



# 1. Introduction

**Asunción Gómez-Pérez**

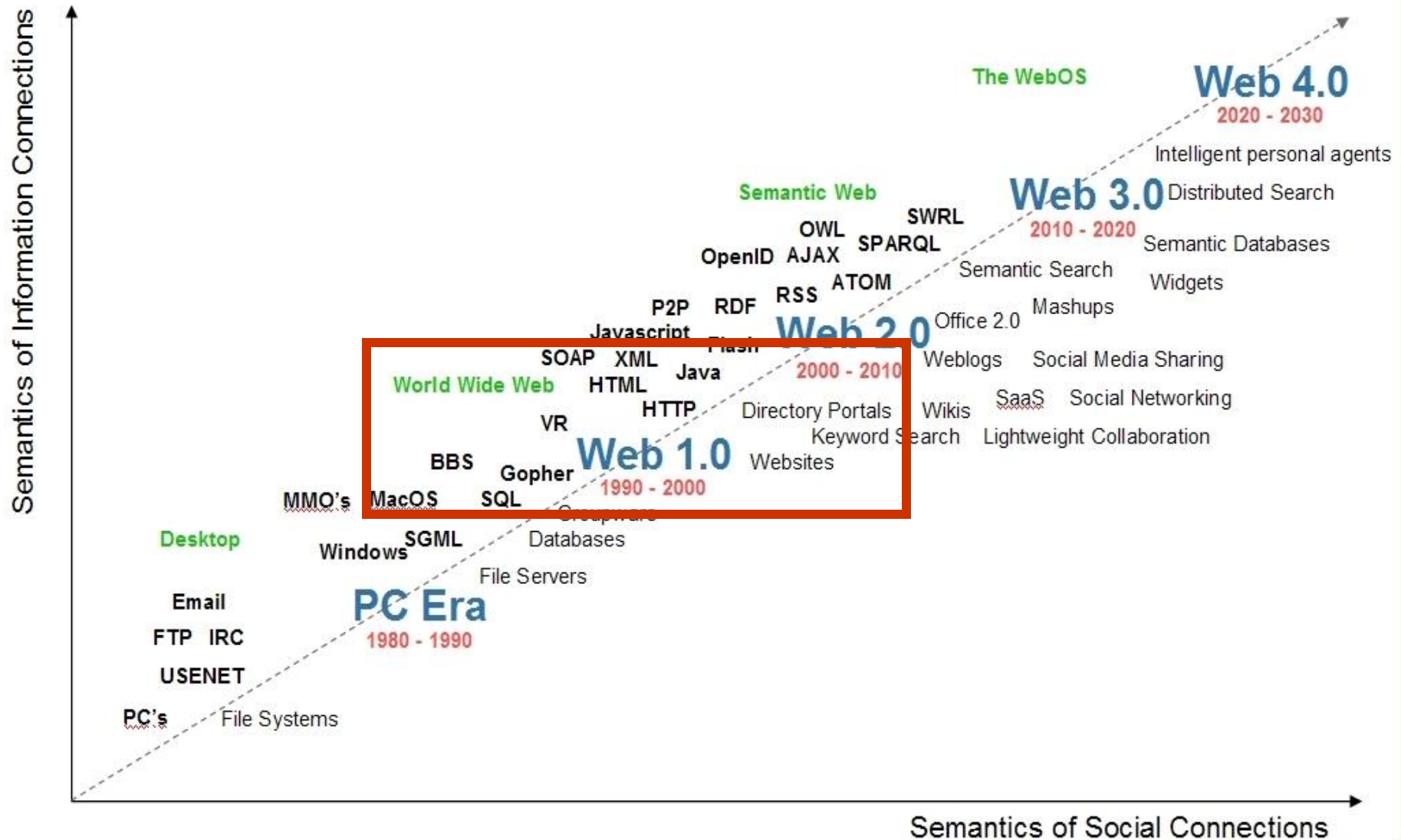
{ asun } @fi.upm.es

<http://www.oeg-upm.net>

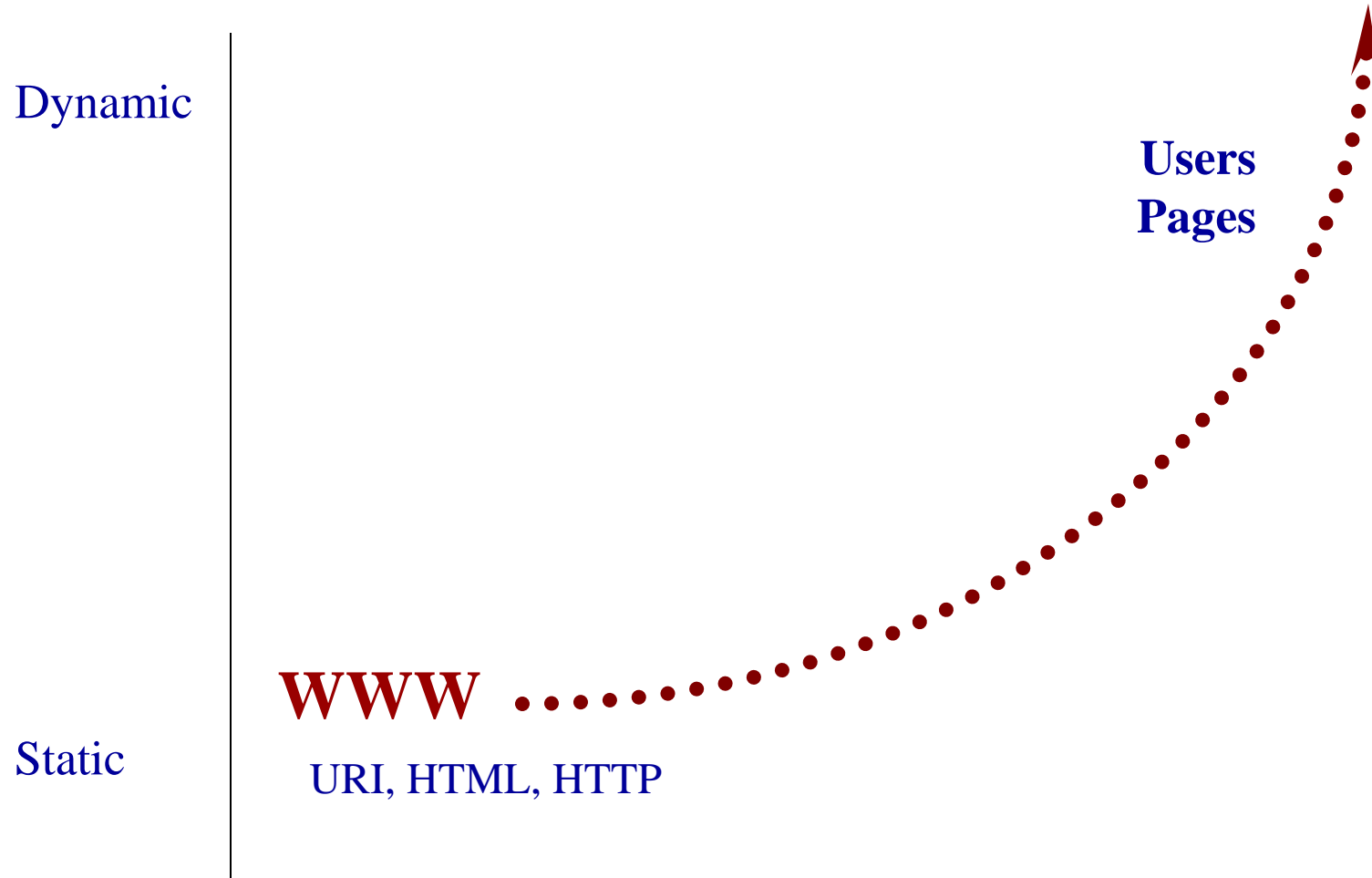
Omtological Engineering Group  
Laboratorio de Inteligencia Artificial  
Facultad de Informática  
Universidad Politécnica de Madrid  
Campus de Montegancedo sn,  
28660 Boadilla del Monte, Madrid, Spain

