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2005-05

Triggering messages for broadcast applications –

Part 1: Format



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TRIGGERING MESSAGES FOR BROADCAST APPLICATIONS –**Part 1: Format****FOREWORD**

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International Standard IEC 62297-1 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/910/FDIS	100/949/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 62297 consists of the following parts, under the general title *Triggering messages for broadcast applications*:

Part 1: Format

Part 2: Transport methods

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under <http://webstore.iec.ch> in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Emerging data broadcasting specifications allow a service provider to **trigger** an **application** in a TV receiver. This International Standard specifies the format of a triggering message for TV broadcasting as based on the requirements defined in Annex A. Examples of possible use include displaying information to warn for severe weather conditions or to give rating advice for extreme content in TV programmes. In an interactive system, a message or icon might be displayed inviting on-line access to vote, to register an interest in an advertised product, or to browse programme-related content.

This standard describes a trigger mechanism for teletext transmission methods. The trigger mechanism can also be used for services broadcast via MPEG-2 DSM-CC sections. For the purposes of this standard, a **trigger** is defined as information sent from a service provider as part of a data broadcasting transmission and intended to control an **application** in a TV receiver. Additional information can be supplied along with the basic **trigger** to allow filtering or prioritization techniques to be applied at the receiver. The transmission aspects of trigger messages are specified in IEC 62297-2.

This trigger mechanism is very similar to the one defined in IEC/PAS 62292. The difference lies primarily in different state models, semantics and attribute names.

TRIGGERING MESSAGES FOR BROADCAST APPLICATIONS –

Part 1: Format

1 Scope

This part of IEC 62297 specifies an application-triggering scheme for TV broadcasting information sent from a service provider as part of a data broadcasting transmission and intended to control an **application** in a receiver.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8859-1, *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

ETSI TS 101 231, *Television systems; Register of Country and Network Identification (CNI), Video Programming System (VPS) codes and Application codes for Teletext based systems*

ETSI EN 300 706, *Enhanced Teletext Specification*

3 Terms, definitions and abbreviations

3.1 Definitions

For the purposes of this document, the following terms and definitions, in singular or plural form, apply.

3.1.1

ActiveTimeValue

member of the **ApplicationObject**. The value decrements at video frame rate. It is updated on every reception of an **event message**.

3.1.2

Application

software running on a receiver that is addressed by the URL of a **trigger message** and providing the following modes of operation:

- a) the display of information, the playback of sound, the download of data;
- b) the initiation of any action.

Application examples include the display of a simple text message sent as part of the trigger message, the display of a Teletext, Superteletext (TeleWeb [Tw]) or Internet page, information from an Electronic Programme Guide (EPG), electronic voting, an emergency alert

3.1.3

ApplicationObject

object storing the information about an **application** started or modified by triggers referencing the same URL

3.1.4**Attribute**

member of an **ApplicationObject** or **TriggerObject** storing the information transported via an **attribute element**

3.1.5**attribute element**

attribute name/value pair

3.1.6**attribute string**

any sequence of characters with codes in the range 0x20 to 0x7E inclusive, excluding square brackets (0x5B and 0x5D)

3.1.7**charset**

abbreviation for character set

3.1.8**CountdownValue**

member of a **TriggerObject**. The value decrements at video frame rate. It is updated on every reception of a **trigger mes**

3.1.9**DateTime**

date and time instance of UTC expressed in the form: *yyyymmddThhmmss*, where *yyyy* represents a year, *mm* represents a month (range 1–12), *dd* represents the day of the month (range 1–31), the capital letter 'T' separates the date component from the time component, *hh* represents an hour (range 0–23), *mm* represents the minutes (range 0–59) and *ss* represents the seconds (range 0–59)

3.1.10**Dummy URL**

URL that does not reference any application or data and used in the mandatory URL field of a **trigger message** when the intention is to display only the trigger icon (together with its text) and not to control an application

3.1.11**event message**

information extracted from a **trigger message** that is used to create an **ApplicationObject**

3.1.12**event start**

event message with its 'script' **attribute element** set to 'start'

3.1.13**event stop**

event message with its 'script' **attribute element** set to 'stop'

3.1.14**pending trigger**

state where a trigger message has created a **TriggerObject** but the conditions to create an **ApplicationObject** have not yet occurred

3.1.15**priority filtering**

rejecting a **trigger message** on account of the value assigned to its 'priority' **attribute element**

3.1.16

RelativeTime

time period measured in seconds and video frames

3.1.17

string

any sequence of characters with codes in the range 0x20 to 0x7E inclusive. Throughout this document **strings** are not case-sensitive unless otherwise indicated

3.1.18

trigger

signal sent from a service provider as part of a data broadcasting transmission with the intention to start or modify an application at a certain time

3.1.19

trigger character

character with a code in the range 0x20 to 0x7E inclusive

3.1.20

trigger del

trigger message with a 'delete' attribute element

3.1.21

trigger event

instant in time when a **trigger** fires and an **event message** is created

3.1.22

trigger mes

trigger message without a 'delete' attribute element

3.1.23

trigger message

information embedded in a **trigger** and intended to control an **application** in a receiver

3.1.24

TriggerObject

object storing the information from all the triggers referencing the same URL

3.1.25

trigger_text

descriptive part of a **trigger message**.

