D4.6

Report about EU-US policy and innovation conference

Trans-Atlantic Symposium on ICT Technology and Policy

ICT Policy, Research and Innovation for a Smart Society

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Authors (organizations):

Margot Bezzi, Martina de Sole (APRE)

Contributors:

Maarten Botterman and Jonathan Cave (GNKS)

Vasilis Papanikolaou (ATC)

Christian Sonntag (TUDO)

Yaning Zou (TUD)

Reviewers (organizations):

IoT/CPS Expert Group, Big Data Expert Group, 5G Expert Group, Inno

Abstract:

The *Trans-Atlantic Symposium on ICT Technology and Policy* was held in Minneapolis on 19th and 20th June 2017 and brought together outstanding representatives of the academic, industrial and policy makers communities from both the EU and the US, in the areas of 5G Networks, Big Data, Internet of Things and Cyber-Physical Systems, covering the spectrum of activities from research strategic prioritization, research assessments, and pre-competitive research, via commercialisation opportunities, to policy issues impacting the ICT area. The main objective of the symposium was to explore the connections and interrelations among PICASSO's technology focus areas, and between these areas and policy, within an EU/US collaboration context. The Symposium was attended by 90 participants, 38 from the EU (42%) and 52 from the US (58%), with a gender share of approximately 60% men and 40% women. The aim of this report is describing the different sessions that took place, highlighting for each one the key messages arisen.

Keywords:

5G; Big Data; IoT/CPS; EU; USA; Conference; Smart Cities; Smart transports.

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.

Table of Contents

Acronyms and Definitions

Acronyms	Defined as
BDVA	Big Data Value Association
CPS	Cyber-physical Systems
EC	European Commission
EG	Expert Group
EU	European Union
FoF	Factory of the Future
IoT	Internet of Things
IMS	Intelligent Manufacturing Systems
NIST	National Institute of Standards and Technology
NGI	Next Generation Internet
NSF	National Science Foundation

1.   Executive Summary

The *Trans-Atlantic Symposium on ICT Technology and Policy* was held in Minneapolis on 19th and 20th June 2017 and brought together outstanding representatives of the academic, industrial and policy maker communities from both the EU and the US in the areas of 5G Networks, Big Data, Internet of Things and Cyber-Physical Systems, covering the spectrum of activities from research strategic prioritization, research assessments, and pre-competitive research, via commercialisation opportunities, to policy issues impacting the ICT area. The Symposium was attended by 90 participants, 38 from EU (42%) and 52 from the US (58%), with a gender share of approximately 60% men and 40% women.

The main objective of the symposium was to explore the connections and interrelations among PICASSO's technology focus areas, and between these areas and policy, within an EU/US collaboration context. For example: How is IoT and CPS impacting on trustworthiness of networks, and data security? And how are EU and US respectively addressing these challenges? Where and how are common views and frameworks being created, and, on the other hand, in which ways are the EU and US diverging? Are there common technology needs and gaps between the EU and US that need more attention and justify shared attention in research priorities or investments? These are only some of the questions that animated the discussions among the high-level participants from academic, industry, and government organisations at the symposium, contributing to a fruitful international dialogue.

The Symposium was structured into a core set of parallel sessions alternated with plenary sessions, for a total of 14 sessions and 7 key notes. Parallel sessions were dedicated to the latest technology developments and to insights from the Big Data, 5G Network and IoT/CPS Expert Groups of the PICASSO project, while plenary sessions focused on cross-cutting policy implications of the above technological domains, as well as on concrete application experiences of these technologies to real environment, in particular in the areas of smart city, smart transport, smart energy and smart manufacturing. Sessions organised by BILAT USA 4.0, Clean Energy Economy Minnesota (CEEM) and IMS as a result of a call for sessions greatly contributed to the overall event success.

The symposium was organised by the project PICASSO, funded by the H2020 R&I Programme of the European Commission. Additional financial support was given by the US National Science Foundation (NSF), the IEEE Control Systems Society, and Intelligent Manufacturing Systems (IMS).

The present document reports on each of these sessions and key notes, describing the key messages highlighted by the speakers, as well as any challenging or diverging point within the discussions. The PICASSO project will build on this material over the next year and develop targeted recommendations for international collaboration in ICT and the related technology/policy nexus.

2.   Introduction

The *Trans-Atlantic Symposium on ICT Technology and Policy* was held in Minneapolis on 19th and 20th June 2017, and was hosted by the Technological Leadership Institute of the University of Minnesota, in particular, in the McNamara Alumni Center. The Symposium brought together representatives of the academic, industrial and policy makers communities from both the EU and the US in the areas of 5G Networks, Big Data, Internet of Things and Cyber-Physical Systems, covering the spectrum of activities from research strategic prioritization, research assessments, and pre-competitive research, via commercialisation opportunities, to policy issues impacting the ICT area. The Symposium was attended by 90 participants, 38 from EU (42%) and 52 from the US (58%), with a gender share of approximately 60% men and 40% women.

The Symposium was organized by the project PICASSO, funded by the H2020 R&I Programme of the European Commission. Additional financial support was given by the US National Science Foundation (NSF), the IEEE Control Systems Society, and Intelligent Manufacturing Systems (IMS).

2.1 Meeting Goals

The main objective of the symposium was to explore the connections and interrelations among PICASSO's technology focus areas, and between these areas and policy measures, within an EU/US collaboration context.

For example: How is IoT and CPS impacting on trustworthiness of networks, and data security? And how are EU and US respectively addressing these challenges? Where and how are common views and frameworks being created, and, on the other hand, in which ways are the EU and US diverging? Are there common technology needs and gaps between the EU and US that need more attention and justify shared attention in research priorities or investments? These are only some of the questions that animated the discussions among the high-level participants from academic, industry, and government organisations at the symposium, contributing to a fruitful international dialogue.

Final aim of this process will be to inform EU and US key stakeholders with targeted recommendations to improve international collaboration across the identified priority areas, including related technology/policy nexuses. For the PICASSO project, this will mean, in practice, building on the Symposium outcome material over the next year to develop the needed reflections and recommendations.

2.2 Session Structure and Agenda

The Symposium was structured into a core set of parallel sessions alternated with plenary sessions, for a total of 14 sessions and 7 key notes. Parallel sessions were dedicated to the latest technology developments and to insights from the Big Data, 5G Network and IoT/CPS Expert Groups of the PICASSO project, while plenary sessions focused on cross-cutting policy implications of the above technological domains, as well as on concrete application experiences of these technologies to real environment, in particular in the areas of smart city, smart transport, smart energy and smart manufacturing. Sessions organised by BILAT USA 4.0, Clean Energy Economy Minnesota (CEEM) and IMS as a result of a call for sessions greatly contributed to the overall event focus.

Supporting material, including a detailed agenda and a speaker list, has been developed for the event and made available on the website. The agenda has also been made available in printed form at the registration desk, together with information material on the hosting institution. The full agenda is available as an annex to this document. An online version of the agenda, comprising all presentations given, is available on the PICASSO website.
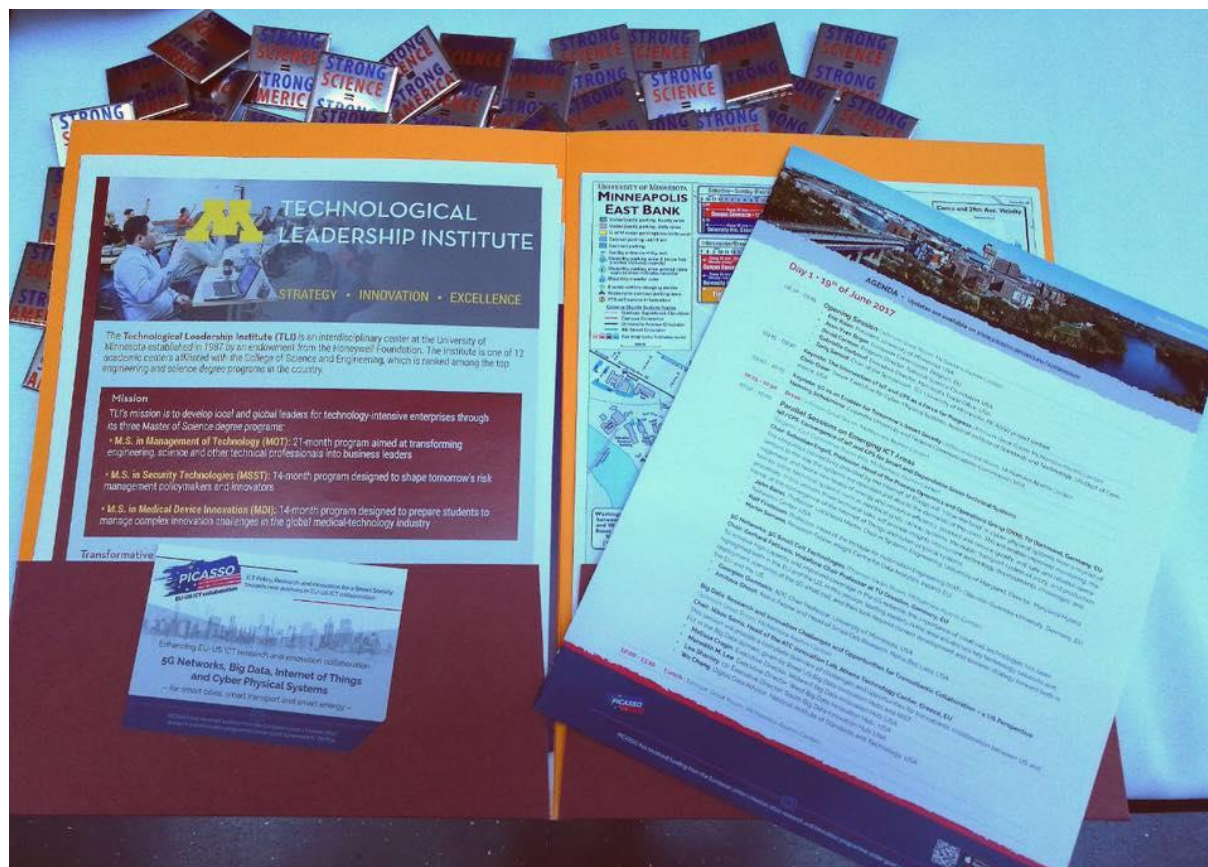
3. Session description

Day 1 – 19th of June 2017

Opening Session

The day was opened by **Eric Kaler**, President of the University of Minnesota, whom presented his institution and its research priorities and approach, in line with the Symposium purposes. He expressed appreciation for hosting the Symposium, as a timely occasion to reflect and tackle urgent issues, relevant not only for both sides of the Atlantic and for the entire world. Mr Kaler stressed how research and discoveries are as much important as their commercialization. Technologies and next generation products are shaping and impacting our lives, and are key for our future economies and smart societies. He also stressed the need to reflect on policy and cross-cutting and multidisciplinary approaches while pushing forward technology discoveries.

The floor was then taken by **Jean-Yves Roger**, project officer at the European Commission for the project PICASSO. Mr Roger emphasized the importance of EU-US economy and trade share at the global level. He then illustrated a number of relevant key actions currently being implemented by the European Commission. Firstly, the EU is investing in having a fully functioning Digital Single Market that can contribute to economic growth and in creating new jobs. Secondly, the EU is focusing and proposing new approaches in three key areas: 1) Data economy – through the cross-border initiative on access to data; 2) Accessibility and reuse of publicly funded data – through amongst other open data related initiatives; 3) Cybersecurity – through the review of the cybersecurity strategy. The latter targets a new framework on standards, including certification and labelling to make objects cybersecure. Other measures include the MoU on counterfeit over the Internet, as well as a reform of ENISA (European Union Agency for Network and Information Security). One of the most important aims for the EC is to move forward protecting the citizens' fundamental rights.

