Dynamic Content Delivery Technical Specification
– CBS Adaptation

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Open Mobile Alliance

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1. Scope

The DCD Enabler is designed to enable content delivery over a number of different underlying protocols and bearer technologies. This document specifies the binding of DCD to Cell Broadcast Service (CBS) bearers in in GSM/UMTS networks, and special considerations that should be taken within DCD interfaces and metadata necessary to facilitate the use of the DCD Enabler over the CBS bearer.

The interface between the DCD Server and a Cell Broadcast Center (CBC) is considered out of scope for this document. However the responsibility and the expected behaviour of each entity are described.

The interface between the DCD Client and CB handler in the ME/UE is assumed to be unidirectional data delivery only from the CB handler towards the DCD Client. Any other data exchange between these entities is considered to be out of scope of standardization. However the responsibility and the expected behavior of each entity are described.

2. References

2.1 Normative References

[3GPP 23.038 v5.0.0]	"Alphabets and language-specific information", V5.0.0 (2002-03), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 5)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.038/
[3GPP 23.038 v6.0.0]	"Alphabets and language-specific information", V5.0.0 (2002-03), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 6)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.038/
[3GPP 23.038 v7.0.0]	"Alphabets and language-specific information", V5.0.0 (2002-03), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 7)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.038/
[3GPP 23.040 v5.0.0]	"Technical realization of the Short Message Service (SMS)", V5.0.0 (2001-06), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 5)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.040/
[3GPP 23.040 v6.0.0]	"Technical realization of the Short Message Service (SMS)", V5.0.0 (2002-09), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 6)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.040/
[3GPP 23.040 v7.0.0]	"Technical realization of the Short Message Service (SMS)", V5.0.0 (2007-03), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 7)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.040/
[3GPP 23.041 v5.2.0]	"Technical realization of Cell Broadcast Service (CBS)", V5.2.0 (2003-12), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 5)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.041/
[3GPP 23.041 v6.2.0]	"Technical realization of Cell Broadcast Service (CBS)", V6.2.0 (2003-12), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 6)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.041/
[3GPP 23.041 v7.0.0]	"Technical realization of Cell Broadcast Service (CBS)", V6.2.0 (2006-03), 3rd Generation Partnership Project; Technical Specification Group Terminals; (Release 7)
	URL:http://www.3gpp.org/ftp/Specs/archive/23_series/23.041/
[DCD-AD]	"OMA Dynamic Content Delivery Architecture", Version 1.0, Open Mobile Alliance™, OMA-AD-DCD-V1_0, URL:http://www.openmobilealliance.org/
[DCD-RD]	"OMA Dynamic Content Delivery Requirements", Version 1.0, Open Mobile Alliance™, OMA-RD-DCD-V1_0, URL:http://www.openmobilealliance.org/
[DCD-TS-Semantics]	"OMA Dynamic Content Delivery Technical Specification – Semantics", Version 1.0, Open Mobile Alliance™, OMA-TS-DCD_Semantics-V1_0, URL:http://www.openmobilealliance.org/
[RFC2119]	"Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, March 1997, URL:http://www.ietf.org/rfc/rfc2119.txt
[RFC4234]	**"Augmented BNF for Syntax Specifications: ABNF". D. Crocker, Ed., P. Overell. October 2005, URL:http://www.ietf.org/rfc/rfc4234.txt**
[SCRRULES]	"SCR Rules and Procedures", Open Mobile Alliance™, OMA-ORG-SCR_Rules_and_Procedures, URL:http://www.openmobilealliance.org/

2.2 Informative References

[OMADICT]	"Dictionary for OMA Specifications", Version x.y, Open Mobile Alliance™, OMA-ORG-Dictionary-Vx_y, URL:http://www.openmobilealliance.org/

3. Terminology and Conventions

3.1 Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except "Scope" and "Introduction", are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

Cell Broadcast Entity Protocol	Generic name for the interface expose by the CBC towards the CBE, the interface is vendor specific.

3.3 Abbreviations

BSC	Base Station Controller (GSM)
CB	Cell Broadcast
CBC	Cell Broadcast Center
CBE	Cell Broadcast Entity
CBEP	Cell Broadcast Entity Protocol
CBS	Cell Broadcast Service
DCH	DCD-CBS Header
DDL	DCD-Data-Length
DID	DCD-ID
DPP	DCD-Packet-Parameter
IE	Information Element
ME	Mobile Equipment (GSM)
OMA	Open Mobile Alliance
PDU	Packet Data Unit
PTM	Point To Multipoint
PTP	Point To Point
RNC	Radio Network Controller (UMTS)
UDH	User Data Header
UE	UMTS Equipment (UMTS)

4.   Introduction

The OMA Dynamic Content Delivery (DCD) 1.0 Enabler provides a set of interfaces designed to enable administration functions and delivery of content to mobile users on a one-to-one (point-to-point) or one-to-many (broadcast) basis. The content delivery functionality of the DCD Enabler is designed to support multiple underlying network technologies (i.e. network types and/or bearers).

The 3GPP Cell Broadcast Service provides a transport mechanism that can be used for DCD data delivery from DCD Server to DCD Client for both administration functions and data delivery.

This document describes:

- the logical architecture of DCD enabler over CBS bearers

- the protocol stack and detailed layer by layer implications

- the CBS service provisioning to support DCD enabler

- the necessary metadata and interactions between the DCD Enabler and CBS bearer to facilitate the delivery of DCD content over CBS.

This document first defines (in Section 5) the logical architecture for delivery of DCD content over CBS. The document then describes (in Section 6) the DCD over CBS protocol stack, Section 7 describes the required interactions between the DCD Enabler and CBS bearer and special considerations that should be taken place when using DCD over CBS across each relevant stage of the DCD lifecycle. Section 8 describes normative behavior of each DCD-CBS component. Section 9 describes the special considerations that should be taken place when delivering the metadata over CBS or when specifying application profile running over CBS.. Section 10 brings reference information related to the use of WBXML including Tag Tokens to support efficient encoding.

5. DCD over CBS Architecture

5.1 General concept

The DCD architecture basic concept is described in Figure 1, one of the common deployment scenarios for DCD is to run over a cellular networks (e.g. GSM, UMTS etc'). In such scenario DCD Server will have access to several cellular bearers (HTTP, OMA-Push and CBS).

It can be assumed that DCD Server combines usage of PTP communication (push or pull) with a PTM (broadcast) communication. A good motivation for the use of PTM is when large number of users shares the same information.

