

Summary Report: Open RAN workshop, 24th May 2022

6 October, 2022



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1. Executive Summary

On 24 May 2022 BEREC conducted an external workshop on Open RAN. The purpose was to develop an understanding of the concept of mobile infrastructure deployment and development using Open RAN.

BEREC invited expert speakers from regulators, policy makers and industry to explore potential future areas of enquiry for BEREC.

The workshop helped to shine a light on differences in terms of what's mature and what's less mature as regards some of the open interfaces at the heart of Open RAN. For example, the interface to the radio unit is more mature in terms of specifications, than other interface between centralised and distributed units and the radio intelligent controller. Expert presenters discussed some of the latest innovations arising from open interface between the Radio Unit and the Centralised Unit, as well as other innovations from open interfaces between the Centralised Unit and Distributed Units. Other experts set out some of the demand-side issues including use cases (industrial test-bed level examples etc.) and yet another expert set out that Open RAN is a live feature in its mobile network today (Vodafone) and expected to be a significant concept in mobile telecommunication networks generally.

Some expert presenters set out that improved access to radio spectrum resources would be an important criterion to help enterprise-wide use cases benefit from Open RAN in the future; a sort of call for more lightly licensed spectrum as opposed to competitive auctions which they claimed were unsuited to satisfy the connectivity needs of smaller players or private network operators. Another expert suggested that access to licensed radio spectrum should be continued and would be important in next generations of mobile technologies.

Between the expert discussions, a paradox about the Open RAN concept became formulated whereby the specifications for Open RAN seem to be arriving too late to be fully incorporated into standards for 5G whilst too early to be concretely included into 6G standards. Essentially, more work needs to be completed to advance Open RAN specifications particularly regarding the topic of security, and it was observed that the Open RAN alliance is one industry association where relevant specifications are being developed before being standardised by other bodies (e.g. 3GPP etc).

The workshop was open for registration with 193 participants taking part, from over 230 registrations. This summary report is not intended to be a transcript of the workshop, but chapter 2 provides some transparency as to the nature of the discussions during the workshop sessions for interested parties. Chapter 2 sets out the main attendee material.

BEREC would like to thank the expert presenters and panellists who made the discussions lively and fruitful. BEREC welcomes the wide participation from players across the value-chain. Due to high levels of interest, BEREC could not include speaking opportunities to all those entities who expressed a willingness to present during the sessions. In this regard, BEREC will consider whether it might be helpful to hear more views from those entities that



couldn't be accommodated during the workshop, but another open external workshop is not envisaged in the BEREC Work Programme 2023 due to other priority projects. BEREC would be open to receive further written submissions to help improve its understanding of the topic, which additional submissions may be published alongside this summary report.

Next steps and recommendations for further work

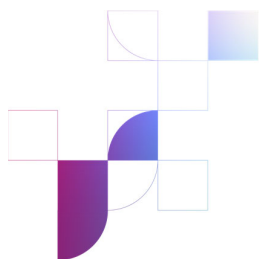
After careful consideration of the expert content and discussions, BEREC does not envisage developing any regulatory measures on Open RAN currently, nor has BEREC identified any specific areas within its competence to examine next year.

Although it seems too early to find definitive issues for BEREC to study next year, it is important that BEREC keeps well informed about relevant supply and demand-side issues in Open RAN. In so doing, BEREC will be equipped with relevant information about the role of mobile telecommunications in our changing world and the impacts of non-traditional players in the RAN market.

BEREC remains interested in the concept of Open RAN and how it relates to other domains such as innovation, choice for operators, role and responsibilities of non-traditional RAN suppliers, standards, radio spectrum use by private networks, and more.

As a result, and to feed BEREC's interest on Open RAN and related topics, BEREC would be minded to track the extent and scale of commercial Open RAN deployments (if any) by European mobile network operators. Essentially, BEREC would be interested to capture any changes in the trend of deployments, particularly largescale ones that might have measurable impacts on downstream markets in the first instance. To accomplish this, BEREC may include some short-form questions into existing reporting requirements of European operators to BEREC. Alternatively, BEREC could seek to follow relevant trends by collecting information during programmatic meetings with industry associations / relevant stakeholders, such as at the Mobile World Congress or Stakeholders' Forum etc.