Steve Riedel, Regional Trade Manager from the Minnesota Trade Office, stressed how relevant the focus topics of the upcoming discussion is for Minnesota, because of its leadership in matter of IoT technologies. Minnesota also has an important legacy from Control Data companies back in the 90ies, reason for which a young generation of strong computer technology scientists is taking roots here. Among other sectors that are core for future investments, for the work of the Trade office as well as for the University of Minnesota, Mr Riedel mentions sensor manufacturing (e.g. helping traditional manufacturing companies to evolve); cybersecurity; precision agriculture and IoT for detect leaks in pipes; medical device with wireless tech. The US and EU are in position to show the rest of the world how to navigate the future smart society.

Svetlana Klessova closed the opening session by giving a presentation of the PICASSO project. The floor was then left to the introduction of the first keynote speeches.

Keynote: The Intersection of IoT and CPS as a Force for Progress

In his keynote talk "The intersection of IOT and CPS", **Chris Greer** (NIST, USA) explained how complex technical systems present both IoT and CPS aspects, and that the distinction between the two is often not clear in this kind of systems. Moreover, IoT and CPS, as broadly used concept, are attributed different meanings according to different people. His view was supported by examples in the field of home energy management system and of an ABS system. The main part of the talk focused on the CPS framework by NIST that was developed to formally represent modern technological systems in a unified framework. Mr Greer introduced a unified CPS mathematical model that can represent interacting digital, analog, physical, and human components through integrated physics and logic, arguing that the model is suitable to conceptualize, realize, and assure all aspects of CPS and IoT systems. The talk closed with an overview of several of the CPS framework elements, including domains, facets, aspects, and illustrated how the formal categorization of system elements within this framework can be used to assess the complexities of interoperability and can be a foundation of cooperation.

Keynote: 5G as an Enabler for Tomorrow's Smart Society

Henning Schulzrinne (Columbia University and Federal Communications Commission, USA) opened his speech by questioning the rationales behind 5G development. Reviewing lessons learnt from the history of mobile communication from 0G to 5G, many questions arise especially considering the economic aspect. According to Henning, EU's current research is mainly focused on radio access network (RAN) while US side is mainly interested in application. Overall, there is lack of understanding and focus on developing viable legacy and carrier models. With dramatically increased complexity and diversity in the upcoming 5G system, the carrier model that has been used for the last 20 years will most likely not be sufficient. In addition, when the research on network architecture pushes towards the direction of NFV/SDN, operators clearly don't have the required expertizes to cope with inherently complexity. It is important to keep in mind that complexity can kill while designing 5G network. 5G shall be the occasion to rethink design assumptions of 4G networks.

Parallel Sessions on Emerging ICT Areas

Two sessions for each emerging technology areas were organized, one in the morning and one in the afternoon, each of which of a duration of 1 hour and 15 minutes each.

Internet of Thing and Cyber Physical Systems

IoT/CPS: Convergence of IoT and CPS for Smart and Dependable Socio-technical Systems (morning session)

Chair: Sebastian Engell, Professor, Head of the Process Dynamics and Operations Group (DYN), TU Dortmund, Germany, EU

The three technical talks of the first parallel IoT/CPS session focused on technology developments, challenges, and trends at the convergence of the Internet of Things and cyber-physical systems, which is a major opportunity for future technical systems since the ubiquitous connectivity provided by the Internet of Things will "close the loop" in cyber-physical systems 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.

After an introductory overview of the work of the IoT/CPS Expert Group by **Sebastian Engell** (TU Dortmund), **John Baras** (University of Maryland) gave a talk on networked cyber-physical systems and the Internet of Things in which he argued that most modern CPS are already networked, either via the internet or the cloud, or via special logical or physical networks. In these CPS, new fundamental challenges emerge on three fronts, at the interface between cyber and physical components (and their joint design), on the implications of the networked interfaces and the collaborative aspects of these systems, and on the incorporation of humans from the start. He then introduced new methods and technologies to deal with challenges in networked CPS, including new types of models based on coevolving multigraphs, distributed algorithms, dynamic coalition forming, and network virtualization.

Rolf Findeisen (Otto-von-Guericke University Magdeburg) looked at the opportunities and challenges in the IoT and CPS from a systems and control perspective. In his talk, he argued that systems and control plays an important, enabling role and that the rise in ubiquity of communication, computation, sensing, actuating, and data leads to systems and control opportunities and challenges, such as resource utilization/attention, hierarchies and modularization to handle complexity, structured design and maintenance, and "personalization" of control and estimation. He described these challenges and arising opportunities in detail and closed with an outlook on future work and open challenges.

Finally, **Martin Serrano** (Insight Centre for Data Analytics) gave a talk on the current state and the future vision of the IoT in Europe. He gave an overview of the IoT communities landscape and the European Internet of Things

roadmap until 2020 and provided a vision and challenges for future connected smart city systems and edge services, describing several major European initiatives in this area.

IoT/CPS: Research and Innovation Challenges and Opportunities for Transatlantic Collaboration (afternoon session)

Chair: Tariq Samad, Senior Fellow and Honeywell/W.R. Sweatt Chair in Technology Management, Technological Leadership Institute, University of Minnesota, USA

The second IoT/CPS session provided an overview of the major analyses and results in the area of IoT/CPS (published in the IoT/CPS opportunity report) as well as industrial statement talks and closed with a discussion on IoT/CPS technology challenges.

Session chair **Tariq Samad** gave an introductory overview of the IoT/CPS Expert Group, then **Christian Sonntag** provided an overview of the IoT/CPS opportunity report, describing drivers, needs, enabling technologies, EU and US research and innovation challenges and priorities, and technology themes that are of importance on both sides of the Atlantic. The talk closed with an overview of the collaboration barriers and opportunities that have been identified in the opportunity report.

Dinkar Mylaraswamy (Honeywell) made a case for the intersection of the IoT and CPS from the point of view of aircraft monitoring and maintenance, illustrating on several challenges in this domain why this domain will be a strong beneficiary of CPS, the IoT, and Big Data analytics.

In the second statement, **Hubertus Tummescheit** CEO and co-founder of the SME Modelon (Sweden/USA) made a case for strong open standards which he views as a necessary enabler for the collaborative design of cyber-physical systems. He argued that the landscape of computer-aided engineering (CAE) software is very fragmented and that generic, compatible data standards are rare. He used the tool-independent, open Function Mockup Interface (FMI) for model integration to illustrate how open standards can quickly boost innovation in different domains. He closed the statement with a call to action, stating that there is still plenty of room for standards that with simplify life for the design of CPS.

One major remark from the closing discussion is that the two parallel IoT/CPS sessions have shown that the IoT in the EU is beyond the research phase, going into the innovation phase. There will be a pruning of solutions, only some will survive. This makes IoT an enabling technology for CPS, and mature solutions are to be expected soon. However, this does not mean that the solutions will fulfill the security and safety requirements that many applications need, and it is an important open issue how this can be solved.

5G Networks

5G Small cell Technologies (morning session)

Chair: Gerhard Fettweis, Vodafone Chair Professor at TU Dresden, Germany, EU

Gerhard Fettweis opened by reviewing design challenges of 5G network and importance of small cells. Then **Amitava Gosh** (Nokia Bell Labs) shortly introduced his vision on 5G small cell. In order to provide extended mobile broadband (eMBB) access, 5G over mmWave frequency is a natural choice. Nokia is promoting a new band at 73 GHz to FCC that shows similar achievable rate as in the 28GHz band. The second presentation was given by **Georgios Giannakis** (University of Minnesota). The basic idea is to reduce backhaul traffic in the small cell at the high peak time via cashing reusable content. By applying, e.g., reinforce learning approach, reusable content will not overload backhaul.

During the panel session, Henning raised many questions on the deployment scenarios of small cells especially for indoor uses. He argued that the cost of cellular small cell is not low and how can it compete with WLAN at

5GHz which is so cheap. Again, he emphasized his concern about carrier model. For example, the lamppost case is very often shown in the 5G study. It might not workable when each operator implements own access point at the lamppost. Especially at the mmWave, the base station should installed to be at certain height and point to certain direction for coverage. It is impossible to install e.g., 4 base stations from 4 operators at the same place on the lamppost. Regarding to the importance of mmWave in small cell context, Amitava emphasized that eMBB use case requires large bandwidth that is only available at higher frequency.

Both delegates from US Henning and Berger emphasized it is important to consider economic factor as part of motivation, for example, it is expensive to drive fibre to every home. Then deploying wireless technology at mmWave becomes to be a reasonable solution. Also self-backhaul via mmWave is also a good choice. Henning also promoted new operating way to combining both unlicensed bands and licensed bands. Gerhard Fettweis suggested that developed technology should be first tested on unlicensed bands and then transferred to licensed bands to avoid unexpected failure or extra costs.

5G Ultra large cell session (afternoon session)

Chair: Gerhard Fettweis, Vodafone Chair Professor at TU Dresden, Germany, EU

Olav Queseth (Ericsson) discussed challenges and technology tools for designing ultra large cell. He also emphasized the importance of business model and policy to enable the technology to benefit the world. In his presentation, **Berge Ayvazian** (Wireless 20/20,USA) pointed out spectrum allocations at EU and US are not compatible with each other. Also US operators try to push the development of non-standalone 5G system in the 3GPP in order to enable early 5G deployment on the fixed wireless. On the other hand, no EU operator is willing to deploy such non-standalone 5G systems. Last, **Ari Pouttu** (University of Oulu) proposed to add 5G for remote area as additional slice to the well-known three 5G use cases. Also satellite could be one more slice to add to 5G. Most importantly, he envisioned the coming of micro-operator and sharing economy.

During discussion and panel session, experts from US (Henning and Berger) pointed out ultra large cell technology is not just for undeveloped and developing countries, as 30% of household in US have no high speed broadband. It is import to have local operators. In US, there were local operators long time ago and they failed. It is very import to study business model for good R&I. Experts from EU emphasize importance of support from policy makers. Henning then mentioned FCC has provided subsidies to Verizon for delivering coverage in rural area via LTE. It is important for 5G to differentiate itself with 4G. Berger also felt that US is isolating itself to the rest of world while EU works closely with other regions. Also he felt lack of leadership at the US side.

In the end the discussion highlighted that there different viewpoints on several technical issues at the moment; however, there are also common challenges which we can handled only if EU and US work together. In particular, experts from both EU and US agreed that the corner cases that have niche market and might not be very profitable, yet that are crucial to enhance equality of society and quality of life, can form a good technology theme for EU-US R&I collaboration.

Big Data

Research and Innovation Challenges and Opportunities for Transatlantic Collaboration – a US Perspective (morning session)

Chair: Nikos Sarris, Head of the ATC Innovation Lab, Athens Technology Center, Greece, EU

The first parallel session was chaired by **Nikos Sarris**, who opened the session and provided a short introduction of the speakers to follow. This session provided a complete overview of challenges and opportunities for transatlantic collaboration between US and EU, in the Big Data domain, given by US Big Data Innovation Hubs

and the National Institute of Standards and Technology (NIST). The first speaker was **Melissa Cragin** (Midwest Big Data Innovation Hub), who presented a clear overview of the Midwest Big Data Innovation Hub activities and priorities. Emphasis was given to Data science education and workforce development, which has been defined as the most prominent area for collaboration. The second speaker was **Meredith M. Lee**, (West Big Data Innovation Hub) who presented the research and application priorities and future activities of the West Big Data Innovation Hub to take place into the following months. The themes of data literacy and big data for transportations were highlighted as key areas for joint collaboration between EU and US. The third speaker to follow was **Lea Shanley**, (South Big Data Innovation Hub), who presented a complete overview of the South Big Data Innovation Hub activities and priorities while presented the key areas for collaboration between the EU and US. As noted, using Big Data for Smart Transportation and developing data literacy and data science capacity through education, training and workforce development have been defined as the two key areas for collaboration. The last speaker of this first session was **Wo Chang** (NIST), who emphasized more on Big Data technological challenges and issues which need to be jointly tackled by both regions. Emphasis was given to the need of jointly developed standards for Big Data which may unlock Big Data dynamics.

