Fifth Generation Fixed Network (F5G);

F5G Advanced Release Documentation

(Release 3 and 4)

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# Foreword

The adoption of specific features by the ETSI ISG F5G and the document progress follows the ISG working procedures, in particular, with the formal approval of ISG Work Items.

The present F5G Advanced Release Documentation will be updated according to the Work Items and deliverables that are approved by the ETSI ISG F5G in order to give an overview and context for releases.

F5G Advanced Release deliverables are part of the ETSI ISG F5G’s work programme and are subject to agreement in the ISG. All F5G and F5G Advanced deliverables are available at ETSI’s “Search and Browse Standards” tool [1].

NOTE: In case of discrepancies between the contents of the present document and the ETSI ISG F5G Group Specifications/Reports/Work Programme, the latter source of information takes precedence.

# 1 Scope

The purpose of the Release Documentation is to identify the informative and normative work that ETSI ISG F5G has done, is in the process of performing, or plans to develop as part of different releases. In particular this release documentation is covering the F5G Advanced network specifications and reports.

The present document is a living document regularly updated to reflect the changes in the ETSI ISG F5G and in the different releases.

The present document describes the specification objectives of the releases and lists the features, which are part of a particular release.

The present document is describing the Release 3 and following releases. Release 1 and 2 define the F5G network. The Release documentation can be found at https://docbox.etsi.org/ISG/F5G/Open/Release\_Documentation

# 2 References

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

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long-term validity.

[1] ETSI, "Search and Browse Standards".

NOTE: Available online: <http://www.etsi.org/standards-search>.

[2] ETSI White Papers

NOTE: Available online: https://www.etsi.org/media-library/white-papers

# 3 Definitions and abbreviations

## 3.1 Definitions

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

**Feature:** functionality which represents added value to the system for a defined set of users.

NOTE: A user could be a network operator, service provider, enterprise, vertical user of technology, or some other defined actor.

**Function:** the abstract concept of a particular piece of functionality in a device, entity or service.

**Functionality:** sum of actions or any aspect an item can do.

NOTE: Functionality can be associated to diverse items, including devices, entities, services and/or features.

**Release:** a set of features and deliverables that define a system and that are specified at a certain point in time.

NOTE 1: A Release differs from the previous Release by being later in time. It might have added and/or improved text or functionality introduced as a result of standardization work.

NOTE 2: Release is different meanings depending on the area, here we refer to the meaning in standardization and system design.

**Release Description:** the description of the documents and technical features including reports and system specifications delivered by the Release.

**Deliverable:** A particular piece of information, which is finished and stable. It might be delivered in different forms with the majority being delivered in the form of document.

**Publication:** A deliverable being publicly available.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations in [2], and the following abbreviations apply:

ISG Industry Specification Group

GR Group Report

GS Group Specification

PoC Proof of Concept

WI Work Item

# 4 Releases overview

## 4.1 Introduction

Releases are a common tool to group technical features, documents and aspects of a network system and serve a variety of purposes depending on the context.

A particular ETSI ISG F5G Release leverages the results of the previous (n-1) Release. A particular release introduces new features, new documents, and new text on top of the specified features in previous releases.

The logic of an ETSI ISG F5G release is a consistent set of content that includes, in minimum, a description of use cases, a specification of requirements, based on that an evaluation of current gaps, and an end-to-end network architecture.

A high-level description for each of the features comprising a particular release is provided below on a per release bases.

There is also work referenced in this document, which does not belong to a particular release and therefore it is release independent. This means it is expected that the description in the document hold for several releases without particular details.

## 4.2 Release 1 and Release 2

For the documentation of Release 1 and 2 refer to <https://docbox.etsi.org/ISG/F5G/Open/Release_Documentation>

Release 1 and 2 are defining the F5G network.

## 4.3 Summary of Releases 3 and following

The present document described the current releases starting from Release 3. The release 3 is the first release defining the F5G Advanced network system. More releases for F5G Advanced might be specified in the future. The ETSI ISG F5G has chosen to take a time-based approach to releases. The timing of the releases is visualized in Figure 1 on the long time scale. Note that the finishing times are the current best guess of ETSI ISG F5G and might change over time.



Figure 1: Timeline on large time scale

And the timelines on a smaller time scale is shown in Figure 2. It contains the currently agreed work items in the work programme and projects potential work items for Release 4 as a place holder. Release has not been defined yet and is for further study.

NOTE: The finishing times of a releases are subject to the progress of the work and are the current best guess. The end time might change on the way (\*).



**Figure 2: Timing of Releases**

# 5 Release Independent

## 5.1 White Papers

### 5.1.1 F5G Advanced and Beyond

This white paper describes the vision of F5G Advanced and beyond. This white paper is seen as a preparation for future Releases of ETSI ISG F5G. Any details are for further study.

[White Paper: F5G Advanced and Beyond, September 2022 [2].](https://www.etsi.org/images/files/ETSIWhitePapers/ETSI-WP-50-F5G-Advanced-and-Beyond.pdf)

### 5.1.2 All-Fibre network facilitates the Carbon Shift

This white paper explains how innovations can help operators to support the sustainable development in terms of emissions and business by reducing energy consumption in fixed networks, as well as helping industries to reduce carbon emissions.

