



GROUP REPORT

Fifth Generation Fixed Network (F5G); F5G Advanced Use Cases; Release 4

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Foreword

This Group Report (GR) has been produced by ETSI Industry Specification Group (ISG) Fifth Generation Fixed Network (F5G).

Modal verbs terminology

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1 Scope

The present document describes the use cases to be enabled by the F5G Advanced network. The use cases in the present document include services and applications for residential users, enterprises, vertical industries, network operation optimizations, and evolved fixed end-to-end infrastructure, which were not supported by the F5G network. Use cases will aim to introduce new technical requirements for the F5G Advance network along various characteristic dimensions. The use cases will be used as input to F5G Advanced Technology Requirements and Gap Analyses activities to extract technical requirements.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

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The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

- [i.1] ETSI GR F5G 021: "Fifth Generation Fixed Network (F5G); F5G Advanced Generation Definition".
- [i.2] ETSI GR F5G 008: "Fifth Generation Fixed Network (F5G); F5G Use Cases Release #2".
- [i.3] ETSI GS F5G 015: "Fifth Generation Fixed Network (F5G); F5G Residential Services Quality Evaluation and Classification Release 2".
- [i.4] IEEE 802.11be™: "Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Enhancements for Extremely High Throughput (EHT)".
- [i.5] [Nokia Lab report: "Focusing on latency, not throughput, to provide a better internet experience and network quality"](#).
- [i.6] ITU-T G.8032: "Use cases and requirements of fibre-to-the-room (FTTR)".
- [i.7] IEEE 802.11k™: "Local and metropolitan area networks -- Specific requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 1: Radio Resource Measurement of Wireless LANs".
- [i.8] IEEE 802.11v™: "Local and metropolitan area networks -- Specific requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 8: IEEE 802.11 Wireless Network Management".
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- [i.20] IEEE 802.11ad™-2012: "IEEE Standard for Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 3: Enhancements for Very High Throughput in the 60 GHz Band".
- [i.21] IEEE 802.11ay™-2021: "IEEE Standard for Information Technology -- Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks -- Specific Requirements -- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 2: Enhanced Throughput for Operation in License-exempt Bands above 45 GHz".
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- [i.24] [Robot Operating System](#).
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- [i.27] ETSI GR F5G 020: "Fifth Generation Fixed Network (F5G); F5G Advanced Use Cases; Release 3".
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3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

binocular parallax: disparity between the two retinal images of a three-dimensional object or scene arising from the slightly different vantage points of the two eyes, such binocular disparity functioning as one of the binocular cues of visual depth perception and providing the basis for stereopsis

NOTE: As defined in <https://www.oxfordreference.com/>.

motion parallax/moving parallax: monocular depth cue arising from the relative velocities of objects moving across the retinae of a moving person

NOTE: The term parallax refers to a change in position. Thus, motion parallax is a change in position caused by the movement of the viewer. Motion parallax arises from the motion of the observer in the environment.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3D	three-dimensional
6DoF	six Degrees of Freedom
AFC	Automatic Fare Collection
AGGN	AGGregation Network
AI	Artificial Intelligence
AOA	Angle Of Arrival
AP	Access Point
API	Application Programming Interface
APP	APPlication
AR	Augmented Reality
B2B	Business to Business
BC	Business Continuity
BNG	Broadband Network Gateway
BoD	Bandwidth on Demand
BSS	Basic Service Set
BYOD	Bring Your Own Device
CAPEX	CAPital EXpenditure
CBR	Constant Bit Rate
CO	Central Office
CoT	Chain of Thought
CPE	Customer Premise Equipment
CPN	Customer Premise Network
CPU	Central Processing Unit
CSMA	Carrier Sense Multiple Access
CT	Computed Tomography
DAS	Distributed Acoustic Sensing
DBA	Dynamic Bandwidth Allocation
DC	Data Centre
DCN	Data Communication Network
DCSW	Data Centre SWitch
DDS	Data Distribution Service
DFOS	Distributed Fibre Optic Sensing
DI	Distributed Intelligence

