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*Growing a sustainable and comprehensive ecosystem
for Next Generation Internet of Things*

D3.2: Community Engagement Report

Version 2

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Abstract

Deliverable D3.2 of EU-IoT relates to the work under development in WP3 – CATALYST, Task



3.1, focused on Community building and stakeholders management. This report outlines the EU-IoT strategy regarding activities of engagement with stakeholders and relevant communities, carried out during the project's 30-month duration. Activities include identification of key stakeholders and communities, definition of target groups and expected outputs, most relevant activities carried out, regular community structures, and ongoing activities and engagements, among others. Finally, a set of conclusions is presented along with recommendations proposed for future development.

Keywords: IoT, Engagements, Stakeholders, Industry Associations, Collaborations, Activities

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ABBREVIATIONS

AI	Artificial Intelligence
AR	Augmented Reality
CB	Coordination Board
CEI	Cloud-Edge-IoT
CTF	Communication Task Force
DID	Decentralised Identifier
CB	Coordination Board
CSA	Coordination and Support Action
CTF	Communication Task Force
DEI	Digitising European Industry
DEP	Digital Europe
DLTs	Distributed Ledger Technologies
EC	European Commission
EG	Expert Groups
EU-CEI	European Cloud Edge IoT Continuum
HPC	High-performance computing
HEP	Horizon Europe
IA	Innovation Actions
IAAS	Infrastructure-as-a-service
IETF	Internet Engineering Task Force
IoT	Internet of Things
IRTF	Internet Research Task Force
JU	Joint Undertaking
LEO	Low-Earth Orbit
NFV	Network Functions Virtualisation
NGI	Next Generation Internet
NGIOT	Next Generation Internet of Things
RIA	Research and Innovation Actions
R&I	Research and Innovation
SDO	Standards Development Organization
SME	Small and Medium Enterprise
SNS	Smart Networks and Services
SoS	System of Systems
SRIA	Strategic Research and Innovation Agenda
VR	Virtual Reality

1 INTRODUCTION

1.1 Purpose

This deliverable relates to the Task 3.1 Community Engagement of the "WP3: EU-IoT Catalyst". The main goal of this task was to ensure the acceleration of the NGIoT initiative by engaging all target stakeholders in growing and strengthening a large-embracing ecosystem, while creating synergies among them. This has reinforced cooperation and ensured long-term evolution of the overall human centric IoT efforts. This breaks down into the following main objectives:

- To grow the NGIoT ecosystem and assist in partnership creation and stakeholders networking, via actions that facilitate and promote the direct engagement of relevant stakeholders, reaching out to new players and across different research and innovation communities.
- To ensure development and adoption of innovative human-centric IoT concepts and solutions, fostering effective technology transfer and know-how exchange, while mapping NGIoT efforts into open-source, pre-standardisation and standardisation activities.
- To contribute to a consolidated NGIoT community through delivery community events which explore the value of the shift towards a distributed architecture with a strong role for edge computing, deliver workshops/sessions and booths at external events support the engagement of SMEs and newer actors, establish liaisons/partnerships with relevant initiatives, open-source, pre-normative and standardisation initiatives landscape.

D3.2 Community Engagement Report Version 2, provides an overview on the different community engagement activities with a reflection on the successful approaches and main takeaways and reflections for improvement towards the EU Cloud Edge IoT Continuum which builds on the work of EU-IoT and the NGIoT Community.

1.2 The NGIoT Community in context

The European NGIoT community brings together a broad spectrum of industry associations, SDOs and other initiatives which demonstrate the evolution of the NGIoT from IoT to bring into the space new members and collaborations that were previously in parallel, a full overview has been provided in D2.2 previously.¹ With the evolution of the definition of IoT towards the CEI continuum, we can observe much more convergence between the data, AI and IoT domains with a relevance for key enabling technologies such as 5G, DLTs and FPGAs, GPUs etc.

For the NGIoT Initiative there are two principal associations which remain a focus, AIOTI, where many of the existing NGIoT participants (across the RIAs) already play a significant and active role and BDVA/DAIRO. Added to this are the principal Standard Development Organisations (SDOs) related to the actions to include, e.g. ETSI, RISC-V, ECSO, etc. and the broader community of SMEs and Industry actors.

¹ D2.2 Towards a vibrant EU-IoT ecosystem. Calisti, M., Kolovou L., Rowan, B., Pomohaci, R., Suarez, T., Sofia, R., Soldatos, J., Pressner, M. (2021). Available at: <https://www.ngIoT.eu/deliverables/#1613463848216-6fe09816-8132>

	HUMAN/IOT INTERFACE	FAR EDGE	NEAR EDGE	INFRA STRUCTURE	DATA SPACES	
TECH	 Alliance for Internet of Things Innovation	 Alliance for Internet of Things Innovation	 Alliance for Internet of Things Innovation	 	 Alliance for Internet of Things Innovation	 EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING
MARKET		 Alliance for Internet of Things Innovation 	 Alliance for Internet of Things Innovation 	 	 	
POLICY/ STANDARDS	 	 Alliance for Internet of Things Innovation 	 	 	 	
SKILLS			 	 Digital Skills and Jobs Coalition		

Figure 1 Mapping of key communities of interest within the NGIoT/EU-IoT framework, details on target working groups and activities are provided as a table in Annex 1 of this document

For the classification of the key actors, the area of action of each and the purpose of its activities will be taken into consideration, and the same association may form part of several groups by having different working groups. The principal actors within the NGIoT ecosystem are listed and classified in Annex 1.

EU-IoT represented the next stage of evolution building from previous initiatives, each of them contributing to growing and consolidating the European community of IoT developers and drivers. Specifically, the creation of the concept of the 'NGIoT Initiative' which refers to the portfolio of ICT56 projects provides a continuity which has been progressed from the IoT-European Platforms Initiative and from the IoT Large Scale Pilots, transforming into the next generation focus of today which aligns with cloud and 5G priorities and marking the grand technological shifts surrounding IoT and the integration of the respective communities.

One of the first actions of EU-IoT was to develop the concept of the NGIoT Initiative and develop the branding of the ICT56 projects as a cohort for three main purposes. The first was to generate a cohort identity among the RIAs to develop an internal community of actors within the projects, provide a visible central reference point of the different communities, and finally anchor the portfolio on the evolution from the EPI Initiative through the Large-Scale Pilots to the NGIoT (CSA), providing continuity and consistency in a crowded space for attention on the route to the Cloud-Edge-IoT (CEI) focuses.

The previous project titled NGIoT (CSA), formally closed in October 2021. This project acted as a link between the community between the completion of the IoT Large Scale Pilots and the current set of ICT56 projects under the coordination of EU-IoT. This NGIoT (CSA) project, lead with the key community members a series of events and activities for the previous three years has provided the roadmap to support the guidance of the European Commission in the definition of the Horizon Europe work programmes.

Similarly EU-IoT liaised closely with the CSA OPEN DEI. It coordinated the Digitalising European Industry platform and pilots' projects, facilitating a cross-sector data sharing platform for digital transformation. The portfolio of Artificial Intelligence (AI) projects from manufacturing, agriculture, energy and healthcare, and intersected with the principal European communities related to RD&I across cloud, data and AI.

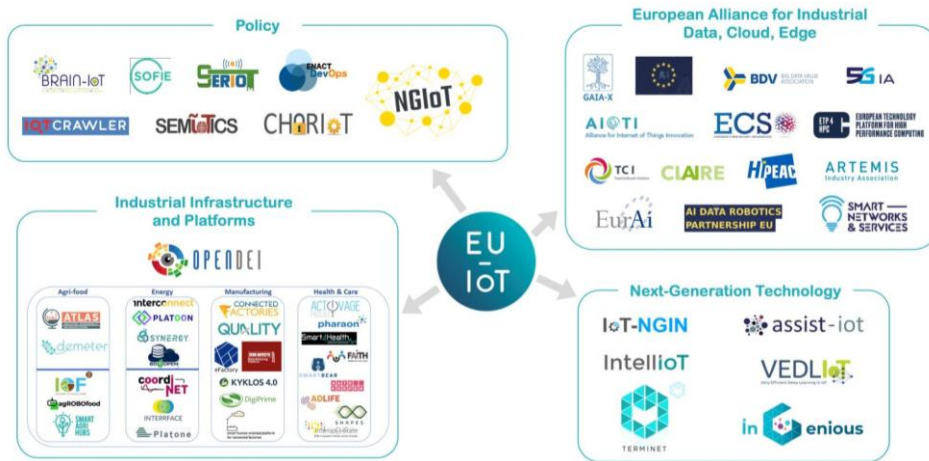


Figure 2 The community context of the NGLoT Initiative

1.3 The evolution of the community: from NGLoT to CEI:

Reflecting of the convergence across the whole digital spectrum driven by the advancement of certain technologies that enable such integration of data processing and services from device to cloud and in-between is the emergence of the Cloud-Edge-IoT (CEI) computing continuum.

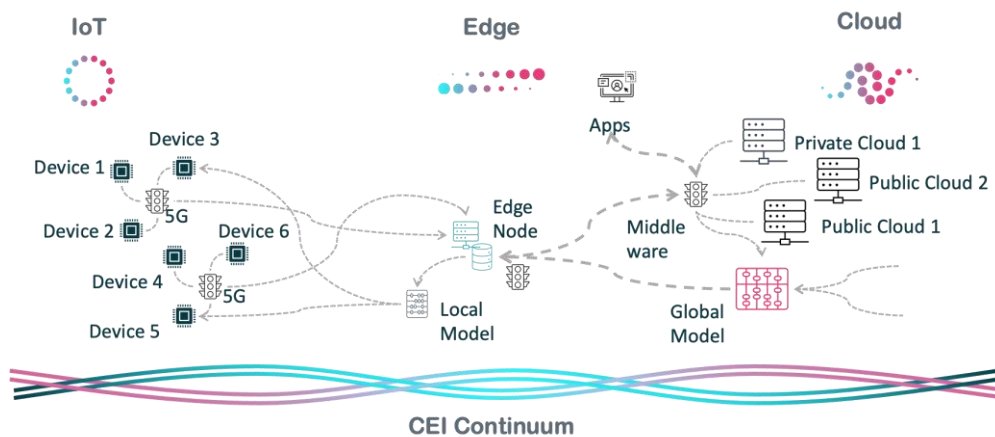


Figure 3 Illustration of the Cloud-Edge-IoT Continuum²

The European Cloud Edge IoT Continuum combines and expands upon two previous initiatives, Next Generation IoT and Horizon Cloud, to create a unified approach to technology convergence. It brings together clusters of projects that address the development of MetaOS, a cognitive cloud and swarm intelligence.

² UNLOCK-CEI | D4.1 Technology Scoping Paper

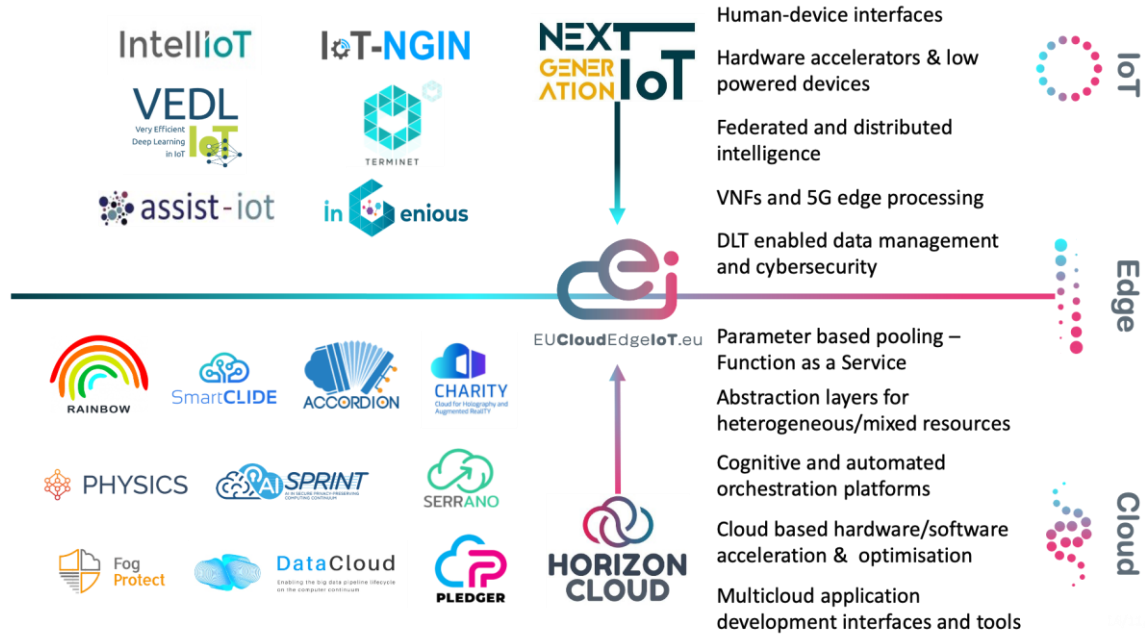


Figure 4 Overview of the progression towards the European Cloud Edge IoT referencing key projects and technology topics addressed within³

Consequently, the engagement activities carried on during the final quarter of 2022 and the first months of 2023 have supported the integration of these two communities and into capitalise all the knowledge generated within the NGIoT Community through EU-IoT Engagement activities and be able to transfer that knowledge and community bonds into the new initiative.

