

12.1 Multimedia Documents

12.2 Hypertext

- Hypermedia
- Hyperlinks and Navigation

12.3 The World Wide Web (WWW)

- Functional Model
- Hyperlinks

12.4 Standard Generalized Markup Language (SGML)

- Tag categories
- Document Processing
- Object Classes
- Scheduling of Objects

12.5 Hypertext Markup Language (HTML)

- Syntax
- Hyperlinks

12.6 Multimedia and Hypermedia Information Coding Expert Group (MHEG)

- Standardisation

Hypertext and Hypermedia Systems:

- WWW

Representation of Hypermedia Documents:

- SGML
- HTML
- MHEG

Multimedia Document

- A document which is comprised of information coded at least one continuous (time-dependent) medium and one discrete (time-independent) medium.
→ need for media synchronisation

Exchanging documents requires that the document architecture is known. This requires a definition of the document architecture.

Content:

- multi- / monomedia information

Structure:

- spatial and temporal relations between information

Manipulation Model:

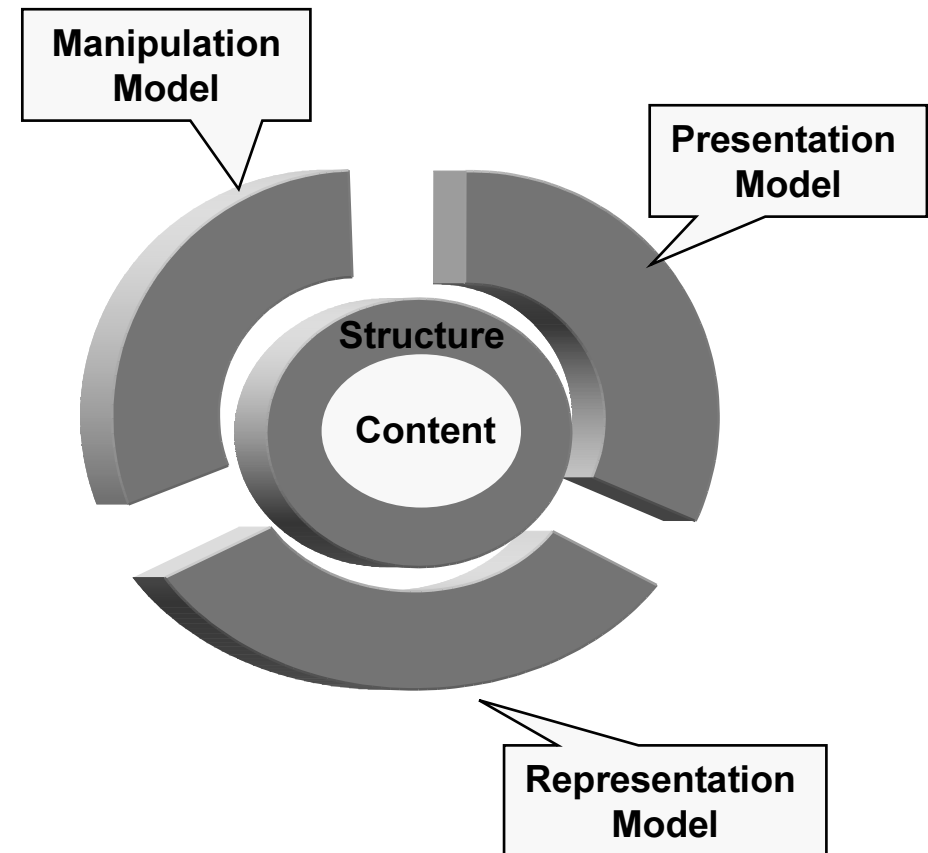
- operation allowed for creation, change and deletion of information

Representation Model:

- exchange protocol and data format

Presentation Model:

- rules for document presentation

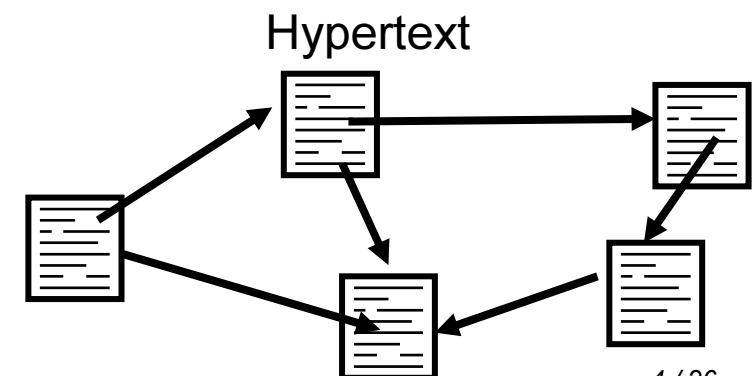
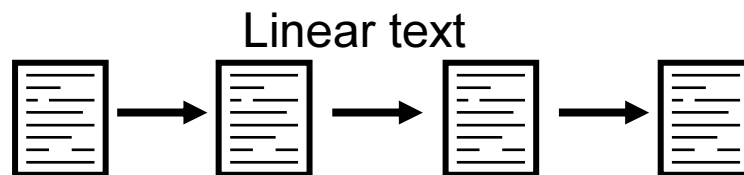
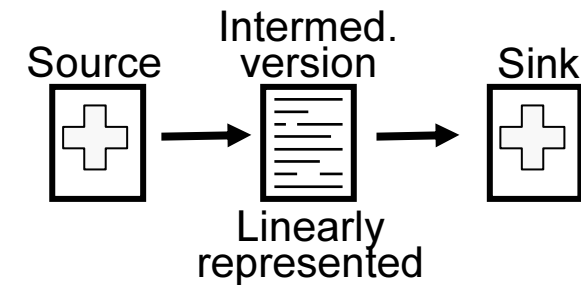


