CREATE-IoT

H2020 Work Programme 2016-2017
H202-IoT-02-2016
Duration: 36 months

European Large-Scale Pilots Programme

CROSS FERTILISATION THROUGH ALIGNMENT, SYNCHRONISATION AND EXCHANGES FOR IoT

H2020 – CREATE-IoT Project

Deliverable 06.09

Workshop on LSPs use cases: integration and standardisation alignment

Revision: 1.00
Due date: 28-02-2019 (m26)
Actual submission date: 22-03-2019 (m27)
Lead partner: ETSI

European Commission

Dissemination level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Summary					
No and name	**D06.09 Workshop on LSPs use cases: integration and standardisation alignment.**				
Status	Released	**Due**	m26	**Date**	28-02-2019
Author(s)	E. Darmois (ETSI), O. Vermesan (SINTEF), R. Bahr (SINTEF), D. Raggett (ERCIM), M. Serrano (NUIG), A. Kung (TI), P. Annicchino (AS)				
Editor	E. Darmois (ETSI)				
DoW	This deliverable summarizes a part of the work carried out in tasks T06.01 (IoT Interoperability, standards approaches, validation and gap analysis) and T06.02 (Pre-normative and standardisation activities). It includes a short summary of the "IoT Interoperability Framework" workshop carried out on March 22nd, 2019 in Brussels. This workshop was a common event where the IoT LSPs have discussed the most recent progress regarding the definition of an IoT Interoperability Framework; the linkage of AG02 with the MSP/DEI Work Group; a refinement of the KPIs associated to standards within the LSPs; and how-to dissemination the progress in standardisation, in particular at IoT Week 2019.				
Comments					

Document history			
Rev.	**Date**	**Author**	**Description**
0.00	30-01-2019	SINTEF	Template/Initial version.
0.01	26-03-2019	ETSI	Document structure and general information.
0.02	27-03-2019	ETSI, SINTEF, NUIG, TI, AS	Integration of Workshop contributions.
0.03	28-03-2019	SINTEF	Update AUTOPILOT input
0.04	28-03-2019	ERCIM, SINTEF, NUIG, TI, AS	Review of document
0.05	29-04-2019	ETSI, SINTEF	Update LSPs; Review comments considered.
0.06	14-05-2019	ETSI	Update LSPs.
0.07	25-05-2018	NUIG	Section 3 review and update ACTIVAGE input
1.00	25-05-2019	SINTEF	Final version released.

Table of contents

1. Executive summary 4
1.1 Publishable summary 4
1.2 Non-publishable information 4

2. Introduction 5
2.1 Purpose and target group 5
2.2 Contributions of partners 5
2.3 Relations to other activities in the project 5

3. Workshop summary 6
3.1 Objectives 6
3.2 Concrete examples of usage of the Interoperability Framework 7
3.2.1 An update on the Reference Architecture objectives and usage 7
3.2.2 The AUTOPILOT analysis 8
3.2.3 The ACTIVAGE feedback 10
3.2.4 The IoF2020 feedback 12
3.2.5 The MONICA analysis 13
3.2.6 The SYNCHRONICITY analysis 13
3.2.7 Feedback and discussion 15
3.3 The MSP Digitalisation of European Industry Work Group 15
3.3.1 The MSP/DEI Work Group report 15
3.3.2 Next steps 15
3.4 Definition of the KPIs for Standardisation in the LSPs 15
3.5 Organisation of the Activity Group 02 Workshop in IoT Week 2019 16

4. Conclusions 17
4.1 Contribution to overall picture 17
4.2 Summary and next steps 17

5. References 18

1. EXECUTIVE SUMMARY

1.1 Publishable summary

The workshop on "LSPs use cases: integration and standardisation alignment" was carried out on March 22nd, 2019 in Avenue Beaulieu 25, Brussels. This workshop was a common event where the IoT LSPs have discussed the most recent progress regarding the definition of an IoT Interoperability Framework; the linkage of AG02 with the MSP/DEI Work Group; a refinement of the KPIs associated to standards within the LSPs; and how-to dissemination the progress in standardisation, in particular at IoT Week 2019.

The definition of the IoT Interoperability Framework (IF) has been consolidated during 2018, in particular with the four workshops held in the course of the year. The work is now shifting on its application to LSP use cases and get feedback in order to improve it and make it applicable to all the stakeholders involved. Beyond the LSPs, the Reference Architecture part of the IF (and its 3D model) will be of interest to other participants in the IoT community: this is in particular the case for those involved in the Multi-Stakeholder Platform (MSP) Digitalisation of European Industry (DEI) Work Group which has been initially associated to the discussion during the Workshop and will be continuously monitored during 2019.

Another important aspect of the work on the Interoperability Framework is the dissemination of the results to the IoT standardisation community. The Workshop has discussed a proposal to maximise the reach of the Interoperability Framework (the IoT 3D architectural model and its application to use cases; the applicable standards and specifications; the IoT platforms; etc.).

1.2 Non-publishable information

None, the document is public.

2. INTRODUCTION

2.1 Purpose and target group

This workshop was a common event where the IoT LSPs have discussed the most recent progress regarding the definition of an IoT Interoperability Framework; the linkage of AG02 with the MSP/DEI Work Group; a refinement of the KPIs associated to standards within the LSPs; and how to dissemination the progress in standardisation, in particular at IoT Week 2019.

The topics discussed are of interest to a large range of the IoT stakeholders, starting from the technical community, e.g., IoT systems designers and developers, standardisation community participants.

2.2 Contributions of partners

ETSI contributed to the organization of the event, the content of the document and two presentations during the event.

ERCIM has contributed to the organization of the event and provided inputs to sections 3 and 4.

SINTEF has contributed to the organization of the event and provided inputs to sections 3 and 4.

NUIG contributed with a presentation during the event and provided inputs to sections 3 and 4.

TL contributed to the discussion during the event and provided input to sections 3 and 4.

AS contributed to the discussion during the event and provided input to sections 3 and 4.

2.3 Relations to other activities in the project

This event has been organized within the framework of activities of CREATE-IoT WP06 (IoT Interoperability and Standardization). It has also benefited from contributions stemming from on-going work in the IoT LSPs and the IoT Activity Group AG02 (IoT standardisation, architecture and interoperability).

3. WORKSHOP SUMMARY

This section presents a short summary about the content and outcomes of the workshop on LSPs use cases: integration and standardisation alignment. The workshop was organised with the objective to exercise the best practices for IoT-related system architecture alignment and also to promote the collaboration amongst the different H2020 LSP projects. The workshop was carried out on March 22nd, 2019 in Avenue Beaulieu 25, Brussels.

The slides of the presentations, with all the details, are available in the e-Room of CREATE-IoT and of the IoT European Large-Scale Pilots (LSP) Programme.

