

# BBC Dynamic Semantic Publishing [DSP] LDBC 2012

- Jem Rayfield : Lead Technical Architect
- BBC Future Media



# Outline

**BBC World Cup 2010**

**BBC Sport 2012 + Olympics**

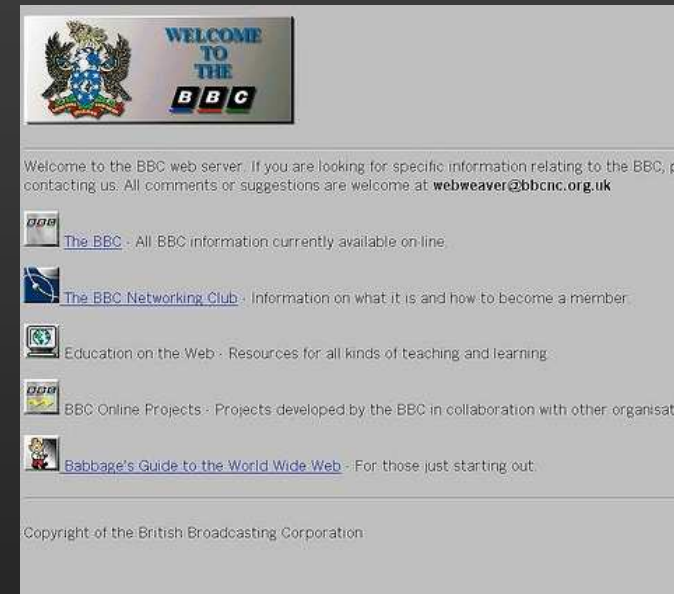
**BBC News**

**Benchmarking**

# Radio since 1922

# TV Since 1930

# Web since 1994





# BBC World Cup 2010



<http://bbc.co.uk/worldcup>



# Page Per Player

http://news.bbc.co.uk/sport/football/world\_cup\_2010/groups\_and\_teams/team/england/wayne\_rooney

**BBC**
Home News Sport Weather iPlayer TV Radio More...
Search

**SPORT**
**WORLD CUP 2010**

SPORT
FOOTBALL
WORLD CUP 2010
GROUPS & TEAMS
FIXTURES & RESULTS
VIDEO
BBC COVERAGE

**Latest matches**

**NED 2-0 DEN**

[Highlights & report](#)

**JPN 1-0 CMR**

[Highlights & report](#)

**ITA 1-1 PAR**

[Highlights & report](#)

**NZL v SVK**

LIVE BUILD-UP

## 🇬🇧 Wayne Rooney

Position: **Striker**  
 Squad number: **10**  
 Date of birth: **24 October, 1985 (24 years old)**  
 Height: **5'10" (178cm)**

**Tournament totals**

Games played	Shots on target   off target
 <b>1</b>	 <b>2   2</b>
Wayne Rooney  <b>1</b>	Total England  <b>9   7</b>

Goals	Assists
 <b>0</b>	 <b>0</b>
Wayne Rooney  <b>1</b>	Total England  <b>1</b>

Fouls by   on	Cards yellow   red
 <b>0   2</b>	 <b>0   0</b>
Wayne Rooney  <b>8   10</b>	Total England  <b>3   0</b>

**England games played**

<a href="#">England 1-1 United States</a> Saturday, 12 June	Match report
<a href="#">England v Algeria</a> Friday, 18 June, 19:30	Preview

**Features**

**Who will win the Golden Boot?**  
 The players with the Midas touch hoping to scoop the award in South Africa

[World Cup scouting: strikers](#)

**Top 5 World Cup stories**

- [BBC gets 545 vuvuzela complaints](#)
- [Drogba cleared to wear arm cast](#)
- [Rooney back in England training](#)
- [Beckenbauer attacks England style](#)
- [Tuesday's World Cup 2010 round-up](#)

**Top TV and radio** **BBC iPlayer**

**Match of the Day Live: 2010 FIFA World Cup: Italy v Paraguay**

- [Match of the Day: 2010 FIFA World Cup: 14/06/2010](#)
- [Match of the Day: 2010 FIFA World Cup: 13/06/2010](#)

[More football on BBC iPlayer](#)

**SPORT**

**WORLD CUP 2010**

SPORT

FOOTBALL

WORLD CUP 2010

GROUPS & TEAMS

FIXTURES & RESULTS

VIDEO

BBC COVERAGE



Latest matches

**NED 2-0 DEN**



Highlights & report

**JPN 1-0 CMR**



Highlights & report

**ITA 1-1 PAR**



Highlights & report

**NZL v SVK**



LIVE BUILD-UP

**Italy**

Italy 1-1 Paraguay  
Monday, 14 June

Match report

Italy v New Zealand  
Sunday, 20 June, 15:00

Preview

Slovakia v Italy  
Thursday, 24 June, 15:00

Preview

	A	B	C	D	E	F	G	H
<b>Group F Teams</b>								
		<b>W</b>	<b>D</b>	<b>L</b>	<b>GD</b>	<b>PTS</b>		
Italy		0	1	0	0	1		
Paraguay		0	1	0	0	1		
New Zealand		0	0	0	0	0		
Slovakia		0	0	0	0	0		

Latest stories



**Buffon confident after back pain**



**Paraguay boss delighted with draw**

- ▶ Gattuso to retire after World Cup
- ▶ Italy's Pirlo to miss two matches
- ▶ Sunday's World Cup 2010 round-up
- ▶ Rossi left out of Italy Cup squad
- ▶ Tuesday's World Cup 2010 round-up
- ▶ Prandelli to be next Italy boss
- ▶ Lippi in post-World Cup exit hint

Features



**World Cup 2010 performance analysis**

All the facts and figures from the World Cup 2010 tournament

- ▶ My World Cup - Noel Gallagher
- ▶ Guide to the teams at South Africa 2010

Around the web

- ▶ Italian FA site
- ▶ Italy Fifa Profile
- ▶ BBC Search+ country page
- ▶ Italy Wikipedia profile

Latest audio and video



World Cup 2010



Highlights - Italy



De Rossi equalises

Top 5 World Cup stories



SPORT

WORLD CUP 2010

- SPORT
- FOOTBALL
- WORLD CUP 2010
- GROUPS & TEAMS
- FIXTURES & RESULTS
- VIDEO
- BBC COVERAGE



Latest matches

NED 2-0 DEN



Highlights & report

JPN 1-0 CMR



Highlights & report

ITA 1-1 PAR



Highlights & report

NZL v SVK



LIVE BUILD-UP

Group F

TEAMS	P	W	D	L	F	A	GD	PTS
Italy	1	0	1	0	1	1	0	1
Paraguay	1	0	1	0	1	1	0	1
New Zealand	0	0	0	0	0	0	0	0
Slovakia	0	0	0	0	0	0	0	0

Latest stories



Buffon confident after back pain

- Gattuso to retire after World Cup
- Skrtel hopeful for opening game
- Rossi left out of Italy Cup squad
- Skrtel makes final Slovakia squad



Paraguay boss delighted with draw

- Italy's Pirlo to miss two matches
- Sunday's World Cup 2010 round-up
- Tuesday's World Cup 2010 round-up
- Cameroon secure Slovakia draw

Latest audio and video



World Cup 2010 extended highlights - Italy 1-1 Paraguay

Watch



Highlights - Italy 1-1 Paraguay

Watch



De Rossi equalises for Italy

Watch



Matches

Italy 1-1 Paraguay Match report  
Monday, 14 June

New Zealand - Slovakia **LIVE**  
Today 12:30

Slovakia v Paraguay Preview  
Sunday, 20 June, 12:30

Italy v New Zealand Preview  
Sunday, 20 June, 15:00

Paraguay v New Zealand Preview  
Thursday, 24 June, 15:00

Slovakia v Italy Preview  
Thursday, 24 June, 15:00

Features



World Cup 2010 performance analysis

All the facts and figures from the World Cup 2010 tournament

- Slovakia performance analysis
- Paraguay performance analysis
- New Zealand performance analysis
- My World Cup - Noel Gallagher
- Guide to the teams at South Africa 2010

Top 5 World Cup stories

# Semantic publishing

**World Cup 2010: Rooney back in training after knock**

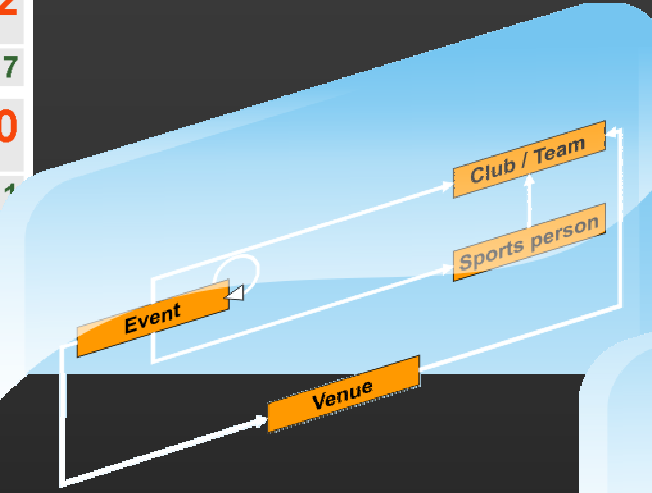
**Tournament totals**

Games played	Shots on target   off target
1	2   2
Wayne Rooney	Wayne Rooney
Total England 1	Total England 9   7

Goals	Assists
0	0
Wayne Rooney	Wayne Rooney
Total England 1	Total England 1

Fouls by   on	Cards yellow   red
0   2	0   0
Wayne Rooney	Wayne Rooney
Total England 8   10	Total England 3   0

