EUROPEAN
COMMISSION

Brussels, 19.4.2016
COM(2016) 176 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

ICT Standardisation Priorities for the Digital Single Market

1. ICT STANDARDS AS THE CORNERSTONE OF THE DIGITAL SINGLE MARKET

The transformation of the global economy to a digital economy affects all industrial and service sectors. Europe's competitiveness and productivity crucially depends on its ability to generate, scale-up, and effectively harness digital innovations across all sectors of the economy including Europe's traditional strengths such as vehicle manufacturing, automation, machine equipment or financial services. To support Europe's role in the global digital economy, the European Commission has adopted a communication on a Digital Single Market strategy, and has made it one of its key priorities.

Common standards ensure the interoperability of digital technologies and are the foundation of an effective Digital Single Market. They guarantee that technologies work smoothly and reliably together, provide economies of scale, foster research and innovation and keep markets open. Effective interoperability guarantees that connected devices such as cars, phones, appliances and industrial equipment can communicate seamlessly with each other, regardless of manufacturer, operating system, or other technical components. Open standards ensure such interoperability, and foster innovation and low market entry barriers in the Digital Single Market, including for access to media, cultural and educational content. Differing national standards[1] may significantly slow down innovation and put European businesses at a disadvantage vis-à-vis the rest of the world.

The recent revision of the EU's standardisation policy resulted in the adoption of Regulation 1025/2012 on European Standardisation[2] and the creation of a framework for a more transparent, efficient and effective European standardisation system for all industry sectors. This Regulation emphasised the fast evolution of ICT and the way in which new products and services, such as 'smart' or connected devices (referred to as the 'Internet of Things' or IoT) or the Cloud, transform markets.

To address the challenges related to ICT standardisation, the Commission announced that it would "*launch an integrated standardisation plan to identify and define key priorities for standardisation with a focus on the technologies and domains that are deemed to be critical to the Digital Single Market*". In its Conclusions of 25 and 26 June 2015, the European Council "*agreed that action must be taken (…) on key components of the Commission communication, notably to identify and deliver rapidly on the key ICT standardisation priorities*"[3].

This Communication builds on Regulation 1025/2012 and is linked to the planned Joint Initiative on Standardisation that is part of the wider Single Market Strategy[4].

This Communication sets out a comprehensive strategic and political approach to standardisation for priority ICT technologies that are critical to the completion of the Digital Single Market. The goal is to ensure that ICT-related standards are set in a way that is more responsive to policy needs, agile, open, more strongly linked to research and innovation, better joined-up, and thus that they ultimately have more impact for the wider European economy as it transforms into a digital one.

2. SETTING STANDARDS FOR ICT: A FAST-CHANGING AND CHALLENGING GLOBAL CONTEXT

The development of ICT standards faces several new challenges that require a focused and sustained European response.

[1] Regulation (EU) 1025/2012 on European standardisation defines the meaning of the terms "standard" and "technical specification". In this document the term "standard" is used with both meanings for the sake of brevity.
[2] Regulation (EU) 1025/2012 OJ L 316, 14.11.2012, p. 12.
[3] http://www.consilium.europa.eu/en/press/press-releases/2015/06/26-euco-conclusions/
[4] COM (2015) 550: Upgrading the Single Market: more opportunities for people and business.

Firstly, **all sectors of the economy increasingly rely on digital technologies** that change **ever faster**, frequently dramatically exceeding the pace of change in more traditional sectors and industries. Timely and harmonised setting of ICT standards would enable European innovators to compete and to bring new products to the global market. Flexible, coordinated, and sufficiently fast standardisation processes are an essential requirement of Europe's Digital Single Market.

Secondly, the **value of digital systems** increasingly derives from **cross-sector** applications, data and **technology convergence.** This, and the convergence of physical and digital worlds, in turn, blurs the boundaries between traditional sectors and industries, products and services, consumption and production, online and offline, and therefore challenges standard setting processes. Interoperable solutions based on open systems and interfaces keep markets open, boost innovation and allow service portability in the Digital Single Market.

For example, mobile health apps currently rely on a wide range of ICT areas, including safety, data-exchange, and security and privacy. These are handled by a host of different standard-setting bodies, involving different stakeholders[5] – which puts a strain on resources and time. It is therefore necessary to bring together the different stakeholders, and to strike a balance between the manufacturing industry and service sectors.

