BEREC Report
about the Study Visit to the East Coast
of the United States of America

December, 2022

Contents

Summary and key lessons learned

From 12 to 16 September 2022, the BEREC Chair and Vice-Chairs, went on a study visit to the East Coast of the United States of America. The aim of the visit was to learn about upcoming regulatory trends and challenges.

During those five days, 17 meetings were held in Washington D.C. and in Boston, during which views were exchanged with relevant Federal Institutions (FCC, FTC, NTIA and the US State Department), think thanks, US-based telecom companies (Verizon, AT&T), digital platforms (Google, Meta) and software companies (Mavenir, Microsoft, Rakuten). Along the lines of BEREC's priorities for 2022, the meetings focussed around digital economy, 5G, access to broadband and affordability as well as sustainability.

In addition, BEREC learned more about the initiatives taken to promote full connectivity and address the digital divide, both at State level (in Massachusetts) as well as on City level (in Boston). Lastly, the BEREC delegation engaged with start-ups and emerged themselves in the Boston Innovation ecosystem, which makes the Boston area so unique, where venture capitals and start-ups meet on a weekly basis.

The main priority in the USA: "Connect the unconnected"

Compared to the availability of broadband in the EU, the quality and availability in the US lags behind. Huge areas, especially in the middle of the country, are still unconnected. In the aftermath of COVID, the US Congress adopted a once-in-a-generation investment to boost the nation's infrastructure, the most significant government funding put forward since the Eisenhower administration. Most relevant for telecoms is the Broadband Equity, Access, and Deployment (BEAD) Program that provides USD 42.5 billion to expand high-speed internet access.

Discussions regarding which technology to use and with quality parameters (e.g. speed) in order to be eligible for funding from BEAD, were the talk of town in Washington DC. Since 2015, the FCC's definition of broadband was 25Mbps down, 3Mbps up. Last year, the FCC proposed to update the definition to 100Mbps down, 20Mbps up.

Whereas the White House has a strong preference for future-proof fiber deployment, in line with the FCC's new definition of broadband, other interlocutors advocated for a nation-wide roll out of broadband, allowing also other technologies (e.g. FWA, low orbit satellites, …) and sometimes cheaper ways, which might imply having to make a compromise on the quality of the network, shifting the focus on supplying broadband connectivity everywhere.

In terms of availability of broadband, the State of Massachusetts is a frontrunner (having services widely available), thanks to collaborative efforts with the municipalities and industry throughout the past decade. The State actively contributed in deploying the Middle Mile network to allow for access to broadband.

The main challenge in the USA: Affordability

In addition to the BEAD, a much mentioned Federal voucher scheme is the Affordable Connectivity Program (USD 14.2 billion) which offers vulnerable groups and families a USD 30 voucher to help them pay their monthly telecoms bill to prevent them to de-connect. Whereas it was mentioned that this Federal program has shown to be very popular and effective, not everyone who is entitled to it uses this opportunity.

The main opportunity in the US: Open interoperable networks are the future

With 5G being deployed in main urban areas, the demand side to 5G user cases was not yet meeting the expectations of the policy makers. Hence, governments and industry are working closely together hoping to boost 5G-driven technologies like precision farming and smart mobility in practise.

That said, our interlocutors made clear that the past 3 years have proven to be the most disruptive in the field of telecoms: not 5G, but OpenRAN was a topic that came back in almost all of our meetings. Whereas traditionally, the MNO has to chose one RAN from one equipment vendor, OpenRAN allows the network operator to chose from a variety of radio vendors making the interfaces open, which allows for more vendor competition and flexibility.

The notion of virtualisation of mobile networks (incl. network virtualisation and cloud driven solutions) has been around for a long time, however software companies like Rakuten, Mavenir have taken the trend in the telco industry further (cloudification, opening up interfaces) and scaled it to a level that might create a significant disruption in the sector (e.g. by Dish), allowing for a quick and flexible deployment of 5G.

In the future, mobile networks will be more software driven and will contain less hardware. This implies a shift from capital expenditures (fixed costs) into operational expenditures (variable costs): whereas the traditional the centre of gravity for the MNOs was on the antennas, the RAN and other hardware equipment, with OpenRAN this shifts to cloud software (provided by Microsoft for example). Networks can be easily customised depending on the characteristics of the region and the specificities needed.

For reasons of trustworthiness and national security, the US government banned the usage of any Chinese equipment; while this benefits the European equipment vendors, there's clearly a catch-up movement from American software companies (e.g. Mavenir, Altiostar, DISH) that specialise in these building disaggregated multi-vendor, web-scale, cloud-native mobile networks, which will decrease the dependence on Ericsson and Nokia.

