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| **Recommendation ITU-R BT.1722-2**  **(03/2011)** |
| **Harmonization of the instruction set for the execution engine for interactive TV applications** |
| **BT Series**  **Broadcasting service**  **(television)** |

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU‑T/ITU‑R/ISO/IEC and the ITU-R patent information database can also be found.

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| Series of ITU-R Recommendations  (Also available online at <http://www.itu.int/publ/R-REC/en>) | |
| **Series** | Title |
| **BO** | Satellite delivery |
| **BR** | Recording for production, archival and play-out; film for television |
| **BS** | Broadcasting service (sound) |
| BT | Broadcasting service (television) |
| **F** | Fixed service |
| **M** | Mobile, radiodetermination, amateur and related satellite services |
| **P** | Radiowave propagation |
| **RA** | Radio astronomy |
| **RS** | Remote sensing systems |
| **S** | Fixed-satellite service |
| **SA** | Space applications and meteorology |
| **SF** | Frequency sharing and coordination between fixed-satellite and fixed service systems |
| **SM** | Spectrum management |
| **SNG** | Satellite news gathering |
| **TF** | Time signals and frequency standards emissions |
| **V** | Vocabulary and related subjects |

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| ***Note***: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.* |

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RECOMMENDATION ITU-R BT.1722-2

Harmonization of the instruction set for the execution engine  
for interactive TV applications

(Question ITU-R 131/6)

(2005-2007-2011)

Scope

This Recommendation is intended to harmonize the application environment for interactive TV applications. The potential for commonality in the executable application environment is based on the analysis of the common core identified in the work leading to this Recommendation. Such commonality would benefit content providers through knowledge of commonly adopted executable functionality and economies of scale.

The ITU Radiocommunication Assembly,

considering

a) the need to avoid proliferation of protocols for interactive multimedia services;

b) that digital broadcasting services (satellite, terrestrial and cable) are becoming widely available and offer multimedia applications;

c) that multimedia applications comprising video, audio, still-picture, text, graphics, etc. associated with interactive features have been developed;

d) that multimedia applications planned or deployed in some Regions are using the executable application environment;

e) that common instruction sets are desirable for production and international exchange of multimedia content;

f) that continuous work and review of Application Programming Interfaces (APIs) is being carried out in the ITU-R and ITU-T Sectors;

g) that Recommendation ITU-T J.200 defines the high-level architecture for a harmonized set of interactive instruction sets and APIs and identifies the structure of application environment comprising the executable application environment and the declarative application environment for digital television services;

h) that Recommendation ITU-T J.202 defines the executable application environment within Recommendation ITU-T J.200 and is the corresponding Recommendation to Recommendation ITU-R BT.1722,

recommends

**1** that the harmonized instruction set for the execution engines specified in Annex 1 should be used for interactive TV applications in the executable application environment.

Annex 1  
  
Harmonization of the instruction set for the execution engine  
for interactive TV applications

# 1 Introduction

This annex specifies the common core APIs consisting of those described in Table 1. Tables 2 and 3 describe additional broadcast extension APIs to Table 1 to conform to either ETSI TS 102 543 V1.1.1 for the purpose of harmonization among specifications derived from ETSI TS 102 543 V1.1.1, or JavaDTV specification which is the core of GINGA-J and functionally equivalent to ETSI TS 102 543.

# 2 References

## 2.1 Normative references

The following texts contain provisions which, through reference in this text, constitute provisions of the present Recommendation.

– Recommendation ITU-T J.200 (2010), Worldwide common core – Application environment for digital interactive television services.

– ETSI TS 102 728 V1.1.1 (2010-01), Digital Video Broadcasting (DVB) Globally Executable MHP (GEM) Specification 1.2.2,

<http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=31422>.

– ABNT NBR 15606-6, Digital terrestrial television – *Data coding and transmission specification for digital broadcasting – Part 6:* *JavaDTV 1.3**.*

## 2.2 Informative references

– ETSI TS 101 812 V1.3.1, *Digital Video Broadcasting Multimedia Home Platform (MHP) version 1.0.3.*

<http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=25178>.