Whatever approach is adopted by BEREC in this regard, it should be aimed at enabling BEREC to follow closely the relevant issues given developments in Open RAN and new architectures in connectivity happen at pace.



2. Introduction: Workshop materials

This chapter sets out some context using the material provided to registered participants.

2.1 Agenda: BEREC Workshop on Open RAN, 24th May 2022

Location:	Videoconference only
Date & Time:	24 May 2022, 12.30-18.00 CEST
Format:	Each session will be a moderated chat with invited panellists.

12.30 **Virtual event starts**

Opening remarks

Co-chairs of Wireless Network Evolution Working Group

Dr. Bo Andersson, Chief Economist, PTS,

Mr. Joe Lynch, International unit analyst, ComReg

12.30 – 13.45 **Session 1: “An Open approach to telecommunications infrastructure in the RAN”**

New technologies, coupled with artificial intelligence and virtualization/cloud, are transforming the notion of a network. Not all virtual RAN is Open RAN and not all Open RAN is open source. Vendors and new market players are working to find the right balance to serve unique demands and requirements.

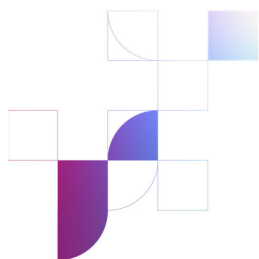
Does the multi-vendor approach represent a “new normal” for telecommunications infrastructure? Is innovation dependent on Open RAN or are other alternatives (vRAN) sufficient? Is industry meeting the need for collaboration across the full stack (Chipsets, RAN hardware, RAN software, Cloud, Services)? What are the network deployment scenarios/use cases (enterprise/rural/urban/macro spectrum bands) currently tested or planned to be tested for interoperability purposes? What are the key issues regarding site integration, in order to secure seamless coexistence with legacy 2G/3G network equipment located at the site? What are the potential differences in implementing Open RAN in Greenfield and Brownfield scenarios.

Mr. Simon Burley, Connectivity Programme Director, Ofcom UK

Mr. Francisco Martin, Group Head of Open RAN, Vodafone

Mr. Mårten Lerner, Head of Product Line Cloud RAN, Ericsson

Dr. Volker Ziegler, Chief Architect and Senior Advisor, Nokia Corporation



Mr. Alexander Pabst, Vice President Market Segment Wireless Communications, Rohde & Schwarz

13.45 – 15.00 Session 2: “Benefits and opportunities dashboard”

Open RAN is said to improve network performance and lead to other benefits in terms of vendor diversity, the possibility of new market entry, and support new private networks which may build and operate niche networks.

What are the main benefits demonstrated in trials/pilots/first commercial experiences? What are the main concerns observed in trials/pilots/first commercial experiences? What’s the availability of empirical data about energy usage and energy efficiency? How will network automation yield efficiencies (and benefits) and is there any distinction between what virtual RAN and Open RAN would yield in this regard? Cloud architectures provide scope for economies of scale and cost savings but are the opportunities the same for virtual RAN and Open RAN? Complexity re-integrating everything after having disaggregating it? Can SMEs compete against Multi Nationals? Do tier 1 and 2/3 operators have the same views on benefits/challenges?

Mr. Adrian O'Connor, CEO, Benetel

Mr. Stan Claes, CEO, Accelleran

Dr. Andreas Mueller, Corporate Sector Research & Advance Engineering - Distributed Systems, Robert Bosch

Mr. Gerald Huber, Head of Open RAN, Telefónica Germany

[tbc] **Ms. Caroline Gabriel, MA**, Research Director (Networks and 5G), Analysys Mason

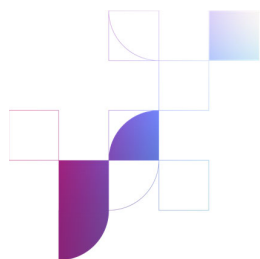
10 min

Break

15.10 – 16.25 Session 3: “Challenges dashboard: security back doors, front doors, and more”

When deploying Open RAN, network operators necessarily focus on security issues. On the one hand, Open RAN could strengthen security by having a wider diversification of equipment manufacturers, contributing to Strategic Measure 5 (Diversification of suppliers; SM05) of the EU 5G Cybersecurity Toolbox. On the other hand, Open RAN brings new security risks that must be considered, like increased vulnerabilities from additional networked components (not to mention integration complexity and various new network configurations).