DR	Disaster Recovery
DT	Data Technology
DTU	Distribution Terminal Unit
E2E	End to End
EMR	Electronic Medical Records
EMS	Element Management System
E-ONU	Edge ONU
F5G	Fifth Generation Fixed Network
F5G-A	Fifth Generation Fixed Network Advanced
FDT	Fibre Distribution Terminal
FIN	Fibre-based In-premises network
FOADM	Fixed Optical Add/Drop Multiplexer
FTTR	Fibre-To-The-Room
FTU	Feeder Terminal Unit
GDPR	General Data Protection Regulation
GIS	Geographic Information System
GPU	Graphics Processing Unit
GUI	Graphical User Interface
HIS	Hospital Information System
HVAC	Heating, Ventilation and Air Conditioning
ICL	In-Context Learning
ICT	Information Communication Technology
IoT	Internet of Things
IoV	Internet of Vehicles
IP	Internet Protocol
IPTV	Internet Protocol TeleVision
IT	Information Technology
JSON	JavaScript Object Notation
KPI	Key Performance Indicators
KQI	Key Quality Indicators
LAN	Local Area Network
LCD	Liquid Crystal Display
LIS	Laboratory Information System
LLM	Large Language Model
LOS	Loss Of Signal
MAN	Metropolitan Area Network
MBB	Mobile BroadBand
MCM	Multi-Carrier Modulation
MFU	Main FTTR Unit
MQTT	Message Queuing Telemetry Transport
MRI	Magnetic Resonance Imaging
MSE	Multi-Service Edge
MSOTN	Multi-Service OTN
MSTP	Multi-Service Transport Platform
MTTR	Mean Time To Repair
NAS	Network Attached Storage
NDA	Non-Disclosure Agreement
NE	Network Element
NLP	Natural Language Processing
NMS	Network Management System
NOC	Network Operations Centre
NP	Network Processor
O&M	Operation & Maintenance
OAI	Optical Artificial Intelligent
OAM	Operation And Maintenance
OCC	Operations Control Centre
OCh	Optical Channel
ODN	Optical Distribution Network
ODSP	Optical Digital Signal Processing
ODU	Optical Data Unit
OFDMA	Orthogonal Frequency Division Multiple Access
OLA	Optical Line Amplifier

OLT	Optical Line Termination
OMCI	ONU Management and Control Interface
ONU	Optical Network Unit
OPEX	OPerational EXpenditure
OPGW	OPTical Ground Wire
OSC	Optical Supervisory Channel
OSU	Optical Switch Unit
OTDR	Optical Time Domain Reflectometer
OTM	Optical Termination Multiplexer
OTN	Optical Transport Network
OTT	Over The Top
OWT	Object Wave Transmission
OXC	Optical Cross-Connect
P2P	Point to Point
PAC	Picture Archiving and Communication
PC	Personal Computer
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PDH	Plesiochronous Digital Hierarchy
PET	Positron Emission Tomography
PIS	Passenger Information System
PON	Passive Optical Network
P-ONU	Primary ONU
PPPoE	Point-to-Point Protocol over Ethernet
QoD	Quality on Demand
QoE	Quality of Experience
QoS	Quality of Service
QR	Quick Response
RaaS	Robotics as a Service
RCA	Root Cause Analysis
RGB	Red Green Blue
ROADM	Reconfigurable Optical Add-Drop Multiplexer
ROS	Robotic Operating System
RTT	Round Trip Time
SDH	Synchronous Digital Hierarchy
SFU	Sub FTTR Unit
SLA	Service-Level Agreement
SLAM	Simultaneous Localization And Mapping
SLM	Spatial Light Modulator
SME	Small and Medium-size Enterprise
SMS	Short Message Service
SNCP	Sub-Network Connection Protection
SOP	State Of Polarization
SPECT	Single-Photon Emission Computed Tomography
STA	Station
TCP	Transmission Control Protocol
TDMA	Time Division Multiple Address
TPU	Tensor Processing Unit
TSDB	Time Series Database
TTM	Time-To-Market
TTU	Transformer supervisory Terminal Unit
UDP	User Datagram Protocol
UGC	User Generated Content
UHV	Ultra High Voltage
VLAN	Virtual Local Area Network
VoD	Video on Demand
VoIP	Voice over Internet Protocol
VR	Virtual Reality
WDM	Wavelength Division Multiplexing
WLAN	Wireless Local Area Network
WMM	Wi-Fi® Multimedia
WSS	Wavelength Selective Switch