3.1 Objectives

The design and architecting of a large IoT system is a complex task and additional complexity is added when the IoT system is designed to be in an specific application domain where interoperability is crucial for the optimal operation of the services and applications provided. This workshop addresses those challenges and also look at the alignment and consolidation of interoperability frameworks that has been defined in a seamlessly way in the past. This workshop was the first one organised in 2019 by the IoT LSPs Activity Group AG02. It was done in continuation with the four LSPs use cases: integration and standardisation alignment workshops organised in 2018 and aims to be pioneer on defining the best strategies to understand and share the best practices for design, architecting and deploying large scale IoT systems at industrial level.

As a summary, the main objectives of the 2018 Workshops have been to work on a synthesis regarding two main aspects:

- The consolidation of the "technical maps", in particular Reference Architectures, Interoperability criteria, platforms, components;
- A view of standardisation that identifies the existing standards adopted by the LSPs as well as the gaps.

The objectives of the Workshop #5 were:

- The consolidation of the LSP Interoperability Framework (IF) developed in 2018;
  - Use the current IF and explain how it applies to LSP use cases
  - Discuss on possible areas of improvement
- Agreement on a simplified set of KPIs relative to Standards to be applied in the LSPs;
  - Discuss and decide on simple and easily actionable criteria
- Preparation of the program for the Workshop #6 to be held during IoT Week
  - Discuss the proposed program and possible contributions

The workshop was attended by stakeholders with technical and operational expertise representing the different applications domains in the LSP's ecosystems i.e. Smart Cities and Societies, Healthcare and Wellbeing, Food and Farming, Connected and Self-Driving cars and Wearables technology. Several participants from the European Commission (EC) participated providing inputs and feedback about the multiple requirements to scale IoT systems and the need to accelerate the take-off of IoT technology in the LSPs and beyond (e.g., in the Digitalisation of European Industry initiative).

3.2 Concrete examples of usage of the Interoperability Framework

The focus part in this workshop was to create awareness, achieve the common understanding and agreement about the existence of the 3D LSP Reference Architecture Model, its meaning and its value as one of the IoT community assets. The 3D LSP Reference Architecture Model is as a tool for alignment across different IoT system Architectures. The value of the 3D model relies in the inherent characteristic for simplifying alignments of multiple conceptual frameworks and also in the alignment of the technical aspects addressed as functionalities

3.2.1 An update on the Reference Architecture objectives and usage

The discussion was introduced by a short presentation of the Reference Architecture part of the Interoperability Framework (with a reference to the CREATE-IoT deliverable D06.02 "Recommendations for commonalities and interoperability profiles of IoT platforms").

The 3D-LSP Reference Architecture (aka the 3D model) is an approach to define, identify and co-relate multiple IoT system features, architectural characteristics and properties in LSP IoT systems. The principle of this reference Architecture is to use a number of 2D views that are a projection of the 3D view on a specific plane. In particular, a preliminary analysis of how the stakeholders are involved in the definition of an IoT systems can be aligned by using in each of the three main views analysed and shortly described in the following figures:

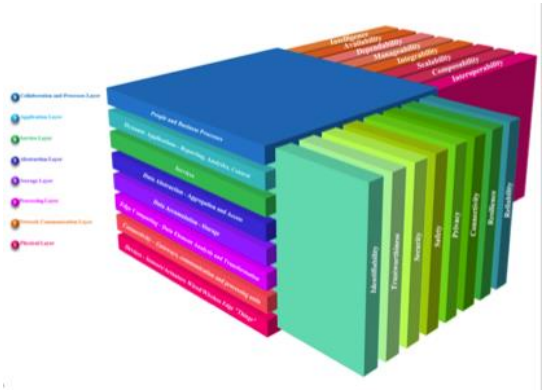
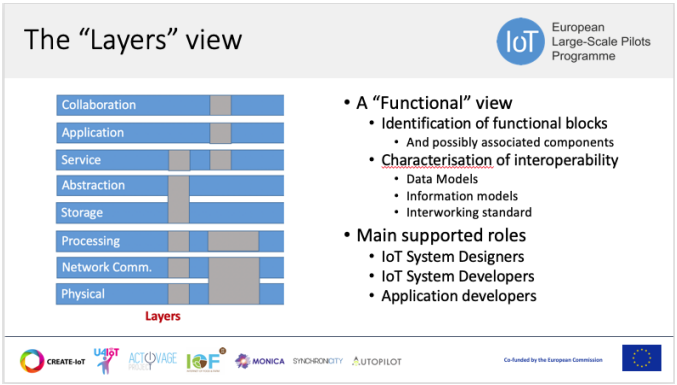
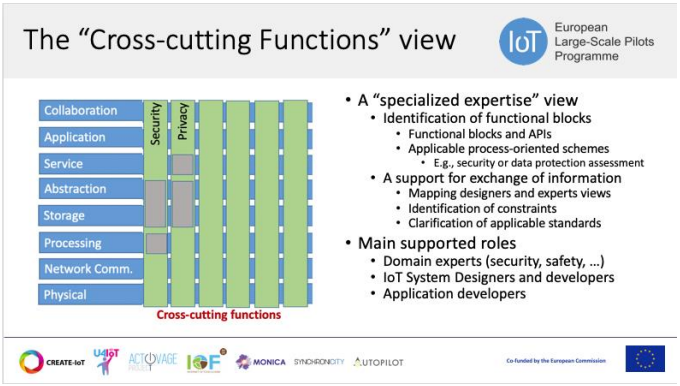


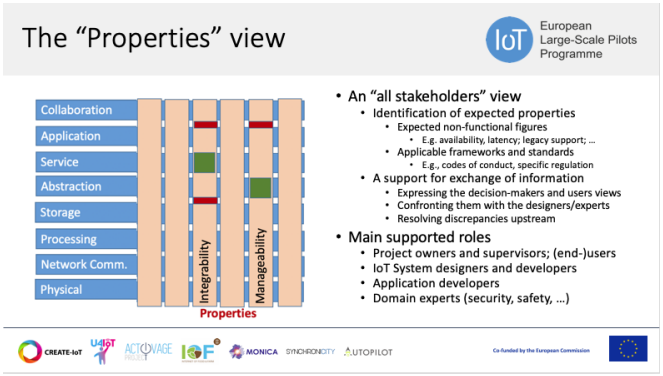
Figure 1: The three main views in the 3D Model (Layers, Cross-cutting functions, and Properties)



The "Layers" view in the 3D model refers to the overall characteristics of IoT Systems from a functional and operational perspective, it includes aspects from physical devices, networking, cloud infrastructures, data, services and applications but also collaboration. The main usage of this layer is to facilitate the identification of necessary functional blocks for interoperability at the different "layers" in IoT systems.



The "Cross-cutting Functions" view refers to properties of the IoT system which are not resulting from just functional components but more from the interactions amongst these components. It includes security, safety & resilience, trust and privacy, connectivity, interoperability, dynamic composition and automated interoperability. The main usage of this layer is to support the protected and reliable exchange of information.



