Deliverable: D2.3

Action Plan of the PICASSO Expert Groups

Yaning Zou
Gerhard Fettweis

5G

Mobile Communications Systems
Faculty of Electrical and Computer Engineering
TU Dresden University, Germany

Vasilis Papanikolaou
Nikos Sarris

Big Data

iLAB
ATC SA, Greece

Christian Sonntag
Sebastian Engell

Internet of Things (IoT) /
Cyber-physical Systems (CPS)

Process Dynamics and Operations Group
Dept. of Biochemical and Chemical Engineering
TU Dortmund University, Germany

Maarten Botterman
Jonathan Cave

Policy

GNKS, IGF DC IoT, NLnet
-
Department of Economics
The University of Warwick, UK

ICT Policy, Research and Innovation
for a Smart Society

August 2017

www.picasso-project.eu

Project Deliverable

Project Number:	Project Acronym:	Project Title:
687874	PICASSO	ICT Policy, Research and Innovation for a Smart Society: towards new avenues in EU-US ICT collaboration

Instrument:	Thematic Priority
COODINATION AND SUPPORT ACTION	H2020 ICT

Title
D2.3: Action Plan of the PICASSO Expert Groups

Contractual Delivery Date:	Actual Delivery Date:
31.06.2017	11.08.2017[1]

Start date of project:	Duration:
January, 1st 2016	30 months

Organisation name of lead contractor for this deliverable:	Document version:
TUD	V1.0

Dissemination level (Project co-funded by the European Commission within the Horizon 2020 Programme)		
PU	Public	X
PP	Restricted to other programme participants (including the Commission	
RE	Restricted to a group defined by the consortium (including the Commission)	
CO	Confidential, only for members of the consortium (including the Commission)	

[1] This report is submitted later than the planned date because the 2nd meetings of the PICASSO Expert Groups took place on June 19/20, 2017, in Minneapolis, US (later than initially planned). At these meetings, the EG action plans were discussed with the EG members. Subsequently, the action plans were discussed aligned, and finalised among the EGs, which took additional time.

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

ICT Policy, Research and Innovation for a Smart Society: towards new avenues in EU–US ICT collaboration   2

Authors (organisations):
Yaning Zou (TUD),
with contributions by Vasilis Papanikolaou (ATC), Christian Sonntag (TUDO), Maarten Botterman (GNKS), Lukas Scheuvens (TUD)

Reviewers (organisations):
Haydn Thompson (Thhink), Svetlana Klessova (inno)

Abstract:

This report first summarises actions of the four PICASSO expert groups, i.e., 5G, Big Data, IoT/CPS and Policy in the first eighteen month period of the project. Based on the ground work, the expert groups set their goals for the next twelve months. A concrete action plan is devised for each expert group and described in detail.

Keywords:

Action plan, 5G, IoT, CPS, Big data, Policy.

Disclaimer

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 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.

List of Acronyms

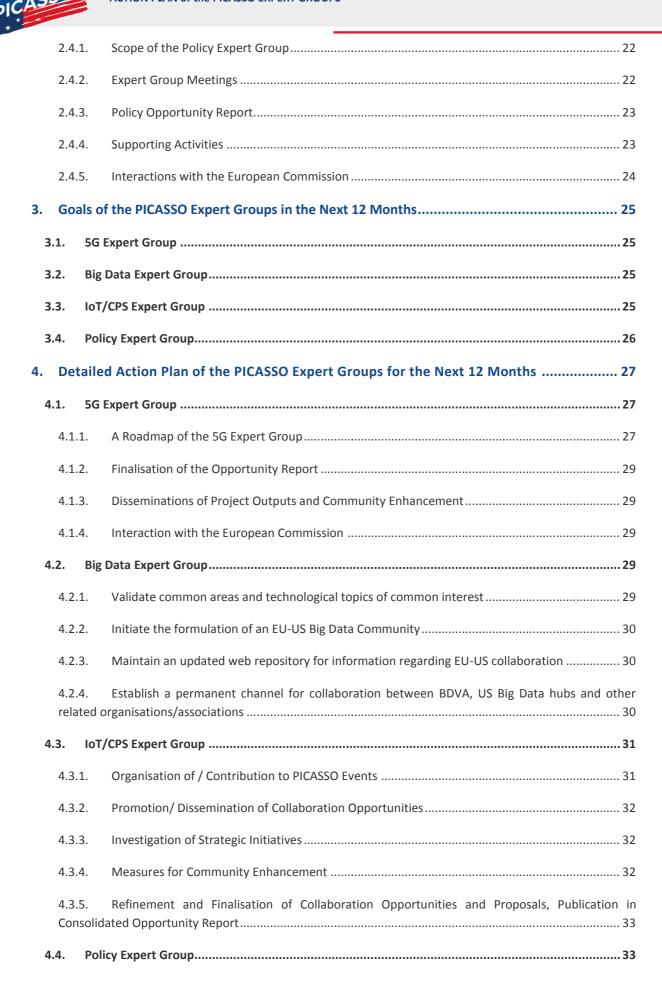|	
5G	Fifth generation
BD	Big Data
BDVA	Big Data Value Association
CPS	Cyber-physical System
CSA	Coordination & Support Action
EC	European Commission
EG	Expert Group
EU	European Union
FP9	Framework Programme 9
H2020	Horizon 2020
IA	Industry Association
ICT	Information and Communication Technology
IIC	Industrial Internet Consortium
IMS	Intelligent Manufacturing Systems
IoT	Internet of Things
NCURA	National Council of University Research Administrators
NESSI	Networked Software and Services Initiative
NIST	National Institute of Standards and Technology
NITRD	Networking and Information Technology Research and Development
NSF	National Science Foundation
RDI	Research, Development, and Innovation
RIA	Research and Innovation Action
R&D	Research & Development
R&D&I	Research & Development & Innovation
R&I	Research & Innovation
SMLC	Smart Manufacturing Leadership Coalition
US	United States

List of Figure

List of Tables

Table of Contents

1. Introduction of the PICASSO Expert Groups

The PICASSO expert groups are essential to the PICASSO project. There exist three ICT technology expert groups (5G, big data and IoT/CPS) and one policy expert group. Members of each group are carefully selected by the expert group (EG) chair and are considered as the most prestigious experts in the corresponding area inside the EU or US. Their participations in this project are set on a voluntary basis without any payment other than refunding of travelling costs to attend expert group meetings.

In general, the objectives of the technical expert groups are to

- **Identify industrial drivers**, **societal challenges** and **policy gaps**, as well as of relevant **challenges** and **opportunities** in EU and the US
- **Propose common priorities** and **future cooperation opportunities** in EU and the US
- **Promote EU-US collaboration** on the specific technical area
- **Provide linkages** between EU and US networks
- **Devise roadmap** for EU-US collaborations

The members of the ICT expert groups and Policy expert group will be introduced briefly in this chapter.

1.1.   Members of the 5G Expert Group

At the beginning of the PICASSO project, the 5G expert group chair identified and invited several top experts in the 5G network area based on scope of the 5G EG. Then the expert list was narrowed down to 6 members inside the EU or US from industry (National Instruments, Ericsson and Nokia), top institute (Eurescom), academia (UGM) and funding agency (NSF). Over the course of the project, additional experts have been included to strengthen the Expert Group further. All those experts are well connected and willing to contribute to all the discussions and dialogues leading to EU-US collaborations.

