

Formal Data Models for SGML and HyTime

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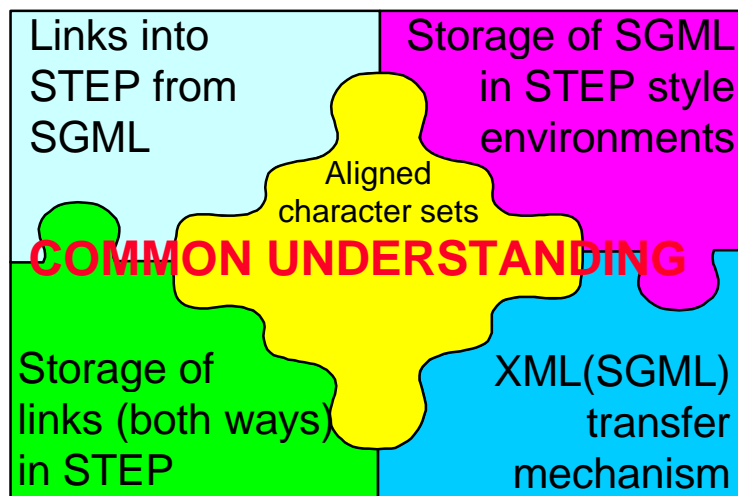
Background

- ISO TC184 / SC4 / WG10 Preliminary Work Item on "SGML and Industrial Data"
 - i.e. STEP and SGML harmonization
- Voluntary work during the last two years

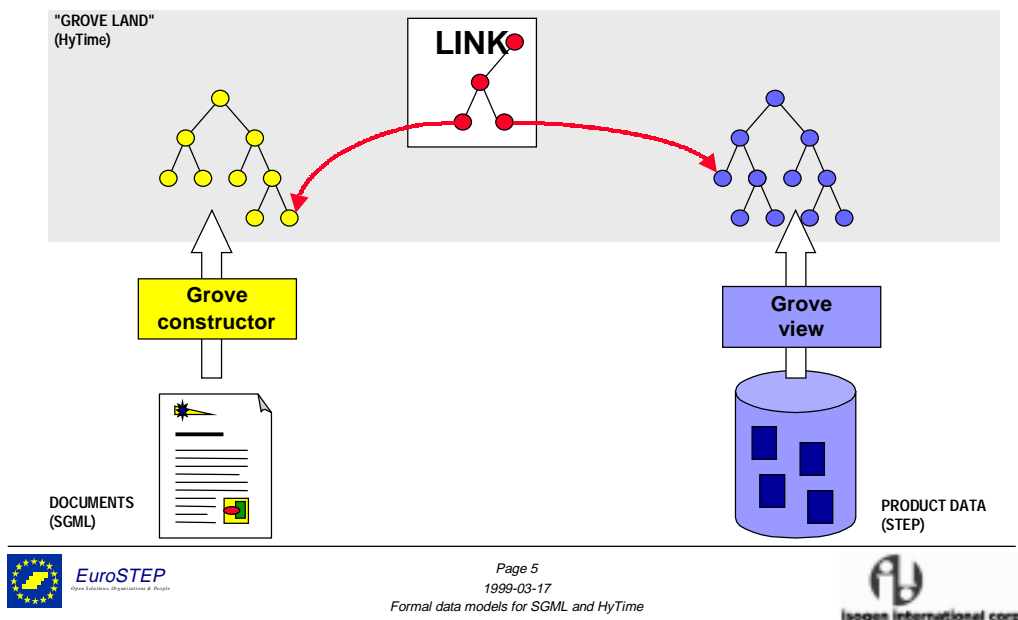
Motivation

- **SGML is a *syntax* standard**
- **Realized that sophisticated processors require formal data models**
- **Defined simple model for SGML (property sets and groves)**
- **Simplicity and SGML focus limited acceptance**
- **Needed better modeling formalism**
- **STEP world needed addressing and linking**
- **Marriage of both will provide whole greater than sum of parts**