1.4 Related outputs

The definition and exploration of the various communities related to the NGIoT have been described in detail and addressed in:

- D2.2 Towards a Vibrant European IoT Ecosystem
- D2.3 Experts consultation and dialogues report Version 1
- D3.4 IoT Open-source Ecosystem Catalogue
- D3.6 Mapping of Knowledge Areas to Standardisation
- D5.3 Dissemination and Communication Report Version 1

³ UNLOCK-CEI | D4.1 Technology Scoping Paper

2 COMMUNITY ENGAGEMENT

2.1 Target Groups

In order to carry out stakeholder ecosystem building actions, it is essential to define the different target groups to be addressed within each of the stakeholder community, considering that the interests vary from one to another and the outputs that each stakeholder group wishes to obtain from these activities will be different.

For the identification of the stakeholders, 3 roles have been differentiated in the first place:

- Tech developers: Those groups whose activity is focused on technological development both for their own use and for third parties, thus becoming suppliers for them.
- Tech adopters: These are groups that, without developing technology, make use of it to develop their activities or improve their processes.
- Tech enablers: These actors play a supportive role for both tech developers and tech adopters, facilitating these activities through regulation, advice or mediation between supply and demand.

Considering these roles, several target groups have been identified, which in turn are divided into different subgroups. It should be noted that a subgroup can be in more than one group at a time and that, within the same group, several roles can be developed.

Table 1 Target groups and their relevance for NGIoT

GROUP	SUBGROUP	ROLE	NGIOT RELEVANCE
Researchers	Universities	Tech developers	<ul style="list-style-type: none"> • Carrying out joint research work • Greater facility to commercialise research results • Direct contact with tech adopters to learn about market realities
	RTOs		
	R&D units		
	DIHs		
Industry	Corporates	<ul style="list-style-type: none"> Tech developers Tech adopters Tech enablers 	<ul style="list-style-type: none"> • Proximity and direct contact with tech developers • Increased knowledge of technology trends and applications in specific sectors • Access to tech enablers, skills and training services and technological talent • Priority access to information on funding opportunities • Sharing of technological knowledge with peers • Increasing their network of potential partners, suppliers and customers • Fostering synergies and business opportunities
	SMEs		
	Startups		
	Clusters/DIHs		
Policy	Regional / National	Tech enablers	

	European		<ul style="list-style-type: none"> • Direct contact with ecosystem actors to be aware of the real needs and opportunities and to be able to take appropriate actions • Ease of awareness-raising and dissemination of new policies • Alignment with other regional strategies and policies, as well as at European level
Training and education	Certification bodies	Tech enablers	<ul style="list-style-type: none"> • Increased knowledge of real training needs and existing skills gaps to be able to offer more tailored training • Possibility of providing better preparation for students to enter the labour market.
	Training providers		
	Universities		
ICT-56 partners (RIAs)	N/A	Tech developers	<ul style="list-style-type: none"> • Expert support in some of the most relevant activities within the projects (e.g. management of open calls) • Expansion of their network of actors potentially involved in their use cases • Facilitation of communication and dissemination of the progress and results of the projects

2.2 Approach

2.2.1 Forms of engagement

Through the activities carried out, the aim is to actively involve and engage the communities of interest. This engagement is classified precisely by the degree of involvement of these actors, and can be direct, collaborative, participatory and indirect.



Figure 5 Representation of the key communities and forms of engagement

Below provides a summary of the key formats for achieving engagement compared to the target communities, groups, and mode of engagement.

Workshops

These events foster the collaboration of the actors involved in the ecosystem and the sharing of knowledge in pursuit of a common goal or the co-creation of relevant solutions or strategies.

- Type: Direct, Collaborative
- Key communities: ICT-56 partners, IoT Next Club, BDVA/DAIRO, AIOTI, OPEN DEI
- Target groups: Researchers, Industry, Policy

Webinars

Aimed at sharing relevant information about a specific topic, with the attendance of potential stakeholders and interested parties. Communication is much more unidirectional than in the case of workshops, and they do not seek to obtain relevant outputs, but simply to share information.

- Type: Participatory
- Key communities: ECSO, ITU, EFFRA, QUANTUM FLAGSHIP, BDVA/DAIRO, ETP4HPC
- Target groups: Industry, Policy

Round tables

A hybrid between a workshop and a webinar, that brings together experts in specific fields to share knowledge and discuss their views on the topic, usually counting with a moderator that animates the discussion and asks different questions to experts.

- Type: Participatory
- Key communities: All
- Target groups: Researchers, Industry, Policy, Training and Education

Participation in events

Refers to the participation of EU-IoT in events organised by third parties around a topic of interest, with the aim of increasing visibility in the ecosystem, networking, or sharing knowledge and progress achieved.

- Type: Participatory, Indirect
- Key communities: All
- Target groups: All

Drafting of white papers

EU-IoT collaborates with different actors in the elaboration of white papers that can contribute value in the definition of the European IoT roadmap.

- Type: Collaborative
- Key communities: AIOTI, OPEN DEI, NGIoT, GAIA-X
- Target groups: Researchers, Industry, Policy, Training and Education

Hackathon

Events aimed at involving different actors of the ecosystem to foster collaboration and the co-creation of solutions to pre-defined challenges.

- Type: Collaborative, Participatory
- Key communities: NGIoT, GAIA-X, EFFRA
- Target groups: Researchers, Industry, Training and Education

Collaborations

Development of joint activities (papers, workshops, etc.) which address cross-project or relevant themes such as business models, skills, adoption barriers, etc. which have both NGIoT and partner branding.

- Type: Collaborative
- Key communities: AIOTI, BDVA, EFFRA, EPoSS, CSAs (OPEN DEI, NGIoT, HCloud, Opencommons/StandICT)
- Target groups: All

Direct contributions

Written contributions to ongoing papers or activities within the specific working groups of targeted communities on behalf of the NGIoT Initiative.

- Type: Collaborative
- Key communities: AIOTI, BDVA/DAIRO, EPoSS, GAIA-X, EFFRA
- Target groups: All

2.2.2 Overview of key engagements

Throughout the delivery of EU-IoT, there were 85 individual events and activities organised by EU-IoT with the target communities. Added to this, there were 17 specialised documents produced for publication (including white papers, symposium takeaways and technical proposals and contributions). These external engagement documents gathered the interest of over 4000 readers and were cited 44 times in specialised publications.

Table 2 Overview of key engagements

TYPE	Nº	COMMUNITY(S)	Examples
Collaborative	43	MDZ Germany, ERASTHOTHENES, Gaia-X Networking and Interconnection WG, IoTAC, SecureIoT, AIOTI, CONASENSE, NGIoT, NDN, CONASENSE, EFPF, DIH4AI, EU-IoT, EC, EUCloudEdgeIoT, Onto Commons	<ul style="list-style-type: none"> • IoT Week 2022: RIA session: Advancing at the edge of Convergence • IoT Day Roundtable Discussion on IoT Security Innovative Technologies & Research Trends • AIOTI Signature Event • Horizon Europe Info Day & Pitch Session
Direct	7	NGIoT, AIOTI, BDVA, EU-IoT	<ul style="list-style-type: none"> • NGIoT Community Events: EV charging – A case for the edge? • IoT Week 2022: EU-IoT: The NGIoT Initiative • NGIoT Community Events: Evolving manufacturing in Europe – the role of Edge Computing • NGIoT Call for abstract on reusability of components
Participatory	35	OASC, NGIoT, BDVA, NGIoT CSA, ATI, SLICES-DS project, IDSA, OpenDEI, EC, H-Cloud, DG CNECT, HaDEA	<ul style="list-style-type: none"> • Privacy Symposium 2022 • CityxCity festival • IoT Tribe: Space Endeavour Tech Games • NGIoT Thematic Workshops • Next Generation ICT Research Infrastructures • Scaling up in Advanced Technologies • NDN Community Event 2021 •

Annex 2 of this document provides further details on the activities provided above.

3 HIGH-LEVEL COMMUNITY ACTIVITIES

3.1 Participation in key conferences and forums

3.1.1 IoT Week 2022

(Direct / ICT-56 partners, Industry, Researchers, Training and education)

EU-IoT: The NGIoT Initiative

During the workshop, the future European roadmap for research and innovation was presented. The plan was the result of various inputs, including stakeholder engagements, surveys, and workshops, that were aligned to identify the key themes, topics, and trends related to the future of IoT. The session explored the main drivers and levers of adoption, as well as the latest emerging technology trends. Furthermore, the session highlighted the primary gaps that still needed to be addressed to encourage greater industrial investment.

The conference, counted with 131 attendees among which there were: 32 members of the scientific community, 40 industry representatives, 18 civil society representatives and 14 policy makers among others. The talk covered the following topics structured the discussion:

- **The Future of IoT on the edge.** *Strategic directions for the Next-generation of IoT. Evolution of European NGIoT technologies and applications on the edge*
- **Approaching the edge of the NGIoT.** *Exploring the drivers of adoption*
- **Standards and Open-source as enablers.** *How standardisation across Europe and an open source approach is key to the realisation of the NGIoT*
- **Further opportunities for participating in the NGIoT**

Next Generation IoT: Research Recommendations towards Standardisation and Open-source

The session that had EU-IoT partners as speakers was divided into three parts. Firstly, there was a strategic presentation and overview of the future of IoT, as it continued to develop and integrate new technologies from the human to the cloud. Secondly, there was a panel discussion on the commercial value derived from progressing operations to the edge. Lastly, there were workshops aimed at integrating the tech developer communities and driving adoption through open source initiatives, skills development, and standards.

Advancing at the Edge of Convergence - Future Trends, Challenges and Standards with the Next Generation Internet of Things (NGIoT)

This conference featured the IoT projects. Four out of the six RIA coordinated within the NGIoT Community presented and took part during the workshop; these being: Assist-IoT, iNGENOUS, IoT-NGN and Termet. It was an opportunity to demonstrate advancement on use cases of IoT in the domains of Energy, Manufacturing, Agriculture, Automotive and Small Ports and the challenges and opportunities each project had in the implementation of different technologies within the sectorial applications previously mentioned. Moreover, each RIA featured their results and upcoming opportunities on their open calls answered questions regarding the 3.75 Million Euro overall budget available for open call opportunities targeted at SME's and research centres that would target funds for: demonstrating tech in specific contexts, contributing with components and models, growing the network of use cases, cross-domain applications.

Finally, the session had the advantage of inviting participants into joining EU-IoT Expert's Groups and for them to contribute into the biannual sessions and workshops activities of Work Package

2 as was informed in Deliverable 2.4 Experts consultation and dialogues report V2⁴

The session also featured the results and upcoming opportunities of the projects' open calls. It hosted 7 speakers and had 53 attendees that included 13 members of the scientific community, 19 industry representatives, 5 members of civil society and 8 policy makers among others.

The Power of Digital Platforms to reshape the business: Platforms Business Models as a Key for Digital Transformation

The panel, organized by the OPEN DEI project in collaboration with the EU-IoT project and AIOTI project, aimed to analyse and discuss potential business models for digital platforms. The panel gathered Speakers from EU Funded CSAs, Consultancy sector, research and development areas as well as with the presence of the European Commission DG Connect. The goal was to generate new revenue mechanisms for data monetization, develop innovative platform-based services to create new value propositions, and identify novelties for value-chain integrated business models to facilitate data and information exchange among numerous stakeholders of digital platforms.

Additionally, during the panel, the results of a Business model co-design workshop for digital platforms, which was organized in May 2022 to support OPEN DEI projects in developing a first archetype of business model for four different domains, including manufacturing, agrifood, energy, and healthcare, were presented.

Identity, trust, and privacy in an intelligent, smart IoT World. Challenges and outcomes - Session 3: Trustworthiness and Tailored applications

The workshop showcased how Europe's Research and Innovation community addressed the issues of identity, trust, security, and privacy for IoT devices and network systems. It was emphasized that the way we AI trustworthiness and application has a significant impact on Europe's collective resilience against cyber threats, which ultimately enables citizens and businesses to benefit fully from trustworthy and reliable services and digital tools. The workshop was co-organised by the ERATOSTHENES and ARCADIAN-IoT projects and hosted around 15 EC research projects and included EU-IoT partners among the panel.

The enriching exchange focused on the following discussion axis:

- The impact of the Internet and IoT on daily life: The speakers presented how the recent connectivity leap and the IoT ecosystem are shaping every aspect of our lives and how IoT changes the way we interact with the internet.
- Security and privacy risks in the IoT ecosystem: The workshop participants discussed the security and privacy risks associated with the enormous penetration of IoT into our day-to-day lives, which has created a similarly large attack surface.
- Transformation across various sectors: The integration of a broad set of technologies into the IoT ecosystem is leading profound transformation across a variety of sectors.
- Pushing the boundaries of identity, trust, and security aspects: The speakers presented how IoT, alongside AI and Blockchain, is pushing the boundaries of existing identity, trust, and security aspects, and how this brings the need for a new vision and way forward.
- The future of Europe's digital future: The participants discussed how the new vision and way forward for IoT, AI, and Blockchain will shape Europe's digital future, while supporting recent efforts on the Cybersecurity Act, GDPR, and the NIS directive, which conform to the three main pillars of the EU perspective on cybersecurity.

⁴ [Deliverable 2.4 Experts consultation and dialogues report V2](#)

Outcomes

Key takeaways included the reinforcement of the following aspects of the realisation of the Next Generation IoT:

- The road to the Next-gen IoT requires collaboration, common standards interoperability, trust, privacy, and regulatory frameworks that reflect European values.
- To provide a dynamic platform for the NGIoT RIAs to promote activities within NGIoT as well as communicate on open call opportunities in order to maximise the reach of future scalable projects.
- The deployment of edge computing and increased intelligence of devices is set to pick up pace as the benefits for businesses, consumers and citizens become clearer, but there are some complexities that could hinder this process. These include access to edge infrastructure, clarifying data ownership, domain-specific hardware and software, trust in the technology, and continued evangelization and education.
- To stimulate investment in the edge, startups, SMEs and researchers need affordable access to fit-for-purpose edge infrastructure, and skills shortages should be addressed by bringing technical and non-technical courses into undergraduate education.
- Clarifying data ownership, corresponding rights and responsibilities, and building trust in the technology is crucial to driving adoption and development of technical solutions.
- IoT products and solutions still require dissemination and education, as most IT and OT spending does not easily align with IoT spending in more traditional organizations, and vendors are required to provide end-to-end solutions that combine the provision of connectivity, hardware, and applications⁵.

