ETSI TS 122 278 V15.4.0 (2018-10)

LTE;
Service requirements for the Evolved Packet System (EPS)
(3GPP TS 22.278 version 15.4.0 Release 15)

Reference
RTS/TSGS-0122278vf40

Keywords
LTE

ETSI

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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.

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.

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).

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
ProSe	Proximity Services
RCS	Rich Communication Services
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.

The Evolved Packet System shall support a UE having simultaneously more than one active PDN connections exchanging traffic with more than one peer (external network or other UE), when the network policies and user subscription allow it.

If a UE is under the coverage of 3GPP access and one or more non-3GPP accesses, it shall be possible for the UE to communicate using multiple accesses simultaneously.

The Evolved Packet System shall provide the system operator with the means to control the number of simultaneously active PDN connections and combinations thereof to and from a UE.

A single application running on the UE shall not be required to send and receive traffic through multiple PDNs.

6.3 Quality of Service

The Evolved Packet System shall have the ability to provide a quality of service equal to or better than the QoS requirements specified for GSM and UMTS. Quality of Service from the customer's perspective is to be considered in phases as specified in ETSI TS 102 250-1[6].

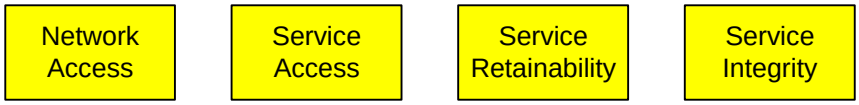

Figure 2: Phases of service use from customer's point of view

Figure 2 shows the different phases (Quality of Service aspects) during service use from the customer's point of view.

The meaning of these QoS aspects are:

1) **Network Access:** The network indication on the display of the mobile is a signal to the customer that he can use the service of this network operator (or any other means to indicate to the user that a network is available).

2) **Service Access:** If the customer wants to use a service, the network operator should provide him as fast as possible access to the service.

3) **Service Integrity:** This describes the Quality of Service during service use.

4) **Service Retainability:** Service Retainability describes the termination of services (in accordance with or against the will of the user).

In particular the Evolved Packet System shall provide for the following:

- There should be no perceptible deterioration of audio quality of a voice call during and following handover between dissimilar CS and PS access networks, and transitions between PS access networks supporting different IP protocol versions.
- There should be no loss of data, as a result of handovers between dissimilar fixed and mobile access systems, including those that support different versions of the IP protocol.
- There should be no discernable difference in perceived service quality for users receiving services via unicast and users receiving the same service via multicast.
- The Evolved Packet System shall support QoS differentiations for unicast bearers.
- The Evolved Packet System shall support QoS backwards compatibility to earlier 3GPP QoS releases.
- It shall be possible for the Evolved Packet System to maintain end-to-end QoS without modification when the terminal moves from one access system to a new access system, and the new access system supports the required QoS.
- It shall be possible for the Evolved Packet System to change QoS, when the terminal moves from one access system to a new access system and the new access system can not provide the same QoS as the old access system or the new access system can provide higher QoS.
- It shall be possible for the Evolved Packet System to support service continuity for a terminal changing access system and the new access system cannot provide the same QoS as the old one.
- The Evolved Packet System shall support transport QoS differentiations for multicast bearers.
- It shall be possible for the Evolved Packet System to maintain QoS within a multicast session without QoS changes for other members of the session when a terminal joins or leaves the multicast session or moves to a new access system.
- The Evolved Packet System network shall support a minimum of 8 levels of QoS in parallel.
- The Evolved Packet System network shall support a minimum of 4 parallel RT QoS levels with the appropriate QoS differentiation.

Note 1: The requirement for the number of simultaneously supported QoS levels is independent of any MBMS QoS levels.

- Multiple RT services, with similar QoS requirements, shall be served by the same RT QoS level and multiple NRT services, with similar QoS requirements, shall be served by the same NRT QoS level.

  The maximum number of parallel RT and NRT services shall not be limited in the Evolved Packet System including the UE. Only the number of parallel RT and NRT QoS levels are limited to the upper value supported by the Evolved Packet System.

- Differentiated handling based on QoS is needed for different traffic types.

- The Evolved Packet System shall support parallel operation of RT and NRT services per user.

Note 2: The different QoS levels provided for RT and NRT services would be differentiated with regards to e.g. maximum end-to-end delay, packet size, packet drop percentage, etc. Bandwidth is not used to define a QoS level.

6.4 Support of Multicast and Broadcast Services

The Evolved Packet System shall be able to support Multicast and Broadcast Services which shall be enhanced especially from some aspects, e.g. optimized service provisioning procedures, better performance compared to current MBMS system, and support of multiple access systems.

6.5 Support of Emergency Calls

The Evolved Packet System shall support IMS emergency calls applicable to the PS domain, defined in TS 22.101 [21]

6.6 Differentiated paging for voice over E-UTRAN terminations

More efficient radio resource usage can be achieved by using a more aggressive paging profile for voice over E-UTRAN services than for other services using the IMS signaling bearer, requiring a distinction to be made between voice over E-UTRAN and non-voice over E-UTRAN traffic.

As a network option, the EPS shall support a mechanism to apply a different paging policy to E-UTRAN access for voice services vs. other services using the IMS signaling bearer.

6.7 IoT resource efficiency

The 3GPP system shall support efficient transmission of IP data and non-IP data to/from a UE.

The 3GPP system shall support efficient transmission of small data to/from a UE.

The 3GPP system shall minimize control and user plane resource usage for stationary UEs (e.g., lower signalling to user data resources usage ratio).

The 3GPP system shall optimize the resource usage of the control plane and/or user plane for transfer of small data units.

The 3GPP system shall support methods to minimize the usage of battery resources at the UE.

7 Multi-access and seamless mobility

7.1 Mobility management

7.1.1 Heterogeneous access systems mobility

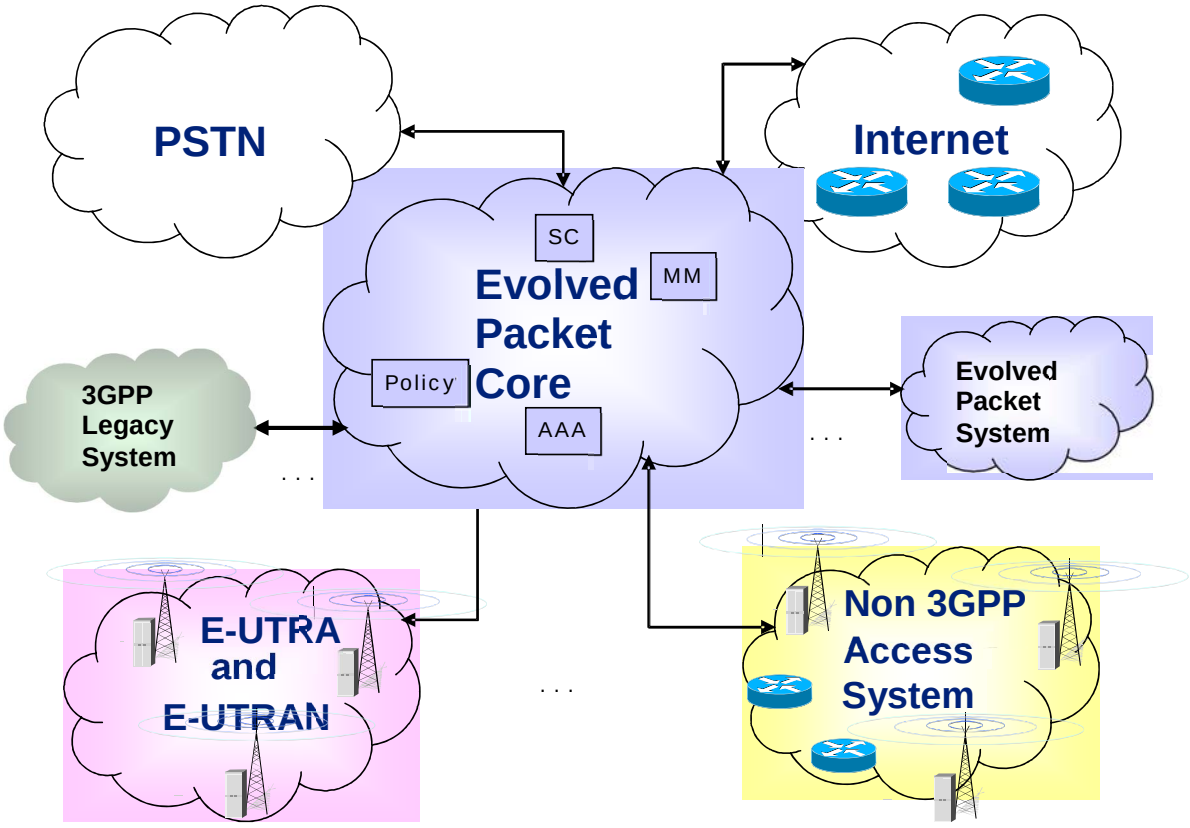

Figure 3: Heterogeneous access system mobility between 3GPP Legacy Systems or E-UTRAN and non 3GPP Access Systems including Fixed Access systems

The Evolved Packet System shall support mobility between heterogeneous access systems.

The Evolved Packet System shall provide mobility mechanisms to support frequent handovers within and across 3GPP legacy systems or E-UTRAN and non 3GPP access systems in order to avoid service degradation.

The Evolved Packet System shall support mobility mechanisms that accommodates access systems within Rel-7 and earlier.

7.1.2 Local breakout

The Evolved Packet System shall allow for local breakout. Local breakout means that for a user which makes mobility within and across one operator-defined network region, routing is optimized such that user plane traffic does not need to leave the current region. An operator may define network regions e.g., according to administrative domains. Local breakout is applicable for user-to-user traffic as well as for 3GPP-operator provided services (including internet access).

Local breakout shall be allowed independently from the access system being used.

Local breakout shall be allowed in both the non-roaming and the roaming case.

The use of local breakout shall be authorised by the HPLMN. If local breakout is not authorised, the user plane traffic shall be handled in the home routed mode.

7.1.3 Fixed Access Systems

The Evolved Packet System shall be able to support fixed access systems with very limited or no mobility functionality.

The Evolved Packet System shall be able to support mobility within and across 3GPP and non-3GPP access systems including fixed access systems

7.1.4 Service continuity

7.1.4.1 General

Service shall be maintained during and following changes of 3GPP access systems and non 3GPP systems.

Service shall be maintained during and following a change of network in either direction between a Rel-7 and earlier network and an Evolved Packet System.

It shall be possible to support Inter-PLMN handover with seamless service continuity within a 3GPP specified access system (UTRAN, E-UTRAN).

When the access system changes, Multicast and Broadcast services shall be able to continue with their corresponding Multicast and Broadcast services, if the corresponding services are provided in the target access system.

Note: Corresponding Multicast and Broadcast services are the Multicast and Broadcast services in the target access system which is associated to the Multicast and Broadcast services in the source access system, providing similar service experience, e. g. with same content but different bit-rate.

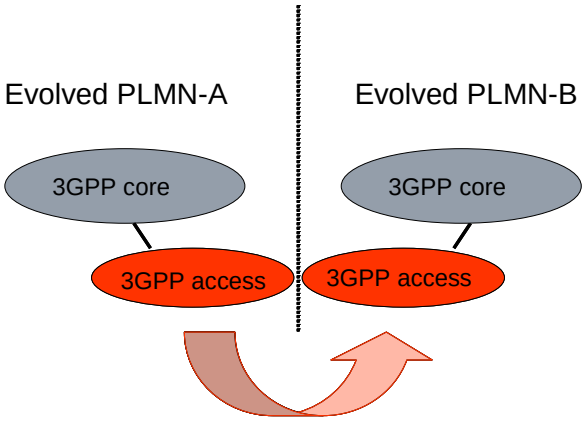

Figure 4: Inter-PLMN handover with seamless service continuity within a 3GPP specified access system

7.1.4.2 Service continuity at domain and RAT change for TS 11, TS 12 and equivalent PS service

It shall be possible to support continuity of an established voice call, i.e. between a TS11, TS12 and an equivalent PS service, when the UE moves between two different domains and RATs. The user experience shall be as far as possible unaffected by the change of domain and RAT. The RAT change procedure executed to enable service continuity for an established voice call shall target an interruption time not higher than 300 ms.

