Evolving Towards F5G-Advanced for Green 10Gbps Everywhere

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ETSI ISG F5G Liaison Officer

NGON & 5G Transport, 30/05/2023

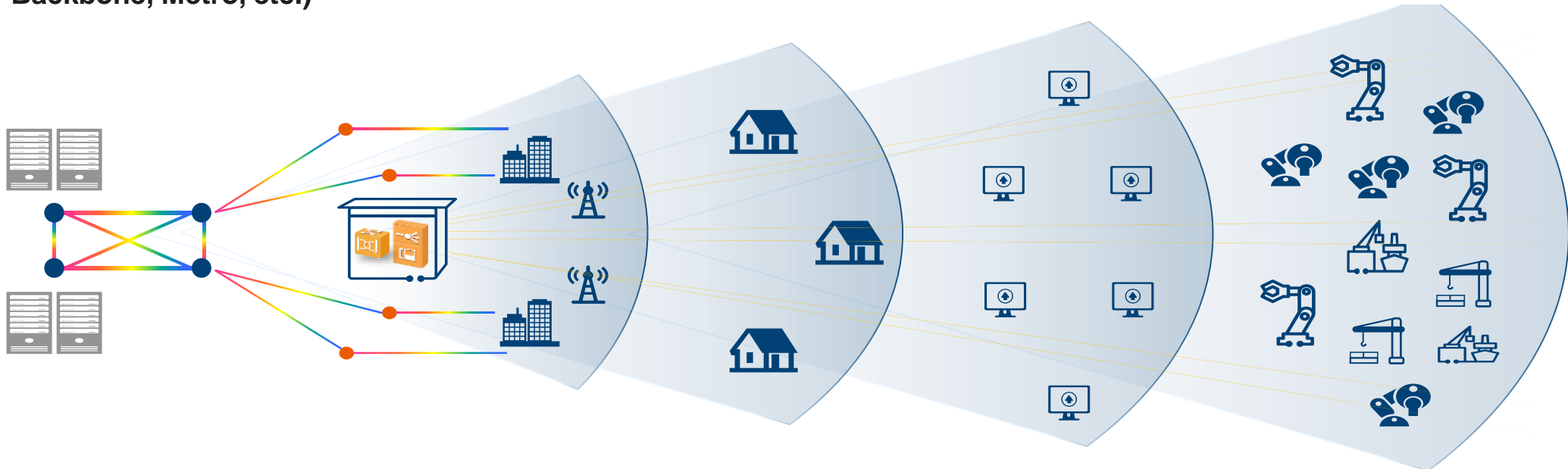# F5G Vision for Fiber to Everywhere & Everything

Data Centre (Core, Backbone, Metro, etc.) · **Home/Business** · **Campus/Verticals** · **Device/Machine**

| OTN extending CO -> Site | FTTH -> FTTR | FTTO->FTTD | FTTC->FTTM |

| 1000KM | 10KM | 1KM | 10M | 1M |

✓ Fiber to Everywhere to make fixed access future proof

✓ Extending to more end-user : 2Home, 2Room, 2Business, 2Comsumer, 2Mobile, 2Device, 2Machine, etc.

✓ Reducing everywhere the fiber-to-end user distance: Km -> 100m -> 10m -> 1m

✓ Number of connections expanding: X3 (Room), X10 (Desk), X30 (Machine), X100 (Smart city)

Snapshot of ISG F5G since 2020

ETSI

F5G Kickoff
(Feb 2020)

3+ years operation

Till Now
(May 2023)

97
Members & Participants

(starting with 10 founding members in Dec 2019, now reaching 35 Members, 59 Participants and 1 counselor)
- China Mobile
- Sandvine

1970
Contributions

(2020: 374, 2021: 634 2022: 715 2023: 218)

70
Active Liaisons

22
Work Items

(7 in 2020, 6 in 2021, 6 in 2022 and 1 in 2023. Till now 15 standard were published,2 in final draft stage and the other 4 in early stage, and 1 just created in February 2023)
https://www.etsi.org/committee/1696-f5g

4
White Papers

(all published: one in 2020,one in 2021, and 2 in 2022)

