MULTIMEDIA PRESENTATIONS: INTEGRATING MEDIA INTO DOCUMENTS

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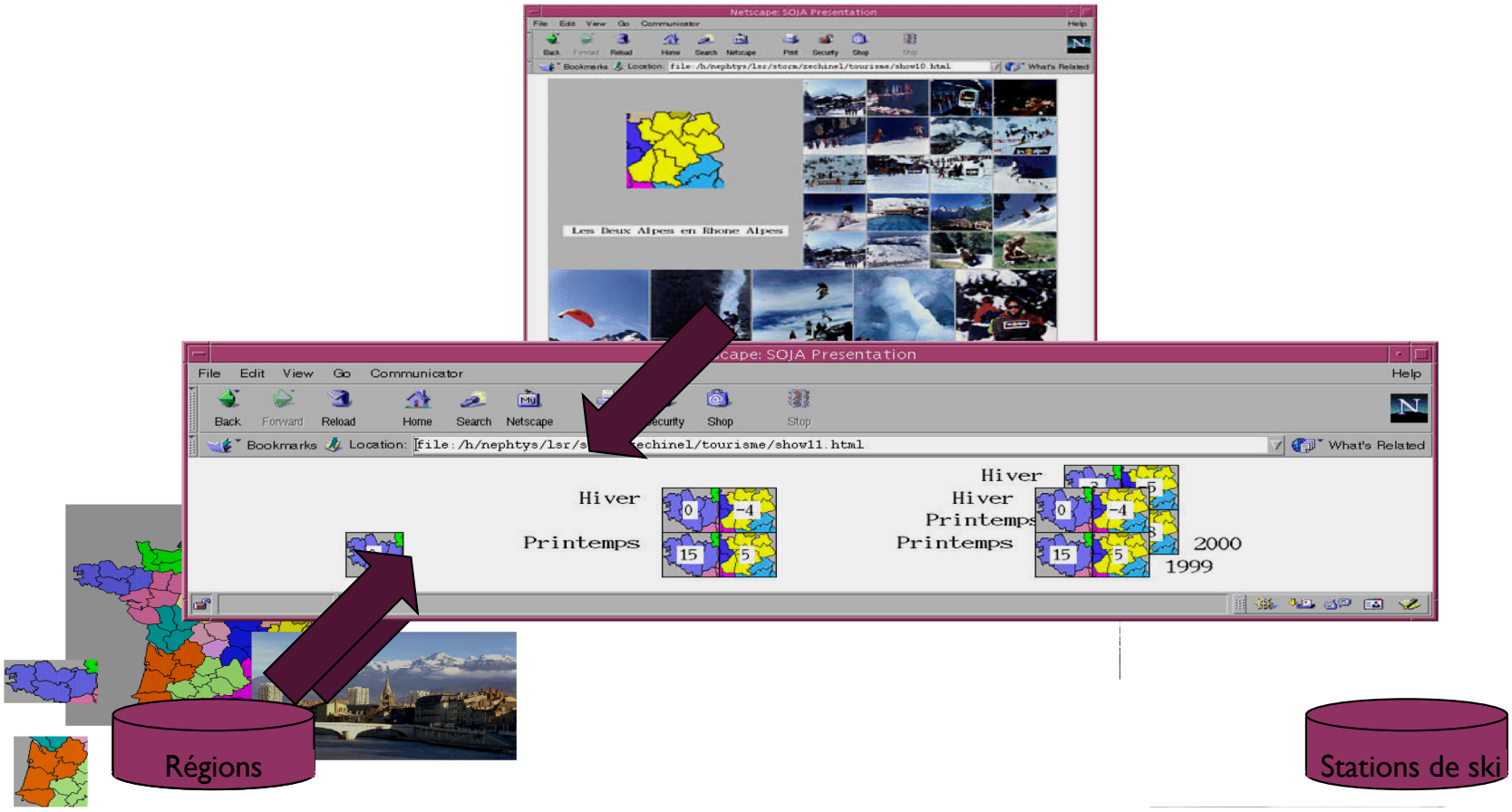
CONTEXT

- Sources d'objets multimédias (BD, Web, …).
- Différents formats (GIF, MPEG, XML, SMIL, …).
- Applications multimédias.
  - Modélisation des données.
  - Intégration des sources différentes.
  - Interrogation de collections d'objets.
  - Visualisation et synchronisation des objets multimédias réparties.

MULTIMEDIA PRESENTATION

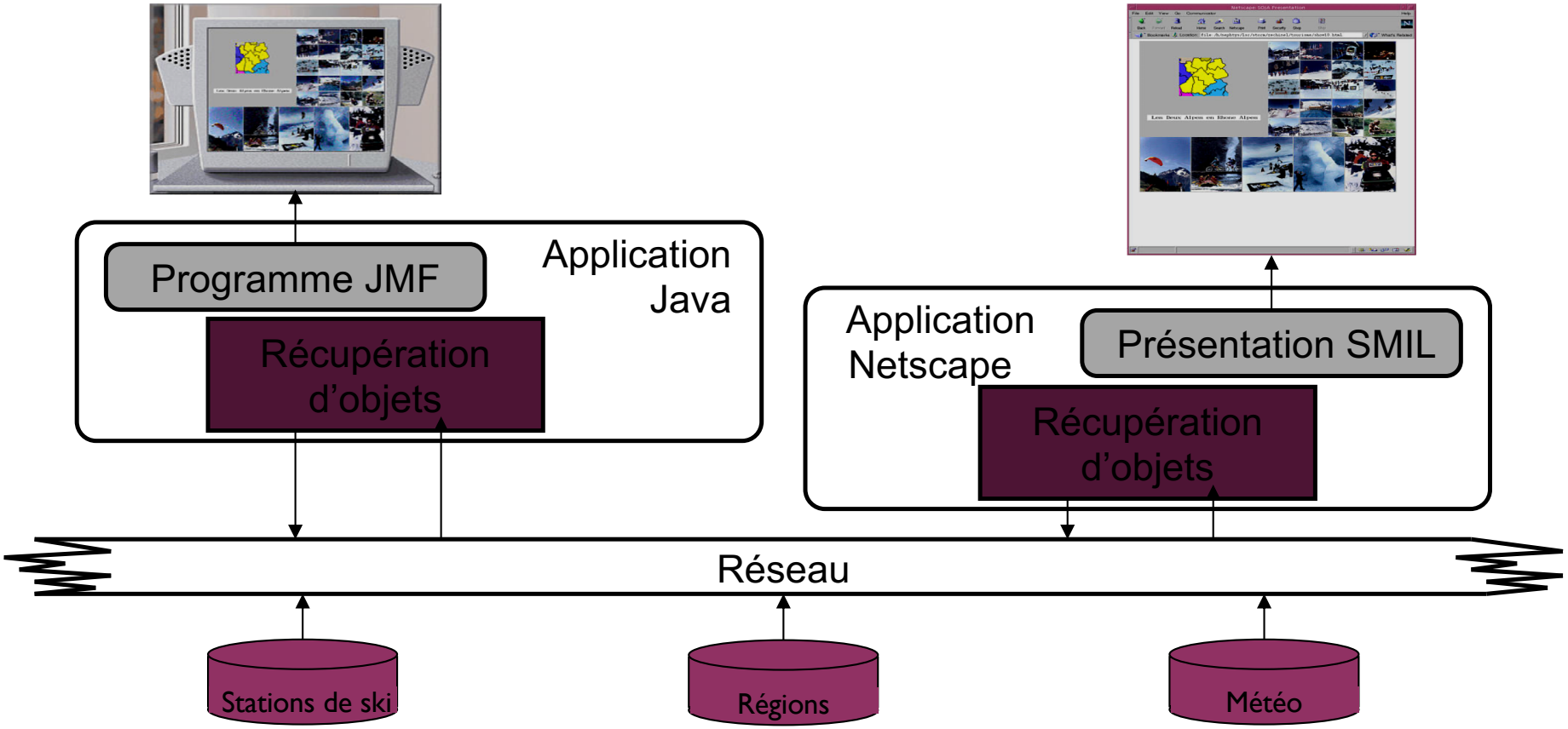
Combinaison de plusieurs objets dans un espace à n dimensions

- Temporelle : une ligne de temps
- Spatiale : deux ou trois dimensions
- Spatio-temporelle


Les Deux Alpes en Rhone Alpes
Hiver
Printemps
0
-4
15
5
Hiver
Hiver
Printemps
Printemps
2000
1999
Régions
Stations de ski

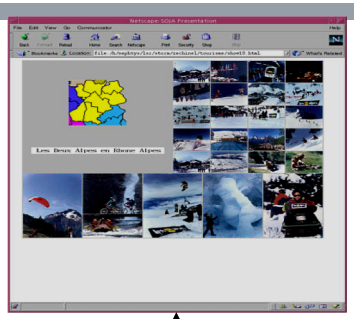
STATE OF THE ART (1)

- Environnements multimédias [DRAKKAR, MPEG, …].
  - Module de communication,
  - Système d'exploitation multimédia,
  - Boite à outils multimédias.
- Langages de programmation [OPERA, SMIL, JMF, …].
  - Interfaces de définition,
  - Compilateurs,
  - Interpréteurs.


Programme JMF
Application
Java
Récupération
d'objets
Application
Netscape
Présentation SMIL
Récupération
d'objets
Réseau
Stations de ski
Régions
Météo

STATE OF THE ART (2)

- SGBD multimédia [Vazirgiannis, Özsu, STORM, …].
  - Stocker des données multimédias volumineuses.
  - Présenter de manière audiovisuelle les résultats de requêtes.
  - Modéliser leur sémantique.
  - Permettre l'interrogation des données multiformes stockées dans des formats différents.
  - Intégrer les données multimédias en prenant en compte leur composition spatiale et temporelle.



Applications Multimédias

Interrogation | Exécution | Outil auteur | Vérification

Schéma de Présentations

SGBD Orienté à Objets

Présentations

Extracteurs

Stations de ski | Régions | Météo

<table>
<tr><th></th><th>Langages de programmation</th><th>Environnements multimédias</th><th>SGBD multimédias</th></tr>
<tr><td>Modèle</td><td colspan="2" rowspan="3"></td><td rowspan="2">Modèle spatio-temporel général :<ul><li>attributs,</li><li>relations.</li></ul>Intégration d’objets hétérogènes.</td></tr>
<tr><td>Placement et synchronisation</td><td>Langages standard pour la spécification de présentations au niveau utilisateur.</td></tr>
<tr><td>Gestion</td><td>Plate-formes d’exécution (JMF, SMIL).</td><td>Définition, interrogation, stockage.</td></tr>
<tr><td>Communication</td><td rowspan="2"></td><td rowspan="2">Intégration d’outils pour supporter la gestion de données multimédias : aspects distribution.</td><td></td></tr>
<tr><td>Architecture</td><td>Fédérations de bases de données : intégration et accès des sources distribuées.</td></tr>
</table>

