Liberty Global supplementary position paper on the role of AI in telecommunications

Artificial intelligence and machine learning will play a major role in the transformation of telecommunications networks and services, as key drivers of software-defined networking and network function virtualization. Electronic communications regulatory authorities are best placed to oversee artificial intelligence and machine learning in the context of the telecommunications sector, taking a holistic, birds-eye view, which takes the challenges posed by artificial intelligence into account. The harmonized regulatory framework applicable to telecoms, which places great emphasis on technological neutrality, is suitable to address those challenges. In light of these developments, Liberty Global supports the European Commission's decision to classify the application of artificial intelligence in telecoms as 'low-risk' in its AI White Paper and subsequent policy documents.

Our evolving networks fulfil a vital role

Europe's electronic communications networks and services fulfil a vital economic and societal role. The ongoing COVID-19 pandemic has underscored their importance for the ability of European end-users to work from home, to engage in eLearning and – very importantly – to continue their social lives by having meaningful connections with friends and family.[1] [2]

Our continuous investment and innovation resulted in resilient and high-capacity networks. These evolved over time to meet the ever-increasing demand for connectivity and to adjust to new services and use cases. Our networks today provide lower latency, higher speeds, and greater security and resilience, benefiting end-users and the wider society.[3]

A pivotal point in network innovation

Network innovation is fast approaching an inflection point, as the changes foreseen by the next generation of networking are more profound than mere increases in speed or capacity. *Softwarization* and *virtualization* of network functions, at the heart of this development, represent a major shift in the configuration of networks, impacting both their *design* and *operation*.[4] [5]

On an abstract level, IP-based networking relies on the joint operation of the *control plane* and the *user data plane* in each device. The former draws a network topology and decides how traffic should be handled. The latter handles traffic according to the *control plane*'s instructions. The distinction between the two planes is logical, not necessarily physical. Their seamless interaction is the basis for the success of the internet in its current form.

Basics of software-defined networking

The logical decoupling of these *control planes* and *data planes* is key to software defined networking (SDN) and network function virtualization (NFV). It allows SDN to

[1] European Commission and BEREC, *Joint Statement on coping with the increased demand for network connectivity due to the Covid-19 pandemic*, BoR (20) 66 (2020).
[2] https://www.libertyglobal.com/whats-new/covid-19-our-response/; https://www.libertyglobal.com/covid-19-a-message-from-our-ceo/.
[3] Oxera, *Gigabit broadband: what does it mean for consumers and society?*, (2019).
[4] S. Gijrath, *(Re-)Defining Software Defined Networks under the European Electronic Communications Code*, ELAW – 007 (2019).
[5] BEREC, *Input paper on potential Regulatory Implications of Software-Defined Networking and Network Functions Virtualisation*, BoR (16) 97 (2016).

centralize all control plane functions on a network at a single SDN controller, as opposed to the decentralised operation of control planes in current networks. The SDN controller's birds-eye view enables it to operate networks in a dynamic and responsive manner. SDN also supports universal abstraction overlays for diverse infrastructure, enabling technology-independent network operation.

NFV is complementary to SDN. NFV uses SDN to virtually create, anywhere in a network, key functionality for that network's operation. For example, in current networks, adding routing capacity at a particular location requires the *physical* installation of routers and cabling at that location. Conversely, NFV enables the *virtual* creation of routing capacity at the most appropriate location at any moment, without placing new devices.

In a nutshell, SDN centralises the control of key network functionalities, providing a software overlay and NFV uses that overlay to dynamically (re)create and operate those key network functionalities.

Software-defined networking requires application of artificial intelligence

SDN and NFV make networks programmable, which in turn makes them more flexible, scalable, and reliable. This facilitates agile service deployment and the lowering of capital and operational expenses, allowing for more innovation and investment to the benefit of Europe's end-users.[6]

However, this dynamic operation of networks requires the real-time processing of vast amounts of information and the rapid, coordinated execution of tasks. These challenges can only be addressed through the application of artificial intelligence (AI) and machine learning (ML) to SDN controllers and in NFV mechanisms.[7] [8] [9] [10] The application of AI is also key to ensure the security of SDN and NFV deployments, as well as to address the security challenges posed by parallel and related trends, such as the increasing number of connected devices (IoT).[11] [12]

Artificial intelligence in telecoms cannot be viewed as a standalone issue

The critical role foreseen for AI and ML applications in the forthcoming evolution of next-generation networking instigated by SDN and NFV, means that the potential regulatory challenges posed by the use of AI and ML in the telecoms sector cannot be viewed in isolation. Instead, telecoms regulators and policymakers must develop a holistic view of the subject-matter and take the relevant context of SDN and NFV into account.

