
**Information technology — Generic coding
of moving pictures and associated audio
information —**

**Part 6:
Extensions for DSM-CC**

iTeh STANDARD PREVIEW

*Technologies de l'information — Codage générique des images animées
et des informations sonores associées —*

Partie 6: Extensions pour DSM-CC

ISO/IEC 13818-6:1998

<https://standards.iteh.ai/catalog/standards/sist/6aa61fae-c3da-4705-881e-51240c7b181d/iso-iec-13818-6-1998>



CONTENTS

0. INTRODUCTION	XIX
0.1 Guiding Factors in the Formulation of DSM-CC	xix
0.2 DSM-CC Client-Network-Server Model	xx
0.3 Outline of the DSM-CC Specification	xx
0.3.1 User-to-Network	xx
0.3.2 User-to-User	xxi
0.4 Supported Network Technologies	xxi
0.5 Supported Connection Types	xxi
0.6 DSM-CC Interfaces	xxi
0.7 DSM-CC Interface Protocols	xxiii
0.8 Communications Requirements	xxv
0.9 Methods of Specification	xxv
0.9.1 Messages	xxv
0.9.2 Message Flow Diagram Scenarios	xxvi
0.9.3 Specification and Description Language	xxvi
0.9.4 Interface Definition Language (IDL)	xxviii
0.9.5 Remote Procedure Call (RPC)	xxviii
0.9.5.1 Independence of RPC	xxix
0.9.5.2 Preferred and Default RPC	xxix
0.9.5.3 Local Equivalent Functions	xxix
1. GENERAL	1
1.1 Scope	1
1.2 Profiles and Compliance	1
1.2.1 Functional Categories of the DSM-CC protocols	1
1.2.2 User-to-Network Session Messages	2
1.2.2.1 U-N Core Session Message Functional Groups	2
1.2.2.2 U-N Extended Session Message Functional Groups	2
1.2.3 User-User Interfaces	2
1.2.3.1 U-U Core Interfaces	2
1.2.3.2 U-U Extended Interfaces	3
1.3 Definitions	3
1.4 Acronyms	4
1.5 Normative References	6
2. DSM-CC MESSAGE HEADER	7
2.1 DSM-CC Adaptation Header Format	8
2.1.1 DSM-CC Conditional Access Adaptation Format	9
2.1.2 DSM-CC User ID Adaptation Format	9
3. USER-TO-NETWORK CONFIGURATION MESSAGES	10
3.1 Overview and the General Message Format	10
3.2 User-to-Network configuration parameters	10
3.2.1 DSM-CC specific configuration parameters	10
3.2.2 Network specific configuration parameters	11
3.2.3 User defined configuration parameters	12

© ISO/IEC 1998

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

ISO/IEC Copyright Office • Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

3.3	User to Network Configuration Messages	12
3.3.1	UNConfigRequest message definition	13
3.3.2	UNConfigConfirm message definition	13
3.3.3	UNConfigIndication message definition	14
3.3.4	UNConfigResponse message definition	14
3.4	User-to-Network Configuration Message Field Data Types	15
3.5	User Initiated UNConfigRequest message Sequence	15
3.6	Network Initiated UNConfigIndication message Sequence	16
3.7	Broadcasting of UNConfigIndication messages	16
3.8	Mixed User/Network Initiated Configuration Sequences	17
3.9	User-to-Network Configuration Reason Codes	17
3.10	User-to-Network Configuration Response Codes	17
4.	USER-TO-NETWORK SESSION MESSAGES	19
4.1	Overview and the General Message Format	19
4.2	Session Messages	19
4.2.1	U-N Functional groups	23
4.2.1.1	U-N Core Group	23
4.2.1.2	Extended Functional groups	24
4.2.2	Use of UserData() structure in session messages	24
4.2.3	Use of Resources() structure in session messages	25
4.2.4	Session Set-Up group message definitions	25
4.2.4.1	ClientSessionSetUpRequest	25
4.2.4.2	ClientSessionSetUpConfirm	26
4.2.4.3	ServerSessionSetUpRequest	26
4.2.4.4	ServerSessionSetUpResponse	27
4.2.5	Session Release group message definitions	28
4.2.5.1	ClientSessionReleaseRequest	28
4.2.5.2	ClientSessionReleaseConfirm	29
4.2.5.3	ClientSessionReleaseIndication	29
4.2.5.4	ClientSessionReleaseResponse	29
4.2.5.5	ServerSessionReleaseRequest	30
4.2.5.6	ServerSessionReleaseConfirm	30
4.2.5.7	ServerSessionReleaseIndication	31
4.2.5.8	ServerSessionReleaseResponse	31
4.2.6	Add Resource group message definitions	32
4.2.6.1	ClientAddResourceIndication	32
4.2.6.2	ClientAddResourceResponse	32
4.2.6.3	ServerAddResourceRequest	33
4.2.6.4	ServerAddResourceConfirm	33
4.2.7	Delete Resource group message definitions	34
4.2.7.1	ClientDeleteResourceIndication	34
4.2.7.2	ClientDeleteResourceResponse	35
4.2.7.3	ServerDeleteResourceRequest	35
4.2.7.4	ServerDeleteResourceConfirm	36
4.2.8	Continuous Feed Session group message definitions	36
4.2.8.1	ServerContinuousFeedSessionRequest	36
4.2.8.2	ServerContinuousFeedSessionConfirm	37
4.2.9	Status group message definitions	37
4.2.9.1	ClientStatusRequest	37
4.2.9.2	ClientStatusConfirm	38
4.2.9.3	ClientStatusIndication	38
4.2.9.4	ClientStatusResponse	38
4.2.9.5	ServerStatusRequest	39
4.2.9.6	ServerStatusConfirm	39
4.2.9.7	ServerStatusIndication	40
4.2.9.8	ServerStatusResponse	40