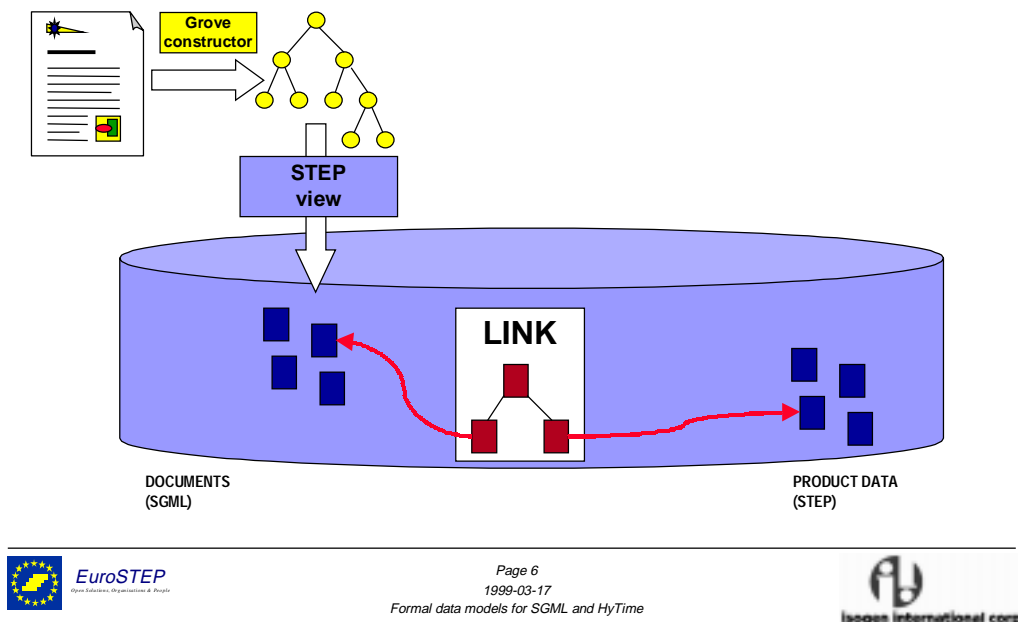
Getting the pieces in place



STEP data from the SGML Perspective



SGML Viewed from the STEP Perspective



SHORT EXPRESS COURSE...



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Page 7
1999-03-17
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The EXPRESS Language

- **ISO 10303 Part 11**
- **Abstract generic information modeling**
- **Entities and attributes**
- **Entity type hierarchies**
- **Rich constraint language**

- **Graphical form: EXPRESS-G**



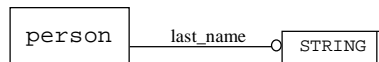
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Page 8
1999-03-17
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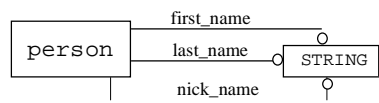
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Entity with attribute



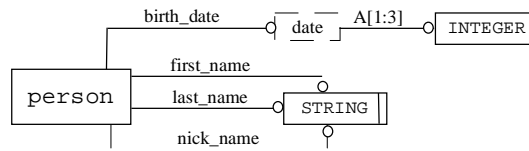
```
ENTITY person;  
  last_name : STRING;  
END_ENTITY;
```

Optional attribute



```
ENTITY person;  
  first_name : STRING;  
  last_name  : STRING;  
  nick_name  : OPTIONAL STRING;  
END_ENTITY;
```

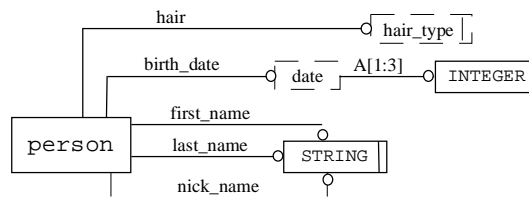
Defined data type



```
TYPE date = ARRAY (1:3) OF INTEGER;
END_TYPE;
```

```
ENTITY person;
  first_name : STRING;
  last_name  : STRING;
  nick_name  : OPTIONAL STRING;
  birth_date : date;
END_ENTITY;
```