Hypertext System (coined by Ted Nelson 1965):

- system that allows to read (hypertext) documents nonlinearly

Node-Link Hypertext Model:

- Individually chunks of information (nodes) are set in relation by means of Hyperlinks
- Hyperlink: relation between two or more nodes
- Hypertext Document: distinct set of nodes and links which constitutes a logical entity
- Hyperweb: distinct set of hyperlinks



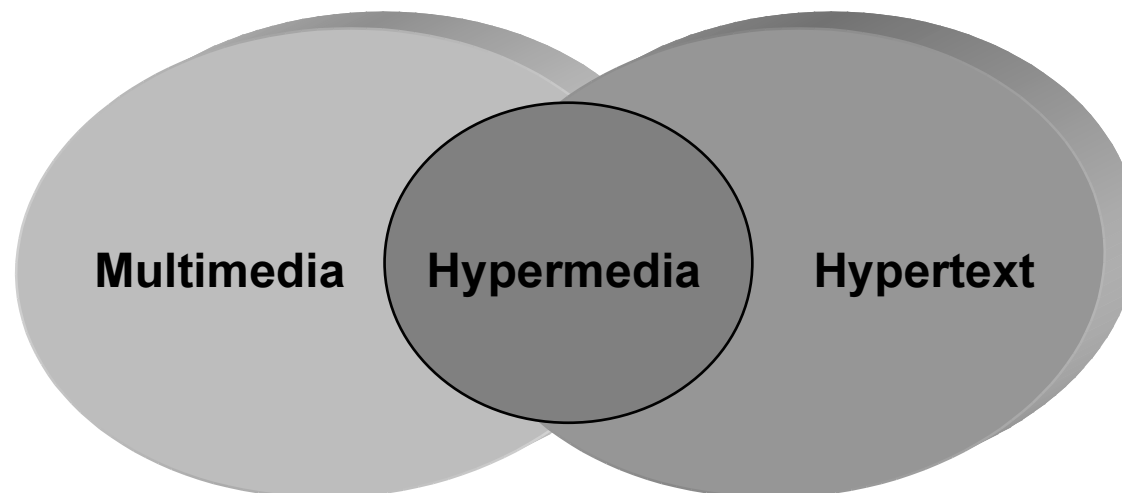
3 Layers with different functionalities:

Upper	<p>Presentation layer, based on a given structure and user's display it is decided:</p> <ul style="list-style-type: none">– which data to present– how the data are presented
Layer	<p>Hypertext abstract machine, constructs the data structure for management of the document</p>
Lower	<p>Storage layer (database layer), handles all functions which are concerned with storage of data;</p> <p>Transaction handling as with databases;</p> <p>Nodes and pointers of hypertext documents are processed as data objects without any semantics</p>

Hypermedia is the generalisation of Hypertext to include dynamic media like audio clips and video clips.

Synchronisation and linking of these media elements to other elements must be possible.

Hypermedia systems allow interactive, integrated and synchronised presentation of multimedia information.



A user traverses the hyperweb by navigating through hyperlinks (navigation = forward movement in linearly sorted documents).

Hyperlink classification:

- number of ends: 1:1, 1:m, n:m
- link direction: directional, bi-directional
- link type: footnote, textual reference, next page, presentation options

Anchors:

- Anchors are link ends (origin or destination of a hyperlink) like text parts, graphic areas or temporal positions of an audio/video stream.

Node:

- Information unit of a hypertext document

Pointer, Link:

- Edge of a hypertext graph

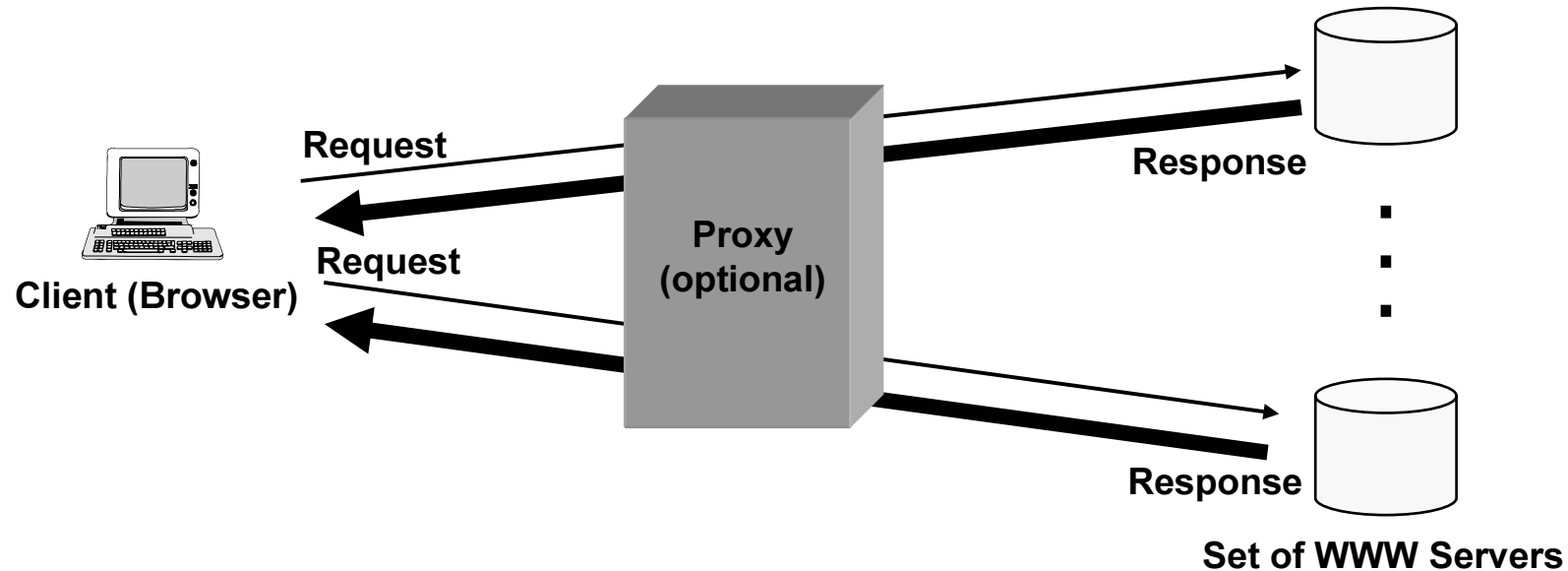
Internet-wide distributed hypermedia information retrieval system provides access to large universe of documents

