

1 3GPP2 S.R0087-A
2 Version 1.0
3 Version Date: 23 February 2006
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3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

10 *cdma2000 – WLAN Interworking*

11 12 *Stage 1 Requirements*

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6 **REVISION HISTORY**

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REVISION HISTORY		
Rev. 1.0	<i>Publication Version</i>	<i>23 February 2006</i>

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1 INTRODUCTION AND SCOPE

This document describes requirements of interworking between cdma2000^{®1} systems and Wireless Local Area Networks (WLANs). The intent of cdma2000 – WLAN Interworking is to extend cdma2000 packet data and multimedia services and/or capabilities to the WLAN environment, and to support the handoff of voice calls between WLAN and cdma2000 1X circuit-switched (CS) environments.

WLAN and cdma2000 radio technologies provide complementary environments for voice service and mobile packet data users. The WLAN environment can in principle be any type of local area network offering wireless access; however the accepted standard for unlicensed spectrum is IEEE 802.11.

WLAN provides high bit rate capabilities in unlicensed spectrum (e.g., IEEE 802.11a, 802.11b, and 802.11g) and can be effectively used in campus or in-building environments. A cdma2000 system provides broad coverage and mature authentication and accounting mechanisms. Thus a WLAN can provide localized coverage that complements the coverage of a cdma2000 system.

Since WLAN networks typically cover small geographic areas, there may be interest by WLAN providers to take advantage of certain capabilities afforded by cdma2000 systems. Conversely, the cdma2000 system operator may off-load the traffic to users with dual-mode devices to WLANs when these users are in the WLAN coverage area. Users can benefit from increased throughput in WLANs, and improved coverage offered by the cdma2000 system outside of WLANs.

Potential areas of interworking between a cdma2000 system and WLANs include but are not limited to:

- Common authentication, authorization, and accounting functions to allow for a single bill for access to both systems.
- Access to common services from both the WLAN and cdma2000 systems.
- Creation of mechanisms for selecting and switching between the WLAN and cdma2000 systems.
- Support for mechanisms to allow session continuity as the mobile switches access between the WLAN and cdma2000 systems.
- Support for mechanisms to allow service continuity as the mobile switches access between the WLAN and cdma2000 systems (including support for multimedia services).

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.

- Support for handoff of voice calls between the WLAN and cdma2000 1X CS-based systems.

These interworking areas are applicable regardless of the ownership of either cdma2000 or the WLAN systems.

Enabling any of these interworking cases may require modifications or additions in cdma2000 systems or WLAN systems as appropriate. However, any change to the cdma2000 system and the WLAN system should be minimized and there should be no changes to IEEE 802.11 specifications.

Two types of mobile stations (MS) are foreseen for cdma2000 - WLAN interworking:

- Single mode mobile station, which supports only the WLAN air interface.
- Dual mode mobile station, which supports both cdma2000 specifications [8-15] and WLAN air interface.

The following sections describe the requirements for cdma2000-WLAN interworking. The scope of these requirements is limited to the case when a user has a subscription to a cdma2000 system. The case when the user has its subscription outside of the cdma2000 system is beyond the scope of these requirements.

2 REFERENCES

- [1] ISO/IEC 8802-11 IEEE Std 802.11, 1999 Edition: "Information technology – telecommunications and information exchange between systems – local and metropolitan area networks – specific requirements. Part 11: wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications".
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- 1 [8] 3GPP2 C.S0001 Introduction to cdma2000 Spread Spectrum
2 Systems.
- 3 [9] 3GPP2 C.S0002 Physical Layer Standard for cdma2000 Spread
4 Spectrum Systems.
- 5 [10] 3GPP2 C.S0003 MAC Layer Standard for cdma2000 Spread
6 Spectrum Systems.
- 7 [11] 3GPP2 C.S0004 LAC Layer Standard for cdma2000 Spread
8 Spectrum Systems.
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10 Spread Spectrum Systems.
- 11 [13] 3GPP2 C.S0017 Data Service Options for cdma2000 Spread
12 Spectrum Systems.
- 13 [14] 3GPP2 C.S0024 cdma2000 High Rate Packet Data Air Interface
14 Specification
- 15 [15] 3GPP2 X.S0011, cdma2000 wireless IP network specification.
- 16 [16] Reserved
- 17 [17] 3GPP2 S.R0006-0 Wireless Features Description, v1.0, December
18 13, 1999
- 19 [18] 3GPP2 X.S0013-003-0 All-IP Core Network Multimedia Domain; IP
20 Multimedia (IMS) Session Handling; IP Multimedia (IM) Call Model,
21 v1.0 2, December 2003