The "Properties" view refers to features and characteristics of the IoT systems that are not associated with the data but with the administrative and managing aspects of the IoT infrastructure and the system itself. It includes Intelligence, Availability, dependability, manageability, integrity, scalability composability and Interoperability. The main usage of this layer is for identification of the properties characterising IoT systems or applications.

The main objective of the workshop was not to discuss the details about the 3D model but to generate the awareness on how this can be used as a tool for IoT systems characterisation and cross-domain interoperability. During the course of the explanations in the workshop overall awareness was arose about the real value and the dedicated efforts to create the 3D model. The full details about the 3D Model are provided in the CREATE-IoT deliverable D06.0 as cited above. At As part of the feedback in the workshop was highlighted the importance of continue the work towards create more awareness and agreement on the 3D model approach and also was suggested to take into account on data ethics as fundamental contributions in trust building.

3.2.2 The AUTOPILOT analysis

The LSP and AUTOPILOT architecture approaches are illustrated in Figure 2 and Figure 3 including the application, IoT, and network layers, together with IoT reference architectures, architecture patterns, and characteristic features of IoT.

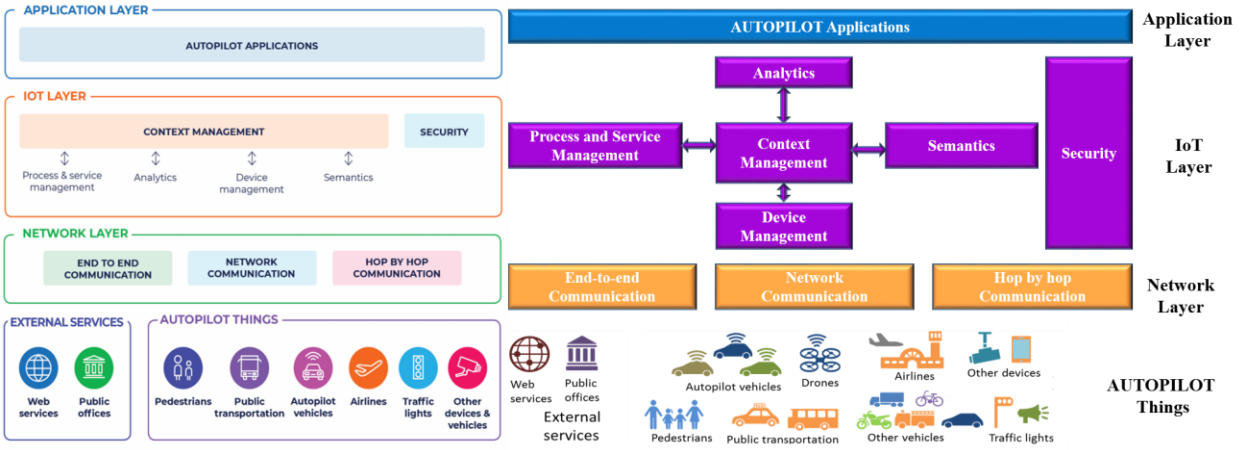


Figure 2: LSP architecture approach

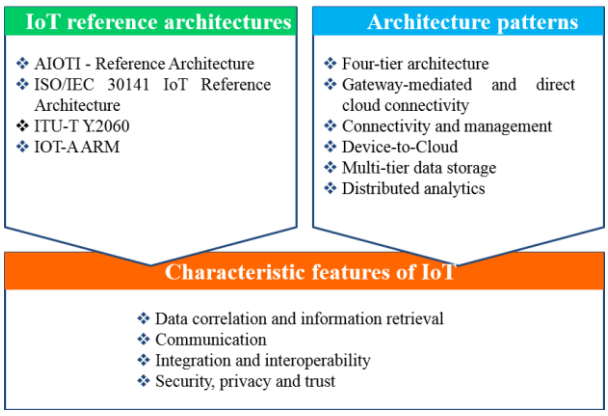


Figure 3: AUTOPILOT architecture approach

Shortly after Workshop #4 in 2018, AUTOPILOT has made an initial analysis of a use case (in the context of the Versailles pilot) with the 3D Architecture Model. This example has been sent to the LSPs before Workshop #5 in order to serve as a basis for the development of their own example. The approach taken is to fill the three main views (Layers; Cross-cutting Functions"; and "Properties") from the point of view of the application designers and developers in order to identify the concrete elements of the implementation. In particular, it has addressed the identification of the functional constraints linked to the various platforms utilised.

As an illustration, the analysis of the IoT system properties related to the use case of the Versailles pilot site is shown in Figure 4. The northbound interfaces between the Service Layer and the Application layer involved in the provision of properties are identified, with the example of the oneM2M Mca Reference Point for interoperability.