CBS can be used for content delivery and for administration info delivery where the information is not specific to a particular user.
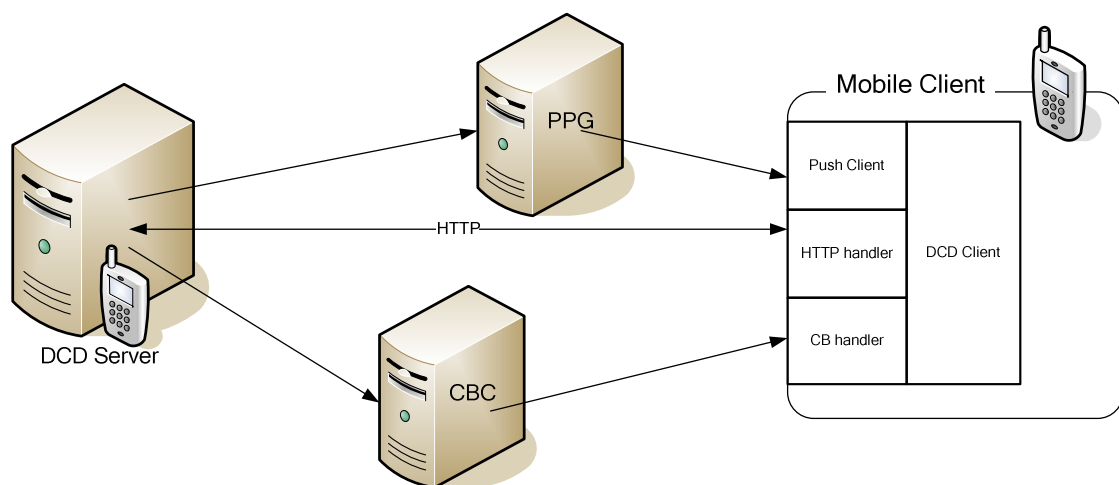
Figure 1: DCD - the basic concept

DCD over CBS has 2 scenarios:

1. DCD Server deployed with both CBS and PTP bearers for applications that require registration in DCD Server before content delivery, and that use broadcast and PTP bearers for content delivery and/or administration functions.

2. DCD Server deployed with CBS as the only bearer (See DCD Lifecycle in received-only devices in [DCD-TS-Semantics]) for applications to which DCD Server is not a precondition to receive content (e.g. Emergency Alert Services), or for receive-only terminals that have no uplink capability or no access authorization.

5.2 DCD over CBS Protocol stack

DCD over CBS protocol stack is described in Figure 2.
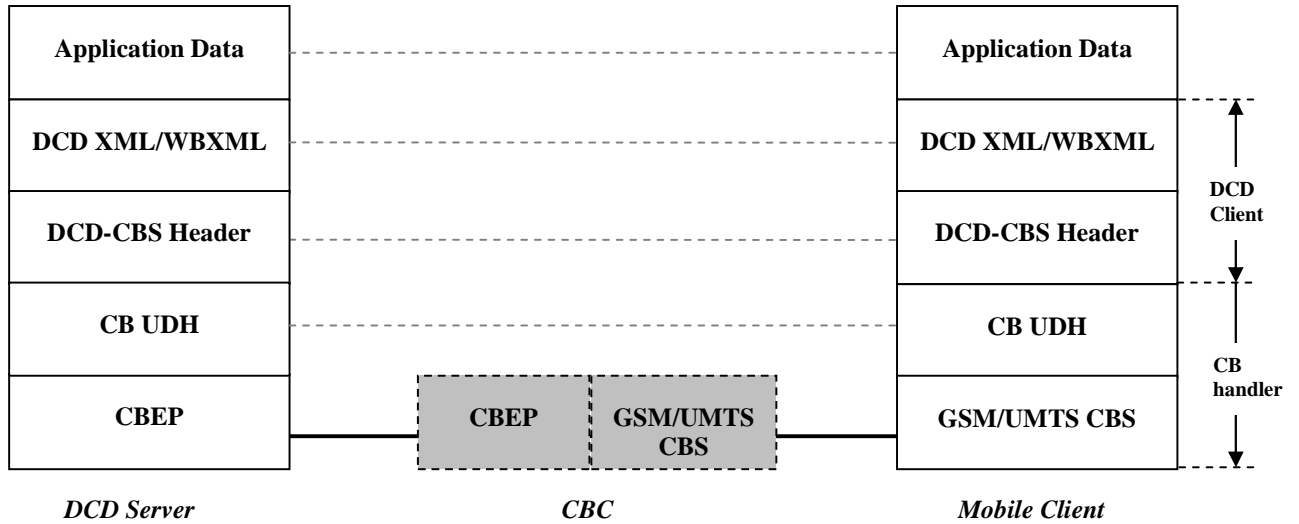
Figure 2: DCD over CBS protocol stack

In the above diagram (Figure 2) the DCD Server acts as a CBE (Cell Broadcast Entity), and connects to the CBC over CBEP (Cell Broadcast Entity Protocol).

At the Mobile Client side the protocol stack is divided among 3 entities:

- CB handler – contains GSM/UMTS CBS layer and the CB UDH handler

- DCD Client – contains the DCD-CBS Header layer and the DCD XML/WBXML.

- Application – an entity that handles Application Data

Details about the protocol stacks and DCD specific considerations can be found in chapter 6.

6. Protocol Stack Description

6.1 GSM/UMTS CB

Figure 3 describes the CBC connectivity to GSM/UMTS network. CBC connectivity in GSM and UMTS share the same basic architecture, but entities names are different.
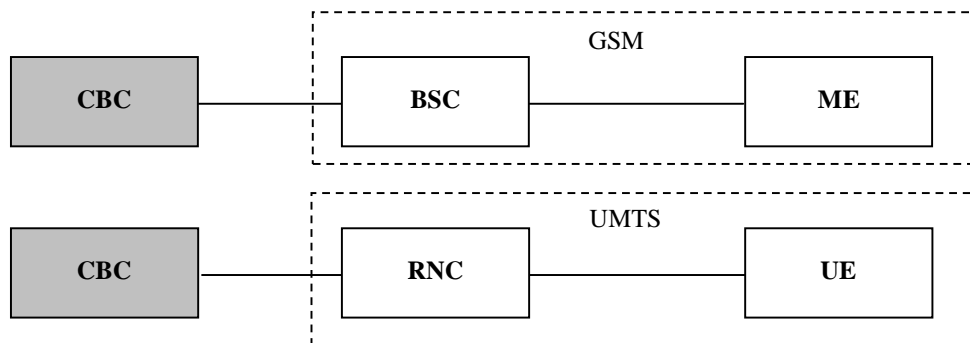
BSC – Base Station Controller (GSM)
CBC – Cell Broadcast Center
ME – Mobile Equipment (GSM)
RNC – Radio Network Controller (UMTS)
UE – UMTS Equipment (UMTS)

Figure 3: CBC basic architecture in GSM and UMTS

[3GPP 23.041] specify the cell broadcast basic structure for both GSM and UMTS.

In both GSM and UMTS within a CBC-BSC/RNC interface, a CBS message is uniquely identified by the triplet: **Message Identifier**, **Serial Number**, and **Cell Identifier**.

Note: In GSM there is additional parameter called "Channel Indicator" that is not used.

- **Message Identifier** parameter is a 2 byte long integer, more familiar as the "Cell Broadcast Channel".
  DCD MAY use the Cell Broadcast Message Identifier as the "Channel-ID" attribute.

  For backward compatibility it is recommended that DCD will use the following ranges of Message Identifier (from 3GPP 23.041):

  o A000 - AFFF (hex): PLMN operator specific range. The type of information provided by PLMN operators using these Message Identifiers is not guaranteed to be the same across different PLMNs. If a Message Identifier from this range is in the "search list", the ME shall attempt to receive this CBS message. (total of 4095 channels)

- **Serial Number** parameter identifies a particular CBS message, which may be several pages in length.

