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3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

Network Evolution for cdma2000 Networks

System Requirements Document

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1 **1.0 INTRODUCTION**

2 This document specifies the system requirements for the phased
3 development of the Evolved Network.

4 This document is intended to be used to guide the formal technical
5 development of the 3GPP2 Evolved Core Network and the 3GPP2
6 Evolved Radio Access Network that will mainly support the 3GPP2
7 Enhanced Packet Data Air Interface (E-PDAI) system.

8 Throughout this document, the following terminology conventions
9 are used:

10 ■ “shall” and “shall not” identify items of interest that are to be
11 strictly followed and from which no deviation is
12 recommended.

13 ■ “should” indicate items of interest that are highly desirable
14 and particularly suitable, without identifying or excluding
15 other items;

16 ■ “may” indicate items of interest that are optional but
17 permissible within the limits of this recommendation.

18 ■ The phrase “The Evolved Network shall be capable of” is
19 intended to mean the following:

20 Stage 3 text will implement these functions as OPTIONAL
21 such that manufacturers can choose to implement or not to
22 implement these functions in their equipment based on the
23 preferences of their customers. In addition, operators may
24 also choose whether or not to activate that functionality
25 based on operator policies.

26 **2.0 REFERENCES**

27 The references which are applicable to this specification include
28 the following:

29 [1] 3GPP2 S.R0058 IP Multimedia Domain SRD

30 [2] 3GPP2 S.R0079 End-to-End QoS Stage 1

31 [3] 3GPP2 S.R0113 cdma2000 Enhanced Packet Data Air
32 Interface System SRD

33 [4] 3GPP2 S.R0115 All IP Emergency Call Support

34 [5] 3GPP2 S.R0117 Multimedia Priority Service (MMPS) for
35 MMD-based Networks Stage 1 Requirements

- 1 [6] ITU-T Recommendation Y.1541 SERIES Y: GLOBAL
 2 INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL
 3 ASPECTS AND NEXT-GENERATION NETWORKS - Network
 4 performance objectives for IP-based services
- 5 [7] ITU-T Recommendation Y.1542 SERIES Y: GLOBAL
 6 INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL
 7 ASPECTS AND NEXT-GENERATION NETWORKS -
 8 Framework for achieving end-to-end IP performance
 9 objectives

11 3.0 DEFINITIONS AND ABBREVIATIONS

12 The terms and abbreviations which are used within this
 13 specification are defined as follows:

1xRTT	cdma2000 ^{®1} 1x radio transmission technology
3GPP-LTE	3GPP Long Term Evolution radio technology
AAA	Authentication, Authorization, and Accounting
AN	Access Network
Application Server	A server (i.e., SIP Application Server, or OSA Application Server) that offers value added IP Multimedia services and resides either in the user's home Evolved Network or in a third party location. The third party could be a network or simply a stand-alone application server.
AT	Access Terminal
Competitive network technologies	Competitive network technologies include but are not limited to 3GPP SAE (TS22.258), WiMAX
E-PDAI	3GPP2 Enhanced Packet Data Air Interface
Home Network	The network to which the user is subscribed for service.

¹ cdma2000[®] is the trademark for the technical nomenclature for certain specifications and standards of the Organizational Partners (OPs) of 3GPP2. Geographically (and as of the date of publication), cdma2000[®] is a registered trademark of the Telecommunications Industry Association (TIA-USA) in the United States.

HRPD	High Rate Packet Data
IP	Internet Protocol
IP Peering	The interconnection of administratively separate IP networks for the purpose of exchanging traffic between the customers of each network.
ISP	Internet Service Provider
JAIN	Java APIs for Integrated Networks
JSLEE	Java Service Logic Execution Environment
Legacy Networks	3GPP2 networks including cdma2000 Rev. 0 through Rev. D and HRPD Rev. 0 through Rev. B
Legacy Terminals	A UE capable of operating on a Legacy Network
NAT	Network Address Translation
Non-SIP Application	Any application that does not use SIP for session control
NSP	Network Service Provider
PSTN	Public Switched Telephone Network
OAM	Operations, Administration, and Maintenance
Roaming	The ability for a user to obtain services through the visited network.
Service	A resource or facility provided by a service provider to their "users" (possibly for a fee). A "user" is any consumer of the Service outside the domain of the service provider. A Service may make use of zero or more enablers and may incorporate other technologies.

Service Enabler	A specification or group of specifications published by a Standards Development Organization (SDO) and used for the creation, implementation, and execution of a service.
SIP	Session Initiation Protocol
SLA	Service Level Agreement
UE	User Equipment Also known as Access Terminal (AT) or Mobile Station (MS)
UNI	User Network Interface
Vanity Number	A telephone number that spells something on the phone keypad (e.g. 1-800-3GPP2SEC).
Visited Network	A network on which the user may be provided service even though he/she is not subscribed for service (i.e., a network that is not the home network). The visited network may use the same or different access technology and can be owned by the same or different operator as the home network.
WiFi	One or more of the 802.11a/b/g radio technologies.
WLAN	Wireless Local Area Network

1

2 4.0 GENERAL DESCRIPTION

3 The Evolved Network is intended to provide the cdma2000
4 community with an architecture that can be deployed within the
5 next three (3) years to coincide with the deployment of the
6 cdma2000 E-PDAI air interface systems. This network will support
7 rapid deployment of enhanced services and features that will
8 benefit the cdma2000 marketplace and, more specifically,
9 cdma2000 users and stakeholders.

