every stakeholder of the same importance for each of the above identified scenarios?

- ✓ Yes, I believe that the stakeholders mentioned are of equal importance. However, I would also add in the stakeholders the corresponding organizations (i.e. Patients Organisations, Medical Professionals, or Public Health Organisations).
- ✓ No. Distinction between eHealth and wellbeing will show differences between the more relevant stakeholders. Other stakeholders can be involved such as quality assessment body, vendors, regulation institutions, public health organizations, etc.
- ✓ The identified actors for the scenarios are the following: 1. Wellness: can be just the patient himself or with other persons (e.g. HCPs, care givers); 2. Assisted living: patient, HCPs, care givers, relatives; 3. Telemedicine: patient and his/her care providers; 4. Integrated care: patient and his/her care provider.
- ✓ The end-user group consists of young people with physical disabilities, their next in kin having bought apartment for the youngsters, municipality health care personnel monitoring 24/7 and other voluntary care givers.
- ✓ Agree with the group of actors mentioned in the description.
- ✓ The group of actors mentioned in the description covers more or less the range of actors involved in the eHealth sector.

VCNT-ISS-HEALTH-005 - Do you foresee any special usability requirements regarding VICINITY in relation with the above identified actors? In many cases (especially for the elderly), the use of some IoT devices is effective. For example, automatic reminder or voice management are functionalities that could prove quite useful. On the other hand, a smartphone device is not a widely accepted solution in terms of usability (complexity). Can you identify these peculiarities?

- ✓ Usability requirements vary significantly given various peculiarities and needs like the following, Aging, Chronic patient and the needs of the patient under the different specialty (i.e. cardiology, pathology, neurology, etc.).
- ✓ I agree with the statement. However, this is the current situation of our times but in ten years forward the adoption of smart phone will be high. What is important is the app to be able to provide much useful functionality with an easy access. Once more, interoperability is the key challenge.
- ✓ The key word will be "user friendliness". "Things" must be as easy to use as possible. An important note comes also from the cost of the devices. Obviously, they have to be at a low cost, if possible.
- ✓ Elderly living in same neighbourhood complex would like to share the technology provided by VICINITY. Their relatives are very positive to invest in new technology for their elderly family. IPads are bought buy health care personnel and distributed to youngsters and elderly for testing new apps before buying their own device. Usability testing can be a part of integrated care. Health personnel will measure impact on reduced hourly care for a week.
- ✓ Usability peculiarities increase when concerning the ages that cannot follow technology that easily, in our case mostly the elderly. So, for example, in Wellness that probably concerns younger ages, there would not be any big problem. In assisted living though, that elderly are the ones mostly involved, the solutions must be as automated and autonomous as possible (e.g. wearables), so that there are not a lot of usability requirements for the end users.
- ✓ The case of elderly is probably the one that most issues will have to be faced. Devices or solutions like smartphones will not be widely accepted. So the solution would be to use wearables in as many cases as possible so that the process of collecting data is equivalently as automated as possible.

VCNT-ISS-HEALTH-006 - Do you find the information gathered by VICINITY as clinically important for health care providers? There is a vast amount of information gathered by a wide range of IoT devices consisting of fitness trackers to sensors tracking electricity consumption. Such information could include the following: Vital signs (e.g. heart pulse rate, blood pressure, etc.); Fitness (e.g. weight, steps/day, etc.); other (e.g. level of electricity consumption/day, etc.). Can you identify which of those information are clinical important for the health care providers?

- ✓ Certainly the first two and with the mentioned ranking (vital signs – fitness).
- ✓ For clinical use, it clearly depends on the disease of the involved patient. So, it would probably be something like: Vital Signs for all diseases; Fitness for some type of diseases (e.g. diabetes, kidney illness, obesity, etc.); Level of electricity consumption/day when access to devices is vital.
- ✓ All information can be important for different scenarios. If I had to choose from the suggested categories and based on the clinical importance for the HCPs, I would say that vital signs are the first in the hierarchy followed by fitness information and information coming from other sensors. In many cases though, a combination of sensors is necessary in such a way where involved information is of the same importance. For example, there might be a clinical case where glucose levels are of the same importance as the weight.
  In any case, the choice of collected information has to be determined by the related use case and of course the potential acceptance by the patient.
- ✓ Easy personalised access to building and apartment for end-user, relatives, healthcare personnel. Access to parking area. No need for physical keys for each apartment. New healthcare personnel might easily have access to their apartments using biometrics or daily issued pin codes. Need for care personnel safety in the building due to being on work 24/7. Need for camera on door-bell to know who you let in. People with disabilities cannot press buttons on alarms. Cooperation with private care units (client-driven personal assistants) on day-time. Need for positioning on people with disabilities and door-warning at nights to discover if client go out of apartment. Care personnel needs more time with their clients or a social network between the clients to avoid loneliness. Need for meal assistance, also social assistance during meals. Sensors for glucose and epileptics measurements. Client interior lightning; dim light and pull curtains in evening and opposite in morning due to sunlight in summer and darkness in winter. Dialect language understanding and terminology for care.
- ✓ All participants agreed that health care providers are more likely to be interested in Vital Signs primarily and Fitness secondarily.
- ✓ Clinical important information is information coming from vital signs. Wellness is not that interesting to everyone, at least med tech companies.

VCNT-ISS-HEALTH-007 - Can you rank the importance of data shared by the rest of the VICINITY domains in terms of usefulness to health-related services? Can you sort the importance of data shared by the rest of the VICINITY domains in terms of usefulness to health-related services?

- ✓ This info is of lower importance, and could be grouped as it is - no need to be differentiated and ranked.
- ✓ Information coming from Energy domain is important. For the rest of the domains, not sure it is clear to me.
- ✓ Buildings/energy can offer information about the activity of a person (e.g. early detection of falls, detection of sudden decrease of the electricity consumption/day, etc.). Transportation may be interesting for locating people with mental disorders, although it is probably less useful. If I had to provide a ranking, I would suggest the following order: Buildings, Energy, and Transportation.

- ✓ After discussion with the participants, their suggested ranking is the following:
  - Transportation
  - Buildings
  - Energy
- ✓ In my opinion, a reasonable ranking would be the following:
  - Transportation
  - Energy
  - Buildings

VCNT-ISS-HEALTH-008 - Can you identify and rank interesting IoT devices that could efficiently contribute to the VICINITY project and even more specifically to the Health domain? A reasonable ranking could produce five main categories:

- Medical devices (e.g. heart rate monitors, blood pressure monitors, etc.)
- Consumer smart IoT devices (e.g. smartphones, fitness trackers, etc.)
- Building automation devices (e.g. sensors tracking electricity consumption, sensors evaluating air quality, etc.)
- Implantable devices (e.g. pacemakers, "smart" pills, etc.)
- Wearable devices (e.g. "smart" textiles, etc.)

Can you verify/correct the above ranking? If not, can you identify any other category or suggest an alternative ranking?

- ✓ The proposed categorization is very logical and correct.
- ✓ My suggested ranking would be the following: Implantable devices, Medical devices, Consumer smart IoT devices, and others.
- ✓ The mentioned ranking is more or less a reasonable one and can be verified. In general, it mostly depends on the use cases. For example, in the case of a diabetic person of course glucose sensors will be of primary importance while they can be less important for other pathologies. On the other hand, for persons with cognitive problems, building automation devices or trackers will be of more importance.
- ✓ Ranking from sensors measuring medical data, motion, fitness trackers, electric consumption, air quality, smart pills into wearable clothing.]
- ✓ In my opinion, the ranking should be as following:
  - Implantable devices
  - Wearable devices
  - Building automation devices
  - Medical devices
  - Consumer smart IoT devices

VCNT-ISS-HEALTH-009 - Do you foresee specific facilities/entities that could benefit more from your capabilities? There are various facilities/entities that could benefit from the use of IoT in the eHealth sector. As an example, a "smart" hospital could better serve patients' needs and, as a result, reduce average inpatient daily cost. Similarly, a wide variety of facilities/entities could possibly be identified.