4.2.10	Reset group message definitions.....	41
4.2.10.1	ClientResetRequest.....	41
4.2.10.2	ClientResetConfirm.....	41
4.2.10.3	ClientResetIndication.....	42
4.2.10.4	ClientResetResponse.....	42
4.2.10.5	ServerResetRequest.....	42
4.2.10.6	ServerResetConfirm.....	43
4.2.10.8	ServerResetResponse.....	43
4.2.11	Session Proceeding group message definitions.....	44
4.2.11.1	ClientSessionProceedingIndication.....	44
4.2.11.2	ServerSessionProceedingIndication.....	44
4.2.12	Connect group message definitions.....	44
4.2.12.1	ClientConnectRequest.....	44
4.2.12.2	ServerConnectIndication.....	45
4.2.13	Session Transfer group message definitions.....	45
4.2.13.1	ClientSessionTransferIndication.....	45
4.2.13.2	ClientSessionTransferResponse.....	46
4.2.13.3	ServerSessionTransferRequest.....	46
4.2.13.4	ServerSessionTransferConfirm.....	47
4.2.13.5	ServerSessionTransferIndication.....	47
4.2.13.6	ServerSessionTransferResponse.....	48
4.2.14	Session In Progress group message definitions.....	49
4.2.14.1	ClientSessionInProgress.....	49
4.2.14.2	ServerSessionInProgress.....	49
4.3	User-to-Network Session Message Field Data Types.....	49
4.4	Reason Codes.....	52
4.5	Response Codes.....	53
4.6	MPEG-2 DSM-CC statusTypes.....	55
4.7	Resource Descriptors.....	56
4.7.1	DSM-CC User-to-Network Resource Descriptors.....	56
4.7.2	Specifying Ranges and Lists of values in resource descriptors.....	62
4.7.3	Horizontal Association of Resource Descriptors.....	64
4.7.4	Vertical Resource Sharing.....	64
4.7.5	Resource Descriptor Definitions.....	65
4.7.5.1	ContinuousFeedSession resource descriptor definition.....	66
4.7.5.2	AtmConnection resource descriptor definition.....	67
4.7.5.3	MpegProgram resource descriptor definition.....	67
4.7.5.4	Physical Channel resource descriptor definition.....	68
4.7.5.5	TSUpstreamBandwidth resource descriptor definition.....	69
4.7.5.6	TSDownstreamBandwidth resource descriptor definition.....	69
4.7.5.7	AtmSvcConnection resource descriptor definition.....	70
4.7.5.8	ConnectionNotify resource descriptor definition.....	70
4.7.5.9	IP resource descriptor definition.....	70
4.7.5.10	ClientTdmaAssignment resource descriptor definition.....	71
4.7.5.11	PSTNSetup resource descriptor definition.....	71
4.7.5.12	NISDNSetup resource descriptor definition.....	71
4.7.5.13	NISDNConnection resource descriptor definition.....	72
4.7.5.14	Q922Connections resource descriptor definition.....	72
4.7.5.15	SharedResource resource descriptor definition.....	72
4.7.5.16	SharedRequestId resource descriptor definition.....	72
4.7.5.17	HeadEndList resource descriptor definition.....	73
4.7.5.18	AtmVcConnection resource descriptor definition.....	73
4.7.5.19	SdbContinuousFeed resource descriptor definition.....	74
4.7.5.20	SdbAssociations resource descriptor definition.....	74
4.7.5.21	SdbEntitlement resource descriptor definition.....	75
4.8	Client Initiated Command Sequences.....	75