3.1.26

URL string

any sequence of characters with codes in the range 0x20 to 0x7E inclusive, excluding angular brackets (0x3C and 0x3E)

3.2 Abbreviations

CNI	Country and Network Identification
URL	Uniform Resource Locator
UTC	Coordinated Universal Time
VPS	Video Programming System

4 Trigger message

4.1 General

4.1.1 Viewer interaction

The mechanism through which the viewer enables or disables trigger handling or sets priority threshold levels is at the receiver manufacturer's discretion.

The appearance of an icon and the viewer interaction when responding to it is also at the receiver manufacturer's discretion.

4.1.2 Priority ratings

Triggers labelled with the 'emergency' priority rating should always be processed, even if the viewer has disabled trigger handling. The 'emergency' priority shall only be used by service providers for genuine emergency situations. The set maker is allowed to provide the user with the ability to switch off this emergency priority.

4.1.3 Character coding

All characters used to code triggers are taken from the ISO 8859-1 character set and are in the range 0x20 to 0x7E inclusive. A character outside this range shall be encoded using the per cent character ('%') followed by the two-digit hexadecimal value of the character. The '%' character itself is represented by the string '%25'. The character '[' is represented by %5B, the character ']' by %5D. The default character coding for all string attribute values is ISO 8859-1. The character coding for the name attribute can be changed with the charset attribute.

4.1.4 Future compatibility

To ensure future compatibility, a receiver should ignore data it does not understand, such as **attribute elements** not defined by this edition.

4.2 Life cycles

4.2.1 Trigger message and event message life cycle

Figure 1 describes the life-cycle **trigger message** and an **event message** referencing the same resource (URL). An incoming **trigger message** is acquired through the transport layer. The **priority filtering** process provides the opportunity to reject a **trigger message** on account of its 'priority' **attribute element**. However, it is not recommended to reject a **trigger message** with its 'priority' **attribute element** set to '0' (zero) as this value is reserved for emergency **trigger messages**.

The **Event message preparation** processes the filtered **trigger messages** and provides robustness to the **trigger** protocol when carried over a unidirectional transport layer where the reception of the information is not always guaranteed. Each **trigger message** carries a countdown value indicating the time delay before the **trigger** should fire. To aid robustness, the **trigger message** can be transmitted at intervals before the **trigger event**, each time with an updated countdown value. When the **trigger** fires, an **event message** is generated to the **application** referenced by the URL.