- ✓ Smart hospitals and smart homes (necessary for effective assisted living) are certainly cases to be benefited from IoT.
- ✓ Agree.
- ✓ Mostly entities in charge of chronic patients as well as of elderly people.
- ✓ Neighbourhood apartment complex is actually a smart hospital having patients, healthcare personnel, relatives and people with disabilities, elderly in order to reduce their daily care support costs. More can benefit from helping each other.

- ✓ "Smart" hospital was a widely accepted example for all the participants. Other facilities/entities recognized by the discussion are the following:
  - o Nursing home/rest home (care facility for the elderly)
  - o Gym (mostly benefit by the Wellness scenario)
  - o Clinics
  - o Disability centres
  - o Municipalities (in a wider level)
- ✓ Apart from the "smart" hospital mentioned in the description, a mechanism where aggregation of local data could generate population health guidelines could be an entity to benefit a lot from the use of IoT in the eHealth sector.

VCNT-ISS-HEALTH-010 - Do you foresee financial benefit for health care performing organizations under VICINITY? There are various use cases where information can be shared. Are there any of them that could bring a positive financial result? For example, sharing of specific information could possibly lead to reducing inpatient cost by early diagnosing/preventing diseases, remotely addressing incidents, reducing readmission rates, reducing unnecessary medical tests, preventing epidemics, etc. Similarly, a wide variety of use cases could be identified.

- ✓ All the scenarios outlined, certainly could lead to reduced costs. However, we should not only focus to the financial benefit for the health care organizations but also for the patients that seem to have a benefit from such cases as well.
- ✓ Financial benefit can occur for health care organizations under VICINITY. However, financial benefit can also come for the patients. If a patient has a better knowledge of his/her disease, he/she will be able to manage his/her health with the support of VICINITY and therefore reductions of the costs will certainly arise.
- ✓ Yes, there can be financial benefit under Vicinity. Relevant use cases that could see a financial benefit are the following: (1) Part of the patient monitoring being made at home would have as a result fewer visits at the health care institution; (2) Quicker intervention in case of problems would result lowering the negative effects; and (3) Use of medical sensors (e.g. sensors tracking various vital signs) would reduce the unnecessary medical tests that might have taken place in the health care institution in a different case.
- ✓ Early sharing of health related information will lead to reduced inpatient costs, reducing readmission rates, reducing unnecessary medical tests, preventing epidemics. Also, different neighbourhoods might share their data into what benefit all stakeholders best.]
- ✓ Financial benefit could occur for health care performing organizations (see also VCNT-ISS-HEALTH-009). The important though is that financial benefit could occur for the patient as well by reducing treatment cost, remotely addressing incidents, reducing unnecessary tests, etc.
- ✓ As mentioned in the description, financial benefit could occur for health care performing organizations but the important is that financial benefit could occur for the patients themselves as well.

VCNT-ISS-HEALTH-011 - Which are the domains in which you foresee the service provided by your organization could be extended by IoT and VICINITY pilots?

- ✓ Home monitoring.
- ✓ Helping elderly people to live longer at home.
- ✓ From healthcare into intelligent buildings, transport designed for all, energy consumption and assistive living.]
- ✓ Municipalities are already used as VICINITY pilots.
- ✓ N/A.

VCNT-ISS-HEALTH-012 - Can you identify key performance indicators (KPIs) for pilot performance evaluation? Examples: Cost per home, fault per year, false alarms per year, others.

- ✓ The ones outlined are logical KPIs and useful for sure. What I would add are qualitative metrics such as patient satisfaction, comfort, trust.
- ✓ Yes, if this is possible.
- ✓ Apart from the already mentioned ones, there could also be the following: (1) Number of unnecessary visits to the health care institution avoided; (2) Number of early problem detection; (3) Patient's general satisfaction; and (4) Increase of patient's serenity.
- ✓ KPIs like Number of false alarms per year, Faults per year, supporting cost per home per year relative to the year before, user surveys, quality of life, matter their own lives]
- ✓ The already mentioned ones (i.e. cost per home, fault per year, false alarms per year) + general patient/user satisfaction.
  Stakeholders interviewed during the Vicinity workshop held at GNOMON headquarters on July, 27 in collaboration with CERTH (see list in 1.1).
- ✓ N/A.

VCNT-ISS-HEALTH-013 - Can you rank the monitoring capacities that the system should perform (and currently doesn't)? Examples are: Activity tracking, dietary habits, drug adherence, others.

- ✓ The ones outlined are appropriate. If I could provide a ranking of importance for them, that would be the following, Drug adherence – activity tracking – dietary habits – other.
- ✓ A plausible ranking would be: Drug adherence; Vital Signs; Dietary habits; and others.
- ✓ Hard to rank – it will depend on the use case.
- ✓ Priorities are activity tracking, dietary habits, drug adherence, step counting.]
- ✓ The already mentioned ones (i.e. activity tracking, dietary habits, drug adherence) + sleep management, motion tracking (i.e. steps/day, running minutes/day, standstill minutes/day), patient's space sensors (e.g. room temperature). General patient/user satisfaction.
- ✓ Apart from the already mentioned ones (i.e. activity tracking, dietary habits, drug adherence), it would be useful to monitor care plan related and social needs.

VCNT-ISS-HEALTH-014 - Can you suggest functionality for caregivers? Examples are: reminder, scheduling, automatic data collection, others.

- ✓ The ones outlined are appropriate. What I would add is video communication.
- ✓ Suggested functionality could be a combination of scheduling, reminders, chat, supervision and monitoring, tips, etc. Better investigation should be done though depending of the usage: (1) From or to Patient/Care givers; (2) From or to data to Patient/Care givers/Suppliers/Relatives.
- ✓ Automatic data collection, reminders and scheduling are important. Alerts when abnormal evolution or condition occurs could also be a suggested functionality.
- ✓ Reminding care givers to visit elderly and people with disabilities living alone, scheduling meetings and automatic collection of relevant data to ease the visits and tours out in the community around.
- ✓ Agree with the already mentioned functionality.
- ✓ Apart from the already mentioned ones (i.e. reminder, scheduling, automatic data collection), I would add data treatment, interoperability, etc. In general, it should work as personal assistant.

VCNT-ISS-HEALTH-015 - Do you use in your organization any integration profiles currently available for similar health related services? Do you use in your organization any integration profiles currently available for similar health related services?

- ✓ Yes, we use the mentioned ones plus IHE (Integrating the Healthcare Enterprise) profiles.
- ✓ Yes. Specifically, HL7, DICOM, IHE.
- ✓ Continua is used by municipality health personnel, alarm centre for managing alarms is already installed.
- ✓ N/A.

VCNT-ISS-HEALTH-016 - Can you identify the linguistic semantics requirements under the Health domain of the VICINITY project? Can you suggest a solution on how to limit the role of polysemy in linguistics semantics? Considering the fact that many IoT devices use different terminology, this might lead to misinterpretations of the sharing data. For example, measurements coming from a fitness tracker regarding the weight of an end user might refer to pounds or to kilograms. Should terminologies used, under VICINITY, be common so that the meaning of the shared data is not misinterpreted? If yes, can you suggest of a way to achieve it?

- ✓ Terminology is important and the flexibility should be given to the user-patient to decide.
- ✓ This is a challenge. Terminologies are not common nowadays. So, process with different steps should be in place: Common set of codes; Mapping of coding systems; and Increase of the number of common codes.
- ✓ Yes, common terminologies have to be used - see VCNT-ISS-HEALTH-003. A good way to limit the role of polysemy and address the problem is the use of IHE profiles, use case by use case.
- ✓ Language and metrics should be commonly understood and standardised for European citizen supporting European community standards.
- ✓ N/A.

