WORKSHOP ON INTERNET OF THINGS: PERSPECTIVES AND COMPETITION

7 March, 2024

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Executive Summary

In 2016, BEREC prepared a Report on Enabling the Internet of Things (IoT)[1]. BEREC concluded that, in general, no special treatment of IoT services and/or Machine-to-Machine (M2M) communications is necessary, except for the following areas: roaming, switching and number portability.

On 26 October 2023, BEREC organized an online workshop on Internet of Things: perspectives and competition[2] to assess the state of the art for the delivery of IoT services, their evolution in recent years in view of the technology and regulatory developments and discuss if new competition or provisioning bottlenecks have arisen or if the issues identified in 2016 have been solved. About 150 participants, representing BEREC members and different types of stakeholders, took part in the event.

BEREC Chair 2023, Prof. Kostas Masselos initiated the workshop with a keynote speech provided. The following exchanges were divided in two roundtables: one on IoT Solutions, the other on IoT providers. Concluding remarks were provided by Mr. Peter Stuckmann, Head of Unit and Deputy Director at DG CONNECT.

The first panel dedicated to IoT solutions included the participation of Mr. Serafino Abate, Regulatory Affairs Expert at Volvo, Dr. Carl Jeding, Director Government & Policy Advocacy at Ericsson and Mr. Musa Unmehopa, Head of Wireless Standards & Regulations at Signify and Chairman of the Board of Directors of the Connectivity Standards Alliance.

In the second panel focused on IoT providers, Mr. Jacques Bonifay represented Transatel, Mr Gonzalo Garcia Arribas, Telefónica, and Mr. Fabien Migneret participated on behalf of the LoRa Alliance.

Closing remarks were provided by Mr. Peter Stuckmann, Head of Unit and Deputy Director at DG CONNECT.

In general terms, the participants shared common views on the need that regulation consider:

- Legal certainty. Some examples of possible improvements in this regard put forward by the stakeholders were the need to clarify certain definitions (e.g. definition of short-range devices) and Open Internet (OI) rules with regard to the use of network slicing.

- The global nature of IoT services. In particular, it was requested to avoid major regulatory differences across geographical borders because this would impede a global marketplace required for the development of IoT services.

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[1]   https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-enabling-the-internet-of-things

[2]   https://www.berec.europa.eu/en/events/berec-events-2023/berec-workshop-on-internet-of-things-perspectives-and-competition
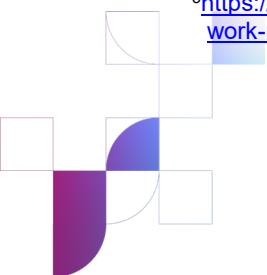
- The consideration of the diverse needs for different use cases and industries. In view of the stakeholders, regulation should be flexible enough to consider the very heterogeneous IoT environments.

- The need to address IoT requirements and relevant inputs for its provision (e.g. ensuring QoS, interoperability of data or ecosystems, or spectrum management).

- The development of further public policies to foster demand of the services.

- Finally, the majority of the participants commented regarding adjacent issues to electronic communications (e.g. data regulation, product safety)

On the other hand, diverse perspectives were hold mainly with regard to the diverse bottlenecks that MVNO and MNO may face to offer IoT services (e.g. permanent roaming or access to satellite connectivity).

BEREC thanks the stakeholders and the EC for the participation in this exchange providing useful inputs and "food for thought" for the improvement of regulation with the aim to progress in enabling innovation and better services for the users.

These considerations will further feed future work by BEREC. Already in 2024, some of the topics referred to in this workshop could be considered in the context of the External workshop about the usage of satellite technologies in mobile communications and the Report on M2M and permanent roaming foreseen in the 2024 BEREC work programme[3]. Furthermore, BEREC envisages a possible report on IoT considering 6G and multi-access edge computing (MEC) developments in 2025.

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[3] https://www.berec.europa.eu/en/document-categories/berec/berec-strategies-and-work-programmes/berec-work-programme-2024

1. Introduction

In 2016, BEREC prepared a Report on Enabling the Internet of Things (IoT)[4]. In this Report, BEREC assessed the state of play on IoT services in terms of sustainable competition, interoperability of electronic communications services and consumer benefits. Namely, it presents the most common characteristics of IoT services and concludes on whether IoT services might require special treatment with regard to current and potential future regulatory issues. In general, BEREC concluded that no special treatment of IoT services and/or M2M communication is necessary, except for roaming, switching and number portability.

In January 2022, the EC published a report about the findings of its competition sector inquiry into the consumer IoT[5]. The report identifies potential competition concerns in the rapidly growing markets for IoT related products and services in the European Union (EU). According to EC those are markets with high entry barriers, few vertically integrated players and concerns about access to data, interoperability or exclusivity practices amongst others. Based on these findings, the EC may consider future enforcement and regulatory activities.

