3GPP TSG RAN#7
Madrid Spain
13 -15 March, 2000

RP#7 (00)0012

Agenda Item:	**4.2**
Source:	**TSG RAN Vice Chairman on behalf of 3GPP2**
To:	**RAN#7**
Title:	**3GPP2 DS41**
Document for:	**Information and comments**

The attached document contains the necessary changes elaborated by 3GPP2 to modify ANSI.41 in order to allow the inter-working of DS on an ANSI.41 core network.

The intent of this contribution is to request WG2 to review this and provide comment if necessary to 3GPP2.

3GPP2 C.P9002

Version 0.5.6

Date: January 28, 2000

Direct Spread Specification for Spread Spectrum Systems on ANSI-41 (DS-41)

Upper Layers Air Interface

Release A

Revision History

Revision	Description	Date
Rev. 1.0.0	Initial Publication	Month, 200x

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

FIGURES

TABLES

FOREWORD

This specification describes changes to the cdma2000 series of standards which will permit the IMT-2000 CDMA Direct Spread (DS) radio air interface to operate with the Call Control and Mobility Management services provided by a TIA/EIA-41 core network. This combination of capabilities is referred to as a “DS-41” system.

This document has the following organization:

1. Introduction. This section defines the terms and vocabulary used in this document, as well as providing a general overview of a DS-41 system.

2. Requirements for DS-41 Mobile Stations. This section specifies requirements which apply to mobile stations supporting the DS-41 operating mode.

3. Requirements for DS-41 Base Stations. This section specifies requirements which apply to base stations supporting the DS-41 operating mode.

Annex A. Reserved.

Annex B. Information Flows. This informative annex provides sample information flow diagrams which illustrate various call scenarios in a DS-41 system.

Annex C. DS-41 Support in 3GPP2 C.S0005-A. This normative annex describes the changes that are required to C.S0005-A to support DS-41 operation.

NOTES

1. This specification uses the following verbal forms: “Shall” and “shall not” identify requirements to be followed strictly to conform to the specification and from which no deviation is permitted. “Should” and “should not” indicate that one of several possibilities is recommended as particularly suitable, without mentioning or excluding others; that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is discouraged but not prohibited. “May” and “need not” indicate a course of action permissible within the limits of the specification. “Can” and “cannot” are used for statements of possibility and capability, whether material, physical, or causal.
2. Footnotes appear at various points in this specification to elaborate and to further clarify items discussed in the body of the specification.
3. Unless indicated otherwise, this document presents numbers in decimal form. Binary numbers are distinguished in the text by the use of single quotation marks.

REFERENCES

Normative

The following standards contain provisions which, through reference in this text, constitute provisions of this specification. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based upon this specification are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. ANSI and TIA maintain registers of current valid national standards published by their respective organizations.

—*3GPP Technical Specifications:*

1. 3GPP TS 25.301 “Radio Interface Protocol Architecture”
2. 3GPP TS 25.303: “Interlayer Procedures in Connected Mode”
3. 3GPP TS 25.304: “UE Procedures in Idle Mode”
4. 3GPP TS 25.322: “RLC Protocol Specification”
5. 3GPP TS 25.324: “Description of the Broadcast/Multicast Control BMC protocol”
6. 3GPP TS 25.331: “RRC Protocol Specification”

—*3GPP2 Technical Specifications:*

1. 3GPP2 C.S0004-A “Signaling Link Access Control (LAC) Specification for cdma2000 Spread Spectrum Systems”
2. 3GPP2 C.S0005-A “Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems”
3. 3GPP2 C.S0023 “Removable User Identity Module”

—*TIA Standards:*

1. TIA/EIA/IS-707-A-2 “Data Service Options for Spread Spectrum Systems – Addendum 2”

Informative

—*3GPP Technical Specifications:*

1. 3GPP TS 23.110: “UMTS Access Stratum Services and Functions”
2. 3GPP TS 25.101: “UE Radio transmission and reception (FDD)”
3. 3GPP TS 25.103: “RF parameters in support of RRM”
4. 3GPP TS 25.104: “BTS Radio transmission and reception (FDD)”
5. 3GPP TS 25.201: “Physical layer -General Description”
6. 3GPP TS 25.211: “Physical channels and mapping of transport channels onto physical channels (FDD)”
7. 3GPP TS 25.212: “Multiplexing and channel coding (FDD)”

REFERENCES

8. 3GPP TS 25.213: “Spreading and modulation (FDD)”
9. 3GPP TS 25.214: “FDD; physical layer procedures”
10. 3GPP TS 25.321: “MAC Protocol Specification”
11. 3GPP TR 25.990: “Vocabulary for UTRAN”
12. 3GPP TR 25.925: “Radio Interface for Broadcast/Multicast Services”

—*3GPP2 Technical Specifications:*

1. 3GPP2 A.S0001 “Access Network Interfaces Interoperability Specification”
2. 3GPP2 C.R1001-A “Parameter Value Assignments for cdma2000 Spread Spectrum Systems”

—*American National Standards:*

1. TIA/EIA-637-A “Short Message Service for Spread Spectrum Systems”

REFERENCES

1 No text.

1 INTRODUCTION

1.1 Scope

This specification provides general requirements and detailed Upper Layers (Layer 3) signaling protocols and procedures for the DS-41 radio interface. The protocols and procedures address functionality that is customarily classified as pertaining to Call Control and Mobility Management. Such functionality includes basic and supplementary services provision, connection management, registration, security functions, identification of subscriber equipment and its capabilities etc.; this functionality excludes the management of radio resources, such as system selection and acquisition, channel allocation, release and monitoring, RF measurement processing, handoff, and other related items.

The normative sections of this specification are stated in terms of requirements to be met by infrastructure and by subscriber equipment that operate in DS-41 mode. The protocols and procedures apply to the Upper Layers, as stated above.

Requirements for dual-mode DS-41/MC-41 systems, when operating in the MC-41 mode and when executing a transition (e.g., handoff, service redirection) to the DS-41 mode are given in Annex C.

Other documents (see 1.4) contain further requirements and/or capability descriptions necessary for the procedures and protocols not covered by this specification. It is intended that this specification, together with the accompanying documents, form a complete and functional specification set for the DS-41 radio interface.

1.2 Vocabulary and Terms

In general, each document referenced by this specification contains sections on definitions and abbreviations for locally used terms. 3GPP TR 25.990 defines some of the vocabulary used in 3GPP documents.

As a rule, the definitions and abbreviations present in the referenced documents are not repeated within this text. The list below contains only definitions and abbreviations that are considered essential for this specification; however, some terms are also provided for clarity or provided as a convenience to the reader. The meaning of some terms is further clarified when the usage in the 3GPP and 3GPP2 documents for the same or very similar entity, functionality or concept is different or can be viewed as ambiguous.

3GPP. See Third Generation Partnership Project.

3GPP2. See Third Generation Partnership Project 2.

Access Stratum. 3GPP term used to identify the protocol layers directly involved in interactions between infrastructure and subscriber equipment. Typically, it includes the Radio Resource Control sublayer, Layer 2 and Layer 1. The corresponding 3GPP2 term is “Lower Layers”.

Acknowledged mode. Term used in 3GPP specifications that refers to a delivery mode which guarantees that a PDU submitted by a transmitting entity will be delivered to the peer receiving entity. The corresponding term used in 3GPP2 specifications is “assured mode”.

AS. See Access Stratum.

Assured mode. Term used in 3GPP2 specifications that refers to a delivery mode which guarantees that a PDU submitted by a transmitting entity will be delivered to the peer receiving entity. The corresponding term used in 3GPP specifications is “acknowledged mode”.

Base Station. 3GPP2 term that refers generically to the infrastructure, as opposed to the subscriber equipment. Depending on the context, “base station” may include, without differentiating, the base station transmitter, the base station controller, the mobile switching center, as well as other equipment. Depending on the context, the corresponding 3GPP terms can be “RAN”, “RNC” or “Node B”.

Base Station Controller. 3GPP2 term that refers to the part of the BS equipment that interfaces with the core network, controls the radio transmitters and receivers at the BTS and performs other radio access and link maintenance functions (such as soft handoff). The corresponding 3GPP term is “RNC”.

Base Station System. Term used to describe a BSC and its associated BTSs.

Base Transceiver System. 3GPP2 term that refers to the infrastructure equipment that performs radio transmissions, receptions and measurements, typically under the control of a BSC. The corresponding 3GPP term is “Node B”.

BS. See Base Station.

BSC. See Base Station Controller.

BSS. See Base Station System.

BTS. See Base Transceiver Station.

Call Control. Generic name for the Layer 3 entity that handles call setup, tear-down and in-call signaling. Other functionality may also be supported. It is seen as part of the Upper Layers (NAS).

CC. See Call Control.

cdma2000. Name of a suite of specifications developed by 3GPP2. Narrowly defined, it refers only to the radio interface. Broadly defined, it also includes (in part or in total) core network specifications (e.g., TIA/EIA-41), A-interface specifications (e.g., TIA/EIA/IS-2001), and interconnection to Internet Protocol network specifications. See also “MC-41”.

Cross mode. Generic term for either the DS-41 or MC-MAP system. Each system is characterized by Upper Layers (Non-Access Stratum) and Lower Layers (Access Stratum) that are defined by different Third Generation Partnership Projects. See also “Native mode”.

Direct Spread. CDMA radio technology defined by 3GPP. One of the ITU-R recommended IMT-2000 radio transmission technologies. See also “W-CDMA”.

DS. See Direct Spread.

DS-41. 3G system which uses the Upper Layers provided by the TIA/EIA-41 protocol and the Lower Layers defined for the Direct Spread mode.

DS-MAP. 3G system which is based entirely on the suite of 3GPP specifications.

Handoff. 3GPP2 term used as a synonym for the 3GPP term “handover”.

Handover. 3GPP term used as a synonym for the 3GPP2 term “handoff”.

IMT-2000. A family of 3G systems and radio technology defined by the International Telecommunications Union (ITU).

Lower Layers. 3GPP2 term used to identify the protocol layers and functionality directly involved in interactions between the infrastructure and the subscriber equipment. Typically these include the Radio Resource Control sublayer, Layer 2 and Layer 1. The corresponding 3GPP term is “Access Stratum”.

MC. See Multi-carrier.

MC-41. 3G system which is based entirely on the suite of 3GPP2 specifications.

MC-MAP. 3G system which uses the Upper Layers provided by the GSM-MAP protocol and the Lower Layers defined for the Multi-carrier mode.

MM. See Mobility Management.

Mobile Station. 3GPP2 term that refers to the subscriber equipment, as opposed to the infrastructure. The corresponding 3GPP term is “UE”.

Mobility Management. Generic name for the Layer 3 entity responsible for registrations, location updates, authentication functions and Layer 3 addressing. Other functionality may also be supported. It is seen as part of the Upper Layers (NAS).

MS. See Mobile Station.

Multi-carrier. CDMA radio technology defined by 3GPP2. One of the ITU-R recommended IMT-2000 radio transmission technologies. See also “cdma2000”.

NAS. See Non-Access Stratum.

Native mode. Generic term for either the DS-MAP or MC-41 system. Each system is characterized by Upper Layers (Non-Access Stratum) and Lower Layers (Access Stratum) that are defined by the same Third Generation Partnership Project. See also “Cross mode”.

Non-Access Stratum. 3GPP term used to identify the protocol layers and functionality related to the core network. Typically it includes the Call Control and Mobility Management layers. The corresponding 3GPP2 term is “Upper Layers”.

Node B. 3GPP term that refers to UTRAN equipment which performs radio transmissions, receptions and measurements, typically under the control of an RNC. The corresponding 3GPP2 term is “BTS”.

Radio Access Network. Term that generically refers to the part of the infrastructure that is directly involved in communications with the subscriber equipment. The RAN performs the radio functionality of the infrastructure, as well as the connection to the core network. See also “Base Station”. The RAN typically includes a controller (RNC in 3GPP and BSC in 3GPP2) and several transmitter/receivers (Node B in 3GPP, BTS in 3GPP2).

Radio Network Controller. 3GPP term that refers to UTRAN equipment which interfaces with the core network, controls the radio transmitters and receivers in Node Bs and performs other radio access and link maintenance functions (such as soft handoff). The corresponding 3GPP2 term is “BSC”.

Radio Resource Control. Generic name for the Layer 3 entity that handles radio dependent operations and handoffs. Other functionality may also be supported. It is seen as part of the Lower Layers (AS).

RAN. See Radio Access Network.

RNC. See Radio Network Controller.

RRC. See Radio Resource Control.

Service Option. 3GPP2 term that refers to an identifier for a specific service. A service option may specify a particular vocoder, a certain type of traffic (such as Short Message Service), or a connection type (such as Internet Protocol).

SO. See Service Option.

Third Generation Partnership Project. The organization responsible for developing W-CDMA specifications.

Third Generation Partnership Project 2. The organization responsible for developing cdma2000 specifications.

Transparent mode. Term used in 3GPP specifications that refers to a delivery mode in which no protocol information is added by the lower layer in charge of the PDU delivery. In the signaling plane, this mode may apply to broadcast. The 3GPP2 specifications view transparent mode as a submode of the unassured mode.

UE. See User Equipment.

UMTS. See Universal Mobile Telecommunications System.

Unacknowledged mode. Term used in 3GPP specifications that refers to a delivery mode which does not guarantee that a PDU submitted by a transmitting entity will be delivered to the peer receiving entity. The corresponding term used in the 3GPP2 specifications is “unassured mode”.

Unassured mode. Term used in 3GPP2 specifications that refers to a delivery mode which does not guarantee that a PDU submitted by a transmitting entity will be delivered to the peer receiving entity. The corresponding term used in the 3GPP specifications is “unacknowledged mode”.

Universal Mobile Telecommunications System. 3G system developed by 3GPP that includes specifications for the core network, UTRAN, IP connections, and various radio interfaces (including W-CDMA).

Upper Layers. 3GPP2 term used to identify the protocol layers and functionality related to the core network. Typically these include the Call Control and Mobility Management layers. The corresponding 3GPP term is “Non-Access Stratum”.

User Equipment. 3GPP term that refers to the subscriber equipment, as opposed to the infrastructure. The UE may be seen as a mobile radio terminal containing a removable user identity module, and may possibly be connected to an application platform (such as a laptop computer). The corresponding 3GPP2 term is “MS”.

UTRAN. The RAN for UMTS systems.

W-CDMA. See Wideband CDMA.

Wideband CDMA. Name of a suite of specifications developed by 3GPP. Narrowly defined, it refers only to the DS radio interface. Broadly defined, it also includes (in part or in total) core network specifications (e.g., GSM-MAP), A-interface specifications (e.g., Iu) , and interconnection to Internet Protocol network specifications (e.g., GPRS). See also “DS-MAP” and “UMTS”.

Note: The terms ITU, ITU-R, TIA/EIA, ETSI, GSM, ANSI, GSM-MAP, A-interface, CDMA, 3G, are considered to be well-known; hence, no additional information is provided about these familiar terms within the body of this specification.

1.3 Protocol Architecture for the DS-41 System

Figure 1.3-1 shows the general architecture for the Control Plane of DS-41 systems, and Figure 1.3-2 shows the general architecture for the User Plane of DS-41 systems.

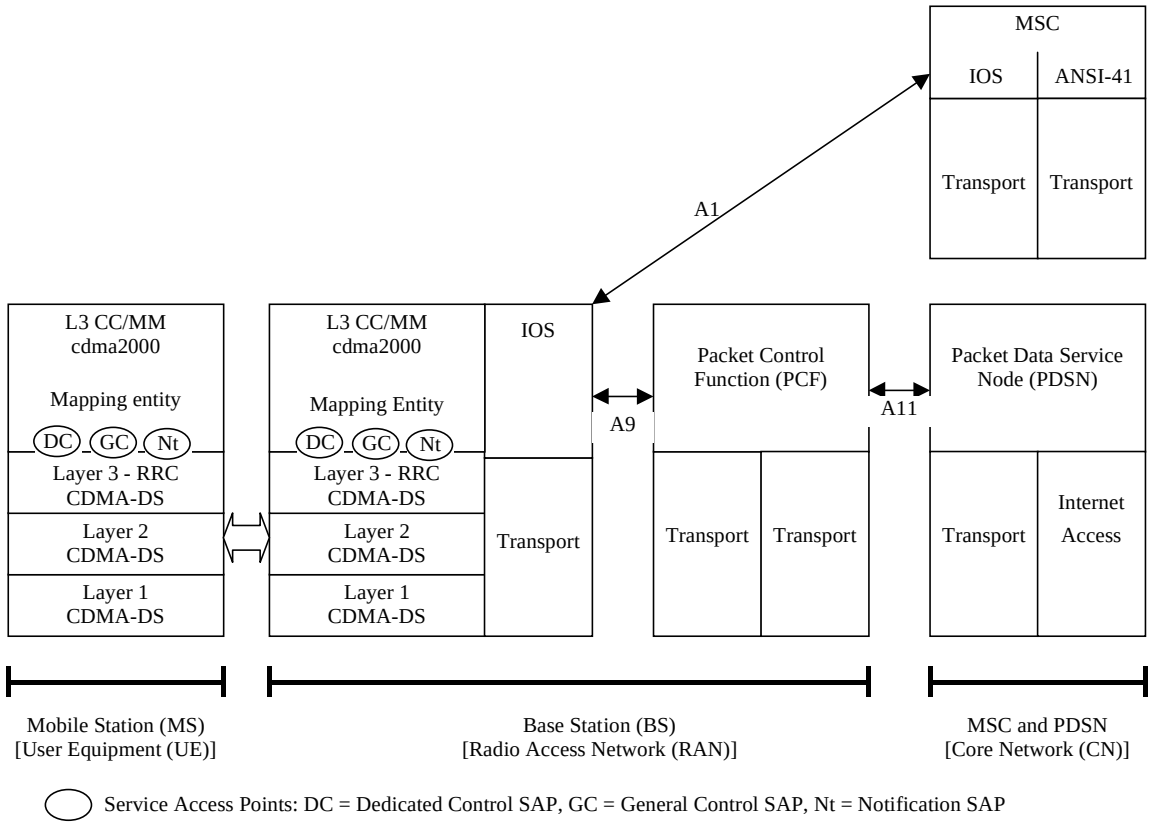


Figure 1.3-1. DS-41 General Architecture: Control Plane

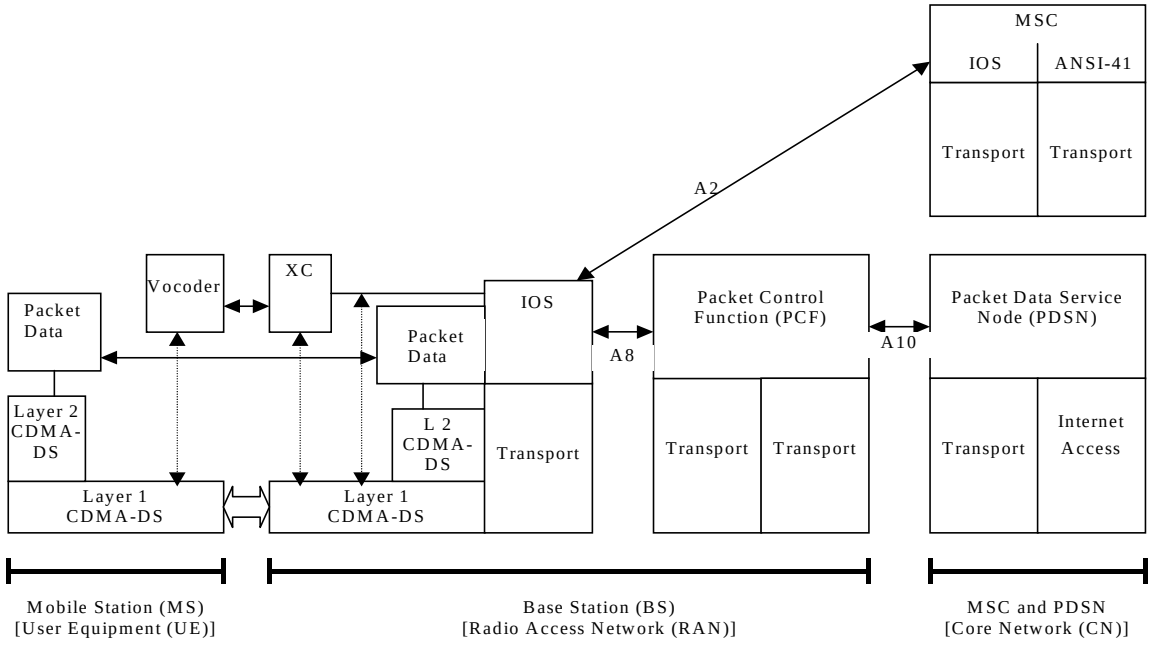


Figure 1.3-2. DS-41 General Architecture: User Plane

1.4 Organization of the DS-41 Specifications

The radio interface portion of the DS-41 system is specified via a series of documents from 3GPP and 3GPP2.

General Description and Requirements

This specification (3GPP2 C.P9002) provides an overview of the radio interface of the DS-41 system, as well as general requirements.

Upper Layers

The Call Control and Mobility Management protocols, as well as other Upper Layers functionality, are specified via the 3GPP2 specifications C.S0005-A, C.S0004-A and via this specification (C.P9002).

Access Stratum

A general description of the functionality covered by the Access Stratum is given in 3GPP TS 25.301.

RRC

The Radio Resource Control protocols are specified in 3GPP TS 25.331. Radio Resource Control procedures for operating in connected-mode are specified in 3GPP TS 25.303. Radio Resource Control procedures for operating in idle mode are specified in 3GPP TS 25.304.

L2

Layer 2 procedures and protocols are specified in 3GPP TS 25.321 (MAC) and TS 25.322 (RLC).

L1

Layer 1 is described in 3GPP TS 25.201, TS 25.214, TS 25.101, TS 25.103, TS 25.104, TS 25.211, TS 25.212 and TS 25.213.

Parameter Value Assignments (for Upper Layers)

Service Option numbers and other values of interest are defined in 3GPP2 C.R1001-A.

Removable User Identity Module (R-UIM)

The R-UIM is specified via the 3GPP2 specification C.S0023.

Quality of Service (QoS)

The QoS record for packet data services is specified in Chapter 12 of TIA/EIA/IS-707-A-2.

Broadcast SMS

A description of the TIA/EIA-41 Short Message Service (including broadcast SMS) can be found in TIA/EIA/IS-637-A. 3GPP TR 25.925 and TS 25.324 describe the radio interface for broadcast services, including the Broadcast/Multicast Control (BMC).

1.5 General Overview of DS-41 Signaling

DS-41 signaling is based upon the WCDMA signaling for the Lower Layers (Access Stratum) and the cdma2000 signaling for the Upper Layers (Non-Access Stratum). The documents identified in 1.4 provide comprehensive and detailed descriptions of all the relevant procedures and protocols. This section provides only a brief summary of the DS-41 signaling needed to facilitate the understanding of this specification. The RAN operations are separate from the core network operations. In signaling terms, the messages employed by the RRC are separate from the Upper Layer messages. The RRC provides a transport service to the Upper Layers by encapsulating the Upper Layer information in System Information Blocks, information elements in RRC messages, or messages embedded in RRC messages.

The Layer 3 signaling between the RAN and the mobile station is performed via messages that are sent on channels. The channels can be *logical* channels, *transport* channels or *physical* channels. Logical channels can be mapped (multiplexed) to one or more transport channels; these channels, in turn, can be mapped to physical channels. From the perspective of DS-41 signaling, the following logical channels are the most important:[1]

- BCCH, mapped to the BCH or FACH transport channels
- PCCH, mapped to the PCH transport channel
- CCCH, mapped to the RACH and FACH transport channels
- CTCH, mapped to the FACH transport channel
- DCCH, mapped to the RACH, FACH, or DCH transport channels

From the RAN perspective, a mobile station is either *idle* or *connected*. An idle mobile station may monitor the BCH transport channel occasionally, but it will monitor the PCH transport channel with some periodicity. The RAN may not be aware of the presence of the mobile station in any particular location; thus, the determination of the exact timing when a page must be sent, along with the addressing information necessary for the successful paging of the mobile station, are the responsibility of the core networks.

When a mobile station is connected it has a (Layer 2) temporary RAN identifier (RNTI) that is understood by both mobile station and RAN, but not by the core networks. In such cases, the paging of the mobile station can be performed using the RNTI and using an exact timing determined by the RAN. The RAN supports different levels of connectivity. In the high connectivity states the mobile station continuously monitors the DCH or the FACH, and it can immediately transmit on the DCH or RACH. In the lower states of connectivity, the mobile station occasionally monitors the PCH transport channel with some periodicity (known to the RAN); and, thus, it is necessary for the RAN to page the mobile station or it is necessary for the mobile station to use the RACH transport channel for communications.

---

[1] Other logical channels are also defined. Alternate logical-to-transport channel mappings are also possible.

1.5.1 System Information Broadcast

System information is generally transmitted on the BCCH logical channel. The information is organized in a hierarchical, tree-like manner, with different nodes containing various pieces of information and scheduling information about their sub-nodes. In this manner, the content and repetition time intervals of the broadcast information can be easily controlled. From the DS-41 system perspective, the system information can be classified as RRC-related or core network-related, and is generally located in different system information blocks. In addition, the broadcast function may be employed to support various applications (e.g., tiered services, location services). Updates to the system information-related to the core network may be sent on the DCCH to mobile stations in the connected mode via the *DS-41 In-Traffic System Parameters Message* (see 3.3.3.2).

1.5.2 Paging

A mobile station may be paged when it functions in idle mode with respect to the RAN, when it monitors the PCH channel while connected to the RAN, or when it monitors a DCCH logical channel mapped to the FACH transport channel.

In idle mode, the mobile station monitors the PCH transport channel, usually in DRX mode (i.e., periodically), with a periodicity (DRX cycle length) known to the core network but usually unknown to the RAN. If the mobile station is simultaneously registered with more than one core network, the minimum (i.e., smallest period) DRX cycle length is used. The page record will contain either the IMSI or the TMSI and will be sent on the PCCH logical channel via a Paging Type 1 message.

If the mobile station is connected to the RAN, but is in a state in which it monitors the PCH, the paging timing is controlled by a DRX cycle length known to the RAN and broadcast on the BCCH.[2] Since an RRC connection exists, it is possible to identify the mobile station by RNTI, as well as by IMSI or TMSI. As in the case of the idle mode, the Paging Type 1 message is employed to carry the page. The Paging Type 1 message is also capable of toggling the DRX mode and of notifying mobile stations regarding changes in the broadcast system information.

If the mobile station operates on a DCCH logical channel mapped to a FACH transport channel, the Paging Type 2 message is employed. The addressing is performed using either IMSI or TMSI.

1.5.3 Cell Selection/Reselection

Since the RAN is functionally separated from the core network, changes in the cell upon which the mobile station is camped result in separate actions for the RAN and for the core network. The cell selection/reselection and cell update procedures are described in TS 25.304 and TS 25.331. For core network-related procedures, the mobile station must

---

[2] It is possible, in principle, for the RAN and/or the core network to define specific values for their respective DRX length cycles on a mobile station by mobile station basis.

update the relevant new system information (e.g., by monitoring the BCH channel) and decide, based upon the core network registration information, if a new registration/location update to the core network is warranted. Such registration must occur via an RRC connection. If a suitable connection is not present, an RRC connection must be setup, to perform the registration-related procedures. See 1.5.8.1 for details. Annex C extends the *Universal Neighbor List Message*, used on MC-41 systems, to facilitate idle handoff between MC-41 and DS-41 systems.

1.5.4 RRC Connection Maintenance

This specification requires the existence of an RRC connection for signaling (with the exception of system information broadcast, paging and SMS broadcast); if an RRC connection does not exist, the mobile station attempts to establish one.

The mobile station sends an RRC CONNECTION REQUEST message to the RAN on the CCCH logical channel, containing, among other information, the reason for the request ("establishment cause") and some minimal capability information necessary for the RAN to continue the dialog with the mobile station. Normally, the RAN responds on the CCCH logical channel with an RRC CONNECTION SETUP message, that establishes a bi-directional signaling bearer (DCCH logical channel) between the mobile station and the RAN. The mobile station completes the sequence by sending an RRC CONNECTION SETUP COMPLETE message (containing more detailed capability information necessary for further operation) on the DCCH. If a signaling bearer cannot be granted, the connection request is rejected via an RRC CONNECTION REJECT message and the mobile may be instructed to retry the connection request after a waiting period. If several attempts are unsuccessful, the mobile station stays in the idle state from the RAN perspective, but the upper layers are notified of the failure and may direct the mobile station to a different, implementation-specific, course of action.

Detailed mobile station capability information may be obtained at any time via the UE CAPABILITY INFORMATION message that can be sent on the DCCH logical channel by the mobile station either autonomously or in response to a UE CAPABILITY ENQUIRY message received on the DCCH from the base station. Upon reception of the UE CAPABILITY INFORMATION message, the base station replies with a UE CAPABILITY INFORMATION CONFIRM message.

In case of RRC link failure, the mobile station may attempt to re-establish the RRC connection by sending an RRC CONNECTION RE-ESTABLISHMENT REQUEST message, containing the RNTI of the mobile station, on the RACH transport channel. If the RRC connection can be re-established successfully, the RAN will reply with an RRC CONNECTION RE-ESTABLISHMENT message on the FACH, followed by the mobile station sending (on the newly re-established DCCH) an RRC CONNECTION RE-ESTABLISHMENT COMPLETE message.