RAT change and domain selection shall be under the control of the registered PLMN. When the UE is roaming, it shall be possible for the VPLMN to take into account any user's HPLMN operator policy.

To support service continuity of an established voice call a UE shall not be required to support simultaneous radio transmission via different 3GPP defined RATs

Note: In the case of CS emergency calls (TS12) the service continuity at domain and RAT change can only be performed if IMS emergency calls are supported by the target system.

7.1.4.2A Voice Call Service continuity between 3GPP defined RATs and non 3GPP defined RATs

Continuity of an established voice call, i.e. between a TS11 and an equivalent PS service, when the UE moves between 3GPP defined RATs and non 3GPP defined RATs, shall be supported provided that the non-3GPP defined RATs is connected to the 3GPP system via the Evolved Packet Core.

The user experience shall be as far as possible unaffected by the change of RAT.

7.1.4.3 Service continuity between E-UTRAN and 3GPP2 accesses on Evolved Packet Core

The Evolved Packet System shall support bidirectional service continuity between cdma2000 1xRTT Revision A [8], [9], [10], [11], [12], [13], [14], [15] and E-UTRAN.

Note 1: if bi-directional support is not practical, service continuity from E-UTRAN to cdma2000 1xRTT Revision A should have the higher priority.

Note 2: The CS component of cdma2000 1xRTT Revision A is not expected to be connected to the Evolved Packet Core.

The Evolved Packet System shall support bidirectional service continuity between cdma2000 HRPD (1xEV-DO) Revision A [17], [14], [15], [16] and E-UTRAN for best effort and real-time applications.

The Evolved Packet System shall support bidirectional service continuity between cdma2000 HRPD (1xEV-DO) Revision 0 [18], [14], [15], [16] and E-UTRAN for best effort applications.

7.1.4.4 Service continuity between 3GPP and WiMAX access on Evolved Packet Core

The Evolved Packet System shall support bidirectional service continuity between Mobile WiMAX [20], [22], [23], [24] and GERAN PS.

The Evolved Packet System shall support bidirectional service continuity between Mobile WiMAX [20], [22], [23], [24] and UTRAN PS.

The Evolved Packet System shall support bidirectional service continuity between Mobile WiMAX [20], [22], [23], [24] and E-UTRAN.

Note: The above requirements assume that the service continuity takes place through the Evolved Packet Core.

7.1.5 Access network discovery

To avoid unnecessary background scan by the UE and to facilitate service continuity by the UE it shall be possible for the VPLMN and the HPLMN to provide the UE with access network information pertaining to locally supported non-3GPP access technologies, in a resource efficient and secure manner. This mechanism is meant to facilitate changes, including service continuity, between 3GPP access systems and non 3GPP access systems and vice versa. The information may be restricted to the access technologies the UE can use. To reduce battery drain, a UE should minimise the frequency of scanning for different access technologies.

When discovering non-3GPP accesses a UE shall be able to receive information from a non-3GPP access network concerning to which PLMN, or PLMNs, the non-3GPP access network provides access.

Note: The capability to provide such information by a non-3GPP access network is out of scope of 3GPP.

When a UE receives service via a non-3GPP access it shall be possible for the PLMN that provides the non-3GPP access to indicate local availability of 3GPP access to the UE,, in a secure manner, subject to capabilities of the non-3GPP access network.

7.1.6 Steering of access

When a UE is accessing the Evolved Packet Core via E-UTRA, the operator of the PLMN that provides the access (registered PLMN or RPLMN for short) may request the UE to use - any or a specific - non-3GPP RAT. Similarly, if a UE is accessing the Evolved Packet Core via a non-3GPP RAT then the RPLMN may want to request the UE to use E-

UTRA. The reason for such steering may be load balancing (for camped- and traffic load balancing), operator policy, private networks/home cells, service based mobility control etc.

The RPLMN shall be able to download on the UE a list of preferred access technologies in priority order. If, while the UE is registered on that PLMN, an access technology with higher priority than the one currently used is detected, the UE shall attempt to use the higher priority access network to access the RPLMN.

The UE shall only perform access technology selection within the RPLMN.

In case the UE is connected to the PLMN via a non-3GPP access, then the PLMN reselection procedures specified for that access technology may be executed.

Note 1: The PLMN operator may provide access to the Evolved Packet Core either through an own access network (E-UTRA or non-3GPP access) or in collaboration with an access network operator that operates a non-3GPP access network.

Note 2: A specific non-3GPP RAT may e.g. be identified by RAT type and the access network name (as advertized by the access network), or a list of access network names.

The HPLMN may also provide the UE with a list of preferred access technologies in priority order for use in the RPLMN. Only one list of preferred access technologies can be active at a time and the list provided by the RPLMN takes precedence over the list provided by the HPLMN. The list of preferred access technologies received from the VPLMN is specific to that VPLMN and PLMNs equivalent to it.

7.1.7 CS fallback

7.1.7.1 General

For those services delivered via the HPLMN that the HPLMN only supports in the CS domain (e.g. voice services), when such services are invoked while the UE is configured to use CS Fallback and registered in the E-UTRAN (either in the HPLMN or in a VPLMN), it shall be possible for the EPS to request the UE to perform a change of radio access technology in order to deliver the service over UTRAN or GERAN or 1xRTT.

In the case of an incoming CS service to a UE that is registered for CS services and active in E-UTRAN, the EPS shall transfer the CLI to the UE if available and the calling party has not restricted the presentation, prior to triggering CS fallback. Depending on UE configuration and when the UE is in connected mode, the user or an application on behalf of the user may request to accept or reject CS fallback before performing a change of radio access technology. The default behaviour of the UE is to accept the CS fallback.

7.1.7.2 Roaming in a VPLMN not supporting CS fallback

When a UE that is configured to use CS fallback registers over E-UTRAN in a VPLMN not supporting CS fallback the default behaviour of the UE is to attempt to select a GERAN/UTRAN/1xRTT CS radio access technology in the VPLMN or in a PLMN equivalent to the VPLMN. The default behaviour of the UE is not to autonomously attempt to (re-)select the E-UTRAN for the duration of the time the UE stays in a VPLMN and PLMNs equivalent to the VPLMN.

The default behaviour may be changed based on user preference settings.

The UE may offer the user to perform a PLMN scan and display the list of available PLMNs. The selection of a different PLMN is performed using the manual mode.

7.1.8 Service Reachability

The Evolved Packet System may provide functionality to enable user access to PLMN IP-based services from outside of the PLMN's domain via non-3GPP access technologies under conditions where there are IP traffic-flow restrictions (e.g. allow only HTTP traffic). Such functionality is known as Service Reachability.

When the Evolved Packet System provides Service Reachability, the following requirements apply:

- pre-existing EPS security shall be maintained; and
- the third party that placed the IP traffic-flow restriction shall be able to prohibit Service Reachability by blocking PLMN IP-based services intentionally.

Note 1: Examples of a third party include enterprises and internet service providers whose traffic restriction lie outside the operator's domain.

Note 2: Service Reachability can also be achieved by the network operator remotely configuring the elements with firewall function, provided there is a trust relationship between the network operator and the operator of the elements with firewall function.

7.2 IFOM Service requirements

Simultaneous active mode of operation is an optional capability for multimode UEs, which support 3GPP and WLAN access. UE supporting simultaneous active mode of operation between one set of technologies may not be capable to support simultaneous active mode of operation between a different technology set (e.g. due to radio interference limitations).

The following requirements apply to the case of UEs with multiple interfaces which will simultaneously connect to 3GPP access and one single WLAN access.

- It shall be possible to provide service continuity when the UE moves from the 3GPP access to WLAN access and vice versa.
- If the UE is under the coverage of more than one access, including 3GPP and WLAN accesses and communicates using multiple accesses simultaneously, it shall be possible to select one access when a flow is started and re-distribute the flows to/from a UE between accesses while connected.
- It shall be possible for the operator to enable and control via policies the simultaneous usage of multiple accesses.
- It shall be possible to distribute IP flows to/from a UE between available accesses based on the characteristics of the flows and the capabilities of the available accesses, subjected to user's preferences and operator's policies.
- It shall be possible for the operator to define policies for the control of the distribution of IP flows between available accesses. Each policy shall include a list of preferred accesses and whether the policy may be overridden by the user's preferences.

  Note: The possibility of manual selection or user override is not precluded.

  These policies may be defined per APN, per IP flow class under any APN or per IP flow class under a specific APN. The IP flow class identifies a type of service (e.g. IMS voice) or an operator defined aggregation of services.

  The policies apply with the following priority order:

  1. Policies per IP flow class under a specific APN.
  2. Policies per IP flow class under any APN.
  3. Policies per APN.
- Distribution of flows to/from a UE between available accesses based on the characteristics of the flows and/or the capabilities of the available accesses shall be possible for flows exchanged by both operator controlled (e.g. IMS) and non operator controlled (e.g. web and mail access) applications/services.
- It shall be possible to move all the flows to/from a UE out of a certain access in case the UE loses connectivity with that access (e.g. UE moves out of coverage of a WLAN access while maintaining connectivity through the 3GPP access).
- Re-distribution of flows to/from a UE between accesses may be triggered by changes to the characteristics of the flows (e.g. QoS requirements) or the capabilities of the available accesses (e.g. due to network congestion, mobility event, or UE discovers a new access) during the connection.

7A Requirements for Proximity Services

7A.0 General

The requirements listed in this clause (7A) exclude GSM and UMTS. Proximity Services shall not impact either of GSM and UMTS.

7A.0A Feature description (Informative)

7A.0A.1 ProSe Discovery

ProSe Discovery identifies that ProSe-enabled UEs are in proximity of each other, using E-UTRA (with or without E-UTRAN) or EPC when permission, authorisation and proximity criteria are fulfilled. The proximity criteria can be configured by the operator.

The use of ProSe Discovery must be authorised by the operator, and the authorisation can be on a "per UE" basis, or a "per UE per application" basis. An authorised application can interact with the ProSe Discovery feature to request the use of certain ProSe Discovery preferences.

The network controls the use of E-UTRAN resources used for ProSe Discovery for a ProSe-enabled UE served by E-UTRAN.

ProSe Discovery can be used as a standalone process (i.e. it is not necessarily followed by ProSe Communication) or as an enabler for other services.

7A.0A.2 ProSe Communication

ProSe Communication enables establishment of new communication paths between two or more ProSe-enabled UEs that are in Communication Range. The ProSe Communication path could use E-UTRA or WLAN. In the case of WLAN, only ProSe-assisted WLAN direct communication (i.e. when ProSe assists with connection establishment management and service continuity) is considered part of ProSe Communication.

The network controls the use of E-UTRAN resources used for ProSe Communication for a ProSe-enabled UE served by E-UTRAN. The use of ProSe Communication must be authorised by the operator.

According to operator policy a UE's communication path can be switched between an EPC Path and a ProSe Communication path and a UE can also have concurrent EPC and ProSe Communication paths.

For Public Safety specific usage:

- ProSe Communication can start without the use of ProSe Discovery if the Public Safety ProSe-enabled UEs are in Communication Range.
- Public Safety ProSe-enabled UEs must be able to establish the communication path directly between Public Safety ProSe-enabled UEs, regardless of whether the Public Safety ProSe-enabled UE is served by E-UTRAN, as well as being able to participate in ProSe Group Communication or ProSe Broadcast Communication between two or more Public Safety ProSe-enabled UEs which are in proximity. Any of the involved Public Safety ProSe-enabled UEs need to have authorisation from the operator.
- In addition, ProSe Communication can also take place over a ProSe UE-to-UE Relay, 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.

7A.1 General Requirements for Proximity Services

Based on operator policy and user choice, the proximity of two ProSe-enabled UEs shall be determinable; for example, using direct radio signals or via the operator network.