The current list of EG members is shown in the following table:

Table 1: Members of the 5G Expert Group

Name	Organisation Position
Gerhard Fettweis (EG Chair)	**TU Dresden, Germany** Vodafone Chair professor, **IEEE Fellow**, member of acatech, **Coordinator** of 5GLab Germany, **Coordinator** of Cluster of Excellence cfaed and HAEC, **Co-chair** of the IEEE 5G Initiative Steering Committee, **Co-founder** of 12 high-tech start-ups
Leif Johansson	**National Instruments, Sweden** **Principle Engineer**, RF Communications Market Development / Lead User Manager, Coordinator of NI's research collaboration in the Communication and SDR areas in Europe with a focus on 5G
Deborah Crawford	**George Mason University, US** **Vice President** for Research
Olav Queseth	**Ericsson, Sweden** Senior researcher in Ericsson Research, **Project coordinator** of EU/5GPPP project METIS-II
Amitava Ghosh	**Nokia, US** **Nokia Fellow** and **Head** of Small Cell Research

David Kennedy		**Eurescom, Germany** **Director**, **Project manager** for the Euro-5G project which facilitates and supports the 5G-PPP initiative
Chengshan Xiao		**NSF, US** **Program Director** at Division of Electrical, Communications and Cyber Systems in the Engineering Directorate
Meryem Simsek		**ICSI/Berkeley, US** Senior Scientist
Matti Latva-Aho		**Oulu University, Finland** Professor, **Head** of Telecommunication Laboratory, Academy of Finland Professor, previous director of CWC.

1.2.   Members of the Big Data Expert Group

In parallel with the initial activity of identifying the scope of the expert group, the Big Data Expert Group chair (Dr Nikos Sarris) has identified a number of potential members which would be available to join and their profiles and interests would help the Expert Group to reach its goal. The Big Data Expert Group combines a mix of expertise by including people both from the private sector and the academia, from "famous" schools from EU and the US (i.e. M.I.T) with strong ICT background, from important Big Data related associations and organisations (i.e. BDVA and IEEE Big Data) and from policy making organisations (i.e. NIST).

Overall the Big Data Expert Group includes 6 permanent members and 4 external members who were engaged into the Expert Group's activities in a later stage.

1.2.1. Permanent Expert Group Members

Table 2: Permanent Members of the Big Data Expert Group

Name	Organization Position	
Nikos Sarris (Chair)		**ATC SA, Greece** Head of the ATC Innovation Lab, **member in the Steering Committee of the NESSI European Technology Platform** and a **representative of ATC in the General Assembly of the Big Data Value Association**
Sören Auer		**University of Bonn, Germany** Head of Enterprise Information Systems group, Member of the leadership council of Fraunhofer-Insitute for Intelligent Analysis and Information Systems (IAIS), **Coordinator of the Big Data Europe Initiative**
Andreas Metzger		**Paluno, University of Duisburg-Essen, Germany** **BDVA – EU** Head of Adaptive Systems and Future Internet Applications, Chief technical architect of the European Future Internet Public Private Partnership project on transport, logistics and agri-food (FIspace), **Deputy general secretary of the Big Data Value Association** (BDVA) and steering committee **vice chair of the European Technology Platform NESSI**
David Belanger		**Stevens Institute of Technology, US** Senior Research Fellow, **Co-Leader IEEE Big Data Initiative and member of the Board of Advisors – IEEE Transactions on Big Data**, IEEE Transactions on Internet of Things
Wo Chang		**NIST, USA** Digital Data Advisor for the NIST Information Technology Laboratory (ITL), Convener of the ISO/IEC JTC 1/WG9 Working Group on Big Data Co-chair of the NIST Big Data Public Working Group
Michail Bletsas		**MIT, USA** Director of Computing at the MIT Media Lab

1.2.2. External Expert Group Members

As the main scope of the Big Data Expert Group is to establish strong links for R&D&I collaboration between International Big Data Structures from EU and US, to facilitate innovation in the Big Data sector, it was critical to engage the most important structures, from the US side, into the Expert Group's activities. For this reason, the Permanent Expert Group decided to invite and establish as strong and continuous channel for discussions with US members from the NSF and from the US Big Data Hubs, who represent the most important public US structures for Big Data, responsible for driving and implementing the federal Big Data strategy for their regions.

Table 3: External Members of the Big Data Expert Group

Name		Organization Position
Chaitan Baru		NSF, USA Senior Data Science Adviser on CISE
Melissa Cragin		Midwest Big Data Innovation Hub & University of Illinois at Urbana-Champaign, USA Executive Director
Meredith M. Lee		West Big Data Innovation Hub & UC Berkeley, USA Executive Director
Lea Shanley		South Big Data Innovation Hub & University of North Carolina at Chapel Hill, USA co-Executive Director

1.3. Members of the IoT/CPS Expert Group

Early in the project, the Expert Group chairs have identified and invited a number of suitable, potential experts in the areas of IoT/CPS and have created a diverse Expert Group consisting of world-renowned experts with complementary backgrounds in the relevant technology and application sectors. Over the course of the project, additional experts have been included to strengthen the Expert Group further, in particular in the sector of the Internet of Things.

The current list of EG members is shown in the following table:

Table 4: Members of the IoT/CPS Expert Group

Name		Organization Position	Background
Sebastian Engell (Chair)		TU Dortmund, Germany Professor	Automation and Control / Systems Management / CPS
Tariq Samad (Co-chair)		TLI, University of Minnesota, US Professor	Industrial Automation
Massoud Amin		TLI, University of Minnesota, US Director / Professor	Infrastructures / Smart Grid
Chris Greer		NIST, US Program Office Director and National Coordinator	CPS / Smart Grid
Amit B. Kulkarni		Honeywell, US Global R&D Leader for Wireless and IoT	Wireless, Internet of Things
Paul Nielsen		Software Engineering Institute, CMU, US Director / CEO	Software development / CPS / Cyber-security
Martin Serrano		Insight Centre for Data Analytics, Ireland Principal Investigator and Data Scientist	Internet of Things
Haydn Thompson		THHINK, UK Director	Wireless sensors / Transpor- tation / Manufacturing / Smart Cities
O. Sinan Tumer		SAP Co-Innovation Lab, US Senior Director	Co-Innovation / Research Commercialization
Hubertus Tummescheit		Modelon Inc., US / Modelon AB, Sweden CEO / Co-founder	Modeling / Simulation
Ovidiu Vermesan		SINTEF ICT, Norway Chief Scientist, Chair WG01 AIOTI	Internet of Things

1.4.   Members of the Policy Expert Group

The Policy Expert Group is set up to support the policy aspects of the Expert Groups on 5G Networks, Big Data, and IoT/CPS. Together, they cover a wide span of subjects related to these topics and sometimes touching upon all of these topics, such as privacy & data protection, ICT security, ICT standards, etc. During the year, one member had to give up their position due to a new job that demanded too much time to continue to commit to PICASSO. We found Dan Caprio (US, Providence Group) able and willing to step in.

The current list of EG members is shown in the following table:

Table 5: Members of the Policy Expert Group

Name	Organisation Position	Background
Maarten Botterman (EG Chair)	**GNKS Consult BV, The Netherlands** Independent Policy Advisor and **Director** of GNKS Consult BV, ICANN **Board Director**, **Chairman** of the Supervisory Board of NLnet Foundation, **Chairman** of the IGF DC IoT.	Business economist, Public policy, Internet of Things, Big Data, Internet Governance, Data protection, cybersecurity
David Farber (EG Co-Chair)	**University of Pennsylvania, USA** Emeritus **Professor**, Adjunct professor at Carnegie Mellon University, visiting professor at Stevens Institute of Technology and the University of Delaware, **IEEE Fellow**, Pioneers Circle of the **Internet Hall of Fame**.	Computer science, Public policy, Internet governance, gigabit networks
Jonathan Cave	**University of Warwick, UK** **Senior Fellow** in Economics, **Member** of UK Government Regulatory Policy Committee, Alan Turing Institute Associate, GNKS Consult Associate	Economist, Game Theorist, Public policy, Internet of Things, cybersecurity, Internet Governance
Avri Doria	**Technicalities, USA** **Principal Researcher**, Faculty Member at School for Internet Governance, Researcher at APC, ICANN Ethos Award. Active in ICANN, ISOC, IETF	Engineer, Psychology, Internet governance, Human rights
Ilkka Lakaniemi	**Finland Chamber of Commerce, Finland** **Vice President** of Digital Economy and Growth, **Research Director** Aalto School of Business, **Executive Director** LGA Helsinki	Innovation management, International economics and political economy, Internet governance
Dan Caprio	**The Providence Group, USA** **Co-Founder** and **Chairman** at The Providence Group, expert on privacy and cybersecurity, **former Chief Privacy Officer** and **Deputy Assistant Secretary** at the US Department of Commerce, **Chief of Staff** for a Federal Trade Commissioner	Privacy and data protection, Internet of Things, Cybersecurity

2. Actions of the PICASSO Expert Groups in the First 18 Months

In this section, we briefly summarise major actions of the four PICASSO EGs in the first 18 months of the project. During this period, all four expert groups have carried out a wide range of actions to engage the EU-US collaborations and dialogues. The fruitful results have laid a solid foundation for the project and EU-US collaboration. They will be carried on to the next phase of the project.