Other observations:
- **The "fair share discussion" is also present in the US**: similarly to the discussions in the EU, there's a debate about who should contribute to the Universal Services Fund, managed by the FCC, helping to cover the costs of the voucher system. Whereas traditionally only the voice operators chip in, the system is currently under review with some actors asking for a direct contribution from the OTTs and digital advertising companies.
- **Environmental sustainability**: sustainability is not yet a topic that is high on the policy agenda within the US Institutions. Whereas US companies are undertaking efforts to become carbon neutral, there's no sign of encompassing policies to strive towards a harmonised approach to measure any efforts under the header of environmental sustainability.
- **Patchwork of regulatory regimes**: we often hear that the fragmentation of regulatory regimes within the EU forms an obstacle for companies to offer services, especially compared with how things work in the US. During our meetings, we realised that the US also knows a very complex relationship between regulation at the Federal level, State level and local level, e.g. in terms of Open Internet regulation but also in terms of privacy and data legislation, as well as in funding available either at Federal level, State level of municipal level.
- **The government matters**: the conception that everything in the US is business-driven is not entirely true: the State and Federal level invest a lot in start ups to support the innovation economy. In a similar vain, the State deploys it's own network to ensure connectivity to communities.

1. Introduction and acknowledgements

Each year, BEREC organises a study visit to a non-member country to gain insights from the local electronic communications markets and digital ecosystem. During a typical study trip, the BEREC delegation meets representatives of the National Regulatory Authorities, the relevant ministries, as well as incumbent operators, new entrants and other stakeholders in the industry. Past destinations include Japan, Canada, India, the United States of America (West Coast) and China.

The BEREC Chair 2022, Annemarie Sipkes (ACM), joined by the Vice-Chairs Prof. Konstantinos Masselos (EETT), Michel Van Bellinghen (BIPT), Klaus Steinmaurer (RTR), Emmanuel Gabla (ARCEP), Pål Wien Espen (NKom), László Ignéczi (BEREC Office), Bert Klaassens (CN representative of ACM) and Mieke de Regt (CN Chair 2021) undertook a study visit to the East Coast of the United States of America (USA) to meet senior policy makers, senior management of various global industry stakeholders, telecom operators as well as representatives of the innovation ecosystem.

Meetings were held between 12 to 16 September in Washington D.C. and Boston, (Massachusetts) with the aim to learn about regulatory developments, trends and challenges in the field of electronic communications and digital innovation. Along the lines of BEREC's priorities for 2022, the meetings were focussed around digital economy, 5G, access to broadband and affordability and sustainability.

We would like to warmly thank all the people we met in the USA for their generosity of time and hospitality.

2. General information about the visited area and main trends

2.1. About Washington D.C. and Boston

- Washington D.C. hosts the Federal Institutions and Agencies as is the heart of the political and legislative decision making in the USA, with the presence of the Congress, the Senate and the White House. Given the high presence of decision makers and policy makers in Washington D.C., this district also hosts a high number of companies active in the US market, having their public governance offices. In addition, Washington D.C. is marked by a high number of think thanks, shaping the work of policy makers. This made the District of Columbia a hotspot for BEREC to engage in conversations about regulatory trends and developments.

- Boston is known for its unique innovation ecosystem, especially start-ups in the field of technology. Given the high concentration of world renowned Universities in the Boston area (amongst which M.I.T, Harvard, Georgetown, Boston University, …) there is a strong focus on fintech, security an biotech. With a large amount of start-ups and software developers, the speed at which business can be done, is remarkable. BEREC visited this city to engage with start-ups and also to learn about initiatives taken by the City of Boston as well as by the State of Massachusetts to promote broadband deployment, take-up and digital inclusion.

2.2. OpenRAN & security

During our meetings in the US, it was mentioned how the developments of OpenRAN caused for the biggest technology shift in telecoms in just three years. This interoperable standard that allows to build telecom equipment to slot into existing 5G infrastructure, was a topic that returned during almost all of the meetings that were held.

During the past years, the US government banned the usage of any Chinese equipment (e.g. from Huawei and ZTE) in telecom networks. While this benefits the European equipment

vendors, there's clearly a catch-up movement from American software companies (e.g. Mavenir, Altiostar, DISH) that specialise in building disaggregated multi-vendor, web-scale, cloud-native mobile networks.

The US government strongly supports the deployment of OpenRAN. The main argument is that OpenRAN driven networks are more secure, yet the reasons for the strong institutional support are manifold:

- It allows for more choice and competition: in the medium to long term, OpenRAN technology allows greater competition in the market as it allows the network operator to chose from a variety of radio vendors making the interfaces open, compared to the situation in which traditionally the MNO had to chose one RAN from one equipment vendor. It allows software companies to join a fast-growing industry.