VCNT-ISS-S&P-018 - What are the current special legal requirements in national and EU level for aggregation, processing and accessing health related data? Data shared among the VICINITY domains and the involved organizations will include personal health related data. For example, current EU law could be summarized in the following: Data Privacy Directive 46/95/EC; New General Data Protection Regulation (draft, still in the making); New NIS Directive; and Cross Border HC Directive 24/11/EC. Apart from the above, does any other official legal framework, in national or EU level, which defines how health related data should be processes?

- ✓ N/A.
- ✓ The already mentioned ones are a good summary of the current law in EU level.
- ✓ Data Privacy Directive 46/95/EC.
- ✓ N/A.

VCNT-ISS-S&P-020 - What are the constraints regulated by EU law and national law in aggregation, storage and processing of health related data?

- ✓ N/A.
- ✓ National law has stronger requirements to encryption of data outside municipality's public control.
- ✓ N/A.

VCNT-ISS-S&P-030 - Should VICINITY support patient consent revocation functionality (data sharing override mechanism) for a defined period of time? Such an example could occur

from the case where a patient plans to be at a specific location for a defined period of time and might wish to not share his/her data during that period. Should VICINITY consider such cases and provide equivalent functionality for the end users?

- ✓ Yes, if this is possible.
- ✓ Yes, it should. Patient has all rights about his/her data.
- ✓ Yes. Vicinity is based on users' participation and so it has to respect them in such cases.
- ✓ Yes, healthy patients and people with disabilities may be outside their specific location in order to master their own life. VICINITY should also support patients outside their building complex to nearby areas, city and reconcilement areas.]
- ✓ In this question, all the participants agreed that VICINITY should consider and support such functionality for the end users. It only has to be considered if it should exist for patients that are not able to decide themselves in clear mind. For example, patients with specific psychiatric issues or issues like dementia, etc. where another family member should probably have the option/right to ask (or not) for consent revocation.
- ✓ Yes, definitely.

VI. Security & Privacy Domain

General

VCNT-ISS-S&P-001 - What private data are collected, processed and stored by your technology? Communication between partners and/or clients usually includes private data - data about persons. Private data are not only persons' name, date of birth, address, or current location, however behavioural or statistical data about persons might be considered as private as well, for example: ""Joe Doe uses bus 36 every morning at 8:00""; ""Joe Doe's energy consumption is 8465 kWh/yr.""". What private data such as name, location, ownership are collected? What statistical data regarding persons are collected? What behavioural data regarding persons?

- ✓ We are collecting private data about passengers only in case they are buying tickets, in case of buying prepaid card or electronic tickets.
- ✓ All citizen data. All infrastructure data, all building data.
- ✓ Lots of private data; real time 10 - 12 parameters; monitoring energy production of PV microgeneration; customers data; old testing results.
- ✓ all things are covered
- ✓ The situation with data generated within a vehicle is unclear. Vehicle manufacturers consider that they own all information generated or stored within the vehicle. For a vehicle which is only driven by one person the data in the vehicle would appear to be subject to the GDPR. Currently the data subject does not have an automatic right to access the information from their vehicles'' ECUs. The OBD convector allows the user to plug in an adaptor and to read the data from the ECU - however, there is no restriction on who can read that data. Future systems will need to be built to a new standard provides required access, whilst preventing unauthorised access.
- ✓ Energy usage by companies and individuals. Total usage only is collected. Consumption at points in time. Names and locations are not collected.

VCNT-ISS-S&P-002 - What issues need to be addressed during the sharing (exchanging) of private data? Data exchanged between partners often includes personal data. Directive 95/46/EC defines how those personal data should be processed. What issues needs to be

addressed during data processing (collecting, transmitting or storing)? What other legislations or regulations needs to be addressed regarding such data processing (e.g. local implementations of the Directive)?

- ✓ Sharing private data regarding third party is very important topic. Sharing private / sensitive business data has following issues: we need to be sure that data will be used on the agreed purpose and with fair and reasonable composition for company.
  As public transport company, we are willing to share sensitive business data on royalty-free basis for non-commercial purposes; otherwise we would like to receive some compensation for data. Data exchange should be covered by the bilateral agreement. In case of sharing third party, private data the agreement with third party should be enclosed. Major national public transport provider in Slovakia
- ✓ All, according to legislative regulation.
- ✓ Credited lab has to meet all the requirements
- ✓ Security
- ✓ Do no harm! Any information set that includes links that could be used to identify a person, e.g. their house; car etc. must be handled according to the DGPR. This means that the data must only be used for the purposes that the Data Subject has agreed to. If data is forwarded to a "fourth party" by the third party recipient, then they must also honour the limitations that the Data Subject agreed to. If an organisation breaks the rules, is there an audit trail to show that they should have understood the restrictions when they received the data?
- ✓ The key ethical issue is the need to support societal benefits (e.g. air quality management) and competitive supply of value-added services / apps vs the manufacturers' view that release of data may undermine confidentiality about the performance of their products and may reduce competitive advantage. There is also the question of protecting information that is linked to an individual and having their consent for its use.
- ✓ Depends on purpose for which it is exchanged and how this is defined.

VCNT-ISS-S&P-003 - What anonymization techniques are used during data exchange or provision to protect privacy? Data exchanged between partners should include only necessary information. Unnecessary information should be excluded and should not be exposed to other parties. Energy consumption statistics of customers should describe their behaviour as precise as possible without identification of the customers. However, payee for energy bills should be identifiable to support latter disputes. In such cases various anonymization techniques are used, such as de-identification, data suppression, data generalization, etc.

- ✓ Usage of the techniques depends on application mostly we are using data generalization. Where our partners have access to statistical data, not raw data.
- ✓ According to general public sector rules and techniques.
- ✓ Private servers. Primary data obtained from the equipment. To comply with conformity requirements.
- ✓ the anonymization technique must ensure that the identity of the Data Subject cannot be determined by combination of the stored data with another database or by using analysis.
- ✓ One key question is whether there will be an obligation on the vehicle manufacturers to open up their closed information systems. "Adoption of an open in-vehicle platform architecture for the provision of ITS services and applications, including standard interfaces". Is the key objective of Priority area IV of Directive 2010/40/EU which requests the definition of the necessary measures to integrate different ITS applications on an open in-vehicle platform. This would appear to place a

requirement that access to key data be made available. As to whether there should be European or national legislation it should be noted that the type approval of road vehicles is undertaken to a common standard across the whole of Europe. National requirements are being phased out. The requirement for openness and access to in-vehicle data would be expected to follow a common standard across all member states and other countries expecting to sell vehicles into Europe. Also UNECE W29 is coordination across world markets, so less is being defined at the national level.

- ✓ Depends on purpose for which it is exchanged and how this is defined. Exchange of data does not always imply anonymization but data can sometimes be sold to 3rd parties under contract law. User will often approve this.

VCNT-ISS-S&P-004 - How should data or services be secured? (Note: usually, public data can be transmitted unprotected over public internet using wireless communication. In other cases encrypted communication is necessary to secure non-public data. How publicly available data needs to be secured during exchange? How transmission of business relevant data needs to be secured? How transmission of private data needs to be secured during exchange (which encryption mechanisms and algorithm should be applied)?

- ✓ Data exchange should be end-to-end encrypted. Security mechanism should be flexible enough to change the encryption mechanism if needed. In trusted environment, securing transported data is enough.
  Only in highly untrusted environment, exchange of the data should be encrypted on application layer.
- ✓ According to legislation.
- ✓ Set of compliance requirements.
- ✓ Encryption over a telecoms network is now well established and by its nature is normally capable of upgrade when this is required. The greater challenge comes from the attachment of low security devices that may be accessed by a local connection, which may be fixed or radio
- ✓ An end-user might wish to opt out of sharing his/her personal data for any reason.
- ✓ Down to contract regulation and economics.

VCNT-ISS-S&P-005 - What issues and challenges should be addressed to keep coherence between shared data and resources? In the interoperable environment peer-to-peer collaboration between partners is established. The partners share their capacities such as parking places or exploit their synergies to use of energy. Due to autonomous or "unpredicted" behaviour of IoT infrastructure or malicious behaviour of a partner the situations like book already occupied parking place or sell same 1KWh twice might occur.

