How industry structure created a mobile miracle

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standardization

Executive summary

3GPP has created a thriving global ecosystem, enabling 8.2 billion mobile connections today. It has delivered unparalleled welfare gains for consumers, businesses and governments.

Contents

The 3rd Generation Partnership Project (3GPP) has ensured backward and forward compatibility of technology generations, avoiding fragmentation and thereby reducing the complexity, cost and risks associated with the commercialization of products and services.

From its inception in 1998, 3GPP has expanded its membership to include India and China, becoming a global ecosystem with unmatched benefits in scale. 3GPP enabled the mobile internet, the primary means of internet access for most of the world's population, and incentivized a new wave of innovation, including the app economy.

Alongside 3GPP, the fair, reasonable, and non-discriminatory (FRAND) licensing framework has provided clarity and certainty, which has encouraged competition, created greater choice for consumers, and helped to reduce prices while at the same time improving quality and performance.

In this paper, we describe the background of the mobile miracle, the scale and innovation power that it continues to leverage, and the industry logic, standardization and interoperability on which the industry is built.

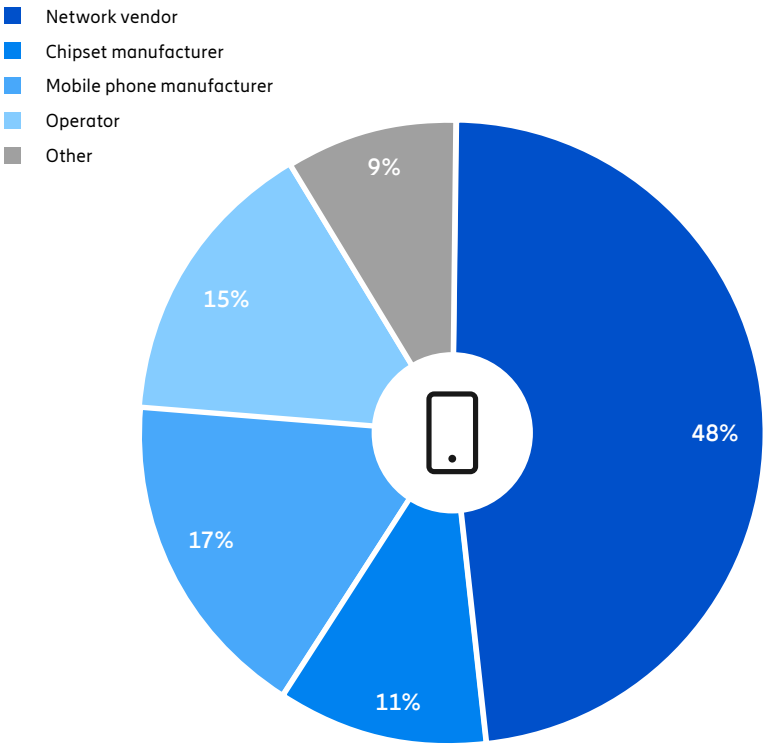
The mobile miracle

By 2027, the number of mobile connections is projected to grow to 9.1 billion.[1]

In 2021, mobile technologies and services generated 5 percent of global GDP, adding economic value equal to USD 4.5 trillion.[2] The mobile ecosystem also supported 26 million jobs, directly and indirectly, and contributed around USD 500 billion through general taxation.

Standardization generates economies of scale that lower costs and make mobile technologies and services affordable. Mobile is the fastest scaling technology ever and the transition to 5G is happening more quickly than previous technology shifts. 5G will add exponential value by driving digital transformation and enabling the decarbonization of economies. It will interconnect an array of emerging technologies, creating the biggest open innovation platform ever. 3GPP is the leading standards development organization that creates the specifications for end-to-end mobile networks and continues to successfully develop open standards, from 2G then – to 5G now. The interoperability and multi-vendor functionality have driven unparalleled welfare gains for consumers, businesses, and governments. 3GPP provides the blueprint for an operator to build a network that encompasses everything; from the device, over the air to the base station, through the Radio Access Network (RAN), into the core network and finally to the applications and services on the internet.

