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
ISO/IEC 8613-14:1997(E)

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Foreword

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

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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INTERNATIONAL STANDARD

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):

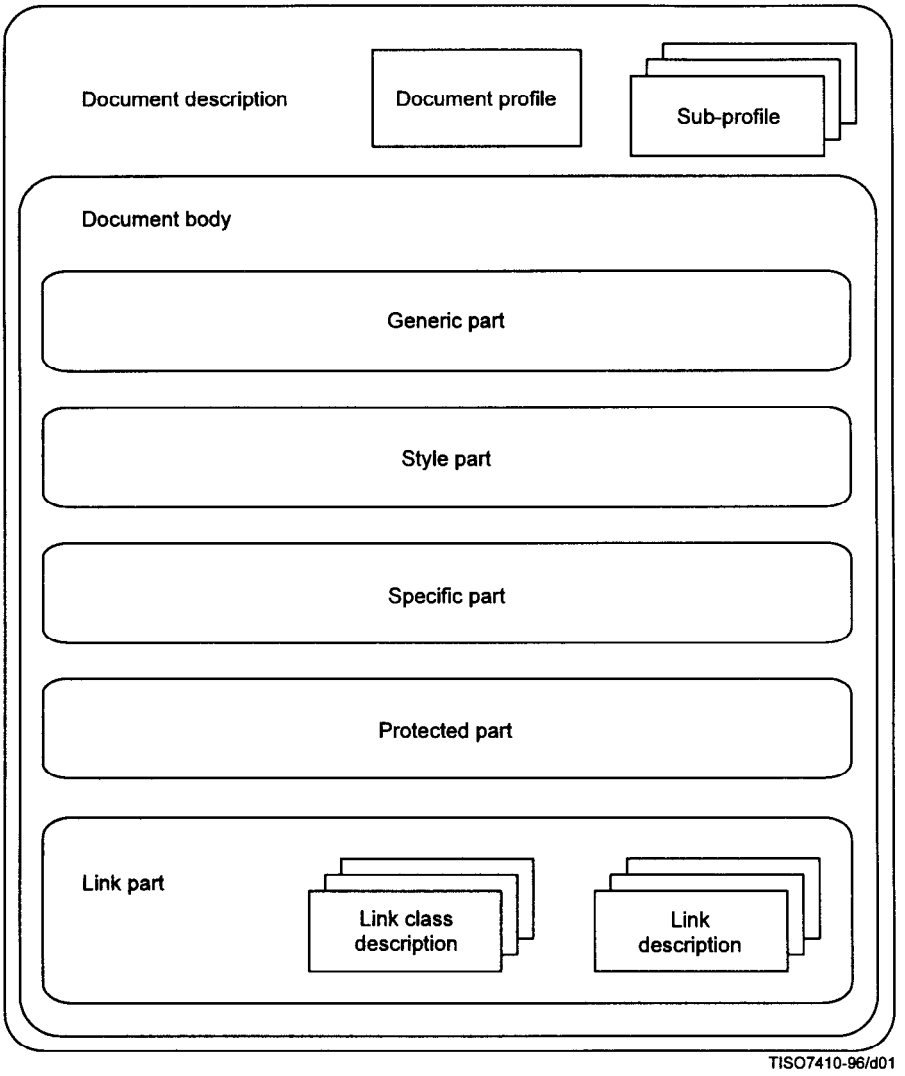


Figure 1 – Descriptive model of a document

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.

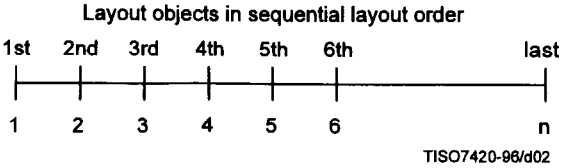
7.4 Reference model for the presentation process with respect to temporal relationships

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.

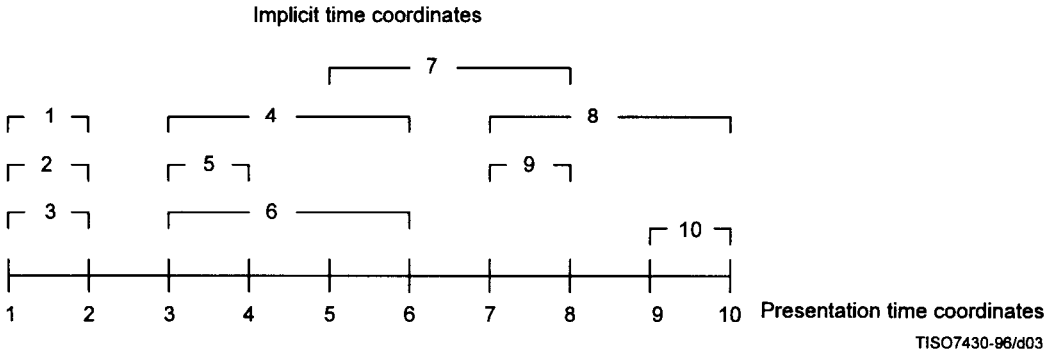


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During the presentation process each point on the implicit time axis is mapped to a point on the (discrete and finite) *presentation time axis*, i.e. each layout object receives a *presentation time coordinate* for its invocation. In addition, each layout object receives a presentation time coordinate for its termination which is always greater than the presentation time coordinate for its invocation. That is, each implicit time coordinate is mapped to two presentation time coordinates representing a presentation time interval in which the presentation of the object associated with the implicit time coordinate takes place. This is done according to the following rules:

- Each presentation time coordinate represents a point in time where a presentation starts or an event occurs.
- All presentation time coordinates are determined by values of the attribute "presentation time" specified (or defaulted) for the layout objects.
- If object X is superior to object Y, the presentation time coordinate for object X must be less than or equal to the one for object Y, i.e. a subordinate object may not be presented earlier than its superior object.

NOTE – The following example shows a mapping from implicit time coordinates to presentation time coordinates.



The layout objects associated with the implicit time coordinates may be: 1: page; 2 and 3: blocks with character text subordinate to the page; 4: page; 5: object with audio content; 6: block with graphics content which is to be presented in parallel with 5; 7: object with audio content which is to be presented after 5 and whose presentation is to terminate when the presentation of 9 terminates; 8: page; 9 and 10: blocks which are to be presented in sequence.

During the presentation process each presentation time coordinate i is further mapped to a point t_i in real time. In general, this mapping is only defined partially by the document. For instance, it may be undefined when the presentation of a particular page in a document starts, because moving from one page to the next may require user interaction. However, the presentation of the objects on a page in real time may be defined completely, by means of the attribute "presentation time", as soon as the presentation of the page itself is initiated.

The presentation time coordinates are mapped uniquely to real time coordinates in ascending order, i.e. each presentation time coordinate i is mapped to exactly one real time coordinate t_i and $t_i < t_j$ for $i < j$.

7.4.2 Reference model for the processing of the presentation time specifications

Temporal relations become effective during the presentation of a document. In particular, all specifications for the presentation of the content of a document in temporal order are given by the attribute "presentation time" specified for the document layout root, page set, page, frame and block components in the layout structure of a document.

If no presentation order is specified explicitly in the layout structure or in a substructure thereof (i.e. the default value as defined in 7.2.2 applies to each layout object), the document is presented in the following temporal order:

- The presentation of the document is started by an external event, e.g. by a user request to present the document.
- The pages of the document are presented in that order in which they appear in the sequential layout order.
- Only one page is presented at any point in time.
- The temporal presentation of all content of the objects on a particular page occurs in parallel.

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- Content which does not change with time is presented as long as the page itself is presented (e.g. the content of a block with character text will be visible as long as the page itself).
- After the termination of the presentation of content which changes with time, the presentation of this content will continue in that state that was reached at its end as long as the page is presented (e.g. for audio content nothing will be perceivable, for video content the final picture of the video – which may be blank – will be visible).
- The presentation of a page is terminated by an external event (e.g. by user interaction), i.e. the duration is indefinite.

NOTE 1 – A particular implementation may provide additional features for the presentation of a document such as starting the presentation of a document at an arbitrary page number or skipping backwards through the pages of a document. However, the effect of such additional features for the reference model described in this subclause is considered implementation-dependent, e.g. each time a layout object is presented the presentation time coordinate could be started at that point.

If explicit specifications for the presentation order are present, the following rules apply:

- The presentation of a document may start automatically or on the occurrence of an external event (e.g. user interaction) depending on the value of the attribute "document presentation time" in the document profile (see C.3.1). If the attribute is specified, the presentation of the document will start automatically when the specified date and time is reached. Otherwise, the presentation of the document will not start automatically.
- Whenever the presentation of the content of a layout object is invoked, the presentation process determines that point in time at which the event belonging to the presentation will be issued, according to the rules specified in 7.2.2.
- Furthermore, whenever the presentation of the content of a composite layout object (i.e. the document layout root, a page set, a page or a frame) is invoked, the presentation time coordinates of its immediately subordinate objects are determined. The presentation coordinate for starting the presentation of the content of an object is either defined by the sequential layout order or by the parameter "invocation time" of the attribute "presentation time", if specified. The presentation time coordinate for terminating the presentation of the content of an object is either defined by the temporal nature of the content or by duration constraints defined by the parameters "duration" or "cyclic" of the attribute "presentation time", if specified.
- If the sub-parameter "fixed timing" is specified for an object with a value of *s*, it is invoked for presentation *s* scaled time units after its immediately superior objects started its presentation.

  NOTE 2 – In particular, this parameter may be used to start the synchronous presentation of the content of two or more objects.
- If the parameter "duration" and the sub-parameter "cycle duration" are not specified, content which does not change with time is presented as long as the content of the superior frame or page is presented (e.g. the content of a block with character text remains visible as long as the superior frame or page itself).
- If the sub-parameter "fixed duration" is specified for an object with a integer value of *s*, the content of the object is presented for *s* scaled time units after the presentation of the content started. If the identifier of a layout object is specified, the presentation of the content of the object continues as long as the content of the referenced layout object is presented.
- If the sub-parameter "fixed duration" or the sub-parameter "cycle duration" of the parameter "cyclic" is specified, the content will no longer be perceivable after the specified time span has expired, e.g. audio content will no longer be heard, visual content such as character text will no longer be visible.
- The presentation of the content of an object which a position and dimension in space does not continue when the presentation of its immediately superior object terminates (e.g. the content of a block cannot be visible when the time span for its superior frame has expired).

  NOTE 3 – This restriction does not apply for blocks for which the value of the attributes "position" and "dimension" is 'null' such as for blocks with audio content. The content of such blocks may still be presented even if the frames or pages to which these blocks are subordinate are no longer presented.

7.5 ASN.1 representations

```
Temporal-Relationships { 2 8 1 14 0 }

DEFINITIONS                ::= BEGIN

IMPORTS                    Date-and-Time
                           FROM Document-Profile-Descriptor { 2 8 1 5 6 }
                           -- see ITU-T Rec. T.415 | ISO/IEC 8613-5 and C.4
```


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```
                        Object-or-Class-Identifier
                        FROM Identifiers-and-Expressions { 2 8 1 5 7 };
                        -- see ITU-T Rec. T.415 | ISO/IEC 8613-5

EXPORTS                 Temporal-Relations, Presentation-Time, Document-Presentation-Time,
                        Time-Scaling;

Temporal-Relations      ::= SET{
  synchronization-type          [0] IMPLICIT Synchronization-Type,
  subordinate-nodes             [1] SEQUENCE OF SET{
  node-identifier                       [0] IMPLICIT Node-Identifier,
  start-time                            [1] IMPLICIT Time-Delay OPTIONAL,
  duration                              [2] IMPLICIT Indefinite-or-Time-Delay OPTIONAL,
  cyclic                                [3] IMPLICIT Cyclic OPTIONAL,
  end-time                              [4] IMPLICIT Time-Delay OPTIONAL,
  application-comments                  [5] IMPLICIT OCTET STRING OPTIONAL}}
                        -- The value 'null' is represented by an empty set

Synchronization-Type    ::= INTEGER{parallel-last(0),
                            parallel-first(1), parallel-selective(2),sequential(3)}

Node-Identifier         ::= PrintableString
                        -- only digits and spaces are used
                        -- the first digit is either 2 for a logical object class or 3 for a logical object

Cyclic                  ::= SET{
  number-of-cycles              [0] CHOICE{Indefinite, INTEGER},
  cycle-start-time              [1] IMPLICIT Time-Delay OPTIONAL,
  cycle-duration                [2] IMPLICIT Indefinite-or-Time-Delay OPTIONAL}

Indefinite                      ::=

Time-Delay              ::= INTEGER { indefinite(-1)}

Presentation-Time               ::= SET{
  timing                        CHOICE{
    fixed-timing                [0] IMPLICIT INTEGER,
    variable-timing             [1] IMPLICIT Time-Spec} OPTIONAL,
  duration                      CHOICE{
    fixed-duration              [2] CHOICE{Indefinite-or-Time-Delay, Object-or-Class-Identifier},
    rule-A                              [3] IMPLICIT Rule-Spec,
    rule-B                              [4] IMPLICIT Rule-Spec} OPTIONAL,
  cyclic                        [5] Cyclic OPTIONAL}
                                -- The value 'null' is represented by an empty set