- The **Cell Identifier** parameter identifies the broadcast area

Data Coding Scheme (DCS) is a CBS parameter that identifies the alphabet or coding employed for the message characters and message handling at the MS/UE and is passed transparently from the CBC to the MS/UE. This parameter is defined in [3GPP 23.038].

DCS in the range of 1001 xxxx indicates a message with a UDH structure, where xxxx bits determine the encoding of the message (7bit, 8 bit or 16 bit) and the target destination (ME specific, SIM card or TE specific)

DCD SHALL use DCS value 1001 0101 i.e. UDH PDU, ME specific, 8 bits.

DCD MAY use DCS value of 1001 0001 UDH PDU, ME specific, 7 bits

DCD MAY use DCS value of 1001 1001 UDH PDU, ME specific, 16 bits (UCS-2)

6.1.1   CBS based concatenation

The basic payload size of Cell Broadcast page is 82 bytes. In order to enable delivery of information longer than 82 bytes a concatenation mechanism should be introduced.

CBS in GSM and UMTS have inherent mechanisms to perform message concatenation. It is assumed that concatenation decisions at this level are autonomously done at the CBC as result of the payload received from the DCD Server, and from the known limitations of both BSC/RNC and ME/UE (e.g. maximum number of supported concatenated CB pages).

6.1.1.1   GSM CBS based concatenation

In GSM the Cell Broadcast specification [3GPP 23.041] define a header named *Page-Parameter* which enable concatenation of Cell Broadcast pages to one long message with maximum size of 15 pages, or 1230 bytes of user data.

The CBC sends up to 15 pages over the air with increasing *Page-Parameter* value i.e.: 1/15, 2/15 …15/15.

The CB handler in the ME SHALL reconstruct the CB pages to one long message.

6.1.1.2   UMTS CBS based concatenation

In UMTS the CB payload (*Cb data*) is sent as one piece over the air to the UE with maximum size of 1246 bytes (user data and control information), the internal structure of the *cb data* consist of up to 15 pages of 82 bytes (1230 bytes) of pure user data, similar to GSM.

The CBC collect the DCD payload from the DCD Server and construct the CB message as described in [3GPP 23.041].

The CB handler in the UE SHALL reconstruct the CB pages to one long message (up to 1230 bytes) containing the message content only (remove all the control/header/concatenation bytes) – see section 8.3.2.

6.2   CB UDH

All CB payload which carries DCD information contains the UDH, as described in section 5.2, primarily to define application port number (DCD Client).

CB UDH is constructed by the DCD Server and it should be passed through the CBC towards the CB handler on the ME/UE.

There are several values of information elements (IE) that 3GPP allocated for messages with User Data Header (UDH) structure, as defined in [3GPP 23.040 and 3GPP 23.038].

The relevant IE for use in DCD is:

Information Element (IE)	Req	Value [Hex]	Meaning	Comments
Source and Destination Port Addressing	Mandatory	05	Application port addressing scheme, 16 bit address	Destination value is registered in IANA

Table 1: IE to be used in CBS UDH

The DCD Server SHALL use the DCD destination port address as allocated by IANA in a binary UDH to send DCD payload over CBS as described in [3GPP 23.040].

The CB handler in the UE SHALL use the DCD destination port address as allocated by IANA in a binary UDH to receive DCD payload over CBS as described in [3GPP 23.040].

6.2.1   Application Port Addressing 16 bit address

This facility allows CB messages to be routed to one of multiple applications, using a method similar to TCP/UDP ports in a TCP/IP network. An application entity is uniquely identified by the pair of source and destination port addresses. The port addressing is transparent to the transport.

The total length of the IE is 4 octets:

> octet 1,2   Destination port.

These octets contain a number indicating the receiving port, i.e. application, in the receiving device.

> octet 3,4   Originator port.

These octets contain a number indicating the sending port, i.e. application, in the sending device.

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the value of the Information-Element-Data is Reserved or not supported.

Destination port number for DCD Client as allocated by IANA: 7278 (0x1C6E)

Source port number can get any value within the range of 2 bytes.

6.2.2   Segmentation and Reassembly

UDH concatenation mechanism which use specific IE's are not allowed to be used according to [3GPP 23.038] and therefore SHALL not be used in DCD.

6.2.3   CB UDH construction example

The UDH for DCD over CBS contains one IE for Source and Destination Port Addressing.

The construction of the UDH is done according to [3GPP 23.040].

The complete UDH starts with one byte for UDH length (UDHL) that specifies the length of the User Data Header (UDH)

The "Length-of-User-Data-Header" field is an integer representation of the number of octets within the "User-Data-Header" information fields which follow.

The following diagram describes a general CBS user data, constructed in UDH format as a sequence of: UDHL, Information Element Identifier (IEI), Information Element Data Length (IEDL), Information Element Data (IED). The same sequence is used for remaining Information Elements. The native payload data encoded in 8 bit or 16 bit starts immediately after the UDH end.

UDHL	IEIa	IEDLa	IEDa	IEIb	IEDLb	IEDb	…	8 bit data or UCS-2 data
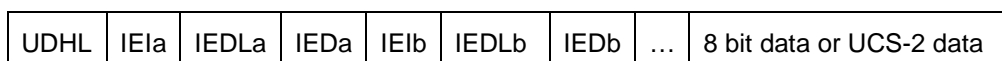
Figure 4: General construction of CBS message with UDH

To complete the byte stream presentation from [section 6.2.1], one byte of UDHL is added to get the complete UDH value.

Example of IE encoding for Source and Destination Port Addressing:

Assuming that the received UDH is equal to: 06 05 04 1C 6E 00 00

IE Type	IE Name	Assign numbers	Comments

UDHL	UDH Length	06	
IEIa	Appl. Port Addressing 16bit	05	
IEDLa	Length in Bytes of the Information Element	04	
IEDa	Destination Port	0x1C6E	7278 oma-dcdocbs (DCD over CBS)
	Source Port	0x0000	

Table 2: Encoding of CB UDH

6.3 CBEP

Cell Broadcast Entity Protocol is a non-standardized protocol exposed by CBC towards CBE's, usually based upon HTTP. This protocol is intended to enable delivery of data to specific locations in the GSM/UMTS network, at specified times, and in specific formats.

The functionality of this interface and expected behavior of the CBC are described in [3GPP 23.041].
DCD-CBS Header

The DCD-CBS Header (DCH) is part of the data delivered from the CB Handler to the DCD Client.

The DCD-CBS Header is created by the DCD Server.

The DCD-CBS Header is following the CB UDH in the CBS message structure.

The purpose of the DCD-CBS Header is to instruct the DCD Client how to handle the DCD byte stream received from the CB handler, in concept similar to HTTP headers that describe the content that follows.

