INTERNATIONAL STANDARD

ISO/IEC 13522-7

First edition
2001-04-01

Information technology — Coding of multimedia and hypermedia information —

Part 7: Interoperability and conformance testing for ISO/IEC 13522-5

Technologies de l'information — Codage de l'information multimédia et hypermédia —

Partie 7: Essais d'interopérabilité et de conformité pour l'ISO/CEI 13522-5

Reference number
ISO/IEC 13522-7:2001(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 13522 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 13522-7 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 13522 consists of the following parts, under the general title *Information technology — Coding of multimedia and hypermedia information*:

— *Part 1: MHEG object representation — Base notation (ASN.1)*

— *Part 3: MHEG script interchange representation*

— *Part 4: MHEG registration procedure*

— *Part 5: Support for base-level interactive applications*

— *Part 6: Support for enhanced interactive applications*

— *Part 7: Interoperability and conformance testing for ISO/IEC 13522-5*

— *Part 8: XML notation for ISO/IEC 13522-5*

Annexes A to F of this part of ISO/IEC 13522 are for information only.

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Information technology — Coding of multimedia and hypermedia information —

Part 7:
Interoperability and conformance testing for ISO/IEC 13522-5

1 Scope

1.1 Context of the scope

ISO/IEC 13522 specifies the coded representation of multimedia/hypermedia information objects (MHEG objects) for interchange as final form units within or across services and applications, by any means of interchange including local area networks, wide area telecommunication or broadcast networks, storage media, etc.

ISO/IEC 13522-5:1997 defines the MHEG-5 object classes for interchange and use in base-level applications intended to be run on limited resource terminals such as set-top-boxes in such contexts as interactive broadband services.

Annex F of ISO/IEC 13522-5:1997 specifies the features that need to be defined by a specific MHEG-5 application domain. The informative annexes of this part of ISO/IEC 13522-5:1997 give illustrative examples of profiles of some common application domains.

1.2 Scope

MHEG-5 engines are system or application components that handle, interpret and present MHEG-5 objects. The scope of this part of ISO/IEC 13522 is to define a test suite that can be used to test an MHEG-5 engine's conformance to a specific application domain. It also defines a format for test cases that can be used to extend the test suite, either for more detailed testing or for extensions defined by the application domain.

It is beyond the scope of this part of ISO/IEC 13522 to define tests for engine performance, engine memory usage or for MHEG-5 applications that run on these engines.

This part of the ISO/IEC 13522 specifies test cases for *all* features of ISO/IEC 13522-5:1997. Application domains define a *subset* of MHEG-5 features that must be supported. In order to test conformance to a specific application domain, a corresponding *subset* of the test cases must be defined. This subset of the test suite is then used to test the conformance of the engine.

This part of ISO/IEC 13522 tests conformance of the behaviour of an MHEG engine. It does not validate the physical presentation of MHEG-5 objects.

The test suite comprises a set of test cases and a corresponding set of test objects. The test cases are defined in terms of:

— test purpose;

— objects and procedures which are to be used to test one or more MHEG-5 features;

— expected result.

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A set of content data will be provided for the test objects. These content data are intended as a guide for generating a test suite and should be converted or replaced by content formats appropriate to the Application Domain.

A test suite for an Application Domain shall be generated by using the PICS template in subclause 9.2.1 PICS Template.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 13522. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 13522 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 9646-1:1994, *Information technology - Open systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts.*

ISO/IEC 9646-2:1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification.*

ISO/IEC 9646-3:1998, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN).*

ISO/IEC 9646-4:1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 4: Test realization.*

ISO/IEC 9646-5:1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 5: Requirements on test laboratories and clients for the conformance assessment process.*

ISO/IEC 9646-6:1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 6: Protocol profile test specification.*

ISO/IEC 9646-7:1995, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements.*

ISO/IEC 13522-5:1997, *Information technology - Coding of multimedia and hypermedia information - Part 5: Support for base-level interactive applications.*

3 Terms and definitions

For the purposes of this part of ISO/IEC 13522, the following terms and definitions apply.

3.1 AIFF
“Audio Interchange File Format” - a digital audio encoding format providing facilities to encode wave and MIDI data.

3.2 application domain
A fully specified instance of the environment framework defined in ISO/IEC 13522-5:1997. The definition of an application domain resolves all potential variants listed in Annex D of ISO/IEC 13522-5:1997, e.g. supported object classes and supported media formats.

3.3 certification
Procedure by which a third party gives written assurance in the form of a certificate of conformance that a given product, process or service conforms to specified requirements.

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3.4 conformance test case
Encapsulation of a test purpose related to a conformance requirement, which provides the basis for testing an implementation. A test case is composed of an identifier and a scenario.

3.5 conformance testing
Testing the extent to which an implementation under test is a conforming implementation.

3.6 conformance test suite
Set of conformance test cases targeted to given requirements and selected according to a given implementation.

3.7 identification
A description of the components required to execute a test case.

3.8 interchanged MHEG-5 object
Representation of an MHEG-5 object that is exchanged or stored at a given time by means of a network or a storage device. A given MHEG-5 object may be exchanged many times between many sites, i.e. represented by many interchanged MHEG-5 objects.

3.9 MHEG-5 application
Set of interchanged MHEG-5 Scene and Application objects encoded according to ISO/IEC 13522-5:1997, together with any referenced contents.

3.10 MHEG-5 engine
Process or set of processes that interpret MHEG-5 objects encoded according to the encoding specifications defined by Annex A or B of ISO/IEC 13522-5:1997.

3.11 MHEG-5 scene
Structure that co-ordinates the presentation (visible and audible) of MHEG-5 objects (Excerpt from ISO/IEC 13522-5:1997)

3.12 PNG
Portable Network Graphics; a format for lossless compression of greyscale and colour images, developed by the WorldWideWeb Consortium; the specification of PNG is available as W3C recommendation 01 October 1996.

3.13 Profile Identifier
Data specifying the intended application domain profile for an MHEG-5 application.

3.14 RDM
Reference Decoder Model; logical description of a standard MHEG decoder implementation.

3.15 scenario
A defined set of MHEG-5 objects in a specific state.

3.16 STU
Set Top Unit; a device that receives AV data from a network interface, decodes it and sends the output to a display device.

3.17 system under test
An MHEG-5 engine implementation running in a specific environment.

3.18 test description
A precise description of the objective of a test case.

3.19 test laboratory
An organisation that carries out conformance testing.

3.20 Testing
Process of examining an implementation of an MHEG-5 engine in accordance with a specified method in order to establish one or more characteristics, that enable the conformance assessment

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4 Document structure

This part of ISO/IEC 13522 is organised into a main body and several Annexes, along with a set of electronically distributed test case descriptions and test objects.

The main body describes the scope, objectives and rationale for the document, application domain conformance mechanism and a specification of the test case format.

Annexes A-D are informative describing existing specified Application Domains.

Annex E is informative describing sample Profile Identifiers for Application Domains.

Annex F is normative describing the PICS template which shall be used as the basis for documenting conformance to an Application Domain.

The test suite is provided in electronic form along with this document, containing test objects and corresponding test data.

5 Objectives of conformance testing

MHEG-5 conformance testing shall take into account two distinct levels of conformance:

— conformance to ISO/IEC 13522-5:1997;

— conformance to a given application domain definition.

Conformance to ISO/IEC 13522-5:1997 is clearly defined by clause 4 of ISO/IEC 13522-5:1997.

An application domain defines requirements on

— applications: which features an application may use;

— engines: which features an engine is required to implement.

For an MHEG-5 application domain definition to be taken into account, it shall be

— fully specified, according to MHEG-5;

— publicly available;

— stable;

— broadly accepted, i.e. approved by a broad consortium or published by a major business actor.

MHEG-5 conformance testing shall make it possible to assess conformance of several kinds of target:

— the ASN.1 coded data stream representing MHEG-5 applications;

— the textual notation representing MHEG-5 application;

— implementations of MHEG-5 engines.

6 Rationale for MHEG-5 application conformance testing

Interoperability is a major issue for STU manufacturers and content providers alike. STU manufacturers need to validate their MHEG-5 engine implementations against the functionality required by the application domain profile. Content providers need to be confident that their applications can be delivered on any STU conforming to the application domain profile.

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This part of ISO/IEC 13552 addresses conformance of an MHEG engine to ISO/IEC 13522-5:1997 and conformance to individual profiles of ISO/IEC 13522-5:1997.

This part of ISO/IEC 13522 does not address the definition of a Reference Decoder Model, nor does it address conformance of MHEG engine implementations to such a model.

7 Test suite complexity

One way to estimate the number of test cases is to simply mix the number of classes, attributes and elementary actions in order to achieve the completeness criteria. However, this would lead to a huge number of test cases. Taking into account *Nc* class, each with an average of *Na* attributes and *Nea* elementary actions then this would lead to the approximate number of test cases:

$(Na^2 + Nea^2) * Nc$

ISO/IEC 13522 defines 31 concrete classes containing an average of about 10 attributes and 14 elementary actions per class. This results in roughly 9176 test cases. This approximation does not take into account variations in attribute values and elementary action parameters, although it does give an idea of test suite complexity.

It would require a large effort to define and implement this number of test cases, and would take a substantial time to perform a complete engine test based on this test suite. Therefore, it seems impractical to use this approach to achieve the completeness criteria. Alternatively we can define and develop:

— a set of basic test cases for each attribute and elementary action of each class, which leads to 750 test cases;

— a set of high-level tests that combine certain base test cases.

The general aim of this part of ISO/IEC 13522 is to provide a set of complex test cases to reduce the number of overall tests.

8 MHEG-5 profile identifier

MHEG-5 based information exchange is possible only between those MHEG-5 engines that share the same profile. To realise a free exchange of MHEG-5 objects each object must have a *profile identifier* that indicates an MHEG-5 profile within itself.

NOTE 1 Though a GetEngineStatus action may handle profile information, it can only return a single Boolean value. Hence, it is not suited to examine multiple profiles, e.g. with different versions. Moreover the profile identifier approach can check the object version in early decoding phase rather than the application running phase, so the decoder can predict unused object classes.

NOTE 2 Examples for the usage of the Profile Identifier are presented in Annex E.

8.1 Definition of the profile identifier

MHEG-7 defines the profile identifier as follows:

— The profile identifier should be embedded in the *ObjectInformation* attribute of an Application object.

— The *ObjectInformation* attribute of an Application object shall contain two parts; *ProfileIdentifier* and *UserInfo*. They are separated by ":". The *UserInfo* part is optional.

— The *ProfileIdentifier* shall contain three parts, *Issuer*, *ProfileName* and *Version*. These parts shall be separated by a period character.

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— *Issuer*, *ProfileName* and *Version* shall not contain the characters "." and ":".

8.2 Attribute registration

8.2.1 Issuer

Issuer shall be either a country name or an internationally registered standardisation organisation name.

8.2.2 ProfileName and Version

ProfileName and *Version* shall be unique within the issuer. Each issuer shall be responsible for the ID registration.

8.3 Syntax description of the profile identifier

```
ObjectInformation   ::= ProfileIdentifier [ ":" UserInfo ] .
ProfileIdentifier   ::= Issuer "." ProfileName"." Version".
Issuer              ::= OctetString .
ProfileName         ::= OctetString .
Version             ::= OctetString .
UserInfo            ::= OctetString .
```

8.4 How to use the profile identifier

During the MHEG-5 object decode phase, an MHEG-5 engine shall read the profile identifier which resides in an application object's ObjectInformation. If the object is not valid, the engine may quit a Launch/Spawn action and/or present error message to a user.

9 Framework for conformance testing

This framework is based on series of ISO/IEC 9646, the major ISO standard on conformance testing framework and methodology.