3.1.2 IoT Week 2021

(Direct / ICT-56 partners, Industry, Researchers, Training and education)

Training Session on Machine Learning at the Edge and the Far Edge:

Training session delivered by EU-IoT with participation from IoT-NGIN and VEDLIOT (ICT 56) with 102 participants.

EU-IoT Hackathon kick-off session:

Focused on challenges for smart decentralised IoT Edge applications, it aims at looking for new ideas, experiments, and prototypes as first steps towards realizing future IoT Edge Computing deployments. This event aimed to present the challenges to be addressed by the participants in the EU-IoT Hackathon to be held from 27-29 June 2022 in Munich (Germany) co-located with CONASENSE2022. The kick-off session was attended by 72 people.

Join the Next Generation IoT; Upcoming Open Calls:

This workshop, which was the official kick-off of the open calls, was divided into two sessions. In the first session, RIA representatives had the opportunity to individually present their open calls, including the most relevant information. Once the objectives of the projects were known, during the second session, technical representatives of the RIAs were divided into different breakout rooms and worked on the co-creation of solutions for a concrete use case with target groups

⁵ For full article see [NGIoT at the IoT Week 2022. The Strategic Directions](#)

interested in submitting their proposals afterwards. The most relevant outputs for the ICT-56 RIAs were:

- Feedback from target groups on their use case
- Engagement with potential participants in open calls
- Deeper knowledge on available solutions and tech providers in the ecosystem
- Ideas and recommendations for open call and use case improvement

The 100 participants on the session had the opportunity to interact directly with other peers and also RIAs representatives, get a better idea on the projects’ needs to prepare a better proposal for open calls, and show their solutions and knowledge to relevant stakeholders within the ecosystem. In addition, an EU-LoT representative was present in each breakout room acting as moderator and listener, and a list of technical and other recommendations based on the information gathered during the workshop was sent after the event.

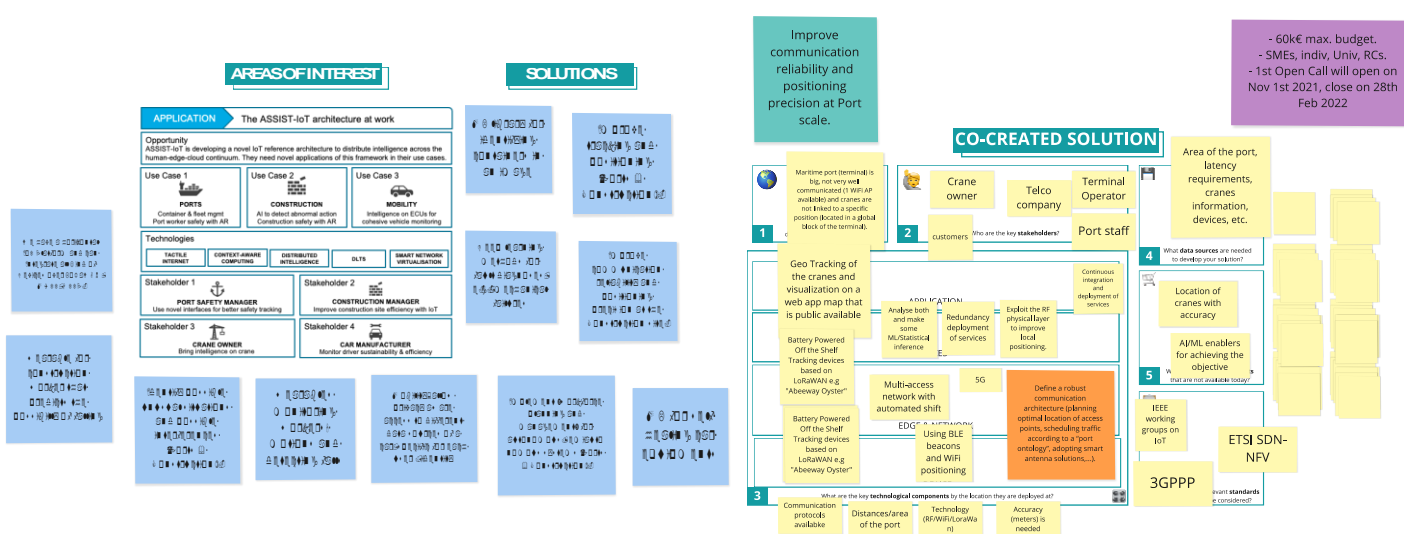


Figure 6 Snapshot of the tool used for co-creation of concepts for the open calls of Assist-LoT

Building an ecosystem for IoT and Edge Computing towards a European Strategy Forum:

In April, the European Commission, supported by EU-LoT, organised the Next-Generation IoT and Edge Computing Strategy Forum. The event gathered top technology experts from across several digital and vertical domains, as well as corporate-strategy level representatives to exchange views on priorities, challenges, and opportunities, and establish a commonly shared strategic European vision for the next-generation IoT and (far) edge computing. This session held at IoT Week 2021 explored achievements so far in building an ecosystem for IoT and Edge Computing, showcases funding opportunities and took a look ahead towards a future European Strategy Forum.

IoT Business Model Innovation at The Edge by EU-LoT/NGIoT:

A panel session delivered by EU-LoT and NGIoT that aimed at exploring the next wave of business models enabled by IoT and the combination of it with edge computing. 4 experts explored results from the H2020 Large Scale Pilot projects, one of the largest investments by the EC in this field and provided mature examples from research and industry in Europe and beyond.

These activities aimed to involve both relevant stakeholders and, mainly, the project's target groups in an active way, thus stimulating their interest and contributing to generate a more dynamic and valuable European IoT ecosystem. Also, a large number of the organisations that participated in the activities are members of the IoT Next Club, demonstrating the value of this asset to the community and the ecosystem's ability to provide feedback among the members it is

made up by. This year's edition will once again seek to energise the European IoT ecosystem and attract the most relevant stakeholders and interest groups through discussions, panels, round tables or the demonstration of use cases of IoT in the domains of Energy, Manufacturing, Agriculture, Automotive and Small Ports. The session will also feature the results and upcoming opportunities of the projects' open calls.

3.1.3 Data Week European Big Data and Data Driven AI, 2022

(Collaborative/ ICT-56 partners, Industry, Policy)

Data Week 2022 took place over a period of three weeks. The event began with an online opening event on May 24th, which kick-started the activities. The event weeks included local events organized by the BDVA i-Spaces and international online sessions/workshops by the community. EU-IoT launched a collaboration with the skills taskforce within BDVA/DAIRO to deliver a set of workshops to map out the skills demands (and complement the surveys underway) in the areas of AI and Robotics at Dataweek and IoT Week respectively.

EU-IoT partners hosted the session that led to two simultaneous workshops. The goal of the workshop was to gather and discuss information and data on the skills challenges that are holding back the growth and adoption of AI challenges within it. The session launched a series of consultations which included a mapping of current skills supply and demand in four thematic technology areas, an understanding of the context in which those skills will be best acquired, and the mapping of the IT specialist profiles relevant for AI and the respective skills basis.

During the session there was active collaboration with OPEN DEI CSA that presented a section on the overview of the skills gap analysis from the perspective of the CSA that presented an introduction of why there is an increase of technical skills demand, the problematic regarding profiles and skills definitions as well as the need to upskill and reskill workers.

The first workshop focused on Identification of the skills that are currently readily available or accessed within the AI tech development areas of:

- High-performance computing
- Federated learning
- Compliance and security

The second workshop focused on selecting and unpacking the main IT profiles for the application of AI within a medium to large company and defining the top three skills that they need to fulfil that role.

Outputs:

For EU-IoT CSA it was a unique opportunity to showcase and disseminate the projects advancement on skills and profile mapping as well as to receive feedback on the results of the EU-IoT launched survey and it's subsequent IoT Skills Framework⁶. This served as the platform for active engagement and increase collaboration between the European Commission (Unit F4 DG-CNECT), Industry stakeholders (Nokia Bell Labs) and Horizon 2020 Programme funded CSA's (OPEN DEI), as well as for showcasing each stakeholder's progress and engaging with the over 50 participants as to draw common takeaways on each of the working group's agendas.

3.1.4 European Big Data Value Forum 2021

(Collaborative / ICT-56 partners, Industry, Policy)

⁶ Full survey report and Analysis available in [EU-IoT White Paper on IoT Skills: Closing the Talent Gap](#)

Edge Computing - the convergence point in the human-cloud continuum framework:

EU-IoT sponsored a session in the European Big Data Value Forum 2021.

The main goal of this session was to address the shifting importance of the edge with regards to the value to be generated by a greater level of processing and coordination closer to the user or environment. Specific objectives included:

- Promoting the activities of the NGIoT initiative
- Animating the discussion around the reason for all the bets on the edge
- Identifying which challenges or opportunities remain for adoption
- Addressing the shift required in approach from tech developers

The session brought together some of the most relevant agents and experts in the ecosystem, such as Christian Winkler (Siemens) and Federico Facca (H-Cloud), seeking to achieve a valuable interaction that would contribute to the sharing of information and the generation of new ideas. In addition, RIAs were involved by reserving a slot so that the two whose open calls were active at the time (Assist-IoT and IoT NGIN) had the opportunity to present their respective funding opportunities to potential participants.

New Challenges Ahead: AI and Society

EU-IoT was a contributor to the session organised in collaboration with BDVA which addressed the relevance of the NGIoT Initiative towards the adoption of responsible AI within the context of the AI Act with speakers from UCD, TNO and InTouchAI.eu

3.1.5 CONASENSE 2022

(Participatory / ICT-56 partners, Industry, Policy)

The CONASENSE2022 symposium attracted a large number of entities from industry and academia worldwide, with at least 50 different European entities participating. The dissemination of the EU-IoT Hackathon was promoted through the NGIoT initiative channels, which reached the broad IoT community in Europe, and via the EU-IoT "NextClub" initiative, which reached over 500 SMEs in Europe.

The CONASENSE2022 symposium was a forum that brought together experts from industry and academia to discuss the integration of research fields related to Communication, Navigation, Sensing, and Services (CONASENSE) for the betterment of society. The event was centered on 6G as a paradigm and focused on four computational areas: communications, satellites and navigation, sensing, and services.

The symposium consisted of keynote speeches, technical tracks with peer-reviewed papers, and a student forum that connected gifted students with research and development stakeholders. Additionally, the event featured the EU-IoT Hackathon, jointly organized by UnternehmerTUM Makerspace, which focused on Mobile Sustainable IoT solutions.

3.1.6 Privacy Symposium – April 2022

(Participatory / Industry, Policy, Researchers)

In 2022, the Privacy Symposium conference had 78 sessions with 245 experts in data protection, including national authorities, European institutions, and international organizations. The conference brought together 500 registered participants and 350 remote participants, aiming to support international dialogue, cooperation, and knowledge sharing.

EU-IoT Partners lead a session on the Cloud-Edge-IoT Paradigm, looking at the idea of Continuous Trust and Data Protection from Cloud to Edge. The session began by looking at the

cloud-to-edge continuum, including a perspective on the scale of the ‘intelligence on the far edge’ market – to the value of 10.2 billion. Far and Near Edge were also compared and contrasted, with the conclusion being that Far Edge is less technologically mature but also has bigger economic potential than Near Edge.

The topics of privacy, security and trust were once again present, where it was discussed that the Edge will only fulfill its potential if it has privacy and trust “baked-in”, with this trust consisting of 5 key components – authentication, validation, agency, reliability and compliance. Additionally, enablers of privacy and trust were covered, focusing on 5G, Edge computing, DLTs and security.

Outcomes

The Symposium served as an opportunity to give dissemination to the EU-IoT Cloud-Edge-IoT framework as well as to showcase NGIoT’s RIAs framework such as the IoT-NGIN Meta Architecture⁷. These two elements were fundamental for the presentation delivered by EU-IoT partners that focused on Continuous Trust and Data Protection from Cloud to Edge.

A rich exchange took place during the presentation in which trust was at the centre, taking into account aspects such as authentication, validation, agency, reliability and compliance in the context of the increased security that moving to the Edge presents. These conclusions an overall discussion was the result of the NGIoT RIAs development and work regarding the potentials of moving to the Edge.

3.2 High-level ecosystem engagements organised with European Commission

3.2.1 EU-IoT CSA Final Event, March 2023

(Collaborative/ Industry, Policy, Researchers)

EU-IoT Final Event: From IoT to Cloud-Edge-IoT Continuum – Takeaways and Transition to the New Paradigm, marked the end of the over 2-year EU-IoT project. It took place on March 30th, 2023, with an invitation extended to the wider community. The event served to showcase some of the most important outcomes of the project, engaging with other relevant projects that will follow on from the work done on the EU-IoT such as the EUCloudEdgeIoT initiative.

The event served as both the end event of EU-IoT and as a unique platform to engage and capitalise EU-IoT’s work on the new EU Cloud Edge IoT initiative. It counted with over 200 subscriptions and 120 participants, that included attendees from Europe’s leading economies as well as EC Policy Officers, other EU Funded Project Coordinators, members of academia, industry associations and SME’s, among others.