To tear down an existing connection, the RAN sends an RRC CONNECTION RELEASE message on the DCCH, to which the mobile station replies (also on the DCCH) with an RRC CONNECTION RELEASE COMPLETE message, prior to terminating the radio link.

1.5.5 Handoff

Handoff is ordered by the base station but is usually triggered by the mobile station measurements and by reports of signal strength. The base station may order the mobile station to report the radio conditions via the MEASUREMENT CONTROL message. The mobile station sends a MEASUREMENT REPORT message containing the latest measurements, or a MEASUREMENT CONTROL FAILURE message if the measurements were ordered by the base station and could not be performed. All of the messages exchanged by the base station and by the mobile station during handoff procedures are sent on the DCCH logical channel.

DS-41 to DS-41 soft handoff is an RRC operation that involves the updating of the active set. The base station may send the ACTIVE SET UPDATE message to the mobile station. The mobile station responds with the ACTIVE SET UPDATE COMPLETE message or ACTIVE SET UPDATE FAILURE message. The core network is not involved in the radio interface signaling for soft handoff.

DS-41 to DS-41 hard handoff may involve the Upper Layers since the capabilities of the target system may be different than those of the source system. The base station may send a *DS-41 Service Option Connect Message* followed by sequences of RRC messages, as part of the procedures listed in 8.3.5.2 of 3GPP TS 25.331. The Upper Layers and the RRC messages can be coordinated in time such that they take effect simultaneously.

Dual mode DS-41/MC-41 and DS-41/Analog mobile stations operating in DS-41 mode may execute handoffs to the MC-41 system or to the Analog system, respectively. The mobile station will usually send a MEASUREMENT REPORT message containing measurements performed on the MC-41 or on the Analog system. Such a message could be triggered by a previous MEASUREMENT CONTROL message sent by the base station. The measurements to be performed and to be reported, along with the threshold values for reporting the measurements to be reported, are specified in 3GPP TS 25.331 based upon the content of the 3GPP2 C.S0005-A-defined *Pilot Strength Measurement Message*, *Candidate Frequency Search Report Message* and *Candidate Frequency Search Request Message*, as well as on values specified in the *Universal Neighbor List Message*. The base station may also send a UE CAPABILITY ENQUIRY message, to find out the capabilities of the mobile station with regard to the target system. Typically, the mobile station would include such information in a UE CAPABILITY INFORMATION message. Upon receiving the message, the base station will reply with a UE CAPABILITY INFORMATION CONFIRM message. Then, the base station may send an INTER-SYSTEM HANDOVER COMMAND message containing, as the “Inter-system message” information element, a handoff command (e.g., a *Universal Handoff Direction Message* or an *Analog Handoff Direction Message*). If the handoff fails, the mobile station sends an INTER-SYSTEM HANDOVER FAILURE message.

Dual mode DS-41/MC-41 mobile stations that are operating in MC-41 mode may execute handoffs to synchronized DS-41 systems. Most of the signaling occurs on the MC-41 side. The base station may send an *Inter-System Transfer Message* (see C.2 of Annex C), having the PAYLOAD_MESSAGE field set to the MEASUREMENT CONTROL message, describing the relevant DS-41 measurements and thresholds necessary for the handoff. The mobile station typically responds with an *Inter-System Transfer Message* (see C.2 of Annex C),

having the PAYLOAD_MESSAGE field set to the MEASUREMENT REPORT message (or, in case of failure, to the MEASUREMENT CONTROL FAILURE message).

It is also possible for the base station and mobile station to use the *Candidate Frequency Search Request Message* and *Candidate Frequency Search Response Message*, respectively, extended as described in Annex C.

To order a handoff, the base station sends an *Inter-System Transfer Message* (see C.2 of Annex C), having the PAYLOAD_MESSAGE field set to the HANDOVER TO UTRAN COMMAND message, with its information elements set as described in 8.3.6.2 of 3GPP TS 25.331. If the handoff is successful, the mobile station sends, on the DS-41 side, a HANDOVER COMPLETE message.

1.5.6 General Messaging

Signaling in this specification is performed on logically dedicated control channels (DCCH), with the exception of system information broadcast, paging, and SMS broadcast. If an RRC connection does not exist, the mobile station attempts to establish one. Upper Layer messages are encapsulated as the “NAS message” information element in the INITIAL DIRECT TRANSFER message, UPLINK DIRECT TRANSFER message, or DOWNLINK DIRECT TRANSFER message.

Signaling uses the radio bearer RB 0 (zero) for unacknowledged transfers and the radio bearers RB 2 or RB 3 for acknowledged transfers, as specified in 3GPP TS 25.331.

Some Upper Layer messages are independent of other messages and can be processed successfully at any time. Other Upper Layers messages are part of sequences of messages associated with defined procedures. Messages that “belong” to the same procedure are usually tagged with a common identifier whenever multiple instances of the same procedure can go on concurrently. It is also possible for different procedures to occur concurrently.

If the execution order of messages is important, the Upper Layers will not send a message until they receive confirmation that a prior message was successfully delivered to the destination.

In general, DS-41 Upper Layer messages that cannot be processed are either rejected explicitly or are ignored, after being acknowledged at Layer 2 (if required).

1.5.7 Call Processing

Call Control signaling between the base station and the mobile station takes place on dedicated logical control channels. The messages are sent in assured mode.

The following DS-41-specific messages are used on the uplink:

- *DS-41 Call Start-up Message*
- *DS-41 Release Message*
- *DS-41 Service Option Connect Complete Message*

The following DS-41-specific messages are used on the downlink:

- *DS-41 Call Request Message*
- *DS-41 Release Message*
- *DS-41 Service Option Connect Message*
- *DS-41 Service Option Disconnect Message*

When the user directs the mobile station to originate a call, the mobile station spawns a call state machine, assigns a CSM_ID to it and sends a *DS-41 Call Start-up Message*. This message is similar in content and functionality to the MC-41 *Origination Message* and *Page Response Message*; it contains a list of acceptable service options, as well as the CSM_ID and an optional QoS record. In addition, it may contain dialed digits, authentication information and registration information as needed. If the base station cannot accept the call, it sends the *DS-41 Release Message*, with the CSM_ID field set to the value in the matching *DS-41 Call Start-up Message*, and, upon reception, the mobile station clears the call. If the base station accepts the call, it will initiate a Radio Access Bearer setup sequence, as described in the RRC specifications.

Then, the base station will send a *DS-41 Service Option Connect Message*, tagged with the CSM_ID and containing the "RAB ID" information element that associates the call to the radio access bearer(s), the service option that the base station has chosen from the submitted list, as well as an optional QoS record identifying the parameters to be used during the call. The mobile station typically responds with the *DS-41 Service Option Connect Complete Message*; user traffic can then proceed. In case of failure, the mobile station responds with the *DS-41 Release Message*.

If the base station initiates the call, it will send a *DS-41 Call Request Message* containing a request ID, the preferred service option, information on bypassing the alerting phase and an optional QoS record. If the mobile station rejects the call, it will send a *DS-41 Release Message* tagged with the matching request ID. If the mobile station accepts the call, it will spawn a new call state machine; the procedure then continues as in the case of origination. The *DS-41 Call Start-up Message* will be tagged with the request ID of the matching *DS-41 Call Request Message*.

The *DS-41 Service Option Disconnect Message* can be used to temporarily suspend a connection without fully releasing it.

While calls are in process, they can be signaled individually by setting the CON_REF information element to the value of the corresponding CSM_ID. Messages such as the *Extended Flash With Information Message*, *Extended Alert With Information Message*, *Connect Order* can be used to signal individual calls.

Both the mobile station and the base station can clear any call, at any time, by sending a *DS-41 Release Message*.

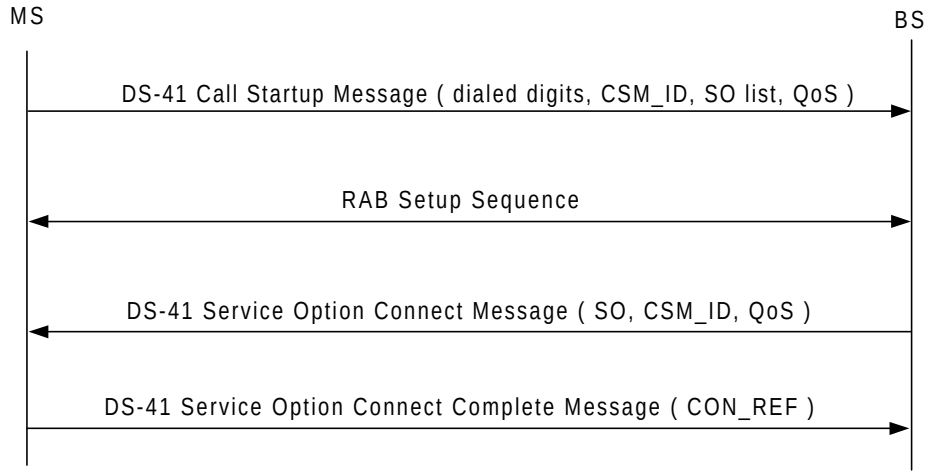


Figure 1.5.7-1. Successful Origination

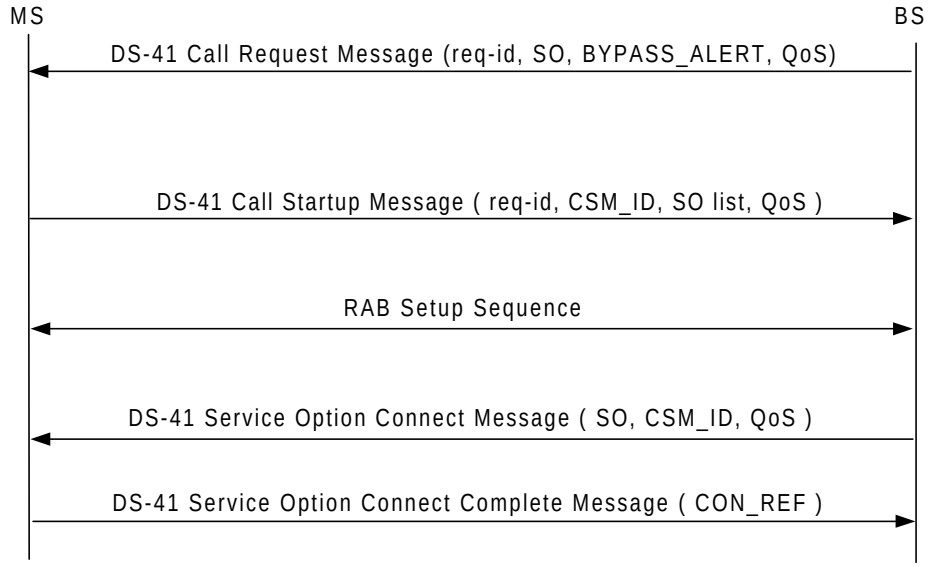


Figure 1.5.7-2. Successful Termination

1.5.8 Mobility Management

Signaling supporting the Mobility Management function occurs on the DCCH (in other words, an RRC connection must be present for the duration of the Mobility Management procedures). If an RRC connection is not present, one must be set up. Once the Mobility Management procedure is completed, the RRC connection may be torn down.

1.5.8.1 Registration and Location Update

The DS-41 system uses the cdma2000 registration procedures (see 3GPP2 C.S0005-A), with the exception that signaling is performed only on dedicated channels and that distance-based registration is not supported. DS-41 cells and sectors have unique identifiers (BASE_ID) which, in general, are read by mobile stations from the broadcast system information and are sent in the registration messages. Thus, a mobile station, which may be in soft handoff between several cells, will have a unique addressing cell from the core network perspective. During registration, the mobile station may identify itself by IMSI (using a "true" IMSI only; MIN-based IMSI is not supported, see 2.3 of 3GPP2 C.S0005-A), or by TMSI, and additionally by ESN. Paging, however, is IMSI- or TMSI-based only (see 1.5.2).

1.5.8.2 Security

The DS-41 system uses the cdma2000 authentication procedures (global and unique challenges, SSD update, etc.; see 3GPP2 C.S0005-A and C.S0004-A). The signaling is performed on dedicated channels. The RAND challenge is broadcast as the *ANSI-41 RAND Message*.

Message ciphering and deciphering use the keys generated during authentication or key-setting agreement procedures and can be performed at the Upper Layers or at the Lower Layers.

The Upper Layers message ciphering and deciphering can be switched on and off by the base station during registration via the *Registration Accepted Order*, and at any other time by sending the *Security Mode Command Message*. The Upper Layers message ciphering is performed as described in 2.3.12.4 of 3GPP2 C.S0005-A, and this ciphering applies only to the Upper Layer PDUs. As a result of the ciphering procedures, an extra octet is appended to the Upper Layers PDUs before transmission; the extra octet is removed upon reception.

The Lower Layers ciphering and deciphering applies to radio bearers. All messages sent on an encrypting radio bearer will be encrypted in totality (i.e., all Layer 3 information, not only the Upper Layers-related information). The RAN may switch encryption on or off by sending the *Security Mode Command Message*. The mobile station replies by sending a *Security Mode Complete Message*, encrypted (if appropriate) with the key specified by the *Security Mode Command Message*. The same messages may be used to encrypt radio bearers used for traffic other than signaling.

1.5.9 Broadcast SMS

Broadcast SMS messages are sent on the CTCH logical channel, mapped to the FACH transport channel. The RAN broadcasts the schedule indicating when the FACH will be allocated to broadcast SMS. The RAN encapsulates the *Data Burst Message* carrying the broadcast SMS as the "CB Data" information element of the BMC CBS message and sends it on the FACH at the advertised time (see 10.1 of 3GPP TS 25.324). Information on further broadcast SMS activity can be communicated by the RAN by sending the BMC SCHEDULE message on the FACH, together with the BMC CBS message (see 10.2 of 3GPP TS 25.324).

1.6 Modeling

1.6.1 Mapping Entity

The Mapping Entity is situated between the Upper Layers and the Access Stratum (AS). It maps Upper Layers logical channels to the Access Stratum logical channels and SAPs. It also tags the Upper Layers messages with proper identification and may perform Upper Layers message-level encryption, if necessary.

In addition to the Upper Layers PDU, the Mapping Entity exchanges PDU-related information with the Upper Layers, via Message Control and Status Blocks (MCSBs). For a detailed description of MCSBs, see 1.2.4.1.1 of 3GPP2 C.S0004-A. In the DS-41 model, on transmission, the MCSB is received from the Upper Layers and is discarded by the Mapping Entity after processing the information within. On reception, the MCSB is generated by the Mapping Entity and sent, together with the SDU, to the Upper Layers. As in 3GPP2 C.S0004-A, the MCSB is a conceptual construct, and it is not subject to detailed specification; however, it is envisioned that the MCSB would contain information such as:

- The MSG_TAG,
- The length of the SDU,
- A unique instance identifier associated with the message, which enables identification of a message for notification of delivery/non-delivery or recovery procedures,
- Whether the message should be delivered in assured mode or unassured mode,
- Whether notification of delivery is required.

The Mapping Entity interacts with the Access Stratum via SAPs defined in 3GPP TS 25.331. See 1.6.2 for a description of the Upper Layers-Access Stratum interactions.

The Mapping Entity maps the message tag to the message ID of each message sent or received. The mapping is based upon tables in 2.3.4 and 3.3.4.

If Upper Layers message ciphering is requested, the Mapping Entity performs:

- on transmission, ciphering of the Upper Layers SDUs as described in 2.3.12.4 of 3GPP2 C.S0005-A before passing the SDUs to the Access Stratum,
- on reception, deciphering of the Upper Layers SDUs as described in 2.3.12.4 of 3GPP2 C.S0005-A before passing the SDUs to the Upper Layers.

1.6.2 Logical Channels and SAPs

The interactions between the DS-41 Upper Layers and Lower Layers are modeled based upon the interactions between the Non-Access Stratum and the Access Stratum, as defined in 3GPP TS 25.301 and the primitive interface to the LAC sublayer described in 3GPP2 C.S0005-A.

Accordingly, the following Service Access Points (SAPs) are offered by the RRC Layer to the Upper Layers:

DC-SAP Dedicated Control SAP. Used for exchange of information (commands and status) via a connection dedicated to a specific user.

GC-SAP General Control SAP. Used for the provision of broadcast information and commands destined for all users.

Nt-SAP Notification SAP. Used for paging and access exchanges.

Table 1.6.2-1 below defines a set of primitives at the SAPs that enable the interactions necessary to support DS-41 services.[3]

The primitives transfer data (PDUs) between the Upper Layers and Lower Layers, together with additional information, dispositions (commands) and status about the transmission and delivery of data. The additional information, dispositions and status are transferred via a parameter block called the Message Control and Status Block (MCSB). The MCSB may contain information about the PDU or generic information appropriate for the primitive for which it is used.

The following primitives are defined:

Data.Request Primitive used by the Upper Layers to submit data for transmission by the Lower Layers. The MCSB may contain information such as the delivery mode (assured or unassured) and a unique tag used for identification of the PDU at a later time.

Data.Confirm Primitive used by the Lower Layers to notify the Upper Layers that a message (PDU) sent in assured mode was successfully delivered to its destination. The MCSB may contain information such as the unique tag used for identification of the PDU when first submitted for transmission.

Data.Indication Primitive used by the Lower Layers to deliver a received PDU to the Upper Layers. The MCSB may contain information about the received PDU.

Condition.Notification Primitive used by the Lower Layers to notify the Upper Layers of the occurrence of an error, or of some rare or unusual condition. The MCSB may contain detailed information about the condition.

Supervision.Request Primitive used by the Upper Layers to send a command to the Lower Layers. The MCSB may contain information identifying the command (e.g., reset) and parameters needed for its execution.

---

[3] Note that the primitives defined by this specification at the three SAPs are different than the primitives defined in 3GPP TS 23.110, at the same SAPs, in support of services described in 3GPP specifications.

Table 1.6.2-1. Primitives for Upper Layers to Lower Layers Interactions

		BS/RAN			MS/UE		
Primitive	**Direction**	**GC-SAP**	**Nt-SAP**	**DC-SAP**	**GC-SAP**	**Nt-SAP**	**DC-SAP**
Data.Request (PDU,MCSB)	UL to LL	Y	Y	Y	N	Y	Y
Data.Confirm (MCSB)	LL to UL	N	Y	Y	N	Y	Y
Data.Indication (PDU,MCSB)	LL to UL	N	Y	Y	Y	Y	Y
Condition.Notification (MCSB)	LL to UL	Y	Y	Y	Y	Y	Y
Supervision.Request (MCSB)	UL to LL	Y	Y	Y	Y	Y	Y

All primitives are defined at all three SAPs, except for the GC-SAP which is transmit-only at the BS/RAN side and is receive-only at the MS/UE side. The Nt-SAP is seen as bi-directional, enabling paging on the downlink and access (including page response) on the uplink,

According to 3GPP TS 25.301, the Access Stratum uses logical channels that are similar in functionality to the logical channels used by the Upper Layers as described in 3GPP2 C.S0004-A. Table 1.6.2-2 shows the mapping model between the Upper Layers and the Lower Layers used by the DS-41 system.

Table 1.6.2-2. DS-41 Mapping of Logical Channels

Upper Layers	Lower Layers	SAP
f-csch sync channel	-	-
f-csch broadcast channel	BCCH	GC
f-csch paging and general signaling	PCCH, CCCH (forward)	Nt
r-csch	CCCH (reverse)	Nt
f-dsch	DCCH (forward)	DC
r-dsch	DCCH (reverse)	DC

1.6.3 State Machines

1.6.3.1 Separation Between RRC and Call Control

The state machines employed by the DS-41 system are different from those used by the MC-41 system, reflecting the separation between the RRC and the Call Control sublayers, inherent in the DS-41 architecture, as well as the functional model upon which the RRC was based. Nevertheless, many similarities between the MC-41 and DS-41 state machines can still be observed.

Although the call setup and tear-down events may act as trigger events for some of the RRC transitions, the RRC state machines can be seen as independent from the Call Control state machines. From an RRC point of view, all the Call Control activity takes place in the Non Access Stratum (NAS), and the interactions take place at a SAP (see 1.6.2). The RRC state machines and transitions are outside the scope of this document.

The opposite can be said about the Call Control state machines: Although the appearance and disappearance of certain radio connections administered by the RRC may trigger transitions in the Call Control state machines, the Call Control state machines are driven essentially by Call Control events, which may be seen as independent of the RRC. This document covers the Call Control state machines.

1.6.3.2 Calls, Connections and Service Options

DS-41 supports several independent calls concurrently. In the version described in this document, each call corresponds to a connection and each connection corresponds to a call; therefore, one identifier suffices to uniquely identify a call or a connection, and the terms can be used interchangeably. The Call State Machine ID may be present in several call control messages (referred to as CSM_ID or CON_REF).

At any moment during a call, there may be either no service option connected (no user traffic is possible) or one service option connected. A call may be serially connected to different service options. Changing of service options may be performed directly (with one message) between an old and a new service option, without having to explicitly disconnect the old service option and then connect the new one.

1.6.3.3 States and Transitions in the Mobile Station

The mobile station responds to a request for a new call by spawning a new call state machine and assigning it a unique CSM_ID. Conversely, when a call exits the associated state machine ceases to exist, and its CSM_ID is returned to the available pool.

A call state machine has the following states:

- *No Service Option State* is the initial state of a call. In this state the mobile station waits for the *DS-41 Service Option Connect Message*. The reception of such a message, specifying a valid service option, will cause the transition to the *User Traffic State* or to *Waiting for Alert State*.
- *Waiting for Alert State* exists for mobile-terminated calls, which do not explicitly indicate that the state should be bypassed. Reception of an *Extended Alert With Information Message* transitions the state machine into the *Waiting for Answer State.*
- *Waiting for Answer State* exists for mobile-terminated calls, for which the *Waiting for Alert State* is not bypassed. The user answering the call transitions the state machine into the *User Traffic State.*

- *User Traffic State* requires that a radio bearer, capable of delivering the required QoS, be available to carry the user traffic. If a *DS-41 Service Option Connect Message* is received, specifying a new service option, the mobile station will connect the new service option at the moment specified by the activation time information element in the message. If no service option is specified, the mobile station will transition back to the *No Service Option State*.

Reception of a *DS-41 Release Message* in any of the states will finish the call and terminate the associated state machine. The *DS-41 Release Message* allows for multiple calls to exit simultaneously.

Note that from the point of view of Call Control the mobile station may simultaneously be in several mutually independent states, one state for each active call or connection.

The individual states of all the calls can be aggregated into a Service Option Connection Record (SOCR), which includes the CSM_ID and the connected service option for each of the calls. The record can be included in the *DS-41 Service Option Connect Message* as well as in handoff messages, allowing for simultaneous signaling of multiple call state machines.

Figure 1.6.3.3-1 shows an example with two state machines. Not all possible transitions and messages are shown.

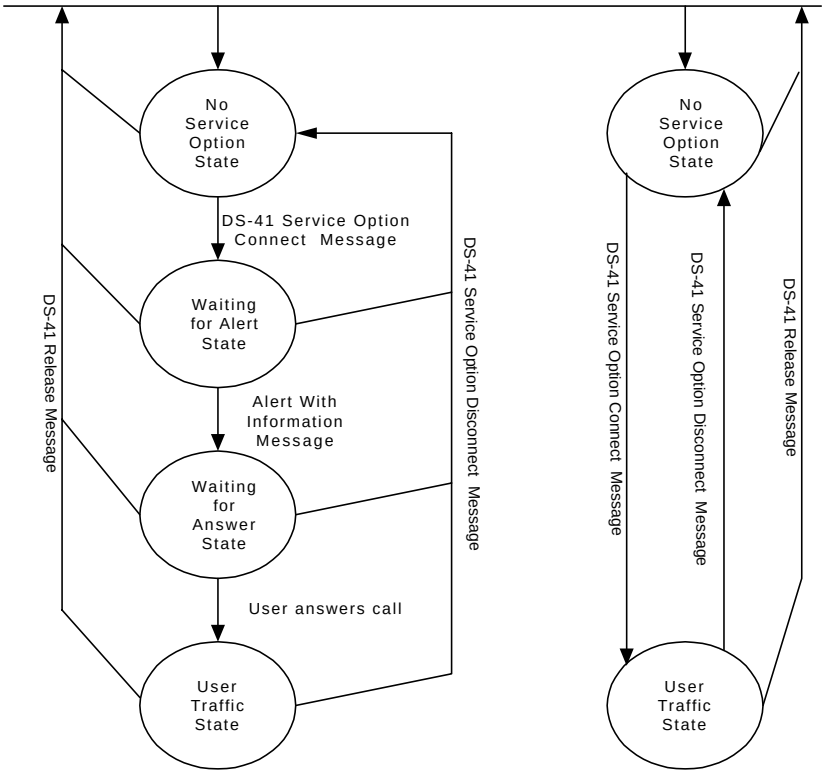


Figure 1.6.6.3-1. Call Control State Machines

2 REQUIREMENTS FOR DS-41 MOBILE STATIONS

2.1 Signaling Between the Mobile Station and the Base Station

If an RRC connection to the base station does not exist, and if the mobile station has not been paged, and if it does not initiate any transfer or any signaling, the mobile station shall perform idle procedures as described in 3GPP TS 25.304 and 3GPP TS 25.331. If an RRC connection to the base station exists, the mobile station may perform RRC-related operation in connected mode with respect to the base station, as described in 3GPP TS 25.303 and 3GPP TS 25.331.

2.1.1 Sending Upper Layers-related Information to the Base Station

In the absence of an RRC connection, a mobile station that has information to send should solicit (on the reverse logical common control channel CCCH) the establishment of an RRC connection (see 8.1.3 of 3GPP TS 25.331).

When the logical dedicated channel is available for communication, the mobile station may send Upper Layers-related messages to the base station. In such cases, the mobile station shall generate an INITIAL DIRECT TRANSFER message or an UPLINK DIRECT TRANSFER message, shall set the “CN domain identifier” information element as described in 8.1.8.2 of 3GPP TS 25.331, shall set the “NAS message” information element to contain the Upper Layers message and shall transmit the INITIAL DIRECT TRANSFER message or the UPLINK DIRECT TRANSFER message on the uplink dedicated logical channel. If the Upper Layer message must be sent in assured mode, the mobile station shall send the INITIAL DIRECT TRANSFER or the UPLINK DIRECT TRANSFER message in acknowledged mode (see 4.2.1.3 of 3GPP TS 25.322); otherwise, the mobile station may send those messages in unacknowledged mode (see 4.2.1.2 of 3GPP TS 25.322).

2.1.2 Receiving Upper Layers-related Information from the Base Station

If an RRC connection does not exist, the mobile station shall monitor the logical broadcast channel BCCH (see 8.1.1.3 of 3GPP TS 25.331) and the logical paging channel PCCH (see 8.1.2 of 3GPP TS 25.331). If the mobile station receives a page (see 8.1.2.3 of 3GPP TS 25.331), the mobile station should solicit the establishment of an RRC connection on the logical common control channel CCCH (see 8.1.3 of 3GPP TS 25.331). To receive broadcast SMS messages, the mobile station shall monitor the BCCH for scheduling information relating to when the broadcast SMS message will be sent on the CTCH logical channel, mapped to the FACH transport channel. Then the mobile station shall monitor the FACH during the advertised period and shall process the broadcast SMS message, as well as additional scheduling information that can be set on the FACH.

If an RRC connection exists, but is in a state that does not allow immediate reception of messages from the base station on the logical dedicated control channel (see 9.3.3 and 9.3.4 of 3GPP TS 25.331), the mobile station shall monitor the logical broadcast channel BCCH, the logical paging channel PCCH, and should respond to the base station upon reception of a page.

The mobile station receives Upper Layers-related information only if a logical dedicated channel exists between the base station and the mobile station. Upon reception on the dedicated logical channel of a DOWNLINK DIRECT TRANSFER message from the base station, the mobile station shall extract the Upper Layers message from the “NAS message” information element and shall route it to the CN domain identified in the “CN domain identifier” information element, as specified in 8.1.9.3 of 3GPP TS 25.331.

Messages that can be identified and decrypted correctly, but that are found to be longer than expected, shall be processed up to the expected length (extraneous information shall be ignored). Messages that cannot be identified, or that cannot be decrypted correctly or that are shorter than expected, should be rejected (by informing the base station of the error) if addressed specifically to the mobile station and should be ignored if addressed generically to several mobile stations. To reject a message, the mobile station may use the *Mobile Station Reject Order* (see 2.7.3 of 3GPP2 C.S0005-A).

The mobile station shall be able to temporarily store and to process four Upper Layer messages requiring acknowledgment that are associated with each active logical connection, and four Upper Layer messages requiring acknowledgment that are associated with services having inactive logical connections or no logical connections, before having to acknowledge the reception of any of the messages.[4]

2.2 Procedures

When requirements are specified based upon sections in 3GPP2 C.S0005-A, the following rules shall apply with regard to the C.S0005-A text:

1. Specific C.S0005-A sections referenced in this text shall be understood as having included all of their subsections, unless indicated otherwise.
2. References to messages, orders, information records, or information elements that are not supported shall be ignored.
3. Redirections and transitions to unsupported states[5] should be understood as redirections to equivalent states, or to states that can properly handle the triggering condition.

---

[4] This capability is useful when the messages are either independent of one another or when a particular order of delivery for processing is guaranteed by the lower layers.