4.8.1	Client Session Set-Up Command Sequence	76
4.8.1.1	Client Initiates Session Set-Up Request	76
4.8.1.2	Network Rejects Client Session Request	78
4.8.1.3	Server Rejects Server Session Indication	78
4.8.1.4	Client Has Final UserData()	79
4.8.1.5	Client Initiates Early Release.....	79
4.8.1.6	Server Does not respond to serverSessionSetUpIndication.....	80
4.8.1.7	Network Rejects Server's Resource AllocationStep 7 (Network):	80
4.8.1.8	Client Unable to Use Resources	80
4.8.2	Client Session Release Command Sequence	81
4.8.2.1	Client Initiates Release Request	81
4.8.2.2	Network Rejects Client Release Request.....	82
4.8.2.3	Server Rejects Server Release Indication	82
4.8.3	Client Initiated Status Command Sequence.....	82
4.9	Server Initiated Command Sequences	83
4.9.1	Server Continuous Feed Session Set-Up Command Sequence.....	83
4.9.1.1	Server Initiates Continuous Feed Session Set-Up.....	84
4.9.2	Server Add Resource Command Sequence	84
4.9.2.1	Server Initiates Add Resource Request	85
4.9.3	Server Session Delete Resource Command Sequence.....	86
4.9.4	Server Session Release Command Sequence.....	87
4.9.4.1	Server Initiates Release Request.....	87
4.9.4.2	Network Rejects Server Release Request.....	88
4.9.4.3	Client Rejects Client Release Indication.....	88
4.9.5	Server Continuous Feed Session Release Command Sequence.....	88
4.9.5.1	Server Initiates Continuous Feed Session Release Request.....	89
4.9.5.2	Network Rejects Server Release Request.....	90
4.9.5.3	Client Rejects Client Release Indication.....	90
4.9.6	Server Status Command Sequence	90
4.9.7	Server Session Forward Command Sequence.....	91
4.9.7.1	Client Initiates Session Set-Up	92
4.9.7.2	Network Rejects Forward	93
4.9.8	Server Session Transfer Command Sequence	93
4.9.8.1	Server A Initiates Session Transfer	94
4.9.8.2	Network Rejects Transfer Request	95
4.9.8.3	Server B Rejects the Transfer Request	95
4.9.8.4	Server B Unable to Allocate Resources for Transfer.....	96
4.9.8.5	Client Rejects Transfer	96
4.9.9	Transferred Session Release.....	96
4.9.9.1	SRM is Selecting sessionIds.....	96
4.9.9.2	Server is Selecting sessionId	96
4.10	Network Initiated Command Sequences.....	97
4.10.1	Network Initiated Session Release Command Sequence	98
4.10.1.1	Network Initiates Session Release.....	98
4.10.2	Network Initiated Continuous Feed Session Release Command Sequence	98
4.10.2.1	Network Initiates Continuous Feed Session Release	99
4.10.3	Network Initiated Client Status Command Sequence	100
4.10.3.1	Network Initiates Client Status command sequence	100
4.10.4	Network Initiated Server Status Command Sequence	101
4.10.4.1	Network Initiates Server Status command sequence	101
4.11	Reset Procedures	101
4.11.1	Client Initiated Reset Command Sequence.....	102
4.11.1.1	Client Initiates Reset command sequence.....	102
4.11.2	Server Initiated Reset Command Sequence	102
4.11.2.1	Server Initiates Reset command sequence	103
4.11.3	Network Initiated Reset Command Sequence.....	103
4.11.3.1	Network Initiates Reset command sequence	103

5.	USER-TO-USER INTERFACES.....	105
5.1	Introduction.....	105
5.1.1	Contents.....	105
5.1.2	Intended Usage.....	105
5.2	The User-to-User System Environment.....	107
5.2.1	U-U System Hardware User Entities.....	107
5.2.2	U-U System Logical Entities.....	107
5.2.3	Application and Service Interfaces.....	109
5.2.4	Categorization of Client Library Interface Sets.....	110
5.2.4.1	Consumer Client.....	110
5.2.4.2	Producer Client.....	111
5.2.4.3	Client Library Profiles.....	111
5.2.5	Core Interfaces.....	112
5.2.5.1	Core Client Application Portability Library.....	113
5.2.5.2	Core Client Service Inter-operability Library.....	115
5.2.6	Extended Interfaces.....	116
5.2.6.2	Extended Client Service-interoperability Library.....	118
5.3	Overview of the Interface Definition Language(IDL).....	118
5.3.1	Operations.....	120
5.3.2	Attributes.....	121
5.3.3	Language Mapping.....	121
5.3.4	Encoding.....	121
5.3.5	Typographical Conventions.....	122
5.3.6	Syntactical Conventions.....	122
5.4	Common Definitions.....	122
5.4.1	Basic Types.....	122
5.4.2	Entity Identification.....	123
5.4.3	Interface Identification.....	124
5.4.4	Access Roles for Operations.....	126
5.4.4.1	Syntax for Access Control.....	126
5.4.5	Exceptions.....	127
5.4.6	Stream and Event Synchronization.....	130
5.5	Application Portability Interfaces(API).....	131
5.5.1	Core Interfaces.....	131
5.5.1.1	Base.....	132
5.5.1.1.1	Summary of Base Primitives.....	132
5.5.1.1.2	DSM Base close.....	133
5.5.1.1.3	DSM Base destroy.....	133
5.5.1.2	Access.....	133
5.5.1.2.1	Setting Permissions.....	134
5.5.1.2.2	Access Definitions.....	135
5.5.1.3	Stream.....	136
5.5.1.3.1	Stream Definitions, Exceptions.....	137
5.5.1.3.2	Stream Primitives.....	138
5.5.1.3.2.1	Application NF 1 values.....	138
5.5.1.3.3	Summary of Stream Primitives.....	138
5.5.1.3.4	Stream State Machine.....	139
5.5.1.3.4.1	State Machine.....	139
5.5.1.3.4.2	Basic State Machine.....	141
5.5.1.3.4.3	Complete state machine.....	142
5.5.1.3.5	DSM Stream pause.....	143
5.5.1.3.6	DSM Stream resume.....	144
5.5.1.3.7	DSM Stream status.....	145
5.5.1.3.8	DSM Stream reset.....	146
5.5.1.3.9	DSM Stream jump.....	146