22

23 **3 DEFINITIONS AND ABBREVIATIONS**

24 The terms and abbreviations that are used within this document are
25 defined as follows:

26 **3.1 Definitions**

cdma2000-Broker Interworking	Interworking relationship between a cdma2000 System and a Broker System.
cdma2000 Home System	A collection of cdma2000 Home network entities, where the user's subscription information exists.
cdma2000 System	A cdma2000 Home System or a cdma2000 Visited System.
cdma2000 Visited System	A collection of cdma2000 Visited network entities
cdma2000-WLAN Interworking	Interworking relationship between a cdma2000 system and a WLAN system.

802.11	A family of standards for Wireless Networking developed by the IEEE 802.11 working group.
Broker System	A collection of intermediaries that facilitate cdma2000-WLAN interworking, where there is no direct relationship between a WLAN System and a cdma2000 Home System.
Packet data session	A period of time over which an authenticated and authorized user is allowed to use resources of a network/service for the purpose of exchanging data with other entities inside or outside of the network/service provider's domain.
Session continuity	Continuity of a packet data session while switching of network connection takes places between the available access systems For example, between a WLAN system and a cdma2000 system, or between WLAN systems.
WLAN Access Network	A local area network that provides wireless access via an 802.11 or other type of air interface.
WLAN System	Wireless local area network entities.

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3.2 Abbreviations

AAA	Authentication, Authorization and Accounting
AP	WLAN Access Point
LAN	Local Area Network
MS	Mobile Station
NAI	Network Access Identifier
WLAN	Wireless Local Area Network

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4 GENERAL FEATURE DESCRIPTION AND GUIDING PRINCIPLES

4.1 Guiding Principles

The following are guiding principles and goals that are considered as a basis for the interworking requirements:

- 1 • Service interworking between cdma2000 systems and WLAN systems
2 should reuse the existing WLANs, i.e. transportation of IP packets, with
3 minimum modifications for both the cdma2000 system and the WLAN
4 system. Any change to the WLAN system should be minimized and there
5 should be no changes to IEEE 802.11 specifications.
- 6 • The functional split and interface(s) between cdma2000 systems and
7 WLAN systems shall be clearly specified.
- 8 • The evolution of cdma2000-WLAN interworking should adopt a flexible,
9 general, scaleable and future proof approach. The approach should be
10 general in that there should be no limitations on the type of WLAN that
11 can be interworked.
- 12 • Considering that cdma2000-WLAN interworking is aimed at enabling
13 voice communication using small devices (handheld phones), limitations
14 on battery life should be of concern. Mobile station operations involved in
15 WLAN Interworking (system selection in idle mode and active mode)
16 should be designed for minimized battery consumption.

17

18 **4.2 WLAN technologies**

19 There are several different technologies that fall into the WLAN category.
20 Despite the different radio technologies, most WLANs are commonly used for
21 transportation of IP packets. The specific technology used in each WLAN does
22 not impact the layers above IP.

23

24 **Gen-01:** cdma2000 - WLAN interworking shall not be limited to any specific
25 WLAN technology.