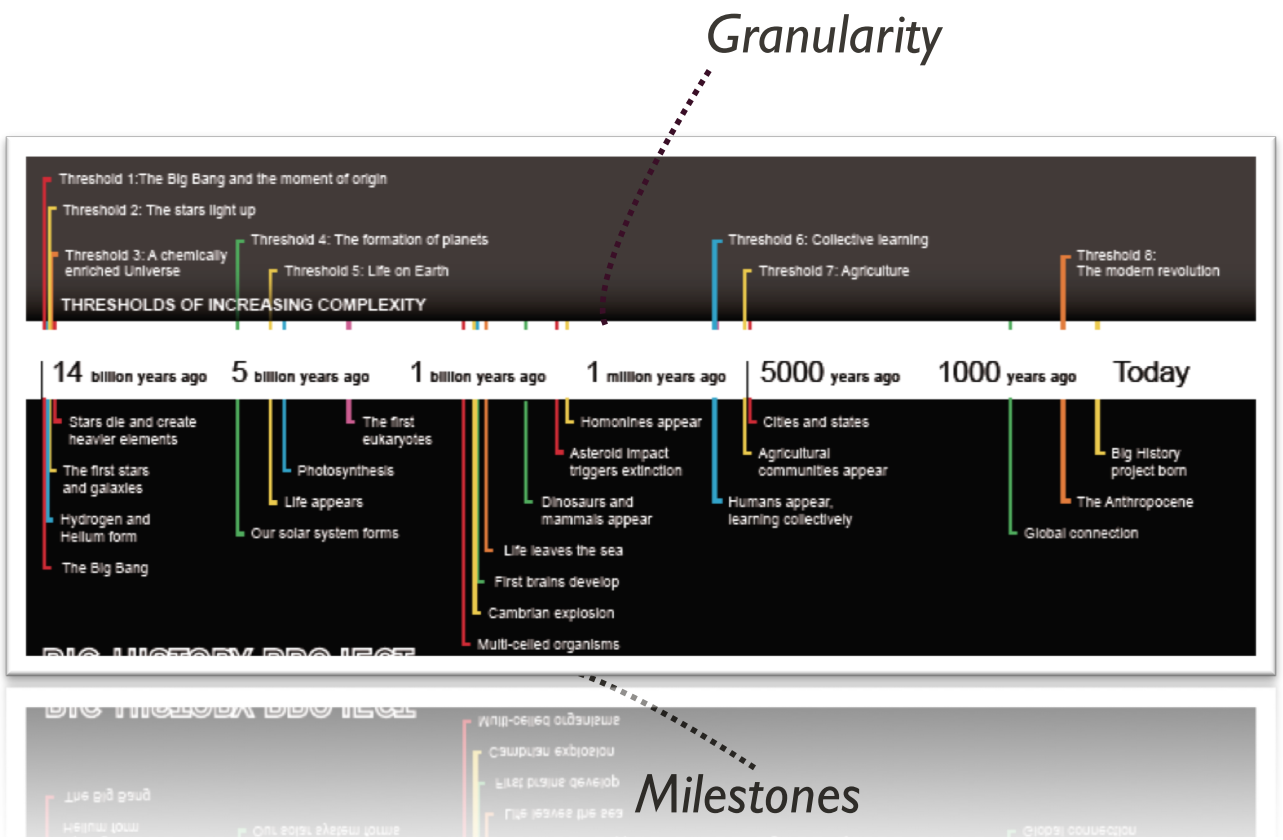
BIG HISTORY

Emerging interdisciplinary field that aims to tie everything in our planet's past

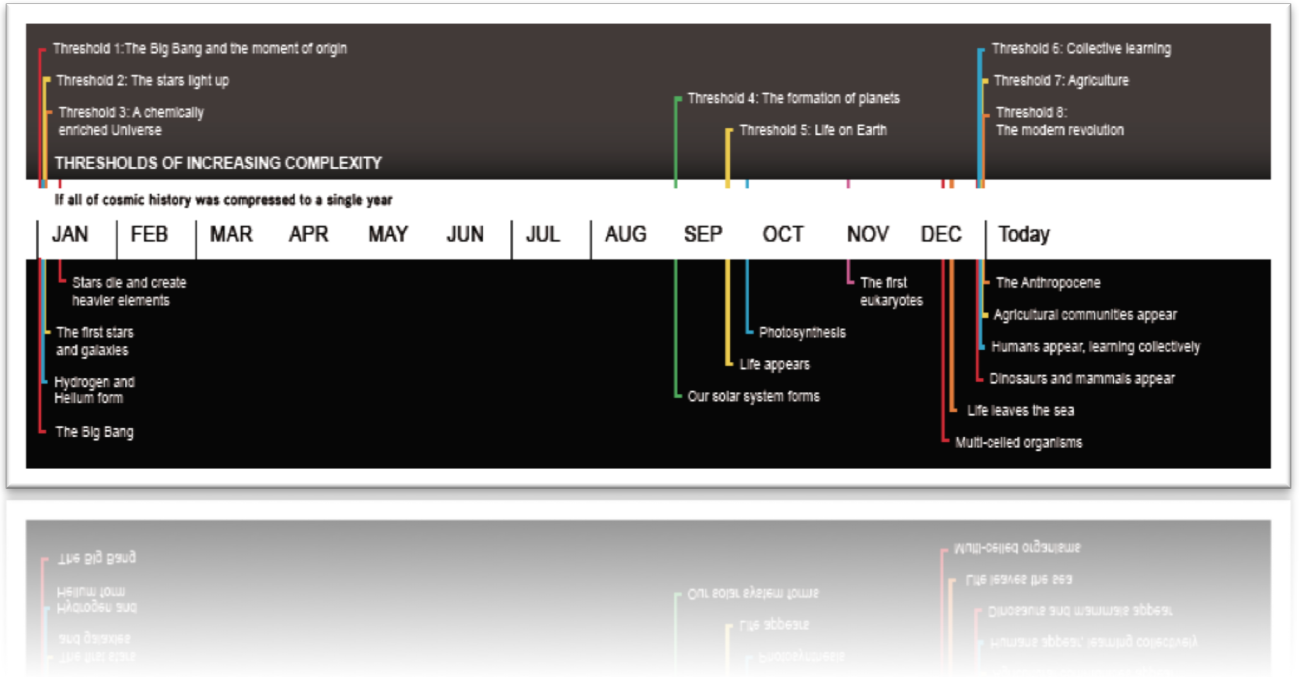
- its cosmic ancestry,
- its geological and paleontological evolution,
- the pageant of human societies

into a coherent understanding of the grand sweep and character of history

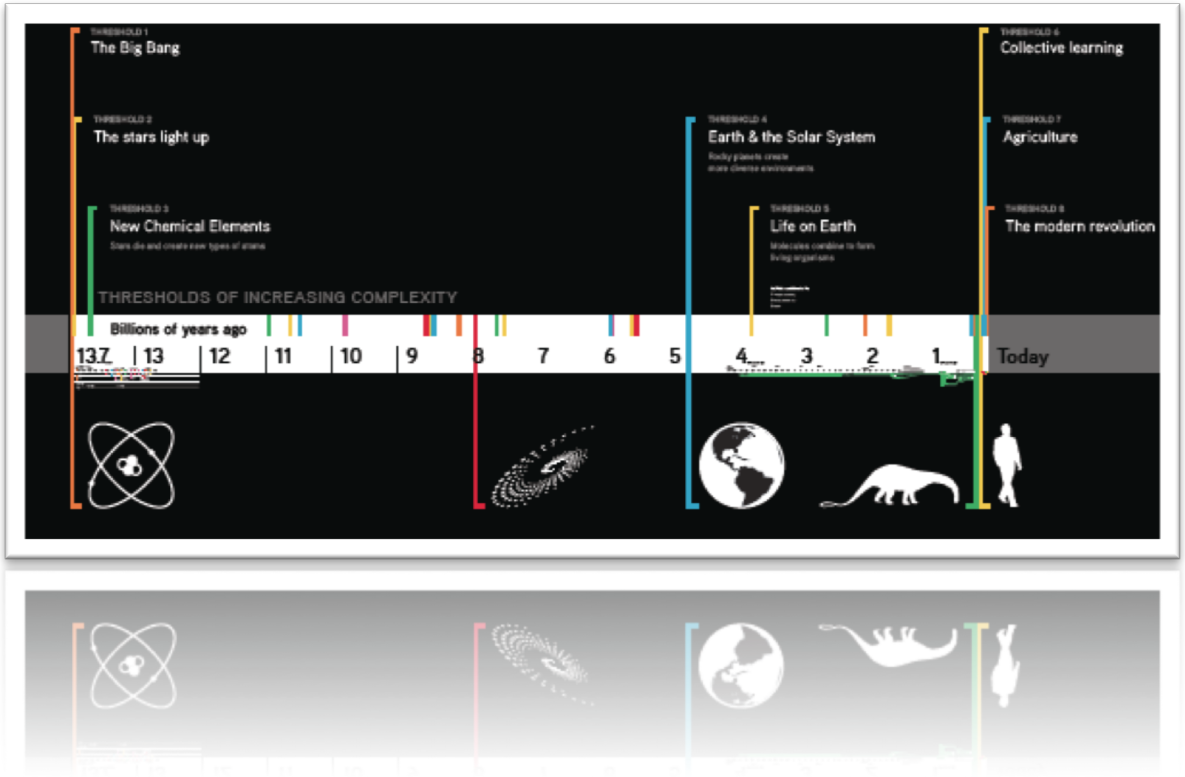
TIMELINE


Granularity
Threshold 1:The Big Bang and the moment of origin
Threshold 2: The stars light up
Threshold 3: A chemically enriched Universe
Threshold 4: The formation of planets
Threshold 5: Life on Earth
THRESHOLDS OF INCREASING COMPLEXITY
Threshold 6: Collective learning
Threshold 7: Agriculture
Threshold 8: The modern revolution
14 billion years ago
5 billion years ago
1 billion years ago
1 million years ago
5000 years ago
1000 years ago
Today
Stars die and create heavier elements
The first stars and galaxies
Hydrogen and Helium form
The Big Bang
The first eukaryotes
Photosynthesis
Life appears
Our solar system forms
Homonines appear
Asteroid impact triggers extinction
Dinosaurs and mammals appear
Life leaves the sea
First brains develop
Cambrian explosion
Multi-celled organisms
Cities and states
Agricultural communities appear
Humans appear, learning collectively
Big History project born
The Anthropocene
Global connection
Milestones

AGGREGATION



TIMELINES


The Big Bang
The stars light up
New Chemical Elements
Earth & the Solar System
Life on Earth
Collective learning
Agriculture
The modern revolution
THRESHOLDS OF INCREASING COMPLEXITY
Billions of years ago
13.7
13
12
11
10
9
8
7
6
5
4
3
2
1
Today

