INTERNATIONAL STANDARD

ISO/IEC 8613-14

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Information technology — Open Document Architecture (ODA) and interchange format: Temporal relationships and non-linear structures

Technologies de l'information — Architecture de documents ouverts (ODA) et format d'échange: Relations temporelles et structures non linéaires

Reference number
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Foreword

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

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

International Standard ISO/IEC 8613-14 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 18, *Document processing and related communication*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation T.424.

ISO/IEC 8613 consists of the following parts, under the general title *Information technology — Open Document Architecture (ODA) and interchange format*:

— *Part 1: Introduction and general principles*

— *Part 2: Document structures*

— *Part 3: Abstract interface for the manipulation of ODA documents*

— *Part 4: Document profile*

— *Part 5: Open Document Interchange Format*

— *Part 6: Character content architectures*

— *Part 7: Raster graphics content architectures*

— *Part 8: Geometric graphics content architectures*

— *Part 9: Audio content architectures*

— *Part 10: Format specifications*

— *Part 11: Tabular structures and tabular layout*

— *Part 12: Identification of document fragments*

— *Part 13: Spreadsheet*

— *Part 14: Temporal relationships and non-linear structures*

Annexes A to C form an integral part of this part of ISO/IEC 8613. Annexes D to G are for information only.

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Introduction

This Recommendation | International Standard was prepared as a joint publication by ITU Study Group 8 and ISO/IEC Joint Technical Committee 1.

At present, the ITU-T Rec. T.410-Series | ISO/IEC 8613 consists of:

- Introduction and general principles;
- Document structures;
- Abstract interface for the manipulation of ODA documents;
- Document profile;
- Open document interchange format;
- Character content architectures;
- Raster graphics content architectures;
- Geometric graphics content architectures;
- Audio content architectures;
- Formal Specification of the Open Document Architecture (FODA);
  (The formal specification is applicable to ISO/IEC 8613 only.)
- Tabular structures and tabular layout;
- Identification of document fragments.

Further Recommendations | International Standards may be added to this series of Recommendations | International Standards.

Development of this series of Recommendations | International Standards was originally in parallel with the ECMA-101 standard: Open Document Architecture.

This Recommendation | International Standard contains seven annexes:

- Annex A (integral): Structuring conventions for "application comments";
- Annex B (integral): Usage of the attribute/parameter "application comments" in links;
- Annex C (integral): Modifications to other parts of ITU-T Rec. T.410-Series | ISO/IEC 8613;
- Annex D (non-integral): Examples for specifying temporal relationships;
- Annex E (non-integral): Compatibility with earlier editions of ITU-T Rec. T.410-Series | ISO/IEC 8613;
- Annex F (non-inegral): Summary of ASN.1 object identifiers;
- Annex G (non-integral): Application class tag assignments.

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ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY — OPEN DOCUMENT ARCHITECTURE (ODA) AND INTERCHANGE FORMAT: TEMPORAL RELATIONSHIPS AND NON-LINEAR STRUCTURES

1 Scope

The purpose of the ITU-T Rec. T.410-Series | ISO/IEC 8613 is to facilitate the interchange of documents.

In the context of these Recommendations | International Standards, documents are to be items such as memoranda, letters, invoices, forms and reports, which may include pictures and tabular material. The content elements used within the documents may include graphic characters, raster graphics elements and geometric graphics elements, all potentially within one document.

NOTE – These Recommendations | International Standards are designed to allow for extensions, including hypermedia features, spreadsheets and additional types of content such as audio and video.

In addition to the content types defined in these Recommendations | International Standards, ODA also provides for arbitrary content types to be included in documents.

These Recommendations | International Standards apply to the interchange of documents by means of data communication or the exchange of storage media.

These Recommendations | International Standards provide for the interchange of documents for either or both of the following purposes:

- to allow presentation as intended by the originator;
- to allow processing such as editing and reformatting.

The composition of a document in interchange can take several forms:

- formatted form, allowing presentation of the document;
- processable form, allowing processing of the document;
- formatted processable form, allowing both presentation and processing.

These Recommendations | International Standards also provide for the interchange of ODA information structures used for the processing of interchanged documents.

This Recommendation | International Standard:

- extends the concepts of ODA beyond sheets of paper;
- describes how to specify temporal relationships for the presentation of information in ODA documents such as sequential, parallel or cyclic presentation of particular pieces of information;
- specifies a reference model for the layout process and presentation process in respect to temporal relationships;
- introduces the concepts of hypermedia documents where non-linear links between presentable content are provided;
- describes how to specify non-linear structures in an ODA document such as links between particular pieces of information as commonly found in so-called hypermedia documents;
- introduces the concept of document sets;
- defines a document set profile for document sets;
- defines a reference model for the layout process and presentation process of hypermedia documents and document sets.