Subject to user and operator settings, the 3GPP system shall be able to support the usage of WLAN direct discovery.

In the case the ProSe-enabled UE supports WLAN direct discovery, the 3GPP network shall be able to configure applications in the UE to use E-UTRA direct discovery or WLAN direct discovery or both for discovering other ProSe-enabled UEs.

ProSe Discovery shall be able to determine whether or not other ProSe-enabled UEs are of interest to a discovering ProSe-enabled UE. A ProSe-enabled UE is of interest to a discovering ProSe-enabled UE if its proximity needs to be known by one or more authorised applications.

Subject to user and operator settings, a ProSe-enabled UE shall be able to be discoverable only by other ProSe-enabled UEs in proximity that are explicitly permitted by the discoverable ProSe-enabled UE.

Note: 'explicitly permitted' refers to Restricted ProSe Discovery.

Subject to user and operator settings, a ProSe-enabled UE shall be able to be discoverable by all other ProSe-enabled UEs in proximity without explicit permission. The ProSe-enabled UEs can be served by the same or different PLMN, including when roaming.

Note: 'without explicit permission' refers to Open ProSe Discovery.

All requirements for ProSe Discovery also apply when one or both of the ProSe-enabled UEs involved in ProSe Discovery are roaming in a VPLMN.

Operator policy disabling or limiting individual ProSe features shall override any user choice.

The following requirements apply to the case where ProSe-enabled UEs use E-UTRA to determine proximity of other ProSe-enabled UEs:

- The operator shall be able to dynamically control the proximity criteria for ProSe Discovery. Examples of the criteria include radio range and geographic range.
- ProSe Discovery shall support a minimum of three range classes – for example short, medium and maximum range.
- The operator shall be able to authorise per subscription the maximum range class ProSe Discovery is allowed to use.
- The ProSe Discovery process shall enable authorised applications to request and to use a certain range class when discovering other ProSe-enabled UEs.
- The ProSe Discovery process shall enable authorised applications to request and to use a certain range class when the ProSe-enabled UE is being discovered by other ProSe-enabled UEs.

Note: For the case where ProSe-enabled UEs use WLAN direct discovery to determine proximity of other ProSe-enabled UEs, the range is determined by the underlying technology.

The operator shall be able to dynamically control the proximity criteria for any ProSe E-UTRA Communication (including ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication). Examples of the criteria include: Communication Range, channel conditions, achievable QoS.

The impact of ProSe Discovery and ProSe Communication on E-UTRA radio usage, network usage and battery consumption should be minimized. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication, ProSe Broadcast Communication, and ProSe-assisted WLAN direct communication.

ProSe shall support the simultaneous operation of a large number of applications on a ProSe-enabled UE, ensuring that the 3GPP system provides ProSe Discovery proximity information only to applications that were authorised by the 3GPP operator.

An application on a ProSe-enabled UE shall be able to use ProSe Discovery to request EPC ProSe to determine the proximity of another ProSe-enabled UE; EPC ProSe shall be able to determine proximity of two ProSe-enabled UEs and inform the requesting application of their proximity.

The operator shall be able to enable or disable the ProSe Discovery feature in its network.

The system shall be capable of monitoring communication characteristics (e.g. channel condition, QoS of the path, volume of traffic etc.) on the ProSe E-UTRA Communication path, regardless of whether there is an existing data session on the EPS path. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication. The monitored communication characteristics on the ProSe E-UTRA Communication path (e.g. channel condition, QoS of the path, volume of traffic etc.) may be different for ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

The establishment of a user traffic session on the ProSe E-UTRA Communication path and the switching of user traffic between a ProSe E-UTRA Communication path and an EPC Path are under control of the network. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

The Radio Access Network shall control the radio resources associated with the ProSe E-UTRA Communication path. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

The ProSe mechanism shall enable the operator to change the communication path of a user traffic session to a ProSe Communication path or EPC Path without negatively affecting the QoS of the session. This requirement is not applicable to ProSe Group Communication and ProSe Broadcast Communication.

The ProSe mechanism shall enable the operator to change the communication path of a user traffic session of a ProSe-enabled UE to a ProSe Communication path or EPC Path without negatively affecting the communication paths (including ProSe Communication paths) of other ongoing user traffic sessions of this or other ProSe-enabled UEs. This requirement is not applicable to ProSe Group Communication and ProSe Broadcast Communication.

The ProSe mechanism shall enable the operator to change the communication path of a user traffic session to a ProSe Communication path or EPC Path based upon the QoS requirements of the session and the QoS requirements of other ongoing sessions of this or other ProSe-enabled UEs. This requirement is not applicable to ProSe Group Communication and ProSe Broadcast Communication.

The system shall be capable of selecting the most appropriate communications path (ProSe Communication path or EPC Path), according to operator preferences. This requirement is not applicable to ProSe Group Communication and ProSe Broadcast Communication. The criteria for evaluation may include the following, although not restricted to:

- System-specific conditions: backhaul link, supporting links or EPC performance;
- Cell-specific conditions: for example cell loading;
- ProSe and EPC Path conditions: Communication Range, channel conditions and achievable QoS;
- Service-type conditions: APN, service discriminator.

Subject to operator policy and user consent, the system shall be capable of establishing a new user traffic session with a ProSe E-UTRA Communication path, and maintaining both of the ProSe E-UTRA Communication path and the existing EPC Path, when the UEs are determined to be in Communication Range allowing ProSe E-UTRA Communication. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication. The UEs can be:

- Served by the same PLMN, including when roaming; or
- Served by different PLMNs, including when roaming.

Note: ProSe E-UTRA Communication between UEs served by different PLMNs can be subject to the availability of suitable radio resources (e.g. shared RAN in a MOCN/GWCN environment).

The 3GPP system shall be capable of moving a user traffic session from the EPC Path to a ProSe E-UTRA Communication path, when the ProSe-enabled UEs are determined to be in Communication Range allowing ProSe E-UTRA Communication. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

The 3GPP system shall be capable of moving a user traffic session from a ProSe E-UTRA Communication path to an EPC Path. At a minimum, this functionality shall support the case when the ProSe E-UTRA Communication path is no longer feasible. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

The user shall not perceive the switching of user traffic sessions between the ProSe E-UTRA Communication and EPC Paths when triggered by the network. This requirement is not applicable to ProSe Group Communication and ProSe Broadcast Communication.

The user shall not perceive the switching of user traffic sessions between the ProSe E-UTRA Communication and EPC Paths when triggered by the ProSe-enabled UE. This requirement is not applicable to ProSe Group Communication and ProSe Broadcast Communication.

The HPLMN operator shall be able to authorize the ability of a ProSe-enabled UE to use ProSe Communication, separately for the HPLMN and for roaming in VPLMNs. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication, ProSe Broadcast Communication and ProSe-assisted WLAN direct communication.

The HPLMN operator shall be able to authorize the ability of a ProSe-enabled UE to use ProSe Communication to communicate with ProSe-enabled UEs served by a different PLMN. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication, ProSe Broadcast Communication and ProSe-assisted WLAN direct communication.

The VPLMN operator shall be able to turn on or off the ability for all the inbound roamers from a specific PLMN to use ProSe Communication. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication, ProSe Broadcast Communication and ProSe-assisted WLAN direct communication.

ProSe proximity information shall be suitable for integration with the Location and Presence information used by the network to offer its services.

ProSe shall be able to accommodate potentially large numbers of concurrently participating ProSe-enabled UEs.

ProSe Discovery and ProSe Communication shall be available to ProSe-enabled UEs that are registered to a PLMN and are served by an E-UTRAN of said PLMN even if potentially served by different eNBs. Whether or not UEs are served by the same eNB, E-UTRAN resources involved in ProSe will be under real time 3GPP network control.

The network shall be able to collect Discovery information from a ProSe-enabled UE regarding which ProSe-enabled UEs are discovered to be in its proximity. Restrictions due to regulation on data collection apply.

ProSe shall:

- Allow a ProSe-enabled UE to selectively discover ProSe-enabled UEs of interest;
- Ensure that 3GPP UE/subscriber identifiers are not disclosed to unauthorised parties when ProSe is used;
- Allow both granting and revocation of discovery permissions;
- Enable applications to individually request the setting of discovery parameters, such as discovery range class.

A minimum set of ProSe Discovery and ProSe Communication capabilities for applications may be defined and present on ProSe-enabled UEs, providing ProSe features for applications.

The operator network shall be able to continuously control the use of E-UTRAN resources for ProSe Discovery and ProSe E-UTRA Communication between UEs, as long as these UEs are served by E-UTRAN and using operator's spectrum. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

Potential negative impact of ProSe on the E-UTRAN services should be minimized. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication, ProSe Broadcast Communication, and ProSe-assisted WLAN direct communication.

Subject to operator policies MOCN networks shall support establishing ProSe Communication between ProSe-enabled UEs camping on the same radio access network but served by different MOCN PLMNs. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication, ProSe Broadcast Communication and ProSe-assisted WLAN direct communication.

7A.2 Public Safety Specific Requirements for Proximity Services

A Public Safety ProSe-enabled UE with ProSe Discovery enabled for discovery of other public safety UEs shall be able to discover other discoverable public safety UEs, without network interaction if allowed by the operator, even when served by E-UTRAN whether or not ProSe E-UTRA Communication is used (including whether or not ProSe Group Communication or ProSe Broadcast Communication are used).

Note**:** A network operator can provide additional services for public safety UEs that are under 3GPP network coverage, such as providing accurate location information through GPS data.

A user of a Public Safety ProSe-enabled UE shall be able to activate or deactivate the UE's ProSe Discovery feature while served by E-UTRAN, if allowed by the operator whether or not ProSe E-UTRA Communication is used (including whether or not ProSe Group Communication or ProSe Broadcast Communication are used).

ProSe shall not be available to ProSe-enabled UEs not served by E-UTRAN, except in the following cases:

- Public Safety ProSe-enabled UEs can use ProSe when operating on public safety spectrum even when not served by E-UTRAN. In this case, at least a one-time pre-authorization to use ProSe is needed.
- A Public Safety ProSe-enabled UE with ProSe Discovery enabled shall be able to discover other discoverable Public Safety ProSe-enabled UEs when some or all of the Public Safety ProSe-enabled UEs involved in ProSe Discovery are not served by E-UTRAN, whether or not ProSe E-UTRA Communication is used (including whether or not ProSe Group Communication or ProSe Broadcast Communication are used).

A Public Safety ProSe-enabled UE shall be capable of determining autonomously whether or not a discovered ProSe-enabled UE is a public safety UE.

The configuration of a Public Safety ProSe-enabled UE that allows the Public Safety ProSe-enabled UE to discover other discoverable Public Safety ProSe-enabled UEs shall be independent from its configuration to allow or not to allow other Public Safety ProSe-enabled UEs to discover it.

Public Safety ProSe-enabled UEs whether they are served by E-UTRAN or not, shall be capable of establishing a secure ProSe E-UTRA Communication on a ProSe E-UTRA Communication path and exchange user traffic on public safety spectrum, assuming they are in Communication Range, are authenticated and authorised. This requirement applies to ProSe E-UTRA Communication between two Public Safety ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

ProSe-enabled UEs shall not be able to use ProSe Discovery and/or Communication services when in Limited Service state, except for Public Safety ProSe-enabled UEs which shall be treated as out-of-coverage under the following circumstances:

- It cannot find a suitable cell of the selected PLMN
- It receives a "PLMN not allowed" response to a registration request
- It receives a "GPRS not allowed" response to a registration request

Public Safety ProSe-enabled UEs using UE preconfigured resource shall not cause interference to a cell if the UE considers the cell as an acceptable cell and is operating as out-of-coverage as per the circumstances above.

The operator shall be able to authorise, via network control, Public Safety ProSe-enabled UEs to establish ProSe Communication when at least one of the two Public Safety ProSe-enabled UEs is served by EUTRAN.