- Web
- Web 2.0
- Web 3.0 and the Semantic Web
- Examples of semantic applications
  - Semantic Webs
  - Corporative semantics

# Web n+1: Roadmap

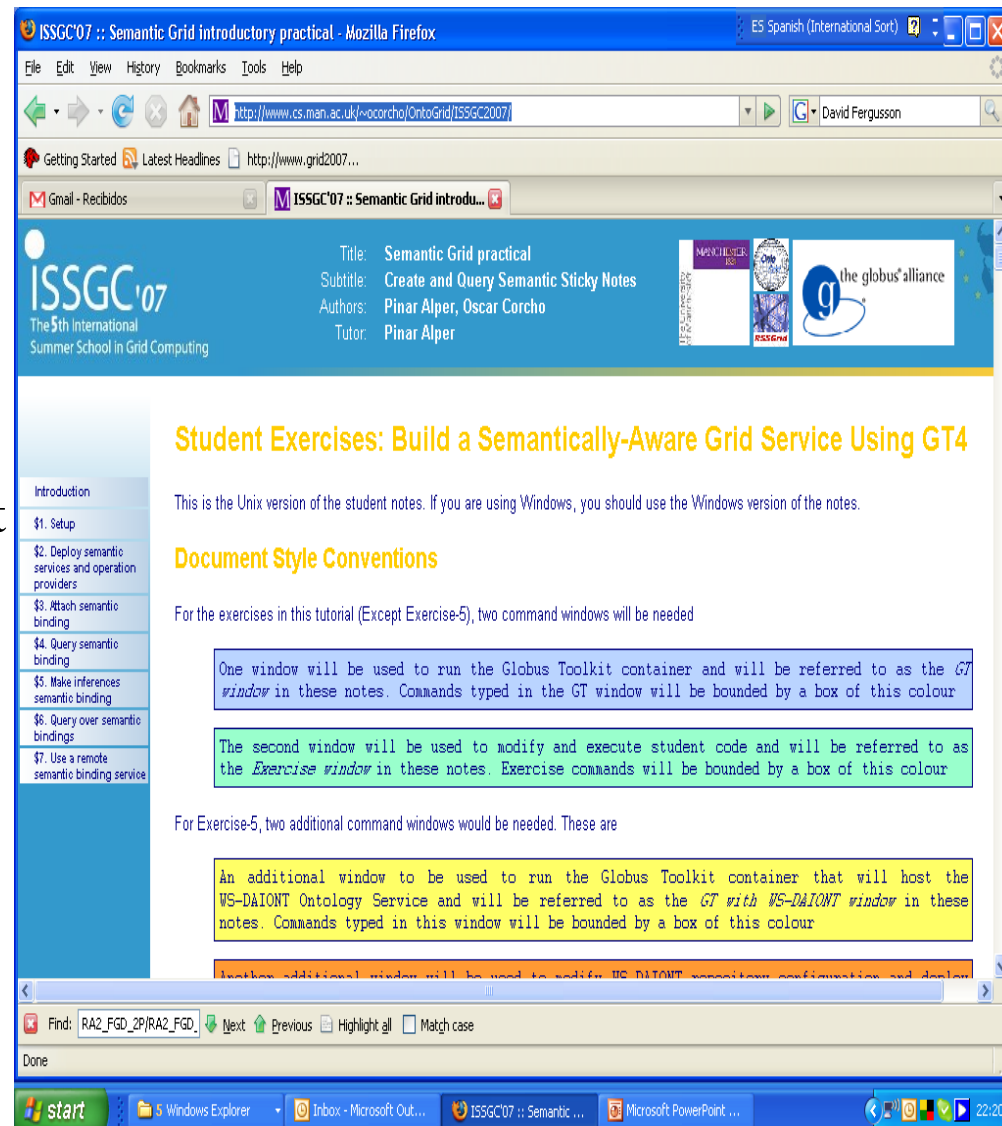


# The problem: Information overload on the WEb



# What's the Problem?

- Typical web page markup consists of:
  - Rendering information (e.g., font size and colour)
  - Hyper-links to related content
- Semantic content is accessible to humans but not (easily) to computers...



# The current Web is multilingual

Árabe



الاسم: الهندسة فعلم التطور  
المؤلفون: أسنسيون غومز بيرز  
السعر: \$74.95  
المنتج: الكتاب

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<b>المؤلفون:</b> أسنسيون غومز بيرز <BR>  
<b>السعر:</b> \$74.95 <BR>  
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Japonés



タイトル: 存在論工学  
著者: アスンシオン ゴメスベレス  
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Noruego



**Skjøte:** Ontological Ingeniørarbeid  
**Forfatter:** Overtakelse Gómez-Pérez...  
**Pris:** 74.95€  
**Produkt:** Bok

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<b>Pris:</b> 74.95€ <BR>  
<b>Produkt:</b> Bok <BR>

Inglés



**Title:** Ontological Engineering  
**Authors:** Asunción Gómez-Pérez...  
**Price:** \$74.95  
**Product:** Book

<b>Title:</b> Ontological Engineering <BR>  
<b>Authors:</b> Asunción Gómez-Pérez... <BR>  
<b>Price:</b> \$74.95 <BR>  
<b>Product:</b> Book <BR>

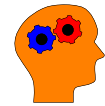


- .- HTML is useful for browsing the information
- .- Content is language-dependent
- .- High cost for keeping the information up-to-date

## Information a machine can see...

[illegible]

# XML allows the creation of metadata with “meaning”



Árabe



الاسم: الهندسة فعلم التطور  
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السعر: \$74.95  
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<الاسم/>الهندسة فعلم التطور  
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<السعر/>\$74.95  
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Inglés



**Title:** Ontological Engineering  
**Authors:** Asunción Gómez-Pérez...  
**Price:** \$74.95  
**Product:** Book



































































































































<Title>Ontological Engineering</Title>  
<Author>Asunción Gómez-Pérez...</Author>  
<Price>\$74.95</Price>  
<Product>Book</Product>

¿What do the tags **mean** for the machine?

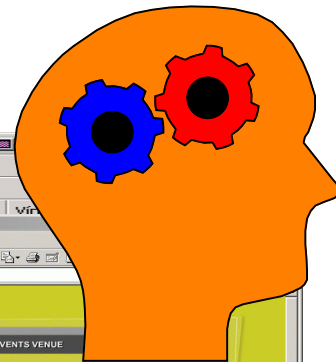




## But What About...?

`<conf>`  `</conf>`  
`<date>`        `</date>`  
`<place>`         `</place>`  
`<introduction>`                                                                                                 `</introduction>`  
`<speaker>`                               

# The problem of choosing information



- .- Find the information
- .- Extract relevant information
- .- Interpretation by human users
- .- Synthesis

- .- Content in different languages (Spanish, English, Japanese,...)**
- .- Find out relevant information from heterogeneous sources**
  - .- Extract**
  - .- Interpretation**
  - .- Agregation**
- .- Consistency of the information**

**CINEMA STREET**  
CINEMA CHANNEL

Archivio - Edizione Web - Favoriti - Canali - Multimedie  
 Archivio - Edizione Web - Favoriti - Canali - Multimedie  
 Directory: http://www.tv-tokyo.co.jp/broadcast/Television.html

Archivio - Edizione Web - Favoriti - Canali - Multimedie  
 Archivio - Edizione Web - Favoriti - Canali - Multimedie  
 Directory: http://www.rttv.se.jp/

新国立劇場  
NEW NATIONAL THEATRE, TOKYO

● ニュース  
 ● 公演日の変更(4月以降のみ)  
 ● 公演  
 ● 公演スケジュール  
 ● 新国立劇場情報センター  
 ● 公演スケジュール  
 ● 公演情報(毎日)  
 ● 全国公演  
 ● 新国立劇場修繕事業  
 ● お知らせ

2004/4/19  
 新国立劇場情報センター資料館  
 『東京演劇館』『新国立劇場』

2004/12/22  
 若手演劇作家 7 名の公演受けがまりました。

2005/12/19  
 新国立劇場『江戸公家』『つもしり』  
 ワールド公演出演変更のお知らせ

2005/12/16  
 2004/2005シーズン  
 シンポジウム「アジア演劇について」

2005/12/11  
 岸原真壽郎のお知らせ

● 最新公演情報 (1月15日 (木))