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2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and International Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- ITU-T Recommendation T.411 (1993) | ISO/IEC 8613-1:1994, *Information technology – Open Document Architecture (ODA) and interchange format: Introduction and general principles.*
- ITU-T Recommendation T.412 (1993) | ISO/IEC 8613-2:1995, *Information technology – Open Document Architecture (ODA) and interchange format: Document structures.*
- ITU-T Recommendation T.413 | ISO/IEC 8613-3:1995, *Information technology – Open Document Architecture (ODA) and Interchange format: Abstract interface for the manipulation of ODA documents.*
- ITU-T Recommendation T.414 (1993) | ISO/IEC 8613-4:1994, *Information technology – Open Document Architecture (ODA) and interchange format: Document profile.*
- ITU-T Recommendation T.415 (1993) | ISO/IEC 8613-5:1994, *Information technology – Open Document Architecture (ODA) and interchange format: Open Document Interchange Format.*
- ITU-T Recommendation T.416 (1993) | ISO/IEC 8613-6:1994, *Information technology – Open Document Architecture (ODA) and interchange format: Character content architectures.*
- ITU-T Recommendation T.417 (1993) | ISO/IEC 8613-7:1994, *Information technology – Open Document Architecture (ODA) and interchange format: Raster graphics content architectures.*
- ITU-T Recommendation T.418 (1993) | ISO/IEC 8613-8:1994, *Information technology – Open Document Architecture (ODA) and interchange format: Geometric graphics content architectures.*
- ITU-T Recommendation T.419 (1995) | ISO/IEC 8613-9:1996, *Information technology – Open Document Architecture (ODA) and interchange format: Audio content architectures.*
- ITU-T Recommendation T.421 (1994) | ISO/IEC 8613-11:1995, *Information technology – Open Document Architecture (ODA) and interchange format: Tabular structures and tabular layout.*
- ITU-T Recommendation T.422 (1995) | ISO/IEC 8613-12:1996, *Information technology – Open Document Architecture (ODA) and interchange format: Identification of document fragments.*

2.2 Paired Recommendations | International Standards equivalent in technical content

- CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*

  ISO/IEC 8824:1990, *Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1).*

2.3 Additional references

- ISO/IEC 2022:1994, *Information technology – Character code structure and extension techniques.*
- ISO 2375:1985, *Data processing – Procedure for registration of escape sequences.*
- ISO 8601:1988, *Data elements and interchange formats – Information interchange – Representation of dates and times.*

3 Definitions

For the purposes of this Recommendation | International Standard, the definitions given in ITU-T Rec. T.411 | ISO/IEC 8613-1 apply, except those redefined here.

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The following additional definitions are used within this Recommendation | International Standard:

3.1 **block**: A basic layout component that corresponds to a rectangular area within a frame or page for presenting visual content of the document, a time span for presenting time varying content (such as audio content) of a document, or a combination thereof.

3.2 **document set**: A document set consists of a document set profile, an (optional) non-integral link part, and an (optional) set of documents or hypermedia documents.

3.3 **event**: Either an internal event or an external event.

3.4 **external event**: An event which is created by some mechanism external to the document, e.g. by user interaction.

3.5 **frame**: A composite layout component that corresponds to a rectangular area within a page or another frame for presenting visual content of the document, a time span for presenting time varying content (such as audio content) of a document, or a combination thereof.

3.6 **hypermedia document**: A hypermedia document is distinguished from a normal document by the presence of links.

3.7 **integral link**: A link that appears in the link part of the document description.

3.8 **internal event**: An event which is issued after a presentation of content is completed.

3.9 **link**: A set of information describing a relationship to or between one or more nodes.

3.10 **node**: Either a whole document or a document fragment.

3.11 **non-integral link**: A link that is separate from a particular document description and only appears in the link part of a document set description.

3.12 **page**: A layout component that corresponds to a rectangular area for presenting visual content of the document, a time span for presenting time varying content (such as audio content) of a document, or a combination thereof.

3.13 **scaled time unit**: A relative time unit whose mapping to a real time unit is defined by the document profile attribute "time scaling".

4 Abbreviations

For the purposes of this Recommendation | International Standard the abbreviations given in ITU-T Rec. T.411 | ISO/IEC 8613-1 apply.

5 Conventions

For the purposes of this Recommendation | International Standard the conventions given in ITU-T Rec. T.411 | ISO/IEC 8613-1 apply.

6 Overview

This clause provides an overview on the additional constituents and attributes which are added by this specification to the ITU-T Rec. T.410-Series | ISO/IEC 8613.

6.1 Constituents of the document structure

The following constituents are added to the ODA document structure as defined in ITU-T Rec. T.412 | ISO/IEC 8613-2:

- link class descriptions;
- link descriptions.

NOTE – Enciphered link descriptions are included in pre-enciphered document body part descriptions. Seals for links or link classes are included in the document profile attribute "pre-sealed document body parts".

