ETSI TS 122 278 V18.0.1 (2024-05)

LTE;
Service requirements for the Evolved Packet System (EPS)
(3GPP TS 22.278 version 18.0.1 Release 18)

Reference
RTS/TSGS-0122278vi01

Keywords
LTE

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
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Contents

Foreword

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Introduction

To ensure competitiveness in a longer time frame an evolution of the overall 3GPP system needs to be considered.

This document compiles requirements to ensure that an Evolved Packet System can cope with the rapid growth in IP data traffic and demanding requirements for new multimedia type of applications in terms of performance and quality, delivered to the user, whilst at the same time enabling cost effective deployment and operation.

The Evolved Packet System is characterised by:

- Reduced latency
- Higher user data rates equating to broadband performance
- Improved system capacity and coverage
- Lower operational costs

1 Scope

The present document describes the service requirements for the Evolved Packet System. Requirements for 5G E-UTRA-NR Dual Connectivity in E-UTRAN connected to EPC, are included in this document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 22.003: "Circuit Teleservices supported by a Public Land Mobile Network (PLMN)".

[2] 3GPP TS 21.905: "Vocabulary for 3GPP specifications".

[3] 3GPP TS 22.258: "Service Requirements for the All-IP Network (AIPN); Stage1".

[4] 3GPP TR 25.913: "Requirements for Evolved UTRA (E-UTRA) and Evolved UTRAN (E-UTRAN)".

[5] 3GPP TS 22.115: "Service aspects; Charging and billing".

[6] ETSI TS 102 250-1: "Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks: Part 1: Identification of Quality of Service aspects".

[7] 3GPP TR 23.882: "3GPP system architecture evolution (SAE): Report on technical options and conclusions".

[8] C.S0001-A Introduction to cdma2000 Standards for Spread Spectrum Systems - Release A.

[9] C.S0002-A Physical Layer Standard for cdma2000 Spread Spectrum Systems - Release A.

[10] C.S0003-A Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems - Release A addendum 2.

[11] C.S0004-A Signaling Link Access Control (LAC) Specification for cdma2000 Spread Spectrum Systems -Addendum 2.

[12] C.S0005-A Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems - Release A addendum 2.

[13] C.S0006-A Analog Signaling Standard for cdma2000 Spread Spectrum Systems - Addendum 2.

[14] A.S0007 – A.S0009 Interoperability Specification (IOS) for High Rate Packet Data (HRPD).

[15] A.S0011 – A.S0017 Interoperability Specification (IOS) for cdma2000 Access Network Interfaces.

[16] X.S0011 cdma2000 Wireless IP Network.

[17] C.S0024-A cdma2000 High Rate Packet Data Air Interface Specification.

[18] C.S0024-0 cdma2000 High Rate Packet Data Air Interface Specification.

[19] Void.

[20] WiMAX Forum Mobile System Profile, Release 1.0 .

[21] 3GPP TS 22.101: "Service Aspects; Service Principles".

[22] "Recommendations and Requirements for Networks based on WiMAX Forum CertifiedTM Products" (WiMAX stage 1)

[23] "WiMAX Forum Network Architecture (Stage 2: Architecture Tenets, Reference Model and Reference Points)"

[24] "WiMAX Forum Network Architecture (Stage 3: Detailed Protocols and Procedures)"

[25] Void.

[26] S.R0048-A 3G Mobile Equipment Identifier (MEID)

[27] BBF TR-144 - Broadband Multi-Service Architecture & Framework Requirements

[28] BBF Technical Report TR-126 - Triple-play Services Quality of Experience (QoE) Requirements

[29] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[30] 3GPP TS 22.261: "Service requirements for the 5G system".

[31] 3GPP TR 38.913: "Study on scenarios and requirements for next generation access technologies".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [2] and the following apply.

Communication Range: The range between UEs and /or between UEs and eNBs such that ProSe Communication is possible.

Evolved Packet System: is an evolution of the 3G UMTS characterized by higher-data-rate, lower-latency, packet-optimized system that supports multiple RATs. The Evolved Packet System comprises the Evolved Packet Core together with the evolved radio access network (E-UTRA and E-UTRAN).

Firewall: a functional entity which blocks or permits the flow of various traffic types based on a set of policy rules and definitions

EPC Path: the user plane communication path through EPC.