The operator shall be able to pre-configure Public Safety ProSe-enabled UEs (e.g., in the USIM or ME) with the permission to use ProSe Discovery and/or Communication services for Public Safety, without the need for the Public Safety ProSe-enabled UEs to connect to the network to get this initial configuration. This requirement applies to any ProSe E-UTRA Communication between two Public Safety ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication.

The system shall enable Public Safety ProSe-enabled UEs to mutually authenticate each other when not served by E-UTRAN.

Assuming Public Safety ProSe-enabled UEs are in Communication Range, are authenticated and are authorised, a Public Safety ProSe-enabled UE on public safety spectrum, whether or not it is served by E-UTRAN, shall be capable

of establishing multiple one-to-one ProSe E-UTRA Communications using multiple ProSe E-UTRA Communication paths, and of exchanging user traffic with each Public Safety ProSe-enabled UE across these multiple paths.

A Public Safety ProSe-enabled ProSe-enabled UE, whether or not it is served by E-UTRAN shall be capable of transmitting data to a group of Public Safety ProSe-enabled UEs using ProSe Group Communications with a single transmission, assuming they are within Communication Range, authenticated and authorised.

Authentication shall allow for security-enablement of large groups, regardless whether group members have discovered each other when served by E-UTRAN or not.

A Public Safety ProSe-enabled UE whether or not it is served by E-UTRAN shall be capable of receiving a ProSe Group Communications transmission, of which it is a group member, regardless of whether or not it has been discovered by the transmitting Public Safety ProSe-enabled UE.

An authorised Public Safety ProSe-enabled UE, whether or not it is served by E-UTRAN shall be capable of sending a broadcast message to all authorised Public Safety ProSe-enabled UEs within Communication Range, regardless of group membership, using ProSe Broadcast Communication in a single transmission.

An authorised Public Safety ProSe-enabled UE, whether or not it is served by E-UTRAN, may be capable of acting as a relay for other public safety UEs.

An authorised Public Safety ProSe-enabled UE shall be capable of acting as a relay for ProSe E-UTRA Communication between two Public Safety ProSe-enabled UEs, ProSe Broadcast Communication, and ProSe Group Communication.

A ProSe UE-to-UE Relay shall be able to relay data for a group of Public Safety ProSe-enabled UEs using ProSe Group Communications regardless of their group membership.

An authorised Public Safety ProSe-enabled UE, whether or not it is served by E-UTRAN, shall be capable of being enabled/disabled by a user or the system to act as a relay for other Public Safety ProSe-enabled UEs.

The user of a Public Safety ProSe-enabled UE acting as a relay should not perceive service degradation due to its use as a relay, regardless whether or not the Public Safety ProSe-enabled UE is served by E-UTRAN.

There shall be a maximum of one ProSe UE-to-UE relay between two Public Safety ProSe-enabled UEs.

A ProSe UE-to-UE Relay serving as a relay for other Public Safety ProSe-enabled UE shall be able to be served at the same time by the UE serving as a relay for it.

A ProSe UE-to-UE Relay shall be capable of relaying communications for one or more Public Safety ProSe-enabled UEs that are within Communication Range of the ProSe UE-to-UE Relay.

A Public Safety ProSe-enabled UE shall be capable of acting as a relay regardless of whether or not it has been discovered by a Public Safety ProSe-enabled UE using it as a relay if they are within Communication Range.

An authorised Public Safety ProSe-enabled UE shall be capable of communication using both the network infrastructure and ProSe Communication with Public Safety ProSe-enabled UEs not served by E-UTRAN in parallel whether or not ProSe Discovery is used.

In addition, the system shall be able to move the user traffic session back to the EPC Path once the Public Safety ProSe-enabled UE is served by E-UTRAN. The user may inhibit the switch back to the EPC Path.

It is desirable that an authorised Public Safety ProSe-enabled UE, whether or not it is served by E-UTRAN, supports the capability to exchange data via ProSe from within a building to Public Safety ProSe-enabled UEs outside the building using a power class 3 E-UTRA UE [29].

Authorised Public Safety ProSe-enabled UEs, whether being served or not by E-UTRAN, shall be able to communicate with other authorised Public Safety ProSe-enabled UEs whether or not ProSe discovery is used.

A Public Safety ProSe-enabled UE shall provide the ability for the end user to activate/deactivate ProSe E-UTRA Communication whether or not the UE is served by E-UTRAN and whether or not ProSe discovery is used. This requirement applies to any ProSe E-UTRA Communication between two Public Safety ProSe-enabled UEs, and to ProSe Group Communication and ProSe Broadcast Communication.

A Public Safety ProSe-enabled UE shall support independent activation/deactivation of ProSe Discovery and ProSe E-UTRA Communication whether or not it is served by E-UTRAN. This requirement applies to any ProSe E-UTRA

Communication between two Public Safety ProSe-enabled UEs, ProSe Group Communication and ProsSe Broadcast Communication.

Re-authorization and specific configurations, including spectrum configurations, of Public Safety ProSe-enabled UEs shall be subject to public safety operator policy.

An operator shall be able to configure a Public Safety ProSe-enabled UE with the permission to be discoverable or not by one or more Public Safety ProSe-enabled UEs, without prior registration to the network.

Subject to operator policy and/or network authorization, a user of a Public Safety ProSe-enabled UE shall be able to select the ProSe Communication path (direct or routed via local eNB) when the Public Safety ProSe-enabled UE is being served by E-UTRAN. This requirement applies to any ProSe E-UTRA Communication between two Public Safety ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communications. The network authorization shall consider the current traffic condition in the specific area.

A Public Safety ProSe-enabled UE shall be able to operate in spectrum allocated exclusively for ProSe and spectrum allocated for both ProSe and other services.

7A.3 ProSe-assisted WLAN direct communication

The Evolved Packet System shall support the following requirements for WLAN to enable ProSe communication.

Subject to operator policy and user consent, a ProSe-enabled UE with WLAN capability shall be able to establish ProSe-assisted WLAN direct communications with another ProSe-enabled UE when they are within WLAN direct communications range, based on ProSe Discovery and WLAN configuration information from the 3GPP EPC.

The 3GPP EPC shall be able to provide configuration information to ProSe-enabled UEs for the purpose of establishing ProSe-assisted WLAN direct communications.

The EPC shall be able to provide configuration information that enables confidentiality and integrity on the ProSe-assisted WLAN direct communications link.

The HPLMN operator shall be able to authorise ProSe-assisted WLAN direct communications for a ProSe-enabled UE, separately for use in the HPLMN and when roaming in VPLMNs.

The HPLMN operator shall be able to authorise a ProSe-enabled UE to engage in ProSe-assisted WLAN direct communications with a ProSe-enabled UE being served by a different PLMN.

The VPLMN operator shall be able to turn on or off ProSe-assisted WLAN direct communications for inbound roamers.

Both the HPLMN and VPLMN operators shall be able to charge for ProSe-assisted WLAN direct communications.

When a ProSe-enabled UE uses ProSe-assisted WLAN direct communications, both the HPLMN and VPLMN shall be able to collect accounting data for ProSe-assisted WLAN direct communications including:

- ProSe-assisted WLAN direct communication duration, amount of data transferred, etc.

Subject to operator policy and user consent the EPC and a ProSe-enabled UE shall be capable of negotiating the move of a traffic flow between the EPC Path and the ProSe-assisted WLAN direct path.

There shall be no impact upon the RAN from service continuity procedures for ProSe-enabled UE traffic sessions that are moved between the infrastructure and WLAN direct communication paths.

The network shall be able to determine whether two ProSe-enabled UEs are within WLAN direct communications range and whether the WLAN direct link can provide the necessary QoS to support the end user application.

The network shall ensure service continuity for ProSe-assisted WLAN direct communications flows and be capable of considering QoS requirements of all data flows when negotiating a communications path switch for a given end user application.

The system shall be capable of establishing a new user traffic session for a ProSe-assisted WLAN direct communications path.

Subject to operator policy and user consent the EPS shall be capable of maintaining existing E-UTRAN infrastructure communications while ProSe-assisted WLAN direct communication is established by a given ProSe-enabled UE.

Subject to operator policy and user consent the EPS shall be capable of establishing new E-UTRAN infrastructure communications while ProSe WLAN communication is on-going for a given ProSe-enabled UE.

The EPC shall be able to request a UE to perform a path switch between the EPC Path and WLAN direct path for some or all of the UE's traffic sessions based on the load in the 3GPP network.

7B Void

7B.1 Void

7B.2 Void

7C Void

7C.1 Void

7C.2 Void

8 Performance requirements for the Evolved Packet System

The Evolved Packet System comprises the Evolved Packet Core together with the evolved radio access network (E-UTRA and E-UTRAN).

The performance objectives for the Evolved Packet System include higher user data rates, reduced latency, improved system capacity and coverage, reduced network complexity and lower operating costs.

The Evolved Packet System shall meet or exceed the following performance criteria:

a) The radio access network shall be capable of supporting instantaneous peak packet data rates of 100 Mbps on the radio access bearer downlink to the UE and 50 Mbps on the uplink.

b) The Evolved Packet System shall be capable of providing lower user and control plane latency when compared to existing 3GPP access networks. The maximum delay should be comparable to that for fixed broadband Internet access technologies. [e.g. less than 5ms in ideal conditions]

c) The system shall be capable of supporting large volumes of mixed e.g. voice, data and multimedia traffic. Enhanced load balancing and steering of roaming methods should be used to minimise cell congestion.

d) The level of system complexity and mobility management signalling shall be optimised to reduce infrastructure and operating costs. UE power consumption shall also be minimised accordingly.

e) For the Evolved Packet System the interruption time during handover of RT and NRT services shall be kept to minimum and shall not exceed the values defined in TR 25.913[4].

f) The Evolved Packet System shall be capable of providing low latency mobile broadband communication services with the following requirements:

- maximum delay in the EPS of 10 ms for 98% packets,

- 99,9999% reliability excluding the delayed packets.

g) The Evolved Packet System shall be capable of providing low latency communication services (e.g., discrete automation as described in TS 22.261 [30]) with maximum delay in the EPS of 10 ms and 99,99% reliability.

h) The Evolved Packet System shall be capable of providing ultra reliable low latency communication services (e.g., intelligent transport systems as described in TS 22.261 [30]) with maximum delay in the EPS of 30 ms and 99,999% reliability.

i) The Evolved Packet System shall be capable of providing ultra reliable low latency communication services (e.g., remote control and electricity distribution – high voltage as described in TS 22.261 [30]) with maximum delay in the EPS of 5 ms and 99,999% reliability.

j) To support ultra reliable low latency communication services, the Evolved Packet System shall support the transmission over the radio interface of a packet of 32 bytes with a reliability of 99,999% and a user plane latency of 1ms, as described in TR 38.913 [31].

9 Security and privacy

9.1 General

The Evolved Packet System shall provide a high level of security and privacy for users and Evolved Packet System operators.

9.2 Security requirements

The Evolved Packet System shall provide a high level of security, equivalent or better than Rel-7 3GPP systems.

Any possible lapse in security in one access technology shall not compromise security of other accesses.

The Evolved Packet System should provide protection against threats and attacks including those present in the Internet.

The Evolved Packet System shall support information authenticity between the terminal and Evolved Packet Systems.

The Evolved Packet System shall allow for a network to hide of internal network elements from the UE.

Security policy shall be under the control of the home operator.

The security solution should not interfere with service delivery or 3GPP inter-access handovers in a way that is noticeable to end-users or service providers.

Appropriate traffic protection measures should be provided by the Evolved Packet System.

The Evolved Packet System shall provide appropriate mechanisms to enable lawful intercept.

The Evolved Packet System shall ensure that no unauthorized user can obtain a legitimate IP address that can be used to establish communication or enable malicious attacks on evolved system entities.

Release 99 or later Releases' USIM application on the UICC is required to authenticate a user in an Evolved Packet System and hence allowing the user to get services in the Evolved Packet System according to her/his subscription.

Note: The above requirement is applicable when providing access to the EPC via E-UTRAN.

Once authenticated via a 3GPP or Evolved Packet System, the USIM shall not be required to re-authenticate upon changing between these systems, unless specifically requested by the operator (PLMN).

