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Abstract:

The PICASSO deliverable D2.3 (Action Plan of the PICASSO Expert Groups) gives an overview of the activities of the PICASSO Expert Groups until the end of July 2017 and defines action plans of the EGs for the remainder of the PICASSO project. This report briefly summarizes the activities of the Expert Groups since deliverable D2.3 was released.

Keywords:

Internet of Things (IoT), Cyber-physical Systems (CPS), Big Data, 5G, Policy, Expert Group Activities

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Report on the ICT Expert Group Activities: Enhancing EU-US Collaboration

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The PICASSO Project

The aim of the 30-months PICASSO project is (1) to reinforce EU-US collaboration in ICT research and innovation focusing on the pre-competitive research in key enabling technologies related to societal challenges - 5G Networks, Big Data, Internet of Things and Cyber Physical Systems, and (2) to support the EU-US ICT policy dialogue by contributions related to e.g. privacy, security, internet governance, interoperability, ethics.

PICASSO is oriented to industrial needs, provides a forum for ICT communities and involves 24 EU and US prominent specialists in the three technology-oriented ICT Expert Groups - 5G, Big Data, and IoT/CPS - and an ICT Policy Expert Group, working closely together to identify policy gaps in the technology domains and to take measures to stimulate the policy dialogue in these areas. A synergy between experts in ICT policies and in ICT technologies is a unique feature of PICASSO.

A number of analyses will be accomplished, as well as related publications, that will for a major part be made public and contribute to the project's outreach. Dedicated communication and dissemination material will be prepared that should support the operational work and widespread dissemination though different channels (website, social media, publications …). The outreach campaign will also include 30+ events, success stories, factsheets, info sessions, and webinars.

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1. Executive Summary

This report briefly summarizes the activities that the PICASSO Expert Groups undertook since August 2017. The activities before until the end of July 2017 are reported in the deliverable D2.3 (Action Plan of the PICASSO Expert Groups).

The Big Data Expert Group (section 2) established a Big Data task force and organized a "Trans-Atlantic Workshop on Public Private Partnerships for Big Data", which also served as the 3rd Expert Group meeting, in November 2017 in Versailles that was attended by 40 experts and brought together academic and industry actors from the US and the EU to share ongoing Big Data research and innovation efforts, to discuss effective models for bridging data science workforce needs with the academic discipline of data science, and to determine how to best support academia-industry collaborative research programs. In addition, the Big Data Expert Group organized a discussion meeting with representatives of the European Commission and helped to organize several webinars. Several members of the Big Data Expert Group were involved in the preparation of a project proposal to coordinate NGI activities between EU and US.

The 5G Expert Group held their 3rd Expert Group meeting in Singapore on Dec. 6, 2017, in conjunction with the IEEE flagship communication society conference *Globecom 2017*, with participation of Expert Group members and external 5G experts.

The IoT/CPS Expert Group held their 3rd Expert Group meeting in the form of an interactive webinar "Challenges and Opportunities in Autonomous Cyber-physical Systems" since funding limitations and other challenges made a face-to-face meeting infeasible. In addition, the Expert Group contributed to several other events, such as the "European Multi Stakeholder Platform on ICT Standardisation Meeting" that took place in January 2018 at the EC premises in Brussels, and interactive workshops organized by the *Platforms4CPS* support action in Brussels in May 2018. In addition, the EG has (unsuccessfully) investigated the feasibility of a coordinated call between the EU and NSF with the EC CPS unit, where two topics were proposed: *Human-machine interactions in CPS* and *overcoming the modelling bottleneck*.

All technical Expert Groups spent significant effort to develop strategic initiative proposals (published in report D3.2), and all Expert Groups updated "their" sections of the *PICASSO opportunity report* (published in report D2.7). The Big Data Expert Group proposes to establish a Big Data EU-US task force for enhancing collaboration based on PICASSO networks and to fund joint Big Data R&D projects under the H2020 or FP9 umbrella. The IoT/CPS Expert Group recommends to establish Joint EU-US Knowledge Exchange Initiative in the short term, and a longer-term joint NSF-EC programme on autonomous IoT-enabled cyber-physical systems in FP9. In addition, it is suggested to extend bilateral local and regional exchanges in the domain of smart cities. The 5G Expert Group recommends to establish initiatives enabling twinning workshops, twinning coordination projects, and academia research collaboration.

All Expert Groups continued to contribute to all PICASSO dissemination, community enhancement, and policy activities and were strongly involved in the organization of the "2nd Annual Transatlantic Symposium on ICT and Policy" that will be held in Washington, D.C., on June 18-19, 2018.

2. Activities of the Big Data Expert Group

2.1. Scope of the Big Data Expert Group

During the first months of the project, the Big Data Expert Group has identified its overall scope which then was used as the final target for designing and implementing a number of activities to tackle and finally meet the ultimate goal. The scope of the Big Data expert group is to

- Establish strong links for R&D&I collaboration among Big Data Structures in the EU and US
- Chart a high-level status of the Big Data sector in Europe and the US
- Chart the greatest opportunities for collaboration between EU and US utilizing the most competitive strengths of each side
- Outline a list of the most competitive achievements, challenges and opportunities
- Find the barriers and opportunities stemming from relevant EU and US policy issues

2.2. Expert Group Meetings & Public Events

2.2.1. Trans-Atlantic Workshop on Public Private Partnerships for Big Data

The NSF Big Data Innovation Hubs, in collaboration with the PICASSO Big Data Expert Group, BDVA and INRIA, held an invitation-only workshop on November 20th, 2017 in conjunction with the European Big Data Value Forum 2017. The workshop brought together academic and industry actors from the US and the EU to share ongoing Big Data research and innovation efforts, who discussed effective models for bridging data science workforce needs with the academic discipline of data science, and determined how to best support academia-industry collaborative research programs.