Enumerated attribute

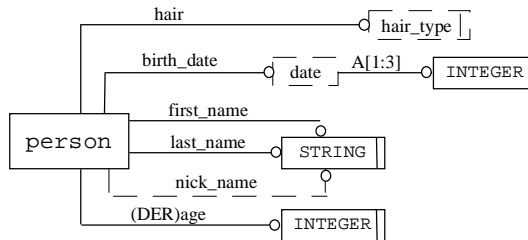


```
TYPE date = ARRAY (1:3) OF INTEGER;
END_TYPE;
```

```
TYPE hairtype = ENUMERATION OF
  (blond,brown,black,red);
END_TYPE;
```

```
ENTITY person;
  first_name : STRING;
  last_name  : STRING;
  nick_name  : OPTIONAL STRING;
  birth_date : date;
  hair       : hairtype;
END_ENTITY;
```

Derived attribute



```

ENTITY person;
    first_name : STRING;
    last_name  : STRING;
    nick_name  : OPTIONAL STRING;
    birth_date : date;
    hair       : hairtype;
    (DER)age   : INTEGER;
END_ENTITY;

FUNCTION calculate_age
    ( initial_date : date ) : INTEGER;
LOCAL
    today : date;
    age : INTEGER;
END_LOCAL;
; -- empty statement to satisfy parser
(* code here *)
RETURN (age);
END_FUNCTION;
  
```



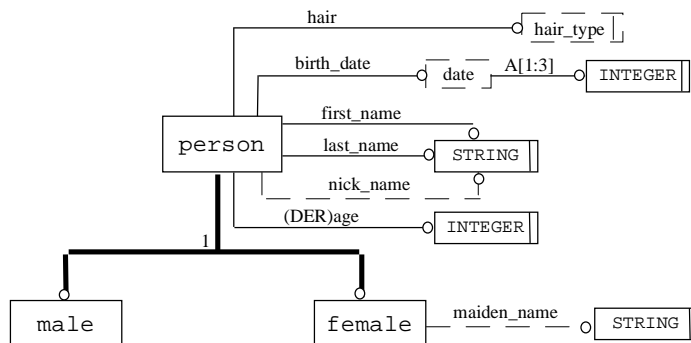
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Page 13
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Entity type hierarchy



```

ENTITY person;
    SUPERTYPE OF (ONEOF(MALE,FEMALE));
    (* attributes here *)
END_ENTITY;

ENTITY male;
    SUBTYPE OF (person);
END_ENTITY;

ENTITY female;
    SUBTYPE OF (person);
    maiden_name : OPTIONAL STRING;
END_ENTITY;
  
```



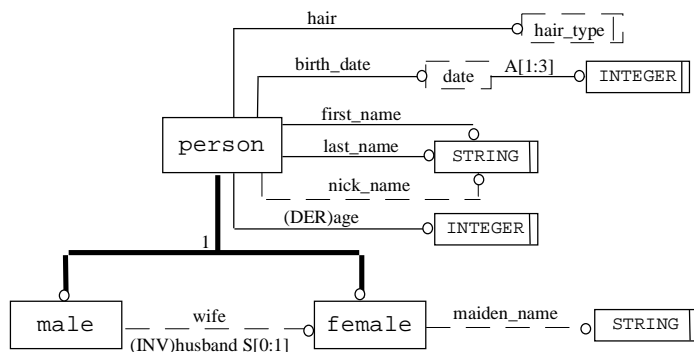
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Page 14
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Inverse attributes