- ✓ Currently all our interactions with external entities are based on the bilateral agreements with prove that real resources exist. As far as agreements are standardized this is good way do it, even with the number of external entities this is manageable. Any disputes can be managed on case bases, however we have process for all such cases.
- ✓ N/A
- ✓ Issues: system is connected to off grid installation. There could be data loss problems.
- ✓ If there are multiple uncoordinated ways to reserve a resource at some future time then it appears that the resource must store the booking information locally so that a sensor would report not just its current state, but its intended state now and at future times.
- ✓ This is not something that can be directly addressed by the Standards community.
- ✓ Not meaningful.

VCNT-ISS-S&P-006 - How should the identity of your partners be verified? Identity of partner with whom data are exchanged, services are consumed or provided should be verified on certain level. What authentication mechanism should be used (e.g. name/password, integrated security or identity providers, tokens, random numbers, etc.)? Which identity providers should be supported in authentication (e.g. Google, Facebook, Twitter, Instagram, live.com, LinkedIn, Xing, etc.)? How the physical presence of identity should be verified (e.g. one time passwords or tokens, installed software recognition, out of band call, peripheral device recognition, biometrics, etc.)? Which governmental identity providers should be supported (e.g. electronic identity cards)?

- ✓ What we foresee as barrier regarding identification is the trust of the identity of partner and resource the partner is providing. None of the existing identity providers can guarantee the trust to identity of partner.
- ✓ Cartao de cidadão (Personal ID)
- ✓ No known methods
- ✓ this is important but there are many solutions to the problem. Trusted third parties may play a role in determining whether a previously unknown device / service should be allowed to connect.
- ✓ This is currently not defined. This question is being worked on by a project in response to European call no. 2015-344 "STUDY ON ACCESS TO IN-VEHICLE DATA AND RESOURCES" that was placed by Directorate C - Mobility and Transport. This will deliver its conclusions well within the VICINITY timescales.
- ✓ Question of identity is currently open. Chains of trust are domain specific or by regulation or best practice.

VCNT-ISS-S&P-007 - How the access to your data or services should be controlled? For example: average household consumption by region is publicly available without authorization, any partnered park sharing operator can book the parking place, any customer can issue the bus e-ticket, only building owner can view current smart meter measurement. What data or services might be publicly available, e.g. without any authorization? What data or services can be available to the particular group of consumers? What data or services can be available to the certain consumers? On which level the authorization should it be enforced (e.g. role of the user, groups, operations, data, etc.)? What technology is used to manage authorization (e.g. Active Directory, OpenLDAP, etc.)? Which authentication protocols should be supported (e.g. SAML, OAuth2, OpenId, JWT, etc.)?

- ✓ Log in requirements.
- ✓ AIOTI is developing the idea that all devices should have a certified trust level. By default any device without a certificate would be at level 0. The security level should be included as an attribute that can be read electronically when the device attempts to connect to a network. Proposed levels are:
  - ✓ 4) Security Certified by third party
  - o 3) Managed Security (maintained)
  - o 2) Secure Update mechanism implemented (maintainable)
  - o 1) Access Controlled device, based on “trusted manufacturer” and self-assessment of security
  - o 0) No security
- ✓ This is not something that can be directly addressed by the Standards community.
- ✓ By contract regulation or economics.

VCNT-ISS-S&P-008 – Where should the data be stored? Data ready to exchange with partners might me available at providers or third parties (in ""cloud"") location. Which type of data can

be stored in cloud? What security measures have to be applied to data stored in cloud? What data should not be available in cloud?

- ✓ Our business data should be under our control otherwise this is Showstopper. We are using cloud services extensively, however we are focusing on local or regional cloud services were we have guaranties 1) no-one have access to our data even cloud provider, 2) data are not leaving our country or in certain cases EU (legal obligations) 3) guaranteed removal of removal.
- ✓ Sever & back-ups.
- ✓ In the cloud
- ✓ It is essential that the limitations set by the Data Subject's consent is associated with the data.
- ✓ The is unlikely to be subject of a technical Standard.
- ✓ By contract regulation or economics.

VCNT-ISS-S&P-009 - What measures should be applied to identify attack or failure? To be sure that data or services were not compromised by malicious attack or simple by system failure, security mechanism should be applied to recognize such situations. These security mechanisms put extra execution and resource overhead on technology operation. Thus it is necessary to balance usage of these mechanism, e.g. every change in payment, service delivery and billing information should be audited, public profile information are not audited, execution normal of the service should be audited, service input data and result are not audited, every service execution failure should be audited including input data and result. What data objects and services should be audited? What information should be stored in audit log? Where the audit information should be stored? How the audit information should be protected?

- ✓ This is a must to have feature.
- ✓ This important subject has not yet been discussed by the AIOT group, but is clearly a candidate for further study
- ✓ this important aspect is unlikely to be addressed by technical Standards.
- ✓ Combination of physical countermeasures, secure technologies and analytics to protect against and identify breeches. Economic considerations will determine what can be put in place.

VCNT-ISS-S&P-010 - Should there be a data sharing override mechanism on interaction with 'break the glass' principles in case of emergency? It is reasonable that cases where the user should grant access for authorized third parties for some data might occur. Besides, everything in health care works with two basic concepts: Informed patient consent and Treatment relationship confirmation. However, in case of emergency the user might not be able to confirm such an action. As a result, a security override mechanism might have to be taken into consideration. Do you foresee, under VICINITY, a security override mechanism as an essential functionality?

- ✓ Yes, security override is a very essential functionality, always respecting and following relevant break the glass principles though.
- ✓ All of the participants agreed that a security override mechanism should exist. Probably, it could also be given a choice to each user to allow breaking the glass access or not. For example, as part of the "Settings" in his/her account where he/she could turn on/off break the glass option so that the health care professional is allowed or not to use it.
- ✓ No. Ethical treaties between parties foresee even these circumstances and even in case of permanent disability such as dementia. The break will not work legally either as it is not previewed by many legal systems.

- ✓ Yes. A security override mechanism should exist. There are two approaches to achieve it: (1) Users participating in Vicinity could be asked whether they would allow such a mechanism so authorized third parties already have that information in case of emergency. And (2) A security overrides mechanism being a default functionality for Vicinity. In any case, user should always be able to check on full detail and based on break the glass principles that accessed his/her data in such cases.
- ✓ While we are operating not in health domain this is not an top concern for us. However, this might be the nice feature for crisis management or ex-off situations. However in such cases the trusts need to be addressed thoroughly: in terms of identity, action, communication and source of data.
- ✓ Is it feasible to include this as a question in the obtaining of consent of the Data Subject Consent?
- ✓ To be determined.
- ✓ Determined by regulation.

VCNT-ISS-S&P-011 - Can you identify the different stakeholder groups? Should different stakeholder groups have different data access rights? (Note: Users involved in the VICINITY project could be placed in various groups. As an example, administrative personnel in municipalities involved in VICINITY could be placed in a separate, own group. Can you identify the different stakeholder groups? Should all stakeholder groups have the same level of data access?

- ✓ Agree, different stakeholder groups should also have different rights on data. Level of data access should depend on the nature of the stakeholder.
- ✓ Now we have small amount of external entities accessing our data, thus the relationships are on one-to-one bases. However, when the number of external entities will rise, they will be grouped by the same scope of access to data and functionality.
- ✓ Yes
- ✓ Platform is being developed to allow access to the real time data. The customer will be able to access data to intermediate results, data and user name and password through will be used through FTP server.
- ✓ The adoption of a limited number of defined set of data sharing rules that the Data Subject would choose from would support this type of grouping. This s a good input for that discussion.
- ✓ To be determined.
- ✓ Different stakeholders will have different requirements for data access.

VCNT-ISS-S&P-012 - Should metadata be collected and saved?

