7.10 International Cooperation

Objective ICT-2013.10.1 EU-Japan research and development Cooperation

a) Optical Communications

Target outcome

The activity intends to focus on the Ethernet ecosystem in conjunction with all-optical networks targeting capacities of 100 Gbit/s per wavelength. While components targeting 100 Gbit/s, and also networks are under development and trial, this activity will focus on further enhancement on a system level of the future Ethernet transport networks by advancing the technologies to efficiently incorporate all network layers, to achieve high-rate server connectivity, and reliable and efficient network access and core switching. Developments of components if needed are to be integrated into an overall system view. Specific target is as follows:

- to achieve efficient and reliable Ethernet transport at 100 Gbit/s rates using single mode- or multi mode fibre for enhanced capacities in short and long range all-optical networks.

- to prove, and if needed, contribute to further advancement of standards such as IEEE802.3ba, ITU-T G.709, and OIF Implementation Agreement.

Expected Impact

- Efficient high rate Ethernet transport and standardisation spin off.

- Key enabling technologies for the future generations of high-speed all-optical networks with improved economic, spectral and energy efficiency.

- Joint EU-Japan contribution to standardization bodies and fora.

b) Wireless Communications

Target Outcome

The goal is to develop short-range wireless systems using millimetre-wave and terahertz-wave technologies to realise ultra high data transmission capacities and high resolution sensing inside or outside of buildings. The focus will be on architectures towards ultra-high speed short-range wireless technology, radio transmission technology, terahertz-wave base band and millimetre-wave radio access technologies including spectrum re-use and cognitive technologies. It includes:

- The use of millimetre bands, both in the context of in-door, in-house applications and the possibility to look for use in outdoor applications like sensing or fibre extensions.

- Achievement of short-range wireless transmission and networking in the teraherz frequency bands.

- A roadmap towards a possible common standardisation in future high-capacity short-range technologies and sensing technologies.

Expected Impact

- Better exploitation of new spectrum parts for short range, very high capacity communication and high resolution sensing applications.

- Key enabling technologies for the future generations of short-range wireless systems with improved economic, spectral and energy efficiency.

- Joint identification of standardization requirements and contribution to standardization bodies and fora

c) Cybersecurity for improved resilience against cyber threats

Target outcome

This activity focuses on research on cybersecurity for improved resilience against cyber threats, such as leak of information, denial of service, malware among EU and Japan. It will develop technologies and strategies for improving and enhancing cybersecurity in heterogeneous networked, service and computing environments and facilitate the early identification of cyber attacks.

The goal is to collaboratively develop a demonstrable and state-of-the-art prototype to improve and enhance cybersecurity against existing and emerging cyber threats in Europe and Japan.

This approach may require additional research and technical development in the field of system and fundamental security, such privacy protection, database security, secure software development, fundamental security technologies based on cryptographic methods and protocols for cloud security, smart-phone security and future network security.

Expected impacts

- Established international critical mass to develop new approaches and instruments in the fight against emerging cyber threats.

- Reinforced policy coordination between the EU and Japan as well as other potential international partners.

d) Extending the cloud paradigm to the Internet of Things - Connected objects and sensor clouds within the service perspective

Target outcome

Current cloud technology lacks features for secure and flexible services that make use of distributed sensing devices and a high quantity of object instances.

The research should focus on the combination of Cloud and Internet of Things (IoT) technologies and to investigate the development of cloud-based service platforms taking into account the IoT perspectives on massive data storage and communication needs in the cloud for the execution of real-time services. The scope may include architecture, middleware and services. The research goals are as follows

- Sound demonstration on how the Internet of Things concept can be enriched and completed by the Cloud paradigm and approach (on sensor, infrastructure, middleware and applications towards end-users level).
- Establishment of a scalable and flexible service platform architecture for enabling secure and smart, partly virtualised, services with processing, integrating, and visualizing contents combined with ambient real life information.
- Additional focus on an Internet of Things-Cloud reference test facilities for ensuring global interoperability for connectivity, services and privacy by design / trusted solutions.
- Concentration on the Smart Cities perspective with a) a business context (business process improvements and industrial applications) and b) societal context (social and environmental applications).
- Road-mapping and recommendations for further activities in the combination of Internet of Things and Cloud.
- Technology for enabling realtime secure communication services with connecting trillions objects and cloud service users

Expected Impact

- Development of integrated Cloud & IoT approaches in terms of architecture, middleware and services within a Smart Cities context.

- Harmonisation of international standardisation efforts and sharing of best practices.

e) Global scale experiments over federated testbeds: Control, tools and applications

Target outcome

The goal is to enable experiments across testbeds as a framework for understanding the management of heterogeneous resources, the access to these resources and the evaluation of their usage. It requires software solutions that are suited to control and deploy an experiment, using distributed resources of various testbeds, possibly wired and wireless. Defining APIs, a thin convergence layer for accessing testbeds seamlessly and a monitoring framework is the focus of this activity. Solutions will be demonstrated for various scenarios ranging from wireless testing to Information-Centric networking.

Research focuses on software defined networking (SDN) paradigm which enables parallel deployment of slices assigned to virtual network providers. The slicing can be done on physical or virtual infrastructures, implying multiple levels of virtualization. Proofs of concept for the benefit of network virtualization can be seen in content-centric networks, or other "beyond-IP" networks.

The activity should produce a demonstration of the relevance of the proposed solutions in a heterogeneous environment. It will cover the control plane (for authentication and resource reservation), the experimental plane for setting up the scenario and monitoring it over the lifetime of the experiment, as well as collecting the appropriate measures. A target environment should be used as a common framework, including wireless and Information-Centric networks.

The software developed in the research projects targets deployment and evaluation in the available testing facilities on both sides (OFELIA, OpenLab, JGN-X).

An integration of SDN with processing capabilities available in Data Centers will bring processing closer to the data it is applied to, improving data access and minimizing transit traffic in the network.

The solutions should then be disseminated for a large adoption, eventually going beyond the testbed framework if appropriate.

Expected Impact

- Interoperability of distributed resources for experiments across heterogeneous testbeds.

f) Green & content centric networks

Target outcome

The focus is on a change in network architecture from host-oriented to content-centric networking[41] The content-centric networking seeks to adapt the network architecture to current network usage patterns. This new paradigm can open new possibilities for energy-efficient content distribution. Of particular importance are issues related to naming, addressing and routing as well as resource control, access analysis and Digital Rights Management. The research needs also to address the migration perspective from the current Internet protocols and architecture.

Green contents distribution platform is addressed from the point of view of integration with power consumption information gathering framework on lower layer network and higher layer network controlling framework that enables optimization of contents location and routing. The content-centric networking seeks to adapt the network architecture to current network usage patterns. This new paradigm can open new possibilities for energy-efficient content distribution.

The call targets a theoretical analysis as well as prototyping and standardisation activities to ensure that the joint work will have an impact on the global green content centric networks landscape. It includes an architectural framework and the related performance assessment framework. Migration technology from current Internet and low energy technology for realizing contents centric networking are included as well. Results may be channelled towards the relevant standardisation fora.

Expected Impact

- Content centric networking architecture for low energy efficient content delivery and associated standardisation requirements

Expected Impact, in addition to specific impacts, for a), b), c), d), e) and f)

Collaborative targeted research and prototyping enable deepened and continued collaboration between European and Japanese researchers and industry, towards the creation of sustainable research links benefiting researchers and industry competitiveness of both sides.

Funding Schemes

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[41] content-centric networking is also referred to as infomation centric networking in some FP7 projects and Data Aware Networking in ITU-T