What are the implications of an increased attack surface and more attack points due to new functions (e.g. xApss and rAPPs) and additional interfaces? How to adapt the certification/accreditation process from competent authorities? What are the implications and possible dependencies on the hyperscalers (cloud-suppliers) outside of EU: what does this mean, and what are the potential benefits and risks?



Mr. Heiner Grottendieck, Head of Section SZ 31 - Infrastructure Security for Telecommunication Networks, 5G, Federal Office for Information Security, DE

Mr. Marnix Dekker, Head of NIS, ENISA

16.25 – 17.50

Session 4: “Regulator and policy maker roles, and responsibilities”

BEREC’s experts are interested to understand if there are topics that we should consider picking up in future work.

What’s the latest thinking about potential dominances in Open RAN ecosystem etc (if any) or about barriers to entry to Open RAN ecosystem? Are there blockages to routes to commercialisation for new players? What might be the impact on competition?

Mr. Charles Mathias, Deputy Chief of the Wireless Bureau, FCC

Mr. Zachary Blackburn, Office of International Affairs, NTIA

Ms. Marie Jousset, Project Manager, Ministry of Economy, France

Mr. Peter Stuckmann, Deputy Director – Future Networks and Interim Executive Director – Smart Networks and Services Joint Undertaking, European Commission

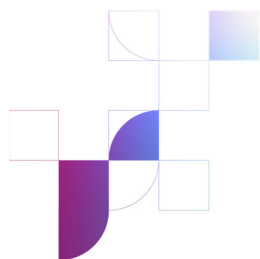
Dr. Hosuk-Lee Makiyama, Director, European Centre for International Political Economy,

17.45

Closing remarks by Co-chairs

18.00

Meeting room closes



2.2 Links to some of the expert panellist presentations

BEREC thanks all the expert panellists for their interesting views and discussions. Hyperlinks to the relevant opening presentations by some of the invited speakers are published alongside this report and these set out the definitive positions of the expert speakers.

To give readers some insight into the moderated discussions, we set out some points below.

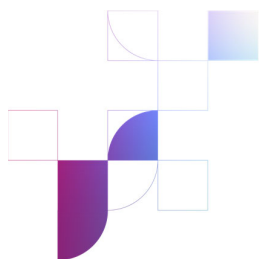
Timing

- Open RAN is still in an early phase of its development/take-up; at least it cannot be considered fully mature. Some stakeholders expect that the path to maturity may take years. Other stakeholders have concrete use-cases tested in private networks, and yet another stakeholder has a live deployment in its mobile network
- As a result, the whole ecosystem is recognized to be dynamic / fast moving and some views recommended a cautious approach to this new architecture
- Open RAN is disruptive, and is an innovation which may take time to develop

Deployment scenarios; Challenges and opportunities, including for private networks

- The implementation of Open RAN is likely to face different challenges in Greenfield than in Brownfield scenarios
- Greenfield is challenging (even in a deployment focus without MIMO), but Brownfield will may be even more challenging (for instance how to integrate diverse new radios)
- Dense urban deployments with MIMO are considered particularly complex. Open RAN in rural and semi-urban deployment scenarios may be considered less complex
- Several stakeholders support what they termed 'light and affordable' spectrum licensing mechanisms (especially for private networks). And in this aspect, it was underlined that there is a demand for uniform spectrum block(s) across Europe for private networks; Easy, affordable, micro-licensing mechanisms should be adopted
- Open RAN's reconfigurability (with ability to mix and match various components) seems to benefit the development of customizable solutions especially adapted to the different needs of the private sectors
- Open RAN and classic RAN are expected to co-exist and complement each other thus 2G may be needed to be part of Open RAN solution
- Performance of Open RAN sites must be at least comparable to existing RAN, likely new tools will be available to deal mixed deployment at sites.