XR

eXtended Reality

3.4 Terminology

The term Cloud typically refers to cloud services that are centrally deployed in data centers and located far from the user side.

The term On-Premises Cloud refers to the cloud services deployed on the user side, such as within an enterprise or a campus.

The term Edge Cloud refers to the cloud services deployed near the user side, such as edge-side equipment rooms. Categorization of use cases.

3.5 F5G Advanced Key Focus

As described in ETSI GR F5G 021 [i.1], the main business needs identified by F5G Advanced are outlined in Figure 1. They improve various dimensions over previous generations of fixed networks.

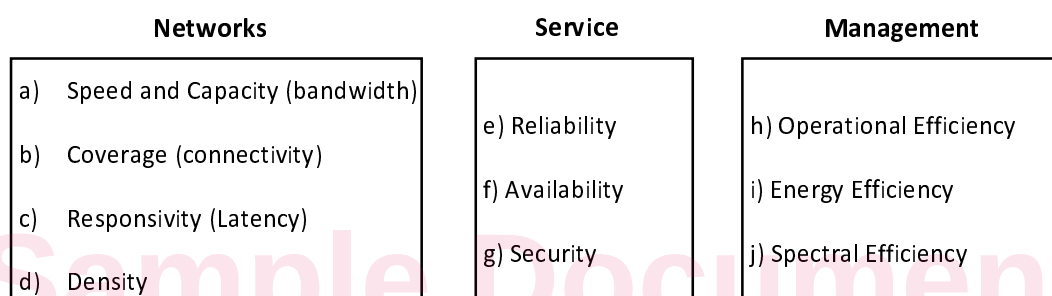


Figure 1: Key Focus for F5G Advanced in the categories of Network, Service, and Management

In the present document, there are seventeen in release 3 and fourteen in release 4 use cases described, which take advantage of the key technical characteristics defined for the F5G-A network. Each use case may demand a different subset of the 10 high level categories depicted in Figure 1. With further research, subsequent use cases may be specified.

3.6 Driving the characteristics of F5G Advanced

The use cases as described in the present document are driving the six characteristic dimensions that are specified in ETSI GR F5G 021 [i.1], namely enhanced Fixed Broadband (eFBB), Real time Resilience Link (RRL), Guaranteed Reliable Experience (GRE), Optical Sensing and Visualization (OSV), Full-Fibre Connection (FFC), and Green Agile Optical network (GAO).

Figure 2 shows that:

- Depending on the use case, one or more dimensions are particularly important.
- All dimensions of the F5G-A system architecture are implemented by the following use cases.