More specific, the goals of the workshop were to **bring together academic and industry actors** from the **United States** (US) and the **European Union** (EU) to:

- **Discuss effective models and practices for supporting academia-industry collaborative research** programs **in Big Data**/data science research and innovation, with particular focus on public-private partnerships (PPP) in the application domains of smart cities, transportation, health, environment, and food-energy-water;
- **Provide presentations to exchange ongoing Big Data research and innovation efforts in the US and EU**, encourage peer-to-peer discussions between NSF and EU funded project leads, and identify opportunities for direct bilateral research and innovation collaborations; and
- **Discuss effective models and practices for bridging data science workforce** needs with the developing academic discipline of data science.

The workshop was **co-funded by NSF (50k)** after a joint application of all NSF US Big Data Hubs, decided during our 2nd PICASSO EG Meeting in Minneapolis, while **40 participants in total** (23 from the US and 17 from the EU) attended. PICASSO and BDVA supported the activity by providing input to the proposal, provide speakers, shaping the agenda and providing dissemination channels to NSF and US Big Data Hubs.

NSF funds, covered US travel costs and some catering costs while PICASSO covered travel costs for EG Members and worked closely with US Big Data Hubs (i.e. weekly calls between PICASSO, BDVA, NSG and US Big Data Hubs) to coordinate the activity.

The main discussion topics of the workshops were:

- Big Data Ecosystems, Strategies in the US and the EU
- Effective models and practices for bridging urgent workforce needs that span academia and industry
- Effective models and practices for supporting academia-industry collaborative research programs in Big Data/data science research and innovation across the US and EU, with particular focus on public-private partnerships (PPP)

Adding to the above, four parallel breakout sessions took place on the following topics:

- Smart Cities and Transportation
- Smart Health
- Environment-Food-Energy-Water
- Big Data Education & Workforce Development

The outcomes of this workshop resulted to an update of the Big Data Opportunity Report and were also infused directly to deliverable **D3.2 Strategic initiatives proposals and recommendations.** Moreover, an active and self-sustained community of over **50 Big Data Experts** and Policy Makers established, as part of the PICASSO Big Data Expert Group, which will be engaged in future activities.

Agenda

Sunday, November 19 – Welcome Reception
Hotel De France, Versailles

6:00 pm	Registration/Networking Write something that people can ask you about on a piece of tape and put on your lapel.
6:45 pm	Welcome and Goals for Tomorrow *Lea Shanley, US South Big Data Innovation Hub* *Laure Le Bars, BDVA President* *Nikos Sarris, Chair, Big Data Expert Group of the PICASSO Project*
7:00 pm	Speed Networking
8:30 pm	Adjourn

Monday, November 20 – Workshop
Inria, Le Chesnay

8:00 am	Bus from Gare de Versailles Château Rive Gauche to Inria
8:30 am	Coffee
9:00 am	Welcome, introductions, and review of workshop goals *Lea Shanley, US South Big Data Innovation Hub* *Nozha Boujemaa, Inria Research Director, DATAIA Institute Director* *Andreas Metzger, EU BDVA Deputy Secretary General*
9:15 am	Keynotes: Big Data Ecosystems, Strategies in the US and the EU *Andreas Metzger, EU BDVA Deputy Secretary General* *Fen Zhao, NSF*
9:45 am	Panel: Effective models and practices for bridging urgent workforce needs that span academia and industry *Renata Rawlings-Goss, co-Executive Director, US South Big Data Hub (moderator)* *Ed Curry, EU BDVA Vice President, Leader "Skills" BDVe PPP support action* *Andrea Manieri, EDISON project* *Tim Gabel, Executive Vice President, Social, Statistical, and Environmental Sciences, RTI International*
10:45 am	Break
11:00 am	Panel: Effective models and practices for supporting academia-industry collaborative research programs in Big Data/data science research and innovation across the US and EU, with particular focus on public-private partnerships (PPP) in the application domains of smart cities, transportation, health, environment/ag/food/energy/ water. *Nick Baguley, US West Big Data Hub Steering Committee and President of Big Data Utah (moderator)* *Nikos Sarris, Chair, Big Data Expert Group of the PICASSO Project* *Gari Clifford, Professor, Emory University and Georgia Tech* *Florence Hudson, Senior Vice President and Chief Innovation Officer, Internet2* *Arne J. Berre, SINTEF, BDVA TF6 Technical Priorities lead and DataBio project* *Milan Petkovic, BDVA Vice-President, Leader BDVA Task Force "Applications"*
12:00 pm	Reflection on morning sessions *Lea Shanley, US South Big Data Innovation Hub*
12:15 pm	Lunch
1:30 pm	Breakout groups instructions Breakout groups on four topics that will identify opportunities for direct bilateral research and innovation collaborations (at the project level and between individual researchers) between the US and EU, especially between the NSF Big Data Hub & Spoke projects and the European BDV PPP Lighthouse/Large Scale Pilots and Innovation projects along the verticals listed above as well as workforce development.
1:45 pm	Speed sessions for contributing to two groups (20 minutes each) Visit your areas of secondary and tertiary interest
2:30 pm	Coffee Break
2:45 pm	Resume Breakout discussions at your main topic of interest
4:45 pm	Reassemble with report outs from breakout groups and discussion, any emerging ideas, recommendations and priority next steps
5:15 pm	Closing Comments
5:30 pm	Adjourn for the Day
5:45 pm	Bus from Inria to Gare de Versailles Château Rive Gauche

Figure 1: Agenda.

Figure 2: Trans-Atlantic Workshop on Public Private Partnerships for Big Data Participants.