1 The design goals for the evolution of the network should focus on
2 reducing of network complexity, simplifying the associated
3 architecture, and improving interoperability across different access
4 technologies. Uniform connectivity is required to all access
5 technologies supporting intra and inter technology mobility based
6 on standardized IP interfaces.

7 The Evolved Network includes the following major components
8 related to the cdma2000 air interface family of standards:

- 9 ▪ An evolved packet-switched core network which is access
10 network agnostic and includes substantial performance
11 enhancements, as described herein, over the existing 3GPP2
12 Core Network.
- 13 ▪ An evolved RAN which supports the E-PDAI and includes
14 substantial performance enhancements, as described herein,
15 over the Legacy Networks.

16 The primary areas of performance enhancements include the
17 following:

- 18 ▪ Higher data rates
- 19 ▪ Reduced communication delay
- 20 ▪ Improved communication quality (i.e., end to end QoS)
- 21 ▪ Improved data transmission efficiency
- 22 ▪ Reduced connection set-up time
- 23 ▪ Reduce dsignaling latency
- 24 ▪ Improved efficiency and scalability of mobility management
25 operations
- 26 ▪ Separation of control signaling and bearer paths between the
27 RAN and Core Network.
- 28 ▪ Increased security and privacy for users and network
- 29 ▪ Expanded and improved support of a variety of access
30 technologies including:
 - 31 • Enabling seamless mobility across technologies
32 including service continuity during and after handoff.
 - 33 • Maintaining consistent access control across
34 technologies – authentication, authorization,
35 accounting
 - 36 • Enabling communication privacy in multi-technology
37 environment

- 1 • Supporting service equivalence across technologies –
2 access to the same service (e.g., IMS-based services)

3

4 **5.0 HIGH LEVEL SYSTEM REQUIREMENTS**

5 The requirements for development of the 3GPP2 Evolved Network
6 follow.

7

8 **5.1 Basic Network Capability Requirements**

9 This section details the basic network requirements including the
10 required network architecture concepts, IPv4/IPv6 support and
11 routing requirements, types of traffic supported, IP session control,
12 QoS support, etc.

13 5.1.1 The Evolved Core Network shall meet all requirements of the latest
14 published version of S.R0058 All IP MMD SRD.

15 5.1.2 The Evolved Core Network shall be a highly scalable and
16 manageable IP network and shall not include any circuit paths.

17 5.1.3 The Evolved Network shall be able to transport both IPv4 and IPv6
18 protocols and fully interwork between them.

19 5.1.4 The Evolved Network shall be capable of handling real-time and
20 non-real time traffic.

21 5.1.5 The Evolved Network shall support IP broadcast and multicast
22 mechanisms.

23 5.1.6 It shall be possible for a UE to obtain information on the
24 availability of and the authorization for 3GPP2 and non-3GPP2
25 access networks with minimal user intervention.

26 5.1.7 The Evolved Network shall be designed to maximize the use of
27 standardized IP protocols. This avoids duplicate protocol
28 development work, enhances interoperability with other networks,
29 and increases operator options for interoperability of RAN and IP
30 system elements from multiple vendors.

31 5.1.8 The Evolved Network shall be capable of interworking with
32 cdma2000 legacy packet-switched and circuit-switched services.

33 5.1.9 The Evolved Network shall support the ability of the home system
34 to make transcoding decisions (e.g. where to transcode and which
35 voice/video codec to use).

36

1 **5.2 Core/Access Network Interworking Requirements**

2 This section details the core network and the access networks
3 expected to be supported, including service continuity
4 requirements and seamless mobility between access networks.
5 This section also includes backward compatibility requirements
6 including support for cdma2000-1x and HRPD RAN and terminal
7 devices.

8 5.2.1 The Evolved Core Network shall be access network agnostic.

9 5.2.2 The Evolved Core Network shall be able to support 3GPP2 Evolved
10 RANs (for E-PDAI), interconnection to the PSTN, and non-3GPP2
11 RANs (e.g. WLAN) plus future radio access network evolutions
12 including networks that support SIP services and IP-based
13 broadband networks.

14 5.2.3 The Evolved Core Network shall be able to support 3GPP2 legacy
15 RANs (e.g. cdma2000 Rev. 0 - Rev. D, HRPD Rev. 0 - Rev. B air
16 interfaces).

17 5.2.4 The Evolved Core Network shall support mobility between
18 supported RANs (e.g., between E-PDAI and WLAN, or between E-
19 PDAI and HRPD Rev. B).

20 5.2.5 The Evolved Core Network shall provide standardized interfaces for
21 mobility management within and across access networks that are
22 connected to supported RANs.