Client-server model:

- clients: (Web browsers) collection of programs which can send requests for documents to WWW servers
- servers: programs that, after they receive requests, send back the appropriate answers - either documents or error messages

Major WWW “standards“:

- HTTP: Hypertext Transfer Protocol
- URL: Uniform Resource Locator
- HTML: HyperText Markup Language



Proxy breaks up the connection into client/proxy and proxy/server requests and responses.

Allows for

- caching (proxy of the RWTH has a hit rate of 30%)
- prefetching (proxy prefetches the links included in the last requested document)
- usage of dedicated (transport) protocols between client/proxy and server/proxy
- conversion of transferred content to meet the client requirements and transfer medium (e.g. low bandwidth transfer medium like wireless access or client with b&w screen)

Nodes

- are hypertext documents represented by Hypertext Markup Language (HTML) or arbitrary information objects referenced by means of an Uniform Resource Locator (URL)

Hyperlinks

- are embedded in HTML documents

Source anchors

- are text portions or images regions included in HTML documents

Destination anchors

- are either information objects addressable through a URL or specific parts of HTML documents

Links

- are directional point to point

Link type

- is always a reference for further reading
- Further information in addition to the pure link between two nodes.
- Example: differentiation between different kinds of destination nodes

Problems:

- Users can get “lost in hyperspace“ documents are arbitrarily structured, no overview possible
- Difficult to find information (search engines have scalability problems)
- No version control of documents (detection of outdated information)
- No support for document authoring
- No link consistency: dangling links are created by the deletion of one link end
- Low performance and high network load (solution: proxy servers)
- No linking between dynamic media possible (no real hypermedia) ... (much more)
 - ➔ leads to second generation hypermedia systems like Hyper-G

Authors:

- prepare content, specify in a uniform way the titles, tables without any description of the actual representation.

Publisher:

- specifies resulting layout.

Basic idea:

- author uses TAGS for marking certain text parts that are later subject of the layout process.

SGML:

- determines the form of tags, but does not specify their meaning.
- makes a frame available that enables the user to specify the syntax description in an object-specific system
- specifies syntax, not semantics

Example: `<title>Multimedia Presentation</title>`
`<author>O. Spaniol</author>`

Descriptive markup tags:

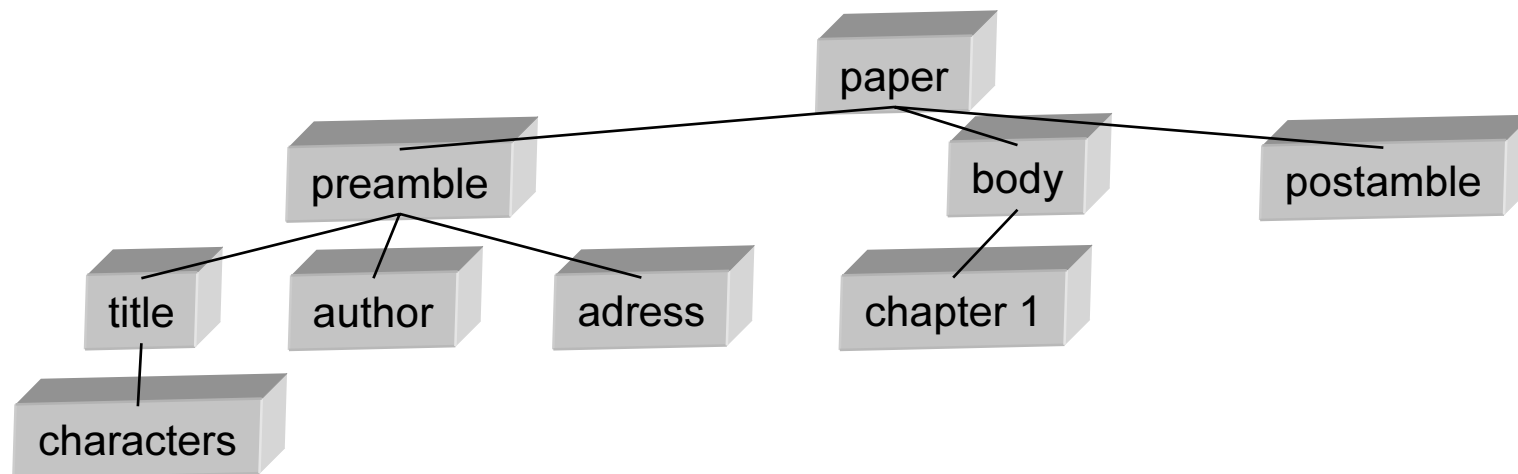
- describe actual structure

Entity reference:

- connection to another element, similar to an abbreviation; the actual content of the reference can be inserted later at the corresponding place

Markup declarations:

- define the elements to which an entity reference refers can be used to define rules for the structure of a document



Processing instructions (e.g. for the formatter or for other programs)

SGML document processing has two processes:

1. Parser - uses the tags occurring in the document in combination with the document type specification. The specification of the document structure is done with tags.
2. Formatter - knows the meaning of the tag and transforms the document into a formatted document

SGML logical structures are defined by markup commands that are inserted in the text (tags)

Markup divides the text into SGML elements

For each SGML document a Document Type Definition exists (DTD)

DTD declares the element type of a document, attributes of the elements and hierarchy of the instances

HTML is a SGML Document Type Definition (DTD)

The HTML DTD defines tags for

- describing the text structure (not the layout)
- creating hyperlinks
- embedding objects like graphics
- describing tables
- ...

Coding:

- HTML Documents are usually stored as text files

Hypermedia systems that make use of HTML use the Hypertext Transfer Protocol (HTTP) for object retrieval. The set of addressable information objects in the internet is denoted as the World Wide Web (WWW).



12.5 Hypertext Markup Language Syntax

Simple text with markup:

```
<HTML>
  <HEAD>
    <TITLE>My first HTML document</TITLE>
  </HEAD>
  <BODY>
    this is the document text content
  </BODY>
</HTML>
```

Other tags (examples):

```
<DFN>      Used for definitions, typically displayed in italics
<CITE>     A citation, for titles of books, films and so on
<CODE>     Used for computer code, typically displayed in fixed-width font
<B> Bold text
<P> Paragraph
<IMG SRC="URL"> Inlined image referenced by means of an URL
```


Links to other documents:

Click ` HERE ` to see my homepage

The text between the anchor 'A' start-tag and end-tag is expected to be the source of the hyperlink. The destination is described by the HREF attribute of the start-tag.

Anchors may be defined without a link, to define them as a link destination:

```
<A NAME="interesting"> interesting information </A>
```

```
This is my <A HREF="#interesting"> link </A> to interesting information
```

Images as link source:

```
<a href="map.html"></a>
```

Anchors within images:

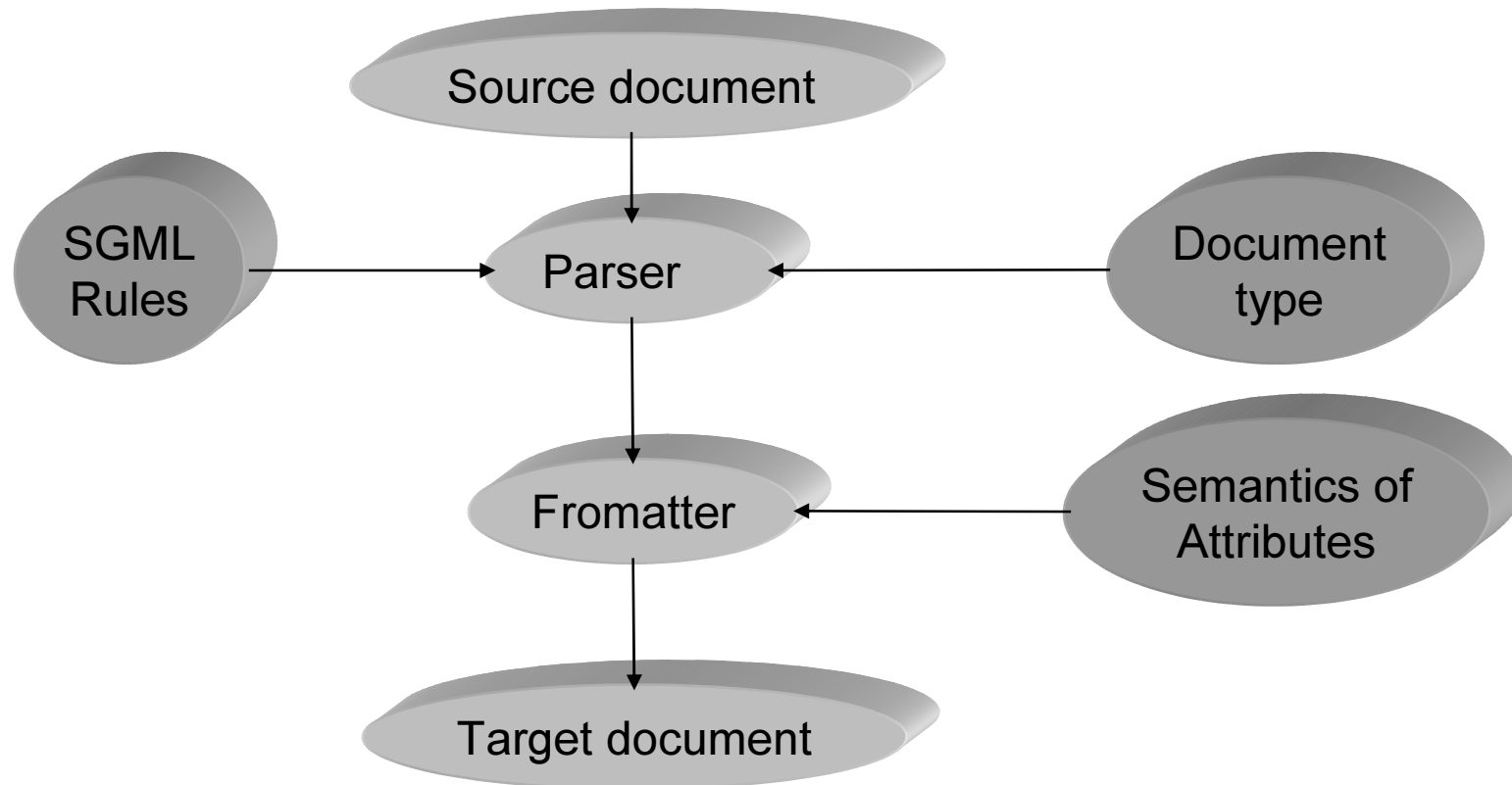
```

```

```
<map name="map1">
```

```
  <area href=" http://www-i4.informatik.rwth-aachen.de" shape=rect  
    coords="102,209,130,235">
```

```
</map>
```



Basic definition of HTML supports only the representation of hypertext documents
Numerous proprietary extensions exist (e.g. defined by Netscape and Microsoft) that move HTML to more interactive documents and hypermedia
Drawback: documents that use extensions are tailored to particular browsers

Exchange format and representation for composed (time-dependent) multimedia information

Provides structures for:

- interactive, spatial and temporal related information (ASN.1 = Abstract Syntax Notation One)

Final form format:

- the structure of the coded documents is fixed after formatting (coding through BER.1 = Basic Encoding Rules)

Suitable for:

- real-time (distributed) multimedia/hypermedia applications (no complex parsing and interpretation required)

Typical application:

- devices with small resources like point-of-sales terminals, video on demand set-top boxes
...



12.6 MHEG Standardisation

**MHEG Work within ISO/IEC JTC1/SC29/WG12
(ISO IS/DIS/CD 13522-X)**

MHEG

**WG1 : JPEG
WG11: MPEG**

Part 1: MHEG Object Representation, Base Notation (ASN.1)

Part 2: MHEG Alternate Notation (SGML) (skipped!)

Part 3: MHEG Extension for Scripting Language Support

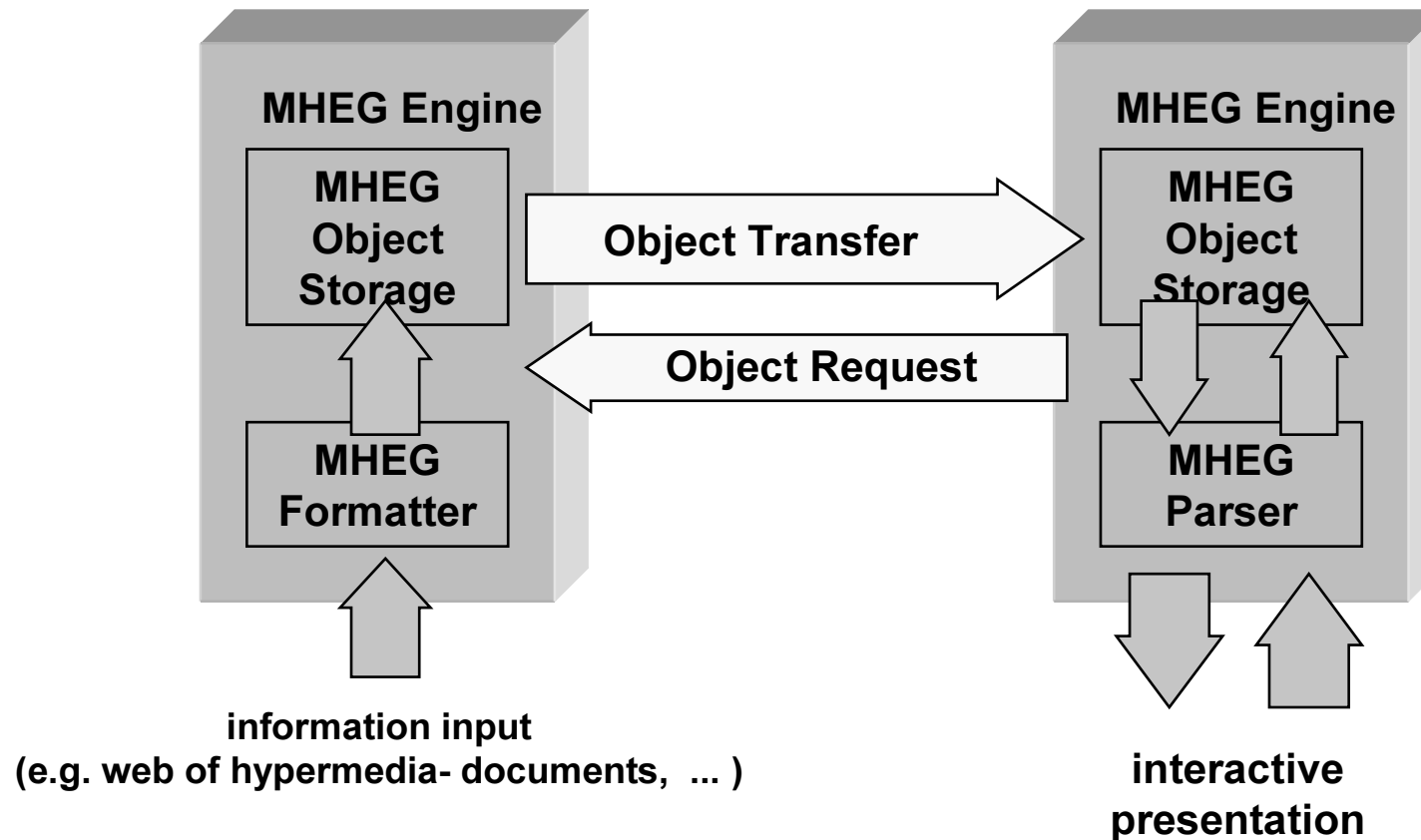
Part 4: Registration Procedures for Format Identifiers