➢ F5G white paper (https://www.etsi.org/images/files/ETSIWhitePapers/etsi_wp_41_FSG_ed1.pdf)
➢ FDI White paper ()https://www.etsi.org/images/files/ETSIWhitePapers/WP_47_GFDI.pdf)
➢ F5G Advanced and beyond (https://www.etsi.org/images/files/ETSIWhitePapers/ETSI-WP-50-F5G-Advanced-and-Beyond.pdf)

30
Participation at Events

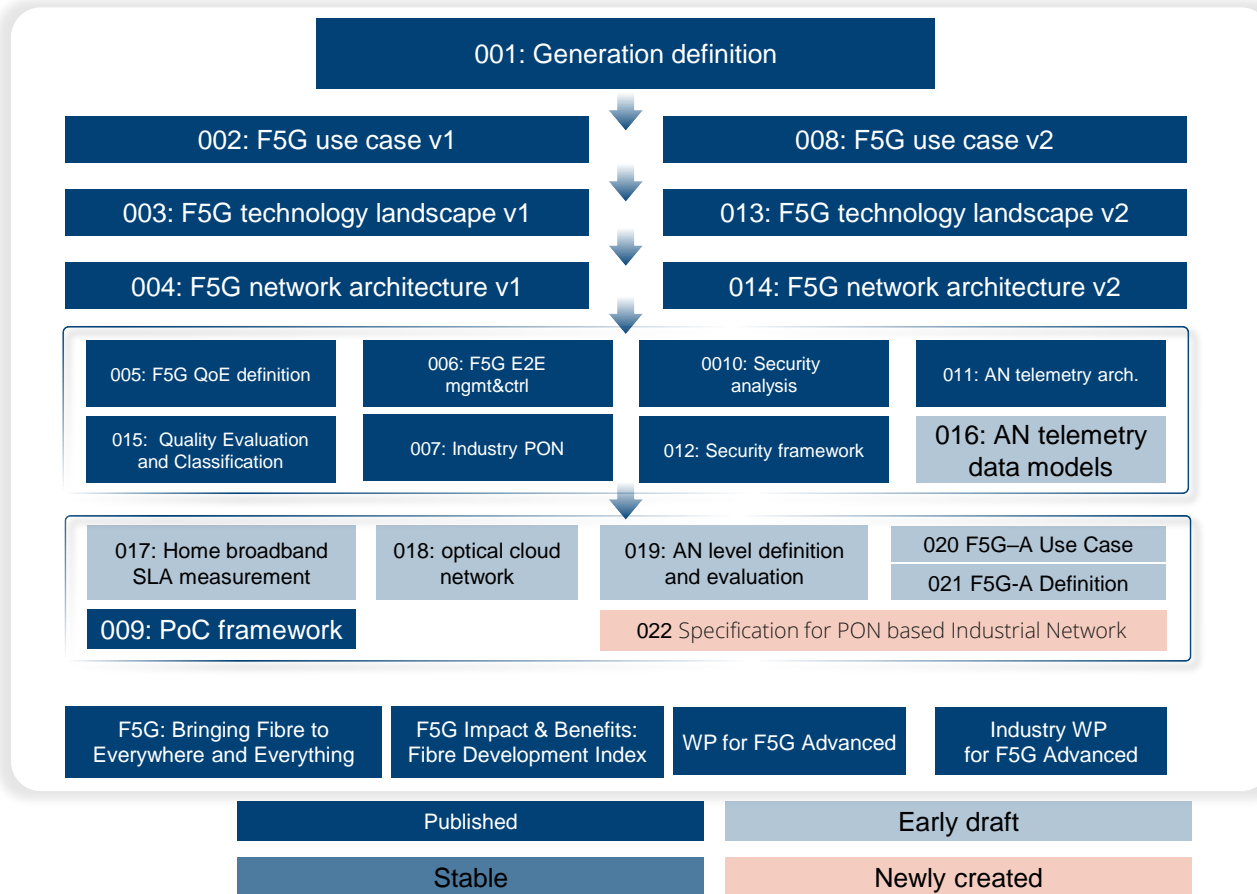(OFC, OSA, ECOC, OECC, ACP, BBWF, NGON&DCI, ETS Webinar)

F5G Standards Contributions

Till now, 15 standard and 4 white paper were published.