- Supply chain diversity: with OpenRAN, networks and interfaces become fully open and interoperable in a disaggregated multi-vendor environment with a diversity of suppliers and vendors in the network.

- More secure networks: the network is more distributed. When a vulnerability arises to the network, network segregation is much easier: if something happens at a part of the network, you can easily isolate that part.

- More flexible and agile network management: deploying a network with the intelligence directly on site is no longer key, it's all in the cloud. The software driven approach significantly reduces costs and increases flexibility.

- More efficient: networks can be easily customised depending on the characteristics of the region and the specific needs for the network, which also increases the energy efficiency of the mobile network. A network based on OpenRAN principles will consumer less energy as cell sites can easily be switched off depending on the need for usage.

Some aspects of OpenRAN, such as network virtualisation and cloud computing and cloud-driven solutions have been under development for years and have their origins outside of the Open RAN environment. However, the growing attention (and most notably, the strong backing from the government) in this technology allows for a quick and flexible deployment of 5G networks in de US by software companies.

In August 2022, President Biden had signed into law the Chips and Science Act, a historic investment to surge production of American-made semiconductors, tackle supply chain vulnerabilities, and strengthens America's economic and national security. The Act comprises a 1.5 billion USD for Open RAN.

2.3. Connecting the un- and underserved

In the aftermath of the Covid pandemic, there was an political recognition that nationwide connectivity across the US was a top priority, which resulted in the adoption of a major federal spending program, called the Infrastructure Investment and Jobs Act (IIJA), a bipartisan Infrastructure Bill, signed by President Biden in November 2021. The act was initially a $715 billion infrastructure package however after congressional negotiations, it was amended to include funding for broadband access (amongst others). This amended version included approximately $1.2 trillion in spending.

Several of our interlocutors in the US underlined that this amount of federal spending was unprecedented. The main objectives within the investment programs - related to connectivity - focus on "connectivity for everyone everywhere". These objectives are targeted by three main pillars:

1. Promoting the **deployment** of broadband infrastructure;
2. Promoting the **adoption** of connectivity (e.g. promoting digital skills, inclusion...);
3. Garanteeing the **affordability** of connectivity.

Regarding the first pillar, the most significant chapter of the Infrastructure Act is called the **Broadband Equity, Access, and Deployment** (BEAD) **Program** and provides $42.45 billion to connect the unconnected, especially in the rural areas in the US. The investment program provides funding to expand high-speed internet access by focussing on planning, infrastructure deployment and adoption programs in all 50 States. The distributions of grants are managed by NTIA whereas the FCC has been charged with mapping the regions in the US which are unserved as well as underserved. Under this program, each State is guaranteed an allocation of USD 100 million. In addition, additional funds can be allocated to those States that are un/underserved, according a formula established by the NTIA that will reflect also the cost to deploy broadband in those regions. The required broadband quality that needs to be deployment in order to be eligible for funding is 100 Mbps down, 20 Mbps up, with preference for fibre.

Under the second pillar, the **Digital Equity Act** includes funding that is allocated directly to the States to develop and implement the State Digital Equity Plan, support digital inclusion activities and build capacity related to the adoption of broadband. This Act addresses the digital divide within the US and contains USD 2.75 billion.

Regarding the third pillar, the US government made USD 14.2 billion available under the **Affordable Connectivity Programme** (ACP). This programme targets vulnerable households and helps them pay their broadband bills via a voucher system. The monthly bills of those households who are eligible under the ACP, are capped at USD 30. The rationale of this programme is to prevent that households deconnect as their monthly expenses are rising.

2.4. The review of the Universal Services Fund

During the moment of our visit to the US, there was an ongoing debate about the Universal Services Fund (USF) in the US, which was being reviewed. The Universal Services Fund contains about USD 9 billion of contributions from the traditional telecommunications sector. Its contribution factor was the main question of in the review process, as some views said that the set-up of the model was no longer sustainable (e.g. broadband services were no factor into the contributions, only voice).

One month before the visit of the BEREC delegation, the FCC had issued their position on how to review the mechanism (see here) and as a next step, Congress had to discuss the review.

There was a clear parallel to the discussion regarding the "fair share" which was, during the time of our visit, very topical at EU-level. Under this discussion, policymakers are invited to reflect on how to develop an adequate framework so that all market actors benefiting from the digital transformation assume their social responsibilities and make a fair and proportionate contribution to the costs of public goods, services and infrastructures, for the benefit of all Europeans. In light of the Digital Decade targets, set by the European Parliament and the Council, telecom operators have hinted at the investment gap and asked policymakers to propose intervention so that big tech companies contribute their share to growing the EU Internet ecosystem, especially in the context of continuous data traffic increases.