Collaboration (labs and testing issues)



- Collaboration is considered key to the success of Open RAN because of the need for testing interoperability between different hardware and software vendors with varied configurations
- Deep co-operation between multiple companies to deliver interoperability is also required and this seems to be happening presently
- System integration is vital so widespread / distributed access to labs will help pre-staging before deployment
- Stakeholders need easy access to lab infrastructure (industry needs to think about labs efficiently and not establish duplicate labs unnecessarily; a sort of call to make labs more accessible was made)
- Testing efforts will likely increase with Open RAN, for instance not only isolated tests required on the disaggregated components (in contrary to the 3GPP integrated approach) but also systems integration testing required, and handset testing must also not be forgotten

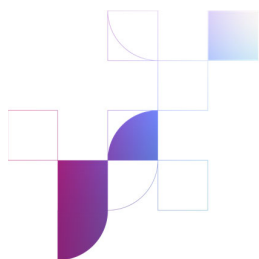
Security

- 5G Toolbox serves as a solid baseline for Europe, stakeholders can reinforce security in certain areas using existing tools
- Security-wise, some stakeholders recommended taking a cautious approach when moving towards the new architecture. Several stakeholders also include security in their primary technological development focus
- One set of stakeholders set out that – “functionality first” may lead to security risks and one stakeholder recommended taking “security/privacy by design/default” first. In addition, one stakeholder suggesting making optional security controls mandatory, etc.

Choice

- Supplier diversity and choice of operators are two distinct considerations. One stakeholder set out that there are plenty of RAN vendors and that the number will further grow with edge and cloud, but that this diversity is not always reflected by simple market share considerations. The stakeholders set out that market share is a reflection of the choices of operators
- Cloud-RAN not expected to replace but rather complement the existing RAN solutions; balance between performance (security, sustainability) and interoperability
- In short, Open RAN may assist supply diversification

Selection of other discussion points (funding, certification, energy efficiency)



- Several stakeholders called for increased European funding for innovative and capable SMEs in this ecosystem. This, in their views, could aid longer term investments, and encourage research, leading to a more diverse and robust ecosystem
- Promoting enhancements in 5G and Open RAN security could be achieved as part of public funding programs (or jointly in private public partnerships)
- Some stakeholders claimed there is a good momentum for energy efficiency innovation but still a challenge to minimize energy consumption (could be coupled with how best to reduce the carbon footprint in networks)
- Certification for all components is needed to support plug-and-play scenarios
- Global standards and certification of components are important to success and one common global standard is a key to future success of the industry

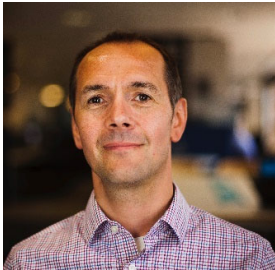


2.3 Panellist's biographies for context

As part of providing additional transparency for interested readers, below you can find biographies of the expert speakers. BEREK was delighted to have gathered such high-level expert speakers for this workshop.

SESSION 1

Mr. Simon Burley, Programme Director, Ofcom, UK



With a career spanning more than 20 years working for telecom infrastructure providers and a mobile operator, Simon's expertise covers the architectural vision, design, and deployment of all leading radio access technologies. He now leads the Connectivity Programme within Ofcom's Communications & Media Technology team.

Mr. Francisco Martin, Group Head of Open RAN, Vodafone



Francisco (Paco) Martín Pignatelli is a Vodafone Executive +22 years of Experience in Mobile. He's worked internationally in US and UK and has great breadth of experience in all Network domains as well as some customer facing positions. He's more recently focused in OPEN RAN, an activity he pioneered in 2016 that's grown to become the most relevant trend in mobile today, with Vodafone as one of the leading promoters.

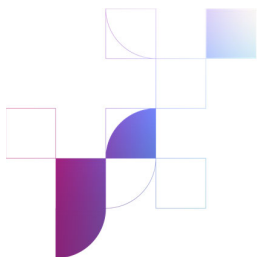
Mr. Mårten Lerner, Head of Product Line Cloud RAN, Ericsson



Mårten Lerner is the Head of Cloud RAN Product Management at Ericsson, driving the strategy and product design of the Cloud RAN portfolio. Mårten's career at Ericsson spans over fourteen years - working across Product Development, Sales, and Product Management. Most recently, he led the sales and business development team for one of Ericsson's largest Nordic customers.

Mårten holds a Master's of Science in Engineering Physics & Industrial Economics from the studies at The Faculty of Engineering at Lund University and University of Illinois. Mårten is based in Stockholm, Sweden.