Fifth Generation Fixed Network (F5G)

Work Items (22)

001: Generation definition

002: F5G use case v1 | 008: F5G use case v2

003: F5G technology landscape v1 | 013: F5G technology landscape v2

004: F5G network architecture v1 | 014: F5G network architecture v2

005: F5G QoE definition | 006: F5G E2E mgmt&ctrl | 0010: Security analysis | 011: AN telemetry arch.

015: Quality Evaluation and Classification | 007: Industry PON | 012: Security framework | 016: AN telemetry data models

017: Home broadband SLA measurement | 018: optical cloud network | 019: AN level definition and evaluation | 020 F5G–A Use Case

021 F5G-A Definition

009: PoC framework | 022 Specification for PON based Industrial Network

WP (4)

F5G: Bringing Fibre to Everywhere and Everything | F5G Impact & Benefits: Fibre Development Index | WP for F5G Advanced | Industry WP for F5G Advanced

Legend:

Published | Early draft

Stable | Newly created

More information's on ISG F5G on ESTI Portal (Open, Transparent and Free)

- https://www.etsi.org/committee/f5g, for generic information and download of specifications on ISG F5G.
- https://portal.etsi.org/tb.aspx?tbid=885&SubTB=885#/, for the technologies part on ISG F5G,
- https://docbox.etsi.org/ISG/F5G/Open/ for the shared activities and information's in the open area (presentation, release documentation, PoCs, etc.