Research and Innovation Challenges and Opportunities for Transatlantic Collaboration – a European Perspective (afternoon session)

Chair: Nikos Sarris, Head of the ATC Innovation Lab, Athens Technology Center, Greece, EU

The second parallel session was also chaired by **Nikos Sarris**, who opened the session and provided a short introduction of the speakers to follow. This session provided a platform to discuss promising future directions for transatlantic collaboration in the Big Data domain, supported by statement talks by BDVA and Big Data Europe representatives. Moreover, an overview and analysis of EU and US research and innovation challenges and priorities, and collaboration barriers and opportunities that are identified in the opportunity report, were presented. The first speaker of this sessions, was **Sören Auer** (University of Bonn), who at that time was the Head of Enterprise Information Systems group in the University of Bonn. Sören provided a clear and detailed overview of the Big Data Europe platform and how this may be adopted by end users providing use cases both from EU and US. Moreover, emphasis was given to three possible technological priorities for collaboration between the EU and US: A Big Data Platform for societal good, Establishing data sharing and data value chains with the Industrial Data Space and Semantic Domain Models (vocabularies, ontologies) for establishing a common understanding of the data. The second speaker was **Andreas Metzger** (University of Duisburg-Essen and BDVA), who presented a detailed gap analysis from the perspective of the European Big Data Value PPP. The last speaker of the session, was **Vasilis Papanikolaou** (ATC Innovation Lab), who presented the Big Data opportunity report, describing drivers, needs, and EU and US research and innovation challenges and priorities, for both regions. The presentation ended with an overview of possible collaboration mechanisms and initiatives to promote EU and US collaboration in Big Data.

All presenters entered into a fruitful discussion with the audience from which it was clear that the areas of smart transportation, media and education were of very high priority for both regions. Lacking of joint funding mechanisms was also highlighted by all presenters as the main bottleneck for cooperation. However, the main outcome and key message of the Big Data session is that Big Data is and will remain in the forefront of research and innovation interest for both regions. Collaboration between the two regions is needed if we want to advance on Big Data and achieve maximum impact for the society and the public good. Adding to the above, the second Big Data session was followed by two Keynote speeches given by high representatives of NSF and BDVA (see below).

Keynote: R.T. Rybak, CEO, Minneapolis Foundation; former Mayor, Minneapolis, USA

During the lunch time **R.T. Rybak** gave an inspirational speech based on his experience of mayor in Minneapolis. In particular, it referred to the role of technology in transforming the government-citizen interaction, relationship and roles. Technology acts as enabler of governance models, global dialogue and empowerment. We have to look at it as challenge and opportunity to seize, as well as a solution. Of course, complexity has to be taken into account and analyzed. This include embracing fundamental questions regarding technology impact and questioning concepts that we now treat as unquestionable assumptions: the quantity of data or information we produce, or the rapidity we gain, for example, are not always good, or sign of societal improvement. We need to make the utmost out of the information we produce; in this context, control of information means being in degree to read them in a predictive and useful way.

Keynotes: EU and US Priorities and Opportunities in Big Data

The keynote session was divided into two parts: the first part was held by **Chaitan Baru** (NSF) on Harnessing the Data Revolution while the second one was held by Andreas Metzger (University of Duisburg-Essen and BDVA) on EU priorities and opportunities in Big Data. Chaitan gave a detailed presentation on the priorities and programmes of the NSF, while special focus was given on the application domains which are of high priority for the US. He concluded by providing a clear overview of the common opportunities and domains on which EU and US could jointly work on, with emphasis given on Smart Communities, Transportation and Health. Metzger presented both the technological and the application priorities of the Big Data Value Public Private Partnership (BDV PPP), where the private side is represented by the BDVA[1], an industry-led, non-profit association with over 180 members of all EU member states. The keynote provided details about the BDVA's and the Big Data PPP's actions and activities in order to provide a clear picture of the European status on Big Data, to the US audience. Emphasis was given to technical and non-technical priorities, application domains and strategic initiatives which may provide a fertile ground for collaboration between EU and US. Following to the two presentations, a fruitful discussion took place with the audience who expressed their views on joint collaboration opportunities on specific technological areas and domains while expressed their concerns regarding the lack of a joint funding mechanism which can act as a boosting enabler to enhance the collaboration between EU and US organisations on Big Data R&D&I.

Keynote: The Road to Safer, Cleaner and More Efficient Transportation for Future Smart Cities

Haydn Thompson (THHINK Group) provided the keynote speech that opened the session dedicated to Smart City Transportation Strategy. Thompson first draw the attention on hyper-connectivity, i.e. the increasing digital interconnection of people and things anytime and anywhere, which will bring to about 50 billion networked devices by 2020 and to profound social, political and economic consequences.

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[1] The Big Data Value Association (BDVA; www.bdva.eu) is an industry-led, non-profit association. The BDVA currently has 186 members (55% industry) from all 28 EU member states, bringing together key European stakeholders on Big Data. The BDVA represents the private side in the Big Data Value Public Private Partnership (BDV PPP). The BDV PPP is implemented through calls for projects (aka. actions) under the Horizon 2020 LEIT research and innovation programme (leadership in enabling and industrial technologies). The LEIT workprogrammes foresee yearly calls for proposals for projects related to the BDV PPP. The BDVA develops roadmaps for research and innovation (Strategic Research and Innovation Agendas – SRIA), which contribute to the shaping of EU Horizon 2020 workprogrammes.".

In order to get there, and to ensure a proper roll out of technology, three dimensions have to be tackled in parallel: the customer demand dimension; the technology development dimension; and the barrier (acceptance, privacy, legal) dimension.

Moreover, a number of open issues (such as privacy, or trust issues), trends, barriers, technology opportunities and societal needs need to be taken into consideration and tackled together:

- Increased urbanisation combined with increased instrumentation and interconnection. This include the problem of traffic congestion. Without integration of information and flow control systems, severe congestion is expected. On the other side, the global traffic management market is expected to grow from USD 4.12 Billion in 2015 to USD 17.64 Billion by 2020, with big opportunities.
- Safety: with the increasing numbers of vehicles being operated the probability of accidents and fatalities becomes a significant issue
- Emissions: Transport accounts for ¼ of all emissions
- Smart Cities: UK, Spain and Italy, have the largest number of Smart Cities – more than 30 each. There are more small smart cities than big ones.
- Car-2-Car Communication: Industry has been working for 10-15 years already on car-to-infrastructure and car-to car communications. A critical issue is the quality of the standard. This needs to work in all the member states and also worldwide, covering Europe, America, Japan, and China.
- Autonomous Car: Autonomous driving is seen as an important technology to make road traffic more secure and more efficient. The majority of the work is currently concentrated on technical solutions, e.g. processor architectures, sensor technologies, and data processing algorithms.
  The key challenge here is to make the technologies cheap enough for mass usage. The systems used on the Google Car, for instance, to make it fully autonomous currently cost $150,000. Another concern regards the coexistence of autonomous cars and traditional vehicles, especially under fault conditions. As a consequence, there is a need for intensive real-time monitoring of the performance of the systems to spot potential issues arising before they develop into accidents. This leads to other potential barriers such as the loss of drivers' privacy. Another issue linked to the development of predicting capacities in autonomous car environments is linked to different countries and different behaviors in the streets (e.g. crossing the street).
- Privacy: There are different attitudes to privacy across member states, and between the EU and the US. In general, it is difficult to roll out technologies across Europe compared to the US, where the approach is driven by business.

Existing Initiatives:

- The sustainable transport initiative; it covers road, rail and marine transport and has identified key routes. The only form of transport that is not covered is pipeline. It highlighted dramatic increase in both freight 35% and passenger transport 20% between 1995 and 2006.
- European Parliament and Council introduced the Directive 2010/40/EU in July 2010 on the framework for the deployment of Intelligent Transport Systems (ITS) in the field of road transport and for interfaces with other modes of transport.
- ERTRAC Strategic Research Agenda for Road Transport
- The *Smart Cities and Communities* European Innovation Partnership, as part of a broader effort by the EC to foster a new multistakeholder approach to EU research and innovation (to date, five European Innovation Partnerships have been launched).
- The United States Department of Transportation(DOT) launched a Smart City Challenge in December of 2015. This was targeted at mid-sized American cities (200,000 and 850,000 residents). The DOT awarded the winning city $50 million of funding to implement proposed ideas and create a model for other cities to follow.

Panel: Good Practices in Smart City Transportation Strategies – Their ICT Needs

Chair: Mark Spinoglio, Manager & Senior Consultant SPI S.A., EU/USA

This session was organized in collaboration with the EU-funded project BILAT USA 4.0 with the objective of validating smart cities and transport as topics of common interest between the EU and US, including suggestions for the future cooperation development in these areas.

The session was chaired and opened by **Mark Spinoglio** (SPI S.A.) who asked panelists to reflect on the major transportation/urban mobility priorities elaborated in EU and US smart city strategies, highlighting any different perspective, common priority, and/or any opportunity for R&I collaboration. He also asked the panel whether these priorities can be actually met through existing and emerging technologies, or if other innovations need to occur to tackle them. In his intervention, Mark Spinoglio also draw the attention on a relevant smart city initiatives, such as the Smart City Challenge launched in 2015 by DOT, and asking mid-sized cities across America to share their ideas for how to create an integrated, first-of-its-kind smart transportation system that would use data, applications, and technology to help people and goods move faster, cheaper, and more efficiently. He also stressed the need for the EU and US to twin and cooperate on Large-scale demonstrations of cooperative Intelligent Transport Systems (ITS).

The second speaker, **Frank Van den Bulcke** (Ghent municipality) stressed how the future of Transport policy shall focus on the quality of life of citizens and quality of movement for travelers, and this shall be enforced through a number of push and pull policy choices, encouraging and steering towards a modal shift, and explaining regarding the effects of choices on time. On the one hand, car drivers shall be pushed to more sustainable transport behaviors (through increasing parking fees in the center; giving more parking capacity, especially in the suburbs; and reduce traffic in city center, making it impossible to drive straight through the city); on the other hand, users shall be pulled to public transports, walking and cycling (through encouraging to park at park & rides; splitting parking garages into long-term parking and rotation parking; improving the walking, cycling and public transport routes and conditions). This has been done also through different price models, for people who have different possibilities. The use of Open data is highlighted as a way to share state of mobility information as well as to inform either citizens and visitors. In this type of action, there are transition phases that can generate discontent that has to be managed (e.g. it could be more difficult reaching some commercial exercises during the week; but very good affluence during the weekend); however, on the long-run the gaining in terms of life quality raises, in particular because people have more free-time.

Jaime Quesado (ESPAP –Portuguese Government Agency for Shared Services) centered his intervention on three main value dimensions that shall be underpinning a common agenda on transports: the mobility dynamics; the ICT effect; the competitive intelligence context.