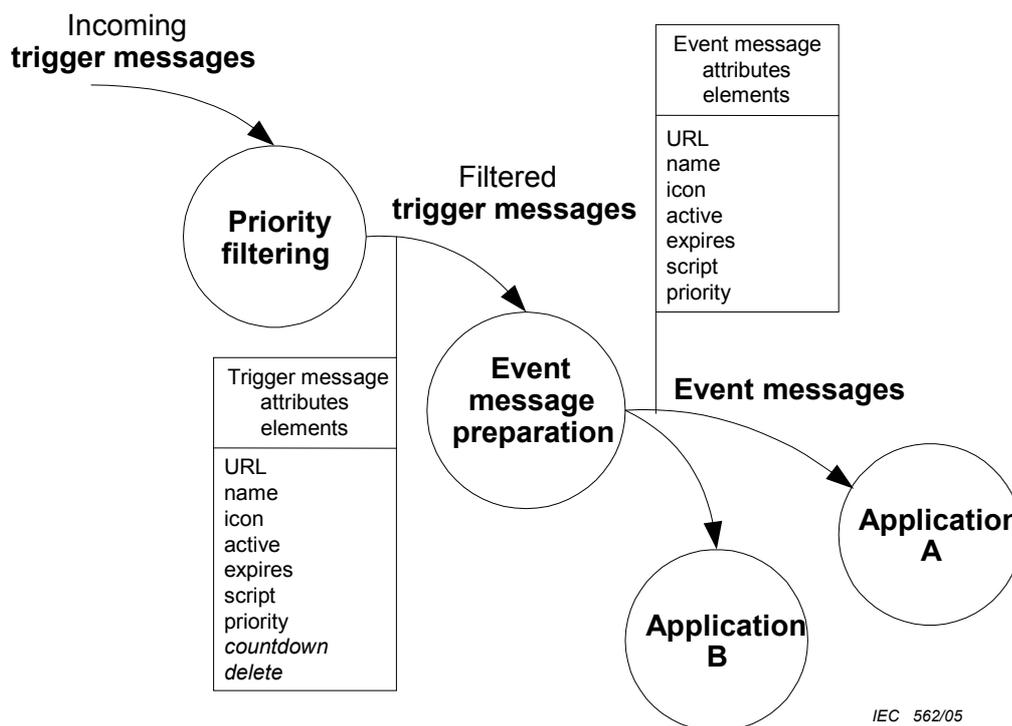
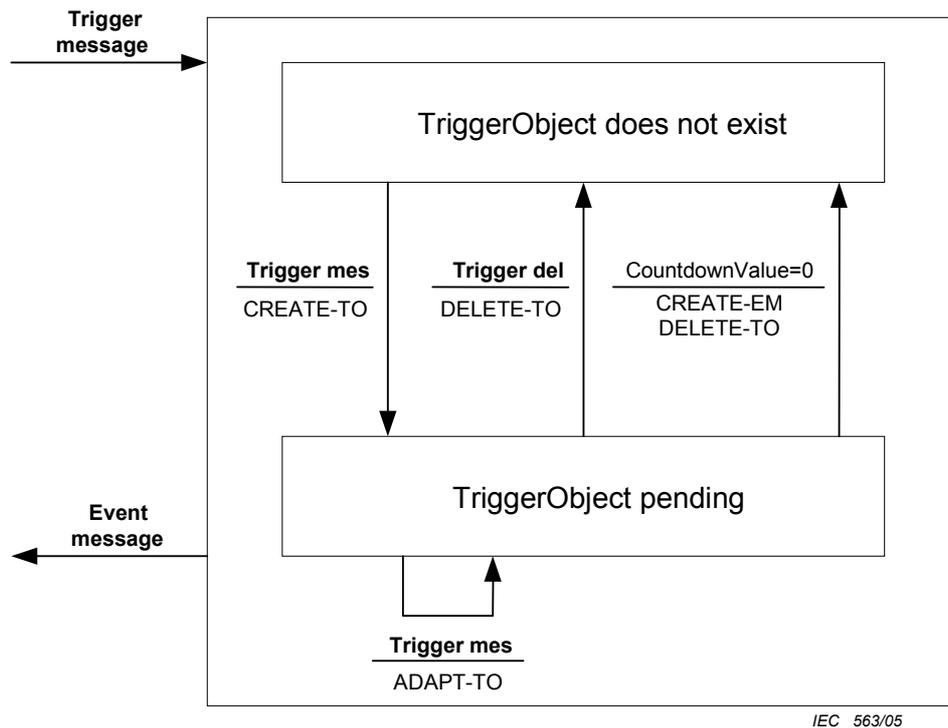


Figure 1 – Trigger messages and event messages life cycle

4.2.2 Event message preparation life cycle

Figure 2 describes the state transitions within the **event message preparation** process. The initial state of a **TriggerObject** is 'TriggerObject does not exist'. On first reception of a **trigger message** without a 'delete' attribute element, a **TriggerObject** referencing the defined URL is created and the state becomes 'TriggerObject pending'. The **attributes** of the **TriggerObject** are adapted on subsequent arrivals of **trigger messages** referencing the same URL.

If the **CountdownValue** equals zero, either explicitly or as a result of decrementing at frame rate a value received previously, an **event message** is signalled to the **application** referenced by the URL. The **event message** inherits the **attribute elements** of the original **trigger message**, excluding the 'delete' and 'countdown' attribute elements. After signalling the **event message** to the application, the **TriggerObject** is deleted.

**Key**

CREATE-TO	The creation of a TriggerObject referenced by the URL.
ADAPT-TO	The adaptation of a TriggerObject referenced by the URL.
DELETE-TO	The deletion of a TriggerObject referenced by the URL.
CREATE-EM	An event message is created and signalled to the application .
CountdownValue=0	The CountdownValue equals 0.

