

2016 Turing Award



2016 Turing Award

Tim Berners-Lee

Um prêmio Turing que todos podem entender

Geraldo Xexéo

O que é o prêmio Turing

- Prêmio anual da Association for Computing Machinery
- “The ACM A.M. Turing Award is given annually for major contributions of lasting importance to computing, and includes a \$1 million prize funded by Google. “
- Premiados selecionados (quase aleatoriamente)
 - 1966 – Alan Perlis
 - 1971 – John McCarthy
 - 1972 – Edsger W. Dijkstra
 - 1974 – Donald E. Knuth
 - 1980 – Tony Hoare
 - 1981 – Edgar F. Coad
 - 1991 – Robin Milner
 - 1999 – Frederick P. Brooks, Jr.
 - 2008 – Barbara Liskov





2016 Turing Award

- “Berners-Lee was cited for inventing the World Wide Web, the first web browser, and the fundamental protocols and algorithms allowing the Web to scale. Considered one of the most influential computing innovations in history, the World Wide Web is the primary tool used by billions of people every day to communicate, access information, engage in commerce, and perform many other important activities.”

Entendendo a Premiação

- Tim criou praticamente sozinho todo o conjunto de tecnologias necessárias para a realização do WWW
 - Alguma ajuda na programação sob sua supervisão no CERN
- A ideia original é sua, e a defesa original da ideia também
- Depois liderou o consórcio que alavancou o WWW no mundo
- Na divulgação da ideia, principalmente dentro do CERN e nos primeiros anos, foi apoiado por Robert Caillaux, belga, físico e membro do CERN

WWW =
Hipertexto +
Internet

Hypertext - Turing Prize 1997

- DOUGLAS ENGELBART
- For an inspiring vision of the future of interactive computing and the invention of key technologies to help realize this vision.
- Douglas Engelbart
 - NLS 1962 – The Mother of All Demos



Internet - Turing Prize 2004

- VINTON (“VINT”) GRAY
CERF



- ROBERT (“BOB”) ELLIOT
KAHN



for pioneering work on internetworking,
including the design and implementation
of the Internet's basic communications
protocols, TCP/IP, and for inspired
leadership in networking.

Antes do WWW

Como chegamos lá

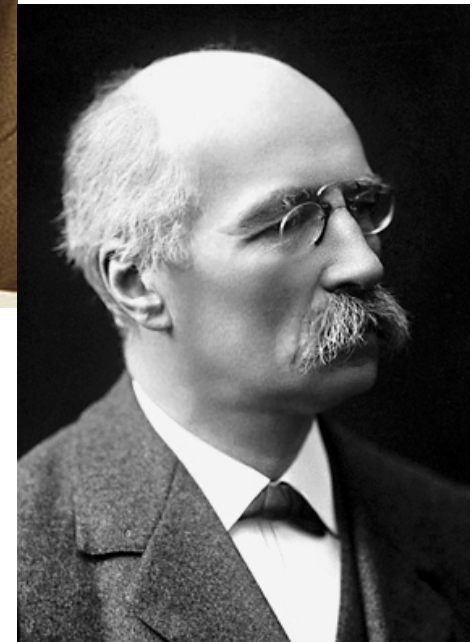
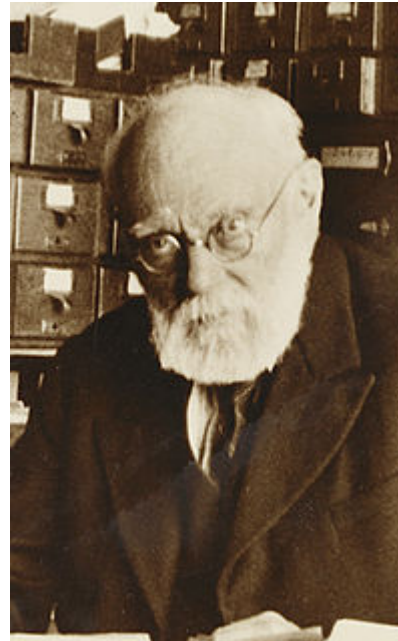
Wilhelm Ostwald

- Prêmio Nobel de Química - 1909
- Die Bruecke – A Ponte
 - Fechou em 2013
- Universal Decimal Classification,
- Cérebro Mundial