Figure 1: Standardization contributions to 3GPP in 2021, categorized by industry segment



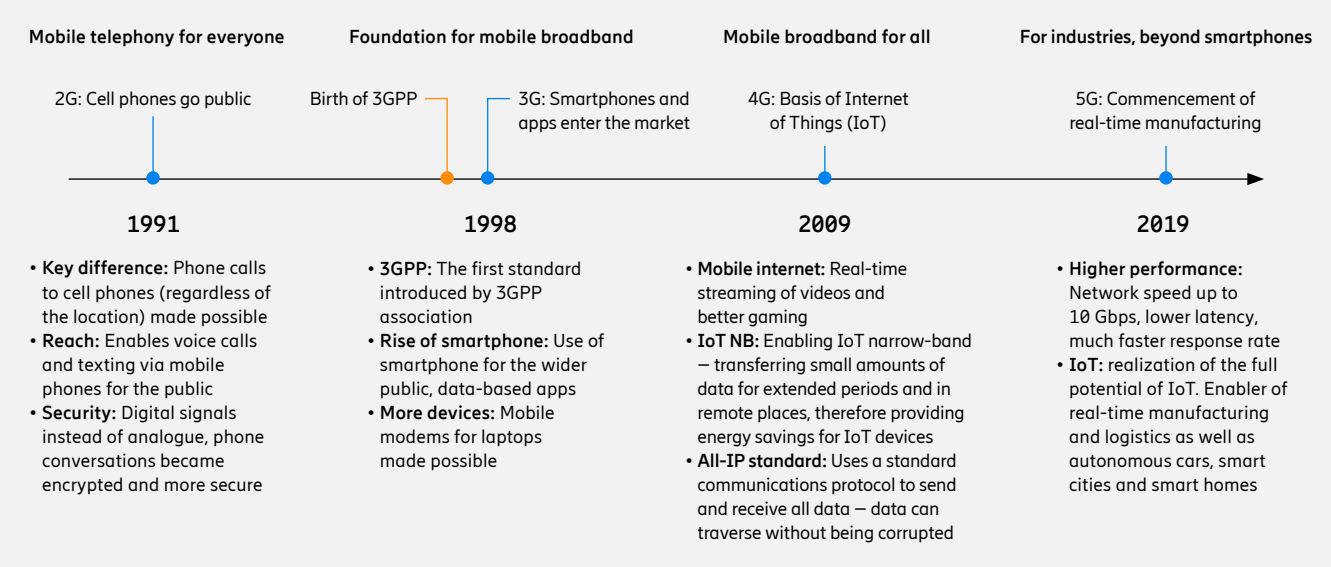
A powerful ecosystem behind 3GPP

3GPP's success is the result of investments made over an extended period of time, of companies' advanced technologies into the open contribution-driven standardization process and in R&D. Network equipment manufacturers, followed by device and chipset vendors, are making the majority of their yearly R&D investments in 3GPP technologies.

The 2G, 3G, 4G and 5G systems were all fueled by investments over several years. Assuming a 10-year investment cycle, each generation is estimated to correspond to more than EUR 300 billion of R&D investments by the network, device, and chipset manufacturers. For the industry, the justification for these investments into standardized, and therefore multi-vendor interchangeable solutions, has so far been the ecosystem scale in a global market. The 3GPP-5G standard empowers a 5G ecosystem with 700 unique actors around the world.[3]

[1] Ericsson Mobility Report June 2022
[2] The Mobile Economy 2022
[3] 5G Companies Infographic & 5G rollouts | TeckNexus

Figure 2: 3GPP – what have the different Gs delivered?