The DCD-CBS Header has 3 primary objectives:

1. To ensure forward compatibility.

2. Identify the followed Content-Type

3. Enable concatenation of DCD-CBS messages

When using DCD-CBS Header to create DCD packets concatenation the DCD-CBS Header must be included in each DCD packet as illustrate in Figure 5:
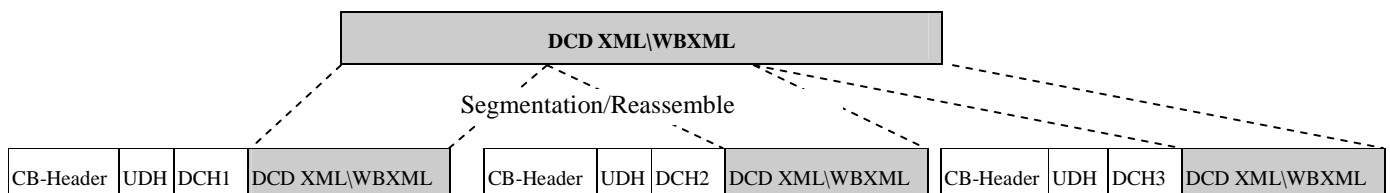
Figure 5: DCD based concatenation

To support the DCD-CBS Header functions the following 5 bytes SHALL be included in each DCD-CBS message as describe in Figure 6:

- DCD-ID (DID) – 1 byte integer

- Content-Type - 1 byte token, as specified in [Section 10.1]

- DCD-Packet-Parameter (DPP) - 1 byte

- DCD-Data-Length (DDL) – 2 bytes Integer

DID [1]	Content-Type [1]	DPP [1]	DDL [2]	DCD XML\WBXML [DDL]

Figure 6: General construction of DCD message with DCD-CBS Header, with segmentation

When no DCD based concatenation is needed the DCD-CBS message will be constructed containing 2 bytes header (DID and Content-Type) as describe in Figure 7

DID [1]	Content-Type [1]	DCD XML\WBXML

Figure 7: General construction of DCD message with DCD Header, no segmentation

6.3.1 DCD-ID (DID)

The first byte after the UDH in the CB payload is the DCD-ID (DID).

This parameter is an 8-bit integer which identifies the DCD-CBS Header version (2 bits) and the DCD-CBS Packet Identifier (6 bits) received from the same Message Identifier. In case of DCD-based concatenated message, all the concatenated messages should share the same Packet Identifier.

Version Ind [2 bits]	Packet Identifier [6bits]

Figure 8: DCD-ID construction

Version Ind. values:

Value	Meaning
00	DCD-CBS 1.0 header (current version)
01	Reserve for future use
10	Reserve for future use
11	Reserve for future use

Table 3: Version Indicator values

When Packet identifier value is all "0" it means the packet is not part of a segmented DCD message (no concatenation) and the followed IE do not exist:

- DCD-Packet-Parameter (DPP) - 1 byte

- DCD-Data-Length (DDL) – 2 bytes Integer

In case the Packet Identifier is not equal to 0, the DCD Client SHALL gather all DCD-CBS packets to one assembled message based on its DCD-ID and the values in the DCD Packet Parameter.

6.3.2   Content-Type

The second byte after the UDH in the CB payload SHALL be a one byte token that represents the DCD media type as specified in [Section 10.1].

6.3.3   DCD-Packet-Parameter (DPP)

This parameter is coded as two 4-bit fields. The first field (bits 0-3) indicates the binary value of the total number of pages in the CBS message and the second field (bits 4-7) indicates binary the page number within that sequence. The coding starts at 0001, with 0000 reserved. If a DCD Client receives the code 0000 in either the first field or the second field then it shall treat the DCD-CBS packet exactly the same as a DCD-CBS packet with DCD Packet parameter 0001 0001 (i.e. a single DCD Message).

This parameter should be present only in case Packet Identifier (in the DCD-ID) does not equal to "0".

This should be used to concatenate all the messages sharing the same DID.

6.3.4   DCD-Data-Length (DDL)

The Chosen DCS [Section 6.1] is indicating the data coding:

If the CBS message is coded using 8-bit data, the DCD-Data-Length field gives an integer representation of the number of octets within the DCD XML/WBXML field to follow.

If the chosen DCS is coded using the GSM 7 bit default alphabet, the DCD-Data-Length field gives an integer representation of the number of septets within the DCD XML/WBXML field to follow.

If the CBS message is coded using UCS2 data, the DCD-User-Data-Length field gives an integer representation of the number of octets within the DCD XML/WBXML field to follow.

This parameter should be present only in case Packet Identifier (in the DCD-ID) does not equal to "0".

6.4   DCD XML/WBXML

6.5   Application Data

Application data is opaque data for the enabler and it being represent as OPAQUE data in the DCD XML/WBXML

7.   DCD over CBS Lifecycle Functions

This Section is complementary to Section 5 in [DCD-TS-Semantics].

All the following sections deal with special considerations that should be taken when implementing DCD enabler based on CBS.

The relevant sections from the [DCD-TS-Semantics] are still applicable if not stated differently.

7.1   Client Activation and Deactivation

DCD Client that supports both 'normal' and receive-only mode operation will operate in receive-only mode if activation with a DCD Server is unsuccessful.

7.1.1   Broadcast Service Identifier for DCD over Broadcast

[DCD-TS-Semantics] introduced the Broadcast Service ID as an identifier for the distribution source for DCD content delivered over broadcast bearers. Use of the Broadcast Service ID is illustrated in the following examples:

- The DCD Service Provider needs to identify itself in the DCD transactions to a predefined group of users, which may be a subset or all of its users. The Broadcast Service ID in this case is unique to the DCD Service Provider. The use of a Broadcast Service ID in this case ensures delivery of related DCD transactions only to the intended group of users, and only in the intended service delivery contexts, e.g. when they are in the service domain of Mobile Network Operators (MNO) providing CBS service to the DCD Service Provider.

- The DCD Service Provider supports globally useful services that are offered in common with other DCD Service Providers, and which are associated with Broadcast Service ID's established through standards or DCD Service Provider agreements. Examples may include traffic and weather reports. The Broadcast Service ID in this case is common to all the associated DCD Service Providers.

- The DCD Service Provider provides Emergency Alert Services that are offered in common with other DCD Service Providers as industry initiatives or regulatory requirements. The Broadcast Service ID in this case is common to all the associated DCD Service Providers.

Applicable Broadcast Service IDs should be provided to the DCD Client by the DCD Server at Activation if the CBS bearer is expected to be used for DCD or by pre-configuring the device or during the application Registration process if the DCD Enabled Client Application was designed for that. The presence of this parameter is conditional on the support of CBS in the DCD Server and Client.

When the application defines the Broadcast Service ID's the DCD Client should accept and deliver to it only DCD-CBS message which contain one of the specified Broadcast-Service-ID values.

When Broadcast Service ID is preset in the device its values will be used in conjunctions with Broadcast Service ID allocated by the DCD Server during client activation.

The DCD Server should include a Broadcast Service ID in each applicable message sent to the DCD Client over CBS.

Transactions received with a Broadcast Service ID should be associated with each DCD-Enabled Client Application that registered with the related DCD Server, unless the transaction specifies a particular Application-ID.

7.2   Registration

7.2.1   Application Registration

Application can express it willingness to work over CBS by filling out the relevant parameters in the DCD-3 connection profile or by referring by name to the CBS based connection profile. Otherwise the DCD Client use its default DCD-3 connection profile set by the Service Provider.

When Application is designed to work with a specific Service Provider it can set the Broadcast Service ID in the DCD-3 Connection Profile as part of the Application profile and ensure by that working only when in the Service Provider network.