5.5.1.3.10	DSM Stream play	147
5.5.1.4	File.....	148
5.5.1.4.1	File Definitions, Exceptions	148
5.5.1.4.2	Summary of File Primitives	149
5.5.1.4.3	DSM File read	149
5.5.1.4.4	DSM File write	150
5.5.1.5	Directory.....	151
5.5.1.5.1	Directory Definitions, Exceptions	152
5.5.1.5.2	Summary of Directory Primitives	154
5.5.1.5.3	DSM Directory list	155
5.5.1.5.4	DSM Directory resolve.....	156
5.5.1.5.5	DSM Directory bind.....	156
5.5.1.5.6	DSM Directory bind_context	157
5.5.1.5.7	rebind.....	158
5.5.1.5.8	DSM Directory rebind_context	158
5.5.1.5.9	DSM Directory unbind.....	159
5.5.1.5.10	DSM Directory new_context.....	160
5.5.1.5.11	DSM Directory bind_new_context.....	160
5.5.1.5.12	DSM Directory destroy	161
5.5.1.5.13	DSM Directory open	161
5.5.1.5.14	DSM Directory close.....	162
5.5.1.5.15	DSM Directory get	163
5.5.1.5.16	DSM Directory put.....	164
5.5.1.6	Session.....	165
5.5.1.6.1	Service Transfer	165
5.5.1.6.2	Summary of Session Primitives	166
5.5.1.6.3	DSM Session attach.....	166
5.5.1.6.4	DSM Session detach.....	167
5.5.1.7	ServiceGateway.....	168
5.5.1.7.1	Summary of ServiceGateway Primitives	168
5.5.1.8	First.....	168
5.5.1.8.1	Summary of First Primitives.....	168
5.5.1.8.2	DSM First root	169
5.5.1.8.3	DSM first service.....	169
5.5.2	Extended Interfaces	169
5.5.2.1	Download	171
5.5.2.1.1	Download Definitions, Exceptions	171
5.5.2.1.2	Summary of Download Primitives.....	171
5.5.2.1.3	DSM Download info	171
5.5.2.1.4	DSM Download alloc	172
5.5.2.1.5	DSM Download start.....	172
5.5.2.1.6	DSM Download cancel.....	173
5.5.2.2	Event.....	173
5.5.2.2.1	Event Definitions, Exceptions	174
5.5.2.2.2	Summary of Event Primitives.....	174
5.5.2.2.3	DSM Event subscribe	174
5.5.2.2.4	DSM Event unsubscribe	175
5.5.2.2.5	DSM Event notify.....	176
5.5.2.3	Composite.....	177
5.5.2.3.1	Summary of Composite Primitives.....	177
5.5.2.3.2	DSM Composite list_subs	177
5.5.2.3.3	DSM Composite bind_subs	178
5.5.2.3.4	DSM Composite unbind_subs	179
5.5.2.4	View	179
5.5.2.4.1	Non-Database View.....	180
5.5.2.4.2	Database View.....	180
5.5.2.4.3	View Procedures.....	180

5.5.2.4.4	Definition: View Style Attribute.....	181
5.5.2.4.5	View Definitions: Statement, Result.....	182
5.5.2.4.6	Summary of View Primitives.....	182
5.5.2.4.7	DSM View query.....	183
5.5.2.4.8	DSM View read.....	184
5.5.2.4.9	DSM View execute.....	185
5.5.2.5	State.....	185
5.5.2.5.1	Summary of State Primitives.....	185
5.5.2.5.2	DSM State suspend.....	186
5.5.2.5.3	DSM State resume.....	187
5.5.2.6	Interfaces.....	187
5.5.2.6.1	TCKind Constants.....	188
5.5.2.6.2	Exception TCKind Constants.....	189
5.5.2.6.3	Interfaces Definitions.....	190
5.5.2.6.4	Summary of Interfaces Primitives.....	190
5.5.2.6.5	DSM Interfaces show.....	190
5.5.2.6.6	DSM Interfaces define.....	192
5.5.2.6.7	DSM Interfaces check.....	193
5.5.2.6.8	DSM Interfaces undefine.....	194
5.5.2.7	Security.....	194
5.5.2.8	Config.....	195
5.5.2.8.1	Config Definitions.....	197
5.5.2.8.2	Summary of Config Primitives.....	197
5.5.2.8.3	DSM Config inquire.....	197
5.5.2.8.4	DSM Config wait.....	197
5.5.2.9	LifeCycle.....	198
5.5.2.9.1	DSM LifeCycle create.....	198
5.5.2.10	Kind.....	199
5.5.2.10.1	Summary of Kind Primitives.....	199
5.5.2.10.2	DSM Kind has a.....	199
5.5.2.10.3	DSM Kind is a.....	200
5.5.3	C Language Mappings.....	201
5.5.3.1	Scoped Identifiers.....	201
5.5.3.2	C Mapping for Operations.....	201
5.5.3.2.1	C Mapping for Basic Data Types.....	202
5.5.3.2.2	Constants.....	202
5.5.3.2.3	Struct Types.....	202
5.5.3.2.4	Sequence Types.....	202
5.5.3.2.5	Strings.....	203
5.5.3.2.6	Any.....	203
5.5.3.2.7	ev.....	203
5.5.3.2.8	Object.....	203
5.5.3.3	API Definitions.....	204
5.5.3.3.1	C Mapping for the Synchronous Interface.....	204
5.5.3.3.1.1	Base.....	204
5.5.3.3.1.2	Access.....	204
5.5.3.3.1.3	Stream.....	205
5.5.3.3.1.4	File.....	206
5.5.3.3.1.5	Directory.....	206
5.5.3.3.1.6	Session.....	207
5.5.3.3.1.7	First.....	207
5.5.3.3.1.8	Event.....	208
5.5.3.3.1.9	Download.....	208
5.5.3.3.1.10	Composite.....	208
5.5.3.3.1.11	View.....	209
5.5.3.3.1.12	State.....	209

