INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

T.175

(02/98)

SERIES T: TERMINALS FOR TELEMATIC SERVICES

Application Programming Interface (API) for MHEG-5

ITU-T Recommendation T.175

(Previously CCITT Recommendation)

ITU-T T-SERIES RECOMMENDATIONS

TERMINALS FOR TELEMATIC SERVICES

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ITU-T RECOMMENDATION T.175

APPLICATION PROGRAMMING INTERFACE (API) FOR MHEG-5

Summary

This Recommendation specifies the Application Programming Interface (API) for the manipulation of multimedia and hypermedia information objects.

MHEG part 5 (Recommendation T.172) is a standard, which specifies the coded representation of interchanged multimedia/hypermedia information objects (MHEG-5 objects) for base-level applications. These so-called MHEG-5 objects are handled, interpreted and presented by MHEG-5 engines.

Source

ITU-T Recommendation T.175 was prepared by ITU-T Study Group 16 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 6th of February 1998.

FOREWORD

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In some areas of information technology which fall within ITU-T’s purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation T.175

APPLICATION PROGRAMMING INTERFACE (API) FOR MHEG-5

(Geneva, 1998)

1 Scope

This Recommendation specifies the Application Programming Interface (API) for the manipulation of multimedia and hypermedia information objects, i.e. the API that shall be provided by MHEG-5 engines for their control by applications running on a DAVIC 1.1 compliant terminal.

MHEG part 5 (Recommendation T.172) is a standard, which specifies the coded representation of interchanged multimedia/hypermedia information objects (MHEG-5 objects) for base-level applications. These so-called MHEG-5 objects are handled, interpreted and presented by MHEG-5 engines.

2 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

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

[2] ETS 300 777-1, *Terminal Equipment (TE); End-to-end protocols for multimedia information retrieval services; Part 1: Coding of multimedia and hypermedia information for basic multimedia applications (MHEG-5).*

[3] ETS 300 777-2, *Terminal Equipment (TE); End-to-end protocols for multimedia information retrieval services; Part 2: Use of Digital Storage Media Command and Control (DSM-CC) for basic multimedia applications*.

[4] ISO/IEC DIS 13522-6, *Information technology – Coding of multimedia and hypermedia information – Part 6: Support for enhanced interactive applications*.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this Recommendation the definition of the standards referenced below apply. Should any ambiguity occur, definitions of the following standards apply, in decreasing order:

– ISO/IEC 13522-5 [1] MHEG-5;

– any other standard part of ISO/IEC 13522 MHEG.

3.1.1 Application Programming Interface (API): A boundary across which a software application uses facilities of programming languages to invoke software services. These facilities may include procedures or operations, shared data objects and resolution of identifiers.

3.1.2 local application: A piece of software which is part of the (telecommunication) application and is running on the considered equipment.

3.1.3 MHEG-5 API: The API provided by an MHEG-5 engine to local applications for the manipulation of MHEG-5 objects, as defined in this Recommendation.

3.1.4 MHEG-5 engine: A process or a set of processes that interpret MHEG-5 objects encoded according to the encoding specifications of ETS 300 777-1 [2] or the MHEG-5 textual notation.

3.2 Abbreviations

This Recommendation uses the following abbreviations:

API	Application Programming Interface
ASN.1	Abstract Syntax Notation One
DAVIC	Digital Audio Visual Council
DSM-CC	Digital Storage Media Command and Control
EBNF	Extended Backus-Naur Form
JTC	Joint Technical Committee
MHEG	Multimedia and Hypermedia information coding Experts Group
SI	Service Information
STU	Set Top Unit
VM	Virtual Machine

4 Overview

The following subclause positions the API defined by this Recommendation in the framework of the DAVIC specifications.

4.1 The DAVIC application interchange format

To deliver multimedia information to STUs in an interoperable way, applications shall use the MHEG-5 final form interchange format, as defined by ISO/IEC 13522-5 [1]. The ASN.1 notation and encoding, as defined by ETS 300 777-1 [2], shall be used to interchange MHEG-5 objects. This format defines the semantics and the encoding of the multimedia and hypermedia objects.

To deliver program code to STUs in an interoperable way, applications shall use the MHEG-5 InterchangedProgram class to encapsulate Java[1] VM code, according to the semantics and encoding defined by ISO/IEC DIS 13522-6 [4]. Java VM classes are called from MHEG-5 objects using the MHEG-5 Call and Fork elementary actions.

The Java VM code interchange unit is a Java VM class. Java VM classes shall be encoded as defined by the *Class File Format* section of the *Java Virtual machine specification*. A Java class encapsulates data and methods that consist of sequences of instructions. The instruction set is defined by the *Java Virtual machine instruction set* section of the *Java Virtual machine specification*.

[1] Java is a trademark or a registered trademark of Sun Microsystems, Inc.

4.2 Core set of Java APIs

The following set of APIs are used by Java VM code in the DAVIC 1.1 specifications to express access to basic functions of the STU in an interoperable way:

- the `java.lang` package;
- the `java.util` package;
- the `iso.mheg5` package;
- the `davic.dsmccuu` package;
- the `etsi.si` package.

NOTE 1 – The Java VM specification provides flexible mechanisms to call upon external functions whose interface is defined as a Java package. The DAVIC 1.1 specification only includes a minimum core set of packages required for Java VM code to be useful in a DAVIC environment. It is anticipated that additional Java packages will be standardised at a later stage.

NOTE 2 – Especially, the `java.io` package, although strictly speaking not necessary to the useful performance of the VM environment, is part of the Java foundation classes. It is intended that the `java.io` package be added to the DAVIC core set of Java APIs together with an adequate specification of its semantics in a DAVIC environment.