9.1 Overview of the testing process

Figure 1 depicts a procedural flow of the testing process:

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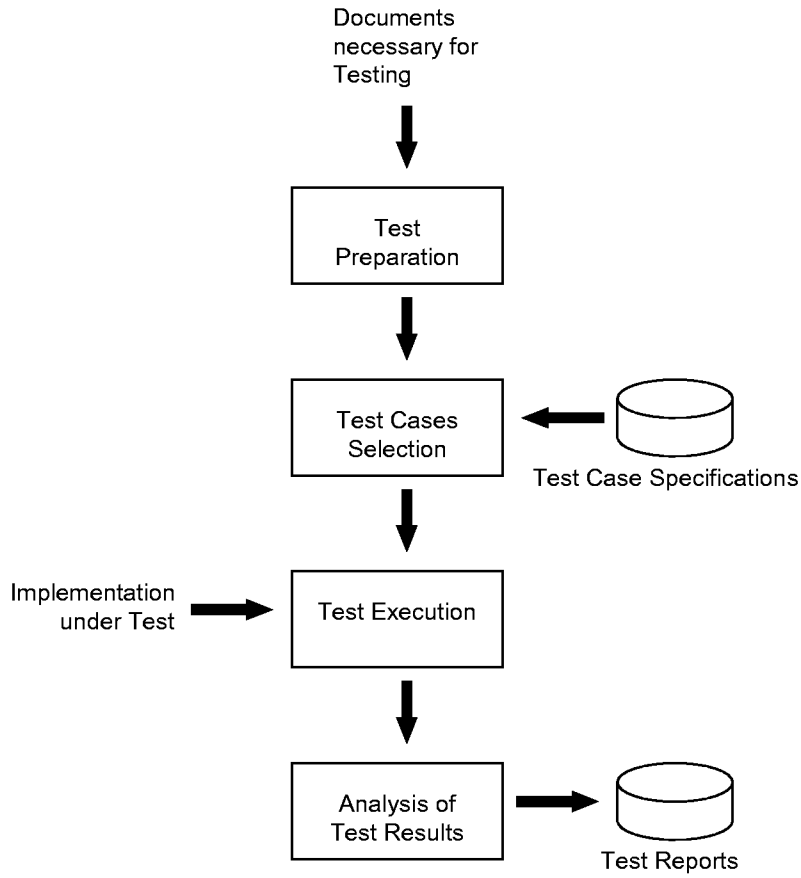

Figure 1 — Procedural flow of the testing process

The conformance testing process runs according to the following steps:

— **test preparation**: this step takes the form of a review of the implementation capabilities according to the documents supplied by the user (see subclause 9.2.)

— **test cases selection**: the objective of this step is to select the test cases that are appropriate by taking into account the capabilities reviewed in the first step

— **test execution**: the implementation under test is tested for its capabilities and behaviours according to the observation section of the test case

— **analysis of test results**: this step aims at producing the test report by evaluating the test verdicts for each test case executed in the previous step (see subclause 9.3.)

9.2 Documents for testing

Some documents are necessary for the testing process. This subclause describes the structure of the main documents.

9.2.1 Protocol Implementation Conformance Statement (PICS)

The "Protocol Implementation Conformance Statement" (PICS) contains the list of features that have to be assessed during conformance testing. These features are specified by

— ISO/IEC 13522-5:1997, subclause 4.2: "Conformance of MHEG-5 engines" (see pages 4-8),

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— the application domain definition.

It must be completed by anyone claiming conformance and requesting certification of their implementations.

This document is mainly dedicated to conformance testing of engine, in order to select the appropriate test cases, and therefore the appropriate *Reference Objects*, for the testing process.

Table 1 describes the format of the PICS table.

The meaning of the status notation of the “MHEG-5 requirements” column is as follows:

— *M*: mandatory: the capability is required to be supported;

— *I*: irrelevant: in the given context, it is irrelevant to use the capability;

— *O*: optional: the capability may be supported or not;

— *C.<i>*: conditional optional: for mutually exclusive or selectable options from a set. *<i>* is an integer that identifies a unique group of related optional capabilities and the logic of their selection;

— *X*: excluded: the support of the capability is prohibited.

The "MHEG-5 requirements" column contains the status of the feature as defined by ISO/IEC 13522-5:1997. The "application domain requirements" column contains the status of the feature as defined by the application domain definition.

Table 1 — PICS Table format

#	Description	MHEG-5 requirement	Support Yes No
A group of features (corresponds to a clause of Annex D of ISO/IEC 13522-5:1997)			
…	Description of a feature	…	[ ] [ ]
…	Description of another feature	…	[ ] [ ]
…	…	…	[ ] [ ]
Another group of features…			
		…	[ ] [ ]
Remarks…			
		…	[ ] [ ]

Application Domain implementers should use the PICS template described in the table below in order to generate a conformance specification document for their profile.

Table 2 — PICS Table

#	Description	MHEG-5 requirement	Support Yes No
Main capabilities			
M1	Classes	C.1	[ ] [ ]
M2	Elementary actions	C.1	[ ] [ ]
M3	ASN.1 encoding format for MHEG-5 interchanged objects	C.3	[ ] [ ]
M4	Textual encoding format for MHEG-5 interchanged objects	C.3	[ ] [ ]
M5	RTE main mechanisms	M	[ ] [ ]

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Classes			
C1	Application	M	[ ] [ ]
C2	Scene	M	[ ] [ ]
C3	Link	M	[ ] [ ]
C4	ResidentProgram	O	[ ] [ ]
C5	RemoteProgram	O	[ ] [ ]
C6	InterchangedProgram	O	[ ] [ ]
C7	Palette	O	[ ] [ ]
C8	Font	O	[ ] [ ]
C9	CursorShape	C.6	[ ] [ ]
C10	BooleanVariable	O	[ ] [ ]
C11	IntegerVariable	O	[ ] [ ]
C12	OctetStringVariable	O	[ ] [ ]
C13	ObjectRefVariable	O	[ ] [ ]
C14	ContentRefVariable	O	[ ] [ ]
C15	TokenGroup	O	[ ] [ ]
C16	ListGroup	O	[ ] [ ]
C17	Bitmap	O	[ ] [ ]
C18	LineArt	O	[ ] [ ]
C19	Rectangle	O	[ ] [ ]
C20	DynamicLineArt	O	[ ] [ ]
C21	Text	O	[ ] [ ]
C22	Stream	O	[ ] [ ]
C23	Audio	O	[ ] [ ]
C24	Video	O	[ ] [ ]
C25	RTGraphics	O	[ ] [ ]
C26	Slider	O	[ ] [ ]
C27	EntryField	O	[ ] [ ]
C28	HyperText	O	[ ] [ ]
C29	Hotspot	O	[ ] [ ]
C30	PushButton	O	[ ] [ ]
C31	SwitchButton	O	[ ] [ ]
C32	Action	M	[ ] [ ]
Elementary actions			
EA1	Activate	M	[ ] [ ]
EA2	Add	C.4	[ ] [ ]
EA3	AddItem	C.4	[ ] [ ]
EA4	Append	C.4	[ ] [ ]
EA5	BringToFront	C.4	[ ] [ ]
EA6	Call	C.4	[ ] [ ]
EA7	CallActionSlot	C.4	[ ] [ ]
EA8	Clear	C.4	[ ] [ ]
EA9	Clone	C.4	[ ] [ ]
EA10	CloseConnection	C.5	[ ] [ ]
EA11	Deactivate	M	[ ] [ ]
EA12	DelItem	C.4	[ ] [ ]
EA13	Deselect	C.4	[ ] [ ]
EA14	DeselectItem	C.4	[ ] [ ]
EA15	Divide	C.4	[ ] [ ]
EA16	DrawArc	C.4	[ ] [ ]
EA17	DrawLine	C.4	[ ] [ ]
EA18	DrawOval	C.4	[ ] [ ]
EA19	DrawPolygon	C.4	[ ] [ ]
EA20	DrawPolyline	C.4	[ ] [ ]
EA21	DrawRectangle	C.4	[ ] [ ]
EA22	DrawSector	C.4	[ ] [ ]

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EA23	Fork	C.4	[ ] [ ]
EA24	GetAvailabilityStatus	M	[ ] [ ]
EA25	GetBoxSize	C.4	[ ] [ ]
EA26	GetCellItem	C.4	[ ] [ ]
EA27	GetCursorPosition	C.6	[ ] [ ]
EA28	GetEngineSupport	M	[ ] [ ]
EA29	GetEntryPoint	C.4	[ ] [ ]
EA30	GetFillColour	C.4	[ ] [ ]
EA31	GetFirstItem	C.4	[ ] [ ]
EA32	GetHighlightStatus	C.4	[ ] [ ]
EA33	GetInteractionStatus	C.4	[ ] [ ]
EA34	GetItemStatus	C.4	[ ] [ ]
EA35	GetLabel	C.4	[ ] [ ]
EA36	GetLastAnchorFired	C.4	[ ] [ ]
EA37	GetLineColour	C.4	[ ] [ ]
EA38	GetLineStyle	C.4	[ ] [ ]
EA39	GetLineWidth	C.4	[ ] [ ]
EA40	GetListItem	C.4	[ ] [ ]
EA41	GetListSize	C.4	[ ] [ ]
EA42	GetOverwriteMode	C.4	[ ] [ ]
EA43	GetPortion	C.4	[ ] [ ]
EA44	GetPosition	C.4	[ ] [ ]
EA45	GetRunningStatus	M	[ ] [ ]
EA46	GetSelectionStatus	C.4	[ ] [ ]
EA47	GetSliderValue	C.4	[ ] [ ]
EA48	GetTextContent	C.4	[ ] [ ]
EA49	GetTextData	C.4	[ ] [ ]
EA50	GetTokenPosition	C.4	[ ] [ ]
EA51	GetVolume	C.4	[ ] [ ]
EA52	Launch	M	[ ] [ ]
EA53	LockScreen	M	[ ] [ ]
EA54	Modulo	C.4	[ ] [ ]
EA55	Move	C.4	[ ] [ ]
EA56	MoveTo	C.4	[ ] [ ]
EA57	Multiply	C.4	[ ] [ ]
EA58	OpenConnection	C.5	[ ] [ ]
EA59	Preload	C.4	[ ] [ ]
EA60	PutBefore	C.4	[ ] [ ]
EA61	PutBehind	C.4	[ ] [ ]
EA62	Quit	M	[ ] [ ]
EA63	ReadPersistent	M	[ ] [ ]
EA64	Run	C.4	[ ] [ ]
EA65	ScaleBitmap	C.7	[ ] [ ]
EA66	ScaleVideo	C.7	[ ] [ ]
EA67	ScrollItems	C.4	[ ] [ ]
EA68	Select	C.4	[ ] [ ]
EA69	SelectItem	C.4	[ ] [ ]
EA70	SendEvent	M	[ ] [ ]
EA71	SendToBack	C.4	[ ] [ ]
EA72	SetBoxSize	C.4	[ ] [ ]
EA73	SetCachePriority	C.8	[ ] [ ]
EA74	SetCounterEndPosition	C.4	[ ] [ ]
EA75	SetCounterPosition	C.4	[ ] [ ]
EA76	SetCounterTrigger	C.4	[ ] [ ]
EA77	SetCursorPosition	C.6	[ ] [ ]
EA78	SetCursorShape	C.6	[ ] [ ]

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EA79	SetData	C.4	[ ] [ ]
EA80	SetEntryPoint	C.4	[ ] [ ]
EA81	SetFillColour	C.4	[ ] [ ]
EA82	SetFirstItem	C.4	[ ] [ ]
EA83	SetFontRef	C.4	[ ] [ ]
EA84	SetHighlightStatus	C.4	[ ] [ ]
EA85	SetInteractionStatus	C.4	[ ] [ ]
EA86	SetLabel	C.4	[ ] [ ]
EA87	SetLineColour	C.4	[ ] [ ]
EA88	SetLineStyle	C.4	[ ] [ ]
EA89	SetLineWidth	C.4	[ ] [ ]
EA90	SetOverwriteMode	C.4	[ ] [ ]
EA91	SetPaletteRef	C.4	[ ] [ ]
EA92	SetPortion	C.4	[ ] [ ]
EA93	SetPosition	C.4	[ ] [ ]
EA94	SetSliderValue	C.4	[ ] [ ]
EA95	SetSpeed	C.4	[ ] [ ]
EA96	SetTimer	C.4	[ ] [ ]
EA97	SetTransparency	C.4	[ ] [ ]
EA98	SetVariable	C.4	[ ] [ ]
EA99	SetVolume	C.4	[ ] [ ]
EA100	Spawn	C.9	[ ] [ ]
EA101	Step	C.4	[ ] [ ]
EA102	Stop	C.4	[ ] [ ]
EA103	StorePersistent	M	[ ] [ ]
EA104	Subtract	C.4	[ ] [ ]
EA105	TestVariable	C.4	[ ] [ ]
EA106	Toggle	C.4	[ ] [ ]
EA107	ToggleItem	C.4	[ ] [ ]
EA108	TransitionTo	M	[ ] [ ]
EA109	Unload	C.4	[ ] [ ]
EA110	UnlockScreen	C.4	[ ] [ ]
RTE main mechanisms			
MM1	Referencing MHEG-5 objects	M	[ ] [ ]
MM2	Attaching to name spaces	O	[ ] [ ]
MM3	RemoteProgram calls	O	[ ] [ ]
MM4	Event handling	M	[ ] [ ]
MM5	Rendering Visibles	M	[ ] [ ]
MM6	Error handling	M	[ ] [ ]
Features			
F1	Ancillary connections (corresponding to OpenConnection and CloseConnection actions)	O	[ ] [ ]
F2	Caching (corresponding to caching of MHEG-5 objects and content data of Ingredient class)	O	[ ] [ ]
F3	Cloning (corresponding to the Clone action defined in Ingredient class)	O	[ ] [ ]
F4	Free moving cursor (corresponding to the CursorEnter and CursorLeave events defined in Interactible class and the CursorShape class))	O	[ ] [ ]
F5	Bitmap and Video scaling (corresponding to the ScaleBitmap and ScaleVideo actions)	O	[ ] [ ]
F6	Stacking of application (corresponding to the Spawn action of Application class)	O	[ ] [ ]
F7	Trick mode (corresponding to the SetSpeed action of Application class)	O	[ ] [ ]