2.1. 5G Expert Group

2.1.1. Scope of the 5G Expert Group

The mission of the 5G expert group is to reinforce EU-US collaboration in 5G research and innovation, and at the same time, to analyse related policy gaps and contribute to EU-US policy dialogue. The main focus is 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.

2.1.2. Expert Group Meetings

2.1.2.1.   1st Expert Group Meeting (May 20, 2016 – Washington DC, US)

The PICASSO 5G Expert Group held the first face-to-face meeting in Washington DC on May 20, 2016. Member of the 5G expert group and an external expert were invited and participated in the meeting [3]. The scope of that meeting was to:

- Identify key challenges, opportunities and social economic issues in the 5G network domain for EU - US collaborations
- Provide recommendations and visions beyond 2025 for EU-US collaborations
- Analyse the landscape for EU/US collaboration on 5G Networks.
- Discuss technical scopes, expected Impacts and funding opportunities of the coordinated call on 5G in EU and US.

2.1.2.2.   2nd Expert Group Meeting (June 20, 2017 – Minnesota, US)

The PICASSO 5G Expert Group held the second expert group meeting in Minnesota on June 20, 2017 (in conjunction with the Minneapolis Symposium). During the second meeting, members of the 5G expert group and an external expert attended [4]. The scope of the second meeting was to:

- Discuss and validate the EU-US collaboration opportunity report on 5G networks.
- Recommend a technology theme and related research topics for EU-US collaborations in the 5G networks domain.
- Identify upcoming call(s) where the 5G expert group can take concrete actions.
- Discuss and brainstorm a concrete action roadmap for the next year.

- Discuss feasible sustainability plans for the 5G expert group after the PICASSO project.

2.1.3. 5G opportunity report

One of the most important tasks for the PICASSO 5G expert group is to contribute a comprehensive and thorough study and analysis on EU-US collaboration in the 5G networks domain. To disseminate the knowledge and understanding obtained from top 5G experts, a "5G opportunity report" was written based on all discussions carried out inside the 5G expert group. In this report, key enabling technologies in 5G domain are discussed and R&I priorities in the EU and the US are analysed and compared. Based on the comparisons, four technology topics for the EU-US collaboration are identified and potential collaboration mechanisms are proposed. This report was carefully reviewed and circulated among expert group members. It has been included as part of the PICASSO public deliverable "Opportunity Report -Towards Enhanced EU-US ICT Pre-competitive Collaboration" [1] and will be updated with any upcoming discussions from internal and external 5G experts. In the continuation, the "5G opportunity report" will provide a solid foundation for the actions of the 5G expert group in the next 12 months.

2.1.4. Supporting Activities in the PICASSO Project

Inside 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 expertised 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 D1.1 on overview of PICASSO Expert groups.
  - Input to D1.3 "Panorama of ICT landscape in EU and US: ICT Policies, regulations, programs and networks in EU and US".
  - Input to CROSSROADS tool kit with information about projects, conferences, events in 5G.
- **Support of WP2 activities**
  - Prepare reports for the 1st and 2nd expert group meetings (D2.1 and D2.4).
  - Co-organise the "Trans-Atlantic Symposium on ICT Technology and Policy" in Minneapolis, June 19-20th, 2017.
    - Invited speakers from policy maker (FCC), industry (Nokia, Ericsson, Wireless 20/20) and academy (TU Dresden, UOulu, UMN).
- **Support of WP3 activities**
  - Input to the following policy briefs and related discussions
    - "EU-US policy recommendations on Data Protection and Privacy", October 11, 2016
    - "Policy Briefing on ICT Security issues affecting EU-US ICT development collaboration", May 16, 2017
  - Participate in the following 2 policy webinars from 5G perspective
    - "PICASSO Policy Paper 1: Privacy and Data Protection", November, 2016
    - "PICASSO Policy Paper 2: ICT Security issues affecting EU/US ICT development collaboration ", May 2017
- **Support of WP4 activities**
  - Disseminate results/ announcements to stakeholders in industry, industry network and academy.
  - Disseminate results of the project in public events.
  - Organise and present a Webinar on "EU-US collaboration on 5G funding opportunities in Horizon 2020" on September 13th, 2016.
    - 170 people from 15+ countries signed-up.

2.1.5. Interaction with the European Commission

A meeting was set between the responsible officer in European Commission 5G unit and representatives from the PICASSO project. The officer generally expressed EU's interests to support and fund EU-US collaborative projects in 5G domain. However, he requested more information on 5G funding and research roadmaps at the US side. This will become one important action for the 5G expert group to do next.

2.2. Big Data Expert Group

2.2.1. 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 would be 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
> - Charting a high level status of the Big Data sector in Europe and the US
> - Charting the greatest opportunities for collaboration between EU and US utilizing the most competitive strengths of each side
> - Outlining a list of the most competitive achievements, challenges and opportunities
> - Finding the barriers and opportunities stemming from relevant EU and US policy issues

2.2.2. Expert Group Meetings

2.2.2.1. 1st Expert Group Meeting (May 20, 2016 – Washington DC, US)

The PICASSO Big Data Expert Group convened for the first time in Washington DC on May 20, 2016 [3]. Only permanent members were invited and participated in the meeting and the scope of that meeting was to:

- Chart the high-level status of the Big Data (BD) sector in Europe, the US and worldwide.
- Perform in-depth discussions on specific areas of Big Data expertise.
- Define the greatest opportunities for collaboration between EU and US by utilizing the most competitive strengths of each side.
- Set up an initial action plan for the following months.

2.2.2.2. 2nd Expert Group Meeting (June 19, 2017 – Minnesota, US)

The PICASSO Big Data Expert Group convened for the second time in Minnesota on June 19 [4]. During the second meeting, the external expert group was also invited in order to identify joint activities and actions between the US Big Data Hubs and BDVA. More specific, the scope of the second meeting was to:

- Discuss, validate, and refine the analyses and technology themes given in the opportunity report and prioritise 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
- Finalise the action plan for the EG for the remainder of the project.
- Decide on concrete actions and activities for building a strong collaboration link between BDVA and the Big Data Hubs.

Major outcomes of the 2nd EG Meeting:

– **Validation of the Opportunity Report**

- **Validation of the Action Plan**
- **Defined 3 internal working groups** between BDVA, NSF, PICASSO and US BDHubs, to work towards Data Literacy, Smart Transportation and Business Models and Best Practices for Industry-Academia Partnerships on Big Data / Data Science -sustaining organisation. The 3 working groups will start working towards these subjects, however if necessary efforts will be re-allocated to 2 or even 1 working group with the highest potential.

2.2.3. Big Data Projects Monitoring Database

The Big Data Expert Group, has implemented and maintains a Big Data Project's Database which included more than 290 Big Data publicly funded projects, from the EU & US. This database is available through the CROSSROADS toolkit and is updated every 2 months. Projects have been collected through CORDIS, DARPA, NSF and other sources and a selection procedure has been applied in order to select the 130 most prominent ones.

2.2.4. Interaction with the European Commission

The Big Data Expert Group has managed to launch an initial communication channel in order to promote interactions with the European Commission. Under this set of activities, the follow actions have taken place.