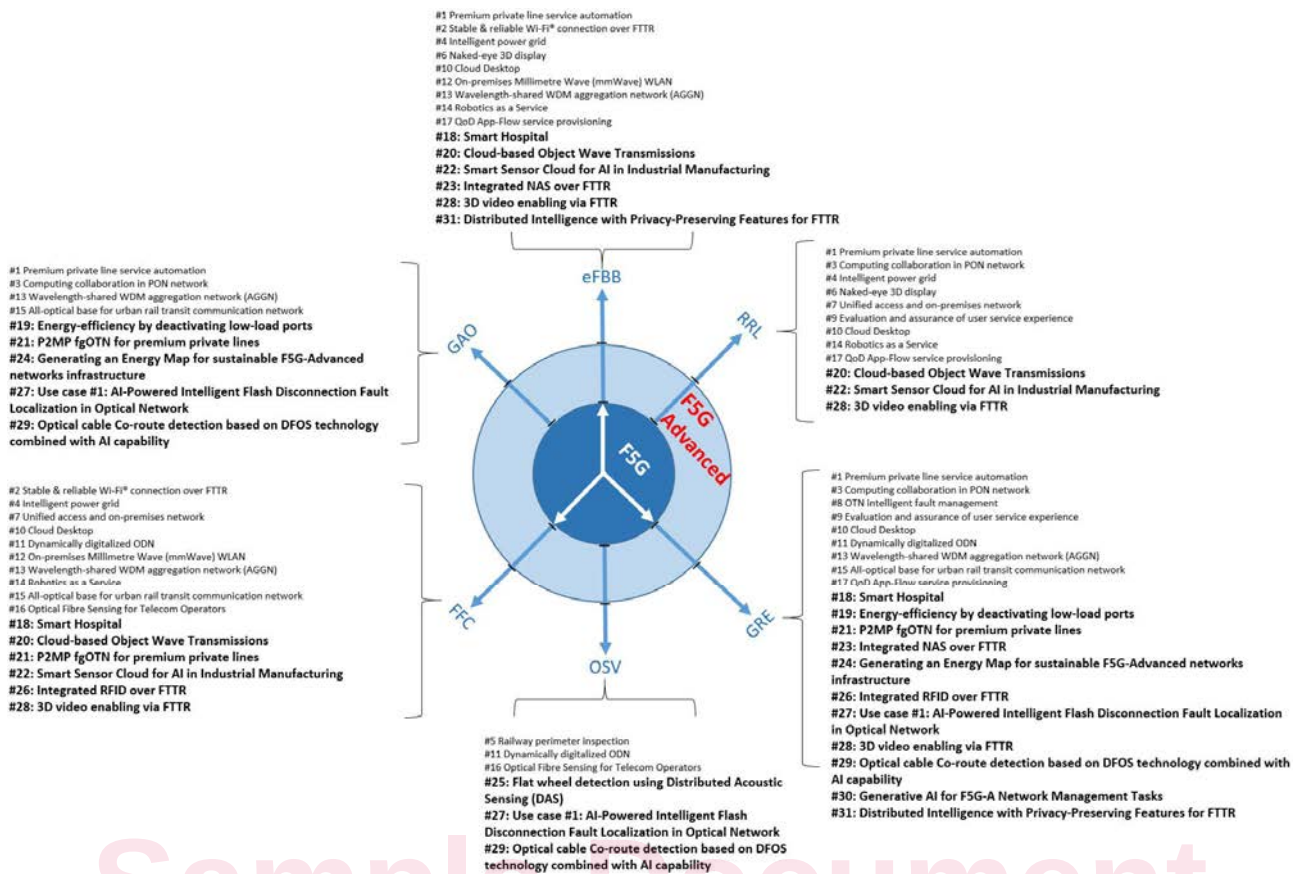


Figure 2: F5G-A use cases (illustrative)

3.7 Paving the Way for Fibre to Everywhere and Everything

F5G-A is leveraging technologies of fibre optical networks to benefit multiple segments including residential applications, enterprise applications, network internal topics such as network optimizations plus the use of F5G-A for the mobile infrastructure and service convergence, and finally vertical industries-oriented use cases.

Figure 3 shows the different high-level segments where fibre to everywhere is applicable. The larger circle named network features focus on optimization of the networking technologies.

In the present document, the aspects of mobile have a limited number of use cases assigned to it. Future use cases might add more mobile oriented aspects.

In the present document the aspects of AI and computing are integrated in all the different segments and therefore are not visualized separately.