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Figure 2 in ITU-T Rec. T.412| ISO/IEC 8613-2 is extended as follows (see Figure 1):

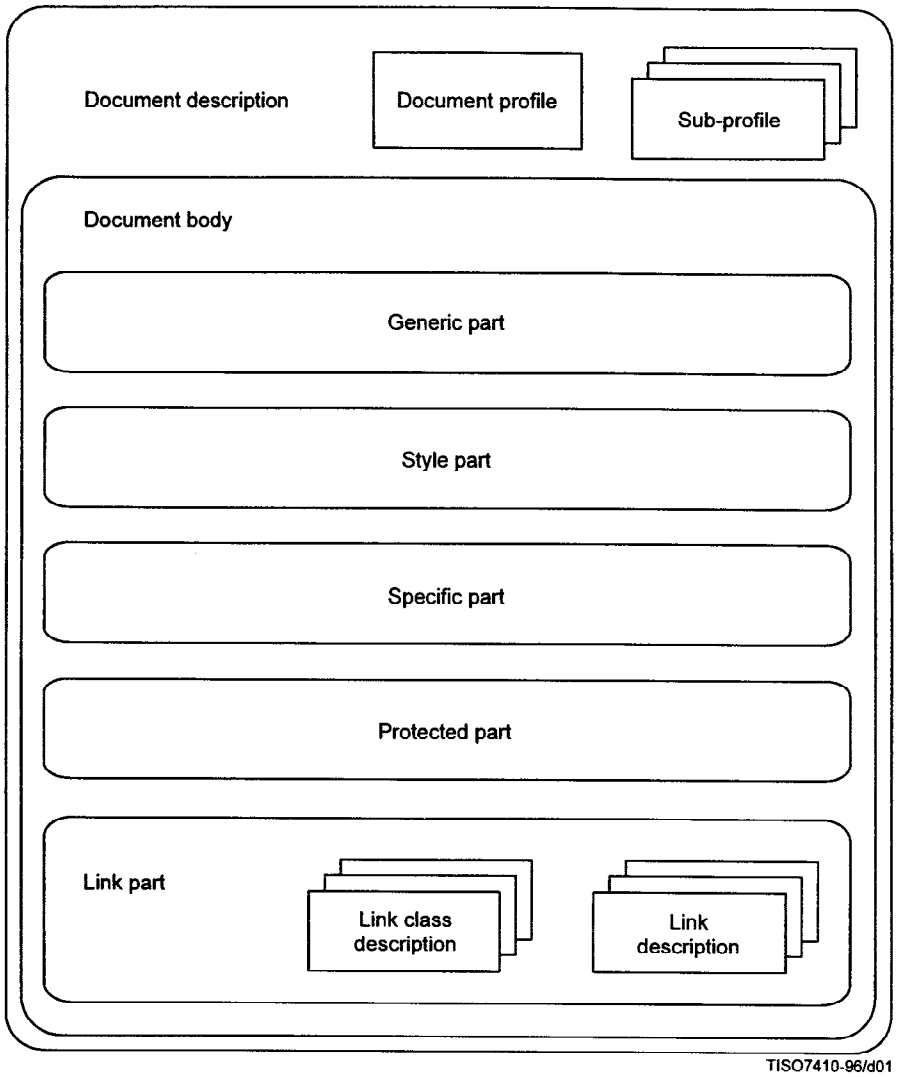

Figure 1 – Descriptive model of a document

In addition to the attributes permitted for link descriptions and link class descriptions (see 8.3), the following attributes are added to the attributes defined in ITU-T Rec. T.412 | ISO/IEC 8613-2: "temporal relations", "presentation time".

The following attributes are added to the attributes defined in ITU-T Rec. T.414 | ISO/IEC 8613-4: "document presentation time", "time scaling", "temporal relations", "links", "link classes".

NOTE – Annex C contains additional details on the modifications to other parts of ITU-T Rec. T.410-Series | ISO/IEC 8613.

6.2 Document profile attributes

6.2.1 Document profile attributes for temporal relationships

The following attributes are added to the document profile to support temporal relations in ODA documents.

- "document presentation time;"
- "time scaling";
- "temporal relations".

NOTE – The structure and semantics of these attributes are defined in C.3.1.

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6.2.2 Document profile attributes for non-linear structures

The following attributes are added to the document profile to support non-linear structures in ODA documents:

- "links";
- "link classes";
- "enciphered links".

NOTE – The structure and semantics of these attributes are defined in Annex C.3.2.

6.3 Document sets

The concept of a document set consisting of a document set profile, an (optional) non-integral link part, and an (optional) set of documents or hypermedia documents is introduced. In this context, the constituent *document set profile* is introduced.

7 Temporal relationships

7.1 Conceptual principles for temporal relationships

Each layout object (document layout root, page set, page, frame and block) has a position and dimension in time, i.e. a point in time – in addition to the spatial position and dimension that some layout objects (pages, frames, blocks) already have – at which the presentation of the content associated with the layout object starts, and a duration, specifying how long the presentation continues.

NOTE 1 – Throughout this document terms such as "content associated with an object" or "content of an object" do not imply that the content is directly associated to the object. (Only basic objects can have directly associated content portions.) If these terms apply to a composite object, the content of content portions associated with all basic objects subordinate to the composite object is meant.