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Attribute permissible values			
ADD Specific	…	I	[ ] [ ]
Content data encoding			
ADD Specific	…	I	[ ] [ ]
User input registers			
ADD Specific	…	I	[ ] [ ]
Feature constraints			
ADD Specific	…	I	[ ] [ ]
Engine events			
ADD Specific	…	I	[ ] [ ]
GetEngineSupport permissible values			
ADD Specific	…	I	[ ] [ ]
Protocol mapping and external interaction			
ADD Specific	…	I	[ ] [ ]
Other characteristics			
ADD Specific	…	I	[ ] [ ]

Sections in the above table with the value “ADD Specific” in the “#” column must be defined by Application Domain implementers. Annex F describes an example of a PICS table.

In addition to defining a PICS table, the Application Domain implementer must customise the MHEG-7 test suite framework by:

— Selecting an appropriate subset of the test case descriptions and corresponding test objects

— Converting or replacing content data related to the test objects

— Adding additional test cases and test objects peculiar to the profile

— Performing macro replacement on the test objects to resolve the profile-specific attributes and generate a set of test objects corresponding to that profile (see subclause 9.3.3.)

No further modification of the MHEG-7 test suite is permitted or required in order to assert MHEG-5 conformance.

9.3 Test notation

This subclause proposes a notation to specify and develop the conformance test cases. The test cases shall be built according to the PICS document. The contents of a test case follow the structure hereafter. This structure can be understood as a proforma for developing the test cases.

9.3.1 Table for the description of test cases

The following table shall be used to describe a test case. It consists of two parts. The first one is the *Identification* section which specified the identifier of the test case, the PICS item(s) under test, the pre-requisite PICS item(s), the purpose of the test, a detailed description, and the number of objects and classes used in the test. The second part of the table is the *Scenario* section. This section defines how the test operator should operate the test and what results he should observe.

Table 3 shows the table format which shall be used to describe the test cases.

--`,,`-`-`,,`,,`,`,,`---
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Table 3 — Table for describing test cases

Identification		
Identifier	<the GroupIdentifier of an ObjectReference to the Application object of the related test object.[1] >	
PICS Item(s) under test	<list of PICS items which are of primary concern of this test case. Numbers in brackets refer to the MHEG-7 list of PICS items. English description>	<list of PICS items which are of primary concern of this test case. Numbers in brackets refer to the MHEG-7 list of PICS items. PICS identifier>
Prerequisite PICS Items	<list of PICS items which must have been successfully tested in order to perform this test case. Numbers in brackets refer to the MHEG-7 list of PICS items. English description>	<list of PICS items which must have been successfully tested in order to perform this test case. Numbers in brackets refer to the MHEG-7 list of PICS items. PICS identifier>
Purpose	<goal of this test case>	
Description	<detailed description of this test>	
Objects	<list of number and type of test objects used in this test case>	
Scenario		
enterTest: **control:** **observe:** **main:** **control:** **observe:** **exitTest:** **control:** **observe:**		
External events	<list of asynchronous MHEG-5 events used in this test case>	
Preconditions	<status of the system under test before performing the test case>	
Postconditions	<status of the system under test after the completion of the test case>	

NOTE This part of ISO/IEC 13522 does not define the actual encoding of the GroupIdentifier of the ObjectReference. The targeted MHEG-5 application domain shall define the form of the GroupIdentifier."

9.3.2 Format of the Scenario section

The Scenario consists of three sections, “enterTest“, “main“, and “exitTest“. Both the “enterTest“ and “leaveTest“ sections are optional and are executed at the beginning or ending of the test case, respectively. The “main“ section is mandatory and describes the actual test case operation.

Each section consists of two parts. The optional “observe“ part describes what the test operator should observe as a result of the actions described in the “control“ part.

The following BNF defines the format of the Scenario sections:

```
scenario    ::=   [enterTest] main [leaveTest]
idformat    ::=   <INTEGER> "." <STRING> [ "." <INTEGER> ]
enterTest   ::=   "enterTest:" step+
main        ::=   "main: " step+
```

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leaveTest	::=	"leaveTest:" step+
step	::=	" ("<INTEGER>")" control_observe
control_observe	::=	control | observe
control	::=	"control:" <STRING> <NL>
observe	::=	"observe:" <STRING> <NL>
<NL>	::=	sequence of one or more LF (0x0A), FF (0x0C), CR (0x0D), which represents a line break
<STRING>	::=	one or more sentences written in the English Language, which may contain line breaks
INTEGER	::=	DECINT | HEXINT | "0"
DECINT	::=	["-"] DIGIT [DIGIT0]*
DIGIT	::=	"1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9"
DIGIT0	::=	DIGIT | "0"

Plain English language will be used in the control and observe parts to describe the observations and to instruct the test operator. However, a designer of a test case should concentrate on very simple sentences, and may be should use pre-defined template sentences or phrases (e.g. “Press ‘Page+’ button“).

In addition, images (screen shots) can be used to ease the description of complicated layouts.

9.3.3 Macro format used in test case

The test cases in the test suites shall use a macro mechanism in order to adapt the test cases to other application domains. This sub-section describes the format of the macros.

The general macro format is described in the following EBNF:

```
macro       ::= "^" macro_name .
macro_name  ::= macro_char+ .
macro_char  ::= <alphanumerical character> .
```

9.3.4 Macro names

The following table lists some few examples of the macros which can be used in test cases.

Table 4 — Some Macro Names for Test Cases

MACRO	Description	Example
^ROOTDIR	Name of the logical root directory of the application	^ROOTDIR/appl/startup = DSM://appl/startup
^GREEN	Representation of the colour “green“	^GREEN = "0F00"
^BLUE	Representation of the colour “blue“	^BLUE = "00F0"
^CANCEL	UserInput event data of the cancel event	^CANCEL = 16
^SELECT	UserInput event data of the OK/Select button	^SELECT = 15
^FONTBOLD14	Representation of the font attribute for bold font with a size of 14 points	^FONTBOLD14 = "bold,14"

9.3.5 Encoding format

The basic encoding format should be the MHEG-5 Textual Notation (TN) as defined in Annex B of ISO/IEC 13522-5:1997 with some extensions which are defined in this document.

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The advantages of using the TN is that test objects it can easily be produced without the help of a complex authoring tool. Using an authoring tool might also cause problems in the production of “false“ applications. Other advantages are that the TN is easy to read, print and understand. The documentation can be derived from comments in the objects themselves.

If necessary the objects can be converted to the ASN.1/DER encoding for use in a real test environment.

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Annex A
(informative)

UK Digital Terrestrial Television application domain profile

A.1 MHEG-5 profile for the UKEngineProfile1 application domain

This Annex specifies the features of ISO/IEC 13522-5:1997 that shall be supported by the UKEngineProfile1 application domain, according to the application domain definition principles set by Annex D of ISO/IEC 13522-5:1997.

The following is extracted from the UK Terrestrial Television MHEG-5 Specification (UKEngineProfile1). ONdigital PLC holds the copyright on the following material on behalf of The Digital Network.

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A.2 Object interchange format

The ASN.1 notation defined in Annex A shall be used as the application interchange format of ISO/IEC 13522-5:1997. The Distinguished Encoding Rules (DER) shall be used to encode the interchanged objects.

A.3 Set of classes

The following set of MHEG-5 classes shall be mandatory:

Action, Application, Audio, Bitmap, BooleanVariable, ContentRefVariable, DynamicLineArt, EntryField, HotSpot, HyperText, IntegerVariable, Link, ListGroup, ObjectRefVariable, OctetStringVariable, PushButton, Rectangle, ResidentProgram, RTGraphics, Scene, Slider, Stream, SwitchButton, Text, TokenGroup, Video.

A.4 Set of features

The set of mandatory and optional features shall be as defined in the following table:

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Table A.1 — Feature requirements

Feature	*Requirement*
Caching	Mandatory
Cloning	Mandatory
Free moving cursor	Disallowed
Scaling (Video and Bitmap)	Mandatory (not PNGs)
Stacking of Applications	Mandatory
Trick modes	Disallowed
Ancillary connections	Disallowed

A.5 Content data encoding

The application domain specifies the content data encoding as defined in Table A.2.

Table A.2 — Content Encoding

Type of content	*Specification (Data Types)*	*Hook values*	*Clause*
Font	(None specified)		
Palette	(None specified)		
Bitmap encoding format	Reserved MPEG-2 Intra frame Reserved PNG Bitmap	1 2 3 4	
Text encoding format	Defined by UK DTT MHEG specification	10	
EntryField encoding format	Defined by UK DTT MHEG specification	10	
HyperText encoding format	Defined by UK DTT MHEG specification	10	
Stream encoding format	An MPEG program with construction and components that conform to the DTG “D Book“	10	
LineArt encoding format	(None specified)		
CursorShape encoding format	(None specified)		
InterchangedProgram encoding format	MHEG-6 (ISO/IEC 13522-6:1998)	1	

A.6 Attribute encoding

The application domain specifies the attribute encoding as defined in Table A.3.

Table A.3 — Attribute Encoding

Attribute	*Specification (Data Types)*
Permissible FontAttributes	Defined by UK DTT MHEG specification
Permissible FontNames	Defined by UK DTT MHEG specification
TransitionEffects	(None specified)
CharacterSet	Defined by UK DTT MHEG specification
AbsoluteColour	Defined by UK DTT MHEG specification

A.7 UserInput registers

The application domain specifies UserInput Registers as defined in Table A.4.

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Table A.4 — InputEventRegisters

Register #	*UserInputEventTag*	*Name*
1	--	Reserved
2	--	Reserved
3	100	Red
	101	Green
	102	Yellow
	103	Blue
	104	Text
	105-128	Reserved for future specification.
	>128	Vendor specific
1	1	Up
	2	Down
	3	Left
	4	Right
	5 - 14	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, respectively
	15	Select
	16	Cancel/Exit
	100	Red
	101	Green
	102	Yellow
	103	Blue
	104	Text
	105-128	Reserved for future specification.
	>128	Vendor specific

A.8 Semantic constraints on the MHEG-5 applications

As implied by the capabilities of the engine in *GetEngineSupport* featuresin Table A.6.

A.9 EngineEvent

Table A.5 defines the EngineEvents that receivers implementing UKEngineProfile1 shall support.

