THE TECHNOLOGY, MEDIA AND TELECOMMUNICATIONS REVIEW

ELEVENTH EDITION

Editor
Matthew T Murchison

THE LAWREVIEWS

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PREFACE

The Technology, Media and Telecommunications Review is now in its 11th edition, and I am excited to be taking the reins of this publication after a decade under the steady hand of long-time editor John Janka. This Review occupies a unique space in the literature on TMT issues. Rather than serving a traditional legal treatise, this publication aims to provide a practical, business-focused survey of law and policy in this arena, along with insights into how this legal and policy landscape continues to evolve from year to year. In the dynamic and ever-changing TMT sector, such perspective is vitally important. And the scope of this Review is global, now covering 20 jurisdictions.

Covid-19 shook the world in 2020, and its reverberations in the TMT sector have been profound. As the threat of infection has led to widespread lockdowns, the importance of connectivity has never been greater nor more obvious. For many businesses, remote working has become the rule rather than the exception. Many schools have switched to distance learning formats. Tele-health is on the rise as doctors check in on patients via videoconference. Even tasks as mundane as grocery shopping have shifted online. And broadband connectivity, where available, has made it all possible.

For policymakers, the experience of covid-19 has begun to reshape their understanding of the TMT arena and to refocus their policy goals. The sudden shift to remote working and distance learning has stress-tested broadband networks across the world – providing a 'natural experiment' for determining whether existing policies have yielded robust systems capable of handling substantial increases in internet traffic. In the European Union, officials called on video-streaming platforms to downgrade high-definition content temporarily to avoid overly straining broadband networks at the start of the pandemic. In the United States, meanwhile, policymakers touted that such measures were not necessary, and have attributed the apparent resilience of broadband networks in the country to deregulatory policies.

At the same time, the pandemic has prompted new initiatives to ensure, improve and expand broadband connectivity for consumers going forward. In various jurisdictions, policymakers are moving forward with subsidy programmes and other efforts to spur the deployment of advanced networks more deeply into unserved and underserved areas. Regulators also have taken steps to preserve internet access where it already exists, including by having service providers 'pledge' that they will not disconnect customers for non-payment in light of the pandemic, or by pursuing more prescriptive measures. In short, covid-19 has been part cautionary tale, part rallying cry, and its long-term impact on the TMT sector remains to be seen.

New technologies likewise have required new approaches and perspectives by policymakers. A notable example is the ongoing deployment of 5G wireless networks, as regulators continue to look for ways to facilitate such deployments. These initiatives take a

variety of forms, and frequently include efforts to free up more spectrum resources, including by adopting new rules for 'sharing' spectrum and by reallocating spectrum from one use to another. 5G spectrum was a significant focus of the World Radio-communication Conference (WRC) of the International Telecommunication Union (ITU), held in late 2019 in Sharm el-Sheikh, Egypt. And multiple jurisdictions have continued to auction off wireless licences in bands newly designated for 5G deployment, capitalising on service providers' strong demand for expanded access for spectrum.

Another example is the planned deployment of multiple large satellite constellations in low-earth orbit to support new broadband services. The providers proposing these networks say they will greatly expand the availability of high-speed internet access service. At the same time, the sheer scale of the planned systems has raised fresh questions about how best to prevent accidental collisions and ensure equitable sharing of spectrum resources.

Even with so many newer issues swirling in the TMT sector, familiar topics have remained in the spotlight as well. Cue network neutrality, the principle that consumers should benefit from an 'open internet' where bits are transmitted in a non-discriminatory manner, without regard for their source, ownership or destination. The basic principle has been around for well over a decade, but policymakers are still sorting out how best to effectuate it without undermining investment and innovation in broadband services. In the United States, network neutrality has become a point of contention between the federal government, which has opted for a light-touch approach, and certain states that wish to impose bright-line prohibitions on internet service providers. In Europe, new guidelines and rulings have addressed internet service providers' 'zero rating' plans, which exempt certain data from counting against a customer's usage allowance. Regulators in Asia are grappling with similar policy questions. And this debate dovetails with efforts in some jurisdictions to increase oversight of the content moderation policies of social media companies and other online platforms.

The country-specific chapters that follow recap these and other developments in the TMT arena, including updates on privacy and data security, regulation of traditional video and voice services, and media ownership. On the issue of foreign ownership in particular, communications policymakers have increasingly incorporated national security considerations into their decision-making, as evidenced by recent actions in the United States against Chinese equipment manufacturers and service providers.

Our authors from around the globe have lent their considerable insight, analysis and experience to the preparation of their respective chapters. I hope readers will find this 11th edition of *The Technology, Media and Telecommunications Review* as helpful as I have found this publication year in and year out.

Matthew T Murchison
Latham & Watkins LLP
Washington, DC
November 2020

Chapter 13

LUXEMBOURG

Linda Funck[1]

I OVERVIEW

The Luxembourg TMT sector has evolved from being predominantly a provider of voice services into a diverse, competitive and interconnected industry using terrestrial, satellite and wireless transmission systems. Today, Luxembourg has first-class infrastructures and telecommunication networks and counts among the top locations for electronic communication services and infrastructure. The current challenge for Luxembourg is to become one of the first countries in the EU with a global 5G network covering the entire Luxembourg territory. In the 2019 edition of the *Global Competitiveness Report* (GCR), published by the World Economic Forum, Luxembourg ranks 18th out of 140 countries. The *Measuring the Information Society Report 2017 Volume 1* issued by the ITU ranked Luxembourg ninth out of 176 countries. Luxembourg ranks 10th out of 28 EU member states in the last edition of the Digital Economy and Society index (DESI) 2020 by the European Commission and is considered a high-performing country.[2] The ITU ranked Luxembourg 11th[3] in the world.

Traditionally, the sector was limited to very few players. For several decades, telecommunication and postal services were operated as a public monopoly of the state-owned Entreprise des Postes et Télécommunications (EPT).[4] Not surprisingly POST (formerly EPT) will be the first operator to offer 5G services in Luxembourg starting from mid-October 2020. In recent years, other operators have increased their presence in the telecommunication sector. The radio and television sector has traditionally been controlled and developed from its early years by a privately owned company. Indeed, the first radio broadcasting in Luxembourg was initiated by the founders of the current broadcaster CLT-UFA. This privately held operator was ensured a leading role in the national and international development of the radio and television sector and, today, RTL Group ranks as the top television and radio broadcaster in Europe. Luxembourg is also a pioneer in non-terrestrial communication technology. SES-Astra, a Luxembourg-based company created in 1985, was Europe's first private satellite operator and has global standing today. Other satellite operators have applied for or obtained a licence.

The presence of important market players in the TMT and TMT-related sectors in Luxembourg and the related know-how and experience have led the Luxembourg government

1 Linda Funck is a partner at Elvinger Hoss Prussen.

2 Digital Economy and Society Index 2020, https://ec.europa.eu/digital-single-market/en/scoreboard/luxembourg.

3 https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2018-PDF-E.pdf.

4 The new commercial name is 'Post Luxembourg'.

to make efforts to maintain, create and further develop its electronic telecommunication technologies. The aim is to be among the best places in Europe and abroad to do business within the sector and to be a hub for e-services in Europe. This is an objective that has been constantly pursued and publicly reaffirmed by the Luxembourg government since 2010. Luxembourg's government, together with a group of private investors, set up a fund dedicated to ICT start-ups, called the Digital Tech Fund, which pursues its investments in companies active in cybersecurity, fintech, big data, digital health, media and next-generation communication networks, digital learning, the internet of things, telecommunications and satellite services.[5]

According to the DESI, Luxembourg is ranked third among all EU countries in regard to its connectivity and eighth in regard to its human capital.[6]

Luxembourg combines many features that are beneficial to the development of an ICT sector, including the diversity and multilingual skills of its population and workforce, a geographical location in the centre of Europe and an important financial industry in need of high-performance communication technologies. In addition, Luxembourg has gradually developed a state-of-the-art digital infrastructure, international telecommunication connections (offering fast and reliable connectivity to other European cities at very low latency rates), efficient national communication networks, performant data centres, a comprehensive, evolving and innovative legal framework, as well as cutting-edge research, safety and security. All these elements contribute to Luxembourg's increasing attractiveness to technology organisations and electronic communication services, but also to financial institutions, companies active in biotechnology, medicine and other e-businesses. Luxembourg figures among the top locations for ICT infrastructures (data centres, high-speed connectivity and internet traffic, low latency internet) and offers specialised expertise to keep data safe.

The presence of regulated ICT support professionals of the financial sector (PSF), who are subject to the same confidentiality obligation as banks, provides considerable comfort and security to clients of the financial sector, in areas such as the outsourcing of IT functions.

Over the past years, Luxembourg has focused strongly on the development of the fintech industry, being an attractive country as it combines a huge range and variety of financial services and innovative technologies, with open-minded regulators, public authorities, private players and associations, all of whom are ambitious to develop a sector that is evolving rapidly and is omnipresent in the overall global economy. Luxembourg, as a hub for financial services, offers an ideal environment for fintech companies to develop their services and expand their business. In fact, many start-ups have chosen Luxembourg to develop fintech activities, ranging from compliance and risk-management, through blockchain and cryptocurrency, security and authentication, automated investment services and big data analytics, to mobile and e-payments.

The quality of the communication infrastructure has led numerous actors in the gaming sector (online video games) and gambling sector to set up their headquarters in Luxembourg.[7] Global brands in the media and internet world, such as Amazon, eBay, PayPal, Vodafone Procurement, Intelsat, RTL Group, Milicom, Fanuc (Robotics and CNC) and Skype, all have European headquarters or major operations in Luxembourg.