Figure 2 – TriggerObject life cycle**4.2.3 Application life cycle**

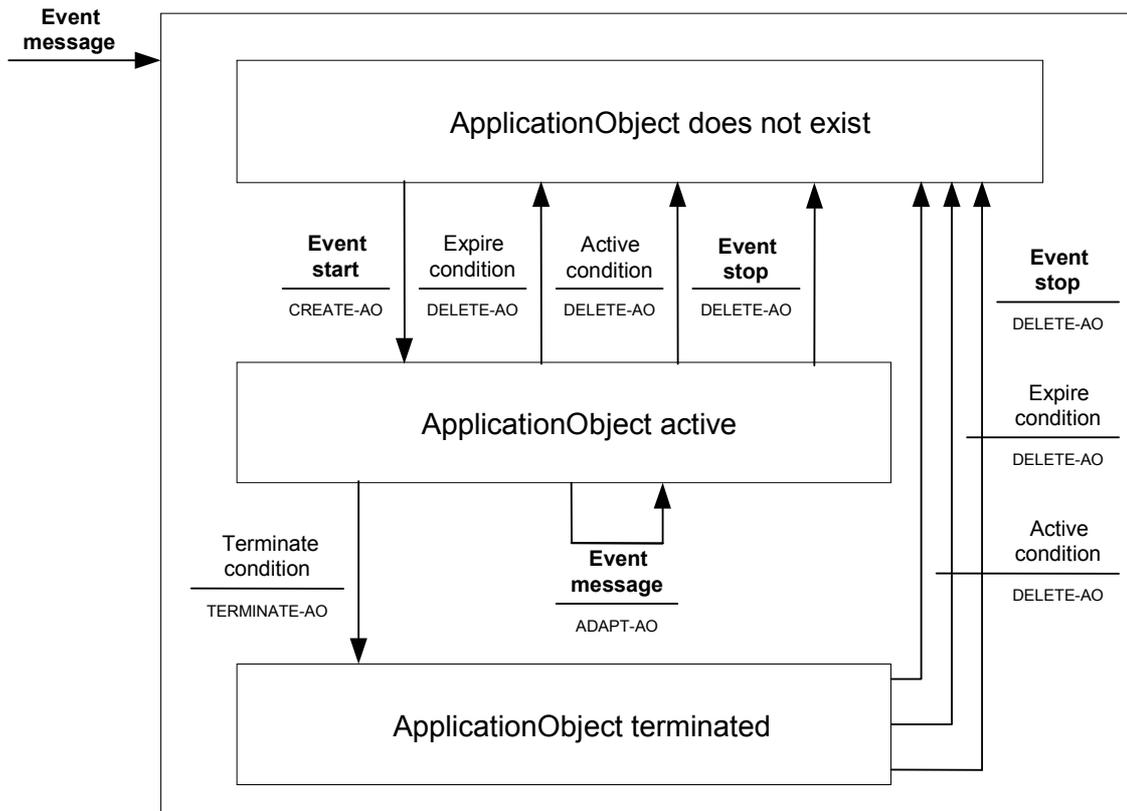
Figure 3 describes the state transitions within the **application** process. The initial state of an **ApplicationObject** is 'ApplicationObject does not exist'. An **ApplicationObject** is created as a result of an **event start**. An icon is displayed before the application is started if the 'name' attribute element is defined.

On first reception of an **event start**, an **ApplicationObject** referencing the defined URL is created and the state becomes 'ApplicationObject active'. The **attributes** of the **ApplicationObject** are adapted on subsequent arrivals of **event messages** referencing the same URL.

An **ApplicationObject** is deleted on reception of an **event stop**, on reaching the (absolute) 'expires' time or when the (relative) 'active' time period has been completed.

If the viewer terminates the **application**, the state becomes 'ApplicationObject terminated'. Once in this state, the **application** cannot be restarted until the **ApplicationObject** has been deleted. This adds robustness to the procedure and prevents the **application** restarting if the same **trigger** is repeated at a later time.

NOTE This is needed if the broadcaster wants to address viewers who join the programme later.



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Key

- Expire condition The DateTime value from the 'expires' attribute element is greater than, or equal to, the current DateTime value. The two values should be compared at video frame rate. The 'expires' attribute element may be updated on every instance of an **event message** referencing the same URL.
- Active condition The ActiveTimeValue equals 0.
- Terminate condition The **ApplicationObject** is terminated due to viewer action or other reason.
- CREATE-AO Create the **ApplicationObject** referenced by the URL.
- ADAPT-AO Adapt the **ApplicationObject** referenced by the URL.
- DELETE-AO Delete the **ApplicationObject** referenced by the URL.
- TERMINATE-AO Terminate the **ApplicationObject** referenced by the URL.

Figure 3 – ApplicationObject life cycle

On the reception of an **event start** with a 'name' **attribute element** defined, an **Application Object** referencing the defined URL is created but the application itself is not run immediately. Instead, an icon defined by the 'name' **attribute element** is displayed. After the confirmation of the icon by the viewer, the **ApplicationObject** is fully started. The icon is removed if the **ApplicationObject** is deleted before a positive response from the viewer.

4.3 Syntax of trigger message

4.3.1 General

The syntax of a **trigger message** is shown in Table 1.

Table 1 – Syntax of trigger_message

Syntax	Number of Bytes
trigger_message() {	
trigger_text_length	2
trigger_text()	trigger_text_length
}	

4.3.2 Trigger text length

The **trigger_text_length** field defines the number of characters in the following **trigger_text** field.

NOTE For practical reasons, the maximum length of the **trigger message** may be limited by the application or transport protocol.

4.3.3 Syntax of trigger text

4.3.3.1 General

The syntax of the **trigger_text** field is shown in Table 2.

Table 2 – Syntax of trigger_text

Syntax	Number of bytes
trigger_text() {	
for (i=0; i<trigger_text_length; i++) {	
trigger_character	1
}	
}	

The sequence of **trigger characters** starts with a **URL string** delimited by angular brackets. This is followed by one or more **attribute strings** delimited by square brackets. Optionally, the final element is a checksum delimited by square brackets:

```
<url> [attr1: val1][attr2:val2]...[attrn:valn][checksum]
```

4.3.3.2 URL element

The first element of the **trigger_text** must be a **URL string** enclosed in angular brackets. The URL element is used twofold: a) it uniquely identifies the **trigger**, and b) it locates the resource of the **application**. This implies that for each resource only one current **trigger** can be defined.