本日の公演は、ごさいせん。

| ● 1月 |    |    |    |    |    |    |    |    |    |    | ● 2月 |    |    |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|
| 日    | 月  | 火  | 水  | 木  | 金  | 土  | 日  | 月  | 火  | 水  | 木    | 金  | 土  | 日  | 月  | 火  | 水  | 木  | 金  | 土  | 日  |
|      |    |    |    |    |    | 1  | 2  | 3  |    |    |      |    |    | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
| 9    | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20   | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31   |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |

● 新国立劇場情報センター  
 ● 公演スケジュール  
 ● 公演情報(毎日)  
 ● 全国公演  
 ● 新国立劇場修繕事業  
 ● お知らせ

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| 100    | ECHIN: ECONOMY 3<br>TERRACERAZO 100<br>1.1 oder abwärts  | 244,90 €     | 244,90 €       | 244,90 €       |
| 100    | COMR: KOMFORT 5<br>TERRACERAZO KHARA<br>1.1 oder abwärts | 314,97 €     | 314,97 €       | 314,97 €       |
| 100    | EMPR: MITTELKLASSE<br>MERCEDES VECTRA                    | 384,97 €     | 384,97 €       | 384,97 €       |



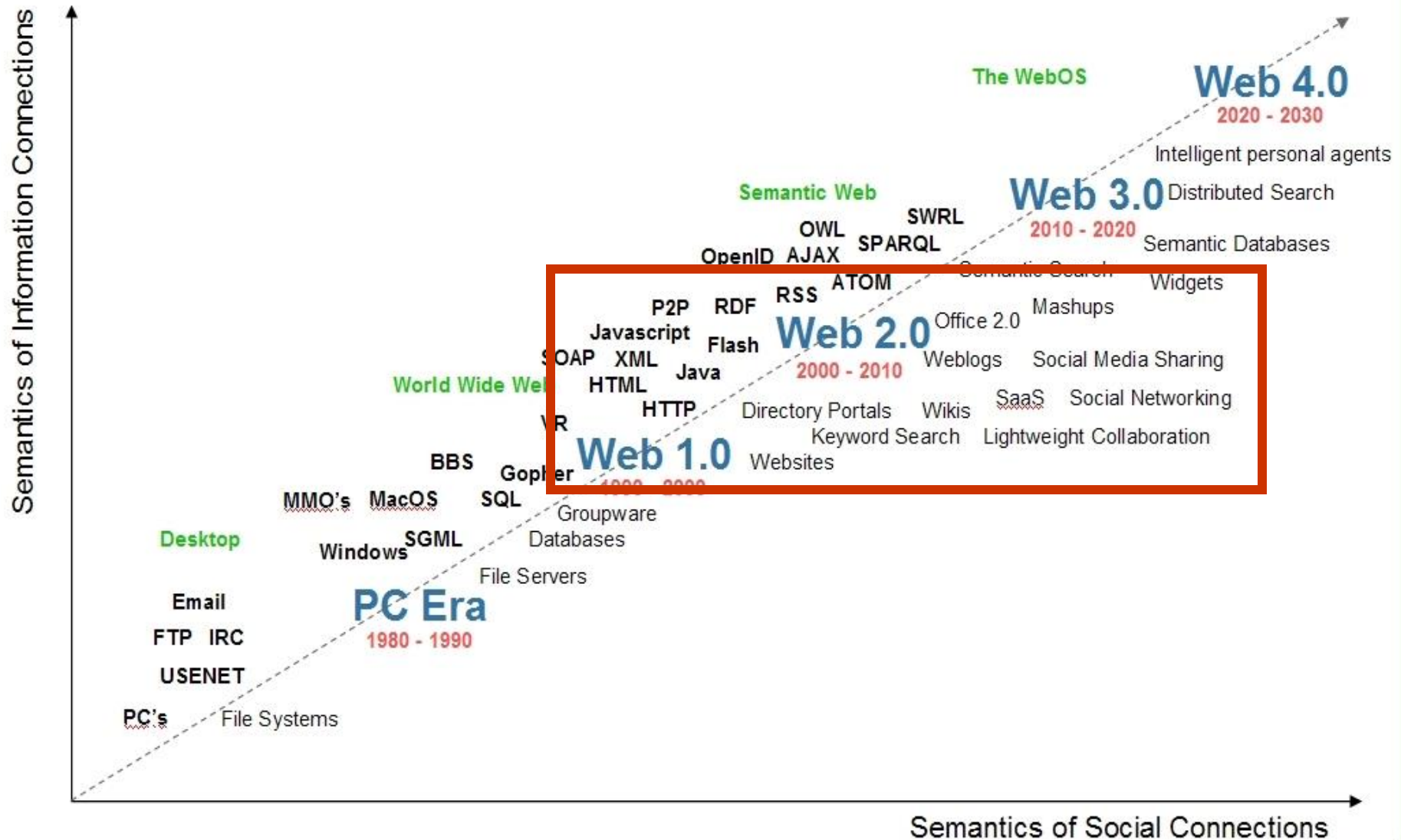
# What was the Web intended to be?



“... a goal of the Web was that, if the interaction between person and hypertext could be so intuitive that the machine-readable information space gave an accurate representation of the state of people's thoughts, interactions, and work patterns, then machine analysis could become a very powerful management tool, seeing patterns in our work and facilitating our working together through the typical problems which beset the management of large organizations.”

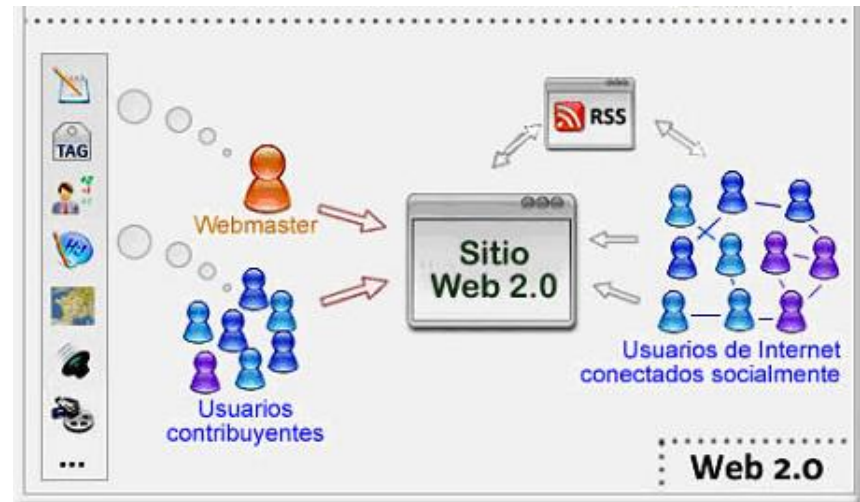
[Berners-Lee 1996]

# Web n+1: Roadmap



# Web 2.0

- **Users are both readers and writers**
  - Generate content
  - Control content
- **Ever-increasing amounts of content**
  - Dynamic content
- **Users participate**
  - Communication
  - Collaboration
- **Users add value to applications as they use it**
  - Collective intelligence by way of user participation
- **Rich user experience**
  - User-friendly interface
  - Personalized content
- **The Web as a programming platform**
  - Run applications entirely through a browser
  - Portability: software above the level of a single device
  - Openness



del.icio.us - Mozilla Firefox

del.icio.us social bookmarking

» all your bookmarks in one place

» bookmark things for yourself and friends

» check out what other people are bookmarking

learn more... » get started «

hotlist what's hot right now on del.icio.us

HOT NOW

see also: popular | recent

Gumption: Do YouJustGetMe? Do I Even Get Myself? 103 people

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This is a short version of the videos I did. I'm drawing people on you want me to draw a picture of you? Just ask me. (more)

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Uploaded on September 2, 2006 by Nils K. Windisch (netomer)

Nils K. Windisch (netomer)'s photostream

1,218 photos View as slideshow

Tags

netomer 50mm 50mm f/1.8 AF D70 Nikkor Nikon black and white August 2006 0.4s f/8 landscape format ISO200 Göttingen Germany Europe Library State and University Library Göttingen on tour with Ralf Stockmann indoor historical Building geo:lat=51.534003 geo:lon=9.932199

The neutrality of this article is disputed. Please see the relevant discussion on the talk page.