Note: It may be possible to use other applications on the UICC in order to provide authentication on the 3GPP or Evolved Packet System (e.g. for connection to IMS). In addition, in case it is desirable to improve the level of security or to add new security mechanisms for accessing the Evolved Packet System compared to the one provided in Rel-7, a revised/upgraded application on the UICC may be required.

9.3 Privacy requirements

The Evolved Packet System shall provide several appropriate levels of user privacy including communication confidentiality, location privacy, and identity protection.

The privacy of the contents, origin, and destination of a particular communication shall be protected from disclosure to unauthorised parties.

The Evolved Packet System shall be able to hide the identities of users from unauthorised third parties.

It shall be possible to provide no disclosure, at any level of granularity, of location, location-related information, e.g. geographic and routing information, or information from which a user's location can be determined, to unauthorised parties, including another party on a communication.

9.4 ProSe Security, Authorization and Privacy Requirements

The Evolved Packet System shall support the following requirements for ProSe security, authorization and privacy. The requirements listed in this sub-clause exclude GSM and UMTS.

When operating ProSe (in both public safety and general cases), the EPS shall be able to support regional or national regulatory requirements, (e.g. lawful interception, PWS).

When offering ProSe, the EPS shall respect local regulatory frameworks on the use of licensed spectrum.

The EPS shall ensure that the confidentiality and integrity of both user data and network signalling over the ProSe Communication path to a level comparable with that provided by the existing 3GPP system. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication, ProSe Broadcast Communication and ProSe-assisted WLAN direct communication.

A mechanism shall be provided to ensure the confidentiality and integrity of user data and signalling over the ProSe Communication path for Public Safety UEs not served by E-UTRAN.

Existing 3GPP security mechanisms shall be reused whenever possible and appropriate.

The level of security provided by the existing EPS shall not be adversely affected when ProSe is enabled.

The EPS shall protect the confidentiality of the subscriber's, UE's, and user's permanent identities used in the EPS when ProSe Discovery and/or ProSe E-UTRA Communication are used. This requirement applies to any ProSe E-UTRA Communication between two ProSe-enabled UEs, ProSe Group Communication and ProSe Broadcast Communication. The EPS shall have confidentiality features that enable the subscriber's, UE's, and user's permanent identities to be protected when ProSe-assisted WLAN direct communication is used.

The system shall ensure the authenticity of the ProSe Discovery information used by an application that is authorised by the operator and the user.

The EPS shall be able to restrict ProSe Discovery information to the ProSe-enabled UEs and applications that have been authorised by the users and operator.

The permission to be discoverable is given by the user and shall be executed by the EPS, subject to operator control, on a per-application basis.

Authentication shall allow for security-enablement of large groups, regardless of whether group members have discovered each other when being served by E-UTRAN or not.

The operator shall be able to enable or disable its ProSe Discovery feature.

The operator shall be able to authorise discovery operations for each individual ProSe-enabled UE, including by pre-provisioning of the UE.

The operator shall be able to authorise the ability of a ProSe-enabled UE to be discoverable by other ProSe-enabled UEs.

The operator shall be able to authorise the ability of a ProSe-enabled UE to discover other ProSe-enabled UEs.

The operator shall be able to authorise the use of ProSe Discovery information by an application.

Based on user input, a ProSe-enabled UE shall be able to allow the use of ProSe Discovery information by an application.

The network shall be able to authorise a third-party application to use ProSe capability features, by interacting with the ProSe-enabled UE

The operator shall be able to authorise the ability of a ProSe-enabled UE to discover ProSe-enabled UEs served by the E-UTRAN of other PLMNs.

The VPLMN shall be able to turn on or off the ability for all the inbound roamers from a specific PLMN to be discovered using ProSe Discovery.

When a ProSe-enabled UE is roaming in a VPLMN, its HPLMN shall be able to authorise the ProSe-enabled UE to discover and independently be discoverable by other ProSe-enabled UEs via settings which may be different from those for the non-roaming case.

The network shall be able to authorise ProSe Discovery preferences (e.g. discover and/or be discoverable) requested by third-party applications.

The network shall be able to store information of third-party applications necessary for performing security and charging functions.

9.5 Void

10 Charging Aspects

The Evolved Packet System shall support various charging models including all those supported by the 3GPP system contained within TS22.115 [5] .

Charging models that shall be supported by the Evolved Packet System include (non-exhaustive list):

- calling party pays
- charging based on assured QoS
- charging based on the transport
- charging based on an event
- charging based on content
- charging adjustment (e.g. based on subscription bands)
- alternate party charging

The Evolved Packet System shall also be able to support introduction of new charging schemes including online and offline schemes, and charging schemes for the multi-access system environment

Charging mechanisms of the Evolved Packet System shall provide (non-exhaustive list):

- Cost effective Control and Charging of IP Flows
- Perform online charging
- Support differentiated charging including zero rating of the bearer and event charging
- Awareness of subscriber identity, time-of-day, roaming status, QoS, Service input etc

Annex A (informative): Requirements for further study

A.1 Management of access networks

The Evolved Packet System shall be able to allow for self-managing technologies (e.g. Plug-and-Play) for dynamically adding and removing non-3GPP defined access networks.
Such self-managing technologies shall take into account the Evolved Packet System and access network policies.

E.g. depending on such policies it shall be possible to for the 3GPP system operator to request encryption of user traffic that is transmitted over the access network.

Note 1: The non-3GPP access network needs to have defined interworking with 3GPP.

An example could be a WLAN (operated by some WLAN operator) that can, if needed, automatically be connected to a PLMN. This would enable the PLMN operator to provide additional access resources on a dynamic basis and to provide service to more customers (e.g. at mass events).

Note 2: The degree of automation provided for network attachment is yet to be determined, but is intended to simplify (or completely automate) administration procedures.

A.2 Use cases for Fixed Mobile Convergence

A family has purchased a family subscription plan that is independent of access (e.g. fixed or wireless) and location (e.g. both when at home and away from home). The subscription contains at least the following components:

- Internet access: Operator specific service such as firewall and content filtering (parental control) independent of access for selected devices within the family. The service should be available at home, within the home mobile network and when roaming to a visited mobile network.
- Voice/Multimedia: QoS and mobility between home WLAN and LTE wide area
- Charging schemas connected to access type, preference and location
- Video: Premium Video on Demand Service incl. guaranteed bandwidth and QoS regardless of access network.

Description

Use case 1: Internet access with Parental control and personal firewall

The kids leave their house and take a bus to their grandparents' house.

The operator specific services, like parental control and personal firewall, are invoked for specific users and terminals from both fixed network and from mobile network; this allows the kids to get the same service and filtering inside the home, in the bus going to grandparents and at the grandparents. In this use case the grandparents have a separate service provider than the family but the services will still be provided by the service provider where the family has a subscription.

Use case 2: Voice/Multimedia and Charging

The father travels home after work while talking on the phone with his colleague.

The ongoing Voice/Multimedia call between the father and his colleague is maintained while switching over between LTE Wide area and residential fixed broadband WLAN network. Once the call is switched over to WLAN charging for home-based access is applied. Bandwidth and QoS is maintained for the duration of the call to guarantee the same service delivery.

Use case 3: Video

The kids in the backseat of the car are watching an Internet TV show on their laptop using LTE while driving home from the grandparent's house.

The TV show is sent from an Internet TV provider. Once home the terminal detects indoor WLAN coverage where the subscriber has a WLAN Residential Gateway connected to his Fixed Broadband network. The user or the terminal automatically may select to switch the IP connection to the wireline broadband connection and enable the user to resume watching the same TV show on the same laptop, possibly with a better quality picture as allowed by the available bandwidth, user-specific policy, network policy and QoS setting.

Use case 4: H(e)NB/Femtocell

A subscriber desires to improve coverage and access speed for their 3GPP device in their home. They purchase and install a small eNodeB (Femtocell AP) device for their home which attaches to the home LAN and establishes a connection back to the subscriber's mobile service provider network. The mobile network provider coordinates with the broadband access provider to deliver proper bandwidth and QoS to support a good QoE for calls and data sessions made within the home that access services from the mobile network. The Femtocell also allows some types of data traffic to be shared with the home LAN, including traffic for Internet applications. Local traffic can be discerned and accounted for differently than traffic that is carried on the mobile network.

Use case 5: Application Mobility

A subscriber is in a multimedia call on their mobile device, and then wishes to change the device they are using to a fixed network attached device (e.g. Set Top Box / TV). The multimedia call is handed over from the mobile network to the fixed network after the subscriber chooses to transfer the multimedia call to a STB / TV. Bandwidth and QoS is maintained for the large screen experience to be meaningful. Accounting and settlement is supported among the application and network service providers, and reflects the changes to the access technology and required bandwidth.

Use case 6: Common Quota

A Common Quota (CQ) can be assigned for both fixed and mobile accesses for a limited time period for a defined set of subscriptions. During each session the network elements monitor the CQ which may be consumed by one or more devices over either the wireless or fixed networks.

When a defined percentage of the CQ and/or all the CQ has been consumed, one or more subscribers in the defined set can be notified of the event (e.g. via SMS and/or email).

When the CQ has been consumed the access to the services is blocked.

Use case 7: Video On Demand Service

Video On Demand (VoD) service is provided to the subscriber via the Set Top Box to the TV or to the PC. A user orders a VoD service interacting with the VoD infrastructure, which sends a resource request to the network. The user may also request mid-session requests triggering the increase/decrease of network resources. The requests will be accepted or rejected according to the available network resources.

Use case 8: Broadband Access Wholesale

In Broadband network the wholesale scenario is quite important as it may be required by the regulation, known as unbundling (access, connectivity and services). For example the operator of the broadband access network lease/sell transport of the connection through its own network from the user to the buyer / leased network. So in the wholesale scenario the renting operator has the end-to-end Service responsibility to the customer and is viewed as the "Retailer" of the service or application. While the leasing network operator has the responsibility for the access network and for the connectivity.

Annex B (Normative):
Void

Annex B1 (Informative): Interworking between Mobile Operators and Data Application Providers

This Annex provides various scenarios and use cases applicable for interworking between mobile operators and data applications.

B1.1 Scenarios

Figure 1 shows the non-roaming scenario where the mobile operator owns the EPS as well as application layer entities. Access and IP connectivity is provided by the mobile operator. Application platforms, also provided by the mobile operator, shown in the figure connect to the core network directly. Application platforms could be application servers (e.g. Video on Demand Server, PSS Server, MTC Server, etc.). Applications developed using APIs (e.g. REST, GSMA OneAPI) and resident on the API Gateway are connected to the operator core network via the API Gateway. The dashed lines between Operator CN and IMS as well as API Gateway are already specified.