During our talks with Microsoft, Google and Meta, they pointed out that there is no demonstrated market failure in the internet ecosystem that would warrant regulatory intervention. They asked for a more broad recognition of the investments in digital infrastructure (e.g. earth stations for satellites, subsea cables, containers, data centres…) they

deploy globally, for which there is very little visibility. Their infrastructure investments ensure more efficient traffic management (bringing the traffic closer to the end user). They also explained that the modern internet is more than a collection of networks. There's intertwined building blocks that are dependant on one and another.

3. Overview and summary of meetings held by the BEREC delegation

3.1. National Telecommunications and Information Administration / Department of State

The **National Telecommunications and Information Administration** (NTIA), located within the Department of Commerce, is the Executive Branch agency that is principally responsible by law for advising the President on telecommunications and information policy issues. NTIA's programs and policymaking focus largely on expanding broadband Internet access and adoption in America, expanding the use of spectrum by all users, and ensuring that the Internet remains an engine for continued innovation and economic growth. These goals are critical to America's competitiveness in the 21st century global economy and to addressing many of the nation's most pressing needs, such as improving education, health care, and public safety.

The **Department of State** advises the President and leads the nation in foreign policy issues. The past year, the State Department was actively promoting the candidacy of Doreen Bogdan-Martin, who was elected for Secretary-General of the International Telecommunications Union (ITU) in September 2022, during the plenipotentiary conference in Bucharest, Romania.

During a joint meeting with both administrations, we exchanged views about future-looking trends and regulatory developments in the field of telecommunications and digital policy.

- The State Department mentioned the need for more capacity building (e.g. at the level of the ITU) in development countries.
- Open interoperable networks with OpenRAN technology and standards were mentioned to be the future. In light of ensuring networks are fully open, the US hopes to develop its 6G approach soon. It was mentioned how the process should be industry-led but supported by the government. Security, resilience and performance were mentioned as the three core challenges for upcoming 6G, keeping in mind that is OpenRAN is not secure, it won't last. The NTIA operates an OpenRAN lab, to test and showcast the technology hand in hand with the industry. It's provides a signal that the government is there to support the sector in testing the challenges of future networks.
- Boosting the supply side of 5G was considered a challenge. The NTIA works closely with the telecom player to promote supply.

3.2. Federal Communications Commission

The Federal Communications Commission (FCC) regulates interstate and international communications through cable, radio, television, satellite and wire in the USA. An independent U.S. government agency overseen by Congress, the Commission is the United States' primary authority for communications law, regulation and technological innovation. The goal of the Commission is to promote connectivity and ensure a robust and competitive market.

BEREC and the FCC have a **Memorandum of Understanding** (MoU) since 2012, which was renewed in 2018. During the visit in 2022, both parties reconfirmed their partnership by signing an updated version of their on their international cooperation (link). The new MoU builds on previous agreements and outlines how BEREC and the FCC have committed to regularly exchange information, share technical skill sets and best practices and organise bilateral meetings, seminars and workshops to facilitate actions in their respective jurisdictions around topics including:

- cooperation on electronic communications, regulatory policy and other relevant topics related to the digital economy in the common interest of both organisations;
- encouraging and accelerating investment in broadband infrastructure deployment;
- promotion of 5G, 6G, and beyond;
- market shaping and competition aspects of spectrum management and
- sustainability in the information and communications technology (ICT) sector.

During a meeting with Chairwoman Jessica Rosenworcel and Commissioner Geoffrey Starks an exchange of views was held about various topics including:

- 5G, OpenRAN (see chapter 2.2);
- Affordability and access to broadband, in light of the Federal funding programs (see chapter 2.3). Affordability and keeping householders connected to broadband is a main focus of the FCC. It was mentioned that the Affordable Connectivity Programme has shown to be very popular and effective, however additional federal funding would be needed for the program to continue in the coming years.
- Definition of broadband: The FCC had recently proposed looking into a boost to broadband minimum speeds from 25 Mbps download to 100, and from 3 Mbps upload to 20, the first change to the FCC's broadband standard since 2015. That update would at least bring the FCC in line with Congress.
- Spectrum policy in the USA.
    - o Low-earth orbit satellites were mentioned as a promising technology to deploy fast internet in rural areas. At the same time, the orbital debris needs to be addressed.
    - o Spectrum prioritisation (repurposing spectrum bands to more efficient technologies and/or new services) will be a key challenge in the future.
    - o Making sure spectrum is made available at its highest and most efficient usage of spectrum is key for the FCC.