5.5.3.3.1.13	Interfaces	210
5.5.3.3.1.14	Security.....	210
5.5.3.3.1.15	LifeCycle	210
5.5.3.3.1.16	Kind.....	210
5.5.3.3.2	C Mapping for the Synchronous Deferred Interface.....	211
5.5.3.3.2.1	Config.....	211
5.5.3.3.2.2	How to Convert Synchronous to Synchronous Deferred.....	211
5.6.3.1	Child Protocol Profile.....	216
5.6.3.2	Options Protocol Profile.....	216
5.6.3.3	Lite Protocol Profiles.....	217
5.6.3.4	BIOP Protocol Profile	217
5.6.3.5	ONC Protocol Profile	218
5.6.4	ServiceContextList	218
5.6.4.1	ServiceContext	219
5.6.5	Core Interfaces	220
5.6.5.1	Base.....	220
5.6.5.2	Access.....	220
5.6.5.3	Stream.....	222
5.6.5.3.1	Transport and Application Level NPT	224
5.6.5.3.2	Consistent Quantization Rules.....	224
5.6.5.4	File.....	224
5.6.5.5	BindingIterator	225
5.6.5.6	NamingContext.....	226
5.6.5.7	Directory.....	227
5.6.6	Extended Interfaces.....	229
5.6.6.1	SessionUU.....	229
5.6.6.1.1	Partial Path	230
5.6.6.2	ServiceGatewayUU	230
5.6.6.2.1	Summary of ServiceGatewayUU Primitives.....	230
5.6.6.3	SessionSI.....	231
5.6.6.4	ServiceGatewaySI	231
5.6.6.4.1	Summary of ServiceGatewaySI Primitives	232
5.6.6.5	DownloadSI.....	232
5.6.6.6	Event.....	235
5.6.6.7	Composite.....	236
5.6.6.8	View	238
5.6.6.9	State.....	240
5.6.6.10	Interfaces	241
5.7	Application Boot Process	241
5.7.1	Session attach() Pre-conditions	242
5.7.2	Session attach() Procedure	243
5.7.2.1	Resolving Path-specific Parameters.....	243
5.7.2.1.1	Post-condition.....	244
5.7.2.2	Establishing the U-N Session	244
5.7.2.2.1	ClientSessionSetupRequest	244
5.7.2.2.2	ClientSessionSetupConfirm.....	245
5.7.2.2.3	Session Establishment Post-conditions.....	246
5.7.2.3	Download	246
5.7.3	Session Tear-down	248
5.7.4	Session Transfer Implications.....	248

6.	USER COMPATIBILITY	249
6.1	Compatibility Descriptors.....	249
6.1.1	IEEE OUI Specifier.....	251
7.	USER-TO-NETWORK DOWNLOAD	252
7.1	Overview	252
7.1.1	Download Network Models.....	253
7.1.2	Preconditions and Assumptions.....	254
7.2	Download Message Set	255
7.2.1	Download Control Message Format.....	255
7.2.2	Download Data Message Format.....	255
7.2.2.1	DSM-CC Download Data Header	255
7.3	Message Descriptions.....	256
7.3.1	DownloadInfoRequest.....	257
7.3.2	DownloadInfoResponse and DownloadInfoIndication.....	257
7.3.3	DownloadDataBlock	259
7.3.4	DownloadDataRequest	259
7.3.5	DownloadCancel	260
7.3.6	DownloadServerInitiate.....	263
7.4	Message Sequence for Flow-Controlled Download Scenario.....	263
7.4.1	Getting Download Protocol Parameters	264
7.4.2	Starting Download.....	265
7.4.3	Acknowledgments	265
7.4.4	Timers and Re-transmission	266
7.4.5	Abort	267
7.4.6	Flow-Controlled Scenario over Reliable Transport.....	267
7.5	Message Sequence for Data Carousel Scenario.....	267
7.5.1	Getting Data Carousel Parameters.....	267
7.5.2	Starting Acquisition and Module Re-Assembly.....	268
7.5.2.1	Pseudo-Code Example of Module Re-assembly.....	268
7.5.3	Timers.....	269
7.5.4	Module Coherency	270
7.5.5	Data Delivery Rate	270
7.6	Message Sequence for Non-Flow-Controlled Download Scenario	270
7.6.1	Getting Download Protocol Parameters	271
7.6.2	Image Assembly and Coherency.....	271
7.6.3	Timers.....	271
7.7	Protocol State Machines for flow-controlled download scenario	271
7.7.1	State Variables common to Client and Download Server.....	272
7.7.1.1	Service Type: reliableService, unreliableService	272
7.7.1.2	Download configured bufferSize: bufferSize	272
7.7.1.3	Download configured maximumBlockSize: blockSize	272
7.7.1.4	Download Identifier: Did.....	272
7.7.1.5	Download negotiated blockSize: Did.blockSize.....	272
7.7.1.6	Download negotiated windowSize: Did.windowSize	272
7.7.1.7	Download negotiated Acknowledgment Period: Did.ackPeriod.....	272
7.7.1.8	Download negotiated Window Timer: Did.tWindow	272
7.7.1.9	Download negotiated Scenario Timer: Did.tScenario	272
7.7.1.10	Download negotiated compatibilities: Did.compatibilities.....	272
7.7.1.11	Download Number of Modules: Did.numModules	272
7.7.1.12	Download Module Identifier: Did.moduleId	272
7.7.1.13	Download Module Version: Did.moduleId.version.....	273
7.7.1.14	Download Module Size: Did.moduleId.moduleSize	273
7.7.1.15	Download Expired downloadId Holding timer: Did.tHold	273
7.7.2.1	Download Lower Receive Window Edge: Did.NmoduleId, Did.NblockNum	273