The EU legislator updated the legal framework in 2018 setting the grounds to facilitate the development and provision of IoT communications, also taking into consideration BEREC's inputs among various sources. Some of the key measures introduced in the European Electronic Communications Code (hereafter, "the Code") include the possibility of extraterritorial use of numbering resources, the promotion of over-the-air provisioning, enabling granting of numbering resources to undertakings other than providers of electronic communications networks or services, advancing in the harmonization of radio spectrum management rules and facilitating 5G deployments.

More recently, the latest review of the Roaming Regulation in 2022 called for the removal of barriers for the provision of machine-to-machine communication, including the development of alternative tariff schemes adapted to IoT services. BEREC was tasked to monitor developments in this regard.

Against this backdrop, BEREC organized a workshop with stakeholders to assess the current state on the delivery of IoT services and their evolution in the last years in view of the technology and regulatory developments. BEREC also aimed at discussing if new competition or provisioning bottlenecks have arisen.

The event took place on the 26 October 2023 with the following agenda:

1. Opening by BEREC's Chair 2023, Prof. Konstantinos Masselos

2. A roundtable on IoT Solutions

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[4] https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-enabling-the-internet-of-things

[5] https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_22_402/IP_22_402_EN.pdf

3. A roundtable on IoT providers

4. Closing statement, Mr. Peter Stuckmann, Head of Unit and Deputy Director at DG CONNECT

The full agenda is available in ANNEX I. About 150 participants took part in the event, both, representatives of various BEREC members and different stakeholders, i.e. large MNOs and alliances.

2. **Keynote speaker**

Prof. Kostas Masselos, BEREC Chair for 2023 and President of the Hellenic Telecommunications and Post Commission, gave the opening speech for the IoT workshop on the perspectives and regulatory/competition challenges of Internet of Things. In more details, he started his speech with a reference to the importance and the potential of IoT to reshape industries, communities, and our daily lives, accompanied by glorious market forecasts for the next years. He mentioned that the global IoT market will generate revenues exceeding US$900bn by 2025, up by 27.4% per year, on average, since 2020, according to GSMA estimates, while estimates by Statista are more conservative foreseeing that the global IoT market (measured as annual spend by end customers on IoT hardware, connectivity, and services) will cross the US$1tn revenue milestone by 2030.

In this direction, Prof. Kostas Masselos considered it is important to take into account the following:

- BEREC's Report on Enabling the IoT, as published in 2016. In this Report, BEREC assesses the state of play on IoT services in terms of sustainable competition, interoperability of electronic communications services and consumer benefits. BEREC concluded that, in general, no special treatment of IoT services and/or M2M communication is necessary, except for roaming, switching and number portability.

- Key measures introduced by the Code as published in 2018, including the possibility of extraterritorial use of numbering resources, the promotion of over-the-air provisioning, enabling granting of numbering resources to the undertakings other than providers of electronic communications networks or services, advancing in the harmonization of radio spectrum management rules and facilitating 5G deployments.

- The EC report as published in 2022 entitled as Sector inquiry into the consumer IoT, identifying potential competition concerns in the rapidly growing markets for IoT related products and services in the European Union. According to EC, this is a market with high barriers to entry, few vertically integrated players and concerns about access to data, interoperability or exclusivity practices amongst others.

- The latest review of the Roaming Regulation in 2022, which called for the removal of barriers for the provision of machine-to-machine communications including the development of alternative tariff schemes adapted to IoT services and asks BEREC to monitor developments in this regard.

Prof. Kostas Masselos underlined that this workshop is of great interest to BEREC, since it aims to provide a platform for a constructive dialogue on a series of crucial topics. The participation of experts and innovators who are shaping the IoT landscape ensures its successful outcome.

Fruitful discussions on key issues like the prospects of IoT development in terms of QoS, handover and network slicing will follow. Moreover, a deeper understanding on emerging competition challenges for IoT services in view of 5G and 6G era is expected, while also suggested areas for regulatory interventions will be also revealed.

3. IoT Solutions

3.1. Volvo

Mr. Abate started the exchange reflecting that "connected cars" are one of the most referred use cases for IoT. Volvo cars have been connectivity enabled since 2016 with their newest model also having the ability to get software updates "over the air" by means of the newest internal and external sensors. Some sensors and cameras are being required by specific regulation on automotive safety, for example driver distraction cameras. Therefore, requirements in terms of connectivity are changing, but the need is definitely increasing and the complexity of the product is increasing.

From a regulatory perspective, the car manufacturer considers that there are three broad issues. Firstly, there is the *communication aspect*. Their current approach is to purchase connectivity from a connectivity provider within the region of country of operations; it is a secure product and is usually the only channel of communications for the car. At this point, they are still far away of the ability of vehicles to communicate with each other and to infrastructure.