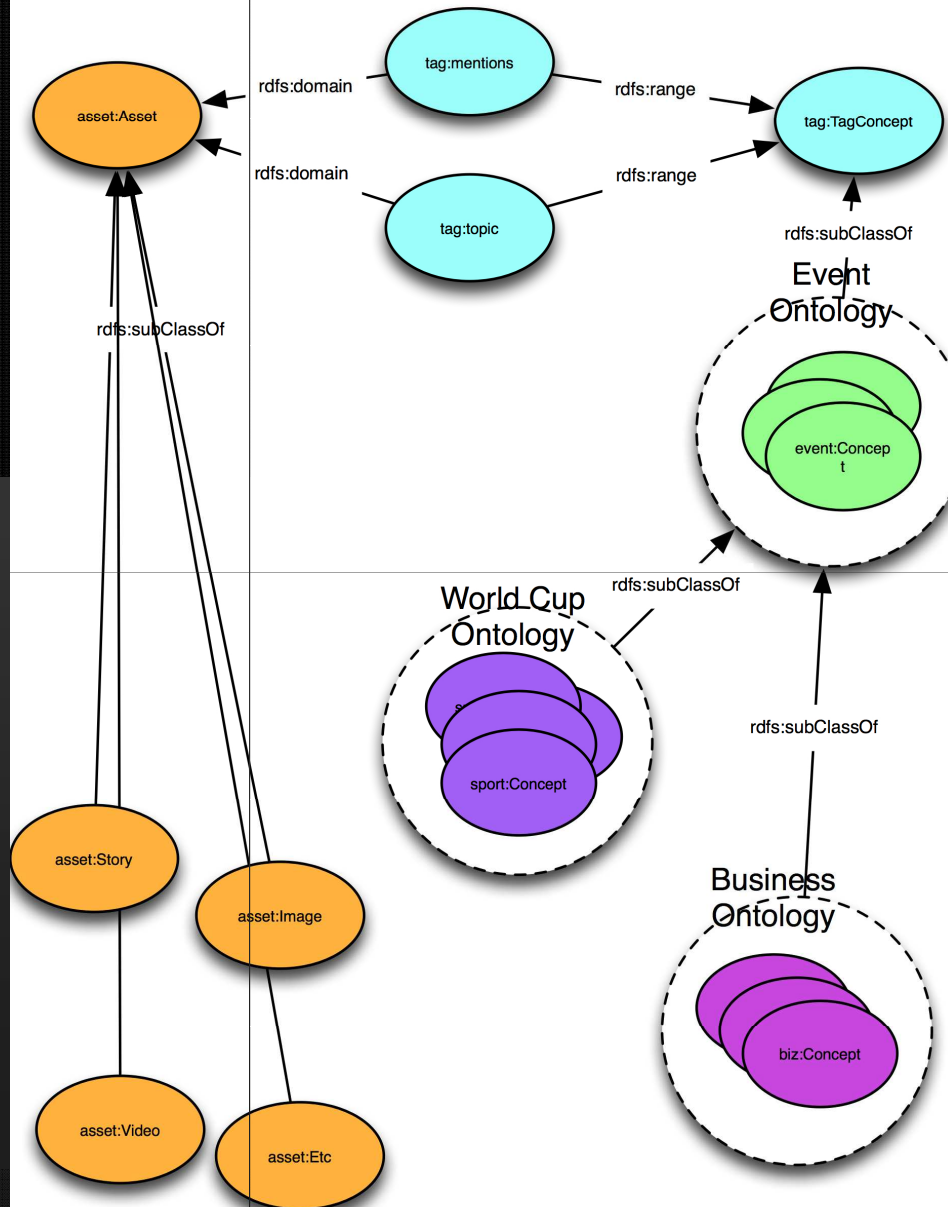
**TRIPLE STORE**



**SPORT VANCOUVER 2010**

**USER EXPERIENCE**

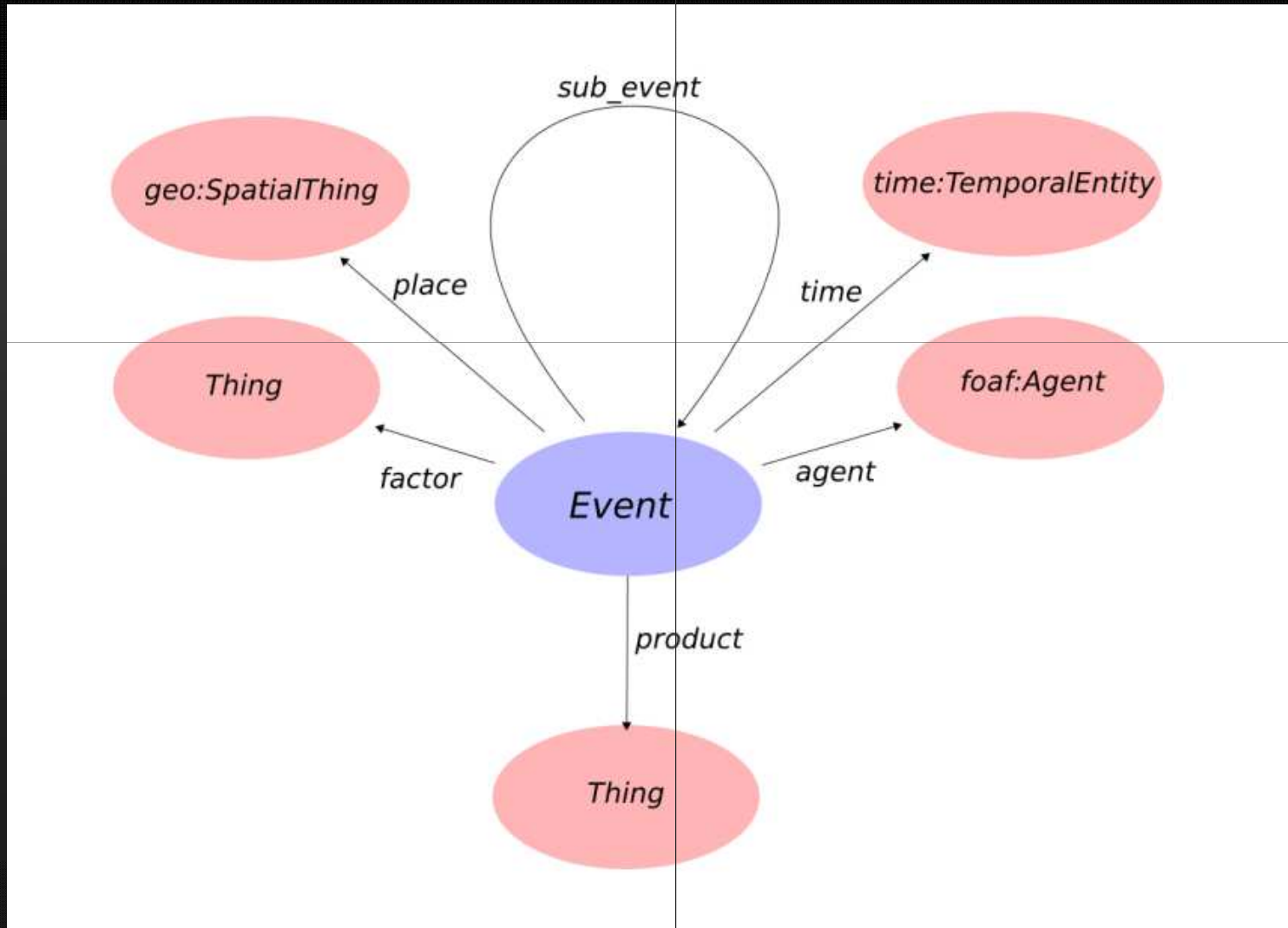
# Extendable Domain Driven Asset Tagging







# Open Ontology/Dataset reuse Event | Geonames | Foaf | Etc.



# Graffiti: Suggest -> Tag [Player]

Graffiti Version=1.0.0.0 **CPS** **Blogs** **Admin** **Help** **System status: OK** Logged in as national\isaact01

Currently viewing: Phil McNulty: Green and Barry on road to recovery (<http://www.bbc.co.uk/blogs/philmcnulty/201>)

**Green and Barry on road to recovery**

Posted **Mon 14 Jun 2010, 1:32 PM** by **Phil McNulty** in **Phil McNulty**

**World Cup 2010: Rustenburg Robert Green's work was not being done under the icy gaze of an expectant nation - but he was literally the focus of attention as England got back to World Cup business at their Rustenburg base....**

Tag story > Select main topics

Select the topics that this story is primarily focused on. Topics could be anything from a person or organization to a broad subject such as 'women in the workplace'.

Suggested topics

This story is mostly about:

- England
- Robert Green
- Gareth Barry

United States

Algeria

Robert Green


Gareth Barry

Joe Hart

<< Back Next >>

Tagging progress

**Gareth Barry**



**Personal information**

Full name	Gareth Barry
Date of birth	23 February 1981 (age 29)
Place of birth	<a href="#">Hastings</a> , England
Height	1.83 m (6 ft 0 in) <a href="#">[u]</a>
Playing position	<a href="#">Midfielder</a>

**Club information**

Current club	<a href="#">Manchester City</a>
--------------	---------------------------------

# Graffiti: Suggest -> Tag [Location] (Geonames)

**Graffiti** Version=1.0.0.0 **CPS** **Blogs** **Admin** **Help** **System status: OK** Logged in as national\isaact01

Find a blog entry or add a new blog

View and/or tag the blog entry

**Currently viewing:** BBC News - England: Man killed as four lorries crash (<http://www.bbc.co.uk/go/rss/int/news/-/ne>)

## Man killed as four lorries crash

Posted **Wed 18 Aug 2010, 11:31 AM** by **unknown author** in **BBC News - England**

**A man dies in a crash between four lorries, leading to the closure of the M1 and 12-mile tailbacks.**

Tag story > Select locations  
Select the locations that appear in this story.

Suggested locations Location search

milton


- Milton Keynes, Borough of Milton Keynes, GB
- Milton Ernest, GB
- Milton Regis, County of Kent, GB
- Milton Damerel, County of Devon, GB
- Milton, County of Oxfordshire, GB
- Milton of Murtle, Aberdeen City, GB

These locations appear in the story:

- Milton Keynes, Borough of Milton Keynes, GB

<< Back Next >>

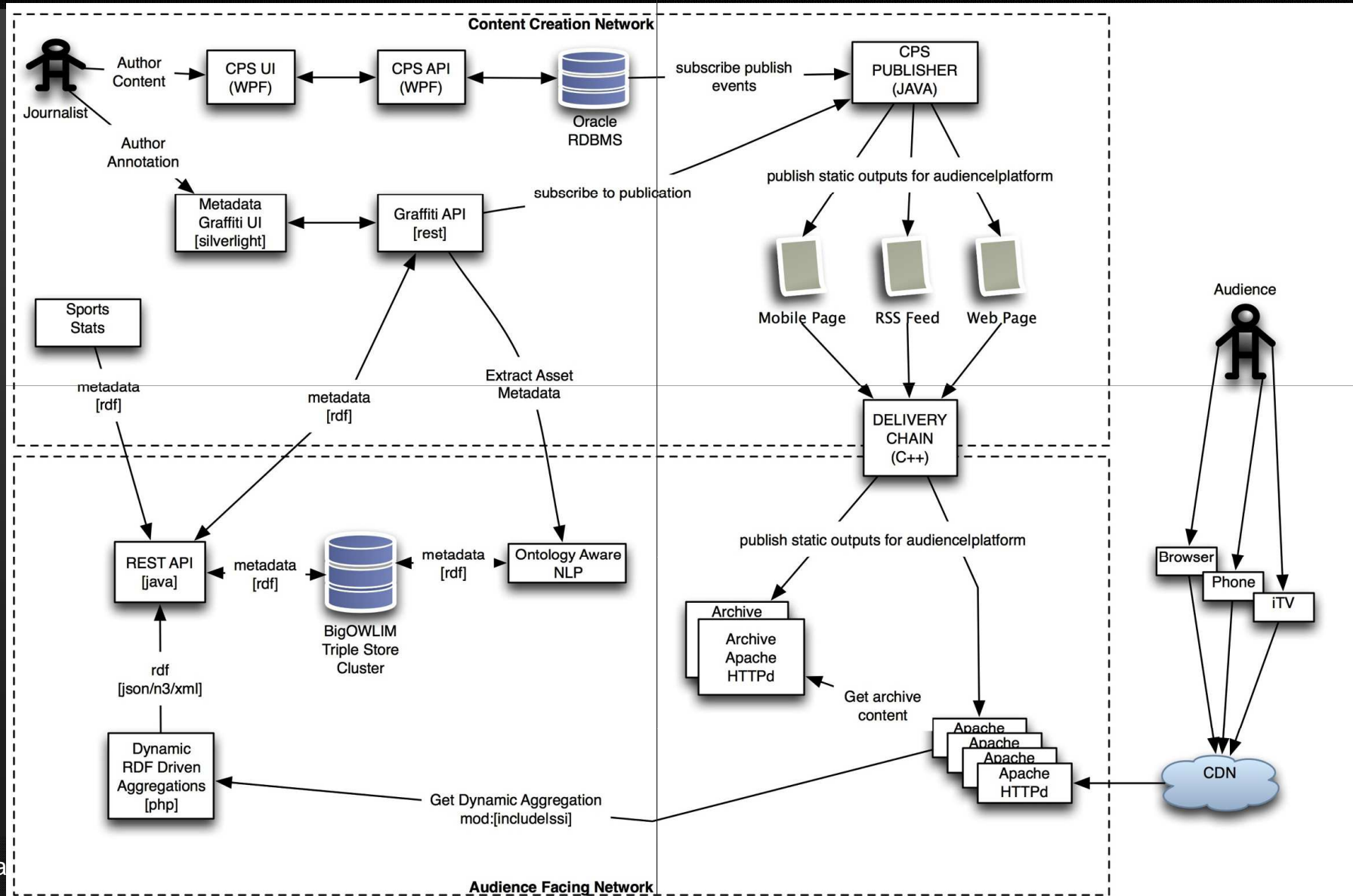
Tagging progress



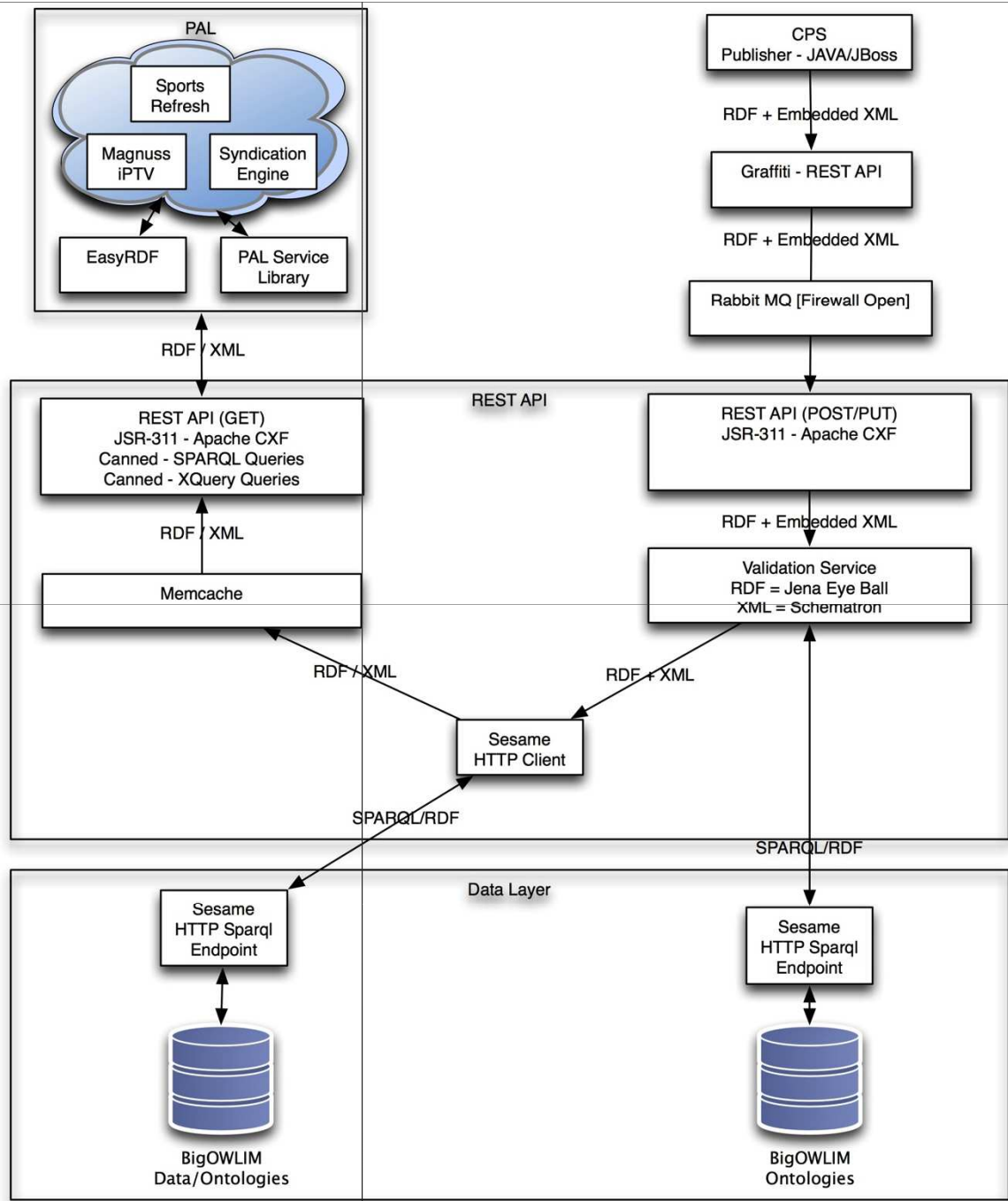
The map shows the United Kingdom and parts of France and the Channel Islands. A green pin is placed on Milton Keynes in central England. Major cities like London, Birmingham, Manchester, and Liverpool are labeled. The map includes a 'Reset Map' button and navigation controls.



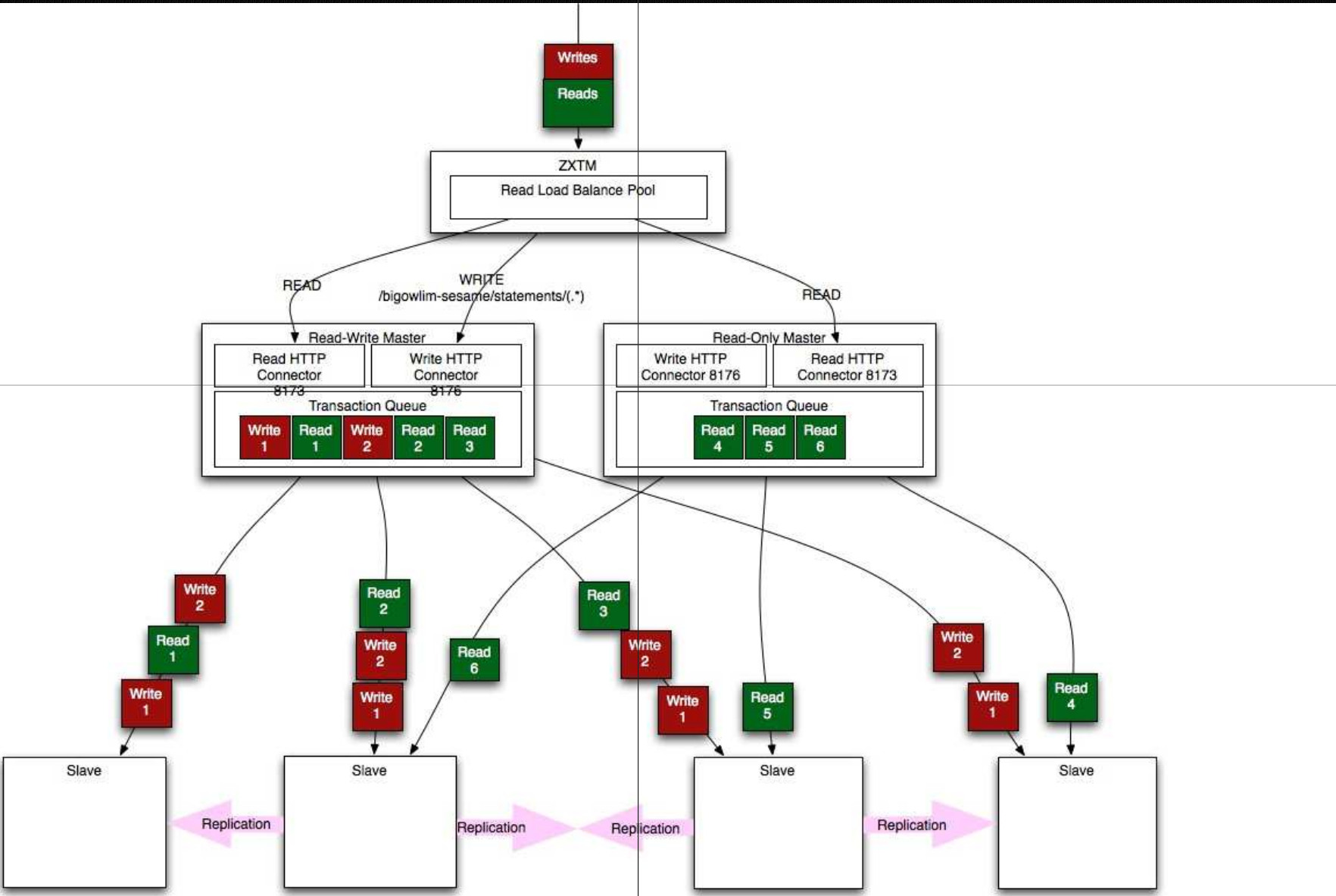
# World Cup DSP Architecture



# API Stack



# Highly Scalable Clustered BigOWLIM





# GET Accept text/rdf+n3

<https://api.live.bbc.co.uk/dsp/sport/football/teams/chelsea>

```
<http://www.chelseafc.com/>
  domain:documentType <http://www.bbc.co.uk/things/document-types/homepage> , <http://www.bbc.co.uk/things/document-types/external> .
```

```
<http://www.bbc.co.uk/sport/football/teams/chelsea>
  domain:documentType <http://www.bbc.co.uk/things/document-types/bbc-document> , <http://www.bbc.co.uk/things/document-types/homepage> .
```

```
<http://www.bbc.co.uk/things/2acacd19-6609-1840-9c2b-b0820c50d281#id>
  a      sport:CompetitiveSportingOrganisation ;
  domain:canonicalName
    "Chelsea"^^<xsd:string> ;
  domain:document <http://www.chelseafc.com/> , <http://www.bbc.co.uk/sport/football/teams/chelsea> ;
  domain:externalId <http://dbpedia.org/resource/Chelsea_F.C.> , <urn:sports-stats:137316635> ;
  domain:name "Chelsea" ;
  domain:shortName "Chelsea"^^<xsd:string> ;
  sport:competesIn <http://www.bbc.co.uk/things/5cd4682a-7643-f445-8b1f-bcbaf450bc89#id> .
```

```
<http://dbpedia.org/resource/Chelsea_F.C.>
  domain:externalIdType
    <http://www.bbc.co.uk/things/external-id-types/dbpedia> .
```

```
<urn:sports-stats:137316635>
  domain:externalIdType
    <http://www.bbc.co.uk/things/external-id-types/bbc-sport-stats> .
```

```
<http://www.bbc.co.uk/things/5cd4682a-7643-f445-8b1f-bcbaf450bc89#id>
  domain:canonicalName
    "Premier League"^^<xsd:string> ;
  domain:externalId <urn:sports-stats:118996114> ;
  sport:competitionType
    <http://www.bbc.co.uk/things/competition-types/domestic-league> .
```