23 5.2.6 The Evolved Core Network shall support mobility between the
24 home Evolved Core Network and visited Evolved Core Network.

25 5.2.7 The Evolved Core Network shall provide standardized interfaces for
26 mobility management between the home Evolved Core Network and
27 visited Evolved Core Network.

28 5.2.8 The Evolved Network shall be based on standardized interfaces and
29 protocols.

30 5.2.9 The Evolved Network shall be based on a common mobility
31 framework for all services (e.g., Mobile IP).

32 5.2.10 The Evolved Network shall provide IP mobility when the UE moves
33 from one network to another, including support for a different IP
34 network address or prefix.

35 5.2.11 The Evolved Network shall support IP mobility for packet data
36 services of legacy terminals, including those that support only
37 simple IP.

38 5.2.12 The Evolved Network shall support IP mobility within and across
39 3GPP2 and non-3GPP2 access networks (e.g. 3GPP, WLAN,
40 WiMAX).

- 1 5.2.13 The Evolved Network shall provide mechanisms to minimize
2 latency and packet loss when the UE moves from one access
3 network to another.
- 4 5.2.14 The Evolved Network shall provide mechanisms to optimize
5 routing for user data traffic based on network operator's policies
6 when the UE changes its point of network attachment (e.g., Anchor
7 AN).
- 8 5.2.15 The Evolved Network shall support UEs that can be assigned
9 multiple IP addresses and that have the ability to use them at the
10 same time (e.g. assign multiple IP addresses, using multiple
11 authentications and multiple bearer paths).
- 12 5.2.16 The visited Evolved Network shall be capable of assigning an IP
13 address to the roaming UE based on permissions of its home
14 operator's policy settings.
- 15 5.2.17 The Evolved Network shall provide mechanisms to support
16 minimization of signaling for mobility management when the UE
17 moves locally within an operator defined region (e.g. city, state,
18 province).
- 19 5.2.18 The Evolved Network shall be able to efficiently and scalably
20 support large numbers of UEs.
- 21 5.2.19 The Evolved Network shall be able to distribute mobility state
22 information across multiple network nodes.
- 23 5.2.20 The Evolved RAN shall support devices with differing capabilities
24 (e.g., voice-only, voice and video, data only) and with different
25 applications and features.
- 26 5.2.21 The Evolved RAN shall support start of session and mid-session
27 codec negotiation.

28

29 **5.3 Security and Privacy Requirements**

30 This section details the requirements for authentication, data
31 encryption, and other service security and privacy requirements
32 (e.g., location privacy). This section also details the requirements
33 for the availability, integrity, and survivability of the network
34 against denial of service attacks and other threats (e.g., adware,
35 spyware, and viruses).

36 Requirements for this section are still under study.

37

1 **5.4 Requirements for Support of Other Services**

2 This section describes how services are to be supported on the
3 Evolved Network.

4 5.4.1 The Evolved Network shall support the addition, modification, and
5 removal of services without disruption of other ongoing services.
6 That is, it shall be possible to introduce a new service into an
7 operational network, modify an existing service, or remove a
8 service without stopping other ongoing services.

9 5.4.2 The Evolved Network shall support the addition, modification, and
10 removal of new application servers without disruption of active
11 application servers. That is, it shall be possible to introduce a new
12 application server into an operational network, modify an existing
13 application server, or remove an application server without
14 stopping other active application servers.

15 5.4.3 The Evolved Network shall be capable of generating accounting
16 related information that is sufficient for both evolved and legacy
17 accounting systems.

18 5.4.4 The Evolved Network shall provide management of all services
19 hosted and partnered by the network service provider to meet
20 customer expectations of service quality in home and visited
21 networks subject to provider agreements. Services shall include
22 real-time, non-real-time services, SIP and non-SIP based services.

23 5.4.5 The Evolved Network shall support end-to-end resource
24 reservation and allocation including radio access and core network
25 resources, transport, and addressable resources in other network
26 service provider networks when SLAs and interconnecting
27 interfaces so allow.

28 5.4.6 The Evolved Network shall support application servers that use
29 standardized APIs (e.g., Parlay, JAIN SIP, JSLEE, and SIP servlets)
30 to billing, provisioning, OAM, or other operational systems.

31 5.4.7 The Evolved Network shall provide application access (read and
32 write) to needed subscriber provisioned data.

33 5.4.8 The Evolved Network shall support Multimedia Priority Service
34 (MMPS) as defined in 3GPP2 S.R0117..

35

1 **5.5 Network Performance Requirements**

2 This section details quantifiable and/or verifiable performance
3 requirements.

4 5.5.1 The Evolved Network shall be capable of supporting IP
5 communication with maximum IP transfer delays that do not
6 exceed 100 msec for Class 0 (constrained routing and distance)
7 and 400 msec for Class 1 (less constrained routing and distances)
8 environments as defined and measured according to ITU-T
9 Recommendations Y.1541, Y.1542, and related amendments.