5 https://digital-luxembourg.public.lu/initiatives/digital-tech-fund.

6 Digital Economy and Society Index, 2020, https://ec.europa.eu/digital-single-market/en/scoreboard/luxembourg.

7 Big Fish Games, Bigpoint, Innova, Valve.

The presence of Level3 (now Centurylink Communication) in Luxembourg (one of the most important operators of telecommunication services at the level of the backbone internet) confirms that the country is a centre of excellence in the internet sector. Luxembourg is also attractive to a number of e-payment and e-money services institutions and can be considered as Europe's e-payment hub with brands including Digicash, Amazon Payments, Six Payment Services, Rakuten, Airbnb Payments, ebay, Ping Pong Europe and Mangopay all based on its territory. Several software giants, including Microsoft and Open Text, also have places of business in Luxembourg.

Luxembourg also has a strong reputation for service availability, security and data protection and responsive and open-minded authorities.

The Luxembourg Commission de Surveillance du Secteur Financier (CSSF) has granted Bitstamp a payment institution licence and has made this company the first nationally licensed Bitcoin exchange. Other licences have been granted since then. There are many other companies, active in the virtual currencies sector, that want to establish themselves in Luxembourg and obtain their licence. This is yet another example confirming the attractiveness of Luxembourg for ICT businesses and open mindedness.

Luxembourg has a longstanding official policy of welcoming pan-European companies in addition to creating the appropriate framework for the development of local businesses and offers multiple opportunities to start-ups by creating an environment that allows existing market players to come into contact with young entrepreneurs. For example, the House of Start-Ups hosts the Luxembourg-City Incubator, a project conducted by the Luxembourg Chamber of Commerce, and currently accompanies a large number of innovative start-ups in a variety of industry sectors. In 2019, the House of Start Ups hosted the Luxembourg House of Financial Technology (Lhoft), the Luxembourg-City Incubator (LCI), the Hub @ Luxembourg and the International Climate Finance Accelerator Luxembourg (ICFA).[8]

According to the DESI, the proportion of ICT specialists compared to total employment is of 5.6 per cent, which is higher than the average of 3.9 per cent in the European Union.[9]

Efforts are also being made in ICT research, with a focus on the security, reliability and trustworthiness of ICT systems and services.[10] In the context of increasing the influence of digital technologies in every aspect of our lives and throughout all business areas and with the further and constantly evolving development in cloud computing and e-archiving, digital security is a key element of the success of the digital economy. Important improvements are being made to the legislation in order to adapt the national legal framework with the aim of overcoming barriers related to the use of new technologies.

Luxembourg joined forces with other European countries in cooperation with the European Commission, since it is 'aiming to deploy in Europe a world-class supercomputing infrastructure and a competitive innovation ecosystem in supercomputing technologies, applications and skills'.[11] The declaration of European Cooperation in the context of 'High Performance Computing' (HPC) was signed by the Luxembourg Minister of Economy on 23 March 2017, which marked ' the official start of the collaboration between the signatory countries (Luxembourg, Germany, Spain, Italy, Portugal, France and the Netherlands). These

8 https://www.host.lu/meet-the-players/.

9 Digital Economy and Society 2020, https://ec.europa.eu/digital-single-market/en/scoreboard/luxembourg.

10 Interdisciplinary Centre for Security, Reliability and Trust (SnT), Computer Science and Communication (CSC).

11 https://hpc.uni.lu/blog/2019/luxembourg-meluxina-supercomputer-part-of-eurohpc/.

countries joined forces to implement the strategy of a European HPC network, of which the Grand Duchy is the initiator. The EuroHPC 'European High-Performance Computing Joint Undertaking' is a public-private partnership in High Performance Computing and has its headquarters in Luxembourg. In the context of that HPC, Luxembourg has been given a leading role in the project 'Driveless cars: The Future Smart Mobility made possible by High Performance Computers'.[12] By September 2020, Luxembourg had acquired 'MeluXina' a petascale supercomputer, capable of executing more than 10 Petaflops, 10 million billion calculations per second and powered by green energy from a cogeneration plant powered by waste wood. This new supercomputing system is expected to be operational early 2021 and will rank in the world's top 30 supercomputers. MeluXina is funded via a joint investment of about €30 million from the European Union and Luxembourg.[13]

Luxembourg is very present at European-level discussions and negotiations and it is stout in its defence of its position in the global process of harmonisation and liberalisation, while supporting the direction of European regulation. At a national level, research and development in the ICT sector are conducted by a number of government-promoted institutions.[14] In developing its communication networks in the context of the investment realities and opportunities in the telecoms and media sector, the challenge is to direct investment in a way that ensures that the right type of network is built and that public investment works in cooperation with the private sector in order to promote a more competitive telecoms environment.

The ongoing efforts in further developing the information society remains one of the key priorities of the government. In addition to the aforementioned policies, Luxembourg pursues the action plan called 'e-Luxembourg' with the ultimate goal that its administrations, corporations, education personnel and individuals may efficiently use and have access to electronic communication means and to help improve their quality of life. A Digital Ministry was created in 2018 to specifically follow and drive the development of the digitalisation in all sectors (public and private). At present, an increasing number of filings, registrations and requests to public administrations (such as those of the tax, social security, public and energy sectors) can be and are made online. The covid-19 crisis has evidenced the importance of digitalisation and efficient electronic communication means. Administrative online platforms, such as eHealth, facilitate the possibility to carry out administrative procedures electronically via online applications have proven to be efficient, specifically during the covid-19 crisis. The government has adopted a GED system (electronic document management) and banned the use of paper, with the aim of streamlining the internal government structures in order to become more cost effective. Luxembourg has also introduced electronic identity cards. The Luxembourg government encourages and is very keen on actively assisting Luxembourg small and middle-sized companies to familiarise themselves with, develop and enhance digitalisation of their businesses and operations so as to increase productivity and competiveness for the long sustainability of their enterprises.[15] In that context, a 'Digital Skill Bridge' programme has been created, allowing businesses and their employees to be accompanied in the possibilities

12 Rapport d'activité 2017 du ministère de l'Economie, p. 51 (https://gouvernement.lu/dam-assets/fr/publications/rapport-activite/minist-economie/2017-rapport-activite-economie/rapport-activite-eco-2017.pdf).

13 https://gouvernement.lu/fr/actualites/toutes_actualites/communiques/2020/09-septembre/29-bettel-fayot-meluxina.html.

14 For instance, the Luxembourg Institute of Science and Technology (LIST).

15 Fit 4 Innovation financed by the Ministry of Economy is one of the initiatives.

that digitalisation may offer.[16] In its efforts to promote Luxembourg as a European logistics Hub, Luxembourg has introduced the 'Single Window Logistic' programme to simplify and digitalise relations between all actors in the logistics chain and thus increase efficiency and competitiveness.

Back in 2014, the Council of Government launched the strategy called 'Digital Luxembourg', which since then has actively focused on developing high-level ICT infrastructure, facilitating the regulation and flow of data, promoting digital competences, modernises online administration and creating an innovative ecosystem. The 'Digital Luxembourg' platform assembles private players and public institutions federating inter- and cross-sectoral interaction. Taking into account the constant need for a workforce with strong skills in IT, Luxembourg implemented the 'Digital (4) Education' strategy. Already in 2015, the first 'WebForce3' school was created and aims to train people in a very short time to become qualified for a developer or junior integrator job.[17] This school is part of the initiative 'Fit4coding', launched by the Luxembourg government and co-financed by the European Social Fund. Other initiatives such as 'Start to code', 'Open Class Room' 'Coding for Kids', 'Kniwellino', 'Code Start' as well as the launch of the AI Academy and the 'House of Training' assist in education and in providing digital skills in technology (including artificial intelligence).

In the context of 'Digital (4) Education' and the effort to raise awareness of the importance of the technologies at a very early stage, high schools innovating in ICT may use the label 'Future Hub' since 2017. For this purpose, in 2019, college students participated in the 'International Computer and Information Literacy Study' (ICILS) in order to assess their IT skills, the aim being that students become aware that technologies will be an integral part of their future, whatever sector they might be working in, and to raise interest in those subjects. At the same time, the Ministry is currently updating the infrastructure of all high schools to provide high-speed internet through fibre. Luxembourg ranks third out of the 28 EU member states in the 'Women in Digital Scoreboard 2019', attesting to the effectiveness of government 'Women in Digital Empowerment' (WIDE) initiatives, which actively support girls and women in the acquisition of digital skills.[18]

BEE Creative is another initiative of the Ministry for Education, constituting a place of discovery and creation intending to stimulate the creativity of the next generation.

Luxembourg is very aware of the need of skills from across its borders and, in view of recruiting IT skills abroad, the government has adapted its legislative framework in order to facilitate the obtaining of residence permits for highly skilled individuals. Luxembourg strongly encourages the development of a Digital Single Market, as this will strengthen its position within the European area.

In addition, the government is fully aware that the continuance of the success and the competitiveness of Luxembourg's financial sector will depend, inter alia, on the availability of cutting-edge services based on fintech.[19]

16 https://adem.public.lu/en/employeurs/futureskills/projet-pilote.html.

17 https://gouvernement.lu/fr/actualites/toutes_actualites/communiques/2015/12-decembre/08-ecole-webforce.html.