Liberty Global commends BEREC and ENISA for realizing this at an early stage. Both conducted extensive studies into the implications of SDN and NFV, as well as into AI and ML on a separate basis. Several national regulators and authorities, such as the Dutch Radio communications Agency followed suit.[13]

[6] D. Wei, *et al., Guest Editorial: Leveraging Machine Learning in SDN/NFV-Based Networks*, IEEE JSC, vol. 38, no. 2, (2020).
[7] S. Troia, *et al., Machine Learning-assisted Planning and Provisioning for SDN/NFV-enabled Metropolitan Networks*, IEEE EuCNC, (2019).
[8] A. Sundelin, *Leveraging Machine Intelligence and Operations Analytics to Assure Virtualized Networks and Services*, SCTE/ISBE Technical Paper (2017).
[9] D. Manias, *et al., The Need for Advanced Intelligence in NFV Management and Orchestration*, IEEE Network (forthcoming).
[10] A. Gebremariam, *et al., Applications of Artificial Intelligence and Machine Learning in the Area of SDN and NFV: A Survey*, IEEE SSD'19 (2019).
[11] A. Molina Zarca, *et al., Semantic-Aware Security Orchestration in SDN/NFV-Enabled IoT Systems*, Sensors (Basel), 20(13): 3622 (2020).
[12] M. Bagaa, *et al., A Machine Learning Security Framework for IoT Systems*, IEEE Access, (2020).
[13] BEREC, BoR (16) 97 (2016).

[14] [15] [16] These public stakeholders agree that the current telecoms regulatory framework is fit for purpose to address the challenges posed by SDN, NFV and enabling technologies, such as AI and ML.

The regulatory framework created by the Code is fit for purpose

The European Electronic Communications Code (Code) foresees the creation of a harmonized regulatory framework, aimed at promoting innovation and investment in the telecoms sector, to the benefit of end-users.[17] Technological neutrality and the principles of proportionality and appropriateness are cornerstones of the Code, which also emphasises the rights of end-users.

The European legislature envisaged the Code to be the instrument upon which regulatory requirements for SDN and NFV – and consequently AI and ML applications enabling such network innovation – shall be based.[18] [19] Relevant regulators and authorities are already acting upon that intent, developing the capabilities to cope with any potential challenges in this domain.[20]

The concurrent application of potentially conflicting rules, or regulatory oversight by another regulator which lacks the capability and jurisdiction to view AI applications in electronic communications within the relevant context, is at odds with the objectives of the Code. The Code aims to achieve regulatory clarity and stability, by delegating independent oversight to specific regulators and authorities only, which in turn best incentivizes investment, innovation and thus consumer welfare.

The Commission's AI initiatives should complement the Code's regulations

This does not mean that electronic communications providers should be exempt from all potentially forthcoming measures aimed at ensuring AI is deployed in the EU under an appropriate legal and ethical framework.

As Liberty Global submitted in its response to the Commission's consultation of its White Paper on AI, the risk-based approach outlined therein is key to achieve the twin objectives of promoting a rapid uptake of AI and addressing potential risks.[21]

Under this risk-based approach, it might be appropriate to regulate particular applications of AI for which extra safeguards are warranted, such as those involving biometric data.[22] Such use cases, which are outside the domain of telecoms regulation, can be subjected to new rules without harming the harmonized application of the Code. Electronic communications providers using such applications will have to so in accordance with generally applicable rules.

Harnessing the power of harmonized standards to promote values-based AI

In Liberty Global's view, potential legislative acts on AI must set a high-level framework. Detailed conformity requirements for products and services are best laid down in

[14] ENISA, *Threat Landscape and Good Practice Guide for Software Defined Networks/5G*, (2015).
[15] BEREC, *Looking into the crystal ball: A report on emerging technologies and security challenges*, version 1.0, (2018).
[16] Van der Vorst, *et al., Managing AI use in telecom infrastructures: Advice to the supervisory body on establishing risk-based AI supervision*, Commissioned by: Dutch Radiocommunications Agency, (2019).
[17] Articles 1 and 3 of Directive (EU) 2018/1972 (Code).
[18] Consideration 14 of the Code references SDN explicitly.
[19] S. Gijrath, *(Re-)Defining Software Defined Networks under the European Electronic Communications Code*, ELAW – 007 (2019).
[20] For example, in June 2020, ENISA established its Ad-Hoc Working Group on Cybersecurity for Artificial Intelligence.
[21] Liberty Global, *Response to the consultation of the European Commission's White Paper on Artificial Intelligence*, (2020).
[22] Liberty Global, *Response to the roadmap (IIA) on Artificial intelligence*, 2020.

Harmonized Standards. The application of standards in the telecoms sector and other domains of the internal market is a success, improving regulatory clarity, technological neutrality and promoting self-regulation.

About Liberty Global

Liberty Global is one of the world's leading converged video, broadband and communications companies, with operations in six European countries under the consumer brands Virgin Media, Telenet and UPC. We invest in the infrastructure and digital platforms that empower our customers to make the most of the digital revolution.

Our substantial scale and commitment to innovation enable us to develop market-leading products delivered through next generation networks that connect 11 million customers subscribing to 25 million TV, broadband internet and telephony services. We also serve 6 million mobile subscribers and offer WiFi service through millions of access points across our footprint.

In addition, Liberty Global owns 50% of VodafoneZiggo, a joint venture in the Netherlands with 4 million customers subscribing to 10 million fixed-line and 5 million mobile services, as well as significant investments in ITV, All3Media, ITI Neovision, LionsGate, the Formula E racing series and several regional sports networks.