7.7.2.2	Number received blocks: Did.Nblock	273
7.7.2.3	Acknowledgment threshold: Did.AckThreshold.....	273
7.7.3	Server-only State Variables	273
7.7.3.1	Lower Transmit Window Edge: Did.LmoduleId, Did.LblockNum	273
7.7.3.2	Upper Transmit Window Edge: Did.UmoduleId, Did.UblockNum	273
7.7.3.3	Data Sending Rate Timer: Did.tSend	273
7.7.4	Client Conditions.....	273
7.7.4.1	Invalid ServerId	273
7.7.4.2	Number of re-transmission exceeded.....	274
7.7.4.3	Unacceptable blockSize.....	274
7.7.4.4	Unacceptable WindowSize.....	274
7.7.4.5	Unacceptable Acknowledgment Period	274
7.7.4.6	Unacceptable Window Timer	274
7.7.4.7	Unacceptable Scenario Timer.....	274
7.7.4.8	Unacceptable Compatibilities.....	274
7.7.4.9	Unacceptable Module Table.....	274
7.7.4.10	Acknowledgment period full	274
7.7.4.11	Download complete.....	274
7.7.5	Download Server Conditions.....	274
7.7.5.1	Unacceptable maximumBlockSize	274
7.7.5.2	Unacceptable bufferSize.....	275
7.7.5.3	Unacceptable Compatibilities	275
7.7.6	Client Procedures	275
7.7.6.1	Initial Setup of State Variables	275
7.7.6.2	Sending DownloadDataRequest Messages	275
7.7.6.3	Sending DownloadCancel Messages	275
7.7.6.4	Increment Lower Receive Window Edge	275
7.7.6.5	Increment block counter	276
7.7.6.6	Transition to DCExpire State	276
7.7.7	Download Server Procedures	276
7.7.7.1	Initial Setup of State Variables	276
7.7.7.2	Increment Lower Transmit Window Edge	277
7.7.7.3	Set Upper Transmit Window Edge.....	277
7.7.7.4	Sending DownloadDataBlock Messages	277
7.7.7.5	Sending DownloadCancel Messages	277
7.7.7.6	Transition to DSExpire State.....	277
7.7.8	State Machine SDL.....	277
7.8	Partial Protocol State Machines for non-flow-controlled download scenario	277
8.	STREAM DESCRIPTORS.....	279
8.1	Normal Play Time	279
8.1.1	NPT Reference Descriptor	279
8.1.2	Reconstruction of NPT	280
8.1.3	NPT Conversion to Seconds and Microseconds.....	281
8.1.4	NPT Uncertainty.....	281
8.1.4.1	Frequency of NPT Reference Descriptor.....	281
8.1.5	NPT Endpoint Descriptor.....	282
8.2	Stream Mode Descriptor	282
8.3	Stream Event Descriptor.....	283
9.	TRANSPORT	284
9.1	DSM-CC Requirements on Lower-Level Network Transport Protocol.....	284
9.1.1	U-N Message Categories	284
9.1.2	U-U Interface Categories.....	284
9.2	Encapsulation within MPEG-2 Transport Streams	285
9.2.1	Role of MPEG-2 Transport Stream in the Protocol Stack.....	285
9.2.2	DSM-CC Sections	285