Time-Spec               ::= SET{
  start-offset                  [0] IMPLICIT INTEGER OPTIONAL,
  end-offset                    [1] IMPLICIT INTEGER OPTIONAL,
  start-separation              [2] IMPLICIT INTEGER OPTIONAL,
  end-separation                [3] IMPLICIT INTEGER OPTIONAL}

Rule-Spec               ::= SET{
  minimum-duration              [0] IMPLICIT INTEGER OPTIONAL,
  maximum-duration              [1] IMPLICIT INTEGER OPTIONAL}

Indefinite-or-Time-Delay ::= CHOICE{
  indefinite                    [0] IMPLICIT NULL,
  fixed                         [1] Time-Delay}

Document-Presentation-Time ::= Date-and-Time

Time-Scaling            ::= IMPLICIT SEQUENCE {INTEGER,INTEGER}
                        END
```

8 Non-linear structures

8.1 Structural model of a hypermedia document

The structural model introduces the structural elements of the hypermedia document architecture.

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A hypermedia document is distinguished from a normal document by the presence of *links* which establish relationships between *nodes*. Different hypermedia documents may use the same set of nodes and link them in different ways.

A node may be related to any number of other nodes within the same document or within other documents. This means that from a structural point of view, the same node may be referred to by more than one link, although this node is contained (i.e. encoded) only once in the hypermedia document. Thus the links between the nodes are in the form of general directed graphs.

The nodes in a hypermedia document can consist of processable documents or document fragments, formatted documents or document fragments, formatted-processable documents or document fragments or a mixture thereof.

8.1.1 Nodes

A node is either a whole document or hypermedia document or a document fragment.

A document is structured as defined in the ITU-T Rec. T.410-Series | ISO/IEC 8613 and in accordance with the extended architectural model defined in clause 6. A document may be in processable, formatted or formatted processable form.

A document fragment is specified by a location expression as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

8.1.2 Links

Links represent relationships between any number of nodes.

Links are a means to express arbitrary relationships which are an integral part of an ODA document, such as cross-references or pointers to annotations.

Furthermore, links may be used to establish relations between nodes without altering the underlying documents or document fragments, i.e. the same set of nodes may be composed into a number of different hypermedia documents.

Links may be part of the document description (often referred to as *integral links*) or – separated from a particular document description – part of the hypermedia document as a whole (often referred to as *non-integral links*).

8.1.3 Link classes

A set of links may have common characteristics, for example:

- to be used by beginners or advanced users;
- to be processed as a result of a user interaction rather than automatically;
- pointing to a certain kind of logical objects such as definitions or annotations;
- representing a cross-reference.

A *link class* is a structural element that may be used for factorizing such common characteristics.

ITU-T Rec. T.410-Series | ISO/IEC 8613 does not define particular link classes; however it provides the means by which link classes may be defined by applications or document application profiles.

8.2 Descriptive representation of a hypermedia document

The descriptive representation introduces the descriptive elements of the hypermedia document architecture.

For the purpose of interchange, a hypermedia document is represented as a collection of constituents, each of which is a set of attributes. Within the ITU-T Rec. T.410-Series | ISO/IEC 8613 each attribute is identified by a name and has a value, which either represents a characteristic of a structural element or a relationship with other constituents.

ITU-T Rec. T.412 | ISO/IEC 8613-2 defines the constituents representing a document. In addition, the following types of constituents are defined to represent a hypermedia document:

- link class description;
- link description;
- enciphered link descriptions.

Constituents are grouped into sets of constituents, which have inter-relationships as defined in the ITU-T Rec. T.410-Series | ISO/IEC 8613.

The possible types of constituents in the descriptive representation of a hypermedia document are shown in Figure 2.

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Figure 2 illustrates that:

- the hypermedia document consists of one document profile, zero, one or more sub-profiles and a number of constituents that form the hypermedia document body;
- the hypermedia document body consists of constituents representing the links or enciphered links and documents or document fragments containing the nodes;
- the link part consists of link descriptions or link class descriptions;
- the protected part includes enciphered link descriptions;
- the document part consists of the document description as described in the descriptive model of a document in ITU-T Rec. T.412 | ISO/IEC 8613-2, ITU-T Rec. T.422 | ISO/IEC 8613-12 and clause 6.

NOTE – The description of document fragments is included in the document descriptions.

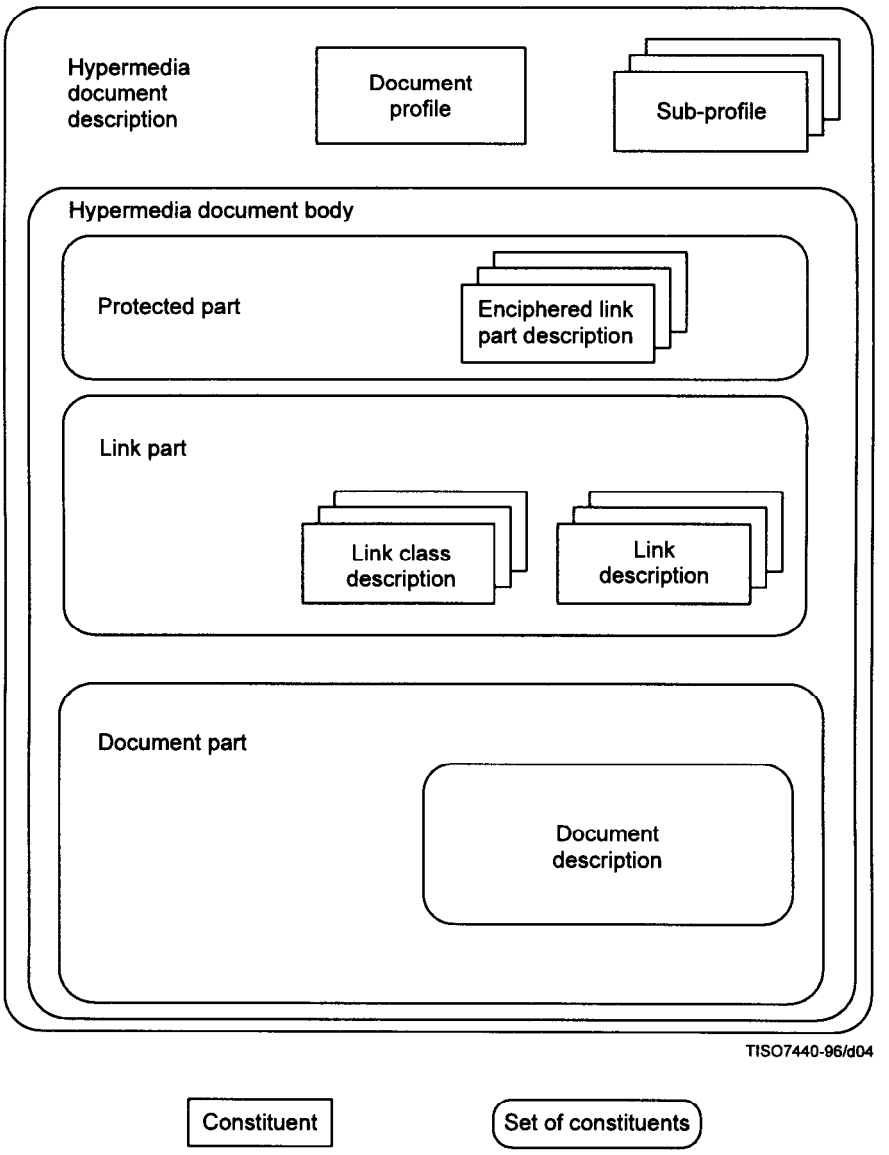


Figure 2 – Descriptive model of a hypermedia document

8.3 Attribute definitions for links and link classes

Links and link classes consist of a set of attributes.

Table 2 summarizes the attributes which may be specified for link descriptions and link class descriptions.

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Table 2 – Summary of attributes for link descriptions and link class descriptions

Link description	Link class description
link identifier	link class identifier
link class	
link roles	link roles
application comments	application comments
user-readable comments	user-readable comments
user-visible name	user-visible name
temporal relations	temporal relations
presentation time	presentation time
sealed	sealed

The values for defaultable attributes of links can be derived from:

- within the link description;
- within the link class description;
- within the ITU-T Rec. T.410-Series | ISO/IEC 8613.

The value of the attribute of a link that is classified as defaultable is determined by the first of the following rules which is applicable:

- if the attribute value is specified for the link description, then that value is used;
- if the link description concerned refers to a link class description, and that link class description contains a value for the corresponding attribute, then the value of the attribute is derived from that corresponding attribute;
- the default value defined in ITU-T Rec. T.410-Series | ISO/IEC 8613 is used.

8.3.1 Link identifier

Constituents

Link descriptions.

Classification

- Mandatory.

Permissible values

A sequence of two non-negative integers. The value assigned to the first integer is 10.

Representation

A character string consisting of decimal numerals and a space character. The space character is used as a separator between successive numerals. The second integer shall be unique within the hypermedia document.

Definition

This attribute identifies a link description uniquely within a link part.

8.3.2 Link class identifier

Constituents

Link class descriptions.

Classification

- Mandatory.

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Permissible values

A sequence of two non-negative integers. The value assigned to the first integer is 11.

Representation

A character string consisting of decimal numerals and a space character. The space character is used as a separator between successive numerals. The second integer shall be unique within the hypermedia document.

Definition

This attribute identifies a link class description uniquely within a link part.

8.3.3 Link class

Constituents

Link descriptions.

Classification

- Non-mandatory.

Permissible values

The identifier of a link class.

Definition

This attribute is used to establish a relationship between a link description and its link class description.

The value of this attribute is the identifier of the corresponding link class description (see 8.3.2)

8.3.4 Link roles

Constituents

Link class descriptions and link descriptions.

Classification

- non-mandatory for link class descriptions;
- mandatory for link descriptions.

Structure

If specified for link class descriptions, a sequence of one or more entries where each entry may consist of the optional parameters "layout style", "presentation style", "application comments", "user-visible name" and "user-readable comments".

If specified for link descriptions, a sequence of one or more entries where each entry consists of the parameter "link ends" and optionally the parameters "layout style", "presentation style", "application comments", "user-visible name" and "user-readable comments".

The parameter "link ends" consists of a set entries, each entry containing the optional sub-parameters "reference name" and "reference qualifier" with the constraint that one of these sub-parameters shall be present, and the optional sub-parameters "layout style", "presentation style", "application comments", "user-visible name" and "user-readable comments".

Permissible values

For the sub-parameter "reference name": a reference name as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

For the sub-parameter "reference qualifier": a location expression as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

For the parameter or sub-parameter "layout style": a layout style identifier.

For the parameter or sub-parameter "presentation style": a presentation style identifier.

For the parameter or sub-parameter "application comments": an octet string.

NOTE 1 – It is recommended that application comments in link descriptions are structured as described in Annex A.

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For the parameter or sub-parameter "user-visible name": A string of characters from a defined character set. The character set is that specified in the hypermedia document profile attribute "comments character sets". The default character set is the minimum subrepertoire of ISO 6937-2[1)] . In addition to the graphic character set, the control functions CARRIAGE RETURN and LINE FEED may be included in the character string. Code extension control functions for the designation and invocation of graphic character sets may also be included.

For the parameter or sub-parameter "user-readable comments": A string of characters from the character set specified by the hypermedia document profile attribute "comments character sets". The default character set is the minimum subrepertoire of ISO 6937-2. In addition to the graphic character set, the control functions CARRIAGE RETURN and LINE FEED may be included in the character string. Code extension control functions for the designation and invocation of graphic character sets may also be included.

Definition

This attribute allows one to identify one or more sets of link ends for a link. For each entry, the parameter "link ends" specifies a set of nodes which serves as one set of link ends for the link.

If the sub-parameter "reference name" is specified, this indicates that the link end resides in an external document (fragment). The sub-parameter "reference name", in conjuction with the parameter "reference name" of the document profile attribute "document references list", provide a mapping to this external document (fragment). If the sub-parameter "reference name" is specified, the sub-parameter "reference qualifier" shall specify only constituents which are a subset of or subordinate to the constituents identified by the parameter "reference qualifier" belonging to the referenced external document (fragment).

NOTE 2 – The attribute "external references list" is defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

The parameter "application comments" can be used by an application as information about the role of this link.

NOTE 3 – Annex B defines possible information present in such an application comment.

The sub-parameter "application comments" similarly can be used by an application as information about a single link end.

The parameter "presentation style" is used to establish a relationship between this set of link ends and a presentation style. The presentation style may be used to override those attributes defined at the node(s) referred to. The parameter "presentation style" can be used to specify a default presentation style for the set of link ends. If a value is specified for the sub-parameter "presentation style" of the parameter "link ends", it overrides the value of the parameter "presentation style" for the particular link end it applies to.

The parameter "layout style" is used to establish a relationship between this set of link ends and a layout style. The layout style may be used to override those attributes defined at the node(s) referred to. The parameter "layout style" can be used to specify a default layout style for the set of link ends. If a value is specified for the sub-parameter "layout style" of the parameter "link ends", it overrides the value of the parameter "layout style" for the particular link end it applies to.

The parameter "user-visible name" can be used to identify the set of link ends. The parameter is intended to assist in browsing through a hypermedia document. For example, the value of this parameter may be a name which serves to indicate semantics of the link end to a human, such as "definition" or "additional background information". However, such values are not defined by ITU-T Rec. T.410-Series | ISO/IEC 8613.

The sub-parameter "user-visible name" similarly can be used to identify a single link end.

The parameter "user-readable comments" is intended for human perception and may be used to describe the set of link ends.

The sub-parameter "user-readable comments" similarly can be used to describe a single link end.

8.3.5 Other attributes

In addition, the attributes "application comments", user-readable comments", "user-visible name", "sealed", and either "temporal relations" or "presentation time" may be specified. The attribute "temporal relations" may be used if the nodes addressed by the links are in processable form. The attribute "presentation time" may be used if the nodes addressed by the links are in formatted form.

---

1) ISO 6937-2:1983, *Information processing-Coded character sets for text communication – Part 2: Latin alphabetic and non-alphabetic graphic characters.*

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8.4 Attributes of the document profile

This subclause defines the attributes that may occur within the document profile of a hypermedia document in addition to the document profile attributes defined in ITU-T Rec. T.414 | ISO/IEC 8613-4. Unless specified otherwise, all attributes are classified as non-mandatory.

Where attribute values consist of character strings, the document profile character set is used. This set consists of SPACE, CARRIAGE RETURN, LINE FEED and a set of graphics characters. In the absence of the attribute "document profile character sets," this set of graphic characters consists of the 73 graphic characters of the minimum subrepertoire of ISO 6937-2.

8.4.1 Entry point

Classification

– Mandatory.

Structure

Either a link identifier or the parameter "reference name" and optionally the parameter "reference qualifier".

Permissible values

For the parameter "reference name": a reference name as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

For the parameter "reference qualifier": a location expression as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12 resulting in an object identifier or a link identifier.

Definition

This attribute defines the entry point of a hypermedia document, i.e. the starting point for hypermedia navigation as defined by the author of the hypermedia document. If this attribute refers to an object, that object serves as a root node for the hypermedia document. It is defined such that all other nodes are accessible from the root node by following one or more links.

If the parameter "reference name" is specified, this indicates that the entry point resides in an external document (fragment). The parameter "reference name", in conjunction with the parameter "reference name" of the document profile attribute "external references list", provides a mapping to this external document (fragment). If the parameter "reference name" is specified, the sub-parameter "reference qualifier" shall specify only a constituent which is subordinate to the one identified by the parameter "reference qualifier" belonging to the referenced external document (fragment).

If this attribute refers to a link, this link provides the highest level of choice for navigation.

NOTE – The attribute "external references list" is defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

8.4.2 Links

This attribute is specified if, and only if, the hypermedia document contains link descriptions for non-integral links.

The value of this attribute (if specified) is 'present'.

8.4.3 Link classes

This attribute is specified if, and only if, the hypermedia document contains link class descriptions for non-integral links.

The value of this attribute (if specified) is 'present'.

8.4.4 Enciphered links

