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# The World Wide Web Virtual Library

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# The WWWVL : Experiences in Building the Semantic Web

Michael Chapman  
WWWVL Secretary

Paper presented to *TMRA 2006*  
Wednesday, October 11th 2006 — Leipzig

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*abstract:* The WWW Virtual Library is the oldest catalogue on the Web, having been created by Tim Berners-Lee when he invented the Web. The VL central catalogue now has a six-figure number of users each year seeking information contained in its 200+ individual VLs. In early 2005 the central catalogue was moved over to a topic map (with a marked increase in its effectiveness). Since then various experiments have taken place to allow deeper access to the data contained in the highly diverse and individual member VLs (a classic meta-indexing challenge). These experiments have initially centred on 'easy' PSI topics but are now moving to a broader indexation. Description of these is set against statistics of the resulting usages. With such a large, well-established, user-base the WWWVL is in a (possibly) unique position to experiment with applying topic maps to a real life situation on the Web and and to make its own contribution to building the semantic web of the future.

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4. Conclusions

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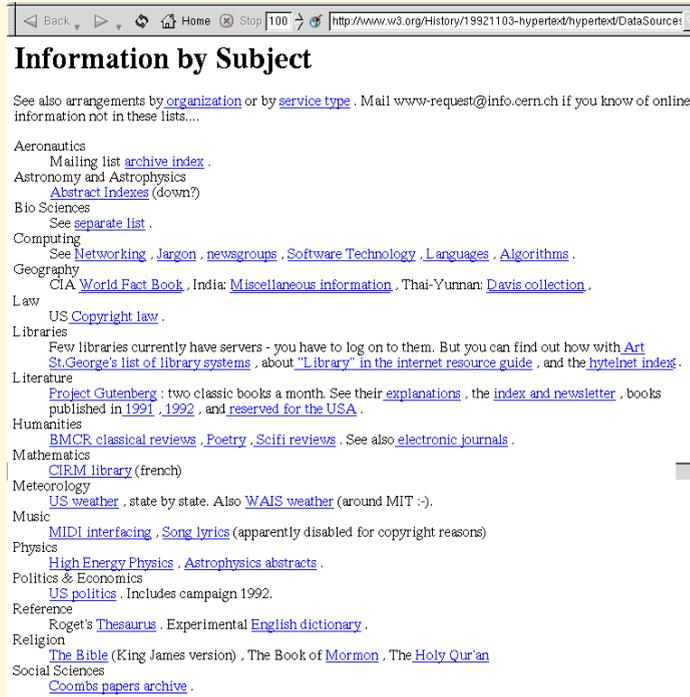
*Print*

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# 1. Introduction

## Overview.html



Information by Subject

See also arrangements by [organization](#) or by [service type](#) . Mail [www-request@info.cern.ch](mailto:www-request@info.cern.ch) if you know of online information not in these lists...

Aeronautics  
Mailing list [archive index](#) .

Astronomy and Astrophysics  
[Abstract Indexes](#) (down?)

Bio Sciences  
See [separate list](#) .

Computing  
See [Networking](#) , [Jargon](#) , [newsgroups](#) , [Software Technology](#) , [Languages](#) , [Algorithms](#) .

Geography  
CIA [World Fact Book](#) , India: [Miscellaneous information](#) , Thai-Yunnan: [Davis collection](#) .

Law  
US [Copyright law](#) .

Libraries  
Few libraries currently have servers - you have to log on to them. But you can find out how with [Art St. George's list of library systems](#) , about "[L library](#)" in the [internet resource guide](#) , and the [hytelnet index](#) .

Literature  
[Project Gutenberg](#) : two classic books a month. See their [explanations](#) , the [index and newsletter](#) , books published in [1991](#) , [1992](#) , and [reserved for the USA](#) .

Humanities  
[BMCR classical reviews](#) , [Poetry](#) , [Sci-fi reviews](#) . See also [electronic journals](#) .

Mathematics  
[CIRM library](#) (french)

Meteorology  
[US weather](#) , state by state. Also [WAIS weather](#) (around MIT :-).