[5] Unlike 3GPP2 C.S0005-A, which is written in a state machine oriented fashion, this specification considers states to be only modeling instruments providing general guidelines for observable behavior. The separation of RRC from the Upper Layers (present in DS-41 but not in C.S0005-A), and the fact that most DS-41 signaling is performed on dedicated rather than common channels, point to the impracticability of basing descriptions of DS-41 behavior on C.S0005-A states. For example, many conditions in C.S0005-A specify transitions to mixed RRC-Upper Layers states such as *System Access State*, to substates where broadcast information is processed (an RRC function in DS-41) or to *System Determination Substate* (to a large extent, an implementation dependent function).

4. Requirements pertaining to RRC behaviors, procedures[6] or variables shall be ignored.

5. Amendments and new requirements specified by this specification shall take precedence over any corresponding text in C.S0005-A.

The mobile station shall process messages specified in 3.7 of 3GPP2 C.S0005-A, subject to the modifications specified in Section 3.2 of this specification.

If the mobile station receives a message recognized as valid in 3.7 of 3GPP2 C.S0005-A but excluded from transmission in Section 3.2 of this specification, the mobile station shall ignore or reject the message, as appropriate.

When sending signaling messages the mobile station shall use the PDU formats described in 2.7 of 3GPP2 C.S0005-A, as completed and amended in Section 2.2 of this specification.

2.2.1 Broadcast System Information Processing

The mobile station shall monitor the broadcast channel and shall process the general and the RRC-related information according to the requirements stated in 3GPP TS 25.331.

The mobile station shall decode and shall process the Upper Layers-related information in the Master Information Block (MIB), the System Information Block 13[7] and its sub-blocks as follows:

- The mobile station shall process the P_REV, MIN_P_REV, SID, NID fields in the MIB, according to the requirements in 2.6.1.3 of 3GPP2 C.S0005-A.
- The mobile station shall process the fields of the *ANSI-41 Systems Parameters Message*, according to the requirements in 2.6.2.2.13 of 3GPP2 C.S0005-A.
- The mobile station shall process the fields of the *ANSI-41 RAND Message*, if encountered, according to the requirements in 2.6.2.2.16 of 3GPP2 C.S0005-A.
- The mobile station shall process the fields of the *User Zone Identification Message*, if encountered, according to the requirements in 2.6.2.2.9 of 3GPP2 C.S0005-A.
- The mobile station shall process the fields of the *Private Neighbor List Message*, if encountered, according to the requirements in 2.6.2.2.10 of 3GPP2 C.S0005-A.

---

[6] For example, access handoff, access probe handoff, etc.

[7] As stated in Section 3.2.1, a DS-41 base station is required to broadcast SIB 13.

- The mobile station shall process the fields of the *Extended Global Service Redirection Message*, if encountered, according to the requirements in 2.6.2.2.11 of 3GPP2 C.S0005-A. The mobile station shall attempt to perform the service redirection as instructed. If RETURN_IF_FAIL is set to '1' and the service redirection fails, the mobile station shall attempt to resume service on the system from which it was redirected. If RETURN_IF_FAIL is set to '0' and the service redirection fails, the mobile station should attempt to acquire service on systems other than the one from which it was redirected.

2.2.2 General Order and Message Processing

The procedures in this section describe the processing by the mobile station of orders and of messages received from the base station on dedicated RRC connections. At the time of the reception of the orders and messages, a dedicated RRC connection is assumed to exist between the base station and the mobile station.

If a dedicated RRC connection does not exist, then:

- The mobile station shall read the *ANSI-41 RAND Message*, if broadcast, on the broadcast channel and shall set $RAND_S = RAND_r$.
- If required by the RRC protocol, the mobile station shall read the proper RRC overhead messages necessary for setting up an RRC connection and shall update its internal variables accordingly (see 3GPP TS 25.331).
- The mobile station shall set up an RRC connection (dedicated logical control channel) as described in 3GPP TS 25.331 (see also Annex B of this specification for an example). The mobile station should set the "Establishment Cause" information element of the RRC CONNECTION REQUEST message as specified in 10.2.3.8 of TS 25.331 and according to the Upper Layers operation that cause the connection request.[8] Failure to set up an RRC connection shall be processed as specified in 8.1.3.6 of TS 25.331. In such cases, the operation is considered to have failed, and the recovery is left to the implementation.

If no activation time is specified for a message, the mobile station shall execute the commands of the message immediately upon decoding the message, unless required otherwise. If an activation time is specified for the message, the mobile station shall

---

[8] It is assumed that at the end of the RRC connection setup sequence, the RAN is in possession of all the information about the radio capabilities of the mobile station. Normally the base station requests capability information from the mobile by setting the "Capability update requirement" information element in the RRC CONNECTION SETUP message, and the mobile station provides the information via the RRC CONNECTION SETUP COMPLETE message. If necessary, as part of the RRC connection setup sequence, or at any time afterwards, the mobile station may send (on DCCH) a UE Capability Information message, to which the RAN would reply (on DCCH) with a UE Capability Information Confirm message. Alternatively, the RAN may request the mobile station to provide capability information by sending (on DCCH) a UE Capability Enquiry message.

execute the commands message at the activation time, unless required otherwise. The activation time shall be determined as described in 10.2.3.5 of 3GPP TS 25.331.

The mobile station shall respond to an Upper Layer message or order requiring response within T_{56m} seconds of receiving the message or order, unless stated otherwise.

The mobile station shall process the following messages as specified in 2.6.2.4 of 3GPP2 C.S0005-A:

- *Abbreviated Alert Order*
- *Audit Order*
- *Feature Notification Message*
- *Local Control Order*
- *Maintenance Required Order*

The mobile station shall process the messages below as follows:

- *Authentication Challenge Message*: See 2.2.4.1.
- *Base Station Challenge Confirmation Order*: See 2.2.4.1.
- *Data Burst Message*: If the received message does not have a broadcast address and the message contains a RESPONSE_TAG field, the mobile station shall send a *Data Burst Response Message* containing the RESPONSE_TAG field set to the value of the RESPONSE_TAG field in the received message.
- *DS-41 Call Request Message*: See 2.2.3.2.
- *DS-41 In-traffic System Parameter Message*: The mobile station shall interpret this message as a simplified form of the *In-traffic System Parameters Message* and shall process the message as described in 2.6.2.4 of 3GPP2 C.S0005-A.
- *DS-41 Release Message*: See 2.2.3.4.
- *DS-41 Service Option Connect Message*: See 2.2.3.1 and 2.2.3.2.
- *DS-41 Service Option Disconnect Message*: See 2.2.3.4.
- *Extended Alert With Information Message*: See 2.2.3.3.
- *Extended Flash With Information Message*: See 2.2.3.3.
- *Lock Until Power-Cycled Order*: The mobile station shall record the reason for the Lock Until Power-Cycled Order in the mobile station's semi-permanent memory (LCKRSN_P_{s-p} equals the least significant four bits of $ORDQ_r$). After a mobile station receives this order, it shall not initiate new operations until it has received an Unlock Order, or until after power-cycling the mobile station (i.e., after the next mobile station power-up). The mobile station should notify the user of the locked condition. If no call is in progress, the mobile may drop the RRC connection and may select a different operating mode while locked.
- *Message Encryption Mode Order*: See 2.2.4.3.
- *PACA Message*: See 2.2.3.3.

- *Parameter Update Order*: See 2.2.4.1.
- *Reorder Order*: See 2.2.3.
- *Registration Accepted Order*: See 2.2.4.
- *Registration Rejected Order*: See 2.2.4.
- *Registration Request Order*: See 2.2.4.
- *Send Burst DTMF Message*: Support of this message is optional; however, if the message is supported, the mobile station shall proceed as follows:
  - If CON_REF is specified, the mobile station shall interpret the DTMF digits within the context of the call identified by CON_REF;
  - If CON_REF is not specified but there is only one active call, the mobile station shall interpret the DTMF digits within the context of the active call;
  - if CON_REF is specified but has a value that does not correspond to a call in progress, the mobile station shall reject the message;
  - if no call is in progress and CON_REF is not specified, the behavior of the mobile station is implementor-defined.
- *Service Option Control Message*: The mobile station shall interpret this message only in the context of the service instance identified by CON_REF, if valid; otherwise, the mobile station shall reject the message. The mobile station shall interpret the Type-specific fields in the context of the service option associated with CON_REF.
- *Service Redirection Order*: The mobile station shall process the message as described in 2.6.2.4 of 3GPP2 C.S0005-A. The mobile station shall immediately terminate all calls and connections in progress. The mobile station shall attempt to perform the service redirection as instructed. If RETURN_IF_FAIL is set to '1' and the service redirection fails, the mobile station shall attempt to resume service on the system it was redirected from. If RETURN_IF_FAIL is set to '0' and the service redirection fails, the mobile station should attempt to acquire service on systems other than the one from which it was redirected.
- *SSD Update Message*: See 2.2.4.1.
- *Status Request Message*: The mobile station shall process the message as described in 2.6.2.4 of 3GPP2 C.S0005-A. No state transitions should occur.
- *TMSI Assignment Message*: See 2.2.4.
- *Unlock Order*: After receiving this order, the mobile station is no longer locked. The mobile station should notify the user that the locked condition has been removed.

The mobile station shall process messages and orders that are deemed erroneous or that are not listed as acceptable, as specified in 2.6.2.4 of 3GPP2 C.S0005-A.

2.2.3 Call Processing

From the Upper Layers perspective, the call processing procedure assumes the presence of a dedicated control channel for the entire duration of the procedure. See Section 2.2.2 for requirements pertaining to setting up an RRC connection.

2.2.3.1 Call Setup for Mobile Station-originated Calls

The origination procedure is used to perform circuit and packet call originations, as well as to perform packet registrations. See 2.2.3.3 for PACA calls.

To start the origination procedure the mobile station shall send a *DS-41 Call Start-Up Message* on the dedicated control channel. The origination procedure shall end when:

- The mobile station receives *DS-41 Service Option Connect Message* which contains a *DS-41 Service Configuration Record* with the matching CSM_ID connected, (successful origination), or
- The mobile station receives a *DS-41 Release Message*, a *Reorder Order*, or a *DS-41 Service Option Connect Message* which releases the call with a matching CSM_ID (unsuccessful origination), or
- There is a time limit for the origination procedure and it expires before the procedure can be completed (e.g., PACA timeout), or
- There is an irrecoverable RRC failure, or
- The user abandons the origination before the base station has a chance of completing it. In such case, the mobile station shall send the *DS-41 Release Message* to the base station.

The mobile station may abandon the call before the origination procedure completes successfully by sending the *DS-41 Release Message* to the base station.

The mobile station shall restart an ongoing incomplete origination procedure when instructed by the base station via a *PACA Message*.

During the origination procedure, the mobile station may start (and may complete) other origination procedures and mobile termination procedures, using different CSM_ID.

Upon successfully processing the *DS-41 Service Option Connect Message* the mobile station shall send a *DS-41 Service Option Connect Complete Message*, shall connect the service option for the specified call if required (i.e., “RAB ID” field in the Service Configuration Record is not ‘0000000000000000’), and shall proceed with the call.

2.2.3.2 Call Setup for Mobile Station-terminated Calls

The termination procedure starts when the mobile station receives the *DS-41 Call Request Message* on the dedicated control channel. The mobile station should either reject the request by sending a *DS-41 Release Message* and ending the procedure, or should proceed with the request, by sending a *DS-41 Call Start-up Message*, tagged with the REQUEST_ID

field of the *DS-41 Call Request Message*. The *DS-41 Call Start-up Message* should contain the service option and, optionally, the QoS record for the call.[9] The termination procedure should end, when:

- The mobile station receives a *DS-41 Release Message* or a *DS-41 Service Option Connect Message* which releases the call with a matching CSM_ID, or
- There is a time limit for the termination procedure and it expires before the procedure can be completed, or
- There is an irrecoverable RRC failure, or
- The mobile station abandons the call by sending the *DS-41 Release Message* to the base station.

Otherwise, the termination procedure should continue with the mobile station receiving a *DS-41 Service Option Connect Message* which contains a *DS-41 Service Configuration Record* with the matching CSM_ID connected. If the BYPASS_ALERT_ANSWER field in the *DS-41 Call Request Message* is set to '1', the mobile station shall connect the service option for the specified call, shall proceed with the call and shall send a *DS-41 Service Option Connect Message*. If the BYPASS_ALERT_ANSWER field in the *DS-41 Call Request Message* is set to '0', the mobile station shall wait for an *Extended Alert With Information Message* related to the call.[10] Upon receiving the *Extended Alert With Information Message*, the mobile station should alert the user. If the user answers the call, the mobile station should stop alerting the user, shall connect the call and shall send a *Connect Order*. The mobile station may also temporarily suspend and then resume the termination procedure by sending the *Extended Flash With Information Message* with Answer Hold information record (see 2.7.4 of 3GPP2 C.S0005-A). Alternatively, the mobile station may end the termination procedure and the call by sending an *Extended Flash With Information Message* indicating a call forwarding by user selection.

At any time during the termination procedure the mobile station may end the procedure, by sending a *DS-41 Release Message*.

The mobile station shall restart an ongoing incomplete termination procedure when instructed by the base station via a new *DS-41 Call Request Message* with the same REQUEST_ID.

During the termination procedure, the mobile station may start (and may complete) other origination procedures and mobile termination procedures, using different CSM_ID.

---

[9] The mobile station should propose a service option and QoS values that are less or equally demanding of the base station, in terms of resources, than what the base station has specified in the *DS-41 Call Request Message*.

[10] In other words, having the CON_REF field set to CSM_ID. If only one call is active, the CON_REF field may be omitted.

2.2.3.3 Signaling During a Call

The mobile station shall process the *Extended Flash With Information Message* according to the 3GPP2 C.S0005-A requirements for the information records carried by the message. The mobile station shall process the *Extended Alert With Information Message* according to the C.S0005-A requirements for the information records carried by the message; the mobile station should alert the user as directed by the message.

If the mobile station supports PACA, it shall proceed as follows:

During the origination of a PACA call the mobile station shall cancel or restart the origination, if so directed via the *PACA Message*. If the *PACA Message* indicates queue position information, the mobile station may make it available to the user. The mobile station should terminate an incomplete PACA origination procedure after the number of minutes since the inception of the procedure, indicated via the PACA_TIMEOUT field of the latest received *PACA Message*. At the completion of a PACA origination procedure, the mobile station may use the special PACA alert tone to alert the user.

At any time during the call, the mobile station may send an *Extended Flash With Information Message* to the base station. The mobile station shall process the *DS-41 Service Option Connect Message* at any time during calls. The activation time for the message shall be based upon the ACTIVATION_TIME and ACTIVATE_ON_HANDOFF fields, as shown in Table 2.2.3.3-1.

Table 2.2.3.3-1. Activation Times for the *DS-41 Service Option Connect Message*

ACTIVATION_TIME	ACTIVATE_ON_HANDOFF	Message takes effect:
Not Specified	Set to zero	Immediately (implicit time)
Specified	Set to zero	At the time specified by ACTIVATION_TIME
Not Specified	Set to a bitmask matching the actual hard handover procedure(s)	On the next successful hard handover (see 8.3.5.2 of 3GPP TS 25.331)
Specified	Set to a bitmask matching the actual hard handover procedure(s)	On the next successful hard handover (see 8.3.5.2 of 3GPP TS 25.331) if it occurs before the time specified by ACTIVATION_TIME, or never, if the time specified by ACTIVATION_TIME passes without a successful hard handoff.

2.2.3.4 Call Clearing

The mobile station shall release calls upon reception of a *DS-41 Release Message* or a *DS-41 Service Option Connect Message* that releases calls. The mobile station shall process the information records contained in the *DS-41 Release Message*. The mobile station may reply to a *DS-41 Release Message* with a *DS-41 Release Message* affecting the same connection as the one specified in the received message. If a received *DS-41 Release Message* attempts to clear a connection which does not exist, the mobile station should ignore the received message.

The mobile station shall release an ongoing call during the origination procedure, if the *Reorder Order* is received. The mobile station shall reject a *Reorder Order* outside of an origination procedure. The mobile station shall release calls if timers indicating the maximum durations of call procedures expire. The mobile station shall release calls in case of irrecoverable radio connection failure.

Upon releasing the last call, the mobile station may release the RRC connection.

The mobile station shall suspend a call upon reception of a *DS-41 Service Option Disconnect Message*. The mobile station shall resume a suspended call upon receiving a *DS-41 Service Option Connect Message*.

The mobile station shall reply with a *DS-41 Service Option Connect Complete Message* or a *DS-41 Release Message* in response to each *DS-41 Service Option Connect Message* or *DS-41 Service Option Disconnect Message*.

At any time, the mobile station may release any call or may request the base station to release any call by sending a *DS-41 Release Message*.

2.2.4 Mobility Management Services Processing

The mobile station shall meet the requirements in 2.6.5 of 3GPP2 C.S0005-A, as amended by this section.

The mobile station shall use only the logical dedicated channel DCCH when it performs mobility management signaling (i.e., for registration and TMSI assignment).

Requirements placed on the *Origination Message* and *Page Response Message* shall be interpreted as requirements placed on the *DS-41 Call Start-Up Message*. Requirements placed on the *Registration Message* shall be interpreted as requirements placed on the *DS-41 Registration Message*.

Requirements related to the SLOT_CYCLE_INDEX and the MC-41 Station Class Mark do not apply.

The mobile station shall support all forms of registration in 2.6.5.1 of 3GPP2 C.S0005-A with the exception of distance-based registration. Requirements related to the BASE_LAT_REG, BASE_LONG_REG, REG_DIST and REG_DIST_REG do not apply.

Within T_{33m} seconds (see Annex D of 3GPP2 C.S0005-A) of receiving a *Registration Request Order*, the mobile station shall attempt to obtain the most recent system information (e.g., by starting to monitor the BCCH) without interrupting any calls in progress. The mobile

station shall register with the core network, using the most up-to-date registration information available to it.

The mobile station shall update its registration variables upon confirmation of delivery of the *DS-41 Registration Message* or of a *DS-41 Call Start-up Message* containing registration information, as well as upon reception of the *Registration Accepted Order* or *Mobile Station Registered Message*. Upon reception of a *Registration Rejected Order*, the mobile station shall ensure that its registration variables have the same values as prior to the registration attempt. When receiving a *TMSI Assignment Message*, the mobile station shall update the TMSI and shall respond with a *TMSI Assignment Completion Message*.

2.2.4.1 Authentication and Ciphering

The mobile station shall meet the requirements in 2.3.12 of 3GPP2 C.S0005-A, as amended by this section.

The mobile station shall use only IMSI_T (IMSI_M is not supported).

The mobile station shall use only the logical dedicated channel DCCH if it performs authentication or ciphering-related signaling, or both.

The term “Layer 3”, when used in authentication and ciphering procedures, shall be interpreted as DS-41 Upper Layers.

2.2.4.2 Global Challenge

If directed by the base station the mobile station shall respond to a global challenge in the absence of an existing service instance when:

- setting up a first service instance or performing a packet zone registration, or
- performing an explicit registration, or
- sending a *Data Burst Message*.

When responding to the global challenge, the mobile station shall set the global challenge authentication fields (see 2.1.1.1.1.1 of 3GPP2 C.S0004-A) for messages that support them, per requirements stated in 2.1.1.1.2.2 of 3GPP2 C.S0004-A, except that the dialed digits for *Originations* shall come from the *DS-41 Call Start-up Message* rather than from the *Origination Message*.

2.2.4.3 Encryption

The mobile station shall be able to perform signaling message encryption as described in Section 2.3.12.2, except that the mobile station shall be able to advertise its encryption capability via the *DS-41 Call Start-up Message* and shall switch on or off the encryption only when commanded via the *Message Encryption Mode Order*.

The mobile station shall be able to decrypt messages that it supports (see Section 3.3) and are received encrypted on the downlink as described in 2.3.12.2.1 of 3GPP2 C.S0005-A.

The mobile station shall be able to encrypt messages that it sends (see Section 2.3) encrypted on the uplink as described in 2.3.12.2.2 of 3GPP2 C.S0005-A.

Voice Privacy as described in 3GPP2 C.S0005-A is not supported.[11]

2.2.4.4 Extended-Encryption

If the mobile station supports extended-encryption for signaling messages, the mobile station shall meet the requirements in 2.3.12.4 of 3GPP2 C.S0005-A, where "Layer 3" shall be interpreted as DS-41 Upper Layers. Requirements placed on the *Registration Message* shall be interpreted as requirements placed on the *DS-41 Registration Message*. The mobile station shall not use extended-encryption for the *DS-41 Call Start-up Message*, in case of an emergency call. The mobile station shall be able to advertise its extended-encryption capability via the *DS-41 Registration Message* and the *DS-41 Call Start-up Message*.

Extended-Encryption for Voice Privacy as described in 2.3.12.4.4 of 3GPP2 C.S0005-A is not supported.

2.2.5 Support for R-UIM

The mobile station shall support an R-UIM as described in 3GPP2 C.S0023, "Removable User Identity Module".

2.2.6 Mobile Station Identity and Characteristics

While connected to the RAN, the mobile station shall be identifiable via RNTIs, as specified in 3GPP TS 25.331. From the perspective of the core network, the DS-41 mobile station shall be identifiable by, and be able to register with, a home system-assigned, semi-permanent IMSI, as specified in 2.3.1 of 3GPP2 C.S0005-A. MIN-based IMSI is not used in DS-41; thus, all references to IMSI shall be understood to be references to the "true IMSI", IMSI_T.

The DS-41 mobile station shall also be identifiable by, and be able to register with, a manufacturer-assigned permanent ESN, as specified in 2.3.2 of 3GPP2 C.S0005-A. The DS-41 mobile station shall also be identifiable by, and be able to register with, a serving system-assigned temporary TMSI, as specified in 2.3.15 of 3GPP2 C.S0005-A. When processing pages, the mobile station shall be able to match its IMSI and its current TMSI. The mobile station shall also meet the requirements in 2.3.13 and 2.3.14 of 3GPP2 C.S0005-A.

The mobile station shall support a home system and network, per requirements in 2.3.8 of 3GPP2 C.S0005-A. Registration memory shall be provided for the mobile station as specified in 2.3.4 of 3GPP2 C.S0005-A, with the exception that distance-based registration is not supported; thus, reserving space for BASE_LAT_REG, BASE_LONG_REG and REG_DIST_REG is unnecessary.

---

[11] The requirements stated in 2.3.12.3 of 3GPP2 C.S0005-A, and elsewhere in the same document, with respect to voice privacy do not apply.

A dual-mode DS-41/MC-41 mobile station shall store its MC-41 defined Station Class Mark and Access Overload Class information as specified in 2.3.3 and 2.3.5 of 3GPP2 C.S0005-A.

2.2.7 Reception of Broadcast SMS

Mobile stations configured to receive broadcast SMS shall monitor the broadcast channel and the CTCH logical channel, mapped to FACH, for SMS messages, according to the requirements in 3GPP TS 25.324. If a BMC CBS message is received, the mobile station shall process the "CB Data" information element as a broadcast *Data Burst Message*.

2.3 Messages Sent by the Mobile Station

When communicating with the base station, the mobile station shall be capable of sending all of the mandatory supported messages and the orders specified in 2.7 of 3GPP2 C.S0005-A, except the following messages and orders which shall not be sent:

- *Candidate Frequency Search Report Message*
- *Candidate Frequency Search Response Message*
- *Enhanced Origination Message*
- *Extended Handoff Completion Message*
- *Extended Pilot Strength Measurement Message*
- *Extended Release Response Message*
- *Extended Release Response Mini Message*
- *Handoff Completion Message*
- *Long Code Transition Request Order*
- *Long Code Transition Response Order*
- *Mobile Station Acknowledgement Order*
- *Mobile Station Resource Release Message*
- *Mobile Station Resource Release Mini Message*
- *Origination Continuation Message*
- *Origination Message*
- *Outer Loop Report Message*
- *PACA Cancel Message*
- *Page Response Message*
- *Parameters Response Message*
- *Periodic Pilot Strength Measurement*
- *Pilot Strength Measurement Message*
- *Power Measurement Report Message*

- *Release Order*
- *Registration Message*
- *Resource Request Message*
- *Resource Request Mini Message*
- *Service Connect Completion Message*
- *Service Connect Message*
- *Service Option Control Order*
- *Service Option Request Order*
- *Service Option Response Order*
- *Service Request Message*
- *Service Response Message*
- *Status Message*
- *Status Response Message*
- *Supplemental Channel Request Message*
- *Supplemental Channel Request Mini Message*

For the messages in use, the mobile station shall use the PDU formats in 2.7.1.3 and 2.7.2.3 of 3GPP2 C.S0005-A, as amended by 2.3.1 of this specification.

For the information records, the mobile station shall use the records and formats in 2.7.4 of 3GPP2 C.S0005-A, as amended by 2.3.2 of this specification.

The mobile station shall be capable of sending all the DS-41-specific messages in 2.3.3.

The mobile station shall be capable of processing all the mandatory supported messages and orders received from a base station compliant with Section 3 of this specification.

2.3.1 DS-41 Modifications to Layer 3 PDUs Described in C.S0005-A

2.3.1.1 *Security Mode Request Message*

The mobile station shall set the UI_ENC_INCL field to '0' and SIG_ENC_INCL to '1'. The mobile station shall set all other fields as described in 2.7.2.3.2.37 of 3GPP2 C.S0005-A.

2.3.2 DS-41 Modifications to C.S0005-A Information Records

When communicating with the base station, a dual-mode DS-41/MC-41 mobile station shall be able to include in signaling messages all the mandatory supported information records specified in 2.7.4 of 3GPP2 C.S0005-A. When communicating with the base station, a DS-41 mobile station that does not support the MC-41 operating mode shall be able to send all the mandatory information records specified in 2.7.4 of 3GPP2 C.S0005-A except the following records, which do not need to be supported:

- *Capability Information*

- *Channel Configuration Capability Information*
- *IMSI_M*
- *Multiplex Option Information*
- *Extended Multiplex Option Information*
- *Power Class Information*
- *Power Control Information*
- *Service Configuration*

The mobile station shall use the value OP_MODE5 in the *Operating Mode Information* record (see C.5.1) to refer to DS-41 operating mode.

2.3.3 Messages Specific to DS-41 Mode

2.3.3.1 *DS-41 Call Start-up Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41CSM

Field	**Length (bits)**
AUTH_MODE	2
AUTHR	0 or 18
RANDC	0 or 8
COUNT	0 or 6
CSM_ID	8
REQUEST_ID	4
PACA_CALL	1
EMERGENCY_CALL	1
DIALED_DIGS_INCL	1
DIGIT_MODE	0 or 1
NUMBER_TYPE	0 or 3
NUMBER_PLAN	0 or 4
NUM_FIELDS	0 or 8

0 or NUM_FIELDS occurrences of the following field:

CHARi	4 or 8

NUM_ SO	3

NUM_ SO occurrences of the following field:

SO	16

PM	1
RETURN_CAUSE	4
UZID_INCL	1
UZID	0 or 16
DRS	0 or 1
BASE_ID	16

MOB_CAPAB_INCL	1
MOB_TERM	0 or 1
MOB_P_REV	0 or 8
ENCRYPTION_SUPPORTED	0 or 4
PACA_SUPPORTED	0 or 1
NAR_AN_CAP	0 or 1
NUM_RECS	4

NUM_RECS occurrences of the following records:.

RECORD_TYPE	8
RECORD_LEN	8
<Record-type specific fields>	RECORD_LEN x 8

AUTH_MODE – Authentication Mode.

This field indicates whether other authentication fields are present. The mobile station shall set this field to '00' if no other authentication fields are present, or to '01' if the authentication fields below are included. All other values are reserved.

AUTHR – Authentication Response.

If AUTH_MODE is '01', the mobile station shall set this field to the response output of the authentication algorithm. If AUTH_MODE is '00', the mobile station shall omit this field.

RANDC – Random challenge value.

If AUTH_MODE is '01', the mobile station shall set this field to the eight most significant bits of the 32-bit Random Challenge held in the mobile station. If AUTH_MODE is '00', the mobile station shall omit this field.

COUNT – Call history parameter.

If AUTH_MODE is '01', the mobile station shall set this field to the Call History Parameter, a modulo-64 event counter maintained by the mobile station and Authentication Center that is used for clone detection. If AUTH_MODE is '00', the mobile station shall omit this field.

CSM_ID – Call State Machine Identifier.

The mobile station shall set this field to a non-zero value which uniquely identifies the call/connection established by this message.

REQUEST_ID – Request Identifier.

If this message is sent in response to a *DS-41 Call Request Message*, the mobile station shall set this field to the value of the REQUEST_ID field in the respective a *DS-41 Call Request Message*; otherwise, the mobile station shall set this field to '0000'.

PACA_CALL – PACA Call.

If this call is a PACA call, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

EMERGENCY_CALL – Emergency call indicator.

If the mobile station determines that the call is an emergency call, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

DIALED_DIGS_INCL – Presence indicator for the dialed digits.

If dialed digits are present in the message, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

DIGIT_MODE – Digit mode indicator.

This field indicates whether the dialed digits are 4-bit DTMF codes or 8-bit ASCII codes using a specified numbering plan.

If DIALED_DIGS_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as follows:

To originate the call using the binary representation of DTMF digits, the mobile station shall set this field to '0'. To originate the call using ASCII characters, the mobile station shall set this field to '1'.

NUMBER_TYPE – Type of number.

If DIALED_DIGS_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as follows:

If the DIGIT_MODE field is set to '1', the mobile station shall set this field to the NUMBER_TYPE value shown in C.S0005-A Table 2.7.1.3.2.4-2 corresponding to the type of the number as defined in ANSI T1.607-1990, Section 4.5.9. If the DIGIT_MODE field is set to '0', the mobile station shall omit this field.