This attribute is specified if, and only if, the hypermedia document contains enciphered link descriptions for non-integral links.

The value of this attribute (if specified) is 'present'.

8.4.5 Pre-sealed document body parts

This attribute has the same structure and semantics as the document profile attribute "pre-sealed document body parts" with the modification that the sealed constituents are only link or link class descriptions for non-integral links.

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8.5 Structural model of a document set

The structural model introduces the structural elements of a document set.

A document set is composed of one *document set profile*, an (optional) set of *links* which establish relationships between nodes and an (optional) set of documents and/or hypermedia documents. Different document sets may use the same set of nodes and link them in different ways.

A node may be related to any number of other nodes within the same document or within other documents. This means that from a structural point of view, the same node may be referred to by more than one link, although this node is contained (i.e. encoded) only once in the document set. Thus the links between the nodes are in the form of general directed graphs.

The nodes in a document set can consist of processable documents or document fragments, formatted documents or document fragments, formatted-processable documents or document fragments or a mixture thereof.
An example of a document set is shown in Figure 3.

8.5.1 Nodes

A node is either a whole document or hypermedia document or a document fragment.

A document is structured as defined in the ITU-T Rec. T.410-Series | ISO/IEC 8613 and in accordance with the extended architectural model defined in clause 6. A document may be in processable, formatted or formatted processable form.

A document fragment is specified by a location expression as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

8.5.2 Links

Links represent relationships between any number of nodes.

Links in a document set are separate from a particular document description part, i.e. they are *non-integral links*.

8.5.3 Link classes

A set of links may have common characteristics; for example:

- to be used by beginners or advanced users;
- to be processed as a result of a user interaction rather than automatically;
- pointing to a certain kind of logical objects such as definitions or annotations;
- representing a cross-reference.

A *link class* is a structural element that may be used for factorizing such common characteristics.

ITU-T Rec. T.410-Series | ISO/IEC 8613 does not define particular link classes; however it provides the means by which link classes may be defined by applications or document application profiles.

8.5.4 Document set profile

The document set profile consists of a set of attributes which specify characteristics of the document set as a whole as well as the entry point to the document set (root node). It is not the intention of the document set profile to duplicate the information in the document profiles of the documents or hypermedia documents which are part of the document set. The attribute values in the document set profile may differ from all values in the associated document profiles.

A document set profile may be interchanged or stored independent of the nodes and links of the document set.

The document set profile contains information for use by humans beings and for machine processing.

8.6 Document set profile attributes

This subclause defines the attributes that may occur within the document set profile. Unless specified otherwise, all attributes are classified as non-mandatory.

Where attribute values consist of character strings, the document set profile character set is used. This set consists of SPACE, CARRIAGE RETURN, LINE FEED and a set of graphics characters. In the absence of the attribute "document set profile character sets," this set of graphic characters consists of the 73 graphic characters of the minimum subrepertoire of ISO 6937-2.

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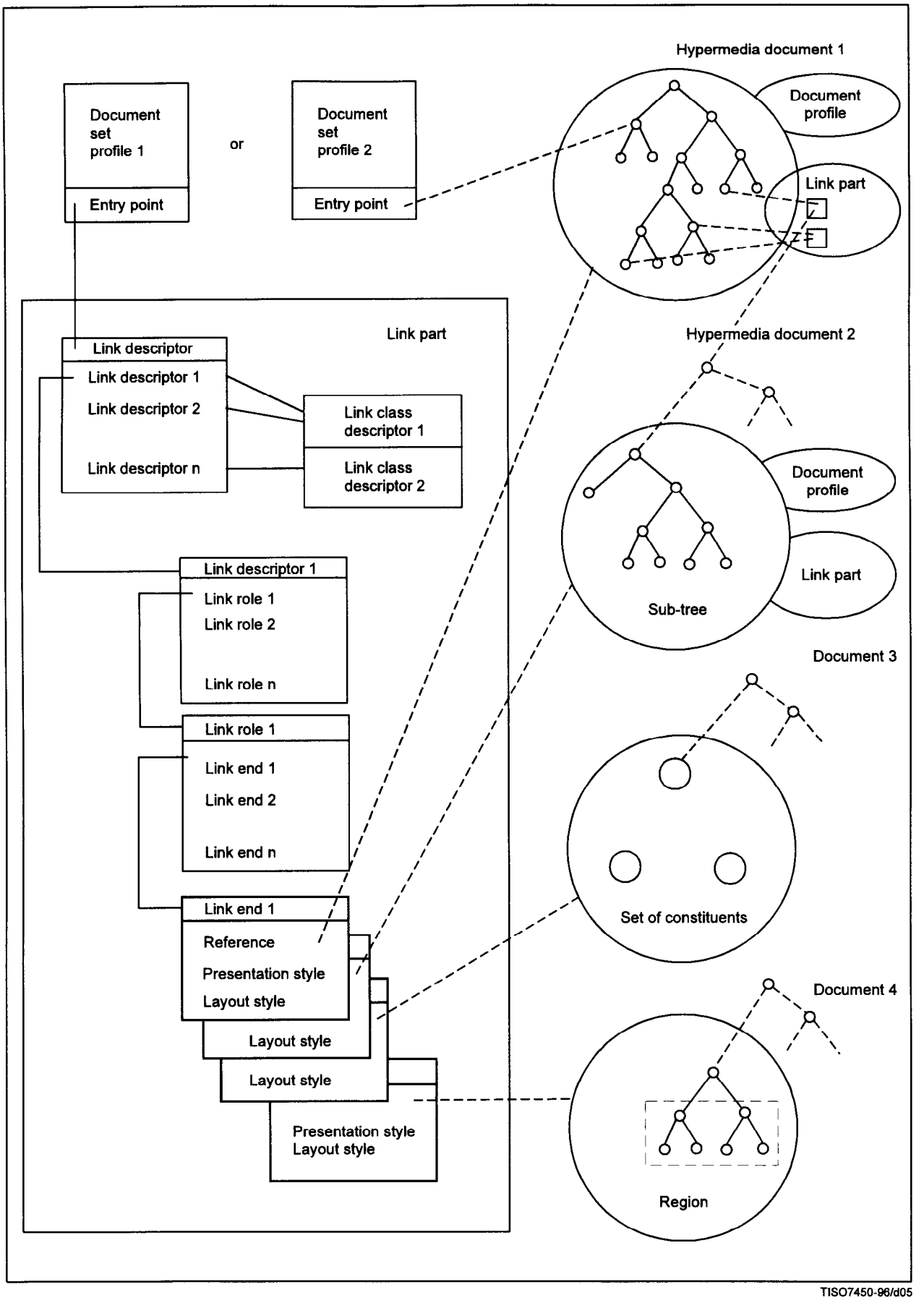


Figure 3 – Illustrative model of the structure of document sets

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8.6.1 Entry point

Classification

– Mandatory.

Structure

Either a link identifier or the parameter "reference name" and optionally the parameter "reference qualifier".

Permissible values

For the parameter "reference name": a reference name as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

For the parameter "reference qualifier": a location expression as defined in ITU-T Rec. T.422 | ISO/IEC 8613-12 resulting in an object identifier or a link identifier.

Definition

This attribute defines the entry point of a document set, i.e. the starting point for navigation as defined by the author of the document set. If this attribute refers to an object, that object serves as a root node for the hypermedia document. It is defined such that all other nodes are accessible from the root node by following one or more links.

If the parameter "reference name" is specified, this indicates that the entry point resides in an external document (fragment). The parameter "reference name", in conjunction with the parameter "reference name" of the document profile attribute "external references list", provides a mapping to this external document (fragment). If the parameter "reference name" is specified, the sub-parameter "reference qualifier" shall specify only a constituent which is subordinate to the one identified by the parameter "reference qualifier" belonging to the referenced external document (fragment).

If this attribute refers to a link, this link provides the highest level of choice for navigation.

NOTE – The attribute "external references list" is defined in ITU-T Rec. T.422 | ISO/IEC 8613-12.

8.6.2 Links

This attribute is specified if, and only if, the document set contains link descriptions for non-integral links.

The value of this attribute (if specified) is 'present'.

8.6.3 Link classes

This attribute is specified if, and only if, the document set contains link class descriptions for non-integral links.

The value of this attribute (if specified) is 'present'.

8.6.4 Enciphered links

This attribute is specified if, and only if, the document set contains enciphered link descriptions for non-integral links.

The value of this attribute (if specified) is 'present'.

8.6.5 Pre-sealed document body parts

This attribute has the same structure and semantics as the document profile attribute "pre-sealed document body parts" with the modification that the sealed constituents are only link or link class descriptions for non-integral links.

8.6.6 Document set characteristics

8.6.6.1 Interchange format class

This attribute specifies the interchange format class used to represent the document set. This attribute shall always be specified. The value of this attribute is 'A'.

NOTE – The definition of interchange format class A as defined in ITU-T Rec. T.415 | ISO/IEC 8613-5 is amended to allow the additional data elements defined by this Recommendation | International Standard.

8.6.6.2 ODA version

This attribute identifies the Document Architecture Standard or Recommendation version, and its publication date, to which the document set conforms. This attribute shall always be specified.

The value of this attribute is structured as defined in 7.3.6 of ITU-T Rec. T.414 | ISO/IEC 8613-4.

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8.6.6.3 Non-basic document set characteristics

8.6.6.3.1 Document set profile character sets

This attribute specifies the graphic character set(s), other than the character set specified in clause 8, used in those document set profile attributes that consist of character strings.

The value of this attribute consists of the escape sequence(s) used to announce and to designate the set(s) in accordance with ISO 2022 and the register of ISO 2375.

In the absence of this attribute the same assumptions as specified in 7.3.8.1 of ITU-T Rec. T.414 | ISO/IEC 8613-4 apply.

8.6.6.3.2 Comments character sets

This attribute specifies the graphic character set(s), other than the default character set specified in ITU-T Rec. T.412 | ISO/IEC 8613-2, used by the link attributes "user-readable comments" and "user-visible name" in the link part for non-integral links of the document set.

The value of this attribute consists of the escape sequence(s) used to announce and to designate the set(s) in accordance with ISO 2022 and the register of ISO 2375.

8.6.6.4 Document set description

8.6.6.4.1 Title

This attribute gives the name of the document set represented by the document set profile, the optional link part for the non-integral links and the optional set of documents or document fragments as specified by the author.

The value of this attribute consists of a string of characters from the document set profile character set.

8.6.6.4.2 Subject

This attribute contains information to indicate the subject of the document set.

The value of this attribute consists of a string of characters from the document set profile character set.

8.6.6.4.3 Document reference

This attribute identifies the document set. The attribute's value is used to refer to the document set (see.8.6.8).

The value of this attribute is either an ASN.1 object identifier or a string of characters from the document set profile character set.

8.6.6.4.4 Document type

This attribute specifies the type of document set, e.g. slide show, audio/visual repair manual. This attribute specifies only an informal name; it does not specify a relation to a particular document class description.

The value of this attribute consists of a string of characters from the document set profile character set.

8.6.6.4.5 Abstract

This attribute contains information to summarize the document set.

The value of this attribute consists of a string of characters from the document set profile character set.

8.6.6.4.6 Keywords

This attribute specifies one or more character strings that permit logical associations to be made about the content of the document set.

The value of this attribute consists of string(s) of characters from the document set profile character set.

8.6.7 Other attributes

In addition, the following attributes may be specified for the document set profile:

- "document date and time";
- "creation date and time";
- "local filing date and time";
- "expire date and time";
- "start date and time";

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- "purge date and time";
- "release date and time";
- "revision history";
- "organizations";
- "preparers";
- "owners";
- "authors";
- "copyright";
- "status";
- "user-specific codes";
- "distribution list";
- "additional information ";
- "superseded documents";
- "local file references";
- "authorization";
- "security classification";
- "access rights".

The semantics of these attributes are as defined in ITU-T Rec. T.414 | ISO/IEC 8613-4 with the modification that whenever the descriptions of these attributes use the term *document*, the term *document* shall be replaced by *document set*.

8.6.8 References to documents

This attribute specifies reference(s) to any document or document fragment which is referenced in the link part for the non-integral links. It consists of one or more entries.

The value of each entry is either an ASN.1 object identifier or a string of characters from the document set profile character set.

This value is equal to the value of the document profile attribute "document reference" of the document or document fragment referred to.

8.6.9 Security features

To prohibit unauthorized access to a document set profile, the document set profile may be enciphered, i.e. a document may contain a constituent of type *enciphered document set profile*.

To support authenticity, integrity and non-repudiation of a document set profile, a document may contain a constituent of type *sealed document set profile*.

8.7 Enciphered link part description

To prohibit unauthorized access to links and link classes, these constituents may be enciphered, i.e. a document may contain constituents of type *enciphered link part*.

Enciphered link part descriptions are included in the protected part of a document set. An enciphered link part description consists of two attributes:

- protected part identifier;
- enciphered information.

The attributes "protected part identifier" and "enciphered information" are as defined in ITU-T Rec. T.412 | ISO/IEC 8613-2 with the following additional/modified semantics:

- The value of the attribute "enciphered information" contains the result of a cryptographic algorithm applied to a sequence of constituents of the link part.

8.8 Reference model for the hypermedia document and document set editing process

The reference model for the editing process as defined in ITU-T Rec. T.412 | ISO/IEC 8613-2 applies also to the editing process for a hypermedia document or document set.

In addition, the editing process for a hypermedia document or document set is concerned with the creation/modification of links, link classes and /or the document set profile.

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8.9 Reference model for the hypermedia document and document set layout process

The reference model for the layout process as described in clause 10 of ITU-T Rec. T.412 | ISO/IEC 8613-2 is extended as follows: if a processable document with a structure as described in ITU-T Rec. T.412 | ISO/IEC 8613-2 contains a link part for integral links, the layout process adds additional links between layout objects created by the layout process to the link part. These additional links reflect the links specified between constituents of the logical structure. Otherwise, the presence of a link part with integral links has no effect to the specific layout structure created by the layout process. In particular, links are not traversed automatically during the layout process.

The remaining specifications in this subclause address only the case that a hypermedia document or document set contains non-integral links and/or that it contains integral links which, in a particular application, are to be taken into account explicitly, thus ignoring the existing sequential order of the constituents of the document.

Since a hypermedia document is distinguished from a normal document by the presence of links which provide different possibilities for reading the content of a hypermedia document, there exists no single visual representation of a hypermedia document. This applies also for a document set with links. Therefore, the layout process as described in this subclause does not result in a (single) specific layout structure as defined in ITU-T Rec. T.412 | ISO/IEC 8613-2.

NOTE 1 – Even if all nodes in a hypermedia document or document set are in formatted form, the union of all specific structures in the nodes does not represent the specific layout structure of a hypermedia document or document set; the concept of the specific structure of a hypermedia document or document set as such does not exist.

The reference model for the layout process specifies only a set of rules for the individual layout processes which are carried out whenever a new node (which is in processable form) is reached by following a node during document browsing. The result of each individual layout process is an *intermediate* specific layout structure according to ITU-T Rec. T.412 | ISO/IEC 8613-2 which is not intended for inclusion into interchanged hypermedia document or document set data streams.

It is assumed that each node (which is in processable form) can be laid out in accordance with the rules defined below and the rules defined in ITU-T Rec. T.412 | ISO/IEC 8613-2. That is, it is assumed that each attribute pertaining to the layout process can be interpreted in accordance with the definition of the attribute. It is outside the scope of this Recommendation | International Standard to indicate how a node containing conflicting or inconsistent information is to be laid out.

During the hypermedia document or document set layout process the layout of each node follows the layout specifications as defined for that node, unless the layout specifications are overridden by the corresponding parameters of the link description (presentation style, layout style, generic structure). In the latter case, the layout process has to be carried out in line with the specifications in the ITU-T Rec. T.410-Series | ISO/IEC 8613 using the values provided by the link description.

NOTE 2 – If there exist specifications with respect to temporal relationships for the presentation of content associated with different nodes, the individual layout processes may need to interact to satisfy these specifications.

8.10 Reference Model for the hypermedia document and document set presentation process

The presentation process for a hypermedia document or document set is a sequence of presentation processes as defined in the ITU-T Rec. T.410-Series | ISO/IEC 8613.

An individual presentation process is started whenever:

- a new node (which is in formatted or formatted-processable form) is reached by following a link during document browsing; or
- an individual document layout process for a node as described in 8.9 is finished.

8.11 ASN.1 representations

8.11.1 Document set descriptor

Document-Set-Descriptor { 2 8 1 14 1 }