[White Paper: All-optical network facilitates the Carbon Shift, November 2023](https://www.etsi.org/images/files/ETSIWhitePapers/ETSI-WP-60-All_Optical_Network_facilitates_the_Carbon_Shift.pdf) [2]

## 5.2 Release Independent Work Items

### 5.2.1 Proof of Concept Framework

The Proof of Concept framework also applies to Release 3 and following for the F5G Advanced development.

The Proof of Concept (PoC) framework defines the roles, interaction and requirement for Proof of Concept being implemented as part of the ETSI ISG F5G. A PoC demonstrates key technical components and use cases of ETSI ISG F5G. In order to be allow to run under ETSI ISG F5G a governance process has been established.

[ETSI GS F5G 009 V1.1.1 Fifth Generation Fixed Network (F5G); Proof of Concept Framework](https://www.etsi.org/deliver/etsi_gs/F5G/001_099/009/01.01.01_60/gs_F5G009v010101p.pdf)

In addition, the material for proposing a PoC or writing the report about a PoC, and the list of accepted and performed PoCs can be found under <https://docbox.etsi.org/ISG/F5G/Open/PoC_Material>

# 6 Release 3 Description

## 6.1 Overview

Release 3 exhibits the first set of documents produced by the ETSI ISG F5G for the F5G Advanced network. The rational of this release is to start from the generation definition of the F5G Advanced fixed networks and what specific characteristics and business drivers it has.

The logic of Release 3 (see Figure 3) is based on various aspects including the F5G Advanced network characteristics, a set of use cases a F5G Advanced network shall be able to implement, based on that functional and performance characteristics of those use cases. Finally, the overall vision of F5G Advanced (described in the white paper). All of those aspects are driving the F5G Advanced network system architecture.



Figure 3: Release 3 Overview and Dependencies

## 6.2 Summary of Release 3

**ETSI GR F5G 021: F5G Advanced Generation Definition**

The fixed network generations definitions (ETSI GR F5G 001 V1.1.1) addresses the history of fixed networks up to the 5th generation fixed networks and summarized their development paths and driving forces. The F5G Advanced generation definition builds on the 5th generation and defines the next step. The business and technology characteristics of F5G Advanced is described.



**Figure 4: Overview of the 6 F5G Advanced Dimensions**

**ETSI GR F5G 020: F5G Advanced Use Cases (in progress)**

A set of use cases for F5G Advanced are described and classified along the dimensions specified in the white paper of the F5G Advanced vision.

**ETSI GS F5G 023: F5G Advanced Requirements and Gap Analyses (in progress)**

The document will specify the technology requirements for F5G Advanced use cases release 3 and will explore existing technologies from related SDOs. This Work Item will perform gap analyses between the technologies required by the use case and those that are available. The identification of the relevant SDOs will be based on their existing projects, Work Items and competence for each matter, thereby avoiding duplication of work and conflicts.

**ETSI GS F5G 024: F5G Advanced Architecture (in progress)**

The document will specify the end to end F5G Advanced network architecture, features and related network elements’ requirements for F5G Advanced, including On-premise, Access, Aggregation, and Transmission Networks. This document will define new features and enhance features from previous releases.

**ETSI GS F5G 017: Architecture of Optical Cloud Networks (OCN) (in progress)**

The Optical Cloud Networks (OCN) enable the F5G Advanced optical network to carry high-quality cloud services. The document specifies the network architecture of the OCN, including an underlay optical infrastructure and a set of control Interfaces used for the control of the optical services and connections. It also specifies the technical requirements for the Optical Service Protocols (OSP) which are running in the control Interfaces of the OCN.

**ETSI GS F5G 018: Measurement Specification for Residential Services Quality Evaluation (in progress)**

The specification of the measurement methods for Residential Services Quality and how the quality is evaluated, based on the KQIs defined in F5G 015 service quality evaluation.

**ETSI GS F5G 019: Autonomous Network level definition (in progress)**

The document specifies the different levels of autonomicity of F5G Advanced networks. It applies industry frameworks on autonomic networks to the optical network domain.

**ETSI GS F5G 022: PON based Industrial Network (in progress)**

The specification of the network architecture, functional requirements, performance requirements, management system for PON based industrial networks being deployed in typical industrial application scenarios and fulfil the requirements from industrial services.

**ETSI GS F5G 025: Architecture for Computing Collaboration in PON (in progress)**

The document specifies the architecture framework of computing collaboration in PON network, the requirements of computing collaboration in PON network, key computing functions and capabilities of each component in the PON network.

**ETSI GS F5G 026: Architecture and Data Models for Residential Service Quality Monitoring (in progress)**

The document defines the system architecture for residential service quality monitoring (service KQI, network KQI) based on GS F5G 015. The corresponding technical requirements, interfaces and data models of the system are also specified.

