

Terms of Reference (ToR) for ETSI ISG “5th Generation Fixed network” (ISG F5G)

Approved by the Director-General on **3 December 2021**, following ETSI Board consultation

Scope

ISG F5G studies and develops the 5th generation fixed network fostering the evolution to a “fibre to everywhere” ecosystem that enables new and enhanced services leveraging, in a framework of growing network capabilities, better performance, intelligent E2E management, network security and enhanced energy efficiency.

F5G aims to work as a hub for the development of fibre based networks standardization in an E2E perspective, identifying major use cases and requirements and interacting with all relevant SDOs and industry stakeholders to produce new standards, where required, or enhancements to existing standards that may be needed to fulfil the identified use cases.

The work to be performed includes:

- identifying and developing the overall characteristics of the 5th generation fixed network,
- exploring all relevant F5G scenarios and related use cases and services including (*but not limited to*) home, business, multiple vertical industries and mobile/ wireless x-haul,
- performing a gap analysis to identify the necessity for both enhancements to existing technology specifications and/or developments of new technology specifications where required to fulfil the identified use cases,
- studying the overall framework, outlining the complete F5G technology landscape,
- developing an E2E reference architecture for F5G networks,
- specifying flexible and agile E2E management, enhancing QoE and QoS,
- establishing a Proof-of-Concept framework, defining a set of rules and procedures for PoC activities that validate F5G specifications, services or architecture options developed throughout the work on F5G,
- evaluating security threats and vulnerabilities and classifying the risk they present, then identifying requirements for mitigating countermeasures in order to manage the risk,
- leveraging the synergies between fixed networks (Transport, Aggregation, Access) and wireless communications to foster convergence in residential, enterprise and vertical services,
- studying migration path scenarios to reach the fifth-Generation Fixed network and evaluating possible evolution to future generations.

Evolution of Fixed Networks

The further evolution of the fixed network creates a new era of opportunities by extending fibre to the home to fibre to other scenarios, such as to new services for business, vertical industries and extended support to wireless networks.

- Home scenarios where emerging cloud-oriented services such as Cloud VR (virtual reality) and AR (augmented reality) video streaming, online gaming, etc., introduce the necessity for ultra-broadband, extremely low latency and zero packet loss.
- Business scenarios such as enterprise Cloudification, leased line services, Passive Optical LAN (POL), etc., requiring enhanced network capabilities, high reliability and high security.
- Vertical industry scenarios with demanding requirements for the deployment of fibre infrastructures in hard environmental conditions (e.g. humidity, temperature, electromagnetic), interoperable with industry specific protocols and enabled for edge computing scenarios.
- The massive deployment of wireless networks, primarily in 5G, bringing growing needs for an efficient optical infrastructure that can deliver the bandwidth, latency and dense distribution required to support those networks.

Various use cases of these different scenarios are investigated by F5G, and the relevant requirements clearly documented.

In order to fulfil the business requirements for 5th generation of fixed network, ISG F5G will define the corresponding framework that includes F5G network capabilities, performance indices and the corresponding

technology landscape F5G targets a full fibre network to maximize the value of utilizing common transport, access and on-premises network technologies such as OTN, XG(S)-PON and supplementary technologies such as Ethernet and Wi-Fi 6.

Throughout the F5G work, new technologies or extensions to existing technologies for transport, aggregation, access and customer premises network will be identified through gap analysis, which may include new ODN technologies, XG(S) PON and Wi-Fi6 enhancements. Furthermore, several aspects will be developed in alignment with F5G E2E network architecture evolution, including (but not limited to) control plane and user plane separation, autonomous operation and management, end-to-end full stack slicing and security framework. Artificial Intelligence will be used to optimize network management and traffic steering as well as in support of consumer and industry services and applications. The synergies of Transport, Aggregation and Access Networks will be further explored as well as the convergence with 5G core network. Smart energy efficiency, telemetry, mobile network x-hauling are part of ISG F5G area of interest. F5G support of the specific requirements of industrial scenarios and applications is considered. Back-compatibility with legacy network and SDN-based network will be addressed.