```
DEFINITIONS ::=          BEGIN

EXPORTS                  Document-Set;

IMPORTS                  Interchange-Data-Element
                         FROM Interchange-Data-Elements { 2 8 1 5 5 }
                         -- see ITU-T Rec. T.415 | ISO/IEC 8613-5
```


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```
                                Document-Set-Profile-Descriptor
                                FROM Document-Set-Profile-Descriptor
                                -- see 8.11.2

                                Link-Class-Descriptor, Link-Descriptor,
                                Enciphered-Link-Descriptor
                                FROM Link-Descriptors;
                                -- see 8.11.3

Document-Set      ::=           SEQUENCE{
  profile                             Document-Set-Profile-Descriptor,
  link-classes                        [0] SET OF Link-Class-Descriptor OPTIONAL,
  links                               [1] SET OF Link-Descriptor OPTIONAL,
  nodes                               [2] SET OF Interchange-Data-Element OPTIONAL,
  enciphered-links                    [3] SET OF Enciphered-Link-Descriptor OPTIONAL}
                                END
```

8.11.2 Document set profile descriptor

```
Document-Set-Profile-Descriptor { 2 8 1 14 2 }

DEFINITIONS ::=                 BEGIN

EXPORTS                         Document-Set-Profile-Descriptor;

IMPORTS                         Location-Expression
                                FROM Location-Expressions { 2 8 1 12 0 }
                                -- see ITU-T Rec. T.422 | ISO/IEC 8613-12

                                Reference-Name, External-References-List
                                FROM External-References { 2 8 1 12 1 }
                                -- see ITU-T Rec. T.422 | ISO/IEC 8613-12

                                ODA-Version, Document-Description, Dates-and-Times, Originators,
                                Other-User-Information, External-References,
                                Local-File-References, Security-Information, Sealed-Doc-Bodyparts
                                FROM Document-Profile-Descriptor { 2 8 1 5 6 }
                                -- see ITU-T Rec. T.415 | ISO/IEC 8613-5 and C.4

                                Link-or-Link-Class-Identifier
                                FROM Link-Descriptors;
                                -- see 8.11.3

Document-Set-Profile-Descriptor ::=SET{
  entry-point                         Entry-Point,
  external-references-list            [0] IMPLICIT External-References-List OPTIONAL,
  interchange-format-class            [1] IMPLICIT INTEGER {if-a (0)},
  oda-version                         [2] IMPLICIT ODA-Version,
  profile-character-sets              [3] IMPLICIT OCTET STRING OPTIONAL,
  document-description                [4] IMPLICIT Document-Description OPTIONAL,
  dates-and-times                     [5] IMPLICIT Dates-and-Times OPTIONAL,
  originators                         [6] IMPLICIT Originators OPTIONAL,
  other-user-information              [7] IMPLICIT Other-User-Information OPTIONAL,
  external-references                 [8] IMPLICIT External-References OPTIONAL,
  local-file-references               [9] IMPLICIT Local-File-References OPTIONAL,
  security-information                [10] IMPLICIT Security-Information OPTIONAL,
  links                               [11] IMPLICIT NumericString OPTIONAL,
  link-classes                        [12] IMPLICIT NumericString OPTIONAL,
  enciphered-links                    [13] IMPLICIT NumericString OPTIONAL,
                                -- The numeric string has the value 'present', represented by "1"
  sealed-links                        [14] IMPLICIT Sealed-Doc-Bodyparts OPTIONAL}

Entry-Point                     ::=CHOICE{
  link-id                             Link-or-Link-Class-Identifier,
  reference                           [1] SET{
    reference-name                          [0] Reference-Name OPTIONAL,
    reference-qualifier                     [1] Location-Expression OPTIONAL}}
                                END
```

8.11.3 Link descriptors

```
Link-Descriptors {2 8 1 14 3 }
```


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```
DEFINITIONS                    ::= BEGIN

EXPORTS                        Link-Class-Descriptor, Link-Descriptor,
                               Link-or-Link-Class-Identifier, Enciphered-Link-Descriptor;

IMPORTS                        Reference-Name
                               FROM External-References { 2 8 1 12 1 }
                               -- see ITU-T Rec. T.422 | ISO/IEC 8613-12

                               Location-Expression
                               FROM Location-Expressions { 2 8 1 12 0 }
                               -- see ITU-T Rec. T.422 | ISO/IEC  8613-12

                               Style-Identifier, Protected-Part-Identifier
                               FROM Identifiers-and-Expressions { 2 8 1 5 7 }
                               -- see ITU-T Rec. T.415 | ISO/IEC 8613-5

                               Comment-String, Sealed
                               FROM Layout-Descriptors { 2 8 1 5 8 }
                               -- see ITU-T Rec. T.415 | ISO/IEC 8613-5

                               Temporal-Relations, Presentation-Time
                               FROM Temporal-Relationships;
                               -- see 7.5

Link-or-Link-Class-Identifier  ::= [APPLICATION 9] IMPLICIT PrintableString
--      only digits and space are used in the present version of this Recommendation | International Standard;
--      other characters are reserved for extensions

Link-Class-Descriptor          ::= SET{
  link-class-identifier                Link-or-Link-Class-Identifier,
  link-roles                           [1] SEQUENCE OF Link-Role OPTIONAL,
  user-readable-comments               [2] IMPLICIT Comment-String OPTIONAL,
  user-visible-name                    [3] IMPLICIT Comment-String OPTIONAL,
  application-comments                 [25] IMPLICIT OCTET STRING OPTIONAL,
  sealed                               [35] IMPLICIT Sealed OPTIONAL,
  temporal-relations                   [38] IMPLICIT Temporal-Relations OPTIONAL,
  presentation-time                    [39] IMPLICIT Presentation-Time OPTIONAL}

Link-Descriptor                ::= SET{
  link-identifier                      Link-or-Link-Class-Identifier,
  link-class                           [0] IMPLICIT Link-or-Link-Class-Identifier OPTIONAL,
  link-roles                           [1] SEQUENCE OF Link-Role OPTIONAL,
  user-readable-comments               [2] IMPLICIT Comment-String OPTIONAL,
  user-visible-name                    [3] IMPLICIT Comment-String OPTIONAL,
  application-comments                 [25] IMPLICIT OCTET STRING OPTIONAL,
  sealed                               [35] IMPLICIT Sealed OPTIONAL,
  temporal-relations                   [38] IMPLICIT Temporal-Relations OPTIONAL,
  presentation-time                    [39] IMPLICIT Presentation-Time OPTIONAL}

Link-Role                      ::= SET{
  link-ends                            SET OF Link-End,
  user-readable-comments               [2] IMPLICIT Comment-String OPTIONAL,
  user-visible-name                    [3] IMPLICIT Comment-String OPTIONAL,
  application-comments                 [25] IMPLICIT OCTET STRING OPTIONAL}

Link-End                       ::= SET{
  reference                            SET{
    reference-name                           [0] Reference-Name OPTIONAL
    reference-qualifier                      [1] Location-Expression OPTIONAL},
  user-readable-comments               [2] IMPLICIT Comment-String OPTIONAL,
  user-visible-name                    [3] IMPLICIT Comment-String OPTIONAL,
  presentation-style                   [17] IMPLICIT Style-Identifier OPTIONAL,
  layout-style                         [19] IMPLICIT Style-Identifier OPTIONAL,
  application-comments                 [25] IMPLICIT OCTET STRING OPTIONAL}