Music  
[MIDI interfacing](#) , [Song lyrics](#) (apparently disabled for copyright reasons)

Physics  
[High Energy Physics](#) , [Astrophysics abstracts](#) .

Politics & Economics  
[US politics](#) . Includes campaign 1992.

Reference  
Roget's [Thesaurus](#) . Experimental [English dictionary](#) .

Religion  
[The Bible](#) (King James version) , The Book of [Mormon](#) , The [Holy Qur'an](#)

Social Sciences  
[Coombs papers archive](#) .



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November 3rd 1992:



The screenshot shows a web browser window with the following content:

- File Edit View Tab Settings Bookmarks Go Tools Help**
- Address bar: <http://www.w3.org/History/19921103-hypertext/hypertext/WWW/ThePr>
- # World Wide Web
- The WorldWideWeb (W3) is a wide-area [hypermedia](#) information retrieval initiative aiming to give universal access to a large universe of documents.
- Everything there is online about W3 is linked directly or indirectly to this document, including an [executive summary](#) of the project, [Mailing lists](#), [Policy](#), November's [W3 news](#), [Frequently Asked Questions](#).
- [What's out there?](#)  
Pointers to the world's online information, [subjects](#), [W3 servers](#), etc.
- [Help](#)  
on the browser you are using
- [Software Products](#)  
A list of W3 project components and their current state. (e.g. [Line Mode](#), X11 [Viola](#), [NeXTStep](#), [Servers](#), [Tools](#), [Mail robot](#), [Library](#))
- [Technical](#)  
Details of protocols, formats, program internals etc
- [Bibliography](#)  
Paper documentation on W3 and references.
- [People](#)  
A list of some people involved in the project.
- [History](#)  
A summary of the history of the project.
- [How can I help?](#)  
If you would like to support the web..
- [Getting code](#)
- Done.

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“... there would be the occasional ‘Hey, I’ve just set up a server, and it’s dead cool. Here’s the address.’

With each new message I would enter in info.cern.ch a hyper-text link to the new web site ...”

“In July and August 1991 there were from ten to one hundred ‘hits’ (pages viewed) a day.”

Tim Berners-Lee *Weaving the Web* (Harper Business ISBN 0-06-251587-X), pp. 47 & 49.



Back Home Stop 100 http://www.w3.org/History/19921103-hypertext/hypertext/DataSources/

## Information by Subject

See also arrangements by [organization](#) or by [service type](#) . Mail [www-request@info.cern.ch](mailto:www-request@info.cern.ch) if you know of online information not in these lists....

### Aeronautics

Mailing list [archive index](#) .

### Astronomy and Astrophysics

[Abstract Indexes](#) (down?)

### Bio Sciences

See [separate list](#) .

### Computing

See [Networking](#) , [Jargon](#) , [newsgroups](#) , [Software Technology](#) , [Languages](#) , [Algorithms](#) .

### Geography

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### Law

US [Copyright law](#) .

### Libraries

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### Humanities

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### Mathematics

[CIRM library](#) (french)

### Meteorology

[US weather](#) , state by state. Also [WAIS weather](#) (around MIT :-).

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[MIDI interfacing](#) , [Song lyrics](#) (apparently disabled for copyright reasons)

### Physics

[High Energy Physics](#) , [Astrophysics abstracts](#) .

### Politics & Economics

[US politics](#) . Includes campaign 1992.

### Reference

Roget's [Thesaurus](#) . Experimental [English dictionary](#) .

### Religion

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### Social Sciences

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August 1992: There are about 20 Web servers in existence.

Ciolek: Global Networking: a Timeline.

VL (with logo) first known screenshot 1993 . . . *next page* . . .

(by October 1993 — 200+ servers . . .)

Ciolek: Global Networking: a Timeline.