NUMBER_PLAN – Numbering plan.

If DIALED_DIGS_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as follows:

If the DIGIT_MODE field is set to '1', the mobile station shall set this field to the NUMBER_PLAN value shown in C.S0005-A Table 2.7.1.3.2.4-3 corresponding to the requested numbering plan as defined in ANSI T1.607-1990, Section 4.5.9. If the DIGIT_MODE field is set to '0', the mobile station shall omit this field.

NUM_FIELDS – Number of dialed digits in this message.

If DIALED_DIGS_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as follows:

The mobile station shall set this field to the number of dialed digits included in this message.

CHARi – A dialed digit or character.

If DIALED_DIGS_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as follows:

The mobile station shall include NUM_FIELDS occurrences of this field. If the DIGIT_MODE field is set to '0', the mobile station shall set each occurrence of this field to the code value shown in C.S0005-A Table 2.7.1.3.2.4-4 corresponding to the dialed digit. If the DIGIT_MODE field is set to '1', the mobile station shall set each occurrence of this field to the ASCII representation corresponding to the dialed digit, as specified in ANSI X3.4, with the most significant bit set to '0'.

NUM_ SO – Number of specified service options.

The mobile station shall set this field to the number of supported service options included in this message. The mobile station shall set this field to a value less than or equal to $MAX\_NUM\_ALT\_SO_S$, but no less than 1.

SO – Preferred service options.

The mobile station shall include NUM_ SO occurrences of this field, in the descending order of preference. The mobile station shall set this field to the value specified in C.R1001, corresponding to the service options supported by the mobile station. The mobile station shall set the first occurrence of this field to the service option requested for the call.

PM – Privacy mode indicator.

To request privacy, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

RETURN_CAUSE – Reason for the mobile station registration or access.

The mobile station shall set this field to the RETURN_CAUSE value shown in C.S0005-A Table 2.7.1.3.2.1-2 corresponding to the service redirection failure condition (see 2.6.1.1 of 3GPP2 C.S0005-A).

UZID_INCL – User Zone Identifier included indicator.

If the message is to contain the User Zone Identifier, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

UZID – User Zone Identifier.

If the UZID_INCL field is included in the message and is set to '1', the mobile station shall include this field and set it to $UZID_S$; otherwise, the mobile station shall omit this field.

DRS – Data Ready to Send.

If there is data to send, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

BASE_ID – Identity of the base station.

The mobile station shall set this field to the value of the BASE_ID information associated with the base station to which this message is being sent. If the message is sent to multiple base stations (e.g., in soft handoff), the BASE_ID should correspond to the base station whose system information was most recently read by the mobile station.

MOB_CAPAB_INCL – Presence indicator for mobile station capability information.

The mobile station shall set this field to '1' if information about the mobile station is included in this message; otherwise the mobile station shall set this field to '0'.

MOB_TERM – Mobile-terminated calls accepted indicator.

If MOB_CAPAB_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as follows:

If the mobile station is configured to accept mobile-terminated calls while operating with the current roaming status (see 2.6.5.3 of 3GPP2 C.S0005-A), the mobile station shall set this bit to '1'; otherwise, the mobile station shall set this bit to '0'.

MOB_P_REV – Protocol revision of the mobile station.

If MOB_CAPAB_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field to '00000111'.

ENCRYPTION-_SUPPORTED – Encryption algorithms supported by the mobile station.

If MOB_CAPAB_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as specified in Table 2.7.1.3.2.4-5 of 3GPP2 C.S0005-A.

PACA_SUPPORTED – PACA supported by the mobile station.

If MOB_CAPAB_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field to '1' if the mobile station supports PACA calls or to '0', if the mobile station does not support PACA calls.

NAR_AN_CAP	–	Narrow analog capability. If MOB_CAPAB_INCL is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field as follows: If the mobile station is capable of narrow analog operation, the mobile station shall set this bit to '1'; otherwise, the mobile station shall set this bit to '0'.
NUM_ RECS	–	Number of information records included in this message. The mobile station shall set this field to the number of information records included in this message.
RECORD_TYPE	–	Type of the information record. The mobile station shall set this field to the type of the included record (see 2.7.4 of 3GPP2 C.S0005-A).
RECORD_LEN	–	Length of the information record. The mobile station shall set this field to the length in bytes of the included record (see 2.7.4 of 3GPP2 C.S0005-A).
<Record-type specific fields>	–	Fields specific to the information record. The mobile station shall set these fields to values specific for the type of the included record (see 2.7.4 of 3GPP2 C.S0005-A).

2.3.3.2 *DS-41 Registration Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41RGM

Field	Length (bits)
REG_TYPE	4
MOB_P_REV	8
MOB_TERM	1
RETURN_CAUSE	4
BASE_ID	16
UZID_INCL	0 or 1
UZID	0 or 16
ENC_INFO_INCL	1
SIG_ENCRYPT_SUP	0 or 8
SIG_ENCRYPT_REQ	0 or 1
KEY_SEQ_NEW	0 or 4
ENC_SEQ_H	0 or 24
ENC_SEQ_H_SIG	0 or 8

REG_TYPE – Registration type.

This field indicates which type of event generated the registration attempt.

The mobile station shall set this field to the REG_TYPE value shown in Table 2.7.1.3.2.1-1 of 3GPP2 C.S0005-A corresponding to the event that caused this registration to occur (see 2.6.5.1 of 3GPP2 C.S0005-A), except for the value '0110' which is reserved.

MOB_P_REV – Protocol revision of the mobile station.

The mobile station shall set this field to '00000111'.

MOB_TERM – Mobile terminated calls accepted indicator.

If the mobile station is configured to accept mobile-terminated calls while operating with the current roaming status (see 2.6.5.3 of 3GPP2 C.S0005-A), the mobile station shall set this bit to '1'; otherwise, the mobile station shall set this bit to '0'.

RETURN_CAUSE – Reason for the mobile station registration or access.

The mobile station shall set this field to the RETURN_CAUSE value shown in Table 2.7.1.3.2.1-2 of 3GPP2 C.S0005-A corresponding to the service redirection failure condition (see 2.6.1.1 of 3GPP2 C.S0005-A).

BASE_ID – Identity of the base station.

The mobile station shall set this field to the value of the BASE_ID information associated with the base station to which this message is being sent. If the message is sent to multiple base stations (e.g., in soft handoff), the BASE_ID should correspond to the base station whose system information was most recently read by the mobile station.

UZID_INCL – User Zone Identifier included indicator.

If the message is to contain the User Zone Identifier, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

UZID – User Zone Identifier.

If the UZID_INCL field is included in the message and is set to '1', the mobile station shall include this field and set it to $UZID_S$; otherwise, the mobile station shall omit this field.

ENC_INFO_INCL – Encryption fields included.

The mobile station shall set this field to '1' if the encryption related fields are included; otherwise the mobile station shall set this field to '0'. The mobile station shall set this field to '1' if it is unable to determine the base station support for encryption. The mobile station shall set this field to '0' if the base station does not support encryption or the mobile station does not support any of the encryption modes supported by the base station.

SIG_ENCRYPT_SUP – Signaling Encryption supported indicator.

The mobile station shall include this field only if ENC_INFO_INCL is equal to '1'. If included, this field indicates which signaling encryption algorithms are supported by the mobile station.

This field consists of the subfields shown in Table 2.7.1.3.2.1-5 of 3GPP2 C.S0005-A.

The mobile station shall set the CMEA subfield to '1'.

The mobile station shall set each remaining subfield to '1' if the corresponding signaling algorithm is supported by the mobile station; otherwise, the mobile station shall set the subfield to '0'.

SIG_ENCRYPT_REQ – Signaling Message encryption request indicator.

The mobile station shall include this field if ENC_INFO_INCL is equal to '1'. If included the mobile station shall set this field to '1' to request signaling encryption to be turned on for signaling messages sent on the f-dsch, r-dsch, f-csch, or r-csch.

KEY_SEQ_NEW – Key sequence number corresponding to the new encryption key generated by the mobile station.

The mobile station shall include this field only if ENC_INFO_INCL is equal to '1' and if $STORE\_KEY_S$ is equal to '1'. If included, the mobile station shall set this field to $KEY\_SEQ\_NEW_{S-P}$, which is the sequence number associated with the new encryption key generated by the mobile station.

ENC_SEQ_H – The 24 MSB of the EXT_ENC_SEQ.

The mobile station shall include this field only if ENC_INFO_INCL is equal to '1' and if the new Algorithm 1 is supported by the mobile station. If included, the mobile station shall set this field to the 24 most significant bits of the EXT_ENC_SEQ to be used as the initial value of crypto-sync for both forward and reverse link encryptions; otherwise the mobile station shall omit this field.

ENC_SEQ_H_SIG – The signature of ENC_SEQ_H.

If the ENC_SEQ_H field is included in the message, the mobile station shall set this field to the digital signature of the ENC_SEQ_H computed using the session encryption key; otherwise, the mobile station shall omit this field.

2.3.3.3 *DS-41 Release Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41RELM

Field	**Length (bits)**
REQUEST_ONLY	1
ALL_CALLS	1
GLOBAL_REASON	0 or 4
NUM_CALLS	0 or 4

0 or NUM_CALLS entries of the following format

CALL_ID_TYPE	1
REQUEST_ID or CSM_ID	4 or 8
INDIVIDUAL_REASON	4

REQUEST_ONLY – Indicator for request.

The mobile station shall set this field to '1' when requesting that the base station sends a *DS-41 Release Message*, releasing the specified calls. The mobile station shall set this field to '0' when requesting that the releasing of the specified calls take place immediately upon reception of the message by the base station.

ALL_CALLS – Scope indicator for this message.

If all the calls need to be released, the mobile station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

GLOBAL_REASON – Reason code for releasing all the calls.

If ALL_CALLS is set to '0', the mobile station shall omit this field; otherwise, the mobile station shall set this field to one of the values specified in Table 2.3.3.3-1.

Table 2.3.3.3**-1. Release "Reason" Codes**

GLOBAL_REASON or INDIVIDUAL_REASON	**Description**
'0000'	Unknown/Unspecified
'0001'	User requested
'0010'	Could not meet QoS
'0011'	Preemption by emergency or higher priority call
'0100'	Too many simultaneous calls
'0101'	SO incompatibility
'0110'	Out of physical resources
'0111'	Out of monetary resources
'1000'	SIM card removed
'1001'	Service Denied
'1010'	Power Down
'1011'-'1111'	Reserved

NUM_CALLS – Number of calls to be released by this message.

If ALL_CALLS is set to '1', the mobile station shall omit this field; otherwise, the mobile station shall set this field to the number of calls to be released by this message.

CALL_ID_TYPE – Type of the call identifier.

The mobile station shall set this field to '0' if the call is identified by a CSM_ID. The mobile station shall set this field to '1' if the call is identified by a REQUEST_ID.

REQUEST_ID or CSM_ID – Call identifier.

If CALL_ID_TYPE is set to '0', the mobile station shall set this field to the CSM_ID of the call to be released; otherwise, the mobile station shall set this field to the REQUEST_ID of the call to be released.

INDIVIDUAL_REASON – Reason code for releasing the specific call.

The mobile station shall set this field to one of the values specified in Table 2.3.3.3-1.

2.3.3.4 *DS-41 Service Option Connect Complete Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41SOCCM

Field	**Length (bits)**
CON_REF	0 or 8

CON_REF – Connection Reference.

If the message is sent in response to a *DS-41 Service Option Connect Message* or a *DS-41 Service Option Disconnect Message* which affect only one call or connection, the mobile station shall include this field and shall set it to the CSM_ID value for the call or connection; otherwise, the mobile station shall omit this field.

2.3.4 PDU Format

When transmitting an Upper Layers message, the mobile station shall use the following Upper Layers PDU format for the “NAS message” information element in the INITIAL DIRECT TRANSFER message and the UPLINK DIRECT TRANSFER message:

Field	Length (bits)
MSG_PID	2
MSG_ID	6
ENC_FIELDS_INCL	1
SIG_ENCRYPT_MODE	0 or 3
ENC_SEQ	0 or 8
Upper Layers SDU	variable

MSG_PID – Message Protocol Identifier.

The mobile station shall set the field to ‘00’

MSG_ID – Message Identifier.

The mobile station shall set the field as specified in Table 2.3.4-1.

ENC_FIELDS_INCL – Encryption fields included indicator.

The mobile station shall set the ENC_FIELDS_INCL field to ‘1’ if Upper Layers enhanced encryption fields are included in this message; otherwise, the mobile station shall set the ENC_FIELDS_INCL field to ‘0’. The mobile station shall set this field to ‘0’ whenever the MSG_ID corresponds to a *DS-41 Registration Message*.

SIG_ENCRYPT_MODE – Signaling Encryption mode in use.

If ENC_FIELDS_INCL is set to ‘0’, the mobile station shall omit the SIG_ENCRYPT_MODE field; otherwise the mobile station shall set the SIG_ENCRYPT_MODE field to the SIG_ENCRYPT_MODE (see Table 2.7.1.3.2.1-5 of 3GPP2 C.S0005-A) used for SDU carried by this PDU.

ENC_SEQ – The eight least significant bits of the Encryption sequence number used to construct a cryptographic synchronization crypto-sync (see 2.3.12.4 of 3GPP2 C.S0005-A) for the encryption algorithm.

If the SIG_ENCRYPT_MODE field is not included or is set to a value other than ‘01000000’ (see Table 2.7.1.3.2.1-5 of 3GPP2 C.S0005-A), the mobile station shall omit the ENC_SEQ field; otherwise, the mobile station shall set the ENC_SEQ field to the eight least significant bits of the 32 bit crypto-sync (see 2.3.12.4 of 3GPP2 C.S0005-A).

Upper Layers SDU – The Upper Layer Message.

The mobile station shall set the field as specified in 2.3.3 of this specification or in 2.7 of 3GPP2 C.S0005-A, as amended by 2.3.1 of this specification.

Table 2.3.4-1. Identification of the Uplink Upper Layers Messages

Message Name	MSG_TAG	MSG_ID	C.S0005-A Reference:	Local Reference:
Authentication Challenge Response Message	AUCRM	'011000'	2.7.2.3.2.2	-
Data Burst Message	DBM	'110000'	2.7.1.3.2.3	-
Data Burst Response Message	DBRM	'110001'	-	C.6.2
DS-41 Call Start-up Message	D41CSM	'000001'	-	2.3.3.1
DS-41 Registration Message	D41RGM	'010000'	-	2.3.3.2
DS-41 Release Message	D41RELM	'000010'	-	2.3.3.3
DS-41 Service Option Connect Complete Message	D41SOCCM	'001000	-	2.3.3.4
Extended Flash With Information Message	EFWIM	'000011'	2.7.2.3.2.32 2.7.1.3.2.13	-
Extended Status Response Message	ESTRPM	'101000'	2.7.1.3.2.10	-
Order Message	ORDM	'111111'	2.7.2.3.2.1	-
Security Mode Request Message	SMRM	'100000'	2.7.2.3.2.37	2.3.1.2
Send Burst DTMF Message	BDTMFM	'110100'	2.7.2.3.2.7	-
Service Option Control Message	SOCM	'001001'	2.7.2.3.2.15	-
TMSI Assignment Completion Message	TACM	'010001'	2.7.2.3.2.17	-

The mobile station shall interpret Upper Layers PDU received from the base station according to the formats described in 3.3.4.

2.3.5 Timers and Constants

The mobile station shall meet the timing constraints reflected in the values for the timers, as specified in Section 13 of 3GPP TS 25.331. The mobile station shall meet the timing constraints reflected in the values for the T_{56m}, T_{57m}, T_{64m}, T_{66m}, T_{69m}, as described in Annex D of 3GPP2 C.S0005-A. The mobile station shall meet the timing constraint indicated by the T_{33m} timer when executing ordered registration (see 2.2.4).

3 REQUIREMENTS FOR DS-41 BASE STATIONS

3.1 Signaling Between the Base Station and the Mobile Station

When no RRC connection between the base station and the mobile station exists, the base station shall proceed as described in 3GPP TS 25.304.

In the absence of an RRC connection to a mobile station, and when solicited by that mobile station, the base station should establish (or re-establish, in case of an RF failure) an RRC connection to the mobile station (see 8.1.3 of 3GPP TS 25.331). The base station shall inform the mobile station if it cannot establish an RRC connection. The base station should obtain the capabilities information of the mobile station (see TS 25.331) as early as practical, while or after the RRC connection is established.

For the duration of the RRC connection, the base station shall establish a bi-directional (uplink and downlink) logical dedicated channel capable of transporting the INITIAL DIRECT TRANSFER message, the UPLINK DIRECT TRANSFER message and the DOWNLINK DIRECT TRANSFER messages (see 8.1.8 of 3GPP TS 25.331) in acknowledged mode (see 4.2.1.3 of 3GPP TS 25.322). The base station may also establish a link for unacknowledged transfers (see 4.2.1.2 of 3GPP TS 25.322). The base station may release the RRC connection to a mobile station at any time.

While an RRC connection to a mobile station exists, the base station may perform RRC-related operation in connected mode with respect to the mobile station, as described in 3GPP TS 25.303 and 3GPP TS 25.331.

3.1.1 Sending Upper Layers-related Information to the Mobile Station

The base station shall broadcast system information on the logical broadcast channel BCCH (see 8.1.1 of 3GPP TS 25.331). The base station may send broadcast SMS messages on the CTCH logical channel.

In the absence of an RRC connection, the base station should page the mobile station on the logical paging channel PCCH (see 8.1.2 of 3GPP TS 25.331), should wait for the mobile station to solicit an RRC connection, and then establish the RRC connection and the associated logical dedicated channel.

If an RRC connection exists, but is in a state that does not allow immediate communication with the mobile station on the logical dedicated control channel (see 9.3.3 and 9.3.4 of 3GPP TS 25.331), the base station should page the mobile station on the logical paging channel PCCH, wait for the mobile station to respond, and then activate the logical dedicated channel.

When the logical dedicated channel is available for communication, the base station may send Upper Layers-related messages to the mobile station. In such cases, the base station shall generate a DOWNLINK DIRECT TRANSFER message, shall set the “CN domain identifier” information element as described in 8.1.9.2 of 3GPP TS 25.331, shall set the “NAS message” information element to contain the Upper Layers message, and shall transmit the DOWNLINK DIRECT TRANSFER message on the downlink dedicated logical channel. If the Upper Layer message must be sent in assured mode, the base station shall send the DOWNLINK DIRECT TRANSFER message in acknowledged mode (see 4.2.1.3 of 3GPP TS 25.322); otherwise, the base station may send the DOWNLINK DIRECT TRANSFER message in unacknowledged mode (see 4.2.1.2 of 3GPP TS 25.322).

For each active logical connection, the base station shall not send more than four Upper Layer messages requiring acknowledgement before receiving acknowledgment of the reception of at least one of the messages. For services having inactive logical connections or no logical connections, the base station shall not send more than four Upper Layer messages requiring acknowledgment before receiving acknowledgment of the reception of at least one of the messages.

3.1.2 Receiving Upper Layers-related Information from the Mobile Station

The base station receives Upper Layers-related information only if a logical dedicated channel exists between the base station and the mobile station.[12] If such a connection does not exist, the base station establishes one upon reception (on the logical common control channel CCCH) of a request from the mobile station.

Upon reception on the dedicated logical channel of an INITIAL DIRECT TRANSFER message or an UPLINK DIRECT TRANSFER message from the mobile station, the base station shall extract the Upper Layers message from the “NAS message” information element and route it to the CN domain identified in the “CN domain identifier” information element, as specified in 8.1.10.3 of 3GPP TS 25.331.

Messages that can be identified and decrypted correctly, but that are found to be longer than expected, should be processed up to the expected length (extraneous information should be ignored). Messages that cannot be identified, that cannot be decrypted correctly, or that are shorter than expected, should be rejected (by informing the mobile station of the error) or ignored.

3.2 Procedures

When requirements are specified based upon sections in 3GPP2 C.S0005-A, the following rules shall apply with regard to the C.S0005-A text:

- Specific 3GPP2 C.S0005-A sections referenced in this text, shall be understood as including all of their subsections, unless indicated otherwise.

---

[12] Except for system information broadcast and broadcast SMS.

- References to messages, orders, information records, or information elements that are not supported shall be ignored.
- Redirections and transitions to unsupported states should be understood as redirections to equivalent states or to states that can properly handle the triggering condition.
- Requirements pertaining to RRC behaviors, procedures or variables shall be ignored.
- Amendments and new requirements specified by this specification shall take precedence over any corresponding text in 3GPP2 C.S0005-A.

If the base station receives a *Mobile Station Reject Order* during a multi-message procedure, the base station should abandon the procedure, unless there is enough information to allow recovery and continuation of the procedure.

3.2.1 System Broadcast

The base station shall broadcast general and RRC-related information according to the requirements in 3GPP TS 25.331. The base station shall broadcast Upper Layers-related system information in the Master Information Block and the System Information Block type 13, as specified in Table 3.3.4-2. The base station may broadcast Upper Layers-related system information in the sub-blocks of the System Information Block type 13, as specified in Table 3.3.4-2.

3.2.2 Call Processing

Call Control signaling between the base station and the mobile station shall take place on dedicated logical control channels. The messages shall be sent in assured mode.

The base station should treat concurrent calls independently, from the perspective of Upper Layers signaling.

3.2.2.1 Call Setup for Mobile Station-originated Calls

The origination procedure is used to perform circuit and packet call originations as well as packet registrations.

The origination procedure starts when the base station receives the *DS-41 Call Start-Up Message* on the dedicated control channel:

- If the *DS-41 Call Start-Up Message* requests the establishment of a call, the base station should select the best available service option from the list presented by the mobile station, should set up the proper radio bearers capable to support the traffic, based upon default or explicit QoS information, should assign a non-zero value for the “RAB ID” field of the *DS-41 Service Configuration Record*, should send a *DS-41 Service Option Connect Message*, and should proceed with the call. If the call cannot be processed successfully, the base station should send a *DS-41 Release Message*.
- If the *DS-41 Call Start-Up Message* requests only a packet registration and the packet registration is successful, the base station should assign a value of zero for the “RAB ID” field of the *DS-41 Service Configuration Record* and should send the record as part of the *DS-41 Service Option Connect Message*.

- If the *DS-41 Call Start-Up Message* requests only a packet registration and the packet registration is not successful, the base station should send a *DS-41 Service Option Disconnect Message* or should send a *DS-41 Release Message*.

The base station may abandon the origination procedure at any time (see 3.2.2.4).

The base station may send a *Reorder Order* to the mobile station, to cause the restart of the origination procedure.

During the origination procedure, the base station may start (and may complete) other origination procedures and mobile termination procedures, using different CSM_ID.

3.2.2.2 Call Setup for Mobile Station-terminated Calls

To initiate the mobile station-terminated procedure, the base station shall send a *DS-41 Call Request Message* with a service option and QoS parameters deemed acceptable to the mobile station.[13]

If a *DS-41 Call Start-Up Message* tagged with the REQUEST_ID value used in the *DS-41 Call Request Message* is received, the base station should set up the proper radio bearers capable to support the traffic, based upon the default or explicit QoS information, should assign a non-zero value for the “RAB ID” field of the *Service Configuration Record*, and should send a *DS-41 Service Option Connect Message*.

Upon confirmation of the successful delivery of the *DS-41 Service Option Connect Message*:

If the BYPASS_ALERT_ANSWER field in the *DS-41 Call Request Message* was set to ‘1’, the base station should proceed with the call.

Otherwise, the base station should send the *Extended Alert With Information Message* to alert the user of the incoming call; and if the base station subsequently receives a *Connect Order*, indicating that the user has answered the call, the base station should proceed with the call. Alternatively, if an *Extended Flash With Information Message* carrying call forwarding information is received in lieu of the *Connect Order*, the base station should end the termination procedure and the call. If the received *Extended Flash With Information Message* carries Answer Hold information (see 2.7.4 of 3GPP2 C.S0005-A), the base station shall suspend and shall resume the call, as appropriate.

The base station may abandon the termination procedure at any time (see 3.2.2.4)

During the termination procedure, the base station may start (and may complete) other origination procedures and mobile termination procedures, using different CSM_ID and REQUEST_ID.

---

[13] Such information can normally become available during registration.

3.2.2.3 Signaling During a Call

The base station should process a received *Extended Flash With Information Message* according to the C.S0005-A requirements for the information records carried by the message.

To alert the user, the base station may send the *Extended Alert With Information Message* carrying information records specified in 3.7.5 of 3GPP2 C.S0005-A. During a PACA origination procedure the base station may send the *PACA Message* to indicate the position of the call in the PACA queue, or to indicate the call cancel or call restart commands.

At any time during the call, the base station may send an *Extended Flash With Information Message* to the mobile station.

3.2.2.4 Call Clearing

If the base station receives a *DS-41 Release Message* soliciting the release of the call, the base station shall send a *DS-41 Release Message*. The base station may reply to a *DS-41 Release Message* with a *DS-41 Release Message* affecting the same connection as the one specified in the received message. If a received *DS-41 Release Message* attempts to clear a connection that does not exist, the base station should ignore the received message.

Upon reception of a *DS-41 Release Message* releasing the call, in case of irrecoverable RRC failure, or in case of expiration of procedure-related timers the base station should abandon the origination or termination procedures, if in progress, and it should clear the call.

The base station may release or disconnect calls at any time by sending the *DS-41 Release Message*, a *DS-41 Service Option Connect Message* which performs releases, or the *DS-41 Service Option Disconnect Message*.

When sending a *DS-41 Release Message*, the base station may provide advice-of-charge and other end-of-call-related information.

After releasing a last call, the base station may disconnect the signaling RRC connection (see 8.1.4 of 3GPP TS 25.331).

3.2.3 Mobility Management Services Processing

The base station shall meet the requirements in 3.6.5 of 3GPP2 C.S0005-A, as amended by this section.

The base station shall use only the logical dedicated channel DCCH when it performs mobility management signaling (i.e., for registration and TMSI assignment).

Requirements placed on the processing of the *Origination Message* and *Page Response Message* with respect to registration shall be interpreted as requirements placed on the processing of the *DS-41 Call Start-Up Message*. Requirements placed on the processing of the *Registration Message* shall be interpreted as requirements placed on the processing of the *DS-41 Registration Message*.

Requirements related to the SLOT_CYCLE_INDEX and the MC-41 Station Class Mark do not apply.

The authentication and ciphering requirements in 3.3.1 and 3.3.2 of 3GPP2 C.S0005-A shall apply. Requirements in 2.3.12 of 3GPP2 C.S0005-A shall also apply, as amended by 2.2.4 of this specification.

3.2.4 Broadcast SMS

The base station may send broadcast SMS messages according to 3GPP TS 25.324. If the base station sends a broadcast *Data Burst Message*, the base station shall encapsulate the message as the "CB Data" information element of the BMC CBS message. The base station should send the BMC CBS message on the FACH at the advertised time (see 10.1 of 3GPP TS 25.324). Information on further broadcast SMS activity is communicated by the base station via the BMC SCHEDULE message transmitted on the FACH, together with the BMC CBS message (see 10.2 of 3GPP TS 25.324).

3.3 Messages Sent by the Base Station

When communicating with the mobile station, the base station shall be able to send all the mandatory supported messages and orders specified in 3.7 of 3GPP2 C.S0005-A, with the exception of the following messages and orders which shall not be sent:

- *Access Parameters Message*
- *Alert With Information Message*
- *Analog Handoff Direction Message*
- *Call Assignment Message*
- *Candidate Frequency Search Control Message*
- *Candidate Frequency Search Request Message*
- *CDMA Channel List Message*
- *Channel Assignment Message*
- *Enhanced Access Parameters Message*
- *Extended CDMA Channel List Message*
- *Extended Channel Assignment Message*
- *Extended Handoff Direction Message*
- *Extended Neighbor List Message*
- *Extended Neighbor List Update Message*
- *Extended Release Message*
- *Extended Release Mini Message*
- *Extended Supplemental Channel Assignment Message*
- *Extended System Parameters Message*
- *Flash With Information Message*
- *Forward Supplemental Channel Assignment Mini Message*

- *General Handoff Direction Message*
- *General Neighbor List Message*
- *General Page Message*
- *Global Service Redirection Message*
- *In-traffic System Parameter Message*
- *Long Code Transition Request Order*
- *MC-RR Parameters Message*
- *Mobile Assisted Burst Operation Parameters Message*
- *Neighbor List Message*
- *Neighbor List Update Message*
- *Outer Loop Report Order*
- *Pilot Measurement Request Order*
- *Periodic Pilot Measurement Request Order*
- *Power Control Message*
- *Power Control Parameters Message*
- *Power Up Function Message*
- *Power Up Function Control Message*
- *Release Order*
- *Resource Allocation Message*
- *Resource Allocation Mini Message*
- *Retrieve Parameters Message*
- *Reverse Supplemental Channel Assignment Mini Message*
- *Service Connect Message*
- *Service Option Request Order*
- *Service Option Response Order*
- *Service Request Message*
- *Service Response Message*
- *Set Parameters Message*
- *Slotted Mode Order*
- *Status Request Message*
- *Status Request Order*
- *Supplemental Channel Assignment Message*

- *Sync Channel Message* (the P_REV, MIN_P_REV, SID and NID fields are used in the Master Information Block; see 3.3.1.1)
- *System Parameters Message*
- *Universal Handoff Direction Message*

For the messages in use, the base station shall use the PDU formats specified in 3.7.2.3 and 3.7.3.3 of 3GPP2 C.S0005-A, as amended by 3.3.1 of this specification.