10 5.5.2 The Evolved Network shall be capable of supporting IP
11 communication with IP delay variations to do not exceed 50 msec
12 for both Class 0 (constrained routing and distance) and Class 1
13 (less constrained routing and distances) environments as defined
14 and measured according to ITU-T Recommendations Y.1541,
15 Y.1542, and related amendments.

16

17 **5.6 Session Control Requirements**

18 This section details the requirements associated with SIP and non-
19 SIP session control, including aspects of authorization, policy
20 control, and static/dynamic session interaction.

21 5.6.1 The Evolved Network shall support S.R0058 requirements SIP-
22 0001 through SIP-0010 for non-SIP sessions.

23 5.6.2 The Evolved Network shall support a user's authorization to access
24 services based solely on authentication of the service subscriber
25 and independent from any authentication of the access device.

26 5.6.3 The Evolved Network shall support a user's authorization to access
27 services based solely on device authentication.

28 5.6.4 The Evolved Network shall control the access to and use of services
29 by subscribers consistent with operator policies and subscription
30 profile.

31 5.6.5 The Evolved Network shall control the usage of network resources
32 that are applied to SIP-based and non-SIP applications to meet
33 customer expectation of service quality.

34 5.6.6 The Evolved Network shall be capable of accounting for the usage
35 of services including start and stop times as well as calling and
36 called party identities when the Evolved Network is either the home
37 or the visited network.

- 1 5.6.7 Any subscriber profile data required for processing sessions in the
2 Evolved Network shall be available from a single shared data
3 repository provided by the system for NSP hosted and partner
4 applications.
- 5 5.6.8 The Evolved Network shall provide mechanisms to support flexible
6 feature interaction management, handling both static feature
7 interactions (those which can be resolved prior to a session) and
8 dynamic feature interactions (those which can only be resolved
9 during a session) amongst SIP-based features. These mechanisms
10 should be programmable by the NSP without software upgrade of
11 the components in the network (e.g., by means of providing filter
12 criteria inputs). This requirement may apply at either the session-
13 control (e.g., SIP) or application (e.g., application server) layers.
- 14 5.6.9 The Evolved Network shall have the capability to determine the set
15 of sessions in progress for a user and to terminate any of those
16 sessions.
- 17 5.6.10 When a user initiates a session, the network shall manage, on a
18 subscriber-by-subscriber basis, the set of NSP-managed and
19 partner application servers that get invoked.

20

21 **5.7 Quality of Service Requirements**

22 This section details the QoS requirements to be supported by the
23 Evolved Network.

- 24 5.7.1 The Evolved Network shall meet all requirements of the latest
25 published version of S.R0079 End-to-End QoS Stage 1.
- 26 5.7.2 The Evolved Network shall support end-to-end QoS on a per
27 application and per user basis.
- 28 5.7.3 The Evolved Network shall provide quality of service (QoS) control
29 based on SLAs and network operator policies.
- 30 5.7.4 The Evolved Network shall be based on a common QoS framework
31 for all services.
- 32 5.7.5 The Evolved Network shall provide authorized subscribers with the
33 capability to request their QoS preferences (both subscriber-
34 specific and application-specific) from the network.
- 35 5.7.6 The Evolved Network shall support QoS operations that are
36 backward compatible with cdma2000 legacy networks.
- 37 5.7.7 The Evolved Network shall be able to override the subscriber's QoS
38 preferences.
- 39 5.7.8 The Evolved Network shall be able to audit an individual session's
40 QoS.

1 5.7.9 The Evolved Network shall provide the ability to authorize end-to-
2 end QoS on a per application and per subscriber basis for both SIP
3 and non-SIP applications.

4 5.7.10 The Evolved Network shall perform network resource admission
5 control at various enforcement points in the access network and
6 core network.

7 5.7.11 The Evolved Network resource admission control decision shall be
8 subject to policy control for both SIP and non-SIP applications.

9 5.7.12 The Evolved Network shall provide the capability of terminating
10 the application setup on failure of the QoS authorization.

11 5.7.13 The Evolved Network shall provide the capability for the lower
12 network layers to inform the higher network layers and the
13 application when QoS resources allocated to the application are
14 changed in either the access network or the core network (e.g. due
15 to hand-off between differing access network technologies).

16 5.7.14 The Evolved Network shall provide the capability for the access
17 network to inform higher network layers that a device is no longer
18 reachable (e.g. due to lost coverage, power-down, and other similar
19 conditions).

20 5.7.15 The Evolved Network resource admission control shall take into
21 account the access network QoS, the network layer QoS between
22 the access and core network, and the network layer QoS between
23 the NSP network and external networks as agreed to in the SLAs.

24 5.7.16 It shall be possible to create, modify, and delete QoS reservations
25 from the UE (user side) as well as the network (network side).

26

27 **5.8 Roaming Requirements**

28 This section details the requirements for Evolved Network roaming
29 services.

30 5.8.1 The Evolved Network shall support protocols and procedures
31 between home and visited networks to allow application-layer
32 services to be provided to roaming subscribers connected via
33 multiple access networks (e.g., HRPD and WLAN).

34 5.8.2 Contingent upon the visited Evolved Network's ability to support
35 bearer characteristics of a given feature or service and in
36 accordance with SLAs, the Evolved Network shall provide
37 consistent user experience of features and services in home and
38 roaming networks.