The `java.lang` package, as defined by the *Java API documentation*, consists of the minimal set of Java VM classes needed to run Java VM code, supporting the following functionality: basic data types, object, mathematic operations, security, thread management, string manipulation, exception handling.

The `java.util` package, as defined by the *Java API documentation*, consists of Java VM classes supporting a number of utility features common to all Java VM programs.

The `iso.mheg5` package, as defined by this Recommendation, provides Java VM code with access to and manipulation of the MHEG-5 multimedia presentation and interaction objects, i.e. access to the dynamic attributes of MHEG-5 objects and invocation of elementary actions on MHEG-5 objects.

The `davic.dsmccuu` package, together with the associated `davic.CosNaming` and `davic.CosNaming.NamingContext_` packages, as defined by ETS 300 777-2 [3], enables Java VM code to use the DSM-CC U-U interface objects for network data access.

The `davic.dsmccuu` package implements a subset of the DSM-CC U-U API. Access to the following Core SetTop services is provided:

- interface Base: operations Close and Destroy;
- interface File: operations Read and Write;
- interface Directory: operations Open, Close and Get;
- interface ServiceGateway: operations Attach and Detach;
- interface CosNaming::NamingContext: operations List and Resolve;
- interface CosNaming::BindingIterator: operations Next_One and Next_N.

The `etsi.si` package enables Java VM code to access information transmitted in the DAVIC Service Information (SI) stream.