Mobility dynamics values are based on the following:

- Intelligent Mobility is a Strategic Agenda envisaged by the City Government and executed and controlled by the Operational Divisions on a permanent collaborative way.
- Clusters of Mobility are developed in the Smart City with the engagement of different stakeholders in order to improve the standards of service provided to the Citizens.
- The New Mobility Solutions (Electric Car, New Bikes, New Public Transport) define a "collaborative ecosystem" that envisages a Trust Contract between the City and the Citizen.
- New Mobility Cities intend to be Open Spaces of Intelligent Quality of Life and an Effective Capability for Citizens to feel and contribute to the social and economic community context.

The ICT effect deals mainly with:

- ICT and Mobility Collaborative Agenda have different formal and informal solutions – the operational results and impacts will depend on the Innovation and Efficiency Value Effects.
- New Mobility Solutions in the Smart City Agenda demand an effective commitment from the Digital Citizen – in this sense, a roadmap for Effective Capacitation will make the difference.

- ICT has a "Push & Pull effect" on the Smart City commitment to the New Mobility Agenda – new solutions provide new answers and new problems demand new innovative ideas.
- ICT provides an open innovation challenge to the smart city new mobility agenda, bringing with it participation, contribution, network, design, intelligence.

Finally, with competitive intelligence context, we refer to the possibility of citizens to intervene in the process and in the "contract", through engagement and responsibility:

- Citizens want and demand better solutions for their global expectations – the City must develop Intelligent Platforms that provide an Operational Quality & Innovative Mobility.
- Energy Efficiency, Habitat Quality, ICT Innovation and Mobility Intelligence are the Key Drivers for a Smart City – the effective integration of these pillars is a challenge for everybody.
- Smart Cities are one of the platforms for an effective Open Society – with New Mobility Solutions Citizens preserve their Individual Capability in a Collective Collaborative Agenda.

The final speaker, **Ümit Özgüner** (Ohio State University), focused on the process of creating a vehicle-pedestrian interaction environment, highlighting the following:

- Main needs addressed by the scenario: 1) Scheduled or on-demand access to mobility for the mobility impaired; 2): Safe, reliable transport of individuals in dense pedestrian areas; 3) Safety and efficiency of intelligent vehicles surrounded by pedestrians in shared space.
- Projects exploring intelligent vehicles in shared space:
  - Auro: self-driving electric golf carts ferrying students on university campuses
  - LUTZ Pathfinder: driverless pods providing service on public streets
  - CityMobil2: a pilot platform for automated road transportation systems
- The projects studied simulated automated vehicles in vehicle-pedestrian interaction scenarios, considering different types of behavior and speed.
- The scenarios allow the testing of various vehicle control and path though planning algorithms; if necessary, characteristics of individual pedestrians can also be specified. Most importantly, this model has the potential of improving vehicle local motion planning algorithm in shared space, by providing societal pedestrian group behavior prediction.

Keynote: Massoud Amin, Director, Technological Leadership Institute, University of Minnesota, USA

The director of TLI, **Massoud Amin**, focused his speech on cybersecurity and cyber vulnerability. First, he identified 16 different industry sectors as critical infrastructure, 85% of which are in the private sector hands. To mention a few sectors: energy; emergency services; government facilities, transportation systems, water and wastewater systems, etc. Secondly, enumerated a number of key issues that are hampering protection, such as: inability to share information; increased cost of security; widely dispersed assets, owners and operators; empowering and training security personnel; commercial off-the-shelf controls and communications; siting constraints; long lead-time equipment. No optimal solution exists for this, but certainly a coordinate approach is needed. The presentation went on providing analytic tools and procedures to understand and tackle the issue in its complexity. First it was presented a vulnerability mapping, under the financial, strategic, hazard and operation point of view. Infrastructure interdependencies – physical, cyber, geographic, through financial markets – is another dimension to analyse, Taking as an example the Ukraine event, a number of mitigation measures were mentioned, as well as prioritization and assessment criteria. Mr Amin then highlighted the role of TLI in contributing to the challenge of shifting toward a smarter city and society, bringing some concrete intervention examples at the local and regional level.

The crucial role of the policy dimension was stressed, and in particular the need to build the necessary policy foundation that addresses legal, ethical, and defense in depth issues in assuring Local/State/National/Global

infrastructures. In particular, he stressed that long-term analysis of what technology, political and economic developments will have far-reaching repercussions for securing infrastructures and keeping them secure (with Economic Growth opportunities). The floor for discussion is open, and some questions remain to be discussed, among which: the right balance between liberty and security; which level of threat is the industry responsible for, and what falls under government responsibility; whether a market-based priorities support will be sufficient to guarantee secure cyber-physical critical systems; and finally, what system architecture is most conducive to maintaining security.

Day 2 – 20th of June 2017

Panel: Policy Implications of ICT

Chair: Maarten Botterman, Director GNKS, ICANN Board Director, Chairman IGF DC IoT, The Netherlands, EU

The second day of the Symposium was opened by introducing the policy dimension of ICT research, development and innovation. Research can be driven by policy and regulation, to which it has to comply; or, inverse situation, we can have policy measures driven by research and innovation discoveries and opportunities. This means that R&I doesn't take place in isolation: the results of ICT R&I affect society, and, in turn, what society wants and/or needs influences the interest and direction of ICT research.

This session was aimed at exploring in the first place how the EU and the US can progress best working together on a number of priority selected topics, such as: privacy & data protection; ICT security; and standardization. Secondly, the discussions focused on how these policy aspects affect the development of 5G Networks, Big Data, and IoT/CPS.

The session brought together PICASSO Policy Group experts, external policy experts, and Representatives of PICASSO Expert Groups' Technology areas. **Maarten Botterman** kicked off the session raising these three questions to the panel:

- What will 5G/Big Data/IoT-CPS ultimately bring to society?
- What can or should be done from a pre-competitive R&I perspective to achieve a more trusted ICT ecosystem? What not?
- What can or should be done from a policy perspective to contribute to a more trusted ICT ecosystem? What not?

The panel was composed by **Jonathan Cave** (Warwick University), **David Farber** (Carnegie Mellon University), by the representatives of PICASSO Expert Groups – **Yaning Zou** (TU Dresden), **Sebastian Engell** (TU Dortmund), and **Nikos Sarris** (ATC) – and finally by external experts – **Jim Clarke** (Waterford Institute of Technology, EU), **Glenn Ricart** (US Ignite), and **Dan Caprio** (The Providence Group, USA). Here are the conclusions of the discussion.

Privacy and cybersecurity aspects become more and more prevalent as the wider public is more and more confronted with these issues in news coverage and daily practice. When we look at the recent Wannacry cyberattacks using systematic vulnerabilities, the DYN DDOS attack using "stupid" connected objects such as CCTV or the many security breaches releasing user data it is clear that the stakes continue to go up. It is therefore important to realise the effects of what we are developing together: up and beyond the effect on income and GDP, it is about enhancement of life. In the digital age we live, solutions must enable the desired services and application, whilst respecting the EU and US privacy and data protection frameworks.

While it would be very difficult to harmonize the EU's GDPR (General Data Protection Regulation) in the US, panelists highlight the importance of trying to come up with an incentive scheme that would help companies to adopt the GDPR in other countries e.g. US, which would enable them to attract a larger EU-based market.

Challenges and opportunities are highlighted, such as the need to look at the innovative uses of technologies that are privacy protecting (e.g. blockchain; fintech), as well as the need to pursue "responsible research and innovation", without stifling innovation and economic growth, and without infringing the fundamental rights of the EU and US privacy and data protection frameworks.

Regarding opportunities for collaboration, they continue to arise. Panelists point out the EU initiative called the Next Generation Internet Flagship (NGI Flagship), which is stressing this redesign approach and basing the NGI on the "Internet for the Humans", and the US initiative called Beyond the Internet.

The panel was finally closed with an optimistic view by **Maarten Botterman**: "towards the future EU and US research will find a way forward that takes our values and ethics into account, becoming more and more focused on "quality of life". Maybe it is time to let go of the strive towards "competitiveness" and find each other in a way forward that serves society, recognizing the Europe and the United States continue to have much in common".

Keynote: Digitizing Europe's Industry: Policy, Research & Innovation Measures

Christoph Runde, Project Development Coach for European Union Intelligent Manufacturing Systems (IMS), explained in his presentation why manufacturing matters in the complex global economic system and can be considered as the heartbeat of EU's Econocmny. Manufacturing amounts for 16% of EU GDP, 20% of direct jobs and twice as many indirect jobs, and for 66% of private EU R&D+I investments. Indeed, the specific sector of Hitech & Medium-Hitech Manufacturing is growing, due to R&D+I, and so is the share of ICT specialists employees, on the total of EU employees. Key to manufacturing innovation and value is the investment on KET (Key Enabling Technologies – as defined by the EC) research. Europe holds a strong position in these science outputs, and EU actors are at the top of patent ranking in each KET. However, there is a gap between the technology base & the manufacturing base, that is why current efforts need to be complemented by product development (including effective demonstrators) and development of manufacturing expertise. And which are

the ingredients to advance manufacturing? The first is innovation, in order to overcome *the valley of death*; then we have advanced technologies (e.g. predictive analytics, advanced materials, smart factories, HPC, augmented reality, open-source design, etc.); finally, we need the right policy mix, with market and government joining forces to create the right enabling conditions in terms of, for example, legal and regulatory system; education and physical infrastructure; economic, trade, financial and tax system; energy policy; local market attractiveness.

The presentation then described all EU initiatives to support manufacturing R&D in Europe as of FP1. In particular it focused on the most recents: FoF (Factory of the Future) and Factory 4.0, explaining the shift from digitising factories to digitising industry. Three are the dimensions through which digitization is creating value: 1) innovation of all types of products ("digital inside"); 2) digital transformation of processes; 3) radical/disruptive changes in business models. New industrial environments embed all the previous dimensions. Moreover, it will be based on a platform concept.

A platform is based on three dimensions: applications; platform/operating systems; sensors/connection with the physical world. The speaker presented then a number of open platforms and of coordinated national initiatives. As a vision for the future, the *EFFRA Recommendations: Factories 4.0 and Beyond* (Sept 2016) was mentioned, together with the PPP FoF Digital Industrial Platform Projects, aimed at connecting manufacturing services through platforms, building on running platform initiatives and integrating digital technologies. The emphasis here is on aligning R&D&I initiatives on digital industrial technology platforms and on large-scale integration.

Parallel Sessions

The morning of the second day also hosted a number of sessions resulting from the collaboration between PICASSO and the EU-funded project Bilat USA 4.0, and from the call for sessions launched by the project PICASSO.

Panel: Smart Transportation and ICT: Topics for Collaboration

Chair: Latif Ladid, Founder & President, IPv6 Forum & Research Fellow, University of Luxembourg, EU

Building on the technical sessions conducted earlier in the agenda, this plenary connected policy with technology in the smart city transportation area by highlighting the successful applications of ICT in support of smart transportation, providing insights on current developments and strategies both in the EU and the US, and finally highlighting new opportunities of collaboration between the EU and US in smart transportation.

Latif Ladid opened the sessions with remarks on the evolution of internet, from Arpanet, through internet, up to the new Internet based on IPv6 (Internet Protocol version 6) which is the IP Protocol to use to scale the Internet to a Global Internet to cater for addressing Internet of Things, Smart Grid networks, 4G and to be used exclusively for 5G deprecating the use of IPv4 and NAT (Network Address Translation). Panelists were then requested to develop remarks in response to the below questions:

- What emerging technology areas/trends (topics) represent opportunities for innovation in smart transportation/urban mobility for the EU and/or the US?
- Do the emerging smart transportation technology areas/trends offer opportunities for EU-US cooperation in RDI?
- What kinds of standards related to smart transportation, which are 'work in progress', are in need of global harmonization and alignment to achieve economies of scale?
- What are the main barriers for developing EU-US RDI cooperation related to the emerging technology areas/trends?
- What should be taken into consideration in order to successfully establish EU-US RDI cooperation related to the emerging technology areas?
- Finally, are there any large-scale pilots in smart transportation that are worth highlighting to support responses to the above questions?