Standards that are anything but standard – from the Global System for Mobile Communications (GSM) to 5G

In 1998, the standards bodies in North America (Alliance for Telecommunications Industry Solutions, or ATIS), Europe (The European Telecommunications Standards Institute, or ETSI), Japan (The Association of Radio Industries and Businesses, or ARIB, and Telecommunications Technology Committee, or TTC) and Korea (Telecommunications Technology Association, or TTA) joined forces to create the 3GPP, forming a united global body, and effectively ending the incompatibility and non-interoperability of local mobile systems and devices. Ericsson was one of the key initiators and has maintained a strong presence in 3GPP since.

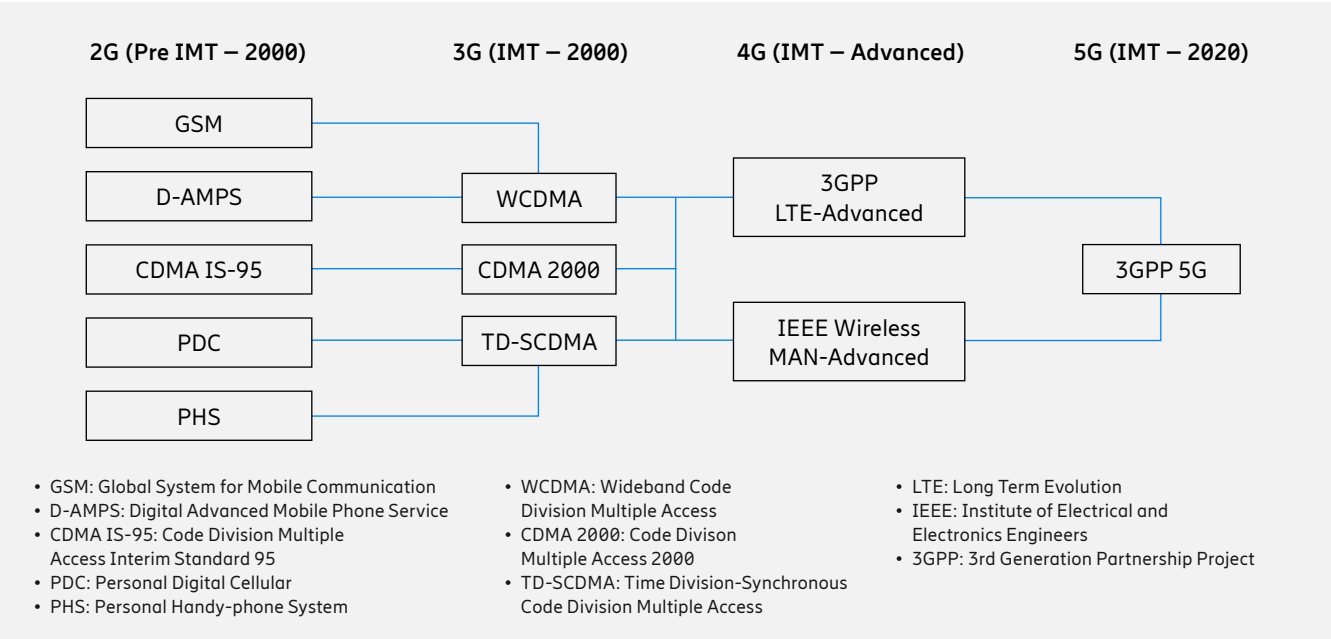
More than 700 companies currently contribute to 3GPP, which has achieved global interoperability, roaming and economies of scale. 3GPP ensures backward and forward compatibility of technology generations, avoiding fragmentation and thereby reducing the complexity, cost and risk associated with the commercialization of products and services that are developed using the standards.

As technologies have evolved, so has 3GPP. New standards partners from China (China Communications Standards Association, or CCSA) and India (Telecommunications Standards Development Society, India, or TSDSI) have joined.