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WorldWideWeb	Links
Info	Mark all
Navigate	Mark selection
Document	Link to marked
Find	Link to New
Edit	Unlink
Links	Link to file...
Style	Help
Print...	
Page layout...	
Windows	
Services	
Hide	
Quit	

Tim's Home Page

## My home page

Atlas

The World-Wide Web Virtual Library: Subject Catalogue

### The WWW Virtual Library

High-Energy Physics Information

CERN Welcome



#### Experiments

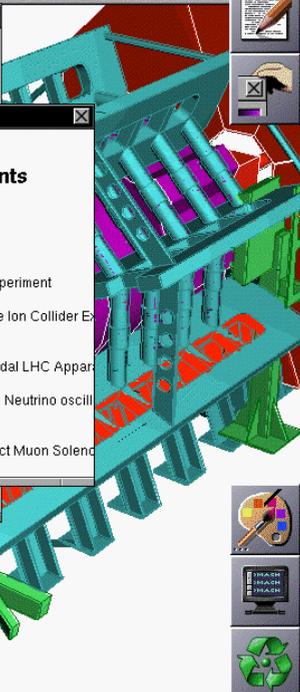
- [WWW Support for Experiments](#)
- [ALEPH](#) LEP experiment
- [ALICE](#) A Large Ion Collider Experiment at the LHC
- [ATLAS](#) A Toroidal LHC Apparatus
- [CHORUS](#) WA95 - Neutrino oscillation experiment at CERN
- [CMS](#) Compact Muon Solenoid

European Laboratory for Particle Physics

Geneva, Switzerland

About the Laboratory:

- [on CERN info](#)
- [General information, divisions, groups and activities, scientific committees](#)



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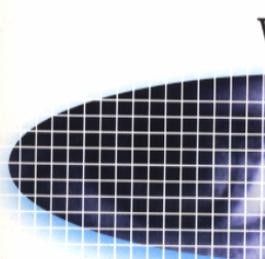
Close

Quit



# Weaving THE WEB

## THE ORIGINAL DESIGN AND ULTIMATE DESTINY OF THE



By now the Web consisted of a small number of servers, with info.cern.ch the most interconnected with the rest. It carried a list of servers, which to a degree could coordinate people who were putting information on the Web. When the list became larger, it needed to be organized, so I arranged it in two lists, by geography and by subject matter. As more servers arrived, it was exciting to see how the subjects filled out. Arthur Secret, another student, joined me for a time and set up the lists into what we called the Virtual Library, with a tree structure that allowed people to find things.

Foreword by MICHAEL DERTOUZOS, *Director of MIT Laboratory for Computer Science*

# TIM BERNERS-LEE

WITH MARK FISCHETTI

...ing global  
ndently with offers  
join Karen as a vis-  
itor at Xerox PARC.  
e both institutions  
me a much-needed  
States rather than  
than physics.  
ple like Larry and  
Web on more Inter-  
y the fact that the  
We trod a fine line  
ers within CERN at  
pursuing the goal of  
ed out for not stick-

g used much within  
or that matter—was  
) for anything other  
king, hypertext, and  
for the Web to grow,  
intosh, and Unix. At  
t for the X Window  
t I had no resources.  
ng that there was no

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The same concept from inception until now.

Like the Web itself, the VL is simple and logical.

Like the Web itself, it also has at its foundation the free distribution of free information.

*“It is futile to discuss whether the Index or the table of Contents is the more useful in a book.”*



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Back Home Stop 90 http://vlib.org/

The WWW Virtual Library : en · es · fr · zh



# The WWW Virtual Library

Quick search:

**Agriculture**  
Irrigation, Livestock, Poultry Science, ...

**The Arts**  
Art History, Classical Music, Theatre and Drama, ...

**Business and Economics**  
Finance, Marketing, Transportation, ...

**Communications and Media**  
Broadcasters, Publishers, Telecommunications, ...

**Computing and Computer Science**  
Artificial Intelligence, Cryptography, Logic Programming, ...

**Information and Libraries**  
Information Quality, Knowledge Management, Libraries, ...

**International Affairs**  
International Relations and Security, Sustainable Development, ...

**Law**  
Arbitration, Forensic Toxicology, Legal History, ...

**Natural Sciences and Mathematics**  
Biosciences, Earth Science, Medicine and Health, Physics, ...

**Recreation**  
Gardening, Recreation and Games, Sport, ...

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# Interfaces in various languages.