- ✓ Metadata would provide an audit trail to show where personal data had been used or shared, to prove that personal data had only been used for approved purposes. However, if the metadata could be hacked this would present a major privacy threat.
- ✓ Yes, if possible and if automatic and depends of the type of data. Insert metadata by hand is not a great task. In the sensors or in their gateways must be possible to identify always the data origin and some data acquisition particularity. If data privacy is a issue only data acquisition particularity (like acquisition rate) must be saved.
- ✓ metadata may include the specific permissions and restrictions that a Data Subject has signed up to. It may also be appropriate to record the rout by which a Data Processor obtained the data that is being stored.
- ✓ To be determined.
- ✓ Too detailed.

VII. Technical Domain

About Technology

VCNT-ISS-TECH-001 - What current technology are you using? (Note: Each partner might use different type of technology, which causes incompatibility issues in interoperability. This Selection of the technology is usually determined by the partner personal preferences. What devices (mobile appliances, sensors, actuators) are you using/supporting? What technology are you using to process data from devices? Is your technology open source or proprietary? What mobile devices can use your customers, employees and partners? What are the advantages of technology you are using? What kind of desired features are not provided by the solutions you use? When are you planning replacement or upgrade of your technology? What are your expected cost regarding replacement or upgrade of your technology?

- ✓ Providing end to end IoT solutions based on different technologies, depending on the application requirements. Communication is mainly GPRS, although LoRa is being investigated for integration. Solutions are FIWARE and MS Azure based. First is better for in-house installations, the latter for general cloud deployments. The latter is also better known in communities outside FP7/H2020.
- ✓ PC, Control system for AVAC. Proprietary (LG). Smart phones. Mobility, more detailed data, remote control. At this time, features include all needed. No upgrade in new building, but yes in old buildings. Not sure about costs.
- ✓ Real time access to customers data; linking three languages from three resources with different bitrates. How to synchronize for visualization. Graphical representation for real time data. Equipment integration, gpib, irs bt3, communication methods.
- ✓ All communication technologies (both fixed and mobile) are used for communication with smart meters.

VCNT-ISS-TECH-002 - How should your technology be customized? Functionalities provided by the technology needs to be adapted to changing environment, e.g. adding new parking spots, sharing economy service providers, renewable energy source, etc. What features/ functionality should be customizable?

- ✓ Localization and branding are among the first requirements we receive. In case of parking monitoring solution, integration of local payment provider is high on the list. In case of agriculture related solution, support for specific crops is required.
- ✓ Renewable energy systems according to each location requirements. AVAC customization. Data output is an important functionality. Remote control via mobile app.
- ✓ It should always be customizable in an easy way. Each time we face a project - the service is always customizable. Integration of different THINGS (persons, technology, institutions).
- ✓ For smart meters, dense urban areas will require different communication technologies to suburban and rural areas. Different regions of the world will have different environmental conditions to meet. Deployment of sensors for smart parking will have similar considerations / constraints to meet.

VCNT-ISS-TECH-003 - What kind of cloud services are you using in your organisation? The trend towards migration of services into cloud is reaching its peak. Public web pages, electronic mail, calendars or even document storages are usually used as public or private cloud services. Are you using cloud services? What services are you using in cloud? What are

your benefits from using the cloud? What were the obstacles you have to overcome during the migration into the cloud? What are the reasons against using the cloud services?

- ✓ We are using FIWARE (in house server) and MS Azure. We are deploying our IoT solutions on the cloud. It enables us to offer software as a service, reduces the need to maintain and keep upgrading infrastructure. The cost can be prohibitive if configuration is not done properly. Usage of cloud, at least for deployment of services, is not straightforward, requires significant expertise.
- ✓ No cloud services used.
- ✓ Internal and external cloud services. Security is a common concern, but not a barrier to use. Virtual transition is taking place.
- ✓ Yes, I am using cloud Services. The most common is to use Linux Machine fast deploy but we will start to use database storage services. Redundancy, fast and dynamic resource allocation and parallel computer very easy and fast. With cloud, we can exclude all the issues related with disk failure and hardware maintenance required on a physical server environment. Problems: The migration between cloud services is not easy and the cost can be high because most of the system you must pay based on traffic out and not based on traffic in.
- ✓ Range of cloud services/providers are used.

VCNT-ISS-TECH-004 - What standards should be followed during data exchange? Structured data are usually provided in XML or JSON format with domain specific data profiles. Unstructured data are usually exchanged with different pictures (GIF, JPEG, TIFF, PNG, BPM), video (AVI, MOV, MPG, ASF), audio (WAV, MP3) and streaming formats. What formats and data profiles are used by your technology (e.g. devices) to exchange structured data? What formats are used by your technology (e.g. devices) to exchange unstructured data? Are these formats open or proprietary?

- ✓ JSON is used most often, followed by XML. In most cases, format is proprietary.
- ✓ Normally use XML for database, and Excel. Both proprietary.
- ✓ JSON based is the best
- ✓ All of these must be supported.

VCNT-ISS-TECH-005 - Which standards should be supported in sharing services? Services shared between partners should be standardized to enable interoperability. The most common standards to provide services are REST (e.g. for providing data), SOAP (e.g. for executing operations), XMPP or MQTT (e.g. for streaming messages of data, like telemetry, voice, etc.)

- ✓ REST, MQTT.
- ✓ Do not know.
- ✓ All defined in the detailed description and any kind of Message queuing protocol.
- ✓ Depends on customer and application.

VCNT-ISS-TECH-006 - What are the examples of good and bad user experience? User experience with technology is key success factor of technology. Technology should always communicate and serve its purpose to user focusing on intuitive navigation, application adapting to users device, fast responsive simple and well-arranged applications, user with constrained IT literacy and people with disabilities friendly user interface. What is the user experience worst practice?

- ✓ When the things listed in the first sentence are not present.
- ✓ Difference in user experience between Windows and iOS.
- ✓ The layout of the portal. Broad and graphics and text. Best practice: thin lettering, smart images, smart graphics; schematics; "Keep it simple"

- ✓ Click in one functionality and that not work. Click in one functionality and it does another thing. User cannot find easily the most basic action.
- ✓ Depends on customer and application.

VCNT-ISS-TECH-007 - How large is your infrastructure or infrastructure of your clients/partners?

- ✓ Small IT infrastructure for now. 1 central server, connecting all services through internet.
- ✓ 50-60
- ✓ City
- ✓ Up to 27m endpoints.

VCNT-ISS-TECH-008 - What is the acceptable amount of technology interruptions periods and its recovery time (back to normal operation)? Shared services and data should be available 24x7, however planned and unplanned service interruptions might occur. What is the acceptable time when shared service or data are unavailable (interrupted) per day, week or month? In which application/situations the shared service or data must be available regardless any unpleasant circumstances? What is the acceptable time when shared service or data should be restored to avoid unacceptable business consequences?

- ✓ My proposal is that this functionality is related to costing. Retransmissions can easily occur without affecting significantly the desired monitoring. Therefore, if 24/7 is costly, 97% availability could also be fine depending on the task. Certainly, for emergency or accident monitoring, harder thresholds have to be set.
- ✓ Our deployments are currently up to a few hundred devices, which from the performance and capacity perspective do not present a significant challenge.
- ✓ 3 minutes
- ✓ Recovery time, milliseconds; acceptable interruptions: 0. Tests failures in data acquisition and performance are critical for the tests. Heavy equipment with large energy equipment with -40 -50 degrees. 20 feet containers.
- ✓ Up to 27m endpoints.

VCNT-ISS-TECH-009 - What is the most important cause of services or data interruption? Planned interruptions are usually performing of software or hardware maintenance of technology; unplanned interruptions are caused by devices or technology failure, lost internet connection, electricity outage, etc.

- ✓ Device failure or connectivity failure (out of network coverage).
- ✓ Electricity failure
- ✓ Energy loss
- ✓ Electricity outage and lost internet
- ✓ Extreme weather events.