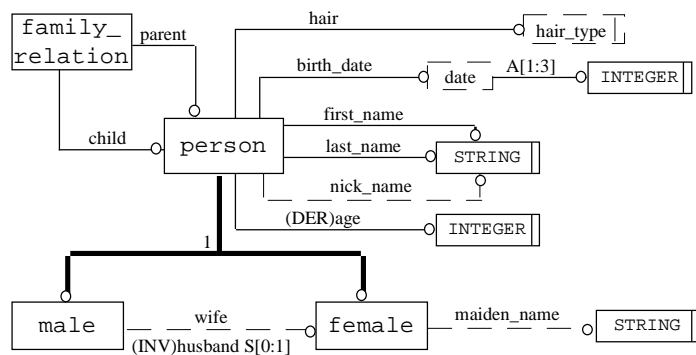
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Page 15
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Structures



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ISO/IEC 10744:1997 Annex A.4

```
<!DOCTYPE propset PUBLIC "ISO/IEC
10744:1997//DTD Property Set//EN" [
]>
```

```
<propset nsd=SGML gcsd=SGMLGC>
```

```
<desc>
```

Defines the classes and properties to be used in the construction of groves from the parsing of SGML documents.

```
</desc>
```

```
<classdef rcsnm=sgmldoc appnm="sgml
document" clause="62001">
```

```
<desc>
```

The parsed SGML document or subdocument. The root of the grove.

```
<propdef rcsnm=appinfo
appnm="application info"
fullnm="application information"
string clause="d6001">
```

```
<desc>
```

Application information provided by the SGML declaration.

```
<when>
```

A literal was specified as the value of the APPINFO parameter of the SGML declaration applicable to the document/subdocument.

[etc. etc.]

[Various pieces deleted]

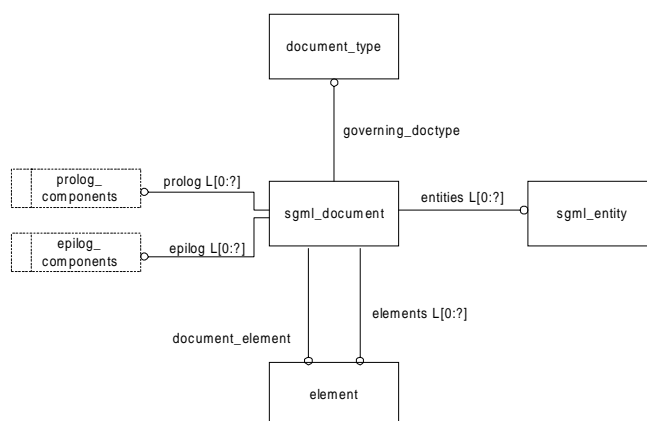


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Page 22
1999-03-17
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SGML Document

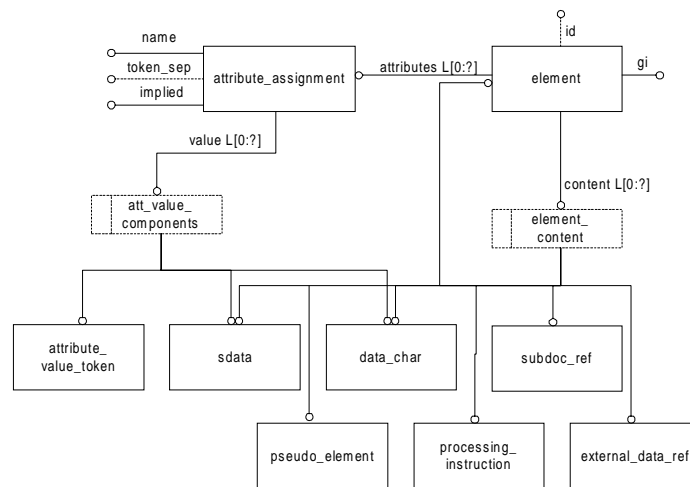


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Page 23
1999-03-17
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Element and attribute