- 1 5.8.3 For call originations, the originator's home Evolved Network
2 operator shall be able to control whether bearer traffic is routed via
3 the originator's home Evolved Network or via the visited Evolved
4 Network only.
- 5 5.8.4 For call terminations, the terminating party's home operator shall
6 be able to control whether bearer traffic is routed through the
7 terminating party's home Evolved Network or via the visited
8 Evolved Network only.
- 9 5.8.5 The visited network shall provide a mechanism to allow for policies
10 (e.g., QoS and charging rules) to be provided by the home system
11 where the visited network supports appropriate interfaces.
- 12 5.8.6 The visited network shall be capable of enforcing local policies (e.g.,
13 for QoS) that may take precedence over home policies.
- 14 5.8.7 The visited network shall be capable of providing the subscriber
15 with at least the same level of security as provided by the home
16 network.
- 17 5.8.8 The visited network shall provide support for Emergency Services
18 for roaming users, in compliance with S.R0115 All IP Emergency
19 Call Support.
- 20 5.8.9 The visited network shall support Multimedia Priority Service for
21 roaming users, in compliance with S.R0117 Multimedia Priority
22 Service (MMPS) for MMD-based Networks Stage 1 Requirements.
- 23 5.8.10 The operator of the visited network shall be capable of making
24 decisions related to the roaming user's use of visited network
25 services and resources in the following areas:
- 26 ▪ The types of network resources (e.g, QoS, accounting,) available to roaming users
 - 27 ▪ The amount of network resources (percentage of access bandwidth, etc.) available to roaming users
 - 28 ▪ Whether network resources are granted to a visited
29 subscriber for better than best-effort service based on the
30 identity of the home provider
 - 31 ▪ Whether network resources are granted to a visited
32 subscriber based on the application that the user is
33 invoking, for both SIP and non-SIP applications
 - 34 ▪ Whether network services or content are delivered to a
35 visiting subscriber based on legal/contractual restrictions
 - 36 ▪ Whether composed network applications can be delivered
37 based on local feature interaction rules
 - 38 ▪
 - 39 ▪

- 1 ▪ Whether the requested service can be provided to a visiting
2 subscriber after meeting home and local security restrictions

3 5.8.11 Roaming shall not impose any mandates on visited networks such
4 as the following:

- 5 ▪ Deployment of the same applications (SIP or non-SIP) as the
6 home network operator
- 7 ▪ Deployment of the same access network technologies as the
8 home network operator
- 9 ▪ Automatic override of any local support policy, QoS, Security
10 and Accounting restrictions in favor of home network
11 variants

12

13 **5.9 Peering Requirements**

14 This section addresses the requirements related to interfacing and
15 interaction between an Evolved Network with another (peer)
16 Evolved Network.

17 5.9.1 The Evolved Network shall support direct and indirect IP peering
18 with other Evolved Networks and application service providers
19 subject either to agreed upon SLAs between the individual network
20 service providers or network service providers' mutual agreements
21 with inter-carrier mediation vendors and clearinghouses.

22 5.9.2 The Evolved Network shall enable the NSP to provide policy peering
23 for SIP and non-SIP applications with other providers for
24 supporting roaming users.

25 5.9.3 The Evolved Network shall support policy peering to allow for both
26 the home and the visited network to exert policy control of
27 resources used in the visited network to meet subscriber
28 expectations of service quality.

29 5.9.4 The Evolved Network shall not require changes to the roaming
30 partner's policy peering interface when new services or features are
31 introduced in the home network.

32 5.9.5 The Evolved Network shall support peering at the SIP level for
33 Evolved Network provider partners, and other SIP-based provider
34 partners.

35 5.9.6 The Evolved Network shall support two types of peering
36 relationships:

- 37 ▪ The NSP supplies carrier-hosted services for a device for
38 which the visited network provides access to the NSP's
39 network.

- 1 ▪ The visited network provides services for one device in the
2 session and the NSP provides such services for another party
3 in the session.

4 5.9.7 The Evolved Network shall support SIP peering with the Internet
5 (i.e., calls/requests to and from SIP devices in general with special
6 consideration to security and accounting).

7 5.9.8 The Evolved Network shall support peering with the PSTN for
8 placing and receiving phone calls.

9 5.9.9 The Evolved Network shall be able to provide transcoding when SIP
10 peering with other networks.

11 5.9.10 The Evolved Network shall support enforcement of security and
12 privacy functions when SIP peering with another network. This
13 applies to incoming as well as outgoing requests.

14 5.9.11 The Evolved Network shall support enforcement of network
15 resource policies when SIP peering with another network. This
16 applies to incoming as well as outgoing signaling and media.

17 5.9.12 The Evolved Network shall support collecting relevant information
18 (e.g., accounting, statistics) when SIP peering with another
19 network. This applies to incoming and outgoing signaling/media,
20 as well as when the UE is in the home network or is roaming.