Álvaro Oliveira (University of Aalto) gave a complex analysis on future urban scenarios, elaborating on smart transportation scenarios, smart mobility trends, new urbanism, human smart cities, urban living labs and participatory methodologies and open platform and technologies. The concept of human smart city was the core of the presentation, since the social context is essential for any technology deployment. The founding assumption is that smart cities differ from human cities, since looking at the cities from the smart point of view means looking at what technologies can improve. The human factor brings with it other consideration than the technical feasibility ones, requiring to take into consideration trends, behavior transformation aspects, enabling ecosystems, collaborative methods, and open platforms and of course user involvement and user-generated data and applications.

More precisely, the Human Smart Cities are defined as open-minded eco-systems (Living Lab Urbano) focused on people (Social Inclusion), which promote wealth and job creation (Economic Development) in a green economic model (Environmental Sustainability). In a Human Smart City Municipal Government, urban planners, universities, technology-based companies and financing institutions are organized in a dynamic and innovative ecosystem (Top Down Support) with a vision for the future. Citizens are involved in identifying need, creating new services, prototyping (Bottom-up), and agents of transformation. Large, medium and small companies are creating agents of new services and processes. Urban Living Lab contributes to creating and locating knowledge as well as generating wealth. In a Human Smart city technologies are tools to support the generation of knowledge communication. In summary, the human smart city has three main pillars: Technology innovation, Democracy innovation, and Social innovation.

A concept is proposed for EU-US cooperation, including in particular the proposal to establish a joint EU-USA initiative for Human Smart Cities in the format of a *Human Smart Cities Institute* covering all the relevant and important specific aspects for EU-USA countries: vision, strategy, common objectives and R&I program, policies, technologies, methodologies, applications and services. A policy to exchange actively best practices and create mechanisms to foster a long-term collaboration between EU and US shall also be adopted.

Andreas Metzger's (University of Duisburg-Essenand BDVA) presentation focused on the value of Big Data in transportation. Big Data is expected to lead to 500 billion USD in value worldwide in the form of time and fuel savings, and savings of 380 megatons CO_2 in transport and logistics. Most important innovations and improvements are expected in terms of operation efficiency. The following are the main opportunities, standards and barriers existing between the US and EU:

- Opportunity: open data. Data sharing via joint "EU-US Data Portal". Cross domain data sharing is another opportunity (e.g. between electric mobility and energy distribution).
- Emerging Standards: for Data Sharing and Integration (DCAT; NETEX/SIRI; OASC)
- Barriers: Data Protection Concerns. In terms of data it has to be noted that non-personal/commercial data (speed of transportation, containers, etc.) amount for the 68% of the entire data sources, while personal data is only 1% of the data we have.

The presentation went on and closed with a panoramic on current funded large-scale pilot projects on big data.

Berge Ayvazian (Wireless 20/20) in its intervention highlighted the following points regarding 5G research. First of all, the US and EU are on parallel and not intersecting tracks in 5G. There is competition and interests ongoing regarding who is ahead of whom, while standardizing and harmonizing 5G is not a priority at the moment, also because 5G standards are still a work in progress.

Speaking about bandwidth, 600 MHz is considered as beach front property, since it penetrates buildings. At the moment, Europe and US are utilizing different bands in several cases, and there is no harmonization in bands between the US FCC and Europe. An opportunity would be to identify a harmonized spectrum for 5G. Policy, however, will differ, as in US it will rely less on auctions and more on sales of bandwidth. Operators do not want to share a spectrum.

Some hints of cooperation are identified in the efforts to conduct large scale pilots in commercial areas such as automotive. There will be intercontinental cooperation between car manufacturers, and hopefully smart transportation will create interest in harmonization.

The open discussion with the participants that followed the individual presentations can be summarized as follows.

- What are the main factors in success in collaboration - the technology or the human factor?

From the technology point of view, there is a need for the best technology. But a strong leadership vision is needed, which the mayors of the cities must provide. You need the human decision to move forward to a pilot project and then to full implementation.

- In Europe 97% of transport companies have 10 trucks or less, without any economy of scale. How do we propagate this down to everyone else and show the benefits to people?

Training is a good way to get this technology down to the individual level. This is exactly why we need publicly funded projects to get this to the smaller users. It is not to the benefit of the large companies to share this knowledge. We shall try to solve issues with the human knowledge not with technology. One of the panelist mentioned that with the Smart City Challenge the US Government invested around 30 million Dollars. US government partnering with US ignite is a model that can be used elsewhere. Community and city policy, regulation, and practice are important to smart cities. There is a need for technologies that are policy capable, not policy restrained.

- In 10 years how do you see the developments in your field?
  - The future will be based on data based decisions. At the individual level, data will orient our decision making for things like mode of transport or impact on carbon footprint.
  - We need to start thinking on how to bring the human element back into the discussion and the experience, exploring the human motivation behind their transportation decisions.
  - One of the major trends is the convergence of infrastructures, while US policies are centered around isolation of the infrastructures (e.g.: tax and regulatory topics are structured around infrastructures). However, the interdependencies between them are becoming more important, and this will disrupt a lot of business and government models. There is not a department of smart cities.
  - Cities need to look at self-sustaining mechanisms so we do not have top down decision making that changes every four years. There is a need for a bottom-up approach.

Clean Energy in Minnesota and Beyond

Chair: Gregg Mast, CEEM, USA

This session dealt with the vast opportunities for collaboration across key stakeholder groups that arise from the rapid transition to cleaner and more sustainable energy solutions. Different experts that are leading this transformation in Minnesota, the Midwest, and globally shared their unique insights in this session. The session took the form of an informal round-table discussion between the chair and the three panelists: **Steven Webster** (Cleantech Open Midwest), **Ravi Pradhan** (Siemens Digital Grid Software and Solutions) and **Deepinder Singh** (75F) discussed about the role of ICT technology, market participants, and policy measures that are necessary for harnessing this opportunity now and into the future. One of the key messages that came out from the discussion is the importance, in terms of EU-US collaboration, to widen at this stage the range of interlocutors beyond researchers, including accelerators.

Intelligent Manufacturing Systems: Prospects for International Collaboration

Chair: Dan Nagy, Managing Director, IMS, USA

The session, chaired by **Dan Nagy**, was the occasion to present the philosophy and the new opportunities for transnational collaboration on advanced manufacturing offered within the IMS framework. In particular, IMS showed the methodology used to attract over 30 projects to its first cluster in Additive Manufacturing.

IMS is an industry-led, international business innovation and research and development (R&D) program established to develop the next generation of manufacturing and processing technologies through multi-lateral collaboration. They provide global services to institutions from their supporting regions, including the European Union, Mexico, South Africa, and the United States of America. Starting from 2018, also South Korea will be associated. These services include international consortium building and coaching services provided at no charge to researchers from member countries, a listing of projects seeking partners, and a project database with valuable research information.

Steve Ray, IMS Project Development Coach, presented the new Project Clustering Programme started by IMS addressing especially Industry 4.0. The programme focuses on clustering and harvesting ongoing activities, exploring together how to solve bigger common problems. In particular, the IMS Project Clustering Platform facilitates on-going projects to share knowledge, provide broader solutions in less time, reduce research costs, and expand networks through building of international coalitions. Possible outcomes include combining and collaborating project research activities. IMS selects a member region to lead each cluster and its activities.

Nine technological trends umbrella topics have been identified to start the clustering activities, and among them, the next actions will be taken on IoT and Advanced robotics. On these two areas, IMS will work as Facilitator, organizing regional and international workshops by the end of 2017. The past edition that took place last year in Barcelona was focused on Additive manufacturing.

The presentation then focused on other processes activated by the IMS network. Through the IMS network, the thirty-nine projects shared their exploitable results and respective TRL levels with each other. Prior to the meeting, IMS asked the projects to rate their interests in other projects. When these interests were analyzed by IMS, several possible project clusters became apparent. Because some projects expressed interest in multiple projects, yet most were represented by only one person, a methodology was applied to the workshop to help participants narrow their choice to one project. Using a methodology and materials developed by the IMS team, the participants self-assembled into clusters, and each cluster then identified its members, leadership, goals and objectives, and work plan.

IMS is also a premier sponsor of the World Manufacturing Forum where high-level government officials and industry executives discuss issues and solutions to challenges in manufacturing. The next edition will be held between the 7th and the 9th November 2017 in Monterrey, Mexico. All information can be found on the website www.worldmanufacturingforum.org.

For the future, the WMF events will have a stable location: Villa Erba in Cernobbio, on the Como Lake. This will allow a stable collaboration and a location that can become the icon of the future of manufacturing.

Panel: Best Practices for Academic/Industry Collaboration in Smart Cities

Chair: Anne Bowser, Senior Program Associate, Woodrow Wilson International Center for Scholars, USA

The goal of this session was to bring together academic and industry actors from the US and EU to discuss effective practices for supporting academia-industry cooperation in smart cities. Objective of this panel was to enhance our knowledge of academia-industry cooperation in the US and the EU, highlighting the benefits of it, and sharing information on opportunities for future exploration.

Anne Bowser opened the session presenting the BILAT Report on Academia-Industry Collaboration Support Schemes and their Openness for International Cooperation. A number of experiences were presented afterwards.

Haydn Thompson (THHINK Group) discussed 30 year experience of running joint research projects around the world. His presentation considered the business opportunities in Smart Cities, cultural differences between Industry and Academia, and respective drivers for collaboration. The talk also addressed the need to match expectations highlighting what is required and approaches to successful collaboration. The second experience was introduced by **Laura Morgagni** (Turin Wireless Foundation). Focusing on public administrations in cities, Morgagni discussed the impact of innovation-based development and collaboration between private companies, cities, and academia. Collaboration, which promotes the continuous exchange of ideas, projects, and resources, is mandatory for cities to achieve clear and long-term goals of a smart city. These objectives shall then be re-oriented, if needed, through monitoring. Focusing on the case example of Torino City from SMILE Master Plan to EU projects and Living Labs, Morgagni elaborated on the impact of innovation-based development, from how it can develop new processes and services within the organization to promoting 'innovation ecosystems' where different players cooperate along the innovation value chain. The panel was closed by **Jason Vargo** (University of Wisconsin-Madison), who brought the experience of his institution. In 2015 the UniverCity Alliance was formed to make the University of Wisconsin-Madison a leader, innovator, and contributor in improving the sustainability, resilience, livability, and general well-being of the places we live. The Alliance oversees multiple initiatives focused on education, technical assistance, and new research. UW-Madison partners with government and industry to cultivate new interdisciplinary collaborations on campus while producing utility for communities well beyond its walls. Vargo also discussed some of the ingredients to the Alliance's early successes.

To the question on the benefits of EU-US and academia-industry collaboration in Smart Cities, the panel highlighted how each different Smart city market has complementary strengths. For example, the US is good with data aggregation; the EU is good with supporting applied research to develop new technologies. Similarly, the EU emphasizes responsible innovation while the US is more focused on unchecked growth. Collaboration could help each share data and technologies, while realizing that responsible innovation is possible without stifling growth. Moreover, cooperation in the smart city sector, would have the benefit to increase global competitiveness for each party; give the possibility to test/ validate research and technologies findings with a range of stakeholders and in different markets; access to new and diverse markets; and finally benefit from shared interest and a common threat around values like security and privacy.