Driver for F5G Evolution to F5G Advanced

Digitization and Cloudification of Applications

UHD immersive experience services

Enterprise digitization and cloudification

Industry going fiber

Metaverse as a Driver

Network Infrastructure Improvements

Digitization of network operations

Optical fiber infrastructure
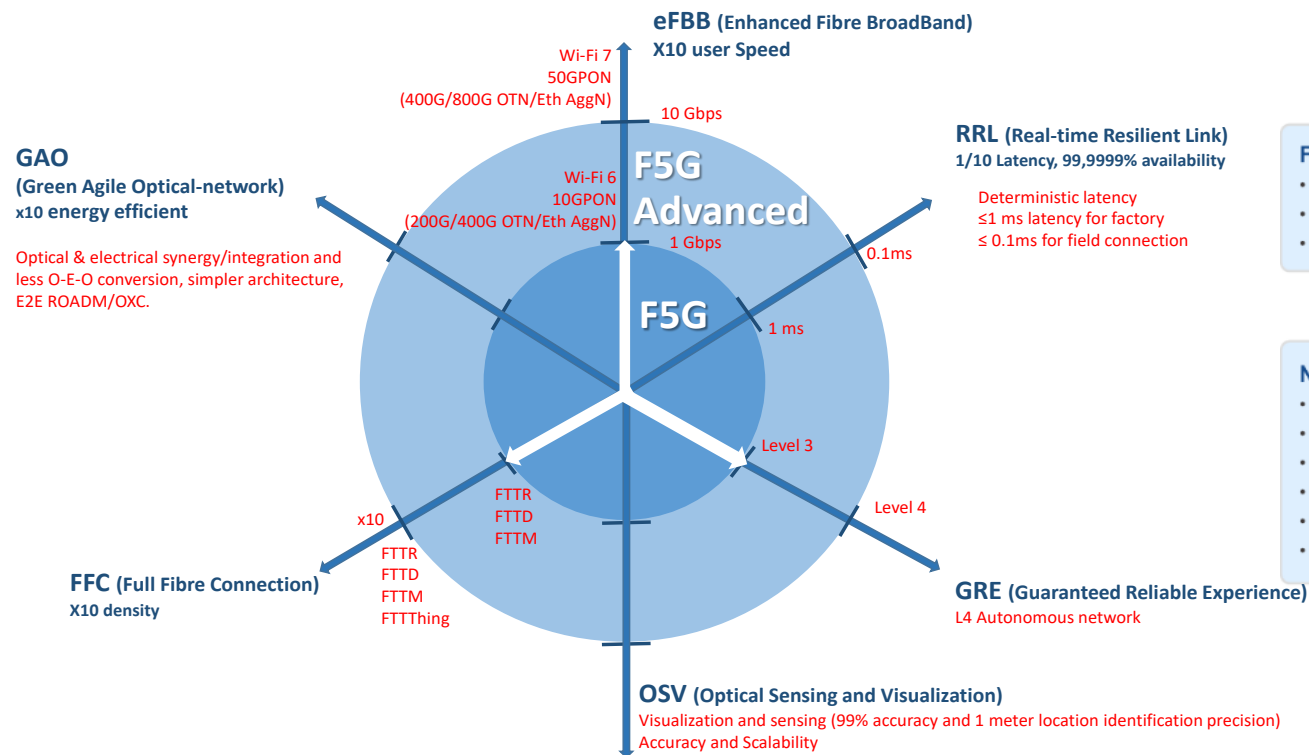

Smart Infrastructures

The green challenge

New Trends

Metaverse · Digitalization · Automation · Green

"F5G Advanced and Beyond" White Paper
--Scan for download freely

F5G Advanced Bring 10G everywhere to the users

● ISG F5G planned to finished F5G-Advanced in three release and then move to F6G in 2027

ISG F5G Created	Release 1 F5G	Release 2 F5G	Release 3 • F5G Advanced	Release 4 • F5G Advanced	Release 5 • F5G Advanced • F6G Vision	Release 6 • F5G-Advanced • F6G	Release 7
2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

F5G Advanced Generation

eFBB (Enhanced Fibre BroadBand)
X10 user Speed

Wi-Fi 7
50GPON
(400G/800G OTN/Eth AggN)

10 Gbps

RRL (Real-time Resilient Link)
1/10 Latency, 99,9999% availability

Deterministic latency
≤1 ms latency for factory
≤ 0.1ms for field connection

GAO
(Green Agile Optical-network)
x10 energy efficient

Optical & electrical synergy/integration and less O-E-O conversion, simpler architecture, E2E ROADM/OXC.

Wi-Fi 6
10GPON
(200G/400G OTN/Eth AggN)

1 Gbps

0.1ms

F5G Advanced

F5G

1 ms

Level 3

Level 4

x10

FTTR
FTTD
FTTM

FTTR
FTTD
FTTM

FFC (Full Fibre Connection)
X10 density

FTTR
FTTD
FTTM
FTTThing

GRE (Guaranteed Reliable Experience)
L4 Autonomous network

OSV (Optical Sensing and Visualization)
Visualization and sensing (99% accuracy and 1 meter location identification precision)
Accuracy and Scalability

Key enabling technologies

Latency control technologies
- Deterministic Networking
- End to end slicing

Energy efficiency technologies
- Network Level Energy efficient technologies
- Equipment Level Energy efficient technologies
- High level design for energy efficiency

Fiber to the terminal (FttT)
- FttRoom (residential)
- FttMachine (industrial)
- FttCampus/Office (business)

Network technologies
- 800G+ OTN and related systems
- Sub-1G OSU-OTN
- OXC for agile green networking
- 50G-PON
- Novel PON functional split
- Wi-Fi 7

Technologies for enhancing trustworthiness

High Quality Distributed Computing Networks
- Security guarantee of computing power
- Computing Network Information gathering
- Elastic resource scaling
- Latency aware process dispatching
- Joint optimization of network and computing
- Ensuring computing service experience

Network-based sensing
- Fiber cable digitization
- Distributed optical fiber sensing
- Wi-Fi sensing

Autonomous Network Management
- Intent-based management
- Knowledge graph for fault management
- Improved network information gathering

Our speakers

Olivier Ferveur

Senior Architect/Vice Chair ETSI ISG F5G

POST Luxembourg/ETSI

Teun Van Der Veen

Senior Consultant Media Networks

TNO

Behnam Shariati

Project Manager

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Raul Muñoz

Research Director, Head of Packet Optical Networks and Services

CTTC