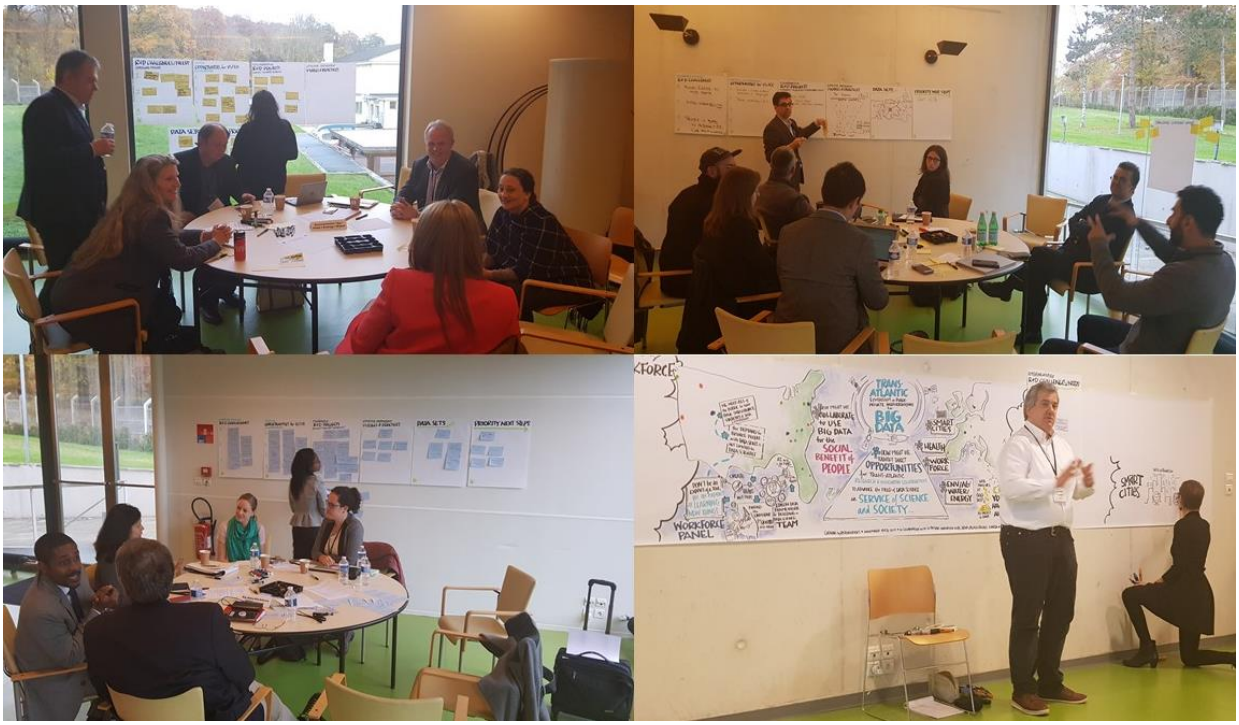

Figure 3: Trans-Atlantic Workshop on Public Private Partnerships for Big Data Breakout Sessions.

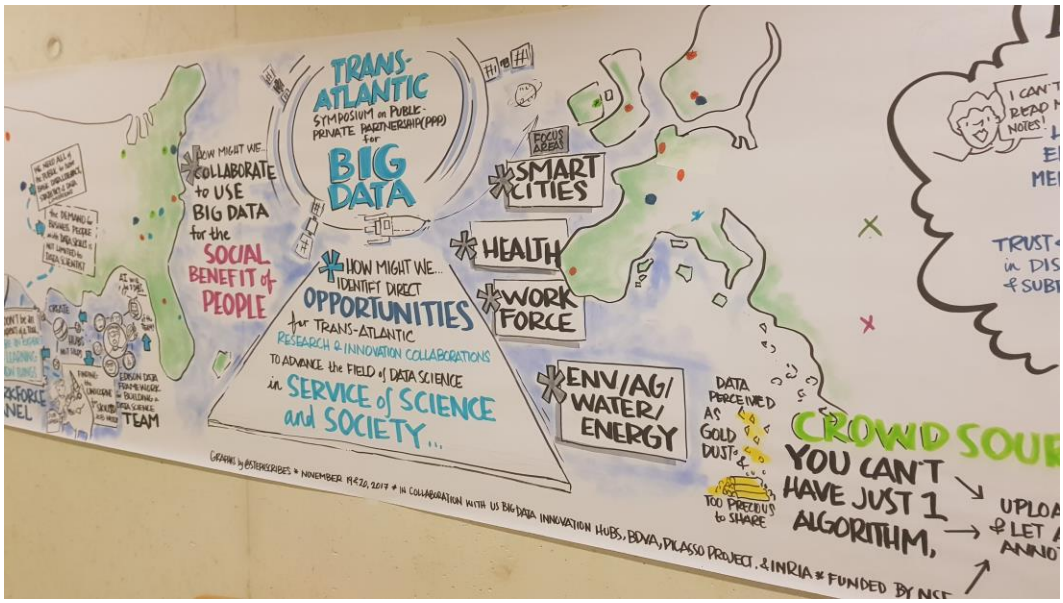

Figure 4: Trans-Atlantic Workshop on Public Private Partnerships for Big Data Infographic.

2.2.2. 3rd EG Meeting

The PICASSO Big Data Expert Group convened for third time in Versailles during the Trans-Atlantic Workshop on Public Private Partnerships for Big Data, held on November 20th, 2017. The main activity of the PICASSO Big Data Expert Group during its third meeting was to actively participate, contribute and orchestrate the workshop and also:

- Discuss, validate, and refine the analyses and technology themes given in the opportunity report and priorities these to identify the most promising key technology themes for which EU-US collaboration will have the highest impact and the highest likelihood of success.
- Discuss, validate, and refine the concrete proposals for EU-US collaboration actions
- Decide on concrete actions and activities for building a strong collaboration link between BDVA and the Big Data Hubs.

2.3. Interactions with the European Commission

The PICASSO Big Data Expert Group has managed to secure and arrange a physical meeting between PICASSO, BDVA, US Big Data Hubs, NSF and representatives of the Big Data Unit (DG Connect), at 22/11/2017 in Versailles, France. Participants at the meeting were Lea Shanley, Saila Rinne, Kimmo Rossi, Francesco Barbato, Fen Zhao, Gari Clifford, Andreas Metzger, Renata Rawlings-Goss, Lucy Erickson and Arne Berre.

The main them of discussion was to identify potential opportunities for collaboration between EC and NSF funded initiatives and organizations on Big Data related issues.