Open ProSe Discovery: is ProSe Discovery without explicit permission from the ProSe-enabled UE being discovered.

ProSe Broadcast Communication: a one-to-all ProSe Communication, between all authorized UEs in proximity, by means of a common ProSe Communication Path established between these UEs.

ProSe E-UTRA Communication: a ProSe Communication using a ProSe E-UTRA Communication path.

ProSe-assisted WLAN direct communication: a ProSe Communication using a ProSe-assisted WLAN direct communication path.

ProSe Communication path: the communication path supporting ProSe Communication. The communication path of a ProSe E-UTRA Communication (ProSe E-UTRA Communication path) could be established e.g. directly between the ProSe-enabled UEs using E-UTRA, or routed via local eNB(s). The communication path of a ProSe-assisted WLAN direct communication (ProSe-assisted WLAN direct communication path) is established directly between the ProSe-enabled UEs using WLAN.

ProSe Group Communication: a one-to-many ProSe Communication, between more than two UEs in proximity, by means of a common ProSe Communication path established between the UEs.

Evolved ProSe UE-to-Network Relay: is a form of relay in which a UE supports Indirect 3GPP Communication between an Evolved ProSe Remote UE and the network, using E-UTRA or WLAN between the Evolved ProSe Remote UE and the Evolved ProSe UE-to-Network Relay.

ProSe UE-to-UE Relay: is a form of relay in which a Public Safety ProSe-enabled UE acts as a ProSe E-UTRA Communication relay between two other Public Safety ProSe-enabled UEs.

Evolved ProSe Remote UE: is a UE that is connected to an Evolved ProSe UE-to-Network Relay using an Indirect 3GPP Communication.

ProSe-enabled Network: a network that supports ProSe Discovery and/or ProSe Communication.

Proximity: proximity is determined ("a UE is in proximity of another UE") when given proximity criteria are fulfilled. Proximity criteria can be different for discovery and communication.

Range Class: Rough indication of distance for use in ProSe Discovery, for example, based on geographical distance, radio conditions.

Restricted ProSe Discovery: ProSe Discovery that only takes place with explicit permission from the ProSe-enabled UE being discovered.

Service Continuity: The uninterrupted user experience of a service that is using an active communication (e.g. an ongoing voice call) when a UE undergoes a radio access technology change or a CS/PS domain change without, as far as possible, the user noticing the change.

NOTE: In particular Service Continuity encompasses the possibility that after a RAT / domain change the user experience is maintained by a different telecommunication service (e.g. tele- or bearer service) than before the RAT / domain change.

Service Reachability: Functionality to enable user access to PLMN IP-based services from outside of the PLMN's domain via non-3GPP access technologies that have IP traffic-flow restrictions (e.g. such as firewall functions that only allow HTTP traffic).

Indirect 3GPP Communication: The signalling and communication between a UE and 3GPP network, where there is an Evolved ProSe UE-to-Network Relay between the Evolved ProSe Remote UE and the 3GPP network.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [2] and the following apply.

GW	Gateway
GWCN	Gateway Core Network
HD	High Definition
MNO	Mobile Network Operator
MOCN	Multi-Operator Core Network
MPS	Multimedia Priority Service
ProSe	Proximity Services
RCS	Rich Communication Services
SHE	Service Hosting Environment
SGW/PGW	Serving Gateway / Packet data network Gateway

4 General description

4.1 Objectives

The Evolved Packet System is a higher-data-rate, lower-latency, packet-optimized system that supports multiple RATs. The focus of the Evolved Packet System work is on enhancement of Packet Switched technology to cope with rapid growth in IP traffic.

The objectives of the Evolved Packet System are to:

- Provide higher data rates, lower latency, high level of security and enhanced QoS;
- Support a variety of different access systems (existing and future), ensuring mobility and service continuity between these access systems;
- Support access system selection based on a combination of operator policies, user preference and access network conditions;
- Realise improvements in basic system performance whilst maintaining the negotiated QoS across the whole system;
- Provide capabilities for co-existence with legacy systems and migration to the Evolved Packet System.

5 High-level requirements – user and operational aspects

5.0 General

The Evolved Packet System shall be capable of accommodating a variety of different access systems thus providing a multi-access system environment to the user.