Paul Otlet & Henri La Fointaine

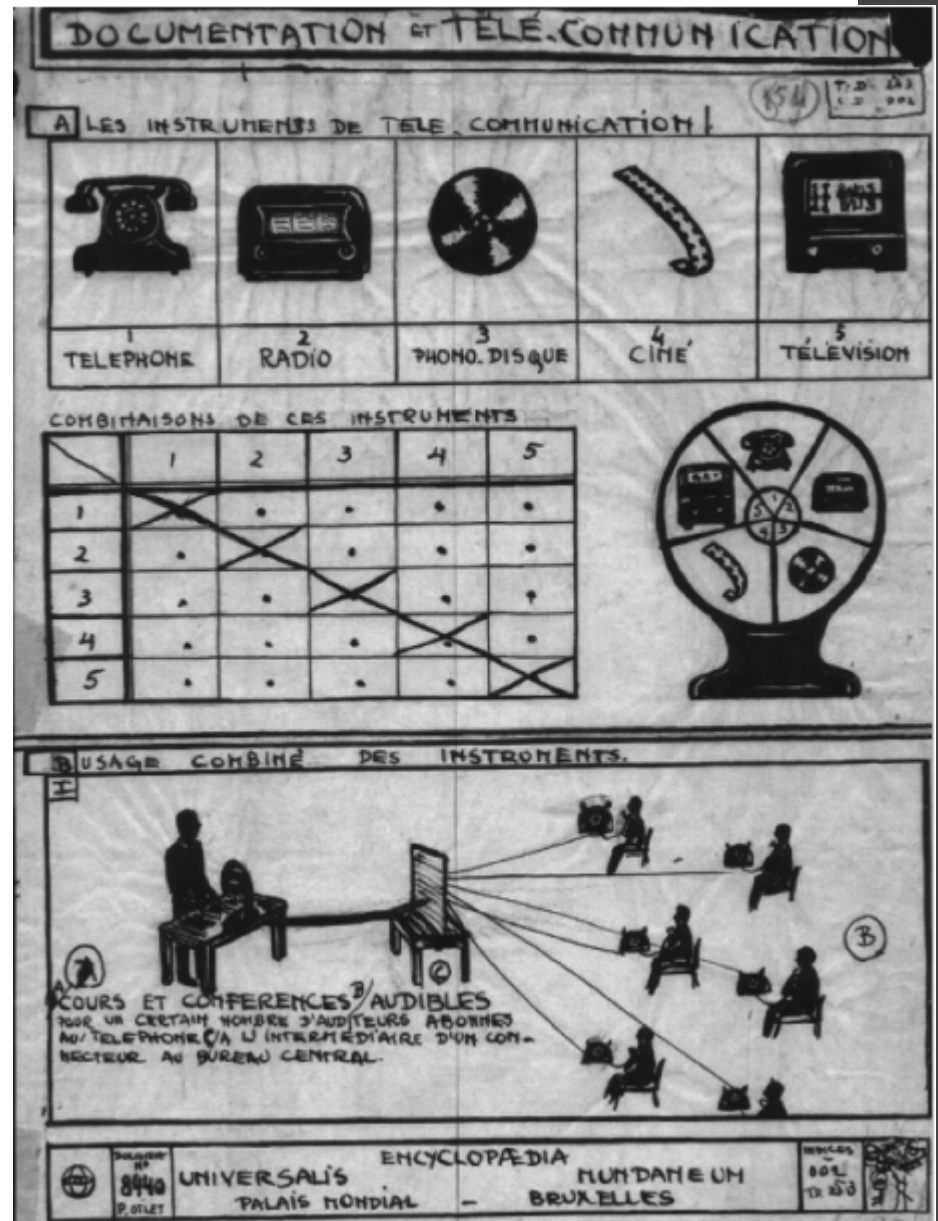
- Como tornar disponível TODO o conhecimento existente
- Union of International Associations
- Paul Otlet - Traité de documentation
- Henri La Fointaine – Nobel da Paz de 1913



https://en.wikipedia.org/wiki/Henri_La_Fontaine
<http://www.mundaneum.org/>
https://en.wikipedia.org/wiki/Paul_Otlet
<http://people.ischool.berkeley.edu/~buckland/otlet.html>