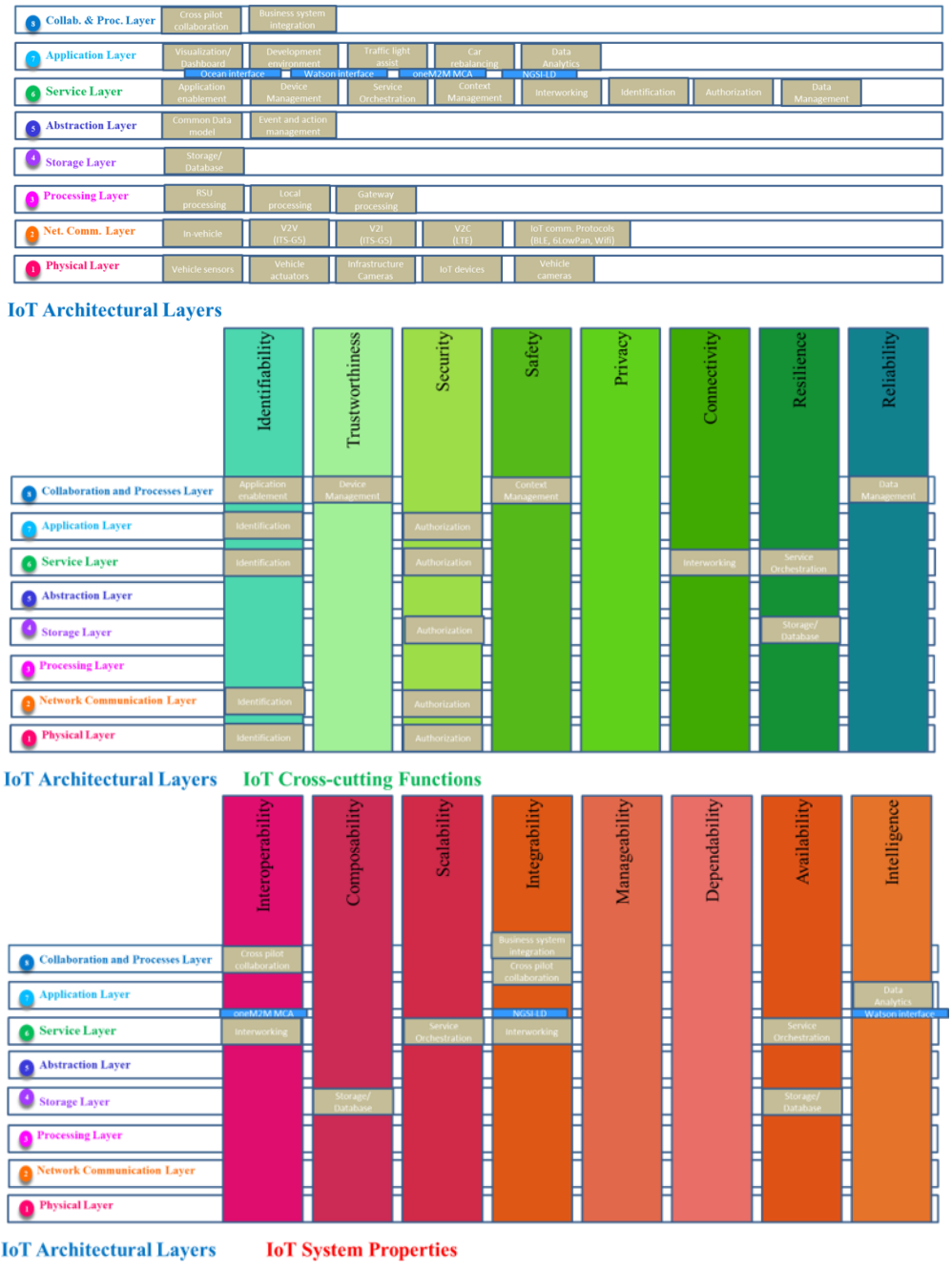


Figure 4: AUTOPILOT use case mapping

The standardisation related activities in the AUTOPILOT project are summarized in Table 1.

Table 1: Contributions/involvement standardisation

SDO/ WG	Title of Contribution	Status
oneM2M	Use case: Urban Driving	Agreed
oneM2M	Data model for platooning - informative	Agreed
oneM2M	Requirements for TS0002	Ongoing
oneM2M	Autonomous Driving section for introduction	Ongoing
oneM2M	MAS - AUTOPILOT	Agreed
oneM2M	Use case on Automated Valet Parking	Agreed
oneM2M	Use case: Platooning	Agreed
oneM2M	Use case: Highway Pilot	Noted
oneM2M	Use case: Car Sharing	Agreed
oneM2M	Use case: Car Rebalancing	Agreed
oneM2M	Use case: Urban Driving	Noted
oneM2M	Federation of IoT automotive Data Model with SAREF	Agreed
oneM2M	Federation of IoT automotive Data Model	Agreed
oneM2M	Data models	Noted
AIOTI	Use case: Urban Driving	AIOTI report "IoT relation and impact on 5G" - Done
AIOTI	Data model for platooning - informative	AIOTI report "IoT relation and impact on 5G" - Done
AIOTI	Requirements for TS0002	AIOTI report "IoT relation and impact on 5G" - Done
AIOTI	Autonomous Driving section for introduction	AIOTI report "IoT relation and impact on 5G" - Done
AIOTI	MAS - AUTOPILOT	AIOTI report "IoT relation and impact on 5G" - Done
AIOTI	Use case on Automated Valet Parking	AIOTI report "IoT relation and impact on 5G" - Done
ETSI SmartM2M	Federation of IoT automotive Data Model with SAREF	Noted
ETSI ISG CIM	Federation of IoT automotive Data Model	Noted
ETSI ISG CIM	Data models	Noted
AIOTI	ETSI G5 versus LTE-V2X	AIOTI report "IoT relation and impact on 5G" - Release 2.0 - Done
TSI TC ITS	ITS Security - ETSI 6th CMS Plugtests™	Agreed

3.2.3 The ACTIVAGE feedback

The LSP and ACTIVAGE architecture is illustrated in Figure 5, at the workshop was explained that ACTIVAGE architecture by design is semantic-oriented and that this is a feature that address the requirement for cross domain interoperability.

The presentation underlined upon the High-Level Architecture of ACTIVAGE and the role of the AIOTES Semantic Interoperability Layer (SIL) in order to provide flexibility with respect to the deployment of applications in such a way that they interoperable and as such they are not constrained by the closed environment of cloud service providers and that at the same time this approach enables the full interoperability from a semantic layer perspective allowing to bridge variety of IoT platforms as shown in Figure 5.

In ACTIVAGE the diversity of IoT technology is an element to consider all the time and particularly when different interoperability scenarios outline the need for a very precise role of data in the architecture. A significant part of the issues to handle are regarding data management (cross-platform sharing; cross-applications and cross-services reuse; data lakes; etc.) but also data usage consent. The possible support of the BDVA approach has been discussed.