Thirdly, the **increasing complexity** resulting from a proliferation of standards, and the diversity of technical communities involved in standard setting can slow down innovation. For example, there are already more than 600 closely related standards in the IoT area. In such cases, it is essential to first clearly **map all relevant standards** to help researchers and innovators and standard setters navigate this complexity. Collaborative research and innovation carried out through experimental platforms or large-scale pilots also delivers results that can improve standard setting in complex technology environments. Such research can also help define increasingly important **reference architectures** and identify and address standardisation gaps, while reducing barriers to entry.

This increased complexity also impacts **access rights to standards**. The convergence and resulting complexity of many technologies can lead to a risk of uncertainty in relation as to the identification of the relevant community of standard essential patents holders, the costs of cumulated intellectual property rights (IPR), and the methodology used to calculate the value of the licensing terms[6].

Fourthly, there are **ever more bodies and organisations** involved in standard or technical specification setting around the world. European leadership through improved cooperation, deeper involvement and increased focus is needed to ensure that the EU's standardisation priorities and the Digital Single Market are sufficiently represented worldwide.

Fifthly, **European work on standardisation cannot be viewed in isolation**. Most of the EU's main trading partners, including notably some large emerging economies, have recognised how important standard-setting is for market access, and for boosting the competitiveness of their industries, and so they invest heavily in standard-setting and certification infrastructures. In the European Union, however, the Commission considers that standardisation has not received the necessary level of political support.

Finally, the actions to address the challenges mentioned above needs to ensure a proper balancing in view of their compliance with **fundamental rights**, as standardisation may have implications in this area. For instance, the actions need to ensure full respect of the rights to private life and personal data

[5] In this illustrative example, CEN/CENELEC, ETSI, ITU-T, HL7, IHE, ISO are all simultaneously involved.
[6] See JRC-IPTS report: Intellectual Property and Innovation in Information Communication Technology (ICT). Stefano Comino and Fabio Maria Manenti. Editor: Nikolaus Thumm, 2015, available at: http://is.jrc.ec.europa.eu/pages/ISG/EURIPIDIS/EURIPIDIS.index.html discusses in more details intellectual property in the ICT sector.

protection7, and should also take into account other fundamental rights, including freedom to provide business and right to property8.

The potential consequences of these challenges include a dispersal of limited resources, lack of efficiency, and more broadly a dampening of Europe's innovative capacity.

ICT standardisation will continue to be primarily industry-led, voluntary and consensus-driven, based on principles of transparency, openness, impartiality and consensus, effectiveness and relevance and coherence. However, a clearer set of priorities for ICT standardisation, together with high-level political support, will boost competitiveness and contribute significantly to achieving the goals of the Digital Single Market.

Defining key priority areas in the context of the Digital Single Market is an opportunity to inspire for standardisation organisations in the ICT area to work in new ways, with more cross-sector partnerships, strengthened cooperation with European standardisation organisations (ESOs) and other standards development organisations (SDOs), as well as more validation of standards through R&D experiments.

The Commission considers that these actions will benefit from the reinforced dialogue with the standardisation community, in particular the European Standardisation Organisations, envisaged by the foreseen Joint Initiative on European Standardisation to be concluded with all actors with the aim of improving the efficiency and effectiveness of the European standardisation system as set up by Regulation (EU) 1025/2012.

3. EUROPE'S RESPONSE: A TWO-PILLAR PLAN TO PRIORITISE AND DELIVER ICT STANDARD-SETTING FOR THE DIGITAL SINGLE MARKET

In the face of these new challenges, this Communication presents a priority action plan for the next wave of technology standardisation in the digital economy[9].

The Commission proposes the following approach:

Firstly, this Communication identifies a list of priority building blocks for the Digital Single Market where improved ICT standardisation is most urgent, accompanied by deliverables and a timeline. This list of priorities was subject to a wide public consultation.

Secondly, as this cannot be a one-off, isolated, exercise, the Commission proposes a high-level political process, to validate, monitor, and – where necessary – adapt the list of priorities.

This process will make use of the instruments[10] of the European Standardisation System, and involve a wide range of stakeholders, both within the EU and at international level, to ensure delivery of improved standard-setting processes, in line with the Joint initiative of European Standardisation. **Both parts of this priority plan will need to be taken forward together, to ensure that the EU becomes a leader in the global digital economy**.

[7] Article 7 and 8 of the Charter of Fundamental Rights of the European Union.

[8] Article 16 and 17 of the Charter.

[9] Possible legislative proposals will be subject to Commission better regulation requirements, in line with Commission's Better Regulation Guidelines, SWD(2015) 111.

[10] The Annual Union Work Programme adopted pursuant to Article 8 of Regulation 1025/2012, the Rolling Plan for ICT Standardisation, the Committee on Standards and the European Multi-stakeholders Platform.