VCNT-ISS-TECH-010 - When and why does your technology have maximum utilization? Technology users' behaviour determine how much the technology is in use, such as morning peak of energy consumption and transport utilization because majority of people get up and travel to work in the morning on working days. Different applications usually have different peaks.

- ✓ That's correct, depends on the application.
- ✓ During the working day hours.
- ✓ Between spring and autumn - peaks and more data to treat
- ✓ N/A
- ✓ Depends on customer and size of deployment. Data is collected every 5-15 minutes throughout the day/night.

VCNT-ISS-TECH-011 - Which services share data and why are they critical for safety? Some services or data are critical for running your business such as multi-modal travel booking, energy storage capacity sharing, adaptive charging of e-vehicles and V2G, etc. Other services or data might be crucial for someone safety such as weather warnings during travelling, personal health status warnings, etc.

- ✓ Health care, Policing, Fire brigade services are all of critical importance. Data is not shared between them.
- ✓ N/A

VCNT-ISS-TECH-012 - What issues need to be addressed to keep your data available in case of technology failure (e.g. data back-up and recovery)? Data should be available (restored) after failure of the technology or interruption of service, thus data should be regularly backed-up and restored if needed. Back-up plans should include short-term (daily - maximal time period where data can be lost) data increments stored locally and long-term (weekly or monthly - maximal period when data can be restored) full back-up stored in remote locations. Back-up plans are usually defined by industry standards, internal processes or by legislation. For example in Slovakia there is a regulation for public agencies which describes the minimal back-up and restore plans that should be implemented including physical security of the backed-up data.)

- ✓ All data should be stored and backed-up.
- ✓ Back up.
- ✓ On daily bases back-ups, not cloud.
- ✓ Back-up of data is operational issue.

VCNT-ISS-TECH-013 - What legislation, standards should be followed to migrate old data into archives? Availability of data in technology is driven by its minimum and maximum storage period. Minimum period is usually driven by business and user expectations; e.g. current energy consumption should be available throughout the whole billing period, history of year energy consumptions should be available in user consumption profile. However, maximum storage period is usually constrained by the legal requirements or company standards to prevent from unnecessary data collection and limit storage resource utilization.

- ✓ Accreditation standard ISO 17025; we must keep min period of 5 years. The data can be migrated thereafter.
- ✓ Never heard of this type of consideration. Usually ad-hoc and then most people find they can't restore data.

VCNT-ISS-TECH-014 - In which shared services do response time play an important role? Active communication between user and technology determines users experience with technology. Users' expectations of responsiveness vary by the application. User can wait few seconds to search for the best travel plan, however 1 second waiting time to turn the lights on in the room is simple unacceptable. Which functionality should have the high responsiveness? What is acceptable time for users using functionality with high responsiveness? What is acceptable time for users using functionality with normal responsiveness?

- ✓ Again, this is application dependant as you already highlighted. When technology is replacing actions previously done manually, then the same level of responsiveness is required.
- ✓ In all services above user response time is important.
- ✓ It will play an important time - embedded in the customer platform. 2 min responsiveness due to different bit rate.

- ✓ Where you have large networks of devices which will want to send e.g. 'last gasp' data in event of failures, e.g. power blackouts which can then cause network congestion/failure. Must understand these scenarios.

VCNT-ISS-TECH-015 - Is there a way to build a 'proof auditing' mechanism for an administrator? An administrator proof auditing mechanism is actually a mechanism where the administrator will not be able to tamper with patients' data in any manner. Moreover, he/she will not have any right to modify the data or even erase them. Can you suggest a way of building such a mechanism?

- ✓ Not familiar how to achieve this, although it would be useful to exist.
- ✓ Yes there is.
- ✓ No (erase, modify data / service options (in compliance with accreditation rules)
- ✓ Yes
- ✓ Where you have large networks of devices which will want to send e.g. 'last gasp' data in event of failures, e.g. power blackouts which can then cause network congestion/failure. Must understand these scenarios.

VCNT-ISS-TECH-016 - Regarding the operational aspect of providing data availability, what is an acceptable level that data availability should reach under the VICINITY project? Details are continuously transmitted from the involved IoT devices. Some cases might occur though arising from transmission interruptions, failures, etc. So, the question refers to the level that data availability should reach. Should the data be 24/7? If not possible, what is an acceptable level: 99.9%, 99%, maybe 97%?

- ✓ My proposal is that this functionality is related to costing. Retransmissions can easily occur without affecting significantly the desired monitoring. Therefore, if 24/7 is costly, 97% availability could also be fine depending on the task. Certainly, for emergency or accident monitoring, harder thresholds have to be set.
- ✓ If possible, data should be 24/7. In case that level cannot be achieved, it has to reach the highest level possible.
- ✓ Really depends on the application.
- ✓ Ideally 24/7 for the Health domain.
- ✓ Stakeholders interviewed during the Vicinity workshop held at GNOMON headquarters on July, 27 in collaboration with CERTH (see list in 1.1).
- ✓ Regarding medicine and eHealth use cases in general, there is no option to that. 24/7 is necessary in medicine, chronicity and EHR (Electronic Health Record).
- ✓ As close as possible to 24/7
- ✓ It should be in a 24/7 base, and if not possible, 98% is the accepted level
- ✓ 24/7 must be possible. But a data acquisition rate of 95 % must be accepted
- ✓ 90%+

VCNT-ISS-TECH-017 - Do you foresee recoverability of data corrupted or 'lost in transit' as an essential functionality for the VICINITY project? Data could be lost for various reasons either while transmitting or when storing. However, data integrity in health care is key and non-negotiable. So, what types of recovery could contribute more in data recoverability? How soon should the data be recovered? Could you suggest of any technique (e.g. data replication) to achieve it?)

- ✓ As mentioned above, in only few cases data cannot be lost. Retransmissions can easily occur.
- ✓ Currently have four back-ups.
- ✓ Not an essential functionality for Vicinity, because data has been already backed-up and replicated before being shared

- ✓ Data replication between databases. A database must exists physical on the place. In case of problems, the system must work with the database on the place and not on the cloud. The database on the place acts like a gateway of data. Gateways must have a UPS and if transmission to data server fails and resend when recovers.
- ✓ VICINITY is not specifically in domain of infrastructure architecture - this is an orthogonal issue.

VIII. Legal & Ethics Domain

About Legal & Ethics

VCNT-ISS-L&E-001- What are the current legal documents and/or processes at national and EU level for an end-user to access his/her personal data contained within a proprietary IoT mechanism? Proprietary devices makers might deny full access on data by the users and especially by authorized third parties. Is there any specific legal framework, in national or EU level, for such cases to be solved? If yes, could we build even more on it? Otherwise, should it be created?

- ✓ N/A.
- ✓ N/A.
- ✓ Depends. Normally the data collected are data that did not has problems with privacy but the technology can store and process data with privacy issues. If the data reach your technology is because exists an agreement and we can use that for free but only for our use. Share the data requires new agreements.
- ✓ One interesting situation relates to data generated within a vehicle. Vehicle manufacturers assert that they own all information generated or stored within the vehicle's control systems. However, for a personal vehicle - normally used by one person - the data would be subject to the GDPR, as it can be associated with that individual. However, currently there is no easy way for the data subject to access the information embedded in the vehicle nor to manage it and its use.
- ✓ The situation with data generated within a vehicle is unclear. Vehicle manufacturers consider that they own all information generated or stored within the vehicle. For a vehicle which is only driven by one person the data in the vehicle would appear to be subject to the GDPR. Currently the data subject does not have an automatic right to access the information from their vehicles'' ECUs. The OBD connector allows the user to plug in an adaptor and to read the data from the ECU - however, there is no restriction on who can read that data. Future systems will need to be built to a new standard that provides required access, whilst preventing unauthorised access.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ EU law over-rides MS law?

VCNT-ISS-L&E-002 - What ethical issues might be raised by open interoperable platforms? IoT applications will dramatically influence our daily life. Technology will be everywhere and everything will be interconnected. New ethical issues will be raised such as what are public and private data, how to opt out from IoT, where and when data should NOT be collected.