The scope of 3GPP has expanded from communication services for consumers to services for enterprises. This includes new use cases such as public safety, where 3GPP has built on relevant national requirements such as Mission Critical Services, based on US Department of Commerce criteria.

Global operations and economies of scale are key requirements for the success of mobile telecommunication systems. The International Telecommunication Union Radiocommunication Sector (ITU-R) has been striving for harmonized global standards all through the process of International Mobile Telecommunications (IMT) - 2000 and IMT-Advanced. Today, with the global consensus on 3GPP 5G technologies as IMT-2020 standards, we are very close to reaching that goal.

Figure 3: Development to one single standard[4]



[4]Standards of 3GPP 5G Technologies – Dell'Oro Group

The 3GPP innovation model

3GPP is an industry-leading innovation model. It defines a complete multi-vendor platform for an interoperable global ecosystem comprising architecture, interface points, protocols and more, ultimately creating a full system-level design.

Open standards have allowed new entrants on the network side and on the device side to enter the industry and compete successfully.

Innovation on top of 5G

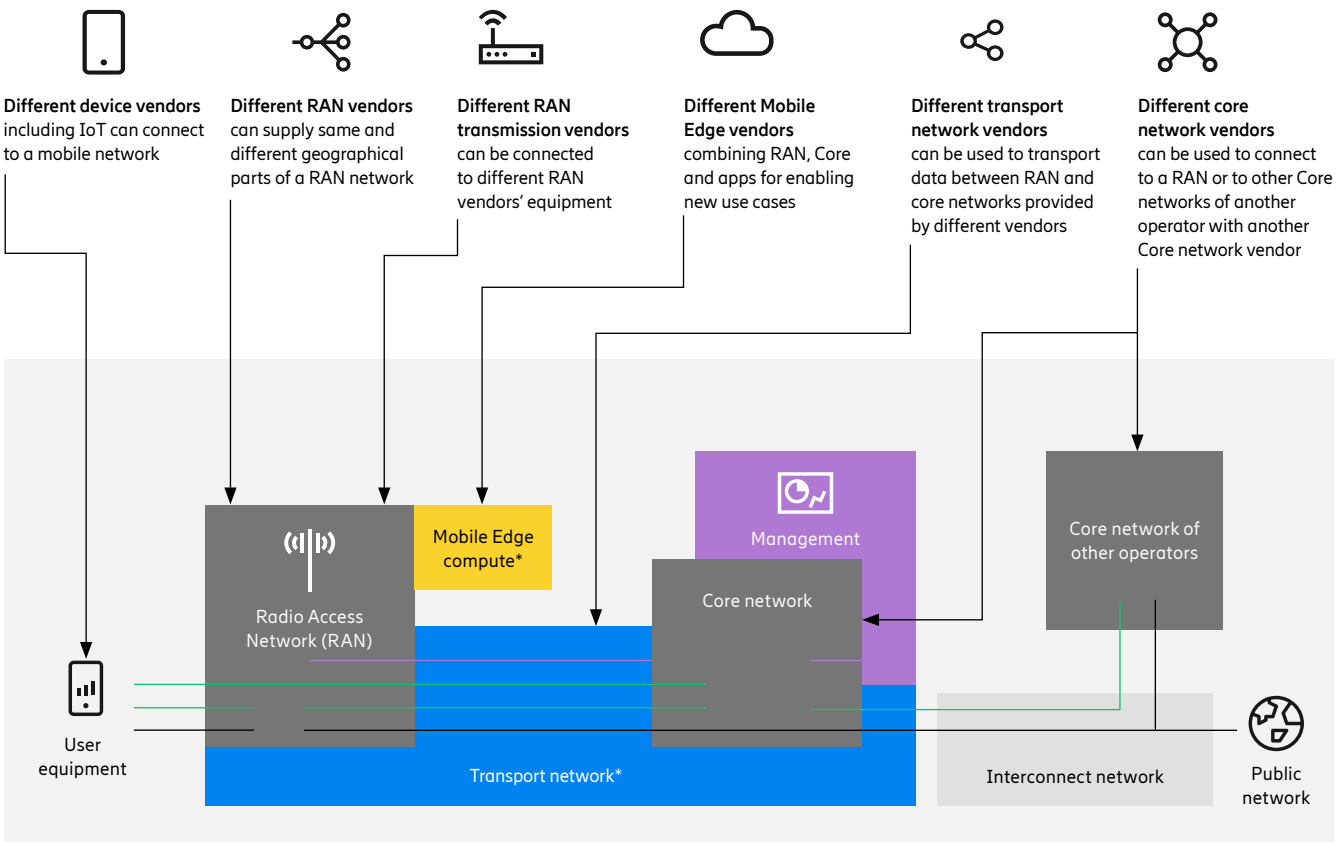
3GPP enabled the mobile internet, which is the primary means of internet access for most of the world's population, and has incentivized a new wave of innovation through the app economy.