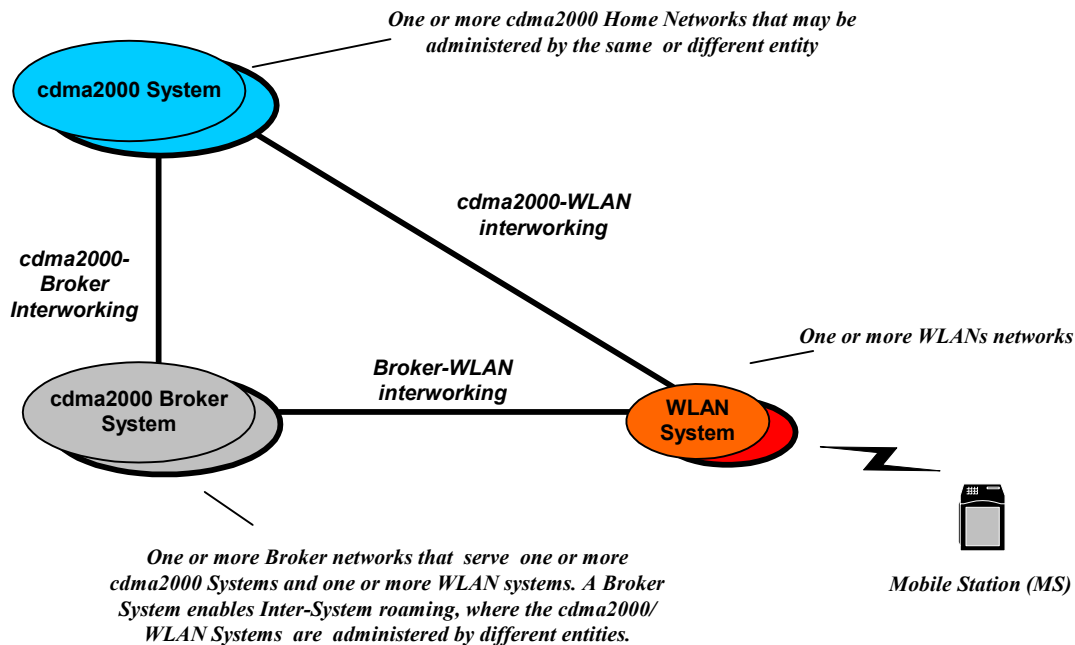
26

27 **4.3 Interworking model**

28 The model for interworking between a cdma2000 and a WLAN system is based
29 on a defined relationship between the cdma2000 System and the WLAN
30 System. The relationship is characterized by specified protocols and
31 procedures. A logical interworking model depicting the interworking
32 relationship scenarios is shown in Figure 1. The logical model in Figure 1
33 shows the cdma2000-WLAN interworking relationships, where the
34 relationships may be either direct or indirect (i.e. through a Broker System). In
35 the case of a direct cdma2000-WLAN interworking relationship, the
36 interworking relationship is defined between the cdma2000 System and the
37 WLAN system. In the case of an indirect cdma2000-WLAN interworking
38 relationship, the interworking relationship is defined between a Broker System
39 and a WLAN System, and between a Broker System and a cdma2000 System.
40 An interworking relationship between a cdma2000 System and a WLAN System
41 may be a many-to-many relationship.

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Figure 1. Interworking model

6 **4.4 Deployment and usage**

7 The deployment of WLAN systems is expected to continue independent of the
8 deployment of cdma2000 systems. The cdma2000-WLAN interworking system
9 is based on the logical model shown in Figure 1.

10 **Gen-02:** The cdma2000-WLAN interworking solution shall support many-
11 to-many relationships between cdma2000 systems and WLAN systems.

12 One WLAN system may interwork with more than one cdma2000 system. Also,
13 a given cdma2000 system may interwork with more than one WLAN system.

14

1 **4.4.1 Network Coverage Areas and user states**

2 Since the cdma2000 and WLAN systems may overlap, the access to packet-
3 data services may be available to a mobile user via a WLAN system, a
4 cdma2000 system or a combination of cdma2000 and WLAN systems. Where
5 the coverage area of a cdma2000 1X CS-based system overlaps with that of a
6 WLAN system, a handoff of voice calls between the two systems may be
7 supported. A WLAN system may have a direct, or indirect interworking
8 relationship with one or more cdma2000 systems in terms of providing access
9 to a mobile user.

10
11 The high-level cdma2000-WLAN interworking scenarios are shown in Table 1.
12 Each scenario realizes an additional step in integrating WLAN into the
13 cdma2000 service offering and generally increases the level of integration. For
14 each of these high-level scenarios the impact to the cdma2000-WLAN
15 interworking system is identified. There may be other impacts not yet
16 identified.

17

No.	Interworking scenario	Impact to the cdma2000-WLAN interworking system
#1	Common Billing and Customer Care	No impact to 3GPP2 specifications.
#2	cdma2000 System based Access Control and Charging and Access to the Internet via the WLAN system	Access to the cdma2000 Home System for authentication, authorization and accounting to the cdma2000 Home System.
#3	Access to the cdma2000 Packet Data Services via the WLAN system	Access to the cdma2000 Home System for authentication, authorization, accounting, and access to the cdma2000 Home System packet data services.
#4	Session continuity	The continuity of a packet data session while switching of network connection takes places between the available access systems. For example, between a WLAN system and a cdma2000 system, or between WLAN systems.
#5	Access to cdma2000 circuit-switched services & support of handoff between WLAN and cdma2000 1X CS systems	The continuity of a cdma2000 circuit -switched service while switching of network connection takes place between the available access systems, for example, handing off between a VoIP call via a WLAN system and a circuit-based voice call via a cdma2000 system.