Secondly, the regulations on IoT for the car industry is more connected with *product safety regulations*. The key regulation comes from the United Nations Economic Committee for Europe (UN ECE), having currently 180 safety regulations[6] some of them connected with cybersecurity (Regulation 155) and software updates (Regulation 156). These regulations apply in Europe[7] but there are different rules for US and China.

Finally, the *regulation on data* is becoming a very important aspect. Since the General Data Protection Regulation (GDPR) has been in force, there has been a *de facto* global standard for the protection of personal data. However, new types of data regulations are now being considered or adopted in different regions. For example, now in Europe there is the Data Act that regulates the user and third-party data access which applies to all data generated by the car. There are also new rules on data security, for extracting data to monitor energy efficiency,

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[6] https://unece.org/un-regulations-addenda-1958-agreement
[7] https://single-market-economy.ec.europa.eu/sectors/automotive-industry/technical-harmonisation/technical-harmonisation-eu_en

to monitor advanced driving system, to record events and voluntary schemes to share data for road safety to which Volvo already participates.

These are all important aspects he emphasized and he welcomed the future debate with the telecom sector to further consider IoT.

3.2. Ericsson

In his address, Mr. Jeding focused his discussion on the mobile networks aspects of IoT. These networks will be crucial for many if not most of the applications both for consumer as well as for industrial use cases. Here, we might speak of a sort of big bang applications, such as smart cost management, smart agriculture or forest and so on. These are services where machines will not have access to a fixed network connection and where network performance must be tailored to the service being delivered. Therefore, the regulation should be able to ensure better conditions for developing those networks and services.

Mr. Jeding gave three brief examples of areas where the regulation could help. First, there is some amount of regulatory uncertainty in the market around QoS differentiation. The question is if that is compatible with the net neutrality requirements of the open Internet regulation.

In the EC implementation report, the mission states that more clarity on the application of the rules is necessary and the industry would encourage the EC to act on that recommendation by either developing its own guidance or BEREC to develop further guidelines. In his opinion, it is an opportunity to have a consistent application by national regulators. This would in particular ensure that there aren't any unnecessary limits put on the development of 5G standalone end-to-end slicing-based services.

In addition, areas where such further signposting or clarification would do the most benefit would be around what constitutes a non-publicly available service and verifying the necessity requirement for specialized services.

The second point was that Europe is lagging far behind Asia in the rollout of private 5G networks and 5G standalone networks. He considers that it is a completely new broad debate worth mentioning because it has direct connection with the development and take up of advanced IoT services. It would be beneficial if European connectivity targets for 5G were set on a much more granular level rather to look at very crude indicators.

The third example concerns European telecom policy that has been almost exclusively focused on supply side reports. There has been so many efforts for infrastructure roll out, spectrum reforms, promoting competition or facilitating market entry and this has been highly successful. Nevertheless, many questions now are not connected closely with the supply side of the market. As an example, the widespread introduction of already existing digital technology could help reduce greenhouse gas emissions from industry by about 15% on a global scale that is enormous, but the process is too slow. Therefore, what needs to be done to speed it up is worth asking? How do you get industries to change their value creating processes to become digital? That is rather a demand side consideration and they do not have well developed existing policy instrument as compared to ones on the supply side.

3.3. Connectivity Standards Alliance

Mr. Unmehopa was representing the Connectivity Standards Alliance (CSA), which is an industry alliance of about 650 member companies distributed across the globe with 40% of members with their headquarters based in Europe. CSA's focus area is mostly connected with the IoT for smart home. This has typically been an unregulated area since 2.4 GHz license spectrum band is used. However, they do deal with a number of very important topics dealing with consumer benefits and ensuring fair competition. Therefore, in his opinion it would be very beneficial to include CSA in future talks when developing this regulation because they will ultimately be relevant across all industries and not just the traditionally regulated ones. It is of great importance to have in mind that, even discussing about IoT in a single monolithic term, there are differences across industry segments. According to Mr. Unmehopa in the smart home-connected devices, they deal with short-range wireless communication equipment, often comprising battery powered or battery-less devices with low power and low memory on site.

Regulatory considerations for those types of devices can be different when dealing with a connected phone or a connected car and it is essential to have that in mind while developing future regulations.

The second point made by Mr. Unmehopa was that they represent many members across the globe which are active on several geographical markets and it is very important to take this into consideration with the new regulations, in order to avoid big geographical differences because that would impede a global marketplace. By understanding and accepting regional differences, it should be striving for a commonality that would allow economies of scale for this industry to grow.

Summary of Q&A after Roundtable I

Question: With regard to IoT, BEREC has mainly focused on the topics connected to roaming, switching and number portability in IoT. Were those conclusions right, do we need to update key findings in the previous BEREC Report on IoT?