- ✓ A new data share agreement is required.
- ✓ Interoperable platforms may result in personal information being extended from one platform to another. Thus user's personal data may be used for purposes that they did not envisage when they signed up to the service, but may still be allowed because of

the loose wording used in the consent agreement. The AIOTI meeting on security (16th June) concluded that all these systems must use privacy by design, with two main features.

1) Minimise occasions when personal data is used or shared
2) "As-if design" requires that systems that are not intended to process personal data should still be designed with a level of security that would be appropriate for handling personal data.

- ✓ The key ethical issue is the need to support societal benefits (eg. air quality management) and competitive supply of value-added services / apps vs the manufacturers' view that release of data may undermine confidentiality about the performance of their products and may reduce competitive advantage. There is also the question of protecting information that is linked to an individual and having their consent for its use.
- ✓ IoT applications will dramatically influence our daily life. Technology will be everywhere and everything will be interconnected. New ethical issues will be raised such as what are public and private data, how to opt out from IoT, where and when data should NOT be collected.
- ✓ EU law over-rides MS law? Principle of whether my private data can be used for other purposes is wider than IoT. Growing opportunity for nefarious use of data by IoT technologies but it's a technology independent problem.

VCNT-ISS-L&E-003 - Should the EC create a legal or regulatory framework for IoT applications comply with? Each country has their own specific legal and regulatory frameworks it's necessary to create a unique legal and regulatory framework - the white Book for IoT.

- ✓ As VICINITY is a "European-spread" project, it is clear that a common legal/regulatory EC framework for IoT applications would make things simpler for similar cases in the future.
- ✓ Yes
- ✓ No personal or direct personal data is stored. Data are stored based on sensors identification and not persons. No data related with a particular costumer is saved, except its fix location is stored on a map and in a database. Also, in cases where indirectly a person can be identified it will not identified by the system but only and maybe by contracts did by the person when, by example, rent a device. This information is not saved on these platforms.
- ✓ the legal framework is established in GDPR. However, at the AIOTI meeting in June it was noted that the precise meaning in some areas is unclear. The normal way to achieve clarity is for the interpretation to be tested in a law court when an organisation is accused of not complying with the rules. That is an expensive process. Perhaps there would be benefit in the Commission developing a code of practice that would indicate best practice guidance, which should help to clarify any areas of uncertainty.
- ✓ One key question is whether there will be an obligation on the vehicle manufacturers to open up their closed information systems. "Adoption of an open in-vehicle platform architecture for the provision of ITS services and applications, including standard interfaces". is the key objective of Priority area IV of Directive 2010/40/EU which requests the definition of the necessary measures to integrate different ITS applications on an open in-vehicle platform. This would appear to place a requirement that access to key data be made available.
  As to whether there should be European or national legislation it should be noted that the type approval of road vehicles is undertaken to a common standard across the whole of Europe. National requirements are being phased out. The requirement for

openness and access to in-vehicle data would be expected to follow a common standard across all member states and other countries expecting to sell vehicles into Europe. Also UNECE W29 is coordination across world markets, so less is being defined at the national level.

- ✓ The extent to which the UK will comply with future EU legislation is to be determined by negotiations over the UK's future relationship with the EU and the Commission. The UK may need to legislate and regulate activity in this area. In general, such legislation will only be created where it is necessary to adopt an approach which would not be adopted as a result of market forces.
- ✓ Need a test for what is an IoT application and what isn't. This would be technically difficult and it's not clear how to manage compliance.

VCNT-ISS-L&E-004 - What are the legal rights and processes at national and/or EU level for an end-user to ask for his/her already recorded data to be erased after willingly opting out of using an IoT mechanism? An end-user might wish to opt out of sharing his/her personal data for any reason. Is there, or even should it be in case it does not currently exist, a legal process that a user could follow in order to erase his/her historical data record?

- ✓ As far as I know, there is no such process to follow right now. Probably it should be considered and suggested in some cases though.
- ✓ Summary of Stakeholders interviewed during the Vicinity workshop held at GNOMON headquarters on July, 27 in collaboration with CERTH (see list in 1.1):
  - No one in the discussion knew if a process currently exists, all agreed though that a legal process should exist for the user to erase his/her data if he/she desires cause he/she should be the one with total control of his/her data after all.
  - An example of a case resulting second thoughts is only when the collected data of all users serve a common good (e.g. data coming from the users' vehicles helping for better distribution of road traffic).
  - Another case that arises is when the end user cannot confirm himself/herself (e.g. dementia case) the desire to erase his/her data record but a family member does. The question that lies is whether a family member should be allowed to do so in such cases.
- ✓ Do not know if a legal framework for such cases currently exists. One is for sure though that it should be.
- ✓ The data transmissions between data gateways and central database or between sensors and gateway can be encrypted. If the data is sensible data(with privacy requirements) we must protect also the data package with some key related with the end user.
- ✓ GDPR includes the explicit requirement that data subjects can ask for all their historical data to be deleted. This can occur at any time after the Data Subject has previously given their explicit permission to record personal data. There are no standards that explain how this should be done.
- ✓ GDPR includes the explicit requirement that data subjects can ask for all their historical usage data to be deleted. There do not appear to be any transport related standard developed to address this need.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ EC have recently given users right to ask for deletion of data which was previous held with user's permission.

VCNT-ISS-L&E-005 - Can you determine a strategy for the VICINITY project to efficiently deal with the digital exclusion challenge? The desired success of the VICINITY project lies on the

extended use of IoT mechanisms by the end-users. There are still many people though that they do not have access on the Internet or they cannot afford buying any kind of IoT device forming the so called "digital exclusion challenge" (Schejter, Ben Harush & Tirosh, 2015). How can we make sure that those individuals will not be excluded by the new era VICINITY envisions? An example comes from the British Government that has started to take this issue into account since April, 2014 when the "Government Digital Inclusion Strategy" was first published. Is there a similar strategy that VICINITY should considerate?

- ✓ Cannot think about a specific strategy to deal with the challenge. However, discrimination is not allowed and accepted in EU space, so it is a challenge that has to be taken into account.
- ✓ Summary of Stakeholders interviewed during the Vicinity workshop held at GNOMON headquarters on July, 27 in collaboration with CERTH (see list in 1.1):
  - If VICINITY is organized and works in a municipality level (or any other official state level), then states can guarantee that no individuals are excluded.
- ✓ I am not aware of any similar strategy. VICINITY though should concentrate to data collection from systems that work at Community/Municipality level. This way there will be no digital exclusion challenge as it will be Municipality's duty to include all citizens.
- ✓ Depends on the type, the way and the rate of data access the resources must the adjusted. If strong real time access to data will be required a streaming data transfer technique or replication, based on data query, over a network must be considered. With this approach, we can avoid problems of speed. In addition, shard queries and partitioning tables must be used on the database and the database engine must not have limits on the number of partitioning tables. Also we must ensure that data acquisition have priority over all process. Also a minimal random delay on data submission to the central database system must be considered. In case of wireless sensors they must have a minimal delay on data submission to the network to avoid data collision. Hundreds of sensors on network or hundreds of data submission to the same server at same time can cause error related with concurrent resource allocation and they can be easily solved or reduced using this type of techniques.
- ✓ Much of the current work on Digital Exclusion is focussed on providing access to the broadband network. A second area of concern is how to bring the advantages of the IoT to non-expert users. Designing systems to provide interoperability by design, with a plug and play approach would enable people to buy products without having to consider the integration into an IoT, then services could be offered to them on "a turn it on if you need it" basis.
- ✓ This is not something that can be directly addressed by the Standards community.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ EC have recently given users right to ask for deletion of data which was previous held with user's permission.

VCNT-ISS-L&E-006 - You may be able to access data, but who are they owned by?