18 Women in Digital Scoreboard 2019, https://ec.europa.eu/digital-single-market/en/women-ict.

19 Financial-sector related technology.

Luxembourg has a Creative Industries Cluster Luxembourg, the aim of which is to support the economic development of the sector. This sector includes activities such as architecture, crafts, visual arts, design, styling, the games industry, marketing and communication, literature, publishing, the performing arts and new media.[20]

Convergence was achieved by creating rules and regulations, regulatory authorities and consulting entities at the national, European and international level, all of which embrace the diversity, interconnectivity and interrelatedness of the various industries and players. The increasing convergence between telecommunications, information technology and media has led to the adoption of the regulatory framework that was introduced into Luxembourg law by two laws of 27 February 2011 (the Telecoms Package). The Telecoms Package was designed to provide for one set of rules for all electronic communication services and networks. The adoption of Directive EU 2018/1972 replaces the existing for directives in that sector[21] and introduces the electronic communication code. Bill of Law 7632 will replace the current Telecoms Package. The main novelty that will be introduced by Bill of Law 7632 is the application of the electronic communication legislation to OTT operators. The continuing development of the ICT sector constantly calls for adjustment of the current legislation and regulations at the national and European levels (see Section II.i).

As a result of the convergence, it is extremely important that interconnectivity and free access to all operators and service providers within the TMT sector is ensured in an equal manner. The use of one infrastructure for different types of services is of particular importance and it is crucial that the operators and owners of the infrastructure or networks make these available to the other participants in the TMT sector. This is particularly true in Luxembourg, because of the small size of the market. Efforts are constantly being made to ensure competitiveness among the players in the TMT sector. Ensuring Luxembourg's international connectivity is at the top of the agenda in future years, the aim being to ensure the lowest latency rates with major capitals, the lowest prices and the presence of the most important carriers. Bill of Law 7632 is also meant to enhance investment in new high-speed networks, cover spectrum availability, prohibit redundant restrictions to the interconnexion of RLAN access points and extend universal service high-speed internet.

Finally, it is important to mention that the government supports the principles of network neutrality (i.e., keeping a free architecture, open and non-discriminatory terms, guaranteed access without unjustified conditions on electronic communication networks) and pushed for the adoption of Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open internet access and of Regulation (EU) No. 531/2012 on roaming on public mobile communications networks within the European Union, adopted on 25 November 2015, during Luxembourg's presidency of the European Union Council.

Competition among incumbent operators and alternative operators remains an important element for e-industry players.

20 https://www.luxinnovation.lu/cluster/luxembourg-creative-industries-cluster/.

21 Directives EU 2002/19, 2002/20,2002/21 and 2002/22.

II REGULATION

TMT services cover an extremely wide scope of technology and services, with different laws and regulations applicable and various regulatory authorities supervising different services and related technology. Currently, the competent ministry in Luxembourg for the telecommunication and media industry is the Ministry for Communications and Media.

i Regulators and regulated activities

The Law of 1997 created the Luxembourg Institute of Telecommunications (ILT), whose duty was to supervise and regulate the telecommunications sector. In 2000, the tasks of the ILT were widened to encompass the Luxembourg energy sector and postal services. As a consequence of the Law of 30 May 2005, the ILT was renamed the Luxembourg Institute of Regulation (ILR).[22] The 2005 law was abrogated by the Law of 27 February 2011, which governs the ILR today. The scope of the ILR's tasks has been modified on several occasions and for the last time by the Law of 27 June 2018. The ILR is an independent regulator, receiving no financial support from public state funds paid for by taxpayers; rather it is financed by the operators of the sector it supervises and regulates.

The Electronic Communication Law and the Spectrum Law clarify the allocation of competence between the Minister for Communications and Media and the ILR in different sectors. The ILR is entitled to set rules in accordance with European directives and national law. Additionally, it controls the efficient use of infrastructure for the benefit of consumers. It is entitled to determine the fees and conditions under which communication networks are operated and services rendered in order to allow the formation of a competitive market. It also has the authority to draw up reports and proposals, which it must submit to its board and the government. It gives advice, and prepares statistics and regulations.

The ILR is competent to receive notifications and to grant authorisations or licences in relation to the provision or operation of electronic communication network services and assists the competent minister in the allocation of licences for radio spectrum. It is also in charge of establishing the plan for frequencies and updating the public registers required by law for the various TMT sectors.

It has the power to issue administrative sanctions against operators that breach laws or regulations. It may also act as a dispute settler between competing operators and acts as mediator between customers and operators.[23] In 2018, the ILR received 129 new mediation requests, with more than 90 per cent of these concerning the field of electronic communication services.[24] In 2019, the ILR received 124 mediation requests, with 101 concerning electronic communication services.[25]

The Law of 27 June 2018 created a database at the ILR, containing information that certain enterprises have to transmit to the Institute. This database may be accessed by the prosecutor, the investigating judge, the State Intelligence Service and, under some circumstances, the officers of the judicial police.

22 www.ilr.lu.

23 ILR Regulation 11/151/ILR of 4th April 2011. See: ILR Activity Report 2013 (https://assets.ilr.lu/Documents/ILRLU-1797567310-62.pdf).

24 ILR Annual Activity Report of the 'Mediation' Service 2018, p. 3 (https://assets.ilr.lu/Documents/ILRLU-1797567310-204.pdf).

25 ILR Annual Activity Report of the ' Mediation Service ' 2019, p. 3 (https://assets.ilr.lu/Documents/ILRLU-1797567310-236.pdf).

The ILR is not empowered to monitor and regulate abuses of dominance. It is however responsible for ensuring that dominant players do not exclude other competitors from the sector and it may take measures and issue rules to make sure that the market is competitive, if it believes that proper competition is no longer possible.

Regarding media, one of several amendments of the Media Law worth mentioning is the Law of 27 August 2013, which replaced the governmental commissions existing under the former law (i.e., the Communication Media Service (CMS), the Independent Radio Broadcasting Commission (CIR) and the National Programming Council (CNP)) with one single authority: the Luxembourg Independent Audiovisual Authority (ALIA). Its main responsibilities are to:

a ensure service providers' compliance with the law;
b grant or withdraw broadcast permits;
c ensure access to audiovisual programmes for persons with a visual or hearing disability;
d stimulate on-demand audiovisual media service providers to promote and distribute European works;
e encourage audiovisual media service providers to elaborate codes of conduct concerning the broadcast of inappropriate contents; and
f impose sanctions on non-compliant service providers such as fines, withdrawal of permits, warnings and suspension of transmission.

The National Commission for Data Protection (CNPD) is the authority in charge of the supervision of the electronic communication market, as far as data protection issues are concerned. It has been created by the Law of 2 August 2002 on the protection of individuals with regard to the processing of personal data (repealed following the entering into force of the GDPR), and is now existing under and governed by the Law of 1 August 2018 (the Luxembourg Data Protection Law).

The CNPD controls the processing of personal data in Luxembourg and ensures compliance with the data protection regulations, in particular those relating to the confidentiality and security of processing operations. In addition, it has an advisory competence towards the government. The CNPD participates in numerous conferences and contributes to the activities undertaken by the European Data Protection Board (EDPB), such as the European Commission's assessment adequacy decision of Japan related to international transfers of personal data.[26] Although the CNPD is a public institution, it enjoys independence in carrying out its mission.

It has investigative competence that allows it direct access to data of processing operations. As an investigative and disciplinary body, the CNPD can issue administrative sanctions. Since the entry into force of the GDPR in 2018, the CNPD is responsible for monitoring the application of the GDPR, in order to protect the fundamental rights and freedoms of natural persons in relation to processing and to facilitate the free flow of personal data within the Union.[27] The authority saw its powers enhanced, as after the adoption of

26 EDPB, opinion 28/2018 regarding the European Commission Draft Implementing Decision on the adequate protection of personal data in Japan, 5 December 2018 (https://edpb.europa.eu/sites/edpb/files/files/file1/2018-12-05-opinion_2018-28_art.70_japan_adequacy_en.pdf).

27 CNPD, GDPR - Certified Assurance Report Based Processing Activities (CARPA), 29 May 2018, p. 1 (https://cnpd.public.lu/content/dam/cnpd/fr/actualites/national/2018/gdpr-carpa-criteria-v0-1.pdf).

GDPR, inter alia, it is able to impose fines of up to €20 million, or in case of an undertaking, up to 4 per cent of the total worldwide annual turnover of the preceding financial year[28] for some infringements.

The TMT sector is extremely broad and diversified. Due to the specifics of the various industries on the one hand and their interrelatedness on the other hand, it appears that laws and regulations apply to more than one specific service within the TMT sector, resulting thus in a large amount of applicable legislation and regulations.