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Table 1 Interworking scenarios

4.5 Ownership, Operation, Trust

4.5.1 Ownership

Ownership of the WLAN system to be interworked with a cdma2000 system may be one or more of the following general classes

- 1) The WLAN system owner is a cdma2000 system operator.
- 2) The WLAN system owner is a public network operator who is not a cdma2000 system operator. This may include, for example, fixed network operators, operators of mobile networks other than cdma2000 systems or public WLAN operators.
- 3) The WLAN system owner is an entity providing WLAN access in a local area (e.g., building manager/owner or airport authority), but who is otherwise not a public network operator. In this class it may be considered that a primary purpose of the WLAN operations is to provide local services and internet access as well as cdma2000-WLAN interworking.
- 4) The WLAN system owner is a business entity providing a WLAN network for its internal use that also wishes to allow interconnection, and possibly visitor use, for some or all of their WLAN systems. The entity may have more than one WLAN system in operation in a location of which some may be interworked to cdma2000 systems and some may not be interworked. In this class it may be considered that the primary purpose of the WLAN operations is for its own business and WLAN interworking is a secondary consideration.

4.5.2 Operations

In addition to supporting billing functions, accounting records are used by the cdma2000 Home System operator for operational functions. These operational functions include usage and performance analysis of the network and services, fraud detection, general record keeping, and settlement. To meet the demands of these operational functions, accounting records should be mediated across all of the operator's WLAN partners in a timely manner.

4.5.3 Internetworking trust

cdma2000 systems interworking with WLAN systems must consider the possibility of security weaknesses within the WLAN. The trust of communication between the WLAN system and the cdma2000 system may be considered to have three levels:

- 1) The WLAN system may be completely untrusted by the MS and the cdma2000 system.
- 2) The WLAN system contains elements that may be trusted by the MS and the cdma2000 system. For example, the WLAN system may include trusted servers that look after aspects of security and authentication interworking with the cdma2000 systems (e.g. 802.1x). However, other elements of the WLAN system may be untrusted.

1 3) All of the elements of the WLAN system may be fully trusted by the MS
2 and the cdma2000 system.

3

4 **5 DETAILED FUNCTIONALITY REQUIREMENTS**

5 **5.1 Detailed Feature Characteristics and Requirements**

6 **5.1.1 Network Selection**

7 The purpose of cdma2000 Network Selection is to:

- 8 - maximize the availability of access to the user
- 9 - optimize the use of the cdma2000 radio access network
- 10 - provide both manual and automatic network selection based on
- 11 cdma2000 operator policies.

12 Network selection may be driven by a variety of possible business
13 arrangements among the following actors: cdma2000 network operator; WLAN
14 owner/operator; Interworking broker; and wireless subscriber. The following
15 network selection requirements are designed to cover any reasonable business
16 arrangement amongst them.

17

18 **Netsel-1:** It shall be possible for the cdma2000 Home System operator to
19 define a preferred and/or forbidden list of WLAN systems.

20 **Netsel-2:** The user shall have the capability to prioritize the selection of the
21 cdma2000 Home System or some other preferred system.

22 **Netsel-3:** It shall be possible for the user to select between available
23 cdma2000 and WLAN systems based on criteria such as cost, service
24 characteristics, bandwidth, etc.

25 Note: to meet requirement Netsel-3, manual and/or automatic network
26 selection capability can be provided in the terminal.

27 **Netsel-4:** [Reserved]

28 **Netsel-5:** It shall be possible for the MS to make automatic switch of network
29 connection among the available access systems (e.g. when entering or leaving
30 regions of system coverage) with no manual actions from the user required.

31

32

33 Note: The dual mode terminal should select a preferred network, when
34 available, with minimum delay. This is beneficial when operators use WLAN as
35 coverage extension, allowing users in building interiors to use WLAN in place of
36 a wired telephone system. The shorter the transition time from cdma2000 to
37 WLAN for users entering the WLAN coverage, the less likelihood exists for a call

1 to originate or terminate on cdma2000 while in this low “geometry” situation
2 which can disproportionately impact overall cellular network capacity.