– ETSI TS 102 727 V1.1.1, *Digital Video Broadcasting Multimedia Home Platform (MHP) version 1.2.2.*

<http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=31420>.

– ETSI TS 102 812 v1.2.2, *Digital Video Broadcasting (DVB); Multimedia Home Platform (MHP) Specification 1.1.1.*

<http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=25177>.

– SCTE 90-1 2004, *OCAP 1.0 Profile.*

<http://www.scte.org/documents/pdf/ANSISCTE9012004.pdf>.

– OC-SP-OCAP1.1.2-090930, OCAP 1.1 Profile.

<http://www.cablelabs.com/specifications/OC-SP-OCAP1.1.2-090930.pdf>.

– ARIB STD-B24 V5.4 (2009), *Data Coding and Transmission Specification for Digital Broadcasting (in Japanese).*

[http://www.arib.or.jp/english/html/overview/archives/br.html](file:///E:\private\var\folders\0Q\0QY9SIoiHv8W6GsTULlJWE+++TI\-Tmp-\com.apple.mail\Library\Library\Mail%20Downloads\J202E.w11).

– ARIB STD-B23 V1.2 (2009), *Application Execution Engine Platform for Digital Broadcasting (in Japanese).*

[http://www.arib.or.jp/english/html/overview/archives/br.html](file:///E:\private\var\folders\0Q\0QY9SIoiHv8W6GsTULlJWE+++TI\-Tmp-\com.apple.mail\Library\Library\Mail%20Downloads\J202E.w11).

– ATSC A/101 (2 August 2005), *Advanced Common Application Platform (ACAP).*

<http://www.atsc.org/standards/a_101.pdf>.

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

<http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=26876&ICS1=35&ICS2=40&ICS3=>.

– ETSI ES 202 184, *MHEG-5 Broadcast Profile*.

<http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=16127>.

– ETSI TS 102 812 V1.2.1 Digital Video Broadcasting (DVB); Multimedia Home Platform (MHP) Specification 1.1.1.

<http://webapp.etsi.org/workprogram/Report_WorkItem.asp?WKI_ID=18801>.

– ABNT NBR 15606-4, *Digital terrestrial television – Data coding and transmission specification for digital broadcasting – Part 4: Ginga-J Environment for execution of procedural applications.*

NOTE 1 – At the time of publication, the editions of normative references indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed above.

# 3 Common platform definitions for interactive TV using executable applications

The recommended platform definitions for interactive TV consist of the common core in Table 1 which is derived from the commonality in ARIB STD-B23, MHP 1.2, ACAP, OCAP 1.0 and GINGA-J.

TABLE 1

Common core APIs

|  |
| --- |
| java.awt |
| java.awt.event |
| java.awt.image |
| java.beans |
| java.io |
| java.lang |
| \*java.lang.reflect |
| \*java.math |
| java.net |
| java.rmi |
| java.security |
| java.security.cert |
| java.security.spec |

TABLE 1 (*end*)

|  |
| --- |
| java.util |
| java.util.zip |
| javax.media |
| javax.media.protocol |
| javax.net |
| javax.net.ssl |
| javax.security.cert |
| javax.tv.graphics |
| javax.tv.locator |
| javax.tv.media |
| javax.tv.net |
| javax.tv.service |
| javax.tv.service.guide |
| javax.tv.service.navigation |
| javax.tv.service.selection |
| javax.tv.service.transport |
| javax.tv.util |
| \*java.awt.color |
| \*java.awt.font |
| \*java.awt.im |
| \*java.rmi.registry |
| \*java.security.acl |
| \*java.security.interfaces |
| \*java.text |
| \*java.util.jar |
| \*javax.microedition.io |
| \*javax.microedition.pki |
| \*javax.microedition.xlet |
| \*javax.microedition.xlet.ixc |
| \*javax.microedition.x500 |
| NOTE 1 – Packages with symbol \* require careful consideration of compatibility with systems based on older versions of this Recommendation. See normative references. |

# 4 Broadcast extension APIs

Broadcast extension APIs are additional APIs to the common core APIs defined in Table 1, which should be normatively used. APIs which are intended to provide harmonization among standards derived from ETSI TS 102 728 V1.1.1 are described in clause 4.1. APIs for those functionalities derived from ABNT NBR 15606-6 are described in clause 4.2.