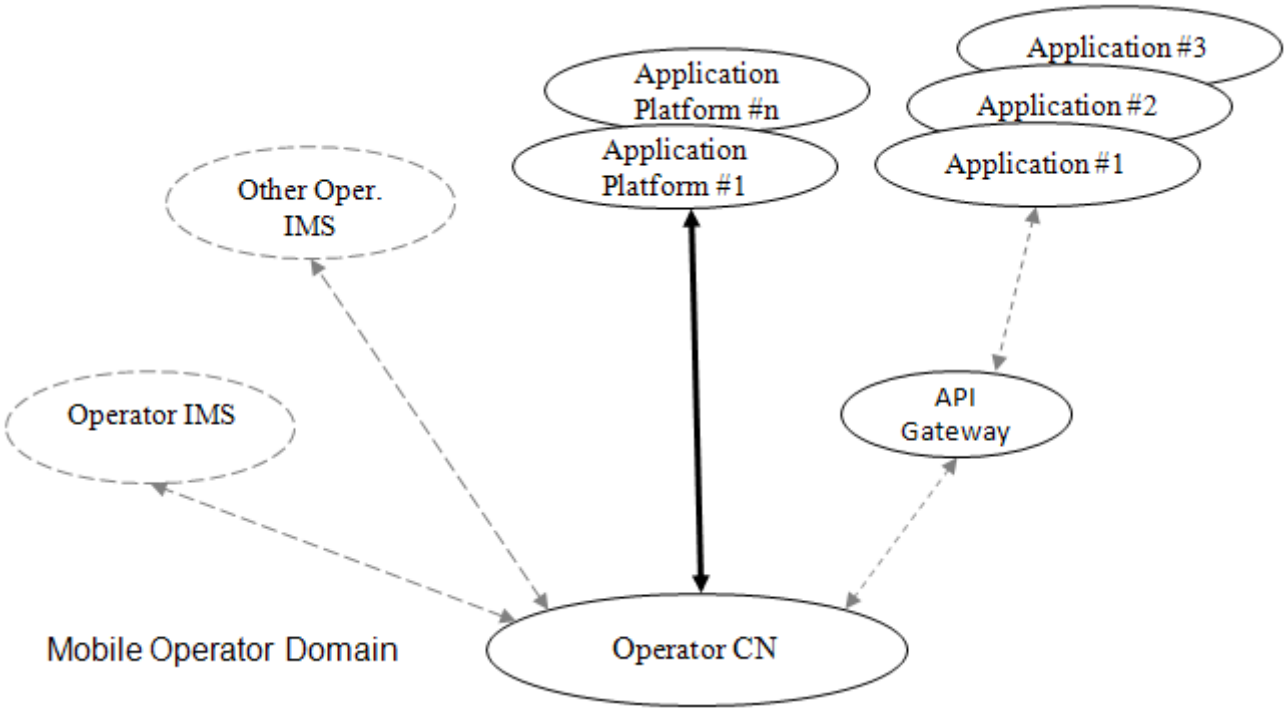

Figure 1: Operator owned non-roaming scenario

Figure 2 provides the non-roaming scenario where the mobile operator does not own all the application layer entities. Access and IP connectivity is provided by the mobile operator. The 3rd party Application Platforms in this figure could be application servers (e.g. Video on Demand Server, PSS Server, MTC Server, etc.) or could be 3rd party software development platforms. The horizontal line represents the demarcation between the mobile operator domain and the 3rd party application provider domain. The mobile operator and 3rd party application providers may have agreements.

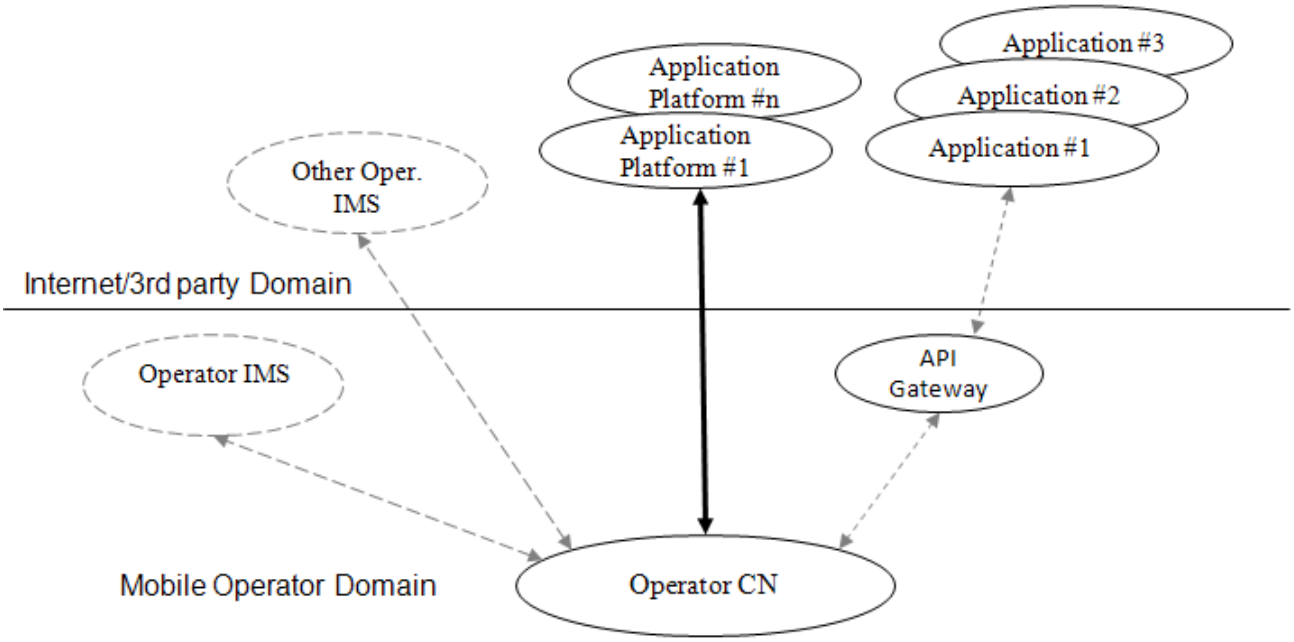

Figure 2: Collaborative non-roaming scenario

Figure 3 provides the roaming scenario for both the above owned and collaborative scenarios. This figure shows the home-routed scenario where all traffic is routed to home mobile operator EPS and applications are delivered via roaming agreements between mobile operators.

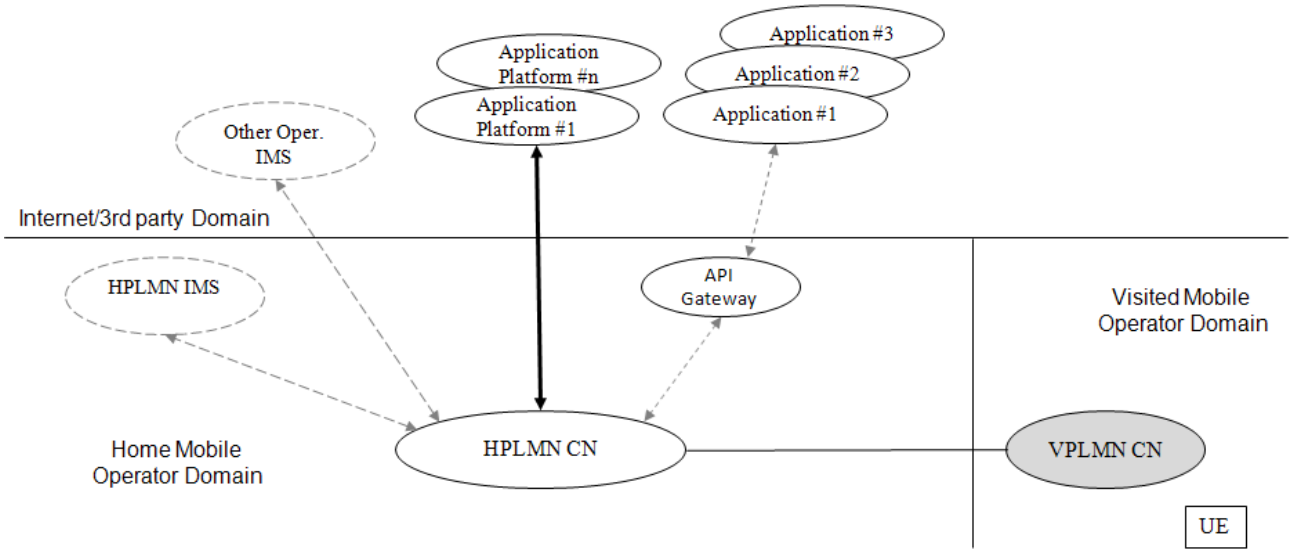

Figure 3: Operator owned/collaborative roaming scenario – Home Routed

Figure 4 provides the roaming scenario between mobile operators and 3rd party application provider domains. In this scenario the application provider has agreements with visited mobile operator. This figure shows the local-breakout scenario where all traffic is routed to application domain from the visited operator network.

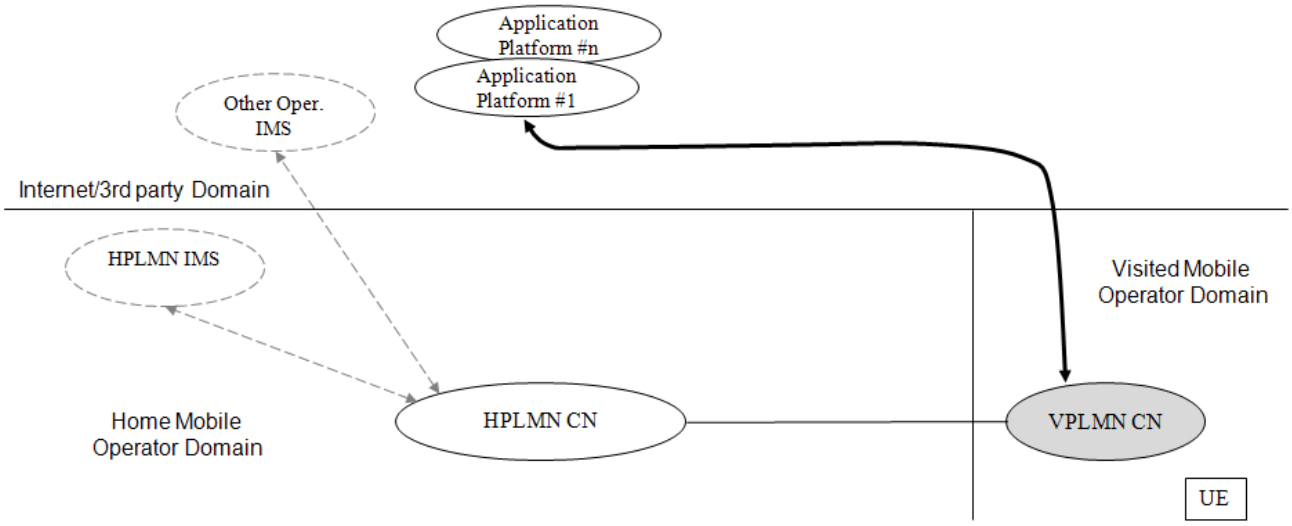

Figure 4: Collaborative roaming scenario – Local Breakout

B1.2 Use cases

B1.2.1 Use cases for owned / collaborated scenarios.

Pre-conditions

A data application provider X develops an application customized for streaming high definition movies to the mobile end user over 3GPP access.

The data application provider X develops this application specifically for a mobile network operator (MNO) Y. The data application provider X hosts this application and establishes agreements with a mobile network operator (MNO) Y to pilot the service. Authentication and charging are provided by the MNO Y. The data application provider X can collaborate with other MNOs as well.

Alice has subscribed to a 3GPP device and video services from the MNO Y.

Use case 1: Authentication and Authorization

Alice gets onto a train for 4-hour long ride to a neighboring country. She turns on her device and looks at the movie catalog. She decides to view a movie and selects the movie offered by the data application provider X and watches it without worrying about the radio access network she is using and any additional login/password procedures.

Use case 2: Allocation of resources and other policy interactions

All along the MNO Y manages the resources and the QoS needed for high definition movie streaming to Alice. On the train, Alice gets distracted by the scenery and misses a few scenes. She rewinds and views the missing scenes.

Use case 3: Simultaneous interactions with multiple application providers

Alice comes across an interesting gadget in the movie and decides to pause on that scene and get a higher resolution closeup view. The close up view prompts an advertisement to pop up for the gadget. Based on this advertisement, Alice purchases the gadget. She is given the choice of paying immediately or being charged on her MNO monthly bill. She decides to charge to her MNO bill.

Use case 4: Roaming

Alice continues watching the movie and the train crosses the country border. She starts roaming into another MNO Z, which has roaming agreement with MNO Y. The movie quality is unaltered in the process of roaming.

Use case 5: Charging

She gets a bill from the MNO at the end of the month which includes the price for the movie she watched on the train and the gadget she purchased.

B1.2.2 Use cases for non-collaborated scenarios.

B1.2.2.1 UE initiates and requests MNO for preferential traffic handling

Pre-conditions

1. Mobile Network Operator Y (MNO Y) has no business relationship nor is there any service collaboration with Data Application Provider X (DAP X).