Dr. Volker Ziegler, Chief Architect and Senior Advisor, Nokia Corporation



Dr. Volker Ziegler is an energetic leader with 30- years of broad and international experience in the telecommunications industry. He currently serves as Senior Technology Advisor and Chief Architect in Nokia Strategy and Technology unit. Previously, Volker has exercised a leadership role with Nokia Bell Labs in 6G research and ecosystem and has served as Head of 5G Leadership and Chief Architect of Nokia Mobile Networks. Prior to this, Volker has been active in the Head of Strategy role of Nokia Siemens Networks where he had also served as the Head of the North East Region. In his 10+ year career with Siemens, Volker has held business unit leadership, finance, sales and marketing, services and R&D global roles and senior positions. He has worked as Information Technology Specialist with the World Bank / IFC in the mid-90s. Volker has started his career as a research scientist with German Aerospace Research / DLR. Volker holds a Dr.-Ing. (PhD) degree in Electrical Engineering from Technische Hochschule (TH) Karlsruhe in Germany and is a graduate of the Executive Development Program at Harvard Business School.

Mr. Alexander Pabst, Vice President Market Segment Wireless Communications, Rohde & Schwarz



Alexander Pabst is heading the market segment wireless communications at Rohde & Schwarz. In this role he is responsible for the global effort to drive the strategic direction of the wireless test & measurement solutions, incorporating 5G technology and 6G vision. He also takes care about Rohde & Schwarz test solutions enabling its worldwide customers to test and certify OpenRAN infrastructure equipment.

Alexander has more than 25 years of experience in the wireless industry. After spending some years in sales he joined R&S to work in various product management and business development positions. Before his current role he was Vice President of the systems group within the Test & Measurement division, furthering the success of Rohde & Schwarz' range of conformance, EMC and over-the-air test systems.

He represents the global Test & Measurement vendors in the board of the Global Certification Forum (GCF).

Alexander Pabst holds a degree in physics from the University of Bonn.



SESSION 2

Mr. Adrian O'Connor, CEO, Benetel



Adrian joined Benetel as Chief Executive Officer in 2014 and leads an organisation of 50+ telecom professionals developing 5G ORAN compliant Radio Units. Adrian brings a wealth of experience in the Telecommunications and Semiconductor markets. Prior to joining Benetel, Adrian led IBM's Semiconductor business in Europe. Adrian's career at IBM spanned 15 years and included Sales, Marketing and Operational leadership roles.

Mr. Stan Claes, CEO, Accelleran



Stan Claes is co-founder and CEO of Accelleran. Stan has over 25 years experience in Technology Research, Development, Marketing and General Management. Prior to founding Accelleran, Stan has worked with Alcatel, Thomson and Technicolor on fixed and mobile broadband technologies. Stan holds a Masters degree in Engineering Electro-Mechanics from the University of Brussels, as well as a Post Graduate Telecommunications Marketing from INSEAD.

Dr. Andreas Mueller, Corporate Sector Research & Advance Engineering - Distributed Systems, Robert Bosch



Dr. Andreas Mueller is leading the Bosch 6G programme and at the same time Bosch's Chief Expert for Communication Technologies for the IoT. In addition to that, he has been coordinating and driving the Industrial 5G activities of Bosch over the past couple of years. Andreas also serves as General Chair of the "5G Alliance for Connected Industries and Automation" (5G-ACIA), the globally leading initiative for driving and shaping Industrial 5G. He has a strong background in both telecommunications and vertical industry applications and is therefore well-positioned to drive the 5G/6G-enabled transformation in different vertical industries.



Mr. Gerald Huber, Head of Open RAN, Telefónica Germany, Senior Innovation manager and Head of Open RAN, Telefónica Germany.



Since 1994 in the telco business. First with Vodafone then as Consulter for Telecom and now since 2012 working for Telefónica Germany. His bigger projects are introduction of C-SON and the last 3 years introduction of 5G NSA at Telefónica Germany.

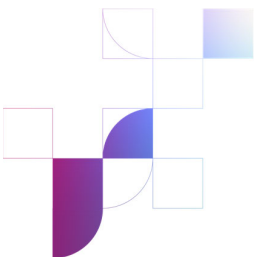
Ms. Caroline Gabriel, MA, Research Director (Networks and 5G), Analysys Mason



Caroline leads Analysys Mason's *Networks* research practice, as well as leading many 5G-related research activities across multiple programmes. She is responsible for building and running Analysys Mason's unique research base of mobile and converged operators worldwide.