Main points of discussion were:

- Joint initiative between NSF and EC on Big Data
- Possibility of joint webinars to feature presentations and connect researchers/innovators from the Big Data Innovation Hubs & Spokes projects and BDVA Lighthouse projects, etc.
- Schedule a series of briefings for the BDVA, NSF, and DGConnect regarding PICASSO opportunity report and Strategic Initiatives Proposals and Recommendations report

2.4. Contributions to Supportive PICASSO Activities

Since the beginning of the PICASSO project, the Big Data Expert Group has provided input and feedback to a number of activities and deliverables produced by the consortium. More specifically:

- **Support of WP1 activities**
  - Contributions to deliverables, collection of feedback from relevant stakeholders, for Tasks 1.2 and 1.4
  - Inputs for the CROSSROADS tool kit
    - Produce, maintain and update a lists of major Big Data events.
    - Produce, maintain and update a lists of most important Big Data research projects from EU and US.
- **Support of WP3 activities**
  - Contributions to policy briefs produced by the Policy Expert Group.
  - Contribution to and participation in policy webinars
- **Support of WP 4 activities**
  - Disseminate information related to PICASSO and to Big Data themes, to own network of experts and specialists, both from the EU and from the US.
  - Present **[NSF Big Data Officer (Dr. Fen Zhao)]** collaboration opportunities between EU and US, at the European Big Data Value Forum 2017.

2.5. Webinars

The South Big Data Hub, with active assistance and participation of the PICASSO Big Data Expert Group, have organised and performed **two webinars on "Security, Networks and Social Computing"**, by establishing an external to the PICASSO working group under the name "Security, Networks and Social Computing Working Group". The scope of this working group is to create a EU-US collaborative platform bringing data scientists, social scientists, cognitive scientists, psychologists, security experts, among others to share, exchange, learn, and develop new concepts, ideas, and principles on manipulation of perceptions through modern communication platforms. Outcomes of the working group will include a repository of resources, policy briefs laying out the research agenda, and viable paths to advance our security apparatus to spark innovation among researchers.

The two webinars were held on February 1st and March 1st, 2017, with the participation of 30 attendees (in total). A third webinar is foreseen for the June 7th, 2018.

2.6. Collaboration Opportunity

The PICASSO Big Data Expert Group has been actively engaged in a proposal submitted under the ICT-31-2018-2019 - Coordination and Support Action call, in order to support and coordinate NGI activities between EU and US. More specifically, 12 individuals of the Expert Group (10 US and 2 EU, representing 11 institutions) have been engaged either as partners or as external experts to this proposal. In particular, the following organizations have been engaged under the Big Data umbrella: US Ignite (US), NYSERNET (US), Univ. of Illinois (US), South Big Data Hub (US), Northeast Big Data Hub (US), West Big Data Hub (US), Midwest Big Data Hub (US), MIT (US), Marshall University, ATC (EU), and Dublin University (EU).

2.7. Strategic Initiative Proposals and Opportunity Report Update

A major outcome of the Big Data Expert Group is the update of the "Big Data Opportunity Report", which was included in the "PICASSSO Opportunity Report" (deliverable D2.7). The Big Data Opportunity Report has been updated and validated throughout the second half of the project. The areas that have been defined as more prominent for collaboration between EU and US are Big Data for Smart Cities, Big Data and the Environment-Food-Energy-Water Nexus, Big Data for Better Health and Leveraging Partnerships to Build Our Workforce. Adding to the above, specific technological fields have been identified and validated as critical:

1. Interoperability and Standardization
2. Adding a semantic layer to Big Data technology
3. Integrating Linked Data and Big Data technology
4. Enable discovery of deeper, fresher insights from all enterprise data resources
5. Improve efficiency, effectiveness, and decision-making
6. Facilitate more timely, agile response to business opportunities, threats, and challenges
7. Provide a single view of diverse data resources throughout the business chain
8. Support tighter security, protection, and governance of data throughout its lifecycle
9. Improve the scale, efficiency, performance, and cost-effectiveness of data/analytics platforms

Moreover, the PICASSO Big Data Expert Group has identified two strategic initiatives to be included in deliverable **D3.2 (Strategic initiatives proposals and recommendations).** The two initiatives are: **Proposal 1: BIG DATA EU-US Task Force for Enhancing Collaboration** and **Proposal 2: Joint R&D projects under the H2020 or FP9 umbrella**. Both initiatives aim to enhance EU-US collaboration and support coordinated efforts to bring Big Data to bear on addressing societal needs by growing the big data ecosystem. More information can be found in deliverable **D3.2**.

3. Activities of the 5G Expert Group

3.1. Scope of the 5G Expert Group

The mission of the 5G expert group was to reinforce EU-US collaboration in 5G research and innovation, and at the same time, to analyse related policy gaps and contribute to the EU-US policy dialogue. The main focus was placed on pre-competitive research in key enabling technologies related to societal challenges. The scope of the 5G expert group is to

- Analyse technological and economic drivers as well as potential obstacles to innovations in the economies on both sides of the Atlantic.
- Analyse existing and emerging sectors as well as evaluate the capabilities of key players in EU and US.
- Derive opportunities for EU/US ICT collaboration improvement and areas for joint collaboration activities and their potential gains.

Based on the PICASSO 5G Expert Group action plan that was published in deliverable D2.3, the 5G Expert Group preliminarily decided to prepare and submit a proposal to the H2020 ICT-21-2018 call in the second Expert Group meeting in the Minneapolis, June 2017. However, the discussions continued afterwards inside the whole 5G Expert Group. During the third Expert Group meeting, it was finally decided that the 5G Expert Group will not pursue the H2020 call ICT-21-2018 EU-US Collaboration for Advanced Wireless Platform as a group. Instead, the 5G Expert Group encourages members of the Expert Group to participate in the call separately. Therefore, the milestone #4 in the action plan "Proposal submission" is cancelled and the milestone #2 "Preparation of the first draft" is combined with "Finalisation of the Opportunity Report".

The activities of the 5G Expert Group since July 2017 are summarised in the following.