Browser address bar: <http://vlib.org/index.zh>

萬維網虛擬圖書館 : [en](#) · [es](#) · [fr](#) · [zh](#)



## 萬維網虛擬圖書館

快速搜索

<a href="#">人文学及人文研究</a>	<a href="#">法律</a>
<a href="#">商學與經濟學</a>	<a href="#">社會學</a>
<a href="#">國際時事</a>	<a href="#">社會行為學</a>
<a href="#">地域研究</a>	<a href="#">自然科學與數學</a>
<a href="#">娛樂休閒</a>	<a href="#">計算與電腦科學</a>
<a href="#">工程學</a>	<a href="#">資訊與圖書管理</a>

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Back Stop 100 http://vlib.org/AsianStudies

Asian Studies : en · es · fr · zh



## The WWW Virtual Library Asian Studies

Quick search:

<b>Asian Studies</b>	<a href="#">Asian Studies</a> Over 10 years of continuous service to the online community; Provision of expert information services, by the experts, for the experts. This research tool is produced by the Internet Publications Bureau, Research School of Pacific and Asian Studies at the Australian National University (ANU), Canberra. <b>this resource in English is indexed under:</b> Asian Studies.
<b>Asian Continent</b>	<a href="#">Asian Continent</a> This document keeps track of leading information facilities pertaining to the whole of the Asian continent. <b>this resource in English is indexed under:</b> Asian Studies.
<b>Asian Studies Electronic Mailing Lists</b>	<a href="#">Asian Studies Electronic Mailing Lists</a> Electronic mailing lists associated with the extensive Asian Studies Virtual Library network. <b>this resource in English is indexed under:</b> Asian Studies.

Done.

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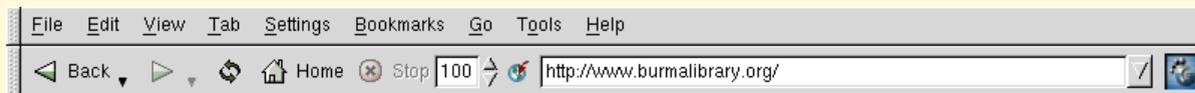
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The World-Wide Web Virtual Library

[\[Alphabetical\]](#) || [\[Category Subtree\]](#) || [\[WWW VL database\]](#) || [\[WWW VL Global Search\]](#)



ASIAN  
STUDIES  
WWW  
VIRTUAL  
LIBRARY

# Online Burma/Myanmar Library

*Classified and annotated links  
to more than 11,000 full text documents on Burma/Myanmar*

[Introduction](#) | [Structural Overview](#) | [What's New](#) | [Advanced Search](#) | [Feedback](#)

**Main Library** (by subject): Activism; Archeology; Aung San Suu Kyt; Children; Civil Society; Civil war; Dialogue/Transitio  
Drugs; Economy; Education; Environment; Ethnic and minority groups in Burma; Foreign Relations; Funding; Geography;  
Health; History; Human Rights; International Assistance to Burma; Internal Displacement; International Labour Organisation  
Labour Issues; Languages of Burma; Law; Migrants; Military (Tatmadaw); Palaeontology; Politics and Government; Refugee  
Social policies; Society and Culture; SPDC-related sites; Sustainability; The United Nations System; Tourism; Trafficking;  
Women.