Internet URL – An Internet URL shall be identified by the sequence http:// and shall be defined according to [URI].

Example: <http://xyz.com/fun.html>

Local Identifier URL – A Local Identifier URL is identified by the sequence lid://. The Local Identifier URL scheme is defined in [DDE].

Example: <lid://xyz.com/fun.html>

TeleWeb URL – A string with the following syntax shall be used to specify a TeleWeb URL:

tw://service_name/filename.filetype#position

Where the sequence is not case-sensitive and

- tw:// identifies the following sequence as a TeleWeb URL;
 - service_name identifies the service provider or the service being provided;
 - filename is the name of the file. It can include directory style elements, for example, /home_page/news/;
 - . (dot) is the separator between the filename and filetype elements.
 - filetype is the type of the file.
- NOTE The receiver may be limited in the number of file types they can handle.
- #position is the optional position element. # is the separator between the filetype and position elements, position is a location (anchortname) within the specified file.

Example: <tw://tvwest/name.type>

Teletext page URL – A string with the following syntax shall be used to reference a page in a teletext service:

ttx://cni/page_number/page_subcode

Where the sequence is not case-sensitive and

- ttx:// identifies the following sequence as a teletext page URL;
- cni is the country and network identification (CNI) code for the network broadcasting the page. CNI codes are defined in ETSI TS 101 231. This element shall always consist of four hexadecimal characters. If the network has only been assigned a three-character VPS CNI code, it shall be preceded with 0. The default value of 0000 shall be interpreted as the "current channel", i.e. the page is being broadcast on the same channel via which the trigger message was received. The 16 bit NI code delivered through packet 8/30 format 1 is excluded here;
- /page_number is a three hexadecimal character value in the range 0x100 to 0x8FF representing the magazine, page tens and page units values respectively of a teletext page as defined in ETSI EN 300 706. Setting both the page tens and page units values to 0xF shall indicate that no valid page number is being defined and no page should be displayed;
- /page_subcode A four hexadecimal character value in the range 0x0000 to 0x3F7F representing the S4, S3, S2 and S1 values respectively of a teletext page subcode as defined in ETSI EN 300 706. The value 0x3F7F shall indicate that no particular subcode value is being defined. S2 has a valid range of 0 to 7, and S4 a valid range of 0 to 3. The inclusion of a /page_subcode element is optional.

Example: <ttx://0DC2/456/3F7F>

When triggering the display of a teletext page, a receiver should display the most recent version of the page available.

The handling of sequences of rolling pages is at the discretion of the receiver manufacturer.

Dummy URL – The Dummy URL does not reference any application or data. It is used when the purpose of the trigger is simply to display the trigger icon defined by the **'name' attribute element**, without running an application. As a result a Dummy URL is only valid if there is **'name' attribute element** defined within the same trigger message. The ApplicationObject is deleted after the confirmation of the icon by the viewer.

The **Dummy URL** is represented by the word 'dummy' (case-insensitive) followed by a colon.

Example: <dummy:>[name:news]

4.3.3.3 Attribute elements

The body of the **trigger_text** consists of none, some or all of the **attribute elements** shown below. They are each described through an **attribute string** enclosed in square brackets. They can occur in any order and there should be no more than one instance of any one particular **attribute element** per trigger message. Attribute names can be shortened to a single character as indicated. All other single character attribute names are reserved for possible future use.

The following **attribute elements** are defined.

[**active**:RelativeTime]
[**a**:RelativeTime]

The **active** attribute specifies a time period in **'RelativeTime'** format. This represents an offset from the time at which the **trigger** is fired, after which the URL is no longer valid. As a consequence, the **ApplicationObject** defined by the URL is deleted. The value '0' shall be used if the receiver can determine the active duration.

If an 'expires' **attribute element** is also defined, a receiver shall ignore the 'active' **attribute element**.

Default: If this attribute is not present, the **ApplicationObject** is allowed to remain activated indefinitely, unless terminated by a viewer action or an **event stop**.

Example: [**active**:120] The **ApplicationObject** exists for 120 s.

[**charset**:string]
[**t**:string]

The charset attribute defines the character set (coding) to be used for the name attribute. The default value for the charset attribute is ISO 8859-1. Possible values for the charset attribute are: ISO 8859-n (n=1,...,9), UTF-8. Receivers must at least support the ISO 8859-1 character set for the name attribute. If the requested character coding is not supported by the receiver only the ASCII characters of 0x20 to 0x7E should be displayed, characters outside this range should be replaced by blanks.