9.2.2.1	Semantic definition of fields in DSMCC_section.....	286
9.2.3	DSM-CC Stream Types.....	288
9.2.4	DSM-CC Multi-protocol Encapsulation.....	288
9.2.5	U-N Message Categories.....	289
9.2.6	U-U Service Inter-operability Interface using Remote Procedure Call.....	289
9.2.7	DSM-CC Stream Descriptors.....	289
9.2.7.1	Semantic definition of fields in DSM-CC Descriptor List.....	289
9.3	Encapsulation within MPEG-2 Program Streams.....	289
9.3.1	DSM-CC Stream Descriptors.....	289
9.3.1.1	Semantic definition of fields in DSM-CC_program_stream_Descriptor List.....	290
9.3.2	U-N Messages and U-U SSI.....	290
10.	U-N SWITCHED DIGITAL BROADCAST -- CHANNEL CHANGE PROTOCOL.....	291
10.1	Overview.....	291
10.1.1	Preconditions and Assumptions.....	291
10.1.2	General Message Format.....	291
10.2	Switched Digital Broadcast Channel Change Protocol Messages.....	291
10.2.1	Use of Private Data in SDB CCP messages.....	292
10.2.2	Use of BroadcastProgramId in SDB CCP messages.....	292
10.2.3	SDB CCP message definitions.....	292
10.2.3.1	SDBProgramSelectRequest message definition.....	293
10.2.3.2	SDBProgramSelectConfirm message definition.....	293
10.2.3.3	SDBProgramSelectIndication message definition.....	294
10.2.3.4	SDBProgramSelectResponse message definition.....	294
10.3	SDB Channel Change Protocol Command Scenarios.....	294
10.3.1	Client Initiated Program Select Command Sequence.....	294
10.3.2	SDB Server Initiated Program Select Command Sequence.....	296
10.4	SDB Reason and Response Codes.....	297
10.4.1	SDB Reason Codes.....	297
10.4.2	SDB Response Codes.....	298
10.5	SDB State Machine.....	298
10.5.1	SDB State Machine for the Client Side.....	298
10.5.2	State machine for the SDB Server Side.....	300
11.	U-U OBJECT CAROUSEL.....	303
11.1	Introduction.....	303
11.2	Concepts.....	304
11.2.1	Supported U-U Objects and Interfaces.....	304
11.2.2	Service Domain and Service Gateway.....	304
11.2.3	Object References.....	305
11.2.4	Transport of BIOP Messages.....	305
11.2.5	Module Delivery Parameters.....	306
11.2.6	Taps.....	306
11.3	Broadcast Inter ORB Protocol.....	307
11.3.1	Inter-operable Object Reference (IOR).....	307
11.3.1.1	Profile Body Definition.....	307
11.3.1.1.1	Object Location Component.....	307
11.3.1.1.2	ConnBinder Component.....	307
11.3.2	Message Set Definition.....	308
11.3.2.1	Generic Object Message Format.....	308
11.3.2.2	Directory Message Format.....	310
11.3.2.3	File Message Format.....	311
11.3.2.4	Stream Message Format.....	311
11.3.2.5	Service Gateway Message Format.....	313
11.3.3	Transport Definitions.....	312
11.3.3.1	BIOP Messages.....	313
11.3.3.2	Module Delivery Parameters.....	313

11.3.3.3	IOR of Service Gateway	314
11.4	MPEG-2 Descriptors	315
11.4.1	Carousel identifier descriptor	316
11.4.2	Association tag descriptor	316
11.4.3	Deferred association tags descriptor	318
12.	USER-TO-NETWORK PASS-THRU MESSAGES.....	319
12.1	Overview and the General Message Format	319
12.2	Pass-Thru Messages	319
12.2.1	Use of PassThruData() structure in Pass-Thru messages	320
12.2.2	Pass-Thru message definitions.....	321
12.2.2.1	PassThruRequest	321
12.2.2.2	PassThruIndication.....	321
12.2.2.3	PassThruReceiptRequest	321
12.2.2.4	PassThruReceiptConfirm.....	322
12.2.2.5	PassThruReceiptIndication.....	322
12.2.2.6	PassThruReceiptResponse.....	323
12.3	User-to-Network Pass-Thru Message Field Data Types.....	323
12.4	Pass-Thru Message Scenario	324
12.4.1	Pass-Thru Message scenario.....	324
12.4.1.1	The Sending User sends a PassThruRequest	324
12.5	Pass-Thru Receipt Message Scenario	324
12.5.1	Pass-Thru Receipt Message scenario.....	325
12.5.1.1	The Sending User sends a PassThruReceiptRequest	325
12.6	Pass-Thru Response Codes.....	326
12.7	Pass-Thru Type Codes.....	326
12.8	State Machine.....	326
ANNEX A (NORMATIVE)	USER-NETWORK PROTOCOL STATE MACHINES.....	327
A.1	Introduction	327
A.2	U-N Session.....	327
A.3	U-N Download – Flow Controlled Scenario.....	364
A.4	U-N Switched Digital Broadcast Channel Change Protocol.....	377
A.5	U-N Pass-Thru.....	390
ANNEX B (INFORMATIVE)	APPLICATION EXAMPLES	399
B.1	Introduction	399
B.2	Video Stream Play.....	399
B.3	Building a Directory Hierarchy	401
B.4	Movie Information Database	402
B.5	View as a Personalized Directory.....	408
ANNEX C (INFORMATIVE)	ONC RPC XDR MAPPINGS.....	410
C.1	Overview	410
C.2	General RPC Message Formats	410
C.3	CORBA IDL C to XDR Mapping	412
C.3.1	Mapping for Integer Data Types	412
C.3.2	Mapping for void.....	412
C.3.3	Mapping for Constants	413
C.3.4	Mapping for octet	413
C.3.5	Mapping for Fixed-length Constructed Types	413
C.3.5.1	Mapping for struct	413
C.3.6	Mapping for sequences.....	413
C.3.6.1	Example: Mapping for opaque	413
C.3.6.2	Example: Mapping for PathSpec	414
C.3.7	Mapping for string.....	415
C.4	DSM-CC ONC Protocol Profile for the Interoperable Object Reference.....	415

