

ISO/IEC 13818-6:1998-09 (E)

Information technology - Generic coding of moving pictures and associated audio information - Part 6: Extensions for DSM-CC

Contents

Page

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	Oudine 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 Croups	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 1	1
3.2.3	User defined configuration parameters	12
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	ServerSessionSetUpIndication	27
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	Server AddResourceConfirm	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
4.2.10.7	ServerResetIndication	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 Descriptor	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 Initiales 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 UserDataQ	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 Conunand 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 1	02
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 1	10
5.2.4.1	Consumer Client 1	10
5.2.4.2	Producer Client III	
5.2.4.3	Client Library Profiles 1 1	1
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
5.2.6.1	Extended Client Application Portability Library	117
5.2.6.2	Extended Client Service-interoperability Library 1 1	8
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 1	26
5.4.5	Exceptions	127
5.4.6	Stream and Event Synchronization 1	30
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 1.....	32
5.5.1.1.2	DSM Base dose.....	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	Normal Play Time Temporal Positioning	137
5.5.1.3.2.1	Application NPT 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 dose	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	Sununary 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	DatabaseView	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 1	85
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
5.5.2.7.1	DSM Security authenticate	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 1	99
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	Service Interoperability Interfaces(SII)	211
5.6.1	ConnBinder and Resource to Connection Association	212
5.6.1.1	Selector	214
5.6.2	Remote Procedure Call	214
5.6.3	The Object Reference	214
5.6.3.1	Min Protocol Profile	215
5.6.3.2	Child Protocol Profile	216
5.6.3.3	Options Protocol Profile	216
5.6.3.4	Lite Protocol Profiles	217
5.6.3.5	BIOP Protocol Profile	217
5.6.3.6	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	PartialPath	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 25	1
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 27	1
7.6.2	Image Assembly and Coherency 27	1
7.6.3	Timers	271
7.7	Protocol State Machines for flow-controlled download scenario 27	1
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	Client-only State Variables	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 28	1
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 29.....	1
10.2	Switched Digital Broadcast Channel Change Protocol Messages 29.....	1
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	313
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 40	1
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 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 42	1
D.1.1 SessionMethod.....	421
D. 1.2 Network Method with AddResource messages between the Server and the SRM 42.....	1
D. 1.3 Network Method with NO AddResource messages between the Server and the SRM 42	1
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.293 1	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 43.....	1
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 45.....	1
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 45.....	6
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
ANNEXE (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 46.....	1
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
ANNEXE (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 47.....	1
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 Asymmetrie 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 Asymmetrie ATM PVC.....	486
G.5.5 Download Phase, Multiple ATM PVCs.....	486
G.5.6 Video Play Phase, Multiple ATM PVCs.....	486
G.5.7 Use of sharedResourceRequest Descriptors.....	486
ANNEX H (INFORMATIVE) SWITCHED DIGITAL BROADCAST SERVICE.....	487
H.1 Introduction.....	487
H.2 Switched Digital Broadcast Service.....	487
H.3 Functional Flows.....	488
H.3.1 Broadcast Program Configuration.....	488
H.3.2 Client Service Profile Transfer to the SDB Server.....	489
H.3.3 Broadcast Program Guide Transfer to Client.....	490
H.3.4 Switched Digital Broadcast Service Session Establishment.....	490
H.3.5 Client Initiated Channel Changes.....	492
H.3.6 Network Initiated Channel Changes.....	493
H.3.7 Digital Broadcast Session Release.....	495
ANNEX I (INFORMATIVE) EXAMPLE U-N LIFE CYCLE WALK THROUGH.....	497
I.1 Introduction.....	497

I.2 General Flow	497
I.3 U-N-Configuration	498
I.3.1 Pre Conditions	498
I.3.2 Procedure	498
I.3.3 Post Conditions 49	8
I.4 U-N Session Setup.....	499
I.4.1 Pre Conditions	499
I.4.2 Procedure	499
I.4.3 Post Conditions	502
I.5 U-N Download	503
I.5.1 Pre Conditions	503
I.5.2 Procedure	504
I.5.3 Post Conditions	504
ANNEX J (INFORMATIVE) EXAMPLE OF AN OSI NSAP ADDRESS FORMAT	505
J.1 Purpose.....	505
J.2 Introduction	505
J.3 E. 164 NSAP.....	505
ANNEX K (INFORMATIVE) STREAM PLAYLIST.....	507
K.1 Overview	507
K.2 DSM QStream next.....	509
ANNEX L (INFORMATIVE) SERVICE TRANSFER MESSAGE FLOWS	510
L.1 Introduction.....	510
L.1.1 Use of Service transfer in the normal course of Service.....	510
L.1.2 Use of Service Transfer in emergency cases	511
L.2 Basic application level Service Transfer.....	511
L.2.1 Service Transfer: sourceServer to destinationServer with sourceServer Session Release	511
L.2.2 Service Transfer: sourceServer to destinationServer, Service maintained on sourceServer 5 ..	12
L.3 Enhanced application level Service Transfer	513
L.3.1 Release the Session with the sourceServer	513
L.3.2 Maintain minimum resources with the sourceServer 5	14
L.3.3 Maintain the Service with the sourceServer	515
L.3.4 Fall back to Server A after Session release with the sourceServer.....	515
L.3.5 Resumption of the full context on Server A after reduced Session.....	515
L.3.6 Emergency Service Transfer	516
ANNEX M (INFORMATIVE) T.120 INTER-WORKING	519
M.1 Introduction	519
M.2 Reference Model for side-by-side integrated DSM-CC/T. 120 5.....	19
M.3 Features, Functions and Services of the DSM-CC and the T.120 specifications.....	521
M.3.1 Features, Functions and Services of DSM-CC	521
M.3.2 Features, Functions and Services of T.120.....	521
M.3.3 Inter-working of DSM-CC and T. 120 Features, Functions and Services.....	521
M.4 DSM-CC and T. 120 Components Harmonized	522
M.5 Specifics for inter-operation between DSM-CC and T. 120	523
M.5.1 Terminal 1 creates a conference	524
M.5.2 Terminal 2 queries a conference.....	524
M.5.3 Terminal 2 joins the conference.....	524
M.6 T. 120 Service within DSM-CC	536
M.6.1 An Example of Extending DSM-UU to provide custom interfaces	536
ANNEX N (INFORMATIVE) THE RELATION OF DSM-CC TO MHEG-5	539
N.1 Overview	539
N.2 Name Space	539
N.2.1 MHEG Object References.....	540
N.2.2 Content References	540
N.3 Stream Events and Normal Play Time	540
N.4 Example of DSM-CC file structure for an application.....	541
N.5 Example of Mapping High-Level API Actions on DSM-CC U-U Primitives.....	542