7.2.2 Channel Registration

In the channel registration process the Content Provider can express its willingness to use broadcast bearer as delivery mechanism, but the Service Provider can overrule the Content Provider preference and it has the role to select which broadcast bearer to use.

7.3 Deregistration

As described in [DCD-TS-Semantics] section 3.

7.4 Session management

In the case of using CBS as the delivery bearer the Session-id element is not used, instead the Broadcast-Service-ID element is used to identify the source of the broadcast as was set during the activation process.

DCD-CBS message that is received with unauthorized Broadcast-Service-ID SHALL be dropped (unless the Broadcast-Service-ID element has a well known value e.g. for supporting Emergency alerts).

7.5 Subscription

Subscription to CBS based channels is mainly internal subscription and initiated from the DCD enabled Client Application.

Subscription to a CBS based channel means that the DCD Client begins listening to the broadcast channel using the Cell-broadcast-message-id parameter, specified in the DCD-2 connection profile, and start handling the received content.

Also, a subscription can be established based on information received through channel discovery operation or based on information obtained outside the enabler (e.g., application "knowledge" or user "knowledge").

Upon channel discovery of a channel for which the subscription-required attribute in the channel-metadata is true, the DCD Client SHALL immediately begin content reception.

When using CBS based channels, the Content delivery start immediately after the DCD Client register the cell-broadcast-message-id in the CB handler on the device (it may happen before the ChannelSubscriptionRequest is sent to the DCD Server).

Unsubscription from CBS based channels is being done locally at the client without waiting to the unsubscription confirmation from the DCD Server. The unsubscription request to the DCD Server can be sent immediately or as a piggy back to other DCD Client originated messages.

7.6 Delivery

Content delivery over CBS is done using DCD-2 interface as described in [DCD-TS-Semantics]. ContentUpdatePush and/or ContentUppdateNotification are the transactions that are used for content delivery.

Content Delivery become available after the DCD Client completes the local subscription procedure, e.g. start "listening" to the Cell-broadcast-message-id according to DCD-2 connection-profile.

7.7 Suspension and Resumption

When Channel Suspension is initiated from the DCD Server over CBS via the ChannelSuspendNotification message to notify all subscribers in the broadcast area, the DCD Client SHALL stop "listening" to the Cell-broadcast-message-id until ChannelResumeNotification is received.

When Channel suspension is initiated from the DCD Enabled Client Application using the ChannelSuspendRequest massage to the DCD Client for a CBS only channel the DCD Client SHALL stop "listening" to the Cell-broadcast-message-id until ChannelResumeRequest message is received from the DCD-Enabled Client Application.

8. DCD over CBS operations

8.1 DCD Server

This Section is complementary to Section 6.2 in [DCD-TS-Semantics]

All the following sections deal with special consideration that should be taken when implementing DCD Server based on CBS.

The relevant sections from the [DCD-TS-Semantics] are still applicable if not stated differently.

This document overrules any contradictions with the [DCD-TS-Semantics] which related to the implementation of DCD over CBS.

DCD Server MAY use CBS for DCD transactions. Note that the decision about which transactions to use over which bearers is a DCD Service Provider deployment issue.

DCD-3 transactions can be delivered to DCD Clients over CBS only if a DCD-3 connection profile containing the cell-broadcast-message-id attribute (the CBS *message-identifier*) is defined for the DCD Client. Note that more than one CBS *message-identifier* may be used, e.g. for different types of devices or user groups. DCD Servers SHALL specify an expected CBS *message-identifier* when sending DCD-3 transactions over CBS.

DCD-2 transactions can be delivered to DCD Clients over CBS only if a DCD-2 connection profile containing the cell-broadcast-message-id attribute is defined for the DCD Client. Note that more than one CBS *message-identifier* may be used, e.g. for different DCD channels, devices, or user groups. DCD Servers SHALL specify an expected CBS *message-identifier* when sending DCD-2 transactions over CBS.

Note that different values of the CBS *message-identifier* may be used for transactions of DCD-3 and DCD-2, as a deployment decision of the DCD Service Provider.

The DCD Server SHALL bind the DCD payload (DCD XML) to CBS according to the protocol stack described in (Section 6) e.g. adding the UDH and the DCD-CBS header.

For WBXML encoding, the DCD Server SHALL use the Token tables specified in [DCD-TS-Semantics] section 15.

DCD packages delivered over CBS SHALL be less than or equal to 1230 bytes including the DCD data, the UDH and the DCD-CBS header (assuming CBS based concatenation is used).

The DCD Server SHALL specify the target area (location indicators), message-identifier, DCS and optionally the timing information for delivery for the CBC using the CBEP.

When using CBS, since it is unacknowledged bearer, it is mostly recommended to use repetition in order to increase the reception probability.

8.1.1 Client Activation

DCD Servers SHALL include the Broadcast Service ID parameter in the ClientActivationResponse message if there are applicable services to be delivered over CBS to the DCD-Enabled Client Application, e.g.:

- those issued by default for all users, e.g. for DCD-3 transactions or DCD-2 transactions
- those applicable for the specific user, e.g. based upon subscriptions

8.1.2 Application Registration

No specific considerations.

8.1.3   Channel Registration

DCD does not provide a specific means for Content Providers to indicate a preference to use broadcast bearers for content delivery. DCD Service Providers and Content Providers will likely arrange such options as a part of business agreements. Allocation of CBS *message-identifier* values to be used for CBS-enabled DCD channels is a deployment decision of DCD Service Providers.

When including channel metadata for CBS-enabled DCD channels in ChannelDiscoveryInfo messages, DCD Servers SHALL include the dcd-2-connection-profile with the allocated CBS *message-identifier* for all DCD Clients that are not configured with a default dcd-2-connection-profile for CBS. Note that how DCD Servers determine when it is necessary to include the CBS *message-identifier* is unspecified.

8.1.4   Channel Subscription

As described in [DCD-TS-Semantics] section 6.2.4.

8.1.5   Channel Metadata Update

The ChannelMetadataUpdate over CBS is a DCD-3 transaction that MAY be used to update all DCD Clients subscribing to the updated DCD-1/DCD-2 Channel, based on Service Provider deployment policy.

8.1.6   Content Delivery

When using ContentUpdatePush and/or ContentUppdateNotification over CBS the DCD Server SHALL set the appropriate parameters to target the relevant audience:

- CBS-massage-identifier as defined in the DCD-2 connection profile as part of the channel metadata.

- Broadcast-Service-ID as allocated by the service provider to its subscribers during activation or a well-known value that is preset on the device.

- Channel-id value as specified in the channel metadata

8.1.7   Channel Suspension

ChannelSuspendNotification/ChannelResumeNotification over CBS MAY be used over DCD-3 when the DCD Server temporary stop/start sending content over the specified channel (mainly to save power for the devices) and based on Service Provider deployment policy.

8.1.8   Channel Discovery

The DCD-3 ChannelDiscoveryInfo/DCD-3 ChannelDiscoveryNotification over CBS MAY be used over DCD-3 based on Service Provider deployment policy.

8.1.9   Usage Tracking Report

RequestForUsageTrackingReport message over CBS MAY be used over DCD-3 based on Service Provider deployment policy.

8.1.10   Contextual Information Upload

ContextualInformationUploadRequest message over CBS MAY be used over DCD-3 based on Service Provider deployment policy.