According to Mr. Abate, there have been a lot of smart objects entering the market very rapidly and capabilities for connected cars have rapidly increased in the past few years. Today there are better use cases. IoT depends on public resource such as spectrum sharing governed by each country and BEREC should keep close eye on that aspect. Another aspect would be how cybersecurity challenges and approaches have evolved, by at the same time reflecting on the use cases with a focus on the telecom.

For Mr. Jeding, QoS differentiation is key to a wider take up of IoT. One of his points is that this sort of demand side reforms should be stimulated to speed up the uptake of digitalization. This is an area that would be fruitful for further work because there is lack of well-developed policy. There is a lack of good policy instruments to implement. Therefore, some serious thinking needs to be done by regulators, legislators and industry altogether, including on promoting digitalization in industry verticals or setting digitalization targets for industry

verticals. Furthermore, how we can tailor other measures like energy consumption in the sense of industry verticals that promotes those targets is becoming an important question.

Mr. Unmehopa considers that issues such as roaming and portability will be highly relevant as the smart home becomes more prevalent and penetrates the market. For instance, such issues include the need to enable devices to change ownership or share the smart system with others, including considering relevant issues like whether personal use of data in the device stays with the consumer after changing ownership of the devices. Another emerging issue as use cases evolve and more devices are connected is the development of "smart home ecosystems" with a "smart hub" that controls all personal devices in our homes. There are small number of companies that customers may choose from and, once users adopt an ecosystem, changing provider becomes highly difficult for the users. Mr. Unmehopa considers that the provisions in the Data Act, where the ownership of the data moves closely to the end user and empowers the user to allow other companies to use the data generated by IoT, is a very useful and important first step. However, in cases where the device can be movable throughout different platforms, these measures might not be sufficient.

Question: What regulatory issues are raising challenges connected to privacy and use of data?

Mr. Abate welcomes the fact that the GDPR has become a *de facto* global standard because that makes compliance easier. Regulatory certainty is important because it takes a few years to design a car as final product. By this metric, we can say that Europe is a region where the regulatory certainty exists.

Mr. Unmehopa's point was that it is of essence to find the balance between protecting end users and fostering innovation.

According to Mr. Bonifay, the role of MVNO must not be observed only on a European level but rather on a worldwide scale. He emphasized the need that MVNOs have access on equal conditions everywhere in Europe so that users have a choice to be able to work with MVNOs as well as MNOs. If IoT becomes part of the Roaming Regulation in the future, it becomes of great importance that all MVNO can be sure to have pan-European access, which would be a key for providing worldwide offer. Mr. Abate complemented this by mentioning that the point of having an equal choice is a fair one. As car producer, they do business globally and therefore need global providers.

Question: Regulators are obliged to regulate based on the Data Act. Edge computing was found to be a key enabler for IoT. What is your opinion on whether BEREC should try to better understand edge computing and how it relates to data and IoT?

According to Mr. Abate, it is good to frame this in terms of what it means for a specific use case instead of considering just the implications on network congestion and spectrum use.

Mr. Jeding thinks the more computing that can move from the device to the network, the cheaper and more widely spread the services will be. For sure, that is something that BEREC

and other regulators need to understand, including what are the drivers behind that development and what could facilitate it.

For Mr. Unmehopa, edge computing traditionally has not been a major topic for smart home connectivity and devices. Connected devices in smart home, connect and talk with each other. However, things may change if we look at future use cases, for example if one smart home would start talking to another smart home, for instance, it may be necessary to regulate who has the highest demand on the grid at that moment. Another example is if one user wants to take his smart home experience and bring it to his smart office, or to smart hotel room. With such future use cases, considerations about edge computing become more relevant, but according to his opinion it remains to be seen in the future.

Question: How should we advance in the digital single market facilitating seamless IoT services across the European Union and what are further measures required. Could roaming and handover be an issue?

Mr. Jeding: No regulatory suggestions can be made but since networks have the ability to handle the services within the national borders as well as within the national network, the EU has to be a coherent single market regarding IoT, so innovators can develop step-changing applications and provide them to users.

According to Mr. Abate, the main problem is the lack of an EU-wide regulation of automated driving systems. However, this is the responsibility of other regulators more than BEREC members.

From Mr. Unmehopa's point of view, cybersecurity is key and, in the field of the smart home industry, a consumer label for product security is required to allow the user to understand, from the moment of acquisition, the security features and data policy of the product. The Radio Equipment Directive and the Cyber Resilience Act are very important but there are also concerns about overly stringent security requirements for constrained devices.

Questions/comments made by the audience.

One participant noted that IoT is a global product that requires a global solution calling for advance in the development of the single market. He also reminded the important role that BEREC can play for further harmonization. This call for harmonization was shared by another participant naming some examples regarding authorisation and access regulation.