[**countdown**:RelativeTime]
[**c**:RelativeTime]

The **countdown** attribute specifies a time period in **'RelativeTime'** format. This represents the delay from the current time until the **trigger** should fire thus allowing a **trigger event** to be scheduled in advance. The value '0' shall cause the **trigger** to fire immediately.

Default: If this attribute is not present, the **trigger event** should occur immediately.

Example: [**countdown**:F19] The **trigger** should fire in 19 frames time.

NOTE To aid robustness, a **trigger** for a particular **trigger event** can be transmitted at intervals before the **trigger event**, each time with an updated countdown value. Receivers should not expect to receive every value in a countdown sequence.

[**delete**:void]
[**d**:void]

The **delete** attribute provides a means of deleting a **trigger** that has yet to fire. It takes precedence over all other attributes.

Default: If this attribute is not present, the **trigger** is not deleted.

Example: [**delete**:] Delete the **trigger**.

[expires:DateTime]
[e: DateTime]

The **expires** attribute specifies an absolute date and optional time in 'DateTime' format, after which the URL is no longer valid. As a consequence, the **ApplicationObject** defined by the URL is deleted.

This **attribute element** takes precedence over an 'active' **attribute element**.

Default: If this attribute is not present, no automatic expiry time is defined.

Example: [expires:20000621T1700] The **Application Object** expires on 21 June 2000 at 17:00 UTC.

NOTE It is possible to shorten the description by reducing the resolution. For example, *yyyymmddThhmm* (no seconds specified) is valid, as is simply *yyyymmdd* (no time specified at all). When no date component is specified, the date reference should be assumed to be the current day. When no time component is specified, the time reference should be assumed to be midnight at the beginning of the specified day.

[name:string]
[n:string]

The **name** attribute indicates that an icon, defined by the receiver, shall be displayed at the point the **ApplicationObject** is created. The **ApplicationObject** will be fully started if the viewer makes a positive response to the appearance of the icon. It is left to the equipment manufacturer to determine the look-and-feel of the user interface under these conditions. Annex B provides an example of a common logo for this purpose.

See Clause B.8.

The string provides information about the **trigger** in **attribute string** format. The text shall be displayed together with the icon. The display format of the string is under control of the receiver but provision shall be made for the display of at least 20 characters. The receiver may ignore additional characters.

Default: If this attribute is not present, the **ApplicationObject** referenced by the URL shall be started immediately, priority level permitting, when the **trigger** fires.

Examples: [name:Weather]
[name:Subtitles – page 888]

[priority:value]
[p:value]

The **priority** attribute defines an absolute rating for the importance of the **trigger**. The lower the value, the higher the priority. The priority range has ten levels and is divided into four categories:

- a) emergency value = 0
- b) high value = 1 or 2
- c) medium value = 3, 4 or 5
- d) low value = 6, 7, 8 or 9

Default: If this attribute is not present, a value of 9, i.e. lowest priority, shall be assumed.

Example: [priority:3]

[script:string]
[s:string]

The **script** attribute provides a script fragment to execute within the context of the **ApplicationObject** addressed through the URL. The string is an ECMAScript fragment [ECMAScript] in **attribute string** format. The script can only act on an existing **ApplicationObject**.

Two specific strings are defined:

- [script:start] Creates the **ApplicationObject** addressed through the URL.
- [script:stop] Destroys the **ApplicationObject** addressed through the URL.

Default: If this attribute is not present, [script:start] shall be assumed.

Example: [script:frame1.src="http://xyz.com/f1"]
The content of an HTML frame within a page is changed to a new URL.

NOTE RelativeTime can be expressed in one of the following forms: *Fff*, *s*, *sFff*, *ss*, *ssFff*, *sss*, *sssFff*, *ssss* or *ssssFff*, where *s* represents a time in seconds, *f* represents a number of video frames and the capital letter "F" separates the seconds component from the frames component. The seconds component may contain up to four decimal digits. Thus, the maximum number of seconds that can be specified is 9999. The maximum number of frames that can be specified is 25 for 50Hz systems and 30 for 60Hz systems. A frame value, if specified, must always be defined using two digits (for example, 5 frames are encoded as F05).

4.3.3.4 Checksum element

The optional checksum element is provided to allow a receiver to detect corrupted data.

To compute the checksum, adjacent characters in the **trigger_text** are paired to form 16-bit integers, starting with the left angular bracket of the URL element and finishing with the right square bracket of the final attribute element (or the right angular bracket of the URL element if there are no attribute elements). If there are an odd number of characters, the final character is paired with a byte of zeros. The checksum is computed so that the one's complement of all of these 16-bit integers plus the checksum equals the 16-bit integer with all 1 bits (0 in one's complement arithmetic). This checksum is identical to that used in the Internet Protocol [IP] and further details on its computation are given in [INetChSum].

The calculated 16-bit checksum is appended to the trigger message as four-hexadecimal digits, in ASCII representation and most significant byte first, and shall be enclosed within square brackets. The sequence shall follow the right square bracket of the final attribute element (or the right angular bracket of the URL element if there are no attribute elements).