- ✓ Each partner must be identified by a project manager, by a own country based document with the company working area and also by a previous meeting when data required have privacy issues. In that meeting privacy contract must be implemented.
- ✓ One interesting situation relates to data generated within a vehicle. Vehicle manufacturers assert that they own all information generated or stored within the vehicle's control systems. However, for a personal vehicle - normally used by one person - the data would be subject to the GDPR, as it can be associated with that

individual. However, currently there is no easy way for the data subject to access the information embedded in the vehicle nor to manage it and its use.

- ✓ this is currently not defined in many cases. A good example is the data in a car. Related questions are being worked on by a project in response to European call no. 2015-344 "STUDY ON ACCESS TO IN-VEHICLE DATA AND RESOURCES". It is hoped that this project will provide clarity on the subject.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ Current digital exclusion strategies should include IoT.
- ✓ The owner may be an individual, or an organisation. For example car makers claim to own all information that is derived from built-in computers used to operate the vehicle.

VCNT-ISS-L&E-007 - Do you need the owner's permission to use the data (even when this is not personal data)?

- ✓ By strong users keys, strong encryption and restricted user permissions. If possible some key permission access technique must be used (like ssh keys, or sha-512 API keys or sha-512 API with hardware validation keys).
- ✓ The AIOTI group concluded that systems should be designed "as if" they were handling personal data. Security and perhaps Data Subject consent should be designed in from the start as if the system did handle personal data, even if it does not access this data at first. Then any change of usage can be accommodated
- ✓ The is unlikely to be subject of a technical Standard.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ VICINITY should talk to legal departments in Brussels about this not to users.

VCNT-ISS-L&E-008 - How will an agreement to use data be recorded? Will this place limits on the uses that can be made from the data?

- ✓ In a unique and well structure database with replication and fail-over techniques on a cloud service. Bad structure database with no replication and fail-over techniques unfortunately still exists nowadays. The type of database engine, their possibilities in terms of:
  - New data types definition
  - Execution external procedures and use external languages
  - Have no limitation in terms of number of partitions
  - Have database, table and query base replication possibility.
  - Easy backup recover techniques
- ✓ Must be considered in one implementation. In addition, the possibility to use divide to conquer techniques on database or increase the resource required easily must be considered where. The application of techniques that minimize the database downtime required must be always the metric of the system."
- ✓ Explicit recording will be required, and this needs to show that the data subject authorising its use was properly informed and was not just adding a tick in an box that is required to move to the next step of loading an app. It is clear what is not allowed, but not clear exactly what should be done instead. There was a view that acceptance of the suppliers' terms may not be just black and white, but that the data subject may wish to decline some aspects of the proposed data usage, which might mean that they could receive a reduced level of service, or that the service may be provided at a higher cost because the service provider is unable to secure the

financial benefit that they expected from being able to use the data subject's information, e.g. to enable better focused sales campaigns

- ✓ This important aspect is unlikely to be addressed by technical Standards.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ The owner may be an individual, or an organisation. For example car makers claim to own all information that is derived from built-in computers used to operate the vehicle.

VCNT-ISS-L&E-009 - Will fees be payable for using the data?

- ✓ I agree that some data needs to be compensated for. Type of data and type of application of such data. Internal tests are being done and we can see that type of data.
- ✓ Number of communication by second and services check with some relevant period. In the most common services over a network are already used a lot of system to avoid issues related with attacks and failures. For attacks are used firewalls and service monitoring because some attacks are based on a simple denial of service. The monitoring must always be implemented because only using services monitoring it's possible to prevent services failures and also attacks. Related with wireless sensors and to avoid problems with attacks must be used strong encryption keys and again, monitoring. If a sensor is transmitting a lot a not expected data or the sensors did not send data the monitoring service must detect this and alert the technical team about that. In addition, the monitoring service can apply some measures to prevent problems until technical assistance.
- ✓ To be determined. It is clear that cost will be incurred in collecting data and providing third parties with access to the data. So fees are likely to be charged by the data controller for third party access to the data. However, a large part of the value of the data is in the information that it reveals about the Data Subject. It appears unlikely that the Data Subject would be paid for each time this information is accessed although there may be an incentive to sign up and give permission to access the data. There is precedent in people who complete market intelligence surveys being given gift vouchers to spend with one of the suppliers paying for the survey.
- ✓ To be determined.
- ✓ To be determined.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ Organisations that have built a closed system that uses data for a specific purpose may be willing to allow third party use of these data, but at a price!

VCNT-ISS-L&E-010 - How will usage be monitored to determine the value of data collected?

- ✓ Yes must be implemented. Actions did by some agent that fail its credentials or try to make mistakes all the time must be banned or warned. The platform webmaster must be advised of this behaviour and do action to prevent them. In case of sharing or storage issues the permission must be overwritten to read-only to all system to avoid data corruption and problems. Never forget the backups and replication implementation and also tests of consistency.
- ✓ To be determined.
- ✓ To be determined.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation

- ✓ The value to the user cannot be assessed from monitoring the collection of the data. It is not possible to monitor how data is actually used rather than collected.

VCNT-ISS-L&E-011 - Who is responsible for the integrity and accuracy of data gathered? Who is responsible if an error in the data collected is in error and causes a loss to another party?

- ✓ Yes and Yes. We can identify the groups of stakeholders but the data access must be done using another type o strategy explain more ahead. But the group of Stakeholders must be something like:
  - Administrators Stakeholders – Reserved for software development Stakeholders with administrative privileges. They have full access to the data.
  - API Stakeholders – Reserved to Stakeholders that want to view the data and access to that data to implement its own applications.
  - Technical Stakeholders – Reserved to Stakeholders that can change some particularity of the metadata of data related with its permissions. Also it can view the data and add and configure new source data. This technical also have permissions to use API
  - Viewers only Stakeholders – Only can view and download data from the web platform based on its permissions.
- ✓ Data access must be always different from a group of users to another group of users. The application must permit to change the permissions by group and by user within a group. Also priorities between each permissions system (group vs individual permissions) must be implemented. With that capacity, one application is always scalable in terms of users' rights. For better permissions system the permissions must be applied/permitted by table, column and data register. Also group of groups can be considered but increases the complexity of the application but permits all combinations of permissions required."
- ✓ To be determined.
- ✓ To be determined.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ Regulator lays down rules for this.

VCNT-ISS-L&E-012 - What is the impact of Data Retention regulations?

- ✓ To be determined.
- ✓ To be determined.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ Question is too general and needs more thought. Depends on how data is stored and how accessible it is.

VCNT-ISS-L&E-013 - What metadata must be kept in order to prove that data has only used for the intended purpose?

- ✓ To be determined. Academics from Cambridge University made the assertion that Meta data had to be stored to track when a data controller had allowed access to data falling within scope of the GDPR. This would enable security / privacy breaches to be identified and for responsibilities for breaches to be assigned. However, the accumulation of the meta data would represent a great deal of information and if the security of that database were to be breached it would create a very significant potential for release of personal data - far greater than if a few data exchanges had been hacked. Further clarification of these requirements is needed.
- ✓ To be determined.

- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ Metadata will not tell you how data has been used.

VCNT-ISS-L&E-014 - How can usage of personal data be described to the data subject where there is uncertainty about exactly how data will be used in yet-to-be-developed applications?

- ✓ Discussed at the AIOTI meeting on 16th June. There was discussion of the need for obtaining much more informed consent from the Data Subject. This might include clarification of the possible consequences of sharing personal data for the purposes outlined. There was also discussion of the use of granting incremental usage rights. The user may lose certain rights, or have to pay more for the service if they decline to allow certain uses of their personal data.
- ✓ We have not yet identified any standards in this area.
- ✓ A new view started to emerge that maybe there should be a limited number of legally defined classes of data usage, which would enable these to be understood by the Data Subjects, Data Controllers and Data Processors. This is for further study.
- ✓ DfT is concerned that any systems or services deployed in the UK fully meet or exceed the current legislation
- ✓ Contract law will determine - clause may say that data may be used for other purposes and customer will agree (or not).