- o When asked about the issue of fears related to electromagnetic fields (EMF), our US counterparts answered that this is not as much as an issue as in some parts of Europe. Guidelines have been established in coordination with the health regulator. The FCC is charged with supervising whether the EMF are within the norms.
- Net neutrality:
    - o In the US, there is no longer any federal law imposing any net neutrality rules however there are policies developed at State level (e.g. in California) and the carriers abide by it. That said, the Biden administration stands behind implementing a Federal law again, which was previously made undone during the Trump administration. It was mentioned that the adoption of a federal net neutrality law is currently not likely to move forward unless a third Democratic Commissioner would be confirmed by Congress. At the moment, there are 4 Commissioners in charge of the FCC, of which two Democrats and two Republicans. The appointment procedure for the fifth Commissioner was still pending at the time of the visit.
    - o BEREC explained the recent developments in the European Union and mentioned the significance of the 2021 judgement by the European Court of Justice, which led to a revision of BEREC's Guidelines related to the Open Internet Regulation. FCC said to study the European development with much interest.

Network security was mentioned to be the topic at the top of the agenda of the FCC.

- Last year, the US Congress created a "rip and replace" program which put the FCC in charge to reimburse service providers for their efforts to increase the security of their nations communications networks, under the Secure and Trusted Communications Networks Act. The program should cover the costs of removing, replacing, and disposing of insecure equipment and services in U.S. networks as it seeks to eliminate the use of untrusted suppliers (Chinese telecom equipment manufacturers Huawei and ZTE were both singled out – see also chapter 2.2).
- The Congress had authorized a $1.9 billion reimbursement program aimed at small and rural carriers who applied for assistance however by the summer of 2022, the FCC had received over 181 applications from carriers to remove and replace equipment in their networks that pose a national security threat, representing $5.6 billion in eligible requests.
- Chairwoman Jessica Rosenworcel recently notified Congress that the foreseen funding for the Secure and Trusted Communications Networks Reimbursement Program would be drastically insufficient to meet its target.

3.3.   Federal Trade Commission

The Federal Trade Commission (FTC) is a federal regulatory agency designed to monitor and protect U.S. consumers from anticompetitive, deceptive or unfair business practices. The FTC develops policy and research tools through hearings, workshops, and conferences. It collaborates with law enforcement partners across the country and around the world to advance our crucial consumer protection and competition missions. Telecom companies and common carriers are exempted from their jurisdiction as this falls under the remit of the Federal Communications Commission.

Last year, Chairwoman Lina Khan outlined her new [vision](#) for antitrust enforcement and consumer protection, upon her appointment at the FTC. She encouraged her staff to prioritize addressing dominant intermediaries (gatekeepers) and unfair contracts and better deterring "facially illegal" mergers.

The BEREC delegation exchanged views with Chairwoman Lina Khan about digital platform regulation and regulatory trends in the internet ecosystem, both from an EU as well as US perspective. The FTC is thinking about digital markets more holistically in their competition studies. Currently, the FTC is focussing on identifying whether certain practices to data gathering (including by ISPs, especially in the context of sale of location data) might be unfair and deceptive, also from a privacy viewpoint.

3.4. Exchange of view with various think thanks

André Haspels, Ambassador of the Kingdom of the Netherlands to the United States, invited the BEREC delegation for an open discussion with representatives of three think thanks (the American Enterprise Institute, the Transatlantic Security Program and the Information Technology and Innovation Foundation).

The following topics were addressed during the presentations:

- The effects/consequences of the EU's new network & information security directive;
- Opportunities and challenges of 5G/6G and OpenRAN;
- The challenges posed by (non) State actors and countering disinformation.

3.5. Information Technology and Innovation Foundation

ITIF is an independent nonprofit, research and educational institute. Its supporters include corporations, charitable foundations, and individual contributors. ITIF's mission is to formulate, evaluate, and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress. ITIF's goal is to provide policymakers around the world with high-quality information, analysis, and actionable recommendations they can trust. Telecoms is one of the six issues on which ITIF's research focusses.

Joe Kane (Director, Broadband and Spectrum Policy) presented us the latest state of play regarding US policy for the following topics:
- The Federal Funding initiatives such as the Infrastructure Investment and Jobs Act with its Broadband Equity, Access, and Deployment (BEAD) Program.
- The challenges and opportunities regarding satellite connectivity and low earth orbit satellite solutions.
- The "fair share discussion" and the US approach in relation to the Universal Services Fund (USF).