The event looked initially into NGIoT research priorities and recommendations towards a solid standardisation, specifically how EU-IoT had been analysing and working with 6 flagship ICT-56 projects, following their research areas and developing recommendations towards a solid standardisation. Next up, a presentation was made on the guidelines for IoT Collaboration Sustainability, which provided a view on the qualitative and quantitative findings collected within the ICT-56 flagship projects, highlighting success stories and innovative research findings. This was followed by a section on continuing the success and development of the NGIoT tech, which comprised a review of the impact of the NGIoT Initiative and key highlights and outcomes for Research and Innovation.

The next section consisted of 3 distinct parts: Market, Skills and Future Outlook. In the Market section, the discussion centred around the applicability of solutions, with an examination of NGIoT

⁷ For full framework see [IoT-NGIN D1.2 IoT meta-architecture](#)

Business models and key sectors for use cases, which delved into the different IoT applications from a technological and business development perspective. Some of the 30 use cases collected were discussed, which varied across various sectors, countries and organisations. Additionally, participants heard a presentation on foresight predictions for key use cases of the Cloud-Edge-IoT and development across the key sectors for the EU economy.

In terms of Skills, the first topic for discussion was Specific Skills Taxonomy, i.e. how different stakeholders can design learning paths to support training, education and career development objectives with the IoT skills taxonomy, the EU-IoT training catalogue and a methodology for constructing skills profiles. This was followed by a presentation on addressing the convergence of Cloud-Edge-IoT in future skills demands for the DIGITAL programme.

The session concluded by looking forward to the future of IoT in the EU, looking at the strategic direction that would be taken using the outputs of the project. This looked specifically at SRIA gaps that still existed, as well as the policy impacts of the work done during the project.

3.2.2 Horizon Europe Info Day & Pitch Session 2023

(Collaborative/ ICT-56 partners, Industry, Policy, Researchers)

The European Commission organised the Horizon Europe Info Day on January 30th, 2023, with the backing of EuCloudEdgeIoT and EU-IoT. The purpose of the event was to introduce the Horizon Europe Work Programme for 2023-2024, which focuses on cutting-edge data and computing technologies. Attendees, including major industry innovators and research organizations, were given the opportunity to present their ideas during the event.

The online event gathered over 70 participants of which 35 belonged to the scientific community, 15 of specific industry sectors, and 3 policy makers beyond the speakers.

The event served as a platform for dissemination and engagement between the European Commission that covered topics specific to cluster 4, these being:

- From Cloud to Edge to IoT for European Data 2021-2027
- Collaboration with NSF on fundamental research on new concepts for distributed computing and swarm intelligence (CSA)
- Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA)
- Coordination and Support of Cognitive Computing Continuum research and policy (CSA).

Moreover there were Presentations of Research Agendas from several European funded projects such as HiPEAC and Gaia-X as well as associations as BDVA.

3.2.3 Information and Virtual Brokerage Session - Horizon Europe Cloud-Edge IoT Call 2022

(Participatory / Industry, Researchers)

More than 275 stakeholders from industry, academia and innovators participated in the Information and Virtual Brokerage Session on the Horizon Europe Cloud, Edge, IoT 2022 Calls, organised by HORIZON CLOUD and NGIoT in collaboration with the European Commission (EC). The open and free half-day virtual event, organised by the European Commission in collaboration with H-CLOUD, HUB4CLOUD, and EU-IoT introduced the three Horizon Europe calls “Cognitive Cloud: AI-enabled computing continuum from Cloud to Edge (RIA)”, “Open source for cloud-based services (RIA)”, and “Programming tools for decentralised intelligence and swarms (RIA)”.

The event offered a unique international networking experience to forge the winning partnerships with academics, researchers, industrial stakeholders, and SMEs, and participants had the unique opportunity to pitch new concepts and applications, proposal ideas, and expertise in front of

leading research organisations and cutting-edge innovators from across industry.

3.2.4 Edge computing and IoT Strategy Summit - April 2021

(Participatory / Industry, Policy)

EU-IoT was part of the high-level Fireside Chat hosted by the European Commission aimed at sharing a view on a strategic European vision for (Far) Edge Computing in the Next Generation Internet of Things.

The event gathered top technology experts from across several ICT domains, as well as high-level corporate representatives that exchanged views on priorities, challenges and opportunities. It represented a great opportunity to meet and exchange views with an exclusive group of high-level actors in the fields of data, cloud, electronic components and systems, mobile communications as well as stakeholders from relevant verticals and associations.

3.2.5 From Cloud to Edge to IoT for European Data – Brokerage Event July 2021

(Participatory / Industry, Policy, Researchers)

More than 250 stakeholders from industry, academia and innovators participated in the “From Cloud to Edge to IoT for European Data” event on 7 July 2021, organised by EU-IoT with the support of the European Commission (EC). The attendees had the opportunity to learn about the section “From Cloud-Edge-IoT for European Data” of the Horizon Europe Programme and the chance to network to forge winning partnerships.

The event counted with the participation of renowned experts, such as Rolf Riemenschneider (Head of Sector IoT, European Commission), Haydn Thompson (Founder and managing director of the THHINK Group) and Monique Calisti (Coordinator EU-IoT).

4 EU IOT SPECIFIC MECHANISMS

4.1 Open Calls Coordination

EU-IoT has provided continuous support to the RIAs in the whole process of their open calls within the framework of the NGIoT initiative. Through various activities, the consortium supported RIAs in this process as follows:

- Dissemination and communication of relevant information about the open calls through various channels
- Support in the recruitment of participating organisations
- Support in the recruitment of evaluators through the creation of a common pool
- Facilitating the sharing of information and standard resources between RIAs for improving the open calls materials and quality of information and communication with potential applicants
- Contact with experts who share previous experience in managing open calls
- Sharing of documents and information related to previous open calls to facilitate their definition and management

Among the most relevant activities carried out, are the provision of a slot for RIAs at IoT Week 2021 and IoT Week 2022 to present their open calls and use cases, as well as the monthly regular meetings held every month since October 2021.

- **EDBVF:** In the session sponsored by EU-IoT, the two RIAs whose open calls were active at the time (Assist-IoT and IoT NGIN) had the opportunity to present their respective funding opportunities to potential participants.
- **Assist-IoT Webinar:** Organisation of a webinar in collaboration with Assist-IoT where its coordinator had the chance to present the open call to potential candidates coming from the IoT Next Club
- **NGIoT Open Calls:** Key learnings and approaches from the IoT Large Scale Pilots and Next Generation Internet: 8th July 2021, 16:00 CET. The goal of this session was to support the process of open calls of the ICT-56 RIAs, sharing lessons learned from previous open calls in H2020 IoT projects, addressing the specific needs of the ICT-56 RIAs in open call management. For this purpose, 3 experts with experience in coordinating open calls were involved: Gemma Guilera (Synchronicity), Mirko Presser (NGI Pointer) and Harald Sundmaeker (Smart AgriHubs & IOF2020), who shared their experiences and gave advice on key aspects of the open calls management.
- **NGIoT Open Calls: IoT Week Briefing session. 25th August 2021, 12:30 - 13:30 CET.** The goal of this session was to prepare all parties involved for the Open Calls Workshop at IoT Week 2021. The main objectives were the following: Review the use cases and check that they conform to the desired format; share the structure of the two sessions; define the roles of each participant; explain the tools to be used, share doubts, opinions, and proposals for improvement.
- **NGIoT Open Calls Workshop. 30th August 2021, 15:15 - 17:30 CET.** The event was divided in two sessions as part of IoT Week Virtual 2021. The aim was to invite stakeholders interested in creating the Next Generation IoT solutions or have a solution and need the funding to enter this space and bring it to market. They focus on about how to participate in the opencalls within the NGIoT initiative (<https://www.ngIoT.eu/>). During a co-creation workshop, they were able to demonstrate their skills and present their ideas by developing a solution for a specific use case working together with members of the NGIoT projects and other stakeholders.

- **NGIoT Open Calls: Funding opportunities on NGIoT.** 15th September 2022, 10:00 - 12:00 CET. The goal of this session was to support the process of open calls, sharing experiences from previous open calls participants in IoT projects, and communicate the open opportunities to: Understand the open calls procedure; share experience on previous open call procedures; and Inform about the ongoing and future Open Calls
- **The Next-generation IoT: Strategic Directions IoT Week 2022** 13:45 – 16:30 21st June 2022. In this session, the future European roadmap for research and innovation, a result of aligned input from different tasks, including the outcomes of stakeholder engagements, surveys and workshops was presented to provide an overview of the key themes, topics and trends facing the future of IoT. The session looked towards the main levers and drivers of adoption and emerging technology trends and the key gaps remaining for scaling industrial investment.

Outputs

Common challenges takeaways:

During the 13 guided discussions and exchanges that took place during the meetings several challenges and topics were identified as very relevant to the OC Process. These were: Publication process of OC on the EC portal and period of publication; Quality of applicants Open Calls; number of applicants on the launch of Open Calls; Webinars to explain processes; requirements and timelines on OC; Designation of evaluators; internal administrative issues through the ongoing OC and time consuming processes to have all contractual documents signed and Lessons learned on previous processes. 5 RIAs participated in these meetings: IntelloT, IoT NGIN, ASSITS-IoT, VEDLIoT, TERMINET.

Best Practice Paper:

NGIoT Open Calls: Positive Action for Diversity and Inclusion: The NG-IoT Open Calls were designed to bring in new technology providers and stakeholders to validate the technical functionality of new Cloud-Edge-IoT environments and contribute to standardisation and explore market potential. As a result of the exchange produced during the monthly meetings a quick guide was produced as to incorporate Diversity and Inclusion principles to all stages of the Open Calls as to improved the indicators on the areas of diversity.

The paper, produced by EU-IoT and NGIoT RIA projects, covered some essential step by step actions that RIAs can take during the four stages of the OCs: design, launch, evaluate and closure and improvement. Moreover, RIA team members were invited to keep this useful resource live and updated based on their future Open Call experiences.

Impact on Open Calls results:

Over the consistent assistance and collaboration period several actions and tools were developed by NGIoT in order to ensure that Open Call for RIAs were successful. This included the sharing of best practices and recommendation in order to critically and collectively assess how to design and disseminate the Open Calls in order to reach the desired audience. Such contemplated the production of joint templates and documents to facilitate and dynamize the administrative burden and make time available for content-scope activities that would result in a most effective Open call.

Moreover, the CSA collaborated in the mapping and disseminating process to reach out to the ideal SMEs and Research institutions, among others. After the dissemination, Q&A and applications a joint database was built in order to summarise the main statistics and KPIs on the first open call in order to critically assess the points of improvements as well as to capitalize the effective actions.

Such database was collectively built and analysed by RIA team members and included information on, though not only: Final number of proposals received, total funding amount in this 1st Open Call (OC), number of projects funded, provenance of total applicants (number per

country), and sector/Vertical of total applicants (number per sector/vertical).

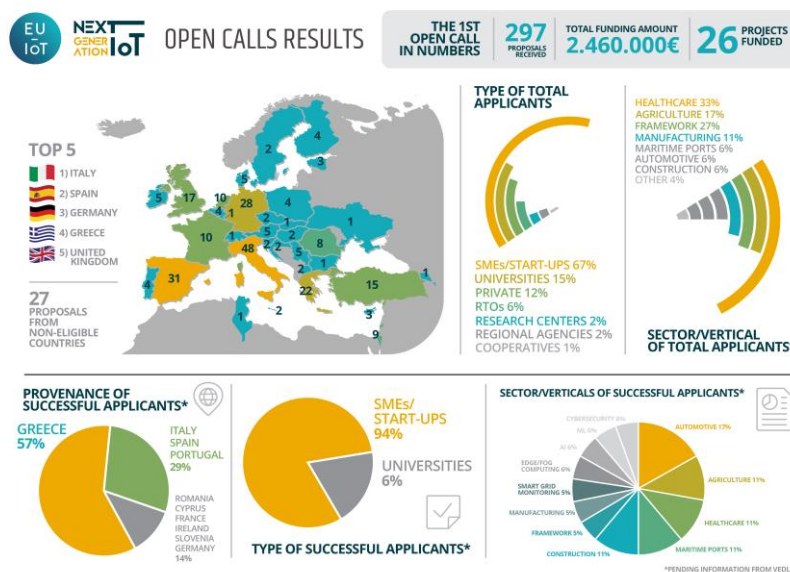


Figure 7 NGIoT RIA's first Open Calls results

At the time of this deliverable the reports on the second round of Open Calls carried out by three out of the six SRIAS was still being collected. Nonetheless, the results of the action previously described allowed 26 projects to be funded over more than 295 proposals received. The vast majority (94%) of the successful applicants were SME, serving the initial scope of the Open Calls. Consequently, the coordinated and collaborative process lead by EU-IoT allowed to correctly channel €2.46 million into intended projects in integrating IoT development into specific areas and industries.

4.2 NGIoT Call for abstract workshop on reusability of components

On September 26th, 2022, during the in-person Consortium meeting that took place in Brussel there was the opportunity to discuss the impact assessment of Research and Innovation Actions (RIAs). During such, several challenges were identified as common, transversal and relevant to ICT-56 use cases. These challenges included market, technical, and impact-related issues.

The denominated “market challenges” involved creating reusability plans for developed components, defining the roadmap to market application, and engaging market actors in adoption from design stages. “Technical challenges” included standardizing the hardware level and ensuring sustainability through integration with existing solutions. “Impact challenges” revolved around achieving alignment in impact assessment frameworks and KPIs to define expected contributions and future needs and mapping specific outputs to market impact.

After consulting with RIA coordinators, the market challenge on reusability components was agreed to be the most relevant given the different RIAs stages. To address this challenge, each research project delivered up to two abstracts covering two use cases within RIA, focusing on how they tackled the challenge of component reusability in their respective use cases.