21

22 **5.10 User Equipment Requirements**

23 This section addresses the requirements for the User Equipment
24 designed to operate on the Evolved Network.

25 5.10.1 The UE shall support end-to-end security and QoS mechanisms.

26 5.10.2 The UE shall support network and service enablers offered on the
27 infrastructure side to provide Enhanced IMS services.

28 5.10.3 The UE shall support feature interaction management of services
29 internally prior to requesting additional services from the network.

30 5.10.4 The UE shall support bandwidth management as negotiated with
31 the network, provided the access technology so permits.

32 5.10.5 The UE shall support QoS management as negotiated with the
33 network.

34 5.10.6 The UE shall support IPv4, IPv6, or both.

35 5.10.7 The UE shall allow both SIP and non-SIP clients to co-exist.

- 1 5.10.8 The UE shall be capable of supporting multiple clients depending
2 on the nature of the UE (single/multi-mode). Examples: BREW
3 client, SIP client(s), clients for non-SIP operator hosted services,
4 and clients for 3rd party application service providers.
- 5 5.10.9 The UE shall support the common security framework in concert
6 with the network.
- 7 5.10.10 The UE shall support over-the-air software updates for
8 application client software, security patches, and operating
9 parameters related to the access network.
- 10 5.10.11 The UE shall be capable of either determining its own location
11 or interacting with the Evolved Network for the purpose of
12 determining its location. The UE shall also be capable of conveying
13 this location information to the Evolved Network using
14 standardized protocols.
- 15 5.10.12 The UE shall be capable of supporting voice codecs and video
16 codecs identified by 3GPP2.
- 17 5.10.13 A multi-mode UE (e.g., WiFi/HRPD) shall support seamless
18 handoff between supported technologies.
- 19 5.10.14 A multi-mode UE shall work in concert with the network to
20 automatically determine which access technology (e.g., 1xRTT,
21 EVDO, WiFi) will be used at any given moment, based on factors
22 such as network policy (e.g. operator preferred roaming or peering
23 partners), RF conditions, QoS capabilities, and bandwidth
24 capabilities. The customer may be allowed to invoke a manual
25 override of access technology used (e.g., customer prefers WiFi).
- 26 5.10.15 The UE should support efficient compression schemes for
27 both signaling and bearer.
- 28 5.10.16 The Evolved Network shall support existing and expanded UE
29 numbering identifiers.

30

31 **5.11 Data Repository Requirements**

32 This section addresses databases (repository of operational data)
33 required for the Evolved Network operation, including creation,
34 access, and maintenance of data elements.

35 5.11.1 The Evolved Network shall provide a general data repository
36 function that is decoupled from other functional elements for all
37 SIP and non-SIP applications, services and features including
38 subscriber profiles and authorization information.

39 5.11.2 The Evolved Network shall provide a repository for Layer 2, Layer
40 3, and application security related data.

1 5.11.3 The general data repository function shall provide a standardized
2 interface for the various network elements that use the general
3 data repository.

4 5.11.4 The Evolved Network shall provide a secure mechanism for
5 trusted partner SIP and non-SIP application servers to access the
6 general data repository.

7 5.11.5 The general data repository shall enable the addition,
8 modification and deletion of fields by the NSP to support changes
9 in SIP and non-SIP applications, services, and features. This shall
10 be possible without requiring interface changes, data repository
11 software upgrades, or going through an integration project for
12 service rollout.

13 5.11.6 The general data repository function shall provide a mechanism
14 to ensure that elements are informed about data changes (e.g.
15 policy function, SIP service function).

16 5.11.7 The general data repository function shall provide an accounting
17 function capable of receiving accounting events/records.

18

19 **5.12 Accounting and Charging Requirements**

20 This section details the requirements related to Evolved Network
21 accounting, which enables creation of billing records and charging.

22 5.12.1 The Evolved Network shall provide accounting information to
23 support various charging alternatives (e.g. by bandwidth, by byte,
24 by content, by time, by event, by QoS provided).

25 5.12.2 The Evolved Network shall provide accounting information to
26 support post-paid and pre-paid charging.

27 5.12.3 The Evolved Network shall enable various accounting triggers
28 (e.g., content, byte count, application, time) under the control of
29 the NSP.

30 5.12.4 The Evolved Network shall provide accounting information to
31 support dynamic charging policies for both SIP and non-SIP
32 applications.

33 5.12.5 The Evolved Network should enable the development and rapid
34 deployment of new hosted applications without requiring the
35 hosted applications to generate accounting records on their own.

36 5.12.6 The Evolved Network should enable new applications to be
37 developed and deployed without requiring upgrades to back-end
38 billing systems.

39

1 **5.13 Regulatory Requirements**

2 This section details the requirements that enable implementation
3 of regulatory mandates in various locales where Evolved Networks
4 may be deployed.

5 5.13.1 The Evolved Network shall be capable of supporting regional
6 regulatory requirements.

7 5.13.2 The Evolved Network shall be capable of supporting a user to
8 make emergency calls, including situations involving a non-
9 activated UE, an unauthorized UE/subscriber, or a subscriber to
10 an alternate NSP whether or not there is a roaming agreement in
11 effect.