4. IoT providers

4.1. Transatel

Mr. Jacques Bonifay emphasized that the IoT business is a global one and it is important not to merely have a European perspective on it. As an example, he emphasized that connectivity of cars in his opinion constitutes the biggest IoT market today, stating that there has been a growing tendency to choose MVNOs for global solutions assuming the reason behind this is they are providing very good services and are focused on IoT. That's why he finds it extremely important for European MVNOs to have pan-European network access and the European regulation including IoT with permanent roaming authorisation should be a way to facilitate this. It is important never to lose sight of the fact that for European companies the domestic market is Europe wide, not a single Member State market. Consequently, the European industry needs to be given a choice between MNOs and MVNOs.

Mr. Bonifay remarked that the business model is such that satellite providers need mobile network operators' frequencies to provide service on ground, giving MNOs the advantageous ability to determine who can access this satellite connectivity. According to his opinion it is important that BEREC and the European regulators should have a mechanism by which the MVNOs will also have access to satellite connectivity on almost equal terms as MNOs.

Regarding the Roaming Regulation or IoT development, Mr. Bonifay claimed that large complexities are at play. These are detrimental to all European players. Moreover, the rules coexisting within the markets of all 27 Member States make it very difficult to negotiate. All this complexity at domestic market level makes it very difficult for the companies to develop on the international markets. He calls for more harmonisation first at the European level, but also at the international markets where Europe can take a lead and have an impact on these markets and regions to take over the European model in terms of regulation.

4.2. Telefónica

Mr. Gonzalo García considered that the current regulatory framework is adequate and fit for purpose as commercial negotiations for the treatment of permanent roaming provides enough flexibility to let the market freely develop. Indeed, the market for IoT services is among little examples of a European market that has developed cross border services based on a light touch regulation. However, he added that there are things that can be improved, such as the approach in the Code regarding the definition of M2M/IoT services. In addition, the obligations that service providers in general have to face when offering IoT services in different Member States, which are but not specifically linked to IoT itself (e.g., information retention, GDPR, contract duration). On top of that, current Net Neutrality rules or Spectrum policies seem also to be supporting the development of an IoT European market and accordingly are not becoming a burden for its evolution.

In relation to the satellite services developments, Mr. Gonzalo García explained that in Spain there is a state aid initiative for fixed broadband rural demand that is relying on satellite in those areas where deploying fibre is not profitable. For that reason, he stated that satellite services could be a complement to the network operators' coverage in several cases across Europe.

Mr. Gonzalo Garcia understood the concerns that Jacques Bonifay (CEO of Transatel) raises about the complexity of complying with domestic market obligations in each Member State. He stated that "*if you want to cover the 27 Member States, you need to be aware of what the situation is and the obligations you need to comply with in France, Germany, Austria… in every country beyond the Roaming regulation, which is quite horizontal. However, the specific national implementations are quite diverse, and you need a lot of head count and effort in order to be aware of what the specific situation is in each country, which in the end becomes a burden to make business in Europe*".

However, Mr. Gonzalo Garcia noted that mobile and IoT markets are competitive enough as long as MVNO providers such as Transatel could rely on the Roam Like At Home regulation. He added that spectrum nowadays is not a burden to prevent the development of the IoT market. Also, he replied to Transatel that it might be necessary to consider the indirect impact that the secondary use of mobile frequencies by satellite services (or any 3rd party) could have on the price in spectrum auctions.

In light of the upcoming review of the Code in 2025, Mr. Gonzalo García explained that what "*could be tackled in this review is whether the definition of M2M services within the Code is fit for purpose to what our customers are currently requesting us. Meaning especially the OEVMs, (car manufacturers), as long as they want to offer M2M/IoT services in vehicles, which are not 100% fully aligned with the definition of the Code of what M2M services are*".

4.3. LoRa Alliance

In his address, Mr. Fabien Migneret provided a little background of the LoRA Alliance, which started in time when the first BEREC Report "Enabling of Internet of Things" was published, and it has since grown into one of the fast-evolving technology associations in the world with 400 companies and operators globally. This helps them to have a global view rather than only a European perspective.

One of LoRA Alliance's priorities, which is in line with the conclusion from 2016 BEREC Report, is interoperability and LoRA Alliance would like to contribute to further work of BEREC and EC on this important issue.

Among the issues, that he mentioned is the need for an update of the European Commission's definition of short-range devices to align with the evolution of the IoT application.

He agreed that harmonisation of spectrum is very important and LoRA Alliance has already started to contribute through CEPT level on the bands for low power networks. However, they believe that the EC should be more active to influence a global band for IoT market.