Eleven use cases from the 6 RIAs within the NGIoT Initiative presented their abstracts for discussion during the workshop:

Table 3 List of abstracts presented and discussed by each NGIoT RIA

RIA	USE CASE	RIA	USE CASE
• IntelloT	• Healthcare use case	• VEDLIoT	• Heterogeneous hardware platform for accelerated AIoT

• Assist-IoT	• Smart Safety of Workers Pilot	• iNGENIOUS	• Next generation IoT – repositioning wireless micro-edge condition sensing from rail-health to other use cases
• IntelloT	• Agriculture use case	• VEDLIoT	• Methods for requirements engineering in AIoT systems
• TERMINET	• User-Centric Devices in Smart Farming	• IoT-NGIN	• Reusability plan for the traffic flow prediction & parking prediction use-case
• IoT-NGIN	• Reusability plans in IoT-NGIN ML-based crop diseases prediction, smart irrigation and precision aerial spraying	• iNGENIOUS	• Predictive analytics solutions for more efficient traffic planning in maritime logistics
Assist-IoT	Tackling reusability plans for components developed for automotive diagnostics pilot		

During the online workshop that counted with 31 participants within the NGIoT community, a series of breakout rooms were organised to facilitate inter-RIA exchange. The result of this workshop was the gathering on common takeaways on how each use case tackled the same challenge. The general takeaways were:

- The concept of Reusability must be conceived since the architecture phase; aiming at reusable systems that will require minor adaptation or re-scoping to specific use-case scenarios.
- Federated learning is a common approach applied by different RIAs as to sort several limitations in use-case applications:
 - a. Having multiple sources of data
 - b. Conceiving private by design models
 - c. Enhancing model sharing (as opposed to data sharing)
- There is a current need to move into the edge as a consequence of the increased computing capacity.
- The centrality of maintaining human-centred design as to enhance AI trustworthiness and consequently its eventual adoption.
- Stakeholders' involvement and engagement is key to facilitate upscaling, and it needs to occur in an open-source context. In relation to this, the lack of standardized data presents a constant challenge for reusability and scalability of pilot use cases.

During the first semester of 2023 a jointly produced paper by EU-IoT and the NGIoT community will be published as to go into further detail on each use cases experiences as to facilitate the transfer of knowledge on use cases' applicability within the NG-IoT community and facilitate future upscaling of use cases.

4.3 NGIoT Community events: Marking the evolution from cloud to Edge

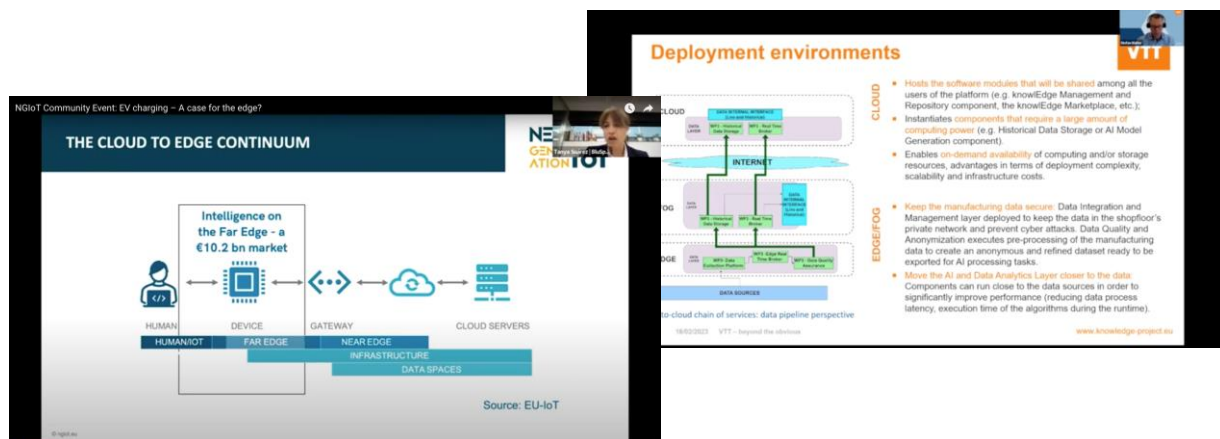


Figure 8 Framework and Use-case presentation of EV Charging at the Edge and Evolving Manufacturing Community Events

These community events addressed key issues related to Next Generation Internet of Things and brought into discussion the changes in models and approaches precipitated by the move to the edge, identify potential barriers to transition, understand which contexts and applications can drive greatest value out of the evolution, identify key players in specific market domains and engage European actors within specific domains and provide visibility to the NGIoT Initiative.

The events were co-organised with key industrial associations and technology developers to address and provide a common vista on the future market potential of the NGIoT and the direction towards the far and near edge within critical sectors in Europe such as Energy, Manufacturing, Automotive, Agriculture, or Logistics and Supply Chain. They aimed to be lively and active discussions which welcome conflicting viewpoints in the form of a debate without a set of drawn-out presentations, and with direct audience participation.

Each event had a presentation of how the application was currently addressed followed by how it will be through a push of intelligence and infrastructure towards the Edge. After the presentation, a debate was stimulated amongst the panellists which will discuss perceived benefits, risks, and feasibility for integration. These events focused on the business parameters that may occur within the transition from cloud to edge, bringing together leading experts and different stakeholders who will share their views and outline the barriers and opportunities of this transition.

4.3.1 Community: EV Charging at the Edge

This webinar, which took place on 29 April of 2022, focused on a specific application to highlight the technical differences between edge and cloud approaches and brought together industry experts to debate the opportunities and barriers that will arise. The event was co-organised between the NGIoT Initiative and the AIOTI Energy Working Group and gathered 102 participants over the two-hour exchange.

As a Community Event, the webinar counted with the presentation of a NGIoT RIA use cases (IoT NGIN Energy Living Lab, Emotion) as to trigger the discussion among stakeholders. Consequently, the webinar gathered ICT-56 RIAs (IoT NGIN), Industry Associations (AIOTI), Industry stakeholders (Siemens), Business Association (smartEn) as well as specialized SMEs (Digital4Grids and Gemserv). The panel was moderated by EU-IoT partners and AIOTI energy.

Outcome

The Community Event was recorded and uploaded to the NGIoT initiative website⁸, allowing to broaden the estimated audience by a 40 percent increase while drawing several inter-sectorial agreements on the following topics regarding the potential of moving to the Edge in the electricity sector and the potential of EV vehicles in accelerating that path.

Challenges presented by the electricity sector regarding the capability of moving to the Edge and incorporating technologies such as the one displayed in the use-case:

- Lack of a unified policy or regulatory framework that would allow for the seamless integration of cloud technology with EV charging.
- Security challenges both physical (on the network) as well new cybersecurity challenges
- Scalability costs dependant on tech adoption and migration

On the other hand, the workshop reflected on the potential benefits of the Energy sector move to the edge that included:

- Reducing cost of transition towards a more flexible grid
- Increase in network's stability and flexibility
- The possibility of new business development through micro transactions through dynamic pricing
- The empowerment of prosumers and the increased awareness of sustainable energy usage

Moreover, dissemination articles will be produced by the NGIoT initiative during the first semester of 2023 as to reflect and go deeper into the main takeaways previously mentioned.

4.3.2 Evolving manufacturing in Europe – the role of Edge Computing

This webinar, which took place on 16 of February of 2023, aimed at stimulating the discussion on the challenges and opportunities that are being created by moving from a Cloud-centric manufacturing approach, to Edge-Cloud based approaches. The event was co-organised between the NGIoT Initiative and the AIOTI and gathered 68 participants from the scientific community, industry associations, civil society and policy makers, among others, during the two-hour event.

As a Community Event, the webinar counted with the presentation of a NGIoT RIA use cases (iNGENIOUS) as well as a ICT-38 KnowlEdge project as to stimulate the discussion among stakeholders. Consequently, the webinar gathered RIAs (iNGENIUOS), Industry Associations (EFFRA), Industry stakeholders (Siemens and Nokia), Research Institutions (VTT) as well as specialized SMEs (Xentara). It also counted with the attendees from EU-CEI community as to strengthen the previously mentioned transition between NGIoT and EU-CEI. The panel was moderated by both BluSpecs (EU-IoT) and Fortiss (EU-IoT) in order to foster the discussion among stakeholders.

Outcome

The Community Event was recorded and uploaded to the NGIoT initiative website⁹ along with the panellists' presentations as to provide deeper knowledge of their sectorial insights. Furthermore, a dissemination article is due to be published by April 2023. In it several inter-sectorial agreements and exchanges will be summarized in order to capture some of the axis that followed throughout

⁸ For full video and even detail please refer to [web](#).

⁹ For full video and even detail please refer to [web](#).

the webinar.

The main challenges that were tackled during the panel orbited around what are the determinants for this kind of use cases scalability and industry adoptability. Far from being a unidimensional matter different insights were provided when thinking what are the main constrains for scalability.

Four were the main axis that ordered the panellists exchanges:

- Edge vs. cloud, trust, and cost reduction

The KnowlEdge use cases emphasised on designing platforms that can be deployed in several environments making focusing on AI trustworthiness. To do so, there were two aspects that were emphasises: AI human-centred design and computing, processing and storing data at the edge when possible.

- Human centred design and need for upskilling

The advancement of edge-cloud technology is enabling more human-centred interactions and possibilities for domain experts in industrial settings. Operational system requirements must include considerations for how human users will interact with the knowledge architecture.

- Knowledge transfer, technical as well as business knowledge

On the one hand, the technical knowledge transfer and the emphasis on open architecture platforms and applications was mentioned as an important path towards edge computing adoption in the manufacturing sector. Ensuring that use cases (particularly from the platform design perspective) are applicable and can be further developed in different industries remains an essential matter.

Moreover, the business knowledge and business perspective were identified as an equally important content that is needed for pilots up-scaling. Use cases need to be conceived also from a business perspective as to facilitate its projection into the real factory floor. For that their business value must be pondered; this being especially significant for SMEs and their prospective of Edge computing adoption.

- Testing opportunity cost, application readiness and adaptability, and new business opportunities

Real environment testing was also discussed as a key issue when thinking on the scalability of Edge-computing technologies in the factory floor. Given the impact that any platform may have in real production (and therefore on cost and profitability of the manufacturing sector) there is a need to have well tested AI solutions. Nonetheless the road to such robust platforms is anything but linear.

Moreover, dissemination articles will be produced by the NGIoT initiative during the first semester of 2023 as to reflect and go deeper into the main takeaways previously mentioned.

On initial projection and execution

Table 4 Planned programme for EU-IoT Community Event Series

DOMAIN	APPLICATION	CO-ORGANISER	RIA
Energy	EV Charging	AIOTI	IoT-NGIN
Manufacturing	Total factory control	EFFRA	INTELLIOT
Automotive	Driver management	EPoSS	ASSIST
Agriculture	Autonomous tractors	DAIRO (SG9)	TERMINET
Logistics/Supply Chain	Container tracking	GAIA-X	INGENIOUS
TBC			VEDLIOT

Table 5 EU-IoT Community Event Series effectively launched

DOMAIN	APPLICATION	CO-ORGANISER	RIA
Energy	EV Charging	AIOTI	IoT-NGIN
Manufacturing	Total factory control	EFFRA	iNGENIOUS KnowlEdge (ICT- 38)

The tentative projection of EU-IoT Community Events presented in D3.1 Community Engagement Report Version 1¹⁰ foresaw the realization of five events distributed among industrial sectors. The final executing of Community Events accounted for two events. There are operational and conceptual reasons to explain why the outcome, though inferior in quantitative terms than expected still achieved the activities objectives.

From the operational point of view, the second half of 2022 presented an overflow of both in-person as virtual events as the reticence to coordinate in-person events post covid was uplifted (along with most EU countries restrictions on gatherings and travel) while most communities persisted in the time/cost efficient approach of organising online events. Consequently, as from the last report, the level of stakeholders' availability decreased as well as the environment saturated from competing agendas within the IoT environment. As for that the priority was to arrange less events with stronger sector representatives and deeper debate on use-cases.

Moreover, the complexities of organising multiple agendas in the interest of having strong industry representatives shifted the focus in having a lower number of events but with most relevant stakeholders discussing mature use cases often applicable to different sectors. That was the result obtained during the *Evolving manufacturing in Europe – the role of Edge Computing*, as the use cases presented were relevant to both the manufacturing domain but also to the three other industries initially mapped such as the Agriculture, Logistics/Supply Chain and Automotive.

The selection of both use-cases, consequently, not only increased the CSA's intended RIA's collaboration scope (by incorporating two ICT-36 RIA use cases, apart from ICT56 projects) but broadened the scope of the attending audience. The iNGENIOUS use case: Improved Driver's Safety with Mixed Reality and Haptic Solutions¹¹ presented applicable solutions for the manufacturing sector as its applicability was fully aligned with improving worker's safety within manufacturing environment, while at the same time tackled the relevance of increased Edge computing on remotely controlled vehicles using 5G network, a technological application most relevant to the Automotive sector development.

Moreover, along the same line the reflection on KnowlEdge use cases were relevant for the manufacturing sector as well as for the agriculture and logistics/supply chain domains. The KnowlEdge pilot project present the applicability of human-centred design of AI applied to both dairy production farms (agriculture) as well as to automotive/fuel tank production¹². Both pilot experiences focused on efficient and secure communication, data management and governance infrastructure as well as advanced user-facing applications and services to deliver optimised production scheduling and enhanced process efficiency (fundamentally relevant for the logistics/supply chain domain).