**Reading Room** (by source): Bibliographies, universities, institutes, libraries, other research tools; Burma news (archive  
Burma news (breaking); Burma news (current); Burmese Community sites; Burmese-language news sources;

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## 1.0.1. VLsearch



Back Home Stop 120 http://vlsearch.org/VLsearch.ar?form=extended&qprev=

# VLsearch --- VL أبحاث

طريقة أبحاث

بسيطة

أبحاث علا

عدد النتائج ١٠ الكا

شكل الخروج

أجمع الكلمات

مساعدة لاتنصيبك الدور

حالات الكلمات

أبحاث علا

استعمل المترادفات

الكا

كلمة كاملة

أنواع الحجم

http://vlib.org,/topics/ , index.html : مثل

بجمع العناوين

أبحث

أكت كلمة أو كلمات والمس ر

الصفحة الرئيسية

معلومات "vlib" ناتجة بخطأها من

معلومات وقاعدة المعلومات

مكتبة الفرضية

معلومات

اخترا تاريخ الرجعة ١٩٩٩

WWW Virtual Library ©

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# World Health Organisation —simple search



## VLsearch

Search for:

[Advanced](#)

Search for **world health organisation**. Search results: **world : 1689, worldly : 85, worlders : 1, worlds : 370, world's : 0, health : 38362, heal : 176, healing : 271, healed : 61, healer : 52, healers : 45, heals : 7, organisation : 8697, organisations : 6102, organisation's : 0, organization : 18927, organizations : 15323, organization's : 0.** Results **1-10** of **179**. Search took **27.628** seconds

Sort by: **relevancy** | [last modified date](#) | [title](#)

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World Health Organisation:

simple search	179
“string”	10
without synonyms	113
“string” without synonyms	4

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WWWVL

## 2. Materials and Methods

- Webserver –as most– logs visits
- Pages visited are static HTML



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## 2.1. Webserver log

Logs: page visited, date/time of request, IP/domain of requester

Analyse using *awstats*<sup>1</sup>



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<sup>1</sup><http://awstats.sourceforge.net/>



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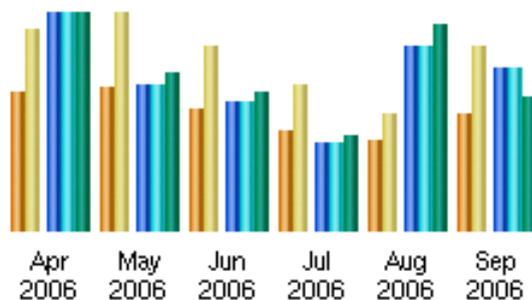
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## Monthly history



Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Apr 2006	2370	3443	19516	19516	50.42 MB
May 2006	2432	3703	13207	13207	36.50 MB
Jun 2006	2068	3145	11628	11628	32.15 MB
Jul 2006	1693	2495	7871	7871	21.99 MB
Aug 2006	1559	2013	16509	16509	48.06 MB
Sep 2006	1997	3160	14708	14708	31.02 MB



## Visitors domains/countries

	Domains/Countries		Pages
?	Unknown	ip	30662
	Network	net	20136
	China	cn	11014
	Australia	au	7134
	Commercial	com	5308
	Switzerland	ch	1670
	France	fr	1634
	Canada	ca	870
	Netherlands	nl	733
	Belgium	be	528
	Japan	jp	526
	Taiwan	tw	389
	United Kingdom	uk	370
	Germany	de	365
	Non-Profit Organizations	org	262
	Others		2965

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## Robots/Spiders visitors (Top 10) - [Full list](#) - [Last visit](#)

25 different robots\*

	Hits
Googlebot	312592
Inktomi Slurp	247505
MSNBot	182548
Unknown robot (identified by 'robot')	110439
Unknown robot (identified by 'spider')	17117
Unknown robot (identified by 'crawl')	8685
BaiDuSpider	7469
AskJeeves	6955
GigaBot	2786
ASpider (Associative Spider)	2299
Others	1689

\* Robots shown here gave hits or traffic "not viewed" by visitors, so they are not included in other charts.



