ETSI TS 122 278 V8.7.0 (2009-01)

Technical Specification

Universal Mobile Telecommunications System (UMTS);
LTE;
Service requirements for the Evolved Packet System (EPS)
(3GPP TS 22.278 version 8.7.0 Release 8)

Reference
DTS/TSGS-0122278v870

Keywords
LTE, UMTS

ETSI

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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where:

x the first digit:

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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. Additional requirements for E-UTRAN are contained in the specifications identified in annex B.

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] Void

[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.

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.

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).

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.

3.2 Abbreviations

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

NRT Non Real Time
RT Real Time

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

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. Mobility functionality shall be optimized meaning that it offers 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 within 3GPP access systems and also between 3GPP access systems and non 3GPP access systems. Support of service continuity within 3GPP access systems and also between 3GPP access systems and 3GPP2 access systems shall not require the UE to support simultaneous radio transmission.

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.

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 Ability to effectively handle a variety of different types of IP traffic

The Evolved Packet System shall support both IPv4 and IPv6 connectivity. IPv4 only, IPv6 only and dual mode (IPv4/IPv6) terminals should be supported. Interworking between terminals, servers and access systems supporting different versions of IP shall be possible. Mobility between access systems supporting different IP versions shall be supported with minimal network/terminal impacts.

The operator shall be able to control whether or not an IPv4 only terminal is allowed access to the network.

Service continuity of subscriber IP sessions shall be supported during in UE handovers from one IP access network to another IP access network, regardless of whether the new IP access network supports the same version of IP as the old IP access network.

The Evolved Packet System shall be able to handle user-to-server traffic, user-to-user traffic and user-to-group traffic.

The Evolved Packet System shall be able to handle different types of IP traffic, such as real-time (e.g. VoIP), non-real time traffic (e.g. Web browsing), and mission critical traffic (e.g. M-Commerce).

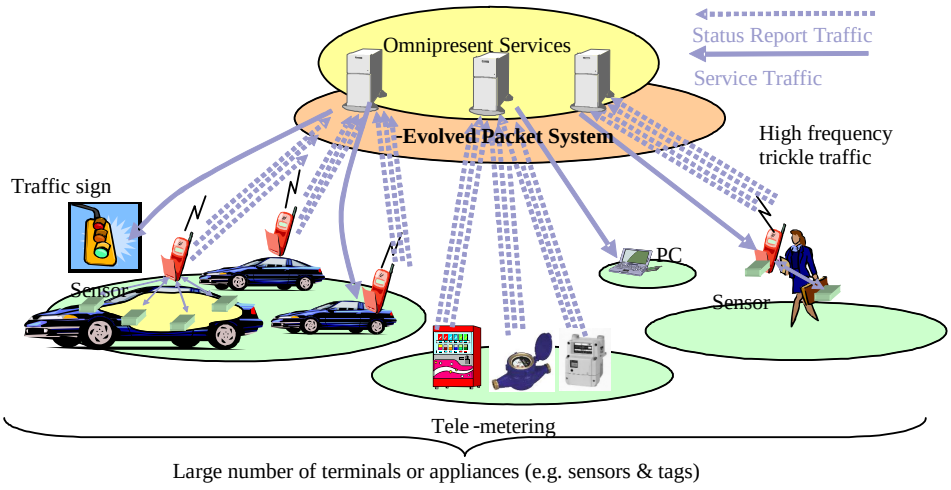

Figure 1: Traffic models of omnipresent services

6.1.3 IP address support

The Evolved Packet System shall have the ability to support both private and public IPv4 and IPv6 addresses. User device IP addresses should normally be allocated dynamically by the network operator and managed without user intervention. For business critical applications, and for firewall configuration simplification purposes, it shall be possible for a user to be allocated a static IP address; the static address shall be assigned by the network operator. Details of an assigned static IP address shall be maintained with the subscriber"s records in the HLR/HSS.

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 scaleable 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.

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].