ISG F5G also ensures a framework for PoC activities that enables to test and demonstrate F5G valuable features and use cases, gathering additional information on requirements and leveraging the creation of a F5G Open ecosystem

ISG F5G considers a wide range of technologies, and therefore seeks to actively cooperate, with the most efficient possible methods, with a number of relevant standardization groups, both inside and outside of ETSI, as well as vertical industrial organizations.

ISG F5G's work will be oriented towards the identification of technology and standards gaps. These gaps will be referenced to the appropriate standardization group/body (either inside or outside of ETSI) and may trigger enhancements to existing technology specifications or the developments of new technology specifications where required.

On top of these activities, F5G will also look to the future and will help to build an evolution path for the fixed network that can provide a solution for future needs and requirements.

Areas of activity

ISG F5G will focus on following activities:

- Revision/maintenance of already published GR and GS
- Definition of additional use cases and related gap analysis, with extended focus to verticals and optical transport, identifying enhancements/developments of existing/new specifications
- Architecture framework – to further develop the Architecture framework from F5G, namely:
 - Enhance the specifications on F5G slicing, to support differentiated and guaranteed SLA
 - Work on Application Aware Traffic Steering based on AI functionalities embedded in the Management and Control layer
 - Refine and expand the details of the service plane, namely on the signalling/routing network protocol and data plane technologies
 - Add the security related features identified in the security framework study
 - Include the mobile mid-haul and mobile front-haul specifications, complementing the mobile backhaul defined in previous releases
 - Study convergence of access and transport/aggregation for a simpler and lower latency/jitter network
 - Expand the fixed-mobile convergence requirements in the defined architecture
 - Study enhancements and synergies with CPN (Customer Premise Networks)
- Security framework
 - Revise and enhance the threat vulnerability risk analysis and make recommendations for the definition of countermeasures
 - Define a security model and security architecture for management of risk in F5G, in close cooperation with TC CYBER, to be included in F5G Architecture
- QoE
 - Identify the major factors impacting the QoE of the various services delivered by F5G and study appropriate mechanisms for improving end-to-end QoE
- Management and control layer
 - Further develop the End-to-End management specifications to ensure flexible and agile management, meeting the end-to-end QoE and the QoS requirements for services and applications in the network

- Embed Autonomous network features in close alignment with the work developed in ISG ENI and ISG ZSM
- Develop the telemetry specifications required to leverage management efficiency and enable QoE and QoS enhancements in F5G networks
- Industrial scenarios
 - Development of an optical ecosystem for the very demanding requirements of industrial environments with respect to quality, reliability, robustness, bandwidth and latency
 - Evaluate the interaction with industry protocols, interfaces and management requirements as well as interaction with edge computing scenarios
 - Develop specifications for optical networking in Industrial environments
- PoC framework
 - Manage the PoC framework and supervise the application of rules and procedures defined by ISG F5G for PoC
 - Evaluate the feedback from PoCs executed to drive the improvement of F5G specifications
- Migration path to F5G
 - Establish a Global Fibre Development Index specification that can guide in the evaluation of the level of development of fibre services for geographical areas, countries or players in the market
 - Define clusters of entities sharing a similar level of fibre development, evaluate requirements for efficient migration paths to F5G and identify possible gaps in standardization
- Next fixed network generation
 - Contribute to build the vision for next fixed network generation and evaluate possible evolution paths from F5G

Annex (informative): collaboration with other bodies

ISG F5G will seek to actively coordinate and cooperate with the following groups both inside and outside of ETSI:

ETSI Groups

- ETSI PP 3GPP
- ETSI TC ATTM
- ETSI TC BRAN
- ETSI TC CABLE
- ETSI TC CYBER
- ETSI TC EE
- ETSI ISG ENI
- ETSI ISG MEC
- ETSI ISG NFV
- ETSI TC STQ
- ETSI ISG ZSM

and others as identified during the progression of the work.

External groups

- ITU-T ITU Telecommunication Standardization Sector
- BBF The Broadband Forum
- IEEE Institute of Electrical and Electronics Engineers
- IETF Internet Engineering Task Force
- WFA Wi-Fi Alliance
- TM Forum
- CCSA China Communications Standards Association
- IEC International Electrotechnical Commission

and others as identified during the progression of the work.