2. DAP X develops a free application customized for streaming movies to the mobile end user over 3GPP access. DAP X develops the application independently from MNO Y and hosts this application outside of MNO Y's network. The user accesses the service via the network of MNO Y connected to DAP X via a transit network. The service is provided to the user transparently through MNO Y's network.

3. The network of MNO Y supports tiered bearers and MNO Y offers prefential traffic handling on demand from users with a preview period defined either by the operator or the application provider for acceptance of the service. MNO Y has a roaming agreement with MNO Z to provide preferential traffic handling for users at an extra cost to the user. MNO Y has no knowledge or control of the service being delivered by DAP X. Further MNO Y has no knowledge of the resources available at DAP X or of those in the transit network through which it is connected.

4. Alice has subscribed to a 3GPP data service from MNO Y and has downloaded the free movie streaming application from DAP X. She has purchased credit through the application to enable streaming of content. No further authentication of authorisation is required with DAP X in order for Alice to receive content. The movie streaming application uses default level of resources and QoS (e.g. best effort, or based the subscriber profile) from the PLMN.

5. Alice is on a train travelling across national boarder from Country A to Country B. Country A is served by MNO Y. Country B is served by MNO Z.

Use case 6: Authentication and Authorization

Alice decides to watch a movie. She turns on her device, registers with the network operated by MNO Y and launches the application to browse the movie catalogue. She decides to view a movie so she selects it and starts to watch it.

Use case 7: Allocation of resources and other policy interactions

At some point in the movie (e.g. due to mobility, network congestion, etc) Alice becomes dissatisfied with the quality of the movie.

Alice requests preferential traffic handling from MNO Y.

Alternative 1. Alice does not notice any improvement in the quality of the streamed movieand she does not confirm the request for preferential traffic handling within the preview period.

Alternative 2. Alice notices a marked improvement in the quality of the streamed movie and she confirms the request for preferential traffic handling.

As the train crosses the national boarder between Country A and Country B, Alice is notified of the change in MNO and charging.

Alternative 3. Alice decides not to consent for the additional charge. The quality of the bearer reverts to its default level after the specified consent period has expired.

Alternative 4. Alice decides to pay additional charge and consents. The quality of the bearer remains at its present level.

Use case 8: Charging

Alternative 1. Alice receives a bill from MNO Y at the end of the month that includes roaming charges from MNO Z, but no additional charges for preferential traffic handling.

Alternative 2 + Alternative 3. Alice receives a bill from MNO Y at the end of the month that includes roaming charges from MNO Z, and the cost for preferential traffic handling from MNO Y.

Alternative 2 + Alternative 4. Alice receives a bill from MNO Y at the end of the month that includes roaming charges from MNO Z, as well as the cost for preferential traffic handling from MNO Y and the additional cost for preferential traffic handling from MNO Z.

Alice does not receive any bill from DAP X related to the request for preferential traffic handling.

B1.2.2.2 UE initiates and Data Application Provider requests MNO for preferential traffic handling

Pre-conditions

1. Mobile Network Operator Y (MNO Y) has a business relationship but no service collaboration with Data Application Provider X (DAP X).

Other pre-conditions are as specified for B1.2.2.1

Authentication and Authorization is as per Use Case 6 in B1.2.2.1

Use case 9: Allocation of resources and other policy interactions

At some point in the movie (e.g. due to mobility, network congestion, etc) Alice becomes dissatisfied with the quality of the movie. Alice requests preferential traffic handling from DAP X.

Alternatives 1 to are as described in Use case 2 under B1.2.X.

Use case 10: Charging

Alternative 1. Alice receives a bill from MNO Y at the end of the month that includes roaming charges from MNO Z.

Alternative 2 + Alternative 3. Alice receives her bill from MNO Y at the end of the month that includes roaming charges from MNO Z. In addition, Alice receives a statement from DAP X which includes an entry for the cost of preferential traffic handling from MNO Y.

Alternative 2 + Alternative 4. Alice receives her normal bill from MNO Y at the end of the month including roaming charges from MNO Z. In addition, Alice receives a statement from DAP X which includes an entry for the cost of preferential traffic handling from MNO Y and MNO Z.

Annex B2 (Informative): Service Reachability

B2.1 Use case: Blocking Service Reachability

B2.1.1 Description

This describes a case where the intention of the firewall provider is to ensure all traffic of a specific type, e.g. VoIP, is blocked even though the network operator and UE uses Service Reachability.

B2.1.2 Pre-conditions

- The network operator provides a VoIP service.
- The user is subscribed to the VoIP service.
- The UE is connected to a firewalled WLAN network that is independent from the network operator.
- The firewall of the WLAN network blocks VoIP traffic as a result of the firewall provider policy.
- The UE and network operator implements Service Reachability.
- The firewall provider blocks Service Reachability.
- The network operator and firewall provider are different entities.
- This scenario applies regardless of whether there is a business relationship between the network operator and the firewall provider.

B2.1.3 Service Flow

a) The user attempts to make a voice call using the network operator VoIP service.

b) The firewall blocks the VoIP call.

c) The UE then uses the Service Reachability functionality to initiate the call.

d) The firewall blocks the Service Reachability function.

B2.1.4 Post-conditions

- User VoIP call attempt fails.
- The firewall provider policy to block VoIP traffic is maintained.

Annex C (informative): Change history

Change history											
TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New	WI
SP-35	SP-070128	S1-070187	22.278	0001	2	Rel-8	F	Clarification on QoS classes for evolved 3GPP system	8.0.0	8.1.0	SAE-R
SP-35	SP-070127	S1-070197	22.278	0002	-	Rel-8	B	Provision of access network information to the UE	8.0.0	8.1.0	SAE-R
SP-36	SP-070365	S1-070806	22.278	0003	3	Rel-8	B	Requirement for handovers between LTE and 3GPP2 access networks	8.1.0	8.2.0	SAE-R
SP-36	SP-070369	S1-070556	22.278	0005		Rel-8	D	Editorial correction for performance requirements for evolved 3GPP system	8.1.0	8.2.0	SAE-R
SP-36	SP-070367	S1-070807	22.278	0006	1	Rel-8	B	Performance requirements for evolved 3GPP system	8.1.0	8.2.0	SAE-R
SP-36	SP-070370	S1-070764	22.278	0008	1	Rel-8	B	Requirement for national roaming between LTE-only operators and 2G/3G-only operators	8.1.0	8.2.0	SAE-R
SP-36	SP-070483	S1-070805	22.278	0009	5	Rel-8	B	Requirements for service continuity between 3GPP system and WiMAX	8.1.0	8.2.0	SAE-R
SP-37	SP-070566	S1-071324	22.278	10	2	Rel-8	D	Addition of 3GPP reference for the evolved 3GPP packet system (EPS)	8.2.0	8.3.0	SAE-R
SP-37	SP-070566	S1-071096	22.278	11	1	Rel-8	B	Multiple IP session	8.2.0	8.3.0	SAE-R
SP-37	SP-070566	S1-071097	22.278	12	1	Rel-8	B	Voice service continuity between 3GPP RAT and non 3GPP RAT	8.2.0	8.3.0	SAE-R
SP-37	SP-070566	S1-070994	22.278	13	1	Rel-8	B	Alignment of terminology with SA2	8.2.0	8.3.0	SAE-R
SP-37	SP-070566	S1-071122	22.278	14	1	Rel-8	B	Access network discovery	8.2.0	8.3.0	SAE-R
SP-38	SP-070855	S1-071856	22.278	0021	2	Rel-8	C	Support for efficient delivery of text-based broadcast messages	8.3.0	8.4.0	AIPN-SAE
SP-38	SP-070855	S1-071912	22.278	0022	1	Rel-8	B	Emergency Call Support	8.3.0	8.4.0	AIPN-SAE
SP-38	SP-070856	S1-071913	22.278	0015	3	Rel-8	B	Enhancements to Access network discovery and steering of access	8.3.0	8.4.0	AIPN-SAE
SP-38	SP-070856	S1-071915	22.278	0017	1	Rel-8	F	Multi-access MBMS	8.3.0	8.4.0	SAE-R
SP-38	SP-070856	S1-071916	22.278	0018	1	Rel-8	B	QoS change requirement clarification	8.3.0	8.4.0	SAE-R
SP-38	SP-070929	-	22.278	0024	2	Rel-8	C	Addition of list of applicable specifications for the EPS and amended scope	8.3.0	8.4.0	AIPN-SAE
SP-40	SP-080306	S1-080740	22.278	0028	2	Rel-8	F	Clarification of EPS access using pre-Rel-8 USIMs	8.4.0	9.0.0	AIPN-SAE
SP-40	SP-080306	S1-080720	22.278	0030	1	Rel-8	F	WIMAX Forum specification reference in TS 22.278	8.4.0	9.0.0	AIPN-SAE
SP-40	-							Creation of v.9.0.0. Content identical to 8.4.0 + CRs 28r2 and 30r1 (but not including CR 27r1, applicable to Rel-8 only, to remove Features which Stage 3 was not completed on time)	8.4.0	9.0.0	-
SP-41	SP-080495	S1-082018	22.278	0037	-	Rel-9	A	Service continuity (mirror to a Rel-8 CR)	9.0.0	9.1.0	AIPN-SAE
SP-41	SP-080639	-	22.278	0039	3	Rel-9	A	Access Network Discovery and Steering of Access	9.0.0	9.1.0	AIPN-SAE
SP-41	SP-080495	S1-082398	22.278	0041	2	Rel-9	A	Update IP session control and local breakout requirements	9.0.0	9.1.0	AIPN-SAE
SP-41	*SP-080495*	*S1-082386*	*22.278*	*0043*	*3*	*Rel-9*	*A*	*Requirement on support of CS Fallback*	*9.0.0*	*9.1.0*	*AIPN-SAE*
SP-41	SP-080652	-	22.278	0043	5	Rel-9	A	De-implementation of CR43r3 and implementation of 43r5, as approved during SA#41	9.1.0	9.1.1	AIPN-SAE
SP-42	SP-080774	S1-083114	22.278	0045	-	Rel-9	A	Deletion of redundant reference	9.1.1	9.2.0	AIPN-SAE
SP-42	SP-080783	S1-083465	22.278	0049	2	Rel-9	B	Terminal Identification of 3GPP and 3GPP2 devices	9.1.1	9.2.0	TEI9
SP-42	SP-080778	S1-084334	22.278	0051	1	Rel-9	B	Support for Multimedia Priority Service in EPS	9.1.1	9.2.0	AIPN-SAE