¹⁰ For full deliverable see [D3.1Community Engagement Report Version 1](#)

¹¹ For full use-case presentation see [iNGENIOUS: Improved Driver's Safety with Mixed Reality and Haptic Solutions](#)

¹² For full use-case presentation see [KnowlEdge project: Challenges of AI implementation within manufacturing sector from a human interaction perspective](#)

4.4 EU IoT Hackathon, June 2022

The EU-IoT/EFPP Hackathon was a collaborative event jointly organised by the Cooperation and Support Action EU-IoT and the Horizon 2020 Research and Innovation project EFPP. The aim of the EU-IoT Hackathon was disseminate new business ideas, experiments, and prototypes as first step to best support next generation sustainable IoT solutions. The overall operational guidelines¹³ and rules were planned by the two projects and made available via the Hackathon GitLab¹⁴.

The EU-IoT/EFPP Hackathon has been developed to encourage the Next Generation IoT (NGIoT) community to interact via the development of i) technical projects (based on open-source tooling and tooling suggested by next generation flagship projects); ii) training tools; iii) business ideas based on the specific domain challenges proposed and which are aligned with the CSA EU-IoT scope areas: tactile Internet/Human IoT interfaces; far Edge; near Edge; infrastructure; data spaces.

The Hackathon took place from the 27th until the 28th of June 2022, in Munich (Germany) co-located to the IEEE co-sponsored symposium CONASENSE2022. Hybrid support has also been provided to teams in Brazil, via the support of the university UNIVESP. During the event, EFPP had a dedicated challenge domain focused on manufacturing.

The teams developed their projects during the Hackathon and had to pitch their projects on the Hackathon pitching session to be held in Munich, 28th of June. The presentations were prepared to last 10 minutes, based on the proposed templates, available via GitLab¹⁵. All winning the projects have been uploaded to the Hackathon GitLab repository¹⁶. The contents of this repository are publicly available and shall last beyond the end of the Hackathon.

The Hackathon counted with an organizing committee involving EFPP members, EU-IoT members, and teachers of UNIVESP (pole to Brazilian students). This structure was extremely helpful to handle the event in hybrid mode. All the entities and respective members participated in a volunteer way, without any kind of contribution.

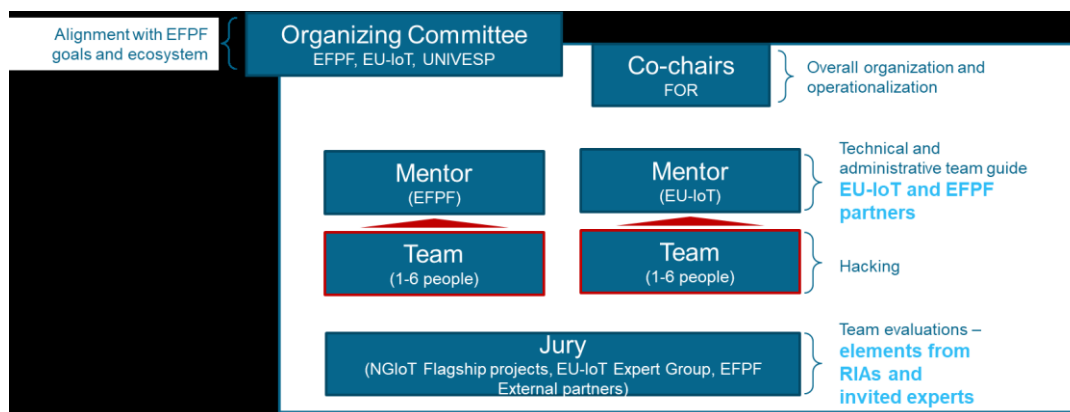


Figure 9 Organizational structure of the EU-IoT/EFPP Hackathon

¹³ For full guidelines, please see the [Guidelines](#)

¹⁴ Full event's available agenda see [DevPost platform](#)

¹⁵ Guiding templates available [here](#)

¹⁶ [GitLab repository](#)

Outputs

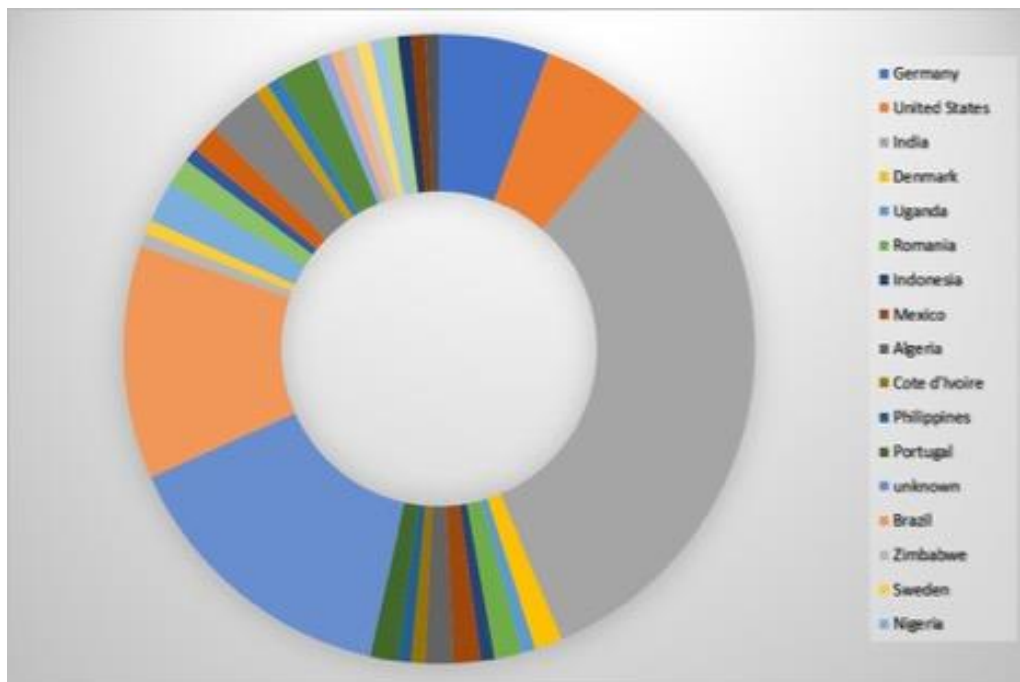


Figure 10 Hackathon Geographic community distribution.

Figure 11 provides the registrant participation per country. The 141 registrants were well distributed across the globe; 32% were in India, while 12% were in Brazil. We highlight 21% described as “unknown”. In Europe, the countries with a larger database of registrants were Germany, Denmark, Portugal, and Sweden. The type of registrants is provided in Figure 12. Others (42%) comprises registrants that did not enter a profile, or where the profile was somewhat vague, e.g., innovator, ideator, network architectures. 27% of the registrants had a profile of full stack developer, and 13% are profiled as data scientists.

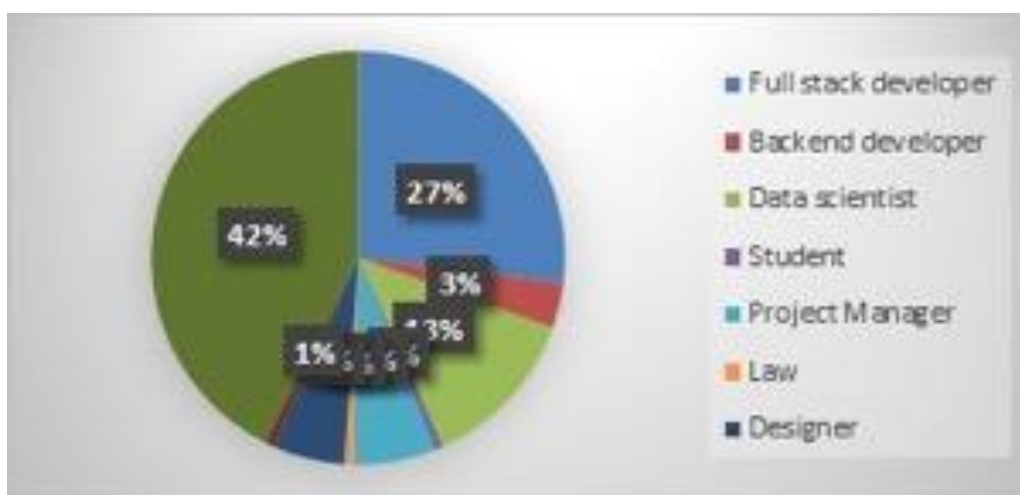


Figure 11 Participants profiles

Out of the 141 registered participants, 31 participants registered projects having selected specific challenges to address. Out of these, 26 have been considered for team formation.

Each of the candidates selected has then been directly contacted several times, to assist in the team formation. The candidates were also in contact with potential mentors. The final list of teams is provided in the Hackathon report (CONASENSE 2022 Proceedings, indexed to Scopus). All of

the participants confirmed their intention to participate in the Hackathon remotely or in presence. Each team has been assigned with 1 mentor and the teams in Brazil had an additional local mentor provided by partner FOR, to ensure a better technical support. The organizing team and mentors have then interacted until the Hackathon as needed.

The three winning projects, available via the Hackathon GitLab, were the following¹⁷:

- Sustainable Irrigation, skills training project. Team 4, Cassio Dias, Felipe da Silva Braz, Gabriel Negri, Jose Angelo de Oliveira, UNIVESP, Brazil.
- Anomaly Detection. Team 2: Sudhir Kshirsagar, University of Illinois at Urbana-Champaign, USA
- Green Backup. Team 3: Bruno Lowczy, UNIVESP, Brazil

Key Takeaways:

The overall reach of the Hackathon led to a registered participation of over 100 elements over 10 countries worldwide and created a broad cooperation event for ICT-56 RIAs, as they participated in CONASENSE 2022 and also as jury and mentors of the Hackathon. Out of the potential candidates, the experimentation carried out in the Hackathon, based on the challenges proposed by partners, counted with an initial set of 31 teams, of which the final formation considered 13 teams.

The organization of such an engagement programme during the COVID-19 pandemic introduced several unforeseen challenges, such as a lower audience in events than expected, or introducing further complexity in the experimentation aspects. This implied extra effort from the involved partners, who committed to solve the detected risks in an agile way. Overall, the Hackathon attained the proposed goals namely, to enrich the NGIoT community via the experimentation supported by students, researchers, and overall research community.

In addition to the overall community engagement, which was the key expected impact of the programme, the overall experiments and projects helped in detecting aspects to be addressed in the specific challenge tools, which addressed needs of the RIAs. The learnings have been integrated into the different tools' documentation.

The mentioned feedback and learning have been broadly communicated via the CONASENSE community as well.

4.5 IoT Next Club

The IoT Next Club was established through the IoT Large-Scale Pilot Programme in 2019, aiming to become the biggest (and best) European IoT ecosystem, bringing together SMEs, start-ups and market-makers. Club members would source, curate and share opportunities to actively shape the next-gen technological business and social landscape. It has five core principles:

- Participatory
- Sharing of experience and good practices
- Optimising resources and know-how
- Offering value to SMEs, start-ups and developers
- Supporting the core work and commitments of the LSPs

Since the launch of IoT Next Club, the community has increased up to a network of more than 300

¹⁷ For full description of type of awards given to winners as well as to participants, please see Annex 4



European SMEs.

The IoT Next Club positions itself as a reference platform for SMEs within the European IoT ecosystem, bringing together SMEs, start-ups and market-makers. It is a collaborative space tailored to the needs of the most relevant players in the IoT landscape today. It is a space where club members meet potential partners, customers and suppliers, increase brand visibility, access the most relevant IoT information, create content, participate in events and much more.

Throughout the engagement with different stakeholders SMEs can find resources to boost their business and to find potential joint collaborations. It is a vital link between the NGLoT initiative and the beating heart of the European IoT.



5 KEY COLLABORATIONS

5.1 CSA collaboration

5.1.1 NGIOT

EU-IoT collaborated closely with NGIoT in co-organisation and participation in events around various topics of interest addressed to a shared target audience. Once the CSA was completed, EU-IoT continued on with the community through the launch of its thematic community events and carries forth the identity and continuity.

5.1.2 H-Cloud

The collaboration between EU-IoT and H-Cloud was focused on co-organising events to address a common target audience. Both through the EBDVF 2021 and the Information and Virtual Brokerage Session on the Horizon Europe 2022 Call on “WORLD LEADING DATA AND COMPUTING TECHNOLOGIES” and “Digital and emerging technologies for competitiveness and fit for the green deal”, held on February 2022, EU-IoT and H-Cloud have established a collaboration framework aimed at engaging tech developer stakeholders offering them a unique international networking experience to forge the winning partnerships and pitch new concepts and applications, proposal ideas, and expertise in front of leading research organisations and cutting-edge innovators from across industry. This is to be continued with the HUB4CLOUD CSA which takes up the mantle.

5.1.3 OPENDEI

EU-IoT is collaborating directly with OPENDEI in the key areas of business model innovation and impact assessment. The business modelling is a bridging activity to that in WP4 of EU-IoT and the standardisation of approaches for defining business models through the AIOTI Manufacturing activities on the Business Impact of IoT in Manufacturing Industries. The collaboration took place from during an online workshop to delivered on the 18th of May 2022 and counted with 103 attendees that included: 25 members of the scientific community, 38 Industry representatives, 10 civil society representatives, and 15 policy makers among others.

Through the participation in the OPEN DEI TF 4 Digital Transformation and Business Impact, EU-IoT is sharing the impact assessment framework developed in WP5 and the approach to the platforms and pilots.

Finally OPEN DEI and EU-IoT hosted a shared panel during 2022 IoT Week as described in 2.3.01 IoT Week 2022, and the CSA was invited to share the workshop held during the 2022 Data Week that is thoroughly described in 2.3.4 BDVA TF9 Skills Data Week 2022.