Web 2.0 is a term often applied to a perceived ongoing transition of the World Wide Web from a collection of websites to a full-fledged computing platform serving web applications to end users. Ultimately Web 2.0 services are expected to replace desktop computing applications for many purposes.

Contents [hide]

1 Overview

1.1 Comparison with Semantic Web

2 Technology

2.1 Content syndication

2.2 Web services

2.3 Server software

3 Social impact

4 Business impact

5 External links

5.1 Examples

Overview

The original conception of the web (in this context, labeled Web 1.0) comprised static HTML pages that were updated rarely, if at all. The success of the dot-com era depended on a more dynamic web (sometimes labeled Web 1.5) where content management systems served dynamic HTML web pages created on the fly from an ever-changing content database. In both senses, so-called eyeballing was considered intrinsic to the web experience, thus making page hits and visual aesthetics important factors.

Proponents of the Web 2.0 approach believe that web usage is increasingly oriented toward interaction and rudimentary social networks, which can serve content that exploits network effects with or without creating a visual, interactive web page. In one view, Web 2.0 sites act more as points of presence, or user-dependent web portals, than as traditional websites.

Comparison with Semantic Web

.- Encontrar  
.- Comprender  
Extraer  
.- Comparar  
.- Agregar  
.- Publicar  
.- Contextualizar

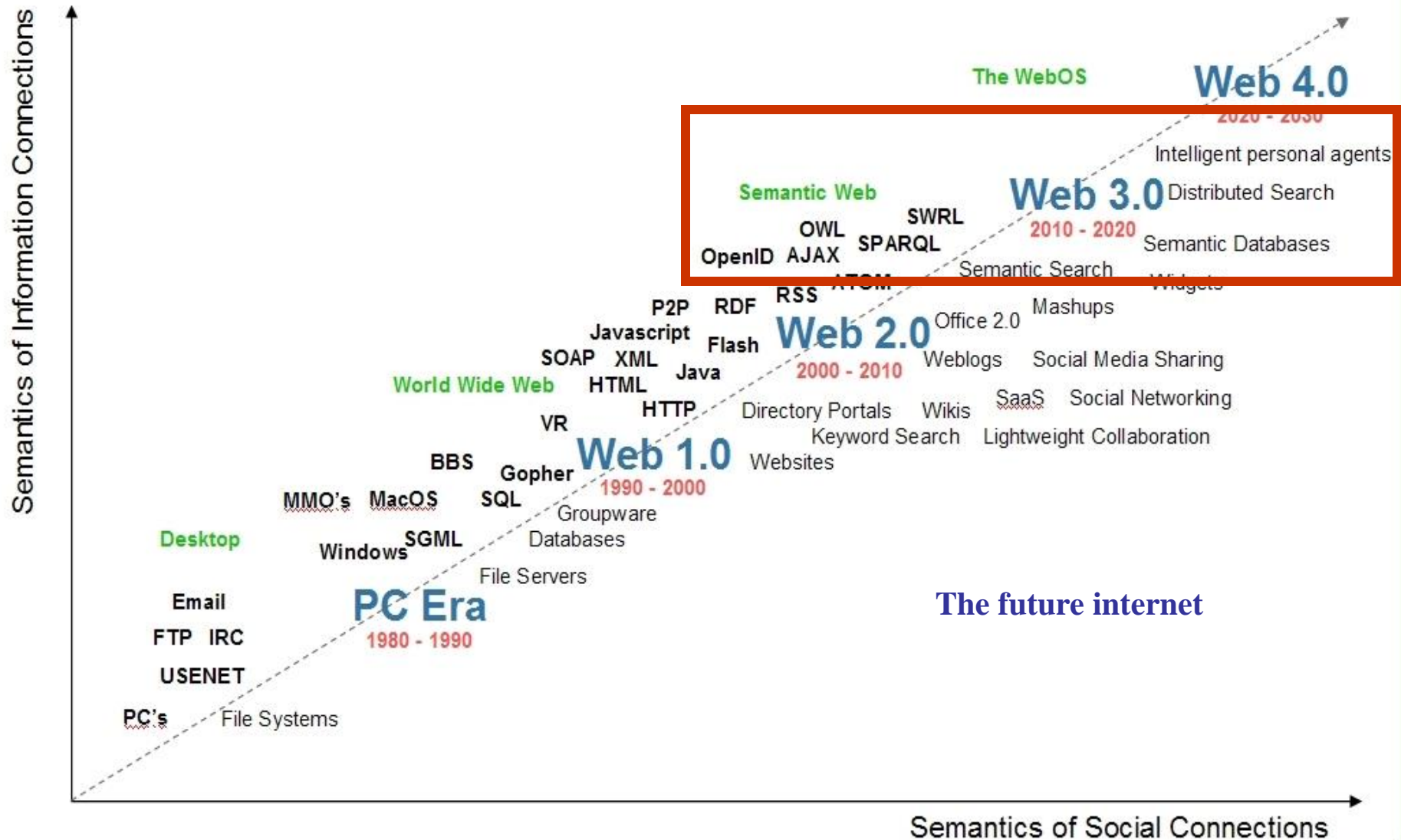
and Tim Berneres-Lee [1996] sentence  
is still valid for the Web 2.0



“... the machine-readable information space ...  
... machine analysis could become a very  
powerful management tool, ...  
... facilitating our working together ....”



# Web n+1: Roadmap



# Web 3.0

- **Web Inteligente**

- Semantic Web technologies
- The Data Web – a global database
- Intelligent applications (NLP, machine learning, machine reasoning, autonomous agents)

- **Conexión Ubicua**

- Broadband adoption
- Mobile Internet access
- Mobile devices

- **Computación en red**

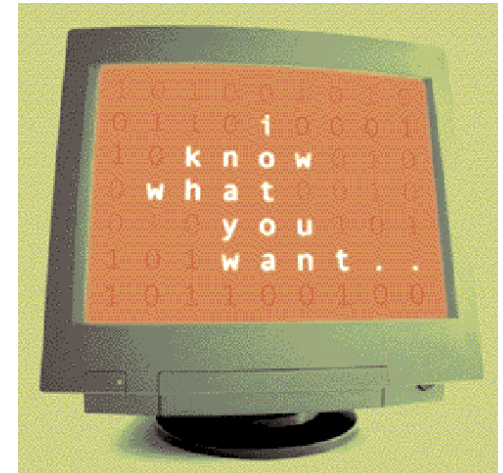
- Software-as-a-service business models
- Web services interoperability
- Distributed computing (P2P, grid computing, hosted "cloud computing" server farms)

- **Tecnologías abiertas**

- Open APIs and protocols
- Open data formats
- Open-source software platforms
- Open data (Creative Commons, Open Data License, etc.)