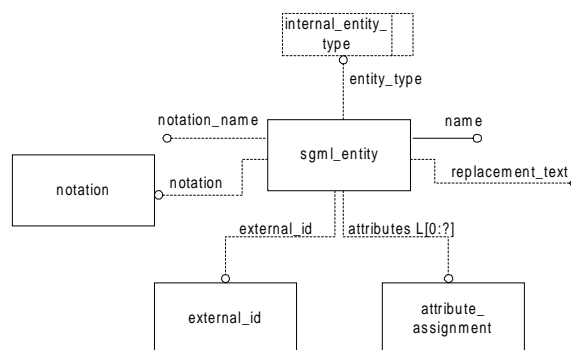
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Page 24
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SGML Entity



Made with simple transliteration



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Page 25
1999-03-17
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Definition in the Property Set

```
<classdef rcsnm=entity clause="60000">
```

```
<propdef rcsnm=name string strnorm=entity
  clause="93001">
```

```
<propdef rcsnm=enttype appnm="entity type" enum
  clause="a5502">
```

```
<enumdef rcsnm=text fullnm="SGML text">
```

```
<enumdef rcsnm=cdata>
```

```
<enumdef rcsnm=sdata>
```

```
<enumdef rcsnm=ndata>
```

```
<enumdef rcsnm=subdoc appnm=subdocument>
```

```
<enumdef rcsnm=pi>
```

```
<propdef rcsnm=text fullnm="replacement text"
  string clause="92101">
```

```
<when>
```

The entity is an internal entity.

```
<propdef subnode rcsnm=extid appnm="external id"
  fullnm="external identifier" node ac=extid
  clause="a1601">
```

```
<when>
```

The entity is an external entity.

```
<propdef subnode rcsnm=atts appnm=attributes
  nmndlist ac=attasgn acnmprop=name
  clause="b4120">
```

```
<desc>
```

A list of data attribute assignments, one for each declared attribute of the entity in the order in which they were declared in the attribute definition list declaration.

```
<when>
```

The entity is an external data entity.

```
<propdef rcsnm=notname appnm="notation name"
  string strnorm=general clause="79408">
```

```
<when>
```

The entity is an external data entity.

```
<propdef irefnod rcsnm=notation node ac=notation
  clause="b4001">
```

```
<when>
```

The entity is an external data entity.



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Page 26
1999-03-17
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Definition in the Property Set

```
<classdef rcsnm=entity clause="60000">
```

```
<propdef rcsnm=name string strnorm=entity
  clause="93001">
```

```
<propdef rcsnm=enttype appnm="entity type" enum
  clause="a5502">
```

```
<enumdef rcsnm=text fullnm="SGML text">
```

```
<enumdef rcsnm=cdata>
```

```
<enumdef rcsnm=sdata>
```

```
<enumdef rcsnm=ndata>
```

```
<enumdef rcsnm=subdoc appnm=subdocument>
```

```
<enumdef rcsnm=pi>
```

```
<propdef rcsnm=text fullnm="replacement text"
  string clause="92101">
```

```
<when>
```

The entity is an internal entity.

```
<propdef subnode rcsnm=extid appnm="external id"
  fullnm="external identifier" node ac=extid
  clause="a1601">
```

```
<when>
```

The entity is an external entity.

```
<propdef subnode rcsnm=atts appnm=attributes
  nmndlist ac=attasgn acnmprop=name
  clause="b4120">
```

```
<desc>
```

A list of data attribute assignments, one for each declared attribute of the entity in the order in which they were declared in the attribute definition list declaration.

```
<when>
```

The entity is an external data entity.

```
<propdef rcsnm=notname appnm="notation name"
  string strnorm=general clause="79408">
```

```
<when>
```

The entity is an external data entity.

```
<propdef irefnod rcsnm=notation node ac=notation
  clause="b4001">
```

```
<when>
```

The entity is an external data entity.