The main legal texts are:

a the Law of 27 July 1991 as amended by Law of 17 December 2010, and the Law of 8 April 2011 on electronic media (the Media Law) as amended for the last time by a Law of 6 January 2018;

b the Law of 11 April 2010 on freedom of expression in electronic media, amending the Law of 8 June 2004 (as amended) on the freedom of expression in the media sector;

c the Law of 27 February 2011 on electronic communication services and networks (the Electronic Communication Law), abrogating the Law of 30 May 2005 on electronic communication services and networks (Former Electronic Communication Law), as amended for the last time by a Law of 12 December 2019;[29]

d the Law of 30 May 2005, as amended by the Law of 27 February 2011, organising the management of radio spectrum (the Spectrum Law);

e the Law of 30 May 2005 regarding the organisation of the ILR as amended (most recently by a Law of 19 June 2015) with an additional Bill of Law No.7632 in process;

f the Law of 30 May 2005 on the specific provisions regarding the protection of individuals as to the processing of personal data in the electronic communication sector and amending Articles 88-2 and 88-4 of the Criminal Instruction Code, as amended for the last time by a law of 27 June 2018 (the Electronic Data Protection Law);

g the Law of 14 August 2000 on electronic commerce (the Electronic Commerce Law) as amended for the last time by the Law of 17 July 2020 and with an additional Bill of Law No. 7456 in process;

h the Law of 1 August 2018 on the organisation of the CNPD and the implementation of the GDPR (the Luxembourg Data Protection Law);[30]

i general laws that are applicable to all aspects not specifically regulated by specific laws or regulations, and in particular the provisions of the Luxembourg Criminal Code (LCC) (e.g., in relation to pornography, discrimination, racism, violence, theft and piracy) and the commercial code with the amended Article 567;[31]

j the Law of 2 April 2014, amending, inter alia, the Consumer Code, the Electronic Data Protection Law and the Electronic Commerce Law (2014 Law);

k the Law of 18 July 2014 on cybercrime;[32]

28 GDPR, Article 83-5.

29 The Electronic Communication Law will be replaced by the Electronic Communication Code as per the Electronic Communication Code Bill of Law except with respect to certain national provisions which do not relate to European legislation.

30 The GDPR harmonises the applicable data protection law and the Luxembourg legislator i adopted relevant legislative texts to cover matters in which the member states keep a certain autonomy.

31 See: Section III.iv.

32 See: Section III.iv.

l the Law of 22 March 2017 on measures to reduce the cost of deploying high-speed electronic communications networks, as amended by Grand-Ducal Regulations, the last one being of 17 August 2018;

m the Law of 7 June 2017 amending the Law of 27 February 2011 on electronic communication services and networks;

n the Law of 27 June 2018, amending, inter alia, the Criminal Procedure Code, the Law of 30 May 2005 and the Electronic Media Law;

o the Law of 1 August 2018 relating to the protection of individuals as to the processing of personal data in criminal and national security matters;

p the Law of 28 May 2019 relating to the implementation of the Directive on security of network and information systems (NIS Directive);[33]

q Bill of Law No. 7651 amending the Media Law implementing some provisions of the Directive EU 2018/1808; and

r Bill of Law No 7632 implementing Directive EU 2018/1972 introducing the Electronic communication Code (the Electronic Communication Code Bill of Law).

In addition, a large number of Grand-Ducal regulations and other regulations (particularly from the ILR) have been adopted in relation to the implementation of the various laws.

ii Ownership and market access restrictions

Luxembourg rules and regulations do not, in principle, impose ownership restrictions within the TMT sector, except in certain specific sectors. Regarding telecommunications services, the previous authorisation regime was replaced by a less stringent notification regime.

There are no specific ownership restrictions for being granted a concession to operate Luxembourg satellite systems or broadcast a Luxembourg program via satellite or cable, except that, for the latter, a broadcasting licence may only be granted to a legal entity incorporated under Luxembourg law.

Because spectrum is considered a rare resource, its management and use is reserved to the state. Licences to use spectrum may, however, be granted to third parties subject to the conditions of national legislation, related regulations or international or European agreements and treaties.

There is no specific national regulation on cross-ownership of media companies. However, general laws on competition still apply.

iii Mergers and acquisitions

There is no specific Luxembourg authority regulating mergers or acquisitions in the TMT sector. The ILR's competences are to guarantee competitiveness on the Luxembourg TMT market and, as such, it will monitor acquisitions and mergers in the sector in order to evaluate their position on the market *ex post*.

The Law of 23 October 2011 on competition, which prohibits restrictive agreements and abuses of dominant position, provides for an independent authority, the Council for Competition Matters (CCM), in charge of investigating cases, consultative missions and

33 Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union (NIS Directive).

sectoral inquiries (or inquiries by types of agreement). The Investigation Division for Competition Affairs was abolished. The CCM is also the decision-making body and exercises various powers for the execution of its mission (i.e., finding and sanctioning legal violations, drafting opinions, undertaking market studies, gaining information about companies and executing missions allotted to the national CCM). Decisions by the ILR in relation to regulation of competition must be taken in agreement with the CCM. None of the relevant authorities has *ex ante* powers nor may they prevent mergers or acquisitions.

III TELECOMMUNICATIONS & INTERNET ACCESS

i Internet and internet protocol regulation

Internet services were regulated, prior to the Electronic Communication Law, by the Law of 21 March 1997 relating to telecommunication services and the operation of telecommunications networks (the Law of 1997).

The Law of 1997 did not provide for specific internet protocol regulations, but covered telecommunications services and networks generally. In the absence of the express exclusion of internet services and in light of the definition of 'telecommunication services and networks',[34] internet services were considered to be governed by this Law. The Electronic Communication Code Bill of Law will extent the scope of the law to OTT (over the top players) and will include services that are not based on numbering as was the case previously.

The Electronic Communication Law introduced certain changes, widened the scope of existing regulation to a larger range of communication technologies and introduced the definitions of 'electronic communication network' and 'electronic communication service', as opposed to the previously used generic term 'telecommunication services'. The new terminology reflected the increased scope of the regulated services and networks, making an express reference to internet services. The Electronic Communication Code Bill of Law currently in process will take a more global approach with respect to networks and electronic communication services due to the convergence between the telecommunication, media and information technology sectors.

Neither the Law of 1997 nor the current Electronic Communication Law provide for any specific rules applicable to internet services or IP-based services as opposed to traditional telephony services, except that certain additional rules apply to the provision of telecommunication services that are offered to the public, due to the specific nature of the telephony services. The Electronic Communication Law provides for certain specific obligations applying to publicly available telephony services and public telephone networks.[35] The aim of these specific regulations is to ensure a universal service to the resident population and apply only to traditional telephony. The Electronic Communication Law which is in process under the Bill of Law 7632 will among others consider the access to high speed internet as a universal service at an acceptable price.

As previously noted, the ILR is the competent regulator in charge of the supervision of the services rendered, both in relation to internet services and to traditional telephony

34 The abrogated Law of 1997 provided for a definition of 'telecommunication services' and 'telecommunication networks', with 'telecommunication' having been defined as 'each transmission, issue or reception of signs, signals, writings, images, sounds or data of any nature, by wire, radio, by optical or by electromagnetic means'.

35 Electronic Communication Law, Articles 11, 12, and 13.

services. The operation or provision of electronic communication services or networks is subject to notification to the ILR.[36] No distinction as regards the notification requirement is made between traditional telephony and internet or IP-based services, other than details on the differences on the various services notified. To the extent that the definition of electronic communication services can be broad, there are circumstances where a follow up might be of interest, as certain case-by-case exemptions apply. Although no licence is required, notified entities are subject to a certain number of formalities and filings and have to pay an administrative fee.

The Electronic Communication Law provides for a global legal framework applicable to all electronic telecommunication services and networks, with certain specifics depending on the type of service or network, ensuring however that the whole sector is consistently governed by the same legislative and regulatory national framework. The future implementation of the Electronic Communication Code will largely change the landscape of electronic communication legal and regulatory framework. The next update of this chapter will take into account the new legal framework, provided the Electronic Communication Code Bill of Law has been passed.

ii Universal service

The development of communication infrastructure in Luxembourg is among the top priorities of the governmental programmes in the field of the information and communication technology. The government has been developing the broadband infrastructure services for approximately 10 years.

Since the end of 2011, Luxembourg has a 100 per cent standard (fixed) broadband coverage (DSL up to 25Mbps) available to all Luxembourg households.[37] Similar to other neighbouring countries, there is a trend for an increased use of fixed lines provided via IP against reduction in number of the standard fixed lines. In DESI, NGA coverage[38] reached 98 per cent (compared to a European Union average of only 86 per cent of the households).[39] 4G broadband availability in Luxembourg reached around 98 per cent in urban and rural areas.[40] Luxembourg residents are very connected: 93 per cent are internet users, compared to 85 per cent in the EU.[41]

The installation of the fibre-optics has been in constant progress since 1997 and Luxconnect,[42] the city of Luxembourg and EPT are joining forces to cover the whole territory with fibre-optics under the 'national ultra-high speed network strategy – ultra-high speed network for everyone'. FTTH, using fibre-optic cable, is further progressing and 60 per cent[43] (+ 3 per cent since 2017) of all Luxembourg households are connected to FTTH according to

36 Electronic Communication Law, Article 8.

37 Luxembourg 2011 Telecommunication Market and Regulatory Developments.

38 Next Generation Access (VDSL, DOCSIS 3 cable and FTTP).

39 Digital Economy and Society Index 2020, https://ec.europa.eu/digital-single-market/en/scoreboard/luxembourg.

40 id.

41 id.

42 Luxconnect was created at the initiative of the government.

43 Rapport d'activité 2018 du ministère d'Etat, p. 11 (https://assets.ilr.lu/Documents/ILRLU-1797567310-236.pdf).

statistics of the ILR as of 28 November 2018.[44] In 2019, this percentage increased to 67.5 per cent.[45] The number of fibre-optic accesses sold also grew in 2019 to 97,120.[46] In July 2020, it was announced that POST would invest an additional €50 million in the deployment of fibre-optics.[47]

In addition to work being carried out on the deployment of fibre-optics throughout the country, efforts are also being made to increase the broadband speed of existing networks. The Grand Duchy is connected through 27 different fibre routes to the main internet exchange hubs in Europe: Frankfurt, London, Paris, Brussels, Amsterdam and Strasbourg with particularly low latency rates of between four and eight milliseconds.[48]

The most recent ILR statistical report (the ILR Report) confirms that more than half of all internet connection subscriptions (54.9 per cent) are those with a speed equal or superior to 100Mbps.[49] Luxembourg ranks third in the European Union in terms of internet access (nearly 90 per cent of households).[50]

A notable market trend towards bundled offers (broadband mobile or fixed telephony and TV) is continuing. At the end of 2016, 84 per cent of all internet accesses were commercialised with at least one other service.[51] The ILR Report for 2019 confirms this trend, as 91.7 per cent of internet subscriptions are coupled with at least one other service. The most subscribed to offer is that of fixed internet and fixed telephone services.[52] As of today, Luxembourg benefits from an extremely developed FTTH architecture.