Internet companies began announcing "mobile first" strategies more than 10 years ago. Today, a growing number of applications are only available in mobile format. This shift is due to mobile's ubiquity, its capabilities, and consistencies. To ensure these characteristics remain, global standards and scale economies are critical. 5G networks are being deployed and commercialized at an unprecedented rate around the world.

Operators in India, for instance, have rolled out 5G coverage to the majority of the country just a few months after obtaining their 5G licenses, surpassing the deployments in both the US and Europe.

Mobile broadband, IoT, and low-latency industrial connectivity enabled by 5G are expected to contribute USD 2.2 trillion to the global economy between 2024 and 2034.[5]

Figure 4: 3GPP-enabled diversity and multi-vendor openness in a mobile network



[5] GSMA_MobileEconomy2020_Global.pdf

Innovation through FRAND-based collaboration

Within the telecoms industry, patents play an important role. They allow innovative companies to share and compare ideas during the standardization process so that the best technologies can be identified and used in the standard.

Patents drive the broad dissemination of the standardized technology via licensing on FRAND terms and conditions.

Outside of standardization, patents can prevent other companies from using the technology they claim. However, in the 3GPP ecosystem, the FRAND commitment ensures that the use of standardized technology cannot be blocked and enables those who contribute technology to the standard to receive adequate compensation for the use of their technology, thereby incentivizing continuous reinvestments in further development (Figure 5).

This FRAND licensing framework is an essential pillar for the success of 3GPP. It strikes an important but delicate balance between technology contributors and technology users. The framework has encouraged competition, created wider choice for consumers, provided clarity and certainty, and helped to reduce prices while at the same time improving quality and performance.

Long-standing industry practices, IPR policies and case law inform the ecosystem on the value of – and processes for – licensing 3GPP-related patent portfolios at the established point in the value chain.

Therefore, retaining incentives for standards developers and avoiding a shift toward proprietary technologies or specific business models is important to ensure interoperability going forward. A strength of the FRAND regime is that it is business-model neutral, allowing for the broadest possible participation in the standardization ecosystem from companies with vastly different business models and product portfolios.