- **Open Identity**

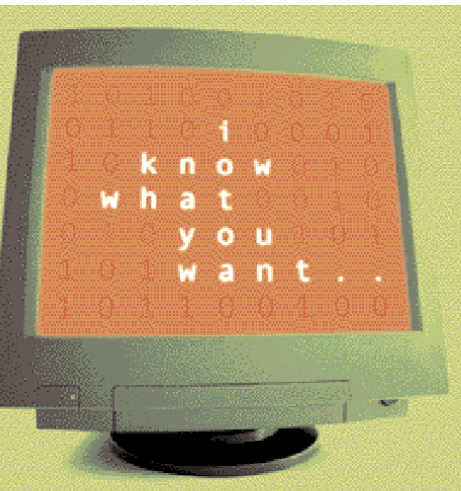
- Open identity (OpenID)
- Open reputation
- Portable identity and personal data



<http://lifeboat.com/ex/web.3.0>

# What is the Semantic Web?

“The Semantic Web is an **extension** of the current Web in which information is given **well-defined meaning**, better enabling computers and people to work in **cooperation**. It is based on the idea of having data on the Web defined and linked such that it can be used for more **effective discovery, automation, integration, and reuse across various applications.**”



**Ontologies**

**Anotation**

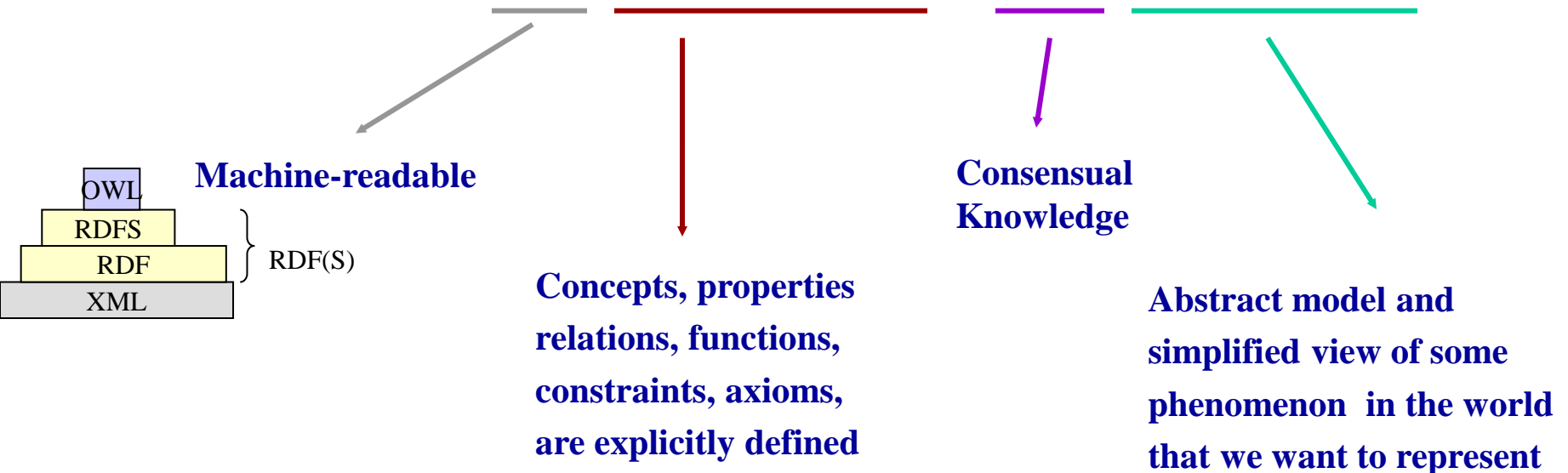
Hendler, J., Berners-Lee, T., and Miller, E.  
Integrating Applications on the Semantic Web, 2002,  
<http://www.w3.org/2002/07/swint.html>

# Need to Add “Semantics”

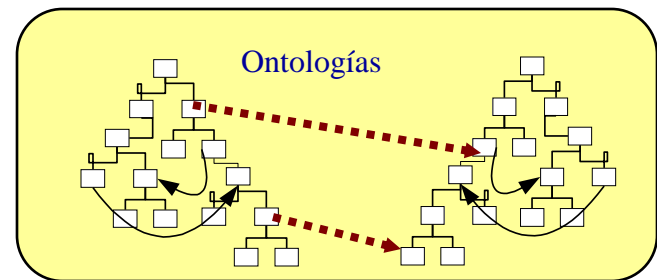
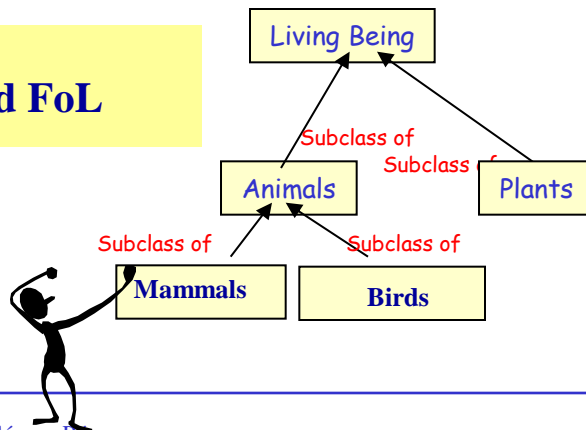
- External agreement on meaning of annotations
  - E.g., *Dublin Core* for annotation of library/bibliographic information
    - Agree on the meaning of a set of annotation tags
  - Problems with this approach
    - Inflexible
    - Limited number of things can be expressed
- Use Ontologies to specify meaning of annotations
  - Ontologies provide a vocabulary of terms
  - New terms can be formed by combining existing ones
    - “Conceptual Lego”
  - Meaning (semantics) of such terms is formally specified
  - Can also specify relationships between terms in multiple ontologies

# Definition of Ontology

“An ontology is a formal, explicit specification of a **shared conceptualization**”



## Frames and FoL



**VIAJES IBERIA**

Personalizada para el origen: **MADRID** Inicio Perfil Reservas/presupuestos

**Vuelos: Madrid, España - Frankfurt, Alemania** **Sábado, 17 de**

Vuelos desde Barajas (MAD), Madrid, España a Frankfurt Int'l (FRA), Frankfurt, Alemania  
Ha seleccionado Turista  
LEYENDA: **OP**=Vuelo operado por otra compañía, **R**=Solicitud en curso **E**=Candidato para electrónico