2.2.4.1. Proposed two specific EU-USA Collaborative activities for WP2018-2020

Managed to propose one additional RIA and one CSA action, for Big Data collaboration with USA, under the International cooperation activities umbrella, for the new WP2018-2020 Work Programme. However, this proposition has not been accepted.

2.2.4.2. Interaction with DG CONNECT [Data Policy and Innovation (Unit G.1)]

Discussions have been initiated with Unit G1 on implementing a joint activity (i.e. a seminar, workshop, etc.) with PICASSO on EU/US collaboration in the Media Industry (as a Big Data apparent case). Moreover the Unit has expressed their interest on exploring similar potential with 5G and IoT as they feel that these topics are quite important for the future media.

2.2.5. 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 preparation & reporting of 1st Expert Group meeting in Washington.
  - Support of preparation & reporting of 2nd Expert Group meeting in Minnesota.
- **Support of WP3 activities**
  - Contributions to policy briefs produced by the Policy Expert Group.
  - Contribution to and participation in the following policy webinars:
    - "EU-US policy recommendations on Data Protection and Privacy", 11 October 2016
    - "Policy Briefing on ICT Security issues affecting EU-US ICT development collaboration", 16 May 2017
- **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.

2.2.6. Big Data Opportunity Report

A major outcome of the Big Data Expert Group, is the production of the "Big Data Opportunity Report", which was included in the "PICASSSO Opportunity Report" [1]. The Big Data Opportunity report, provided a complete overview of common technology themes and collaboration mechanisms that have been identified as being promising for EU-US collaboration in Big Data, which were synthesised based on comprehensive analyses of the technological EU and US research and innovation priorities in these sectors, the EU-US funding and collaboration landscape, the major barriers for EU-US collaboration, and the current EU and US policy environment. The sections in this report were based on in-depth discussions with a large network of international experts, analytical research by the Big Data Expert Group, preliminary PICASSO results and other feedback collection mechanisms such as an interactive webinar and a public consultation.

2.3. IoT/CPS Expert Group

During the first 18 months of the PICASSO project, the Expert Group on IoT/CPS has worked on a variety of activities, with the objectives to define a scope for the EG work that is relevant to today's technological and application requirements and challenges while being sufficiently limited to facilitate the identification and development of specific collaboration opportunities, to analyse the current state of the art in IoT/CPS and application sectors in the EU and the US, to identify barriers and promising opportunities for collaboration, to provide technology-related input to the Expert Group on policy, and to support the dissemination, awareness raising, and community enhancement activities of PICASSO. This section briefly summarises the main activities of the Expert Group.

2.3.1. Scope of the IoT/CPS Expert Group

The IoT/CPS expert group focuses 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 are 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.

2.3.2. Expert Group Meetings

So far, the IoT/CPS expert group has met in person twice (in addition to numerous remote interactions via email and webinars).

2.3.2.1. 1st Expert Group Meeting (May 20, 2016 – Washington DC, US)

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 [3]. In addition to EG members, the meeting was attended by seven external experts, mostly from NIST.

The main objective of the meeting was to understand and analyse the views of EU and US experts on notions and concepts relating to the IoT, to CPS, and particularly to their intersection, i.e. the large increase in connectivity delivered by the IoT to modern CPS, on challenges, needs, and opportunities that arise from this intersection, and on existing EU-US collaborations and future opportunities. The meeting led to a fruitful discussion of numerous important aspects that helped both sides to understand in more detail the initiatives, the players, and their focus on the other side. The results were used as the basis for follow-up activities, in particular for the development of the IoT/CPS opportunity report.

2.3.2.2. 2nd Expert Group Meeting (June 20, 2017 – Minnesota, US)

The **second EG meeting** was organised and held on June 20, 2017, in Minneapolis, alongside the public *PICASSO Trans-Atlantic Symposium on ICT Technology and Policy* [4]. The objectives of this meeting were:

- **Discuss**, **validate**, and **refine** the analyses and technology themes published in the IoT/CPS opportunity report (see below)
- **Discuss**, **validate**, and **refine** proposals for EU-US collaboration actions
- Finalise the **action plan** of the EG for the remainder of the project

The meeting led to a list of key technology themes and key proposals that will be promoted during the remainder of the project, as well as to an action plan (see below) that contains a list of activities that the EG will implemented over the next year.

2.3.3. IoT/CPS Opportunity Report

Most of the effort of the EG in the first 18 months was focused on the development and validation of the IoT/CPS opportunity report that was published in March 2017 [1].

A preliminary version of the opportunity report was developed based on the results of the first EG meeting in Washington (and subsequent discussions within the EG), the results of preliminary data collection and analysis that was done in the first 10 months of PICASSO (leading to summaries of industrial drivers, societal needs, and EU-US ICT panorama), and a comprehensive analysis of strategic documents and roadmaps from the following institutions:

In addition, a **database** of relevant running EU/US IoT and CPS **projects** was created and analysed. This database was integrated into the PICASSO CROSSROADS tool.

The draft report was circulated widely for feedback collection to leading individual researchers and practitioners in the EU and the US, to the expert networks of the projects and initiatives *AIOTI*, *CPS Summit*, *BILAT USA 4.0*, *TAMS4CPS*, *CPSoS*, *Road2CPS*, *oCPS*, and *CPSE Labs*, and to the industry associations *ARTEMIS-IA*, *Industrial Internet Consortium* (*IIC*), and *SafeTRANS*. Furthermore, the report contents were presented and discussed in detail with an international audience in an **interactive webinar** that was held by the PICASSO IoT/CPS Expert Group on February 2, 2017, and in-depth 30-minute personal interviews were subsequently conducted with senior representatives from the US government agencies *NSF* (*National Science Foundation*) and *NIST* (*National Institute of Standards and Technology*), the IoT and CPS units of the European Commission, the *ERA-NET* instrument, the industry-led associations *Industrial Internet Consortium* (*IIC*), *Smart Manufacturing Leadership Coalition* (*SMLC*), and *ARTEMIS-IA*, the *University of California*, the *Intelligent Manufacturing Systems* (*IMS*) global research and business innovation program, and the *National Council of University Research Administrators* (*NCURA Global*).

2.3.4. Supporting Activities

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

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 to a wide audience (including industry, associations, academia, and others, see examples in the following table):

Table 6: IoT/CPS Group Audience

	EU (Examples)	US (Examples)
Industry	Senior industrial experts from a variety of domains (e.g. production, energy, transport)	
International Organisations / Industry Networks & Associations	AIOTI, ARTEMIS-IA, Industrial Internet Consortium (IIC), SafeTRANS, Smart Manufacturing Leadership Coalition (SMLC), Intelligent Manufacturing Systems (IMS), National Council of University Research Administrators (NCURA Global)	
Specialised Communities of Actors/Stakeholders	International collaboration, research, and innovation projects and initiatives, e.g. CPS Summit, BILAT USA 4.0, Road2CPS, CPSoS, CPSE Labs, HYCON2, …	
Policy Oriented Organisations & Actors	EC CPS and IoT units, ERA-NET	NSF, NIST, NITRD
Independent Stakeholders (of significant importance)	Leading EU researchers in CPS and the IoT	Leading US researchers in CPS and the IoT (e.g. MIT, CMU, UPenn, UC Berkeley, UC Irvine, Caltech, Univ. of Maryland, Vanderbilt, …)

The Expert Group so far has conducted the following major dissemination and community enhancement actions:

- Dissemination and feedback collection of project reports (opportunity report, report on the analysis of industrial drivers and societal needs) 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, Twitter, more than 800 recipients).

- Dissemination of other project results and announcements to relevant stakeholders and via social media (LinkedIn, Twitter).
- Organisation of the interactive webinar "Towards EU-US Collaboration on the Internet of Things & Cyber-Physical Systems" on Feb. 2, 2017.
- Presentation of PICASSO concepts and results at public events.
- Contributions to the CROSSROADS tool kit (database of currently funded R&I projects, lists of relevant main conferences, workshops, and other events in the EU and the US, and online teaching materials), to the PICASSO website, and to other WP4 activities (e.g. project communications, promotion of H2020 and US ICT opportunities, newsletters).