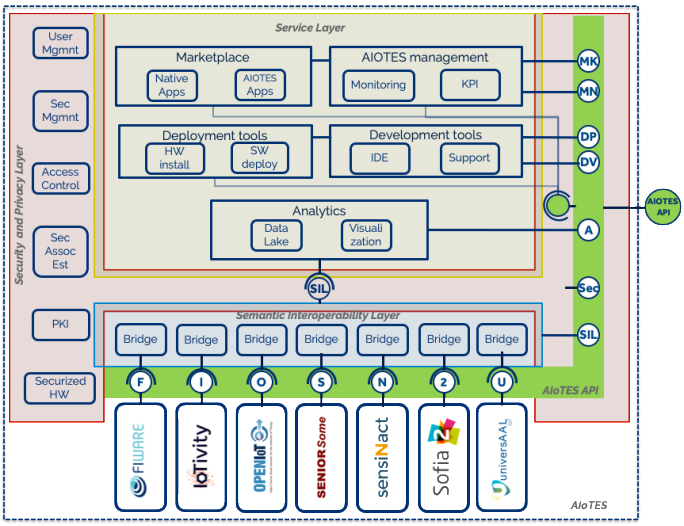


Figure 5: ACTIVAGE Functional Architecture

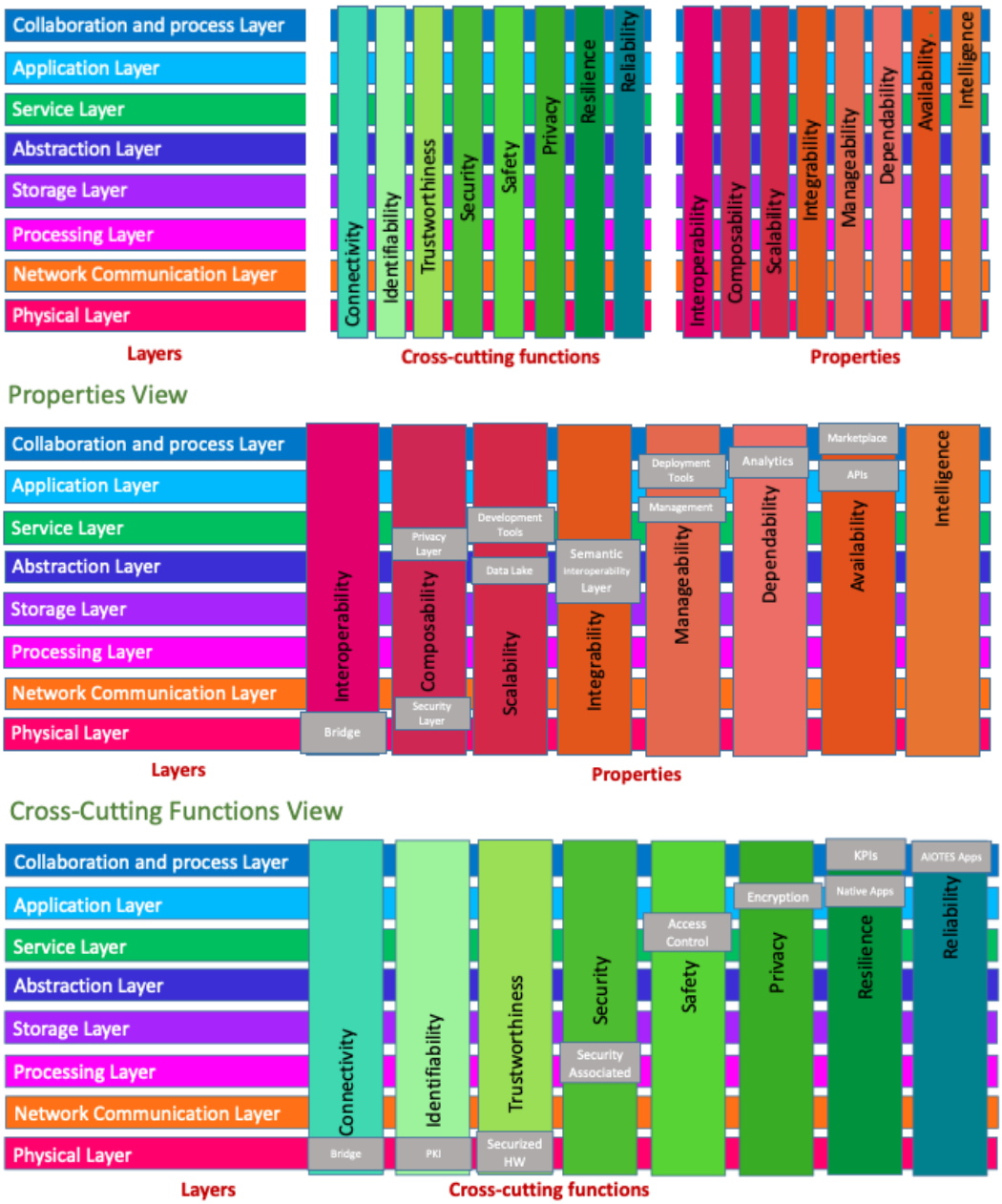


Figure 6: ACTIVAGE preliminary Architecture Mapping

A preliminary revision and analysis of the mapping with the 3D Model to ACTIVAGE use case has started by aligning the current AIOTES layers and the cross-cutting functions for the semantic layer (SIL) from AIOTES architecture. The preliminary analysis has also focused on the identification of the processes at the AIOTES level and the services for mapping with the properties layer in the 3D model, from a designer/developer perspective, of the different functional blocks used the 3D model and the LSP ACTIVAGE AIOTES architecture can be mapped. In ACTIVAGE the interoperability level follows the definition provided form the IoT interoperability manifesto [5] which reflects the IoT community contribution. The mapping with the 3D model also re-organises the properties and cross-domain functions following the interoperability levels.

3.2.4 The IoF2020 feedback

IoF2020 was highlighting that its deliverable D3.3 (Opportunities and Barriers in the present regulatory situation for system development) [1] talks about interoperability points and specific standards and SDOs. It identifies heterogeneous environments with diverse fields of interest. It concludes about horizontal and vertical agri-chain integration: IoT end users and business support organisations.

An IoT related focus of the upcoming activities in IoF2020 is the usage of the IoT Catalogue (www.iot-catalogue.com) to support interoperability, replicability and reusability. Also identifying reusable components based upon installability, replaceability and adaptability aspects.

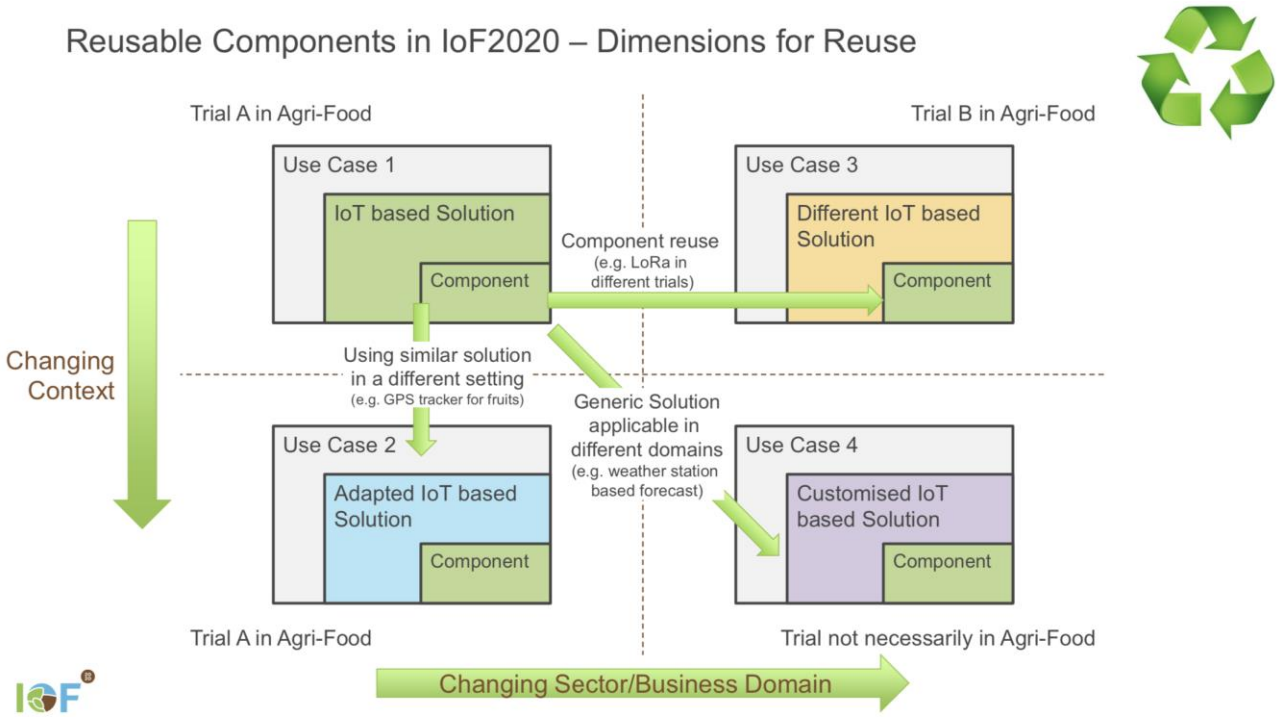


Figure 7: Dimensions for reuse in IoF2020

IoF2020 is also using internal task forces to facilitate work on interoperability and specifically addressing semantic interoperability. Moreover, IoF2020 was already elaborating in first half of 2018 a mapping of the IoF2020 functional architecture with RAMI4.0 that composes a view from different perspectives, also touching the different modelling dimensions used in IoF2020. Since IoF2020 was analysing all its initial 19 use cases from different perspectives, where the functional view is just one of it. All this is summarised in the IoF2020 deliverable D3.2 (The IoF2020 Use Case Architectures and overview of the related IoT Systems) [2]. This also includes an analysis of security, privacy and trust, by using the STRIDE methodology. However, the analysis approach is also documented in IoF2020 deliverable D3.1 (Guidelines for Use Case Analysis & Design) [3].