3.6. Microsoft

Microsoft Corporation is an American multinational technology company with headquarters in Redmond, Washington. It develops, manufactures, licenses, supports, and sells computer software, consumer electronics, personal computers, and related services. Its best known software products are the Microsoft Windows line of operating systems, the Microsoft Office suite, and the Internet Explorer and Edge web browsers. Its flagship hardware products are the Xbox video game consoles and the Microsoft Surface line-up of touchscreen personal computers.

Microsoft ranked No. 21 in the 2020 Fortune 500 rankings of the largest United States corporations by total revenue; it was the world's largest software maker by revenue as of 2019.

During a visit in Microsoft Innovation & Policy Center, we focussed the discussion on the following topics:

- OpenRAN (cf. Chapter 2.2)

- Telecoms & 5G Cybersecurity: we learned about the solutions Microsoft builds to support telecom operators in terms of security and resilience and help operators comply with the jurisdiction.

- Sustainability for cloud & telecoms: Microsoft explained that it is carbon neutral since 2012 and that it wants to become carbon negative by 2030. It is the third largest corporate buyer of renewable energy. It was explained how Azure has become more energy efficient, tackling both operational, infrastructure and equipment efficiency, as well as focusing on datacenters and using electricity from renewable sources. Microsoft pointed out that 80% of the energy consumption of a telecommunication network is driven by the Radio Access Network. It observes that sustainability requirements are becoming a major indicator in the decision making of the supplier or vendors. Lastly, it pointed out that data-gathering (sustainability indicators) is seen as

challenging, given there are numerous different data sets, which does not facilize uniform reporting.

- Digital infrastructure investments in light of the "fair share" discussions at EU level (cf. chapter 2.4) and how Microsoft facilitates and supports network operators. Microsoft explained it has invested 12 billion USD of capital spending over the past 2 years.

- Technology neutrality in 6 GHz as well as 5G connectivity & unlicensed spectrum. It was explained how 5G & cloud services are merging more and more due to the Cloud infrastructure that 5G relies on (especially compared to 3G and 4G). Therefore, it's important to future-proof the cloud infrastructure to ensure that it's resilient.

3.7. Meta

Meta, formerly named Facebook, Inc. is an American multinational technology conglomerate. The company changed its name in October 2021 to reflect its focus on building the metaverse, which refers to an integrated environment that links all of the company's products and services. The company owns Facebook, Instagram, and WhatsApp, among other products and services. Meta is one of the world's most valuable companies. In September 2022, the company was worth $364.64 billion. In 2021, the company generated 97.5% of its revenue from the sale of advertising.

During a meeting with Meta, we touched upon the following subjects:

- The Digital Markets Act & interoperability of Number-Independent Interpersonal Communications Services (NI-ICS): Meta supports that BEREC would be involved in the legislation and play a role in order to have a consistent application of the issue of interoperability. It was explained that when imposing any interoperable solutions, it is important to maintain certain safeguards such as privacy, security and integrity that would undermine with consumer experience. Meta explained some initial challenges when building the complex solutions for interoperability that will involve trade-offs.

- The Open Internet review: BEREC explained its involved in the review of the Open Internet Regulation that is foreseen by the European Commission in 2023. Whereas 5G and network slicing might require an alternative approach, Meta mentioned is sees no reasons to relax the current regulatory principles of the OI framework.

- The European "Fair share" debate (cf. infra).

- OpenRAN: Meta sketched its involved in the TIP foundation (Telecom Infra Project) that gathers over 100 companies (chips makers, traditional vendor companies as well as smaller challengers) working together to open up the supply chain ecosystem of network elements.

3.8. Google

Google is an American multinational technology company that focuses on search engine technology, online advertising, cloud computing, computer software, quantum computing, e-commerce, artificial intelligence, and consumer electronics. It has been referred to as the "most powerful company in the world" and one of the world's most valuable brands due to its market dominance, data collection, and technological advantages in the area of artificial intelligence.

The following topics were discussed:

- Google's investments in physical infrastructure: Google explained us about their partnerships with telecom operators as well as the different applications they develop to drive demand in 5G. A presentation was provided about the various infrastructure deployed by Google to connect its content with ISPs, which represent an investment of about USD 125 billion a year.

- Main challenges in the US: in line with our conversations with other stakeholders in Washington DC, Google pointed out that the main issues on the ground are to increase the equity and inclusion of connectivty in the US (connecting the unconnected). We exchanged views on a number of topics that are high on the political agenda, such as promoting full broadband connectivity, internet policy and content moderation. Spectrum policy was mentioned as a particular challenge, especially from a future-orientated perspective.

3.9. Mavenir and Altiostar: cloud companies deploying OpenRan

Mavenir is building the future of networks and pioneering advanced technology, focusing on the vision of a single, software-based automated network that runs on any cloud. As the industry's only end-to-end, cloud-native network software provider, Mavenir is focused accelerating software network transformation for 250+ Communications Service Providers and Enterprises in over 120 countries.