2.3.5. 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. In addition, the EG has 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 was not successful.

2.4. Policy Expert Group

Since the start of the PICASSO project, the Policy Expert Group has established its way of working, and proposed a number of "horizontal policy issues" across the PICASSO technology domains to further develop and interact with the other Expert Groups and external stakeholders. The first policy papers (on Data protection & privacy, and on ICT Security) have been developed, discussed (during meeting and webinars) and published, and the third policy paper (on ICT Standards) has been developed in outset and discussed during the Minneapolis meeting. In addition, the Policy Expert Group contributed to other PICASSO deliverables ensuring policy relevance of its work. This section briefly summarises the main activities of the Expert Group.

2.4.1. Scope of the Policy Expert Group

The Policy Expert Group (PEG) supports the policy dialogue and the development of evidence and research based policy in relation to the societal challenges and thematic R&I topics of the project (5G, Big Data, IoT/CPS). Where relevant the policy contributors look at developments to or triggered by policy developments in the EU, the US or in relation to joint related policies where EU-US scientific and commercial collaboration and policy coordination are affected. The work of the ICT Expert Groups and the Policy Expert Group is tightly connected – the focus of the Policy Expert Group is not "policy" in general but the intersection of: EU-US shared issues and collaboration opportunities in ICT R&I; the specific policy areas identified in the briefs; and the technological areas represented by the other three thematic expert groups.

2.4.2. Expert Group Meetings

The Policy Expert Group has met twice, physically, as a group, organised two webinars with external experts, and used email and Skype, intersessional, to prepare and progress the work.

2.4.2.1.   1st Expert Group Meeting (May 20, 2016 – Washington DC, US)

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 [3]. In addition to EG members, the meeting was attended by nine other stakeholders.

The main objective of the meeting was to discuss the Data protection & Privacy Policy paper as to be able to assess the aspects in depth with a wider group than just the Policy Expert Group members, both from a US and

an EU perspective. In addition, we used the meeting to discuss what other candidate policy subjects should be addressed by our activities (in total 5 policy papers and a concluding white paper at the end). At this time, we ended up with ICT Security, ICT Standards, Spectrum, and possibly Smart Cities.

2.4.2.2.   2nd Expert Group Meeting (June 20, 2017 – Minnesota, US)

The **second EG meeting** was organised and held on June 20, 2017, in Minneapolis, alongside the public *PICASSO Trans-Atlantic Symposium on ICT Technology and Policy* [4]. Next to the Policy Expert Group members present, 8 external stakeholders participated. The objectives of this meeting were to review the policy landscape in which EU US ICT R&I collaboration takes place; to review where we stand towards developing the Policy White paper (final deliverable of the project), and in particular to the contributions hereto from the papers on Data Protection & Privacy and on ICT Security (both finalised) and ICT Standardisation (draft in preparation for webinar); and to agree on a way forward including the focus of the upcoming policy briefs and interaction with the target groups of PICASSO.

Overall, the Policy Expert Group is happy with the quality and depth of the Policy Papers produced so far, and is looking forward to finalise the ICT Standards Policy Paper, and two more, before the end of 2018. One of the two will focus on Industry 4.0, or Smart Industry – the other one will either focus on Digital Communities or Spectrum. A decision on this is to be taken during August 2017, based on a one pager by Glenn Ricart on Digital Communities and by Jonathan Cave on Spectrum.

2.4.3. Policy Opportunity Report

The Policy Expert Group also contributed to the opportunity report that was published in March 2017 [1].

For 5G, the two main policy areas are:

- Spectrum - a priority for policymakers to set the stage for 5G is allocation of high-band millimetre wave spectrum. Here the US FCC has set a strong precedent: in 2015 the Commission proposed rules as to how best to put high-band spectrum to use and has proposed an order to open up a significant amount of high-band spectrum79. For its part, the EU has made spectrum an explicit part of both the 5G Action Plan and the Proposed Electronic Communications Code.
- Infrastructure - high-band spectrum, or any small-cell densification will require significant investment in infrastructure—both for siting the antenna equipment and for backhaul. The US again is relying on industry, while the EU foresees substantial co-funding.

For IoT/CPS, the priorities are more diffuse, but include such elements as:

- Governance of complex and diverse masses of connected devices;
- Secure and accurate identification of devices and their systemic compatibility;
- Privacy, trust, security and performance of complex systems of interacting devices and subsystems;
- Algorithmic regulation in the context of cyber-physical systems; and
- Legal and regulatory issues and policies arising from these phenomena.

We do not cover Big Data in the same way, in part because industry and academia are well in advance of government in this area and in part because the linkage to policy domains beyond the scope of this project is stronger for that area.

2.4.4. Supporting Activities

The Policy Expert Group has supported all other activities in the PICASSO project. The EG has contributed to deliverables of other work packages and has supported other partners in the collection of feedback from relevant stakeholders. Specifically, the Expert Group contributed to:

- D1.1 (M4): establishment of high-quality ICT Policy Expert Group (PEG);

- D1.3 (M5): contributions to and review of policy and regulatory aspects;
- D1.5 (M10): contributions on policy issues related to industry drivers and societal needs;
- D2.1 (M5): report on PEG meeting and on contributions from the PEG input to the plenary meeting in Washington DC
- D2.2 (M14): contributions to the opportunity report from a policy perspective

In addition, the Policy Expert Group has been active in the **community enhancement** and **outreach** activities of PICASSO. Policy Expert Group members have been actively participating in other relevant events, both in the global Internet Governance domain and the future Internet R&I domain. With this, the EG has been active in the dissemination of project results to a wide audience including all stakeholders.

2.4.5. Interactions with the European Commission

Both during the PICASSO events and a number of global and European events the issues were presented to and discussed with stakeholders including European Commission policy officers and scientific officers. There were no interactions by the Policy Expert Group with the European Commission beyond that.

3. Goals of the PICASSO Expert Groups in the Next 12 Months

In order to effectively devise an action plan for the next 12 months, the PICASSO expert groups need to set their goals first based on all the groundwork during the first 18 months. However, due to different situations for different areas, each expert group sets slightly different goals for the next 12 months and inherently will apply different approaches to reach those goals.

3.1. 5G Expert Group

During the first 18 months of the project, the 5G expert group has focused on analysing topics and mechanisms for the EU-US collaboration. According to newly obtained information, most likely, there will be a H2020 call in Spring 2018 on EU-US collaboration in the 5G domain. The 5G expert group considers this call as an excellent opportunity to turn all the analysis into actions and continue its activities beyond 2018. The goals of the 5G expert group in the last year are to:

- Prepare **a proposal for EU-US research collaboration in the 5G network domain**, turning analysis and study into actions.
- Continue to **engage with the internal and external 5G expert group members** for continuous contributions to the discussions and dialogues on EU-US collaboration.
- Analyse and propose **strategic initiatives for policy makers** on how to build a joint funding programme, targeting, e.g., EU FP9, beyond 2020.
- Continue to **disseminate results and outputs** from the 5G expert group to interesting parties and related communities, increasing visibility and impact of the project.

3.2. Big Data Expert Group

For the remaining of the project, the Big Data Expert Group has defined a set of goals and objectives that can be found below:

- Validate **common areas and technological topics of common interest**, between EU and US. Update the Opportunity Report.
- **Activate and maintain a small community on Big Data**, particularly focused and interested in EU-US Big Data collaboration, around the PICASSO Expert Group. Organise and implement at least 2 webinars.
- Maintain **an updated web repository** for information regarding EU-US collaboration on Big Data. Update the projects and the events Database. Collect at least 2 success stories on EU-US Big Data collaboration.
- **Establish a permanent channel** for collaboration between BDVA, US Big Data hubs and other related organisations/associations. Organise an EU-US Big Data Public Event with participation of EU and US participants. Organise the 3rd Expert Group Meeting. Initiate and stabilise internal working groups between organisations on topics of mutual interest.