Finally, he emphasised the importance of growing use of satellites for the evolution on the IoT market. Satellites are enabling very diverse use cases in the IoT market and LoRA Alliance is grateful to the European administrations to have initiated some work on the 860 to 870 MHz band. He concluded that there is already very good regulatory environment in place but he hopes that there will soon be regulatory agreements that will facilitate European satellite operators to provide European and worldwide IoT applications.

He stressed his expectation for further harmonisation and invited BEREC and EC to finalise harmonisation of 868 and 915 MHz band and contribute further to interoperability issue.

In addition, among other important issues for the development of IoT market, he mentioned roaming and end-to-end data security.

Summary of Q&A after Roundtable II

Question: How are the different technologies developing and how it is relevant for IoT?

Mr. Migneret explained that LoRa devices are operating on batteries, using very low power and expecting to achieve very long range aimed at many agricultural, utilities, shipment use cases and devices are proven to be scalable and very well adaptive to many different use cases.

Mr Garcia indicated that satellite could complement terrestrial where mobile coverage is weaker and indeed, there are several cases of it across Europe. According to Mr. Garcia the MNOs' advantage would be a question of scale. Nevertheless, he would tend to think this is a very competitive market especially on the mobile front but also on IoT. In mobile we have RLAH (Roam Like At Home) regulation providing the basis for such competition though it is true that there could be an indirect impact of secondary use of spectrum on auctions. In general, we tend to be cautious when pledging for this secondary use of spectrum while in any case need to be minimised to only that required to deliver an ecosystem.

Actually, we have a wide IoT market in Europe, regardless of these 27 different spectrum auctions. We have roaming regulation in force where MNOs have the obligation to offer roaming agreements to third parties. Therefore, he does not think that spectrum nowadays is a burden for the development of the market. Telefonica sees that as part of the market, satellite providers having one role, MVNOs having another and they as MNO having something in between.

Mr. Bonifay agreed that regarding satellite there is still time to agree on things. However, because of licence for the satellite, MNOs would have a strong position to dictate what will happen. Whenever MNOs will give a bit of the spectrum to a low earth orbit satellite company to provide connectivity on a given territory, then MVNOs must have a mechanism by which they can also have access to the satellite connectivity within fair economical equation.

The Roaming Regulation today authorizes MNOs to accept permanent roaming on their network if they choose to do so, but MNOs may also refuse. Moreover, behind that there is a complicated procedure. There are cases in Europe where one or two operators in some country accepts permanent roaming but also we have opposite cases with operators refusing access. By his opinion, as Europe, we can do much more on the question of IoT to ensure access to MNO operators.

Mr. Garcia favours the opinion that Roaming Regulation allows better conditions to make business in Europe rather than Asia or Latin America where such regulation does not exist. Of course, there are differences in the domestic market of each of the 27 Member States but those differences do not necessarily mean that they are negative and not important for developing a successful business.

Mr. Bonifay made a call to all Member States and EU institutions, to establish equal principles and rules for doing business across all member states.

Question: Does the latest continuous growing of M2M and use of permanent roaming imply changes in roaming regulation, regarding quality of service, investments, numbering and how this should be seen in the future?

According to Mr. Garcia's opinion, any kind of improvement regarding roaming regulations will be a softer regulatory approach and not a stringent one. We have no competition risk as long as there are at least three mobile operators per member state, and in case we face problems these can be limited to specific country/situation. Therefore, maybe in light of new revision of the EECC for 2025, one should look more closely whether the definition of M2M services is aligned to what car manufacturers want to provide as M2M/IoT services in their vehicles. For instance, providing Wi-Fi connectivity on board was not even considered in the Code 3-4 years ago. What car manufacturers are likely to provide might not be pure M2M services according to the Code but enhanced IoT services such as entertainment.

According to Mr. Bonifay, there are some European countries where you can get a deal with a MNO and in others, it is not possible. We need national access conditions and where three MNOs exist it is harder than on those markets having four MNOs. For the car industry, we have machine-to-machine services such as "Telematic", we have infotainment system with Google and Apple in place and with that we provide better value for Google and Apple. We have "Wi-Fi on board" as a service, which should be under debate whether it is an IoT service. By his opinion, the infotainment system in the car should be considered as machine-to-machine service.

Question: What about the diligence from the devices to the network? What does this imply to the value chain, what are the possibilities for the business model? What would be the consequence from the edge computing to the business?

Mr. Migneret thinks devices are very important. Mostly based on sensors that are bringing back data to the network for helping to monitor some situation. Most of the devices are using batteries and very low power, so they last in the device for around ten years. These services

are mostly requested by developers of apps, utilities, in cases they want to have easy access to the data from monitoring stations.

In continuation, Mr. Migneret brought "LoRa Alliance" view on roaming which is very important for different applications and use cases. Through roaming agreements, "LoRa Alliance" have expanded programs to help members and non-members to have access to data. Guaranteeing the security of data and devices is essential.