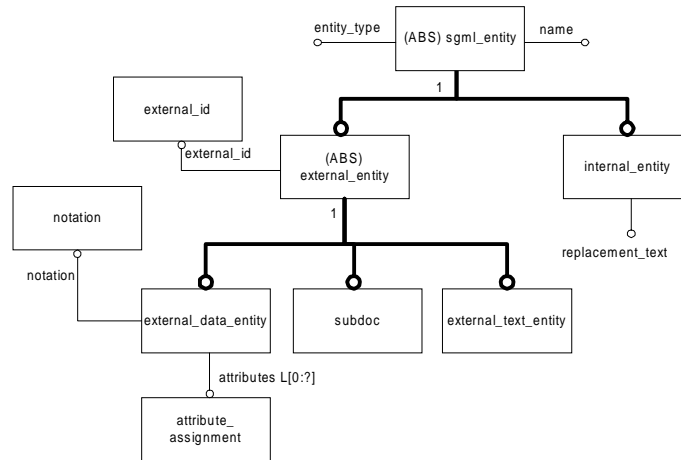


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Page 27
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SGML Entity, with type hierarchies



Type hierarchies added



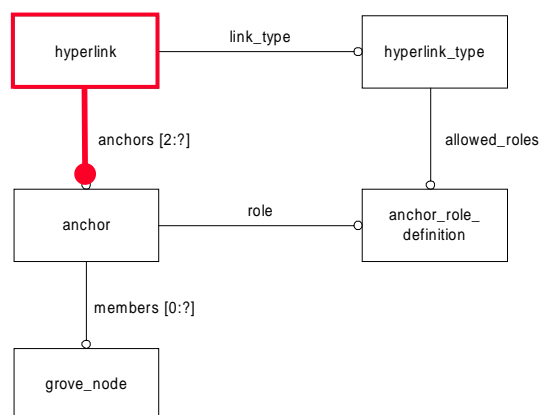
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Page 28
1999-03-17
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Hyperlink



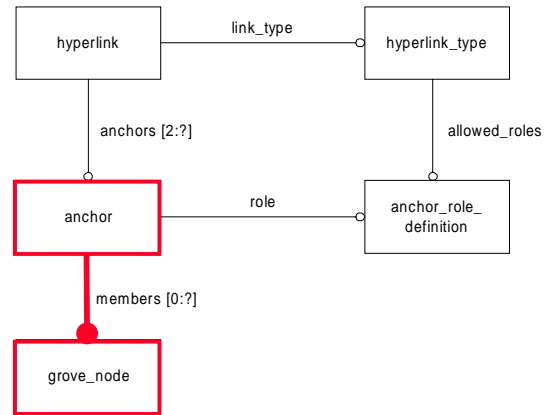
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Page 29
1999-03-17
Formal data models for SGML and HyTime