The Rakuten subsidiary Altiostar (based in the USA) is a young start-up under the heading of Rakuten, which is the 4th mobile player in Japan. While building the technology for 4G in Japan, Rakuten wanted to keep the possibility open for the transition towards 5G and adopt a different approach vis-à-vis the traditional way of building networks. Rakuten networks was designed with only the radio's at cell locations without the need to need to employ thousands of technicians for it to be deployed. Hence, the set-up of the network was very flexible. Altiostar

is currently building the network for 1&1 in Germany, building further upon lessons learned and their experiences in Japan and the US.

The notion of virtualisation of the telecom network has been around for a long time, however companies like Rakuten and Altiostar (but also DISH) have taken the trend of cloudification and opening up interfaces to the telecoms industry and scaled it which created a disruption. Both companies are merely software companies and don't produce any radios. They don't have legacy hardware issues to support like other companies.

Both Mavenir and Altiostar presented their activities and explained us the advantages of deploying OpenRan mobile network in terms of costs savings, efficiency and less energy consumption. In separate meetings, they provided presentations about their global activities and how they operate and deploy their activities. In light of BEREC's previous workshops about OpenRAN in 2021 and 2022, this meeting helped BEREC to gain further knowledge in the topic. We learned how OpenRAN reduces the CAPEX of telecom operators: traditional telecom companies now buy cloud software and computer hardware (containers) rather than hardware equipment.

It was explained how the RAN Intelligent Controller (RIC) defines how networks will be working in the future. The RIC is a software-defined component of the Open RAN architecture that's responsible for controlling and optimizing RAN functions. It contains AI software management that can operate the customer needs of every customer individually, and therefore it is a critical piece of the Open RAN disaggregation strategy, bringing multivendor interoperability, intelligence, agility, and programmability to radio access networks. The RIC helps mobile operators reduce both infrastructure and operational costs, improve network performance, and increase business agility. It also helps them build new revenue streams with personalized services, network slicing, and indoor location tracking capabilities.

3.10. Verizon

Verizon Communications Inc. is an American multinational telecommunications company. Verizon's mobile network is the largest wireless carrier in the United States, with 120.9 million subscribers as of the end of Q4 2020.

During our visit, Verizon provided a presentation of its activities in the US, focussing on the deployment of 5G and fibre. Verizon indicated that very few of the promised user cases of 5G connectivity (precision agriculture, eHealth) have not come to scale yet. In that regard, efforts from the government and the sector to promote the take-up and demand side for 5G connectivity, is a collaborative effort: many people are involved thinking jointly on how to harvest the opportunities to make 5G deliver.

We exchanged views about sustainability in the field of electronic communications and talked about the review of the Universal Services Fund in the US.

Other topics that were discussed more in depth include OpenRAN and the definition of broadband. The latter was relevant in light of the Federal investment programs such as the Broadband Equity, Access, and Deployment Program (BEAD) as the White House has a strong preference for fibre deployment, whereas Verizon prefers a more technology-neutral approach as in some cases, Fixed-Wireless Access might be more efficient to cover rural areas.

Lastly, Verizon toured us through their Innovation Center alongside their "Technology and History Wall".

3.11.   AT&T

AT&T Inc. is an American multinational conglomerate holding company headquartered in Dallas, Texas. It is the world's largest telecommunications company, the largest provider of mobile telephone services, and the largest provider of fixed telephone services in the United States through AT&T Communications. Since June 2018, it is also the parent company of mass media conglomerate Warner Media, making it the world's largest media and entertainment company in terms of revenue.

During our visit, AT&T provided presentations on the following topics:

● The state of play of broadband deployment in the US;

● The recent Federal Investment Programs (see chapter 2.3);

● The review of the Universale Services Fund (see chapter 2.4);

● 5G and 5G security of supply Chain (O-RAN) and market trends. AT&T pointed out that OpenRAN provides a more open and competitive supply chain, aside the two main European equipment vendors.

3.12.   EU Mission in Washington D.C.

The EU delegation in Washington DC works in close cooperation with the Embassies of EU countries to promote the EU policies in the US (US Administration, Congress). The delegation had an interactive exchange of views with Peter Fatelnig (Minister-Counsellor for Digital

Economy Policy). He provided an overview trade- and technology related issues between the EU and the US.

We had a more profound discussion about the US industrial policy, especially in relation to OpenRAN. The recent Federal funding for the deployment of connectivity was also discussed in more depth.