At the same time, it is not yet clear of which purpose shall be fulfilled with the 3D model proposed by CREATE-IoT. It is rather complex if it stays to an assessment perspective, while a procedural description might help to understand the analysis & design approach as well as on what can be achieved with this exercise.

3.2.5 The MONICA analysis

A preliminary analysis of the application of the 3D Model to a MONICA use case has been presented, based on a similar approach than that of AUTOPILOT. The analysis has focused on the identification, from a designer/developer perspective, of the different functional blocks used.

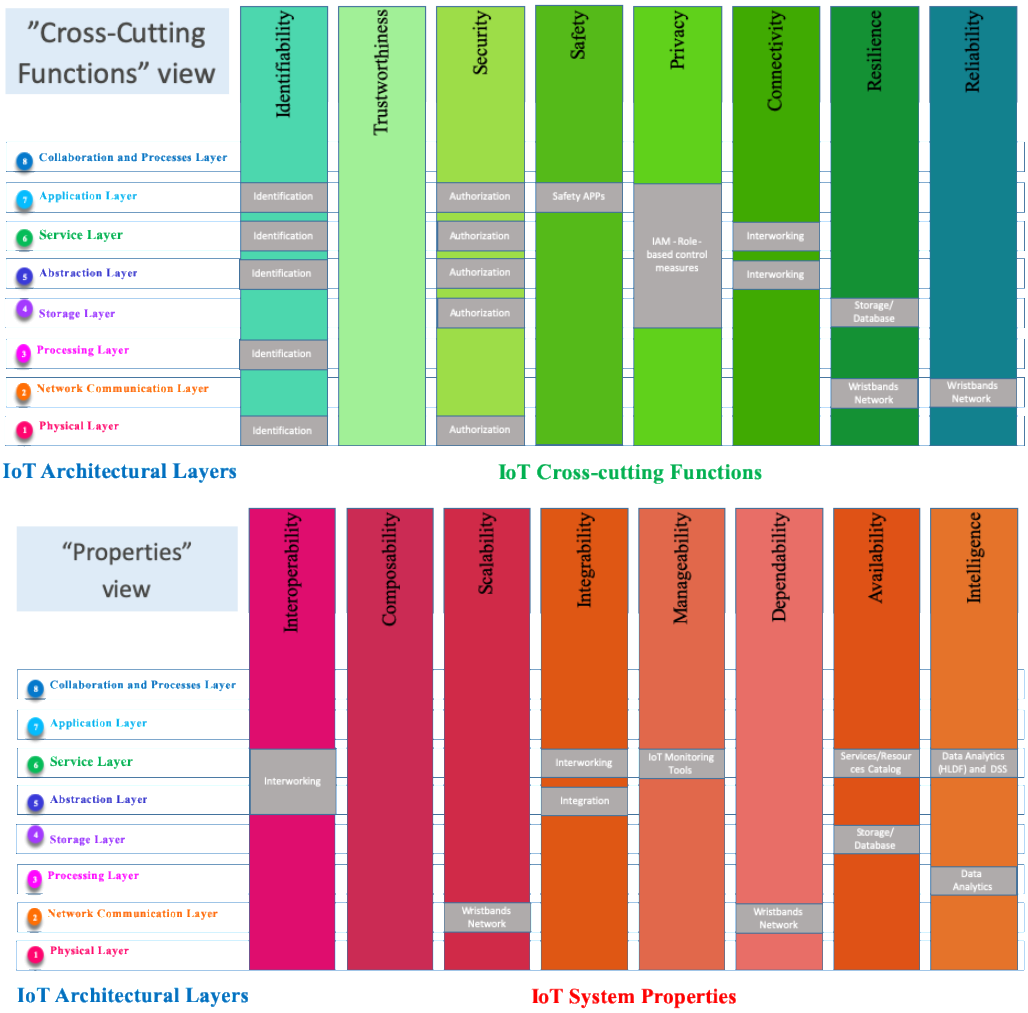


Figure 8: MONICA Use Case mapping on 3D Architecture

A follow-up will address the other elements involved in the 3D models such as the interoperability points and mechanisms, the APIs, etc. A short feedback on the lessons learned will be also provided.

3.2.6 The SYNCHRONICITY analysis

The presentation has insisted on the role of the Interoperability Points in the context of the Use Cases and of the open calls, and how they provide interoperable, replicable and reusable solutions across cities and sectors. A preliminary analysis of the application of the 3D Model to a SYNCHRONICITY use case has been presented, based on a similar approach than that of AUTOPILOT.