3.2. Third Expert Group Meeting

The PICASSO 5G Expert Group held the 3rd expert group meeting in Singapore on Dec. 6th 2017 in conjunction with the IEEE flagship communication society conference Globecom 2017 (without using travel budget of PICASSP project). This is referred as milestone #3 in the action plan (deliverable D2.3). Five members of the 5G expert group and two other prominent 5G experts were invited and participated in the meeting. The scope of that meeting was to:

- Refine and validate the final recommendations for the opportunity report.
- Decide how to proceed the H2020 call ICT-21-2018 EU-US Collaboration for Advanced Wireless Platform as a group.
  - Decision: the 5G Expert Group encourages members of the Expert Group to participate in the call separately instead of joining as a group.
- Brainstorm and propose strategic initiative recommendations for EU-US collaboration.
- Discuss organization strategies for the PICASSO final event in Washington D.C., June, 2018.

3.3. Finalisation of the 5G Opportunity Report

Based on the discussions from the second and the third Expert Group meetings, the chair of the PICASSO 5G Expert Group has updated recommendations on EU-US R&I technology themes to be technologies that have niche market shares yet will have strong societal impact:

- Connecting the last billion – ultra large cell
- mmWave technology at carrier frequencies beyond 100 GHz
- Narrowband IoT devices for goods tracking in global supply chain management
- Ultra-wide band RF IC at mmWave frequency
- V2X for regional niche markets
- Satellite communications for broadband access in oceans
- Spectrum farming

As planned in "Finalisation of the Opportunity Report" in the action plan, the chair of the 5G Expert Group finalised the 5G opportunity report including the above-mentioned updates (deliverable D2.7).

3.4. Strategic Initiative Proposals for Policy Makers

As planned in milestone #5 of the action plan, based on thorough analyses on the opportunities and challenges of EU-US collaboration, the PICASSO 5G Expert Group proposed the following three strategic initiatives:

- EU-US Twinning Workshop Initiative
- EU-US Twinning Coordination Project Initiative
- EU-US academia research collaboration initiative

In addition, three additional recommendations were provided for constructing the proposed strategic initiatives. All the proposals are described in details in deliverable D3.2.

3.5. Supporting Activities in the PICASSO Project

Within the PICASSO project, the 5G expert group also interacts with other expert groups/partners and supports different activities. The general target is to, in addition to provide expertise contributions to the EU-US collaboration, increase visibility and impact of the 5G expert group and the PICASSO project as a whole. The major actions are summarised as follows:

- **Support of WP1 activities**
  - Input to CROSSROADS tool kit with information about projects, conferences, events in 5G. Planned as "Disseminations of Project Outputs and Community Enhancement" in the action plan.
- **Support of WP2 activities**
  - Co-organise a panel session in the Dresden 5G Summit on EU-US's common visions to push 5G forward towards deployment, September 19, 2017.
    - This is a deviation from Milestone #6 "Organisation of a public workshop" due to limited funding for supporting a specialised workshop.

- Co-organise the second "Trans-Atlantic Symposium on ICT Technology and Policy" in Washington DC, June 18-19th, 2018. Planned as the milestone #7 "Co-organisation of the last event".

- **Support of WP3 activities**
  - Input to the following policy briefs and related discussions
    - "Spectrum issues affecting EU/US ICT development collaboration"
    - "Standardization and its impact on EU-US ICT collaboration"
  - Participate in the following policy webinars from a 5G perspective
    - "PICASSO Policy Paper 3: Standardization and its impact on EU-US ICT collaboration", September 29th, 2017
    - "PICASSO Policy Paper 4: Spectrum issues affecting EU/US ICT development collaboration", March 28th, 2018

- **Support of WP4 activities**
  - Disseminate results/announcements to stakeholders in industry, industry network and academy.
  - Disseminate results of the project in public events.
  - Co-Organise and present a Webinar on "EU-US collaboration on 5G funding opportunities in Horizon 2020" on May 7th, 2018. Planned as "Disseminations of Project Outputs and Community Enhancement" in the action plan.

3.6. Interactions with the European Commission

- Based on action plan "Interaction with the European Commission" in the action plan, the chair of the 5G Expert Group prepared and sent an internal report on the US 5G landscape analysis to the EC 5G unit, September, 2017.
- Regarding to the new call on EU-US collaboration, i.e. H2020 ICT-21-2018, the chair of the 5G expert group arranged a telco with "Future Connectivity Systems" unit and informed them the major findings and recommendations from the 5G expert group and the corresponding opportunity report In October, 2017. This activity was not planned in the action plan.
- Upon request, the chair of the 5G Expert Group prepared and an internal report on the US 5G investment landscape analysis to the EC 5G unit, January, 2018. This activity was not planned in the action plan.

4. Activities of the IoT/CPS Expert Group

4.1. Scope of the IoT/CPS Expert Group

The IoT/CPS Expert Group focused on the intersection of the Internet of Things (IoT) and cyber-physical systems (CPS) where the IoT is seen as an enabler for future cyber-physical systems. The ubiquitous connectivity provided by the Internet of Things will "close the loop" in CPS from a myriad of sensors to the way the systems are operated and also to the demands of the users. This will enable improved monitoring, management, and hence new levels of energy and resource efficiency, product and service quality, and safe and reliable operation for socio-technical systems such as electrical grids, railway systems, the public transport system of a city, and production processes.

The main objectives of the Expert Group on IoT/CPS were as follows:

- Identify the key societal challenges where the intersection of IoT and CPS will offer a large potential for improvements.
- Analyse technology strengths, technology gaps, the collaboration landscape, and barriers for collaboration in the EU and in the US.
- Make proposals for future EU-US collaborations in the intersection of IoT and CPS, in particular on how to handle the huge amounts of real-time data produced by IoT-connected sensors and how to transform it into useful knowledge and actions that will improve the performance and the safety of Cyber-physical Systems of Systems.