5 The MHEG-5 API

```
// ---------------------------------------------------------------------------
// Package
// ---------------------------------------------------------------------------
package iso.mheg5;
// ---------------------------------------------------------------------------
// Useful definitions
// ---------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□
{
/* Attributes */
// The groupIdentifier attribute is optional (it may be empty)
     public byte[] groupIdentifier;
     public int objectNumber;

/* Constructors */

     public ObjectReference();
     public ObjectReference(
       int objectNumber);
     public ObjectReference(
       byte[] groupIdentifier,
       int objectNumber);
}
// ---------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□□
{
/* Attributes */
     byte[] reference;
/* Constructors */
     public ContentReference();
     public ContentReference(
       byte[] reference);
}
// ---------------------------------------------------------------------------
public class □□□□□□□□□□□□□ extends java.lang.Exception
{
/* Attributes */
// Constant declarations for exceptionCode
     public static final short TARGET_NOT_AVAILABLE = 1;
     public static final short INVALID_TARGET = 2;
     public static final short INVALID_PARAMETER = 3;

     public short exceptionCode;
     public short parameterRank;
/* Constructors */
     protected MhegException();
// Construct an MhegException with exceptionCode identified by the reason
// parameter
     public MhegException(
       short reason)
          {
              exceptionCode = reason;
              parameterRank = -1;
          }
```

```
// Construct an MhegException with exceptionCode identified by the reason
// parameter and parameterRank by the position parameter
     public MhegException(
       short reason,
       short position)
          {
             exceptionCode = reason;
             parameterRank = position;
          }
}
// ---------------------------------------------------------------------------------
abstract public class □□□□
{
/* Constructors */
     protected Root();
/* Methods */
// Return the reference of the Java object associated with the MHEG-5 object
// whose identification is mheg5ObjectReference
// If the Java object does not exist, create it first
     public static final Root getObject(
       ObjectReference mheg5ObjectReference)
       throws MhegException;
// Correspond to the GetAvailabilityStatus MHEG-5 elementary action
     public Boolean getAvailabilityStatus()
       throws MhegException;
// Correspond to the GetRunningStatus MHEG-5 elementary action
     public Boolean getRunningStatus()
       throws MhegException;
}
// ---------------------------------------------------------------------------------
abstract public class □□□□□ extends Root
{
/* Constructors */
     protected Group();
/* Methods */
// Correspond to the SetCachePriority MHEG-5 elementary action
// The cachePriority parameter value shall be within the range [0,255]
     public void setCachePriority(
       byte cachePriority)
       throws MhegException;
// Retrieve the value of the GroupCachePriority attribute
     public Integer getCachePriority()
       throws MhegException;
}
// ---------------------------------------------------------------------------------
public class □□□□□□□□□□□ extends Group
{
/* Constructors */
     protected Application();
/* Methods */
// Correspond to the LockScreen MHEG-5 elementary action
     public void lockScreen()
       throws MhegException;
// Correspond to the UnlockScreen MHEG-5 elementary action
     public void unlockScreen()
       throws MhegException;
```

```
// Retrieve the value of the LockCount attribute
// The wrapped returned value shall be positive or equal to zero
     public Integer getLockCount()
       throws MhegException;

// Correspond to the GetEngineSupport MHEG-5 elementary action
     public Boolean getEngineSupport(byte[] feature)
       throws MhegException;

}

// --------------------------------------------------------------------------------
public class □□□□□ extends Group
{

/* Constructors */

     protected Scene();

/* Methods */

// Correspond to the TransitionTo MHEG-5 elementary action
     public void transitionTo()
       throws MhegException;
     public void transitionTo(
       int connectionTag)
       throws MhegException;
     public void transitionTo(
       byte transitionEffect)
       throws MhegException;
     public void transitionTo(
       int connectionTag,
       byte transitionEffect)
       throws MhegException;

// Correspond to the SetTimer MHEG-5 elementary action
     public void setTimer(
       int timerId)
       throws MhegException;
     public void setTimer(
       int timerId,
       int timerValue)
       throws MhegException;
     public void setTimer(
       int timerId,
       int timerValue,
       boolean absoluteTime)
       throws MhegException;

// Retrieve the value of the TimerPosition (in the timerPosition parameter) and
// AbsoluteTime (in the absoluteTime parameter) fields of the timer whose
// identification is timerId in the Timers attribute
// If the targetted timer exists, the method returns true otherwise false
     public boolean getTimer(
       int timerId,
       Integer timerPosition,
       Boolean absoluteTime)
       throws MhegException;

// Correspond to the SendEvent MHEG-5 elementary action
     public void sendEvent(
       ObjectReference eventSource,
       byte eventType)
       throws MhegException;
     public void sendEvent(
       ObjectReference eventSource,
       byte eventType,
       boolean eventData)
       throws MhegException;
     public void sendEvent(
       ObjectReference eventSource,
       byte eventType,
       int eventData)
       throws MhegException;
     public void sendEvent(
       ObjectReference eventSource,
       byte eventType,
       byte[] eventData)
       throws MhegException;

// Correspond to the SetCursorShape MHEG-5 elementary action
     public void setCursorShape()
       throws MhegException;
     public void setCursorShape(
       ObjectReference cursorShape)
       throws MhegException;

// Retrieve the shape of the cursor
// A returned null object reference indicates that the cursor has been removed
// from the scene
     public ObjectReference getCursorShape()
       throws MhegException;

// Correspond to the SetCursorPosition MHEG-5 elementary action
     public void setCursorPosition(
       short xCursor,
       short yCursor)
       throws MhegException;

// Correspond to the GetCursorPosition MHEG-5 elementary action
     public void getCursorPosition(
       Integer xCursor,
       Integer yCursor)
       throws MhegException;

}
// ------------------------------------------------------------------------------
abstract public class □□□□□□□□□□ extends Root
{


/* Constructors */

     protected Ingredient();

/* Methods */

// Correspond to the SetData MHEG-5 elementary action
     public void setData(
       byte[] includedContent)
       throws MhegException;
     public void setData(
       ContentReference referencedContent)
       throws MhegException;