Table A.5 — EngineEvents

Feature		*Constraint*
Name	*Value*	
	<0	Manufacturer Specific.
Reserved	0	Reserved
QuitApp	1	Generated when the MHEG engine is about to kill the application.
GroupIDRefError	2	This event shall be raised if an application attempts to access an application or scene object that cannot be provided by the file system.
ContentRefError	3	This event shall be raised if an application attempts to access referenced content that cannot be provided by the file system.
TextFunction	4	Generated when the user input function “Text“ happens.
Reserved	>4	Reserved

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A.10 GetEngineSupport

Table A.6 defines the *GetEngineSupport* feature strings that receivers implementing UKEngineProfile1 shall support

Table A.6 — Feature Constraints

Feature	*Constraint*
AncillaryConnections	Shall return “false“.
ApplicationStacking	Shall return “true“.
Cloning	Shall return “true“.
FreeMovingCursor	Shall return “false“.
MultipleAudioStreams(N)	Shall return “true“ for N <= 1.
MultipleRTGraphicsStreams(N)	Shall return “true“ for N <= 1.
MultipleVideoStreams(N)	Shall return “true“ for N <= 1.
OverlappingVisibles(N)	Shall return “true“ for all values of N.
Scaling	Shall return “false“.
SceneCoordinateSystem(X,Y)	Shall return “true“ for (X,Y) is (720,576).
SceneAspectRatio(W,H)	Shall return “true“ for (W,H) is (4/3) or (16/9).
TrickModes	Shall return “false“.
VideoScaling(X,Y)	Shall return true for (X,Y) is (720,576).
UKEngineProfile(N)	Shall return “true“ for N=1 to indicate that the engine supports at least the minimum requirements of UKEngineProfile1.

A.11 Protocol mapping and external interaction

Table A.7 defines the mapping to the DAVIC external environment:

Table A.7 — Protocol Mapping

MHEG-5 entity	*Mapping needed*	*Semantics*
OpenConnection, CloseConnection	Mapping to connection management	Not required in UKEngineProfile1.
RemoteProgram objects	Mapping to RemoteProgram call protocol in the application domain (see ISO/IEC 13522-5:1997 subclause 8.4)	
Application name space in case a TransitionTo action uses the ConnectionTag parameter.	Mapping to name space of the application domain	
Persistent storage name space	Mapping to the name space of the persistent storage	Defined by the UK DTT MHEG specification.
Stream actions	Mapping to the stream interface of the application domain	Defined by the UK DTT MHEG specification.
Stream events	Mapping to stream states and stream events in the application domain	

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Annex B
(informative)

ISDB (Integrated Services Digital Broadcasting) application domain profile

B.1 MHEG-5 profile for the ISDB application domain

This Annex specifies the features of ISO/IEC 13522-5:1997 that shall be supported by version 1.0 of the ISDB application domain, according to the application domain definition principles set by Annex D of ISO/IEC 13522-5:1997.

This application domain profile has been proposed for the Association of Radio Industries and Businesses **(ARIB)** technical standard for Integrated Services Digital Broadcasting (ISDB) in Japan. The ISDB application domain defines two profile levels:

— Base Level this covers a service category where the basic services are the main services. Limited MHEG-5 classes are supported at this level.

— High Level this covers a service category where extended services, such as interactive services with two-way transmission are included. Almost all MHEG-5 classes are supported at this level.

Example applications include multimedia electronic program guide, electronic newspaper, multimedia information related to TV programs, closed captioning and near video on demand using home server.

B.2 Object Interchange Format

The **ASN.1 DER** notation defined in Annex A of ISO/IEC 13522-5:1997 shall be used as the application interchange format.

B.3 Set of classes

The following set of MHEG-5 concrete classes shall be mandatory:

Base Level

Action, Application, Audio, Bitmap, BooleanVariable, ContentRefVariable, EntryField, HotSpot, IntegerVariable, Link, LineArt, ListGroup, ObjectRefVariable, OctetStringVariable, Palette, Rectangle, ResidentProgram, RTGraphics, Scene, Stream, Text, TokenGroup, Video.

High Level

All Base Level concrete classes plus -

CursorShape, HyperText, Interchanged Program, PushButton, Slider, SwitchButton

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B.4 Set of features

The set of mandatory and optional features shall be as defined in the following table:

Table B.1 — Feature Requirements

Feature	*Base level Requirement*	*High Level Requirement*
Caching	Option	Mandatory
Cloning	Mandatory	Mandatory
Free moving cursor	Disallowed	Option
Scaling (Video and Bitmap)	Mandatory (not Bitmap)	Mandatory (not Bitmap)
Stacking of Applications	Mandatory	Mandatory
Trick modes	Disallowed	Disallowed
Ancillary connections	Option	Mandatory

B.5 Content data encoding

B.5.1 Content encoding

ISDB specifies the content data encoding as defined in the following table.

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Table B.2 — Content Encoding

Type of content	*Base Level Specification (Data Types)*	*High Level Specification (Data Types)*	*Hook values*
Font encoding format	N/A	N/A	
Palette encoding format	Defined by ARIB-MHEG specification	Defined by ARIB-MHEG specification	101
Bitmap encoding format	PNG JPEG (baseline) MNG [1)] MPEG2 intra frame[2)] (I frame carousel)	PNG JPEG (baseline) MNG [1)] MPEG2 intra frame[2)] (I frame carousel) MPEG2 intra frame [2)] (data carousel)	4 101 102 201 202
Text encoding format	8-bit code[3)] (plain text) 8-bit code(Base level)	8-bit code[3)] (plain text) 8-bit code(Base level) 8-bit code(High level)	101 102 103
EntryField encoding format	Plain	Plain	101
HyperText encoding format	N/A	HTML 3.2 subset	1
Stream encoding format	AIFF-C MPEG 2 TS MPEG 2 Video MPEG 1 Audio ISDB subtitling rtgraphics [4)] MPEG1 MPEG 2 I frame rtgraphics (I frame carousel) PNG rtgraphics JPEG rtgraphics Plain text rtgraphics MPEG TS on storage device MPEG 2 Video MPEG 1 Audio ISDB subtitling rtgraphics [4)]	AIFF-C MPEG 2 TS MPEG 2 Video MPEG 1 Audio ISDB subtitling rtgraphics [4)] MPEG 2 TS MPEG 4 Video AAC Audio MPEG1 MPEG 2 I frame rtgraphics (I frame carousel) MPEG 2 I frame rtgraphics (data carousel) PNG rtgraphics JPEG rtgraphics Plain text rtgraphics MPEG TS on storage device MPEG 2 Video MPEG 1 Audio ISDB subtitling rtgraphics [4)]	3 8 10 101 201 202 203 204 205 206
LineArt encoding format	 PDI[6)]	SLAM [5)] PDI [6)]	101 102
CursorShape encoding format	N/A	(none specified)	
InterchangedProgram encoding format	N/A	MHEG-6 (ISO/IEC 13522-6:1998)	1

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NOTE 1: Multiple-image Network Graphics (MNG) can contain animations (slide shows) comprising PNG single-image datastreams.
NOTE 2: MPEG2 intra frame has two Chook values for distinguish two transmission methods, I frame carousel and data carousel. These transmission methods are defined in ARIB-MHEG specification.
NOTE 3: For character coding, an 8-bit code based on the code extension technique of ISO/IEC 2022:1994 is used.
NOTE 4: Subtitle coding scheme for Integrated Services Digital Broadcasting (ISDB).
NOTE 5: Simple LineArt coding for MHEG
NOTE 6: Picture Description Instruction (PDI) is a geometric graphics coding used in teletext system C and system D which are recommended by International Telecommunication Union–Radio Communication Sector (ITU-R).

B.5.2 Attribute encoding

ISDB specifies the attribute encoding as defined in the following table:

Table B.3 — Attribute Encoding

Attribute	*Base Level Specification*	*High Level Specification (Data Types)*	*Hook*
Permissible FontAttributes	Defined by ARIB-MHEG specification	Defined by ARIB-MHEG specification	
Permissible FontNames	Defined by ARIB-MHEG specification	Defined by ARIB-MHEG specification	
TransitionEffects	Defined by ARIB-MHEG specification	Defined by ARIB-MHEG specification	
CharacterSet	Japanese Teletext [1)]	Japanese Teletext [1)] UCS	104 2
AbsoluteColour	Defined by ARIB-MHEG specification	Defined by ARIB-MHEG specification	
NOTE1: For character sets, any single and multi-byte set can be used simultaneously, as far as they are based on the ISO code system. Should a character not be included in the character generator and not able to be transmitted in code transmission, a dynamically redefinable charcter sets (DRCS) scheme can be applied.			

B.6 UserInput registers

ISDB specifies the following InputEventRegisters defined in the following table:

Table B.4 — InputEventRegisters

Register #	*UserInputEventTag*	*Name*
1	1	Up
	2	Down
	3	Left
	4	Right
	5 – 14	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, respectively
	15	Select
	16	Exit
	17	Help
	18-149	Reserved for future specification.
	>149	Vendor specific
2	1	Up
	2	Down
	3	Left
	4	Right
	15	Select
	16	Exit
	17	Help
	18-149	Reserved for future specification.
	>149	Vendor specific

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B.7 Semantic constraints on the MHEG-5 applications

The GetEngineSupport action in subclause 10.4 of ISO/IEC 13522-5:1997 provides a list of features that may be supported to some extent. ISDB defines constraints for these features in the following table:

Table B.5 — Feature Constraints

Feature	*Constraint*
SceneCoordinateSystem(X,Y)	1920x1080, 960x540, 720x480
SceneAspectRatio(W,H)	16:9, 4:3 (only 720x480)
MultipleRTGraphicsStreams(N)	Not specified
MultipleAudioStreams(N)	Not specified
MultipleVideoStreams(N)	Not specified
OverlappingVisibles(N)	Mandatory
Cloning	Mandatory

B.8 EngineEvent

Table B.6 defines the EngineEvents that receivers implementing ISDB Profile shall support

Table B.6 — Engine Events

Feature		*Constraint*
Name	*Value*	
forceAbort	0x00000100	This event shall be raised when the external force abort is given to engine.
eventWillFinish	0x00000101	This event shall be raised if the related TV program will be finished within several seconds.
eventFinished	0x00000102	This event shall be raised if the related TV program is finished.
newSceneDetected	0x00000103	Generated when a new version of current scene is detected in receiving data carousel.
isLinkedToScene	0x00000104	Generated when the hyperlink descriptor is detected in Service Information (SI).
transmissionFinished	0x00000105	Generated when the bi-directional transmission is finished.
Reserved	0x00000106- 0x0000FFFF	Reserved
UserEventMessage	0x1111[IIII] IIII: eventID	Generated when a general event message is received. The general event message is specified by ARIB-MHEG speification
ModuleUpdate	0x0002[MMMM] MMMM: moduleID	Generated when a new version of module is received.
Reserved	0x00030000-	Reserved

B.9 GetEngineSupport

The following table identifies the *GetEngineSupport* feature strings that receivers implementing ISDB Profile shall support

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Table B.7 — Feature Constraints

Feature	*Constraint*
WWWBrowserCapable	Shall return “true” if WWW Browser is installed in the receiver.
EPGControlable	Shall return “true” if EPG function is available.
GroupReserveCapable	Shall return “true” if program group reservation function using group index is available. Program group index is defined in ARIB-MHEG specification.
IndexPlayCapable	Shall return “true” if the index play function is installed in the receiver.

B.10 Protocol napping and external interaction

The following table defines the mapping to the ISDB external environment:

Table B.8 — Protocol Mapping

MHEG-5 entity	*Mapping needed*	*Semantics*
OpenConnection, CloseConnection	Mapping to connection management	Not required
RemoteProgram objects	Mapping to RemoteProgram call protocol in the application domain (see ISO/IEC 13522-5:1997 subclause 8.4)	Not required.
Application name space	Mapping to name space of the application domain.	Defined by ARIB-MHEG specification.
Persistent storage name space	Mapping to the name space of the persistent storage	Defined by ARIB-MHEG specification.
Stream actions	Mapping to the stream interface of the application domain.	Defined by ARIB-MHEG specification.
Stream events	Mapping to stream states and stream events in the application domain.	Defined by ARIB-MHEG specification.

B.11 Resident programs

The following sets of MHEG-5 resident programs are defined for the ISDB.