## 4.1 Additional APIs to conform to Globally Executable MHP

In this section, additional APIs to the common core in Table 1 are defined, which are intended to provide harmonization among standards derived from ETSI TS 102 728 V1.1.1. The standards are MHP 1.0.3, MHP 1.1, MHP 1.2.2, OCAP 1.0, OCAP 1.1, ACAP, and ARIB STD-B23 1.2. These additional APIs should be used in conjunction with common core APIs.

NOTE 1 – ETSI TS 102 728 V1.1.1 covers broadcast, packaged media and IPTV targets. In this Recommendation, only broadcast target should be considered.

TABLE 2

Additional APIs to conform to ETSI TS 102 728 V1.1.1

|  |
| --- |
| org.davic.media |
| org.davic.resources |
| org.davic.mpeg |
| org.davic.mpeg.sections |
| org.davic.net |
| org.davic.net.tuning |
| org.dvb.application |
| org.dvb.dsmcc |
| org.dvb.event |
| org.dvb.io.ixc |
| org.dvb.io.persistent |
| org.dvb.lang |
| org.dvb.media |
| org.dvb.net |
| org.dvb.net.tuning |
| org.dvb.net.rc |
| org.dvb.test |
| org.dvb.ui |
| org.dvb.user |
| org.havi.ui |
| org.havi.ui.event |

## 4.2 Additional APIs to conform to JavaDTV specification

In this section, additional APIs to the common core defined in Table 1 are defined, which are intended to conform to ABNT NBR 15606-6 and are functionally equivalent to ETSI TS 102 728 V1.1.1.

TABLE 3

Additional APIs to conform to JavaDTV specification

|  |
| --- |
| com.sun.dtv.application |
| com.sun.dtv.broadcast |
| com.sun.dtv.broadcast.event |
| com.sun.dtv.filtering |
| com.sun.dtv.io |
| com.sun.dtv.locator |
| com.sun.dtv.lwuit |
| com.sun.dtv.lwuit.animations |
| com.sun.dtv.lwuit.events |
| com.sun.dtv.lwuit.geom |
| com.sun.dtv.lwuit.layouts |
| com.sun.dtv.lwuit.list |
| com.sun.dtv.lwuit.painter |
| com.sun.dtv.lwuit.plaf |
| com.sun.dtv.lwuit.util |
| com.sun.dtv.media |
| com.sun.dtv.media.audio |
| com.sun.dtv.media.control |
| com.sun.dtv.media.dripfeed |
| com.sun.dtv.media.format |
| com.sun.dtv.media.language |
| com.sun.dtv.media.text |
| com.sun.dtv.media.timeline |
| com.sun.dtv.net |
| com.sun.dtv.platform |
| com.sun.dtv.resources |
| com.sun.dtv.security |
| com.sun.dtv.service |
| com.sun.dtv.smartcard |
| com.sun.dtv.test |
| com.sun.dtv.transport |
| com.sun.dtv.tuner |
| com.sun.dtv.ui |
| com.sun.dtv.ui.event |

# 5 System specific APIs

In the appendices, the system-specific APIs are given to supplement the common core where appropriate and for possible future use.

Appendix I  
(Informative)  
  
Specific additional APIs common to MHP 1.0.3,  
MHP 1.1.1 and MHP 1.2

|  |
| --- |
| org.davic.mpeg.dvb |
| org.davic.net.ca |
| org.dvb.net.ca |
| org.dvb.si |

Appendix II  
(Informative)  
  
Specific additional APIs common  
to OCAP 1.0 and OCAP 1.1

|  |
| --- |
| org.ocap |
| org.ocap.application |
| org.ocap.event |
| org.ocap.hardware |
| org.ocap.hardware.pod |
| org.ocap.media |
| org.ocap.mpeg |
| org.ocap.net |
| org.ocap.resource |
| org.ocap.service |
| org.ocap.si |
| org.ocap.system |
| org.ocap.ui.event |
| org.ocap.storage |
| org.ocap.system.event |
| org.ocap.test |
| org.ocap.ui |