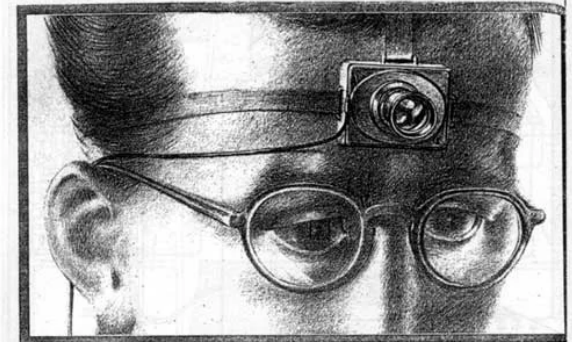
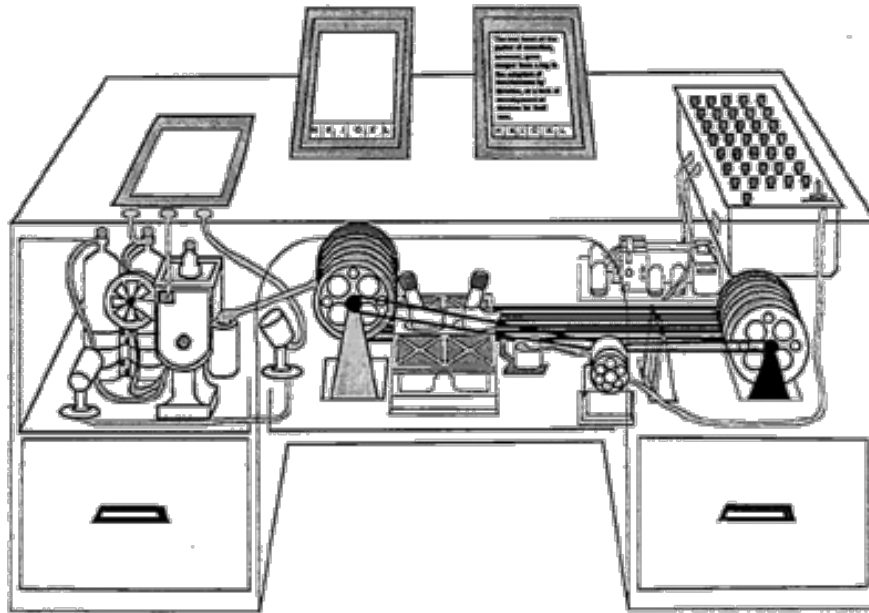
Paul Otlet

- Everything in the universe, and everything of man, would be registered at a distance as it was produced.
- In this way a moving image of the world will be established, a true mirror of his memory.
- From a distance, everyone will be able to read text, enlarged and limited to the desired subject, projected on an individual screen. In this way, everyone from his armchair will be able to contemplate the whole of creation, in whole or in certain parts.



Vannevar Bush

- *As We May Think*
- *Memex*



A SKETCH OF THE FUTURE RECORDS EXPERIMENT WITH A TEST CAMERA FITTED WITH UNIVERSAL-FOCUS LENS. THE IMAGE FORMED IN THE EYEGLASS AT THE LEFT SHOWS THE SKY

AS WE MAY THINK

A TOP U.S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD IN WHICH MAN-MADE MACHINES WILL START TO THINK

by VANNEVAR BUSH

DIRECTOR OF THE OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT
Condensed from the Atlantic Monthly, July 1945

THIS has not been a scientists' war; it has been a war in which all have had a part. The scientists, hating their old professional competition in the demand of a common cause, have shared greatly and learned much. It has been exhilarating to work in effective partnership. What are the scientists to do now?

For the biologist, and particularly for the medical scientists, there can be little indication, for their war work has hardly required them to leave the old paths. Many indeed have been able to carry on their war research in their familiar prewar laboratories. Their objectives remain much the same.

It is the physicist who have been thrown most violently off stride, who have left academic pursuits for the making of strange destructive gadgets, who have had to devise new methods for their unanticipated assignments. They have done their part on the device that made it possible to run back the enemy. They have worked in combined effort with the physicists of one ally. They have felt within themselves the stir of achievement. They have been part of a great team. Now one asks when they will find objectives worthy of their lust.

There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization retards. The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial.

Professionally our methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate for their purpose. If the aggregate time spent in writing scholarly works and in reading them could be evaluated, the ratio between these amounts of time will be startling. Those who conscientiously attempt to keep abreast of recent thought, even in restricted fields, by close and continuous reading will shy away from an examination calculated to show how much of the present month's efforts could be profited on call.

Mendel's concept of the laws of genetics was lost to the world for a generation because his publications did not reach the few who were capable of grasping and extending it. This sort of catastrophe is undoubtedly repeated all about us as truly significant statements become lost in the mass of the inconsequential.

Publication has been extended far beyond our present ability to make use of the record. The summation of human experience is being expanded a prodigious rate, and the means we use for threading this is the most queer state in the numerically important time in the same it was used the days of square-rigged ships.

But there are signs of a change as new and powerful instruments come into use. Photocopy capable of saving things in a physical state, x-rayed photography which can record what is seen or even what is felt, thermocouples capable of controlling point forces under the guidance

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「LIFE」 1945年9月10日号に特集された「AS WE MAY THINK」のページ

「LIFE」 1945年9月10日号より引用

「AS WE MAY THINK」 From the Atlantic Monthly, July 1945

J.C.R. Licklider

- Man-Computer Symbiosis
- The Intergalactic network
- The Computer as a Communication Device



