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Perspective

A Brief Note on Beyond 5G Network Infrastructure Technology

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ABOUT THE STUDY

In 5G and beyond, private networks will play a key role in enabling smart factories to effectively install, operate, and use existing resources and infrastructure. 5G private networks will provide a lean and agile solution for deploying and operating services with stringent and heterogeneous constraints in terms of reliability, latency, re-configurability, and resource re-deployment, as well as issues related to 5G component and element governance and ownership. The Study provides a fresh approach to operator models in this study, with a focus on 5G and beyond private networks. The suggested operator models are applied to a variety of network design alternatives as well as a number of relevant use cases involving mixed private–public network operator governance and ownership.

In particular, various critical enabling technologies for 5G private networks have been identified. Stakeholders should think about spectrum allocation and on-site channel measurements before deploying to fully understand the propagation characteristics of a specific environment and build up end-to-end system settings. A monitoring tool will be used during the deployment to validate the deployment and ensure that the end-to-end system meets the intended KPI. Finally, some optimization may be done on an individual basis for service placement, network slicing, and configuration, or collectively at the radio access, multi-access edge computing, and core network levels.

The 5th generation of mobile communication networks (5G) broadens the scope of wireless communication networks beyond individual human end users to create an integrated communication system that also provides wireless connectivity to new vertical applications driven by industries like manufacturing, automotive, health, and agriculture. Apart from 4G, which was largely associated with traditional operator models due to nationwide spectrum allocation and high infrastructure costs, 5G creates a new market opportunity for private networks, and early 6G research, predicts that private networks will play a key role in future cellular network evolutions. Future private networks, such as 5G and beyond, will be critical enablers for future smart factories, allowing for better deployment, operation, and flexible use of existing resources and infrastructure.

5G private networks will provide a lean and agile solution for deploying and operating services with stringent and heterogeneous constraints in terms of reliability, connect-compute latency, resource re-configurability and re-deployment, as well as issues related to 5G component and element governance and ownership. Several essential enabling technologies, like as network slicing and orchestration, Multi-Access Edge Computing (MEC) support, and machine learning at the edge support, have already been identified and implemented for 5G public networks. Private networks, on the other hand, face unique context-dependent issues in terms of local ownership, governance, and resource optimization.

This comprises dynamic hardware and software component configuration and reconfiguration to determine which parts of the network belong to private or public operators. Because non-public networks cause network parts to be disaggregated not just on a technical but also on an organizational level, potential deployment and operator models must be explored. The study give a rigorous examination of operator models based on four innovative network topologies for non-private deployments, as well as an in-depth conceptual study of their interconnection.

Finally, the end-to-end system findings, which included major enabling technological components as well as optimization and planning approaches, tailored to 5G non-public industrial networks.

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