12 5.13.3 The Evolved Network shall be capable of routing calls to
13 emergency service centers based on the location of the caller, and
14 of conveying the location information and identity of the caller to
15 the emergency service center.

16 5.13.4 The Evolved Network shall provide emergency services for mobile
17 users without requiring manual entry of location information by
18 the user.

19 5.13.5 The visited Evolved Network shall be capable of supporting
20 emergency services in cases where the home network is
21 unreachable or unable to provide emergency services.

22 5.13.6 The Evolved Network shall be capable of supporting multimedia
23 emergency services, including voice, video and text.

24 5.13.7 The Evolved Network shall be capable of providing, based on NSP
25 policy, emergency services with QoS and priority treatment over
26 existing non MMPS calls.

27 5.13.8 Emergency services calls shall override calling restrictions which
28 would otherwise prevent a user from making a call, such as calling
29 barring or inbound only services.

30
31 **5.14 OAM&P Requirements**

32 This section details the requirements for Operation,
33 Administration, Maintenance and Provisioning (OAM&P)
34 associated with the Evolved Network.

35 5.14.1 The Evolved Network shall support Over the Air Service
36 Provisioning (OTASP).

37 5.14.2 The Evolved Network shall support Over the Air Parameter
38 Administration (OTAPA).

1 5.14.3 The Evolved Network shall be capable of supporting a unified view
2 of network operations.

3

4 **5.15 Services Requirements**

5 This section lists the services that the Evolved Network shall be
6 capable of supporting, and details the requirements associated with
7 these services, with the emphasis on VoIP and associated
8 supplementary services.

9 5.15.1 The Evolved Network shall be capable of supporting the following
10 features (based on IP networks and SIP protocol).

- 11 ▪ Call Forwarding-Busy (CFB)
- 12 ▪ Call Forwarding Default (CFD)
- 13 ▪ Call Forwarding-No Answer (CFNA)
- 14 ▪ Call Forwarding-Unconditional (CFU)
- 15 ▪ Call Waiting (CW)
- 16 ▪ Three-Way Calling (3WC)
- 17 ▪ Calling Number Identification Presentation (CNIP)
- 18 ▪ Calling Number Identification Restriction (CNIR)
- 19 ▪ Call Transfer (CT)
- 20 ▪ Wireless Number Portability (WNP)
- 21 ▪ Voice Mail Deposit (VMD)
- 22 ▪ Message Waiting Notification (MWN)
- 23 ▪ Voice Message Retrieval (VMR)
- 24 ▪ Ring Back Tones (RBT)
- 25 ▪ Short Message Service (SMS)
- 26 ▪ Over the Air Service Provisioning (OTASP)
- 27 ▪ Over the Air Parameter Administration (OTAPA)
- 28 ▪ Flexible Alerting (FA)
- 29 ▪ Abbreviated Dialing (AD)
- 30 ▪ Outbound Call Restrictions/Dialing Permissions
- 31 ▪ Vanity Numbers
- 32 ▪ Inbound Call restrictions
- 33 ▪ Directory Assistance
- 34 ▪ Feature Code Activation/De-activation

- 1 ▪ Short Code Dialing
- 2 ▪ Locally Allowed Abbreviated Dialing
- 3 ▪ Special Service Dialing (e.g., emergency, information, etc.)
- 4 ▪ DTMF support
- 5 ▪ Misdialed Calls – Play Proper Network Announcements

6 The Evolved Network shall provide at least the quality of voice
7 service that exists in the circuit-switched network in terms of
8 latency and MOS.

9 5.15.2 It shall be possible for a particular call to involve both visited
10 network services and home network services that are invoked as
11 part of call processing, and also involve feature interaction
12 management across these services. For example, home network
13 services like call log generation, outbound screening, prepaid, and
14 call recording may need to be invoked in conjunction with visited
15 network services.

16

17 **5.16 Policy Requirements**

18 This section details the requirements for network level (applicable
19 network-wide) and user level (applicable on a per-user basis)
20 policies enforceable by the Evolved Network.

21 Requirements for this section are still under study.

22

23 **5.17 Mobility Management and Handoff Requirements**

24 This section details the requirements for mobility, including
25 handoffs between access technologies supported by the Evolved
26 Network.

27 5.17.1 The Evolved Network shall provide the following types of handoffs:

- 28 ▪ Layer 2 mechanisms for handoffs within the same access
29 technology;
- 30 ▪ Layer 2 mechanisms for handoffs across different access
31 technologies, if needed for seamless mobility;
- 32 ▪ IP layer mechanisms for handoffs within the same access
33 technology, and as needed between different access
34 technologies where IP is the common denominator;