The panel then offered three strategies for ensuring goals were clear, and negotiated effectively: (1) Establishing trust between parties; (2) Establishing clear goals, definitions and a plan of action; and, (3) Providing visible leadership and a clear point of contact. The panel also advocated for the value of an agile, user-centered approach.

To the question on which policies effectively encourage collaboration between the EU and US, and between academia and industry, all panelists agreed that money is a key enabler. Regarding EU-US cooperation, here are the approaches listed as better enablers: Bilateral agreements between Member states and the US; Exchange of students, e.g. through Marie-Curie; Embracing shared grant challenges, such as autonomous vehicles; Data sharing, especially in the context of smart cities; Joint EU-US projects, where one partner will be funded later if the first partner is successful (e.g., no required harmonisation of call timing); LEIT, where academic/industry partner on the EU side is joined by an academic/industry partner on the US side funded by a granting agency like NSF or industry. Regarding existing sector specific bilateral agreements (for example, between the EC and NIH on healthcare), these have been deemed necessary, because of the US funding structure, and because different sectors will have different levels of and mechanisms for cooperation driven by different US agencies.

Concerning Academia-Industry Cooperation, panelists suggested that collaboration could be more strongly supported by modifications to existing funding mechanisms. For example, in cases where existing support schemes already encourage academia-industry cooperation in the US or the EU, many of these could be opened to international participation.

Attention was given to privacy, as another potential barrier to cooperation. For example, the EU and the US have different policies and norms when it comes to consent. A few European partners believe that recent US data

breaches involving leaks of personal records would not have happened in the EU, due to stronger policies for informed consent and data aggregation. For better EU-US cooperation, there needs to be harmonization in the general approach and also in specific laws. The limited shared understanding of what privacy means makes it difficult to know how to treat it. Will privacy be addressed through a systems-level approach, as with privacy by design? Or will privacy be treated as an individual decision? The EU's forthcoming General Data Protection Regulation (GDPR) is going to be very difficult if not impossible to comply with. But it's serving an important function within companies, who are forced to do things like data mapping and data governance work. GDPR may become a sort of de facto global standard that is focused around compliance.

Another perceived barrier to collaboration between Academia and Industry, as well as to EU-US, is IPR, which is still perceived by the industry as an impossible hurdle.

Finally, the panel selected the following areas as the ones where there should be high-level policy support and funding for the EU and US to cooperate on cross cutting issues: (1) standards and interoperability, (2) intellectual property, (3) cybersecurity, and (4) privacy and ethics. In all of these topics both public and private interests should be considered.

Panel: Perspectives on EU/US Collaboration in ICT

Chair: Tariq Samad, Senior Fellow and Honeywell/W.R. Sweatt Chair in Technology Management, Technological Leadership Institute, University of Minnesota, USA

Focus of the closing session was identifying obstacles to, and offering constructive recommendations for, more effective EU/US collaboration in ICT, especially IoT/CPS, Big Data, and 5G Networks, highlighting key insights from the previous technical and policy sessions of the symposium. The closing panel was formed by the four chairs of PICASSO expert groups, PICASSO coordinator, PICASSO project officer at the European Commission, and representatives from the US NSF, and NIST.

Tariq Samad kicked-off the discussion through a series of reflection points, to which a round table followed:
- What are three sticking point on the policy front?
- What are the obstacles?
- What are the most promising opportunities?
- Do you have any specific plans for the future of PICASSO?
- What do you recommend to foster new partnership in ICT between EU US?

Maarten Botterman (GNKS) stressed the need for leadership, so as for a clear long-term vision on policy, and a clear framework for responsibility. Technology makes sense if based on values – such as, for example, ethics – and perhaps the EU and US shall work on recognize and become aware of these common values, to better align and improve their ICT collaboration.

Chaitan Baru (NSF) spoke about the huge opportunities in the field of data, with also a clear history of existing interaction (a joint project with Finland was mentioned at this regard). However, what is needed is a more structured relationship, for example a big data programmes.

Chris Greer (NIST) shared a number of successful examples of EU-US collaboration, notably on cyberphysical systems, software sharing, and smart cities, underlining that collaboration between the US and the EU can be highly successful when there is a clear, technical focus. NIST collaboration with the FIWARE foundation on software systems for cyberphysical system testbeds, is one of these examples, together with other very successful, and focused, collaborations on a volunteer basis. Another example is the collaboration with the Italian agency ENEA (Italian National Agency for New Technologies, Energy, and Sustainable Economic Development) on a framework for harmonizing smart city technologies. He also stressed how these initiatives are usually more successful where the European Commission and member states are supportive. From the US side, US agencies are generally involved in a sector by sector basis, reflecting the nature of the respective agency missions.

Sebastian Engell (TU Dortmund) highlighted how scientific collaboration is easier than the innovation. This is true not only within EU but also between the EU and US. For example, the EU funding system is very strong in supporting excellent precompetitive collaboration between academia and industry, which guarantees a real-work involvement of academia in project. However, industry still needs to get access to existing knowledge, and to people. This would be certainly relevant also for the US. He then perorated for an active, direct and real presence of US partners projects, with support, in order to allow industry to get real access to the problems.

Nikos Sarris (ATC) stressed how in Big Data common problems were very easily identified since there are some very actual and pressing issues, for both sides from the Atlantic. This represents indeed a great opportunity and a good momentum to seize in order to work together, also given the enthusiasm perceived in the US colleagues.

Gerhard Fettweis (TU Dresden) pointed out how, concerning 5G, that we are dealing with an internationally competitive area. Network are international by definition, so we do not necessarily need to know each other. But it is interesting to understand which areas are underserved or unaddressed in the way they should be, either in the US or in the EU. At this regard, we identified three topic that are too nichy to justify any investment, both in the EU and in the US. Therefore, there is room to join force in join projects, and perhaps jointly we can come up with a solution that after can also serve Africa or South America. In terms of methods, we have to find ways not only to meet, but also to make research. Currently private companies are disadvantaged in EU funding programmes, compared to academia, with only 70% of funding.

Jean-Yves Roger (European Commission) brought the point of view and data of the European Commission. Over 900 EC-funded projects include US organizations, which makes EU-US cooperation very important. However, additional efforts have to be done to ensure easier cooperation. One of the measures proposed is based on fostering flexibility, in particular through the new implementation agreement that has come into force since February 2017. But other tools are equally important, as for example the agreement with NIH, where EU organizations receive automatically funding.

Svetlana Klessova, PICASSO coordinator, concluded stressing the importance of this reflection occasions, such as the symposium, where strategic thinking can be done.

Conclusions, Path Forward and Adjournment

A closing panel drew main conclusions out of the two-day symposium. Here are their key messages as reported by PICASSO Expert Group chairs:

- In the cyber-physical systems area, Human interaction dynamics are a central topic for future research. Joint R&D in the transportation sector stands out as almost mandatory in this area.
- From the policy and regulation point of view, sharing data shall become easier cross border – since we share a legacy.
- In the 5G area, three topics have been identified as important for both EU and US sides, but they can be addressed only jointly, since they are to nichy to be able to attract investments. In the remaining time of PICASSO, we shall work on how putting these ideas into a framework, in order to push and address these identified topics. Other topics show the inverse situation: the needs are the same, but if we intensify joint efforts and the network, there will be no gain.
- In the Big Data area, skills are a major issue. New professions can and must be created, generating new jobs. We shall work very hard towards educating new generations to get the most of opportunities, and in the most ethical way, out of these space. There is a clear shared interest in this area, and reasons to be optimistic on future collaborations.
- We need to reflect on what is *smart.* This word is losing its meaning, and we shall work a roadmap and taxonomy for defining *smartness*.
- We shall be able to combine different dimension thinking, addressing the levels of core technology, of policy aspects, and of the application domain altogether. These levels have different requirements and characteristics in many ways, and complexity shall be taken into account.

- We shall reflect on the capacity to help people realize their objectives through cooperation mechanisms, while fostering a multidisciplinary approach and supporting the way policy and technology work interact with each other. The symposium is a first step to reflect on lessons learnt and on how continuing to work together better. Most importantly, a contact with agencies shall be sought to promote further discussion on different thematic, which shall result into joint projects and joint research.

4.   Key Messages and Outcomes

The following are the key messages that have been selected as priority messages and actions out of the different sessions, or that have been stressed more often during the discussions. They are ordered by area.

CPS / IOT

In the IoT/CPS sectors, human interactions, trust and (cyber-)security, and model-based systems engineering are central topics for future (collaborative) research and innovation. New challenges emerge e.g. at the interface between cyber and physical components and the Internet of Things (and their joint design) and on collaborative aspects and the incorporation of humans from the start in these systems.

A key conclusion from the parallel sessions is that the IoT in the EU is beyond the research phase, moving into the innovation phase. There will be soon a pruning of solutions coming into a mature phase, and only some of these will survive. IoT will act, thus, as an enabling technology for CPS. In particular, joint R&D in the transportation sector stands out as almost mandatory in this area.

In terms of EU/US collaboration, however, it is to be stressed how scientific collaboration is easier than joint innovation. In the innovation phase, indeed, solutions have to show to be fulfilling a number of needed security and safety requirements, and it is an important open issue how this can be solved.

Big Data

Sessions easily identified some very actual and pressing technological challenges and issues which need to be jointly tackled by both regions, if we want to advance on Big Data and achieve maximum impact for the society and the public good. In terms of challenges, the lack of joint funding mechanisms was highlighted by all presenters as the main bottleneck for cooperation. However, the main outcome and key message of the Big Data session is that Big Data is and will remain in the forefront of research and innovation interest for both regions.

Emphasis was given to the need of jointly developed standards for Big Data which may unlock Big Data dynamics. Two are the key areas for collaboration in the Big Data area: 1) Big Data value in transportation is increasing, being of great importance to the smart cities strategy; 2) Skills are indeed a major issue, to be tackled by developing data literacy and data science capacity through education, training and workforce development. New professions can and must be created, generating new jobs. We must work very hard towards educating new generations to get the most of opportunities, in the most ethical way, out of these space. There is a clear shared interest in this area, and reasons to be optimistic for future collaborations.

5G Network

The discussion highlighted that there are different viewpoints on several technical issues at the moment; however, there are also common challenges which we can handled only if EU and US work together. In particular, experts from both EU and US agreed on three topics that are important for both sides, although are too *nichy* to be able to attract investments, both in the EU and in the US. Yet, these topics are crucial to enhance equality of society and quality of life, and can form a good technology theme for EU-US R&I collaboration.

In the remaining time of PICASSO, we shall work on how putting these ideas into a framework, in order to push and address these identified topics. Other topics show the inverse situation: the needs are the same, but if we intensify joint efforts and the network, there will be no gain.

Smart Cities, Smart Energy, Smart Transport

We need to reflect on what is smart. This word is losing its meaning, and we shall work a roadmap and taxonomy for defining smartness. In particular, we shall be able to combine different dimensions, addressing the levels of core technology, of policy aspects, and of the application domain altogether. These levels have different requirements and characteristics in many ways, and complexity shall be taken into account.

Future urban scenarios were analysed taking into account their complexity, elaborating on smart transportation scenarios, smart mobility trends, new urbanism, human smart cities, urban living labs and participatory methodologies and open platform and technologies. The concept of human smart city was stressed, with different wording, in more than a presentation, since the social context is essential for any technology deployment.

The role of technology as enabler of governance models, global dialogue and empowerment was stressed. As an enabler, we have to look at technologies as solutions and opportunities, but also as a complex challenge. This include embracing fundamental questions regarding technology impact and questioning concepts that we now treat as unquestionable assumptions: the quantity of data or information we produce, or the rapidity we gain, for example, are not forcedly good, or sign of societal improvement.