In order to explain the synchronization of presentations, the concept of an *event* is introduced. An event is called an *internal event* if it is issued when the presentation of a particular piece of content is terminated because of time constraints specified in the document for that piece of content. The rules for the occurrence of events are defined in clause 7.1.1. An event is called an *external event* if it is created by some mechanism external to the document, e.g. the presentation of a particular piece of content may be terminated by user interaction.

In general, an event is used to invoke the presentation of temporally succeeding content of the document. The temporal presentation of a document is usually controlled both by internal events and external events. For instance, the moving from one page to the next may be controlled by the external events of user interaction whereas the temporal presentation of the content on a particular page may be controlled by internal events.

Layout objects may overlap in time, i.e. the presentation of the content associated with layout object X may start at the same time as the presentation of the content associated with layout object Y or at a point in time where the presentation of the content associated with layout object Y still continues.

If it is required that on a particular area of a page different layout objects are presented at different points in time, this can be achieved by means of overlapping frames (see example 9 in Annex D).

The duration for the presentation of the content associated with a layout object may be 0 time units, if the presentation of the content requires no time *per se* (e.g. the presentation of a portion of character text). In this case, an event may be issued immediately when the presentation of the content occurs.

NOTE 2 – In practice, the rendition of content (e.g. the rendition of a character text portion on a computer screen) will always take some time depending on the processing speed of the hardware. However, from the conceptual point of view of the temporal relationships model, this time is assumed to be negligible.

The temporal characteristics of the layout objects are defined by the attribute "presentation time" which applies to each layout object (directly or indirectly by means of the defaulting mechanism). In general, the values of these attributes can be determined during the layout process.

With respect to the derivation of the values for the attribute "presentation time", the layout process takes account of the values of the attribute "temporal relations" which defines the temporal requirements of logical objects, and/or of the values of the attribute "presentation time" in the generic layout structure.

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7.1.1 Synchronization of presentations

7.1.1.1 Parallel presentations

Two or more presentations are regarded as being carried out in parallel if those presentations are initiated at the same time, i.e. the presentations are carried out concurrently.

Parallel presentations are sub-divided into the following three types:

- *Parallel-last*: In this case, an event is issued when all the presentations in the set of presentations have terminated.
- *Parallel-first*: In this case, an event is issued when any presentation in the set of presentations has terminated.
- *Parallel-selective*: In this case, an event is issued when a specific presentation in the set of presentations has terminated.

7.1.1.2 Sequential presentations

Two or more presentations are regarded as being sequential if the presentations occur one after the other so that one presentation cannot begin until another presentation has terminated. Thus the ending of a presentation is a pre-condition for starting another presentation.

7.1.1.3 Cyclic presentations

A cyclic presentation is a presentation which is repeated more than once. The number of repetitions can be limited to a specified number or can be specified as being indefinite. In the case of a number, an event is issued when the presentation has been carried out the specified number of times.

In the case of indefinite, it is assumed that an external event will terminate the cyclic presentation, or it is terminated because of time constraints which apply to superior objects. At the start of each cycle the presentation state is reset to the state which was in effect before the first cycle started in respect to the piece of content involved in the cycle (e.g. a computer screen will be cleared totally or in parts).

NOTE – The effect of specifying that a presentation is cyclic means that the subordinate presentations, if any, which are processed in parallel or in sequence, are repeated as specified.

7.1.2 Temporal characteristics

Two types of temporal constraints can be specified for presentations, namely:

- start time delays; and
- duration constraints.

A *start time delay* is a time delay which enables the actual start time of a presentation to be distinguished from the time at which the presentation is invoked. If no start time delay is specified, then the start time of the presentation and the invocation time are coincident.

The *duration constraint* specifies the time for which a presentation is to continue. If no duration is explicitly specified, then no constraints are applicable to the time for which the presentation is to continue. In this case, it depends on the nature of the content when an event will be issued. That is, an event will be issued as soon as the presentation of the content is finished. (For instance, for character content this will be immediately, for audio content this will be at that point in time when the audio content has been presented.)

The above time constraints for a start time and a duration can also be specified for each cycle and a constraint can be specified for the maximum time for each cycle.

7.2 Attribute definitions for temporal relationships

Temporal relationships in a document are specified by the attributes "temporal relations" and "presentation time".

7.2.1 Temporal relations

The attribute "temporal relations" is classified as a logical attribute.

Constituents

Logical document root component descriptions and composite logical object component descriptions.

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Classification

- non-mandatory for object class descriptions;
- defaultable for object descriptions.

Structure

The value of the attribute is either 'null' or it consists of the two parameters "synchronization type" and "subordinate nodes".

The parameter "subordinate nodes" is structured into a sequence of entries where each entry consists of the sub-parameters "node identifier" and, optionally, "cyclic", "duration", "start time", "end time" and "application comments".

The sub-parameter "cyclic" is structured into the sub-sub-parameters "number of cycles" and, optionally, "cycle duration" and "cycle start time".