B.11.1 Date and time functions

GetCurrentDate()

FormatDate()

GetDayOfWeek()

ConvYMDtoMJD()

ConvMJDtoYMD()

ConvHMStoSEC()

ConvSECtoHMS()

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B.11.2 Random number function

Random()

B.11.3 String manipulation functions

GetJStringLength()

GetJSubString()

CompareJString()

SearchJSubString()

SearchAndExtractJSubstr()

LoadDRCS()

B.11.4 Table manipulation functions

MakeTable()

GetItemFromTable()

GetItemFromTableFile()

CompareStringInTableStrAndMakeSubTable()

CompareStringInTableFileAndMakeSubTable()

CompareIntegerInTableStrAndMakeSubTable()

CompareIntegerInTableFileAndMakeSubTable()

SortTableStrAsInteger()

SortTableFileAsInteger()

GetSizeOfTableStr()

GetSizeOfTableFile()

B.11.5 EPG related functions

EPG_GetEventTime()

EPG_Tune()

EPG_IsReserved()

EPG_Reserve()

EPG_CancelReservation()

EPG_RecIsReserved()

EPG_RecReserve()

EPG_RecCancelReservation()

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B.11.6 Group program reservation functions

GRP_IsReserved()

GRP_Reserve()

GRP_CancelReservation()

GRP_RecIsReserved()

GRP_RecReserve()

GRP_RecCancelReservation()

GRP_GetNodeEventList()

GRP_GetERTNodeInfo()

EPGX_Tune()

B.11.7 Program Index functions

SetCounterToLocalEvent()

SetCounterToNodePlayMode()

B.11.8 Persistent memory functions

GetPersistentInfo()

DeletePersistent()

B.11.9 WWW related functions

WWWTransitionTo()

B.11.10 Other MHEG related functions

ReloadActiveScene()

SubscribeEventMessage()

UnsubscribeEventMessage()

GetEventDataBytes()

GetNPT()

SubscribeModuleUpdate()

UnsubscribeModuleUpdate()

SubscribeActiveSceneUpdate()

testLinkedToScene()

LinkedScene()

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IsBeingBroadcast()

CastToContentRef()

CastToObjectRef()

BitCalc()

Calc()

B.11.11 Two way transmission related functions(base level)

Connect()

Disconnect()

Send()

BSend()

Receive()

BReceive()

B.11.12 Two way transmission related functions(high level)

RegisterRawTransmission()

ExecuteRawTransmission()

ContinueRawTransmission()

RegisterPPPTransmission()

ExecutePPPTransmission()

ContinuePPPTransmission()

CancelTransmission()

GetFinishedTransmissionID()

GetTransmissionResult()

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Annex C
(informative)

JISC (Japanese Industrial Standards Committee) Application Domain Profile

C.1 MHEG-5 profile for the JISC application domain

This Annex specifies the features of ISO/IEC 13522-5:1997 that shall be supported by the JISC application domain, according to the application domain definition principles set by Annex D of ISO/IEC 13522-5:1997.

This application domain definition has been adopted as Technical Report **TR X 0009 (1998)** of JISC (Japanese Industrial Standards Committee) and will be referred to as the JISC application domain throughout this Annex. Two functional levels are defined so that a user of the standard can select one of them depending on the intended application domain requirements.

— *Base Level* this covers a service category where basic services are the main services. Limited MHEG-5 classes are supported at this level.

— *High Level* this covers a service category where extended services, such as interactive services with two-way transmission are included. Almost all MHEG-5 classes are supported at this level.

The JISC application domain intends to cover on-demand services, near on-demand services including broadcast services and also package services. Example applications include advertising and sales promotion, electronic publishing, information kiosk, interactive TV, karaoke, education and training, presentation, office information and technical documents, simulation and games.

C.2 Object interchange format

The **ASN.1 DER** notation defined in Annex A of ISO/IEC 13522-5:1997 shall be used as the application interchange format.

C.3 Set of classes

The following set of MHEG-5 concrete classes shall be mandatory:

— Base Level:

Action, Application, Audio, Bitmap, BooleanVariable, ContentRefVariable, EntryField, HotSpot, IntegerVariable, Link, ObjectRefVariable, OctetStringVariable, Rectangle, ResidentProgram, Scene, Slider, Stream, Text, TokenGroup, Video.

— High Level: All Base Level concrete classes plus

Font, HyperText, Interchanged Program, LineArt, ListGroup, Palette, Remote Program, PushButton, SwitchButton.

C.4 Set of features

The set of mandatory and optional features shall be as defined in the following table:

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Table C.1 — Feature requirements

Optional Features	*Base level*	*High level*
Ancillary connections	N	Y
Caching	Y	Y
Cloning	Y	Y
Free-moving Cursor	N	Y
Bitmap Scaling	N	Y
Video Scaling	N	Y
Stacking of Applications	N	Y
Trick Mode	N	Y

C.5 Content data encoding

C.5.1 Content encoding

JISC specifies the content encoding as defined in the following table:

Table C.2 — Content Encoding

Type of content	*Base Level Specification*	*High Level Specification (Data Types)*	*Hook values*
Font encoding format	N/A	DAVIC 1.3	1
Palette encoding format	N/A	ID,R,G,B	101
Bitmap encoding format	PNG	PNG JPEG (Baseline)	4 101
Text encoding format	Plain	Plain HTML 3.2 subset	101 1
EntryField encoding format	Plain	Plain	101
HyperText encoding format	N/A	HTML 3.2 subset	1
Stream encoding format	AIFF-C[1)] MPEG1 system MPEG1 video MPEG1 audio	AIFF-C[1)] MPEG1 system MPEG1 video MPEG1 audio MPEG2 TS MPEG2 video MPEG1 audio	3 101 1
LineArt encoding format	N/A	SLAM [2)]	101
CursorShape encoding format	N/A	N/A	
InterchangedProgram encoding format	N/A	MHEG-6 (ISO/IEC 13522-6:1998)	1
NOTE 1: Uncompressed mode only.			
NOTE 2: Simple LineArt coding for MHEG.			

C.5.2 Attribute representation

JISC specifies the attribute encoding as defined in the following table.

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Table C.3 — Attribute Encoding

Attribute	*Base Level Specification*	*High Level Specification (Data Types)*	*Hook*
Permissible FontAttributes	large | normal | small	<style>.<size> <style> ::= plain | bold | italic | bold-italic | emphasis | strong <size> ::= Integer	
Permissible FontNames	N/A	Mincho | Gothic | Helvetica | TimesRoman	
TransitionEffects	N/A	DAVIC 1.3 [1)]	
CharacterSet	Shift JIS [2)]	Latin-1 UCS JIS Shift JIS Japanese EUC Japanese Teletext	1 2 101 102 103 104
AbsoluteColour[3]	Character (X11 rgb.txt style) Hex (ex. rgb:a0/c0/ff) Decimal (ex. 175,238,238)	RGB α16 (in addition to base level representation)	
NOTE 1: No. 3, 4, 5, 6, 9, 11 only.Parameters 2 to 5 shall be ignored. NOTE 2: Permitted control codes shall be SPACE (20h) and a set of CR (0Dh) + LF (0Ah). Other control codes shall be ignored. NOTE 3: An AbsoluteColour value in binary form and a TransitionEffect parameter value shall be MSB first.			

C.6 InputEventRegister

This profile assigns the InputEventRegister as defined in the following table:

Table C.4 — InputEventRegister

Register #	*UserInputEventTag*	*Name*
1	1	Up
	2	Down
	3	Left
	4	Right
	5 - 14	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, respectively
	15	Select
	16	Exit
	17	Help
	18-99	Reserved for future specification.
	>99	Private
2	1	Up
	2	Down
	3	Left
	4	Right
	15	Select
	16	Exit
	17	Help
	18-99	Reserved for future specification.
	>99	Private

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C.7 Semantic constraints on the MHEG-5 applications

C.7.1 Constraints on GetEngineSupport

The GetEngineSupport action in subclause 10.4 of ISO/IEC 13522-5:1997 provides a list of features that may be supported to some extent. JISC defines constraints for these features in the following table:

Table C.5 — Feature Constraints

Feature	*Constraint (Basic Level)*	*Constraint (High Level)*
SceneCoordinateSystem(X,Y)	No constraints	No constraints
SceneAspectRatio(W,H)	No constraints	No constraints
MultipleRTGraphicsStreams(N)	N/A	N/A
MultipleAudioStreams(N)	Y	Y
MultipleVideoStreams(N)	N/A	Y
OverlappingVisibles(N)	Y	Y
ApplicationStacking	N/A	Y
FreeMovingCursor	N/A	Y
Scaling	N/A	Y
AncillaryConnections	N/A	Y
TrickModes	N/A	Y
Cloning	Y	Y

C.8 EngineEvent

This profile reserves no particular values of EngineEvent.

C.9 GetEngineSupport

User defined string shall not be used in the GetEngineSupport elementary action in this profile.

C.10 Protocol mapping and external interaction

The following table defines the mapping to the external environment:

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Table C.6 — Protocol Mapping

MHEG-5 entity	*Base level*	*High level*
OpenConnection/ CloseConnection	N/A	OnDemand system Protocol ::= PSTN | ISDN Address ::= E.164 NSAP Near OnDemand system Protocol ::= BC Address ::= DVB NSAP Package system N/A
RemoteProgram object	N/A	Name, Parameters, ProgramConnenctionTag
Name space	DAVIC 1.3 [1)]	DAVIC 1.3 [1)]
Persistent storage name space	N/A	File names shall be any string less than or equal to 64 single byte characters long.
Stream actions	Speed: (0,1)(1,1) CounterPosition: (ms)	Speed: (-1,1)(0,1)(1,1) CounterPosition: (ms)
Stream event	StreamPlaying/StreamStopped	StreamPlaying/StreamStopped CounterPosition StreamEvent
NOTE 1: The data source component in an object reference shall not be omitted, unless the shorthand notation is used.		

C.11 ResidentPrograms

ResidentPrograms shall be supported as defined in **DAVIC 1.3** in this profile. Output parameters shall be in the form of object reference.

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Annex D
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DAVIC Application Domain Profile

D.1 Introduction

This subclause specifies the features of ISO/IEC 13552-5:1997 that shall be supported by the DAVIC application domain, according to the application domain definition principles set by Annex D of ISO/IEC 13552-5.:1997 This specification is taken from the DAVIC 1.3 Specifications, "Part 13: Conformance and Interoperability", Revision 6.0, Technical Report, 1997.

D.2 Object interchange format

The ASN.1 notation defined in Annex A of ISO/IEC 13522-5:1997 shall be used as the application interchange format of ISO/IEC 13522-5:1997, as well as the Distinguished Encoding Rules (DER) for the encoding of the interchanged objects.

D.3 Set of classes

The following set of MHEG-5 classes shall be mandatory:

Action, Application, Audio, Bitmap, BooleanVariable, ContentRefVariable, DynamicLineArt, EntryField,

HotSpot, HyperText, IntegerVariable, InterchangedProgram, Link, ListGroup, ObjectRefVariable,

OctetStringVariable, Palette, PushButton, Rectangle, RemoteProgram, ResidentProgram, RTGraphics, Scene,

Slider, Stream, SwitchButton, Text, TokenGroup, Video.

D.4 Set of features

The set of mandatory and optional features shall be as defined in Table D.1.

Table D.1 — Feature requirements

Feature	*Requirement*
Caching	Optional
Cloning	Mandatory
Free moving cursor	Optional
Scaling (Video and Bitmap)	Optional
Stacking of Applications	Optional
Trick modes	Optional
Ancillary connections	Optional

D.5 Content data encoding

DAVIC specifies the content data encoding as defined in Table D.2.