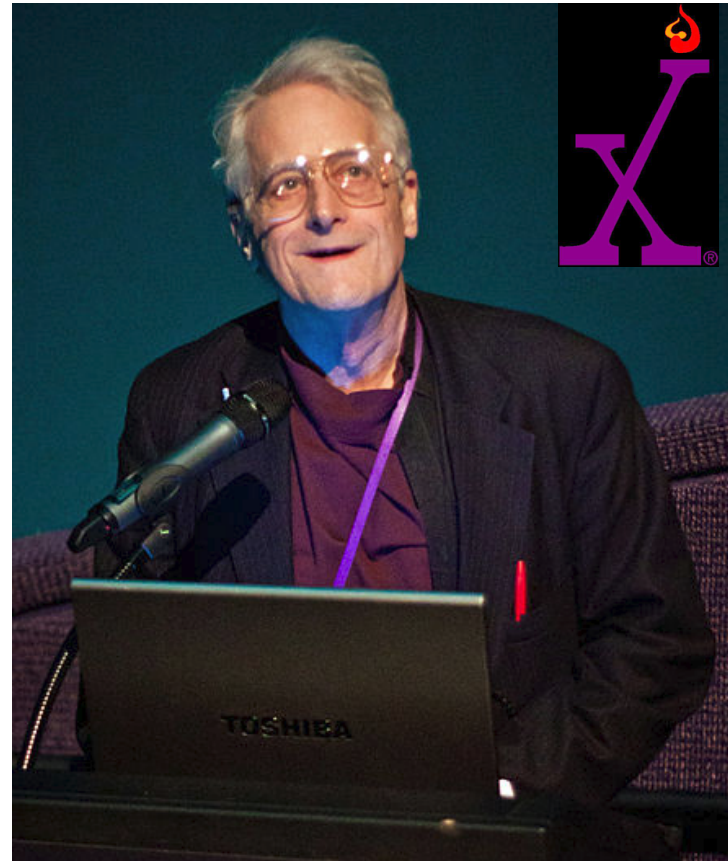
Douglas Engelbart

- Augmenting Human Intellect: A Conceptual Framework
- Augmentation Research Center, SRI International
 - Mouse
 - Monitores bitmapped
 - Hipertexto
 - Redes de Computadores
 - Interfaces Gráficas
 - Ferramentas Colaborativas
- The Mother of All Demos - 1968