Mr. Garcia, complementing to what had been said, mentioned that at national level the capabilities of deployments and the availability of a 5G standalone solution are still very limited. In the future, it can be assessed how this goal interlinks with the roaming solution but nowadays it seems a bit premature. In addition, the Telecom Sector proposed as an alternative to have its "Open gateway" solution providing worldwide access to developers to mobile network capabilities regardless of the network you rely on. This would give in the future the possibility for third parties to develop their own services with specific QoS capabilities, with higher or lower latency throughput or its complete capabilities regardless of the operators underlying the connection. This is also something to take into account or to think about in the future for the 5G business development as a complement of the traditional QoS and slicing.

Questions/comments made by the audience.

Do single chip solutions occur with multiple standards that they can use in different environments with different standards.

Mr. Migneret said that we can see that chip set manufacturers are putting together different standards in one chip. Then you have the problem with lower efficiency of battery life and the efficiency of the antenna to transfer on a different frequency range. Simple answer would be that yes, it is possible, and we let the chip set manufacturer and device producers to choose.

Regarding the need to harmonize the slicing definitions, specifically KPIs for slicing across European markets. Slicing would be a strong use case and business case for IoT. Do you identify it as a strong issue for the moment or a prospective issue to materialize?

Mr. Garcia shared that it is still too early to assess whether harmonization of slicing at EU level could occur. His opinion is that 99% of IoT business now is relying on access to the standard internet provided by mobile networks and there is no specific quality of service beyond than that we provided to the verticals (private networks). He mentioned he would be cautious with setting some KPIs in advance. He advised to wait for specific cases to mature and see if there is a need for specific levels of quality of service to be sure before going into harmonization.

The point is that deployment of 5G standalone as it is in Europe now is still at early stages with mainly trials with little/no commercial launch. Therefore, trying to harmonize within next one or two year period, it seems a bit too premature. What needs to be done as far as 5G standalone becomes mature and as far as there is the coverage for this kind of services, business cases will appear and then we could discuss whether a quality of service could be fit for purpose and for what business cases.

Mr. Bonifay agrees it's bit too early to start working on some KPIs on 5G standalone. We already know how we are going to use 5G standalone once it is deployed. Today, the quality of service, which is requested by the customers, is more on the side of coverage. Today the MNOs are willing to have the best 5G standalone network so in the eyes of the customer they appear better than MVNOs.

One participant commented that in his opinion, 5G standalone is something far away, but the job of regulators is to anticipate rather than being reactive. The challenges of enabling access to the network is much more complex of what it is today in the normal roaming world. However, these topics have to be addressed in a timely manner to avoid the same discussion we had with roaming regulations and now with IoT.

Other participant, complementing Mr. Bonifay, said there is a necessity of having more of a European single market but we should not be just focused on the level playing field and single market for IoTs. We should ensure that there is a single market for innovations on telecom infrastructure. That is something which could not be fixed by just looking at individual parts, like consumer roaming, because changes which may be done in one part of the market may result in changes in other parts of the market which, at the end of the day should be on the table of EC, BEREC and national lawmakers. There are huge divergences in the fees, which are paid for spectrum. There are countries where it is expensive. There are differences in timing of spectrum, like in Germany, we have a 95% of coverage and it is not the case in Belgium for example. Additionally, the difficulties of rolling out the network. The point is that there are not just problems resolving MVNOs' cases but also consumers, innovation and so on. IoT application developers will have to adapt to different market characteristics as they adapt for many things. This should be seen as part of the broader picture of the single market.

Mr. Bonifay added that with regard to the cost of a licence for spectrum per gigabyte, if you calculate it on a 10 or 20 years amortization plan, the cost is negligible. The cost of deployment, even if it is higher, it is also not a big issue. What makes a difference is not that the licence is more expensive in one country compared to another, but rather how many mobile operators you have and how developed the infrastructure and competition are.

5. Closing statement

Mr. Stuckmann, Head of Unit, Electronic Communications Policy, Implementation and Enforcement, at EC started his closing remarks indicating the link between IoT in the 5G and the single market.

He pointed out that IoT is a very broad field, and recommended BEREC to focus more on its key responsibilities and areas where it could really make a difference. In addition, the policy issues are very broad: ranging from data and safety to energy efficiency and finally connectivity, which is probably the focus. Discussions on data are very broad and it is important to understand how this ecosystem works. Mr. Stuckmann signalled the relevance of IoT also from the policy perspective in the context of enabling the twin transition, meaning both digital transition and the green transition, and the digitalization of economy society.

The EC shared the consideration that regulation should be investment and innovation friendly (e.g. net neutrality). However, he explained that dedicated networks for IoT are out of scope of the net neutrality obligations with the exception of the impact on the open internet. Nevertheless, clarity on the approach to network slicing and what are the rules was underlined as important.