     public void setData(
       ContentReference referencedContent,
       int contentSize)
       throws MhegException;
     public void setData(
       ContentReference referencedContent,
       byte contentCachePriority)
       throws MhegException;
     public void setData(
       ContentReference referencedContent,
       int contentSize,
       byte contentCachePriority)
       throws MhegException;
```

```
// Retrieve the value of the ContentData attribute
// The returned value shall be true and content shall be of type byte[] for an
// included content
// The returned value shall be false and content shall be of type
// ContentReference for a referenced content
// contentSize and contentCachePriority are output parameters which are valid
// only for a referenced content
     public boolean getData(
       Object content,
       Integer contentSize,
       Integer contentCachePriority)
       throws MhegException;

// Correspond to the Clone MHEG-5 elementary action
     public ObjectReference clone()
       throws MhegException;

// Correspond to the Preload MHEG-5 elementary action
     public void preload()
       throws MhegException;

// Correspond to the Unload MHEG-5 elementary action
     public void unload()
       throws MhegException;

}
// --------------------------------------------------------------------------------
public class □□□□ extends Ingredient
{
/* Constructors */

     protected Link();

/* Methods */

// Correspond to the Activate MHEG-5 elementary action
     public void activate()
       throws MhegException;

// Correspond to the Deactivate MHEG-5 elementary action
     public void deactivate()
       throws MhegException;

}
// --------------------------------------------------------------------------------
public class □□□□□□□ extends Ingredient
{
/* Constructors */

     protected Program();

/* Methods */

// Correspond to the Call MHEG-5 elementary action
// Every element of the parameters array shall be of one of the following types:
// Boolean, Integer, byte[],ObjectReference or ContentReference; otherwise, an
// exception is raised
     public boolean call(
       Object[] parameters)
       throws MhegException;

// Correspond to the Fork MHEG-5 elementary action
// Every element of the parameters array shall be of one of the following types:
// Boolean, Integer, byte[],ObjectReference or ContentReference; otherwise, an
// exception is raised
     public boolean fork(
       Object[] parameters)
       throws MhegException;

// Correspond to the Stop MHEG-5 elementary action
     public void stop()
       throws MhegException;
```

```
}
// -----------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□ extends Program
{
/* Constructors */
     protected ResidentProgram();
}
// -----------------------------------------------------------------------------
public class □□□□□□□□□□□□□ extends Program
{
/* Constructors */
     protected RemoteProgram();
}
// -----------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□□□□□ extends Program
{
/* Constructors */
     protected InterchangedProgram();
}
// -----------------------------------------------------------------------------
public class □□□□□□□ extends Ingredient
{
/* Constructors */
     protected Palette();
}
// -----------------------------------------------------------------------------
public class □□□□ extends Ingredient
{
/* Constructors */
     protected Font();
}
// -----------------------------------------------------------------------------
public class □□□□□□□□□□□ extends Ingredient
{
/* Constructors */
     protected CursorShape();
}
// -----------------------------------------------------------------------------
public class □□□□□□□□ extends Ingredient
{
/* Constructors */
     protected Variable();
}
// -----------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□ extends Variable
{
/* Constructors */
     protected BooleanVariable();
/* Methods */
```

```
// Correspond to the SetVariable MHEG-5 elementary action targetted at a
// BooleanVariable object
     public void setVariable(
       boolean value)
       throws MhegException;

// Retrieve the value of the variable
     public Boolean getVariable()
       throws MhegException;

}
// ---------------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□ extends Variable
{
/* Constructors */

     protected IntegerVariable();

/* Methods */

// Correspond to the SetVariable MHEG-5 elementary action targetted at an
// IntegerVariable object
     public void setVariable(
       int value)
       throws MhegException;

// Retrieve the value of the variable
     public Integer getVariable()
       throws MhegException;

// Correspond to the Add MHEG-5 elementary action
     public void add(
       int value)
       throws MhegException;

// Correspond to the Subtract MHEG-5 elementary action
     public void subtract(
       int value)
       throws MhegException;

// Correspond to the Multiply MHEG-5 elementary action
     public void multiply(
       int value)
       throws MhegException;

// Correspond to the Divide MHEG-5 elementary action
     public void divide(
       int value)
       throws MhegException;

// Correspond to the Modulo MHEG-5 elementary action
     public void modulo(
       int value)
       throws MhegException;

}
// ---------------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□□□□□ extends Variable
{
/* Constructors */

     protected OctetStringVariable();

/* Methods */

// Correspond to the SetVariable MHEG-5 elementary action targetted at an
// OctetStringVariable object
     public void setVariable(
       byte[] value)
       throws MhegException;
```

```
// Retrieve the value of the variable
     public byte[] getVariable()
       throws MhegException;

// Correspond to the Append MHEG-5 elementary action
     public void append(
       byte[] value)
       throws MhegException;

}
// ----------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□□□ extends Variable
{
/* Constructors */

     protected ObjectRefVariable();

/* Methods */

// Correspond to the SetVariable MHEG-5 elementary action targetted at an
// ObjectRefVariable object
     public void setVariable(
       ObjectReference value)
       throws MhegException;

// Retrieve the value of the variable
     public ObjectReference getVariable()
       throws MhegException;

}
// ----------------------------------------------------------------------------
public class □□□□□□□□□□□□□□□□□□ extends Variable
{
/* Constructors */

     protected ContentRefVariable();

/* Methods */

// Correspond to the SetVariable MHEG-5 elementary action targetted at an
// ContentRefVariable object
     public void setVariable(
       ContentReference value)
       throws MhegException;

// Retrieve the value of the variable
     public ContentReference getVariable()
       throws MhegException;

}
// ----------------------------------------------------------------------------
abstract public class □□□□□□□□□□□ extends Ingredient
{
/* Constructors */

     protected Presentable();

/* Methods */

// Correspond to the Run MHEG-5 elementary action
     public void run()
       throws MhegException;