3.13. Initiatives to promote full connectivity: Massachusetts and Boston City

The Massachusetts Broadband Initiative (MBI) is a State-funded public agency, tasked with overseeing broadband grants to or on behalf of towns from the State of Massachusetts. Their mission is to make affordable high-speed Internet available to all homes, businesses, schools, libraries, medical facilities, government offices, and other public places within the State of Massachusetts.

BEREC learned about the initiatives of the State of Massachusetts to promote and improve broadband connectivity: In 2016, the MBI built a framework to help all 53 "last mile" towns achieve broadband access via locally-owned networks ("the MassBroadband 123 Middle Mile network"). The network connects over 120 communities within the State and serves as a building block for the region. The funding for this initiative came both from federal, State and municipal government level as well as private sector.

As for connecting the rural areas, the goal was to achieve at last 96% coverage in each town, using FCC's definition of broadband (25Mbps down / 3Mpbs up). As a principle, technology neutrality was used (grant-funded projects utilized fiber, hybrid fiber-coax and fixed wireless).

The MBI project includes broadband mapping, broadband planning, collecting data on computer and Internet ownership and usage, and technical assistance. The data is used to update the National Broadband Map, a combined effort of the NTIA and the FCC.

The Massachusetts broadband Strategic Plan compiles the infrastructure and digital equity investments and strategy and sets out certain pillars going forward, focussing on extending and improving the broadband access, adoption and affordability, as well as increasing digital literacy.

After the meeting on State level, the BEREC Delegation met with the **City of Boston**, to get further insights on what initiatives are taken at city-level to tackle digital inclusion and promote competition in the broadband market.

The "Broadband and Digital Equity" is an initiative of the City of Boston with the aim to improve the access to affordable and reliable high-speed Internet in Boston, targeting both the quality as well as the affordability of broadband connectivity. In addition to that, there's also a strong focus on promoting access to devices, digital skills and addressing the digital divide aiming to ensure Boston becomes a more fair and innovative City.

The program is overseen by the Department of Innovation and Technology at the City Council and a fund was established in 2017 to help fund projects so residents can digital participate in educational, economical and civil opportunities. As an example, the city provided 55.000 Chromebooks, 10.000 hotspot routers, 3.500 internet subscriptions and 6.000 tablets to vulnerable populations and families with school-aged children – during the pandemic.

In the period of the visit of the BEREC delegation, affordability was with no doubt mentioned as the most pertinent challenge. About USD 2 billion a year is being spend to digital equity and after the efforts of the past years, the focus of the City shifts to getting eligible Boston households enrolled in the Affordable Connectivity Programme (see also chapter 2.3) to ensure Bostonians can keep paying their broadband bills. It was mentioned the Federal fund is much welcomed as this shifts the financial burden from City to the Federal government.

During our visit, it was explained how Boston City had been a main driver in ensuring there's more competition in the city area between the telecom providers, for example by removing barriers for the rollout of networks, ensuring that apartment buildings to have multiple Internet options… At the same time, the City has intentionally been building fiber assets over the years. The local government also plays a regulatory role (e.g. issuing licenses, granting permits for small cells, regulating the right of way, managing franchise agreements for backhaul, …).

3.14. The Boston Innovation ecosystem

Mart Duitemeijer (Innovation attaché at the Netherlands Innovation Network at Boston) explained why Massachusetts (MA) is the centre of innovation and technology in the US and why Boston has an unique innovation ecosystem, especially for start-ups in the field of technology. Given the high concentration of world renowned Universities in the Boston area (amongst which M.I.T, Harvard, Georgetown, Boston University, …) there is a strong focus on fintech, security an biotech. With a large amount of start-ups and software developers, the speed at which business can be done, is remarkable.

- The BEREC delegation visited the Cambridge Innovation Center (CIC), which was founded in 1999 by two Massachusetts Institute of Technology (MIT) graduates. The CIC has now several locations worldwide and consists of a mix of startups, corporate innovation spin-outs, and venture capital funds, with tenants given access to desks, meeting rooms, labs, etc.

- The delegation also participated in a weekly-held networking event called the Venture Café, an initiative that exists since 2010 and aims to spark meaningful ideas and big changes by colliding spontaneity with intention. The gatherings bring together creators, entrepreneurs, investors, academics, corporates, students and visionaries. During our visit, we were impressed by the amount of people representing start-ups and by the open, low-key atmosphere that allowed all participants to learn from each other. We noticed that the State and Federal level invest a lot in start ups to support the innovation economy.

- During a meeting with various representatives of EU Member States, based in Massachusetts, we learned more about their experiences in the Boston Innovation ecosystem. We reflected on the regulatory differences in the US versus the EU as well as the impact of various digital policies and regulation.