## Search Keyphrases (Top 20)

[Full list](#)

3060 different keyphrases	Search	Percent
abbreviation pays	202	2.6 %
abréviation pays	158	2 %
country name abbreviation	134	1.7 %
abréviation	133	1.7 %
abreviation	122	1.5 %
regions of the world	112	1.4 %
国家名	65	0.8 %
	64	0.8 %
midp ?_?? filetype pdf	62	0.8 %
abbreviations etc	53	0.6 %
eec	52	0.6 %
縮寫	50	0.6 %
acronyme	46	0.5 %
abréviations pays	44	0.5 %
cee	40	0.5 %
european economic community	39	0.5 %
abréviation des pays	38	0.4 %
etc abbreviation	37	0.4 %
eu	32	0.4 %
abbreviation of words	31	0.4 %

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## 2.2. Pages

- Pages visited are static HTML
- using a CSS stylesheet
- They are created automatically from a Topic Map
- written in LTM<sup>2</sup>
- using simple bespoke PERL scripts

---

<sup>2</sup><http://www.ontopia.net/download/ltm.html>



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Benin : en · fr · zh

*Topic Maps*

**WWW Virtual Library --- Topics Database**

**Benin**

Quick search:

---

Capital city : [Porto-Novo](#)

Towns : [Porto-Novo](#)

broader categories

- [Africa](#)
- [The Francophonie](#)

---

This record is of type: [Countries](#), [States](#), [Jurisdictions](#), etc..

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The Francophonie : en · fr · zh



**WWW Virtual Library --- Topics Database**

**The Francophonie**

Quick search:

---

narrower categories

- [Albania](#)
- [Andorra](#)
- [Armenia](#)
- [Austria](#)
- [Belgium](#)
- [Benin](#)
- [Bulgaria](#)
- [Burkina Faso](#)
- [Burundi](#)
- [Cambodia](#)
- [Cameroon](#)
- [Canada](#)

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[Switzerland](#)  
[Togo](#)  
[Tunisia](#)  
[Vanuatu](#)  
[Vietnam](#)

---

[Organisation Internationale de la Francophonie](#) external link  
provides a definitive list of members, and other details of the Francophonie

Relevant VL member library:  
[Francophonie](#)

WWW Virtual Library **Arbitration Database**  
This subject is also covered in the [WWW Virtual Library Arbitration Database](#).

WWW Virtual Library **Law**  
This subject is also covered in the [WWW Virtual Library Law](#).

Note  
All 'members' are listed here. That is the forty-nine full members, the four "états associés" (Albania, Andorra, Greece and Macedonia) and the ten "états observateurs" (Armenia, Austria, Croatia, the Czech Republic, Georgia, Hungary, Lithuania, Poland, Slovakia and Slovenia).

---

This record is of type: [Regions of the World](#).

---

Main Page

Done.



## WWW Virtual Library --- Francophonie

Catégorie supérieure : [WWW Virtual Library --- International Affairs](#)

### francophonie et Francophonie

La francophonie désigne la communauté composée des personnes qui ont en commun l'usage de la langue française. Avec un F majuscule, elle désigne la Francophonie institutionnelle, dont le principal acteur est l'Organisation internationale de la Francophonie.

A la base d'un travail de Doctorat sur le thème de « La géopolitique des aires linguistiques : le cas de la Francophonie institutionnelle », ce site vise à répertorier un certain nombre de sites internet touchant au thème de la francophonie.

La liste non exhaustive sera complétée au fil des recherches.

Done.

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## 3. The three phases

### 3.1. Phase I

- A hierarchical catalogue of the two hundred or so member libraries was moved from hand-written webpages to a topic map.
- Hierarchical webpages are then built and published automatically each night, from that topic map.



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At the same time:

- Each VL was indexed under as many relevant category names as logical. (Thus *Admiralty and Maritime Law* is indexed under *Law*, *Transportation* and *Water*.)
- A description was added to each entry. Typically of some fifty words.
- Some, at first sight, perhaps bizarre cross-categories were created. These included topics such as *Sound*, *Light* and *Water*. These allow users to 'think outside the box': arts-based Music and the scientific vibration engineering now occur on the same page, as do *Admiralty and Maritime Law* and *Oceanography*.



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Simultaneously, the catalogue was offered in various other languages. Initially French, then Spanish and basic Chinese. The language choice is automatic relying on a procedure known as 'content negotiation': the user of the web browser states language preferences when setting up the browser and these are relayed with each webpage request.