Figure 5: The FRAND ecosystem

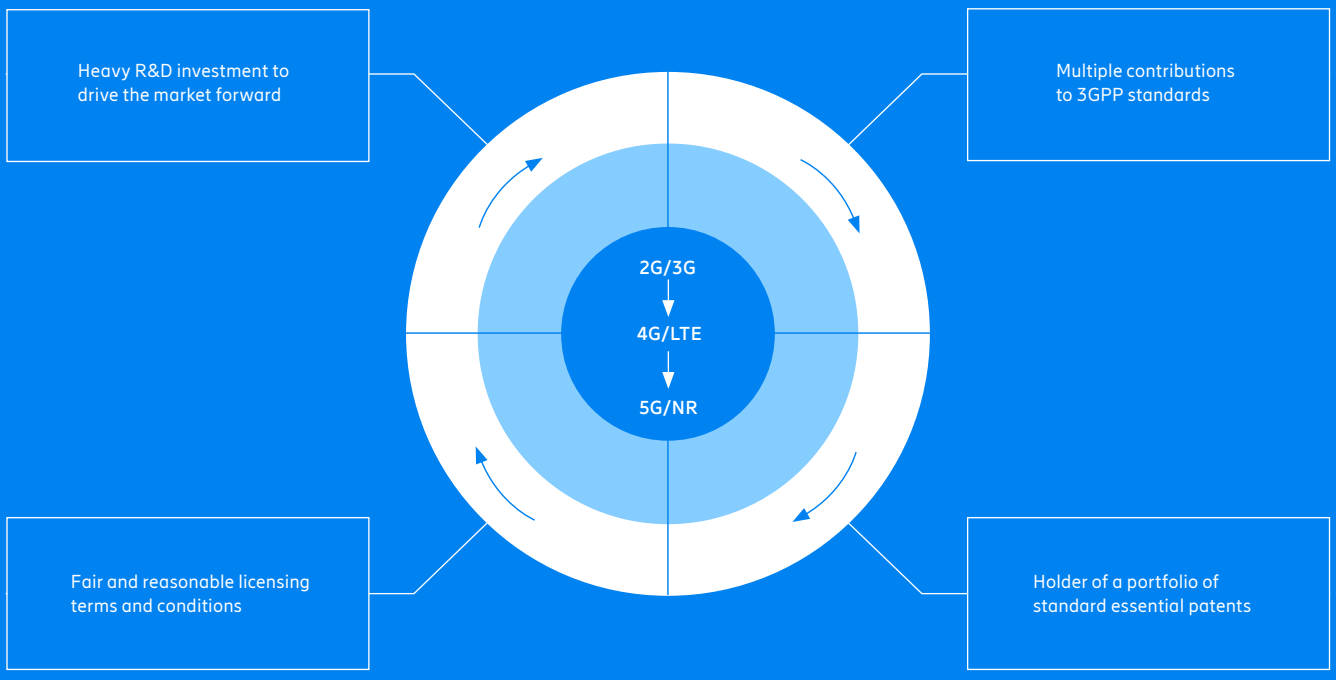
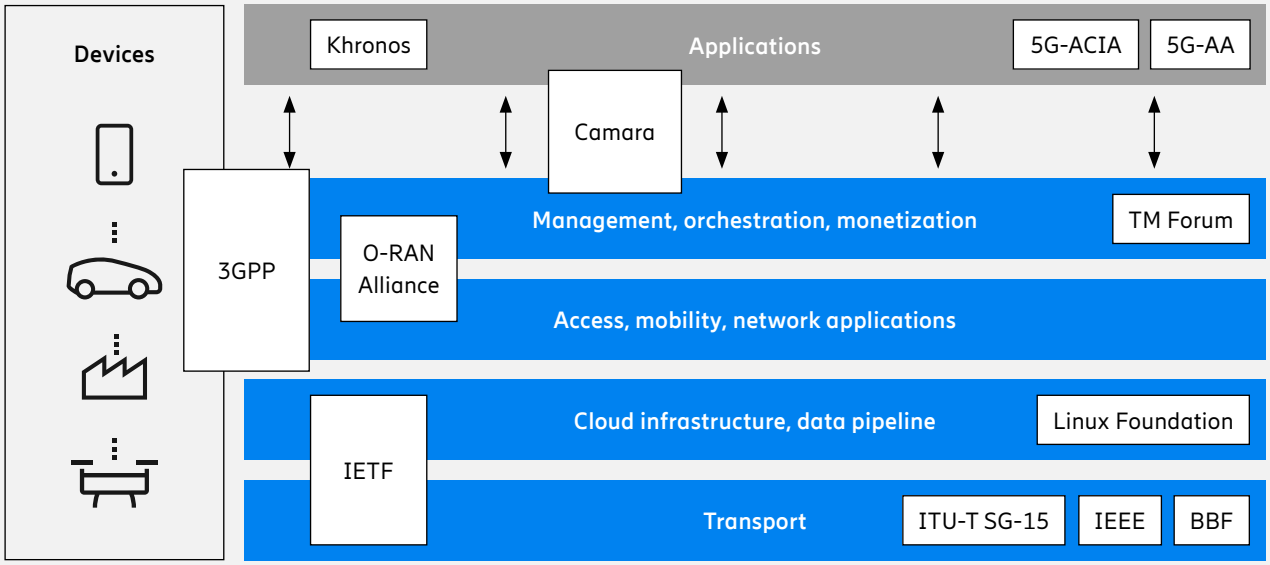