5.1.4 LEADS CSA

The Collaboration on LEADS was focused on complementing the work carried out on Skills Gap mapping done by the EU-IoT partners and the recently forms Leading Europe’s Advanced Digital Skills (LEADS) CSA. LEADS main objectives is to provide guidance for the deployment of the €580 funding of DIGITAL programme Advanced Digital Skills (ADS) over the next 7 years.

The convergence between EU-IoT and LEADS research agenda was particularly focused on the new advanced digital skills challenges that will rise from the current shift from Cloud-IoT paradigm to the Cloud-Edge-IoT continuum. Both EU-IoT and LEADS CSA identified the need to reconfigure current skills into new roles and positions that will be required for the transition to more transversal roles along the CEI. The common takeaways and point of coincidence on this matter were particularly stressed at the EU-IoT final event (described in the following subsection

5.1.5 EU-CEI

Along with the final months of EU-IoT as thoroughly described on Section 1.3 The European Cloud Edge IoT Continuum Initiative was towards the last months of EU-IoT CSA and since then initial collaborative activities were carried on. These included the invitation to joint workshops such as that on the Call for Abstract as well as the presentation of the novel Initiative during all EU-IoT Community Engagement Events. This coordinated strategy will allow EU-CEI to start from a ground base in terms of engagement with the relevant stakeholders that will need to be involved for the Initiative's fruitful outcomes.

The final collaboration activity was carried out during EU-IoT's final event in which UNLOCK-CEI was able to present their CSA in the context of EU-CEI and present the initiative to the over 100 attendees. The event served as both the end event of EU-IoT and as a unique platform to engage and capitalise EU-IoT's work on the new EU Cloud Edge IoT initiative. IT counted with over 120 participants, that included attendees from Europe. It also counted with the participation of EC Policy Officers, other EU Funded Project Coordinators, members of academia, industry associations and SMEs among other.

5.2 Standardisation bodies

EU-IoT maintained an active collaboration framework with various standardisation bodies, which translates, in most cases, into the co-organisation of events or the writing of joint reports and white papers.

These organisations included IEEE, FIWARE, ITU, ETSI, IETF, ISU, ENISA, or ECSO among others. Notable collaborative events included:

- The Need for IoT Security Standards & Certification. Global IoT Day Roundtable (April 2022) – ECSO, ENISA and ETS.
- Workshop on IoT and Edge Computing Research and Standardisation Convergence (September 2021) – ETSI, ISO, ITU and FIWARE
- Organisation of 2 Open-source and Standardization Aspects events with the NGIoT RIAs with representatives from AIOTI and DAIRO for sourcing collaborations in the reports focused on “IoT and Edge computing integration into data spaces” (AIOTI) and “Data sharing/data spaces and interoperability” (BDVA/DAIRO) and sharing mapping and links with EU-IoT and standardisation activities within the RIAs¹⁸.

5.2.1 EU-IoT and OntoCommons Workshop – Ontological interoperability, standardisation recommendations discussion

An e-workshop on ontological interoperability and standardisation recommendations was held on 7 July 2022, organised by EU-IoT and OntoCommons. The event brought together experts from various fields and entities from Europe and beyond, all working towards more efficient ontologies.

Interoperability and the use of ontologies to enhance it are crucial elements in creating open and adaptable IoT systems. Through this workshop, the EU-IoT and OntoCommons CSAs created a platform for participants to discuss how to address interoperability challenges, a major issue within the IoT landscape.

During the e-workshop attendees were informed about the challenges related to the use of ontologies across different entities in Europe and the United States, such as NIST. Furthermore,

¹⁸ For full definition of targeted standardisation bodies and activities, please refer to D3.4 and D3.6.

they were introduced to relevant initiatives and standards, including the Industry space by OntoCommons, the AIOTI Ontological landscape, and the ETSI SAREF standard. The workshop counted with an estimate of 500 participants, these being 140 members of the scientific community, 170 industry representatives, 60 civil society representatives, and 20 policy makers, among others.

Outputs

The interactive sessions and Q&A from the informative and panel sessions revealed that there are three primary challenges that need to be addressed: fragmentation and vendor lock, cross-domain interoperability, and a lack of open tooling and application examples.

To prevent fragmentation, experts suggested the need to ensure that information models do not rely on specific protocols or vendor-based information. However, they acknowledged that data encoding may still exhibit some dependency, which should be considered in open standards.

For cross-domain interoperability, the use of open-source and open ontologies was deemed crucial. Experts also emphasized the importance of a universal language and a universal approach to mapping across different ontologies. The IOF-core and COBE examples were recommended for further modelling, along with the SAREF standard and its extensions.

Finally, experts agreed that open-source, open ontologies, and tooling that provide examples of applications are vital to achieving interoperability.

The main challenges along with the expert recommendations previously mentioned were published in a joint report¹⁹ between EU-IoT and Ontocommons that presents a more exhaustive view on the previously explained outcomes.

¹⁹ EU-IoT and Ontocommons workshop ontological interoperability, standardization recommendations discussion [report](#)

6 CONCLUSIONS

6.1 Continuity and community presence

EU-IoT has successfully managed to position itself and the NGLoT Initiative within the principal communities of interest through a smooth transition of branding and communication assets and the close collaboration between the two projects. The NGLoT Initiative has forged a strong identity, which has generated recognition as the reference RD&I activity within the IoT and AI communities leading to a generated momentum that is showing results and opening opportunities for engagement. While the NGLoT and EU-IoT CSA operated in parallel, EU-IoT was sensitive to the series of community workshops being delivered by NGLoT CSA and provided a supporting role, the prominence of EU-IoT activities is apparent in the previous 6 months and builds on this body of evidence, pushing advanced topics with practical outcomes.

The productive and collaborative relationship with the ICT 56 RIA projects has been a significant driver in the delivery of community engagement, through the provision of content, use cases, technology descriptions and general activities. This relationship has been symbiotic with EU-IoT successfully providing visibility and accessibility to the RIAs activities and making connections with relevant actors and communities where appropriate such as with SDOs, industry players and SMEs or researchers for the participation in their open calls.

EU-IoT has consolidate its presence and lead to further collaborations with the target communities and SDOs. This was supported by the coming online proper of new partnerships and alliances such as the European Alliance for Industrial Data Cloud and Edge, Key Digital Technologies JU (KDT-JU) and the AI, Data and Robotics Association. Added to this was the launch of the first group of DATA projects from the recent Horizon Europe round of calls and the lead-in to the upcoming next set of large-scale pilots.

6.2 Types of activities and formats

The level of activities was primarily through direct or collaborative approaches with the specific communities, however, it is observed that there was a concentration surrounding specific events such as IoT Week and EBDVF which provides direct access and contact with the target communities within AIOTI, BDVA/DAIRO and others. This proved to be successful and leading to a high average number of attendees to sessions and workshops within the target groups for the NGLoT.

The approach which has formed in this first period, through tailored collaborations with other ecosystem developers (e.g. CSAs or Industry Associations), delivered the combined benefits and enabling the NGLoT Initiative projects to span different forums. Through these collaborations, shared communities benefit from efficient and effective engagement with a natural combination driven by the use case or topic, particularly relevant at the current disruptive stage of convergence in the field.

The past few years of activities has been exclusively online. This has provided benefits through growing the reach of participants, enabling participation through use of online tools and workshops, and supporting the dissemination with a strong body of content provided with recordings of sessions easily provided online. That said, the proliferation of virtual events has led to challenges and competition for space among these particularly interconnected audiences. The initial perceived benefits are quickly dissipating, with low levels of active participation in spite of attendance and poor opportunities for networking. Online works particularly well for round tables, webinars with a dissemination focus, i.e. indirect engagements, and remote workshops (only when the participants are familiar and structure tools are used in parallel sessions) with a reduced risk of external costs but with limited benefits on personnel resources. In-person events such as IoT Week 2022 and Data Week 2022 provided stronger networking opportunities and the capacity to host longer workshops, in one session with deeper inputs from participants.

Each of the EU-IoT consortium members was extremely active, and as reflected on D5.4, has leading to a high-level of participatory actions where the actions of the project and the overall initiative have been well presented and represented within key forums across all areas from data spaces through to the human interfaces.

6.3 Engaged communities

EU-IoT has been successful in linking the NGIoT Initiative with the principal networks of AIOTI and BDVA/DAIRO within specific working groups establishing direct collaborations through co-organisation of events, workshops and contributions. There has not been the same level of engagement with the more embedded systems communities within the KDT JU (formerly ECSEL JU) and the connectivity with the 6G-IA SNS (formerly 5GIA). While GAIA-X is a community of interest for the NGIoT Initiative, and with the consortium forming members of the network, the opportunities for engagement remained unclear as activities in the network mature and develop at national level and the EU-IoT consortium remains attentive and proactive. Similarly, while the Quantum Flagship was of interest in principle, the immediate links were often secondary to the more immediate priorities of enabling federated architectures and applications.

The launch of the NGIoT Community Events Series provided a strong mechanism for engaging with all main industry associations across the community while reaching directly to industry and providing the connection between the technologies and use cases being developed within the RIAs and commercial applications. The specific nature and the driving theme enabled a hook into the activities of the target communities and provides specific value to the Industry target groups.

SMEs have been effectively engaged through the coordination of the RIAs Open Calls, providing mobilisation of the IoT Next Club members and the collective growth of the network around the NGIoT Initiative whereby each of the RIAs acts as a gateway and multiplier with a central hub akin to the NGI, IoT LSPs or similar broader R&I programmes that will continue on to mature participation in the next round of calls and projects.

The Community Engagement activities of EU-IoT have principally addressed researchers and industry more in the tech developer and tech enabler role than in a tech adopter and there has to date been a low engagement with education and training stakeholders who will benefit from skills actions within the project.

ANNEX 1 – LIST OF RELEVANT WORKING GROUPS FOR NGIOT

TECH	
Name	Working group(s)
AIOTI	<ul style="list-style-type: none"> • Distributed Ledger Technologies Forum • Testbeds • WG01 Research and Partnerships
BDVA/DAIRO	<ul style="list-style-type: none"> • TF6 – Technical • TF10 – European Data Sharing spaces
EFFRA	<ul style="list-style-type: none"> • Made in Europe/FoF PPP
ITU	<ul style="list-style-type: none"> • SG13 Future networks
ETC4HPC	<ul style="list-style-type: none"> • Energy Efficiency WG
ETP4HPC	<ul style="list-style-type: none"> • Industrial Users WG
ECSCO	<ul style="list-style-type: none"> • WG6: SRIA and Cyber Security Technologies
European alliance for Industrial Data, Edge and Cloud	<ul style="list-style-type: none"> • Alliance in initial phase
European AI Alliance	N/A
MARKET	
AIOTI	<ul style="list-style-type: none"> • WG02 Innovation Ecosystems • WP06 – Agriculture • WP08 – Urban Society • WP09 – Mobility • WP10 – Digital for Green • WP11 – Manufacturing • WP12 – Energy • WP13 – Buildings • WP Health • IG Logistics & Supply chain
ITU	<ul style="list-style-type: none"> • SG15 transport and access
BDVA/DAIRO	<ul style="list-style-type: none"> • TF3 Ecosystem • TF7 – Applications • TF8 – Business
ECSCO	<ul style="list-style-type: none"> • WG2: Market Deployment, Investments, and International Collaboration • WG3: Sectoral Demand and Users Committee • WG4: support to SMEs, coordination with countries and regions
OPEN DEI	<ul style="list-style-type: none"> • TF2 Data - Powered Business Ecosystem Building • TF4 - Digital Transformation & Business Impact
SKILLS	
BDVA/DAIRO	<ul style="list-style-type: none"> • TF9 – Skills
ECSCO	<ul style="list-style-type: none"> • WG5: Education, Training, Awareness, Cyber Ranges
DSJC	N/A

AIOTI	<ul style="list-style-type: none"> • WG03 IoT Standardisation
ITU	<ul style="list-style-type: none"> • SG17 Security
W3C	N/A
ETSI	N/A
ECSC	<ul style="list-style-type: none"> • WG1: Standardisation, Certification and Supply Chain Management
IETF	N/A
IEEE	<ul style="list-style-type: none"> • Communications • Information technology • Power and energy • Transportation technology
GAIA-X	<ul style="list-style-type: none"> • Agriculture WG • Energy WG • Energy WG • Finance WG • Geoinformation WG • Health WG • Industry 4.0 / SME WG • Mobility WG • Smart Living WG • Public Sector WG
OPEN DEI	<ul style="list-style-type: none"> • TF1 Data Sharing Spaces
POLICY	
AIOTI	<ul style="list-style-type: none"> • WG04 – Policy and strategies
BDVA/DAIRO	<ul style="list-style-type: none"> • TF1 – Programme • TF2 – KPI Monitoring • TF5 – Policy and societal
ITU	<ul style="list-style-type: none"> • SG3 – Economic and Policy Issues
OPEN DEI	N/A

²⁰ For full definition of standardisation bodies, please refer to D3.3, D3.5

ANNEX 2 – SAMPLE OF ENGAGEMENT ACTIVITIES

1.1.1 Sample of delivered leading activities

Throughout the lifetime of the project, EU-IoT has carried out a series of activities aimed at different stakeholders and target groups which, in turn, are classified according to the type of activity, which can be direct, indirect, collaborative or participatory, depending on the degree of EU-IoT's involvement in them. Below outlines a selection of the prominent examples.