3

4 **Netsel-6:** It shall be possible for the user to manually initiate the switching
5 of network connection between the available access systems.

6 **Netsel-7:** It shall be possible for the user to be notified when a switch of
7 network connection occurs between available access systems.

8 **Netsel-8:** [Reserved]

9

10 **5.1.2 cdma2000-WLAN Connectivity Requirements**

11 **Conn-01:** The cdma2000-WLAN system interworking shall support IPv4 and
12 should support IPv6 based connectivity.

13 **Conn-02:** It shall be possible for the MS to establish connectivity to the
14 Internet through the WLAN System directly, or through the WLAN and
15 cdma2000 Systems.

16

17 **5.1.3 cdma2000-WLAN Access Control, Authentication and Subscription**

18 cdma2000-WLAN access authentication and authorization enables the
19 cdma2000 and the WLAN operator to protect their resources and provide
20 revenue-based services.

21 **ACTRL-1:** The cdma2000-WLAN Interworking system shall support mutual
22 authentication between the MS and the cdma2000 System for WLAN access to
23 assure the needed level of trust by all entities for interworking.

24 Note: It should be allowable for various WLAN systems to use the MS’s home
25 cdma2000 system to authenticate the MS for WLAN access. The benefit is that
26 the MS doesn’t need to maintain multiple sets of shared secrets and
27 algorithms, one per each WLAN system. Another benefit is that the WLAN
28 system doesn’t need to manage the shared secrets, since each shared secret is
29 maintained between the MS and its home cdma2000 system.

30

31 **ACTRL-2:** If the MS subscribes to both WLAN and cdma2000 access services
32 provided by the same operator, or different operators who have mutual
33 agreement, it shall be possible for the MS to use the same secret and algorithm
34 for both WLAN and cdma2000 access authentication.

35 **ACTRL-3:** The cdma2000 - WLAN interworking service shall support the
36 authorization and authentication by the home cdma2000 system of a
37 cdma2000 subscriber accessing a WLAN system.

1 **ACTRL-4:** The cdma2000 home system shall maintain a user authorization
2 profile which is used to manage attributes of the user's WLAN access.

3 **ACTRL-5:** Usage of the cdma2000 – WLAN interworking bearer service shall
4 be prohibited prior to successful user authentication and authorization.

5 **ACTRL-6:** Legacy WLAN terminal and access point hardware shall be
6 supported.

7 Note: Software/firmware of the legacy WLAN terminal and access point may be
8 upgraded to support cdma2000-WLAN interworking.

9 **ACTRL-7:** The user identification shall be based on Network Access Identifier
10 (NAI) format [5] (username@realm) for data calls (except VoIP calls).

11 Note: Usage of NAI format ensures that cdma2000 and WLAN equipments are
12 compatible with IETF protocols.
13

14 **ACTRL-8:** It shall be possible for the cdma2000 – WLAN interworking to
15 support re-authentication

16 **ACTRL-9:** Selected Authentication mechanisms for cdma2000-WLAN
17 interworking should support data integrity and privacy keying material for the
18 resulting session.

19 **ACTRL-10:** The WLAN authentication mechanisms shall be secure against
20 man-in-the-middle attacks.

21 **ACTRL-11:** It shall be possible to store all long-term security credentials used
22 for subscriber and network authentication in a tamper resistant memory
23 within an MS.

24 Note: For example, security credentials may be stored in a removable card or in
25 the MS.

26 **ACTRL-12:** It shall be possible to support an authentication mechanism based
27 on a User ID & Password/Secret.

28 **ACTRL-13:** It shall be possible to support an authentication mechanism that
29 does not depend on IEEE 802.1x support in the MS.

30 **ACTRL-14:** It shall be possible for the cdma2000 system, or Broker System to
31 indicate to the WLAN system that an ongoing session should be terminated,
32 interrupted or modified (for example for pre-paid users).

33 A mobile user may have different user profiles for different access types. For
34 example, some services provided by the cdma2000 home system may be
35 restricted to user access from a WLAN system, and this restriction can be
36 indicated in the user profile for WLAN access. These considerations lead to the
37 following requirements:

1 **ACTRL-15:** The cdma2000 home system shall be able to determine the access
2 type (e.g. WLAN).