// Correspond to the Stop MHEG-5 elementary action
     public void stop()
       throws MhegException;

}
// ----------------------------------------------------------------------------
public interface □□□□□□□□□□□□
{
/* Methods */
```

```
// Correspond to the Move MHEG-5 elementary action
     public void move(
       short movementId)
       throws MhegException;

// Correspond to the MoveTo MHEG-5 elementary action
// The index parameter value shall be within the range [0, number of elements in
// the group]
     public void moveTo(
       short index)
       throws MhegException;

// Correspond to the GetTokenPosition MHEG-5 elementary action
     public Integer getTokenPosition()
       throws MhegException;

}
// -------------------------------------------------------------------------------
public class □□□□□□□□□□ extends Presentable implements TokenManager
{
/* Constructors */

     protected TokenGroup();

/* Methods */

// Correspond to the implementation of the TokenManager.move method
     public void move(
       short movementId)
       throws MhegException;

// Correspond to the implementation of the TokenManager.moveTo method
// The index parameter value shall be within the range [0, number of elements in
// the group]
     public void moveTo(
       short index)
       throws MhegException;

// Correspond to the implementation of the TokenManager.getTokenPosition method
     public Integer getTokenPosition()
       throws MhegException;

// Correspond to the CallActionSlot MHEG-5 elementary action
// The index parameter value shall be within the range [0, number of elements in
// the group]
     public void callActionSlot(
       short index)
       throws MhegException;

}
// -------------------------------------------------------------------------------
public class □□□□□□□□□ extends TokenGroup
{
/* Constructors */

     protected ListGroup();

/* Methods */

// Correspond to the AddItem MHEG-5 elementary action
     public void addItem(
       short itemIndex,
       ObjectReference visibleReference)
       throws MhegException;

// Correspond to the DelItem MHEG-5 elementary action
     public void delItem(
       ObjectReference visibleReference)
       throws MhegException;
```

```
// Correspond to the GetListItem MHEG-5 elementary action
     public ObjectReference getListItem(
       short itemIndex)
       throws MhegException;

// Correspond to the GetCellItem MHEG-5 elementary action
     public ObjectReference getCellItem(
       short cellIndex)
       throws MhegException;

// Correspond to the GetItemStatus MHEG-5 elementary action
     public Boolean getItemStatus(
       short itemIndex)
       throws MhegException;

// Correspond to the SelectItem MHEG-5 elementary action
     public void selectItem(
       short itemIndex)
       throws MhegException;

// Correspond to the DeselectItem MHEG-5 elementary action
     public void deselectItem(
       short itemIndex)
       throws MhegException;

// Correspond to the ToggleItem MHEG-5 elementary action
     public void toggleItem(
       short itemIndex)
       throws MhegException;

// Correspond to the ScrollItems MHEG-5 elementary action
     public void scrollItems(
       short itemsToScroll)
       throws MhegException;

// Correspond to the SetFirstItem MHEG-5 elementary action
     public void setFirstItem(
       short itemIndex)
       throws MhegException;

// Correspond to the getFirstItem MHEG-5 elementary action
     public Integer getFirstItem()
       throws MhegException;

// Correspond to the getListSize MHEG-5 elementary action
     public Integer getListSize()
       throws MhegException;

}
// -----------------------------------------------------------------------------
abstract public class □□□□□□□ extends Presentable
{
/* Constructors */

     protected Visible();

/* Methods */

// Correspond to the SetPosition MHEG-5 elementary action
     public void setPosition(
       short xPosition,
       short yPosition)
       throws MhegException;

// Correspond to the GetPosition MHEG-5 elementary action
     public void getPosition(
       Integer xPosition,
       Integer yPosition)
       throws MhegException;
```

```
// Correspond to the SetBoxSize MHEG-5 elementary action
// The xBoxSize and yBoxSize parameter values shall be positive and different
// from zero
     public void setBoxSize(
       short xBoxSize,
       short yBoxSize)
       throws MhegException;

// Correspond to the GetBoxSize MHEG-5 elementary action
     public void getBoxSize(
       Integer xBoxSize,
       Integer yBoxSize)
       throws MhegException;

// Correspond to the BringToFront MHEG-5 elementary action
     public void bringToFront()
       throws MhegException;

// Correspond to the SendToBack MHEG-5 elementary action
     public void sendToBack()
       throws MhegException;

// Correspond to the PutBefore MHEG-5 elementary action
     public void putBefore(
       ObjectReference visibleReference)
       throws MhegException;

// Correspond to the PutBehind MHEG-5 elementary action
     public void putBehind(
       ObjectReference visibleReference)
       throws MhegException;

// Correspond to the SetPaletteRef MHEG-5 elementary action
     public void setPaletteRef(
       ObjectReference paletteReference)
       throws MhegException;

// Retrieve the value of the PaletteRef attribute
     public ObjectReference getPaletteRef()
       throws MhegException;

}
// --------------------------------------------------------------------------------
public class □□□□□□ extends Visible
{
/* Constructors */

     protected Bitmap();

/* Methods */

// Correspond to the ScaleBitmap MHEG-5 elementary action
// The xScale and yScale parameter values shall be positive and different from
// zero
     public void scaleBitmap(
       short xScale,
       short yScale)
       throws MhegException;

// Correspond to the SetTransparency MHEG-5 elementary action
// The transparency parameter value shall be within the range [0,100]
     public void setTransparency(
       byte transparency)
       throws MhegException;
// Retrieve the value of the Transparency attribute
     public Integer getTransparency()
       throws MhegException;

}
// --------------------------------------------------------------------------------
public class □□□□□□□ extends Visible
{
```

```
/* Constructors */

     protected LineArt();

/* Methods */

// Correspond to the SetLineWidth MHEG-5 elementary action
// The lineWidth parameter value shall be positive and different from zero
     public void setLineWidth(
       byte lineWidth)
       throws MhegException;

// Correspond to the SetLineStyle MHEG-5 elementary action
// The lineStyle parameter value shall be 1 for solid, 2 for dashed, 3 for dotted
     public void setLineStyle(
       byte lineStyle)
       throws MhegException;

// Correspond to the SetLineColour MHEG-5 elementary action
     public void setLineColour(
       byte colourIndex)
       throws MhegException;
     public void setLineColour(
       byte[] absoluteColour)
       throws MhegException;

// Correspond to the SetFillColour MHEG-5 elementary action