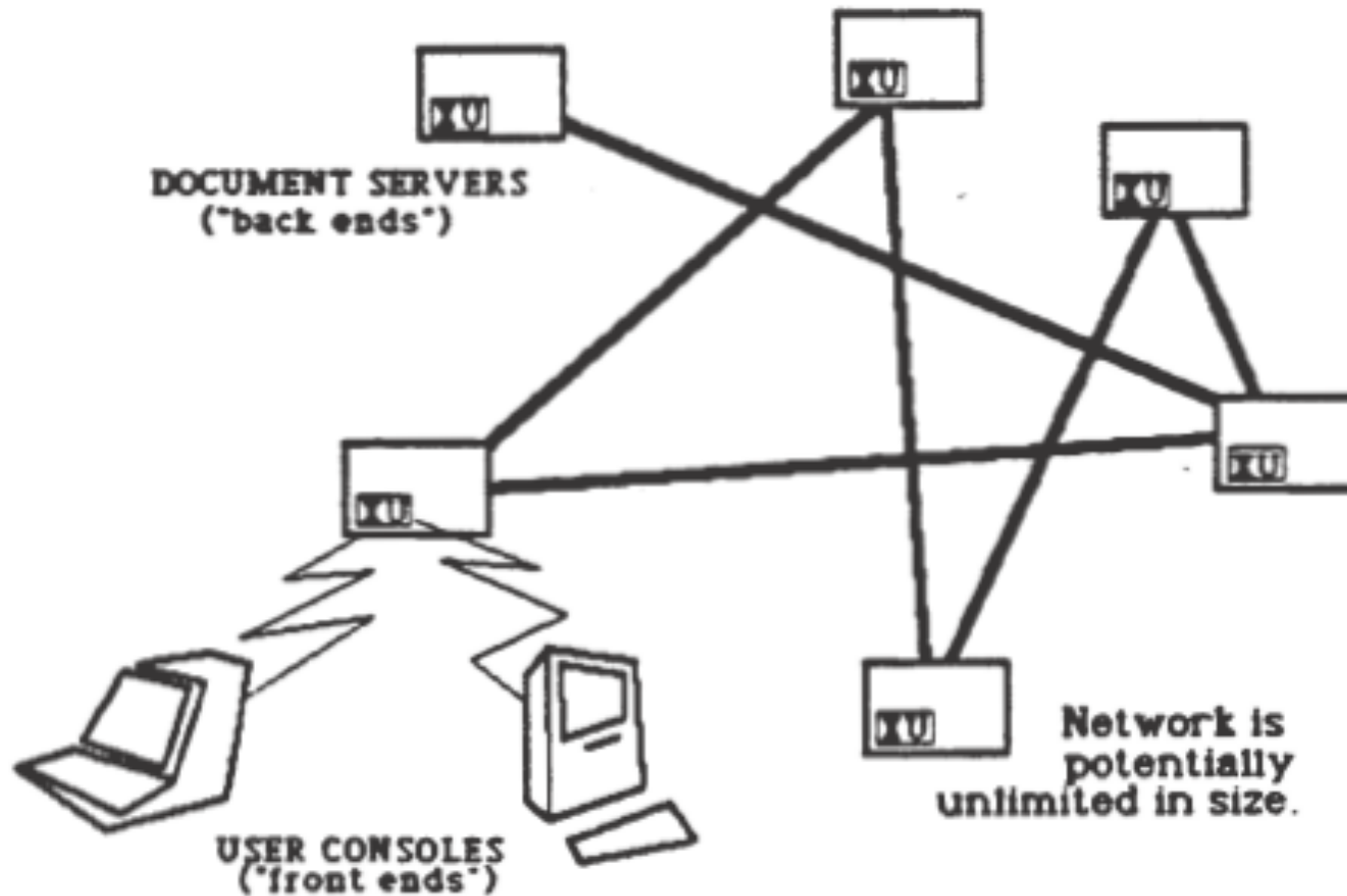


Ted Nelson

- Literaly Machines
- Projeto Xanadu 1963
- Grande divulgador e inspirador do hipertexto
 - Criador do termo
- Links bi-direcionais
- Micro transações
- (1987)
 - *“Forty years from now (if the human species survives), there will be hundreds of thousands of file servers – machines storing and dishing out materials. And there will be hundreds of millions of simultaneous users, able to read from billions of stored documents, with trillions of links among them.”*



A SINGLE PROGRAM, RUNNING THROUGHOUT A NETWORK



Quem é TimBL?

Tim Berners-Lee

- Sir Timothy John Berners-Lee
- Nascido em 9/6/1955
- Bacharel em Física (1976)
- Sempre trabalhou com software
 - Type setting para impressoras matriciais
 - ENQUIRE
 - Software de hipertexto fechado, para uma máquina, onde guardava as informações de seu projeto
 - RPC

ENQUIRE WITHIN

UPON

EVERYTHING

"Whether you wish to model a flower in wax; to study the rules of etiquette; to serve a relish for breakfast or supper; to supply a delicious entrée for the dinner table; to plan a dinner for a large party or a small one; to cure a headache; to make a will; to get married; to bury a relative; whatever you may wish to do, make, or to enjoy, provided your desire has relation to the necessities of domestic life, I shall be happy to assist you, and therefore hope you will not fail to 'Enquire Within.'"—*Editor*.

ENQUIRERS ARE REFERRED TO THE INDEX

TWO HUNDRED AND SEVENTY-SEVENTH THOUSAND

LONDON
HOULSTON AND WRIGHT
65, PATERNOSTER ROW
MDCCLXV.

268. b. 3.

Digitized by Google

Enquire (1ª passagem no CERN)

- Textos são nós
- Precisam ser criados a partir de outro nó
- Única máquina (sem rede)
- Código perdido
 - Deixou um disquete ...

In Enquire, I could type in a page of information about a person, a device, or a program. Each page was a "node" in the program, a little like an index card. The only way to create a new node was to make a link from an old node. The links from and to a node would show up as a numbered list at the bottom of each page, much like the list of references at the end of an academic paper. The only way of finding information was browsing from the start page.



Tim Berners-Lee na década de 90

A ideia que cresceu lentamente (2ª vez no CERN)

- I just had to take the hypertext idea and connect it to the Transmission Control Protocol and domain name system ideas and—ta-da!—the World Wide Web ...
- Creating the web was really an act of desperation, because the situation without it was very difficult when I was working at CERN later.
- Most of the technology involved in the web, like the hypertext, like the Internet, multifont text objects, had all been designed already.
- I just had to put them together.
- It was a step of generalising, going to a higher level of abstraction, thinking about all the documentation systems out there as being possibly part of a larger imaginary documentation system.