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Table D.2 — Content Encoding

Type of content	*Specification (Data Types)*	*Hook values*	*Clause*
Font encoding format	DAVIC 1.3 defined Outline Font Format	1	6.3
Palette encoding format	CLUT Definition Segment (ETS 300 743) 1)	1	6.12.2.2
Bitmap encoding format	reserved MPEG-2 Intra frame Region Definition Segment (ETS 300 743) PNG bitmap	1 2 3 4	 6.11 6.12.2.2 6.14
Text encoding format	Subset of HTML 3.2	1	6.2
EntryField encoding format	Characters encoded according to ISO/IEC 10646-1:1993 (Unicode) or according to ISO/IEC 8859-1:1998, depending on the value of the CharacterSet Attribute of the Entryfield	1	6.1
HyperText encoding format	Subset of HTML 3.2	1	6.2
Stream encoding format	video: MPEG-1 Video (ISO/IEC 11172-2:1993) MPEG-2 Video (ISO/IEC 13818-2:2000) audio: MPEG-1 Audio (ISO/IEC 11172-3:1993) rtgraphics: DVB Subtitling (ETS 300 743)	1 2)	6.10 6.10 6.7.1 6.12.2.1
	video: MPEG-2 Still (ISO/IEC 13818-2:2000) audio: MPEG-1 Audio (ISO/IEC 11172-3:1993) rtgraphics: DVB Subtitling (ETS 300 743)	2 2)	6.10 6.7.1 6.12.2.1
	video: - audio: DAVIC Linear Audio (AIFF-C) rtgraphics: -	3 3)	 6.9
	video: MPEG-1 Video (ISO/IEC 11172-2:1993) MPEG-2 Video (ISO/IEC 13818-2:2000) audio: AC-3 Audio (ATSC A52) rtgraphics: DVB Subtitling (ETS 300 743)	4 2)	6.10 6.10 6.7.2 6.12.2.1
	video: MPEG-2 Still (ISO/IEC 13818-2) audio: AC-3 Audio (ATSC A52) rtgraphics: DVB Subtitling (ETS 300 743)	5 2)	6.10 6.7.2 6.12.2.1
	video: MPEG-1 Video (ISO/IEC 11172-2:1993) MPEG-2 Video (ISO/IEC 13818-2:2000) scaleable audio: MPEG-2 Audio (ISO/IEC 13818-3:1998, layer II) rtgraphics: DVB Subtitling (ETS 300 743)	6 2)	6.10 6.10 6.8 6.12.2.1

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	video: MPEG-2 Still (ISO/IEC 13818-2:2000) scaleable audio: MPEG-2 Audio (ISO/IEC 13818-3:1998, layer II) rtgraphics: DVB Subtitling (ETS 300 743)	7 [2)]	6.10 6.8 6.12.2.1
LineArt encoding format	(None specified)		
CursorShape encoding format	(None specified)		
InterchangedProgram encoding format	MHEG-6 (ISO/IEC 13522-6:1998)	1	9.1
NOTE 1 : Only for use by bitmaps coded in the Region Definition Segment format NOTE 2 : For Stream objects with ContentHook 1, 2, 4, 5, 6 and 7, the value of the attribute Storage shall be "stream" or "memory". NOTE 3 : For Stream objects with the ContentHook 3, the value of the attribute Storage shall be"memory".			

D.5.1 Attribute encoding

DAVIC specifies the attribute encoding as defined in Table D.3.

Table D.3 — Attribute Encoding

Attribute	*Specification (Data Types)*
Permissible FontAttributes	"<style>.<size>" with <style> being "plain", "bold", "italic", "bold-italic", "emphasis" or "strong", and <size> being an integer. e.g. "bold-italic.20"
Permissible FontNames	"fixed" specifying a font with a fixed spacing "proportional" specifying a font with proportional spacing
TransitionEffects	See subclause 9.2.11
CharacterSet	1: ISO/IEC 8859-1:1998 (Latin) 2: ISO/IEC 10646-1:1993 (Unicode)
AbsoluteColour	RGBα16, that is coding of graphics in 16 bits per pixel, allocating 4 bits to the Red, Green and Blue components, as well as 4 bits for the translucency component. The first three nibbles are unsigned integers, providing the value of the red, green and blue components of the pixel respectively. The value 0 indicates minimum value, while the value 15 indicates maximum value. The last nibble specifies the transparency level of the pixel. The value zero indicates an opaque pixel, while the value 15 indicates full transparency. The value shall be coded as the big-endian octet string representation of the integer value.

D.6 UserInput registers

DAVIC specifies the following InputEventRegisters defined in Table D.4.

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Table D.4 — InputEventRegisters

Register #	*UserInputEventTag*	*Name*
1	1	Up
	2	Down
	3	Left
	4	Right
	5 - 14	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, respectively
	15	Select
	16	Exit
	17	Help
	18-99	Reserved for future specification.
	>99	Vendor specific
2	1	Up
	2	Down
	3	Left
	4	Right
	5-14	Forbidden
	15	Select
	16	Exit
	17	Help
	18-99	Reserved for future specification.
	>99	Vendor specific

D.7 Constraints on the use of variables

The use of IntegerVariables shall be restricted as defined in Table D.5.

Table D.5 — Constraints to IntegerVariables

type of value	*default value*	*Size*	*min value*	*max. value*
signed integer	0	32 bits	-214783648	214783647

D.8 Semantic constraints on the MHEG-5 applications

Table D.6 provides a list of constraints that each MHEG-5 application shall apply to features of ISO/IEC 13522-5. STUs may support the features to a higher or lesser degree.

Table D.6 — Feature Constraints

Feature	*Constraint*
SceneCoordinateSystem(X,Y)	The following coordinate systems are supported:. 720x576, 720x480, 640x480 and 1080x1920.
SceneAspectRatio(W,H)	The following aspect ratios are supported: 1/1, 4/3 and 16/9.
MultipleRTGraphicsStreams(N)	One active RTGraphic stream at a time.
MultipleAudioStreams(N)	One active MPEG-1 audio stream at a time and one active AIFF-C audio stream at a time.
MultipleVideoStreams(N)	One active video stream at a time.
OverlappingVisibles(N)	No constraint.
Cloning	Mandatory

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D.9 EngineEvent

The DAVIC application domain reserves no particular value of EngineEvent. This is left to the application developer.

D.10 GetEngineSupport

DAVIC specifies no other strings for the GetEngineSupport action than the ones listed in ISO/IEC 13522-5.

D.11 TransitionEffect parameter of the TransitionTo elementary action

To support transition effects between Still Picture Compositions in DAVIC 1.3, the TransitionEffect parameter of the TransitionTo elementary action can be used, as specified in this Clause.

The TransmissionEffect parameter consists of 32 bits. The structure of the parameter is as follows :

Transition Effect Parameter: [parameter_1] [parameter_2] [parameter_3] [parameter_4] [parameter_5]

[parameter_1] : Parameter_1 is 7 bits field which defines transition effect type

[parameter_2] : Parameter_2 is 3 bits field which defines number of splits

[parameter_3] : Parameter_3 is 6 bits field which defines duration of effect time

[parameter_4] : Parameter_4 is 8 bits field which defines horizontal position of effect start

[parameter_5] : Parameter_5 is 8 bits field which defines vertical position of effect start

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Table D.7 — TransitionEffect parameter of "TransitionTo" action

No.	*Transition Effect type*	*Abbreviation*	*Parameter_1*	*Parameter_2*	*Parameter_3*	*Parameter_4*	*Parameter_5*
0	Reserved		00				
1	Simple cut	CUT	01				
2	Dissolve	DIS	02		T		
3	Vertical wipe (top to bottom)	WVD	03		T		
4	Vertical wipe (bottom to top)	WVU	04		T		
5	Horizontal wipe (left to right)	WHR	05		T		
6	Horizontal wipe (right to left)	WHL	06		T		
7	Wipe that vertically opens from the center	WVO	07		T		Y
8	Wipe that vertically closes from both top and bottom	WVC	08		T		Y
9	Wipe that horizontally opens from the center	WHO	09		T	X	
10	Wipe that horizontally closes from both left and right	WHC	0A		T	X	
11	Square wipe (open)	WRO	0B		T	X	Y
12	Square wipe (close)	WRC	0C		T	X	Y
13	Vertical split wipe (top to bottom)	WDD	0D	N	T		
14	Vertical split wipe (bottom to top)	WDU	0E	N	T		
15	Horizontal split wipe (left to right)	WDR	0F	N	T		
16	Horizontal split wipe (right to left)	WDL	10	N	T		
17	Vertical slide-out (top to bottom)	SOD	11		T		
18	Vertical slide-out (bottom to top)	SOU	12		T		
19	Horizontal slide-out (left to right)	SOR	13		T		
20	Horizontal slide-out (right to left)	SOL	14		T		
21	Vertical slide-in (top to bottom)	SID	15		T		
22	Vertical slide-in (bottom to top)	SIU	16		T		
23	Horizontal slide-in (left to right)	SIR	17		T		
24	Horizontal slide-in (right to left)	SIL	18		T		
25	Vertical roll (top to bottom)	RVD	19		T		
26	Vertical roll (bottom to top)	RVU	1A		T		
27	Horizontal roll (left to right)	RHR	1B		T		
28	Horizontal roll (right to left)	RHL	1C		T		
29	Reserved		1D				
30	Reserved		1E				
31	Reserved		1F				
32	Reserved		20				
33	Reserved		21				
34	Reserved		22				
35	Reserved		23				
36	Half vertical roll (top to bottom)	RPD	24		T		Y
37	Half vertical roll (bottom to top)	RPU	25		T		Y
38	Half horizontal roll (left to right)	RPR	26		T	X	
39	Half horizontal roll(right to left)	RPL	27		T	X	
40	Reserved		28-7F				

The symbols used in Table D.7 indicate the following:

N: Number of splits as defined in Table D.8. For the coordinate systems supported by DAVIC the start positions of the split-effects are defined in Table D.9.

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Table D.8 — Number of splits

Parameter Value	*Number of splits*
0x0	0
0x1	2
0x2	3
0x3	4
0x4	5
0x5	8
0x6	10
0x7	Reserved

Table D.9 — Start positions of split-effects with n splits per Coordinate System

Transition Effect number	*Transition Effect type with Split Effect*	*Start position in Coordinate System (x * y)* *Supported coordinate systems by DAVIC : (720 * 576), (720 * 480), (640 * 480), and (1920 * 1080). NOTE : the most left pixel and the top line have index value zero.*
13	Vertical split wipe (top to bottom)	lines (y*(n-k)/n), where k=n, n-1, ..., 1 and with truncation to zero after division.
14	Vertical split wipe (bottom to top)	lines ((y-1) - (y*(n-k)/n)), where k=n, n-1, ..., 1 and with truncation to zero after division.
15	Horizontal split wipe (right to left)	pixels (x*(n-k)/n), where k=n, n-1, ..., 1 and with truncation to zero after division.
16	Horizontal split wipe (left to right)	pixels ((x-1) - (x*(n-k)/n)), where k=n, n-1, ..., 1 and with truncation to zero after division.

T: An unsigned integer, specifying the duration time of the effect, with an inclusive range of 0 – 63 indicating the duration time of the transition effect in units of 0.5 seconds.

X: An unsigned 8 bit integer, specifying the horizontal start position of the effect. The horizontal start position indicates the horizontal index of the pixel of the coordinate system where the effect starts. The most left pixel of the coordinate system has index zero. For the four coordinate systems supported by DAVIC, 720 x 576, 720 x 480, 640 x 480 and 1920 x 1080 (see Table D.6) the horizontal index of the pixel where the effect starts is defined by the formula in Table D.10. If an index value larger than the index of the most right pixel of the coordinate system is indicated, then the effect is indicated to start at the most right pixel. Table D.10 also specifies the range permitted for X.

Table D.10 — Coding of horizontal index of pixel where the effect starts

Horizontal resolution of Coordinate System	*Horizontal index of pixel where effect starts*	*Permitted range of X (inclusive)*
640	4*X	0 - 160
720	4*X	0 - 180
1920	8*X	0 - 240

Y: An unsigned 8 bit integer, specifying the vertical start position of the effect. The vertical start position indicates the vertical index of the line of the coordinate system where the effect starts. The top line of the coordinate system has index zero. For the four coordinate systems supported by DAVIC, 720 x 576, 720 x 480, 640 x 480 and 1920 x 1080 (see Table D.6) the vertical index of the line where the effect starts is defined by the formula in Table D.11. The formula is defined such that the effect can be defined to start in the exact center position of the coordinate

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system. If an index value larger than the index of the bottom line of the coordinate system is indicated, then the effect is indicated to start at the bottom line. Table D.11 also specifies the range permitted for Y.

Table D.11 — Coding of vertical index of line where the effect starts

Vertical resolution of Coordinate System	*Vertical index of line where effect starts*	*Permitted range of Y (inclusive)*
480	2*Y	0 - 240
576	4*Y	0 - 144
1080	8*Y + 4	0 - 134

D.12 MHEG-5 resident programs

In order to improve the functionality of MHEG-5 applications, DAVIC has defined a set of MHEG-5 resident programs. These MHEG-5 resident programs offer the following facilities in a platform independent fashion:

— The ability to retrieve and manipulate date information

— The ability to request a random number

— The ability to manipulate strings

— The ability to convert an OctetString to a ContentReference or an object reference.