// When neither a colour index nor an absolute colour is specified, the fill-in
// colour shall be set to transparent
     public void setFillColour()
       throws MhegException;
     public void setFillColour(
       byte colourIndex)
       throws MhegException;
     public void setFillColour(
       byte[] absoluteColour)
       throws MhegException;

}
// ------------------------------------------------------------------------------
public class □□□□□□□□□ extends LineArt
{
/* Constructors */

     protected Rectangle();

}
// ------------------------------------------------------------------------------
public class □□□□□□□□□□□□□□ extends LineArt
{
/* Constructors */

     protected DynamicLineArt();

/* Methods */

// Correspond to the GetLineWidth MHEG-5 elementary action
     public Integer getLineWidth()
       throws MhegException;

// Correspond to the GetLineStyle MHEG-5 elementary action
     public Integer getLineStyle()
       throws MhegException;

// Correspond to the GetLineColour MHEG-5 elementary action
// The returned value shall be of one of the following types: Integer (in which
// case it represents an index) or byte[] (in which case it represents the
// absolute colour)
     public Object getLineColour()
       throws MhegException;
```

```
// Correspond to the GetFillColour MHEG-5 elementary action
// The returned value shall be of one of the following types: Integer (in which
// case it represents an index) or byte[] (in which case it represents the
// absolute colour); a returned null object reference indicates no fill-in colour
// (transparent)
     public Object getFillColour()
       throws MhegException;

// Correspond to the DrawArc MHEG-5 elementary action
     public void drawArc(
       short x,
       short y,
       short ellipseWidth,
       short ellipseHeight,
       short startAngle,
       short arcAngle)
       throws MhegException;

// Correspond to the DrawSector MHEG-5 elementary action
     public void drawSector(
       short x,
       short y,
       short ellipseWidth,
       short ellipseHeight,
       short startAngle,
       short arcAngle)
       throws MhegException;

// Correspond to the DrawLine MHEG-5 elementary action
     public void drawLine(
       short x1,
       short y1,
       short x2,
       short y2)
       throws MhegException;

// Correspond to the DrawOval MHEG-5 elementary action
     public void drawOval(
       short x,
       short y,
       short ellipseWidth,
       short ellipseHeight)
       throws MhegException;

// Correspond to the DrawPolygon MHEG-5 elementary action
     public void drawPolygon(
       short[][] pointList)
       throws MhegException;

// Correspond to the DrawPolyline MHEG-5 elementary action
     public void drawPolyline(
       short[][] pointList)
       throws MhegException;

// Correspond to the DrawRectangle MHEG-5 elementary action
     public void drawRectangle(
       short x1,
       short y1,
       short x2,
       short y2)
       throws MhegException;

// Correspond to the Clear MHEG-5 elementary action
     public void clear()
       throws MhegException;

}

// -----------------------------------------------------------------------------
public class □□□□ extends Visible
{
```

```
/* Constructors */

     protected Text();

/* Methods */

// Correspond to the GetTextContent MHEG-5 elementary action
// The returned value shall be of one of the following types: ContentReference
// (in which case it represents a reference to the content) or byte[] (in which
// case it represents the actual content)
     public Object getTextContent()
       throws MhegException;

// Correspond to the GetTextData MHEG-5 elementary action
     public byte[] getTextData()
       throws MhegException;

// Correspond to the SetFontRef MHEG-5 elementary action
     public void setFontRef(
       byte[] fontName)
       throws MhegException;
     public void setFontRef(
       ObjectReference fontReference)
       throws MhegException;

// Retrieve the value of the Font attribute
// The returned value shall be of one of the following types: ObjectReference (in
// which case it represents a reference to an MHEG-5 Font object) or byte[] (in
// which case it represents a resident font name); a returned null object
// reference indicates the default font
     public Object getFontRef()
       throws MhegException;

}

// ---------------------------------------------------------------------------------
public class □□□□□□ extends Presentable
{

/* Constructors */

     protected Stream();

/* Methods */

// Correspond to the SetCounterTrigger MHEG-5 elementary action
// When the counter value is not specified, the targetted trigger shall be
// removed
     public void setCounterTrigger(
       short triggerIdentifier)
       throws MhegException;
     public void setCounterTrigger(
       short triggerIdentifier,
       byte counterValue)
       throws MhegException;

// Retrieve the value of the CounterPosition field of the trigger whose
// identification is triggerIdentifier in the CounterTriggers attribute; a
// returned null object reference indicates that the targetted trigger does not
// exist
     public Integer getCounterTrigger(
       short triggerIdentifier)
       throws MhegException;

// Correspond to the SetSpeed MHEG-5 elementary action
     public void setSpeed(
       byte nominator)
       throws MhegException;
     public void setSpeed(
       byte nominator,
       byte denominator)
       throws MhegException;
```

```
// Retrieve the value of the Speed attribute
     public void getSpeed(
       Integer nominator,
       Integer denominator)
       throws MhegException;

// Correspond to the SetCounterPosition MHEG-5 elementary action
     public void setCounterPosition(
       short counterPosition)
       throws MhegException;

// Retrieve the value of the CounterPosition attribute
     public Integer getCounterPosition()
       throws MhegException;

// Correspond to the SetCounterEndPosition MHEG-5 elementary action
     public void setCounterEndPosition(
       short counterEndPosition)
       throws MhegException;

// Retrieve the value of the CounterEndPosition attribute
     public Integer getCounterEndPosition()
       throws MhegException;

}
// --------------------------------------------------------------------------------
public class □□□□□ extends Presentable
{
/* Constructors */

     protected Audio();

/* Methods */

// Correspond to the SetVolume MHEG-5 elementary action
     public void setVolume(
       byte volume)
       throws MhegException;

// Correspond to the GetVolume MHEG-5 elementary action
     public Integer getVolume()
       throws MhegException;

}
// --------------------------------------------------------------------------------
public class □□□□□ extends Visible
{
/* Constructors */

     protected Video();

/* Methods */

// Correspond to the ScaleVideo MHEG-5 elementary action
// The xScale and yScale parameter values shall be positive and different from
// zero
     public void scaleVideo(
       short xScale,
       short yScale)
       throws MhegException;

}