3.3. IoT/CPS Expert Group

The work of the IoT/CPS Expert Group has yielded a comprehensive analysis of the technological environments, challenges, drivers, and needs of different application sectors in the EU and the US that has been validated with experts from industry, government, and academia. This analysis was disseminated widely to raise awareness of EU experts for the priorities and challenges of US research and innovation and vice versa, and has received positive feedback from both sides of the Atlantic. Based on the analysis and the obtained feedback, a list of

collaboration opportunities and measures was created that target the technological areas and collaboration mechanisms with the highest overlap, impact, and probability for success. The analysis and proposals for collaboration actions have been published in the *PICASSO Opportunity Report* [2] that is available for download here: http://www.picasso-project.eu/outreach/project-reports.

In the present state of the next work programme of the EU, CPS and IoT are not among the most prominent topics for 2018 and 2019 and in contrast to other areas, no calls for EU-US collaboration are planned in this area. The further work of the Expert Group therefore is planned to focus on measures that can have a long-term effect on shaping the domain of IoT/CPS and on paving the ground for possible collaborations after 2019.

The action plan of the IoT/CPS Expert Group for the remainder of the PICASSO project has four objectives:

- Implement **technological exchange and roadmapping** measures to foster a common understanding between the EU and the US of the state of the art, challenges, and opportunities that arise at the intersection of the IoT and CPS, to refine the EU-US collaboration proposals defined in the opportunity report, to foster discussions on collaboration actions, and to identify upcoming opportunities for EU-US projects, in particular in the scope of the H2020 work programme 2018-2020 that will be released in the autumn of 2017.

- Identify at least one **strategic EU-US initiative proposal** that focuses on policy-related aspects, based on collaboration topics that were identified in previous work that have a significant policy dimension.
- **Validate**, **concretise**, and **refine** the collaboration opportunities and proposals for collaboration actions that are discussed in the opportunity report (deliverable D2.2) to provide realistic options to all relevant parties for the set-up of EU-US collaboration measures with a high probability of success, including the EC, US federal agencies, companies and industry-led associations, and research institutes and universities.
- Implement targeted measures to **disseminate and raise awareness of EU and US communities** to the PICASSO work and results.

3.4. Policy Expert Group

During its last year, the Policy Expert group will:

- Finalise the 3rd **Policy paper** and have a **webinar** on ICT Standards. Webinar foreseen during September, final paper foreseen by December 2017.
- 4th **Policy brief** and **webinar** (in "Spectrum" of "Digital Communities") webinar foreseen during October 2017 (M21), final paper foreseen by December 2017 (M22);
- 5th **Policy paper** and **webinar** on Smart Industry/Industry 4.0, webinar foreseen during November 2018, final policy paper foreseen during December 2018.
- **White paper** on policy, covering the 5 policy papers and the 3 PICASSO domains, full draft paper foreseen by April 2018.

4. Detailed Action Plan of the PICASSO Expert Groups for the Next 12 Months

Based on the goals set in the Chapter 3, each expert group has devised its own action plan for the next 12 months. Those plans were reviewed internally in each expert group during the 2nd expert group meeting. The summarises of action plan for each EG have been presented in [4]. The corresponding details are discussed as follow.

4.1. 5G Expert Group

4.1.1. A Roadmap of the 5G Expert Group

During the 2nd expert group meeting, information on a potentially upcoming H2020 call on EU-US collaboration in 5G network, (ICT-44-2018 in [2]), came to light and was discussed inside the 5G expert group. In order to prepare this call as well as to carry on actions inside the PICASSO project, the 5G expert group devised a roadmap that reaches all goals set in the Subsection 3.1 in an integrated and structured manner, as shown in Figure 1. The **one-year target** is to prepare and submit a project proposal to promote and actualise the identified technology theme and research topics by the PICASSO 5G EG for the EU-US collaborations as described as follow in the milestone #1. If the submission to the potentially upcoming H2020 call succeeds, work of the 5G expert group will naturally continue after the PICASSO project ends.
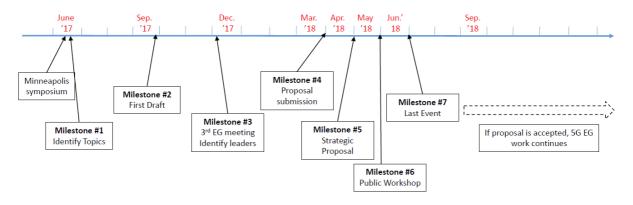

Figure 1: Roadmap of the 5G Expert Group in the Next 12 Months and Beyond

In the following, we briefly summarise important milestones of the roadmap shown in Figure 1.

Milestone #1: Identification of a technology theme and 5 research topics

> **Due time**: June, 2017
> **Description**: In the 2nd expert group meeting, the 5G expert group identified a technology theme for EU-US collaboration, i.e., technologies that have **niche market shares yet have strong society impact**. By strategically combining R&I capabilities of both sides, commercially viable and profitable solutions can be developed with reasonable cost on each side. The developed solutions will benefit niche markets inside the EU and US as well as similar markets in the rest of world, eventually enhancing equality of society and quality of life. Under this technology theme, 5 research topics are proposed
> > – Ultra Large Cell
> > – Small Cell
> > – V2X

- – Fragment IoT
- – Satellite

> **Success Criteria:** Decisions on Topics (done)

Milestone #2: Preparation of the first draft

> **Due time**: September, 2017
> **Description**: Based on the technology theme and topics identified in the milestone #1, **an overview summary of technology theme** and a **one page flyer** of descriptions on each proposed topic will be prepared. The one page flyer will include information on both the topic as well as **potential research partners** in the EU and US. This first draft will be sent to the 5G EG circulating around for review and feedback. The selected topics are subjected to change based on review results.
> **Success Criteria:** A draft of technology theme summary and descriptions of selected topics

Milestone #3: The 3rd expert group meeting and identification of topic leaders

> **Due time**: December, 2017
> **Description**: The 3rd expert group meeting will be held in conjunction with the IEEE Comsoc flagship conference Globecom 2017. In this meeting, 5G experts will review progress of the proposal preparations and also **identify a leader** for each considered topic. The selected topics are subject to change based on review results.
> **Success Criteria:** Participations of experts and names of identified leaders

Milestone #4: Proposal submission

> **Due time**: March, 2018
> **Description**: The prepared proposal will be **submitted** to H2020-48 call with deadline in April (ICT-44-2018 in [2]).
> **Success Criteria:** one proposal is submitted before the deadline.

Milestone #5: Strategic initiative proposals for policy makers

> **Due time**: April, 2018
> **Description:** The 5G expert group will **propose strategic initiatives** on EU-US collaboration mechanisms for policy makers. The target will be to provide policy recommendations, e.g., to EC, on FP9 beyond 2020.
> **Success Criteria:** the proposal is submitted to the EC.

Milestone #6: Organisation of a public workshop

> **Due time:** April/May, 2018
> **Description:** A public workshop will be held in conjunction with a major event in the 5G domain. In this workshop, the 5G expert group will present and discuss the topics identified in the updated opportunity report and the submitted proposal. The targets are to deliver key messages to related audiences as well as bring more public attention. According to the current event calendar, the 5G expert group mainly targets the IEEE Comsoc flagship conference ICC, on May 20-24 2018, in Kansas City, USA, or IEEE WCNC, on April 15-18th 2018, in Barcelona, Spain. The final choice will be decided later based on conference programs as well as available time and resources.
> **Success Criteria:** High-level speakers and good attendance.

Milestone #7: Co-organisation of the last event

> **Due time:** May/June, 2018

> **Description:** As a part of the PICASSO consortium, the 5G expert group will co-organise the last event for dissemination of project outputs to the general public and related communities, particularly, from the 5G perspective.
> **Success Criteria:** High-level speakers and good attendance.