# PHP->EasyRDF->API

PHP Render layer consumes RDF from REST API via EasyRDF  
(<http://www.aelius.com/njh/easyrdf/>)

EasyRDF open PHP library  
(Primary committer Nicholas Humfrey BBC)

```
protected function getOptions() {
    return array(
        "config" => array("usecert" => true),
        "headers" => array(
            "Accept" => "application/rdf+json",
            "X-Expect" => "http://www.bbc.co.uk/things/platforms/hiweb"
        )
    );

    $options = $this->getOptions()
    $response = $this->get("https://api.test.bbc.co.uk/dsp/sport/football/teams/chelsea", $options)
    $this->data = new EasyRdf_Graph("http://www.bbc.co.uk", $response->getBody());
    $teams = $this->data->allofType("sport:CompetitiveSportingOrganisation")
}
```



# World Cup statistics the GOOD

The background of the slide is a photograph of a soccer goal. A goalkeeper in a blue uniform is diving on the grass in front of the goal. The goal net is visible, and the scene is set on a green soccer field.

- 750+ Dynamic aggregations/pages (Player, Squad, Group, etc..)
- Average unique page requests a day : 2 million +
- Average OWLIM SPARQL queries a day : 1 million
- 100s RDF statement updates/inserts per minute with full OWL reasoning and associated inference.
- Multi data center fully resilient, clustered 6 node triple store
- RDF graph model ideally suited to model domain representations such as sport



# World Cup statistics the BAD

The background of the slide is a photograph of a soccer goal. A goalkeeper in a blue uniform is diving on the grass in front of the goal. The goal net is visible, and the scene is set on a green field.

- Sports stories and indices static
- Sport content not responsive or personalized
- RDF Store unable to handle thousands of statistic updates a second
- RDF Store forward-chained closures expensive increase write latency
- RDF graph model and SPARQL not ideally suited to the BBC's News and Sport document publication model



# BBC Sport 2012; Online Refresh



<http://bbc.co.uk/sport>

# Sport Refresh 2012

Page per Athlete [10,000+], Page per country [200+], Page per Discipline [400-500], Page per venue, Page per team

→ A lot of output...

Almost real time statistics and live event pages

Time coded, metadata annotated, on demand video, 58,000 hours of content

Far too many web pages for far too few journalists

DSP annotation architecture to automate content aggregation



# Sport Refresh 2012; Red -> Bright Yellow

Mobile News Sport Weather iPlayer TV Radio More Search the BBC

## SPORT FOOTBALL

Watch Sport news bulletin

### Chelsea

Last updated at 12:33 BST, 24/05/11

**Recent results**

Sunday, 22 May 2011   Barclays Premier League
Everton 1 - 0 Chelsea
Sunday, 15 May 2011   Barclays Premier League
Chelsea 2 - 2 Newcastle
Sunday, 8 May 2011   Barclays Premier League
Man Utd 2 - 1 Chelsea

**Barclays Premier League**

Monday, 23 May 2011 12:00 UK

Team	P	GD	PTS
1 Man Utd	38	41	80
2 Chelsea	38	36	71
3 Man City	38	27	71
4 Arsenal	38	29	68
5 Tottenham	38	9	62
6 Liverpool	38	15	59
7 Everton	38	6	54
8 Fulham	38	6	49
9 Aston Villa	38	-11	48
10 Sunderland	38	-11	47
11 West Brom	38	-15	47
12 Newcastle	38	-1	46
13 Stoke	38	-2	46
14 Bolton	38	-4	46
15 Blackburn	38	-13	43
16 Wigan	38	-21	42
17 Wolverhampton	38	-30	40
18 Birmingham	38	-21	39
19 Blackpool	38	-23	39
20 West Ham	38	-27	33

**Latest stories**

- Hiddink 'committed to Turkey job'
- Rangers 'play joker for Chelsea'
- Van Aanholt: extends Chelsea deal
- Manager Ancelotti leaves Chelsea
- Everton v Chelsea
- Ancelotti brushes off exit rumour
- Ancelotti should stay - Wilkins
- Ancelotti awaits fate at Chelsea
- Title race not over - Ancelotti
- Chelsea 3-1 Birmingham

**Comment and analysis**

- Phil McNulty: Ancelotti suffers harsh fate
- Lawro's predictions
- Ups and downs
- Alistair Magowan - BBC Sport: Park peerless in United's decisive victory

**Around the web**

- Official club website
- The BBC is not responsible for the content of external internet sites

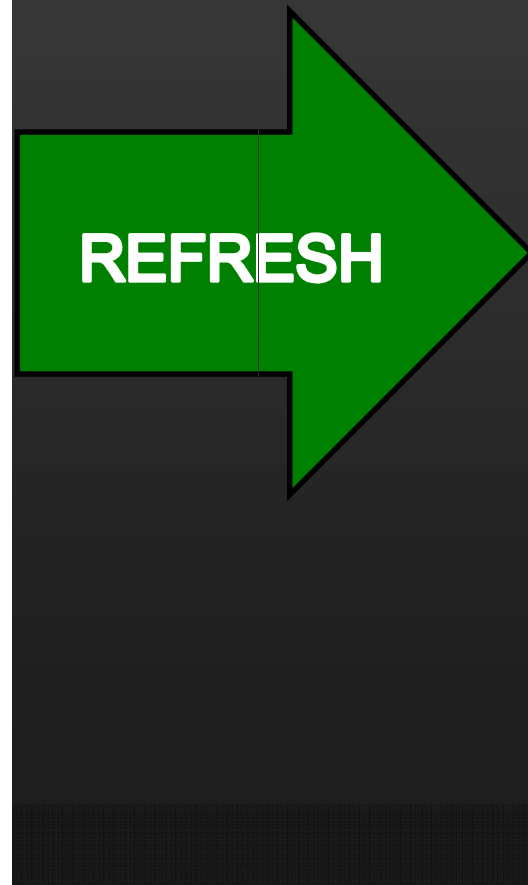
**Club stats overview**

GET THE LATEST FOOTBALL GOSSIP!

Monday's gossip column

Porto boss Andre Villas-Boas favourite for Chelsea job, plus other rumours

**Latest football stories**



BBC News Sport Weather iPlayer TV Radio More London 2012

## SPORT FOOTBALL

Home Football Formula 1 Cricket Rugby U Rugby L Tennis Golf Olympics

All Teams Chelsea Results Fixtures Live Scores All Teams Leagues & Comp

### Chelsea

**Suspended Terry can lift trophy**

Chelsea captain John Terry can lift the Champions League trophy if they win the final against Bayern Munich.

**Last Match**

Tue 24 April 2012 CHAMPIONS LEAGUE  
vs Barcelona (Away)  
Drawn 2 - 2 (Agg 2 - 3)

**Next Match**

Sun 29 April 2012 PREMIER LEAGUE  
vs Queens Park Rangers (Home)  
13:30

**Latest Video & Audio**

- Chelsea will not beat Bayern - Savage
- The story of Chelsea's triumph
- Chelsea win horror to watch - Cahill

**Comment & Analysis**

Chelsea rediscover resolve to reach Champions League final

Pat Nevin and Danny Mills on how Chelsea managed to overcome Barcelona to reach...

**Latest Football**

**PREVIOUS RESULTS**

**UPCOMING FIXTURES**

SUN 29 APR 2012 - PREMIER LEAGUE  
Chelsea v QPR

WED 2 MAY 2012 - PREMIER LEAGUE  
Chelsea v Newcastle

SAT 5 MAY 2012 - FA CUP  
Chelsea v Liverpool

TUE 8 MAY 2012 - PREMIER LEAGUE  
Liverpool v Chelsea

All times UK

**League Table**

Show me: Premier League

Pos	Team	P
1	Man Utd	35
2	Man City	35
3	Arsenal	35
4	Newcastle	34
5	Tottenham	34
6	Chelsea	34
7	Everton	34
8	Liverpool	34
9	Fulham	34
10	West Brom	35
11	Sunderland	35
12	Swansea	35
13	Norwich	35
14	Stoke	34
15	Aston Villa	35
16	QPR	35
17	Wigan	35
18	Bolton	34
19	Blackburn	35
20	Wolves	35

**Competitions**

- Domestic PREMIER LEAGUE
- European CHAMPIONS LEAGUE

**In Pictures**

Tuesday's Champions league photos

**Around the web**

- Anton Ferdinand advised to snub Terry hand
- ESPN Soccernet
- Bavem Munich take

**Football Tactics**

ALISTAIR MAGOWAN - BBC SPORT  
Chelsea can prey on Barcelona's weaknesses

Chelsea midfielder Ramires was rightly lauded for his display in the first leg...

BBC SPORT BLOG EDITOR  
Ranieri relishes return to England

# 10000+ Dynamic Aggregations

The image displays three overlapping screenshots of the BBC Sport website, illustrating dynamic aggregations of content. The left screenshot shows a football article about Chelsea, the middle one shows a cycling event at the Olympic Stadium, and the right one shows a profile for cyclist Sir Chris Hoy.

**Left Screenshot: Chelsea Football**

- Navigation: News, Sport, Weather, iPlayer, TV, Radio, More - London 2012
- Section: SPORT FOOTBALL
- Sub-sections: Chelsea, Results, Fixtures, Live Scores, All Teams
- Article: "Suspended Terry can..."
- Next Match: Chelsea vs Queens Park Rangers (Home), 13:30
- League Table: Premier League table showing Chelsea at 6th position.
- Competitions: Premier League, Champions League
- Video & Audio: "Chelsea rediscover resolve to reach Champions League final"

**Middle Screenshot: Team GB Olympic Stadium**

- Navigation: News, Sport, Weather, iPlayer, TV, Radio, More - London 2012
- Section: SPORT OLYMPICS
- Sub-sections: Home, Football, Formula 1, Cricket, Rugby U, Rugby L, Tennis, Golf
- Section: Team GB
- Image: Olympic Stadium
- Article: "Olympic Stadium test event in May"
- Table: "Athletes from Team GB" showing a list of athletes.