- 1 ▪ Application layer mechanisms for handoff of voice services
2 based on different call control protocols/models and where
3 there is no common denominator at layer 2 or 3 (e.g., 1xRTT
4 to and from WiFi VoIP; HRPD VoIP to 1xRTT; E-PDAI VoIP to
5 1xRTT)
- 6 5.17.2 The Evolved Network shall enable the NSP to define and deploy
7 new services that will be immediately available to the user both
8 when in the home network, and when roaming.
- 9 5.17.3 The network shall support the ability of the NSP to use the
10 following to control the user's access to specific services when the
11 user is roaming: (1) service properties, (2) operator policy specific
12 to a roamed network, and (3) service profile data.
- 13 5.17.4 The Evolved Network shall support access network independence
14 including the support of the following:
- 15 ▪ Various access technologies (e.g., HRPD, 1xRTT, WiFi,
16 wireline broadband, E-PDAI, WiMAX, 3GPP-LTE);
- 17 ▪ Inter-access technology handoff;
- 18 ▪ Access-independent authentication on entry to the NSP
19 network.
- 20 5.17.5 The Evolved Network shall support the following:
- 21 ▪ QoS context transfer for real-time services;
- 22 ▪ Security context transfer for real-time services.
- 23 5.17.6 The serving Evolved Network shall have the ability to apply load-
24 sensitive policies to delivery of services to the UE.
- 25 5.17.7. The access Evolved Network shall be capable of supporting
26 operator policy with regard to packet transmissions. For example,
27 the access network may note a priority marking on a packet and
28 make decisions on the method and priority of delivery as specified
29 by operator policy.
- 30 5.17.8 The Evolved Network shall support service continuity across
31 handoffs.
- 32 5.17.9 The Evolved Network shall allow presence and policy functions to
33 obtain UE state (e.g., geographic location, registration status) from
34 the access network. The network should also allow these functions
35 to obtain UE status according to NSP policies to control the
36 aggregate event flow (e.g., signaling dormant mobiles after X
37 minutes). Note: This would allow the NSP to make decisions about
38 how applications should proceed based on such states.

1 5.17.10 The Evolved Network shall support subscribers of the
2 following different types of roaming partners.

- 3 ▪ Partners that have Enhanced IMS networks;
- 4 ▪ Partners that provide only managed and controlled IP
5 services, but do not provide SIP services;
- 6 ▪ Partners that do not provide either SIP or managed and
7 controlled IP services, but merely provide access;
- 8 ▪ Partners that have wireless access networks of different
9 types, such as HRPD, WiMAX, 3GPP-LTE, or WiFi, and
10 partners with wireline broadband access networks.

11 5.17.11 The Evolved Network shall support access to network services
12 for subscribers that access the network from the public Internet
13 using any available ISP.

14 5.17.12 The Evolved Network shall support service continuity between
15 an operator controlled network (both home and visited) and access
16 from the public Internet using any available ISP.

17

18 **5.18 NAT and Firewall Traversal Requirements**

19 This section details the requirements for NAT elements that may be
20 supported by the evolved network. It also addresses firewalls that
21 may need to be traversed by the media or signaling paths
22 associated with services offered by the evolved network.

23 5.18.1 The Evolved Network shall operate consistently in the presence of
24 NAT devices in NSP networks and in partners' networks.

25 5.18.2 The Evolved Network shall operate consistently whether or not
26 firewalls are present, subject to the NSP defined set of policies.

27 5.18.3 The NAT traversal solutions shall support SIP and non-SIP
28 applications.

29 5.18.4 The NAT traversal solutions shall not require software upgrade of
30 any components of the network when a new application is added.

31 5.18.5 The NAT traversal solutions should not require routing of the
32 voice packets back to the home network.

33 5.18.6 The NAT traversal solutions shall not adversely affect the
34 network security framework, including application security.

35 5.18.7 The NAT traversal solutions for IPv4 shall coexist with an IPv6
36 environment.

37

1 **5.19 System Design Attribute Requirements**

2 This section details the non-quantitative and non-verifyable system
3 design attributes that are required to support the operator
4 requirements (e.g., minimize overhead, minimize AT power
5 consumption, etc.).

6 5.19.1 The Evolved Network should be based on a simplified architecture
7 design which minimizes signaling and transport overhead.

8 5.19.2 The Evolved Network should minimize protocol translations at
9 signaling and bearer layers to meet performance requirements.

10 5.19.3 The Evolved Network should provide efficient usage of network
11 resources (especially radio resources) by optimizing signaling and
12 transport mechanisms.

13 5.19.4 The Evolved Network design should be optimized for maximum
14 performance in combination with E-PDAI.

15 5.19.5 The Evolved Network design should decrease system equipment
16 complexity as compared to systems based on the current network
17 as well as other network technologies.

18 5.19.6 The Evolved Network design should decrease system operational
19 complexity as compared to systems based on the current network
20 as well as other network technologies.

21 5.19.7 Call setup latency shall be reduced whenever possible for both
22 SIP and non-SIP applications (e.g., minimize impact of QoS control
23 function).

24 5.19.8 The Evolved Network architecture should minimize the number of
25 provisioning points (i.e., services databases) in the network.

26 5.19.9 The Evolved Network should minimize the number of network
27 elements sending accounting records to back-end systems. A
28 single point of aggregation should be provided for presentation to
29 the back office.

30 5.19.10 The Evolved Network should minimize the number of formats
31 of accounting records while maintaining backward compatibility.

32