She works directly with Analysys Mason's research clients to advise them on wireless network trends and market developments. She has been engaged in technology analysis, research and consulting for 30 years, and has focused entirely on mobile and wireless since 2002. Her focus is on critical issues and trends related to mobile and wireless infrastructure, particularly operator deployment intentions for 4G, 5G, cloud-RAN and other technologies. She has led research and consulting projects with a wide range of clients, including mobile infrastructure vendors, large and start-up operators, regulators, trade bodies, government agencies and financial institutions.

Caroline co-founded Rethink Technology Research in 2002. Prior to that, she held various executive positions at VNU Business Publishing (then Europe's largest producer of technology-related B2B reports and publications). She holds an MA from the University of Oxford.



SESSION 3

Mr. Heiner Grottendieck, Head of Section SZ 31 - Infrastructure Security for Telecommunication Networks, 5G”, Federal Office for Information Security, DE



Heiner Grottendieck holds a Diploma in Communications Engineering and had been working in industry projects on hardware and software development for 27 years.

Since 2008 he took over Management positions in the domains of Application Performance Management, Test Automation, Blockchain Solutions and IT-Security. In these roles he built various teams and business areas. In 2021 Heiner joined the Federal Office for Information Security (BSI)

in Germany at the newly established BSI Location in Freital near Dresden. There he runs Section SZ 31 with the main topic 5G Security.”

Dr Marnix Dekker, Head of Sector for NIS, the networks and information systems covered by the NIS Directive. Leads several teams covering telecom security (e.g. the 5G toolbox), digital identity, trust services in the EU (under the eIDAS regulation), internet core, cloud, but also the critical vertical sectors under the NIS Directive, such as health care and transport. We support the implementation of EU cybersecurity policy across the EU and try to solve cross-cutting cybersecurity issues.

Previously worked at the European Commission as the deputy CISO, developed the corporate IT security strategy and policy framework, and helped building up a corporate IT security function of 50 people, from a 3 people CISO office.

In the past I worked for KPMG in The Hague, as a (CISA) certified IT auditor and for almost 2 years I was the designer/architect of the Dutch national e-ID system. I started in IT as a software developer in Pisa, Italy. I also worked as a university math/physics teacher and as a sailor in the North Sea offshore.

Holds a Ph.D. degree in Computer science (computer security research) and a university degree in Theoretical physics (research thesis in Quantum mechanics).

SESSION 4

Mr.Charles Mathias, DEPUTY Chief of the Wireless BUREAU, FCC

Charles is Deputy Bureau Chief in the Wireless Telecommunications Bureau of the Federal Communications Commission, where he is responsible for a wide range of



issues including procurement of spectrum for 5G deployments, UAS and Counter UAS, supply chain diversity, and wireless network security. He is also the Commission's Ombudsperson for Contraband Wireless Device Issues and served as Co-Director of the Commission's T-Mobile-Sprint Transaction Task Force. In addition, Mr. Mathias leads Commission initiatives related to the deployment of positive train control systems. Previously, he was Special Counsel to Chairman Genachowski, where he was responsible for Public Safety, Cybersecurity, Spectrum Policy and the Commission's Reform Agenda. Prior to joining Chairman Genachowski's office, Mr. Mathias was Assistant Bureau Chief in the Wireless Bureau. In that role, he led various Bureau initiatives in the areas of spectrum management, technology, and innovation, and was a member of the Bureau's transaction review team. He also served as Senior Legal Advisor to former FCC Commissioner Meredith Attwell Baker, where, in addition to managing the day-to-day operations of the Commissioner's office, he was responsible for wireless, international, satellite, and public safety issues. Before that, Mr. Mathias served in a variety of roles in the Wireless Telecommunications Bureau and as acting Public Safety and International advisor to former FCC Chairman Kevin Martin.

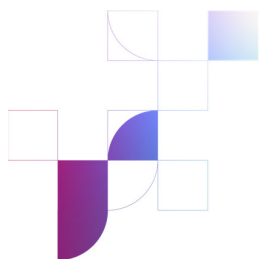
Prior to joining the FCC, Mr. Mathias served for nearly ten years as government and Regulatory affairs director for Lucent Technologies in Washington, DC and Brussels, Belgium. A lawyer, Mr. Mathias was a partner in the law firms of Baker & Hostetler and Baker, Donelson, Bearman Caldwell & Berkowitz. He began his legal career at Ropes & Gray in Boston.