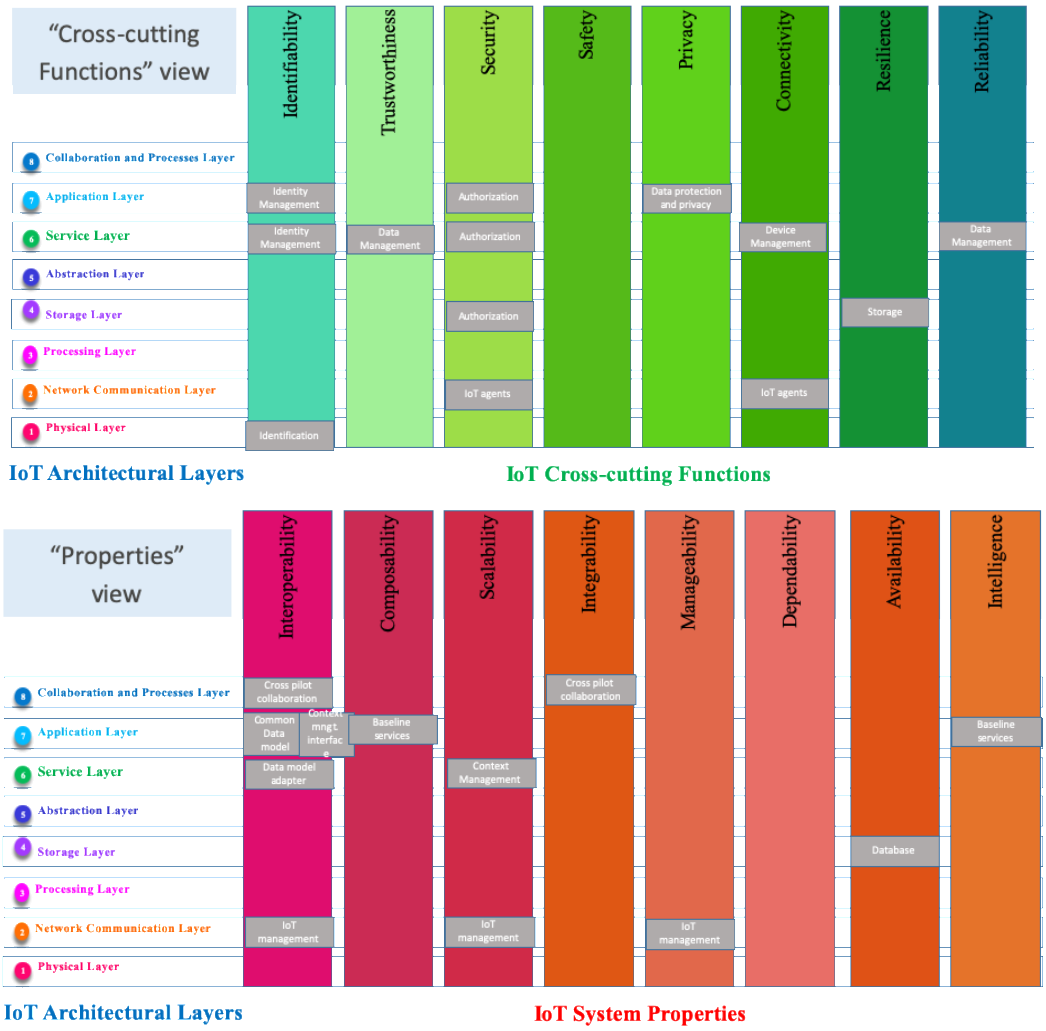


Figure 9: SYNCHRONICITY Use Case mapping on 3D Architecture

Beyond the identification of functional blocks used, the analysis has also pointed to some interoperability points, in particular regarding the interface between the service platforms and the application layer. It was also reported a list of standardisation activities (Figure 10) performed by SYNCHRONICITY partners in the context of ITU:

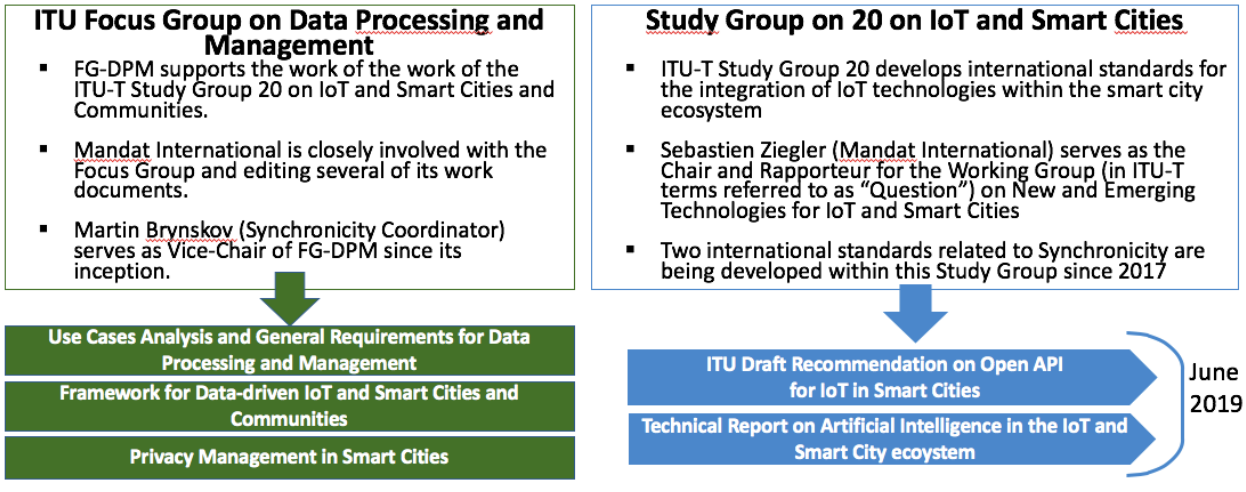


Figure 10: SYNCHRONICITY standardisation activities

3.2.7 Feedback and discussion

Some remarks and suggestions have been made during the discussion, in particular regarding the 3D Reference Architecture approach:

- The role of data in the architectures (the 3D reference Architecture model as well as the LSP ones) is becoming more and more important and it needs to be clarified (e.g., as a specific element within the Cross-cutting functions). Additionally, the way the 3D model maps with the BDVA approach requires additional investigation;
- The model may seem difficult to use for some of the stakeholders involved in its potential usage. Even if it seems that the designers and developers may use it easily (though with a strong focus on functionality rather than on properties), it is probably more difficult to handle for the project owners and supervisors or the (end-)users. Some clarification, more detailed examples and guidelines will be needed;
- A view of the evolution of the IoT Reference Architecture since 2014 has been presented by Martin Serrano. It outlines the refinement of their objectives in-line with the evolution of the IoT systems towards more centred around the handling data and the cloud-based deployments and suggest that the LSP 3D model is aiming more at the verification and validation of the coherence of the IoT systems. This presentation also provided an interesting clarification of the scope of the "properties" and how they span only a part of the "layers".

3.3 The MSP Digitalisation of European Industry Work Group

3.3.1 The MSP/DEI Work Group report

The Multi-Stakeholders Platforms (MSP) Digitalisation of European Industry (DEI) Work Group has been kicked-off in March 2018 with, in particular, the goal to identify the standardisation needs in the manufacturing sector and how they can be mapped with the activities on-going or planned in the IoT Standardisation community. It has recently delivered a Final Report [4] document that identify a list of potential actions largely related to the scope of the LSP Activity Group 02 (Interoperability and Standardisation) such as Reference Architecture and architecture models, platforms and service layers, use cases, etc. These actions have been reflected in the 2019 "Rolling Plan for ICT Standardisation". As a follow-up, five Work Packages have been defined that will have to be closely monitored by Activity Group 02 during 2019.

3.3.2 Next steps

Amongst its tasks, the MSP/DEI Work Group has worked on the development of a model for the synchronisation of the various standardisation activities at national (member state), European and global level. The presentation has described the model under development, its objectives and the stakeholders involved. It is a pragmatic approach to create a (largely informal with a lightweight governance) networking platform to "to stimulate active, open and fair cooperation of stakeholder groups".

3.4 Definition of the KPIs for Standardisation in the LSPs

There has been a huge effort for the definition of Horizontal KPIS to measure the strategic impacts of the LSP programme. Regarding standards and standardisation, some initial KPIS have been outline or defined regarding: the number of standards developed; the evolution of the number of standards compared to a 2016 baseline – to be defined for each of the sectors where the LSPs are deployed. The goal of this presentation was to foster a discussion amongst the participants on how these KPIS could and should be refined, and to identify the most relevant measurement criteria.