**Right Screenshot: Sir Chris Hoy Profile**

- Navigation: News, Sport, Weather, iPlayer, TV, Radio, More - London 2012
- Section: SPORT OLYMPICS
- Section: Sir Chris Hoy
- Biography: "Competes in CYCLING - TRACK", "Chris Hoy was knighted after becoming the first Briton for a century to win three gold medals at one Olympics"
- Key Facts: Country (Great Britain & N. Ireland), Date of birth (23 Mar 1976), Height (1.85m), Weight (92.0kg)
- Articles: "Brailsford ponders sprint options", "Hoy's mum can't watch kieran win", "Year ban hurt me - champion Bauge"
- Medals: Beijing 2008 (3 Gold, 0 Silver, 0 Bronze)



# Lots of Dynamic (Live) sports stats

### It Stands Table

View me: Premier League

Team	P	GD	Pts
Man Utd	35	54	83
Man City	35	60	80
Arsenal	35	24	65
Newcastle	34	11	62
Tottenham	34	18	59
Chelsea	34	18	58
Everton	34	4	48
Liverpool	34	3	46
Fulham	34	1	46
West Brom	35	-6	45
Sunderland	35	1	44
Swansea	35	-6	43
Norwich	35	-13	43
Stoke	34	-16	42
Aston Villa	35	-14	36
QPR	35	-18	34
Wigan	35	-26	34
Bolton	34	-28	33
Blackburn	35	-26	31
Wolves	35	-41	23

[View full table](#)

## Europa League Results

Thursday 26th April 2012

### UEFA EUROPA LEAGUE

>	Athletic Bilbao	0-0	Sporting	Thu 26 Apr	5'	<b>LIVE</b>
		(agg 1 - 2)				
>	Valencia	0-0	Atl Madrid	Thu 26 Apr	6'	<b>LIVE</b>
		(agg 2 - 4)				

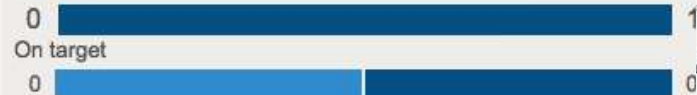
Last updated 5 minutes ago

### MATCH STATS

#### Possession



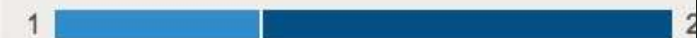
#### Shots



#### Corners



#### Fouls



### 2012

4-2	Valencia	Thu 19 Apr	Full time
2-1	Athletic Bilbao	Thu 19 Apr	Full time

Last updated 7 days ago

### 012

2-2	Schalke 04	Thu 5 Apr	Full time
(agg 6 - 4)			
1-1	Sporting	Thu 5 Apr	Full time
(agg 2 - 3)			
1-2	Atl Madrid	Thu 5 Apr	Full time
(agg 2 - 4)			
4-0	AZ Alkmaar	Thu 5 Apr	Full time
(agg 5 - 2)			

Last updated 21 days ago

### Latest Football

#### TODAY (2)

Athletic Bilbao 0 - 0 Sporting  
(agg 1 - 2)

Valencia 0 - 0 Atl Madrid  
(agg 2 - 4)

All times UK

[View Live](#)

### Europa League

Show me: Group A

#### Group A

Pos	Team	P	GD
1	PAOK Salonika	6	4
2	Rubin Kazan	6	6
3	Tottenham	6	5
4	Shamrock	6	-15

[View](#)

### More from Europa League

# Olympics - 27 Live Video Steams

## Live Stats overlays

### Stats -> Ontology driven aggregations



**NEWS & CATCH UP**

Adlington sets sights on GB medal  
Swimming

**London 2012 medals**

	🥇	🥈	🥉	Total
1 🇺🇸 USA	12	9	7	28
2 🇷🇺 RUS	11	10	6	27
3 🇷🇺 RUS	6	9	9	24
4 🇰🇪 KEN	5	9	1	15
5 🇦🇺 AUS	4	5	5	14
9 🇬🇧 GBR	2	1	1	4

**LIVE VIDEO**

**BBC One**  
Day 5 Coverage  
30 min left

**BBC Three**  
Day 5 Coverage

**Diving**  
Men's 10m Platform Final

**Athletics**  
Day 5 Morning Session

**Cycling - Track**  
Day 5 Morning Session

**Rowing**  
Day 5 Coverage

**BBC SPORT** |

CHOOSE SPORT

# Dynamic Schedule



## Schedule & Results

**Picks of the day**

Never miss a moment of the Olympic Games

[More video](#)

<p>AVAILABLE SOON</p> <p>13:15 - 15:14 Cycling - Mountain Bike</p>	<p>CATCH UP</p> <p>03h 02m Boxing</p>	<p>CATCH UP</p> <p>04h 12m Modern Pentathlon</p>	<p>CATCH UP</p> <p>02h 48m Basketball</p>	<p>CATCH UP</p> <p>02h 26m Handball</p>	<p>AVAILABLE SOON</p> <p>19:30 - 00:10</p>
--	---	--	---	---	--

		July							August											
		Wed 25	Thu 26	Fri 27	Sat 28	Sun 29	Mon 30	Tue 31	Wed 01	Thu 02	Fri 03	Sat 04	Sun 05	Mon 06	Tue 07	Wed 08	Thu 09	Fri 10	Sat 11	Sun 12
	Archery																			
	Athletics																			
	Badminton																			
	Basketball																			
	Beach Volleyball																			
	Boxing																			
	Canoe Slalom																			



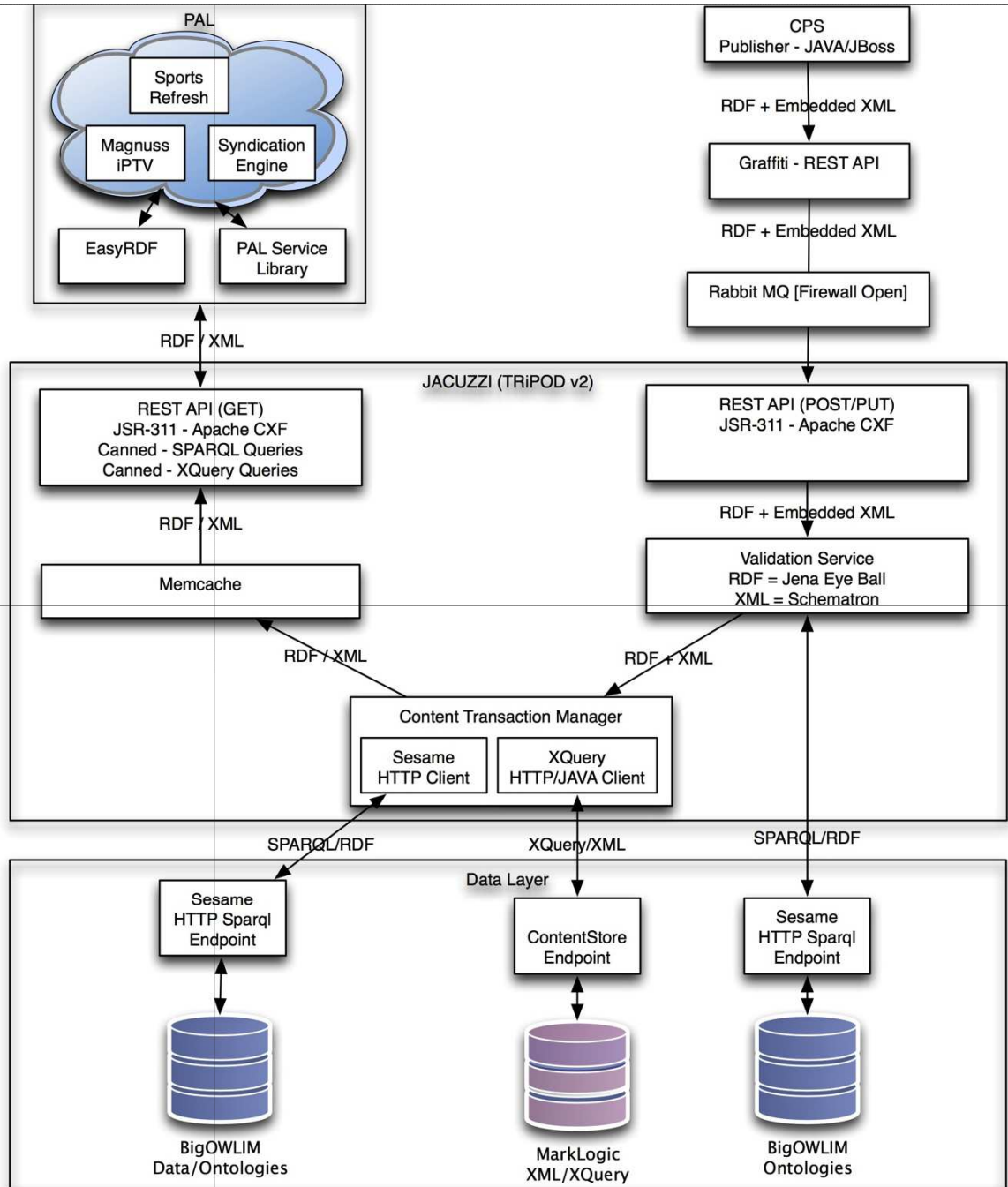
# Augment architecture with a Content Store

1. Atomic content assets stored in MarkLogic XML store
2. XML content queryable via Xquery
3. Content Assets searchable
4. Sports statistics searchable/queryable via XQuery
5. Ontological SPARQL via BigOWLIM, assets Xquery via MarkLogic