4.2. Strategic Initiative Proposals and Opportunity Report Update

The first step towards the development of concrete proposals for strategic collaboration initiatives was the development of the *IoT/CPS Opportunity Report* that provides comprehensive surveys and comparisons of EU and US cross-domain and application-specific drivers and needs, enabling technologies, research and innovation priorities, current funding and collaboration landscapes, and potential barriers for collaboration in the IoT and CPS sectors. The report has been discussed face-to-face with a variety of stakeholders (in personal interviews and at events of PICASSO and of other initiatives) and was circulated widely, with positive feedback by a variety of relevant stakeholders from the EU and the US, including the FIWare initiative that was involved after the first version of the opportunity report was published and that contributes to the final PICASSO symposium in Washington in June 2018.

After the IoT/CPS Opportunity Report which outlines promising technology themes and preliminary recommendations was published, the Expert Group focused its efforts on the refinement and prioritization of the recommendations and on the identification of the most promising areas for technological collaboration from the six technology themes. Two avenues were followed to identify the most promising opportunities for **technological R&I collaboration** and for **collaboration focusing on standardization**.

Internal discussions within the EG (both face-to-face at the first Trans-Atlantic PICASSO Symposium and remotely, e.g. at the 3rd Expert Group meeting in May 2018, see below) and with external stakeholders yielded that for **technological R&I collaboration**, the technology theme of **autonomy** currently is of highest importance in both the US and the EU. Other themes that are currently seen as important are **model-based systems engineering** and **trust / (cyber-) security**.

Since **industry-driven standardization** was identified as a suitable topic for EU-US collaboration, and since the topic of interoperability is of high importance in IoT-enabled CPS, which often are inherently multi-national, the current landscape for **standardization for interoperability of IoT-enabled CPS was analyzed in detail**. To this

end, the EU and US approaches to interoperability standardization and the multitude of existing interoperability standards and reference architectures were analyzed and compared. While we found that in particular design and engineering tools for IoT-enabled CPS were not considered much yet in interoperability standardization, we decided to drop the topic of standardization due to the multitude of international activities that are already ongoing in this area.

The Expert Group proposes to establish two different strategic initiatives to foster EU-US collaboration at this time, a **joint EU-US knowledge exchange initiative** on IoT-enabled cyber-physical systems in the short term, and a **joint NSF-EC collaboration programme** at a later stage (i.e. in FP9) that focuses on low-TRL research and innovation on **autonomous cyber-physical systems**. In addition, exchange on technologies and implementations in the area of smart cities on the local and regional level in the context of partnerships between cities and regions or states seem to be a feasible option. The strategic initiative proposals are described in detail in deliverable report **D3.2 (Strategic Initiatives Proposals and Recommendations)**.

The IoT/CPS opportunity report, which complements the strategic initiative proposals in deliverable report D3.2 and provides a wide range of additional recommendations that, while not feasible at this time, provide concrete guidelines for promising initiatives in EU-US collaboration that may become feasible again in the future, was updated to reflect the results and prioritizations of the activities of the IoT/CPS Expert Group since its original publication in March 2017.

4.3. Meetings & Events

4.3.1. 3rd Expert Group Meeting

The **first expert group meeting** was organised and held in Washington D.C. on May 20, 2016, in conjunction with meetings of the other EGs and a public workshop. In addition to EG members, the meeting was attended by seven external experts, mostly from NIST. The **second expert group meeting** was organised and held on June 20, 2017, in Minneapolis, alongside the public *PICASSO Trans-Atlantic Symposium on ICT Technology and Policy*. This meeting led to a list of key technology themes and key proposals that were promoted during the remainder of the project and that were used to guide to development of strategic initiative proposals in WP3.

While the first two Expert Group meetings were very successful and have fostered the awareness of EU and US stakeholders of the views of the other side (as the positive feedback shows that we have received), they were more expensive than anticipated, which drained the available funds of the IoT/CPS Expert Group for the organization of the 3rd Expert Group and the IoT/CPS contribution to the final PICASSO symposium in Washington in June 2018. The Expert Group investigated a number of different options to organize the 3rd Expert Group meeting as a physical event, such as its co-location with workshops of other initiatives (Platforms4CPS, AIOTI) or with large related conferences (such as CPSWeek 2018). Due to the limited budget, and due to the current political climate which makes it very challenging to attract significant interest and/or external funding sources for EU-US collaboration actions in particular in the CPS domain, it was finally decided to use the remaining funds for the final PICASSO symposium in Washington. Thus, the third Expert Group meeting was organized remotely on May 16, 2018, in the form of **an interactive IoT/CPS webinar "Challenges and Opportunities in Autonomous Cyber-physical Systems"**. The invitation and agenda of the webinar are shown in the following two figures. The invitation was circulated widely, including to an international audience of appr. 250 high-level CPS and IoT experts from industry, industry-led associations, academia, and policy organizations including the EC and the NSF.

Invitation

Challenges and Opportunities in Autonomous Cyber-physical Systems

Interactive Webinar by the PICASSO Project

The Internet of Things (IoT) and cyber-physical systems (CPS) are key pillars for future smart technological systems and industrial infrastructures, and their enormous potential has been recognized in the EU and the US. The PICASSO project has developed a comprehensive analysis of the drivers, needs, and research and innovation priorities in the EU and the US in these technology domains[1] and has identified **autonomy in IoT-enabled cyber-physical systems** as a key challenge in both, the EU and the US. To discuss, validate, and refine our findings, we will hold an **interactive webinar** to which you are warmly invited. The main objectives of the webinar are to discuss the current challenges in autonomy as well as suitable EU-US collaboration mechanisms with an international audience of IoT, CPS, and application experts and to generate new ideas and recommendations for EU-US research and innovation collaboration. The details are:

Date and time: Wednesday, May 16, 2018, 2 pm UTC / 4 pm CEST / 10 am EDT

Duration: Approx. 60 minutes

Registration:

If you are interested in research and innovation in the *IoT* and *CPS*, in meeting like-minded experts from around the world, and in supporting us in the development of promising ideas for EU-US collaboration, please **register to the webinar – it's free**: https://goo.gl/V9P6Go

For more information, please write to contact@picasso-project.eu. We are looking forward to discussing with you!