Part 5: MHEG Subset for Base Level Implementation

Part 6: Support for Enhanced Interactive Applications

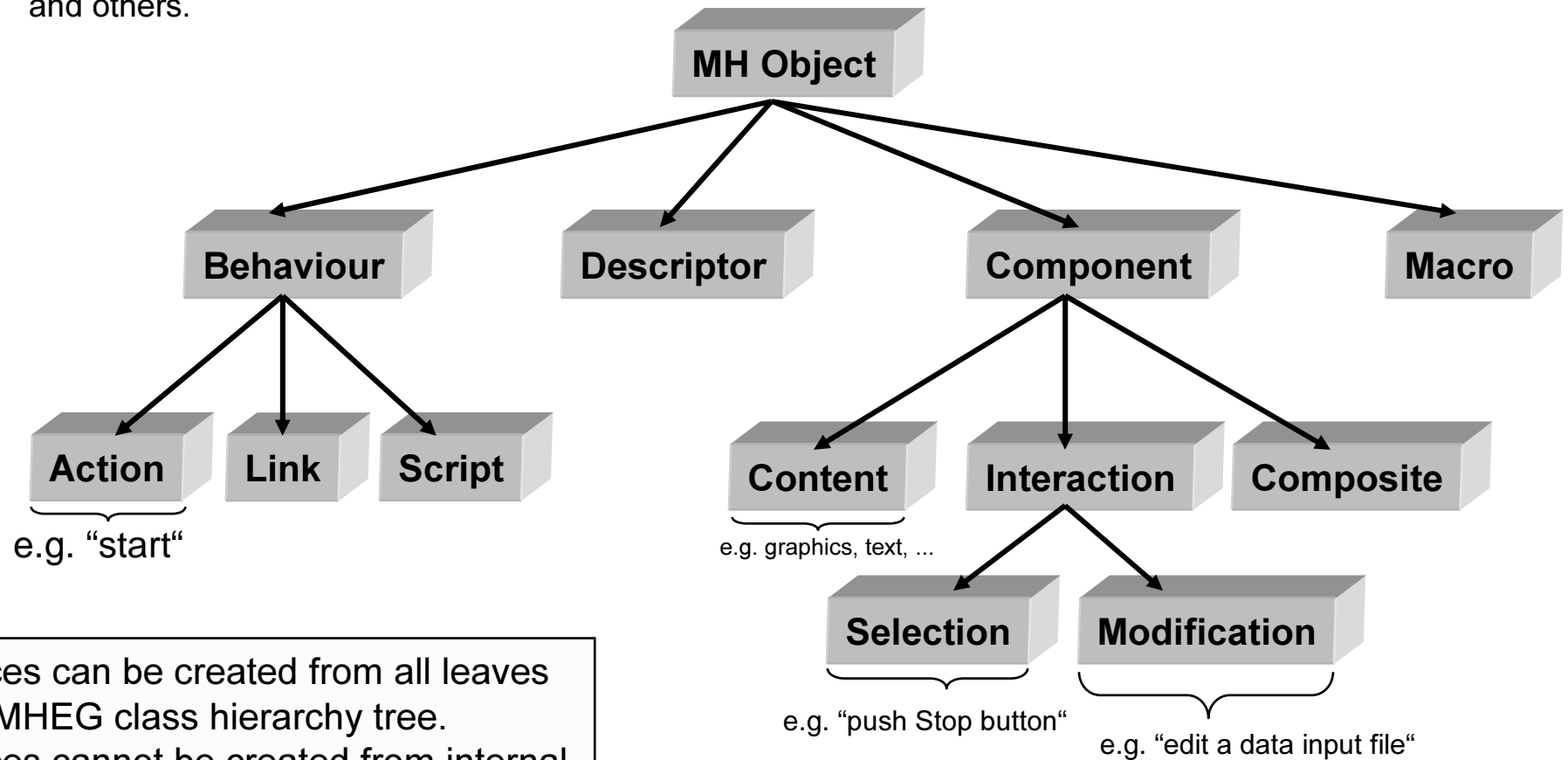
MHEG Standard:

- data structures and binary representation of MHEG Objects (not: retrieval protocol or MHEG Engine)