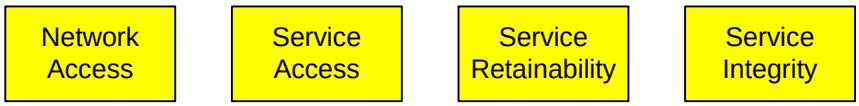

Figure 2: Phases of service use from customer's point of view

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 Void

6.5 Void

7 Multi-access and seamless mobility

7.1 Mobility management

7.1.1 Heterogeneous access systems mobility

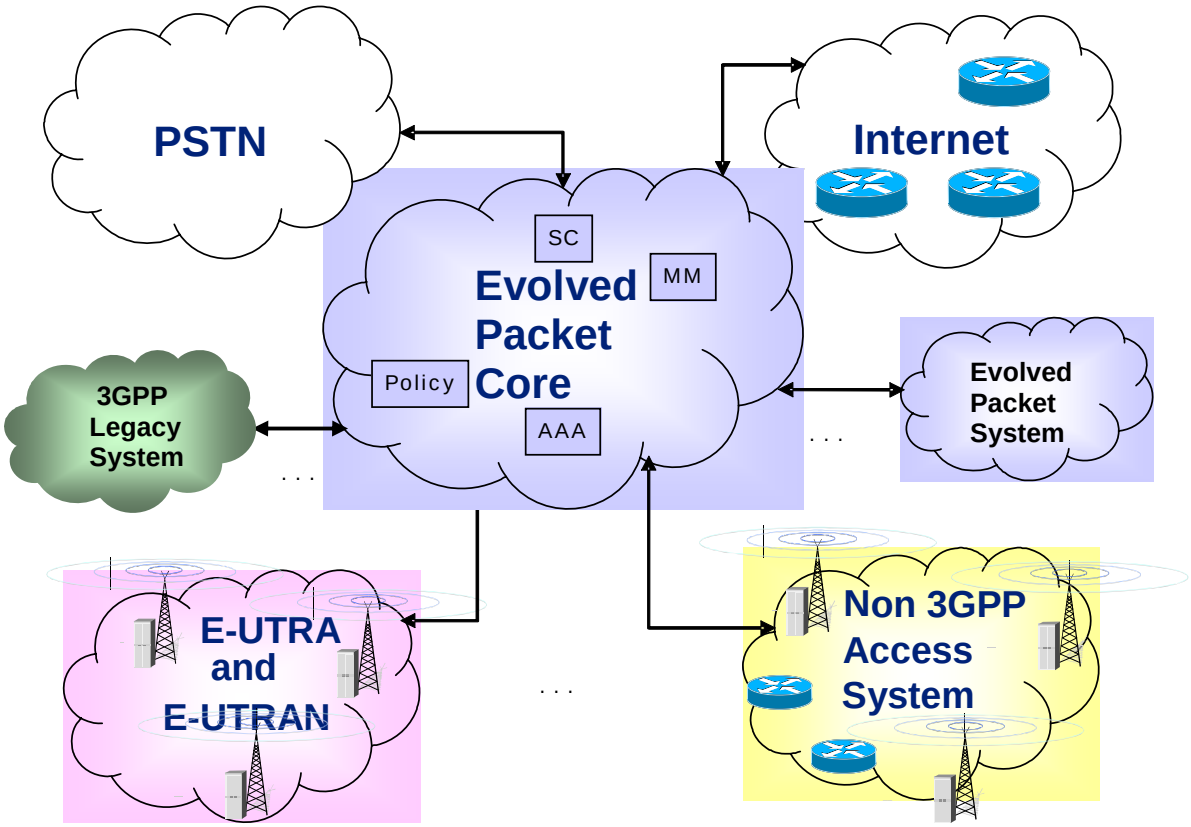

Figure 3: Heterogeneous access system mobility between 3GPP Legacy Systems or E-UTRAN and non 3GPP Access Systems including Fixed Access systems

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.

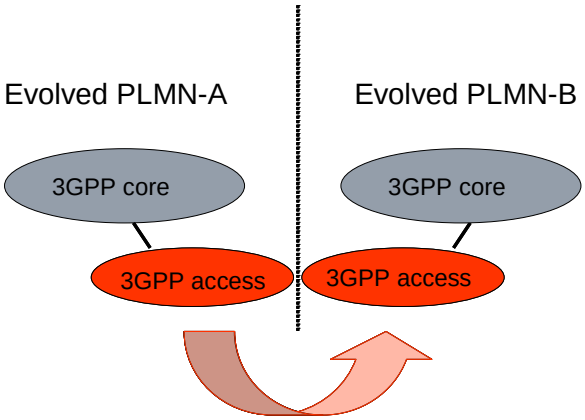

Figure 4: Inter-PLMN handover with seamless service continuity within a 3GPP specified access system

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. This mechanism is meant to facilitate changes 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.

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, 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.

If the UE finds an access technology with a higher priority than the currently used access technology, belonging to a PLMN which has higher priority then the RPLMN, the UE may reselect such PLMN. 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. The list provided by the RPLMN takes precedence over the list provided by the HPLMN. The list of preferred access technologies is specific to a PLMN.

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.

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.

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). A study of the Evolved Packet Core can be found in TS23.882 [7] and the evolved radio access network E-UTRA and E-UTRAN in TR25.913 [4].

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].

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.

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 to serve as an I-WLAN access. 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.