The Evolved Packet System shall provide mobility functionality within and across the different access systems.

The Evolved Packet System shall provide capabilities to support the efficient integration of E-UTRAN PS Core Network Nodes and GERAN/UTRAN PS Core Network Nodes.

The Evolved Packet System shall optimize mobility functionality meaning that it shall offer minimal signalling overhead, minimal handover interruption time, secure handover procedure and local breakout.

The Evolved Packet System shall provide capabilities to inter-work with a variety of broadband networks based on IP technologies including those not specified by 3GPP.

The Evolved Packet System shall provide enhanced performance e.g., low communication delay, low connection set-up time and high communication quality.

The Evolved Packet System shall be able to efficiently support a variety of traffic models e.g. user-to-user, user-to-group and traffic models generated by ubiquitous services.

The Evolved Packet System shall provide functionality to support outbound roaming subscribers on other Evolved Packet Systems and legacy networks.

The Evolved Packet System shall provide functionality to support inbound roaming subscribers from other Evolved Packet Systems and legacy networks.

The Evolved Packet System shall be capable of supporting and inter-working with PS services provided on Rel-7 and earlier networks. The Evolved Packet System shall be capable of inter-working with CS services provided on Rel-7 and earlier networks.

The Evolved Packet System shall support service continuity between 3GPP access systems and also between 3GPP access systems and non 3GPP access systems whether the UE supports simultaneous radio transmission or not.

The Evolved Packet System shall be able to accommodate fixed access systems and to inter-work with fixed networks in order to provide service continuity over fixed/mobile converged networks.

The Evolved Packet System service capability set shall include, as a minimum, support for the following categories of services that are likely to be used by the majority of operators:

- Voice
- Video
- Messaging
- Data file exchange

The Evolved Packet System shall provide for efficient usage of system resources, especially of radio resources through both signalling and transport optimization, e.g. overhead, terminal power, radio resources, mobility state, signalling load.

The Evolved Packet System shall support efficient delivery of text-based broadcast messages received from a legacy CBC.

The Evolved Packet System shall support E-UTRAN only operators. The system shall allow these operators to offer national roaming to their subscribers.

The Evolved Packet System shall be capable of uniquely identifying each device that connects via 3GPP access networks and 3GPP2 access networks. For a dual mode device supporting both 3GPP and 3GPP2 access technologies, there shall be a single persistent identifier used to identify the device. This device identifier shall be the same even when the device moves between 3GPP and 3GPP2 access types.

NOTE: The 3GPP2 device identifier structure is consistent with the IMEI structure [26].

The EPC shall be capable of restricting access of specific 3GPP devices, 3GPP2 devices and dual mode 3GPP/3GPP2 devices.

5.1 Requirements for Fixed Mobile Interworking

The Evolved Packet System shall support the following scenarios: a single Operator offering both fixed and mobile access; different Operators collaborating to deliver services across both networks. These scenarios will be supported by interworking between the access networks.

The Evolved Packet System shall support access to services on the mobile network via interworking with a fixed access network for the following scenarios:

- Residential scenarios for operators that own both wireless and wireline access networks
- Residential scenarios for operators that own wireless access networks only
- Enterprise scenarios with managed connectivity between mobile operators and enterprise networks

The Evolved Packet System shall be able to support the following functions for interworking between the fixed access in the above scenarios and Evolved Packet Core:

- connectivity,
- subscriber authentication/authorization,
- offline charging
- online charging for traffic routed via the Evolved Packet Core
- Policy Control and
- Quality of Service.

The Evolved Packet Core shall support the following for fixed access:

- policy management,
- authentication for WLAN terminals and fixed devices,
- charging

The EPS shall be capable to set operator policies to support simultaneous access to PLMN services and traffic offloading to the fixed network.

Interworking shall support the following scenarios:

When traffic is routed via EPC

- When H(e)NB is being used and traffic is offloaded in the local wireline network
- When WLAN is being used and traffic is offloaded in the local wireline network (i.e. non-seamless WLAN offloading)

Additionally the Evolved Packet System shall be able:

- to minimize QoS and Policy management signalling overhead while interworking between the fixed access and Evolved Packet Core.

- to route different simultaneously active PDN connections through different accesses while interworking between the fixed access and Evolved Packet Core.
- to route different IP flows belonging to the same PDN connection through different accesses while interworking between the fixed access and Evolved Packet Core.

