



**5G PPP**

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**INNOVATIONS  
FOR NEW BUSINESS  
OPPORTUNITIES**

# EXECUTIVE SUMMARY

5G is the next generation mobile network that enables innovation and supports progressive change across all vertical industries and across our society<sup>1</sup>. Through its Radio Access Network (RAN) design and its orchestrated end-to-end architecture, it has the potential to boost innovation and generate economic growth in the European economy. The 5G service models support agility and dynamicity, thereby impacting the granularity, duration and trustworthiness of business relationships. The ability to combine private and public networks and data centres across multiple domains in a secure and controlled way facilitates collaborative business processes. It reshapes the digital business ecosystem with new value chains linking stakeholders from the telecommunications world and the vertical industries in win-win situations. New stakeholders emerge in this evolved ecosystem, for example cloud companies and software houses that profit from the cloudification and virtualization of the infrastructure, and brokers that facilitate sharing of spectrum and trading of connectivity and processing resources. Small and medium-sized enterprises and start-ups are able to embed 5G in their innovative products and services for existing and new customers and markets, leveraging on the Anything as a Service (XaaS) model.

These opportunities are conditioned by the ability of 5G architecture and technologies to deliver the performance levels required for vertical industry stakeholders to engage in the 5G digital business ecosystem. This white paper highlights the technological innovations of the first phase of the 5G Public Private Partnership (5G PPP)

and how they contribute to the key performance targets for the 5G service classes: enhanced Mobile Broadband (eMBB), Ultra-Reliable Low Latency Communications (URLLC), and massive Machine Type Communications (mMTC). The performance levels ensure an unprecedented experience for end users including high data rates, reduced end-to-end latency, massive connectivity, ultra-reliability and support for very high mobility. The 5G PPP innovations go far beyond what is announced for early 5G deployments. For eMBB service, the integration of mm-wave and frequencies below 6 GHz, along with ultra-dense networks and nomadic nodes, ensure the targeted performance levels with ubiquitous coverage and in high mobility scenarios, in contrast with standalone deployments of mm-wave networks, suitable for fixed usage. The innovations related to the transport network allow also translating the peak throughputs available at the air interface into perceived user experience at affordable deployment cost for operators. In addition to this, the envisioned 5G air interface serves simultaneously all service classes (eMBB, mMTC and URLLC) in a cost effective way, paving the way for new business opportunities with and for verticals.

The 5G concept developed in this paper is not limited to the RAN; it covers the end-to-end path and allows the 5G network to act as a secure, reliable and flexible orchestration platform across multiple domains. The 5G PPP innovations converge towards the vision of 5G as a holistic orchestration platform that integrates networking, computing and storage resources into one programmable and unified infrastructure. The 5G PPP innovations

on multi-domain orchestration enable quick end-to-end service deployment and dynamic sharing of networking and processing resources among stakeholders. The 5G security architecture is built on a baseline trust model as a fundamental feature, and provides tools to analyse trust and make it explicit in specific scenarios. The 5G architecture ensures resilience of the network against attacks and its availability during failure incidents. Availability and reliability are achieved by mechanisms such as error recovery, fault detection and fault resolution. These security, reliability and flexibility properties, along with the multi-service air interface, ensure that the 5G network is not just an enhanced air interface as for pre-5G early deployments, announced for the period 2018-2020, but also an open platform for new business opportunities.

The architecture and protocols are designed to adapt to a wide range of deployment scenarios including deep indoor, hot spots, urban areas, rural areas, maritime areas and in an aeronautical context. The 5G concept combines various access technologies, such as cellular, wireless, satellite and wireline, for delivering reliable performance for critical communications and improve area coverage.

Standardization and spectrum regulation are critical elements for avoiding fragmentation of future deployments and increasing efficiency

by eliminating redundant options. Spectrum regulation must ensure the early availability of a limited number of frequency bands, which eases the development of the necessary equipment and facilitates faster preparation of tests and trials. As of standardization, 5G PPP projects contribute to 5G standards development by building consensus among European industry, leading to individual and concerted actions towards standardization bodies. In contrast to early announcements of 5G deployments, the 5G results are aligned with the standardization trends in 3GPP, ensuring a global impact of European 5G innovations.

Once the first 5G standards are released and the frequency bands are available, deployments of 5G networks will start, adopting cost efficient upgrade paths building on existing 4G infrastructure. Networking and processing resource sharing strategies between stakeholders can be implemented for delivering the performance targets, e.g. for URLLC use cases, at an affordable cost. This resource sharing/integration is enabled by the multi-domain orchestration advocated by 5G PPP projects and aim at achieving win-win situations for all the stakeholders involved in the 5G service. Regulation must facilitate such flexibility in infrastructure sharing in order to foster the development of the 5G digital business ecosystem.



<sup>1</sup> <https://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>