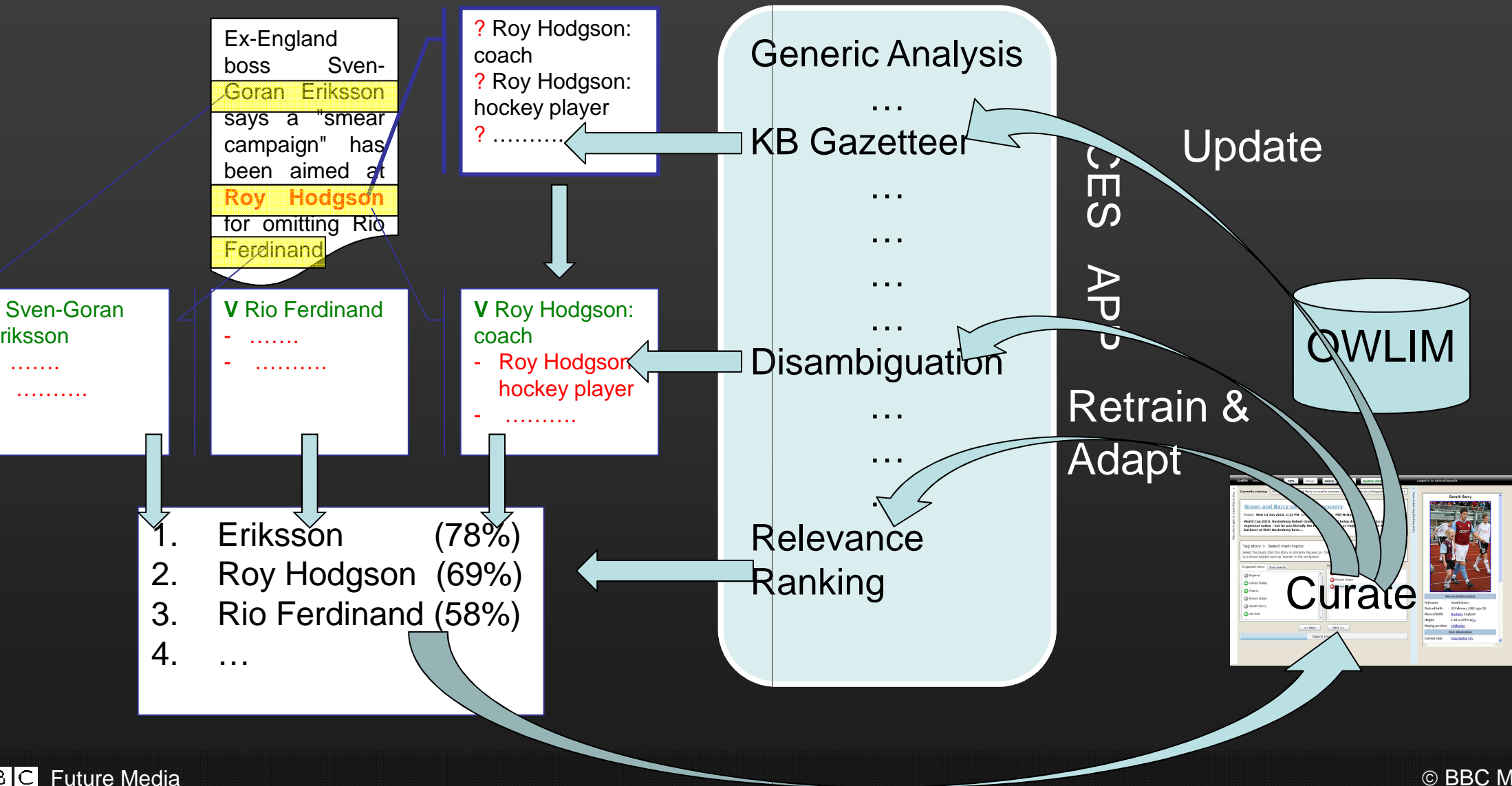


# API Stack

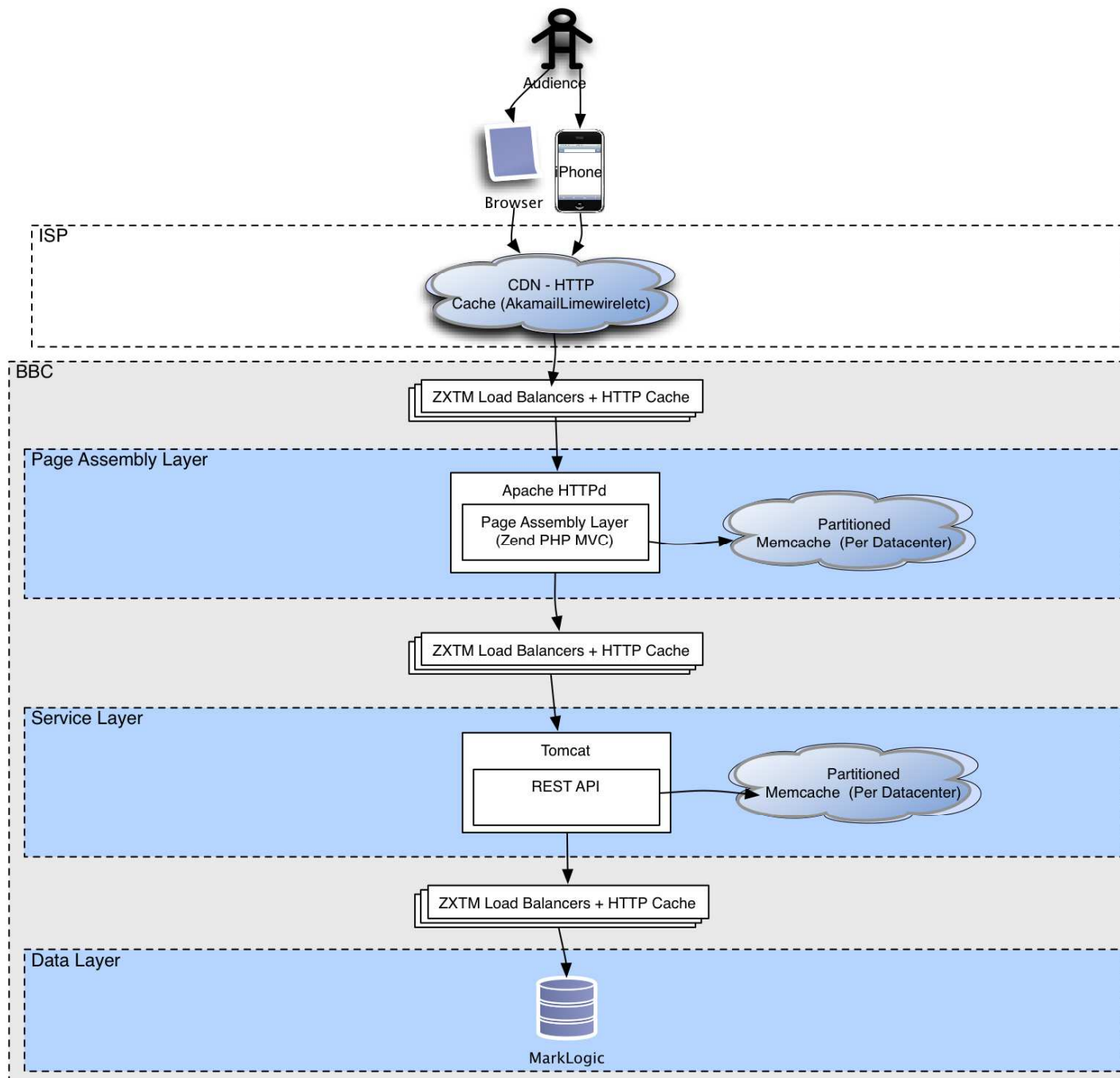
# MarkLogic BigOWLIM



# Ontology Aware NLP and Semantic Disambiguation



# Plenty of Caching





# Sport Stats REST API

REST Endpoint for all Sports Stats on BBC

- [/football/teamstats/team/{team}](#)
  - [/clubstats](#)
- [/football/table](#)
  - [/ais/competition/{comp}](#)
  - [/competition/{comp}](#)
  - [/positions/competition/{comp}/team/{team}](#)
  - [/snapshot/competition/{comp}](#)
  - [/structure/{structureid}/group/{groupid}](#)
- [/football/matches](#)
  - [/structure/{structureid}/group/{groupid}](#)
- [/football/match](#)
  - [/{matchid}](#)
- [/football/recentresults](#)
  - [/match/{matchid}](#)
- [/football/videprinter](#)
- [/football/config](#)
  - [/competition/structure/{structureid}](#)
  - [/competition/structure/{structureid}/groups](#)
  - [/competition/{competitionid}/structure/{structureid}/groups](#)
- [/football/stats](#)
  - [/competition/{comp}](#)
  - [/competition/{comp}/team/{team}](#)
- [/cricket/scorecard](#)
  - [/{matchid}](#)
- [/cricket/matches](#)
- [/cricket/table](#)
  - [/competition/{comp}](#)
  - [/positions/competition/{comp}/team/{team}](#)
- [/cricket/stats](#)

# Sport Stats REST API

## L Accessible API

replays Premier League LIVE as it stands Table

**T <https://api.live.bbc.co.uk/sportsdata/statsapi/football/table/ais/competition/118996114>**

replays Premier League LIVE as it stands Table

**T <https://api.live.bbc.co.uk/sportsdata/statsapi/football/table/ais/competition/118996114>**

**cept: application/json**

trieve that latest football events ordered by timestamp

**T <https://api.live.bbc.co.uk/sportsdata/statsapi/football/videoprinter>**

t the formula 1 calendar for the specified season.

**T <https://api.int.bbc.co.uk/sportsdata/statsapi/formula1/year/2012/calendar>**

**cept: application/json**

# Olympics API (Semantic RDF)

**/tripod2012**

**/athletes**

**/{uid}**

**/countries**

**/{country}**

**/countries-iso**

**/{iso}**

**/sports**

**/stories**

**/{discipline}**

**/{discipline}/events**

**/{discipline}/events/stories**

**/{discipline}/events/{event}**

**/metadata**

**/disciplines**

**/onestowatch**

**/countries/{countryUrIName}**

**/london2012**

**/sports/{disciplineUrIName}**

**/sports/{disciplineUrIName}/events/{eventUrIName}**

**/podium/events**

**/{rscCode}**

**/record/events**

**/venues**

**/{urIName}**



# Olympics API (RDF)

@prefix par: <http://purl.org/vocab/participation/schema#> .  
@prefix dc: <http://purl.org/dc/elements/1.1/> .

```
<http://www.bbc.co.uk/things/82f5db84-0591-49ee-b6f4-a1d26e9381fb#id> a sport:Person ;
    rdfs:label "Usain Bolt"^^xsd:string , "Bolt Usain-athletics-jam-1986-08-21"^^xsd:string ;
    foaf:name "Usain Bolt"^^xsd:string , "Bolt Usain-athletics-jam-1986-08-21"^^xsd:string ;
    domain:canonicalName "Bolt Usain-athletics-jam-1986-08-21"^^xsd:string ;
    foaf:givenName "Usain"^^xsd:string ;
    foaf:familyName "Bolt"^^xsd:string ;
    domain:name "Usain Bolt"^^xsd:string ;
    oly:dateOfBirth "1986-08-21"^^xsd:date ;
    oly:gender "M"^^xsd:string ;
    oly:height "195.0"^^xsd:float ;
    oly:weight "94.0"^^xsd:float ;
    oly:worldOlympicDream "true"^^xsd:boolean ;
    sport:discipline <http://www.bbc.co.uk/things/b3a086df-ab42-2b44-be8b-76b600bfcfce#id> ;
    sport:competesIn <http://www.bbc.co.uk/things/1b499a08-4f02-4196-aa6c-c43ea353138b#id> .
```

```
<http://www.bbc.co.uk/things/b3a086df-ab42-2b44-be8b-76b600bfcfce#id> a sport:SportsDiscipline ;
    domain:name "Athletics"^^xsd:string ;
    domain:document <http://www.bbc.co.uk/sport/olympics/2012/sports/athletics> .
```

```
<http://www.bbc.co.uk/things/1b499a08-4f02-4196-aa6c-c43ea353138b#id> a sport:MedalCompetition ;
    domain:name "Men's 100m"^^xsd:string ;
    domain:shortName "Men's 100m"^^xsd:string ;
    domain:document <http://www.bbc.co.uk/sport/olympics/2012/sports/athletics/events/mens-100m> ;
    oly:measurementType <http://www.bbc.co.uk/things/measurement-types/time> ;
    domain:externalId <urn:ioc2012:ATM001000> .
```

```
<http://www.bbc.co.uk/things/903ef380-bdae-4a45-9a8b-5e5a270a7d6c#id> oly:oneToWatch <http://www.bbc.co.uk/things/82f5db84-0591-49ee-b6f4-a1d26e9381fb#id> .
```

```
<http://news.bbc.co.uk/sport1/hi/athletics/16554814.stm#asset> tag:tag <http://www.bbc.co.uk/things/a50dc8ba-947e-4856-8eb0-1cddb208ef7#thing> ;
    dc:title "Event Guide: ATHLETICS"^^xsd:string ;
    asset:storyType <http://www.bbc.co.uk/things/story-types/profile> ;
    domain:document <http://news.bbc.co.uk/sport1/mobile/athletics/16554814.stm> .
```