The government aims to provide households and businesses with downstream speeds ranging up to 1GB/s and upstream speeds of 500Mbps in 2020. The EPT and other alternative operators offer ultra-high speed internet access.

iii Restrictions on the provision of service

Pursuant to the Electronic Data Protection Law and GDPR, ISPs and operators of electronic communication services and networks are compelled to ensure the confidentiality of communications exchanged by way of electronic communication means. The general rule is that no person other than the user is allowed to listen to, intercept or store communications and data relating to the traffic and location without the agreement of the user.

This prohibition does not apply to:

a communications relating to emergency calls;

b commercial transactions to the extent that they constitute proof of the transactions;

44 Fiche Statistique Internet 2018, p. 3 (https://assets.ilr.lu/telecom/Documents/fiche%20stat%20Internet%202018.pdf).

45 ILR Telecommunications Statitstical Report 2019, p. 42 (https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-779.pdf).

46 id., p. 8.

47 https://www.wort.lu/de/business/ausbau-des-glasfasernetzes-schnelles-internet-bis-in-die-hinterste-ecke-5f1730cfda2cc1784e36226f.

48 http://www.surprisinglux.com/#page=did-you-know. http://www.surprisinglux.com/asset/download/PDF_LearnMore_ICT.pdf.

49 ILR Telecommunications Statistical Report 2019, p. 26.

50 id. At 29.

51 ILR Telecommunications Statistical Report 2016, p. 40. (https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-620.pdf).

52 ILR Telecommunications Statistical Report 2019, p. 40.

c authorities investigating and acting in relation to a *flagrante delicto* act or within the scope of criminal offences in order to ensure national and public security.

A regulation from the ILR, adopted on 14 December 2017, provides for the conditions and limitations of any permitted interceptions.[53]

In relation to data resulting from commercial transactions and cookies, the user or parties to the transaction must be informed that their data may be processed and of the conditions of (in particular the duration) and reason for its storage, as well as of the possibility to oppose such data processing. Cookies may only be used with the express consent of the user. The user must have a real choice and there cannot be any risk of deception or negative consequences if the user chooses not to give his or her consent.

For the purpose of criminal law enforcement, specific conditions must be met to have recourse to intercepted communications data. In addition, for the purpose of research, monitoring and pursuit of criminal offences and with the sole aim of providing relevant information to the judicial authorities, each ISP or operator must store traffic information and locational data for a period of six months. The Law of 24 July 2010 has amended the scope of criminal offences by limiting the possibility of only consulting the data that relates to criminal offences resulting in penal sanctions of more than one year's imprisonment. The Grand-Ducal Regulation of 24 July 2010 relating to traffic data and localisation data determines the category of traffic data that may be useful for the research, observation and prosecution of criminal offences, as well as the manner pursuant to which such information is made available to the authorities. The Law of 28 May 2019 implementing the NIS Directive provides legal measures to further enhance and strengthen the level of cybersecurity.

Intellectual property theft and piracy are regulated by:

a the Copyright Law;
b the LCC;[54]
c the Privacy Law;
d the Electronic Data Protection Law; and
e the GDPR.

There is currently no public authority in Luxembourg that exercises global supervisory or monitoring power over the content and traffic data of network operators, ISPs and users, as this would violate the essential privacy principles.

Similarly, and for the same reasons, network operators may not control the content, application and services accessed by their network users.

The practice of deep packet inspection is prohibited in Luxembourg, as it infringes confidentiality rules and constitutes an invasion of privacy in complete violation of the above-mentioned legislation. The same analysis would apply to the filtering of data processed by means of electronic communication.

However, in order to comply with the secrecy or confidentiality requirements and to avoid invasion of privacy, piracy or intellectual property theft, network operators, data centre

53 Règlement ILR/T17/11 du 14 décembre 2017 relatif aux spécifications techniques pour l'interception des communications électroniques au Luxembourg - Secteur communications électroniques.

54 Criminal Code, Articles 309, 460, 488, 505, 509-1 and following.

operators and PSF are obliged to take appropriate technical and organisation measures, and to have systems and procedures (firewalls, encryption, secured and restricted access, etc.) in place that render the network and the data processing via their network secure.

iv Security

National security

The Electronic Communication Law, the Electronic Communication Data Protection Law and the Data Protection Law provide for specific applicable measures to ensure national interests.

In certain circumstances, where national security (including public health and public order) is endangered, the government may requisition the entire electronic communication network established in Luxembourg, as well as the connected equipment, or prohibit the provision of some or all electronic communication services.

In order to maintain access to the emergency services, the government may also dictate special conditions for the use of electronic communication services and networks. Although storage of personal data is generally prohibited, the Electronic Communication Law provides for an exception in relation to the storage of traffic data relating to emergency calls or inspection of false alerts, attacks or abusive calls.

The Law of 23 July 2016, as amended by the Law of 28 May 2019, created a High Commission for national protection. with special powers, allowing it to prevent, anticipate and manage a crisis and its effects, in order to return to a normal state. For example, according to Article 4 of the Law of 23 July 2016, '[t]he protection of critical infrastructure includes all activities aiming to prevent, attenuate or neutralise the risk of a reduction or discontinuity … of services essential to the protection of vital interests or essential needs for all or part of the country or its population.'

Furthermore, following the recent terrorist attacks, a law on the exchange of personal data and information in police matters was adopted on 1 August 2018.

Finally, the Law of 7 June 2017 abolished anonymous prepaid SIM cards for mobile phones. Mobile operators have to deactivate prepaid SIM cards with a Luxembourg number whose holders have not yet been identified. In return, they have to collect certain data in relation to the identification of their clients before activating the purchased prepaid cards.

The Law of 28 May 2019 relating to the implementation of the Directive on security of network and information systems (the NIS Directive) creates a computer security incident response teams network (CSIRTs network) in order to contribute to the development of trust and confidence between Member States and to promote swift and effective operational cooperation.

Privacy and consumer protection

Privacy and consumer protection in the electronic communication domain are guaranteed by both the Consumer Code and the Media Law. They set guidelines and restrictions in relation to commercial advertisements and specific provisions for the protection of children.

Information about consumers must be treated confidentially and may not be made accessible to third parties and the processing of consumer data is allowed only if it falls within the criteria defined by the relevant laws. Processing of data is subject to the principle of legitimacy of processing.

Luxembourg law prohibits in principle the addressing of advertisements or other unrequested communications to persons by electronic means without their consent. In any

event, the consumer shall be able to object. If the supplier of a product received the email addresses during a previous sale, he or she can use those email addresses to promote analogous products and services unless the concerned person requests such actions to be stopped.[55]

Specific Luxembourg provisions related to specific sectors (e-payment, financial services concluded or offered via electronic means) apply when the contractor/prospective client agrees to enter into contracts or receives services over the internet or other mobile means which do not necessitate direct human contact.

The proposal for an e-Privacy regulation that is currently negotiated at EU level will further enhance consumer protection as well as the future Electronic Communication Code to be adopted as per the Electronic Communication Code Bill of Law

Protection of children

In Luxembourg, no specific legislation or regulation that ensure the online protection of children exist.

In 2011, Luxembourg ratified the United Nations Convention on the Rights of the Child and the Council of Europe Convention on Protection of Children against Sexual Exploitation and Sexual Abuse. It is also involved in the implementation of their provisions.

Moreover, the government is issuing a number of recommendations and is supporting various projects to render children and their parents aware of the risk related to the use of the internet. The BEE Secure project has been drawn up in the context of the EU Safer Internet Programme, which gives directions for the use of the internet to children, parents and educational staff. In this context, it provides 'trainings, which are mandatory for all 7th-grade classes in Luxembourg's secondary schools'.[56] Plus, 'Luxembourg is the only country in Europe that has introduced mandatory trainings for safe internet use within the education system'.[57]

Generally, the policy is to familiarise children with new technology rather than filtering or blocking access to various types of information (these two techniques might, however, be alternatives); the intention is to teach children how to use the internet safely and to always be aware of the risks related to such use.

Children's rights are protected by provisions of the Luxembourg Criminal Code (LCC). After the adoption of the Law of 21 February 2013 amending Articles 372 and 377 of the LLC, the LLC provides for enhanced sanctions in relation to sexual child abuse matters. The BEE Secure Stopline is a project operated by a national consortium that provides a structure to report illegal information transmitted over the internet anonymously. The E-commerce Law requires information service providers to withdraw or render inaccessible any illegal content that they become aware of. The Media Law includes specific child protection provisions.

The University of Luxembourg is an active member of the EU Kids Online project, which is a multinational research network seeking to enhance European children's opportunities, risks and safety.[58] Each year, a Safer Internet Day is organised.

55 Electronic Data Protection Law, Article 11.

56 BEE Secure Annual Report 2018, p. 16. https://www.bee-secure.lu/wp-content/uploads/2020/03/118_beesecure_annual_public_report_2018.pdf and BEE Secure Annual Report 2019, p. 9 (https://www.bee-secure.lu/wp-content/uploads/2020/02/119_beesecure_annual_public_report_2019.pdf).