Permissible values

For the parameter "synchronization type": either 'parallel first', 'parallel last', 'parallel selective' or 'sequential'.

For the sub-parameter "node identifier":

If the attribute is specified for an object class: A sequence of non-negative integers representing an object class identifier which appears in the value of the attribute "generator for subordinates" specified for the object class.

If the attribute is specified for an object: A sequence of non-negative integers representing an object identifier which is immediately subordinate to the object for which the attribute is specified.

For the sub-sub-parameter "number of cycles": Either 'indefinite' or a positive integer.

For the sub-parameters "start time" and "end time" and the sub-sub-parameter "cycle start time": A non-negative integer.

For the sub-parameter "duration" and sub-sub-parameter "cycle duration": Either 'indefinite' or a non-negative integer.

For the sub-parameter "application comments": An octet string with a sub-structure as defined in Annex A.

Default value

- 'null'.

Definition

This attribute specifies temporal relations for the presentation of content that is associated with objects immediately subordinate to the object for which the attribute is specified.

A value of 'null' indicates that no temporal relations are specified for the presentation of the content of the immediately subordinate objects.

If the attribute is inherited from a class and its value is not 'null', the values of the sub-parameters "node identifier" (which are object class identifiers) are replaced by object identifiers of those objects which are immediately subordinate to the object which inherits the attribute, and which refer to the respective class. The value of the attribute "generator for subordinates" of the class shall be chosen such that it ensures a unique correspondence between such objects and the object classes referred to by the sub-parameters "node identifier".

The parameter "synchronization type" whose value is either 'parallel first', 'parallel last', 'parallel selective' or 'sequential', specifies the type of synchronization mechanism that is to be applied to the content of the objects identified by the sub-parameters "node identifier" of the parameter "subordinate nodes". That is, this parameter specifies whether the content associated with the subordinate objects is to be presented in parallel or in sequence. In the case of parallel, this parameter indicates whether the synchronization is to be 'parallel-last', 'parallel-first' or 'parallel-selective' as defined in 7.1.1.1.

The parameter "subordinate nodes" specifies the list of subordinate objects whose content is involved in the synchronization process and, optionally, additional presentation constraints which apply to an individual object.

NOTE – The sub-parameter "node identifier" refers to objects or object classes within the same document. If temporal relationships shall be specified for object or object classes which reside in a document fragment separate from the current document, dummy objects or dummy object classes are inserted into the document which act as placeholders for the resolution process as defined by the inclusion rules for distributed documents.

The order of specification of the node identifiers is significant when the synchronization type is 'sequential' or 'parallel selective'. In the case of 'sequential', the content associated with the objects is intended to be presented in the order indicated. In the case of 'parallel selective', the first object specified is the nominated selective node.

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The (optional) sub-parameter "start time" specifies the time delay between the invocation of the presentation of the content of the subordinate object and the actual start time at which the content is presented. If the sub-parameter is not specified, invocation time and start time are coincident.

The (optional) sub-parameter "end time" specifies the time delay between the actual time at which the presentation of the content of the subordinate object finishes and the time at which an event is issued.

The (optional) sub-parameter "duration" defines a constraint on the time for which the presentation of the content of an object occurs. If the sub-parameter is not specified, an event is issued with the delay of "end time", if specified, after the presentation of the content, taking account of a possibly specified start time. If the value 'indefinite' is specified, the presentation of the content of the object may continue indefinitely, i.e. until the process is terminated by an external event, by the time constraints specified by the sub-parameter "cyclic" for this object, or by time constraints applying to superior objects.

The (optional) sub-parameter "cyclic" specifies whether or not the content of the object is to be presented more than once. If the sub-parameter is not specified, presentation takes place once. This sub-parameter shall only be specified for objects whose content requires a positive amount of time for presentation, either because of the nature of the content such as audio content or because the sub-sub-parameters "cycle duration" and/or "cycle start time" are specified with a positive value.

The sub-sub-parameter "number of cycles" of the sub-parameter "cyclic" specifies the number of times that the content of the object is to be presented. The value of 'indefinite' indicates that cycles may be repeated indefinitely, i.e. until terminated by an external event, by the time constraints specified by the sub-parameter "duration" for this object, or by time constraints applying to superior objects.

The (optional) sub-sub-parameter "cycle start time" of the sub-parameter "cyclic" specifies the time delay between the invocation of each cycle and the actual start time of each cycle. If the sub-sub-parameter is not specified, a value of 0 (zero) is assumed.

The (optional) sub-sub-parameter "cycle duration" of the sub-parameter "cyclic" defines a constraint on the time for which the cycles may continue to be processed. If the sub-sub-parameter is not specified, a value of 0 (zero) is assumed. If the value 'indefinite' is specified, the cyclic presentation of the content of the object may continue indefinitely, i.e. until the process is terminated by an external event or by other temporal constraints applying to the object.