8.1.11   Connection Profile Update

ConnectionProfileUpdate message over CBS MAY be used over DCD-3 based on Service Provider deployment policy.

8.2   CBC

The CBC is the network entity that enables Cell Broadcast delivery in GSM/UMTS networks.

DCD Server SHALL be connected to the CBC using CBEP.

The CBC SHALL receive the target area (location indicators), message-identifier, DCS and the timing information if exist from the DCD Server than it SHALL construct the DCD payload together with the DCD UDH and prepare it for delivery over the GSM/UMTS network to the MS/UE.

If more than one CB page is required the CBC SHOULD recognized it by checking the DCD payload length and use the CB based concatenation to create a long CB message.

8.3   CB handler

8.3.1   GSM CB handler

The CB handler in the ME will reassemble all CB pages related to the same message (up to 15 pages to one long CB message), construct them as one piece of user data and UDH information as described in [3GPP 23.041].

The CB handler in the ME will then analyze the UDH IE, identify the destination as the IANA-registered port for DCD Client and then it will deliver the complete message to the DCD Client according to the API it exposes to the DCD Client.

The following table describes the necessary fields that the CB handler API is expected to support:

Parameters/Fields	Operation	Comments
CB header	Get	
message-identifier	Get/Set	the API must support registration to specific message identifier
CB payload	Get	Constructed from: UDH, CBS-DCD header and DCD body or CBS-DCD header and DCD body
UDH	Get	If not part of the CB payload
Length of CB payload	Get	The length of the assembled CB payload (as described above) in case of CBS based concatenation

Table 4: Necessary fields exposed by GSM-CB handler API

The above table does not dictate the API structure, the information can be provided as one package of information that will require the DCD Client to parse and extract the relevant information or by implementing an API that can provide each parameter individually (CB handler parse the CB message and extract the required fields/parameters).

The CB handler SHALL not deliver incomplete user data to the DCD Client

8.3.2 UMTS CB handler

The CB handler in the UE will reorganize the CB data as one piece of pure user data (originating by the DCD Server), analyze the UDH IE, identify the destination as the IANA-registered port for DCD Client and then it will deliver the complete message to the DCD Client according to the API it expose to the DCD Client.

The following table describes the necessary fields that the CB handler API is expected to support:

Parameters/Fields	Operation	Comments
CB header	Get	
message-identifier	Get/Set	the API must support registration to specific message identifier
CB payload	Get	Constructed from: UDH, CBS-DCD header and DCD body or CBS-DCD header and DCD body
UDH	Get	If not part of the CB payload
Length of CB payload	Get	The length of assembled CB payload (as described above) in case of CBS based concatenation The CB handler is assumed to calculate the length of the cb_data (with or without UDH, CBS-DCD header, DCD body) that contains no control information i.e. no CBS-Message-Information-Length bytes (see [3GPP 23.041]).

Table 5: Necessary fields exposed by UMTS-CB handler API

The above table does not dictate the API structure, the information can be provided as one package of information that will require the DCD Client to parse and extract the relevant information or by implementing an API that can provide each parameter individually (CB handler parse the CB message and extract the required fields/parameters)

The CB handler SHALL not deliver incomplete user data to the DCD Client

8.4 DCD Client

This Section is complementary to Section 6.1 in [DCD-TS-Semantics]

All the following sections deal with special consideration that should be taken when implementing DCD Client based on CBS.

The relevant sections from the [DCD-TS-Semantics] are still applicable if not stated differently.

This document overrules any contradictions with the [DCD-TS-Semantics] which related to the implementation of DCD over CBS.

DCD-3 transactions can be delivered to DCD Clients over CBS only if a DCD-3 connection profile containing the cell-broadcast-message-id attribute (the CBS *message-identifier*) is defined for the DCD Client. DCD Clients SHALL accept DCD-3 transactions over CBS when received with a valid CBS *message-identifier*.

DCD-2 transactions can be delivered to DCD Clients over CBS only if a DCD-2 connection profile containing the cell-broadcast-message-id attribute is defined for the DCD Client. DCD Clients SHALL accept DCD-2 transactions over CBS when received with a valid CBS *message-identifier*.

DCD Client SHALL support reassembly of messages for which the segments are received out of sequence, e.g. in the case that a segment is incompletely received and is subsequently successfully received after retransmission.

The DCD Client SHALL parse DCD payload according to the protocol stack described in [section 6] (DCD-CBS Header and DCD XML) and decode the data according the specified content-type (WBXML or text/XML).

8.4.1   Client Activation

Upon a successful ClientActivationResponse message, the DCD Client SHALL begin use of any included Broadcast Service IDs for reception of DCD transactions over CBS.

DCD Clients SHALL perform a "local activation" (i.e. completed through actions local to the terminal only) for DCD over CBS when all of the following are true:

- an applicable dcd-3-connection-profile containing the cell-broadcast-message-id attribute is available, i.e. is configured as a default or has been provided by a DCD-Enabled Client Application in Application Registration

- the terminal is receive-only (i.e. not capable of data transmission), or no applicable dcd-3-connection-profile containing the dcd-server-address attribute is available

Note that a dcd-3-connection-profile cell-broadcast-message-id provided by a DCD-Enabled Client Application is only "applicable" to that DCD-Enabled Client Application. If a default dcd-3-connection-profile cell-broadcast-message-id is configured, it is applicable to all DCD-Enabled Client Applications unless overridden for a specific DCD-Enabled Client Application.

DCD Clients SHOULD perform local activation only when at least one applicable DCD-Enabled Client Application is registered.

DCD Clients SHALL perform local activation, if not already activated, when the first applicable DCD-Enabled Client Application attempts registration.

DCD Clients SHALL perform local activation when at least one applicable DCD-Enabled Client Application is already registered upon terminal startup.

DCD Clients SHALL activate with a DCD Server if an applicable dcd-3-connection-profile containing the dcd-server-address attribute is available.

DCD Client that supports both 'normal' and CBS mode operations SHALL be capable of operating in receive-only mode if activation with a DCD Server is unsuccessful.

DCD Clients that have previously performed a local activation SHALL activate with a DCD Server if the DCD Client subsequently receives a dcd-3-connection-profile containing the dcd-server-address attribute.

8.4.2   Application Registration and Deregistration

DCD Client MAY accept a dcd-3-connection-profile containing the cell-broadcast-message-id attribute when received from a DCD-Enabled Client Application in the DCD-CAR ApplicationRegistrationRequest.

For locally activated DCD, registration for CBS-enabled DCD-Enabled Client Applications SHALL be considered complete when the DCD Client accepts the DCD-Enabled Client Application registration request.

If a PTP DCD-3 connection with a DCD Server is available, registration for CBS-enabled DCD-Enabled Client Applications SHALL be considered complete only when the DCD-3 Application Registration transaction is successfully completed.

DCD Client MAY accept a dcd-3-connection-profile containing the broadcast-service-id attribute when received from a DCD-Enabled Client Application in the DCD-CAR ApplicationRegistrationRequest. In such case the broadcast-service-id is

a list of allowed Broadcast Service IDs that the application is designed to work with, and the DCD Client SHALL use the application's broadcast-service-id when DCD-CBS messages are received in the DCD Client and ignore other broadcast-service-id defined by other means with respect to this application.