Mr. Zachary Blackburn, Office of International Affairs, NTIA



Zachary Blackburn is a Telecommunications Policy Specialist in the National Telecommunications and Information Administration's (NTIA) Office of International Affairs. Zachary leads the office's work in Europe and Latin America, with a particular focus on 5G. Prior to joining NTIA, Zachary worked for the U.S. Department of State's Office of International Communications and Information Policy where he helped lead the Department's efforts on 5G security. Zachary graduated Phi Beta Kappa from the University of Virginia with a Bachelor of Arts in Foreign Affairs and Economics and completed a Master of Public Policy from the Batten School of Leadership and Public Policy at the University of Virginia.

Dr. Hosuk-Lee Makiyama, Director, ECIPE





Hosuk Lee-Makiyama is director of ECIPE in Brussels and Senior Fellow of London School of Economics. His research on trade and technology has played a prominent role in reforming policies across the world, while his advice has been sought by G7 governments, and various organizations including the European Commission, ASEAN, OECD, World Bank, WTO and the UN.

He is also a regular commentator on CNBC, FT, Politico, Nikkei, BBC, and other international broadcasters. During his government career, he represented Sweden in the Council of the EU, the UN and the WTO, and served in other roles in the

Government of Sweden. He was born in Tokyo, Japan.

Mr. Peter Stuckmann, Deputy Director – Future Networks and Interim Executive Director – Smart Networks and Services Joint Undertaking, European Commission



Peter is Head of Unit and Deputy Director for Future Networks in DG CONNECT, where he is managing the Commission's policy on 5G communication systems and the related research and innovation programme.

In 2021 he has been appointed Interim Executive Director of the newly established Smart Networks and Services Joint Undertaking, responsible to manage its office and implement its work programme until its autonomy.

Before his appointment to Head of Unit he was Head of Sector "Spectrum Policy", was coordinating the 2015 Digital Single Market Strategy, the 2012 Roaming Regulation, and the EU R&D programme leading to the 4G mobile communications standards.

Before joining the European Commission in 2004 he has occupied several engineering and management positions in industry, academia and start-ups. He holds engineering and doctoral degrees from RWTH Aachen University, Germany and is author of the text book "The GSM Evolution" (Wiley 2003).

Ms. Marie Jousset, Project Manager, Ministry of Economy, France

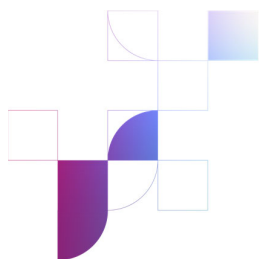


Marie Jousset is a 5G project manager for the Directorate General for enterprises of the French Ministry of the Economy, Finances and Recovery. She elaborated the national strategy on 5G and future networks, and is the French representative to the Smart Networks and Services partnership.

Moderators

Dr. Bo Andersson, Chief Economist of the Swedish Post and Telecom Authority (PTS, Sweden). He is also rapporteur for 5G with the RSPG, and liaison between RSPG and BEREC. He has more than 20 years of experience from infrastructure industries. Bo Andersson has a Ph.D. in economics from Stockholm School of Economics and has a background as a researcher. He has written several papers and journal articles on price formation and competition in deregulated markets. Prior to his current position as Chief Economist he has worked as a market analyst in the power sector and as a consultant, working primarily with infrastructure issues, for different government agencies and industries.

Mr. Joe Lynch, International unit analyst, ComReg (Ireland). Joe is passionate about radio science and propagation phenomena in wired and wireless communications systems. He holds an MSc in Experimental Physics from Maynooth University, an Executive MBA degree from University College Dublin, and a Diploma in Digital and Marketing Strategy from the Irish Management Institute where he was student of the year (2017). He has 15 years' communications experience in various positions in regulation and international relations, including as a delegate for Ireland at the ITU Regional Radio Conference held in Geneva in two sessions between 2004 and 2006.



3. Key conclusions

The workshop was a fact-finding mission for BEREC on Open RAN, the many different viewpoints and perspectives. It is, however, too early for BEREC to uncover which, if any, are the potential regulatory bottlenecks..

The coalescing of many factors such as technical, political, international, legal and environmental makes this a complex field of enquiry for BEREC.