If the sub-parameter "duration" and the sub-parameter "cyclic" are specified, the sub-parameter "duration" takes precedence over "cyclic", i.e. the cyclic processing of the content associated with the object will be terminated after the number of time units given by the sub-parameter "duration", even if the processing specifications given by the sub-parameter "cyclic" are not yet satisfied.

The sub-parameter "application comments" may be used to specify the semantics of the value 'indefinite' for the sub-parameter "duration". This sub-parameter has no significance for the reference models of the layout or imaging/presentation processes defined in ITU-T Rec T.412 | ISO/IEC 8613-2, nor for any content layout or imaging/presentation processes defined in this Recommendation | International Standard or other common texts of ITU-T Rec. T.410-Series | ISO/IEC 8613.

All time specifications are given in scaled time units.

For the determination of the value of the attribute, steps a), c), e) and j) as in 9.1.2.4 of ITU-T Rec. T.412 | ISO/IEC 8613-2 are applicable.

7.2.2 Presentation time

The attribute "presentation time" is classified as a layout attribute.

Constituents

Layout component descriptions.

Classification

- non-mandatory for object class descriptions;
- defaultable for object descriptions.

Structure

The value of the attribute is either 'null' or it is structured into the optional parameters "timing", "duration", "cyclic" and "application comments". At least one parameter must be specified unless the value is 'null'.

The parameter "timing" consists either of the sub-parameter "fixed timing" or the sub-parameter "variable timing".

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The parameter "duration" consists of one of the sub-parameters "fixed duration", "rule A" or "rule B".

The parameter "cyclic" is structured into the sub-parameters "number of cycles" and, optionally, "cycle duration" and "cycle start time".

The sub-parameter "variable timing" consists of one or more of the optional sub-sub-parameters "start offset", "end offset", "start separation" or "end separation".

The sub-parameters "rule A" and "rule B" may specify the (optional) sub-sub-parameters "minimum duration" and/or "maximum duration".

Permissible values

For the parameter "application comments": An octet string with a sub-structure as defined in Annex A.

For the sub-parameter "fixed timing": A non-negative integer.

For the sub-parameter "fixed duration": Either 'indefinite', a non-negative integer or a sequence of non-negative integers representing an identifier of a layout object. The identifier of a layout object shall not be specified if the attribute is specified for an object class.

For the sub-parameter "number of cycles": Either 'indefinite' or a positive integer.

For the sub-parameter "cycle start time": A non-negative integer.

For the sub-parameter "cycle duration": Either 'indefinite' or a non-negative integer.

For the sub-sub-parameters "start offset", "end offset", "start separation", "end separation", "minimum duration" and "maximum duration": A non-negative integer.

Default value

- 'null'.

Definition

This attribute specifies the position and dimension in time for the presentation of the content of the layout object for which the attribute is specified.

If the value of the attribute is 'null', no constraints are specified for the temporal presentation of the content of the layout object.

Two cases for "timing" are to be considered: That of specifying the sub-parameter "fixed timing" and that of specifying the sub-parameter "variable timing".

In the case of fixed timing, the value of the sub-parameter "fixed timing" specifies the time delay between the start of the presentation of its immediately superior object and the start of the presentation of the object itself.

The sub-parameter "variable timing" may only be specified for frame class descriptions that are referred to in construction expressions only from other frame class descriptions. All other layout components, in particular, all specific layout objects, may only specify the sub-parameter "fixed timing".

In the case of variable timing, one or more of the sub-sub-parameters "start offset", "end offset", "start separation" or "end separation" may be specified whose semantics are as follows (the specifications given by these sub-sub-parameters are rules for the temporal layout process to determine the values of the attributes "presentation time" for layout objects created during the layout process):

- the sub-sub-parameter "start offset" specifies the minimum delay between the start of the presentation of a frame belonging to this frame class and the start of the presentation of its immediately superior frame;
- the sub-sub-parameter "end offset" specifies the minimum delay between the end of the presentation of a frame belonging to this frame class and the end of the presentation of its immediately superior frame;
- the sub-sub-parameter "start separation" specifies the minimum delay between the start of the presentation of a frame belonging to this frame class and the end of the presentation of that frame which is immediately preceding in sequential layout order;
- the sub-sub-parameter "end separation" specifies the minimum delay between the end of the presentation of a frame belonging to this frame class and the start of the presentation of that frame which is immediately succeeding in sequential layout order.

Two cases for "duration" are to be considered: That of specifying the sub-parameter "fixed duration" and that of specifying the sub-parameters "rule A" or "rule B".

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The sub-parameter "fixed duration" defines a constraint on the time for which the content of an object may continue to be presented. If the sub-parameter is not specified, an event is issued immediately after the presentation of the content, taking account of the value of the parameter "timing", if specified. If the value 'indefinite' is specified by, the presentation of the content may continue indefinitely, i.e. until the process is terminated by an external event or by time constraints applying to superior objects. If a non-negative integer is specified, it defines the number of scaled time units for the presentation of the content of the object. If a layout identifier is specified, it indicates that the presentation of the content of the object shall terminate at the same time as the presentation of the content of the referenced object terminates. A layout identifier shall not be specified at the document layout root level.