In case of roaming, he noted that some progress is being made and permanent roaming is not forbidden by the legal framework. With regard to spectrum, the EC acknowledged the concerns regarding consistent spectrum regulation and spectrum resources for this cross-border services.

Mr. Stuckmann explained the public funding instruments aimed especially for the areas where there are market failures and the development of 5G corridors as a multi country project, flagged in the digital decade. Campus networks need to be boosted and evolved. Additionally, Mr. Stuckmann elaborated on the investments on infrastructure and the new deployment models emerging such as power companies or tower companies that are having an important role.

The EC committed to look into barriers to the single market and how these can be removed. Mr. Stuckmann shared the views that cross-border use cases for IoT are indeed relevant and multinational services would benefit from a less fragmented market, including spectrum consistency to shape the market.

Technology transition is also important, where we have cloud-based networks, software-based networks, to operate networks in a more centralized way while ensuring that data are moving to the edge at the same time. From the perspective of market regulation and network access, mobile joint dominance is very difficult to prove and maintain but the role of the different players may be evolving due to the network transformation. Questions arise regarding who will be providing the services to the end user (MNOs or other enablers). On the other hand, new business opportunities may emerge.

The EC representative closed the workshop with some reflections about the future mentioning the transition to edge and cloud and its implications for industrial policy, digital sovereignty and the aims to reduce dependence and increase network resilience and scale in relation to the digital single market.
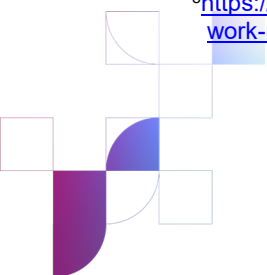
6. Conclusions and next steps

BEREC thanked the stakeholders and the EC for the participation in this exchange providing useful inputs and food for thought for the improvement of regulation with the aim to progress in enabling innovation and better services for the users.

These considerations will feed future work by BEREC. Already in 2024, some of the topics referred to in this workshop will be considered in the context of the External workshop about the usage of satellite technologies in mobile communications and the Report on M2M and
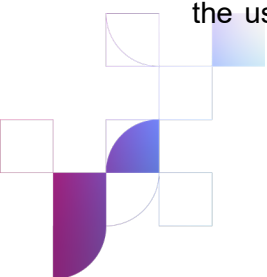
permanent roaming foreseen in the 2024 BEREC work programme[8]. Furthermore, BEREC envisages a possible report on IoT considering 6G and multi-access edge computing (MEC) developments in 2025.

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[8]https://www.berec.europa.eu/en/document-categories/berec/berec-strategies-and-work-programmes/berec-work-programme-2024

Annex I – Workshop Agenda

AGENDA

14:00	OPENING

14:00 - 14:15 Opening statement

> Prof. Kostas Masselos. BEREC Chair 2023 (EETT, President of Hellenic Telecommunications and Post Commission

14:15 - 15:00	ROUNDTABLE II – IoT SOLUTIONS

14:15 - 15:00 Speakers

> Mr. Serafino Abate, Regulatory Affairs Expert Volvo
>
> Dr. Carl Jeding, Director Government & Policy Advocacy at Ericsson.
>
> Mr. Musa Unmehopa, Head of Wireless Standards & Regulations at Signify and Chairman of the Board of Directors of the Connectivity Standards Alliance

Moderator: Mr. Bert Klaassens. Co-chair of BEREC Planning and Future Trends Working Group.

15:00 - 15:15 Break

15:15 - 16:00	ROUNDTABLE II – IoT PROVIDERS

15:15 - 16:00 Speakers

> Mr. Jacques Bonifay. CEO Transatel
>
> Mr Gonzalo Garcia Arribas, Manager of European Regulation, Telefónica
>
> Mr. Fabien Migneret. Director regulatory affairs LoRa Alliance

Moderator: Ms. María Ruiz Mérida Co-chair of BEREC Planning and Future Trends Working Group.

16:00 - 16:15 Q & A

16:15 - 16:30 Closing statement

> Mr. Peter Stuckmann – Head of Unit and Deputy Director, Directorate-General for Communications Networks, Content and Technology (DG CONNECT)

16:30	END OF WORKSHOP

Annex II – Acronyms

CEPT - European Conference of Postal and Telecommunications Administrations

CSA – Connected Standards Alliance

EC - European Commission

GDPR - General Data Protection Regulation

IoT - Internet of Things

MEC - Multi-access Edge Computing

MNOs - Mobile Network Operators

MVNOs - Mobile Virtual Network Operators

M2M - Machine to Machine

QoS - Quality of Service

RLAH – Roam Like At Home

UN ECE - United Nations Economic Committee for Europe