3.1. Five priority domains: the building blocks of ICT standard setting

The Commission has identified the following priority areas: **5G communications, cloud computing, the internet of things (IoT), (big) data technologies and cybersecurity.** These are the **essential technology building blocks** of the Digital Single Market.

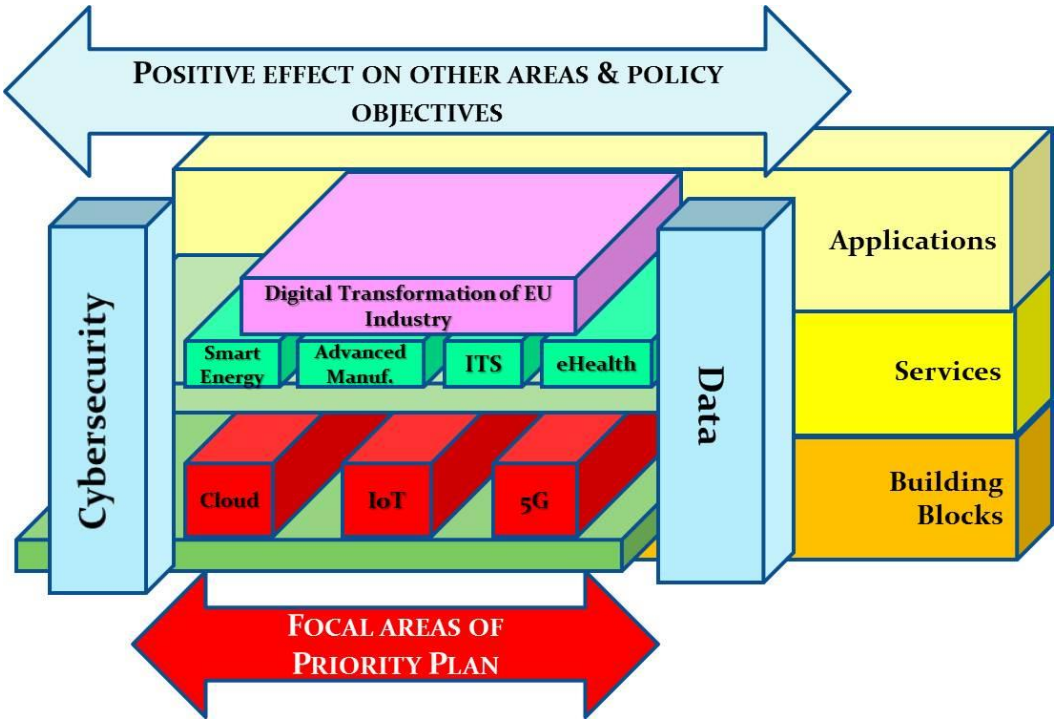
Stronger European leadership in standard setting in these areas should increase competitiveness and help European innovations better access the global market.

These areas were selected based on advice from the European Multi-stakeholders Platform on ICT Standardisation[11], which brings together industry stakeholders, standard setters, governments and civil society representatives. A public consultation process[12] confirmed a broad consensus around the prioritisation presented here.

As technologies converge, stronger European leadership in standard setting in these priority areas will also significantly impact many other technology areas. Therefore, the ICT standardisation actions outlined in this Communication are not restricted to a single area.

Areas such as eHealth, smart energy, intelligent transport systems and connected and automated vehicles, including trains, advanced manufacturing, smart homes and cities and smart farming will significantly benefit from the proposed prioritisation of standards, as they rely on the essential building blocks identified. A regular review of the priorities is planned so as to respond to changes in technology and society.

The figure below shows this context, including the different layers of technology areas, enablers, services and applications.



[11] https://ec.europa.eu/digital-single-market/en/european-multi-stakeholder-platform-ict-standardisation
[12] https://ec.europa.eu/digital-single-market/news/contributions-and-preliminary-trends-public-consultation-standards-digital-single-market

The actions identified in this Communication aim to raise the political and strategic importance of ICT standardisation as a crucial element of the Digital Single Market, in response to growing global competition. They aim to improve the focus, agility and efficiency of the standards setting system in ICT. They encourage new approaches in standardisation, such as promoting community building, attracting new sectors, promoting open standards and platforms where needed, strengthening the link between research and standardisation, including testing of the standards, promoting consistent application of standards and their uptake by the market, developing when needed certification schemes.