The requirements for mobility in chapter 7.1.3 apply also to interworking between the fixed access and Evolved Packet Core.

5.2 Requirements for Fixed Mobile Convergence

The Evolved Packet System shall be able to accommodate fixed access systems to provide services over a converged network supporting both fixed and mobile accesses. The Evolved Packet System shall support common functions (e.g. for policy management, accounting) when a single operator operates both fixed and mobile accesses.

The Evolved Packet System shall be capable of providing an equivalent experience to users consuming converged services on different accesses, subject to different accesses capabilities.

The Evolved Packet System shall provide the following, while providing converged services:

- common operational and management procedures,
- common subscriber profiles,
- common services profiles,
- common charging procedures (e.g. a common post-paid bill).

The Evolved Packet System should optimize QoS and Policy management.

The requirements for mobility in clause 7.1.3 of this specification also apply to a converged network supporting both fixed and mobile accesses.

The Evolved Packet System shall support requests for allocation and enforcement of QoS for layer 2 and layer 3 in fixed broadband networks as defined in [27].

The Evolved Packet System shall support operator network policies for application sessions to request QoS in fixed broadband networks as defined in [27].

The Evolved Packet System shall support user requests for authorization of QoS for application sessions in fixed broadband access network as defined in [27].

The Evolved Packet System shall support policy management for QoS attributes of fixed broadband access network services (e.g. voice, VPN, IPTV) as defined in [28].

The Evolved Packet System shall support policy management for unicast and multicast traffic for fixed devices and IPTV services in fixed broadband access network as defined in [27].

5.3 Requirements for Interworking with Data Application Providers

The Evolved Packet System shall support the following interworking scenarios between a mobile operator and data application providers:

- Scenario #1: access/IP connectivity and non-IMS/non-OSA based data applications provided by the same mobile operator
- Scenario #2: collaboration between mobile operator providing access/IP connectivity and non-IMS/non-OSA based data applications provided by 3rd party providers
- Scenario #3: no collaboration between mobile operator providing access/IP connectivity and non-IMS/non-OSA based data applications provided by 3rd party providers

The Evolved Packet System shall support all scenarios in non-roaming and roaming configurations.

The Evolved Packet System shall support all scenarios for home routed and local breakout roaming traffic except for authentication and authorization as identified below.

For scenario#2, the Evolved Packet System shall enable 3rd party data applications to rely on security derived from the security provided by the operator.

For scenario#2, the Evolved Packet System shall support authorization and allocation of resources on 3GPP accesses for 3rd party data applications. The home network performs authentication and authorisation in the local-breakout roaming scenario.

The Evolved Packet System shall support policy control interactions between a mobile operator and data applications for all scenarios triggered by application layer signalling or by user plane traffic.

For scenario #3, the Evolved Packet System shall support UE initiated requests for prioritised traffic handling through authorisation and allocation of resources on 3GPP access for 3rd party data applications. The Evolved Packet System shall revert to normal traffic handling if the request is not confirmed by the UE within a specified preview period.

The Evolved Packet System shall support online and offline charging models (e.g., user pays, application provider pays, etc.) for all scenarios.

6 Basic capabilities

6.1 Support of IP traffic

6.1.1 Support of increased IP traffic demand

The Evolved Packet System shall be able to provide guaranteed QoS for services and use the resources of the Evolved Packet System with high efficiency i.e. ensure that quality conditions for a particular communication are fulfilled without deterioration between the communicating end-points.

6.1.2 Void

6.1.3 Void

6.1.4 Support of basic IP connectivity

Following registration on the network, the Evolved Packet System shall maintain an IP connectivity with the UE. Following registration, it shall be possible for an UE to send and receive IP packets.

6.1.5 Support of IP multicast service

The Evolved Packet System shall support IP multicast service.

6.2 IP session control

The Evolved Packet System shall provide for session mobility and session adaptation to terminal capabilities, user preferences, subscriber priorities, network conditions and/or other operator-defined criteria. Session adaptation shall be under the control of the operator.

The Evolved Packet System shall support session control for multi-party sessions (e.g. user-to-group) and shall provide a scalable solution.

In order to support the efficient routing of IP traffic, local breakout (see Section 7.1.2) shall be supported.