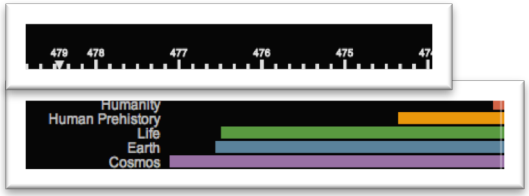
http://www.bighistoryproject.com

CHALLENGES

ChronoZoom beta

Navigation for querying collections

Multimedia data collection

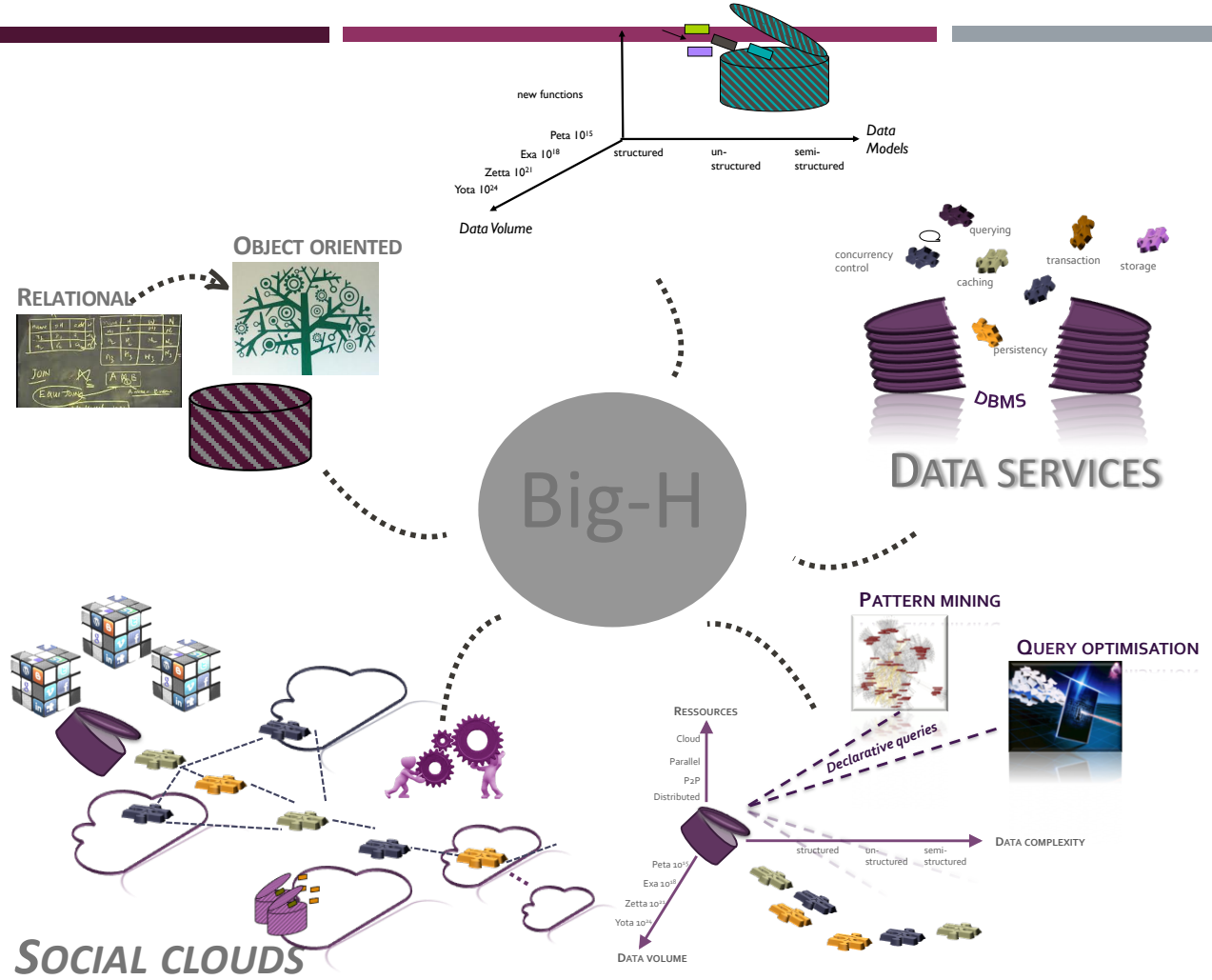


Aggregated views of data

Big-H

Data management and querying

Share, disseminate, collectively discuss and navigate through content


new functions
Peta 10^15
Exa 10^18
Zetta 10^21
Yota 10^24
Data Volume
structured
un-structured
semi-structured
Data Models
OBJECT ORIENTED
RELATIONAL
Big-H
querying
concurrency control
caching
transaction
storage
persistency
DBMS
DATA SERVICES
PATTERN MINING
QUERY OPTIMISATION
RESSOURCES
Cloud
Parallel
P2P
Distributed
Declarative queries
DATA COMPLEXITY
structured
un-structured
semi-structured
DATA VOLUME
SOCIAL CLOUDS

AGENDA

- Introduction: dealing with multimedia
- Multimedia presentations
  - Temporal models
  - Spatio-Temporal models
- Mashups: building multimedia documents on the Web
- Open issues and perspectives

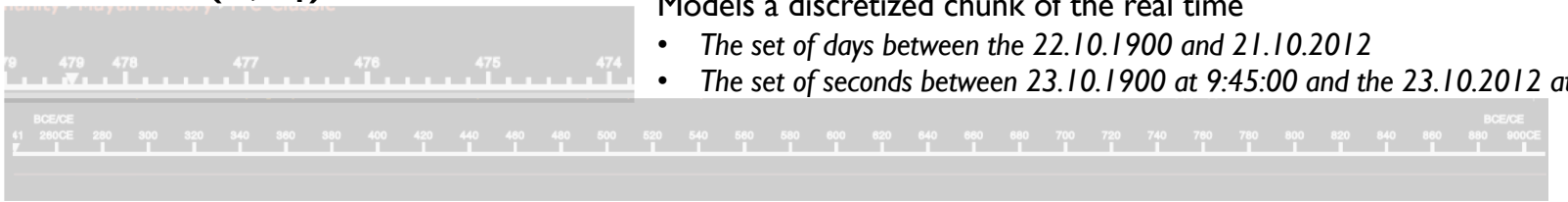
MANAGING TIME

D: finite set of *chronons*
$<_T$: binary relationship total linear order on *D*

- Time line modelled as an interval of integers with 0 as lower bound
- A *chronon* is identified by a natural integer

- A *granularity* on a time line is a partition of the set of *chronons of the line* into convex sets named *grains (e.g., week, month, year)*
- *Minimal granularity* is the one consisting of grains that are singletons (day)

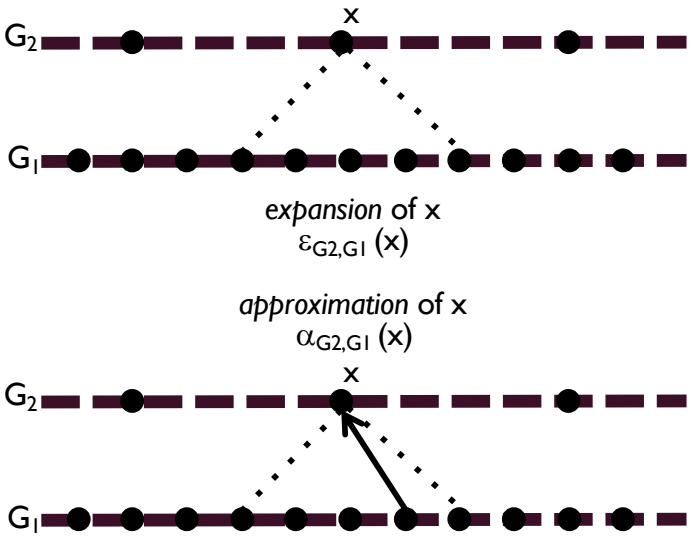
Time line: (D, $<_T$)



Models a discretized chunk of the real time

- *The set of days between the 22.10.1900 and 21.10.2012*
- *The set of seconds between 23.10.1900 at 9:45:00 and the 23.10.2012 at 10:00:00*

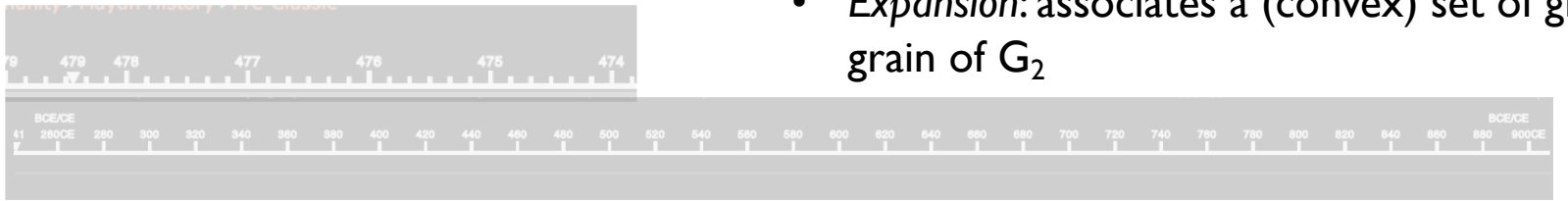
MANAGING TIME



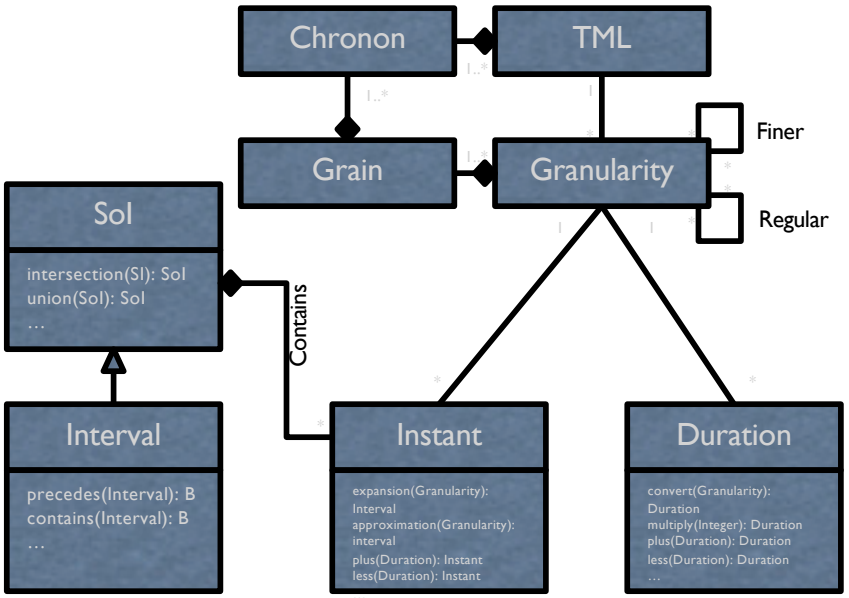
Relationship "finer than" $\prec$: $G_1 \prec G_2$ *iff* they are defined on the same time line $\forall g_2 \in G2,\ g_2 = \bigcup_{g_1 \in G1,\ g_1 \subseteq g_2} g_1$

Enables the definition of a hierarchy among granularities. For each couple $G_1 \prec G_2$ two conversion functions are defined:

- *Approximation*: approximates a grain of G_1 through a grain of G_2 that contains it
- *Expansion*: associates a (convex) set of grains G_1 to each grain of G_2



MANAGING TIME



- *Instant*: an approximation of a segment of a time line through a grain. Completely described by a grain and a positive integer, its *position*
- *Duration*: number of grains used to measure the distance between two grains. Signing the duration enables to model the movement from past to future
- *Set of instants*: composed of instants of the same granularity. The type *interval* is models sets of convex instants

ORGANIZING CONTENT IN TIME

Parametric type
`History (T)`

`History (T)`: is a function with

- domain in the finite set of instants with the same granularity
- image in the set of objects of type T

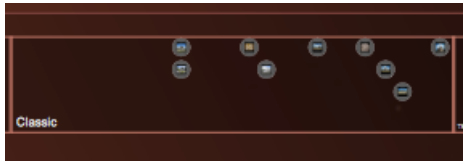
`IChronicle`: represents a list of tuples `<instant, object>` chronologicaly ordered

[< 200, > … < 1000, >]

`XChronicle`: represents a list of tuples `<interval, object>` chronologicaly ordered

[< [1796BCE,140ACE], >

,

< [256,1000], 

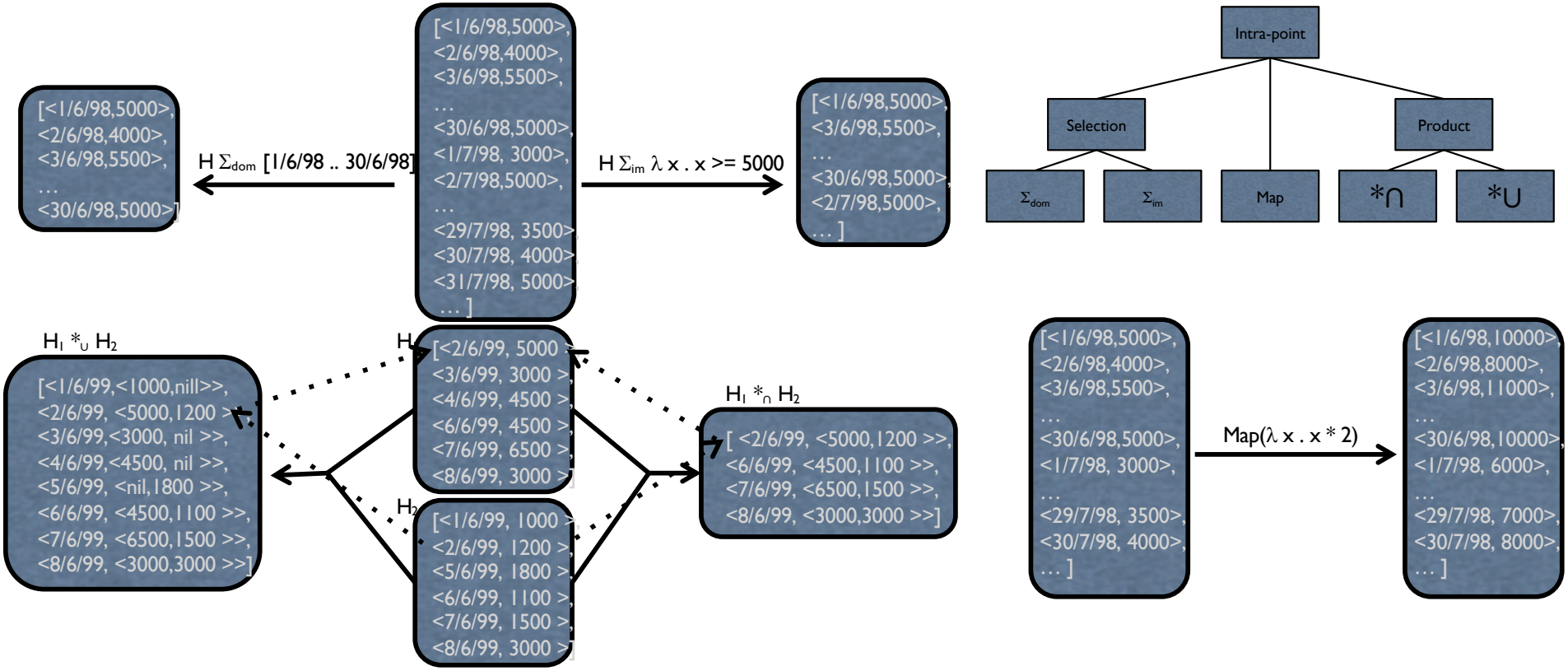
>,]