In addition to the roadmap shown in Figure 1, the 5G EG will also take actions on the following aspects.

4.1.2. Finalisation of the Opportunity Report

Activity: Opportunity report update

> **Description:** The 5G expert group will update the opportunity report according to all the discussion and comments carried out inside the group during the last 12 months. This is also the major output of the 5G expert group.
> **Time Frame:** July 2017 - June 2018
> **Success Criteria:** Updated opportunity report for the 5G.

4.1.3. Disseminations of Project Outputs and Community Enhancement

One important mission for the 5G expert group is to disseminate project outputs, increase impact and influence of the PICASSO project. In addition to the 5G public workshop as described as in milestone #6 and the final event described in milestone #7 in the Subsection 4.1.1, the following activities are also planned.

Activity 1: CROSSROADS tool kit update

> **Description:** The 5G expert group will continuously update 5G related inputs and contents to the CROSSROADS tool kit.
> **Time Frame:** July 2017 - June 2018
> **Success Criteria:** Updated CROSSROADS tool kit from the 5G perspective.

Activity 2: A webinar

> **Description:** The 5G expert group plan to give a webinar on the final opportunity report, in regard to the identified technology theme and research topics.
> **Time Frame:** Jan. 2018 - June 2018
> **Success Criteria:** Good attendance in the webinar.

4.1.4. Interaction with the European Commission

Activity: Analysis of US Funding Landscape

> **Description:** During the previous interaction with the EC 5G unit, a request was made to analyse the landscape and roadmap of US funding organisations on 5G. The 5G expert group will carry out such analysis to provide a comprehensive report as requested.
> **Time Frame:** July 2017 - Aug. 2017
> **Success Criteria:** A report on US 5G funding landscape is written and sent to the EC 5G unit.

4.2.   Big Data Expert Group

4.2.1. Validate common areas and technological topics of common interest

Activity: Opportunity report Update

> **Description:** Update the Opportunity Report by the incorporation of additional content from publicly available documents and the engagement of external organisations/associations. External associations/organisations will be engaged through the following means, if and when possible: personal interviews, online "open" consultations, dedicated webinars to exchange views and thoughts, discussions though the social media
> **Time Frame:** Feb. 2018 - June 2018
> **Success Criteria:** 1 updated opportunity report for Big Data

4.2.2. Initiate the formulation of an EU-US Big Data Community

Activity: Webinars

> **Description:** Organise and implement at least 2 webinars on EU or/and US R&D opportunities for collaboration and collection of feedback for the opportunity report, with the participation of external attendees.
> **Time Frame:** Sep. 2017 - June 2018
> **Success Criteria:** 2 webinars with 30 attendees in total

4.2.3. Maintain an updated web repository for information regarding EU-US collaboration

Activity 1: Support of CROSSROADS Toolkit

> **Description:** Update the projects and the events Database, available through the CROSSROADS toolkit. Project and events are being periodically collected through public databases (i.e. CORDIS, NSF websites, etc.) and are being aggregated into a specific form in order to be uploaded in CROSSROADS.
> **Time Frame:** June 2017 - June 2018
> **Success Criteria:** Big Data section of the CROSSROADS toolkit remains updated

Activity 2: Success Stories

> **Description:** Collect at least 2 success stories on EU-US Big Data collaboration and make it available through the CROSSROADS toolkit
> **Time Frame:** June 2017 - June 2018
> **Success Criteria:** 2 Success Stories produced and disseminated

4.2.4. Establish a permanent channel for collaboration between BDVA, US Big Data hubs and other related organisations/associations

Activity 1: EU-US Big Data Public Event

> **Description:** Organise an EU-US Big Data Public Event which will be open to the public. At this stage, we have already applied for a dedicated workshop slot during the European Big Data Value Forum 2017, to be held in Versailles, France (Palais des Congrès) from 21st to 23rd November. The European Big Data Value Forum 2017, jointly organised by the Big Data Value Association and the European Commission, will include presentations will range from cutting-edge industrial applications of Big Data technologies, innovative business cases of the data economy, inspiring future visions, and insights on EU policy-making and R&D&I funding in this area. In case our application for a workshop is unsuccessful, other opportunities will be examined such as organising an event in the US, jointly with the final PICASSO event, with the support of the US Big Data Hubs.
> **Time Frame:** Nov. 2017 - May 2018

> **Success Criteria:** Participation of at least 30 attendees

Activity 2: The 3rd Expert Group Meeting

> **Description:** Organise the 3rd Expert Group Meeting in conjunction with the Public Event, with the participation of both the Permanent and the External Members
> **Time Frame:** Nov. 2017 - May 2018
> **Success Criteria:** Participation of all Permanent and External Expert Group Members

Activity 3: Suggestions for Strategic EU-US Initiatives.

> **Description:** Suggestion of strategic EU-US initiatives proposals related to the enhancement of collaboration in Big Data between EU and US and exploit possible paths for achieving sustainability.
> **Time Frame:** June 2017 - Apr. 2018
> **Success Criteria:** Development of at least 1 strategic EU-US initiatives proposal

Activity 4: Animation of 3 Internal Working Groups

> **Description:** Animate the 3 Internal working groups between US BDHubs, NSF, BDVA and PICASSSO.
> **Time Frame:** June 2017 - June 2018
> **Success Criteria:** Production of White Papers, Roadmaps for collaboration, etc.

4.3. IoT/CPS Expert Group

In the following, we list the activities that are planned for the IoT/CPS Expert Group for the last year of the project. The action items are described in detail. The action plan has been discussed and validated at the 2nd Expert Group meeting in Minneapolis on June 20, 2017.

4.3.1. Organisation of / Contribution to PICASSO Events

Activity 1: Organization of a working meeting, along with the 3rd EG meeting

> **Description:** The IoT/CPS Expert Group has concluded that an important step to establish EU-US collaboration measures in the areas of the IoT and cyber-physical systems is to discuss the research and technology challenges and to do roadmapping to create a common understanding of the challenges at the intersection of IoT and CPS in the EU and the US and to identify the most promising topics for collaboration. The 1st PICASSO workshop in Washington D.C. and the development and feedback iterations of the opportunity report have already increased the awareness of EU and US stakeholders of the views of the other side (as the positive feedback shows that we have received), and we plan to follow up this work by organising a public **trans-Atlantic working meeting** in the first half of 2018 (in conjunction with the 3rd Expert Group meeting). We aim to bring together a group of EU and US experts with different backgrounds (industry, academia and government agencies; focused on CPS or IoT, interested in fundamental issues or in technical solutions) to present and discuss and the state of the art and the challenges for the convergence of the IoT and CPS. A list of important technology themes were presented in the opportunity report. The 3rd Expert Group meeting, which is planned to take place in conjunction with the working meeting, will focus on the refinement of the proposals for technological and strategic collaboration actions that were identified in the opportunity report, based also on the results of the public meeting. To discuss concrete collaboration opportunities between EC and US representatives, the organisation of a follow-up informal meeting after the meeting will be investigated. To reduce the threshold of attendance for interested experts, we plan to attach the workshop to a public EU technology event that promises to attract a large audience of experts who are interested in the IoT and CPS domains. We will widely disseminate the workshop announcement and will send targeted invitations to high-profile stakeholders such as *NIST*, the *NSF*, the relevant EC units, and representatives

of industry-led associations. To provide additional incentives for important stakeholders, we may offer to cover travel costs if there is PICASSO travel funding available after the cost of the EG members and the consortium have been covered.