NOTE – The sub-parameter "fixed-duration" (when referencing a layout object) may refer only to objects in the same document. If a reference shall be made to an object which resides in a document fragment separate from the current document, a dummy object is inserted into the document which acts as a placeholder for the resolution process as defined by the inclusion rules for distributed documents.

The sub-parameters "rule A" or "rule B" may only be specified for frame class descriptions that are referred to in construction expressions only from other frame class descriptions. All other layout components, in particular, all specific layout objects, may only specify the sub-parameter "fixed duration".

The specifications given by these sub-parameters "rule A" or "rule B" are rules for the temporal layout process to determine the values of the attributes "presentation time" for layout objects created during the layout process. Their semantics is as follows:

- The sub-parameter "rule A" specifies that the duration of the presentation of a frame belonging to this frame class shall be the minimum duration necessary for the presentation of that immediately subordinate frame or block which contains content that is earliest in sequential logical order.
- The sub-parameter "rule B" specifies that the duration of the presentation of a frame belonging to this frame class shall be the minimum duration necessary for the presentation of all immediate subordinate frames or blocks.
- The sub-sub-parameters "minimum duration" and "maximum duration" may specify additional constraints for the durations determined by the respective rule. If the value determined by the rule would otherwise be smaller than the value specified by "minimum duration", then the value of "minimum duration" takes precedence. If the value determined by the rule would otherwise be larger than the value specified by "maximum duration", then the value of "maximum duration" takes precedence.

The (optional) parameter "cyclic" specifies whether or not the content of the object is to be presented more than once. If the parameter is not specified, processing takes place once. This parameter shall be specified only for objects whose content requires a positive amount of time for presentation, either because of the nature of the content such as audio content or because the sub-parameters "cycle duration" and/or "cycle start time" are specified with a positive value.

The sub-parameter "number of cycles" of the parameter "cyclic" specifies the number of times that the content of the object is to be presented. The value 'indefinite' indicates that cycles may be repeated indefinitely, i.e. until terminated by an external event, by the time constraints specified by the parameter "duration" for this object, or by time constraints applying to superior objects.

The (optional) sub-parameter "cycle start time" of the parameter "cyclic" specifies the time delay between the invocation of each cycle and the actual start time for each cycle. If the sub-parameter is not specified, a value of 0 (zero) is assumed.

The (optional) sub-parameter "cycle duration" of the parameter "cyclic" defines a constraint on the time for which the cycles may continue to be processed. If the sub-parameter is not specified, a value of 0 (zero) is assumed. If the value 'indefinite' is specified, the cyclic presentation of the content of the object may continue indefinitely, i.e. until the process is terminated by an external event or by other temporal constraints applying to the object.

If the parameter "duration" and the parameter "cyclic" are specified, the parameter "duration" takes precedence over "cyclic", i.e. the cyclic processing of the content associated with the object will be terminated after the number of time units given by the parameter "duration", even if the processing specifications given by the parameter "cyclic" are not yet satisfied.

The parameter "application comments" may be used to specify the semantics of the value 'indefinite' for the sub-parameter "fixed duration". This sub-parameter has no significance for the reference models of the layout or imaging/presentation processes defined in ITU-T Rec T.412 | ISO/IEC 8613-2, nor for any content layout or imaging/presentation processes defined in this Recommendation | International Standard or other common texts of ITU-T Rec T.410-Series | ISO/IEC 8613.

All time specifications are given in scaled time units.

The point in time at which the event associated with the presentation of the content of the layout object is issued is determined by the parameters specified according to the following rules.

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Let

t_0 be the number of time units for the presentation of the content of the layout object without taking account of the specifications of the attribute "presentation time", e.g. t_0 will be 0 for content types such as character text or raster graphics;

t_1 be the number of time units specified by the sub-parameter "fixed timing";

t_2 be the number of time units specified by the sub-parameter "fixed duration" which may be 'indefinite', or the time at which the object referenced by the sub-parameter "fixed duration" issues an event;

t_3 be the number of time units required for the cyclic processing of the content as specified by the parameter "cyclic" which may be 'indefinite'.

Table 1 indicates the point in time – relative to the presentation time of the immediately superior object – at which the event occurs for each possible combination of parameters. (If the value of the attribute is 'null', an event will be issued at t_0.)

Table 1 – Temporal occurrence of events depending on the specified (sub-) parameter(s)

Fixed timing (t_1)	Fixed duration (t_2)	Cyclic (t_3)	Event at
–	–	–	t_0
+	–	–	$t_0 + t_1$
–	+	?	t_2
+	+	?	$t_1 + t_2$
–	–	+	t_3
+	–	+	$t_1 + t_3$
A "+" in this table indicates that the parameter is specified, a "–" that it is not specified and a "?" that it may be specified but has no effect on the time at which the event is issued.			