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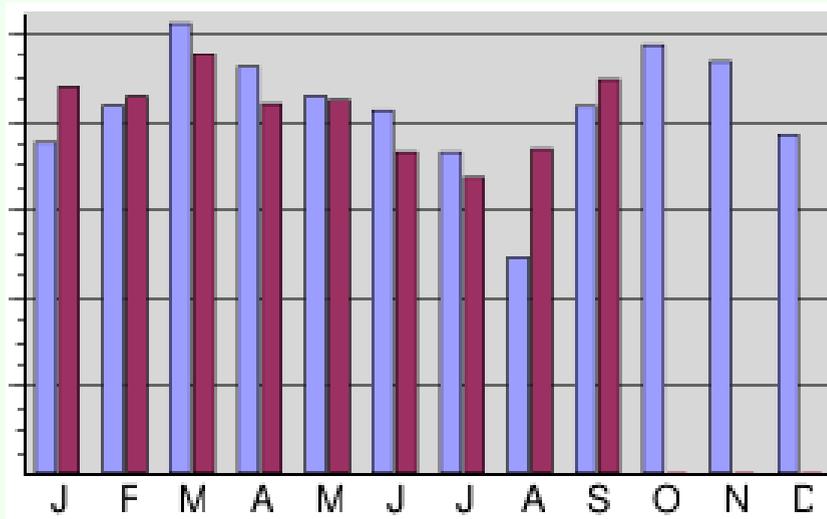
*Print*

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## Results:

The effect on visitors to the catalogue was neutral. (An increase of 1.9% in visits.)



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The anecdotal effect on member libraries was highly positive. Many maintainers emailed to not only compliment the better aesthetic quality of the new catalogue, but also to report they were receiving more users accessing their individual VLs.

Three example libraries' number of visits were analysed. VLs 'A' and 'C' were complex multi-page VLs, whilst 'B' was a classic one-page links catalogue. All were mature sites (four years and more on the Web) though 'B' had only been entered in the WWWL catalogue at the turn of 2004/5.

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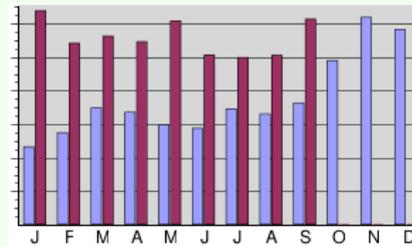
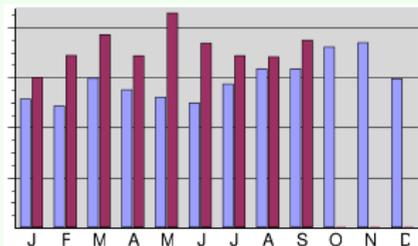
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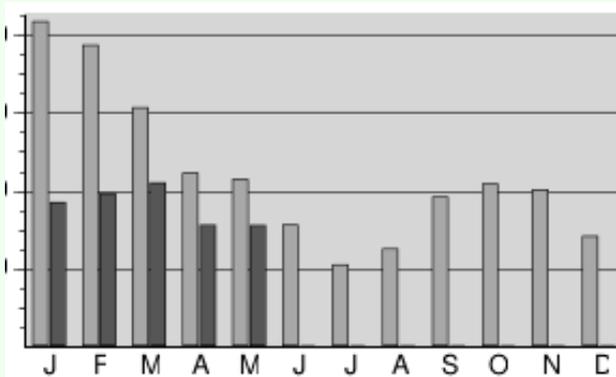


**A and B:** Increases of 29% and 78% on average for the first nine months of 2006.



Only one VL reported a decline in visitors. This was a dramatic fall, and the possible reasons for it are discussed below (*Unforeseen results*).

**Library C:** In this case 'pages visited' (rather than 'visits'). The decline year on year for the first five months is 42%, though largely accounted for by January and February.



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### 3.2. Phase II

In May 2005 [actually I await access to archive.org, to check on this!] a very simple topic map of World geography was created. This listed the countries of the World. It also had their capital cities and a few other towns (a data set carried over from another project). It grouped countries in continents, other groupings (e.g. the Francophonie) were added later.