The priorities selected will complement other standardisation instruments used to implement European standardisation policy. In addition to the planned Joint Initiative on European standardisation, these are the Rolling Plan for ICT Standardisation, and the Annual Union Work Programme.

Certain aspects of this priority plan also complement and develop specific public sector requirements identified in the revised version of the European Interoperability Framework for European Public Services[13], taking on board the standardisation needs of the European public administrations.

3.1.1. Cloud Computing

Cloud computing supports new digital services by providing the massive data storage and computational power needed for the digitisation of European industry and science. This is recognised in the Communication on the European Cloud Initiative[14] which highlights the value of widening the user base of research and education networks. These networks are ideal for designing, specifying, testing and deploying standards.

Proprietary solutions, purely national approaches and standards that limit interoperability can severely hamper the potential of the Digital Single Market. The take-up of cloud computing services by businesses, consumers, public administrations and the scientific sector requires seamless user-friendly access, but also trust and confidence, in particular regarding cloud providers' compliance with appropriate levels of data protection, security, and service levels. The Communication on the European Cloud Initiative highlights the need for the use of existing relevant certification and standards as well as – where appropriate – the creation of European-level certification and labelling.

Common open standards will help users access new innovative services, especially for SMEs, the public sector and the scientific community. In particular, the portability of applications and data between different providers is essential to avoid lock-in. This will require a mapping of cloud standards and guidelines for end users (especially SMEs and the public sector).

The Commission

- intends to support funding the development and use of the ICT standards needed to further improve the interoperability and portability of the cloud. This includes making more use of open source elements by better integrating open source communities[15] into SDOs' standard setting processes, by the end of 2016.

- will facilitate the adoption of cloud computing services by supporting the finalisation of international standards on service level agreements, by mid-2017. This will ensure transparency and quality for end users, especially SMEs.

[13] Current EIF version in http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf.

[14] COM (2016)178

[15] Examples for Open Source communities active in the area of Cloud are the OpenStack Foundation, Cloud Foundry and the Eclipse Foundation.

- will request ESOs to update the mapping of cloud standards and guidelines for end users (especially SMEs and the public sector), in collaboration with international SDOs, cloud providers and end users, by mid-2017.

3.1.2. Internet of things (IoT)

The IoT[16] is an emerging technology that connects more objects to the internet – including household equipment, wearable electronics, vehicles and sensors. The number of such connected devices is expected to exceed 20 billion by 2020. Besides the innovation potential in many industrial sectors, the IoT also has the potential to help address many societal challenges including climate change, resource and energy efficiency and ageing.

However, the IoT landscape is currently fragmented because there are so many proprietary or semi-closed solutions alongside a plethora of existing standards. This can limit innovations that span several application areas. Large-scale implementation and validation of cross-cutting solutions and standards is now the key to interoperability, reliability and security in the EU and globally.

The European Union needs an open platform approach that supports multiple application domains and cuts across silos to create competitive IoT ecosystems. This requires open standards that support the entire value chain, integrating multiple technologies, based on streamlined international cooperation that build on an IPR framework enabling easy and fair access to standard essential patents (SEPs).

The Commission will:

- Foster an interoperable environment for the Internet of Things, working with ESOs and international SDOs. This will develop consensus under the umbrella of the Alliance of IoT innovation (AIOTI[17]), targeting reference architectures, protocols and interfaces, the promotion of open application programming interfaces (APIs), support of innovation activities related to reference implementations and experimentation and the development of missing interoperability standards[18]. As part of its progress review, the Commission will assess if further steps are needed to tackle identified interoperability failures, and if necessary, consider using legal measures to recommend appropriate standards.

- Promote an interoperable IoT numbering space that transcends geographical limits, and an open system for object identification and authentication.

- Explore options and guiding principles, including developing standards, for trust, privacy and end-to-end security, e.g. through a 'trusted IoT label'.

- Promote the uptake of IoT standards in public procurement to avoid lock-in, notably in the area of smart city services, transport and utilities, including water and energy.

3.1.3. 5G communication networks

5G communication networks enable seamless global communication between different kind of 'nodes', connecting data, vehicles and other objects, smart sensors or voice. 5G is expected to become the essential global infrastructure for communication.

Given its global nature, and the connections it creates between ICT and non-ICT sectors, 5G critically depends on standards to ensure interoperability and security, privacy and data protection. The

[16] The Staff Working Document on Advancing the Internet of Things in Europe provides further evidence for this section.

[17] http://www.aioti.eu/

[18] Especially in the cross sector domain of semantic interoperability

Commission intends to develop a 5G Action Plan for EU wide deployment of 5G networks beyond 2020 which will leverage take up of 5G standards.