The 30-month *PICASSO* project seeks to reinforce EU-US collaboration in ICT research and innovation focusing on pre-competitive research in key enabling technologies related to societal challenges – 5G Networks, Big Data, Internet of Things and Cyber Physical Systems – and to support policy dialogue on privacy, security, internet governance, and interoperability.

Website: www.picasso-project.eu

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If you have not participated in an **Adobe Connect** meeting before, you may wish to use the following links to:

1. Test your connection
2. Familiarize yourself with the software using this overview

[1] Download the report here: http://www.picasso-project.eu/wp-content/uploads/2017/03/PICASSO-Opportunity-Report_March-2017_revMar19.pdf

PICASSO has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 687874.

Figure 5: Invitation for the 3rd ioT/CPS Expert Group meeting, the interactive webinar "Challenges and Opportunities in Autonomous Cyber-physical Systems".

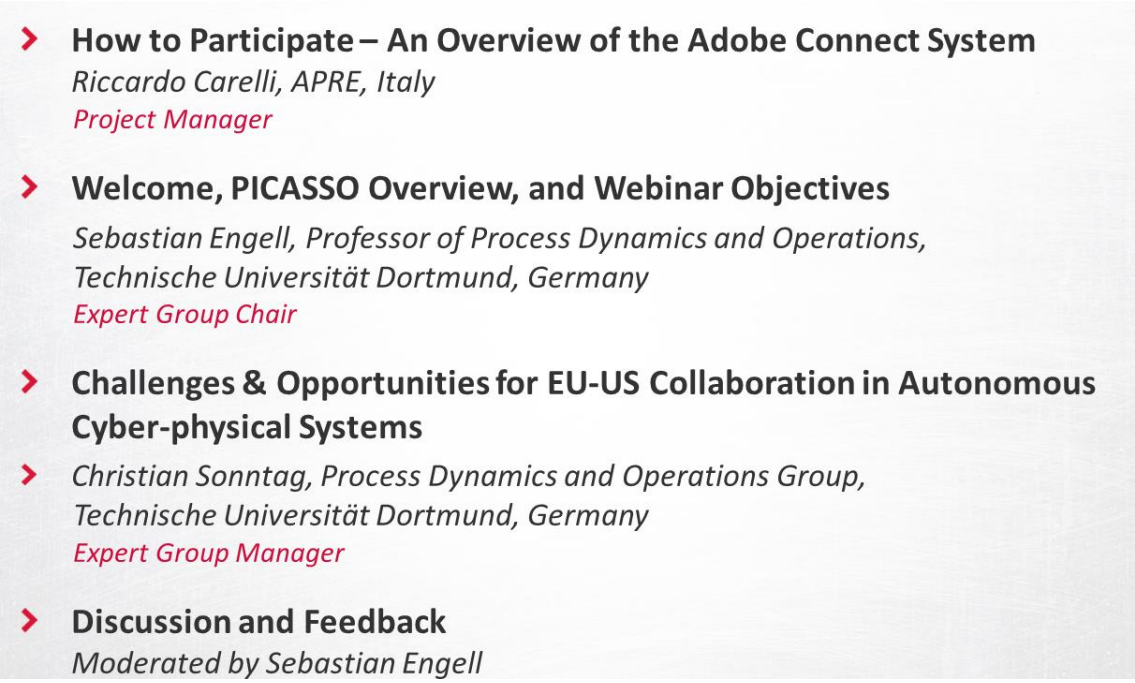

Figure 6: Agenda of the 3rd ioT/CPS Expert Group meeting, the interactive webinar "Challenges and Opportunities in Autonomous Cyber-physical Systems".

The objectives of the webinar were to discuss the current challenges in autonomy as well as EU-US collaboration mechanisms and the proposals for concrete strategic initiatives that were developed by the IoT/CPS Expert Group with an international audience of IoT, CPS, and application experts and to generate new ideas and recommendations for EU-US research and innovation collaboration.

The webinar was attended by 8 US experts, 19 EU experts, and an expert from Argentina. The main objectives of the discussion were to:

- Discuss, validate, and elaborate on the proposed technological challenges in autonomy and humans in the loop
- Discuss, validate, and elaborate on EU-US collaboration barriers
- Discuss, validate, and elaborate on the two strategic initiative proposals

The key result of the fruitful discussion that followed the presentations was that there are significant opportunities for collaboration at the city and state levels between Europe and the US. The feeling was that initiatives focusing on local/regional collaborations, e.g. between EU and US cities or (preferably) associations of cities, between US states and single EU member countries, or between EU and US ports, have a high chance of success even in the current political climate. Suitable initiatives could focus on the exchange of experiences with technologies and implementation on topics such as autonomy, AI, cyber-security, smart cities, or smart ports where actors on both sides, such as cities, are engaged in bilateral partnerships and are able to obtain external funding (e.g. from local funding agencies or states). The results of the discussion were used to finalize the key PICASSO documents (the IoT/CPS opportunity report and the proposals for strategic initiatives), where the option for local cooperation was added as a promising opportunity.

4.3.2. Final PICASSO Symposium

The IoT/CPS used all their remaining funds to provide financial support for the 2nd Annual Transatlantic Symposium on ICT and Policy that was organized by PICASSO in Washington, D.C., on June 18/19, 2018. In addition, the IoT/CPS Expert Group supported the organizing committee in the search for co-organizers and session organizers, recruiting e.g. **David Shaw from Mississippi State University** as a supporter, and organized

several sessions at the symposium. To deepen the cooperation of PICASSO with relevant IoT initiatives, **Jose Gonzalez (FIWare)** was recruited as a speaker by the IoT/CPS Expert Group.

4.3.3. Contributions to Other Events

As described above, the IoT/CPS Expert Group analyzed the current landscape for standardization for interoperability of IoT-enabled CPS in detail during their activities for the development of strategic initiative proposals (deliverable D3.2). The results of these efforts were presented at the **"European Multi Stakeholder Platform on ICT Standardisation Meeting" that took place in January 2018 at the EC premises in Brussels**. At the meeting, the PICASSO results were presented to and discussed with representatives of different units of the EC, including the IoT, 5G, Innovation/Standardisation, and International units.