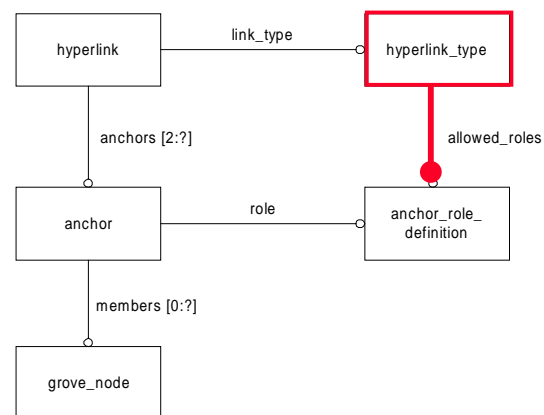


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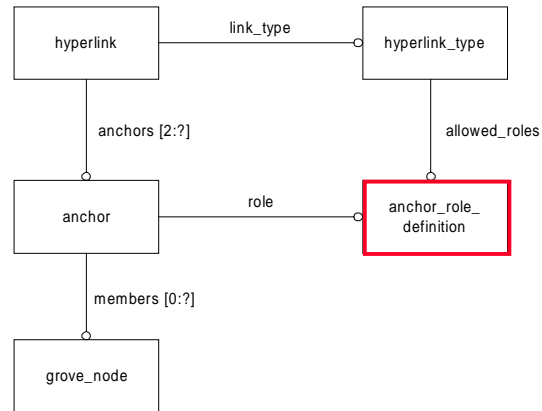
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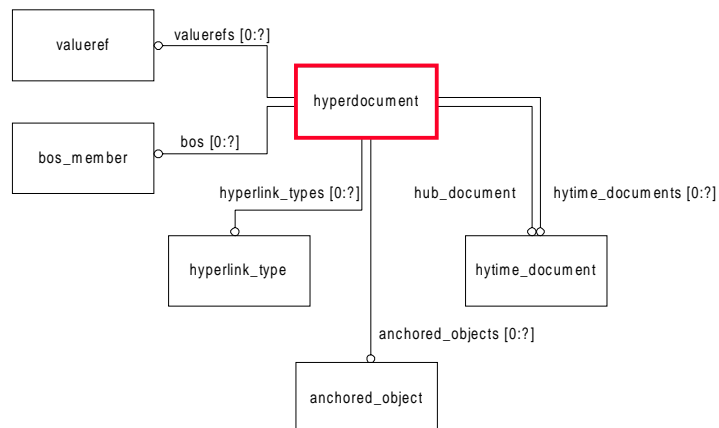
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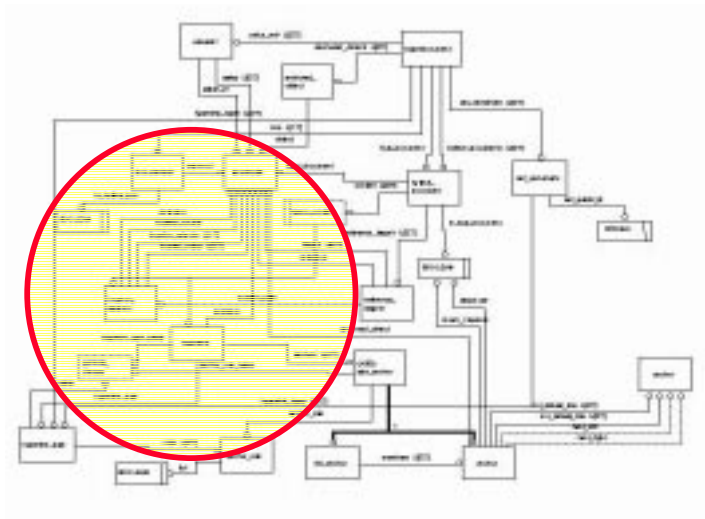
Hyperlink



Hyperdocument



Full HyTime Semantic Data Model



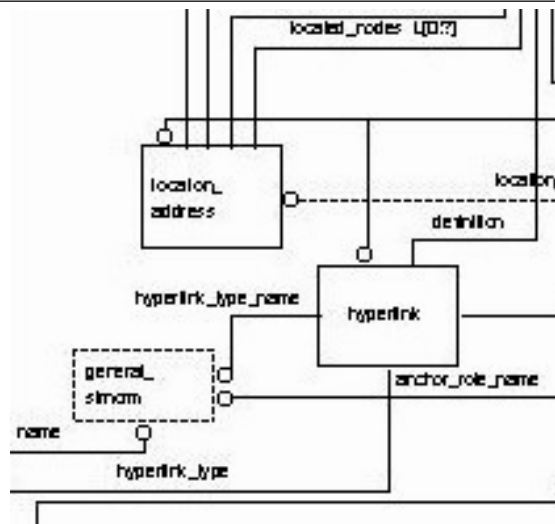
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Page 34
1999-03-17
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Detail of Full HyTime Semantic Grove



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Page 35
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Design Principles

- **Literal transcription from the original property sets**
- **Classes are mapped to Entities**
- **Properties to Attributes**
- **Supertypes only when clear from the standard, or necessary for understanding**

Conclusions

- **Possible and useful to use EXPRESS**
- **Discovered where the property sets can be enhanced**
- **data models make the standards clearer**
- **We hope EXPRESS will be used by standards like SGML in the future to define their fundamental data models as part of their normative definition.**
- **The first step in getting the SGML data model available to STEP-based environments. Next step is to prove and work through inspection and implementation.**