In case the broadcast-service-id was not set by the DCD Enabled Client Application, the DCD Client SHALL use the broadcast-service-id set by the DCD Server and/or preset controlled by DCD MO or any other proprietary mechanism.

DCD Client SHOULD request that the CB handler stop listening to the DCD-3 broadcast channel when the last applicable DCD-Enabled Client Application has deregistered.

8.4.3   Channel Subscription

The DCD Client is subscribed to a channel immediately after the DCD Client has registered the Cell-broadcast-message-id in the CB handler at the device.

8.4.4   Channel Metadata Update

Upon reception of ChannelMetadataUpdate over CBS the DCD Client SHALL behave according to [DCD-TS-Semantics] section 6.1.4.

ChannelMetadataUpdateConfirmation will be sent after successful operation of the ChannelMetadataUpdate and with a pseudo random delay as described in [DCD-TS-Semantics] Section 11.

8.4.5   Content Delivery

The DCD Client SHALL matches the following elements in the content delivery message before accepting and processing the message:

* Cell-broadcast-message-id - as specified in DCD-2 connection profile

* Broadcast-Service-ID as allocated by the DCD Server during activation

* channel-id - as associated by the channel metadata after subscription

If one of the above elements in the message is not matching to the allocated parameters in the DCD Client, The DCD Client SHALL drop the message.

8.4.5.1   Content Update Push

The DCD Client SHALL use a pseudo random delay as described in [DCD-TS-Semantics] Section 11 when sending the DCD-1 ContentDeliveryConfirmation message to reduce the network load from the DCD Server (spreading the DCD-1 ContentDeliveryConfirmation messages arriving from all subscribed DCD Clients).

In the broadcast case it is not recommended to set the content-delivery-notification content metadata attribute to "true".

8.4.5.2   Content Notification

The DCD Client SHALL use a pseudo random delay as described in [DCD-TS-Semantics] Section 11, when reacting to the broadcast ContentUpdateNotification with the DCD-1 ContentUpdateRequest message to reduce the network load from the DCD Server (spreading the DCD-1 ContentUpdateRequest messages arriving from all subscribed DCD Clients).

8.4.6   Channel Suspension

Suspension SHALL-NOT apply to "emergency" channels as defined in [DCD-TS-Semantics] section 6.1.7.

8.4.6.1   Channel Suspension Requested by DCD Enabled Client Application

When ChannelSuspendRequest/ChannelResumeRequest is received in the DCD Client from the DCD Enabled Client Application for CBS based channel, the suspension/resumption SHALL be done locally by DCD Client stop/start "listening"

respectively to the applicable cell-broadcast-message-id as specified in the DCD-2 connection profile of the channel metadata.

DCD Client SHALL not send ChannelSuspendRequest/ChannelResumeRequest to the DCD Server when the channel is delivered over CBS only.

8.4.6.2   Channel Suspension Notification by DCD Server

When ChannelSuspendNotification/ChannelResumeNotification is received in the DCD Client the DCD client SHALL stop/start "listening" respectively to the applicable cell-broadcast-message-id as specified in the DCD-2 connection profile of the channel metadata.

8.4.7   Channel Discovery

8.4.7.1   Channel Discovery Info from the DCD Server

When ChannelDiscoveryInfo message is received over CBS the DCD Client SHALL-NOT send ChannelDiscoveryConfirmation back to the DCD Server.

8.4.7.2   Channel Discovery Notification from the DCD Server

Upon reception of the DCD-3 ChannelDiscoveryNotification message over CBS, DCD Client SHALL send a ChannelDiscoveryRequest message to the DCD Server with a pseudo random delay as described in [DCD-TS-Semantics] Section 11.

8.4.8   Usage Tracking Report

Upon reception of RequestForUsageTrackingReport message over CBS, DCD Client SHALL send a UsageTrackingReport message to the DCD Server with a pseudo random delay as described in [DCD-TS-Semantics] Section 11.

8.4.9   Contextual Information Upload

Upon reception of ContextualInformationUploadRequest message over CBS, DCD Client SHALL send a ContextualInformationUpload message to the DCD Server with a pseudo random delay as described in [DCD-TS-Semantics] Section 11.

8.4.10   Connection Profile Update

Upon successful reception of ConnectionProfileUpdate message over CBS, DCD Client SHALL send a ConnectionProfileConfirmation message to the DCD Server with a pseudo random delay as described in [DCD-TS-Semantics] Section 11.

9. DCD Metadata Modifications for CBS

9.1 Channel Metadata

When Channel is configured to be delivered over CBS channel the selected CBS channel (i.e. message-identifier) SHALL be specified in the DCD-2 connection profile as described in [DCD-TS-Semantics].

9.2 Channel Discovery

Channel Discovery over CBS is enabled only when DCD-3 connection profile is configured to receive CBS messages.

9.3 Application Profile

When DCD-Enabled Client Application is designed to receive administration content over CBS it SHALL specify the cell-broadcast-message-id value in the DCD-3 connection profile as part of the Application Profile registration in the DCD Client or it SHALL refer to the CBS based DCD-3 connection profile by "dcd-3-connection-profile-name", otherwise the DCD-Enabled Client Application will receive administrative information according to the default DCD-3 connection profile configured at the DCD Client.

9.4 DCD-3-Connection-Profile

DCD-3 connection profile in the DCD Client MAY contains a PTP DCD-3 connection profile and MAY contains a broadcast DCD-3 connection profile both can be active at the same time.

10. DCD-CBS Reference Information

DCD-CBS is an application of [XML] version 1.0

10.1 DCD-CBS Media Type

DCD-CBS Media types are specified in [DCD-TS-Semantics] chapter 15.

The Media-Types tokens assignments for CBS are allocated by this document.

Media-Type tokens assignment:

Content-Type	Assigned number
application/vnd.oma.dcdc	0x54
application/vnd.oma.dcd	0x53

Table 6: Media-Type Tokens assignment

Appendix A.   Change History   (Informative)

A.1   Approved Version History

Reference	Date	Description
n/a	n/a	No prior version –or- No previous version within OMA