| Seleccionar           | Vuelo   | Salida                           | Llegada   | Escalas - avión             | Dura    |
|-----------------------|---|----------------------------------|---|-----------------------------|---------|
| <input type="radio"/> | <a href="#">Lufthansa</a><br>LH 4417              | Barajas (MAD),<br>Madrid, España | Frankfurt Int'l<br>(FRA),<br>Frankfurt,<br>Alemania | 08:20 Sin<br>escalas<br>320 | 2h45    |
| <input type="radio"/> | <a href="#">Spanair</a><br>JK 3000<br><b>OP</b>   | Barajas (MAD),<br>Madrid, España | Frankfurt Int'l<br>(FRA),<br>Frankfurt,<br>Alemania | 06:20 Sin<br>escalas<br>320 | 2h45    |
| <input type="radio"/> | <a href="#">Iberia</a><br>IB 3500 <b>E</b>        | Barajas (MAD),<br>Madrid, España | Frankfurt Int'l<br>(FRA),<br>Frankfurt,<br>Alemania | 09:00 Sin<br>escalas<br>320 | 2h40    |
| <input type="radio"/> | <a href="#">Spanair</a><br>JK 105                 | Barajas (MAD),<br>Madrid, España | Frankfurt Int'l<br>(FRA),<br>Frankfurt,<br>Alemania | 09:45 Sin<br>escalas<br>320 | 2h50    |
| <input type="radio"/> | <a href="#">Lufthansa</a><br>LH 2581<br><b>OP</b> | Barajas (MAD),<br>Madrid, España | Frankfurt Int'l<br>(FRA),<br>Frankfurt,<br>Alemania | 09:45 Sin<br>escalas<br>320 | 2h50min |
| <input type="radio"/> | <a href="#">Iberia</a><br>IB 3514 <b>E</b>        | Barajas (MAD),<br>Madrid, España | Frankfurt Int'l<br>(FRA),<br>Frankfurt,<br>Alemania | 11:00 Sin<br>escalas<br>M87 | 2h40min |
| <input type="radio"/> | <a href="#">Lufthansa</a><br>LH 2583<br><b>OP</b> | Barajas (MAD),<br>Madrid, España | Frankfurt Int'l<br>(FRA),<br>Frankfurt,<br>Alemania | 15:25 Sin<br>escalas<br>320 | 2h45min |

```

rdfs:Class rdf:ID="Travel">
<rdfs:comment>A journey from place to
place</rdfs:comment>
</rdfs:Class>

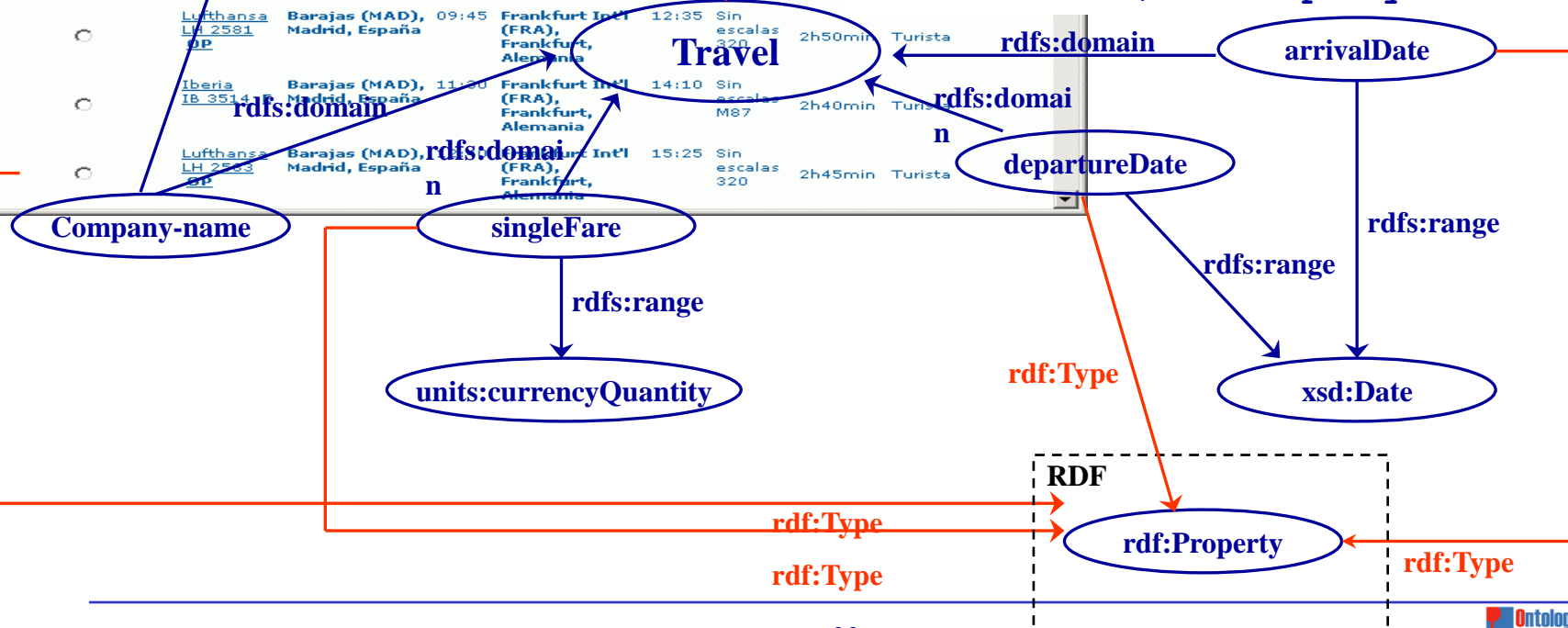
```

```

<rdf:Property rdf:ID="arrivalDate">
<rdfs:domain rdf:resource="#Travel"/>
<rdfs:range rdf:resource="&xsd:date"/>
</rdf:Property>

<rdf:Property rdf:ID="departureDate">
<rdfs:domain rdf:resource="#Travel"/>
<rdfs:range rdf:resource="&xsd:date"/>
</rdf:Property>

```





VIAJES IBERIA - Microsoft Internet Explorer

Archivo Edición Ver Favoritos Herramientas Ayuda

Atrás → Búsqueda Favoritos Multimedia

Dirección http://www.viajesiberia.com/ Ir

**VIAJES IBERIA**

Personalizada para el origen **MADRID** Inicio Perfil Reservas/presupuestos

Vuelos: Madrid, España - Frankfurt, Alemania **Sábado, 17 de Enero 2004**

Vuelos desde Barajas (MAD), Madrid, España a Frankfurt Int'l (FRA), Frankfurt, Alemania

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| Seleccionar                      | Vuelo                                | Salida                        | Llegada                                    | Escalas - avión | Duración | Clase   |
|----------------------------------|--------------------------------------|-------------------------------|--|-----------------|----------|---------|
| <input checked="" type="radio"/> | <a href="#">Lufthansa LH 4417 E</a>  | Barajas (MAD), Madrid, España | Frankfurt Int'l (FRA), Frankfurt, Alemania | Sin escalas 320 | 2h45min  | Turista |
| <input type="radio"/>            | <a href="#">Spanair JK 8863 OP</a>   | Barajas (MAD), Madrid, España | Frankfurt Int'l (FRA), Frankfurt, Alemania | Sin escalas 320 | 2h45min  | Turista |
| <input type="radio"/>            | <a href="#">Iberia IB 3500 E</a>     | Barajas (MAD), Madrid, España | Frankfurt Int'l (FRA), Frankfurt, Alemania | Sin escalas 320 | 2h40min  | Turista |
| <input type="radio"/>            | <a href="#">Spanair JK 125</a>       | Barajas (MAD), Madrid, España | Frankfurt Int'l (FRA), Frankfurt, Alemania | Sin escalas 320 | 2h50min  | Turista |
| <input type="radio"/>            | <a href="#">Lufthansa LH 2581 OP</a> | Barajas (MAD), Madrid, España | Frankfurt Int'l (FRA), Frankfurt, Alemania | Sin escalas 320 | 2h50min  | Turista |
| <input type="radio"/>            | <a href="#">Iberia IB 3514 E</a>     | Barajas (MAD), Madrid, España | Frankfurt Int'l (FRA), Frankfurt, Alemania | Sin escalas M87 | 2h40min  | Turista |
| <input type="radio"/>            | <a href="#">Lufthansa LH 2583 OP</a> | Barajas (MAD), Madrid, España | Frankfurt Int'l (FRA), Frankfurt, Alemania | Sin escalas 320 | 2h50min  | Turista |

# Metadata

```
<Travel rdf:ID="IB-4321">
  <Company-name>Iberia</Company-name>
  <singleFare>500 Euros</singleFare>
  <departureDate rdf:datatype="&xsd:date">
    2005-11-10
  </departureDate>
  <arrivalDate rdf:datatype="&xsd:date">
    2005-11-10
  </arrivalDate>
  <arrivalPlace rdf:resource="#Paris"/>
</Travel>
```