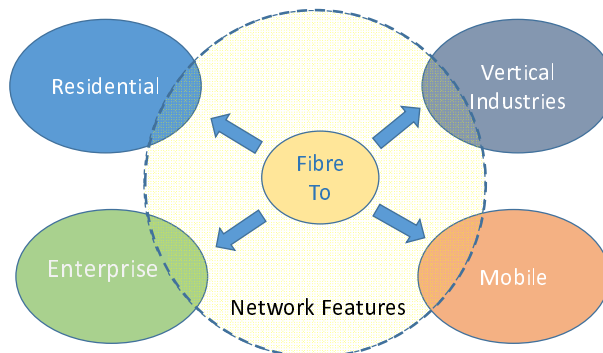


Figure 3: High-level Segment Perspective

As a quick reference, Table 1 summarizes the different use cases from three different perspectives:

- Key F5G-A dimensions. This column is filled in alphabetical order per use case.
- Key segment and business area addressed.
- Key focus of the use case - new or enhanced services, network infrastructure and service features or in network management and optimization.

Table 1: Use cases with key dimensions, segments and focus

F5G-A Use Cases	Key F5G-A Dimensions	Key Segments					Key Focus			Clauses
		Residential	Enterprise	Mobile	Vertical industry	Network Features	Services	Network	Management	
F5G-A Use case #1: Premium private line service automation	eFBB, GAO, GRE, RRL	x	x					x		4.1
F5G-A Use case #2: Stable & reliable Wi-Fi® connection over FTTR	eFBB, FFC	x						x		4.2
F5G-A Use case #3: Computing collaboration in PON network	GAO, GRE, RRL					x			x	4.3
F5G-A Use case #4: intelligent power grid	eFBB, FFC, RRL				x			x		4.4
F5G-A Use case #5: Railway perimeter inspection	OSV				x	x		x		4.5
F5G-A Use case #6: Naked-eye 3D display	eFBB, RRL	x	x		x		x			4.6
F5G-A Use case #7: Unified access and on-premises network	FFC, RRL	x						x	x	4.7
F5G-A Use case #8: OTN intelligent fault management	GRE					x			x	4.8
F5G-A Use case #9: Evaluation and assurance of user service experience	GRE,RRL	x					x		x	4.9
F5G-A Use case #10: Cloud Desktop	eFBB, FFC, GRE,RRL		x				x			4.10
F5G-A Use case #11: Dynamically digitalized ODN	FFC, GRE,OSV					x			x	4.11
F5G-A Use case #12: On-premises MillimetreWave (mmWave) WLAN	eFBB,FFC	x						x		4.12
F5G-A Use case #13: Wavelength-shared wDM aggregation network (AGGN)	eFBB, FFC, GAO, GRE					x		x		4.13
F5G-A Use case #14: Robotics as a Service	eFBB,FFC,RRL		x		x		x			4.14
F5G-A Use case #15: All-optical base for urban rail transit communication network	FFC, GAO, GRE				x	x		x		4.15
F5G-A Use case #16: Optical Fibre Sensing for Telecom Operators	FFC, OSV					x		x	x	4.16
F5G-A Use case #17: QoD App-Flow service provisioning	eFBB, GRE,RRL					x	x		x	4.17
F5G-A Use case #18: Smart Hospital	eFBB, FFC, GRE		x			x		x	x	5.1
F5G-A Use case #19: Energy-efficiency by deactivating low-load ports	GAO, GRE					x			x	5.2
F5G-A Use case #20: Cloud-based Object Wave Transmissions	eFBB, FFC, RRL	x	x				x			5.3
F5G-A Use case #21: P2MP fgOTN for premium private lines	FFC, GAO, GRE		x		x			x		5.4
F5G-A Use case #22: Smart Sensor Cloud for AI in Industrial Manufacturing	eFBB, FFC, RRL				x		x	x		5.5
F5G-A Use case #23: Integrated NAS over FTTR	eFBB, GRE	x					x			5.6
F5G-A Use case #24: Generating an Energy Map for sustainable F5G-Advanced networks infrastructure	GAO, GRE					x		x	x	5.7