The discussion has addressed a number of aspects with the main following points:

- The number of contributions to standards is always a valuable indicator of activity. However, the numbers may vary from one LSP content to another one and a comparable measurement approach is needed;
- It is also very important to understand how the contributions are actually taken into account (e.g., versus simply noted and not discussed). This is not always easy to measure since there might be a difference between what is initially considered and what is finally adopted. The length of the delay between the submission and the approval is also an issue;
- In some case, the focus of the contribution and how it is adequate to the needs of the community is also a major aspect for an evaluation that will focus on specific elements. Examples of such contribution:
  - The 3D Reference Architecture model that appears to fill a gap in the standardisation;
  - The major contribution of MONICA on "just" a wireless standard that was missing;
  - The contributions to SAREF that support a strong European standards ecosystem;
  - The contributions of SYNCHRONICITY to leading ITU-T groups.
- It appears that the notion of "adequacy" or "criticality" of the contribution is key. This could be self-evaluated by the LSPs in order to focus on the most significant elements.

As a follow-up, it was agreed to:

- Ask LSP to provide a list of their most relevant ("crucial") standards (used or target of contributions), new Work Items, etc. This might take the form of a very lightweight set of questions;
- Based on the answers, an Activity Group 02 will be organised to decide on the refined KPIs.

3.5 Organisation of the Activity Group 02 Workshop in IoT Week 2019

The goal of the presentation was to introduce a coordinated effort for the participation to the Standardisation-related sessions and presentations at IoT Week 2019 in Aarhus. A proposal is made for a coordinated event with 4 half-day (i.e. 2 times 1h 15 mn) sessions bringing together AIOTI, European Large-Scale Pilots, representatives from SDOs and Industry Alliances, stakeholders from industry, and researchers with insights for what is needed.

The four sessions have to be refined in terms of content by proposed session coordinators:

- Session 1: The IoT Standardisation Landscape (organisers: P. Guillemin and G. Karagiannis)
- Session 2: Architectures for IoT Systems (organiser: E. Darmois)
- Session 3: Data models and Semantic Interoperability (organiser: Dave Raggett)
- Session 4: New issues, new frontiers (organisers: A. Kung and P. Annicchino)

As a follow-up, it was agreed to:

- Create a Google docs document to quickly evolve the content of the proposal;
- To very rapidly submit the document to the IoT Week 2019 organisers in order to alert them on the opportunity and the associated logistic requirements (slots, rooms, etc.);
- To quickly converge on complete sessions that can be advertised to the IoT community.

4. CONCLUSIONS

4.1 Contribution to overall picture

The IoT Interoperability Framework (IF) developed in the IoT LSP Activity Group AG02 is gradually gaining momentum, in particular thanks to the 3D Reference Architecture model that is offering a new approach to the upstream definition of IoT systems by all the stakeholders involved (and not only the designers and developers which are the usual users of Reference Architecture frameworks).

As already noted, several elements of the Interoperability Framework (such as Interoperability Points and Mechanisms, APIs) are emerging innovative evolutions that bring a significant contribution to the IoT community. It is important for other stakeholders (project owners, city planners, etc.) to be able to identify early in the IoT project life-cycle how and where they are going to be used. Such an approach is supported by the LSP 3D Reference Architecture model. This is one of the elements that is likely to gain attention of the potential users, provided that the benefits of the approach are clearly articulated and the way to use it made simple.

The positive contribution of the LSP Interoperability Framework can be the provision of an approach to IoT systems development that allow various stakeholders with different roles, skills and knowledge to work together, share different perspectives and exchange viewpoints. The actual contribution of the LSP Interoperability Framework to the IoT community can be, in particular, the contribution of its major elements to the IoT standardisation community. This is an effort that has already started (with contributions to a variety of standards organisations – as already mentioned above).

4.2 Summary and next steps

In the short-term, the work of Activity Group 02 will continue with:

- The analysis by all LSPS of the example they have chosen to illustrate their view on the usage of the Reference Architecture part of the Interoperability Framework;
- A further consolidation of the Reference Architecture based on the feedback provided by the LSP examples, in particular regarding the definition of the “cross-cutting functions” and “properties”, and more precision on the usage of the 3D model in order to ensure it is easy to use;
- Identification of the most critical aspects of standardisation as seen by the LSPs, and their consolidation in a very short list of KPIs proposed for adoption;
- The precise definition of the Workshop in IoT Week 2019, sessions, presenters, logistics, etc.

Two other Workshops and one final event will be conducted in 2019:

- An AG02 workshop #6 organised during the IoT Week 2019 as a global set of coordinated sessions;
- The AG02 workshop #7 to be organised in September 2019;
- A final AG02 event to be organised in October 2019 in Majorca.

Several telephone conferences will take place in April and May in order to: 1/ finalise the proposal for standards KPIs; and 2/ prepare the sessions of the Standards Workshops at IoT Week 2019.

5. REFERENCES

[1] José Manuel Cantera, Joud Sayed Issa, Peter van der Vlugt, Sabine Klaeser, Tim Bartram, Ayalew Kassahun, Isabel Neira, Thierry Milin. *D3.3 - Opportunities and Barriers in the present regulatory situation for system development*, (version 1.2). IoF2020, May 2018. Online at: https://www.iof2020.eu/deliverables/d3.3-opportunities-and-barriers-in-the-present-regulatory-situation-for-system-development-v1.2.pdf

[2] Lead editors: R. Tomasi, F. Rizzo, D. Conzon, T. Montanaro. Contributors: H. Sundmaeker, G. Große Hovest, A. Vyas, J. Berg, F. Manoel, R. Campos, et al. *D3.2 - The IoF2020 Use Case Architectures and overview of the related IoT Systems*, (version 2.0). IoF2020, July 2018. Online at: https://www.iof2020.eu/deliverables/d3.2-uc-architectures-v2-final-1.3.pdf

[3] R. Tomasi, F. Rizzo, D. Conzon, H. Sundmaeker, G. Große Hovest, A. Vyas, C. Verdouw, J. Berg, F. Manoel. *D3.1 - Guidelines for Use Case Analysis & Design*, (version 11). IoF2020, September 2017. Online at: https://www.iof2020.eu/deliverables/d3.1-guidelines-for-uc-analysis-design.pdf

[4] European Commission. *Final workshop on standardisation support to the Digitising European Industry initiative: report and presentations*. Digital Single Market, Event report, November 2018. Online at: https://ec.europa.eu/digital-single-market/en/news/final-workshop-standardisation-support-digitising-european-industry-initiative-report-and

[5] Martín Serrano, Payam Barnaghi, Francois Carrez Philippe Cousin, Ovidiu Vermesan and Peter Friess, IERC Semantic Interoperability Manifesto http://www.internet-of-things-research.eu/pdf/IERC_Position_Paper_IoT_Semantic_Interoperability_Final.pdf