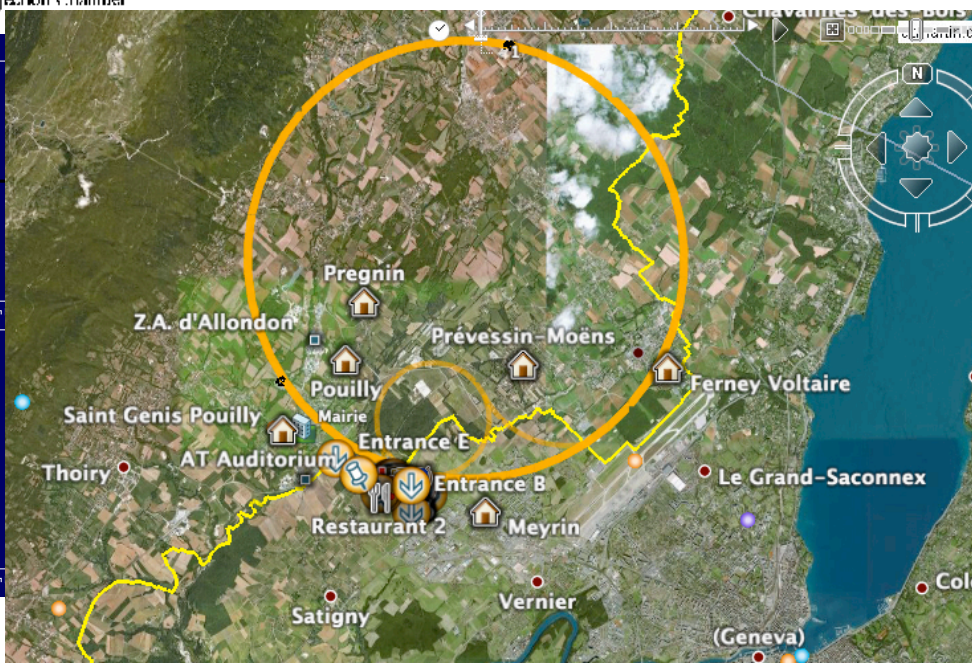
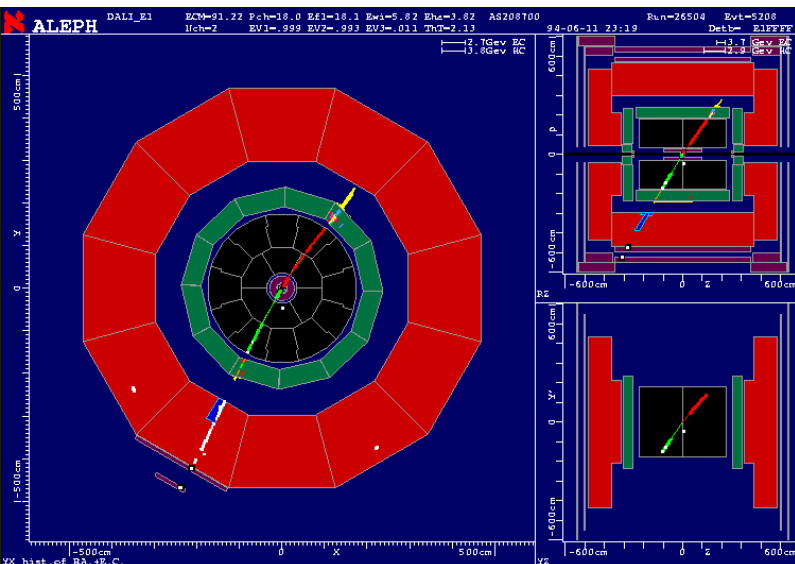
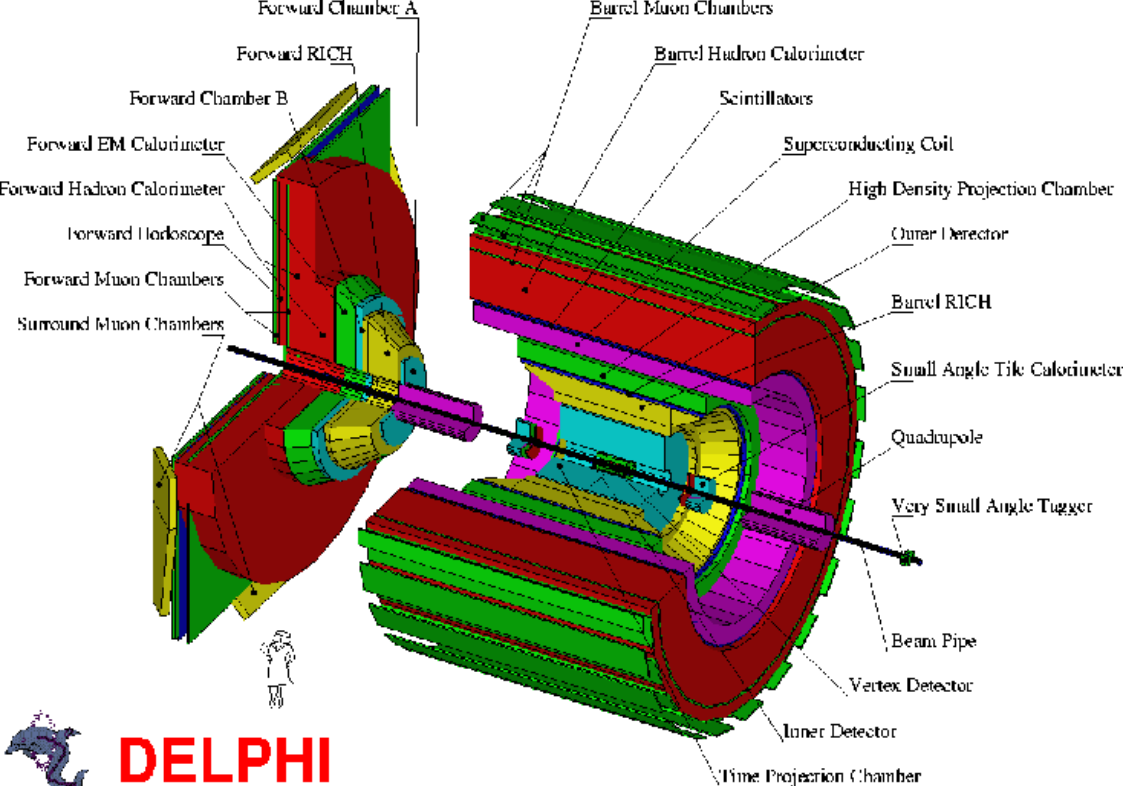
Hipertexto segundo TimBL