500 euros

singleFare

Iberia

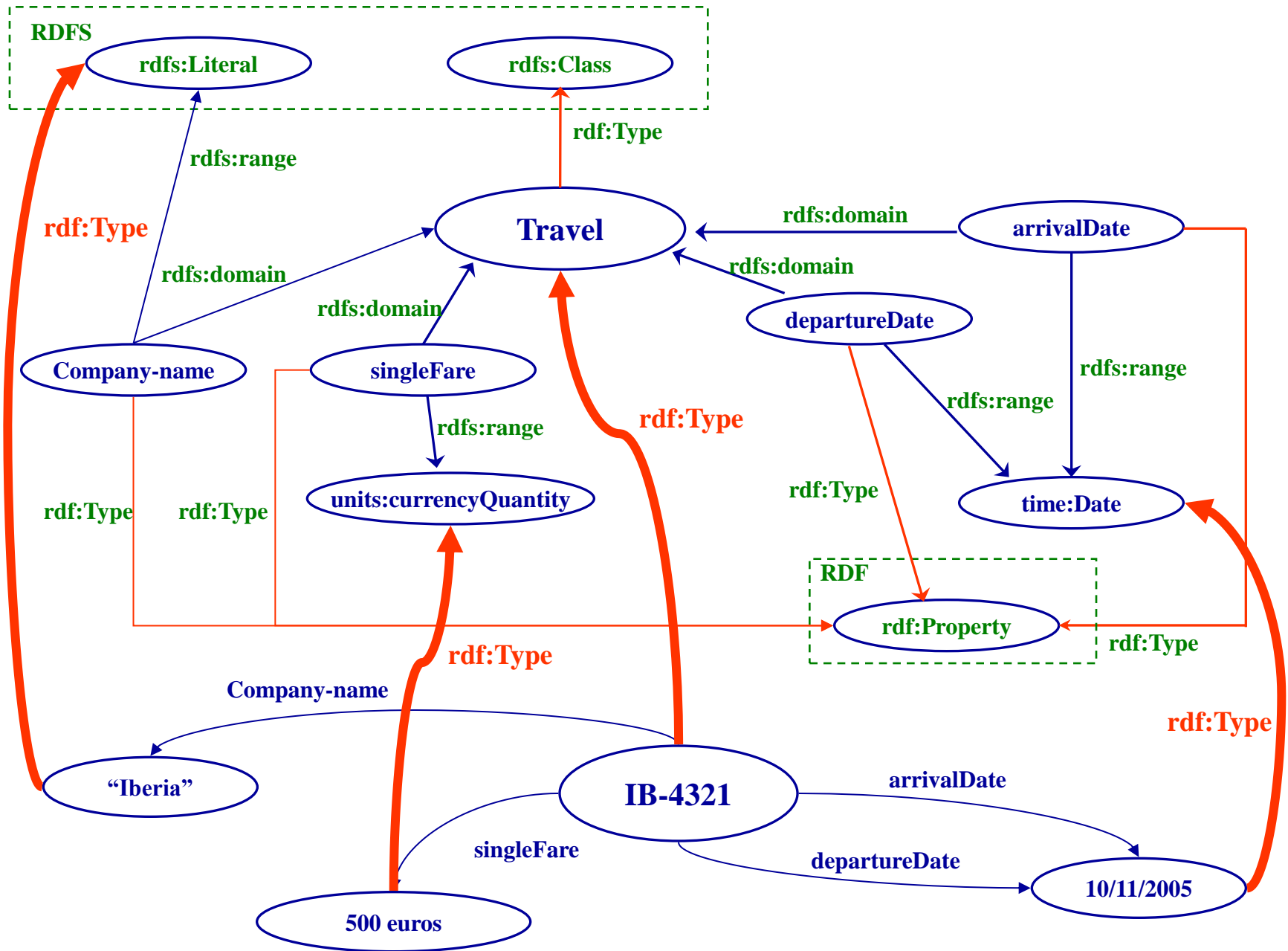
Company-name

IB-4321

arrivalDate

10/11/2005

departureDate



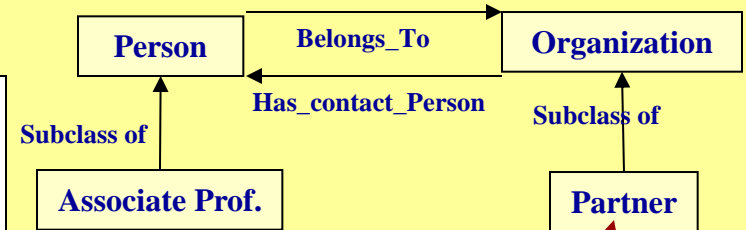


# Ontologies and Metadata



## Ontologies

```
xmlns:rdf='http://www.w3.org/1999/02/22-rdf-syntax-ns#'
xmlns:NS0='http://www.esperonto.net/semanticportal/RDFS/Person_Ontology#'
xmlns:NS1='http://www.esperonto.net/semanticportal/RDFS/Organization_Ontology#'
```



Instance of

Instance of

## Annotation (RDF)

```
<rdf:Description rdf:about='Asunción Gómez-Pérez'>
<rdf:type rdf:resource='Associate Prof'/>
<NS0:Full_Name>A. GomezPerez</NS0:Full_Name>
<NS0:Belongs_To>UPM</NS0:Belongs_To>
<NS0:e-mail>asun@fi.upm.es</NS0:e-mail>
```

|           |  |
|-----------|--|
| Full Name | Asuncion Gomez-Perez   |
| e-mail    | asun@fi.upm.es   |
| Photo     |  |

Asunción Gómez-Pérez is contact person [UPM](#) ( Partner ).  
Asunción Gómez-Pérez belongs to [UPM](#) ( Partner ).

```
<rdf:Description rdf:about='UPM'>
<rdf:type rdf:resource='Partner'/>
<NS1:Acronym>UPM</NS1:Acronym>
<NS1:Has_Contact_Person>Asunción Gómez-Pérez
</NS1:Has_Contact_Person>
```

|           |  |
|-----------|--|
| Full Name | Universidad Politécnica de Madrid  |
| Acronym   | UPM  |
| Logo      |  |

UPM has contact person [Asunción Gómez-Pérez](#) ( Associate Professor ).  
UPM participates in [Esperanto](#) ( Project ).  
UPM team is formed by :