For the information records, the base station shall use the formats specified in 2.7.5 of 3GPP2 C.S0005-A, as amended by 3.2.2 of this specification.

The base station should be able to send the DS-41 specific messages specified in Section 3.3.3.

3.3.1 Modifications to Layer 3 PDUs Described in C.S0005-A

3.3.1.1 *Sync Channel Message*

The base station shall use only the following fields: P_REV, MIN_P_REV, SID, NID. The base station shall set these fields as specified in 3.7.2.3.2.26 of 3GPP2 C.S0005-A.

3.3.1.2 *ANSI-41 Systems Parameter Message*

The base station shall omit the PILOT_PN and CONFIG_MSG_SEQ fields. The base station shall set DIST_REG_INCL to ‘0’ and OTHER_INFO_INCL to ‘1’ .The base station shall set the included fields as specified in 3.7.2.3.2.29 of 3GPP2 C.S0005-A.

3.3.1.3 *ANSI-41 RAND Message*

The base station shall omit the PILOT_PN field. The base station shall set the included fields as specified in 3.7.2.3.2.31 of 3GPP2 C.S0005-A.

3.3.1.4 *User Zone Identification Message*

The base station shall omit the PILOT_PN and CONFIG_MSG_SEQ fields.

The base station shall set the UZID_EXIT field to a value corresponding to a threshold for the quality of the received signal (3GPP TS 25.304 defines the quality of the received signal for cell reselection). The same definition applies to the quality of received signal for UZID_EXIT).

The base station shall set the other included fields as specified in 3.7.2.3.2.23 of 3GPP2 C.S0005-A.

3.3.1.5 *Private Neighbor List Message*

The base station shall omit the PILOT_PN field. The base station shall set the fields as specified in 3.7.2.3.2.24 of 3GPP2 C.S0005-A.

3.3.1.6 *Extended Global Service Redirection Message*

The base station shall omit the PILOT_PN and CONFIG_MSG_SEQ fields. The base station shall set the fields as specified in 3.7.2.3.2.27 of 3GPP2 C.S0005-A.

3.3.1.7 *Status Request Message*

In addition to the requirements in 3.7.3.3.2.16 of 3GPP2 C.S0005-A, the base station may set the OP_MODE field to '00000101' for the DS-41 operating mode (see C.5.2).

3.3.1.8 *Security Mode Command Message*

The base station shall use the format specified in 3.7.3.3.2.44 of 3GPP2 C.S0005-A, except that the ACTION_TIME field shall be replaced by the 8-bit ACTIVATION_TIME. If included, the field shall be set as specified in 10.2.3.5 of 3GPP TS 25.331. The base station shall set the NUM_RECS field to '000'. All other fields shall be set as specified in 3.7.3.3.2.44 of 3GPP2 C.S0005-A.

3.3.1.9 *Order Message*

The base station shall use the format specified in 3.7.3.3.2.1 of 3GPP2 C.S0005-A, except that the ACTION_TIME field shall be replaced by the 8-bit ACTIVATION_TIME. If included, the field shall be set as specified in 10.2.3.5 of 3GPP TS 25.331. The base station shall set the ORDER field to values corresponding to orders supported by the mobile station (see 3.3). All other fields shall be set as specified in 3.7.3.3.2.1 of 3GPP2 C.S0005-A.

3.3.1.10 *Mobile Station Registered Message*

The base station shall omit the BASE_LAT, BASE_LONG and REG_DIST fields. The base station shall replace the omitted fields with the 16-bit field BASE_ID. The base station shall set the BASE_ID field to the ID of the base station with which the mobile station is registered.

3.3.2 DS-41 Modifications to Information Records Described in C.S0005-A

When communicating with a dual-mode DS-41/MC-41 mobile station, the base station shall be able to include in signaling messages all the mandatory supported information records specified in 3.7.5 of 3GPP2 C.S0005-A.

When communicating with a DS-41 mobile station that does not support the MC-41 operating mode, the base station shall be able to include in signaling messages all the mandatory supported information records specified in 3.7.5 of 3GPP2 C.S0005-A with the exception of the *Service Configuration Information* record, which does not have to be supported.

Instead, the base station shall support the following service configuration information record and shall be able to include it in a *DS-41 Service Option Connection Message* to specify a service configuration to be used:

Field	Length (bits)
NUM_CALLS	4
NUM_CALLS occurrences of the group formed by the following fields:	
CSM_ID	8
SO	16
RAB ID	16
QoS_PARAMS_INCL	1
QoS_PARAMS_LEN	0 or 5
QoS_PARAMS	0 or 8 × QoS_PARAMS_LEN
QoS_PARAMS_PAD	0-7

NUM_CALLS – Number of calls to be connected/reconnected via this message.

The base station shall set this field to the number of existing calls to be connected or reconnected by this message.

CSM_ID – Call State Machine Identifier.

The base station shall set this field to an unique value for a Call State Machine Identifier for an existing call which is to be connected or reconnected via this message.

SO – Service option.

The base station shall set this field to a value specified in 3GPP2 C.R1001-A, corresponding to the service option to be connected or reconnected by the mobile station to the call identified by the associated CSM_ID.

RAB ID – Upper Layer reference to the radio bearer identity.

The base station shall set this field to the RAB ID for the radio bearer associated with the call identified by CSM_ID, as specified in 3GPP TS 25.331. In the absence of a binding, the base station shall set this field to '0000000000000000'.

QoS_PARAMS_INCL – Presence indicator for QoS information.

The base station shall set this field to '1', if it includes QoS information in the message; otherwise, the base station shall set this field to '0'.

QoS_PARAMS_LEN – Length in octets of the QoS information block.

If QoS_PARAMS_INCL is set to '0', the base station shall omit this field; otherwise, the base station shall set this field to the combined length in bytes of the QoS_PARAMS and QoS_PARAMS_PAD fields.

QoS_PARAMS – QoS information block.

If QoS_PARAMS_INCL is set to '0', the base station shall omit this field; otherwise, the base station shall set this field as specified in 3GPP2 C.S0017-0-2.

QoS_PARAMS_PAD – Padding for the QoS information block.

If QoS_PARAMS_INCL is set to '0', the base station shall omit this field; otherwise the base station shall set this field to the minimum number of '0' bits necessary to make the combined length in bits of QoS_PARAMS and of this field an integral multiple of eight.

3.3.3 Messages Specific to DS-41 Mode

3.3.3.1 *DS-41 Call Request Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41CRM

Field	**Length (bits)**
REQUEST_ID	4
SO	16
BYPASS_ALERT_ANSWER	1
EMERGENCY_IND	1
NUM_RECS	4
NUM_RECS occurrences of the following records:	
RECORD_TYPE	8
RECORD_LEN	8
<Record-type specific fields>	RECORD_LEN × 8

REQUEST_ID – Tag uniquely identifying the request.

The base station shall set this field to a value different than '0000'.

SO – Service Option.

Service option requested for the call.

BYPASS_ALERT_ANSWER – Indicates whether the call has alert/answer phases.

If the mobile is to connect the call without waiting for alerting and answering, the base station shall set this field to '1'; otherwise, the base station shall set this field to '0'.

EMERGENCY_IND – Indicates an emergency call.

If the base station can identify the call as an emergency call, the base station shall set this field to '1'; otherwise, the base station shall set this field to '0'.

NUM_ RECS – Number of information records included in this message.

The base station shall set this field to the number of information records included in this message.

RECORD_TYPE – Type of the information record.

The base station shall set this field to the type of the included record (see 3.7.4 of 3GPP2 C.S0005-A).

RECORD_LEN – Length of the information record.

The base station shall set this field to the length in bytes of the included record (see 3.7.4 of 3GPP2 C.S0005-A).

<Record-type specific fields> – Fields specific to the information record.

The base station shall set this field to values specific for the type of the included record (see 3.7.4 of 3GPP2 C.S0005-A).

3.3.3.2 *DS-41 In-traffic System Parameter Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41ITSPM

Field	Length (bits)
SID	15
NID	16
P_REV	8
PACKET_ZONE_ID	8

SID – System identification.

The base station shall set this field to the system identification number for this cellular system (see 2.6.5.2 of 3GPP2 C.S0005-A).

NID – Network identification.

This field serves as a sub-identifier of a system as defined by the owner of the SID.

The base station shall set this field to the network identification number for this network (see 2.6.5.2 of 3GPP2 C.S0005-A).

P_REV – Protocol revision level.

The base station shall set this field to the base station protocol revision level.

PACKET_ZONE_ID – Packet data services zone identifier.

If the base station supports a packet data service zone, the base station shall set this field to its non-zero packet data services zone identifier.

If the base station does not support a packet data service zone, the base station shall set this field to '00000000'.

3.3.3.3 *DS-41 Release Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41RELM

Field	**Length (bits)**
RESERVED	1
ALL_CALLS	1
GLOBAL_REASON	4
NUM_CALLS	0 or 4

0 or NUM_CALLS entries of the following format

CALL_TYPE	1
REQUEST_ID or CSM_ID	4 or 8
INDIVIDUAL_REASON	4
REC_INCL	1
RECORD_TYPE	8
RECORD_LEN	8
<Record-type specific fields>	RECORD_LEN × 8

RESERVED – Reserved.

The mobile station shall set this field to '0'.

ALL_CALLS – Scope indicator for this message.

If all the calls need to be released, the base station shall set this field to '1'; otherwise, the mobile station shall set this field to '0'.

GLOBAL_REASON – Reason code for releasing all the calls.

If ALL_CALLS is set to '0', the base station shall omit this field; otherwise, the base station shall set this field to one of the values specified in Table 2.3.1.x-1.

NUM_CALLS – Number of calls to be released by this message.

If ALL_CALLS is set to '1', the base station shall omit this field; otherwise, the base station shall set this field to the number of calls to be released by this message.

CALL_ID_TYPE – Type of the call identifier .

The mobile station shall set this field to '0' if the call is identified by a CSM_ID. The base station shall set this field to '1' if the call is identified by a REQUEST_ID.

REQUEST_ID or CSM_ID – Call identifier.

If CALL_ID_TYPE is set to '0', the base station shall set this field to the CSM_ID of the call to be released; otherwise, the base station shall set this field to the REQUEST_ID of the call to be released.

INDIVIDUAL_REASON – Reason code for releasing the specific call.

The base station shall set this field to one of the values specified in Table 2.3.2.2-1.

REC_INCL – Presence indicator for the record.

The base station shall set this field to '1' if an information record is included for the entry; otherwise the base station shall set this field to '0'.

RECORD_TYPE – Type of the information record.

The base station shall set this field to the type of the included record (see 3.7.4 of 3GPP2 C.S0005-A).

RECORD_LEN – Length of the information record.

The base station shall set this field to the length in bytes of the included record (see 3.7.4 of 3GPP2 C.S0005-A).

<Record-type specific fields> – Fields specific to the information record.

The base station shall set this field to values specific for the type of the included record (see 3.7.4 of 3GPP2 C.S0005-A).

3.3.3.4 *DS-41 Service Option Connect Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41SOCM

Field	Length (bits)
RELEASE_CALLS	1
USE_TIME	1
ACTIVATION_TIME	0 or 8
ACTIVATE_ON_HANDOFF	1
DS-41 Service Configuration	variable

RELEASE_CALLS – Indicator to release all the calls without a service option listed in the current Service Configuration Record.

The base station shall set this field to '1' if the mobile station is instructed to release all calls that do not have a service option connected, after performing all the connections listed in the message; otherwise, the base station shall set this field to '0'.

USE_TIME – Indicator to take action at or by a specified time.

The base station shall set this field to '1' if the actions specified in this message are to take place at, or no later than, the moment specified via ACTIVATION_TIME. The base station shall set this field to '0' if the activation time for the message is implicit, or if the activation is to take place unconditionally, on the next hard handoff.

ACTIVATION_TIME – Time when, or by when, all specified connections should take place.

If USE_TIME is set to '0', the base station shall omit this field; otherwise, the base station shall include this field and shall set it as follows:

If ACTIVATE_ON_HANDOFF is set to '0', the base station shall set this field to the time when the connections specified in the message should take place (see 10.2.3.5 of 3GPP 25.331 for details on how this field should be set). If ACTIVATE_ON_HANDOFF is set to '1', the base station shall set this field to the threshold time value beyond which a successful handoff will not trigger the specified connections to take place.

ACTIVATE_ON_HANDOFF – Indicator to defer the actions prescribed by this message until a hard handoff occurs.

The base station shall compare each bit of this bitmask field with a hard handoff procedure (see 8.3.5.2 of 3GPP TS 25.331), as specified in Table 3.3.3.4-1. If the specified logical connections are to become effective at the time when all the identified procedures are successful, the base station shall set the corresponding bits of the field to '1'; otherwise, the base station shall set the corresponding bits of the field to '0' (i.e., the specified connections are to take place either immediately or at the exact time specified by ACTIVATION_TIME). The base station shall set the unused bits to '0'.

Table 3.3.3.4-1. Bitmask Index Assignment for Hard Handoff Procedures

Hard handoff procedure	3GPP TS 25.331 Reference	Index in bitmap (1= rightmost)
Physical channel reconfiguration	8.2.6	1
Radio bearer establishment	8.2.1	2
Radio bearer reconfiguration	8.2.2	3
Radio bearer release	8.2.3	4
Transport channel reconfiguration	8.2.4	5
Reserved	-	-

DS-41 Service Configuration – Service Configuration record.

The base station shall set this record as specified in 3.3.2.

3.3.3.5 *DS-41 Service Option Disconnect Message*

The Upper Layers PDU for the message has the following format:

MSG_TAG: D41SODM

Field	**Length (bits)**
USE_TIME	1
ACTIVATION_TIME	0 or 8
NUM_CALLS	4
NUM_CALLS entries of the following format	
CSM_ID	8
KEEP	1

USE_TIME – Indicator to take action at an explicit time.

The base station shall set this field to '1' if the actions specified in this message are to take place at the moment specified via ACTIVATION_TIME. The base station shall set this field to '0' if the activation time for the message is implicit.

ACTIVATION_TIME – Time when all specified disconnections should take place.

The base station shall set this field to the time when the connections should take place. See 10.2.3.5 of 3GPP 25.331 on how this field should be set.

NUM_CALLS – Number of calls to be disconnected via this message.

The base station shall set this field to the number of existing calls to be disconnected by this message.

CSM_ID – Call State Machine Identifier.

The base station shall set this field to a unique value for a Call State Machine Identifier for an existing call which is to be disconnected via this message.

KEEP – Indicator to keep the current service option ready for reconnection.

The base may set this field to '1' if it anticipates that the same service option will be reconnected; otherwise, the base station should set this field to '0'.

3.3.4 PDU Format

When transmitting an Upper Layers message on the DCCH logical channel, the base station shall use the following Upper Layers PDU format for the “NAS message” information element in the DOWNLINK DIRECT TRANSFER message:

Field	Length (bits)
MSG_PID	2
MSG_ID	6
ENC_FIELDS_INCL	1
SIG_ENCRYPT_MODE	0 or 3
ENC_SEQ	0 or 8
Upper Layers SDU	variable

MSG_PID – Message Protocol Identifier.

The base station shall set the field to ‘00’

MSG_ID – Message Identifier.

The base station shall set the field as specified in Table 3.3.4-1.

ENC_FIELDS_INCL – Encryption fields included indicator.

The base station shall set the ENC_FIELDS_INCL field to ‘1’ if Upper Layers enhanced encryption fields are included in this message; otherwise, the base station shall set the ENC_FIELDS_INCL field to ‘0’.

SIG_ENCRYPT_MODE – Signaling Encryption mode in use.

If ENC_FIELDS_INCL is set to ‘0’, the base station shall omit the SIG_ENCRYPT_MODE field; otherwise the base station shall set the SIG_ENCRYPT_MODE field to the SIG_ENCRYPT_MODE (see Table 2.7.1.3.2.1-5 of 3GPP2 C.S0005-A) used for the SDU carried by this PDU.

ENC_SEQ – The eight least significant bits of the Encryption sequence number used to construct a cryptographic synchronization crypto-sync (see 2.3.12.4 of 3GPP2 C.S0005-A) for the encryption algorithm.

If the SIG_ENCRYPT_MODE field is not included or if it is set to a value other than ‘01000000’ (see Table 2.7.1.3.2.1-5 of 3GPP2 C.S0005-A), the base station shall omit the ENC_SEQ field; otherwise, the base station shall set the ENC_SEQ field to the eight least significant bits of the 32 bit crypto-sync (see 2.3.12.4 of 3GPP2 C.S0005-A).

Upper Layers SDU – The Upper Layer Message.

The mobile station shall set the field as specified in 3.3.3 of this specification or in 3.7 of 3GPP2 C.S0005-A, as amended by 3.3.1 of this specification.

Table 3.3.4-1. Identification of the Downlink Upper Layers Messages (part 1 of 2)

Message Name	MSG_TAG	MSG_ID	C.S0005-A Reference:	Local Reference:
ANSI-41 RAND Message	A41RANDM	-	3.7.2.3.2.31	3.3.1.3
ANSI-41 System Parameters Message	A41SPM	-	3.7.2.3.2.29	3.3.1.2
Authentication Challenge Message	AUCM	'011000'	3.7.3.3.2.2	-
Data Burst Message	DBM	'110000'	3.7.3.3.2.4	-
DS-41 Call Request Message	D41CRM	'000001'	-	3.3.3.1
DS-41 In-traffic System Parameters Message	D41ITSPM	'111000'	-	3.3.3.2
DS-41 Release Message	D41RELM	'000010'	-	3.3.3.3
DS-41 Service Option Connect Message	D41SOCM	'001000'	-	3.3.3.4
DS-41 Service Option Disconnect Message	D41SODM	'001001'	-	3.3.3.5
Extended Alert With Information Message	EAWIM	'000100'	3.7.3.3.2.42	-
Extended Flash With Information Message	EFWIM	'000011'	3.7.3.3.2.43	-
Extended Global Service Redirection Message	EGSRM	-	3.7.2.3.2.27	3.3.1.6
Feature Notification Message	FNM	'101001'	3.7.2.3.2.12	-
Mobile Station Registered Message	MSRM	'010000'	3.7.3.3.2.15	3.3.1.10
Order Message	ORDM	'111111'	3.7.3.3.2.1	3.3.1.9
PACA Message	PACAM	'000101'	3.7.2.3.2.20	-
Private Neighbor List Message	PNLM	-	3.7.2.3.2.24	3.3.1.5
Security Mode Command Message	SMCM	'100000'	3.7.3.3.2.44	3.3.1.8

Table 3.3.4-1. Identification of the Downlink Upper Layers Messages (part 2 of 2)

Message Name	MSG_TAG	MSG_ID	C.S0005-A Reference:	Local Reference:
Service Option Control Message	SOCM	'001010'	3.7.3.3.2.21	-
Service Redirection Message	SRDM	'111110'	3.7.3.3.2.23	-
Status Request Message	STRQM	'101000'	3.7.3.3.2.16	3.3.1.7
SSD Update Message	SSDUM	'011001'	3.7.3.3.2.13	-
TMSI Assignment Message	TASM	'010001'	3.7.3.3.2.22	-
User Zone Identification Message	UZIM	-	3.7.2.3.2.23	3.3.1.4

When transmitting broadcast system information on the BCCH logical channel, the base station shall use the Upper Layers SDU format (defined in 3.7 of 3GPP2 C.S0005-A, and amended by 3.3.1 of this specification) for the appropriate information elements, as follows:

Table 3.3.4-2. Broadcast System Information

Broadcast Information	Information Block	Information element
MIN_P_REV, P_REV, SID, NID from the *Sync Channel Message*	MIB	MIN_P_REV, P_REV, SID, NID
ANSI-41 System Parameters Message	SIB 13	NAS (ANSI-41) system information
ANSI-41 RAND Message	SIB 13.1	ANSI-41 RAND information
User Zone Identification Message	SIB 13.2	ANSI-41 User Zone Identification information
Private Neighbor List Message	SIB 13.3	ANSI-41 Private Neighbor List information
Extended Global Service Redirection Message	SIB 13.4	ANSI-41 Global Service Redirection information

When transmitting a broadcast SMS message on the CTCH logical channel, the base station shall use the following Upper Layers PDU format for the "CB Data" information element in the BMC CBS message:

Field	Length (bits)
MSG_PID	2
MSG_ID	6
BC_ADDR	40
Upper Layers SDU	variable

MSG_PID – Message Protocol Identifier.

The base station shall set the field to '00'

MSG_ID – Message Identifier.

The base station shall set the field as specified in Table 3.3.4-1.

BC_ADDR – Broadcast Address.

The base station shall set the field as specified in TIA/EIA-637-A.

Upper Layers SDU – The Upper Layer message.

The mobile station shall set the field as specified in 3.3.3 of this specification or in 3.7 of 3GPP2 C.S0005-A, as amended by 3.3.1 of this specification.

1 **ANNEX A RESERVED**

1 No text.

ANNEX B INFORMATION FLOWS

This informative annex contains examples of information flows between the various functional parts of a DS-41 system.

The conventions used in the information flows contained in this annex are as follows:

- RRC messages defined by 3GPP are in upper case,
  e.g., RRC CONNECTION REQUEST.
- cdma2000 messages defined by 3GPP2 are italicized,
  e.g., *DS-41 Call Start-Up Message*.
- Service Access Point names are indicated in square brackets,
  e.g., [DC-SAP.req].
- Channels used to carry the specified message are indicated in parentheses,
  e.g., (CCCH).
- Messages that are encapsulated within other messages are indicated in braces,
  e.g., INITIAL DIRECT TRANSFER (DCCH) {*DS-41 Call Start-Up Message*}.

B.1 Call Setup – Circuit-based Calls

B.1.1 Mobile-originated Call Setup

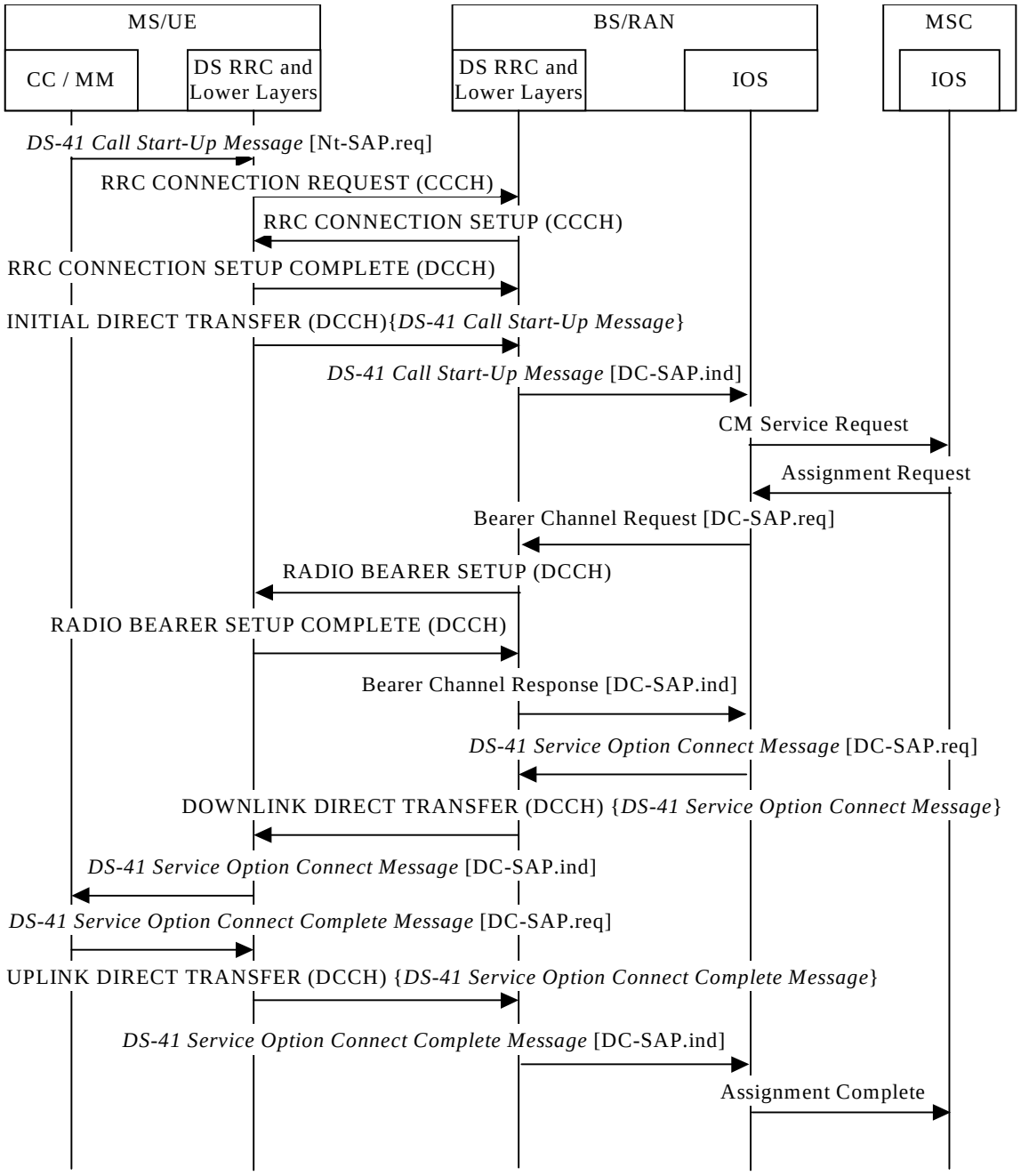
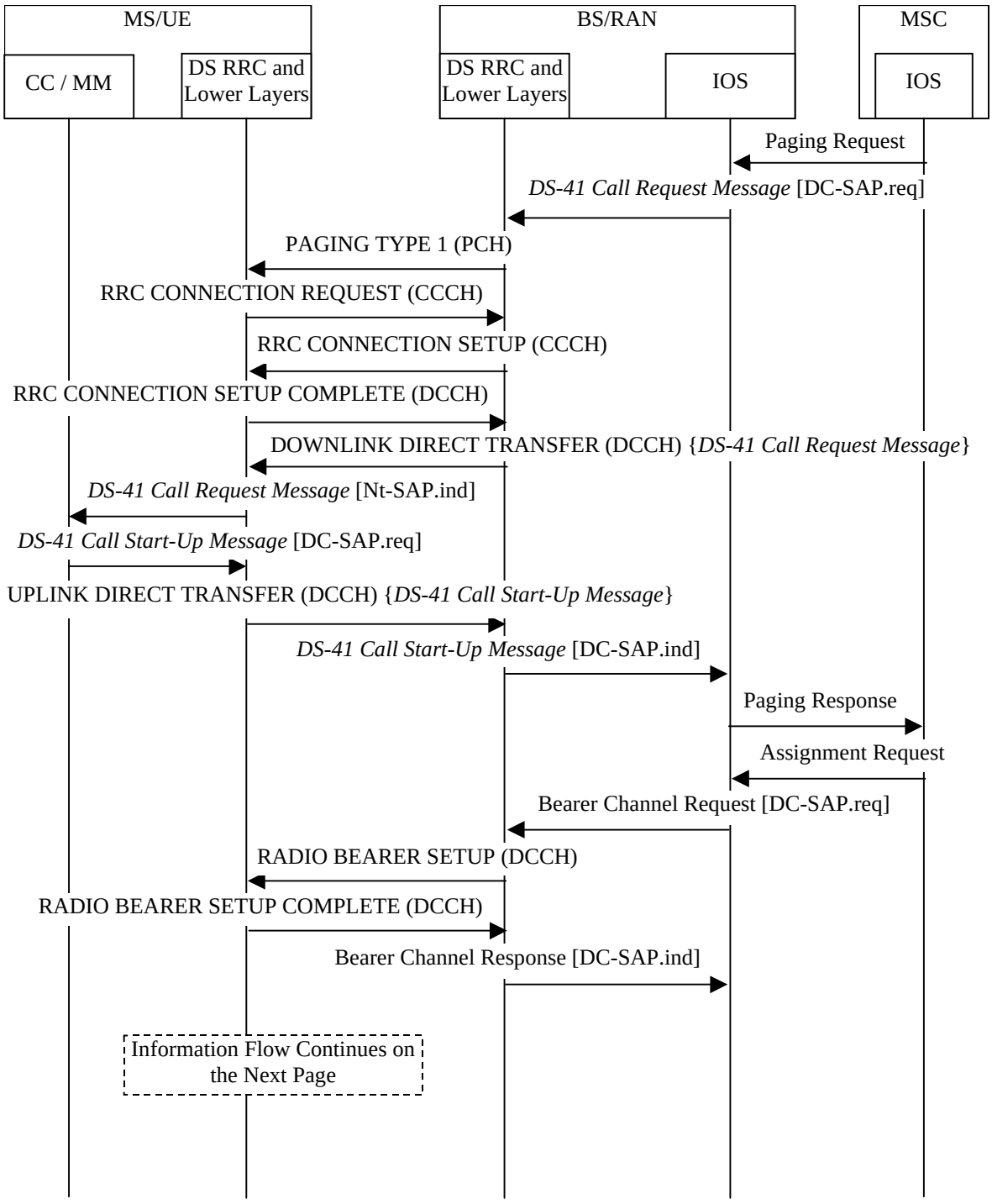


Figure B.1.1-1. Mobile-originated Call Setup

B.1.2 Mobile-terminated Call Setup



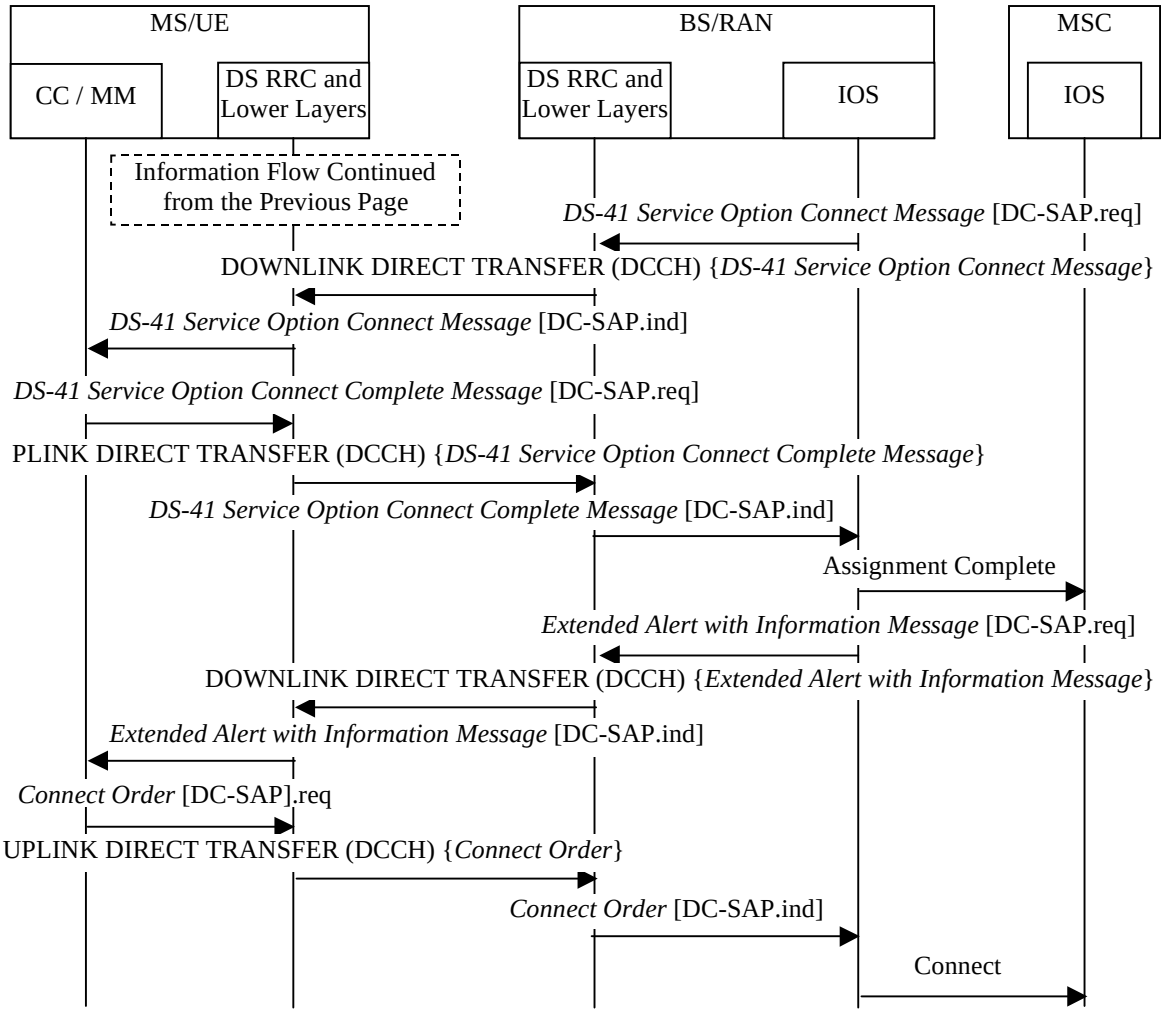


Figure B.1.2-1. Mobile-terminated Call Setup

B.2 Call Clearing – Circuit-based Calls

The following sections contain example scenarios of call clearing in a DS-41 system when a single call instance exists.