- 1945 : Vannevar Bush (Science Advisor to president Roosevelt during WW2) proposes Memex.
- 1965 : Ted Nelson coins the word "Hypertext"
- 1967 : Andy van Dam et al build the Hypertext Editing System and FRESS
- 1968 : Doug Engelbart demos NLS system at FJCC
- 1975 : ZOG (now KMS) at CMU.
- 1978 : Aspen Movie Map, first hypermedia videodisc, MIT.
- 1984 : Filevision from Telos: hypermedia database for Macintosh
- 1985 : Symbolics Document Examiner, Janet Walker.
- 1985 : InterMedia, Brown University, N. Meyrowitz
- 1986 : OWL introduces Guide, first widely available hypertext
- 1987 : Apple introduces Hypercard, B. Atkinson.
- 1987 : Hypertext'87 Workshop
- 1990 : ECHT (European Conference on HyperText)

CERN



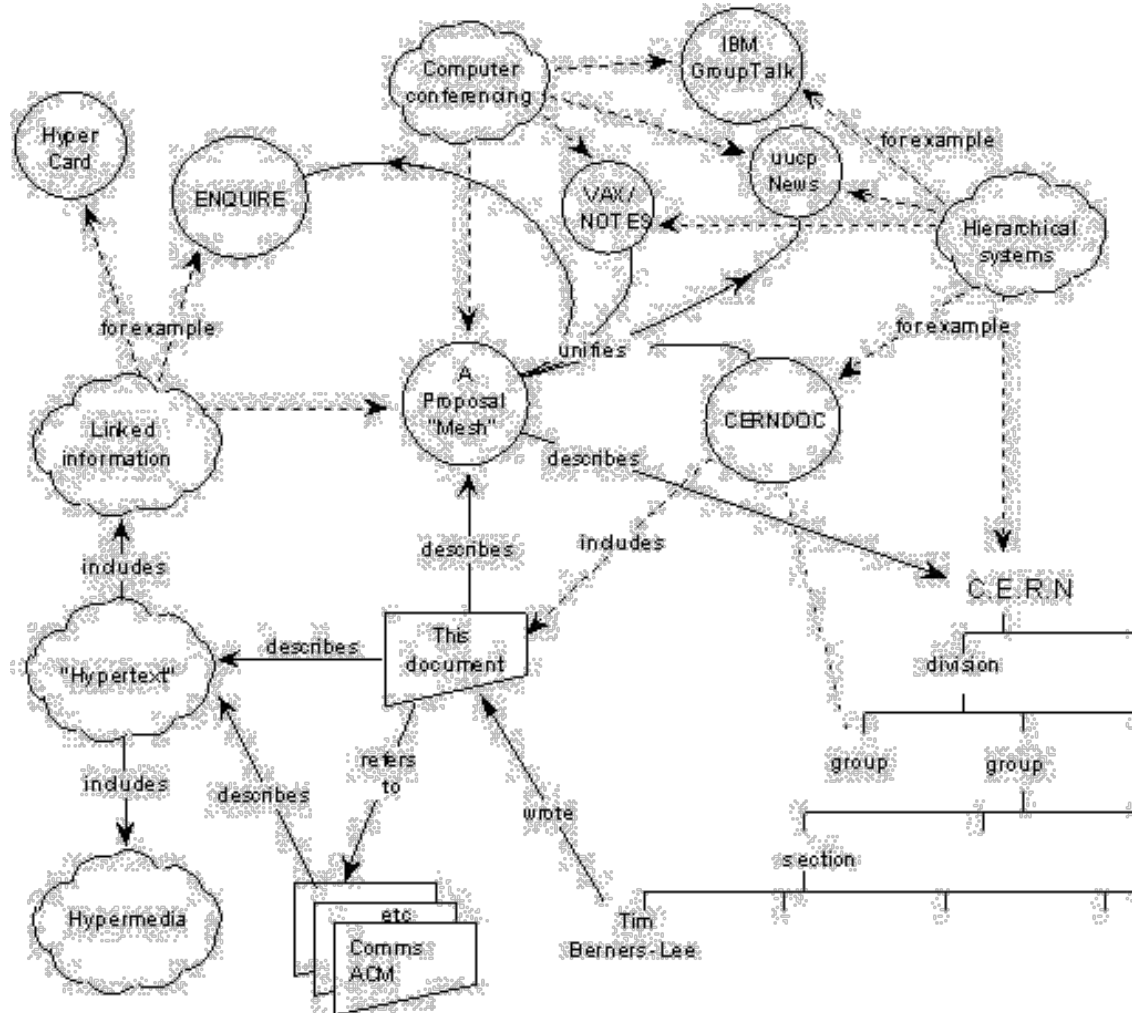
ALEPH
L3
LEP
OPAL



CERN: European Organization for Nuclear Research

- Fazer partículas sub atômica colidirem em busca de comprovar, repudiar ou descobrir novas partículas
 - Higgs Boson
 - Weak Neutral Currents
 - Bosons W e Z
 - Light Neutrinos
 - Antimatéria
 - Charge Parity Violation
- E o WWW?
- O CERN tem uma história de criação de tecnologias de apoio
 - Georges Charpak, 1992 Nobel, Câmara Proporcional Multifios

Uma proposta (feita 2 x)



Os primeiros dias do WWW

- Março 89 – Primeira proposta
- Outubro 89 – Segunda proposta (com Robert Caillaux)
- Novembro 90 – Primeiro protótipo no NeXT
 - Nicola Pellow Browser de texto
- Natal 90 – Browser de texto e NeXTStep demonstráveis
- Fevereiro 91 – Plano de Trabalho para ECP
- Março 91 – Browser de texto lançado para audiência limitada
- Maio 91 – Lançamento do WWW no CERN
- Agosto 91 – Arquivos distribuídos na internet
- Outubro 91 – Gateway para VMS/HELP e WAIS
 - WWW anunciado para a comunidade HEP
- Julho 92 – Distribuição do WWW na CERNLib

O “truque” do NeXT



Um Sistema de Documentação

- Sem imposições aos usuários