The use of open data is highlighted as a way to share state of mobility information as well as to inform either citizens and visitors. In this type of actions, there are transition phases that can generate discontent that has to be managed (e.g. it could be more difficult reaching some commercial exercises during the week; but very good affluence during the weekend); however, on the long-run the gaining in terms of life quality raises, in particular because people have more free-time.

Regarding the benefits of EU-US and academia-industry collaboration in Smart Cities, the panel highlighted how each different Smart city market has complementary strengths. Three strategies were offered by the panel to ensure that goals are negotiated effectively: 1) Establishing trust between parties; 2) Establishing clear goals, definitions and a plan of action; and, 3) Providing visible leadership and a clear point of contact. The panel also advocated for the value of an agile, user-centered approach.

In terms of EU-US collaboration opportunities in the energy sector, it was stressed how at this stage, it is important to widen the range of interlocutors beyond researchers, including accelerators.

Policy Issues

The importance of policy was stressed throughout different sessions. Policy and research are intrinsically linked, since research can be driven by policy and regulation, to which it has to comply; or, on the contrary, we can have policy measures driven by research and innovation discoveries and opportunities.

In general, however, technology makes sense if based on values – such as, for example, ethics – and perhaps the EU and US shall work on recognize and become aware of these common values, to better align and improve their ICT collaboration. That is why technology cooperation initiatives are usually more successful where the EC and MS are involved. The right policy mix is that where market and government are joining forces to create the right enabling conditions in terms of, for example, legal and regulatory system; education and physical infrastructure; economic, trade, financial and tax system; energy policy; local market attractiveness.

The main sectors which were analysed as closely depending on policy foundations are:

- Infrastructures: solid policy foundation shall addresses legal, ethical, and defense issues in assuring Local/State/National/Global infrastructures. In particular, technology, political and economic developments will have far-reaching repercussions for securing infrastructures and keeping them secure (with economic growth opportunities).

- Privacy: there are different attitudes to privacy across Member States, and between the EU and the US. Privacy can be seen as a potential barrier to cooperation. For example, the EU and the US have different policies and norms when it comes to consent. As a consequence, it is sometimes difficult to roll out technologies across Europe compared to the US, where the approach is driven by business. However, from the policy and regulation point of view, an easier environment for data cross border shall be envisaged, since we share a legacy.

- Cybersecurity: no optimal solution exists for the many challenges connected to cybersecurity, but certainly a coordinate approach is needed. Some questions remain to be discussed, among which: the right balance between liberty and security; which level of threat is the industry responsible for, and what falls under government responsibility; whether a market-based priorities support will be sufficient to guarantee secure cyber-physical critical systems; and finally, what system architecture is most conducive to maintaining security.

- Regarding opportunities for collaboration, they continue to arise. Panelists point out the EU initiative called the Next Generation Internet Flagship (NGI Flagship), which is stressing this redesign approach and basing the NGI on the "Internet for the Humans", and the US initiative called Beyond the Internet.

Measures to Support Cooperation

Regarding which policies effectively encourage collaboration between the EU and US, and between academia and industry, all panelists agreed that money is a key enabler, together with other approaches and measures, such as: bilateral agreements between Member States and the US; exchange of students, e.g. through Marie-Curie; embracing shared grant challenges, such as autonomous vehicles; data sharing, especially in the context of smart cities; joint EU-US projects, where one partner will be funded later if the first partner is successful (e.g., no required harmonisation of call timing); the LEIT programme, where academic/industry partner on the EU side is joined by an academic/industry partner on the US side funded by a granting agency like NSF or industry.

Regarding existing sector-specific bilateral agreements (for example, between the EC and NIH on healthcare), these have been deemed necessary, because of the US funding structure, and because different sectors will have different levels of and mechanisms for cooperation driven by different US agencies.

Additional efforts have to be done to ensure easier cooperation. One of the measures proposed is based on fostering flexibility. Moreover, the need to allow financial support for US organizations participating to H2020 was stressed several times.

Annex

Agenda

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Day 1 · 19th of June 2017

08:30 – 09:15	**Opening Session** - **Eric Kaler**, President, University of Minnesota, USA - **Jean-Yves Roger**, European Commission, Belgium, EU - **David Corman**, Program Director, National Science Foundation, USA - **Gabrielle Gerbaud**, Executive Director, Minnesota Trade Office, USA - **Tariq Samad**, Chair of the Symposium, TLI, University of Minnesota, PICASSO project partner
09:15 – 09:50	**Keynote: The Intersection of IoT and CPS as a Force for Progress** **Chris Greer**, Senior Executive for Cyber-Physical Systems, National Institute of Standards and Technology, US Dept of Commerce, USA
09:50 – 10:25	**Keynote: 5G as an Enabler for Tomorrow's Smart Society** **Henning Schulzrinne**, Columbia University and Federal Communications Commission, USA
10:25 – 10:50	**Break**
10:50 – 12:00	**Parallel Sessions on Emerging ICT Areas** **IoT/CPS: Convergence of IoT and CPS for Smart and Dependable Socio-technical Systems** **Chair: Sebastian Engell, Professor, Head of the Process Dynamics and Operations Group (DYN), TU Dortmund, Germany, EU** The ubiquitous connectivity provided by the Internet of Things will "close the loop" in cyber-physical systems 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. In this session, three technical talks will provide insights into current technology developments, challenges, and trends at the convergence of the Internet of Things and cyber-physical systems. - **John Baras**, Professor, Lockheed Martin; Chair in Systems Engineering, University of Maryland; Director, Maryland Hybrid Networks Center, USA - **Rolf Findeisen**, Professor, Head of the Institute for Automation Engineering (IFAT), Otto-von-Guericke University, Germany, EU - **Ovidiu Vermesan**, Chief Scientist, SINTEF Digital, Norway; Chair, European Alliance for Internet of Things Innovation (AIOTI), EU **5G Networks: 5G Small Cell Technologies** **Chair: Gerhard Fettweis, Vodafone Chair Professor at TU Dresden, Germany, EU** To achieve high capacity and improved coverage in the 5G network, the importance of small cell technologies has been highlighted both in the EU and the US. In this session, leading experts in the area will discuss key technology solutions and deployment scenarios of the 5G small cell, and then look beyond current development and towards strategy forward both in the EU and the US. - **Georgios Giannakis**, ADC Chair Professor, University of Minnesota, USA - **Amitava Ghosh**, Nokia Fellow and Head of Small Cell Research, Nokia Bell Labs, USA **Big Data: Research and Innovation Challenges and Opportunities for Transatlantic Collaboration – a US Perspective** **Chair: Nikos Sarris, Head of the ATC Innovation Lab, Athens Technology Center, Greece, EU** This session will provide a complete overview of challenges and opportunities for transatlantic collaboration between US and EU, in the Big Data domain, given by three US Big Data Innovation Hubs and NIST. - **Melissa Cragin**, Executive Director, Midwest Big Data Innovation Hub, USA - **Meredith M. Lee**, Executive Director, West Big Data Innovation Hub , USA - **Lea Shanley**, co-Executive Director, South Big Data Innovation Hub, USA - **Wo Chang**, Digital Data Advisor, National Institute of Standards and Technology, USA
12:00 – 13:10	**Lunch**
12:30 – 13:00	**Keynote: R.T. Rybak, CEO, Minneapolis Foundation; former Mayor, Minneapolis, USA**

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12:30 – 13:00	Keynote: R.T. Rybak, CEO, Minneapolis Foundation; former Mayor, Minneapolis, USA (Johnson Great Room, McNamara Alumni Center)
13:10 – 14:25	**Parallel Sessions on Emerging ICT Areas (Cont'd)** IoT/CPS: Research and Innovation Challenges and Opportunities for Transatlantic Collaboration (Regents East Committee Room 665, McNamara Alumni Center) Chair: Tariq Samad, Senior Fellow and Honeywell/W.R. Sweatt Chair in Technology Management, Technological Leadership Institute, University of Minnesota, USA This session will provide a platform to discuss promising future directions for transatlantic collaboration in the IoT and CPS domains, supported by statement talks and an overview and analysis of EU and US research and innovation challenges and priorities, and collaboration barriers and opportunities that are identified in the opportunity report that was recently published by the PICASSO Project. · Dinkar Mylaraswamy, Fellow, Honeywell Aerospace Advanced Technology, USA · Hubertus Tummescheit, CEO & Co-founder, Modelon, Sweden, EU · Christian Sonntag, Senior Scientist & Manager, TU Dortmund, Germany, EU 5G Networks: 5G Ultra-large Cell Technologies (Thomas Swain Room, McNamara Alumni Center) Chair: Gerhard Fettweis, Vodafone Chair Professor, TU Dresden, Germany Based on the PICASSO opportunity report, 5G ultra-large cell design has been identified as one of the high priority R&I themes for future EU and US collaboration. In this session, top academy and industry experts from both the EU and the US will share their insights on enabling technologies, potential social impacts as well as perspective EU-US collaboration opportunities in this area. · Olav Queseth, METIS-II Project Coordinator, Ericsson, Sweden, EU · Ari Pouttu, Professor, University of Oulu, Finland, EU · Berge Ayvazian, Principal Consultant, Wireless 20/20, USA Big Data: Research and Innovation Challenges and Opportunities for Transatlantic Collaboration – a European Perspective (Johnson Great Room, McNamara Alumni Center) Chair: Nikos Sarris, Head of the ATC Innovation Lab, Athens Technology Center, Greece, EU This session will provide a platform to discuss promising future directions for transatlantic collaboration in the Big Data domain, supported by statement talks by BDVA and Big Data Europe representatives. Moreover, an overview and analysis of EU and US research and innovation challenges and priorities, and collaboration barriers and opportunities that are identified in the opportunity report that was recently published by the PICASSO Project will be presented. · Sören Auer, Head of Enterprise Information Systems group, University of Bonn · Andreas Metzger, Head of Adaptive Systems and Future Internet Applications, University of Duisburg-Essen, BDVA Deputy Secretary General, EU · Vasilis Papanikolaou, Innovation Manager, ATC Innovation Lab, Athens Technology Center, Greece, EU
14:25 – 14:50	Break (Johnson Great Room, McNamara Alumni Center)
14:50 – 15:35	Keynotes: EU and US Priorities and Opportunities in Big Data (Johnson Great Room, McNamara Alumni Center) · Chaitan Baru, Senior Data Science Adviser on CISE, NSF, USA · Andreas Metzger, Head of Adaptive Systems and Big Data Applications, paluno (The Ruhr Institute for Software Technology), University of Duisburg-Essen, Germany & Deputy Secretary General, Big Data Value Association (BDVA), EU
15:35 – 16:05	Keynote: The Road to Safer, Cleaner and More Efficient Transportation for Future Smart Cities (Johnson Great Room, McNamara Alumni Center) · Haydn Thompson, CEO, THHINK Group, United Kingdom, EU

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16:05 - 16:50	**Panel: Good Practices in Smart City Transportation Strategies – Their ICT Needs** (Johnson Great Room, McNamara Alumni Center) **Chair: Mark Spinoglio, Manager & Senior Consultant SPI S.A., EU/USA** Building on the technical sessions conducted earlier in the agenda, this plenary will connect policy with technology in the smart city transportation area by highlighting the successful applications of ICT in support of smart transportation, providing insights on current developments and strategies forward both in the EU and the US. · Frank Van den Bulcke, Director, Mobility Company, City of Ghent, Belgium, EU · Jaime Quesado, Specialist in Competitiveness and Innovation, President of ESPAP –Portuguese Government Agency for Shared Services, EU · Umit Ozguner, Chair in ITS and Professor Emeritus, Electrical & Computer Engineering, Ohio State University, USA
16:50 - 17:20	**Keynote: Cybersecurity Implications for ICT and Smart Society** (Johnson Great Room, McNamara Alumni Center) · Massoud Amin, Director, Technological Leadership Institute, University of Minnesota, USA
17:30 – 19:00	**Networking Reception** (Pinnacle Ballroom at the Commons Hotel, 615 Washington Ave SE, Minneapolis)