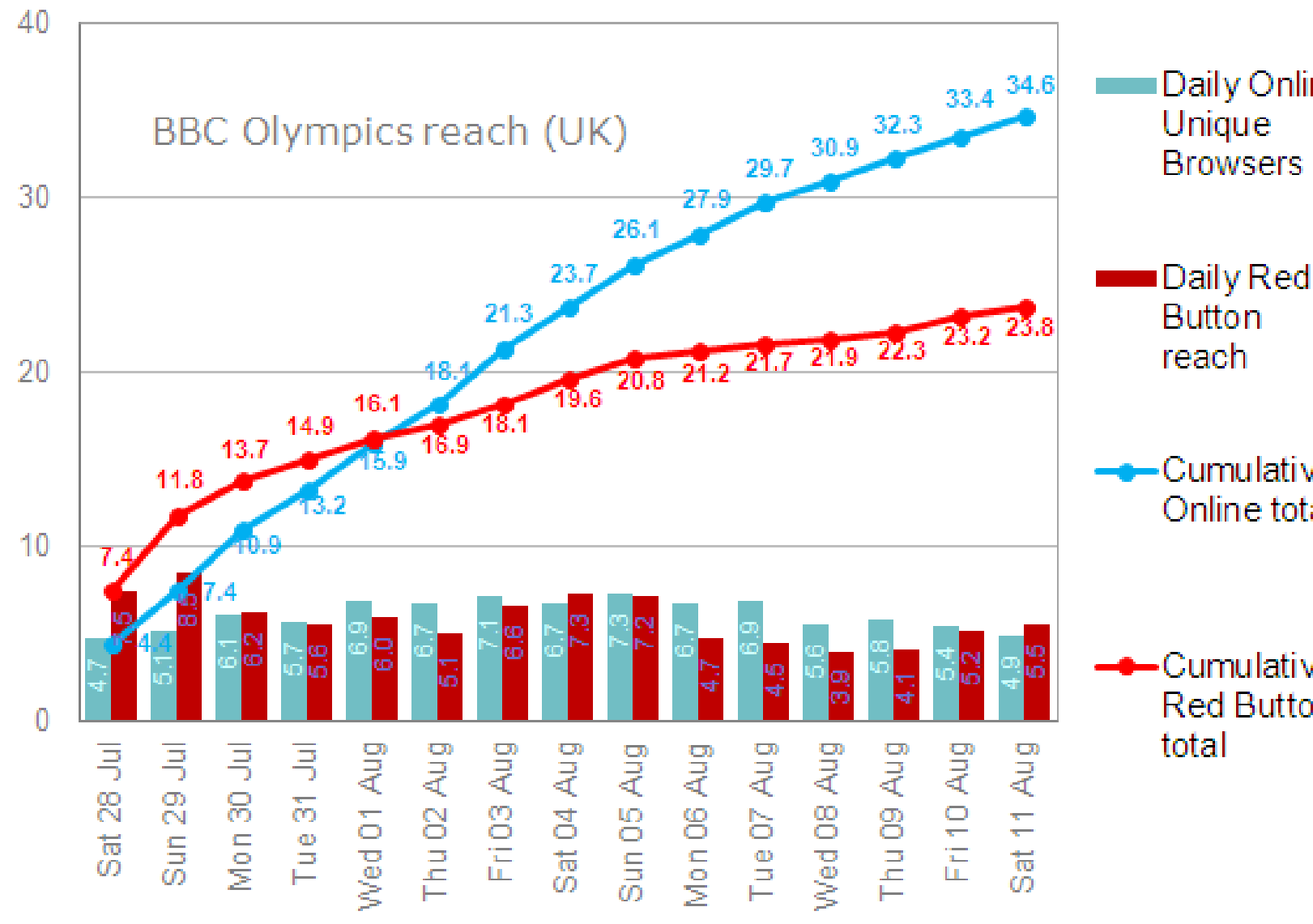
```
<http://www.bbc.co.uk/things/a50dc8ba-947e-4856-8eb0-1cddb208ef7#thing> tag:taggedWithTag <http://www.bbc.co.uk/things/b3a086df-ab42-2b44-be8b-76b600bfcfce#id> .
```

```
<http://news.bbc.co.uk/sport1/mobile/athletics/16554814.stm> domain:platform <http://www.bbc.co.uk/things/platforms/mobile> .
```

# Olympic numbers

Unique Browser Requests per day peaked at just over 8 million UK and 10 million Globally.

Cumulative Unique browsers online total 34.6 million

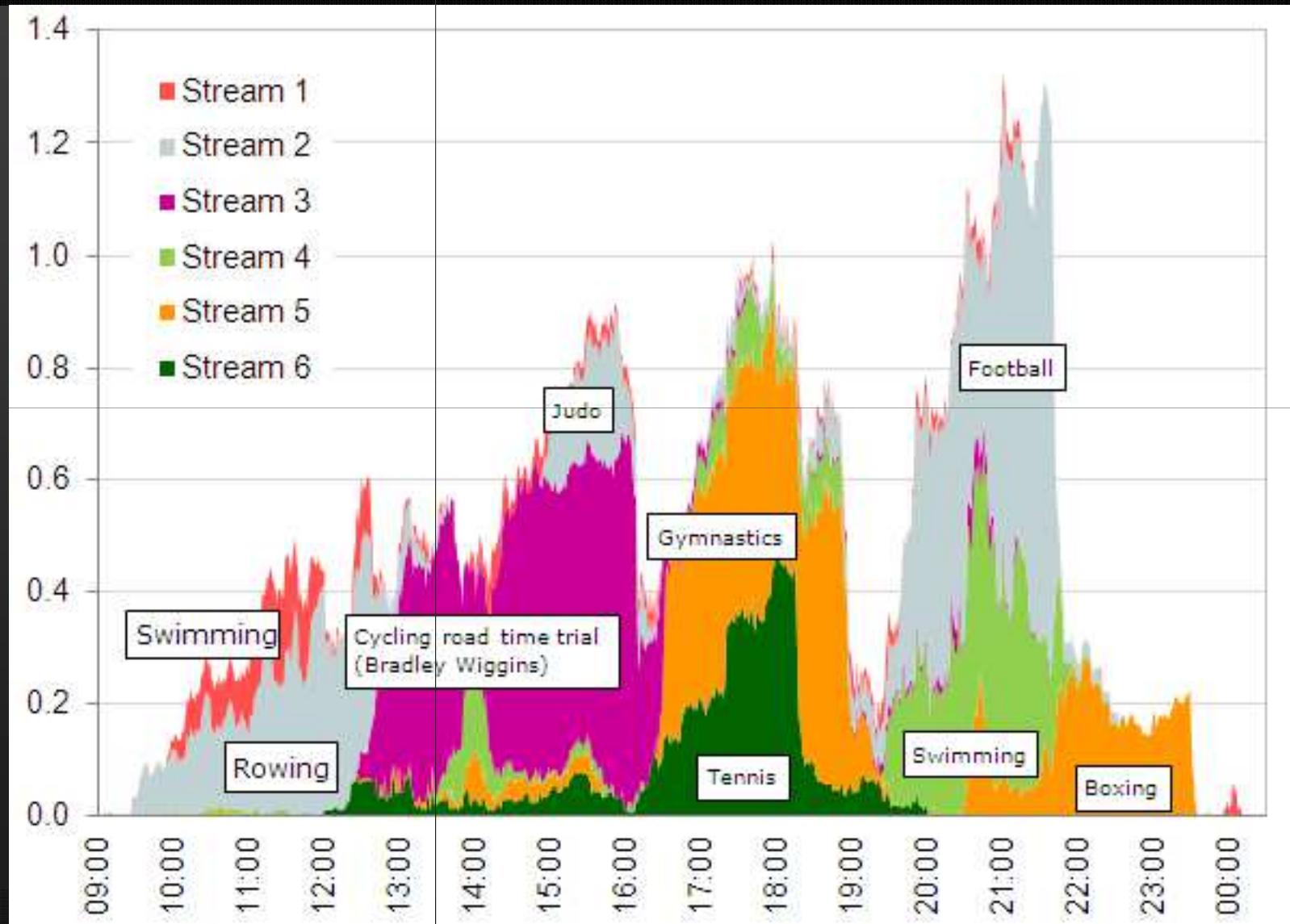


# Olympic numbers

On the busiest day, the BBC delivered 2.8 petabytes, with the peak traffic moment occurring when Bradley Wiggins won Gold and we shifted 700 Gb/s.