…

ORGANIZING CONTENT IN TIME

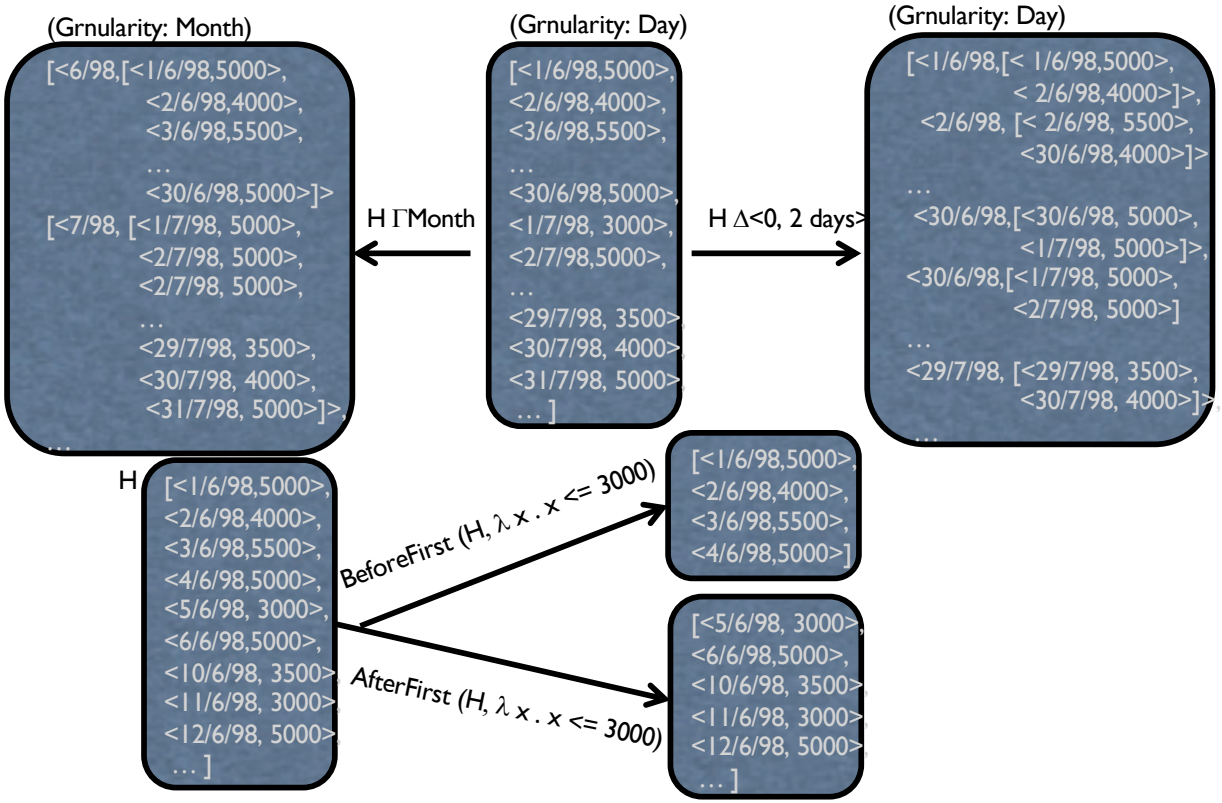
Parametric type

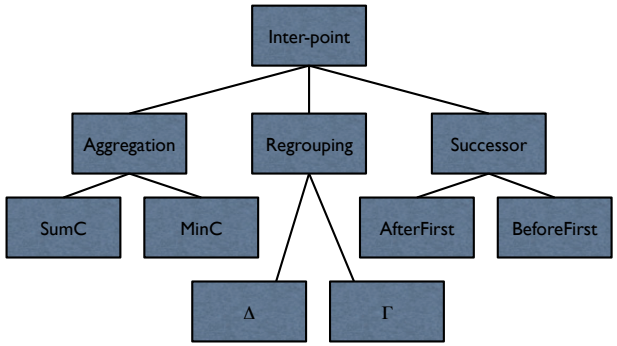
`History (T)`



ORGANIZING CONTENT IN TIME

Parametric type
`History (T)`



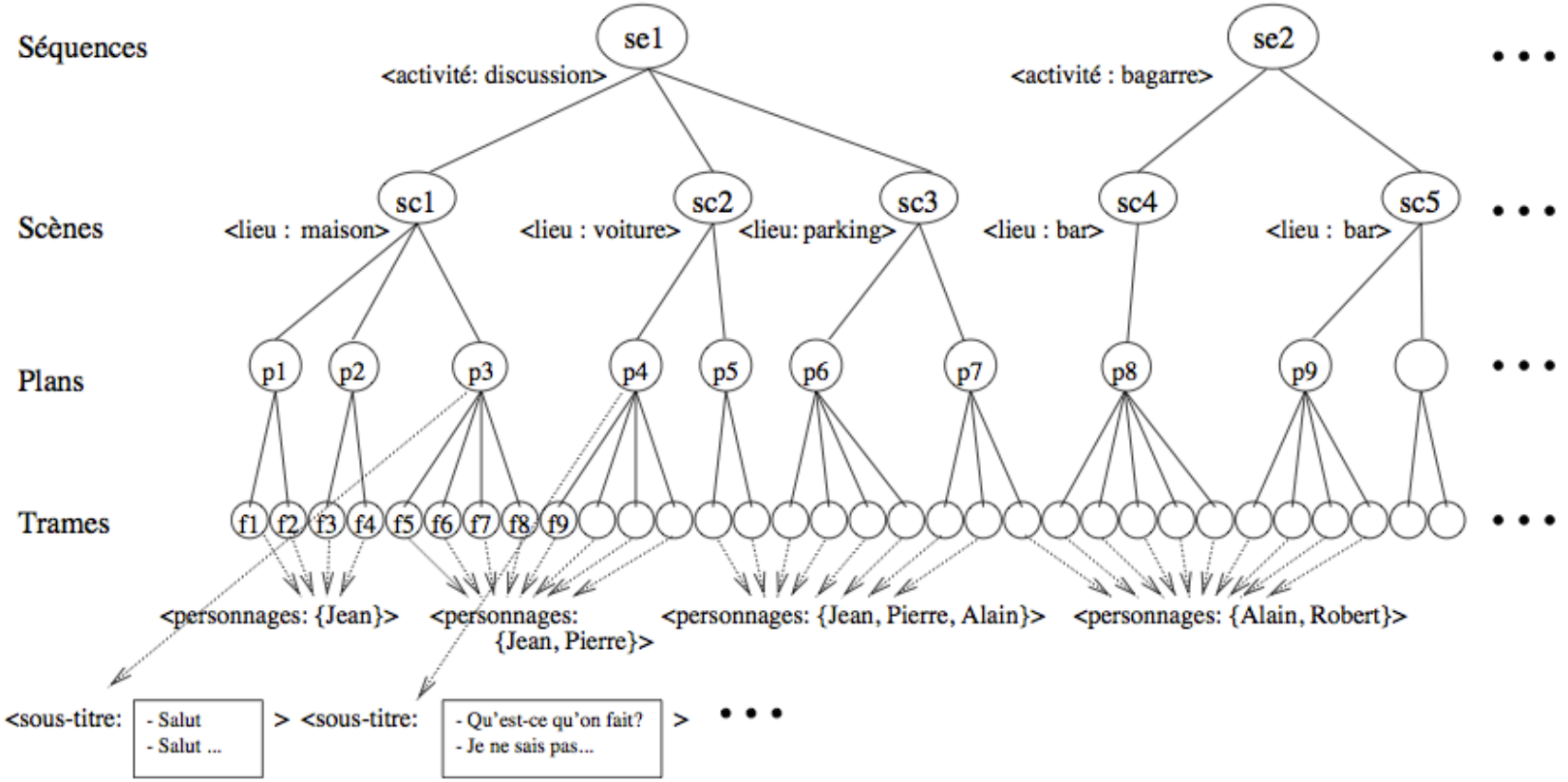


ROLLING AND DRILLING UP/DOWN

ZOOMING IN/OUT

MINDS ON VIDEO

BACK TO EXERCISE 3


Séquences
Scènes
Plans
Trames
se1
se2
<activité: discussion>
<activité : bagarre>
sc1
sc2
sc3
sc4
sc5
<lieu : maison>
<lieu : voiture>
<lieu: parking>
<lieu : bar>
<lieu : bar>
p1
p2
p3
p4
p5
p6
p7
p8
p9
f1
f2
f3
f4
f5
f6
f7
f8
f9
<personnages: {Jean}>
<personnages: {Jean, Pierre}>
<personnages: {Jean, Pierre, Alain}>
<personnages: {Alain, Robert}>
<sous-titre:
- Salut
- Salut ...
>
<sous-titre:
- Qu'est-ce qu'on fait?
- Je ne sais pas...
>

```
interface VidéoBrute; /* interface détaillée dans [Loz00] */
interface RéférenceImage {
  attribute VidéoBrute source;
  attribute short postition;
}
```

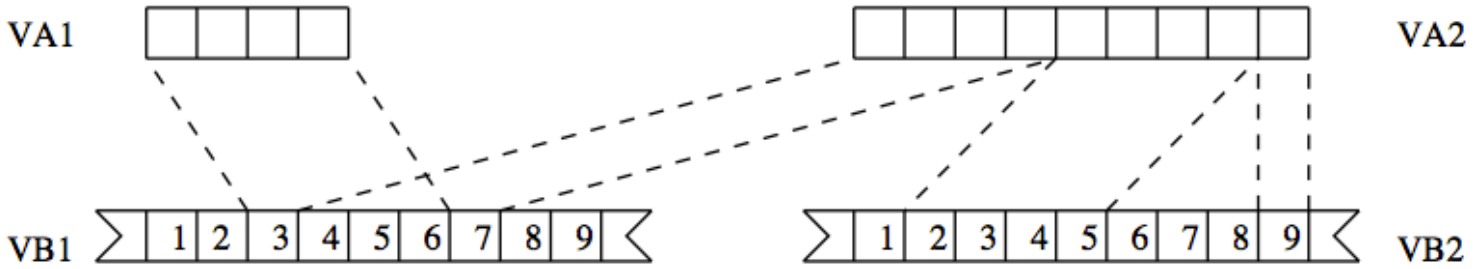


FIG. 5.5 *Exemple de partage des images d'une vidéo brute par deux vidéos "virtuelles". VA1 et VA2 dénotent les historiques des références à des images associés à deux vidéos annotées. VB1 et VB2 dénotent les images de deux vidéos brutes.*

AGENDA

- Introduction: dealing with multimedia
- Multimedia presentations
  - Temporal models
  - Spatio-Temporal models
  - Putting presentations on the Web
- Mashups: building multimedia documents on the Web
- Open issues and perspectives