Day 2 – 20th of June 2017

08:30 - 10:00	**Panel: Policy Implications of ICT** (Johnson Great Room, McNamara Alumni Center) **Chair: Maarten Botterman, Director GNKS, ICANN Board Director, Chairman IGF DC IoT, The Netherlands, EU** EU US ICT-oriented collaboration doesn't take place in isolation: the results of ICT R&I affect society, and what society wants and/or needs influences the interest and direction of ICT research. In this understanding, the PICASSO Policy expert group is exploring key policy issues that affect the development of 5G Networks, Big Data, and IoT/CPS, and the way they help address policy challenges. With you we will be exploring how we can progress best working together on privacy & data protection; ICT security; and standardization. Because of the collaboration between EU and US researchers, the solutions found are likely to be more relevant and more sustainable for the global markets that are served with what we create. · Jonathan Cave, Lecturer Warwick University, Member Regulatory Policy Committee, United Kingdom, EU · Avri Doria, Principle Researcher, Technicalities, USA · David Farber, Adjunct Professor of Internet Studies Carnegie Mellon University, USA · Representatives of PICASSO Expert Groups
10:00 - 10:30	**Keynote: Digitizing Europe's Industry: Policy, Research & Innovation Measures** (Johnson Great Room, McNamara Alumni Center) **Christoph Runde, MTP Project Development Coach for European Union Intelligent Manufacturing Systems (IMS), EU**
10:30 - 10:55	Break (Johnson Great Room, McNamara Alumni Center)
10:55 - 12:10	**Parallel Sessions** **Panel: Smart Transportation and ICT: Topics for Collaboration** (Johnson Great Room, McNamara Alumni Center) **Chair: Latif Ladid, Founder & President, IPv6 Forum & Research Fellow, University of Luxembourg, EU** This session will build on the EU and US policies towards smart city transportation highlighted by the first session on the first day and on the sessions that focused on emerging ICT areas. New opportunities of collaboration between the EU and US in smart transportation will be discussed amongst the panel and extended to the session's participants. · Álvaro de Oliveira, Invited Professor, University of Aalto, Finland, EU · Andreas Metzger, Head of Adaptive Systems and Big Data Applications, paluno (The Ruhr Institute for Software Technology), University of Duisburg-Essen, Germany & Deputy Secretary General, Big Data Value Association (BDVA), EU · Berge Ayvazian, Senior Analyst and Consultant, Wireless 20/20, USA ·

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

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Clean Energy in Minnesota and Beyond
(Multipurpose Room 6, Recreation and Wellness Center, 123 SE Harvard St, Minneapolis)
Chair: Gregg Mast, CEEM, USA
The rapid transition to cleaner and more sustainable energy solutions present vast opportunities for collaboration across key stakeholder groups. This session will bring together experts that are leading this transformation in Minnesota, the Midwest, and globally to share their unique insights. Participants will discuss the role of ICT technology, market participants, and policy that is necessary for harnessing this opportunity now and into the future
- **Steven Webster**, Executive Director, Cleantech Open Midwest, USA
- **Ravi Pradhan**, Vice President, Technology Strategy, Siemens Digital Grid Software and Solutions, USA
- **Deepinder Singh**, co-founder, 75F, USA

Intelligent Manufacturing Systems: Prospects for International Collaboration
(Multipurpose Room 7, Recreation and Wellness Center, 123 SE Harvard St, Minneapolis)
Chair: Dan Nagy, Managing Director, IMS, USA
Having introduced project clustering in a prior PICASSO event in Washington DC, IMS will show the methodology used to attract over 30 projects to its first cluster in Additive Manufacturing, the ongoing work, and explain the upcoming workshop for the next Industry 4.0 topics in Advanced Robotics, and Industrial Internet of Things.
- **Steve Ray**, IMS Project Development Coach, U.S. Region; Distinguished Research Fellow; Carnegie Mellon Silicon Valley, Princeton University, USA

12:10 - 13:10 Lunch (Johnson Great Room, McNamara Alumni Center)

13:10 - 14:10 **Panel: Best Practices for Academic/Industry Collaboration in Smart Cities**
(Johnson Great Room, McNamara Alumni Center)
Chair: Anne Bowser, Senior Program Associate, Woodrow Wilson International Center for Scholars, USA
The goal of this session is to bring together academic and industry actors from the US and EU to discuss effective practices for supporting academia-industry cooperation in smart cities. Each panelist will be invited to give a short talk to set the scene, followed by a moderated discussion from members of the audience. Key outcomes of this panel will be enhanced knowledge of academia-industry cooperation in the US and the EU, and information on opportunities for future exploration.
- **Laura Morgagni**, Director, Turin Wireless Foundation; Secretary General, Italian Technology Cluster 'Smart Communities Tech', Italy, EU
- **Haydn Thompson**, CEO, THHINK Group, United Kingdom, EU
- **Jason Vargo**, Director, University of Wisconsin-Madison UniverCity Alliance, USA

14:10 - 15:10 **Panel: Perspectives on EU/US Collaboration in ICT** (Johnson Great Room, McNamara Alumni Center)
Chair: Tariq Samad, Senior Fellow and Honeywell/W.R. Sweatt Chair in Technology Management, Technological Leadership Institute, University of Minnesota, USA
The focus of this session will be on identifying obstacles to, and offering constructive recommendations for, more effective EU/US collaboration in ICT, especially IoT/CPS, Big Data, and 5G Networks. Key related insights from the technical and policy sessions of the symposium will also be highlighted. The panelists include PICASSO Expert Group leaders and government representatives.
- **Maarten Botterman**, Director GNKS, ICANN Board Director, Chairman IGF DC IoT, The Netherlands, EU
- **David Corman**, Program Director, National Science Foundation, USA
- **Sebastian Engell**, Professor, Head of the Process Dynamics and Operations Group (DYN), TU Dortmund, Germany, EU
- **Gerhard Fettweis**, Vodafone Chair Professor at TU Dresden,TU Dresden, Germany, EU
- **Chris Greer**, Senior Executive for Cyber-Physical Systems, National Institute of Standards and Technology, US Dept of Commerce, USA
- **Jean-Yves Roger**, European Commission, Belgium, EU
- **Nikos Sarris**, Head of the ATC Innovation Lab, Athens Technology Center, Greece, EU

15:10 – 15:30 Break (Johnson Great Room, McNamara Alumni Center)

15:30 - 16:00 Conclusions, Path Forward and Adjournment (Johnson Great Room, McNamara Alumni Center)

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List of Speakers

 Massoud Amin, Director, Technological Leadership Institute, University of Minnesota, USA

 Sören Auer, Head of Enterprise Information Systems group, University of Bonn, Germany, EU

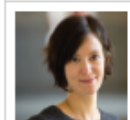 Berge Ayvazian, Senior Analyst and Consultant, Wireless 20/20, USA

 John Baras, Professor, Lockheed Martin: Chair in Systems Engineering, University of Maryland: Director, Maryland Hybrid Networks Center, USA

 Chaitan Baru, Senior Data Science Adviser on CISE, NSF, USA

 Maarten Botterman, Director GNKS, ICANN Board Director, Chairman IGF DC IoT, The Netherlands, EU

 Anne Bowser, Senior Program Associate, Woodrow Wilson International Center for Scholars, USA

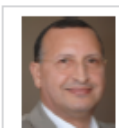 Jonathan Cave, Warwick University, United Kingdom, EU

 Wo Chang, Digital Data Advisor, National Institute of Standards and Technology, USA

 David Corman, Program Manager, National Science Foundation, USA

 Melissa Cragin, Executive Director, Midwest Big Data Innovation Hub, USA

Álvaro de Oliveira, Invited Professor, University of Aalto, Finland, EU

Avri Doria, Technicalities, USA

Sebastian Engell, , Professor, Head of the Process Dynamics and Operations Group (DYN), TU Dortmund, Germany, EU
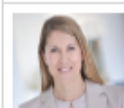

Dave Farber, Carnegie Mellon University, USA

Gerhard Fettweis, Vodafone Chair Professor at TU Dresden,TU Dresden, Germany, EU

Rolf Findeisen, Professor, Head of the Institute for Automation Engineering (IFAT), Otto-von-Guericke University, Germany, EU

Gabrielle Gerbaud, Executive Director, Minnesota Trade Office, USA

Amitava Ghosh, Nokia Fellow and Head of Small Cell Research, Nokia Bell Labs, USA

Georgios Giannakis, ADC Chair Professor, University of Minnesota, USA

Chris Greer, Senior Executive for Cyber-Physical Systems, National Institute of Standards and Technology, US Dept of Commerce, USA

Jack Harris, US IMS Head of Delegation: CEO, Parametric Studio: Vice Chair, Advanced Manufacturing Working Group, Aerospace States Association: General Manager, PDES Inc.: Director, Advanced Manufacturing Technology, Rockwell Collins (Retired), USA

Eric Kaler, President, University of Minnesota, USA

Svetlana Klessova, Director, inno TSD, France, EU

Latif Ladid, Founder & President, IPv6 Forum & Research Fellow, University of Luxembourg , EU

Meredith M. Lee, Executive Director, West Big Data Innovation Hub, USA

Andreas Metzger, Head of Adaptive Systems and Big Data Applications, paluno (The Ruhr Institute for Software Technology), University of Duisburg-Essen, Germany & Deputy Secretary General, Big Data Value Association (BDVA), EU

Laura Morgagni, Director, Turin Wireless Foundation: Secretary General, National Technology Cluster 'Smart Communities Tech', Italy, EU

Dinkar Mylaraswamy, Fellow, Honeywell Aerospace Advanced Technology, USA

Dan Nagy, Managing Director, IMS, USA

Gregg Mast, CEEM, USA

Umit Ozguner, Chair in ITS and Professor Emeritus, Electrical & Computer Engineering, Ohio State University, USA

Vasilis Papanikolaou, Innovation Manager, ATC Innovation Lab, Athens Technology Center, Greece, EU

Ari Pouttu, Professor, University of Oulu, Finland, EU

Ravi Pradhan, Vice President, Technology Strategy, Siemens Digital Grid Software and Solutions, USA

Jaime Quesado, Specialist in Competitiveness and Innovation, President of ESPAP –Portuguese Government Agency for Shared Services, EU

Olav Queseth, METIS-II Project Coordinator, Ericsson, Sweden, EU

Steve Ray, IMS Project Development Coach, U.S. Region: Distinguished Research Fellow: Carnegie Mellon Silicon Valley, Princeton University, USA

Christoph Runde, MTP Project Development Coach for European Union Intelligent Manufacturing Systems (IMS), EU

R.T. Rybak, Minneapolis Foundation and former Mayor, Minneapolis, USA

Tariq Samad, Senior Fellow and Honeywell/W.R. Sweatt Chair in Technology Management, Technological Leadership Institute, University of Minnesota, USA

Nikos Sarris, Head of the ATC Innovation Lab, Athens Technology Center, Greece, EU

Henning Schulzrinne, Columbia University and Federal Communications Commission, USA

Lea Shanley, co-Executive Director, South Big Data Innovation Hub, USA