> **Time Frame:** July 2017 - June 2018
> **Success Criteria:** 1 working meeting & 3rd meeting of EG organised

Activity 2: Contribution to the organization of the final PICASSO event (IoT/CPS perspective)

> **Description:** The IoT/CPS Expert Group will in addition contribute to the organisation and content of the final public PICASSO event that has the objective to expose PICASSO experiences and to highlight project outcomes, lessons learnt and recommendations.
> **Time Frame:** Feb. 2018 - June 2018
> **Success Criteria:** IoT/CPS content contributed to final event

4.3.2. Promotion/ Dissemination of Collaboration Opportunities

Activity: Promotion/ dissemination of collaboration opportunities

> **Description:** The parts and project calls of the **upcoming H2020 work programme 2018-2020**, which is due to be released in the autumn of 2017, will be **monitored** to identify calls that target relevant technology domains and international collaboration efforts and that provide opportunities to include US partners. This analysis will go beyond the LEIT-ICT domain to include other programme parts in which EU-US projects were funded in recent years, such as the societal challenges pillar. Suitable calls will be disseminated to our Expert Group members and to the interested stakeholders that we have identified (EU and US universities, industry representatives, and industry associations).
> **Time Frame:** July 2017 - June 2018
> **Success Criteria:** Dissemination of relevant information.

4.3.3. Investigation of Strategic Initiatives

Activity: Investigation of strategic initiatives

> **Description:** We will investigate **strategic EU-US initiative proposals** that focus on IoT/CPS-related policy issues and that will target policy makers. In the opportunity report, several high-priority challenges with a significant policy dimension have been identified, in particular in the areas of cyber-security, trust/trustworthiness, interoperability, and standardization for IoT-enabled cyber-physical systems. While all of these topics are of large importance in both, the EU and the US, cyber-security may be too sensitive an area for policy collaboration. On the other hand, interoperability and standardization in CPS and in particular in the IoT is of highest interest, and EU-US collaboration in this area is seen as essential by many experts and interview partners. Thus, we currently plan to focus this activity on the identification of at least one proposal for standardization and interoperability collaboration measures for IoT-enabled cyber-physical systems, focusing on the main opportunities defined in the opportunity report, targeting relevant policy makers such as EU and US agencies and industrial standardisation initiatives. The results of these efforts will be discussed and validated with the IoT/CPS Expert Group.
> **Time Frame:** July 2017 - April 2018
> **Success Criteria:** At least 1 strategic proposal made.

4.3.4. Measures for Community Enhancement

Activity: Measures for Community Enhancement

> **Description:** The IoT/CPS Expert Group plans to keep up its dissemination and community enhancement activities (see above) throughout the remainder of the project. The following activities are planned:

- Organisation of a trans-Atlantic working meeting.
- Dissemination of and feedback collection for strategic EU-US initiative proposals.
- Continued broad dissemination of project results and announcements to relevant stakeholders and via social media.
- Presentation of PICASSO concepts and results at public events.
- Contributions to the PICASSO website and to other outreach activities (e.g. project communications, promotion of H2020 and US ICT opportunities, newsletters).
- Contribution to upcoming webinars organised by the Policy Expert Group.

> **Time Frame:** July 2017 - June 2018
> **Success Criteria:** Contributions to PICASSO community enhancement

4.3.5. Refinement and Finalisation of Collaboration Opportunities and Proposals, Publication in Consolidated Opportunity Report

Activity: Finalisation of the opportunity report

> **Description:** The results of the activities described above will be used to assemble an updated set of opportunities and proposals for collaboration actions, based on the recommendations provided in the opportunity report [1], to provide a list of realistic options to all relevant parties for the set-up of EU-US collaboration measures with a high probability of success, including the EC, US federal agencies, companies and industry-led associations, and research institutes and universities. The final PICASSO event will provide a good stage to advertise the final results to relevant actors.

> **Time Frame:** Feb. 2018 - June 2018
> **Success Criteria:** Updated opportunity report on IoT/CPS

4.4. Policy Expert Group

In order to ensure the deliverables mention in Subsection 2.4.3 will be well informed and relevant, as well as in order to ensure the insights to get spread as wide as possible, the Policy Expert Group will interact with wider groups of stakeholders in international events including the Internet Governance Forum. Expert Group Members will actively reach out in their networks for input and feedback.

Up and beyond the workplan, the Policy Expert Group foresees a final public check and update on all 5 Policy Papers during 2018 Q1, and plans to meet as a group to extract the main messages for the PICASSO White Paper on EU US R&I collaboration in the fields of 5G Networks, Big Data, and the Internet of Things/CPS.

During the final PICASSO conference, this White paper will be presented and discussed before finalisation.

The detailed action plan is presented in the following:

Activity 1: Preparation and dissemination of the policy paper #3

> **Description: Finalise policy paper on Standardization** and include a webinar on the full draft paper in September 2017.
> **Time Frame:** July 2017 - Dec. 2017
> **Success Criteria:** High-quality participation in webinar to discuss full draft, and high-quality policy paper

Activity 2: Preparation and dissemination of the policy paper #4

> **Description: Develop a policy paper on Industry 4.0 (working title)** and include a webinar on the full draft paper in October/November 2017
> **Time Frame:** July 2017 - Dec. 2017

> **Success Criteria:** High-quality participation in webinar to discuss a full draft, and a high-quality policy paper.

Activity 3: Preparation and dissemination of the policy paper #5

> **Description: Select the subject for a policy paper, and develop that policy paper** and include a webinar on the full draft paper in October/November 2017.
> **Time Frame:** July 2017 - Dec. 2017
> **Success Criteria:** Agree on the topic, develop a solid draft paper, webinar with high-quality participants, and a final policy paper

Activity 4: Finalisation of all the policy papers

> **Description:**. **Review and update all 5 policy papers.**
> **Time Frame:** Jan. 2018 - Mar. 2018
> **Success Criteria:** Review all policy papers and add relevant updates, where necessary (NB: in particular for 1,2 and 3 as 4 and 5 are finalised towards the end of 2017)

Activity 5: Preparation and dissemination of the final white paper

> **Description:** Develop a Policy White Paper for presentation at the PICASSO final conference
> **Time Frame:** Jan. 2018 - June 2018
> **Success Criteria:** A short yet high-quality paper with clear policy findings and recommendations

5. Conclusions

In this report, the three PICASSO ICT technology expert groups, 5G, Big Data and IoT/CPS, as well as the PICASSO Policy expert group presented their action plans for the next twelve months.

In general, all the three technology EGs are committed to continue their activities on identifying and analysing R&I topics as well as funding opportunities for the EU-US collaboration. A final version of the opportunity report will be provided in the end of the PICASSO project. Based on the outputs of opportunity report, the 5G EG plans to prepare and submit a proposal for a potentially upcoming H2020 call. The Big Data and the IOT/CPS EGs will keep on monitoring and identifying new funding opportunities and programme. Meanwhile, the Policy expert group will continue to focus on preparing policy papers discussing highly EU-US collaboration related topics, such as, standardization and Industry 4.0. Targeting for policy makers, all the EGs plan to propose strategic initiatives on the EU-US collaboration to the related organisations, e.g., EC and NSF. In the last 7 months of the project, each technology EG plans to hold an independent 3rd expert group meeting as well as a public workshop. Meanwhile the final event will be held jointly by the three EGs and other partners in the PICASSO consortium. The exact dates and arrangements will be decided later based on upcoming events and available resources in the project. In addition, all the EGs will continue to work closely with partners in the PICASSO consortium to enhance community awareness and interests on the EU-US collaboration. They have planned a wide range of activities, e.g., webinars, inputs to the CROSSROAD toolkit and other promotional activities to disseminate the outputs of the PICASSO project, eventually maximizing the social impact and influences of the project.

6. References

[1] **Sonntag, C., et al.**, *Towards Enhanced EU-US ICT Pre-competitive Collaboration - Opportunity Report of the EU Project PICASSO.* [Hrsg.] C. Sonntag und S. Engell. Revised version V1.0.1 (March 19, 2017). 2017. Available at: http://www.picasso-project.eu/outreach/project-reports.

[2] *H2020 Work Programe 2018-2020, part 5.i Information and Communication Technologies*, Drafted version, July, 2017.

[3] **Thompson, H.**. *First Expert Group Meeting Report, Washington D.C. 2016*. Available at: http://www.picasso-project.eu/outreach/.

[4] **Sonntag, C., et al.**, *Second Expert Group Meeting Report*, 2017.