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Visitors viewed more pages per visit, and re-visited more often within the same calendar month:

	catalogue	topics
pages viewed per visit	2.7	4.6
visits per visitor/month	1.33	1.47

Data for first nine months of 2006.

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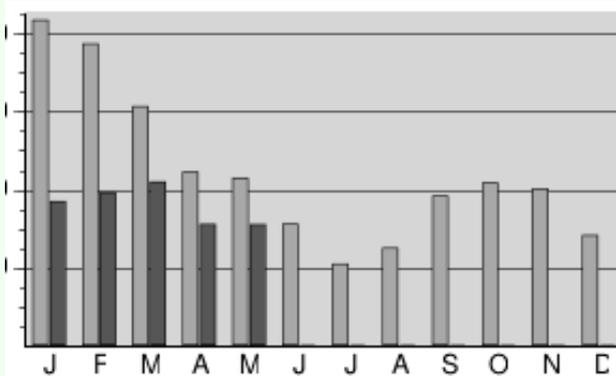
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## Unforeseen results:

Library C



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### 3.2.1. Phase III

From Spring 2006 the basic geographical topic map was expanded.



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Even after excluding robots (about half of all ‘hits’), there was not only broad use of all pages, but most pages at one time were either a point of ‘entry’ or ‘exit to the site.

	entry	exit
total	92.1	93.2
English en	95.8	97.0
French fr	85.2	85.9
Chinese zh	95.4	96.6

Percentage of total possible URLs that were reported as ‘entry’ or ‘exit’ pages (that is as the first or last page of an entire visit).

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	'index'	internal
total	4180	8587
English en	4133	2500
French fr	31	3227
Chinese zh	16	2860

Visits to `index.en.html` or just  `'/'`, (left hand column), visits to the site's main page(s) from internal links (right hand column).

This contrasts markedly with `vlsearch.org` where over 9% of visits request a non-`*.en.*` page.

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The most popular pages were those listing regions, countries, towns, abbreviations (generally and for country names) and dealing with the United States and Canada.

Popularity was almost independent of page language.

The most popular ten pages received 3057–8656 hits each, the most popular one hundred 1469–8656, and the most popular one thousand 838–8656 hits (including robots). Whilst some of this might be accounted for by out-of-control robots, the pages receiving high scores were also those matching search engine search criteria in the referral logs.

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## 4. Conclusions

A rich set of data has only just started to be analysed.

Even with, as yet, only very limited outlinking to member VLS the pages have drawn users, who have explored them (visiting a relatively high number of pages per visit) and have in about half the cases chosen to return within a month.

Analysis of actual paths through the topics would yield further insights into how Web users move through such a topic map.

In the coming months the range of topics mapped will move beyond the basic (largely geographical) core.



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It is intended to link deeper into member VLs (rather than predominantly just to main entry pages).

1. *Of great importance* is the need for an easy system to *query* the underlying topic map(s). The web directories produced from topic maps definitely have marked advantages over their predecessors and other alternatives. However to use conventional searching of these static pages, rather than querying the actual TM loses a great opportunity.
2. *Of greatest importance* topics must cease to be isolated. Topics must have PSIs. Fundamental decisions will have to be made about how to use PSIs (and how far to diverge from mono- or bi-lingual PSIs in an attempt to maintain multi-lingual usage). Those decisions will in great effect be based on the discussions that take place during this week.

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3. Examples of real world usages of topic maps will do much to raise their profile, and undoubtedly free-of-charge software will help in creating and enabling viewing such examples. However, my personal view, is that to engender wider *confidence* in topic maps there is a need for some basic<sup>3</sup> **open source** tools.<sup>4</sup>

---

<sup>3</sup>comparable perhaps with the Lynx browser rather than Firefox!

<sup>4</sup>This final comment resulted from discussions at the *Wrap Up* session on the final day of the conference, rather than in this presentation, but is recorded here for completeness.



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