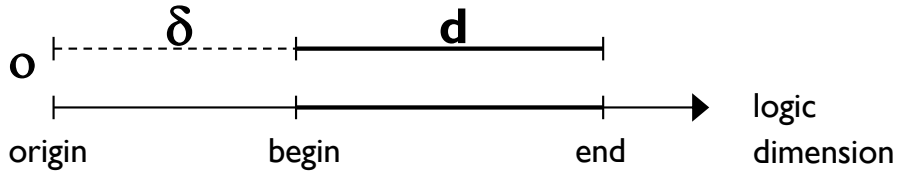
INTEGRATING AND MANAGING MULTIMEDIA PRESENTATIONS BY A WEB-BASE OBJECT SERVER

THIS WORK WAS PROPOSED BY PROF. JOSÉ LUIS ZECHINELLI MARTINI AND PROF. MICHEL ADIBA

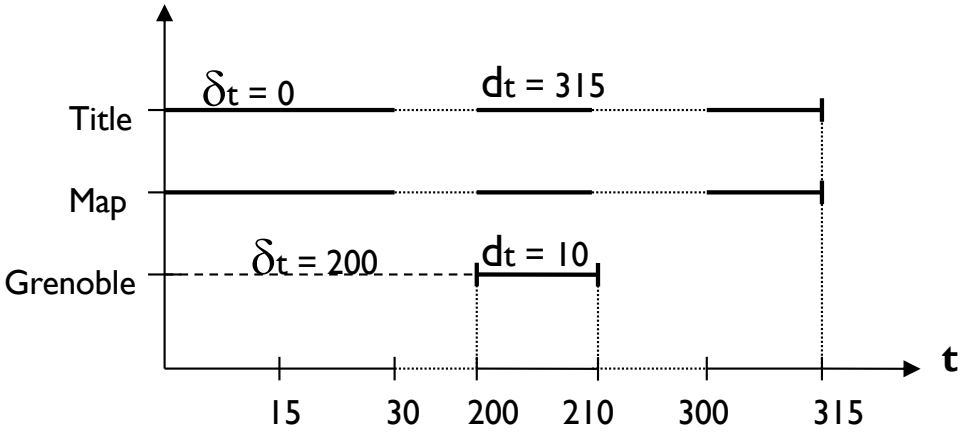
PROBLEM STATEMENT

- **Integrate heterogeneous and distributed objects in multimedia presentations:**
  - *retrieve a set of images of Paris from different data sources and*
  - *show them according to a spatio-temporal definition*
- **Specify and experiment a:**
  - spatio-temporal model;
  - a middleware tool between data sources and multimedia applications

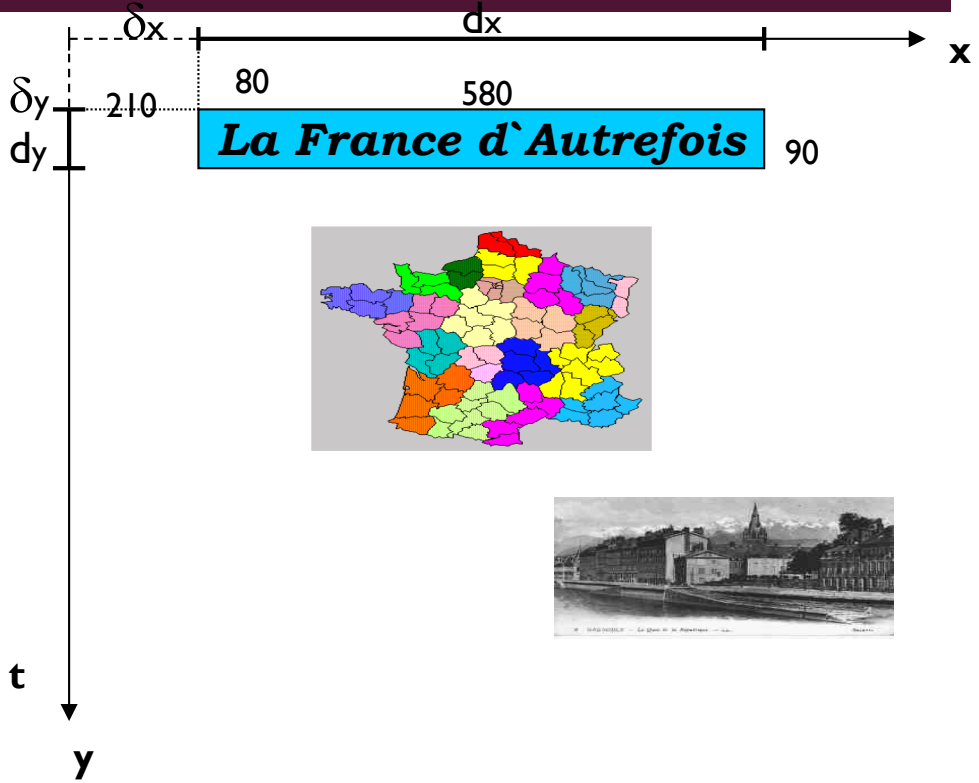
SPATIO TEMPORAL SHADOW



(a) Shadow

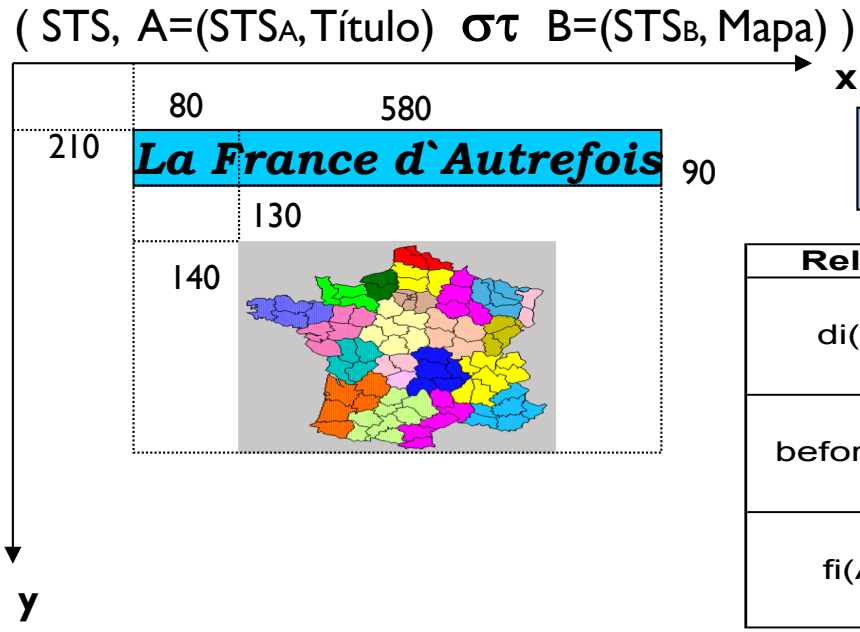


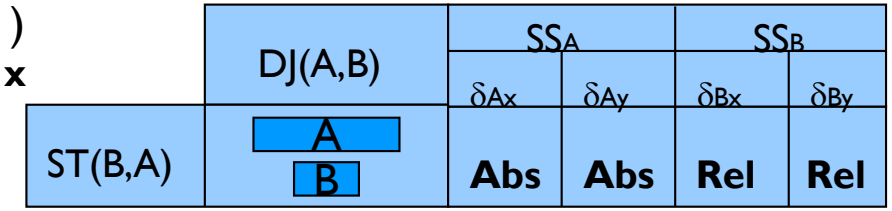
(b) Temporal Shadow (TS)



(c) Spatial Shadow (SS)

MULTIMEDIA ST PRESENTATION





Relation	Inverse	Semantics
di(A,B)	during(B,A)	δAx >= 0 ; dAx > dBx + dBx ; δBx > 0 ; dBx > 0
before(A,B)	bi(B,A)	δAy >= 0 ; dAy > 0 ; δBy > dAy ; dBy > 0
fi(A,B)	finish(B,A)	δAt >= 0 ; dAt = δBt + dBt ; δBt > 0 ; dBt > 0

- Present the title at position (210, 80) during 315 seg
- Show the map disjoint and to the south of the title (130 pixels from the upper side and 140 pixels from the left side)
- The presentations of the title and the map must finish at the same time

TOPOLOGICAL RELATIONS

Relation	Inverse	Definition
Disjoint(A,B)	**Disjoint(B,A)**	**Ax {before, bi} Bx** *or* **Ay {before,bi} By**
Touch(A,B)	Touch(B,A)	Ax {meet, mi} Bx *and* Ay {meet, mi, overlap, oi, start, si, during, di, finish, fi, equal} By *or* Ax {meet, mi, overlap, oi, start, si, during, di, finish, fi, equal} Bx *and* Ay {meet, mi} By
Overlap(A,B)	Overlap(B,A)	Ax {overlap, oi} Bx *and* Ay {overlap, oi, start, si, during, di, finish, fi, equal} By *or* Ax {equal} Bx *and* Ay {overlap, oi} By *or* Ax {start, during, finish} Bx *and* Ay {overlap, oi, si, di, fi} By *or* Ax {si, di, fi} Bx *and* Ay {overlap, oi, start, during, finish} By
Cover(A,B)	Covered_by(B,A)	Ax {di} Bx *and* Ay {si, fi, equal} by *or* Ax {si, fi} Bx *and* Ay {si, di, fi, equal} By *or* Ax {equal} Bx *and* Ay {si,di,fi} By
Inside(A,B)	Contain(B,A)	Ax {during} Bx *and* Ay {during} By
Equal(A,B)	Equal(B,A)	Ax {equal} Bx *and* Ay {equal} By

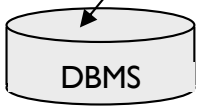
DIRECTIONAL RELATIONS

Relation	Inverse	Definition
North(A,B)	**South(B,A)**	**Ax {during, di, equal} Bx *and* Ay {before, meet, overlap, start, fi} By**
West(A,B)	East(B,A)	Ax {before, meet, overlap, start, fi} Bx *and* Ay {during, di, equal} By
Northwest(A,B)	Southeast(B,A)	Ax {before, meet, overlap, start, fi} Bx *and* Ay {before, meet, overlap, start, fi} By
Northeast(A,B)	Southwest(B,A)	Ax {bi, mi, oi, si, finish} Bx *and* Ay {before, meet, overlap, start, fi} By

SIMPLE PRESENTATION

(STS, O)

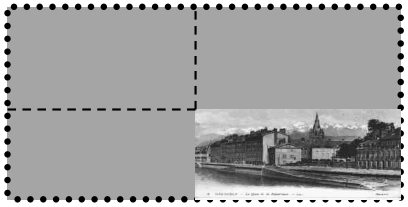
O = OID



URL

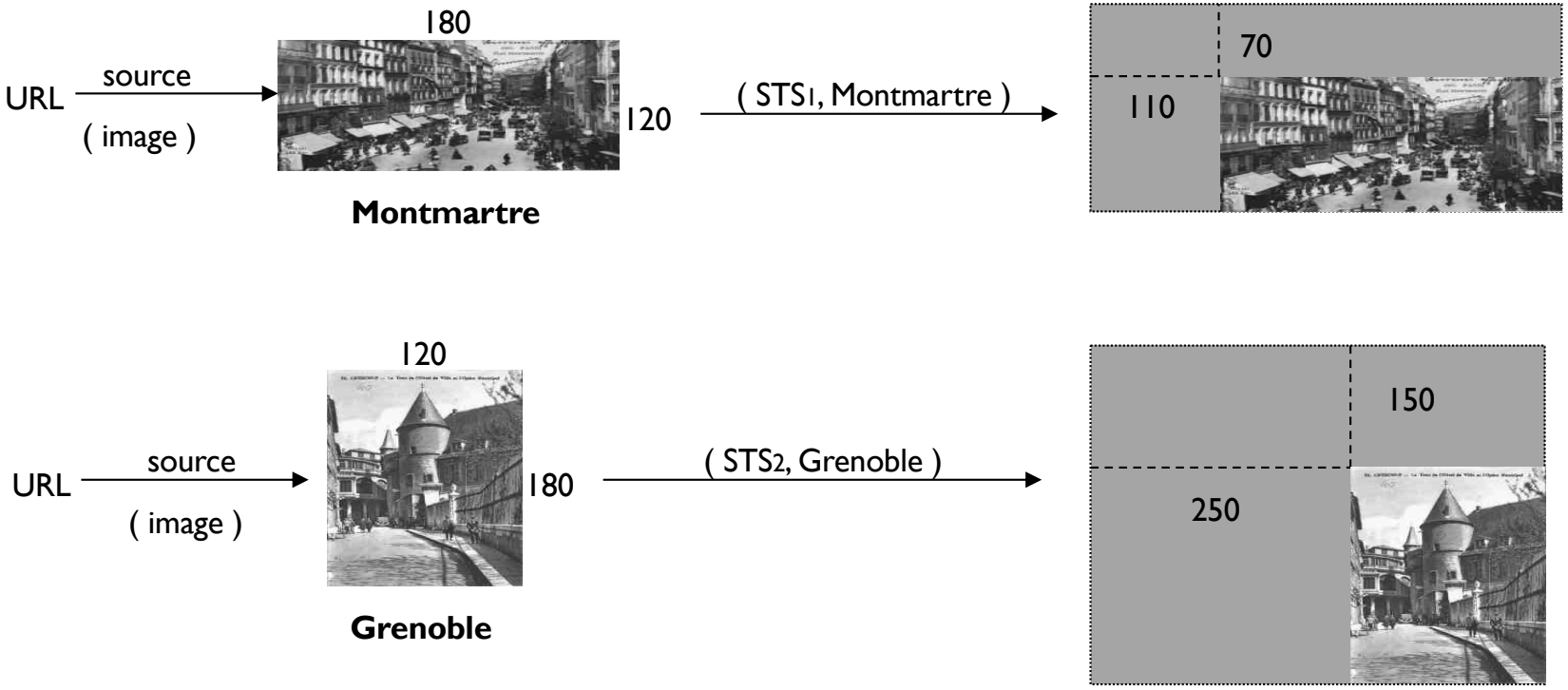
size of the presentation space	=	size of the presention of the object O
size of the O in the source	=	size of the object O being presented

size of the presentation space	>	size of the presentation of the object O
size of the object O in the source	=	size of the object O being presented