Enciphered-Link-Descriptor     ::= SEQUENCE{
  protected-part-identifier            Protected-Part-Identifier,
  enciphered-information               OCTET STRING}
                               END
```


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Annex A

Structuring conventions for "application comments"

(This annex forms an integral part of this Recommendation | International Standard)

NOTE 1 – This annex contains specifications which are not only useful for this Recommendation | International Standard. Therefore, this annex may be moved to another part (e.g. Part 1 or 2) of ITU-T Rec. T.410-Series | ISO/IEC 8613 with the next republication.

This annex describes conventions for the use of the attribute (or parameter or sub-parameter) "application comments" to represent application specific information that can automatically be extracted by applications.

In order to represent application specific information within the attribute "application comments", an appropriate substructure of this attribute shall be used which is specified subsequently.

According to this Recommendation | International Standard and ITU-T Rec. T.415 | ISO/IEC 8613-5, this attribute is encoded as an ASN.1 OCTET STRING:

application-comments **[...] IMPLICIT OCTET STRING OPTIONAL ....**

Within this OCTET STRING, ASN.1 Basic Encoding Rules are applied, again, resulting in a substructure of two components:

```
Appl-Comm-Encoding  ::=  SEQUENCE {
  constraint-name        [0] IMPLICIT PrintableString OPTIONAL,
  external-data          [1] IMPLICIT OCTET STRING OPTIONAL}
```

The first component is a PrintableString.

NOTE 2 – This component is intended to be used by document application profiles to identify the DAP constituent constraints defined therein.

The second component is encoded as an ASN.1 OCTET STRING which is, in turn, substructured as a sequence of ASN.1 EXTERNAL types represented in ASN.1 Basic Encoding Rules.

Appl-Comm-External-Data-Encoding ::= **SEQUENCE OF EXTERNAL**

Each EXTERNAL value shall consist of at least two components:

- an ASN.1 OBJECT IDENTIFIER to uniquely identify the corresponding type; and
- the value itself, being encoded as an OCTET STRING, again.

NOTE 3 – As defined in CCITT Rec. X.208 and ISO/IEC 8824, one possible form of EXTERNAL is:

```
EXTERNAL  :=  [UNIVERSAL 8] IMPLICIT SEQUENCE {
  direct-reference    OBJECT IDENTIFIER,
  encoding            [1] IMPLICIT OCTET STRING}
```

NOTE 4 – This substructure has been chosen in order to conform to existing document application profiles and to provide maximum flexibility for making use of the attribute "application comments" in arbitrary applications.

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Annex B

Usage of the attribute/parameter "application comments" in links

(This annex forms an integral part of this Recommendation | International Standard)

This annex specifies ASN.1 object identifiers for use within application comments in link descriptions and link class descriptions. It also provides examples of their use.

General

Application comments structured in accordance with Annex A use sequences of ASN.1 EXTERNAL data to represent application specific information.

The semantics of each piece of EXTERNAL data are identified by its ASN.1 object identifier. This object identifier is called an *application tag*.

This annex defines a number of application tags that are likely to be useful for many applications of links and their semantics.

NOTE – This annex requires a modification of Annex D of ITU-T Rec. T.411 | ISO/IEC 8613-1 as described in C.1.1.

B.1 Source role

Applicability: within the parameter "application comments" of an attribute "link roles".

Structure of octet string: empty.

ASN.1 object identifier: { 2 8 5 14 1 }.

Definition

This application tag is used to identify a link role as a possible source for traversal. It can be used to specify the traversal direction of the link:

If "Source Role" applies to only a subset of the link roles of the link, it specifies that the link may only be traversed from the nodes specified by these link roles to the nodes specified by other link roles, in particular those tagged with "Destination Role".

B.2 Destination Role

Applicability: within the parameter "application comments" of the attribute "link roles".

Structure of octet string: empty.

ASN.1 object identifier: { 2 8 5 14 2 }.

Definition

This application tag is used to identify a link role as a possible destination for traversal. It can be used to specify the traversal direction of the link: if "Destination Role" applies to only a subset of the link roles of the link, it specifies that the link may be traversed only towards the nodes specified by these link roles from the nodes specified by other link roles, in particular those tagged with "Source Role".

NOTE – A combination of "Source Role" and "Destination Role" application tags can be used to describe bidirectional links.

B.3 Single-ended Role

Applicability: within the parameter "application comments" of the attribute "link roles".

Structure of octet string: empty.

ASN.1 object identifier: { 2 8 5 14 3 }.

Definition

This application tag specifies that the number of nodes addressed by this link role is restricted to one.

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B.4 Multi-ended Role

Applicability: within the parameter "application comments" of the attribute "link roles".

Structure of octet string: empty.

ASN.1 object identifier: { 2 8 5 14 4 }.

Definition

This application tag specifies that there is no restriction on the number of nodes addressed by this role.

B.5 Automatic Invocation

Applicability: within the attribute "application comments" of a link or link class description.

Structure of octet string: empty.

ASN.1 object identifier: { 2 8 5 14 5 }.

Definition

This application tag specifies that the link shall be invoked automatically when a hypermedia document is processed (e.g. presented). The processing application shall traverse the link immediately upon encountering it during processing; the destination location of the link becomes the next object in the processing sequence.

NOTE – The processing model for automatic link traversal is not defined by this annex.

B.6 User Invocation

Applicability: within the attribute "application comments" of a link or link class description.

Structure of octet string: empty.

ASN.1 object identifier: { 2 8 5 14 6 }.

Definition

This application tag specifies that the link shall be invoked selectively, i.e. by external events initiated by a user or application. This allows for navigating through the hypermedia document using different paths. The link shall be traversed only at the request of a user. How the user shall make the request is application-specific and beyond the scope of this annex.

B.7 Link-Path-Selector

Applicability: within the attribute "application comments" of a link or link class description or within the parameter "application comments" of the attribute "link roles".

Structure of octet string: ASN.1 binary encoding of a sequence of externals.

ASN.1 object identifier: { 2 8 5 14 7 }.

Definition

This application tag is used to contain application specific information for the selection of a link or of a link role. When used within the parameter "application comments", the application tag "link-path-selector" defines the selection criteria by which the associated set of link ends may be selected for processing. The selection criteria are application-specific, and are not standardized by this annex. Similarly, when used within the attribute "application comments", the application tag defines selection criteria by which the link as a whole may be selected for processing. An example of such application-specific information might be whether the link is intended for use by an expert or a novice user.

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Annex C

Modifications to other common texts of ITU-T Rec. T.410-Series | ISO/IEC 8613

(This annex forms an integral part of this Recommendation | International Standard)

The specifications contained in this annex are intended to be included into the other common texts of ITU-T Rec. T.410-Series | ISO/IEC 8613 with the next republication.

C.1 Modifications to ITU-T Rec. T.411 | ISO/IEC 8613-1

C.1.1 Amendment for the assignment of ASN.1 object identifiers

Annex D needs to be amended to specify that the third component of ASN.1 object identifiers may be 5. In this case, the fourth component is equal to the part number of a Recommendation | International Standard of ITU-T Rec. T.410-Series | ISO/IEC 8613. The permitted values of the fifth component and the semantics of the respective ASN.1 object identifier are defined in that Recommendation | International Standard identified by the fourth component.

C.2 Modifications to ITU-T Rec. T.412 | ISO/IEC 8613-2

C.2.1 Amendment of the structural model

In clause 6 the structural model needs to be extended to include a link part with links and link classes with a reference that these concepts are defined in ITU-T Rec. T.424 | ISO/IEC 8613-14.

C.2.2 Amendment of the processing model

In clauses 6, 10 and 11 the processing model needs to be amended to include temporal relationships and links with a reference that the extended processing model in respect to temporal relationships and links is described in ITU-T Rec. T.424 | ISO/IEC 8613-14.

C.2.3 Amendment of attribute definitions

In clause 9 the attributes temporal relations and presentation time have to be added with a reference that the structure and semantics of these attributes are defined in ITU-T Rec. T.424 | ISO/IEC 8613-14.

C.3 Modifications to ITU-T Rec. T.414 | ISO/IEC 8613-4

C.3.1 Document profile attributes for temporal relations

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

Document presentation time

The value of this attribute is a date character string and a time character string in accordance with ISO 8601.

This attribute specifies the date and time at which the presentation of the document shall start. If the attribute is not specified, the presentation of the document will not start automatically but requires human interaction. If the attribute is specified, the presentation of the document is intended to start automatically at the indicated date and time.

Time scaling

The value of the attribute is a sequence of two positive integers *m* and *n*.

This attribute specifies a scaling factor for all attribute, parameter and sub-parameter values which specify scaled time units. Each scaled time unit equals *m/n* seconds. If this attribute is not specified, the sequence of the two integers 1 and 1 is assumed.

Temporal relations

This attribute is specified if, and only if, the document contains temporal relationships. The value of this attribute (if specified) is 'present'.

C.3.2 Document profile attributes for non-linear structures

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

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Links

This attribute is specified if, and only if, the document contains link descriptions for integral links.

The value of this attribute (if specified) is 'present'.

Link classes

This attribute is specified if, and only if, the document contains link class descriptions for integral links.

The value of this attribute (if specified) is 'present'.

Enciphered links

This attribute is specified if, and only if, the document contains enciphered link or link class descriptions.

The value of this attribute (if specified) is 'present'.

C.4 Modifications to ITU-T Rec. T.415 | ISO/IEC 8613-5

C.4.1 Amendment of interchange data elements

In addition to the interchange data elements defined in ITU-T Rec. T.415 | ISO/IEC 8613-5, the following data elements are permitted in interchange format class A:

- link descriptor;
- link class descriptor;
- enciphered link descriptor.

These interchange data elements appear in the following order (see 7.2 of ITU-T Rec. T.415 | ISO/IEC 8613-5):

o) link class descriptors;

p) link descriptors;

q) enciphered link descriptors.

```
Interchange-Data-Elements { 2 8 1 5 5 }
IMPORTS                 -- Existing definition; extended by the following:
                        Link-Class-Descriptor, Link-Descriptor, Enciphered-Link-Descriptor
                        FROM Link-Descriptors { 2 8 1 14 3 }
                        -- See ITU-T Rec. T.424 | ISO/IEC 8613-14

Interchange-Data-Element    ::= CHOICE{     -- Existing definition; extended by the following:
link-class                          [13] IMPLICIT Link-Class-Descriptor,
link                                [14] IMPLICIT Link-Descriptor,
enciphered-link-descriptor          [15] IMPLICIT Enciphered-Link-Descriptor}
```

C.4.2 Amendment of the document profile descriptor

```
EXPORTS                 -- Existing definition; extended by the following:
                        Document-Description, Dates-and-Times, Originators,
                        Other-User-Information, External-References,
                        Local-File-References, Security-Information, ODA-Version,
                        Sealed-Doc-Bodyparts, Date-and-Time

IMPORTS                 -- Existing definition; extended by the following:
                        Document-Presentation-Time, Time-Scaling
                        FROM Temporal-Relationships { 2 8 1 14 0 }
                        -- See ITU-T Rec. T.424 | ISO/IEC 8613-14

Document-Profile-Descriptor ::= SET{ -- Existing definition; replaced and extended by the following:
  links                             [17] IMPLICIT NumericString OPTIONAL,
  link-classes                      [18] IMPLICIT NumericString OPTIONAL,
  enciphered-links                  [19] IMPLICIT NumericString OPTIONAL,
  temporal-relations                [20] IMPLICIT NumericString OPTIONAL}

Document-Characteristics    ::= SET{    -- Existing definition; modified by the following:
  oda-version                       [8] IMPLICIT ODA-Version,

ODA-Version                 ::= SEQUENCE{
  standard-or-recommendation        Character-Data,
  publication-date                  Date-and-Time}
```


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```
Document-Security-Attributes ::= SET{        -- Existing definition; extended by the following:
  sealed-links                   [8] IMPLICIT Sealed-Doc-Bodyparts OPTIONAL

Additional-Doc-Characteristics ::= SET{      -- Existing definition; extended by the following:
  time-scaling                   [6] IMPLICIT Time-Scaling OPTIONAL,
  document-presentation-time     [7] IMPLICIT Document-Presentation-Time OPTIONAL}
```

C.4.3 Amendment of layout descriptors

```
IMPORTS                          -- Existing definition, extended by the following:
                                 Presentation-Time
                                 FROM Temporal-Relationships { 2 8 1 14 0 }
                                 -- See ITU-T Rec. T.424 | ISO/IEC 8613-14

Layout-Object-Descriptor-Body ::= SET{       -- Existing definition, extended by the following:
  presentation-time              [52] IMPLICIT Presentation-Time OPTIONAL}

Layout-Class-Descriptor-Body ::= SET{        -- Existing definition, extended by the following:
  presentation-time              [52] IMPLICIT Presentation-Time OPTIONAL}
```

C.4.4 Amendment of logical descriptors

```
IMPORTS                          -- Existing definition, extended by the following:
                                 Temporal-Relations
                                 FROM Temporal-Relationships { 2 8 1 14 0 }
                                 -- See ITU-T Rec. T.424 | ISO/IEC 8613-14

Logical-Object-Descriptor-Body ::= SET{      -- Existing definition, extended by the following:
  temporal-relations             [36] IMPLICIT Temporal-Relations OPTIONAL}

Logical-Class-Descriptor-Body ::= SET{       -- Existing definition, extended by the following:
  temporal-relations             [36] IMPLICIT Temporal-Relations OPTIONAL}
```


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Annex D

Examples for specifying temporal relationships

(This annex does not form an integral part of this Recommendation | International Standard)

For better readability, objects are not identified by sequences of integers, as it is the usual way in ODA documents, but by names such as "A" or "B" in the following examples.