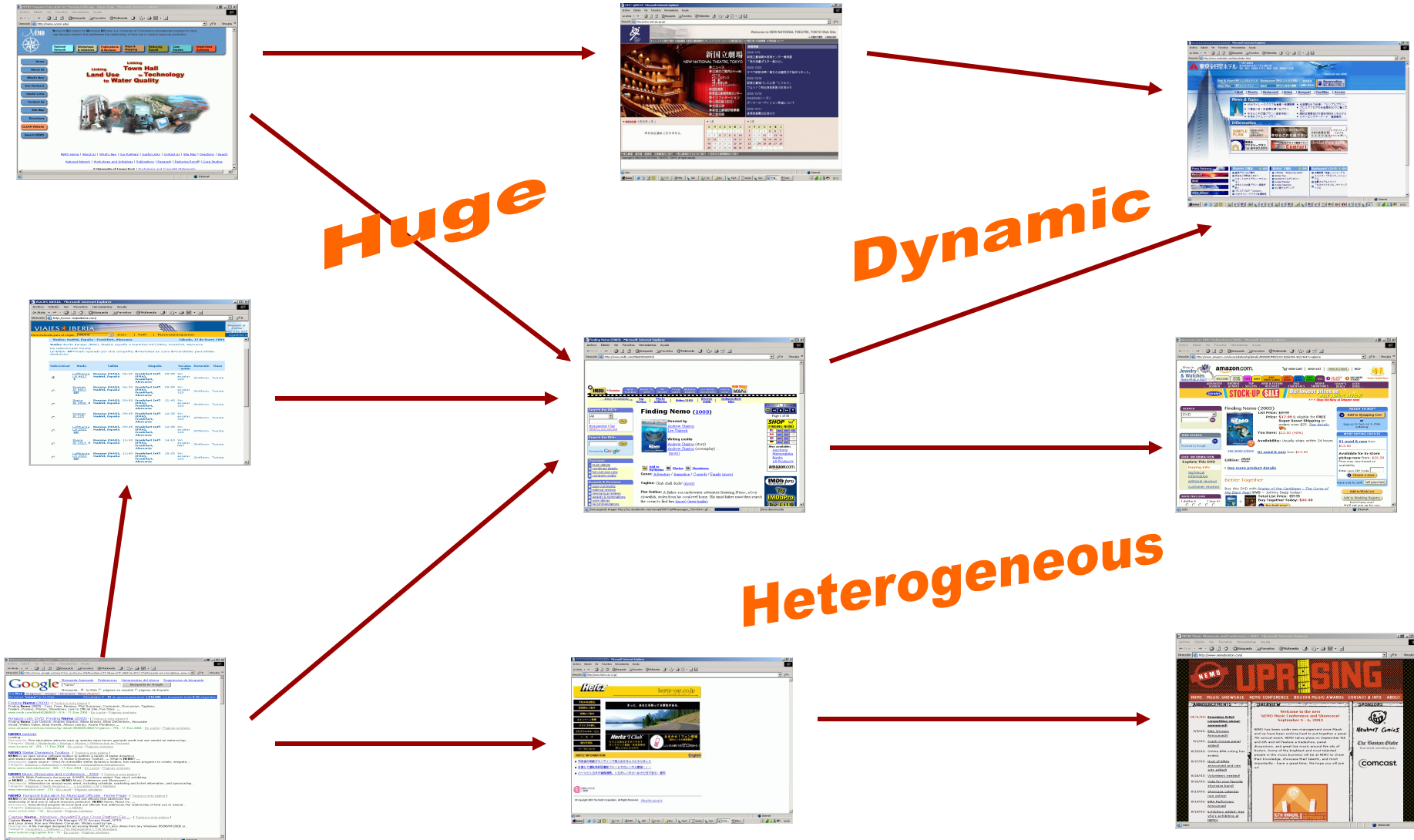
## Web Page

URL <http://www.esperonto.net>

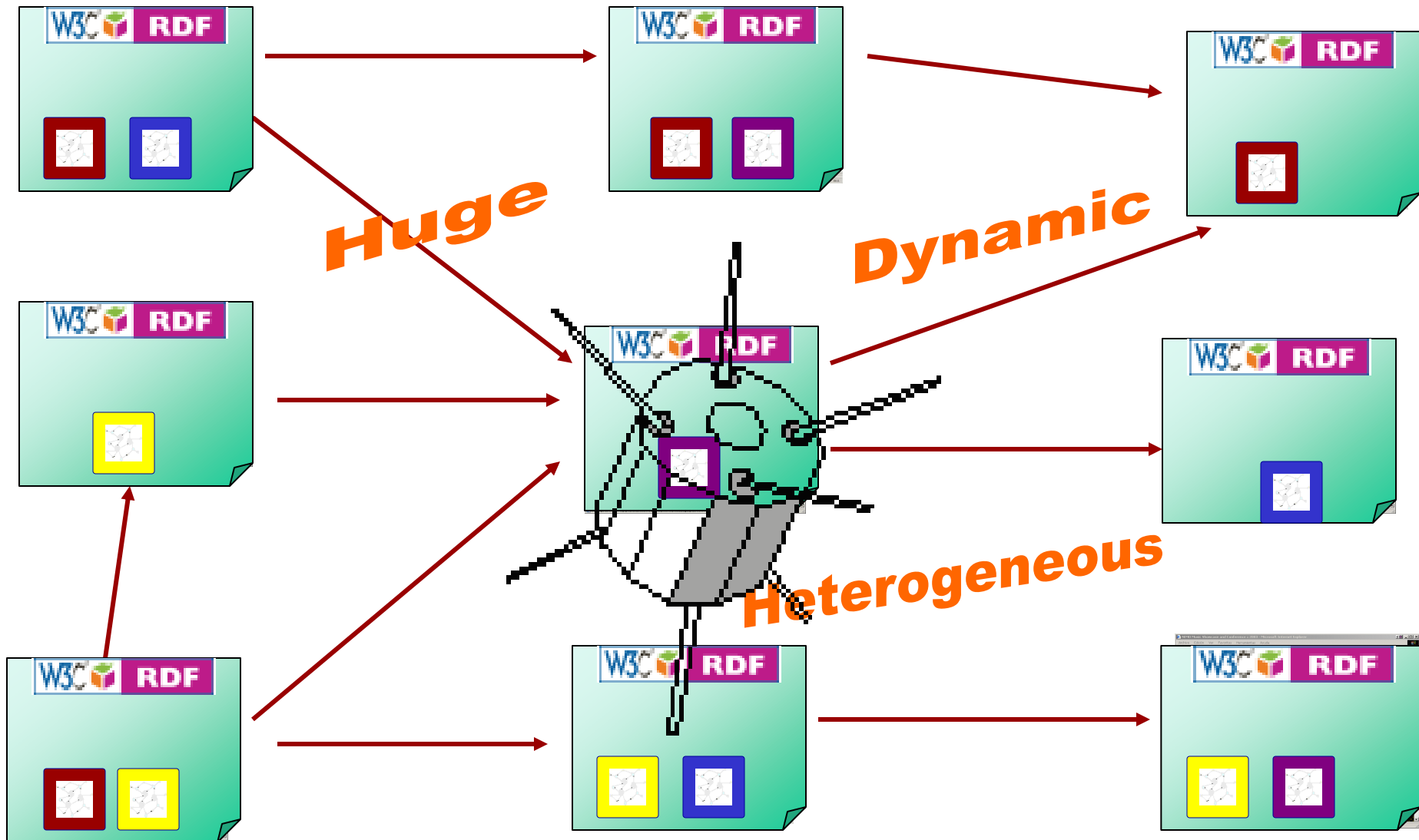
<http://www.esperonto.net>

- Web
- Web 2.0
- Web 3.0 and the Semantic Web
- Examples of semantic applications
  - Semantic Webs
  - Corporative Semantics
  - Annotation at large scale
  - Semantic portals
  - Semantic Information exchange between heterogeneous data sources

# The Web

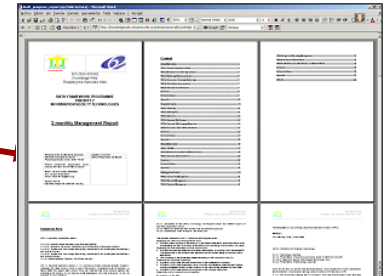
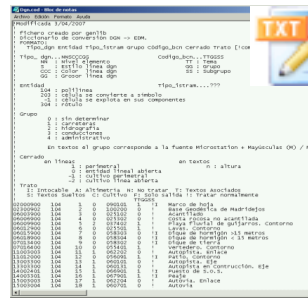
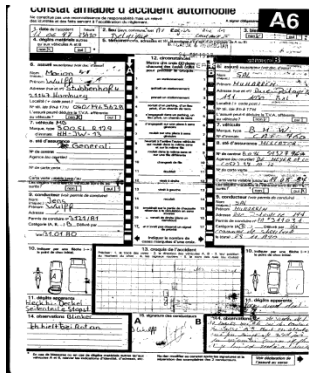


# Semantic Webs





# Corporative Semantics



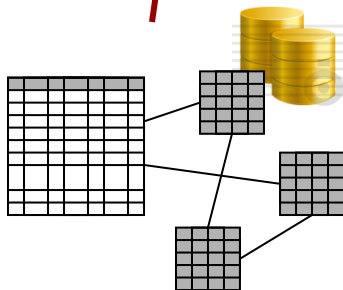
**Huge**

**Dynamic**

| ID  | TITLE              | BENEFICIARIOS         | BEGIN   | END   | LES     | REF        |
|-----|--------------------|-----------------------|---|---|---------|------------|
| 623 | PROFIT - Program 1 | Empresas <Br>2        | Agrop   | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |
| 614 | PROFIT - Program 1 | Primes <Br>2          | Empresas  | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |
| 582 | PROFIT - Program 1 | Associacions empresar | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59   | 9452    | 0000000000 |
| 581 | PROFIT - Program 1 | Associacions empresar | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59   | 9452    | 0000000000 |
| 576 | PROFIT - Program 1 | Primes <Br>2          | Empresas  | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |
| 574 | PROFIT - Program 1 | Primes <Br>2          | Empresas  | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |
| 573 | PROFIT - Program 1 | Primes <Br>2          | Empresas  | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |
| 572 | PROFIT - Program 1 | Primes <Br>2          | Empresas  | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |
| 571 | PROFIT - Program 1 | Primes <Br>2          | Empresas  | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |
| 570 | PROFIT - Program 1 | Primes <Br>2          | Empresas  | Des de 19 de novembre fins al 19 de març del 2000 | BOCE 59 | 9452       |



**Heterogeneous**



```

FILE ; MIPAS CTI_SEM_MP File
}
RECORD ftr
  FILENAME="CTI_SEM_MP_V0020021_105356_00000000_00000458_20020829_1
  0349_20020829_101010.MP"
  DESTINATION="FOS"
  PHASE_START="002"
  CYCLE_START="009"
  REL_START_ORBIT="000037"
  ABS_START_ORBIT="02596"
ENDRECORD ftr
RECORD sem_vhr ; Variable header
  TABLE_DESCR="MIPAS SEM MCO Parameter"
  TABLE_SET_ID=" "
  TABLE_SET_DESCR=" "
  IPOV_SURV_OFF="0"
  IPOV_SURV_ON="0"
  EXECUTION_TIME="29-AUG-2002 10:29:49.745552"
  UNION sem_cti=last_in_sequence
  END_LAST_CTI="29-AUG-2002 10:10:18.796907"
  ENDPOINT sem_cti
  LENGTH="00007"
ENDRECORD sem_vhr
RECORD sem_obs
  F1.166581E102 +9.000000E+1 +0000000022 +0000000023 +0000000002
  ENDRECORD sem_obs
ENDFILE
  
```

# Corporative Semantics