C.5	Exceptions	416
C.6	Request and Reply Header Structures	417
C.7	DSM-CC RPC Program Numbers	418
C.7.1	RPC Program Dispatch Tables Mapping	418
ANNEX D (INFORMATIVE) USING DSM-CC U-N SESSION MESSAGES WITH ATM.....		421
D.1	Methods of using DSM-CC over ATM	421
D.1.1	Session Method	421
D.1.2	Network Method with AddResource messages between the Server and the SRM	421
D.1.3	Network Method with NO AddResource messages between the Server and the SRM.....	421
D.1.4	Integrated Method	422
D.2	Association of DSM-CC connection resources to ATM SVCs	423
D.2.1	DSM-CC resourceId Mapping into Q.2931.....	423
D.3	Session Method Command Sequences	424
D.3.1	Session Set-Up	424
D.3.1.1	Client Session Set-Up	425
D.3.2	Add Resource Request	428
D.3.2.1	Add Resource Request by the Server	429
D.3.3	Resource Deletion	430
D.3.3.1	Resource Deletion by the Server	431
D.3.4	Session Tear-Down	433
D.3.4.1	Session Tear-Down by Server	434
D.3.4.2	Session Tear-Down by Client.....	436
D.4	Network Method with DSM-CC AddResource messages between the Server and SRM	437
D.4.1	Session Set-Up	437
D.4.1.1	Client Session Set-Up, Server ATM Connection Set-Up	437
D.4.2	Add Resource Request	440
D.4.2.1	Add Resource Request by Server and ATM SVC Connection Set-Up by Server	440
D.4.3	Resource Deletion	442
D.4.3.1	Resource Deletion Request by Server and ATM SVC Connection Release by Server....	442
D.4.4	Session Tear-Down	443
D.4.4.1	Session Tear-Down Request by Server and ATM SVC Connection Release by Client ..	443
D.4.4.2	Session Tear-Down Request by Client and ATM SVC Connection Release by Server ..	444
D.4.4.3	Session Tear-Down Request by Server and ATM SVC Connection Release by Server..	445
D.5	Network Method with NO DSM-CC AddResource messages between the Server and SRM	446
D.5.1	Session Set-Up	446
D.5.1.1	Client Session Set-Up	447
D.5.2	Add Resource Request	447
D.5.2.1	Add Resource Request by the Server	447
D.5.3	Connection Clearing	449
D.5.3.1	Connection Clearing by the Server	449
D.5.3.2	Connection Clearing by the Client.....	451
D.5.4	Session Tear-Down	451
D.5.4.1	Session Tear-Down by Server	451
D.5.4.2	Session Tear-Down by Client.....	452
D.6	Integrated Method Command Sequences	453
D.6.1	Session Set-Up	454
D.6.1.1	Client Session Set-Up	454
D.6.1.2	Server Session Set-Up	455
D.6.2	Integrated Method for Adding Resources.....	455
D.6.3	Connection Clearing	456
D.6.4	Session Tear-Down	456
D.6.4.1	Server Session Tear-Down	457
D.6.4.2	Client Session Tear Down	457
D.7	References	457
ANNEX E (INFORMATIVE) UNO INTER-OPERABLE RPC PROTOCOL STACK.....		459

E.1	Abstract	459
E.2	Motivation	459
E.3	Solution Space	459
E.4	Inter-operation Framework	460
E.5	Protocol Selection	461
E.6	Common Data Representation	461
E.6.1	Encapsulation	462
E.6.2	Alignment	462
E.6.3	Primitive Data Types	462
E.6.4	Compound Types	463
E.6.5	TypeCode	463
E.7	UNO Session Protocol	464
E.7.1	Message Set	464
E.7.1.1	Request Message	464
E.7.1.2	Reply	465
E.7.1.3	CancelRequest	466
E.7.1.4	LocateRequest	466
E.7.1.5	LocateReply	466
E.7.1.6	CloseConnection	466
E.7.1.7	MessageError	466
E.7.2	Session Semantics	466
E.8	Transport and Network Semantics	467
ANNEX F (INFORMATIVE) USE OF U-U OBJECT CAROUSEL		468
F.1	Introduction	468
F.2	Purpose of U-U Object Carousels	468
F.3	IDL structures	468
F.3.1	Inter-operable object Reference	468
F.3.2	Generic object Message	470
F.3.3	Directory Message	470
F.4	Support for New Object Representations	471
F.5	How to resolve an object from its IOR	472
F.6	Service Gateway and Download support	474
F.7	U-U Object Carousels on top of MPEG-2 TS Broadcast Networks	475
ANNEX G (INFORMATIVE) SHARED RESOURCES AND THE ASSOCIATION TAG		477
G.1	Introduction	477
G.2	Use of the Association Tag	477
G.3	Use of the SharedResource Descriptor	478
G.4	Use of the SharedRequestId Descriptor	478
G.5	Common Examples of Use	479
G.5.1	Download Phase, Multiple ATM SVCs	479
G.5.1.1	End-to-End ATM	479
G.5.1.2	Non-ATM HFC Client View	480
G.5.2	Video Play Phase, Multiple ATM SVCs	481
G.5.2.1	End-to-End ATM	481
G.5.2.2	Non-ATM HFC Client View	482
G.5.3	Single Asymmetric ATM SVC	483
G.5.3.1	End-to-End ATM	483
G.5.3.2	Non-ATM HFC Client View	484
G.5.4	Single Asymmetric ATM PVC	486
G.5.4.1	End-to-End ATM	486
G.5.5	Download Phase, Multiple ATM PVCs	486
G.5.5.1	End-to-End ATM	486
G.5.5.2	Non-ATM HFC Client View	486
G.5.6	Video Play Phase, Multiple ATM PVCs	486
G.5.6.1	End-to-End ATM	486
G.5.6.2	Non-ATM HFC Client View	486
G.5.7	Use of sharedResourceRequest Descriptors	486
ANNEX H (INFORMATIVE) SWITCHED DIGITAL BROADCAST SERVICE		487
H.1	Introduction	487