Example 1

Document without any explicitly specified temporal relations.

In this case, the attribute "temporal relations" is not specified in the logical structure, i.e. the default value 'null' is assumed during the layout process.

The layout process does not insert the attribute "presentation time" into the specific layout structure, i.e. the default value 'null' is assumed for the parameter "start time" of this attribute during the presentation process. No time constraints apply during the presentation process. Switching from one page to the next at a computer terminal requires human interaction.

Example 2

All pages of a document are presented for a specified amount of time, e.g. 20 time units, independent of the content on the page, i.e. independent of the logical structure of the document.

In this case, the attribute "temporal relations" is not specified in the logical structure, i.e. the default value 'null' is assumed during the layout process. The layout process does not insert the attribute "presentation time" into the specific layout structure.

In the generic layout structure, the attribute "presentation time" is specified for the page class(es) to which the pages belong with the following value:

```
Presentation-Time:      {
        duration:           {fixed duration: 20}}
```

According to the defaulting mechanism for the attribute "presentation time", this value applies to all pages of the document, i.e. moving from one page to the next at a computer terminal requires no human interaction but is performed every 20 time units.

Example 3

Two pieces of content associated with the logical objects A and B are to be presented in sequence; the duration of the first one shall be 20 time units.

In this case, the attribute "temporal relations" is specified for the object immediately superior to the two objects with the following value:

```
Temporal-Relations:             {
        synchronization-type:   sequential,
        subordinate-nodes:      {
            (node-identifier:   A,
            duration:           20)
            (node-identifier:   B)}}
```

The layout process adds the attribute "presentation time" to the layout object X which receives the content of the logical object A with the following value:

```
Presentation-Time:  {
        duration:           {fixed duration: 20}}
```

Example 4

A piece of content associated with the logical object B is to be presented only after a user interaction is given after the presentation of the content associated with the logical object A.

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In this case, the attribute "temporal relations" is specified for the object immediately superior to the two objects with the following value:

```
Temporal-Relations:          {
        synchronization-type:  sequential,
        subordinate-nodes:     {
            (node-identifier:  A,
            duration:          indefinite)
            (node-identifier:  B)}}
```

The layout process adds the attribute "presentation time" to the layout object X which receives the content of the logical object A with the following value:

```
Presentation-Time:  {
        duration:       {fixed duration: indefinite}}
```

Example 5

A piece of audio content associated with the object A is to be presented during the presentation of the content associated with object B, possibly repeatedly, if the presentation of the content of object B takes longer than that of the audio object.

In this case, the attribute "temporal relations" is specified for the document logical root with the following value:

```
Temporal-Relations:          {
        synchronization-type:  parallel-last,
        subordinate-nodes:     {
            (node-identifier:   A,
            duration:          indefinite,
            cyclic:            {number-of-cycles: indefinite})
            (node-identifier:  B)}}
```

The layout process adds the attribute "presentation time" to the object X which receives the content of the object A with the following value:

```
Presentation-Time:          {
        duration:                  {fixed duration: indefinite},
        cyclic:                {number-of-cycles: indefinite}}
```

Note that it is assumed that the presentation process will be terminated by an external event.

Example 6

A piece of audio content associated with object A is to be presented during the presentation of certain parts of a document, e.g. as long as the content of B, C, and D is presented. The presentation of the audio content shall be repeated, if the presentation of the other content takes longer than that of the audio content.

In this case, the attribute "temporal relations" is specified for the logical object immediately superior to A ... D with the following value:

```
Temporal-Relations:          {
        synchronization-type:  parallel-last,
        subordinate-nodes:     {
            (node-identifier:  A,
            duration:          indefinite,
            cyclic:            {number-of-cycles: indefinite})
            (node-identifier:  B)
            (node-identifier:  C)
            (node-identifier:  D)}}
```

The layout process adds the attribute "presentation time" to the object X which receives the content of the object A with the following value:

```
Presentation-Time:          {
        duration:                  {fixed duration: Z},
        cyclic:                {number-of-cycles: indefinite}}
```

The object Z is the object created by the layout process which contains the content associated with the objects B, C and D. In the case that the layout process creates more than one object, Z shall denote the last of these objects, in sequential layout order.

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Example 7

A part of a document may have the following logical structure (see Figure D.1).

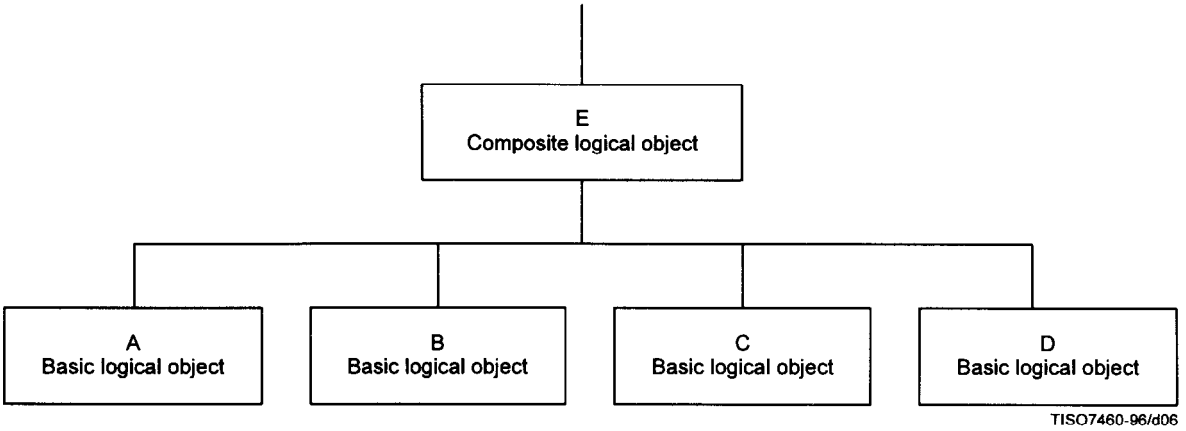


Figure D.1 – Logical structure of a document

The following temporal relationships shall be specified for the objects: the content associated with A and B shall be presented in parallel and the content associated with C and D shall be presented in parallel. The content of the pair (A, B) and of the pair (C, D) shall be presented sequentially and each pair shall be presented for 20 time units.

Therefore, the logical structure has to be changed as follows (see Figure D.2):

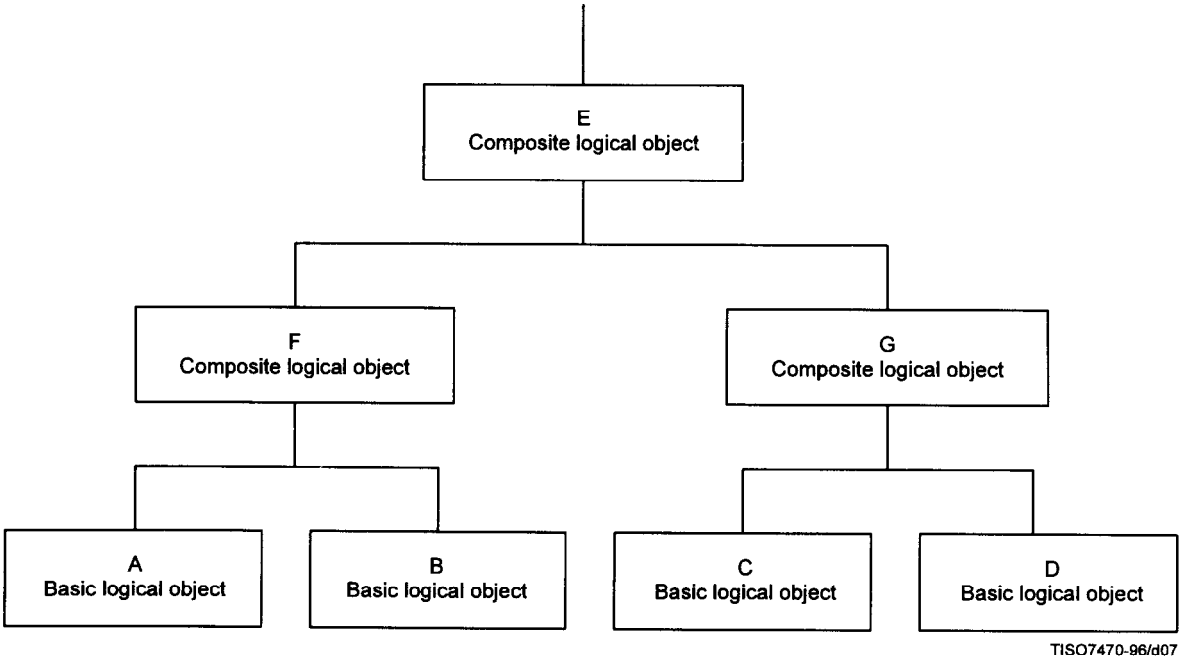


Figure D.2 – Modified logical structure of the document

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The following specifications have to be made:

For the object E:

Temporal-Relations: {
synchronization-type: sequential,
subordinate-nodes: {
(node-identifier: F,
duration: 20)
(node-identifier: G,
duration: 20)}}

For the object F:

Temporal-Relations: {
synchronization-type: parallel-last,
subordinate-nodes: {
(node-identifier: A)
(node-identifier: B)}}

For the object G:

Temporal-Relations: {
synchronization-type: parallel-last,
subordinate-nodes: {
(node-identifier: C)
(node-identifier: D)}}

The layout process may create a page X with layout objects T, U, V and W (in this sequential layout order) which contain the content associated with A, B, C and D, respectively (see Figure D.3).

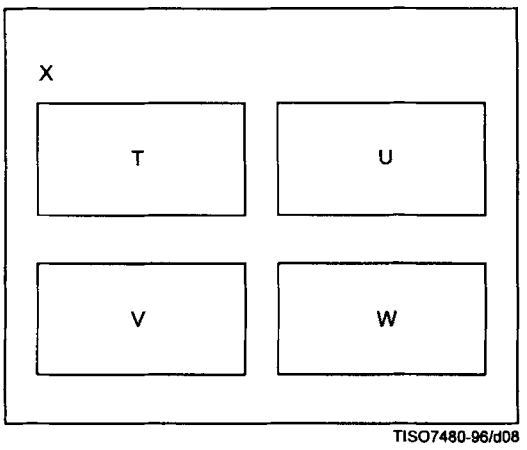


Figure D.3 – Layout structure of the document

The layout process adds the attribute "presentation time" to the objects T and U with the following value:

Presentation-Time: {
timing: {fixed timing: 0},
duration: {fixed duration: 20}}

The values added to the objects V and W:

Presentation-Time: {
timing: {fixed timing: 20},
duration: {fixed duration: 20}}

Example 8:

Same scenario as in the previous example but with the additional constraint, that each page shall be presented for 30 time units.

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In this case, the layout process will create two pages Y and Z with the following structure [note that the pair (T, U) requires 20 time units for presentation as well as the pair (V, W), i.e. the two pairs do not fit in the available time span (30 time units) of a single page] (see Figure D.4):

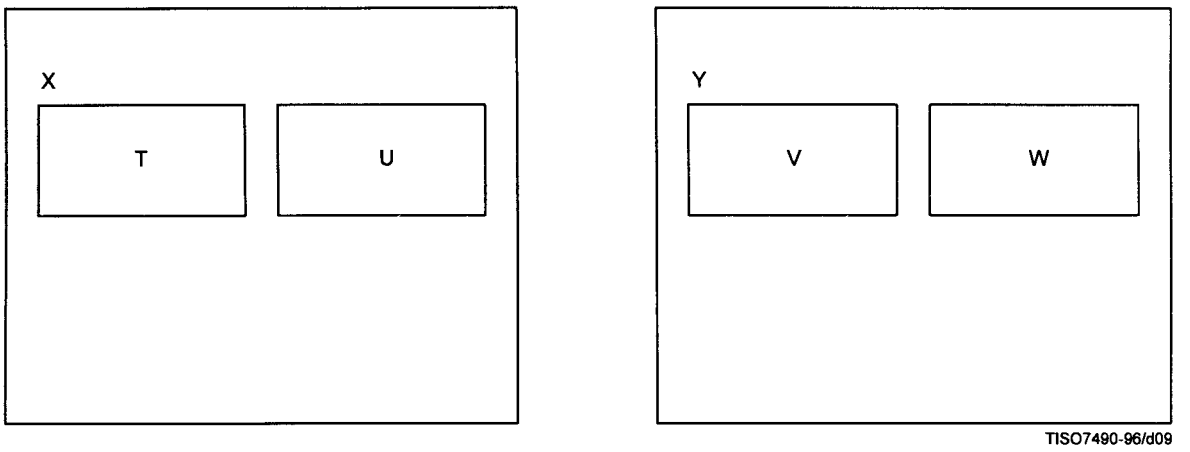


Figure D.4 – Modified layout structure of the document

In this case, the layout process adds the attribute "presentation time" to the objects T, U, V and W with the following value:

Presentation-Time: {
timing: **{fixed timing: 0}}**

Furthermore, the value for the two pages is:

Presentation-Time: {
duration: **{fixed duration: 30}}**

Example 9

The content of a particular area on a page shall vary with time, e.g. from time t_1 to t_2 character text shall be presented, from t_3 to t_4 a video, from t_5 to t_6 raster graphics.