B.2.1 MS-initiated Call Clearing – Circuit-based Call

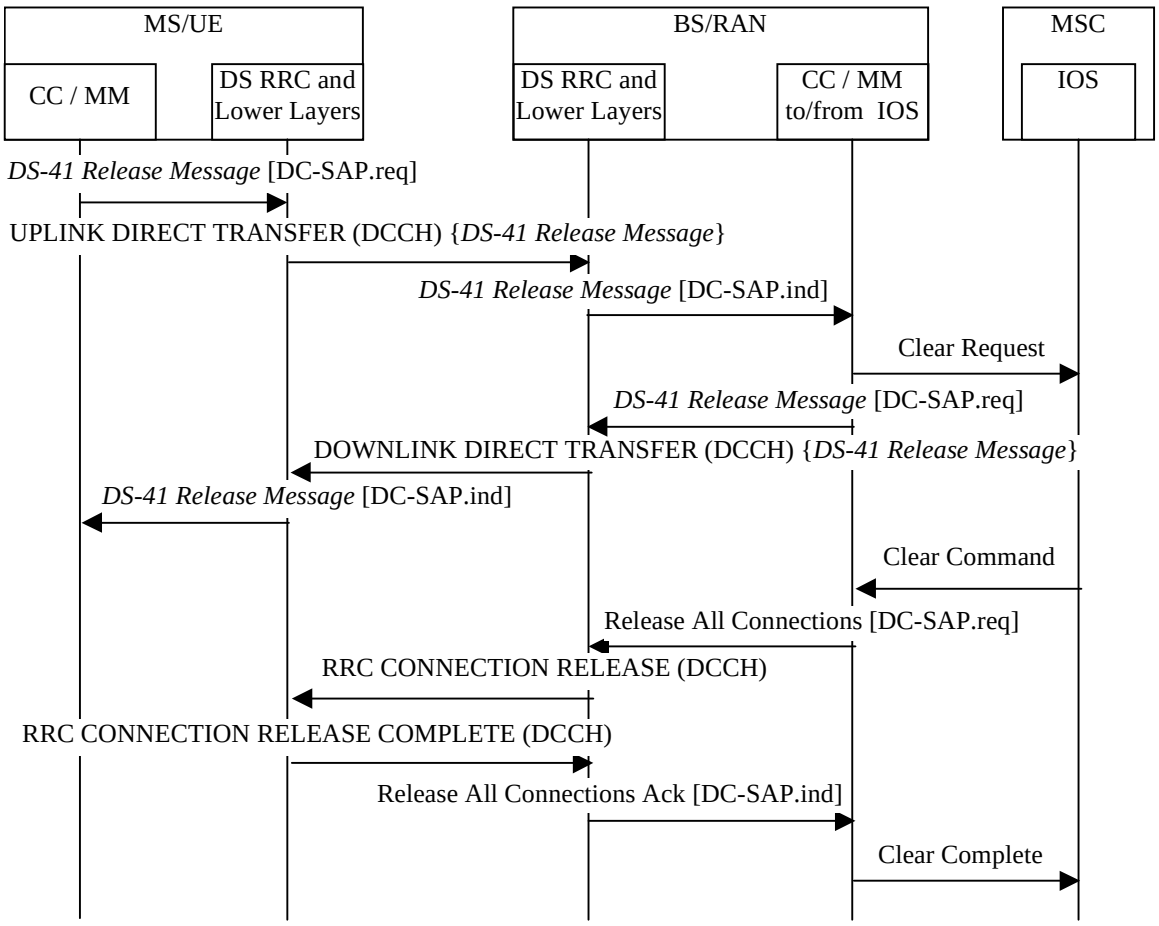


Figure B.2.1-1. Mobile-initiated Call Clearing – Circuit-based Call

B.2.2 BS- and MSC-initiated Call Clearing – Circuit-based Call

The following information flow is an example of circuit-based call clearing initiated by either the MSC or the BS/RAN. The only difference in the two flows is the first message. The Clear Request message is used by the BS/RAN to request call clearing and is followed by the Clear Command message from the MSC. When the MSC wishes to clear a call, it immediately issues the Clear Command message and the remainder of the information flow is then identical in both call clearing situations.

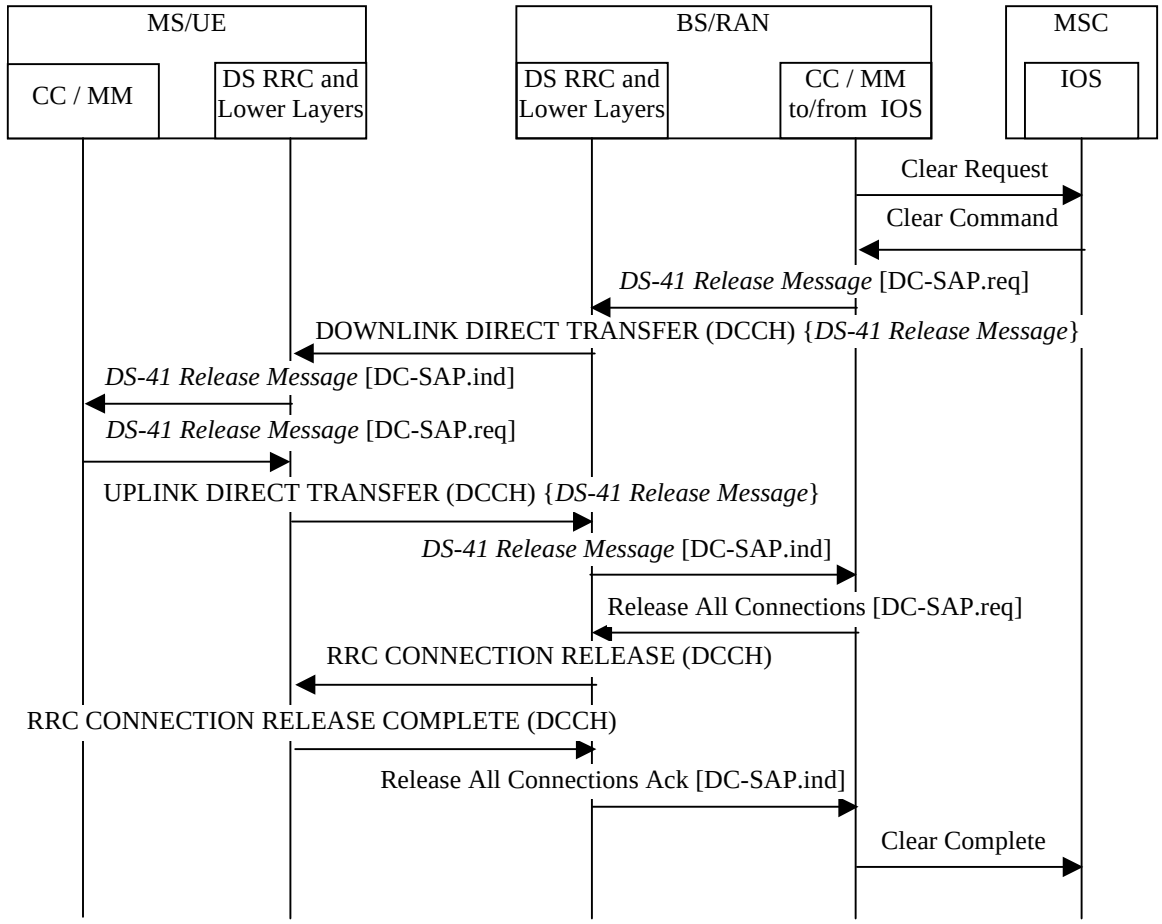


Figure B.2.2-1. BS- and MSC-initiated Call Clearing – Circuit-based Call

B.2.3 PDSN-initiated Call Clearing – Packet Call

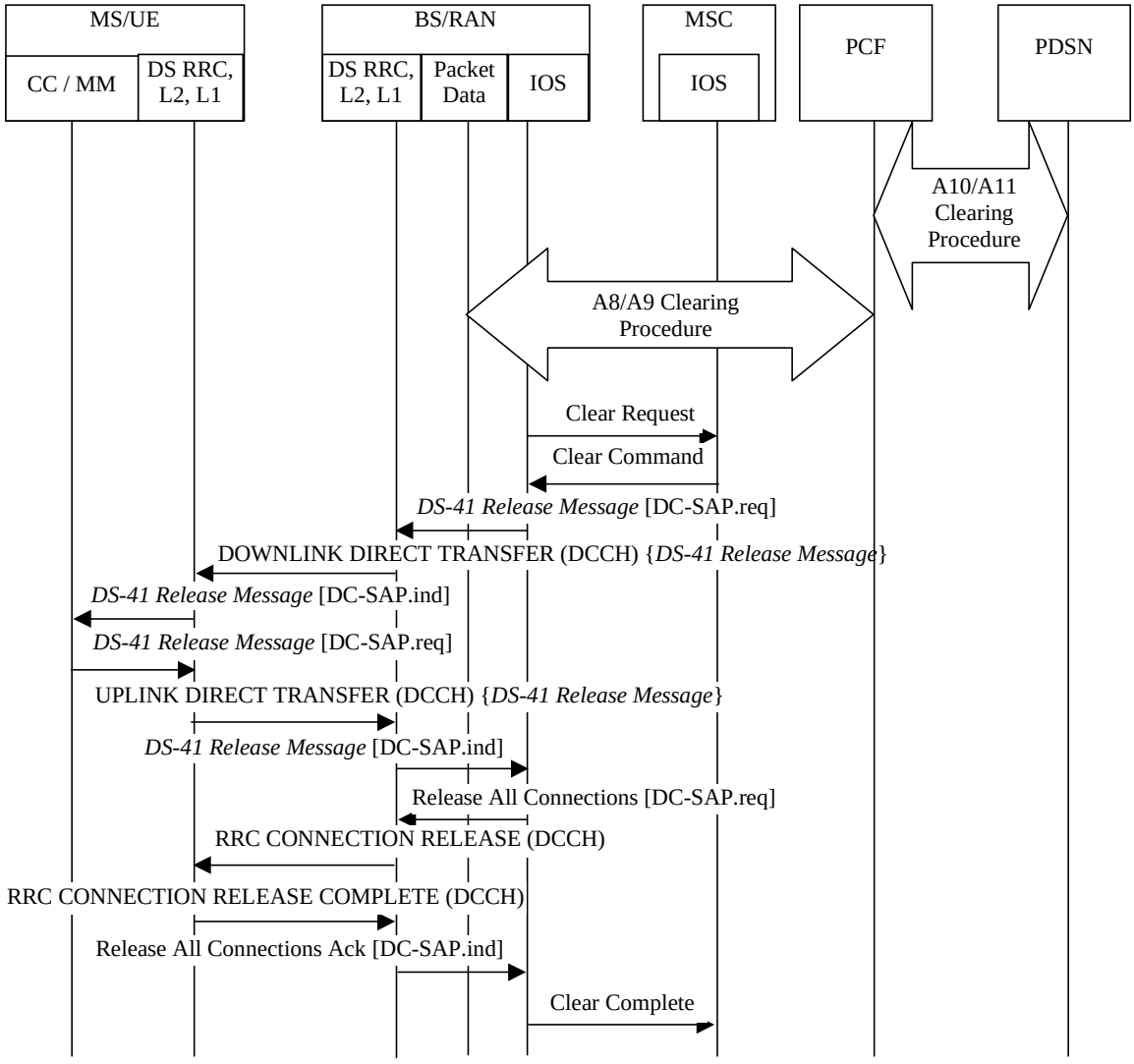


Figure B.2.3-1. PDSN-initiated Call Clearing – Packet Call

B.3 Short Message Service (SMS)

B.3.1 Mobile-terminated Point-to-Point SMS

The following scenario is an example of Mobile-terminated Point-to-Point Short Message Service (SMS-MT) in a DS-41 system. This scenario assumes the SMS-MT delivery is accomplished on the control channel from the IOS perspective, and that an RRC connection does not exist at the time of the request.

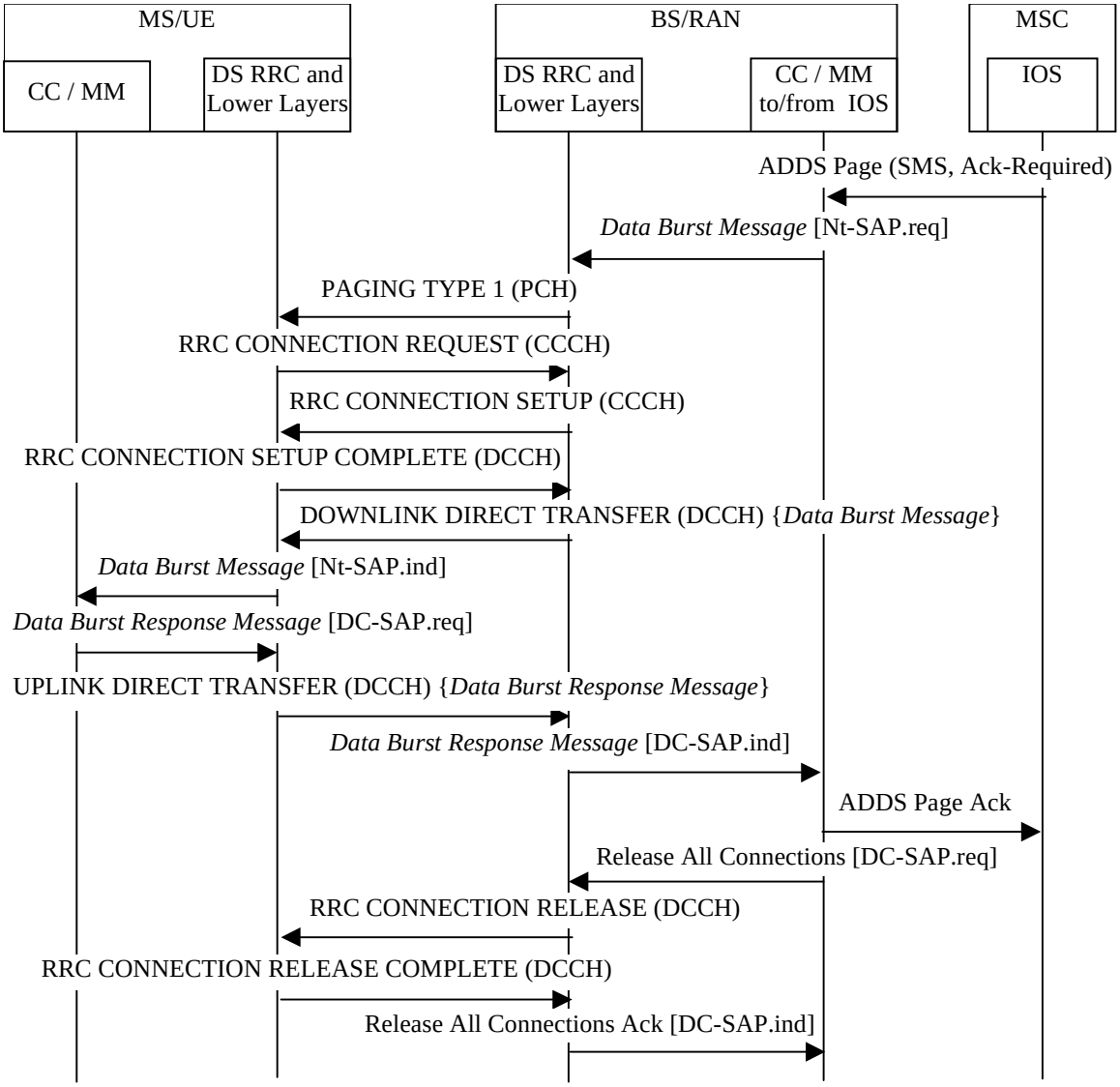


Figure B.3.1-1. Mobile-terminated Point-to-Point Short Message Service (SMS-MT)

B.3.2 Mobile-originated Point-to-Point SMS

The following scenario is an example of Mobile-originated Point-to-Point Short Message Service (SMS-MO) in a DS-41 system. This scenario assumes the SMS-MO delivery is accomplished on the control channel from the IOS perspective.

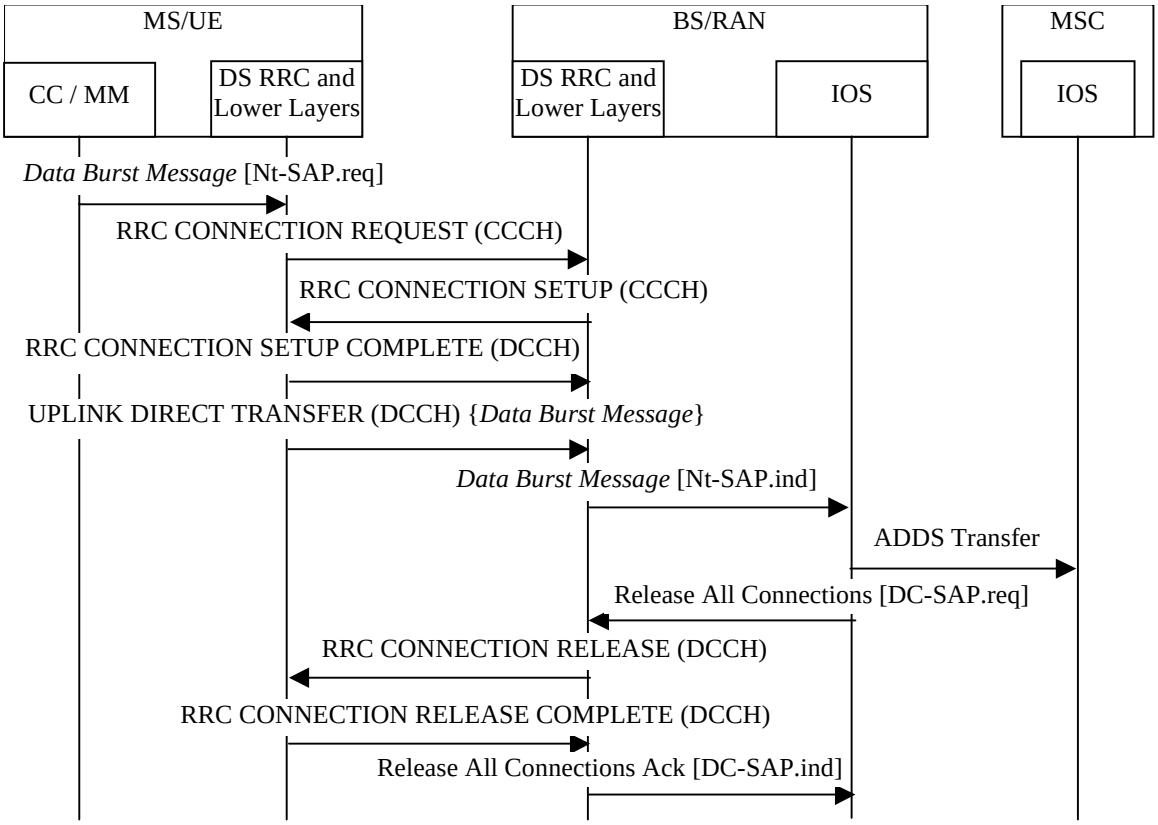


Figure B.3.2-1. Mobile-originated Point-to-Point Short Message Service (SMS-MO)

B.3.3 Broadcast SMS

The following scenario is an example of Cell Broadcast Short Message Service:

- For Broadcast SMS, the DS-41 system uses the delivery mechanism provided by the RRC sublayer via the 3GPP Broadcast/Multicast Control (BMC) protocol as defined in 3GPP TR 25.925 and 3GPP TS 25.324.
- The repetition of the broadcast message may be done via the MSC. Each repetition would result in the following scenario being executed.
- The *Data Burst Message* (defined in 3GPP2 C.S0005-A) that carries the broadcast SMS (defined in TIA/EIA-637-A) is encapsulated in the BMC CBS message by the BMC at the RAN. Upon receiving the BMC message, the mobile station DS RRC layer delivers the *Data Burst Message* to the upper layer cdma2000 broadcast SMS application.

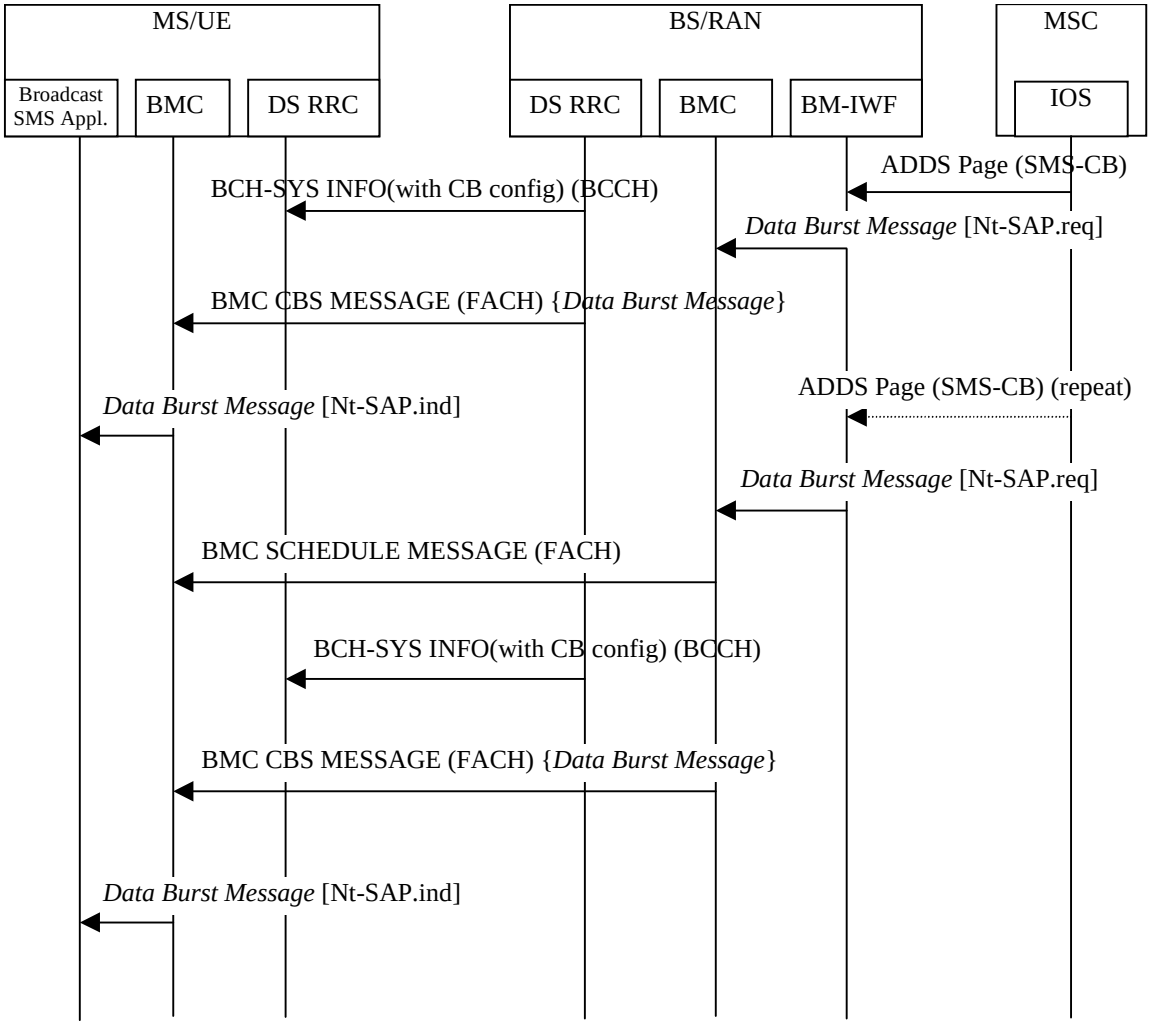
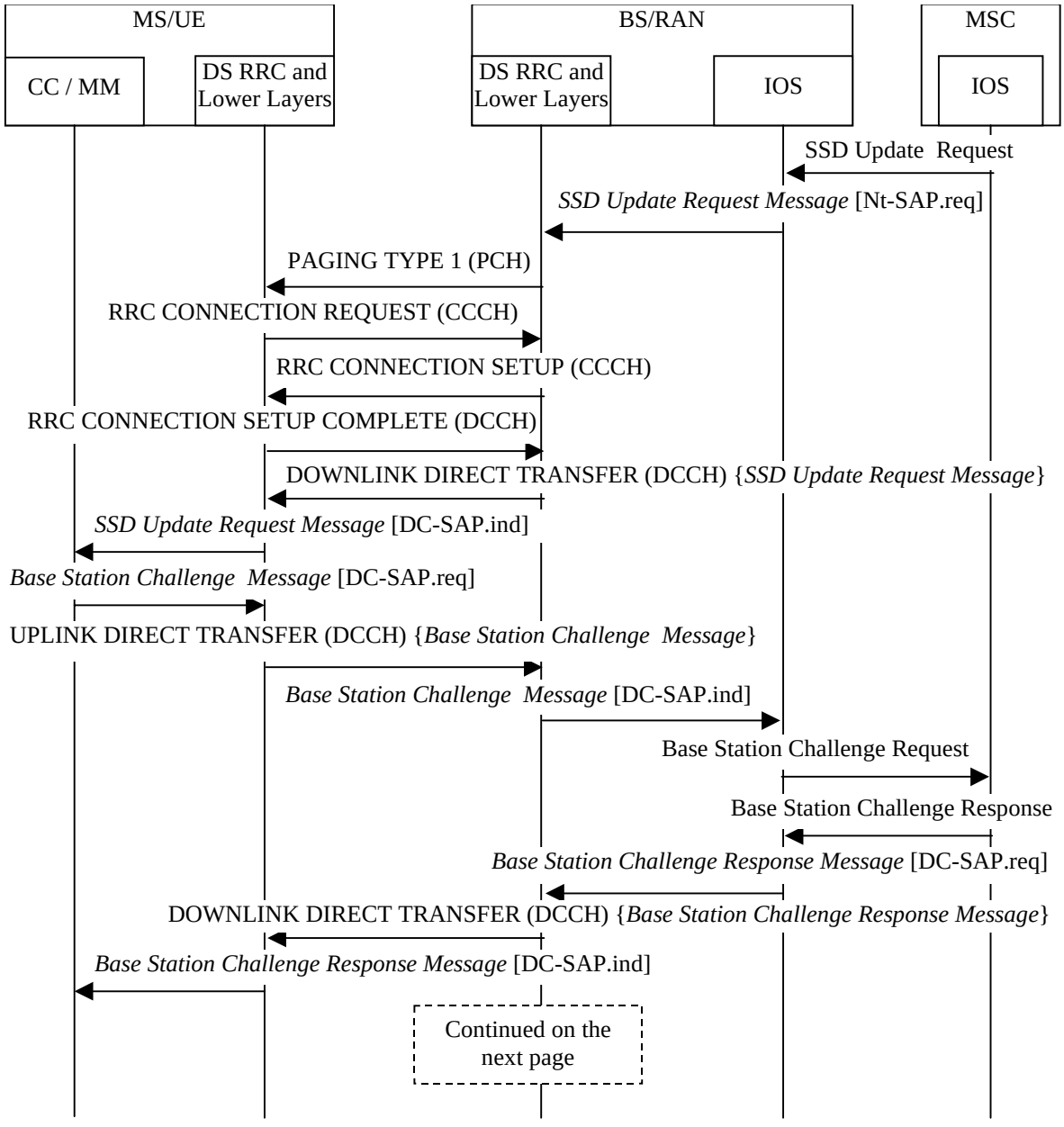


Figure B.3.3-1. Cell Broadcast Short Message Service

B.4 SSD Update

The following scenario shows the message exchange necessary to accomplish Shared Secret Data (SSD) Update in the mobile station (MS/UE). From the perspective of the IOS protocol, this procedure is carried out on the control channel, even though the DS radio layers perform the messaging over the RRC connection.