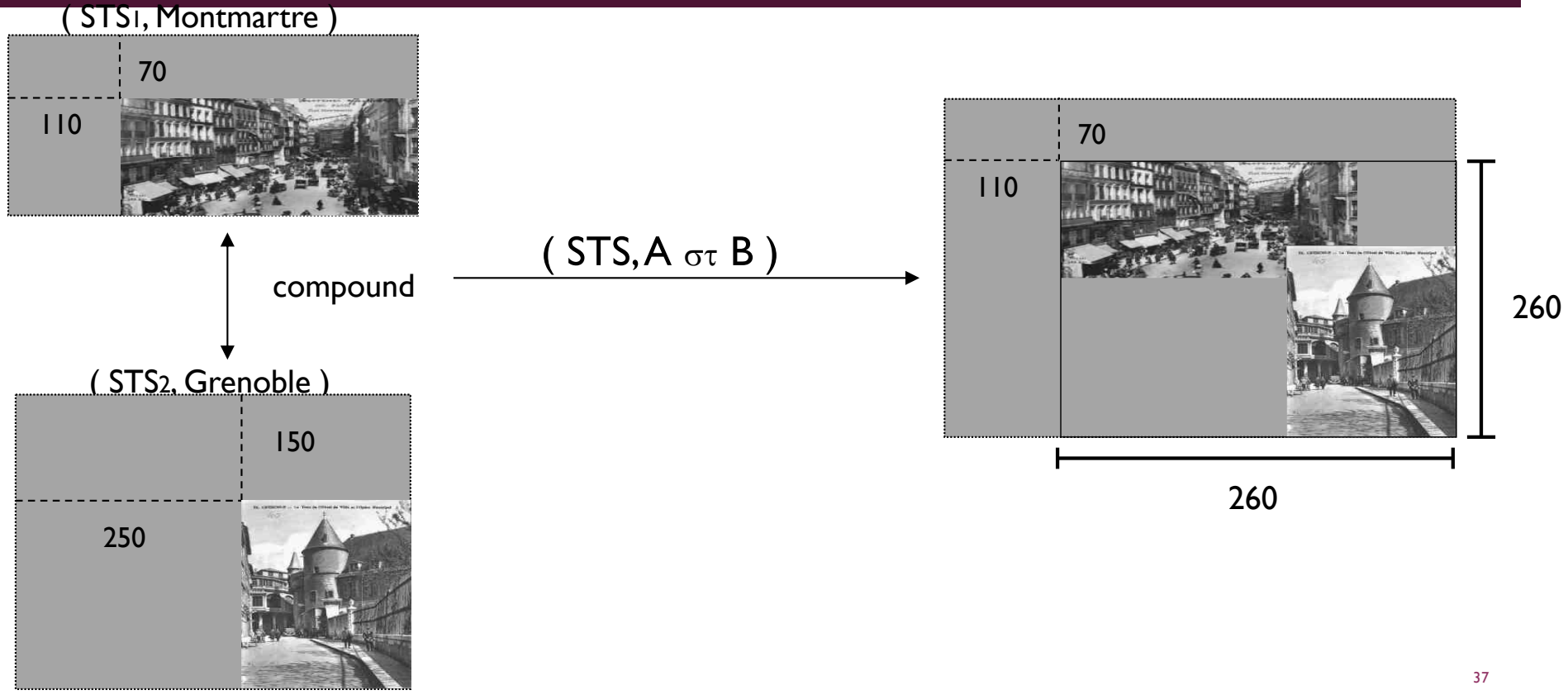


size of the presentation space	>	size of the presentation of the object O
size of the object O in the source	trans-formed	size of the object O being presented