Table D.12 — MHEG-5 resident programs

MHEG-5 Run-Time Engine	Date and Time functions
	Random Number function
	String Manipulation functions
	Miscellaneous functions

D.12.1 Date and time functions

GetCurrentDate() - Retrieves the current date and time

Synopsis:

GetCurrentDate(date, time)

Arguments:

output	IntegerVariable	date
output	IntegerVariable	time

Description:

Retrieves the current date and time. The argument date is the Modified Julian date which is encoded as the number of days since Midnight on November 17, 1858 and the argument time is the current time encoded as the number of seconds since midnight. The date and time values represent **Local Time**.

FormatDate() - Format a string representing a date according to a specifiable format

Synopsis:

FormatDate(dateFormat, date, dateTime, datestring)

Arguments:

input	GenericOctetString	dateFormat

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input	GenericInteger	date
input	Genericinteger	dateTime
output	OctetStringVariable	dateString

Description:

Returns a string in the argument string dateString formatted according to the string argument dateFormat. The function also takes the argument date as a date encoded as the Modified Julian date (number of days since Midnight on November 17 1858) and the argument dateTime as the number of seconds since midnight. The argument string dateString is the same as the dateFormat string except for the field codes (defined below) which start with a '%' character. Where encountered in the dateFormat string, the field codes must be replaced by the indicated part of the date. The following field codes have been defined:

'%Y' Year, 4 digits

'%y' Year, last 2 digits

'%X' Month, with padding zero (01-12)

'%x' Month, without padding zero (1-12)

'%D' Day, with padding zero (01-31)

'%d' Day, without padding zero (1-31)

'%H' Hour, with padding zero (00-23)

'%h' Hour, without padding zero (0-23)

'%I' Hour, with padding zero (01-12)

'%i' Hour, without padding zero (1-12)

'%M' Minutes, with padding zero (00-59)

'%m' Minutes, without padding zero (0-59)

'%S' Seconds, with padding zero (00-59)

'%s' Seconds, without padding zero (0-59)

'%A' AM/PM indication

'%a' am/pm indication

'%%' single"%" character

The following is an example of the use of this function at June 4, 1995, at 16:56, when the input argument dateFormat "%Y-%x-%d %I:%M %a" results an output argument dateString of "1995-6-4 4:56 pm".

GetDayOfWeek() - Returns the day of the week

Synopsis:

GetDayOfWeek(date, dayOfWeek)

Arguments:

input	Genericinteger	date
output	IntegerVariable	dayOfWeek

Description:

Returns the day of the week. From the input argument date in the Modified Julian form, the argument dayOfWeek returns an integer starting from 0 representing Sunday, 1 Monday, 2 Tuesday … until 6 representing Saturday.

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D.12.2 Random number function

Random() - Returns a random number

Synopsis:

Random(num, random)

Arguments:

input	GenericInteger	num
output	IntegerVariable	random

Description:

Returns a random integer number between 1 and num (inclusive).

D.12.3 String manipulation functions

GetStringLength() - Returns the number of octets within the string

Synopsis:

GetStringLength(string, length)

Arguments:

input	GenericOctetString	string
output	IntegerVariable	length

Description:

Returns in the output argument length the number of octets within the input argument string.

GetSubString() - Extracts a sub-string from a string

Synopsis:

GetSubString(string, octetLengthSearch, beginExtract, endExtract, stringResult)

Arguments:

input	GenericOctetString	string
input	GenericInteger	octetLengthSearch
input	GenericInteger	beginExtract
input	GenericInteger	endExtract
output	OctetStringVariable	stringResult

Description:

Extracts part of a string from an octet specified by argument beginExtract upto the octet specified by argument endExtract. The octets specified by the beginExtract and endExtract arguments are included. The substring is returned in the argument stringResult. The first octet in the string starts at index 1. A string can be octet based or double octet based. The argument octetLengthSearch specifies whether the search is on an octet basis or a double octet basis. A value of 1 represents an octet search and a value of 2 represents a double octet search.

CompareString() - Compares two strings

Synopsis:

CompareString(string1, string2, octetLengthSearch, result)

Arguments:

input	GenericOctetString	string1

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input	GenericOctetString	string2
input	GenericInteger	octetLengthSearch
output	IntegerVariable	result

Description:

Compares two octet strings using lexicographical order, the result is -1 if string1<string2, 0 if string1=string2, + 1 if string1>string2. A string can be octet based or double octet based. The argument octetLengthSearch specifies whether the search is on an octet basis or a double octet basis. A value of 1 represents an octet search and a value of 2 represents a double octet search.

SearchSubString() - Searches for a sub-string within a string

Synopsis:

SearchSubString(string, octetLengthSearch, startIndex, searchedString, stringPosition)

Arguments:

input	GenericOctetString	string
input	GenericInteger	octetLengthSearch
input	GenericInteger	startIndex
input	GenericOctetString	searchedString
output	IntegerVariable	stringPosition

Description:

Searches for a sub-string within a string from a specified starting index. The string is specified by the first argument string. The octet to start the search from is specified by the startIndex argument and the sub-string is specified by the searchedString argument. The argument stringPosition returns the index within the string of the first octet of the sub-string , -1 is returned if the string is not found. The first octet of the string is at index 1. A string can be octet based or double octet based. The argument octetLengthSearch specifies whether the search is on an octet basis or a double octet basis. A value of 1 represents an octet search and a value of 2 represents a double octet search.

SearchAndExtractSubString() - Searches and extracts a sub-string within a string

Synopsis:

SearchAndExtractSubString(string, octetLengthSearch, startIndex,
searchedString, stringResult, stringPosition)

Arguments:

input	GenericOctetString	string
input	GenericInteger	octetLengthSearch
input	GenericInteger	startIndex
input	GenericOctetString	searchedString
output	OctetStringVariable	stringResult
output	IntegerVariable	stringPosition

Description:

Searches and extracts a sub-string within a string from a specified starting index. The string is specified by the first argument string. The octet to start from is specified by the startIndex argument and the sub-string is specified by the searchedString argument.

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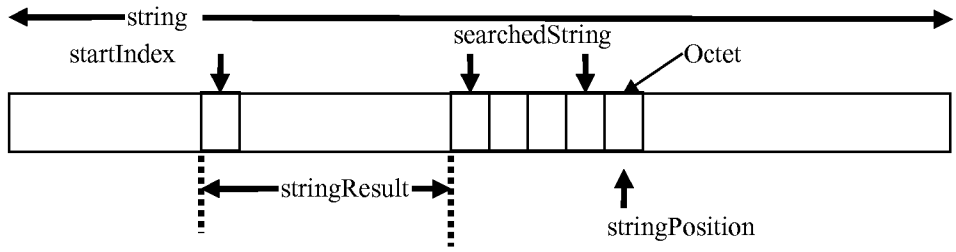

Figure D.1 — Searching and extracting a sub-string within a string

The argument stringPosition returns the index of the octet immediately after the searchedString within the string, -1 if the string is not found. The first index of the string is 1. The stringPosition may if the substring is the last element within the string have an index beyond the end of the string i.e. the index = the number of octets within the string + 1. The argument stringResult returns the string itself between the startIndex upto not including the searched string. The first octet of the string is at index 1. A string can be octet based or double octet based. The argument octetLengthSearch specifies whether the search is on an octet basis or a double octet basis. A value of 1 represents an octet search and a value of 2 represents a double octet search.

D.12.4 Miscellaneous functions

CastToContentRef() - Casts an OctetString to a ContentReference.

Synopsis:

CastToContentRef(inString, outString)

Arguments:

input	GenericOctetString	inString
output	ContentReferenceVariable	outString

Description:

Casts the OctetString variable inString to the ContentReference variable outString.

CastToObjectRef() - Casts an OctetString and Object Identifier to an Object Reference

Synopsis:

CastToObjectRef(inString, ObjectId, outObjectRef)

Arguments:

input	GenericOctetString	inString
input	GenericInteger	ObjectId
output	ObjectRefVariable	outObjectRef

Description:

Casts the combination of the OctetString variable inString and the Integer variable ObjectId to the Object Reference variable outObjectRef.

D.13 Protocol mapping and external interaction

Table D.13 defines the mapping to the DAVIC external environment:

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Table D.13 — Protocol Mapping

MHEG-5 entity	*Mapping needed*	*Semantics*
OpenConnection, CloseConnection	Mapping to connection management	In OpenConnection: Protocol: one of the two strings: “PSTN” or “ISDN”. Address: E.164 NSAP.
RemoteProgram objects	Mapping to RemoteProgram call protocol in the application domain (see ISO/IEC 13552-5:1997 subclause 8.4)	In Call and Fork: Name Parameters ProgramConnectionTag
Application name space	Mapping to name space of the application domain	ObjectReference (see subclause 9.9.3) ContentReference (see subclause 9.9.4)
Application name space in case a TransitionTo action uses the ConnectionTag parameter	Mapping to the name space of the application domain	ObjectReference (see subclause 9.9.3) ContentReference (see subclause 9.9.4)
Persistent storage name space	Mapping to the name space of the persistent storage	In StorePersistent and ReadPersistent: InFileName, OutFileName Flat name space. Names may be anything from one to 64 characters long.
Stream actions	Mapping to the stream interface of the application domain	In Stream Speed CounterPosition (see subclause 9.9.1) In Audio, Video, RTGraphics ComponentTag
Stream events	Mapping to stream states and stream events in the application domain	In Stream StreamPlaying, StreamStopped (mapping to application-domain stream state machine) CounterPosition StreamEventTag (see subclause 9.9.1)

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Annex E
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Examples for profile identifiers

E.1 Japanese profile JTC1

This Annex presents examples for the usage of the Profile Identifiers defined in clause 8.

E.1.1 International ID

The following notation might be used for International ID, e.g.

JTC1.MHEG-7.01

E.1.2 Domestic ID

The following notation might be used for Domestic ID, e.g.

Japan.JISC.21

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Annex F
(informative)

PICS table

F.1.1 PICS Table template

The following PICS table presents a list of MHEG-5 classes, elementary actions, features, content encodings, etc. It can be used as a guide when producing Application Domain Definitions. It is derived from [DAVIC1.3]

Table F.1 — PICS Table

#	Description	MHEG-5 requirement	Support Yes No
	Main capabilities		
M1	Classes	C.1	[ ] [ ]
M2	Elementary actions	C.1	[ ] [ ]
M3	ASN.1 encoding format for MHEG-5 interchanged objects	C.3	[ ] [ ]
M4	Textual encoding format for MHEG-5 interchanged objects	C.3	[ ] [ ]
M5	RTE main mechanisms	M	[ ] [ ]
	Classes		
C1	Application	M	[ ] [ ]
C2	Scene	M	[ ] [ ]
C3	Link	M	[ ] [ ]
C4	ResidentProgram	O	[ ] [ ]
C5	RemoteProgram	O	[ ] [ ]
C6	InterchangedProgram	O	[ ] [ ]
C7	Palette	O	[ ] [ ]
C8	Font	O	[ ] [ ]
C9	CursorShape	C.6	[ ] [ ]
C10	BooleanVariable	O	[ ] [ ]
C11	IntegerVariable	O	[ ] [ ]
C12	OctetStringVariable	O	[ ] [ ]
C13	ObjectRefVariable	O	[ ] [ ]
C14	ContentRefVariable	O	[ ] [ ]
C15	TokenGroup	O	[ ] [ ]
C16	ListGroup	O	[ ] [ ]
C17	Bitmap	O	[ ] [ ]
C18	LineArt	O	[ ] [ ]
C19	Rectangle	O	[ ] [ ]
C20	DynamicLineArt	O	[ ] [ ]
C21	Text	O	[ ] [ ]
C22	Stream	O	[ ] [ ]
C23	Audio	O	[ ] [ ]
C24	Video	O	[ ] [ ]
C25	RTGraphics	O	[ ] [ ]
C26	Slider	O	[ ] [ ]
C27	EntryField	O	[ ] [ ]
C28	HyperText	O	[ ] [ ]
C29	Hotspot	O	[ ] [ ]