One of the Commission's priorities is to ensure that the industry-driven 5G standardisation process supports innovative digital business models of vertical markets[19] from the outset. This means that the standardisation process and priorities will include new radio access technologies but not limited to these, as promoted by some non-EU countries. For what concerns new Radio Access standards, the priority is for solutions that ensure backward compatibility with existing xG[20] ecosystems and greatly improve spectrum efficiency usage in line with the EU Spectrum Policy. Global consensus and alignment of standard roadmaps will be fostered through cooperation with major trading partners. This will be complemented by a joint approach to facilitate the future use of globally available 5G frequency bands, including at new high-frequency ranges.

The Commission will:

- Foster the emergence of global industry standards under EU leadership for key 5G technologies (radio access network, core network) and network architectures notably through the exploitation of the 5G public-private partnership results at the level of key EU and international standardisation bodies (3GPP, ITU, OPNFV)[21].

- Ensure that 5G standards are compatible with innovative use cases of vertical industries, notably through broader participation of industries with sector-specific needs, in 5G standardisation organisations. This work will begin in 2016.

3.1.4. Cybersecurity

Cybersecurity provides the bedrock of trust and reliability on which the Digital Single Market will be built. As the number of connected objects grows, and communication channels multiply, European citizens and businesses will expect a very high quality of security standards to be built-in to any new technology or service.

Cybersecurity requires a collective effort. Supply chains are increasingly complex and key market operators and digital service providers are increasingly interconnected and interdependent. Each organisation, big and small, public or private, is expected to appropriately manage cybersecurity risks and, where necessary, be in a position to show that it does so successfully.

Innovative communication technologies, widespread use of smart objects, distributed computing devices and data services will provide even bigger business and growth opportunities if they are fully integrated into the Digital Single Market. To this end, seamless and interoperable secure authentication across objects, devices, individuals and entities is needed to enable secure and transparent access to and exchange of data. This may need new authentication protocols in order to build trust in seamless electronic identification and authentication, supported by global cross-domain interoperability standards based on comparable authentication schemes.

Incorporating security-by-design principles is essential to mainstreaming cybersecurity considerations into all emerging ICT standards and reference architectures. Real-life implementation pilots are needed to test and validate the performance of these standards, in conjunction with a coordinated approach to cybersecurity labels and certification.

[19] E.g. automotive, heath, manufacturing industries.

[20] 2G, 3G, 4G backward compatibility.

[21] 3GPP is the 3rd Generation Partnership Project, see http://www.3gpp.org/about-3gpp; ITU is the International Telecommunication Union; OPNFV is the Open Platform for Network Function Virtualisation, see https://www.opnfv.org/

The Commission will:

- Invite ESOs, other SDOs and relevant stakeholders to draw up practical guidelines covering IoT, 5G, Cloud, Big Data and smart factories, by the end of 2016. These should aim to ensure that security and seamless secure authentication are considered from the outset in the development of ICT standards. They should highlight best practices and gaps to be addressed. Based on the degree of uptake and progress, the Commission will consider adopting a Recommendation by end 2017 regarding the integration of cyber security and application of privacy and personal data protection requirements including data protection-by-design and data protection-by-default.

- Invite ESOs and other SDOs and relevant stakeholders to develop standards by the end of 2018 that support global interoperability and seamless trustworthy authentication across objects, devices and natural and legal persons based on comparable trust models. This work should be based on technical standards aligned with the eIDAS regulatory framework[22].

- Over the next three years, support ESOs, SDOs, European regulators as well as public-private initiatives, including those in support of the NIS Directive implementation, in the development of standards-based cybersecurity risk management guidelines for organisations and of corresponding audit guidelines for authorities or regulators with oversight responsibilities.

3.1.5. Data

Data is the fuel of the digital economy. Efficient sharing and exchange of data across national borders, within 'data value chains' (e.g. data exchange on spare parts between vehicle manufacturers and the aftermarket, access to vehicle data for service providers, or ensuring cross-border energy trading) and across sectors (e.g. sharing traffic data with parcel services) will be key for the Digital Single Market. Better interoperability of scientific research data is equally important to ensure that the R&D data ecosystem can contribute fully to future economic growth.