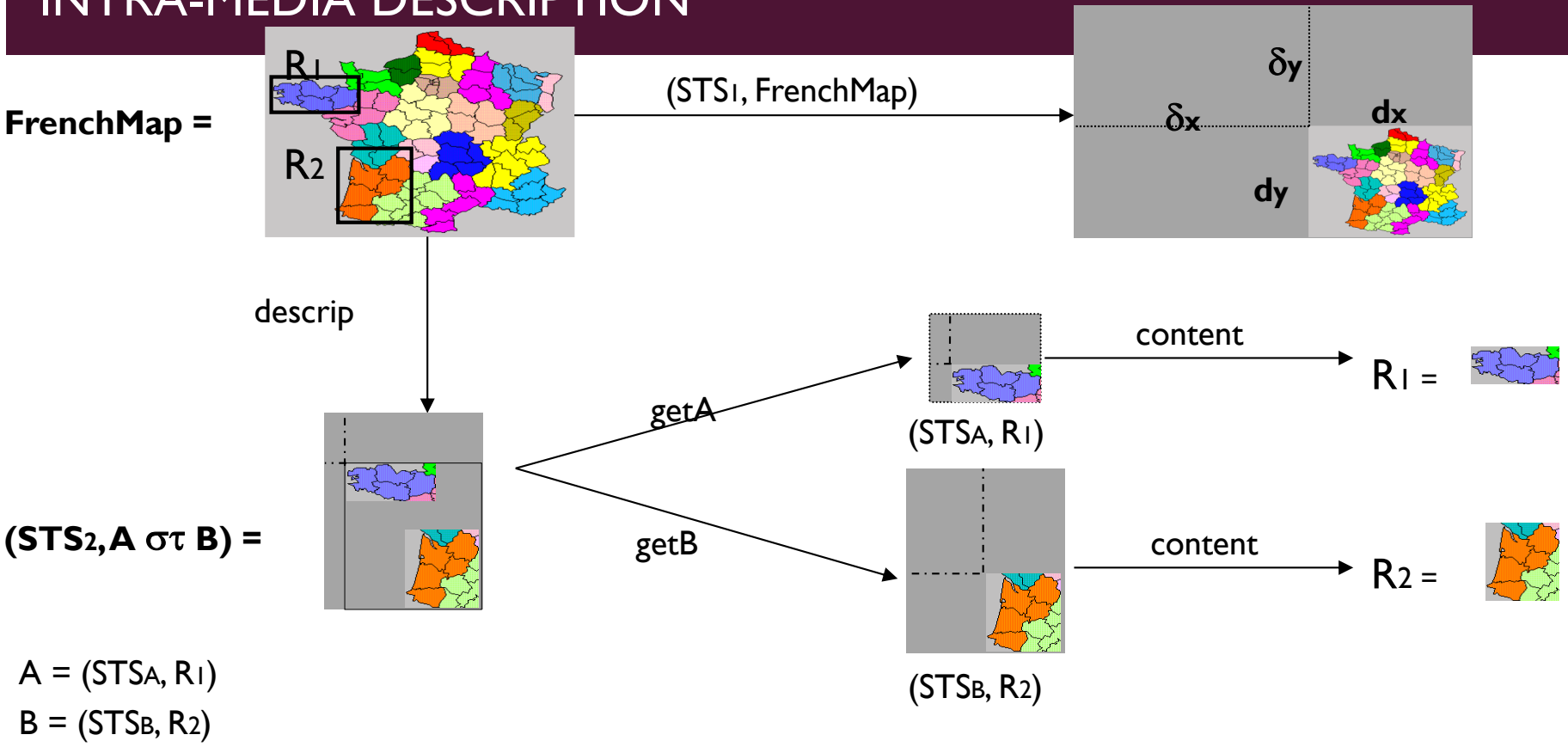
INTERMEDIA DESCRIPTION

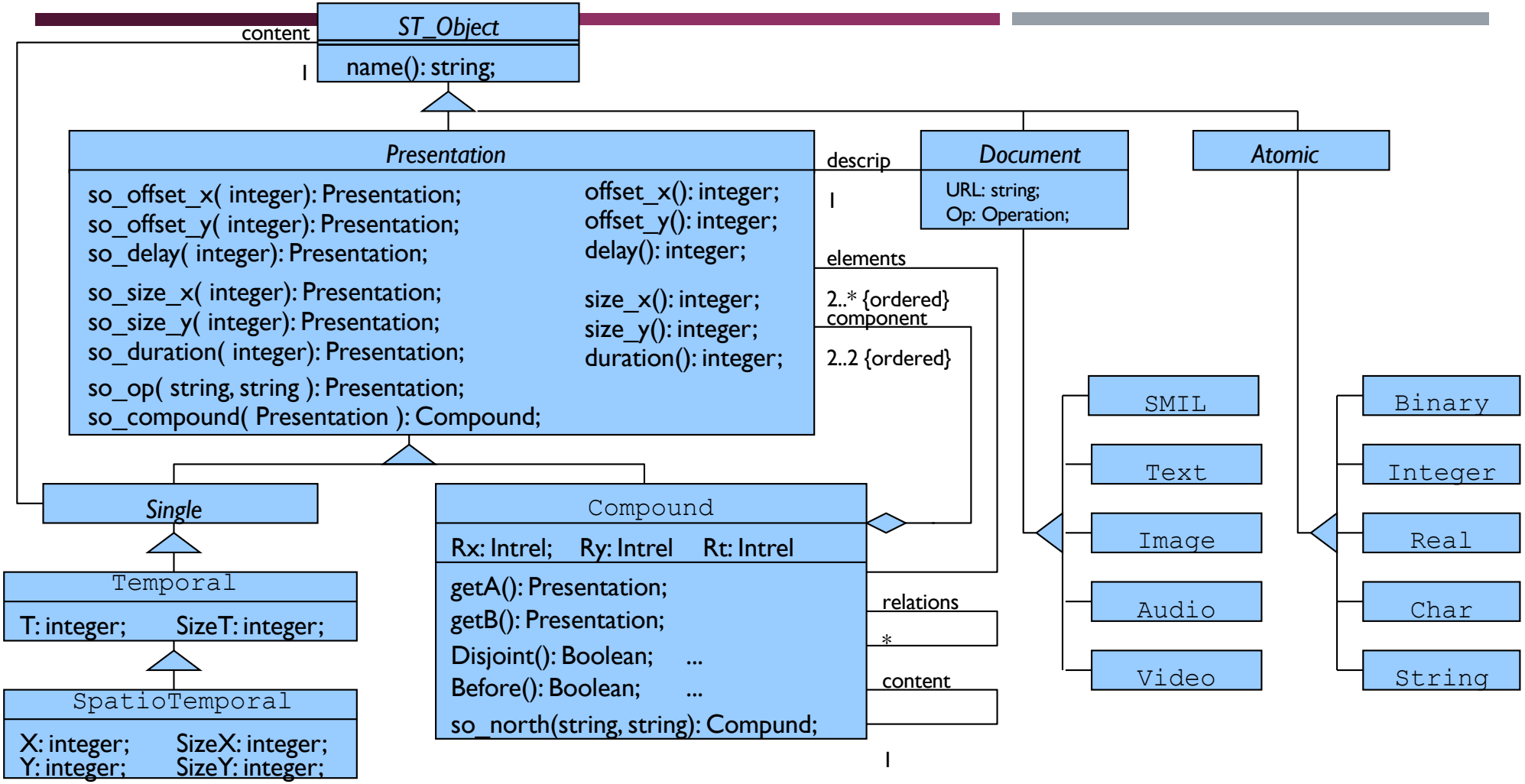


INTERMEDIA DESCRIPTION



INTRA-MEDIA DESCRIPTION

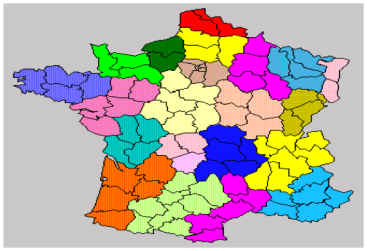



ST_Object
name(): string;
content
1
Presentation
so_offset_x(integer): Presentation;
so_offset_y(integer): Presentation;
so_delay(integer): Presentation;
so_size_x(integer): Presentation;
so_size_y(integer): Presentation;
so_duration(integer): Presentation;
so_op(string, string): Presentation;
so_compound(Presentation): Compound;
offset_x(): integer;
offset_y(): integer;
delay(): integer;
size_x(): integer;
size_y(): integer;
duration(): integer;
descrip
1
Document
URL: string;
Op: Operation;
Atomic
elements
2..* {ordered}
component
2..2 {ordered}
Single
Compound
Rx: Intrel; Ry: Intrel Rt: Intrel
getA(): Presentation;
getB(): Presentation;
Disjoint(): Boolean; ...
Before(): Boolean; ...
so_north(string, string): Compund;
relations
*
content
1
Temporal
T: integer; SizeT: integer;
SpatioTemporal
X: integer; SizeX: integer;
Y: integer; SizeY: integer;
SMIL
Text
Image
Audio
Video
Binary
Integer
Real
Char
String

x

y

La France d`Autrefois



x

y

0 seg.

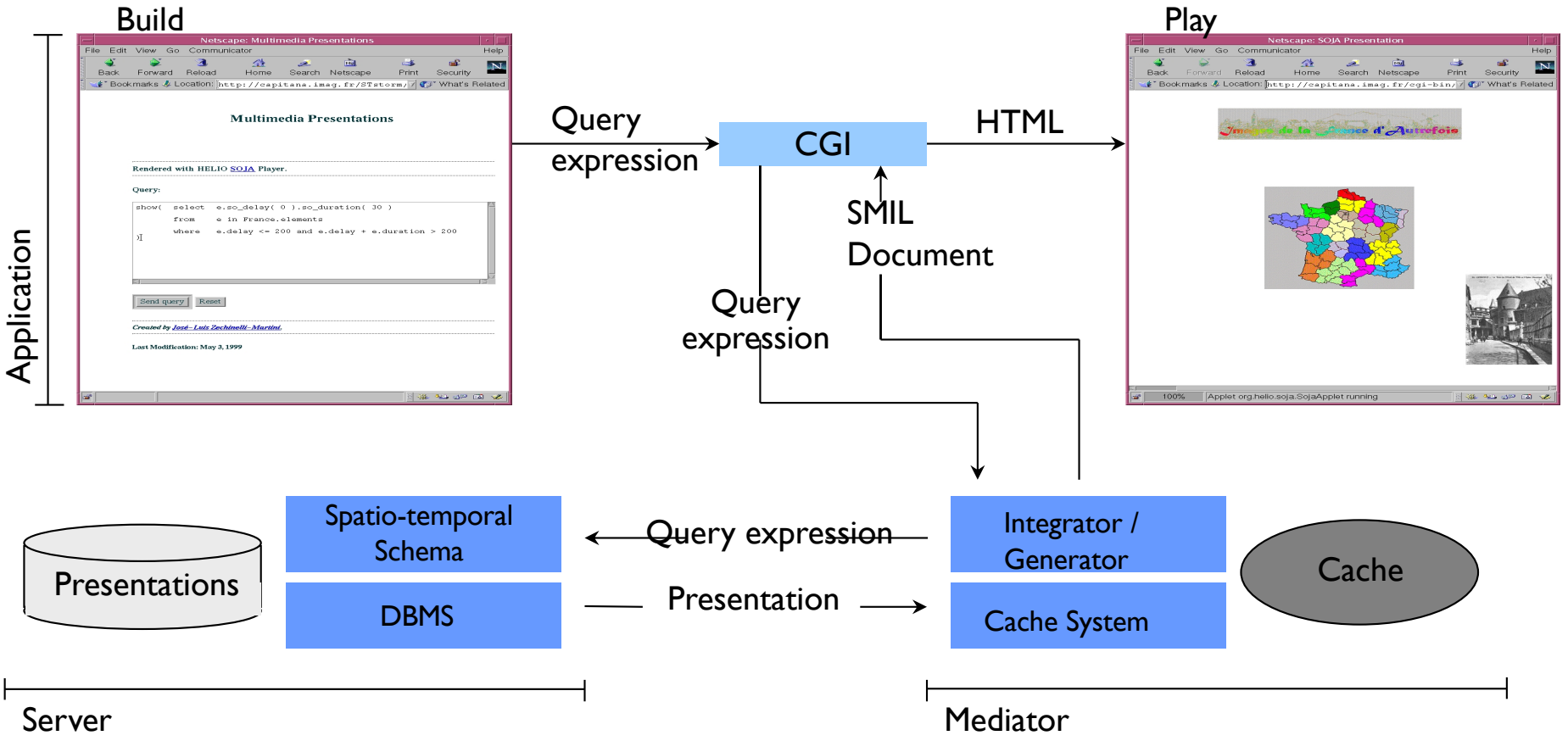
x

y

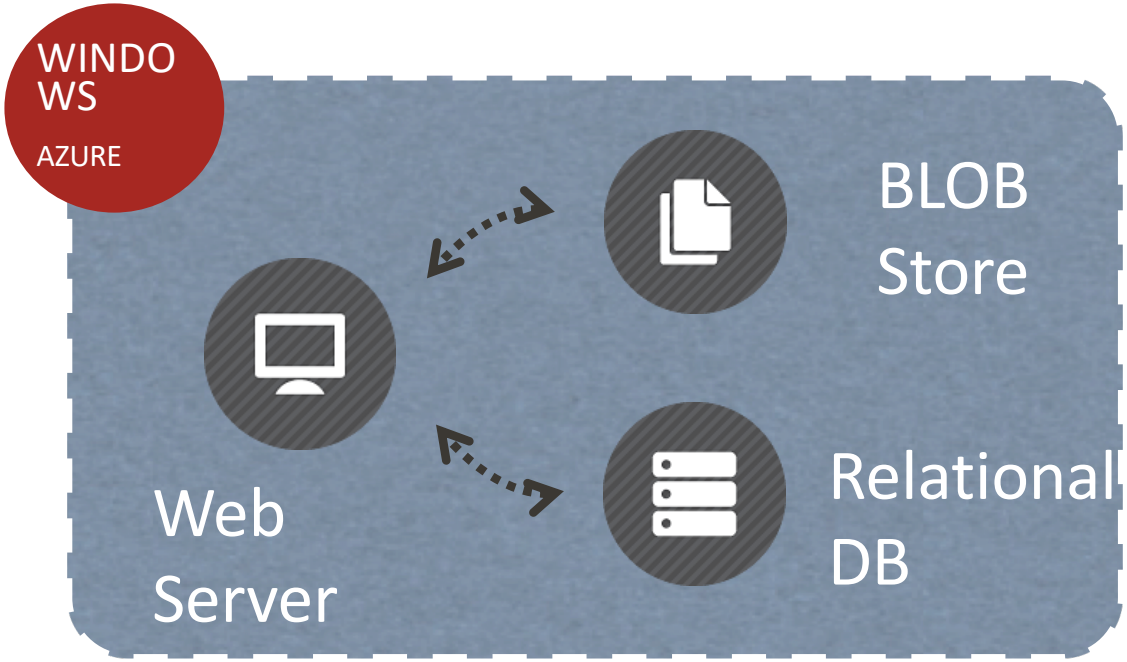
5 seg.

AGENDA

- Introduction: dealing with multimedia
- Multimedia presentations
  - Temporal models
  - Spatio-Temporal models
  - Putting presentations on the Web
- Mashups: building multimedia documents on the Web
- Open issues and perspectives


Build
Play
Application
Netscape: Multimedia Presentations
Multimedia Presentations
Rendered with HELIO SOJA Player.
Query:
Send query
Reset
Last Modification: May 3, 1999
Query expression
CGI
HTML
SMIL Document
Query expression
Netscape: SOJA Presentation
Spatio-temporal Schema
DBMS
Query expression
Presentation
Integrator / Generator
Cache System
Cache
Presentations
Server
Mediator