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C30	PushButton	O	[ ] [ ]
C31	SwitchButton	O	[ ] [ ]
C32	Action	M	[ ] [ ]
Elementary actions			
EA1	Activate	M	[ ] [ ]
EA2	Add	C.4	[ ] [ ]
EA3	AddItem	C.4	[ ] [ ]
EA4	Append	C.4	[ ] [ ]
EA5	BringToFront	C.4	[ ] [ ]
EA6	Call	C.4	[ ] [ ]
EA7	CallActionSlot	C.4	[ ] [ ]
EA8	Clear	C.4	[ ] [ ]
EA9	Clone	C.4	[ ] [ ]
EA10	CloseConnection	C.5	[ ] [ ]
EA11	Deactivate	M	[ ] [ ]
EA12	DelItem	C.4	[ ] [ ]
EA13	Deselect	C.4	[ ] [ ]
EA14	DeselectItem	C.4	[ ] [ ]
EA15	Divide	C.4	[ ] [ ]
EA16	DrawArc	C.4	[ ] [ ]
EA17	DrawLine	C.4	[ ] [ ]
EA18	DrawOval	C.4	[ ] [ ]
EA19	DrawPolygon	C.4	[ ] [ ]
EA20	DrawPolyline	C.4	[ ] [ ]
EA21	DrawRectangle	C.4	[ ] [ ]
EA22	DrawSector	C.4	[ ] [ ]
EA23	Fork	C.4	[ ] [ ]
EA24	GetAvailabilityStatus	M	[ ] [ ]
EA25	GetBoxSize	C.4	[ ] [ ]
EA26	GetCellItem	C.4	[ ] [ ]
EA27	GetCursorPosition	C.6	[ ] [ ]
EA28	GetEngineSupport	M	[ ] [ ]
EA29	GetEntryPoint	C.4	[ ] [ ]
EA30	GetFillColour	C.4	[ ] [ ]
EA31	GetFirstItem	C.4	[ ] [ ]
EA32	GetHighlightStatus	C.4	[ ] [ ]
EA33	GetInteractionStatus	C.4	[ ] [ ]
EA34	GetItemStatus	C.4	[ ] [ ]
EA35	GetLabel	C.4	[ ] [ ]
EA36	GetLastAnchorFired	C.4	[ ] [ ]
EA37	GetLineColour	C.4	[ ] [ ]
EA38	GetLineStyle	C.4	[ ] [ ]
EA39	GetLineWidth	C.4	[ ] [ ]
EA40	GetListItem	C.4	[ ] [ ]
EA41	GetListSize	C.4	[ ] [ ]
EA42	GetOverwriteMode	C.4	[ ] [ ]
EA43	GetPortion	C.4	[ ] [ ]
EA44	GetPosition	C.4	[ ] [ ]
EA45	GetRunningStatus	M	[ ] [ ]
EA46	GetSelectionStatus	C.4	[ ] [ ]
EA47	GetSliderValue	C.4	[ ] [ ]
EA48	GetTextContent	C.4	[ ] [ ]
EA49	GetTextData	C.4	[ ] [ ]
EA50	GetTokenPosition	C.4	[ ] [ ]
EA51	GetVolume	C.4	[ ] [ ]
EA52	Launch	M	[ ] [ ]

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EA53	LockScreen	M	[ ] [ ]
EA54	Modulo	C.4	[ ] [ ]
EA55	Move	C.4	[ ] [ ]
EA56	MoveTo	C.4	[ ] [ ]
EA57	Multiply	C.4	[ ] [ ]
EA58	OpenConnection	C.5	[ ] [ ]
EA59	Preload	C.4	[ ] [ ]
EA60	PutBefore	C.4	[ ] [ ]
EA61	PutBehind	C.4	[ ] [ ]
EA62	Quit	M	[ ] [ ]
EA63	ReadPersistent	M	[ ] [ ]
EA64	Run	C.4	[ ] [ ]
EA65	ScaleBitmap	C.7	[ ] [ ]
EA66	ScaleVideo	C.7	[ ] [ ]
EA67	ScrollItems	C.4	[ ] [ ]
EA68	Select	C.4	[ ] [ ]
EA69	SelectItem	C.4	[ ] [ ]
EA70	SendEvent	M	[ ] [ ]
EA71	SendToBack	C.4	[ ] [ ]
EA72	SetBoxSize	C.4	[ ] [ ]
EA73	SetCachePriority	C.8	[ ] [ ]
EA74	SetCounterEndPosition	C.4	[ ] [ ]
EA75	SetCounterPosition	C.4	[ ] [ ]
EA76	SetCounterTrigger	C.4	[ ] [ ]
EA77	SetCursorPosition	C.6	[ ] [ ]
EA78	SetCursorShape	C.6	[ ] [ ]
EA79	SetData	C.4	[ ] [ ]
EA80	SetEntryPoint	C.4	[ ] [ ]
EA81	SetFillColour	C.4	[ ] [ ]
EA82	SetFirstItem	C.4	[ ] [ ]
EA83	SetFontRef	C.4	[ ] [ ]
EA84	SetHighlightStatus	C.4	[ ] [ ]
EA85	SetInteractionStatus	C.4	[ ] [ ]
EA86	SetLabel	C.4	[ ] [ ]
EA87	SetLineColour	C.4	[ ] [ ]
EA88	SetLineStyle	C.4	[ ] [ ]
EA89	SetLineWidth	C.4	[ ] [ ]
EA90	SetOverwriteMode	C.4	[ ] [ ]
EA91	SetPaletteRef	C.4	[ ] [ ]
EA92	SetPortion	C.4	[ ] [ ]
EA93	SetPosition	C.4	[ ] [ ]
EA94	SetSliderValue	C.4	[ ] [ ]
EA95	SetSpeed	C.4	[ ] [ ]
EA96	SetTimer	C.4	[ ] [ ]
EA97	SetTransparency	C.4	[ ] [ ]
EA98	SetVariable	C.4	[ ] [ ]
EA99	SetVolume	C.4	[ ] [ ]
EA100	Spawn	C.9	[ ] [ ]
EA101	Step	C.4	[ ] [ ]
EA102	Stop	C.4	[ ] [ ]
EA103	StorePersistent	M	[ ] [ ]
EA104	Subtract	C.4	[ ] [ ]
EA105	TestVariable	C.4	[ ] [ ]
EA106	Toggle	C.4	[ ] [ ]
EA107	ToggleItem	C.4	[ ] [ ]
EA108	TransitionTo	M	[ ] [ ]

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EA109	Unload	C.4	[ ] [ ]
EA110	UnlockScreen	C.4	[ ] [ ]
RTE main mechanisms			
MM1	Referencing MHEG-5 objects	M	[ ] [ ]
MM2	Attaching to name spaces	O	[ ] [ ]
MM3	RemoteProgram calls	O	[ ] [ ]
MM4	Event handling	M	[ ] [ ]
MM5	Rendering Visibles	M	[ ] [ ]
MM6	Error handling	M	[ ] [ ]
Features			
F1	Ancillary connections (corresponding to OpenConnection and CloseConnection actions)	O	[ ] [ ]
F2	Caching (corresponding to caching of MHEG-5 objects and content data of Ingredient class)	O	[ ] [ ]
F3	Cloning (corresponding to the Clone action defined in Ingredient class)	O	[ ] [ ]
F4	Free moving cursor (corresponding to the CursorEnter and CursorLeave events defined in Interactible class and the CursorShape class))	O	[ ] [ ]
F5	Bitmap and Video scaling (corresponding to the ScaleBitmap and ScaleVideo actions)	O	[ ] [ ]
F6	Stacking of application (corresponding to the Spawn action of Application class)	O	[ ] [ ]
F7	Trick mode (corresponding to the SetSpeed action of Application class)	O	[ ] [ ]
Attribute permissible values			
AV1	“<style>.<size>“, where <style> being “plain“, “bold“, “italic“, “bold-italic“, “emphasis“ or “strong“, and <size> being an integer for FontAttributes	I	[ ] [ ]
AV2	“fixed“ or “proportional“ for FontName	I	[ ] [ ]
AV3	TransitionEffect	I	[ ] [ ]
AV4	1 (Latin) or 2 (Unicode) for CharacterSet	I	[ ] [ ]
AV5	RGB16 for AbsoluteColour	I	[ ] [ ]
Content data encoding			
CD1	ContentHook # 1 for Palette encoding format (CLUT definition segment)	I	[ ] [ ]
CD2	ContentHook # 1 for Bitmap encoding format (PNG)	I	[ ] [ ]
CD3	ContentHook # 2 for Bitmap encoding format (MPEG-2 intra frame)	I	[ ] [ ]
CD4	ContentHook # 3 for Bitmap encoding format (Region definition segment)	I	[ ] [ ]
CD5	ContentHook # 1 for Text encoding format (Subset of HTML 3.2)	I	[ ] [ ]
CD6	ContentHook # 1 for EntryField encoding format (Unicode or Latin-1)	I	[ ] [ ]
CD7	ContentHook # 1 for HyperText encoding format (Subset of HTML 3.2)	I	[ ] [ ]
CD8	ContentHook # 1 for Stream encoding format (MPEG-1 or MPEG-2 video, MPEG-1 audio and DVB subtitling)	I	[ ] [ ]
CD9	ContentHook # 2 for Stream encoding format (MPEG-2 still, MPEG-1 audio and DVB subtitling)	I	[ ] [ ]

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CD10	ContentHook # 3 for Stream encoding format (AIFF-C)	I	[ ] [ ]
CD11	ContentHook # 1 for InterchangedProgram encoding format (MHEG-6)	I	[ ] [ ]
User input registers			
UI1	UserEventRegister # 1	I	[ ] [ ]
UI2	UserEventRegister # 2	I	[ ] [ ]
Feature constraints			
FC1	Support of the following coordinate systems: 720x576, 720x480, 640x480	I	[ ] [ ]
FC2	Support of the following aspect ratios: 1/1, 4/3, 16/9	I	[ ] [ ]
FC3	Support of one active RTGraphics object at a time	I	[ ] [ ]
FC4	Support of one active MPEG-1 Audio object at a time and one active AIFF-C Audio object at a time	I	[ ] [ ]
FC5	Support of one active Video object at a time	I	[ ] [ ]
FC6	Support of unconstrained overlapping visibles	I	[ ] [ ]
Engine events			
EE1	Implementation defined engine events	I	[ ] [ ]
GetEngineSupport permissible values			
SV1	Implementation defined strings	I	[ ] [ ]
Protocol mapping and external interaction			
PM1	Mapping of Protocol parameter to “PSTN“ or “ISDN“ and Address parameter to E.164 NSAP in OpenConnection and CloseConnection elementary actions	I	[ ] [ ]
PM2	Mapping of elementary actions and attributes to DAVIC Call interface in RemoteProgram class	I	[ ] [ ]
PM3	Mapping of elementary actions and attributes to MHEG-6 specifications in InterchangedProgram class	I	[ ] [ ]
PM4	Mapping of ObjectReference and ContentReference to DSM-CC UU names	I	[ ] [ ]
PM5	Mapping of InFileName and OutFileName to flat names of up to 64 characters in ReadPersistent and StorePersistent elementary actions	I	[ ] [ ]
PM6	Mapping of elementary actions to DSM-CC UU Stream interface operations in Stream class	I	[ ] [ ]
PM7	Mapping of events to DSM-CC UU stream states and events in Stream class	I	[ ] [ ]
Other characteristics			
OC1	Handling of an MHEG-5 interchanged object of 128 Kbytes in size	I	[ ] [ ]
OC2	Handling of content data of 512 Kbytes in size	I	[ ] [ ]
OC3	Handling of persistent data of 64 Kbytes in size	I	[ ] [ ]
OC4	Handling of 128 items in an MHEG-5 Application or Scene object	I	[ ] [ ]
OC5	Handling of 64 elementary actions in an MHEG-5 Action object	I	[ ] [ ]
OC6	Handling of 128 active MHEG-5 Link objects at a time	I	[ ] [ ]
OC7	Handling of 16 colours at a time, when displaying visibles	I	[ ] [ ]

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OC8	Handling of 256 colours at a time, when displaying visibles	I	[ ] [ ]
OC9	Handling of 65536 colours at a time, when displaying visibles	I	[ ] [ ]
OC10	Handling of a timer resolution of 1000 milliseconds	I	[ ] [ ]
OC11	Handling of a timer resolution of 100 milliseconds	I	[ ] [ ]
OC12	Handling of a screen resolution of 352x240 pixels	I	[ ] [ ]
OC13	Handling of a screen resolution of 720x576 pixels	I	[ ] [ ]

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