57 id.

58 http://www.saferinternetday.org/web/eu-kids-online/home.

In relation to the adoption of the 2014 Law, the CNP lobbied to introduce an appropriate visual warning obligation. A Grand-Ducal Regulation was adopted on 8 January 2015 for the protection of minors regarding audiovisual media services.

The GDPR establishes enhanced protection for children when it comes to the processing of their data and to their consent in relation to information society services. The processing of the personal data of a child shall be lawful where the child is at least 16 years old. If the child is younger, 'such processing shall be lawful only if and to the extent that consent is given or authorised by the holder of parental responsibility over the child'.[59]

v Cybersecurity

Cybersecurity is one of the priorities of the government. Individuals and companies are encouraged to take appropriate technical measures to defend themselves against cyberattacks.

Similar to the internet project for children, the government has created CASES Luxembourg, a project that is accessible to all internet users and the purpose of which is to make the public aware of potential cyberattacks that are inherent in internet use and to advise on how to identify them. In this context, it is worth mentioning the certification authority, Luxtrust, which manages electronic certificates with the highest level of security.

Network operators and ISPs are required by applicable law to comply with stringent security measures.

As a response to the increasing number of cyberattacks, the LCC has been amended so as to include offences in the electronic communication sector.

The government pursues efforts to prevent and fight cybercrime and, in 2011, created two dedicated structures: the Luxembourgish Cybersecurity Board (CSB), the mission of which is to work on a strategic plan against attacks via the internet and the governmental Computer Emergency Response Team (GOVCERT), linked to the national agency for the security of information systems, the Agence nationale de la sécurité des systems d'information (ANSSI), is the body with the authority to deal with incidents of cybercrime in the information systems for the public sector and operators of critical infrastructure.

The GOVCERT also cooperates with the High Commission for National Protection (HCPN) and the Government IT Centre (CTIE). Both the HCPN and the GOVCERT adopted a cybersecurity plan that has been submitted to the counsel of government. The CSB has determined five priorities (on both the national and international scale) on which Luxembourg shall focus.[60] The CSB asked a working group to review the national strategy regarding cybersecurity in order to determine whether any amendments are necessary. Furthermore, the government has signed a letter of intent with Belgium and the Netherlands to cooperate in the prevention and fight against cybercrime. LUXCIX's infrastructure has been strengthened in order to create a national centre for filtering (DDOS) which will be operational by the end of 2020.

The CSB acts as a central point of information and contact for users to report cybersecurity incidents, which should allow the CSB to supply businesses with this information and put them in a position to take appropriate action to fight the risk against security.

The Computer Incident Response Center Luxembourg (CIRCL), official CERT (Computer Emergency Response Team) of Security made in Lëtzebuerg (SMILE), is competent for the private sector, municipalities and non-governmental entities in

59 GDPR, Article 8.

60 Ministère d'Etat- Stratégie nationale en matière de cyber sécurité.

Luxembourg. SMILE, is an initiative that has the objectives of coordinating governmental initiatives, as well as supporting and making the public more aware of cybersecurity issues. In addition, SECURITYMADEIN.LU aims to develop an ecosystem for cybersecurity.

After the delay in the implementation of the European Council Convention on Cybersecurity (CCC)[61] and the Directive 2013/40/EU relating to attacks against information systems, a law relating to cybercrime was adopted on 18 July 2014. This law adapted the national substantive and procedural criminal law to the specific needs of fighting cybercrime. The law introduced new criminal offences into the LCC, in particular the misuse of identity, 'phishing' and illegal interception of computer data supplementing the legal instrument of computer-related crimes, which includes the illegal access, hacking and deletion of computer data. The law also amends the Criminal Procedure Code to achieve the requirements of the CCC regarding the prompt preservation of stored computer data and traffic data.

In May 2016, the Luxembourg government announced a collaboration between the ANSSI and SMILE through their respective CERT (computer emergency response team)[62] in relation to all activities in connection with the detection, management and notification of incidents.

Given the importance of international cooperation on cybersecurity at an EU level, the NIS Directive establishes that CSIRTs[63] should be able to participate in international cooperation networks in conjecture with national authorities.

Finally, in October 2017, the national centre of expertise concerning cybersecurity in Luxembourg was created, which helps to strengthen the positioning and the economic attractiveness of the country for undertakings in the ICT sector.[64]

In October 2020 takes place the Cybersecurity Week-Luxembourg in the framework of the European Cybersecurity Month (ECSM), an annual advocacy campaign organised by the European Union Agency for Network and Information Security (ENISA) and the European Commission,

Luxembourg is fully aware that security in the increasingly highly technological environment is and will, in the future, be one of the important pillars of a data-driven economy. It participates in initiatives and programmes, which aim to share information on cybersecurity-related subjects, for instance through MONARC and MISP (Malware Information Sharing Platform and Threat Sharing).

The International Telecommunication Union (ITU) Global Cybersecurity Index (CGI) ranked Luxembourg seventh in Europe and 11th in the world in its latest edition. These rankings highlight the commitment of Luxembourg to cybersecurity and its growing position in the leader ranking.[65]

61 The treaty entered into force on 1 July 2004. The Grand-Duchy of Luxembourg signed the treaty in 2003 and ratified it on 16 October 2014. The entry into force in Luxembourg was 1 February 2015.

62 https://gouvernement.lu/fr/actualites/toutes_actualites/communiques/2016/05-mai/30-cybersecurite-anssi.html.

63 Computer security incident teams.

64 https://www.wort.lu/en/business/security-luxembourg-to-launch-cybersecurity-centre-in-2017-580725845061e01abe83a969.

65 Global Security Index (CGI) 2018. https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2018-PDF-E.pdf.

In July 2020, the ILR announced the launch of a cybersecurity platform called SERIMA for security risk management. Even if it is at first to be used by operators of the electronic communications sector, it will soon be used in other sectors, such as energy, transport, health, water distribution and IT infrastructure.[66]

Emergency response networks

Traditionally, Luxembourg first responders and other emergency responders (such as the police, customs and civil protection) benefit from a dedicated network (RIFO), which was analogue in the beginning. With the adoption of the Law of 20 May 2014, as amended by the Law of 1 March 2019, for the financing of a national integrated radio communication network for Luxembourg, RIFO was replaced by RENITA. RENITA is based on the Terrestrial Trunked Radio (TETRA) digital technology and, in case of a congestion of mobile networks, the RENITA network is less exposed to inherent risks. RENITA has been operational since July 2015.

On an international scale, the government has actively cooperated on the strengthening of emergency telecommunication and of rapid response in the event of disasters. It has developed a nomadic satellite-based telecommunication system, emergency.lu, which aims to assist 'humanitarian agencies respond to communities affected by natural disasters, conflicts or protracted crisis'.[67] As of 2012, this platform is available as a public global service. In the beginning of 2018, the government decided to join the European Commission's European Response Coordination Centre (ERCC) and thus Luxembourg will be the first state to bring in a common module to the voluntary pool.

At an EU level, harmonisation of the digital frequency relating to these services has been achieved, permitting interoperability.

IV SPECTRUM POLICY

i Development

The increasing development of wireless communication, media and information technology also affects spectrum policy in Luxembourg.

The need for radio spectrum has increased significantly over the past few years, and Luxembourg actively participates in the elaboration of a pan-European spectrum policy and favours a more flexible and efficient use of spectrum.

In its contribution paper to the European Commission of in 2010, Luxembourg indicated that it is in favour of a more flexible use of spectrum; however, emphasising that it is crucial that the more flexible use will not negatively impair the current quality of services or entail harmful interferences. Luxembourg has expressed its concern that a more flexible use would need to take into consideration the characteristics of more specific and sensitive technology, which would be more prone to harmful interference than others.

During the negotiations that led to the adoption of the European regulatory framework, Luxembourg explained that one of its top priorities was to maintain national competence in relation to the management of the spectrum and a full subsidiarity in this area.

66 http://assets.ilr.lu/Documents/ILRLU-1797567310-239.pdf.

67 www.itu.int/net/pressoffice/press_releases/2011/52.aspx#.VecVX1IcQUI.

ii Flexible spectrum use

As a result of the Law of 27 February 2011 amending the Spectrum Law, allocated licences are no longer personal.[68] On that account, it is currently possible to sell, transfer or sublease allocated spectrum, thus enhancing the flexibility of spectrum use. The Spectrum Law also provides for the possibility of spectrum sharing.

The mobile use of spectrum dedicated to fixed use is possible as a matter of applicable law and regulations and is in line with the principle of technological neutrality.

iii Broadband and next-generation mobile spectrum use

According to the DESI 2020, fixed broadband internet is accessible for 91 per cent of the population of Luxembourg, compared to 78 per cent for the rest of the European Union.[69] For the 'new generation' high-speed internet, 98 per cent of the population is covered compared with only 86 per cent for the other EU Member States.[70]

In Luxembourg, the increasing need for spectrum for use by the offer of increasing broadband services is partly solved by opening additional frequencies or release of spectrum for the use of broadband and next generation mobile services.

Luxembourg completed the switch-off of analogue television broadcasting in 2006, replaced by DTTV. The released spectrum (referred to generally as 'the first digital dividend') is used for next-generation mobile services.

The ILR adopted a new frequency plan on 13 August 2018. The new frequency plan takes into account recent decisions, such as the Commission Implementing Decision EU 2017/899 concerning the 470-790MHz frequency band, the decision EU 2018/637 concerning the 900 and 1,800MHz frequency band and the decision EU 2018/661 of 26 April 2018 amending decision (EU) 2015/750 of 8 May 2015 on the harmonisation of the 1,452–1,492MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union.