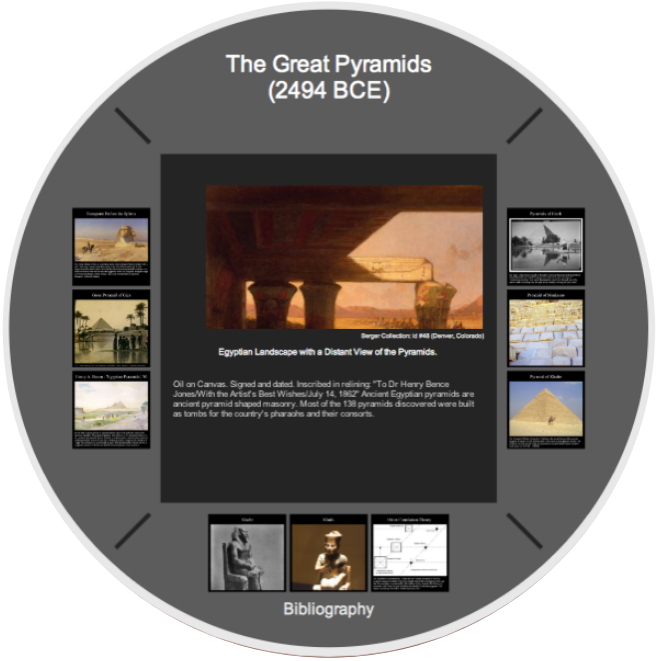
3-TIER ARCHITECTURE

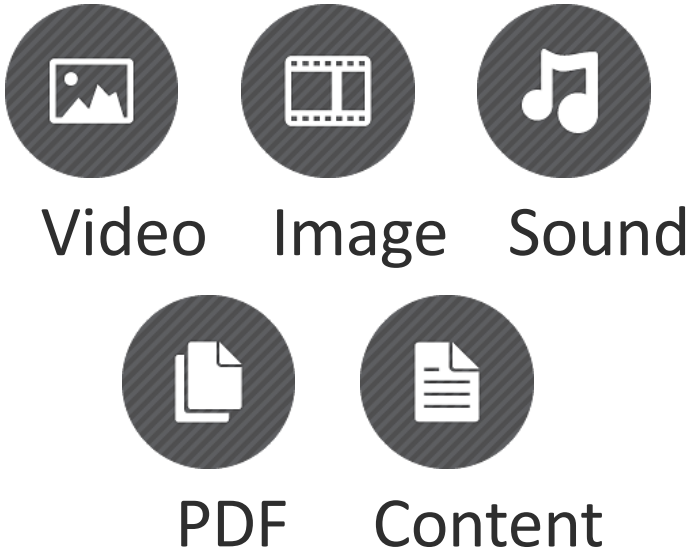


SCENARIOS

AUTHORING

Ancient Egypt > Early Dynastic > Old Kingdom





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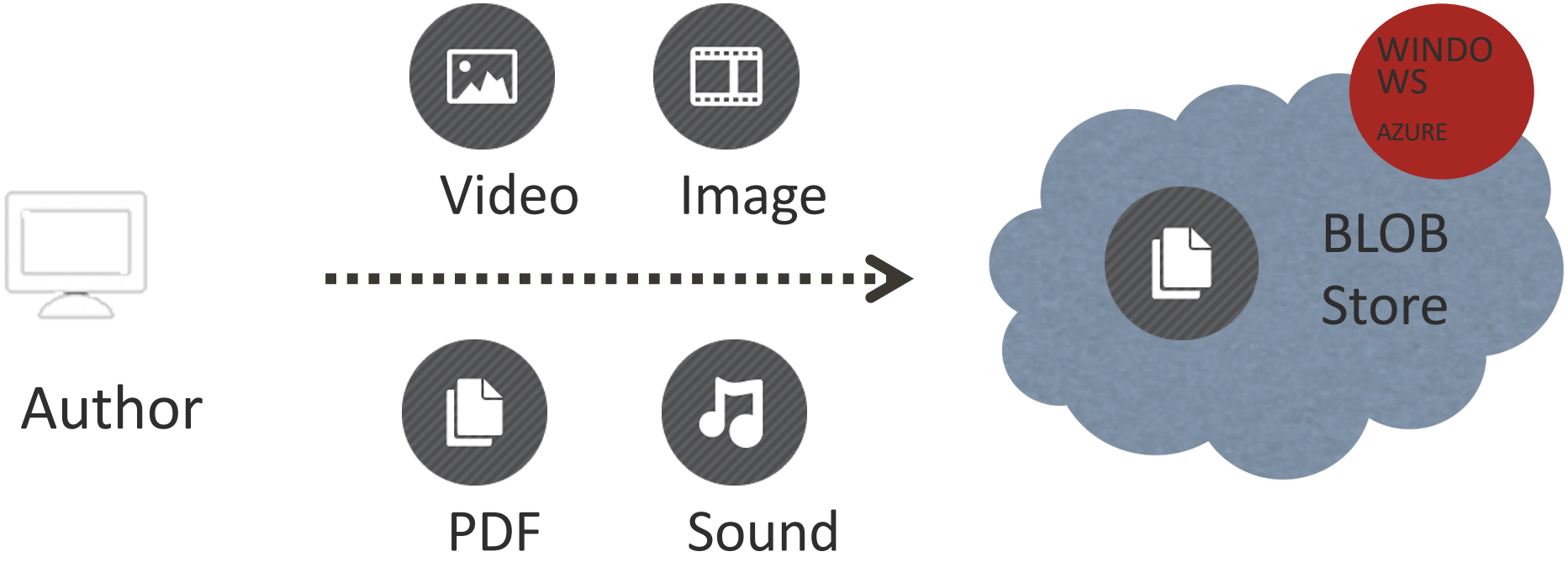
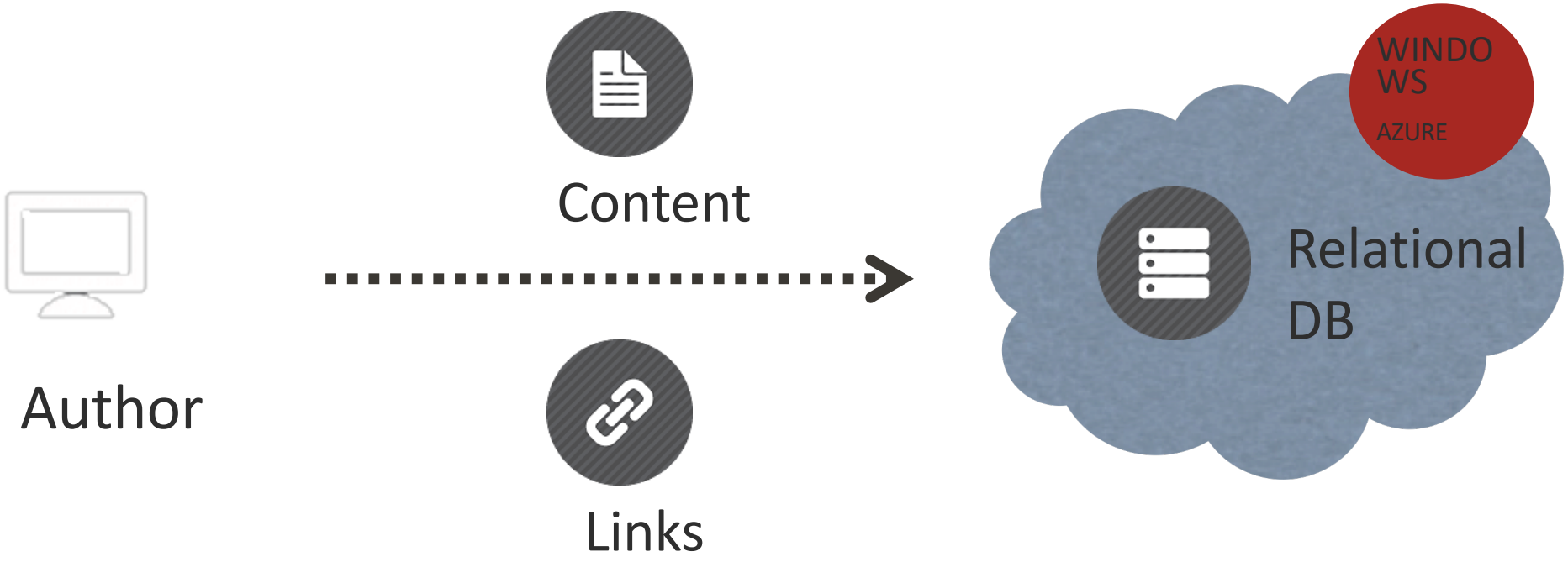


AUTHORING



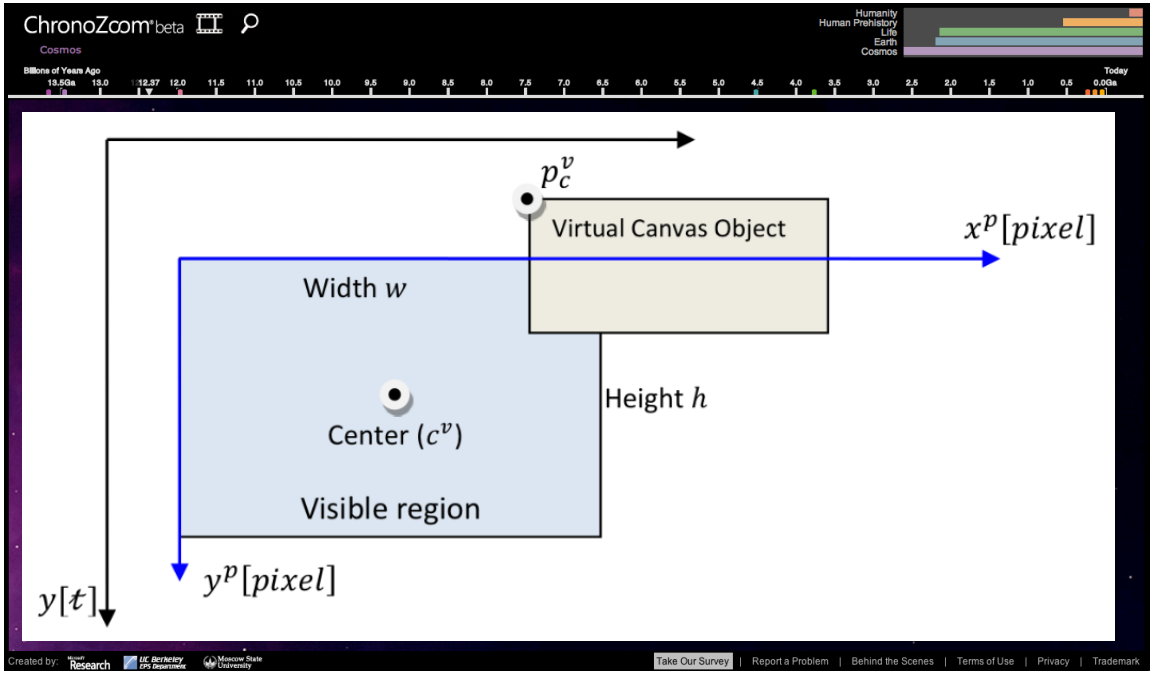
VISUALIZATION

Clients

HTML

Keyboard + Mouse + Touch Inputs

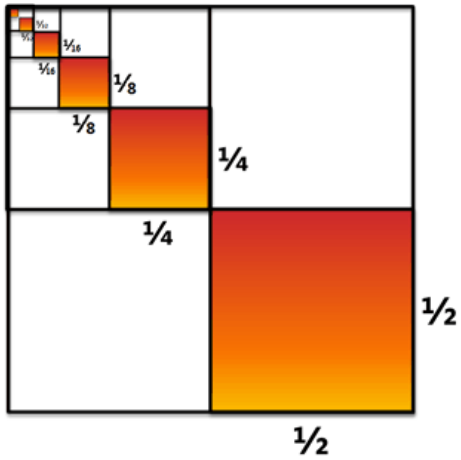
INFINITE CANVAS



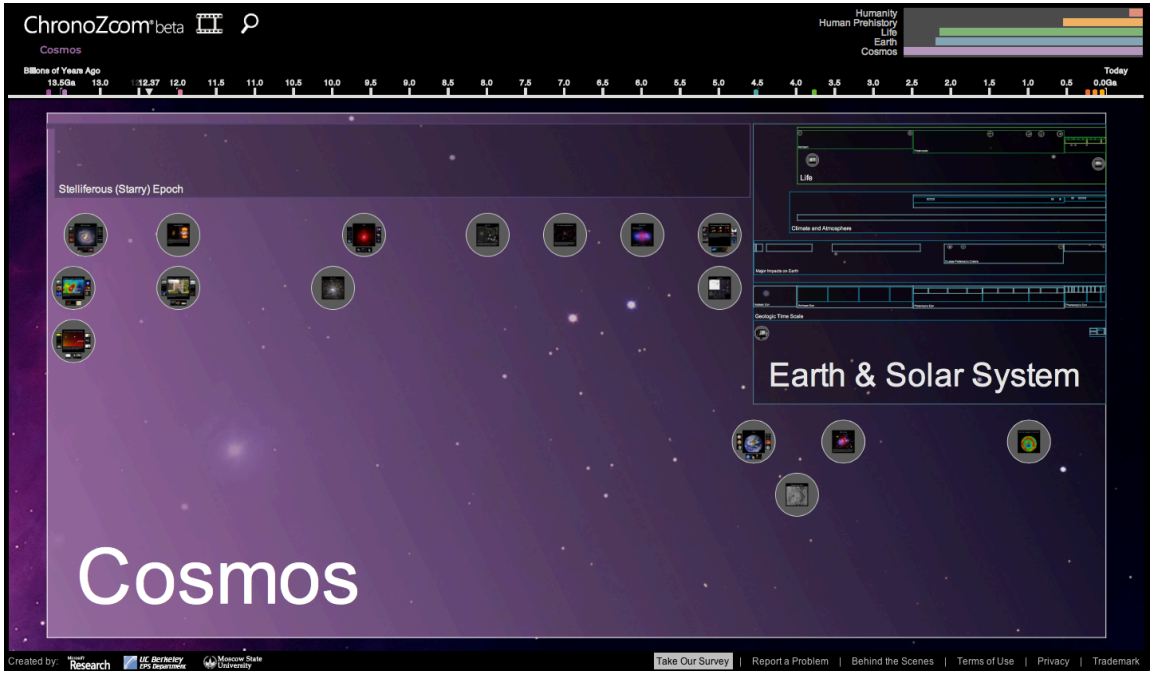
http://zoom.it

Microsoft Live Labs Seadragon

$$\sum_{i=0}^{8}\left(\frac{1}{2}\cdot\frac{1}{2}\right)^{i} = 1+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\ \ldots = 1.\overline{33}$$



INPUT PROCESSING



LINQ

Microsoft .NET

Stream of Events

UI Controlle

Fetch & Update

1 DATA LOADING

All canvas' objects are fetched when the client is loaded

Multimedia content loaded in response of zoom in/out ops

2 LAYOUT COMPUTATION

Done in the client side

Heavy use of browser resources

3 CLOUD ARCHITECTURE

Load balancing, backend scalability (Microsoft)

Focus on visualization and user interaction (Researchers)

1

DATA LOADING

Caching strategies

Offline navigation

2

LAYOUT COMPUTATION

Asynchronous calls for server side computations

Event composition

3

LOCATION BASED CONTENT

Using browsers geo position functionality

Storing data in data centers near to the user

Genoveva.Vargas@imag.fr
http://www.vargas-solar.com/