Open standards, as well as initiatives such as Open Data Portal, can help overcome barriers to data sharing between technologies, scientific disciplines and countries. Future data infrastructures - including the European Data Infrastructure announced in the Communication on the European Cloud Initiative - will require standards not only for security and privacy, but also for metadata, data preservation, semantics, data values, and others. In the context of scientific research data, the Commission supports the Research Data Alliance (RDA)[23] in building both social and technical bridges that enable open sharing of research data, with a view to work effectively across multiple disciplines, and to define options for data storage for sustainable use and re-use. In the context of public sector information and open government data, the Commission supports the use of data standards promoted under the ISA programme[24].

The Commission will:

- Increase R&D&I investment specifically for data interoperability and standards as of 2016. This will cover areas such as (i) cross-sectorial data integration (e.g. for entity identifiers, data models, multilingual data management, etc); (ii) better interoperability of data and associated metadata[25]. This will also be used to contribute to global standardisation in the field of data.

[22] In particular the implementing acts on interoperability and assurance levels (i.e. (EU) 2015/1501 and (EU) 2015/1502).

[23] Research Data Alliance is a strategic initiative supported by the European Commission, the US NSF/NIST and Australian Ministry of Research responding to the need of research communities and operators of research infrastructures to have interoperable global research data infrastructure.[replace it by hyperlink]

[24] E.g. the DCAT-AP and the Core Vocabularies.

[25] This will include, inter alia, the exploitation of INSPIRE geospatial metadata in various EU policy domains

- Bring the European data community together, including through the H2020 Big Data Value public-private partnership, to identify missing standards and design options for a big data reference architecture, taking into account existing international approaches, by 2018.

- Support, as of 2016, together with stakeholders and relevant global initiatives[26], data and software infrastructure services for access and long-term preservation of scientific data. Such data infrastructures will address meta-data for discoverability, best practices for Data Management Plans, certification of repositories for quality, trust and transparency, in line with the requirements on data infrastructure and open science cloud from the European Cloud Initiative.

3.1.6. The wider impact on the digital transformation on industry and consumers

The prioritised technology areas for ICT standardisation appear in several industrial sectors, and form the backbone of the future digital transformation of European industry, including the manufacturing industry, the agricultural sector, and future consumer products. It is essential for the Digital Single Market that future connected devices can seamlessly and reliably work together – both in the industrial context and for consumer goods. This should be regardless of manufacturer, operating system or other technical details, and include the possibilities for data interoperability and portability between platforms.

Some of the expected impact of the prioritised technologies in specific sectors can be seen from the examples below.

- **eHealth** systems are instrumental to meeting patients' expectations, improving patient safety and achieving greater health systems' responsiveness. Likewise, interoperable eHealth systems will support the implementation of European Reference Networks envisaged by the Directive on patients' rights in cross-border care[27], which will have to deploy telemedicine at a large scale to be successful in providing treatment. Better interoperability will bring more efficiency, smarter use of health data and better access to safety and security in the medical domain, while avoiding small scale implementations in fragmented markets.

  Better interoperability would make it possible to exchange electronic health records, starting with patient summary data and e-prescriptions, in line with personal data requirements. This would provide new opportunities for digital scale-ups and foster large scale deployment and uptake of eHealth solutions. Crucial success factors include the involvement of a broad set of stakeholders, strong end-user engagement and open international collaboration.

  The Commission will continue to encourage strong collaboration between Member States in the eHealth Network and in the research community to address the challenges of interoperability between health systems. This will enable patients and health care providers to fully benefit from the Digital Single Market in health. Moreover, the Commission will encourage actions to promote the security, safety and interoperability of mHealth apps, accelerate the deployment and scaling up of tele-medicine and tele-monitoring and support the development and adoption of international standards and terminologies.

- There is significant potential to improve the performance, safety and efficiency of the **transport system** by supporting and promoting the seamless deployment of connected and automated vehicles across Europe. New business models based on digital services provided via vehicles will also emerge. A significant part of a car's value already comes from the digital technology

[26] E.g., RDA.

[27] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0045:0065:EN:PDF

that is inside. Connected vehicles already generate large and increasing quantities of data, and communicate through wireless networks with other vehicles and traffic infrastructure.

Representatives of the relevant stakeholders present in the Cooperative ITS Platform, the automotive-telecommunication Round Table and the Gear 2030 High-Level Group have committed to working together to develop and drive forward the necessary standards. These include: (i) connectivity and security standards; (ii) an advanced and secure interface that provides fair and non-discriminatory access to in-vehicle data making connected and automated driving services possible; (iii) and the elaboration of test standards and profiling of standards to ensure interoperability in implementations. Cooperation with ESOs and between SDOs active in these fields is also critical.