Appendix III  
(Informative)  
  
OCAP 1.1 specific additional APIs

|  |
| --- |
| org.ocap.diagnositics |
| org.ocap.environment |

Appendix IV  
(Informative)  
  
ARIB STD-B23 specific additional APIs

|  |
| --- |
| jp.or.arib.tv.media |
| jp.or.arib.tv.net |
| jp.or.arib.tv.si |
| jp.or.arib.tv.ui |
| org.davic.net.ca |
| jp.or.arib.tv.peripheral |
| jp.or.arib.tv.peripheral.devices |
| jp.or.arib.tv.peripheral.protocol |
| jp.or.arib.tv.peripheral.stream |
| jp.or.arib.tv.io |
| jp.or.arib.tv.service.selection |
| org.ocap.shared.dvr |
| org.ocap.shared.dvr.navigation |
| org.ocap.shared.media |

Appendix V  
(Informative)  
  
MHP 1.2 specific additional APIs

|  |
| --- |
| org.dvb.application.inner |
| org.dvb.application.privileged |
| org.dvb.application.plugins |
| org.dvb.application.storage |
| org.dvb.auth.callback |
| org.dvb.dom.bootstrap |
| org.dvb.dom.css |
| org.dvb.dom.dvbhtml |
| org.dvb.dom.environment |
| org.dvb.dom.event |
| org.dvb.dom.inner |
| org.dvb.internet |
| org.dvb.smartcard |
| org.dvb.spi |
| org.dvb.tvanytime |
| org.dvb.xml |
| org.w3c.dom |
| org.w3c.dom.events |
| org.w3c.dom.views |

Appendix VI  
(Informative)  
  
ACAP specific additional APIs

|  |
| --- |
| org.atsc.dom |
| org.atsc.dom.environment |
| org.atsc.dom.events |
| org.atsc.dom.events |
| org.atsc.dom.html |
| org.atsc.dom.views |
| org.atsc.si |
| org.ocap.media |
| org.ocap.net |
| org.ocap.si |
| org.ocap.ui.event |
| org.ocap.application |
| org.ocap.event |
| org.ocap.service |
| org.ocap.system |
| org.ocap.hardware.pod |
| org.w3c.dom |
| org.w3c.dom.css |
| org.w3c.dom.events |
| org.w3c.dom.html2 |
| org.w3c.dom.views |

Appendix VII  
(Informative)  
  
Ginga-J specific additional APIs

|  |
| --- |
| br.org.sbtvd.bridge |
| br.org.sbtvd.net |
| br.org.sbtvd.net.si |
| br.org.sbtvd.net.tuning |
| br.org.sbtvd.ui |
| com.sun.net.ssl |
| javax.net |
| javax.net.ssl |
| javax.security.cert |
| javax.crypto |
| javax.crypto.interface |
| javax.crypto.spec |
| javax.microedition.apdu |

Appendix VIII  
(Informative)  
  
Migration from MHEG-5 to MHP

The process of migration may be assisted by modification and/or addition to a harmonized specification. By way of example, additional functionalities to migrate from MHEG-5 to DVB‑MHP are given below:

1. Extend the graphics APIs to support drawing lines thicker than 1 pixel for all primitives. This could be implemented by extending the underlying PersonalJava specification or by making DVB-specific extensions.

2. Add 14:9 font support to the DVBTextLayoutManager. If this is not feasible, then it may be possible to use a defensive solution of 16:9 for all display types. This would distort the font (by compressing it horizontally) but would ensure the expected text flow.

However, the logical widths calculated when using this aspect ratio would be different, resulting in the line breaks being inserted at different points in the body of text. More importantly, anything other than very basic formatted text (relying on tabulation) would have a slim chance of being rendered correctly.

3. Add VK\_CANCEL to the set of minimum supported key events.

4. Synchronize the character repertoire to MHEG repertoire specified in ETSI ES 202 184.

5. Provide CI AppMMI extensions; the ability for an interoperable plug-in to register itself as a handler for specific application domains, and the ability to operate a data pipe to the source module.