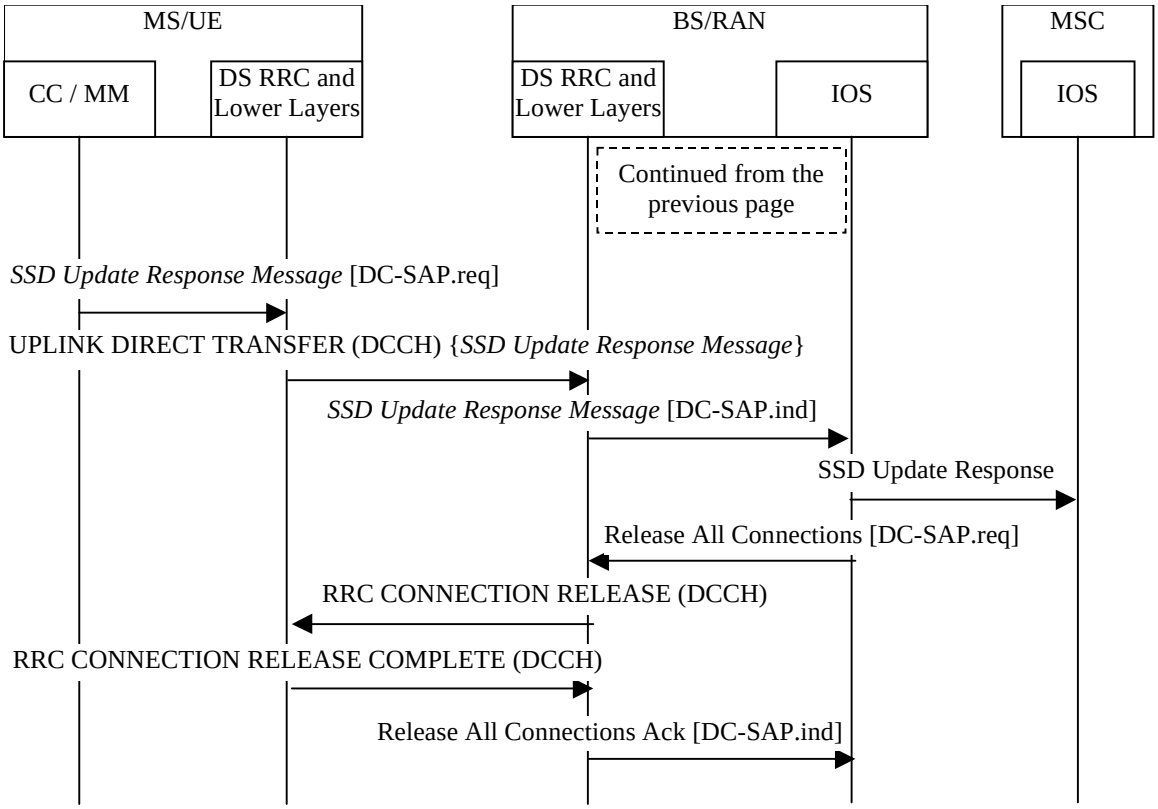


Figure B.4-1. SSD Update in a DS-41 System

B.5 OTASP and OTAPA

OTASP (Over-The-Air Service Provisioning) involves establishing a voice call and then sending signaling messages to the mobile station using ADDS Deliver messages on the IOS A1 interface.

OTAPA (Over-The-Air Parameter Administration) involves sending application level messaging between the network and the mobile station. This is performed on a traffic channel using ADDS Deliver messages on the IOS A1 interface.

The following scenario is an example of OTASP and OTAPA support in a DS-41 system. It is assumed that a traffic channel has already been established between the mobile station and the network. The scenario shows two activities that are considered independent by the IOS and DS layers, but may be related at the application layer (for example, a message from the network to the mobile station followed by a reply from the mobile station to the network).

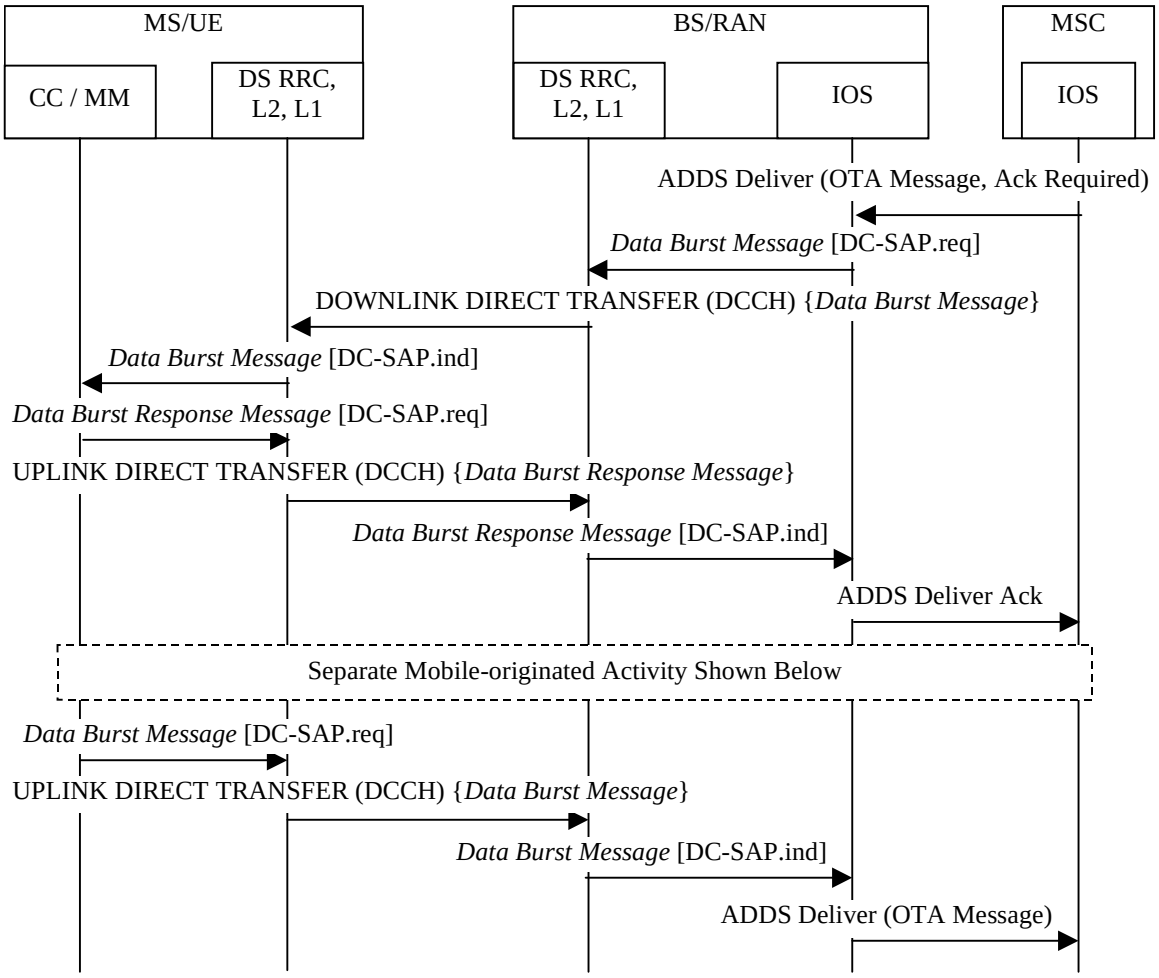
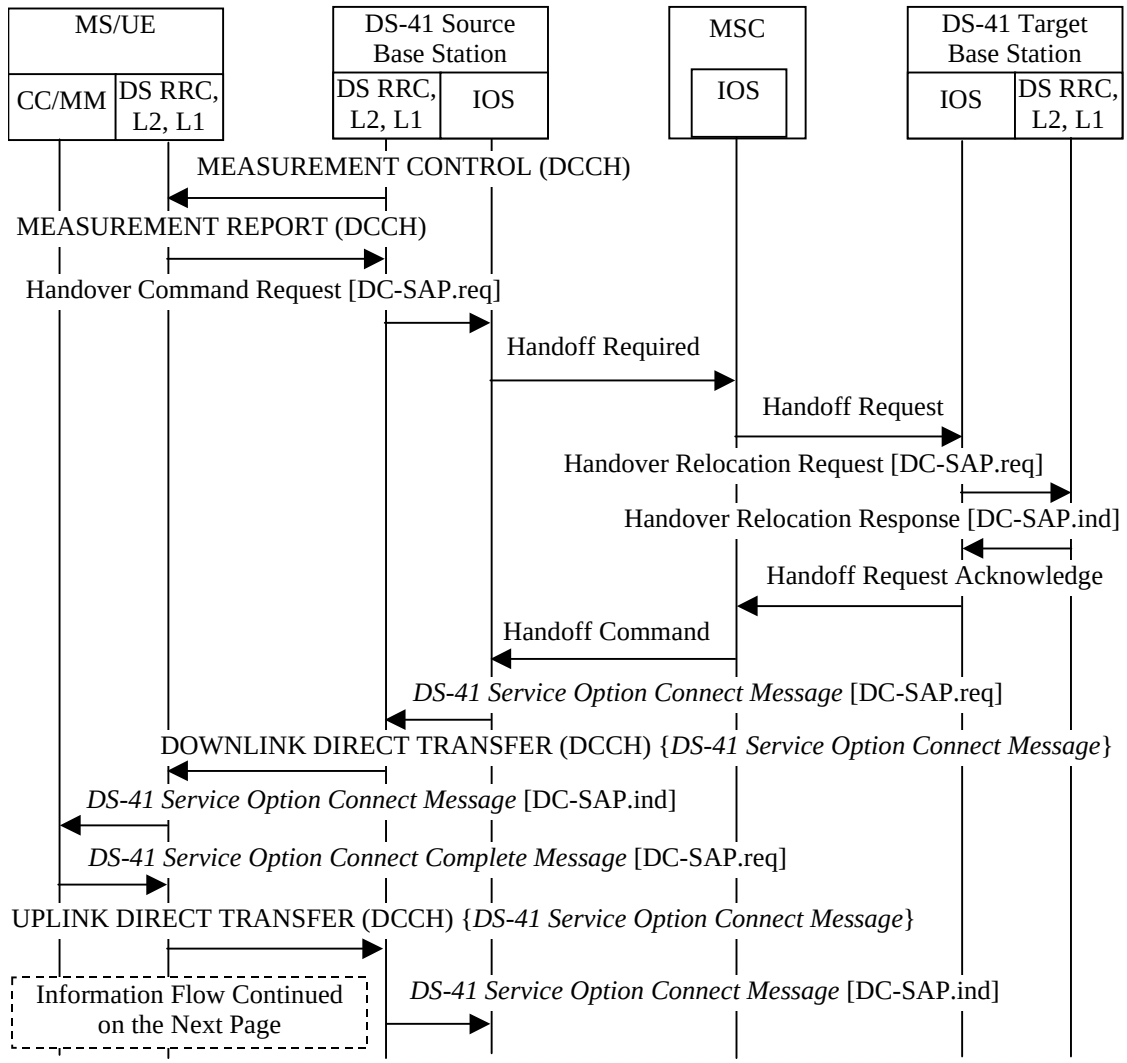


Figure B.5-1. OTASP and OTAPA Support

B.6 Hard Handoff

B.6.1 DS-41 to DS-41 Hard Handoff



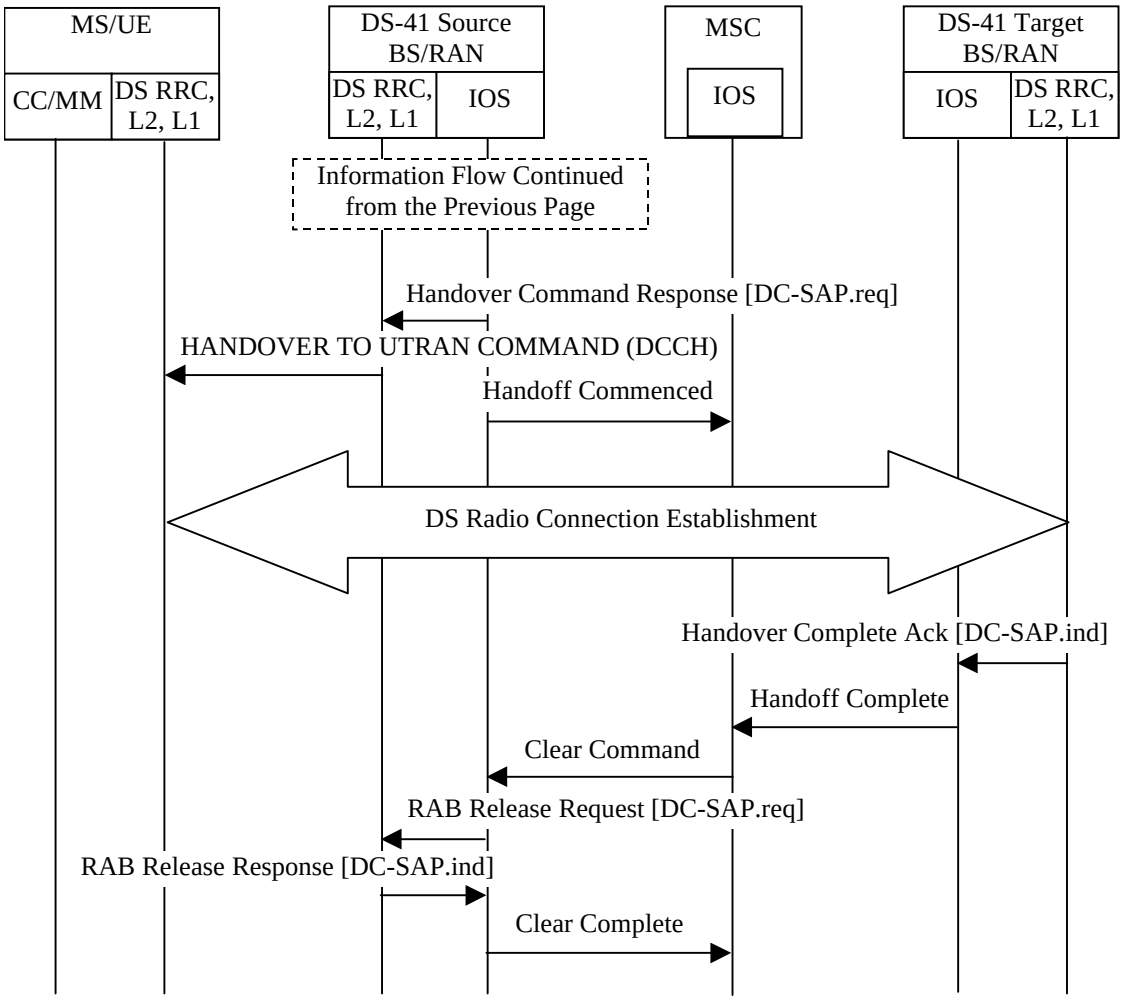


Figure B.6.1-1. DS-41 to DS-41 Hard Handoff

B.6.2 DS-41 to MC-41 Hard Handoff

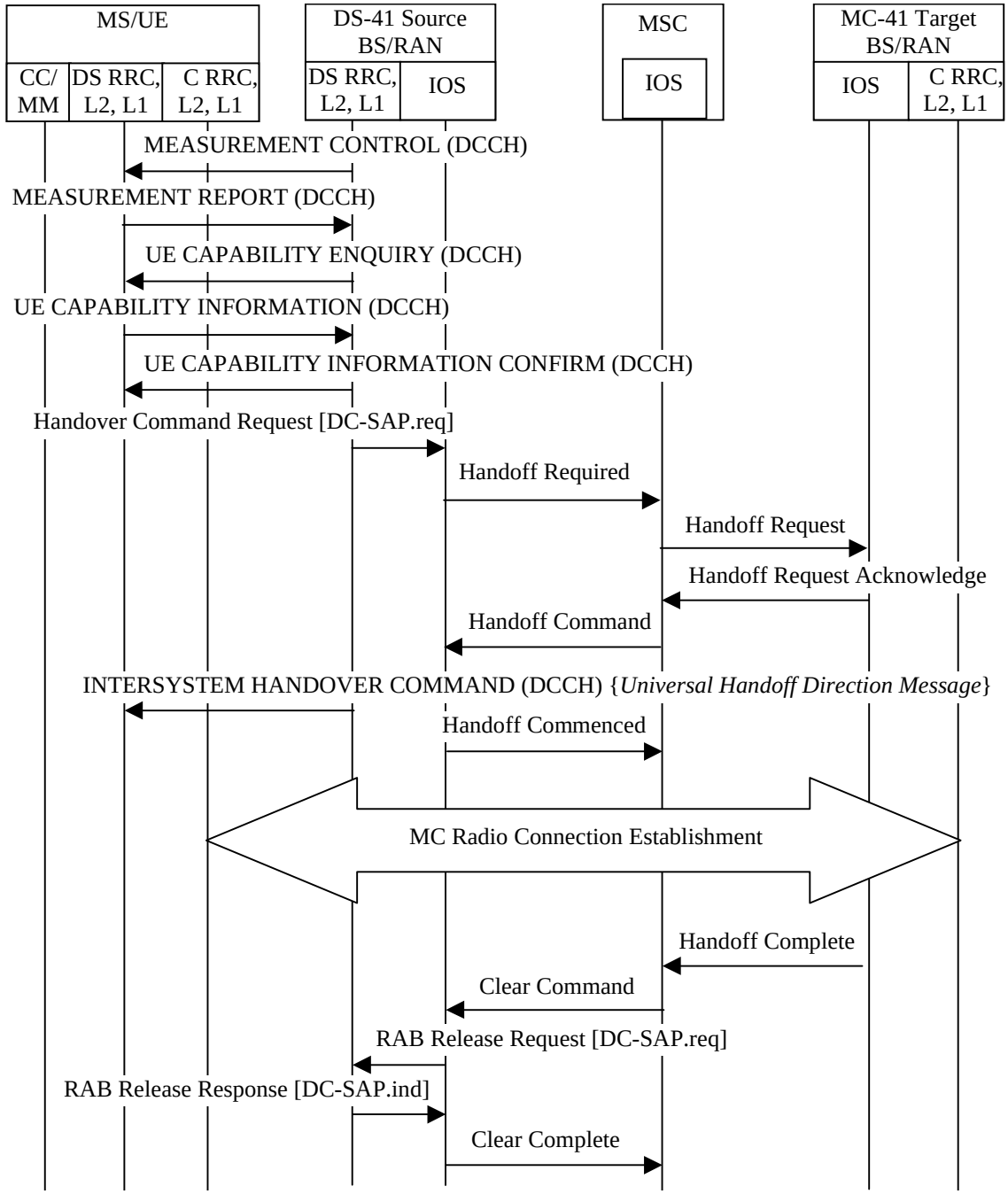


Figure B.6.2-1. DS-41 to MC-41 Hard Handoff

B.6.3 DS-41 to Analog Hard Handoff

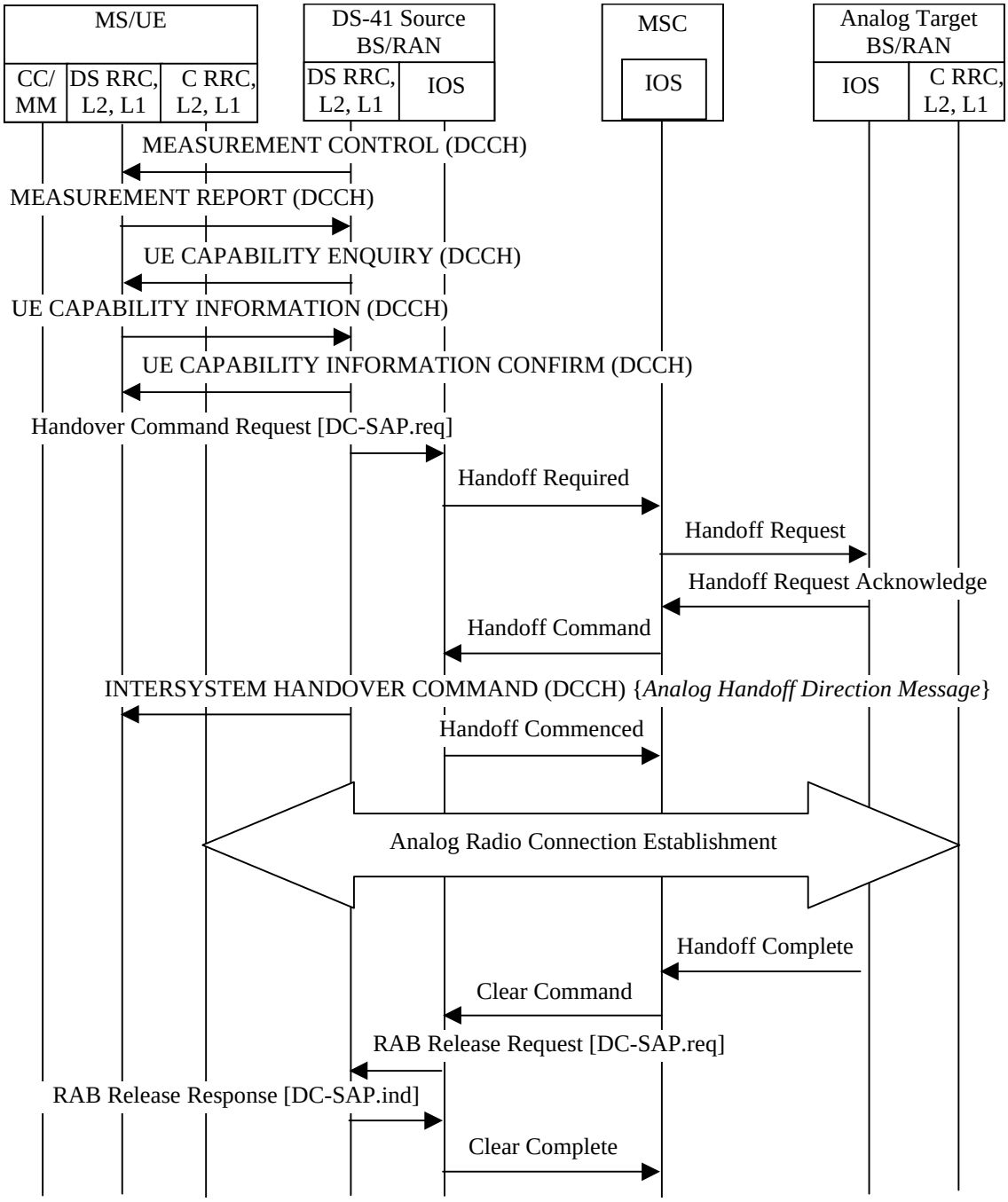
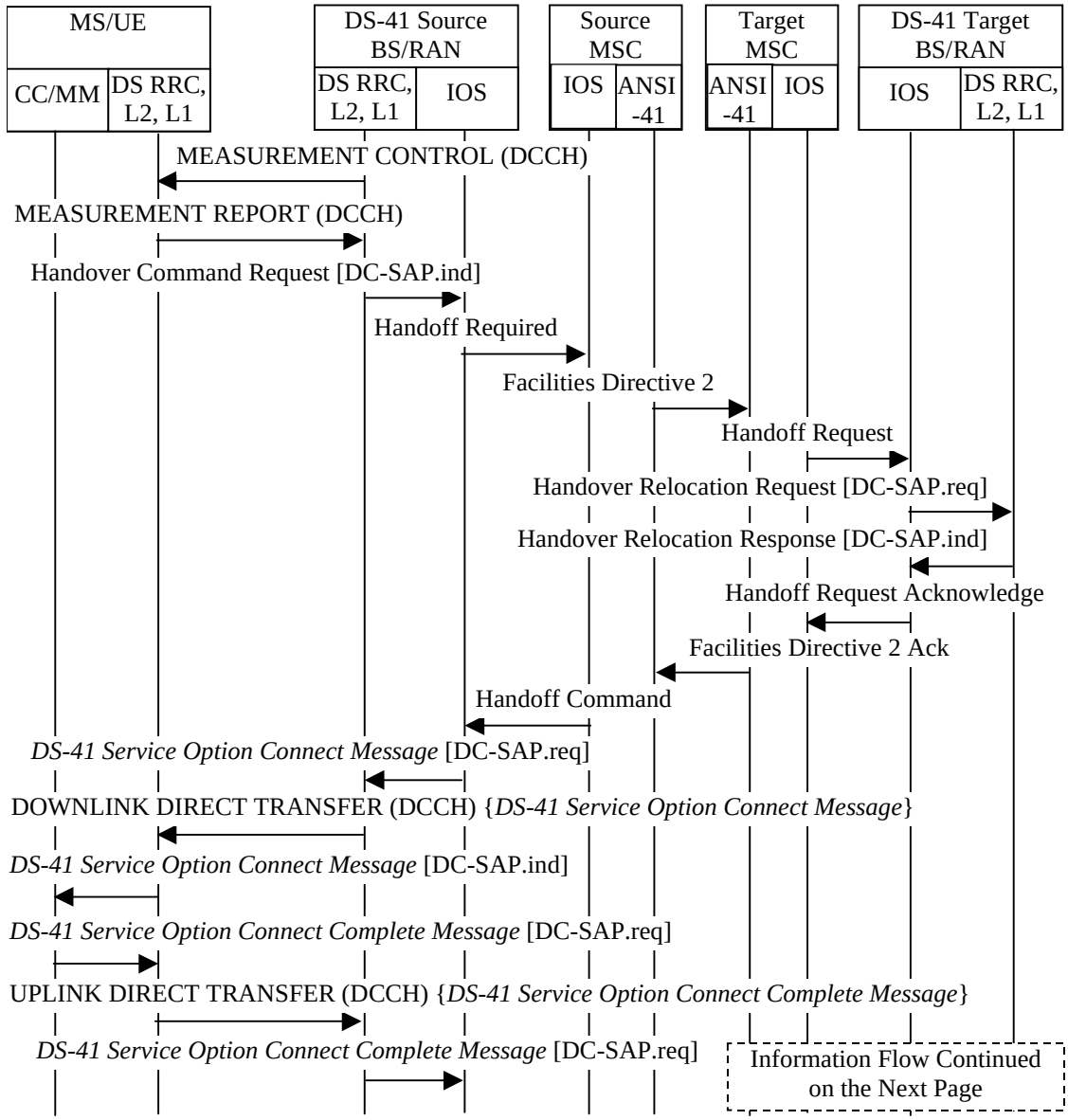