MHEG objects are a composition of a set of objects defining

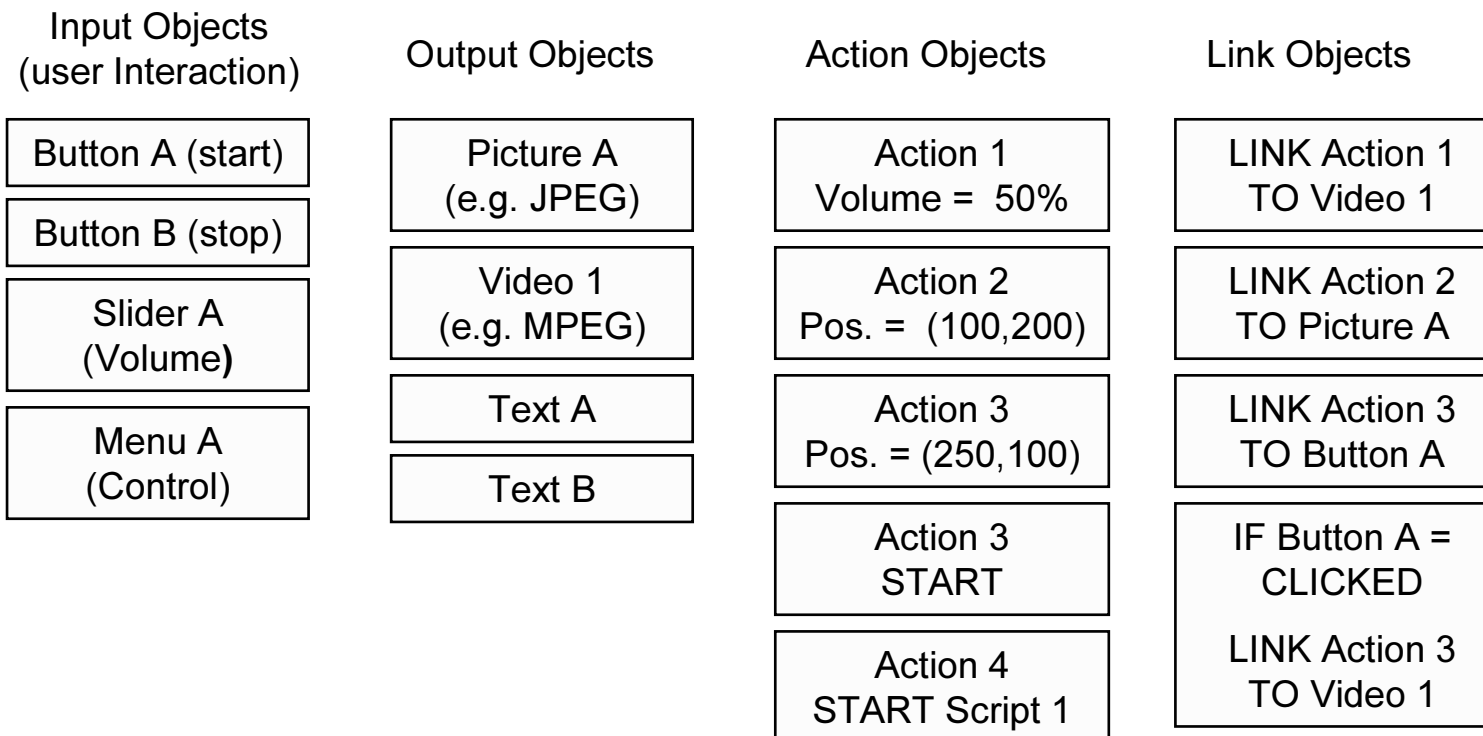
- contents (Content Class),
- User Interaction (Interaction Class) presentation attributes (Behaviour Class)
- and others.



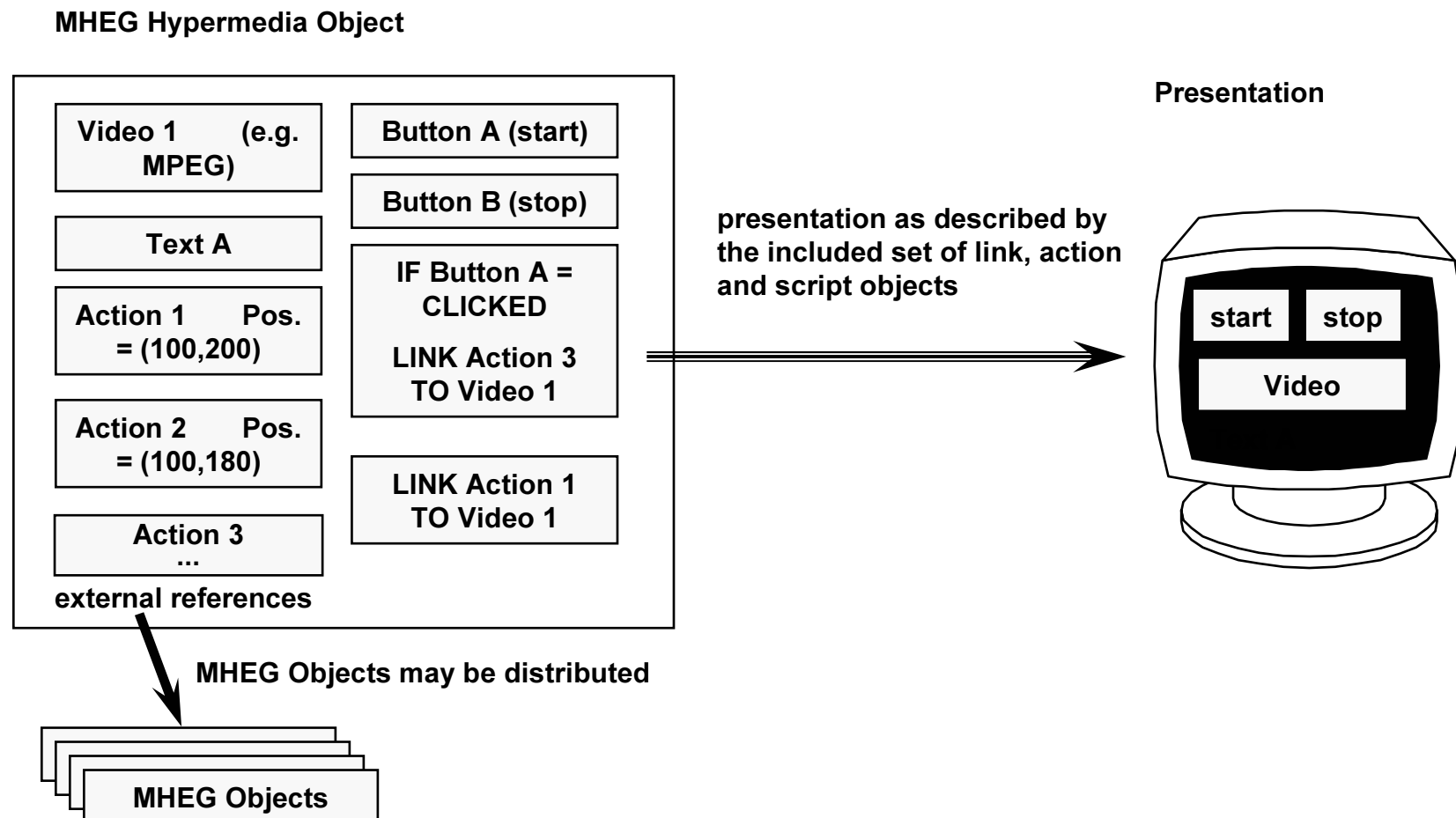
Instances can be created from all leaves of this MHEG class hierarchy tree. Instances cannot be created from internal nodes of the tree.