Figure 6: Key standardization forums for the open network platform



- 3GPP: 3rd Generation Partnership Project
- 5G-ACIA: 5G Alliance for Connected Industries and Automation
- 5G-AA: 5G Automotive Association
- BBF: Broadband Forum
- O-RAN Alliance: Open RAN Alliance
- IETF: Internet Engineering Task Force
- ITU-T SG-15: International Telecommunication Union Study Group 15
- Camara: Telco Global API Alliance
- IEEE: Institute of Electrical and Electronics Engineers

The coming five years

Integral to future 5G use cases is horizontal network platform architecture, using cloud and virtualization technologies, which allows for a separation of hardware and software and is based on open industry standards and open-source software.

The open network platform will build on more than 100 3GPP open interfaces across the access, mobility and network application layers, and the open air-interface, which is the cornerstone of the mobile industry's success. In addition to today's open interfaces, new interfaces are needed to fully utilize cloud and virtualization technologies. In Figure 6, we have identified key interface areas.

The technical work to develop standards for the open network platform will take place in both existing and new forums.

Introducing new interfaces creates a risk of ecosystem fragmentation, which could impact interoperability and other longer-term potential public benefits. For innovators, fragmentation can act as a disincentive to invest in areas that don't have scale. For consumers, smaller markets created by fragmentation could lead to higher prices and poorer performance.

Networks are complex systems. To evolve the 5G network platform, a system-wide view is needed, with careful evaluation of the trade-off between providing optimal network performance and remaining agile in the deployment of new technologies and innovations.

To retain the global industry scale advantage and time to market, it is critical to avoid costly system integration efforts, to maintain at least the current level of security, and provide attractive life cycle management of both existing and new equipment. In this context, existing multi-vendor, open standards-based tested-and-verified telecom logic has the potential to support a broad range of societal needs going forward.

For the next few years, digital infrastructure based on 3GPP will be fundamental to countries' rapid digitalization and will have the possibility to become a truly open innovation platform. In addition, digital technologies can help reduce global carbon emissions by up to 15 percent by 2030.

Conclusion

For more than two decades, the 3GPP collaboration model has established the fastest-scaling global technology ecosystem ever. The rate of 5G network launches and new connections is also unprecedented; take India for example, operators rolled out 5G coverage to the majority of the country just a few months after obtaining their 5G licenses, outpacing the deployments in the US and Europe. With 4.4 billion 5G connections expected by 2027,[6] the mobile industry's economic contribution is set to increase by almost 400 billion to USD 4.9 trillion by 2025.[7]

The success of 3GPP and FRAND has proven the model to be a collaborative, cross-industry, interoperability based open innovation model. In the years to come, 5G and its evolution will serve consumers with high-quality and cost-efficient mobile services. At the same time, it will enable enterprises and society at large to digitalize and get the benefits of scale, while meeting higher performance demands and flexibility requirements than can be met with current technologies.

[6] Ericsson Mobility Report June 2022
[7] The Mobile Economy 2022

About Ericsson

Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York. www.ericsson.com

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