## 6.3 Overview of the F5G Advanced Architecture

Editor’s Note: description of the F5G Advanced network architecture

## 6.4 Summary of Features

1. Higher speeds of the end-to-end network services through new technologies including F5G-A FTTR, 50G-PON, Wi-Fi7TM, 400/800G OTN, fine grain OTN (fgOTN) and Ethernet Aggregation.
2. Optical Cloud Networks: The use of cloud computing paradigm needs adaptation to the optical networks providing the capabilities of on-demand ordering, service-oriented communication, and the integration with the computing platform for delivering premium services (a combination of computing, storage, and communication)
3. Domain specific autonomous networking: Several general architectures and approaches for autonomous networking have been developed. F5G Advanced is specifying the optical communication domain specific functions, architectures, and interfaces.
4. Next level of Quality of Experience and QoE Measurement: QoE is a major topic for ETSI ISG F5G to improve the customer QoE for many services. Through more automation and automatically deriving the need for the application, the QoE is improved and can be guaranteed. The improvement can be measured through a set of service quality measurements and evaluations.
5. An energy efficient network architecture: the network architecture of F5G Advanced takes the move of all-optical communication further and further out to the edge with more advance ROADM and OXC technologies, the reduction of electrical-optical-electrical conversions, and more intelligent energy saving mechanisms providing load-aware energy usage.
6. Industrial optical networks: optical communication technologies are not only advantageous in telecommunication applications, but also in industrial or vertical sectors due to the large capacity, guaranteed quality, longer reach, and less energy usage.
7. Collaboration of Networking and Compute: computing power can be placed at various locations in the network (from the very near edge to central cloud infrastructure). In order to optimize the QoE of services and enabling certain services at all (very low delay services), the networking and the computing aspects needs to be coordinated.

Editor’s Note: Additions to features and further features might be developed in course of the work in F5G Advanced. They will be added in the future development of this document.

## 6.5 Documents

The finalized documents can be found in the search for standards under [1] and also in the following list:

* ETSI GS F5G 017 V1.1.1 Fifth Generation Fixed Network (F5G); F5G Measurement Specification for Residential Services Quality Evaluation (in progress)
* ETSI GS F5G 018 V1.1.1 Fifth Generation Fixed Network (F5G); Architecture of Optical Cloud Networks (in progress)
* ETSI GR F5G 019 V1.1.1 Fifth Generation Fixed Network (F5G); Autonomous Level Definition and Evaluation (in progress)
* ETSI GR F5G 020 V1.1.1 Fifth Generation Fixed Network (F5G); F5G Advanced Use Cases Release 3 (in progress)
* [ETSI GR F5G 021 V1.1.1 Fifth Generation Fixed Network (F5G); F5G Advanced Generation Definition](https://www.etsi.org/deliver/etsi_gr/F5G/001_099/021/01.01.01_60/gr_F5G021v010101p.pdf)
* ETSI GS F5G 022 V1.1.1 Fifth Generation Fixed Network (F5G); Specification of PON based Industrial Network (in progress)
* ETSI GS F5G 023 V1.1.1 Fifth Generation Fixed Network (F5G); F5G Advanced Technology Requirements and Gap Analyses; Release 3 (in progress)
* ETSI GS F5G 024 V1.1.1 Fifth Generation Fixed Network (F5G); F5G Advanced Architecture Release 3 (in progress)
* ETSI GS F5G 025 V1.1.1 Fifth Generation Fixed Network (F5G); Architecture of computing collaboration in PON network (in progress)
* ETSI GS F5G 026 V1.1.1 Fifth Generation Fixed Network (F5G); Architecture and data models for residential service quality monitoring (in progress)

Editor’s Note: additional documents will be added, when agreed by the ETSI ISG F5G.

# 7 Release 4 Description

Editor’s Note: it is early for Release 4, but a first gist is given

## 7.1 Overview

Release 4 exhibits the second set of documents produced by the ETSI ISG F5G for the F5G Advanced network specification. The rational of this release is to start from the generation definition and release 3 of the F5G Advanced networks and extends it into various directions.

The logic of Release 4 (the same as shown in Figure 3 for release 3) is based on various aspects including the F5G Advanced network characteristics, a set of release 4 use cases a F5G Advanced network shall be able to implement, based on that functional and performance characteristics of those use cases.

## 7.2 Summary of Release 4

## 7.3 Extension of the F5G Advanced Architecture in Release 4

Editor’s Note: description of the F5G Advanced network architecture

## 7.4 Summary of Additional Features

Editor’s Note: Additions to features and further features might be developed in course of the work in F5G Advanced. They will be added in the future development of this document.

## 7.5 Documents

The finalized documents can be found in the search for standards under [1] and also in the following list:

* ETSI GS F5G 027 V1.1.1 Fifth Generation Fixed Network (F5G); F5G Advanced End-to-End Management and Control (in progress)
* ETSI GS F5G 028 V1.1.1 Fifth Generation Fixed Network (F5G); F5G-A SME service and network quality classification (in progress)
* ETSI GS F5G 029 V1.1.1 Fifth Generation Fixed Network (F5G); Test specification for residential FTTR functionality and performance (in progress)

Editor’s Note: additional documents will be added, when agreed by the ETSI ISG F5G.