Example: [A17C]

Because the checksum characters themselves (including the surrounding square brackets) are not included in the calculation of the checksum, they must be stripped from the **trigger_text** by the reception equipment before the received checksum is calculated.

4.3.4 Trigger repetition

A new instance of a **trigger message** with the same *<url>* element shall cause a receiver to update in full the resulting **TriggerObject** or **ApplicationObject** with the new values of the **attribute elements**. If a particular **attribute element** is not repeated, the object should revert to the appropriate default value for that **attribute element**.

Annex A (informative)

Recommendations

A **trigger** mechanism for TV use needs to satisfy the following requirements.

- The method of conveying **trigger** information should be flexible and extendible.
- The **trigger** mechanism should provide the following modes of operation:
 - a) The **trigger** initiates the display of information.
 - b) The **trigger** initiates the display of an icon or message, the design of which is under the control of the receiver manufacturer. A positive response by the viewer to its appearance results in the display of information.
 - c) The **trigger** initiates an action that does not require information to be presented on the screen.
- The general principles and coding should be applicable to a wide range of systems and transport protocols.
- URLs for all major data services should be supported.
- The protocols should be relatively easy to implement in all systems and on any appropriate platform.
- The protocol should have low transmission overheads to allow real-time operation.
- It should be possible to send the **trigger** information in advance and on several occasions to reinforce reception robustness and allow the receiver to allocate resources or pre-fetch data.
- The service provider should be able to clear **triggers** that have yet to fire.
- The **trigger message** should be able to specify the amount of time for which its application should remain active unless cancelled.
- The service provider or the viewer can cancel a **trigger event**.
- Time-related parameters should be compatible with the timing information that can be derived from the accompanying broadcast.
- The accuracy of the **trigger event** is application-dependent but should be at least within 5 frames.
- Additional information can be supplied to customize the **trigger** according to the receiver or viewer profile.
- **Triggers** can have different priorities.
- **Triggers** can be targeted to particular applications or specific equipment types.

Annex B (informative)

Code of practice

B.1 Time reference

To ensure a receiver has a suitable time reference, the service should provide a source of UTC time. Where the service is teletext based, a packet 8/30 format 1 should be broadcast.

B.2 Modifying triggers

If the definition of a trigger changes before it has completed, the pending **trigger** should first be cancelled and a new **trigger** issued. It is not recommended that a pending **trigger** be modified other than to update the countdown attribute.

B.3 Trigger expiry

The expiry of a **trigger** should normally be determined by the '*expires*' **attribute element**. The '*active*' **attribute element** is intended only as a backup solution for realizing a timeout counter in the receiver if time management is not possible or no reference time is available.

If the receiver is unable to manage the reference time or **pending triggers** while in standby or power-off modes, any **pending trigger** should be cancelled when entering these modes.

B.4 Countdown values

Receivers should not expect to encounter every value between the initial countdown value and zero. A countdown timer should be started in the receiver on first reception of the **trigger message**. This should be updated with the new countdown value on each subsequent reception and should decrement automatically at the appropriate time intervals.

When the timer countdown reaches 0, the **trigger** should occur irrespective of whether a **trigger message** is received with a countdown value of 0, unless the **trigger** is deleted.

The content provider should always try to broadcast the **trigger message** with countdown value equal to zero.

B.5 Initial state

In the initial state neither **TriggerObjects** nor **ApplicationObjects** exist. The initial state is entered each time the receiving equipment is switched on or after a channel change.

B.6 Multiple sources

When multiple sources of triggers are used simultaneously (for example, dual screen display or picture-in-picture video features), at least one **trigger** stream should be processed. It is left to the receiver to select the source(s).

B.7 Receivers not supporting concurrent ApplicationObject instances

When a receiver does not support concurrent **ApplicationObject** instances, an active **ApplicationObject** should be terminated on the creation of an **ApplicationObject** with equal or higher priority. When the lower priority **ApplicationObject** resulted in the display of an icon that has yet to be confirmed by the viewer, it should be deleted.