If in a sum of time values any one of the operands is 'indefinite', the sum shall have the value 'indefinite', i.e. the presentation of the content will continue until an external event occurs or it may terminate because of temporal constraints which apply to superior layout objects.

External events take precedence over specifications given by the attribute "presentation time", i.e. an external event such as a user interaction always terminates the presentation of the content associated with a layout object, even if, e.g. the time given by the sub-parameter "fixed duration" has not yet expired. The effect of external events is considered implementation-dependent.

For the determination of the value of the attribute, steps a), c), e) and j) as in 9.1.2.4 of ITU-T Rec. T.412 | ISO/IEC 8613-2 are applicable.

7.3 Reference model for the layout process with respect to temporal relationships

The reference model of the layout process as described in ITU-T Rec. T.412 | ISO/IEC 8613-2 is extended as follows. The extended layout process:

- consists of the generation of a specific layout structure and the layout of the content of basic logical objects; during this process, the basic logical objects are considered in accordance with their sequential order (as it is);
- controls the allocation of the time spans and the (spatial) areas at the same time as described in this subclause.

The specifications of temporal relations become effective during the presentation (imaging) process. It is the task of the layout process, to transfer the temporal relationship specifications encountered in the logical structure by means of the attribute "temporal relations" or specifications in the generic layout structure to the layout objects created by the layout process.

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In particular, if temporal relations are specified for the content associated with logical objects, the layout objects with which the content will be associated, have to reflect these relations, i.e. the layout process has to add one or more of the attributes "presentation time" with appropriate values for the parameters and sub-parameters to suitable objects in the layout structure.

NOTE 1 – The layout process need not add the attribute "presentation time" explicitly to a specific layout object. Nevertheless, specifications for the temporal presentation of such a layout object may apply if the layout object class to which the layout object belongs contains such specifications. For instance, no temporal relations may be specified within the logical structure of a document, but the generic layout structure may specify, by means of the attribute "presentation time", that each page is to be presented for a specified amount of time after which the next page will be presented automatically.

The document layout process and the content layout process interact as follows: The document layout process informs the content layout process about the available time span (in addition to the available area) which the content layout process may consume. (The available time span may be infinite.) The content layout process informs the document layout process about the required time span it needs for laying out the content. (The required time span may be 0 time units.) If the available time span is smaller than the required time span, the content layout process fails. In this case, the document layout process may try to find a larger available time span, e.g. by starting a new page, and initiate the content layout process again.

NOTE 2 – The spatial layout process and the temporal layout process are separate processes. In particular, the specifications of the attributes "temporal relations" and "presentation time" have no direct implications for the spatial content layout process. However, the spatial layout process and the temporal layout process may interact, e.g. specifications for the temporal layout process may influence the spatial layout process (see example 8 in Annex D).

NOTE 3 – The distinction between the document layout process and the content layout process conforms to the reference model for the layout process described in ITU-T Recommendation T.412 (1993) | ISO/IEC 8613-2:1995. In an actual implementation there may not exist such a distinction.

If concatenation of content occurs, i.e. the content associated with a basic logical object is concatenated with the content of one or more other basic logical objects, only the specification of the attribute "temporal relations" for the first basic logical object, if present, is taken into account; specifications for the other basic logical objects, if present, are ignored.

If the content of one basic logical object is split into several layout objects, the effect of how the temporal specifications are applied to the individual layout objects is considered application dependent. Individual content architectures may specify additional rules for this case.

NOTE 4 – Unresolvable constraints for the temporal presentation of a document are possible. For instance, the constraint that the content of two logical objects A and B shall be presented in parallel may not be resolvable if the content of A and B does not fit on one page. This specification assumes that all constraints can be satisfied; the specification does not define how to handle unresolvable constraints.

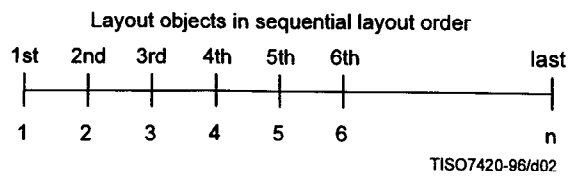
7.4 Reference model for the presentation process with respect to temporal relationships

The specifications of the attribute "presentation time" encountered in the layout structure are ignored if the concept of time is not supported (e.g. by a printer). If in such a case the content of a particular area on the presentation medium changes with time (e.g. the content portions to be imaged within one particular block are different at time t_1 and t_2), the result is considered implementation-dependent. It is recommended that this feature (see example 8 in Annex D on time-varying content in overlapping frames) shall be used only in conjunction with alternative representations.

The following specifications apply only if the concept of time is supported, e.g. by a computer screen connected to a computer system with a built-in clock.

7.4.1 Reference model for the temporal order of layout objects

Each layout object has a unique position in time on an abstract (discrete and finite) time axis which corresponds to the position in the sequential layout order of the specific layout structure. Since this position in time is specified implicitly by the sequential layout order, it is called the *implicit time coordinate* of the layout object.



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