A.2   Draft/Candidate Version 1.0 History

Document Identifier	Date	Sections	Description
Draft Versions TS-DCD_CBS_Adaptation-V1_0	11 Feb 2008	All	Initial draft
	20 Mar. 2008	7.1.1, 8.1.1, 8.4.1	Incorporated inputs (minutes 2008-0104-19Mar2008): OMA-CD-DCD-2008-0102-CR_CBS_TS_Broadcast_Service_ID.doc
	23 Apr. 2008	6.4	Incorporated inputs (minutes 2008-0143R01-10Apr2008_Interim): OMA-CD-DCD-2008-0125R01-CR_DCD_based_concatenation_for_CBS.doc Editorial updates: Replace "DCD Header" with "DCD-CBS Header" all over the document
	11 June 2008	3.2, 3.3, 6.1.1.2, 6.4, 6.4.1, 6.4.3, 8.3.1, 8.3.2	Incorporated inputs (minutes 2008-0215R02-02Jun2008_Interim _Toronto): OMA-CD-DCD-2008-0209-CR_Update_to_sections_3.2_and_3.3_in_CBS_adaptation.doc OMA-CD-DCD-2008-0210-CR_Editorial_changes_to_CBS_Adaptation_spec_section_6.1.1.2.doc OMA-CD-DCD-2008-0211-CR_Adding_text_to_section_6_in_CBS_Adaptation.doc OMA-CD-DCD-2008-0212R01-CR_GSM_UMTS_CB_handler_API.doc Editorial: Changing encoding of CB UDH example in section 6.2.3 to be presented in a Table
	01 Jul. 2008	7, 8.1, 8.4, 9, 10	Incorporated inputs (minutes 2008-0241-23Jun2008_ F2F_Prague): OMA-CD-DCD-2008-0243R01-CR_Section_7_in_CBS_Adaptation OMA-CD-DCD-2008-0247R01-CR_Filling_out_section_8.1_in_CBS_Adaptation OMA-CD-DCD-2008-0249R01-CR_Filling_out_section_8.4_in_CBS_Adaptation OMA-CD-DCD-2008-0250R01-CR_Filling_out_section_9_in_CBS_Adaptation OMA-CD-DCD-2008-0251-CR_Updating_section_10_in_CBS_Adaptation
	09 Jul. 2008	7.1.1, 7.2.1, 8.4.2, Appendix B	Incorporated inputs (minutes 2008-0265-09Jul2008): OMA-CD-DCD-2008-0254R01-CR_SCR_Tables_for_CBS_Adaptation_TS OMA-CD-DCD-2008-0262-CR_Broadcast_Service_ID_updates_in_CBS_Adaptation
	15 Jul 2008	2 3	Editorial fixes: - Copyright updated - References and Abbreviations sorted alphabetically - Cross-references fixed.
	29 Oct. 2008	2.1, 4	Editorial comments from the CONR: E001-E005 Incorporated inputs (minutes 2008-0300-20Oct2008_F2F_Osaka): OMA-CD-DCD-2008-0303-CR_CONRR_E006.doc
Candidate Version: TS-DCD_CBS_Adaptation-V1_0	23 Dec 2008	All	Status changed to Candidate by TP OMA-TP-2008-0493-INP_DCD_V1_0_ERP_for_Candidate_Approval

Appendix B.   Static Conformance Requirements   (Normative)

The notation used in this appendix is specified in [**Error! Reference source not found.**].

The assumption is that DCD-CBS SCR tables are complimentary to DCD SCR tables as described in [DCD-TS-Semantics], and not planed to replace them.

B.1   SCR for DCD-CBS Client

Item	Function	Reference	Status	Requirement
DCD-CBS-C-001	Support DCD over CBS Adaptation		M	DCD-CBS-C-017
DCD-CBS-C-002	Allocation of Broadcast-Service-ID during activation	8.4, 8.4.1, 9.4 [DCD-TS-Semantics]: 5.4.1	M	
DCD-CBS-C-003	Application Registration and Deregistration with CBS profile	8.4.2, 9.3	M	
DCD-CBS-C-004	DCD Server-Initiated Channel Discovery Push over CBS with DCD-2 connection profile	8.4.7.1	M	
DCD-CBS-C-005	DCD Server-Initiated Channel Discovery notification over CBS	8.4.7.2	O	
DCD-CBS-C-006	Internal Subscription with DCD-2 connection profile already set in the DCD Client	8.4.3	M	DCD-CBS-C-004 (with DCD-2 connection profile)
DCD-CBS-C-007	Channel Metadata Update over CBS	8.4.4	O	
DCD-CBS-C-008	Content Update Push over CBS	8.3, 8.4, 8.4.5, 8.4.5.1	M	DCD-CBS-C-009 DCD-CBS-C-010
DCD-CBS-C-009	DCD based concatenation	6.4	M	
DCD-CBS-C-010	CBS based concatenation	8.3, 6.1.1	O	
DCD-CBS-C-011	Content Update Notification over CBS	8.4.5.2	M	
DCD-CBS-C-012	DECA-Initiated Local Suspension and Resumption	8.4.6.1	M	
DCD-CBS-C-013	DCD Server-Initiated Suspension and Resumption over CBS	8.4.6.2	M	
DCD-CBS-C-014	Usage Tracking Report	8.4.8	O	
DCD-CBS-C-015	Contextual Information Upload	8.4.9	O	

Item	Function	Reference	Status	Requirement
DCD-CBS-C-016	DCD-3 connection profile management	8.4.10, [DCD-TS-Semantics]: 5.4, 7.1.3.14, 16	O	
		Receive-only Client		
DCD-CBS-C-017	Support of Receive-only Client		M	
DCD-CBS-C-018	Transition from Normal to Receive-only mode	8.4, 8.4.1 [DCD-TS-Semantics]: 5.1.1, 5.4.1	M	
DCD-CBS-C-019	Local DECA registration with CBS profile in receive-only mode	8.4.2, 9.3, 9.4 [DCD-TS-Semantics]: 5.2.1.1, 5.3.1.1, 6.1.2.1	M	
DCD-CBS-C-020	DCD Server-Initiated Channel Discovery Push over CBS in receive-only case	8.4.7	M	
DCD-CBS-C-021	Local Internal Subscription and Unsubscription in receive-only case	8.4.3 [DCD-TS-Semantics]: 5.5.1, 6.1.3.5	M	
DCD-CBS-C-022	Channel Metadata Update over CBS in receive-only case	8.4.4	O	
DCD-CBS-C-023	Content Update Push over CBS in Receive-only mode	8.4.5 [DCD-TS-Semantics]: 5.4.1, 5.6.1, 6.1.5.1	M	
DCD-CBS-C-024	Local DECA-Initiated Suspension and Resumption	8.4.6.1	M	

B.2   SCR for DCD Server

Item	Function	Reference	Status	Requirement
DCD-CBS-S-001	Support DCD over CBS Adaptation		M	
DCD-CBS-S-002	Allocation of Broadcast Service ID during Activation	8.1.1 [DCD-TS-Semantics]: 5.1, 5.4, 6.2.1	M	
DCD-CBS-S-003	Application Registration and Deregistration	8.1.2	O	
DCD-CBS-S-004	Channel Registration and Deregistration	8.1.3	O	
DCD-CBS-S-005	Internal Subscription and Unsubscription	8.1.4	M	DCD-CBS-S-010
DCD-CBS-S-006	Channel Metadata Update over CBS	8.1.5	O	
DCD-CBS-S-007	Content Update Push over CBS	8.1.6	M	

Item	Function	Reference	Status	Requirement
DCD-CBS-S-008	Content Update Notification over CBS	8.1.6	O	
DCD-CBS-S-009	DCD Server-Initiated Suspension and Resumption	8.1.7	O	
DCD-CBS-S-010	DCD Server-Initiated Channel Discovery Push over CBS with DCD-2 connection profile	8.1.8	M	
DCD-CBS-S-011	DCD Server-Initiated Channel Discovery notification over CBS	8.1.8	O	
DCD-CBS-S-012	Usage Tracking Report	8.1.9	O	
DCD-CBS-S-013	Contextual Information Upload	8.1.10	O	
DCD-CBS-S-014	DCD-3 connection profile management	8.1.11 [DCD-TS-Semantics]: 5.4, 7.1.3.14, 16	O	