Table 6 Main activities carried out within community engagement²¹

TYPE	TARGET	COMMUNITY(S)	ACTION	DESCRIPTION
Collaborative	Industry Policy	AIOTI, BDVA/DAIRO, GAIA-X	IoT Week 2022: A growing vibrant European IoT ecosystem	This first session included a discussion on future direction of NGIoT involving the European Commission and also an Industry panel that discussed preparing the ground for adoption of Next Generation IoT.
	Industry Training and education Researcher and Policy	EC, AIOTI, DSJC, BDVA/DAIRO	Skills and training workshops	Organisation of events in workshop format to promote digital skills in the social and business context. Some of these workshops were delivered directly by EU-IoT and others in collaboration with experts and training providers.
	Industry ICT-56 partners	BDVA/DAIRO	EBDVF	EU-IoT sponsored a session that addressed the shifting importance of the edge and brought together some relevant industry representatives in a panel discussion. ICT-56 partners were also involved, and the two projects whose open calls were active at the time (Assist-IoT and IoT NGIN) had the opportunity to present their respective funding opportunities to potential participants.

²¹ For complete events' list see D5.4 Dissemination and Communication Report Version 2



	Industry Policy	OntoCommons, ADRA, SNS, BDVA/DAIRO, CLAIRE, EURAI, StandICT, IAOA	Ontological interoperability, standardisation recommendations discussion	Virtual event co-organised with OntoCommons scheduled for May, that focused on Ontological interoperability and standardisation recommendations. This collaboration will follow with the writing of a white paper focused on ontologies role in SDOs and gaps.
Direct	ICT-56 partners	ICT-56 partners	IoT Week 2022 - Advancing at the Edge of Convergence	This session featured the IoT projects and demonstrate use cases of IoT in the domains of Energy, Manufacturing, Agriculture, Automotive and Small Ports. The session also featured the results and upcoming opportunities of the projects' open calls
	ICT-56 partners	ICT-56 partners	Cross-project OC task force	Creation of a group of representatives[R,M1] from all RIAs and celebration of a monthly meeting to share information, experiences and advice on the management and execution of their respective open calls.
	ICT-56 partners	EU-IoT, NGIoT	NGIOT Call for abstract reusability components	The aim of this closed workshop was to compile valuable insights on the market challenges regarding reusability plans for developed components of use cases within the ICT-56 RIAs. The topic of reusability includes an array of reusability possibilities, such as interoperability and openness.
Participatory	Researchers Industry Policy Training and education	EU-IoT, EC, EUCloudEdgeIoT	Horizon Europe Info Day & Pitch Session	The HE Info Day, hosted by the European Commission, with the support of EuCloudEdgeIoT and EU-IoT, brought together key stakeholders to present the Horizon Europe Work Programme 2023-2024 on "World leading data and computing technologies." The event offered participants a platform to pitch their ideas to leading research organizations and innovators across the industry.
	ICT-56 partners	CONASENSE	CONASENSE 2022	CONASENSE 2022 was aimed at researchers and engineers specializing in 6G services, networks and the Internet of Things (IoT), as well as interested students, from June 27 to 29, 2022. The symposium provided an excellent platform for experts to present their technical and commercial solutions and approaches.
	Industry Policy Researchers	The European Centre for Certification and Privacy	Privacy Symposium 2022	Privacy Symposium 2022 was a unique conference with top experts in the latest regulatory and technology evolutions for data protection and GDPR compliance. Privacy Symposium aims at promoting international dialogue, cooperation, and knowledge sharing on data protection and compliance. It provides a multi-stakeholder venue for data protection professionals, experts, authorities and





				researchers to discuss a wide variety of data privacy issues.
Industry Researchers	EC, Hub4Cloud	HCloud,	Horizon Europe Information and Virtual Brokerage Session	<p>Half-day virtual event organised by the EC in collaboration with NGIoT, HCloud, and Hub4Cloud, where stakeholders from industry, academia, and innovators were invited to participate and get relevant information on three Horizon Europe calls.</p> <p>The event offered a unique international networking experience to forge the winning partnerships, and also, participants had the opportunity to pitch new concepts and applications, proposal ideas, and expertise.</p>
Industry Training and education Policy Researchers	IEEE, CONASENSE	EFPP,	EU-IoT Hackathon	<p>Was a collaborative event that will take place in Munich, co-located to the IEEE co-sponsored symposium CONASENSE2022. The aim of the EU-IoT Hackathon was to disseminate new business ideas, experiments and prototypes as first step to best support next generation sustainable IoT solutions.</p>
ICT-56 partners Industry Training and education Policy Researchers	EU-IoT, NGTiOT	EFFRA,	NGIoT Community Events: Evolving manufacturing in Europe – the role of Edge Computing	<p>This event provided a perspective on recent Manufacturing use-cases being explored by a flagship ICT-56 project, inGENIOUS applicable Manufacturing project along with ICT-38 Knowledge Project on designing a more human-centered AI.</p>





ANNEX 3- LIST OF EVENTS

Event Name	Board ENGAGED (EG, CB, RIAs, IG)	Type	Organised by (or in collaboration with) other EU projects	Name of project(s) / Cluster(s) / Initiative(s)
7-in-1-symposium		Talk	yes	CONASENSE
AIoT and Edge Machine Learning	RIAs (partially)	e-Workshop	yes	ICT-56 Projects
Applied Sciences special Issue: State-of-Art of Network Architectures and Protocols for Industrial IoT		Other	no	
ASSIST IoT Open Call webinar	RIAS	Webinar	no	
ASSIST-IoT Open Call Webinar #1 – Overview		Webinar		EU-IoT
ASSIST-IoT Open Call Webinar #2 – Eligibility criteria and challenges’ analysis		Webinar		EU-IoT
ASSIST-IoT Open Call Webinar #3 – Overview and Q&As		Webinar		EU-IoT
Business model for Digital Platforms: A co-design workshop for digital platforms in Energy, Manufacturing, Agrifood and Healthcare		Workshop		
Business model innovation session		e-Workshop		OPEN DEI
CONASENSE 2021		Workshop	yes	CONASENSE
CONASENSE 2022		Conference		CONASENSE
Conferences and panel discussions		Conference		All
Cross-project OC task force		Other		ICT-56 partners
Decentralization of Services and Edge computing		Other	yes	Gaia-X Networking and





				Interconnection WG
Digital Autonomy in the Computing Continuum		e-Workshop		EC, HCloud, Hub4Cloud, SWForum
Digital Autonomy in the Computing Continuum		e-Workshop		EC, HCloud, Hub4Cloud, SWForum
Distributed Ledger Technologies for IoT Decentralization	RIAs (partially)	e-Workshop		
EBDVF		Talk		BDVA/DAIRO
EBDVF 2021 Conference	RIAs, EG	Conference		BDVA
EU-IoT and OntoCommons Workshop		e-Workshop		EU-IoT
EU-IoT Community Event Series		Webinar		ICT-56 partners, AIOTI, EFFRA, EPoSS, BDVA/DAIRO, GAIA-X
EU-IoT Hackathon		Other		IEEE, EFPF, CONASENSE
EU-IoT Hackathon Kick-off Session @ IoT Week		Workshop		
EUCNC		Conference		
European Factory Platform (EFPF) Hands on Event		e-Workshop		European Factory Platform
EFFRA Connected Factories Final Event	CB, RIAS	Conference		
Expert Group Sessions		Other		All
Funding opportunities from NGIoT		Webinar		EU-IoT
Global IoT Summit 2022	-	Conference		





Horizon Europe Info Day & Pitch Session		Talk		EU-IoT, EC, EUCloudEdgeIoT
Horizon Europe Information and Virtual Brokerage Session		Webinar		EC, HCloud, Hub4Cloud
IARIA ICNS2021: EdgeIntelli: Intelligence on the Edge Track		Other		
IEEE Access Special Issue on "Internet of Space: Communication Systems for Future Space-based Internet Services"	RIAs, EG, CB	Other		
Info session on Horizon Results Booster – steering research towards a strong societal impact		Talk		EC
IoT and Edge computing in the Green-Digital Transformation: Presentation of the NGIoT roadmap for Europe		Workshop		OASC
IoT Day Roundtable Discussion on IoT Security Innovative Technologies & Research Trends		Conference	yes	IoTAC, SecureIoT, SerIoT H2020 projects
IoT Week 2021: workshop on open calls		e-Workshop		ICT-56 partners
IoT Week 2022: A growing vibrant European IoT ecosystem		Conference		AIOTI, BDVA/DAIRO, GAIA-X
IoT Week 2022: Advancing at the Edge of Convergence		e-Workshop		ICT-56 partners
IoT Week 2022: EU-IoT: The NGIoT Initiative		Webinar		
IoT Week 2022: RIA session: Advancing at the edge of Convergence		Conference		IoTWeek
IoT Week Safer & more connected: IoT Security & Data Protection session		Workshop	yes	ERASTHOTHENES





NDN community event 2021		Talk	yes	NDN
Next-Generation IoT and Edge Computing Strategy Forum		Other		EC
NGIOT Call for abstract on reusability of components		Workshop		EU-IoT, NGIoT
NGIOT Community Events: EV charging – A case for the edge?		e-Workshop		NGIoT
NGIoT Community Events: Evolving manufacturing in Europe – the role of Edge Computing		Webinar		EU-IoT
NGIOT OPEN CALLS, IOT WEEK 2021	EG, CB, RIAs, IG	Workshop	yes	NGIoT, AIOTI, etc.
NGIoT Webinar: Presentation of the NGIoT Roadmap		Webinar		
NGIOT: Cloud to Edge - MANUFACTURING		Webinar		EFFRA
Ontological interoperability, standardisation recommendations discussion		e-Workshop		OntoCommons, ADRA, SNS, BDVA/DAIRO, CLAIRE, EURAI, StandICT, IAOA
OPEN DEI Final Event		Other		OPEN DEI
Presentation of the NGIoT Roadmap		Webinar		AIOTI
Privacy Symposium 2022		Conference		The European Centre for Certification and Privacy
Skills and training workshops		Workshop		EC, AIOTI, DSJC, BDVA/DAIRO
TERMINET Open Call Webinar		Webinar		EU-IoT
The Need for IoT Security Standards & Certification. Global IoT Day Roundtable		Other		IOTAC





VEDLIoT Open – Webinar		Webinar		VEDLIOT
Virtual info day for second Connecting Europe Facility (CEF) Digital calls		Webinar		DG CNECT and HaDEA
Webinar on Edge AI for IIoT		Webinar		Mittlestand Augusburg 4.0
Webinar: data exchange in IIoT		Webinar	yes	Mittlestand4.0 (Germany)
Webinar: IIoT Edge-based services		Webinar	yes	Mittlestand4.0 (Germany)
Webinar: introduction to IIoT		Webinar	yes	Mittlestand (Germany) 4.0
Webinar: real-time communication for modern Industrial environments		webinar	yes	Mittlestand4.0 (Germany)
WF-IoT 2021 Forum	CB	Conference	yes	AIOTI
Wireless Industrial IoT: the next generation of industrial networking		Other	yes	IARIA ICNS2021/InfoSyS2021
Workshop on Business Impact of IoT in Manufacturing Industries, prepared by AIOTI WG Manufacturing		Webinar		AIOTI WG Manufacturing
Workshop open source and standardisation 2	RIAs	Workshop	yes	BDVA



ANNEX 4- LIST OF AWARDS GIVEN TO THE TEAMS DURING THE EU-IOT HACKATHON 2022

Position	Award
First Position	<ul style="list-style-type: none"> • UnternehmerTUM TUM Award - Entrepreneurship and Incubation for 1 year, valued in 10000 Euros. • EFPF Challenges Award - 1st prize – 1 Google Pixel 6
Second Position	<ul style="list-style-type: none"> • IoT Forum voucher for 1 person, IoT Week 2023, provided via the IoT Forum (Aarhus University) • EFPF Challenges Award, 2nd prize - Google Next HUB 2nd generation smart display and Google Chromecast Stream player, and 2 Google Nest Audio Smart Speakers
Third Position	<ul style="list-style-type: none"> • EFPF Challenges Award - 3rd prize, Arduino Kit Explore • IoT Kit (English) Education and a set of 40 sensors for Arduino projects, plus Arduino® Sensor Kit - Base with Shield and 10 Grove Sensors, Arduino® Sensor Kit - Base with Shield and 10 Grove Sensors
Awards given to all participants	<ul style="list-style-type: none"> • Infineon Kit I(PSoC™ 62S2 Wi-Fi BT Pioneer Kit (CY8CKIT-062S2-43012) and IoT Sense Expansion Kit. CY8CKIT-062S2-43012 and 10x CY8CKIT-028-SENSE. <ul style="list-style-type: none"> • Infineon Kit I(PSoC™ 62S2 Wi-Fi BT Pioneer Kit (CY8CKIT-062S2-43012) and IoT Sense Expansion Kit. CY8CKIT-062S2-43012 and 10x CY8CKIT-028-SENSE. The PSoC™ 62S2 Wi-Fi BT Pioneer Kit (CY8CKIT-062S2-43012) is a low-cost hardware platform that enables design and debug of the PSoC™ 62 MCU and the Murata 1LV Module (CYW43012 Wi-Fi + Bluetooth Combo Chip). The IoT sense expansion kit (Y8CKIT-028-SENSE) is a low-cost Arduino™ UNO compatible shield board that can be used to easily interface a variety of sensors with the PSoC™ 6 MCU platform, specifically targeted for audio and machine learning applications. • Infineon Kit II CY8CPROTO-062-4343W. <ul style="list-style-type: none"> • PSoC™ 6 Wi-Fi BT Prototyping Kit (CY8CPROTO-062-4343W) is a low-cost hardware platform that enables design and debug of PSoC™ 6 MCUs. It comes with a CY8CMOD-062-4343W module, industry-leading CAPSENSE™ for touch buttons and slider, on-board debugger/programmer with KitProg3, microSD card interface, 512-Mb Quad-SPI NOR flash, PDM microphone, and a thermistor. It also includes a Murata LBEE5KL1DX module, based on the CYW4343W combo device.