// --------------------------------------------------------------------------------
public class □□□□□□□□□□ extends Visible
{
/* Constructors */

     protected RTGraphics();

}
```

```
// ----------------------------------------------------------------------------
public interface □□□□□□□□□□□□
{
/* Methods */
// Correspond to the SetInteractionStatus MHEG-5 elementary action
     public void setInteractionStatus(
       boolean interactionStatus)
       throws MhegException;
// Correspond to the GetInteractionStatus MHEG-5 elementary action
     public Boolean getInteractionStatus()
       throws MhegException;
// Correspond to the SetHighlightStatus MHEG-5 elementary action
     public void setHighlightStatus(
       boolean highlightStatus)
       throws MhegException;
// Correspond to the GetHighlightStatus MHEG-5 elementary action
     public Boolean getHighlightStatus()
       throws MhegException;
}
// ----------------------------------------------------------------------------
public class □□□□□□ extends Visible implements Interactible
{
/* Constructors */
     protected Slider();
/* Methods */
// Correspond to the implementation of the Interactible.setInteractionStatus
// method
     public void setInteractionStatus(
       boolean interactionStatus)
       throws MhegException;
// Correspond to the implementation of the Interactible.getInteractionStatus
// method
     public Boolean getInteractionStatus()
       throws MhegException;
// Correspond to the implementation of the Interactible.setHighlightStatus method
     public void setHighlightStatus(
       boolean highlightStatus)
       throws MhegException;
// Correspond to the implementation of the Interactible.getHighlightStatus method
     public Boolean getHighlightStatus()
       throws MhegException;
// Correspond to the Step MHEG-5 elementary action
     public void step(
       byte nbOfSteps)
       throws MhegException;
// Correspond to the SetSliderValue MHEG-5 elementary action
     public void setSliderValue(
       byte sliderValue)
       throws MhegException;
// Correspond to the GetSliderValue MHEG-5 elementary action
     public Integer getSliderValue()
       throws MhegException;
// Correspond to the SetPortion MHEG-5 elementary action
     public void setPortion(
       byte portion)
       throws MhegException;
```

```
// Correspond to the GetPortion MHEG-5 elementary action
     public Integer getPortion()
       throws MhegException;

}
// ---------------------------------------------------------------------------------
public class □□□□□□□□□□ extends Text implements Interactible
{
/* Constructors */

     protected EntryField();

/* Methods */

// Correspond to the implementation of the Interactible.setInteractionStatus
// method
     public void setInteractionStatus(
       boolean interactionStatus)
       throws MhegException;

// Correspond to the implementation of the Interactible.getInteractionStatus
// method
     public Boolean getInteractionStatus()
       throws MhegException;

// Correspond to the implementation of the Interactible.setHighlightStatus method
     public void setHighlightStatus(
       boolean highlightStatus)
       throws MhegException;

// Correspond to the implementation of the Interactible.getHighlightStatus method
     public Boolean getHighlightStatus()
       throws MhegException;

// Correspond to the SetOverwriteMode MHEG-5 elementary action
     public void setOverwriteMode(
       boolean overwriteMode)
       throws MhegException;

// Correspond to the GetOverwriteMode MHEG-5 elementary action
     public Boolean getOverwriteMode()
       throws MhegException;

// Correspond to the SetEntryPoint MHEG-5 elementary action
// The entryPoint parameter value shall be positive or equal to zero
     public void setEntryPoint(
       byte entryPoint)
       throws MhegException;

// Correspond to the GetEntryPoint MHEG-5 elementary action
     public Integer getEntryPoint()
       throws MhegException;

}
// ---------------------------------------------------------------------------------
public class □□□□□□□□□ extends Text implements Interactible
{
/* Constructors */

     protected HyperText();

/* Methods */

// Correspond to the implementation of the Interactible.setInteractionStatus
method
     public void setInteractionStatus(
       boolean interactionStatus)
       throws MhegException;

// Correspond to the implementation of the Interactible.getInteractionStatus
// method
     public Boolean getInteractionStatus()
       throws MhegException;
```

```
// Correspond to the implementation of the Interactible.setHighlightStatus method
     public void setHighlightStatus(
       boolean highlightStatus)
       throws MhegException;

// Correspond to the implementation of the Interactible.getHighlightStatus method
     public Boolean getHighlightStatus()
       throws MhegException;

// Correspond to the GetLastAnchorFired MHEG-5 elementary action
     public byte[] getLastAnchorFired()
       throws MhegException;
}
// ------------------------------------------------------------------------------
abstract public class □□□□□□ extends Visible implements Interactible
{
/* Constructors */

     protected Button();

/* Methods */

// Correspond to the implementation of the Interactible.setInteractionStatus
// method
     public void setInteractionStatus(
       boolean interactionStatus)
       throws MhegException;

// Correspond to the implementation of the Interactible.getInteractionStatus
// method
     public Boolean getInteractionStatus()
       throws MhegException;

// Correspond to the implementation of the Interactible.setHighlightStatus method
     public void setHighlightStatus(
       boolean highlightStatus)
       throws MhegException;

// Correspond to the implementation of the Interactible.getHighlightStatus method
     public Boolean getHighlightStatus()
       throws MhegException;

// Correspond to the Select MHEG-5 elementary action
     public void select()
       throws MhegException;

// Correspond to the Deselect MHEG-5 elementary action
     public void deselect()
       throws MhegException;

}
// ------------------------------------------------------------------------------
public class □□□□□□□ extends Button
{
/* Constructors */

     protected Hotspot();

}
// ------------------------------------------------------------------------------
public class □□□□□□□□□□ extends Button
{
/* Constructors */

     protected PushButton();

/* Methods */

// Correspond to the SetLabel MHEG-5 elementary action
     public void setLabel(
       byte[] label)
       throws MhegException;
```

```
// Correspond to the GetLabel MHEG-5 elementary action
     public byte[] getLabel()
       throws MhegException;

}
// -----------------------------------------------------------------------------
public class □□□□□□□□□□□□ extends PushButton
{


/* Constructors */

     protected SwitchButton();

/* Methods */

// Correspond to the GetSelectionStatus MHEG-5 elementary action
     public Boolean getSelectionStatus()
       throws MhegException;

// Correspond to the Toggle MHEG-5 elementary action
     public void toggle()
       throws MhegException;

}
```