High-quality standards are also needed for future automated vehicles, building on the work done for connected vehicles standards, and allowing reliable, safe and secure automated vehicle functions. Digital technology is already a key element of rail transport and EU companies are among the leading suppliers. Rail sector will also benefit from ICT standardisation, including for cross-transport modes.

The Commission is considering the set-up of a large-scale cross-border and federated deployment project that will validate the interoperability of standard based solutions, business models and data issues necessary for the deployment of connected and automated vehicles.

Furthermore, in the freight transport sector the broad range of actors and approaches to digitalisation leads to a wide range of systems lacking interoperability. This hinders the reuse of data across transport modes and countries and hampers the development of new and reliable multimodal digital applications and services.

There is a need to develop standards for data exchange in logistics, including the cross-modal harmonisation of standards, the definition of a common vocabulary, and agreement on standard messages and content of transport documents for various transport modes.

- In the area of ***smart energy*** more than 70% of standards are ICT standards. Implementing them will empower consumers and improve the overall system by making retail markets more transparent and competitive, and supporting new services and businesses. Smart grid solutions will lead to system cost savings and, in combination with smart appliances, will allow consumers to manage and reduce their energy consumption. High quality security standards guarantee that our energy systems are kept safe. Major achievements have been made by the Commission's Smart Grids Task Force[28] and in relation to smart appliances, while new standardisation-related work, including for smart homes and buildings, is ongoing.

  Additional work is needed in this area to address the lack of interoperability between solutions implemented by Member States, agree on functional specifications, understand new service models, and continually improve cooperation between SDOs.

- The uptake of ***advanced manufacturing*** technologies by European industry including agriculture and the agro-food sector, will incorporate intelligent production and intelligent process handling and integration, including optimisation solutions to improve productivity and flexibility, decrease waste and pollution, and/or lower costs in the entire manufacturing lifecycle.

  Standardisation is a challenge for the success of advanced manufacturing which demands an unprecedented degree of system integration across disciplines, hierarchies and life cycle phases. The Commission will encourage close cooperation between researchers, industry and

[28] https://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force

standardisation bodies to create the necessary conditions for innovation, methodical soundness and functionality, stability and security of investments, practicability and market relevance.

The Commission will work with ESOs and other ICT SDOs to ensure that their strategies and activity roadmaps take into account the new requirements emerging from the digitisation of industries such as vehicles, energy and eHealth.

In the broader context of digitising industry, several national and regional initiatives, such as Industrie 4.0 (DE), Smart Industry (NL), Catapults (UK) and Industrie du Futur (FR), have developed a comprehensive standardisation plan and started working on reference architectures[29]. However, since markets and value chains are global, national initiatives need to be brought to a European and global level.

Public-private partnerships and other large scale, industry-driven research initiatives enable European companies to link their research to standardisation. In the light of the accompanying Communication, "Digitising European Industry - Reaping the full benefits of a Digital Single Market " there is a need for further collaboration between the relevant stakeholders, including European industry, European and international SDOs, and forums like AIOTI[30] and IIC[31], aiming at a comprehensive standardisation roadmap.

The Commission will:

- Promote the development of interoperability standards and European reference architectures, as well as open cross-sectorial platforms for the digitisation of European industry, including experimentation, validation, interoperability testing facilities and trusted labels and certification schemes;

- Launch lighthouse pilot projects in the framework of the Joint Undertaking on Electronic Components and Systems for European Leadership to validate the standards for future markets, including large scale experimental test-beds.

3.2. A high-level commitment to deliver and ensure leadership through standards

Setting priorities for ICT standards for the Digital Single Market alone will not suffice. Success depends on a high-level commitment to standardisation from a broad stakeholder base, including from industry, standard-setting organisations, and the research community, as well as from EU institutions and national administrations. Specific and strategic actions can address the challenges of the global transformation towards the digital economy.

The Commission therefore proposes a high-level process to achieve the prioritised actions. This process will build on and complement the European Multi-stakeholders Platform, the ICT Rolling Plan on ICT Standardisation and the Annual Union Work Programme for European Standardisation as delivery mechanisms for standards and standardisation deliverables. The new elements of this process are as follows:

[29] See, e.g. the German Standardisation Roadmap https://www.dke.de/de/std/documents/rz_roadmap%20industrie%204-0_engl_web.pdf,
[30] Alliance for Internet of Things Innovation. https://ec.europa.eu/digital-single-market/en/alliance-internet-things-innovation-aioti

[31] Industrial Internet Consortium http://www.iiconsortium.org/

1) *Validation of priorities and improving the efficiency of the standard-setting process in Europe*:

The Commission will work with the standardisation community**,** in particular ESOs, to draw up annual timetables and roadmaps for each of the deliverables set out in this Communication, in line with the planned Joint Initiative on Standardisation. The Commission will also work with the ESOs and their members to identify pathways to a more agile response to ICT standardisation needs in Europe including the needs of the European public sector.