In October 2011, Luxembourg concluded an agreement with its neighbouring countries regarding the reduction of risks of interference due to overlapping coverage in the frequency band 790–862MHz. Additional agreements were reached in May 2017 with the administrations of Belgium, France, Germany, Switzerland and the Netherlands on the frequency usage and frequency coordination in border areas. Another multilateral agreement between France, Germany, Switzerland and Luxembourg was concluded in 2014 concerning the allotment of preferential frequency blocks in the band 406.100–410.000MHz in order to ensure equal spectrum access in the respective border areas. A bilateral agreement was signed with Germany regarding Luxembourg and Germany's common approach on dealing with the 470–694MHz and the 694–790MHz frequency bands. A similar bilateral agreement has existed with France since 2016.

The licences within the 900MHz have been renewed to the existing operators and one new operator and the use thereof has been expanded to different technologies. These licences allowed the introduction of 4G technology in Luxembourg specifically (LTE). In addition, the three operators have spectrum in the 1,800MHz band allowing flexibility for the introduction of innovative new technologies.

68 Article 2 of the Law of 27 February 2011 amending Law of 30 May 2005 organising the management of radio spectrum.

69 Digital Economy and Society Index 2020, p. 5.

70 id., p. 5.

At a European level, the European Commission has adopted a decision to make more spectrum available for mobile services in the 700MHz band (694–790MHz) by 2020 allowing to provide high-quality internet to users, whereas '(f)requencies in the sub-700MHz area (470-694MHz) will remain available, as a priority, for audiovisual services'.[71] This development is in line with the deployment of 5G, foreseen as from 2020.

In August 2017, the ILR has launched a public consultation to enquire about the interest in the 700 MHz band and the possible use thereof and quantity needed to cover mobile services, security and emergency services. Three interested parties have responded (out of which RENITA, in charge of the emergency call network) and expressed their interest to obtain broadband in that frequency, in particular also in a view of the upcoming introduction of the 5G network. Two consultations were opened in May 2019 in order to establish the criteria allowing the competent Minister to issue rights-of-use of 3,400–3,800 MHz and 700MHz bands.[72]

The European telecommunication ministers have signed the common declaration 'Making 5G a success for Europe' and the ministers envisage a deployment of the 5G network between 2018 and 2025 with the aim to cover major cities and major transportation routes by 2025.[73] On 12 September 2018, Prime Minister Xavier Bettel presented the 5G strategy for Luxembourg, whereby Luxembourg's vision is to be among the leaders in 5G. Indeed the Luxembourg government wants to launch several pilot zones in Luxembourg in order to enable a timely deployment of 5G.[74] In April 2020, the competent Ministry set the conditions and the modalities of the frequency auction procedure'.[75] The candidates to participate in a public auction are Eltrona Interdiffusion S.A., Luxembourg Online S.A., Orange Communications Luxembourg SA, Post Luxembourg and Proximus Luxembourg SA[76] with three frequency bands to be allocated to the highest bidder (i.e., 30MHz were to be allocated twice in the 700MHz band and 330MHz in the 3,600MHz band).[77] On 22 July 2020, the results of the auction were made public.[78]

The licences are attributed to four out of the five candidates and they contain obligations relating to the offering of 5G coverage in the City of Luxembourg. The deadline to cover the entire national territory with 5G is 2025. Post started its first launch in October 2020.

iv Spectrum auctions and fees

Given the small size of the market and the limited number of operators, the experience of the authorities shows that allocations of spectrum through auctions or 'beauty contests' do not produce satisfactory results. Hence, although they are theoretically possible as a matter of law, auctions are not currently practised.

71 http://europa.eu/rapid/press-release_IP-16-207_en.htm.

72 https://web.ilr.lu/FR/Professionnels/Frequences-radioelectriques/Consultations.

73 'Rapport d'activité 2017 du ministère d'Etat, p. 9 (https://gouvernement.lu/dam-assets/fr/publications/rapport-activite/minist-etat/2017-rapport-activite-etat/rapport-annuel-me-2017.pdf).

74 https://www.luxinnovation.lu/event/luxembourg-5g-conference-2/.

75 https://smc.gouvernement.lu/fr/actualites.gouv_smc%2Ben%2Bactualites%2BArticles%2Bfrequencyauction.html. http://www.legilux.lu/eli/etat/adm/dmin/2020/04/27/b1437/jo.

76 http://legilux.public.lu/eli/etat/adm/amin/2020/06/11/b1959/jo.

77 http://assets.ilr.lu/Documents/ILRLU-1797567310-235.pdf.

78 https://smc.gouvernement.lu/fr/actualites.gouvernement%2Bfr%2Bactualites%2Btoutes_actualites%2Bcommuniques%2B2020%2B07-juillet%2B22-resultats-5g.html.

The Spectrum Law provides for various procedures for the allocation of spectrum licences such as competitive selection, comparative selection or by a public bidding procedure for the best offeror. The competent minister will determine the applicable procedure on a case-by-case basis after having undertaken a public consultation and publish this decision in the Luxembourg Official Gazette and in the EU Official Journal at least one month prior to the launch of the procedure.[79]

The fees payable to the state (as owner of the national spectrum) for the allocated spectrum are determined by a Grand-Ducal Regulation of 21 February 2013 on royalties for radio frequencies,[80] and by the Grand-Ducal Regulations amending it.[81] The Spectrum Law has modified the allocation and recovery of the fees payable in relation to spectrum licences in favour of the ILR. Public services and authorities are not subject to the payment duty to the extent that spectrum is used for the provision of services within the scope of national defence, public security or emergency services.

V MEDIA

i Restrictions on the provision of service

The Media Law has been amended several times the most recent amendment being from January 2018. The Law aims to cover all types of audiovisual and sonorous media. High importance is attributed to content regulation, protection of children, non-discriminatory content and the form and the content of commercial advertising.

i Internet-delivered video content

It is difficult to measure the importance of internet video distribution in Luxembourg, given the absence of surveys or statistics on this phenomenon. The only indicator is the fact that, as in most other Western countries, people watch less traditional TV, which seems to indicate that internet video is becoming more popular, particularly with the younger public. However, given the general availability of cable and satellite TV, the impact has so far been minimal.

VI THE YEAR IN REVIEW

i Key legislation

The adoption of the Luxembourg Electronic Communication Code law and the e-privacy regulation are certainly a major step towards harmonisation at European level of the electronic communication services and will provide wider transparency and enhanced availability of internet services to consumers.

Luxembourg was the first state in Europe to adopt a legal and regulatory framework ensuring property rights to private companies owning space resources by adopting the law of 28 July 2017 on the exploration and use of space resources (Space Law). In this context, in response to the growing interest of the various actors to develop the space activities, Luxembourg is working on Bill of Law No. 7317 on space activity. Such new law would,

79 Article 6 of the Spectrum Law.

80 Grand-Ducal Regulation of 21 February 2013 on royalties for radio frequencies.

81 Grand-Ducal Regulation of 8 November 2016 and Grand-Ducal Regulation of 5 December 2018.

among others, submit all Luxembourg space activities to a prior authorisation and thus would allow Luxembourg to accede to the Convention on Registration of Objects Launched into Outer Space of 1974 by creating a register of Luxembourg space objects.

VII CONCLUSIONS AND OUTLOOK

The digital economy has developed as one of important Luxembourg pillars, and is a top priority of the government: 'From a networking point of view, Luxembourg is ideally located in the middle of the so-called golden ring linking London to Amsterdam, Frankfurt, Strasbourg and Paris'.[82] Continuing efforts are being made to favour the development of new communication and information technologies that will allow Luxembourg to play a key role in the digital domain. The development of international connectivity, access of its industries to high-performance computer and security in the current context remain key priorities. Digital Letzebuerg's ongoing actions and initiatives show the government's commitment to and awareness of the importance of the ICT sector and ICT-related services. The development of fintech services is strongly supported by many market players and the government.

The acquisition of Meluxina, high-performance computer in October 2020 shall drive the 'digital transformation of the economy and offer companies new opportunities to innovate and remain competitive in an increasingly digital world'[83] according to the Minister of the Economy.

The choice for certain European projects or international players to chose Luxembourg as its headquarters or to establish a presence does confirm Luxembourg's attractiveness when it comes to digital, electronic and telecommunication services (ranging from infrastructure, security, interconnectivity to a variety of services) but also forces Luxembourg to keep pace with the sophisticated and fast-evolving environment. Luxembourg is keen to be part of the European projects and praises its competences and advantages also internationally. As one of the big challenges remains the attraction and education of skilled persons who are key for the digital world to progress and bring advantages to the world of economy, but also nations and the environment. Luxembourg is committed in the skill research and talent development in the ITC sectors. It widely supports the teaching of coding skills and computational thinking.[84]

More specifically, it continues to build its position as a European hub for the exploration and use of space resources as it continues to pursue its path towards innovation and constant search for new opportunities. It has notably participated in the new project at European level named Quantum Communication Infrastructure, which, besides the terrestrial feature, has a space component. Luxembourg joined the International Space Exploration Coordination Group, which 'is an international forum for promoting coordinated efforts toward human and robotic space exploration on and around the Moon and Mars', in 2020.[85] The space activities sector will be one of the areas Luxembourg will focus on given its history in the satellite industry.

82 https://www.luxconnect.lu/landing-page/brexit-and-the-data-centre/.