This effect can be achieved with overlapping frames. The layout process may have created the following layout structure (note that the reference layout process does not deal with overlapping frames; therefore, the original logical structure is not considered in this example) (see Figure D.5):

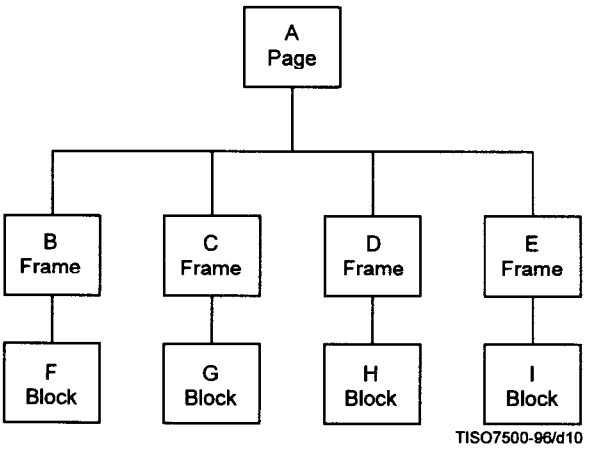


Figure D.5 – Layout structure of a document

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Depending on the point in time, the following content of the page shall be shown (See Figure D.6):

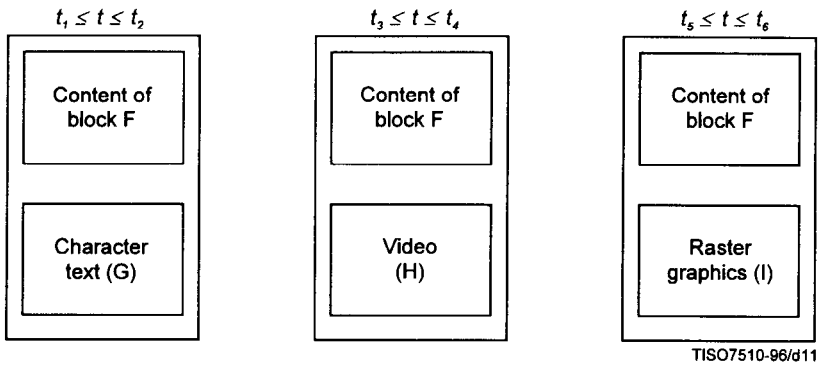


Figure D.6 – Temporally overlapping frames

The following specifications have to be made:

For the object C:

Presentation-Time: {
timing: {**fixed timing: t_1**},
duration: {**fixed duration: t_2-t_1**}}

For the object D:

Presentation-Time: {
timing: {**fixed timing: t_3**},
duration: {**fixed duration: t_4-t_3**}}

For the object E:

Presentation-Time: {
timing: {**fixed timing: t_5**},
duration: {**fixed duration: t_6-t_5**}}

Note that $t_2 \leq t_3$ or $t_4 \leq t_5$ is not necessarily required.

For $t_3 < t_2$ or $t_5 < t_4$ the presentation of the content in the different frames will overlap in time.

Example 10

Similar scenario to the previous example. However, the presentation of the character text shall continue until the occurrence of an external event (e.g. user interaction), then the video will start and afterwards the raster graphics will be presented for 20 time units.

In this case, the following specifications have to be made:

For the object C:

Presentation-Time: {
duration: {**fixed duration: indefinite**}}

For the object E:

Presentation-Time: {
duration: {**fixed duration: 20**}}

The attribute "presentation time" is not required for the object D since it follows object C in sequential layout order.

Example 11

Specification of temporal relations between content associated with several objects.

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A document may have the following logical structure (see Figure D.7):

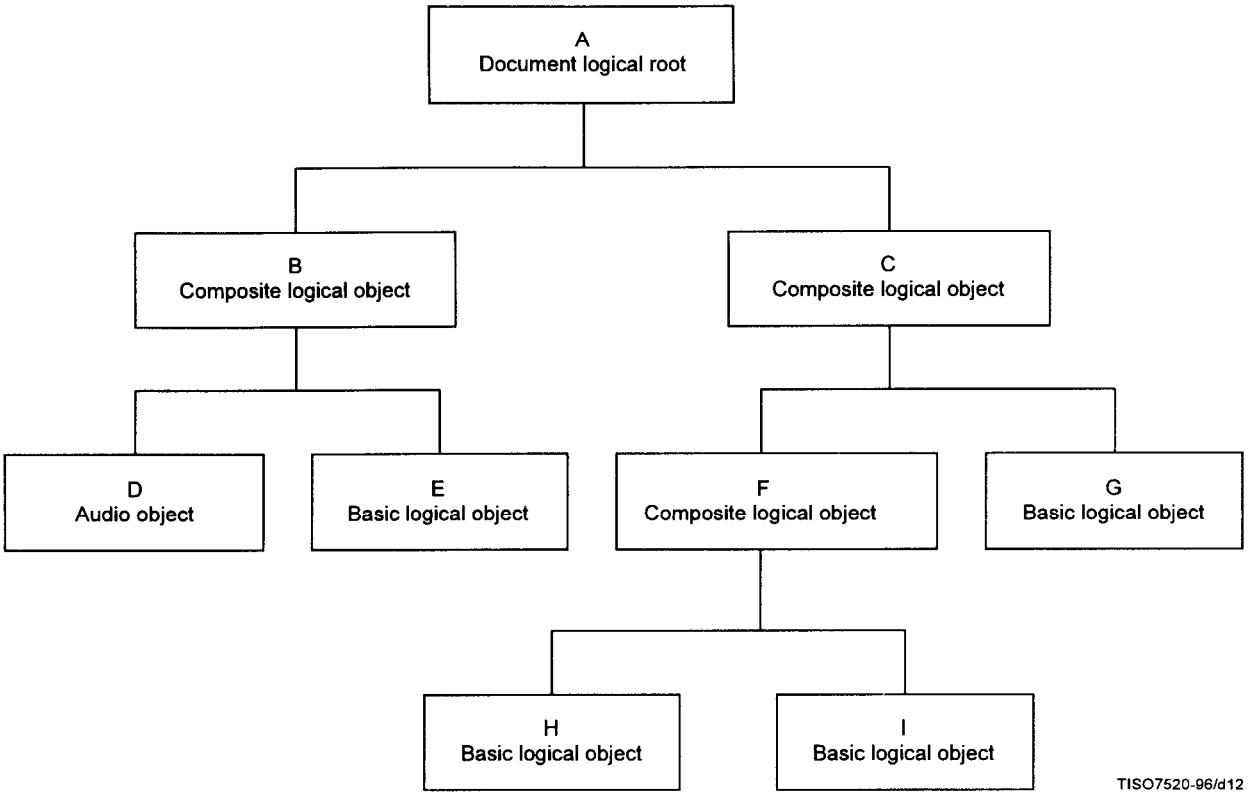


Figure D.7 – Logical structure of a document

For instance, the semantic meaning of B and C may be a "chapter", the content associated with D may be audio content, the content associated with E, G, H and I may be character content.

Now the following temporal relations have to be added:

- D (the audio content) should be presented (possibly repeatedly) as long as E, F, and G are presented;
- E, F and G should be presented sequentially with a specified time delay;
- H and I should be presented in parallel.

Therefore, the logical structure of the document is modified as follows (see Figure D.8):

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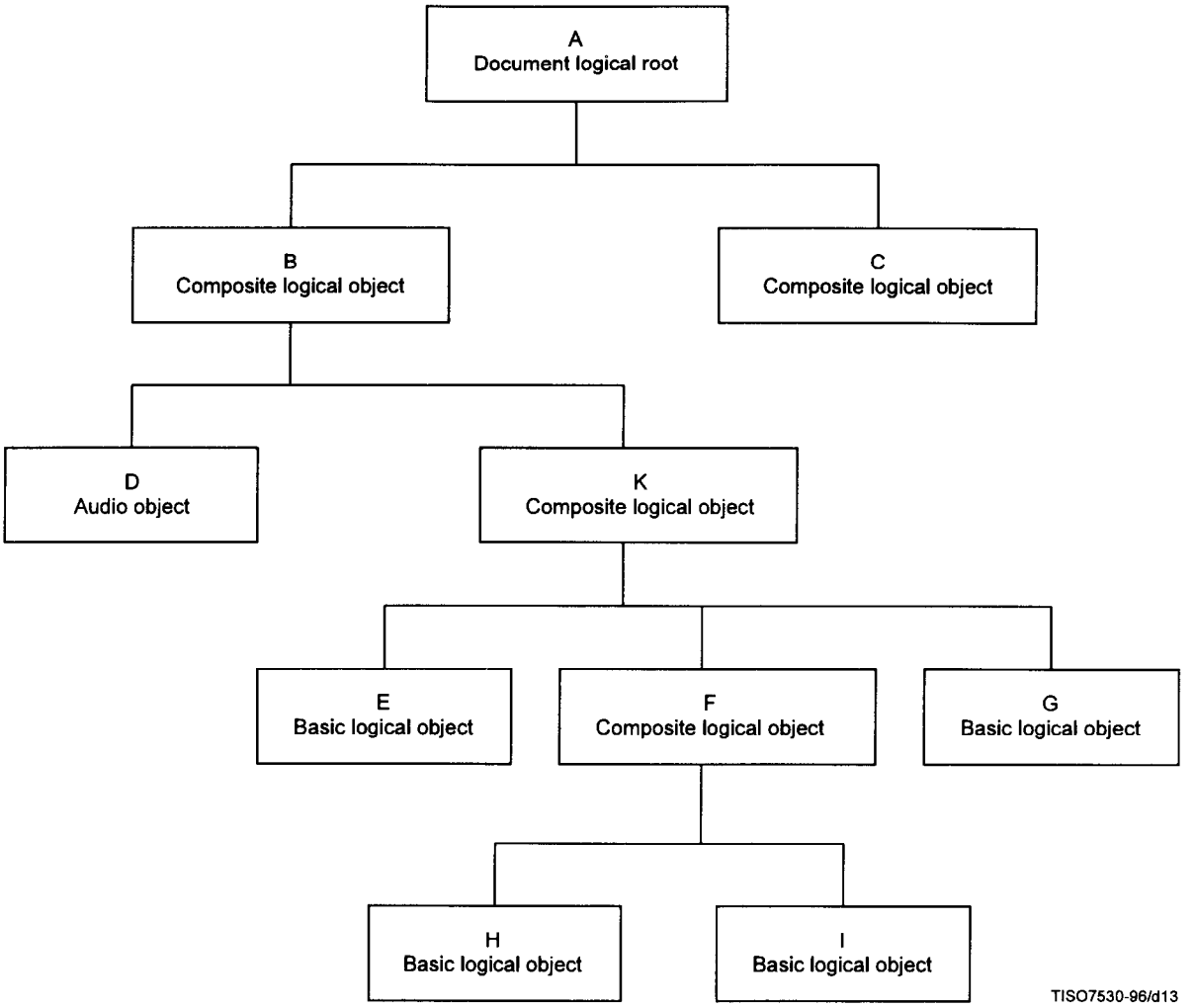


Figure D.8 – Modified logical structure of the document

The temporal relations are specified by the attribute "temporal relations" as follows:

For the composite logical object B:

Temporal-Relations: {
synchronization-type: parallel-first,
subordinate-node: {
(node-identifier: K)
(node-identifier: D,
cyclic: {
number-of-cycles: indefinite})}}

For the composite logical object K:

Temporal-Relations: {
synchronization-type: sequential,
subordinate-node: {
(node-identifier: E)
(node-identifier: F,
start-time: 20)
(node-identifier: G,
start-time: 50)}}

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For the composite logical object F:

Temporal-Relations: {
synchronization-type: parallel-last,
subordinate-node: {
(node-identifier: H)
(node-identifier: I)}}

The layout process may create the following layout structure (see Figure D.9):