To address issues around the convergence of technologies, ESOs should build on recent successes such as in intelligent transport systems and home appliances, to take more systematic account of the requirements of non-ICT sectors in their work on developing standards. They should strike a balance between the interests of the digital and manufacturing communities, and build on work to map research and innovation-related standardisation activities.

2) *Regularly reviewing and monitoring progress:*

Building upon the reporting obligations to which European standardisation organisations are submitted under Article 24 of Regulation 1025/2012, the Commission will inform the European Parliament and Council regularly, highlighting especially the prioritisation of ICT standards to achieve the Digital Single Market. The Commission will involve industry representatives, other relevant stakeholders and the European standardisation organisations in the process of monitoring progress on the deliverables for each of the priority domains, taking due account of the reporting obligations. The Commission intends to include such regular dialogue in the foreseen Joint Initiative on Standardisation.

3) *Improving EU support to ICT priority standardisation:*

As of 2016, the Commission intends to use its Horizon 2020 and Connecting Europe Facility funds to strengthen existing and deploy forward-looking standardisation activities. H2020 will put a particular focus on promoting open standards. The Commission will continue to support effective knowledge transfer between R&D&I projects and the standardisation organisations. Moreover, through its Joint Research Centre, the Commission will provide pro-active scientific and technical support in the priority standardisation areas. In addition the Commission will fund large-scale pilot projects in the priority areas identified, in order to validate and improve the take-up of standards.

When allocating grants to the ESOs, the Commission will take into account the prioritisation in ICT standardisation. The planned Joint Initiative on Standardisation is also expected to support the delivery of the actions in this priority plan.

4) *Ensuring fair and non-discriminatory access*

ICT standardisation requires a balanced IPR policy, based on FRAND licensing terms. Various debates at European and international level are currently taking place with varying approaches being considered. A balanced policy should take into account a variety of needs: fair return on investment to incentivise R&D and innovation, a sustainable standardisation process, wide availability of technologies in an open and competitive market, and the difficulty for SMEs to participate.

With the many technologies involved in implementing complete digital value chains, notably in the area of IoT, there is uncertainty in particular in relation to: (i) who is the relevant community of standard essential patent holders; (ii) the cost of the cumulated IPR needed to implement the standard; (iii) the methodology applied to calculate the value of the licensing terms; (iv) the regime regarding the settlement of disputes. Against this background, a fast, predictable, efficient and globally acceptable licensing approach, which ensures a fair return on investment for standard essential patent (SEPs) holders and fair access to SEPs for all players – and especially SMEs - of the value chain would be beneficial.

5) *Strengthening the EU's presence in international dialogue and cooperation on ICT standards:*

Reflecting the global nature of digital technology development**,** the Commission will continue to proactively engage with key international partners (such as the US, China, Japan, South Korea) to ensure global alignment of priorities in the ICT domain, and a consistent approach to standard setting. The Commission intends to identify, by mid-2016, possibilities for setting-up and funding a supporting mechanism to monitor on-going work and support the participation of European experts in the relevant international standardisation and other fora working on the ICT priority areas.

EU institutions, Member States, and industry need to better understand in which standardisation work to invest and increase and optimise the European presence and coordination in international standardisation bodies, in close coordination with EU Member States.

Regular dialogue between international SDOs and ESOs working on the priority areas identified in this Communication will avoid duplication of activities and support work towards internationally coherent standards.

In summary, the Commission will:

- launch by 2017 a regular inter-institutional dialogue on European standardisation, highlighting – inter alia – ICT priorities in order to take stock of progress on the deliverables – and where necessary – to adapt the priorities. The Commission intends to include such regular dialogue in the foreseen Joint Initiative on Standardisation.

- work in collaboration with stakeholders including ESOs, EPO, industry and research, on the identification, by 2017, of possible measures to (i) improve accessibility and reliability of information on patent scope, including measures to increase the transparency and quality of standard essential patent declarations as well as (ii) to clarify core elements of an equitable, effective and enforceable licensing methodology around FRAND principles and (iii) to facilitate the efficient and balanced settlement of disputes.

– as of mid-2016, investigate possibilities for setting up and funding supporting mechanism to strengthen European participation in global standard setting, by monitoring global standardisation activities in the ICT domain, and support the wider participation of European experts.