On May 14/15, 2018, the *Platforms4CPS* support action (https://www.platforms4cps.eu) organized two interactive workshops:

- **Platforms4CPS Workshop on Societal and Legal Issues regarding CPS Deployment** (May 14)
- **Platforms4CPS Cyber-physical Systems Roadmap Workshop – Deployment of CPS Technologies to Support Digital Transformation** (May 15)

Both workshops were attended by several representatives of the IoT/CPS Expert Group, and the final results of the IoT/CPS Expert Group work (i.e. the identified technology themes, collaboration barriers, and strategic initiative proposals) were presented at the workshop on May 15 to an audience of appr. 30 international experts (see picture on the right).

4.4. Contributions to Supportive PICASSO Activities

The IoT/CPS Expert Group has supported all other activities in the PICASSO project. The EG contributed to deliverables of other work packages and has supported other partners in the collection of feedback from relevant stakeholders. The EG contributed to the EU-US ICT **policy dialogue** in PICASSO and to the PICASSO **policy briefs** and **policy seminars** on the topics of **spectrum**, **standardisation**, **security**, and **digital communities**.

In addition, the IoT/CPS Expert Group has been active in the **community enhancement** and **outreach** activities of PICASSO. The EG has been active in the dissemination of project results and announcements to a wide audience that includes industry, associations, academia, and policy makers:

- Dissemination of project reports (e.g. opportunity report, strategic initiative proposals) and project announcements to relevant stakeholders (EC, government agencies, industry representatives, non-governmental industry associations, research institutions, and others) via direct mailing, distribution to expert networks, and via social media (LinkedIn, more than 800 recipients).
- Organisation of an interactive webinar on May 16, 2018.
- Contributions to the organization of the final PICASSO symposium.
- Presentation of PICASSO concepts and results at public events.
- Contributions to PICASSO materials (website, fact sheets, social media initiatives), project communications, and outreach activities.

- Monitoring of collaboration opportunities[1].

4.5. Interactions with the European Commission

The EG has validated the findings in the opportunity report with the IoT and CPS units of the EC in personal interviews and has continued these efforts also after the first version of the IoT/CPS opportunity report was published.

The IoT/CPS Expert Group contributed an analysis on the standardization for interoperability of IoT-enabled CPS to the "European Multi Stakeholder Platform on ICT Standardisation Meeting" that took place in January 2018 at the EC premises in Brussels. At the meeting, the PICASSO results were presented to and discussed with representatives of different units of the EC, including the IoT, 5G, Innovation/Standardisation, and International units.

Early in the PICASSO project, the EG investigated the feasibility of a coordinated call between the EU and the NSF unit with the EC CPS unit, where two topics were proposed: *Human-machine interactions in CPS* and *overcoming the modelling bottleneck*. This effort however did not lead to short-term results.

[1] While the H2020 work programme contains several items on EU-US collaboration, none of them cover the topics that are covered by the IoT/CPS Expert Group. Thus, no opportunities were disseminated.

5. Activities of the Policy Expert Group

The Policy Expert Group has continued to interact with wider groups of stakeholders in international events including the Internet Governance Forum. Expert Group members have actively reached out in their networks for input and feedback.

During EuroDIG, we aim to present and discuss the 5th policy paper and the key findings as presented in the Policy White paper for validation and feedback. During the final PICASSO symposium, we will present and discuss aspects of a number of our policy papers as well as the Policy white paper.

During its last year, the Policy Expert group has produced:

- 3rd Policy paper on ICT Standards and a webinar on ICT Standards;
- 4th Policy brief on Spectrum and a webinar on Spectrum;
- 5th Policy paper and a webinar on Digital Communities;
- White paper on policy, covering the 5 policy papers and the 3 PICASSO domains. Draft in May, finalization after the two conferences in June 2018 (EuroDIG and PICASSO Washington symposium).

6. Conclusions and Outlook

All Expert Groups have put significant effort into the analysis, development, and promotion of EU-US collaboration efforts and mechanisms, and most of the objectives that the Expert Groups defined in their action plans were achieved. We believe that the efforts of the PICASSO Expert Groups, which have already led to concrete collaboration actions and which provide guidelines and concrete proposals for the establishment of new EU-US collaboration actions, will have a profound positive impact also after PICASSO has concluded.

In particular, the PICASSO Expert Groups have developed proposals for concrete strategic collaboration actions that are aimed at policy makers and describe strategic initiatives that should be enacted to foster EU-US collaboration. The opportunity reports of the Expert Groups complement these strategic initiative proposals as well as the final policy white paper prepared by the Policy Expert Group since they provide background information and more extensive overviews of collaboration opportunities and mechanisms.

The relevance of our results is guaranteed by the contributions from high-level experts from EU and US funding agencies, industry (networks), and academia, and several actors have already expressed interest in participating in such actions. This material will be valuable for many external stakeholders even after the end of PICASSO, e.g. in follow-up initiatives that are established in response to our recommendations. In addition, the lessons learnt in this work, as well as the new EU and US contacts, partnerships, and working relationships that were established in PICASSO, will be beneficial for all participants in the future, e.g. to establish follow-up activities and projects.

Several of the actors that are part of the IoT/CPS Expert Group are involved in other initiatives in the area of international collaboration and will continue to pursue the PICASSO objectives and to promote the PICASSO results.

The Big Data opportunity report and the Big Data strategic initiatives proposal have been co-developed with the critical input of a large number of stakeholders and actors coming from EU and US. These reports have been shared and introduced to policy makers from both regions in order to disseminate PICASSO findings, results and suggestions to high-level decision makers.

As there will be a coming project on EU-US collaboration on Advanced Wireless Platform, the 5G Expert Group will deliver the PICASSO opportunity report and provide well-studied insights to the next selected projects, inherently helping the selected EU and US peers proceed the collaboration in a constructive way and continuing PICASSO results and objectives in a long run.