3 **ACTRL-16:** The cdma2000 home system shall be able to use the access type
4 (e.g. WLAN) to enable the appropriate user profile for authorization.

5

6 **5.1.4 Data integrity and Privacy**

7 Without WLAN-level privacy protection, 802.11 control messages may become
8 vulnerable. For example, an attacker can perform denial of service attacks
9 against a valid MS, by replaying captured 802.11 Disassociate messages to
10 disconnect the MS from the AP. End-to-end privacy protection at IP or higher
11 layers may not be able to prevent this type of attacks.

12 **DIP-1:** It shall be possible to support integrity of signalling between the MS
13 and the WLAN system.

14 **DIP-2:** Integrity of signalling between the WLAN system and the cdma2000
15 system shall be supported.

16 **DIP-3:** Privacy of signalling between the WLAN system and the cdma2000
17 system shall be supported.

18

19 **5.1.5 Accounting**

20 **ACC-1:** Accounting records shall be generated by either the WLAN system
21 or cdma2000 system or both.

22 **ACC-2:** The accounting information for the user's WLAN access shall be
23 made available to the home cdma2000 system.

24 **ACC-3:** To assist billing, it shall be possible for the home operator to
25 receive Accounting records associated with WLAN system usage, to support
26 online (i.e., prepaid) and offline (i.e., postpaid) accounting by the cdma2000
27 system.

28 In many cases system operators prefer to generate simplified bills. As a user
29 engaged in a data session roams between various WLAN systems or cdma2000
30 systems, each system will generate accounting records for the data session. In
31 order to represent the data session as a single line item on the customer's bill,
32 the accounting records for each session-segment must be correlated. To
33 perform the correlation operation the accounting records must have the
34 appropriate information. These considerations lead to the following
35 requirements:

36 **ACC-4:** It shall be possible to correlate accounting records generated by
37 cdma2000 system(s) and WLAN system(s) for a given user session.

1 **ACC-5:** The WLAN system should provide a set of accounting records for
2 use by the cdma2000 system operator .
3

4 The intention of ACC-5 is to maximize compatibility with existing accounting
5 standards.

6 **ACC-6:** When the user accesses the cdma2000-WLAN interworking
7 services via a WLAN system, at a minimum the following accounting data
8 record information shall be recorded:

9 a. User's identity

10 b. Session identity

11 c. Access network identity

12 d. Indication of Access type (e.g. WLAN)

13 e. Session usage (e.g. duration and/or number of bytes).

14 f. Quality of Service information (if available)
15

16 **5.1.6 Common billing and customer care**

17 **CBCC-1:** The cdma2000 – WLAN interworking service shall support the
18 ability of the cdma2000 operator to provide the customer with one bill for the
19 usage of both cdma2000 and WLAN services.

20 Note: This allows for integrated customer care, which allows for a simplified
21 service offering from both the operator and the subscriber's perspective.
22

23 **5.1.7 Roaming**

24 The cdma2000-WLAN Interworking allows the cdma2000 system operator to
25 extend some of the cdma2000 system packet data services to the user
26 accessing via the WLAN system. These services may include, for example, IMS
27 based services, immediate messaging, presence based services, MMS and any
28 service that is built upon the combination of several of these components. The
29 packet data services provided by the cdma2000 system are transparent to and
30 independent of any specific access technology, thus are referred to as access
31 independent IP services. Note that the term "roaming" in the context of WLAN
32 interworking refers to changing of the radio access technology from cdma2000
33 to WLAN. The visited WLAN system may, but not necessarily be part of the
34 cdma2000 Home System.

35 **Roam-1:** While roaming in a WLAN system, it shall be possible for the MS to
36 obtain all access independent IP services provided by the cdma2000 Home
37 system.

1 **Roam-2:** It shall be possible for a dual mode MS to revert to the cdma2000
2 system to access a desired service if it is unable to access the desired
3 cdma2000 service via the WLAN system.

4 **Roam-3:** While roaming in a WLAN system, it should be possible for the
5 dual mode MS to obtain, via the WLAN system, circuit-switched services (e.g.
6 voice, SMS) equivalent to those provided by the cdma2000 Home system (e.g.
7 voice, SMS).

8

9 **5.1.8 Session Continuity**

10 The objective of session continuity is to allow the MS to continue the same
11 sessions for all access independent IP services while it moves among available
12 access systems.