83 https://www.tradeandinvest.lu/news/luxembourg-supercomputer-meluxina-will-support-digital-transformation/.

84 Rapport d'activité 2019 du ministère de l'Education, https://gouvernement.lu/dam-assets/fr/publications/rapport-activite/minist-education-nationale-enfance-jeunesse/2019-rapport-activite-menej/2019-rapport-activite-menej.pdf.

85 https://space-agency.public.lu/en/news-media/news/2020/luxembourg_becomes_member_isecg.html.

Indeed, in the satellite sector, the SES has continued to expand its fleet of satellites offering global connectivity covering 99 per cent of the world's population. It is investing in new onsite infrastructures. The SES has ordered seven ultramodern satellites in order to increase its services starting in 2021 and wants to enter into the new connectivity area with O3b mPower, the next-generation MEO system, allowing it to establish the world's most powerful satellite based-communications system.[86] For this purpose, the SES launched four additional O3b satellites in 2019 and more launches are planned until the end of 2021 with the aim of expanding its activities in Europe, Asia and South America.[87] The broadcasting of ultra HD content is another SES priority. The SES is part of a 16-member consortium that has been tasked to integrate satellite into 5G networks, enabling ubiquitous and instantaneous 5G coverage and capacity.[88]

In this context, the SES is investing in multi-orbit capabilities in GEO and MEO to address the massive bandwidth growth expected in 5G networks and in the revolutionary O3b mPower next-generation satellite system, which are expected to be launched in 2021.[89] In August 2020, the SES announced that it had chosen SpaceX as a partner in order to launch four additional O3b mPower satellites, which will be launched from Capa Canaveral. Thus, the system will comprise 11 satellites in total: 'Built by Boeing, each satellite will generate thousands of dynamic beams and can deliver connectivity services ranging from 50Mbps to multiple gigabits per second to telecommunications, maritime, aeronautical, and energy, as well as governments and institutions across the world.'[90]

Furthermore, the SES has signed a partnership agreement with the Luxembourg Institute of Science and Technology (LIST) that will allow cooperation through their international network of research partners with unique expertise in satellite communications (SATCOM), and widen the scope of the SES's international research activities together with reputable universities. The partnership agreement further enhances Luxembourg's technology ecosystem by attracting start-ups to develop their businesses in Luxembourg, and will facilitate the transfer of new technologies stemming from national public and private research.[91]

In June 2020, the ESAIL microsatellite, built by LuxSpace and exactEarth (a Canadian operator), was ready for launch. Its aim is to 'track ships worldwide by detecting messages that ships radio-broadcast with their automatic identification systems (AIS)'.[92] It was launched at the beginning of September and 'enables fisheries monitoring, fleet management, environmental protection and security monitoring for maritime and government authorities and industry – making the seas safer'.[93]

In 2018, a law was adopted which authorised the government to buy a satellite for military usage, particularly in the domain of reconnaissance.

In partnership with the European Space agency (ESA), SES established a Quantum Cryptography Telecommunication System (QUARTZ) a new platform aimed at providing

86 https://www.ses.com/news/newsrooms.

87 https://www.ses.com/o3b-satellites-roared-space.

88 https://www.ses.com/press-release/ses-and-sat5g-spearhead-development-ubiquitous-5g-network-capabilities.

89 https://www.ses.com/newsroom/o3b-mpower-newsroom-driving-new-era-cloud-scale-connectivity.

90 https://www.ses.com/press-release/ses-picks-spacex-launch-four-additional-o3b-mpower-satellites.

91 https://digital-luxembourg.public.lu/stories/ses-and-list-collaborate-develop-innovative-business-solutions.

92 https://space-agency.public.lu/en/news-media/news/2020/ESAIL_ready_for_launch.html.

93 https://meco.gouvernement.lu/fr/actualites.gouvernement%2Ben%2Bactualites%2Btoutes_actualites%2Bcommuniques%2B2020%2B09-septembre%2B03-launch-microsatellite.html.

a global service for next-generation encryption keys for use in geographically dispersed networks. Luxembourg and ESA have also signed a joint statement on future activities concerning related technologies and space exploration.

Government policy also aims at further promoting ICT-related infrastructure (data centers, etc.) as one of the pillars of the Luxembourg economy. The government is continuing to invest heavily in the security of the networks and infrastructures as one of the main pillars of the development of the electronic communication systems. As of January 2017, Luxembourg, with its eight Tier IV data centres, had 40 per cent of the total number of Tier IV data centers in Europe, Tier IV being the highest level possible for a data centre with very high security and availability standards.[94] Luxembourg is already hosting the European Commission's data processing centres and, at the end of 2016, a new data centre for the European Commission was inaugurated in Betzdorf, which, according to the former European Commissioner for Digital Economy and Society, is a 'world-class data center' ensuring a modern, liable and economic IT infrastructure for the Commission.[95]

The discussions underway between the Luxembourg government and Google for the creation of one of the biggest data centres are still ongoing and some progress is expected within the next 12 months.

In June 2017, Luxembourg signed an agreement to establish Estonia's first 'data embassy' with the aim to store sensitive data for the Estonian government on servers in the Grand Duchy. Similarly 'the European Patent Offices decided to store their most critical and confidential data in Luxembourg'.[96] This innovative legal framework ensures security and non-violation of its premises and data.

The creation of various structures at a national level evidences the government's focus on preventing and combating cybercrime and other attacks on electronic communication services and infrastructure.

The continuing development of the online video games sector in Luxembourg and the establishment of internationally known companies is encouraging LU-CIX to further develop its services. The government has renewed its prior efforts to establish efficient technical infrastructures and a business-friendly legal environment to assure the best development possible for these companies.

The government is aware of the opportunities artificial intelligence can present given the quantity of data that is created and the possibilities to use such data but is also aware of the need for limitations. In May 2019, the Prime Minister and the Minister for the Economy presented a new strategy for the development of artificial intelligence, 'based on three pillars: making Luxembourg one of the most advanced digital societies in Europe and the world; creating a sustainable data-driven economy and building citizen-focused artificial intelligence'.[97]

Luxembourg hosts the annual ICT spring conference. As a result of the covid-19 crisis, the format has been changed to a virtual event.

The 'Infrachain' project (common blockchain infrastructure project), launched in 2016, is gaining more momentum. This non-profit organisation was incorporated in May

94 http://www.innovation.public.lu/fr/decouvrir/pourquoi/secteurs-innovants/finance/index.html.

95 https://digital-luxembourg.public.lu/news/inauguration-european-commissions-new-data-center.

96 https://www.luxconnect.lu/landing-page/brexit-and-the-data-centre/.

97 https://www.luxinnovation.lu/news/digitisation-for-the-benefit-of-businesses-and-citizens/.

2017 and various actors are showing an interest in the technology. It has been awarded its first European financing in relation to the Horizon Program 2020. It will participate in the Token[98] project.

Luxembourg is taking advantage of the growing demand for high-performance infrastructure bandwidth capacity and the connectivity needs of the e-economy. Its geographical location close to the major European cities is a clear advantage. Luxembourg is actively participating in the deployment of the 5G bandwidth both on national and European level. The launch by Post of the first 5G services evidences Luxembourg's determination. In 2020, the plan is to cover 50 per cent of Luxembourg with 700Mhz frequency bands, and increasing this to 90 per cent by 2024.[99]

On the data protection side, the challenge that is faced on transfers to non-EU countries that do not benefit from an decision of adequacy as a result of the *Schrems II* court case, may lead the European regulators to adopt new guidelines in that respect and we expect a need for strong encryption tools and EU-located servers for data storage.

Concerning cybersecurity, the EU Commission launched four pilot projects: Concordia, Echo, Sparta and CyberSec4Europe. They 'are expected to strengthen the EU's cybersecurity capacity and tackle future cybersecurity challenges for a safer European Digital Single Market'.[100] The budget for these projects is €63.5 million and '[€]1.9 million has been awarded to Luxembourg organisations'.[101] This European initiative is 'in line with the idea behind the European Commission proposal for a European Regulation establishing a European Cybersecurity Industrial, Technology and Research Competence Centre and a Network of National Cybersecurity Coordination Centres in 2021'.[102]

The programme 'Fit 4 Digital' was further developed in 2019 to appeal to very small companies (fewer than 50 employees).[103] In the same vein, the 'Luxembourg Digital Innovation Hub' was launched, the role of which 'is to actively contribute to digital transformation by supporting companies in their strategic thinking and concrete actions', by 'facilitat(ing) contacts between companies that need access to digitalisation skills, technologies, services and support mechanisms on the one hand, and digital technology and service providers that meet the needs of industry, on the other'.[104]

98 Transformative impact of Blockchain technologies in public services.

99 https://www.rtl.lu/radio/invite-vun-der-redaktioun/a/1544598.html.

100 https://ec.europa.eu/digital-single-market/en/news/four-eu-pilot-projects-launched-prepare-european-cybersecurity-competence-network.

101 https://www.luxinnovation.lu/news/europe-counts-on-luxembourgs-expertise/.

102 https://ec.europa.eu/digital-single-market/en/news/four-eu-pilot-projects-launched-prepare-european-cybersecurity-competence-network.

103 https://www.luxinnovation.lu/news/fit-4-digital-packages-un-nouveau-programme-de-digitalisation-tout-en-un-pour-les-tpe/.

104 https://www.luxinnovation.lu/news/official-launch-of-the-luxembourg-digital-innovation-hub/.

Appendix 1

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Linda Funck is a partner with Elvinger, Hoss, Prussen, which she joined in 2000 when she became a member of the Luxembourg Bar.

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