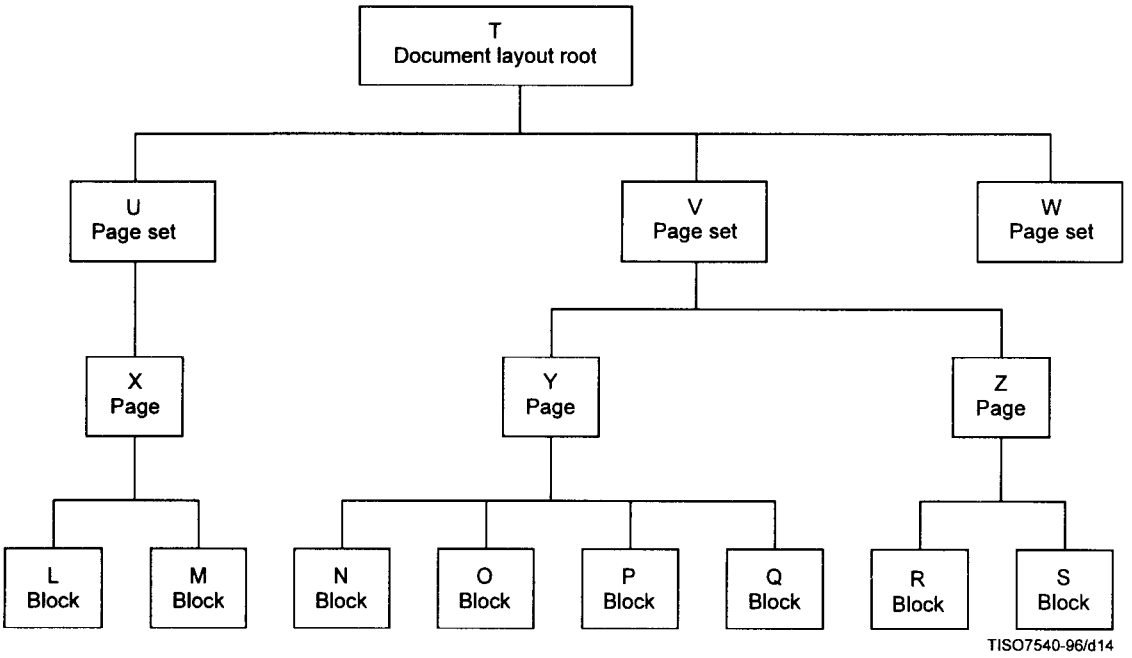


Figure D.9 – Layout structure of the document

The pages X, Y and Z may look as follows (see Figure D.10):

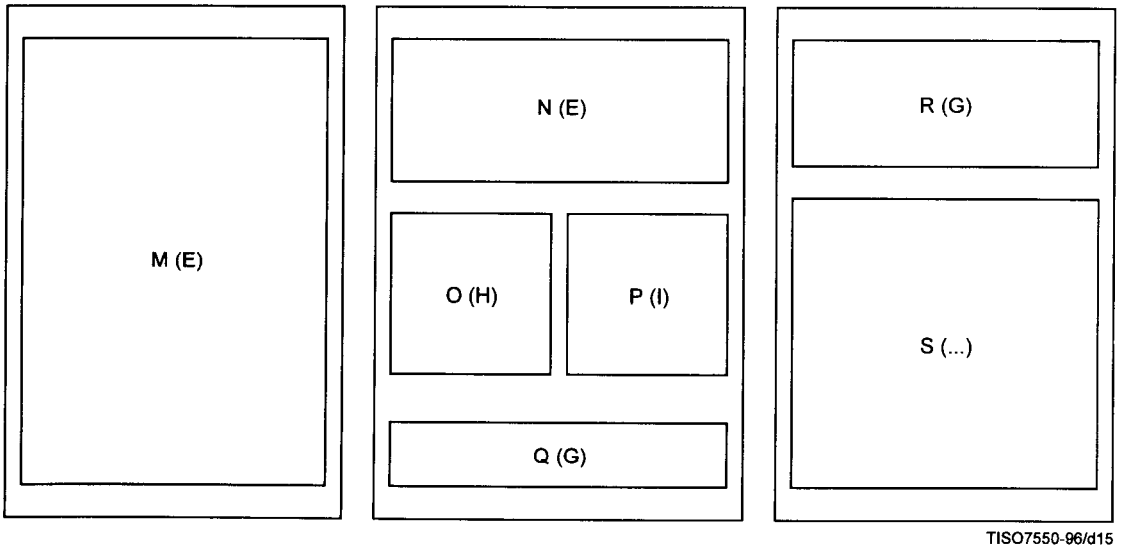


Figure D.10 – Pages of the document

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For simplicity, it may be assumed that the layout objects M, ..., S shown on the pages are blocks. The letters in parentheses shall indicate the basic logic objects whose content is displayed within the particular block. For instance, the content associated with logical object E is laid out in block M on page X and in block N on page Y. (The content of block S may be derived from other logical objects which are not listed in the logical structure shown above.) Pages X and Y shall belong to different page sets, because different layout characteristics may apply to the first page and the succeeding pages of a chapter.

The layout process adds the attribute "presentation time" with the indicated values to the following objects:

Object L (object with associated audio content, not shown in the picture of the pages above, since the audio object has a position and dimension of 'null'):

Presentation-Time: {
timing: {fixed timing: 0},
duration: {fixed duration: R},
cyclic: {number-of-cycles: indefinite}}

Note that R is the last layout object in sequential order which contains content associated with the basic logical object G.

Object O:

Presentation-Time: {
timing: {fixed timing: 20}}

Object P:

Presentation-Time: {
timing: {fixed timing: 20}}

Object Q:

Presentation-Time: {
timing: {fixed timing: 50}}

Example 12

Use of generic layout structures

There are a group of processable documents, each of which consists of a sequence of speeches and a cyclic Background Music (BGM) which begins 20 seconds before the start of the first speech and terminates 15 seconds after the end of the last speech. (1 STU is equal to 1 second hereafter.)

In this case, a generic logical structure and a generic layout structure, as shown in Figure D.11, may be used.

In these generic structures, all the values of "content architecture class" for the basic object class "Talks", "BGM", "Talks Frame" and "BGM Frame" are 'formatted processable audio' which defines a content architecture of sampled sound.

In the generic layout structure, all values of "dimension" and "position" are supposed to be zero, since spatial relation makes no sense here and all the directions of progression of the allocation of any immediately subordinates are "temporal first".

For the page class Page:

Presentation-Time: {
duration: {fixed duration: 900}} -- *15 minutes (=900STU-default) is system constraint*

For the frame class Page-Frame:

Presentation-Time: {
timing: {fixed timing: 0},
duration: {Rule-A}}
-- *minimum to contain its immediately subordinate in sequential order*
-- *Talks Frame – and acts as a constraint on the other – BGM-Frame*

For the frame class Talks-Frame:

Presentation-Time: {
timing: {variable timing:
start-offset: 20, -- *interval for BGM*
end-offset: 15, -- *as above*
start-separation: 10 -- *inter-speech blanking*}}}

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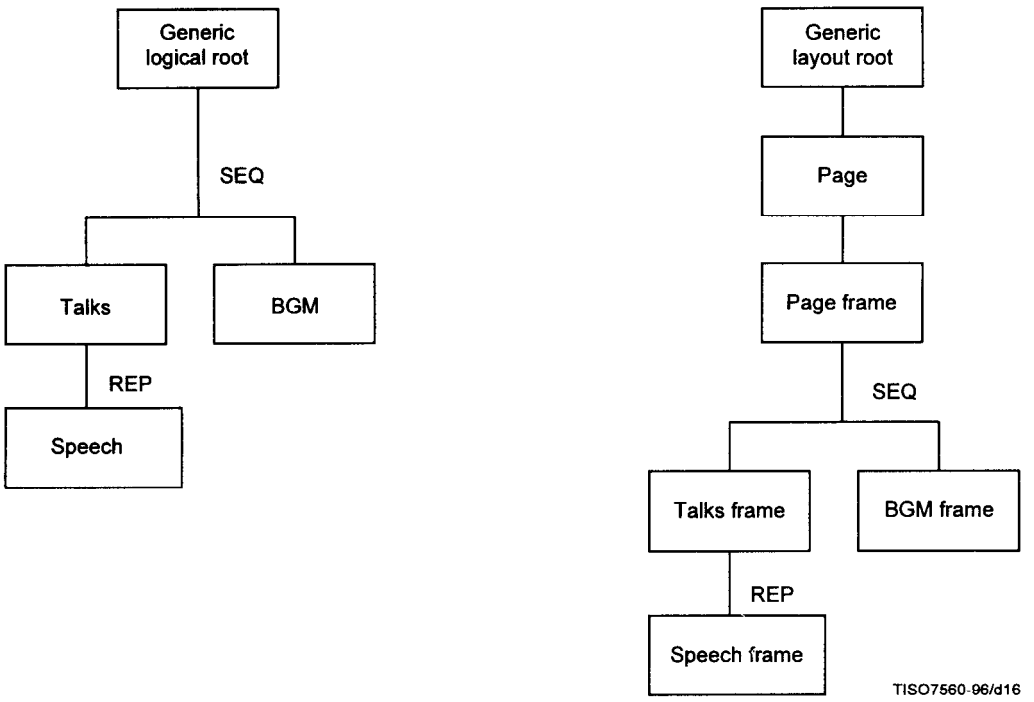


Figure D.11 – Generic structures

For the frame class Speech-Frame:

Presentation-Time: {
duration: **Rule-B}**

For the frame class BGM-Frame:

Presentation-Time: {
cyclic: **{number-of-cycles: indefinite}}**

With these generic structures, a specific logical structure, as shown in Figure D.12, is formatted into a specific layout structure, of which time relationships are shown in Figure D.13.

Relations among boxes are defined by "generator for subordinates".

The links from

Talks

Speech

BGM

to

Talks Frame

Speech Frame

BGM Frame

respectively, using "layout style" and "layout object class", are omitted here.

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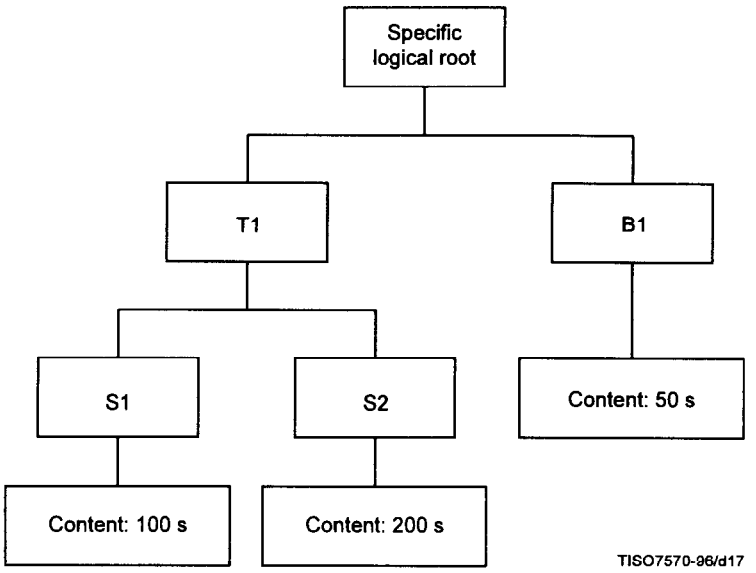


Figure D.12 – A specific structure with audio contents of which durations are 100, 200 and 50 s

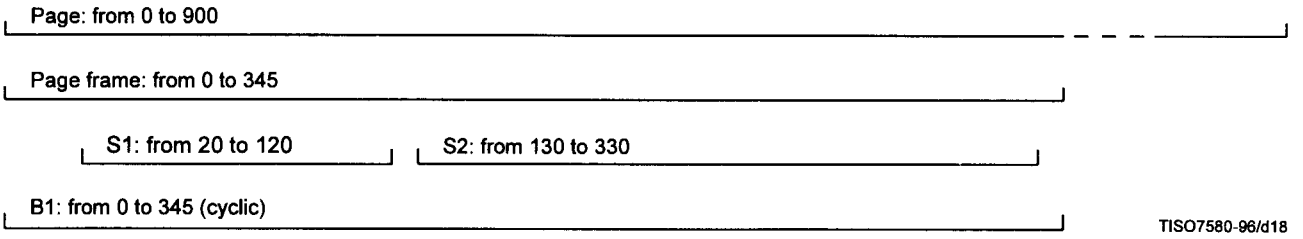


Figure D.13 – Time sequence of the formatted audio content

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Annex E

Compatibility with earlier editions of ITU-T Rec. T.410-Series | ISO/IEC 8613

(This annex does not form an integral part of this Recommendation | International Standard)

This annex defines the default behaviour for the presentation of a document, in the case where no explicit specifications are given for the temporal presentation of a document or parts thereof.

The presentation of a document is started by an external event, e.g. by a user request to image a document.

The pages of a document are presented in the order in which they occur in the sequential layout order.

Only one page is presented at any point in time.

The presentation of a page is terminated by an external event (e.g. by user interaction), i.e. the duration is indefinite.

The temporal presentation of all content of the objects on a particular page occurs in parallel.

All content of a page remains visible as long as the page itself is presented. All content of a page disappears as soon as the presentation of the page terminates.

--`,,```,,,,````-`-`,,`,,`,`,,`---

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Annex F

Summary of ASN.1 object identifiers

(This annex does not form an integral part of this Recommendation | International Standard)

The following ASN.1 object identifiers are assigned in this Specification:

ASN.1 object identifier value	Description	Subclause
{ 2 8 1 14 0 }	Identifies module Temporal-Relationships	7.5
{ 2 8 1 14 1 }	Identifies module Hypermedia-Document-Descriptor	8.11.1
{ 2 8 1 14 2 }	Identifies module Hypermedia-Document-Profile-Descriptor	8.11.2
{ 2 8 1 14 3 }	Identifies module Link-Descriptors	8.11.3

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Annex G

Application class tag assignments

(This annex does not form an integral part of this Recommendation | International Standard)

The following application class tag assignments are made in this Specification:

Tag	Data type	Subclause
APPLICATION 9	Link-or-Link-Class-Identifier	8.11.3

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