Annex B (normative): Evolved Packet System (EPS) applicable specifications

The specifications listed in clause B.1contain requirements applicable to the Evolved Packet System (EPS)

B.1 EPS Applicable Specifications

TS	Title
21.905	Vocabulary for 3GPP Specifications
22.011	Service accessibility
22.016	International Mobile Equipment Identities (IMEI)
22.022	Personalisation of Mobile Equipment (ME); Mobile functionality specification
22.030	Man-Machine Interface (MMI) of the User Equipment (UE)
22.038	USIM Application Toolkit (USAT/SAT); Service description; Stage 1
22.041	Operator Determined Call Barring
22.042	Network Identity and Time Zone (NITZ) service description; Stage 1
22.066	Support of Mobile Number Portability (MNP); Stage 1
22.067	enhanced Multi-Level Precedence and Pre-emption service (eMLPP); Stage 1
22.071	Location Services (LCS); Service description; Stage 1
22.078	Customised Applications for Mobile network Enhanced Logic (CAMEL)
22.101	Service Principles
22.105	Services and Service Capabilities
22.115	Charging and Billing
22.127	Service Requirement for the Open Services Access (OSA)
22.129	Handover requirements between UTRAN and GERAN or other radio systems
22.146	Multimedia Broadcast/Multicast Service (MBMS); Stage 1
22.173	IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1
22.174	Push service; Stage 1
22.182	Customized Alerting Tones (CAT) Requirements
22.226	Global text telephony (GTT); Stage 1: Service description
22.228	Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS); Stage 1
22.233	Transparent end-to-end packet-switched streaming service; Stage 1
22.234	Requirements on 3GPP system to Wireless Local Area Network (WLAN) interworking
22.240	Service requirements for 3GPP Generic User Profile (GUP); Stage 1
22.242	Digital Rights Management (DRM); Stage 1
22.246	Multimedia Broadcast/Multicast Service (MBMS) user services; Stage 1
22.250	IP Multimedia Subsystem (IMS) Group Management; Stage 1
22.259	Service requirements for Personal Network Management (PNM); Stage 1
22.279	Combined Circuit Switched (CS) and IP Multimedia Subsystem (IMS) sessions; Stage 1
22.340	IP Multimedia Subsystem (IMS) messaging; Stage 1

Annex C (informative): Change history

Change history											
TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New	WI
2006-06								First skeleton		0.0.0	
2006-06	SA1#33	S1-060877						Initial draft (Inclusion of agreed documents at SA1#33 in order of related sections: S1-060693, S1-060717, S1-060715 (ref only), S1-060718 (ref only), S1-060901, S1-060900, S1-060905, S1-060810 (section 1 only - modified figure)	0.0.0	0.1.0	
2006-08	SA1 Ad hoc	S1-061067						Inclusion of agreed documents(or even only parts of it e.g. reference) as well as modifications discussed at SA1 Ad hoc. Related document numbers: S1-060991, S1-060992, S1-060993, S1-060978, S1-060979, S1-060989, S1-061006, S1-061037, S1-061039, S1-061052, S1-061062, S1-061063, S1-061091, S1-061089, S1-061090, S1-061092, S1-061082, S1-061066, S1-061093, S1-061086, S1-061087	0.1.0	0.2.0	
2006-09	SA#33							Presentation at SA for information	0.2.0	1.0.0	
2006-10	SA1#34	S1-061338						Inclusion of agreed documents	1.0.0	1.1.0	
2006-10	SA1#34	S1-061427						Raised to version 2.0.0 for presentation to SA for approval	1.1.0	2.0.0	
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	S1-080561	22.278	0027	1	Rel-8	C	Removal of features (Emergency call and MBMS) from Rel-8 SAE	8.4.0	8.5.0	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	8.5.0	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	8.5.0	AIPN-SAE
SP-41	SP-080495	S1-082182	22.278	0033	1	Rel-8	F	CR to TS 22.278 ch 5 to align R8 stage 1 and stage 2 wrt service continuity	8.5.0	8.6.0	AIPN-SAE
SP-41	SP-080495	S1-082183	22.278	0036	1	Rel-8	F	CR to TS 22.278 ch 7.1.4.2 to align stage 1 and stage 2 wrt service continuity	8.5.0	8.6.0	AIPN-SAE
SP-41	SP-080639	-	22.278	0038	3	Rel-8	F	Access Network Discovery and Steering of Access	8.5.0	8.6.0	AIPN-SAE
SP-41	SP-080495	S1-082369	22.278	0040	1	Rel-8	F	CR to 22.278 on Update IP session control and local breakout requirements	8.5.0	8.6.0	AIPN-SAE
SP-41	*SP-080495*	*S1-082385*	*22.278*	*0042*	*3*	*Rel-8*	*F*	*Requirement on support of CS Fallback - replaced by SP-080652*	*8.5.0*	*8.6.0*	*AIPN-SAE*
SP-41	SP-080652	-	22.278	0042	5	Rel-8	F	CR 42r3 "de-implemented" and CR 42r5 implemented, as approved during SA#41	8.6.0	8.6.1	AIPN-SAE
SP-42	SP-080774	S1-083383	22.278	0044	1	Rel-8	F	Deletion of redundant reference	8.6.1	8.7.0	AIPN-SAE

History

Document history		
V8.7.0	January 2009	Publication