SP-42	SP-080783	S1-084368	22.278	0054	1	Rel-9	C	EPS operational deployment and mobility optimization	9.1.1	9.2.0	TEI9
SP-42	SP-080783	S1-084069	22.278	0055	-	Rel-9	B	Removal of chapter 6.1.2 and 6.1.3	9.1.1	9.2.0	TEI9
SP-42	SP-080783	S1-084425	22.278	0056	3	Rel-9	D	Enhanced ANDSF Requirements	9.1.1	9.2.0	TEI9
SP-42	SP-080783	S1-084414	22.278	0057	1	Rel-9	C	Basic support for multiaccess	9.1.1	9.2.0	TEI9
SP-42	SP-080783	S1-084363	22.278	0058	1	Rel-9	B	Adding an appendix with FMC uses cases to 22.278	9.1.1	9.2.0	TEI9
SP-44	SP-090417	S1-091153rev	22.278	0062	2	Rel-9	A	Access Technology Selection across PLMNs	9.2.0	9.3.0	SAES
SP-44	SP-090371	S1-091169	22.278	0066	-	Rel-9	A	Move sentence about non-3GPP access	9.2.0	9.3.0	SAES
SP-44	SP-090371	S1-091352	22.278	0067	-	Rel-9	A	Frequency of Scanning for Different Access Technologies	9.2.0	9.3.0	SAES
SP-45	SP-090476	S1-093272	22.278	0060	4	Rel-9	A	Alignment about accepting/rejecting CSFB	9.3.0	9.4.0	AIPN-SAE
SP-46	SP-090843	S1-094500	22.278	0070	2	Rel-9	F	One active policy ruleset in ANDSF	9.4.0	9.5.0	eANDSF
SP-46	SP-090904	-	22.278	0071	7	Rel-10	B	Adding of IFOM Requirements	9.5.0	10.0.0	IFOM
SP-47	SP-100185	S1-100236	22.278	0080	5	Rel-10	B	Requirements for Fixed Mobile Interworking	10.0.0	10.1.0	BBAI
SP-49	SP-100575	S1-102056	22.278	0089	-	Rel-10	A	Removal of references to 3GPP OSA	10.1.0	10.2.0	TEI10
SP-49	SP-100582	S1-102032	22.278	0083	-	Rel-11	B	Adding a H(e)NB use case to FMC use cases	10.1.0	11.0.0	BBAI
SP-49	SP-100582	S1-102303	22.278	0084	1	Rel-11	B	Adding a Application Mobility use case to FMC use cases	10.1.0	11.0.0	BBAI
SP-49	SP-100582	S1-102307	22.278	0086	1	Rel-11	D	Clarifications on FMC use cases	10.1.0	11.0.0	BBAI
SP-49	SP-100582	S1-102308	22.278	0085	2	Rel-11	B	Adding a Common Quota use case to FMC use cases	10.1.0	11.0.0	BBAI
SP-49	SP-100582	S1-102309	22.278	0087	2	Rel-11	B	New Requirements for Fixed Mobile Convergence scenario	10.1.0	11.0.0	BBAI
SP-50	SP-100802	S1-103263	22.278	0090	1	Rel-11	F	Clarifying the scenarios supported by FMC interworking, including building block II	11.0.0	11.1.0	BBAI
SP-50	SP-100802	S1-103266	22.278	0091	2	Rel-11	B	New Requirements for Enterprise Interworking scenario	11.0.0	11.1.0	BBAI
SP-50	SP-100802	S1-103242	22.278	0093	3	Rel-11	B	3GPP EPC based FMC	11.0.0	11.1.0	BBAI
SP-50	SP-100802	S1-103321	22.278	0095	1	Rel-11	B	Use cases for BBAI Building Block 3 - Converged scenario	11.0.0	11.1.0	BBAI
SP-50	SP-100802	S1-103323	22.278	0097	-	Rel-11	B	Evolved Packet Core support for fixed access	11.0.0	11.1.0	BBAI
-								LTE logo changed into LTE Advanced logo	11.1.0	11.1.1	-
SP-51	SP-110165	S1-110297	22.278	0094	2	Rel-11	B	Scenarios for Interworking between Mobile Operators and Application Providers	11.1.0	11.2.0	MOSAP
SP-51	SP-110165	S1-110404	22.278	0098	3	Rel-11	B	New requirements for MOSAP	11.1.0	11.2.0	MOSAP
SP-51	SP-110165	S1-110302	22.278	0100	2	Rel-11	B	Use cases for MOSAP	11.1.0	11.2.0	MOSAP
SP-51	SP-110169	S1-110181	22.278	0099	2	Rel-11	B	Fixed Broadband Access Network Requirements for BBAI Building Block 3 - Convergent scenario	11.1.0	11.2.0	BBAI
SP-52	SP-110372	S1-111223	22.278	0101	2	Rel-11	B	User consent-based charging use case for MOSAP	11.2.0	11.3.0	MOSAP
SP-52	SP-110372	S1-111412	22.278	0103	2	Rel-11	B	Non-collaboration requirements for MOSAP	11.2.0	11.3.0	MOSAP
SP-53	SP-110575	S1-112357	22.278	0110	3	Rel-11	F	MOSAP - Roaming LBO Architecture Correction	11.3.0	11.4.0	MOSAP
SP-54	SP-110883	S1-113264r	22.278	0106	3	Rel-12	B	End User Service Reachability via Non-3GPP Access Technologies	11.4.0	12.0.0	SMURFs
SP-56	SP-120295	S1-121406	22.278	0113	2	Rel-12	B	Mechanism to block Service Reachability	12.0.0	12.1.0	SMURFs
SP-59	SP-130116	S1-131308	22.278	0120	7	Rel-12	B	Incorporation of ProSe Security, Authorization & Privacy Requirements	12.1.0	12.2.0	ProSe
SP-59	SP-130116	S1-131310	22.278	0121	3	Rel-12	B	Add WLAN assisted communication requirements	12.1.0	12.2.0	ProSe
SP-59	SP-130116	S1-131319	22.278	0122	6	Rel-12	B	Add definitions and abbreviations	12.1.0	12.2.0	ProSe
SP-59	SP-130116	S1-131307	22.278	0123	2	Rel-12	B	General Requirements for Proximity Services	12.1.0	12.2.0	ProSe

SP-59	SP-130116	S1-131309	22.278	0124	1	Rel-12	B	Public Safety Specific Requirements for Proximity Services	12.1.0	12.2.0	ProSe
SP-60	SP-130315	S1-132025	22.278	0133	1	Rel-12	F	Explicitly excluding GSM and UMTS from ProSe	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132140	22.278	0150	3	Rel-12	F	Replace WiFi Direct with WLAN direct communications	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132145	22.278	0143	2	Rel-12	F	Clarify what means off network ProSe	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132146	22.278	0140	2	Rel-12	F	Deleting a duplicate Public Safety requirement arising from the ProSe Group use case	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132150	22.278	0128	3	Rel-12	F	Addition of an agreed requirement in the Public Safety Specific Requirements for Proximity Services	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132153	22.278	0152	2	Rel-12	F	Correcting Service Continuity Requirement in UE-to-Network Relay Scenarios	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132165	22.278	0153	4	Rel-12	F	Infrastructure path corrections	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132166	22.278	0156	2	Rel-12	F	Clarification to interactions between ProSe relaying, ProSe Communication and ProSe Group Communication	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132169	22.278	0148	4	Rel-12	D	Clarifying the Requirement on Authorizing ProSe Data Sessions in Public Safety Scenarios	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-132193	22.278	0131	4	Rel-12	B	Addition of a new requirement in the Public Safety Specific Requirements for Proximity Services for the use of direct radio signals	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133021	22.278	0163	1	Rel-12	B	Add requirement to limit the number of ProSe UE-to-UE relays between two Public Safety ProSe-enabled UEs to one.	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133112	22.278	0158	3	Rel-12	F	Addressing uncertainties in deployment of Public Safety ProSe	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133113	22.278	0132	4	Rel-12	F	Correction of "in / out of E-UTRAN coverage" and editorials	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133157	22.278	0172	3	Rel-12	F	ProSe System means ProSe	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133245	22.278	0181	1	Rel-12	F	Correction of ProSe Services to ProSe	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133247	22.278	0168	2	Rel-12	F	Update to Requirement on EPC Proximity Detection	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133249	22.278	0182	3	Rel-12	F	Setting Up and Handling for ProSe UE-to-UE Relay	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133252	22.278	0165	3	Rel-12	F	ProSe Discovery Definition Update	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133257	22.278	0173	2	Rel-12	F	Control of resource applies also when UEs are served by the same eNB.	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133259	22.278	0155	3	Rel-12	F	On dimensioning requirements for ProSe UE-to-UE Relay	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133267	22.278	0159	3	Rel-12	F	Clarifying the Requirement on Pre-Configuring Public Safety ProSe-enabled UEs for operations without any connection to the E-UTRAN. [PR.59-2] (Use Case 5.2.5)	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133272	22.278	0183	5	Rel-12	F	Clarification for the use of ProSe UE-to-Network Relay - Network Reachability Indication by ProSe-enabled Public Safety UE Served by E-UTRAN	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133295	22.278	0169	4	Rel-12	F	Discovery can be requested by any application	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133296	22.278	0126	2	Rel-12	F	Add a ProSe API requirement and two requirement fixes for Proximity Services	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133297	22.278	0175	4	Rel-12	F	Remaining details in consistent usage of range terminology	12.2.0	12.3.0	ProSe

SP-60	SP-130315	S1-133299	22.278	0146	8	Rel-12	F	Service description for ProSe Discovery and ProSe Communication	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133301	22.278	0136	2	Rel-12	F	Clarifying the use of the term "range"	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133310	22.278	0127	9	Rel-12	F	Broadening of ProSe Communication Definition to include ProSe Group and ProSe Broadcast Communications for Public Safety.	12.2.0	12.3.0	ProSe
SP-60	SP-130315	S1-133311	22.278	0176	4	Rel-12	F	The addition of a definition for "communication range"	12.2.0	12.3.0	ProSe
SP-61	SP-130412	S1-134013	22.278	0186	-	Rel-12	D	Removing duplicate ProSe definitions	12.3.0	12.4.0	ProSe
SP-61	SP-130412	S1-134144	22.278	0187	1	Rel-12	F	Clarification on the ProSe Communication part in ProSe Feature description	12.3.0	12.4.0	ProSe
SP-61	SP-130412	S1-134145	22.278	0188	1	Rel-12	F	Clarification on the agreed wording on "concurrent" or "concurrently" in ProSe	12.3.0	12.4.0	ProSe
SP-61	SP-130412	S1-134170	22.278	0189	1	Rel-12	F	Clarify requirements for ProSe Security in Public Safety applications.	12.3.0	12.4.0	ProSe
SP-64	SP-140236	S1-141576	22.278	0201	2	Rel-13	B	Differential paging for voice over E-UTRAN vs. other services using the IMS signalling bearer	12.4.0	13.0.0	voE-UTRAN_PPD
SP-65	SP-140523	S1-143486	22.278	0210	1	Rel-13	A	I-WLAN clean up	13.0.0	13.1.0	TEI12
SP-66	SP-140749	S1-144429	22.278	215	-	Rel-13	F	Interference during ProSe Operation in Limited Service state	13.1.0	13.2.0	ProSe
SP-72	SP-160352	S1-161315	22.278	228	1	Rel-13	F	Removal of list of EPS Applicable Specifications	13.2.0	13.3.0	TEI13
SP-72	SP-160362	S1-161602	22.278	227	4	Rel-14	B	Requirements for relay UE selection for remote UE access via relay UE	13.3.0	14.0.0	REAR
SP-72	SP-160362	S1-161603	22.278	225	7	Rel-14	B	Requirements for Indirect 3GPP Communication	13.3.0	14.0.0	REAR
SP-73	SP-160539	S1-162058	22.278	0230		Rel-14	A	Removal of incorrect reference in scope	14.0.0	14.1.0	TEI14
SP-74	SP-160895	S1-163440	22.278	0231	3	Rel-14	F	Clarification on REAR	14.1.0	14.2.0	REAR
SP-74	SP-160901	S1-163241	22.278	0232	2	Rel-15	B	Inclusion of WLAN direct discovery technologies as an alternative for ProSe direct discovery	14.1.0	15.0.0	ProSe_WLAN_DD
SP-75	SP-170153	S1-170356	22.278	0236		Rel-15	A	Removal of CS Fallback support for Evolved ProSe Remote UE	15.0.0	15.1.0	REAR
SP-75	SP-170153	S1-171439	22.278	0237	1	Rel-15	A	Relay selection criteria	15.0.0	15.1.0	REAR
SP-79	SP-180129	S1-180290	22.278	0240	1	Rel-15	F	Clarification of Option 3 core network requirements	15.1.0	15.2.0	SMARTER
SP-79	SP-180129	S1-180627	22.278	0239	4	Rel-15	F	Release 15 alignment on the performance requirements	15.1.0	15.2.0	TEI15
SP-79	-	-						MCC corrected " as specified in TR 38.913" into "as described in TR 38.913".	15.1.0	15.2.0	
SP-80	SP-180304	S1-181359	22.278	0247	2	Rel-15	F	Release 15 further alignment on URLLC KPIs	15.2.0	15.3.0	SMARTER
SP-81	SP-180750	S1-182630	22.278	0258	1	Rel-15	A	Inclusion of the CIoT requirements	15.3.0	15.4.0	TEI13
SP-81	SP-180753	S1-182041	22.278	0253		Rel-15	F	Alignment of REAR requirement	15.3.0	15.4.0	REAR

History

Document history		
V15.3.0	July 2018	Publication
V15.4.0	October 2018	Publication