B.8 Receivers supporting concurrent ApplicationObject instances

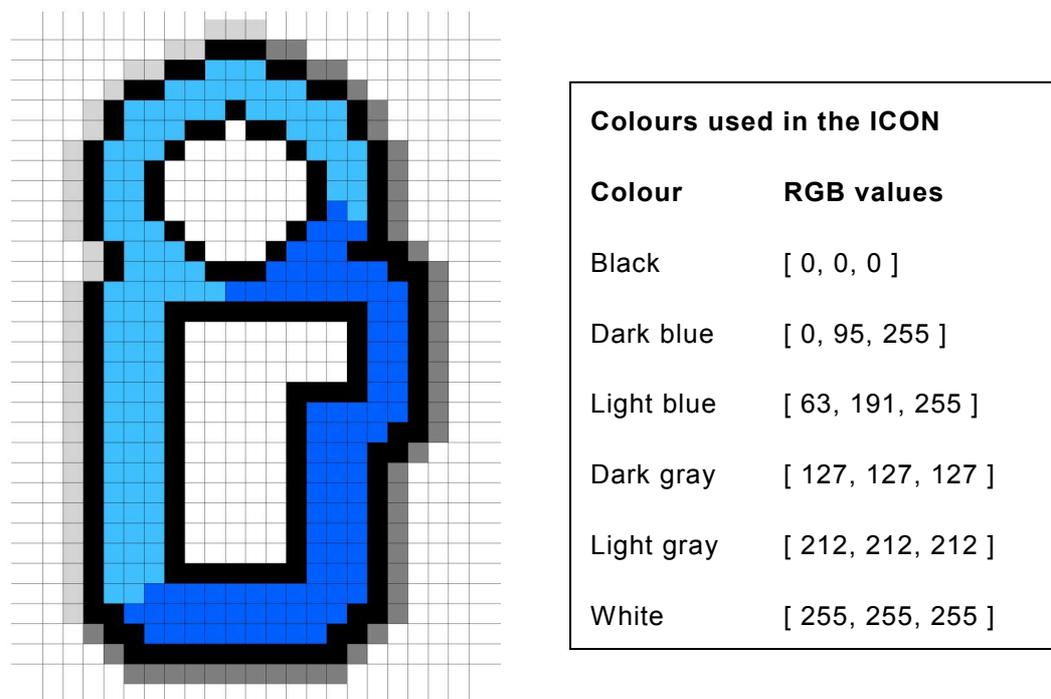
When a receiver supports concurrent **ApplicationObject** instances, an active **ApplicationObject** should be interrupted by the creation of a new **ApplicationObject** with equal or higher priority. 'Interruption' implies suspending the current **application** in order to run the new **application**. When the latter expires, the suspended **application** resumes.

The display of concurrent **ApplicationObject** instances is under control of the receiver. However, the latest created **ApplicationObject** with the highest priority should always be visible.

B.9 The ICON bitmap

If the 'name' attribute element is included in a trigger message, an icon is displayed before the application is started and the viewer is expected to react to its appearance. A proposal for an icon is presented here in an attempt to make its display platform and receiver independent so that it is always recognizable to the viewer. It incorporates the well-known lower-case "i" symbol, meaning information (Unicode code value 0x2139).

The proposal is tailored for a display with a resolution of 640 by 480. The size of the currently proposed icon is 19 by 33 pixels. If the icon is redesigned, the image should not exceed a maximum size of 30 by 40 pixels (see Figure B.1).



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Figure B.1 – Icon bitmap tailored for a display with a resolution of 640 by 480

It is recommended to adopt both the shape and colours of this proposal. If the colours are incompatible with the receiver's user interface, it is still recommended that the proposed shape be used. If manufacturers wish to design their own icon, the inclusion of a prominent "i" symbol is recommended.

If broadcasters wish to define their own icon, they can directly start the application (excluding the **name attribute** from the **trigger message**) and display their own icon on a transparent background. Some applications may not be able to implement this scenario.

B.10 The use of priority

Because **applications** can terminate abruptly, service providers should allocate priorities such that the resulting receiver behaviour described in Clauses B.7 and B.8 is not confusing to the viewer. Priorities should never be used to implement categories or themes, the latter should be handled within the **application** itself.

B.11 Interaction of name and script attributes

Service providers using the 'name' **attribute element** should note that if the content of the 'script' **attribute element** changes, the application might begin part way through a sequence of received scripts. This situation could arise if the viewer responded rather late to the display of the icon.

B.12 Supporting multiple applications

A service provider may wish to trigger the display of the same message via different applications using multiple triggers with the same priority, for example, for Teletext and TeleWeb applications. Under these circumstances, it is left to the receiver to decide which trigger to process. If necessary, user settings can be provided to influence this behaviour.

B.13 Supporting multiple transport layers

A broadcaster can send triggers through different transport layers. Multiple **trigger messages** for the same **trigger event** coming over different transport layers will reference the same URL enabling the trigger receiver to route the **trigger messages** to the same **TriggerObject**. Some applications (like TeleWeb) can put restrictions on the type of used transport layers.

B.14 Who is in control

After an application is started by a trigger, the application may be controlled by the service provider as well as by the user. However, as soon as the user interacts with the application (filling in a form, clicking through to another page), the service provider loses the ability to stop or update the running application.

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- [DDE] IEC/PAS 62292:2001, Draft SMPTE Engineering Guideline SMPTE XXXX – Declarative Data Essence
- [IP] IETF, RFC 791:1981, Internet Protocol
- [INetChSum] IETF, RFC 1071:1988, Computing the Internet checksum
- [ECMAScript] ISO/IEC 16262: 2002, Information technology – ECMAScript language specification
-

¹ To be published.



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