6 Map between MHEG-5 elementary actions and MHEG-5 API operations

The following Table 1 describes how the MHEG-5 API maps MHEG-5 classes to Java classes and interfaces, and MHEG-5 elementary actions to Java methods. Table 1 is not normative.

Table 1/T.175 – Map between MHEG-5 elementary actions and MHEG-5 API operations

MHEG-5 class	MHEG-5 elementary action	API operation (overloads)	API interface or class
Root		getObject	Root (abstract class)
	GetAvailabilityStatus	getAvailabilityStatus	
	GetRunningStatus	getRunningStatus	
Group	SetCachePriority	setCachePriority	Group (abstract class)
		getCachePriority	
Application	StorePersistent		Application (class)
	ReadPersistent		
	Launch		
	Spawn		
	Quit		
	LockScreen	lockScreen	
	UnlockScreen	unlockScreen	
		getLockCount	
	OpenConnection		
	CloseConnection		
	GetEngineSupport	getEngineSupport	

Table 1/T.175 – Map between MHEG-5 elementary actions and MHEG-5 API operations *(continued)*

MHEG-5 class	MHEG-5 elementary action	API operation (overloads)	API interface or class
Scene	TransitionTo	transitionTo (4)	Scene (class)
	SetTimer	setTimer (3)	
		getTimer	
	SendEvent	sendEvent (4)	
	SetCursorShape	setCursorShape (2)	
		getCursorShape	
	SetCursorPosition	setCursorPosition	
	GetCursorPosition	getCursorPosition	
Ingredient	SetData	setData (5)	Ingredient (abstract class)
		getData	
	Clone	clone	
	Preload	preload	
	Unload	unload	
Link	Activate	activate	Link (class)
	Deactivate	deactivate	
Program	Call	call	Program (abstract class)
	Fork	fork	
	Stop	stop	
ResidentProgram			ResidentProgram (class)
RemoteProgram			RemoteProgram (class)
InterchangedProgram			InterchangedProgram (class)
Palette			Palette (class)
Font			Font (class)
CursorShape			CursorShape (class)
Variable	SetVariable		Variable (abstract class)
	TestVariable		
BooleanVariable		setVariable	BooleanVariable (class)
		getVariable	

Table 1/T.175 – Map between MHEG-5 elementary actions and MHEG-5 API operations *(continued)*

MHEG-5 class	MHEG-5 elementary action	API operation (overloads)	API interface or class
IntegerVariable		setVariable	IntegerVariable (class)
		getVariable	
	Add	add	
	Subtract	subtract	
	Multiply	multiply	
	Divide	divide	
	Modulo	modulo	
OctetStringVariable		setVariable	OctetStringVariable (class)
		getVariable	
	Append	append	
ObjectRefVariable		setVariable	ObjectRefVariable (class)
		getVariable	
ContentRefVariable		setVariable	ContentRefVariable (class)
		getVariable	
Presentable	Run	run	Presentable (abstract class)
	Stop	stop	
TokenManager	Move	move	TokenManager (interface)
	MoveTo	moveTo	
	GetTokenPosition	getTokenPosition	
TokenGroup	CallActionSlot	callActionSlot	TokenGroup (class)
ListGroup	AddItem	addItem	TemplateGroup (class)
	DelItem	delItem	
	GetListItem	getListItem	
	GetCellItem	getCellItem	
	GetItemStatus	getItemStatus	
	SelectItem	selectItem	
	DeselectItem	deselectItem	
	ToggleItem	toggleItem	
	ScrollItems	scrollItems	
	SetFirstItem	setFirstItem	
	GetFirstItem	getFirstItem	
	GetListSize	getListSize	

Table 1/T.175 – Map between MHEG-5 elementary actions and MHEG-5 API operations *(continued)*

MHEG-5 class	MHEG-5 elementary action	API operation (overloads)	API interface or class
Visible	SetPosition	setPosition	Visible (abstract class)
	GetPosition	getPosition	
	SetBoxSize	setBoxSize	
	GetBoxSize	getBoxSize	
	BringToFront	bringToFront	
	SendToBack	sendToBack	
	PutBefore	putBefore	
	PutBehind	putBehind	
	SetPaletteRef	setPaletteRef	
		getPaletteRef	
Bitmap	ScaleBitmap	scaleBitmap	Bitmap (class)
	SetTransparency	setTransparency	
		getTransparency	
LineArt	SetLineWidth	setLineWidth	LineArt (class)
	SetLineStyle	setLineStyle	
	SetLineColour	setLineColour (2)	
	SetFillColour	setFillColour (3)	
Rectangle			Rectangle (class)
DynamicLineArt	GetLineWidth	getLineWidth	DynamicLineArt (class)
	GetLineStyle	getLineStyle	
	GetLineColour	getLineColour	
	GetFillColour	getFillColour	
	DrawArc	drawArc	
	DrawSector	drawSector	
	DrawLine	drawLine	
	DrawOval	drawOval	
	DrawPolygon	drawPolygon	
	DrawPolyline	drawPolyline	
	DrawRectangle	drawRectangle	
	Clear	clear	
Text	GetTextContent	getTextContent	Text (class)
	GetTextData	getTextData	
	SetFontRef	setFontRef (2)	
		getFontRef	

Table 1/T.175 – Map between MHEG-5 elementary actions and MHEG-5 API operations *(concluded)*

MHEG-5 class	MHEG-5 elementary action	API operation (overloads)	API interface or class
Stream	SetCounterTrigger	setCounterTrigger (2)	Stream (class)
		getCounterTrigger	
	SetSpeed	setSpeed (2)	
		getSpeed	
	SetCounterPosition	setCounterPosition	
		getCounterPosition	
	SetCounterEndPosition	setCounterEndPosition	
		getCounterEndPosition	
Audio	SetVolume	setVolume	Audio (class)
	GetVolume	getVolume	
Video	ScaleVideo	scaleVideo	Video (class)
RTGraphics			RTGraphics (class)
Interactible	SetInteractionStatus	setInteractionStatus	Interactible (interface)
	GetInteractionStatus	getInteractionStatus	
	SetHighlightStatus	setHighlightStatus	
	GetHighlightStatus	getHighlightStatus	
Slider	Step	step	Slider (class)
	SetSliderValue	setSliderValue	
	GetSliderValue	getSliderValue	
	SetPortion	setPortion	
	GetPortion	getPortion	
EntryField	SetOverwriteMode	setOverwriteMode	EntryField (class)
	GetOverwriteMode	getOverwriteMode	
	SetEntryPoint	setEntryPoint	
	GetEntryPoint	getEntryPoint	
HyperText	GetLastAnchorFired	getLastAnchorFired	HyperText (class)
Button	Select	select	Button (abstract class)
	Deselect	deselect	
Hotspot			Hotspot (class)
PushButton	SetLabel	setLabel	PushButton (class)
	GetLabel	getLabel	
SwitchButton	GetSelectionStatus	getSelectionStatus	SwitchButton (class)
	Toggle	toggle	

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