Figure B.6.3-1. DS-41 to Analog Hard Handoff

B.6.4 DS-41 to DS-41 – Inter-MSC Hard Handoff



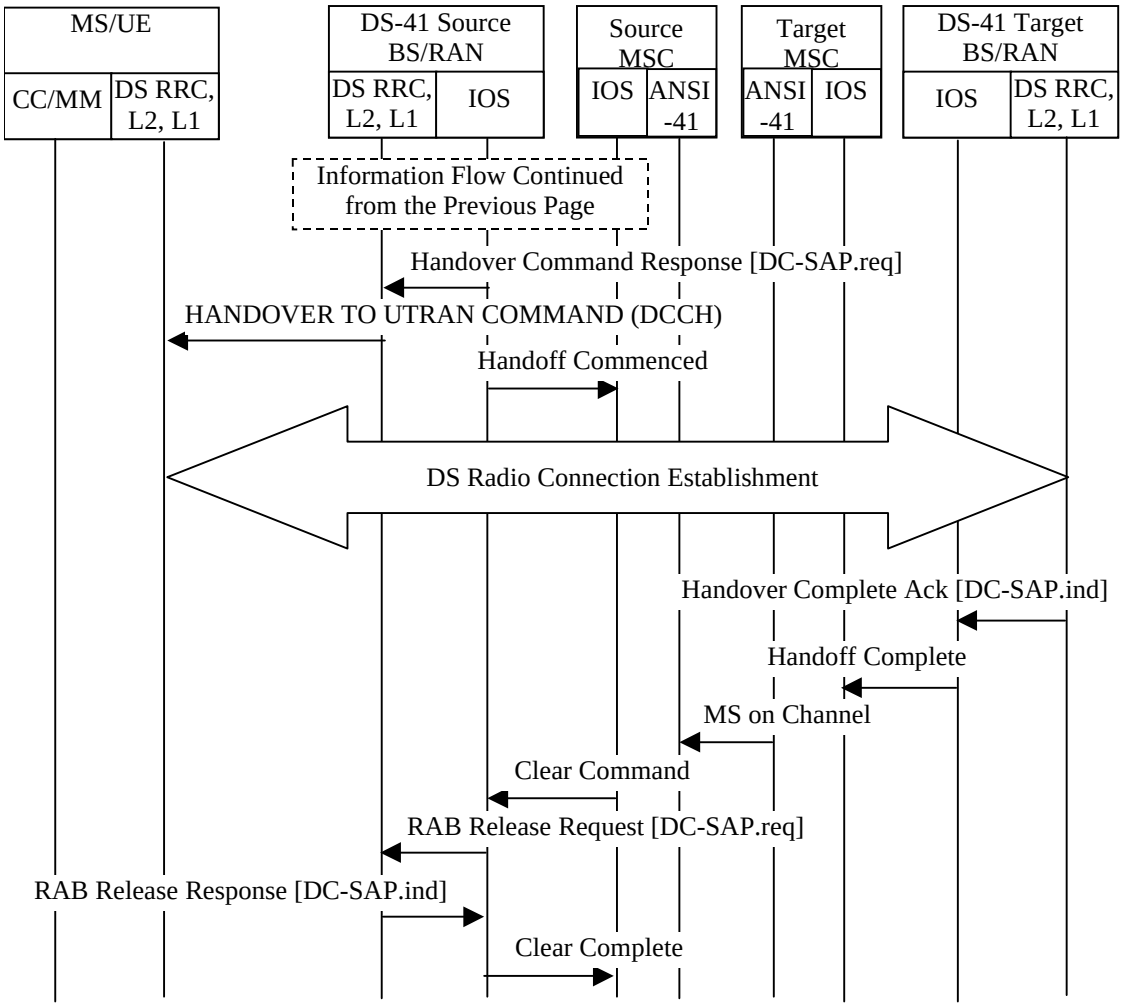


Figure B.6.4.1. DS-41 to DS-41 Inter-MSC Hard Handoff

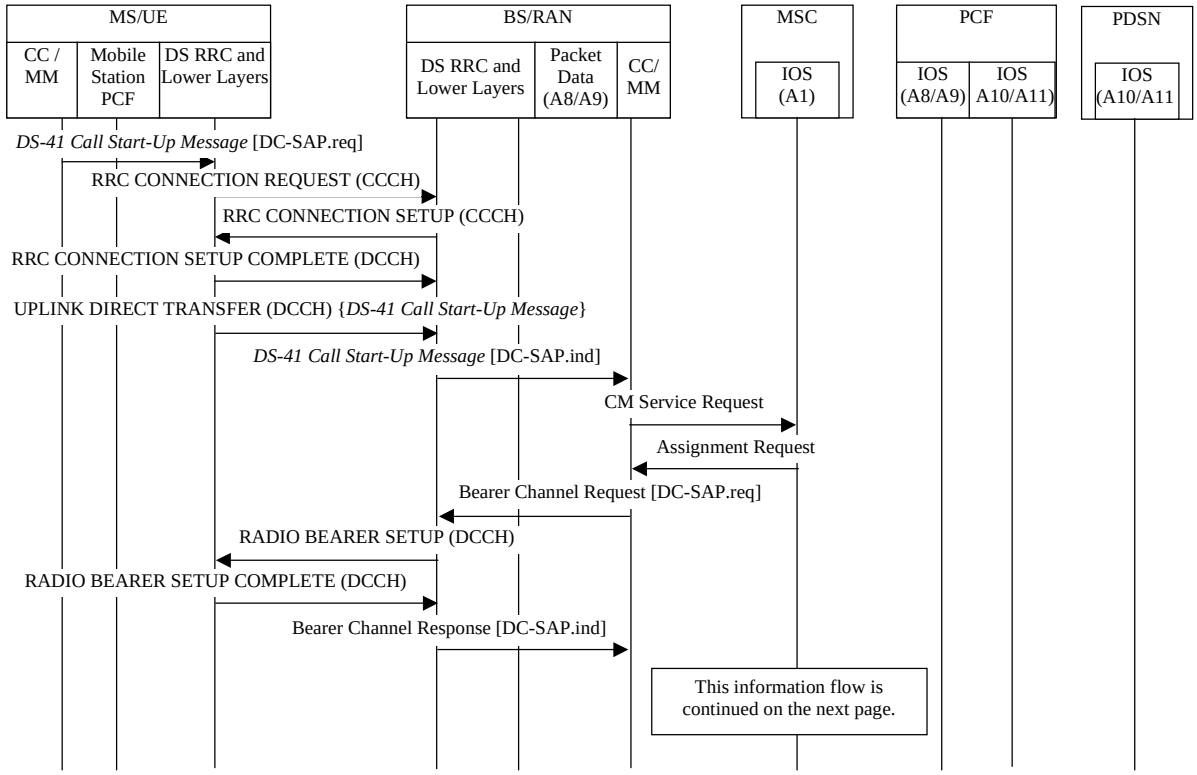
B.7 Packet Data Calls

This section contains references to the packet control function (PCF), packet data service node (PDSN), and A8, A9, A10 and A11 connections. The reader is directed to 3GPP2 A.S0001 “Access Network Interfaces Interoperability Specification” for further information.

B.7.1 Origination and Packet Registration

The following scenario is an example of packet data origination and registration in a DS-41 system.

This same scenario applies to re-registration when the mobile is in a dormant state and enters a new packet zone area (i.e., an area served by a different PCF which must connect to a PDSN).



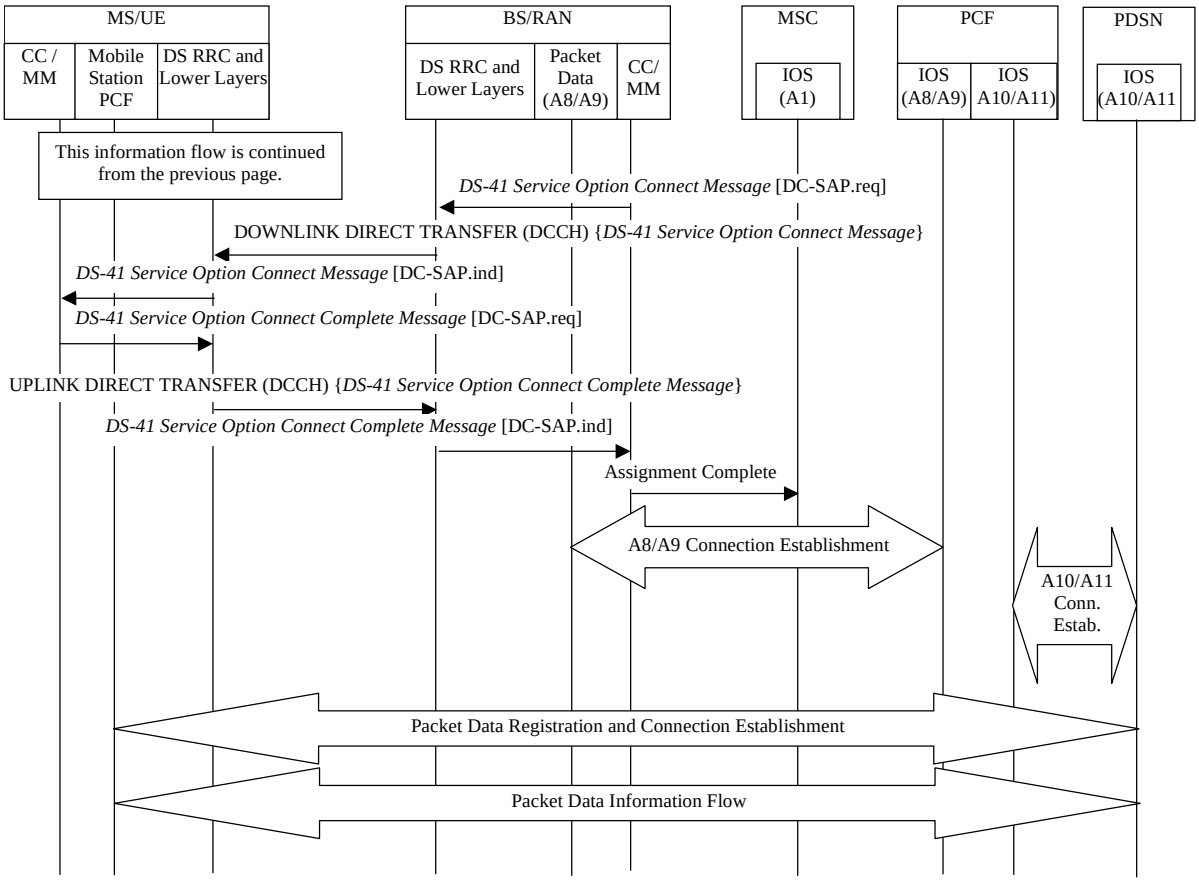


Figure B.7.1-1. Packet Data – Mobile-originated Registration and Call Setup

B.7.2 Entering Dormant State

The following scenario is an example of a packet call entering the dormant state in a DS-41 system.

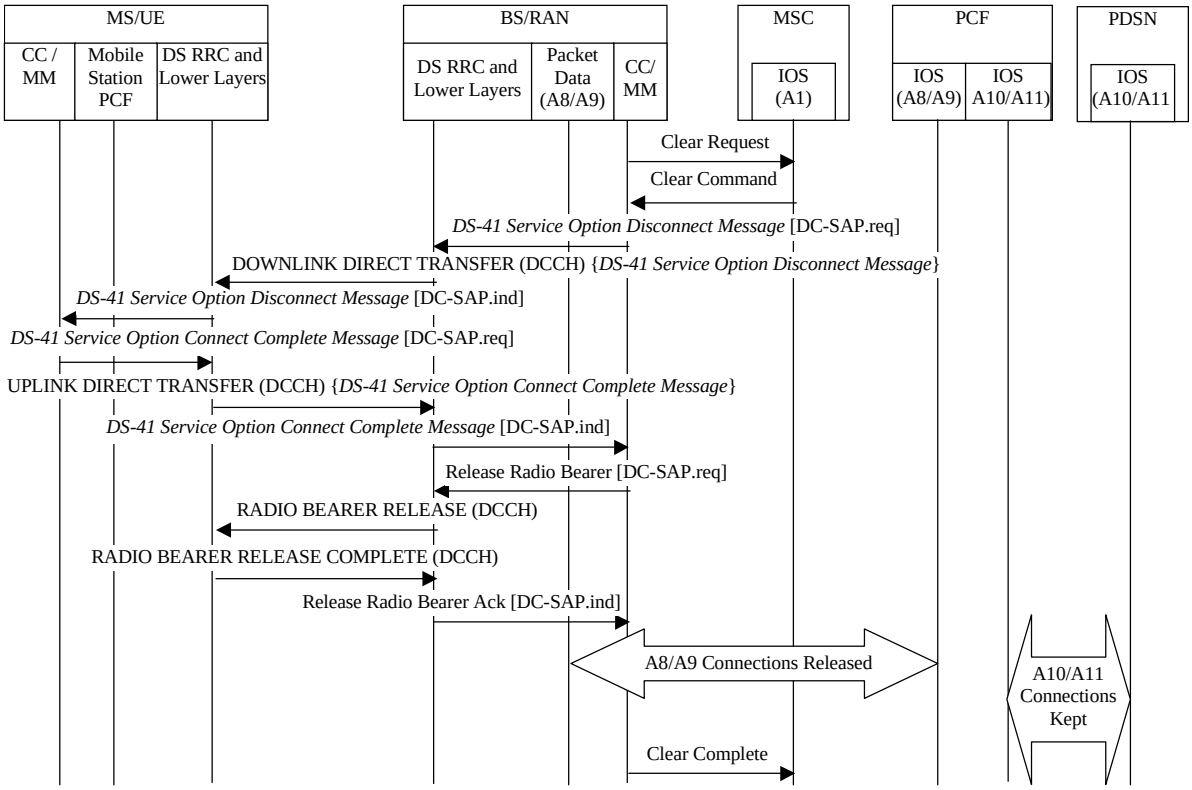


Figure B.7.2-1. Packet Data – Call Enters Dormant State

B.7.3 Packet Data Call Network Re-Activation

The following scenario is an example of packet data call re-activation by the network. This scenario assumes that the mobile station is still within the service area of the BS where it was last connected to the network.

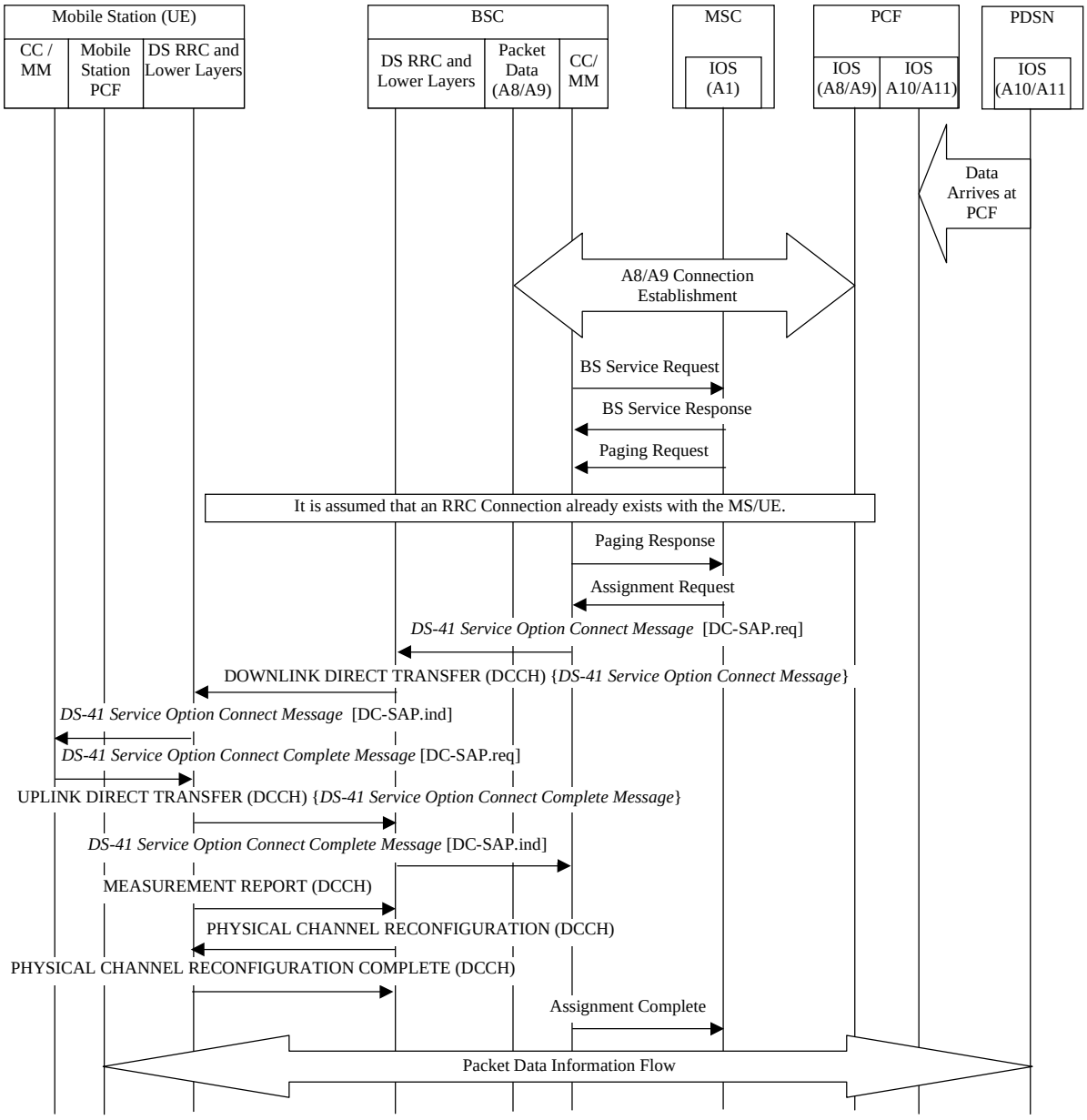


Figure B.7.3-1. Packet Data – Network Re-Activation

1 No text.

ANNEX C DS-41 SUPPORT IN 3GPP2 C.S0005-A

C.1 Procedures

When operating in MC-41 mode, dual-mode DS-41/MC-41 base stations and mobile stations shall be able to send and respectively, to receive the *DS-41 Inter-system Transfer Message* on the f-dsch. To initiate inter-system handoff procedures to a DS-41 system, the base station should send the *DS-41 Inter-system Transfer Message* with the PAYLOAD_MESSAGE field set to one of the following messages:

- MEASUREMENT CONTROL message,
- HANDOVER TO UTRAN COMMAND message,
- UE CAPABILITY ENQUIRY message,
- UE CAPABILITY INFORMATION CONFIRM message.

When operating in MC-41 mode, dual-mode DS-41/MC-41 mobile stations and base stations shall be able to send and respectively, to receive the *DS-41 Inter-system Transfer Message* on the r-dsch. Dual-mode DS-41/MC-41 mobile stations shall respond to the received *DS-41 Inter-system Transfer Message*, if required, by sending a *DS-41 Inter-system Transfer Message* with the PAYLOAD_MESSAGE field set to one of the following messages, as appropriate:

- ME ASUREMENT REPORT message,
- MEASUREMENT CONTROL FAILURE message,
- UE CAPABILITY INFORMATION message.

C.2 *DS-41 Inter-system Transfer Message*

The Layer 3 PDU for the message has the following format:

MSG_TAG: D41ISTM

Field	Length (bits)
RADIO_INTERFACE_TYPE_ID	4
CORE_NETWORK_ID	4
PAYLOAD_MESSAGE_LENGTH	16
PAYLOAD_MESSAGE	PAYLOAD_MESSAGE _LENGTH x 8

RADIO_INTERFACE-
_TYPE_ID – Identifier of the radio interface type.

The base/mobile station shall set this field as specified in Table C.2.-1.

Table C.2-1. Radio Interface Types

RADIO_INTERFACE_TYPE_ID	Description
0000	IS-95, IS-2000 or MC system
0001	Synchronized DS system
0010	Unsynchronized DS system
0011-1111	Reserved

CORE_NETWORK _ID – Identifier of the core network.

The base/mobile station shall set this field as specified in Table C.2-2.

Table C.2-2. Core Networks Types

CORE_NETWORK_ID	Description
0000	Unspecified
0001	ANSI-41
0010-1111	Reserved

PAYLOAD_MESSAGE-_LENGTH – Length of the transported message.

The base/mobile station shall set this field to the length in octets of the other system's message.

PAYLOAD_MESSAGE – Transported message.

The base/mobile station shall set this field to the other system's message.

C.3 Service Redirection to DS-41 Systems

When the base station sends a redirection record in the *Service Redirection Message* or *Extended Global Service Redirection Message* that redirects to a DS system, the base station shall set RECORD_TYPE of the redirection to '00000101' and it shall set the redirection record type-specific fields to the following record:

Subfield	Length (bits)
EXPECTED_SID	15
EXPECTED_NID	16
RESERVED	4
NUM_UARFCN	4

NUM_UARFCN occurrences of the following record:

RESERVED	5
UARFCN	9
BANDWIDTH	3

RESERVED	0–7 (as needed)

EXPECTED_SID – Expected SID.

If the base station is redirecting the mobile station to a specific system, the base station shall set this field to the SID of that system; otherwise, the base station shall set this field to '0'.

EXPECTED_NID – Expected NID.

If the base station is redirecting the mobile station to a specific network, the base station shall set this field to the NID of that network; otherwise, the base station shall set this field to 65535.

RESERVED – Reserved bits.

The base station shall set this field to '0000'

NUM_UARFCN – Number of frequencies.

The base station shall set this field to the number of frequencies in this record.

For each frequency on which the mobile station is to attempt to acquire a DS system, the base station shall include one occurrence of the following record specifying the associated frequency and bandwidth.

RESERVED – Reserved bits.

The base station shall set this field to '00000'

UARFCN – Frequency.

The base station shall set this field to the frequency of the DS system as specified in 3GPP TS 25.101.

BANDWIDTH – Bandwidth.

The base station shall set this field to the bandwidth of the DS system as specified in the 3GPP specifications.

RESERVED – Reserved bits.

The base station shall add reserved bits as needed in order to make the length of the record equal to an integer number of octets. The base station shall set these bits to '0'.

C.4 Handoff to DS-41 Systems

C.4.1 Idle Handoff to DS-41 Systems

When operating in the MC-41 idle mode, dual-mode DS-41/MC-41 mobile stations should be able to receive DS neighbor cell information in the *Universal Neighbor List Message* (see C.4.1.1).

When operating in MC-41 mode, dual-mode DS-41/MC-41 base stations should be able to send DS neighbor cell information in the *Universal Neighbor List Message*.

C.4.1.1 DS-41 Addition to C.S0005-A *Universal Neighbor List Message*

When the base station sends DS neighbor cell information in the *Universal Neighbor List Message* (see 3.7.2.3.2.33), it shall include the following fields immediately following the last occurrence of the neighbor record if the BAND_CLASS/SYS_A_B record is not included or following the last occurrence of the BAND_CLASS/SYS_A_B record if included:

Field	**Length (bits)**
DS_RADIO_INTERFACE_TYPE	4
DS_RADIO_INTERFACE_LEN	8
DS neighbour cell information	8 × DS_RADIO_INTERFACE_LEN

DS_RADIO-_INTERFACE_TYPE – Identifier of the radio interface type.

The base station shall set this field to '0001'.

DS_RADIO-_INTERFACE_LEN – Length of the DS neighbour cell information.

The base station shall set this field to the number of octets in the DS neighbour cell information of this record.

DS neighbour cell information – DS neighbor cell information.

The base station shall set this field as described in 3GPP TS 25.331.

C.4.2 Traffic Channel Measurements of DS

When operating in MC-41 mode, dual-mode DS-41/MC-41 base stations and mobile stations, should be able to send and to receive the *Candidate Frequency Search Request Message* including DS neighbour cell information (SEARCH_MODE equal to '0010') on the f-dsch.

When operating in MC-41 mode, dual-mode DS-41/MC-41 mobile stations and base stations, should be able to send and respectively receive the *Candidate Frequency Search Report Message* including DS neighbour cell measurement information (SEARCH_MODE equal to '0010') on the r-dsch.

When conducting searches of a DS neighbor cell, the base station and mobile station shall use the same procedures as used for analog searching (SEARCH_MODE equal to '0001'), replacing the analog search mode-specific fields with the DS search mode-specific fields.

C.4.2.1 Addition to C.S0005-A *Candidate Frequency Search Request Message*

When the base station sends DS neighbour cell information in the *Candidate Frequency Search Request Message* (see 3.7.3.3.2.27 of 3GPP2 C.S0005-A), it shall set SEARCH_MODE equal to '0010' and shall set the search mode-specific fields to the following record:

Field	**Length (bits)**
SF_TOTAL_EC_THRESH	5
SF_TOTAL_EC_IO_THRESH	5
RESERVED	6
DS neighbour cell information	Variable length

SF_TOTAL_EC-_THRESH – Serving Frequency total pilot Ec threshold.

If the mobile station is not to use the measurement of total Ec of the pilots in the Serving Frequency Active Set in the DS periodic search procedure, the base station shall set this field to '11111'; otherwise, the base station shall set this field to

$$\lceil (10 \times \log_{10} (total\_ec\_thresh) + 120) / 2 \rceil$$

where total_ec_thresh is defined by the following rule: The mobile station is not to visit any DS frequency if the total Ec of the pilots in the Serving Frequency Active Set is greater than total_ec_thresh.

SF_TOTAL_EC-_IO_THRESH – Serving Frequency total pilot Ec/Io threshold.

If the mobile station is not to use the measurement of total Ec/Io of the pilots in the Serving Frequency Active Set in the DS periodic search procedure, the base station shall set this field to '11111'; otherwise, the base station shall set this field to

$\lfloor -20 \times \log_{10}(total\_ec\_io\_thresh) \rfloor$

where total_ec_io_thresh is defined by the following rule: The mobile station is not to visit any analog frequency if the total Ec/Io of the pilots in the Serving Frequency Active Set is greater than total_ec_io_thresh.

RESERVED – Reserved bits.

The base station shall set this field to '000000'.

DS neighbour cell information – DS neighbour cell information.

The base station shall set this field as described in 3GPP TS 25.331.

C.4.2.2 Addition to C.S0005-A *Candidate Frequency Search Report Message*

When the mobile station sends DS neighbour cell measurement information in the *Candidate Frequency Search Report Message* (see 2.7.2.3.2.20 of 3GPP2 C.S0005-A), it shall set SEARCH_MODE equal to '0010' and shall set the search mode-specific fields to the following record:

Field	**Length (bits)**
SF_TOTAL_RX_PWR	5
RESERVED	3
DS neighbour cell measurement information	Variable length

SF_TOTAL_EC-_THRESH – Serving Frequency total pilot Ec threshold.

If the mobile station is not to use the measurement of total Ec of the pilots in the Serving Frequency Active Set in the DS periodic search procedure, the base station shall set this field to '11111'; otherwise, the base station shall set this field to

$\lceil (10 \times \log_{10}(total\_ec\_thresh) + 120) / 2 \rceil$

where total_ec_thresh is defined by the following rule: The mobile station is not to visit any DS frequency if the total Ec of the pilots in the Serving Frequency Active Set is greater than total_ec_thresh.

SF_TOTAL_EC-_IO_THRESH – Serving Frequency total pilot Ec/Io threshold.

If the mobile station is not to use the measurement of total Ec/Io of the pilots in the Serving Frequency Active Set in the DS periodic search procedure, the base station shall set this field to '11111'; otherwise, the base station shall set this field to

$$\lfloor -20 \times \log_{10} (total\_ec\_io\_thresh) \rfloor$$

where total_ec_io_thresh is defined by the following rule: The mobile station is not to visit any analog frequency if the total Ec/Io of the pilots in the Serving Frequency Active Set is greater than total_ec_io_thresh.

RESERVED – Reserved bits.

The base station shall set this field to '000000'.

DS neighbour cell measurement information – DS neighbour cell measurement information.

The base station shall set this field as described in 3GPP TS 25.331.

C.5 Operating Mode

C.5.1 Additions to the Definition of OP_MODE for the MS in 2.7.4.15 of C.S0005-A

Table 2.7.4.15-2. OP_MODE for P_REV_IN_USE$_S$ Greater Than Three

Subfield	Length (bits)	Subfield Description	Standards for Band Class 0 and Band Class 1
OP_MODE0	1	CDMA mode	TIA/EIA-95-B
OP_MODE1	1	CDMA mode	TIA/EIA-95-B
OP_MODE2	1	Analog mode	TIA/EIA-95-B
OP_MODE3	1	Wide analog mode	TIA/EIA/IS-91
OP_MODE4	1	Narrow analog mode	TIA/EIA/IS-91
OP_MODE5	1	DS-41 mode	TIA/EIA/IS-834
RESERVED	~~3~~2	–	–

[...]

RESERVED – Reserved bits.

The mobile station shall set this field to '~~0~~00'.

C.5.2 Additions to the Definition of Operating Mode for the BS in 3.7.2.3.2.15 of C.S0005-A

Table 3.7.2.3.2.15-4. Operating Mode for MOB_P_REV Greater Than Three

Description	Standards for Band Class 0 and Band Class 1	Value (binary)
CDMA mode	TIA/EIA-95	00000000 or 00000001
Analog mode	TIA/EIA-95	00000010
Wide analog mode	TIA/EIA/IS-91	00000011
Narrow analog mode	TIA/EIA/IS-91	00000100
DS-41 mode	TIA/EIA/IS-834	00000101
All other values are reserved.		

C.6 Data Burst Messages

C.6.1 Procedures

The base station may append a 4-bit RESPONSE_TAG at the end of a *Data Burst Message*. If the mobile station receives a non-broadcast *Data Burst Message* containing a RESPONSE_TAG field, the mobile station shall reply with a *Data Burst Response Message*. The mobile station shall not send a *Data Burst Response Message* unless requested by the base station (via the RESPONSE_TAG field included in a received *Data Burst Message*).

C.6.2 Message Definition

The Upper Layers PDU for the *Data Burst Response Message* has the following format:

MSG_TAG: DBRM

Field	Length (bits)
RESPONSE_TAG	4

RESPONSE_TAG – Response tag.

The mobile station shall set this field to the value of the RESPONSE_TAG field in the received *Data Burst Message* which is being acknowledged by this message.

The mobile station shall use a MSG_ID value of ‘001111’ when the message is sent on the r-csch and a MSG_TYPE value of ‘00100000’ when the message is sent on the r-dsch.