Complex MHEG Objects include several other MHEG objects that determine:

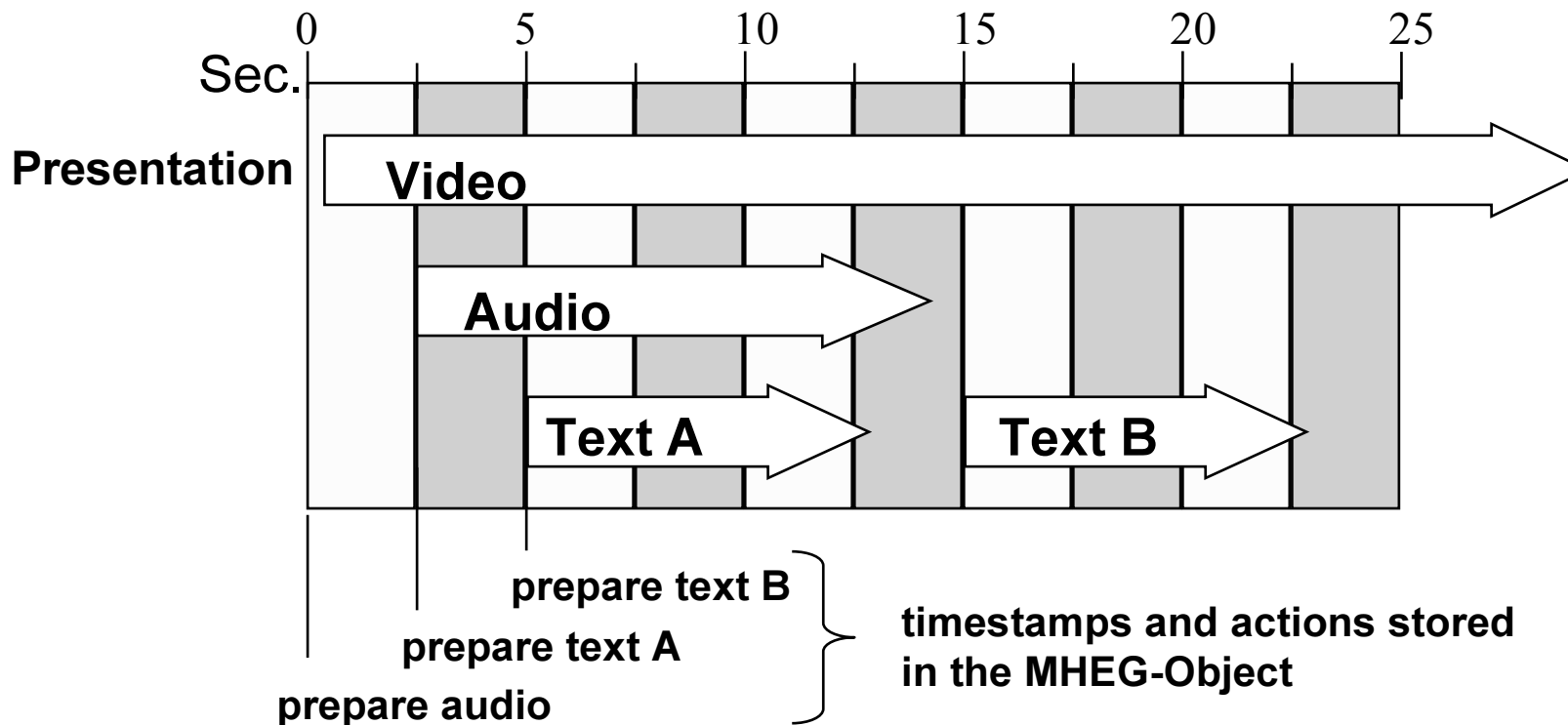
- the content (output objects)
- the user interaction (input objects)
- the presentation (action objects)
- the relations between the different objects (link objects)



Structural information included in MHEG objects allows to determine the presentation of the object



MHEG supports real-time hypermedia presentations by allowing to add time dependent object preparation and presentation attributes (time stamps)



**The PREPARE action triggers the retrieval and initialisation of the MHEG object.
Problem: delays cannot be exactly predicted by the MHEG engine.**

Complex structures:

- MHEG Engine implementation becomes difficult

Relation to "script only approaches" or "virtual machines (JAVA)" not clear

MHEG Engine needs small memory resources ?

Set of standards is growing