13 For a packet data session to continue across the changes of connections among
14 the available access systems, there would be no need for the user to re-
15 establish the packet data session, but the change may be noticeable to the
16 mobile user. These considerations lead to the following requirements:

17 **SC-1:** It shall be possible to support session continuity as the MS
18 switches network connections among the available access systems.

19 **SC-2:** Session continuity shall be independent of the access system's air
20 interface technology.

21 **SC-3:** During the switching of the network connection between two of the
22 available access systems, if the target access system cannot support the QoS or
23 the services provided by the serving access system, a transition to the target
24 access system at a reduced set of QoS or services shall be possible.

25 **SC-4:** The cdma2000-WLAN interworking shall be capable of supporting
26 the handoff of VoIP calls between cdma2000 and WLAN networks.

27

28 **5.1.9 Inter-working with cdma2000 Circuit Services**

29

30 The objective of cdma2000 circuit-switched services and WLAN inter-working is
31 to allow the MS to continue to receive services (such as voice, SMS, etc.) while
32 it moves among available access systems. This includes the inter-working
33 between cdma2000 circuit based voice calls and WLAN based VoIP calls.

34 These considerations lead to the following requirements:

35 **CKTSVCS-1:** The cdma2000-WLAN interworking system shall support
36 session-based service registration (e.g. SIP registration) for a Dual mode mobile
37 station connected to a WLAN network.

1 **CKTSVCS-2:** The cdma2000-WLAN interworking system shall be able to
2 support voice call origination and termination regardless of which access
3 network (cdma2000 or WLAN) is serving the terminal.

4 **CKTSVCS-3:** The dual mode mobile station shall be able to receive voice calls
5 using a single user identity (e.g. Mobile Directory Number) regardless of which
6 access network (cdma2000 or WLAN) is serving the terminal.

7 **CKTSVCS-4:** The cdma2000-WLAN interworking system shall be capable of
8 supporting voice calls over cdma2000 connected to LMSD Step 2, legacy circuit
9 switched core networks, and MMD core networks, as well as WLAN systems
10 connected to MMD core networks.

11 **CKTSVCS-5:** The cdma2000-WLAN interworking system shall be capable of
12 maintaining a voice call while handing off from cdma2000 circuit-switched
13 voice service to WLAN VoIP service.

14
15 Note: Upon entering a WLAN coverage area suitable for use, the handoff delay
16 should be minimized. Expediting the handoff from cdma2000 to WLAN will in
17 many practical installations result in minimizing the incidence of the wireless
18 link entering low geometry state. This will improve network capacity and
19 prolong handset battery life.

20 **CKTSVCS-6:** The cdma2000-WLAN interworking system shall be capable of
21 maintaining a voice call while handing off from WLAN VoIP service to
22 cdma2000 circuit-switched voice service.

23 **CKTSVCS-7:** Users should be able to receive or originate cdma2000 SMS
24 messages regardless of which network (cdma2000 or WLAN) is serving the
25 terminal.

26 **CKTSVCS-8:** The cdma2000-WLAN interworking system shall be capable of
27 terminating an incoming voice call which originated in either the packet
28 switched or circuit switched domain to a mobile station on the WLAN RAN.

29

30 **5.1.10 Inter-working with cdma2000 Supplementary Services**

31 The support for cdma2000 wireless services [17] based on the IMS IP
32 multimedia call model [18], e.g., VoIP over WLAN, will be realized through SIP
33 signaling. The feasibility and applicability of any specific wireless feature in the
34 WLAN-cdma2000 interoperable system should be determined during the Stage-
35 2/3 development.

36 **Feat-001** - cdma2000-WLAN interworking system should support, where
37 applicable, wireless features such as Call Forwarding, Call Waiting, Calling
38 Number Identification Presentation, Conference Calling, Voice Message
39 Retrieval, SMS, etc.

1

2 **Annex A (Non-Normative)**

3 This non-normative annex contains requirements that are viewed to be outside
4 the scope of 3GPP2 responsibilities but provide information on the desired
5 operation of the WLAN interworking capabilities.

6 **WLAN-1:** It shall be possible for the dual mode terminal to discover and
7 select new or altered WLANs which may have been installed independently
8 from cdma2000 home operator, and may be outside its service territory.

9 Other requirements for future study.