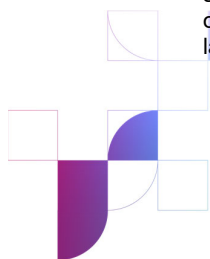
BEREC is satisfied that the workshop achieved the main objective; to build a collective appreciation amongst BEREC experts about the Open RAN concept.

From listening to expert panellists during the virtual event, BEREC's current impression is that some market participants may value choice in RAN equipment and as such, they are making headway on improving the information they need to make informed decisions about Open RAN architectures. BEREC observes that some market participants want to be well informed about all the relevant issues, benefits, and security and integration challenges, and are taking appropriate steps to fill any such gaps through activities at appropriate testing facilities¹ and live network trials and early deployments.

The theme of collaboration was mentioned many times, small and large market players working collaboratively on specifications that may assist new standards to be agreed. Another focus was set out on suppliers and on the maturity of their Open RAN products. It seems clear to BEREC that industry can advance this architecture itself without regulatory invention at this point. In line with the 5G toolbox, however, large-scale Open RAN deployments may need to be followed closely given the number of current issues. On the whole, secure and resilient equipment from new and traditional RAN vendors based on Open RAN offers the possibility for new players to provide connectivity whether for public or private networks.

When it comes to the complex matter of promoting innovation, BEREC recognises that policy makers need to be careful to not steer the market. Open RAN is a multi-facet issue complicated by possible security vulnerabilities. In addition, countries may wish to retain digital sovereignty in the face of complicated trade policy issues, of which there are a number of layers including chip manufacture, cloud service provision and new RAN software integration etc. What is needed is a high degree of regulatory predictability. More to the point, regulators must avoid generating uncertainty about Open RAN, which supports BEREC taking a more wait and see approach by gathering facts about what's mature and less mature about the concept. BEREC considers that regulatory predictability is one key element of innovation which helps attract and retain investors.

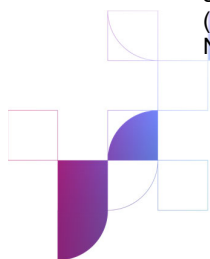
¹ One example mentioned by an expert was the open lab in Berlin, Germany, www.i14y-lab.com and another expert set out views on the joint initiative between Ofcom and Digital Catapult UK on "Sonic labs". BEREC is also aware of other initiatives including those of the Telcom Infra Project. Several experts voiced the need for complementary lab initiatives to avoid unnecessary duplication.



Other investor friendly policies include public private partnerships, and appropriate bodies should consider whether partnerships are needed. At the workshop, participants also heard a strong example of shared activities on 5G cross border between France and Germany. France's strategy for future high-capacity connectivity is technology neutral and Open RAN can play a part if connectivity architectures move in that direction. This type of technology neutral and shared initiative is helpful given the European context of achieving the Digital Decade.

In summary, BEREC agrees that well informed markets are environments where more new investments in technologies can take place. It also seems to BEREC that there is clear dialogue taking place² and in BEREC's view therefore, there does not seem to be any impediment to the information flow. In short, there is no need for regulatory interventions currently. BEREC believes that it was on the right track by conducting a fact finding mission on Open RAN, and that holding such a virtual event was valuable for BEREC's Members and Participants without voting rights in that context.

² Post the workshop, many new white papers and other industry discussions have taken place. For example, in security the The National Security Agency (NSA) and the Cybersecurity and Infrastructure Security Agency (CISA), through the Enduring Security Framework (ESF), have published an assessment of Open Radio Access Network (Open RAN) security considerations - [here](#)



4. Next steps and recommendation for further work

BEREC remains interested on Open RAN and related topics. Therefore, BEREC would be minded to track the extent and scale of commercial Open RAN deployments (if any) by European mobile network operators. Essentially, BEREC would be interested to capture any changes in the trend of deployments, particularly largescale ones that might have measurable impacts on downstream markets in the first instance. To accomplish this, BEREC may include some short-form questions into existing reporting requirements of European operators to BEREC. Alternatively, BEREC could seek to follow relevant trends by collecting information during programmatic meetings with industry associations / relevant stakeholders, such as at the Mobile World Congress or Stakeholders' Forum etc.

Whatever approach is adopted by BEREC in this regard, it should be aimed at BEREC to quickly refresh itself of the relevant issues on Open RAN. Given how quickly developments in Open RAN and new connectivity architectures happen, it might be timely to look at this again in subsequent years building on the content from this valuable workshop.