6 million requests for BBC Olympic video content across online platforms

Number of people watching individual streams →





**BBC**  
**NEWS**  
**online**

012 → <http://m.bbc.co.uk/news>

# Dynamic News mobile

Multi device capability

Responsive Web design

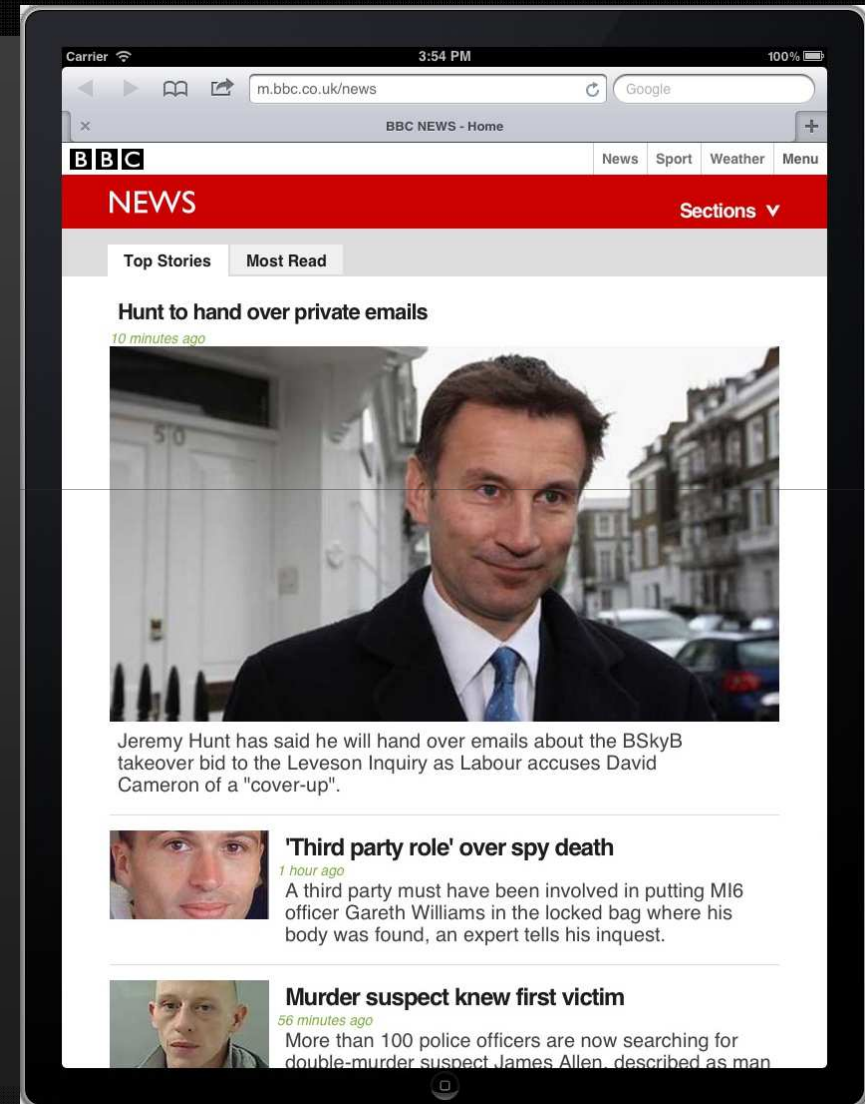
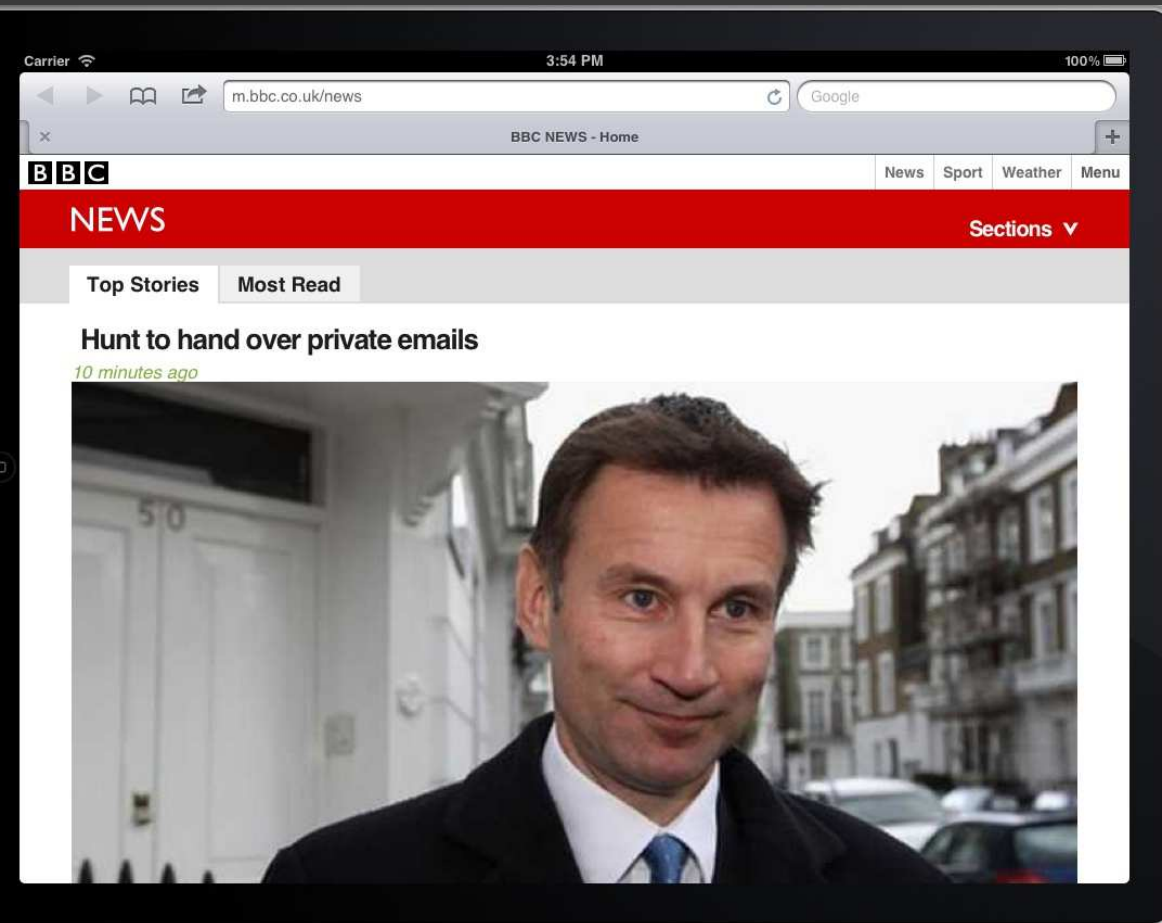
Built on a dynamic service API

New re-usable content model

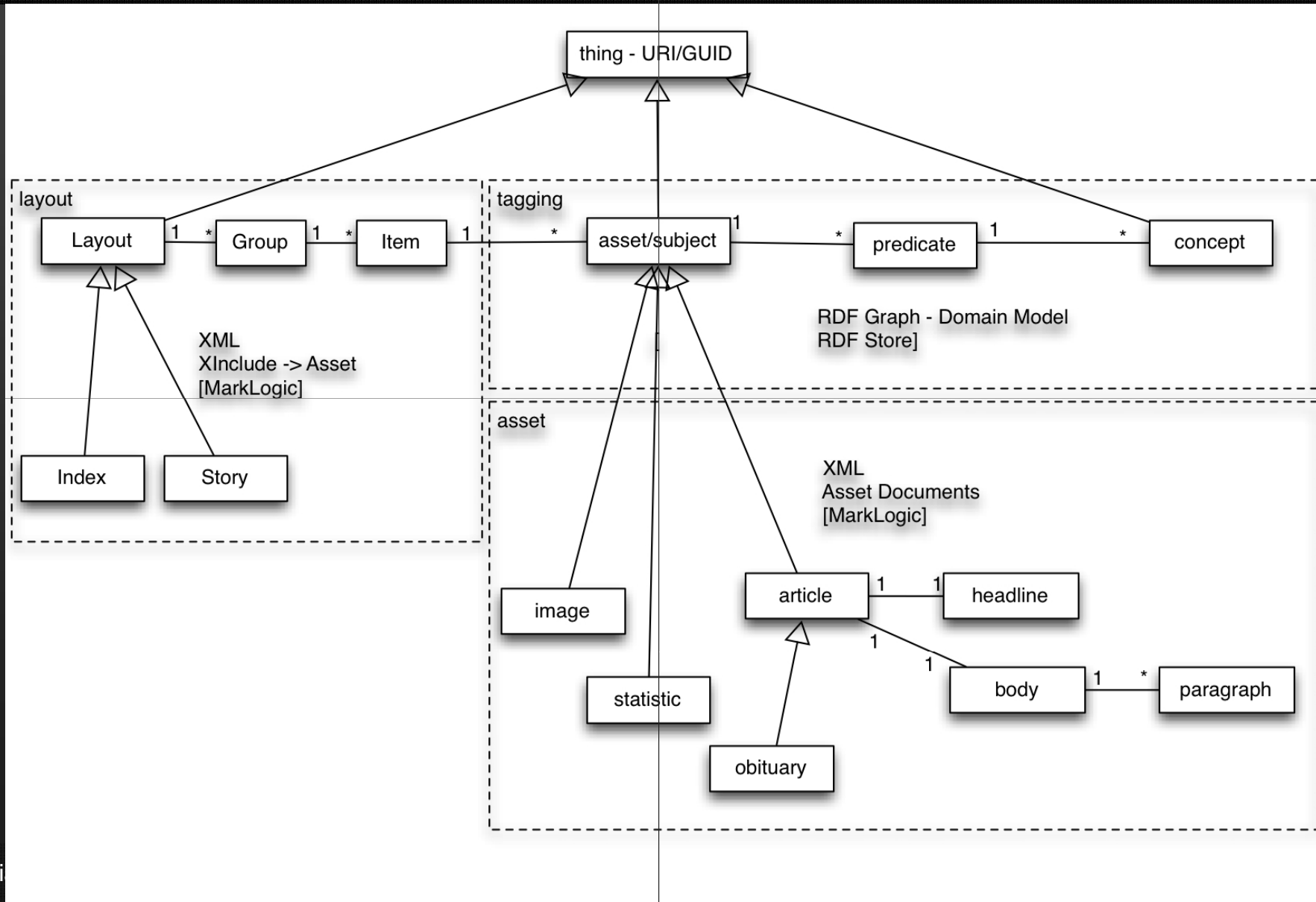
Dynamic assets + additional ontology models

- Geo/Business/Science/NewsEvent/Etc...

# Responsive Dynamic News mobile (iPad)



# New Content Model (Re-usable XML/RDF)





# Challenges

- High Query throughput many millions of SPARQL queries a day
- Continually changing asset instance data
- Periodic changes to domain instance data sport/news knowledge model
- Simple RDFS/OWL inference (forward chain)
- Read / Write ratio 95% / 5%
- No graph store capable of graph of document queries SPARQL+XQUERY with respect to BBC performance requirements. (Thus multiple data stores)

# Challenges

No benchmarks that cover

- Existing Benchmarks query mix not representative of BBC SPARQL (simple)
- Existing Benchmark data set and ingest rates not representative of BBC RDF/model
- No usable concurrent Read/Write benchmarks with associated inference (BBC use case)
- Existing benchmarks are normally Bulk load.
- Benchmark numbers very confusing as underlying topology, kit not standardized. Vendors create NASA clusters to run tests on comparison difficult.
- No benchmarks with complex cluster topologies (replication). Typical enterprise model

# Challenges

No benchmarks that cover

- Failure/maintenance scenarios
  - Cluster node failure
  - Backups etc..

# Challenges

BBC would like Benchmarks which provide transparent visibility of:

## – Ingest characteristics

- Materialization; different levels of forward/backward chained inference
- Model complexity; named graphs, simple->complex models
- Data complexity; sparse/rich with non-standard indices geospatial etc
- Concurrency; small->large concurrent data writers

## – Query characteristics

- Query complexity; simple->complex
- Backward chained; deduction
- Concurrency; small-> concurrent query clients
- Size/Form; Result size and multiple representations (content negotiation)



# What can the BBC provide

Datasets; RDF/OWL

- SPARQL; BBC SPARQL / SPARQL Update
- Usage scenario; Concurrency numbers etc.
- Topology + Enterprise scenarios; cluster, data center, network characteristics, etc

# Platform future.....

BBC news completely re-engineered to use semantic approach (News Mobile style)

- Geo aggregations

- News Events

- Business

- Science/Technology

- Etc..

Personalization

Open RDF / LOD + public SPARQL endpoint



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