- Os usuários não deveriam ter que reorganizar seus documentos para atender o sistema
- Poucas (ou nenhuma) regras que fossem aceitas por todos
- Links externos para documentos fora do sistema
- Hipertexto que pudesse apontar para tudo
- Interconexões como fez com RPC
- Descentralizado
 - Sem autorização para entrar nele
 - Sem link central – mais fácil de escalar
- Internet?

WWW

As contribuições

HTTP

- Um protocolo de comunicação
- Baseado nos outros padrões do TCP/IP

- 3 comandos

- GET
- POST
- HEAD

```
GET /documentation/apache/ HTTP/1.0<crlf>
Connection: Keep-Alive<crlf>
User-Agent: Mozilla/4.01 [en] (Win95; I)<crlf>
Host: hal.etc.com.au<crlf>
Accept: image/gif, image/x-xbitmap, image/jpeg, image/
pjpeg, */*<crlf>
Accept-Language: en<crlf>
Accept-Charset: iso-8859-1,*,utf-8<crlf>
<crlf>
```

```
HTTP/1.1 200 OK<crlf>
Date: Mon, 19 Jan 1998 03:52:49 GMT<crlf>
Server: Apache/1.2.4<crlf>
Last-Modified: Wed, 08 Oct 1997 04:15:24 GMT<crlf>
ETag: "2ce0b-89f-343b08dc"<crlf>
Content-Length: 2207<crlf>
Accept-Ranges: bytes<crlf>
Keep-Alive: timeout=15, max=100<crlf>
Connection: Keep-Alive<crlf>
Content-Type: text/html<crlf>
<crlf>
[ 2207 byte HTML document deleted ]
```

HTML

- Uma linguagem de marcação
- O comportamento junto com o texto

- Comportamento em um nível abstrato

- Baseada em SGML
 - Abordagem prática e política
 - Muito mais simples

- Devia usar editor

- Só um tipo de link
 - unidirecional

```
<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
</head>
<body>

<h1>This is a Heading</h1>
<p>This is a paragraph.</p>

</body>
</html>
```

URIs (URNs e URLs)

- Uma forma de identificação única de recursos
- U de Universal
 - Arrogância!
- Uniform Resource
 - Name
 - Locator
 - Identifier
- URI podem ser URL e URNs
- URN identificam identidade
- URL identifica localização
- <http://www.cos.ufrj.br/>

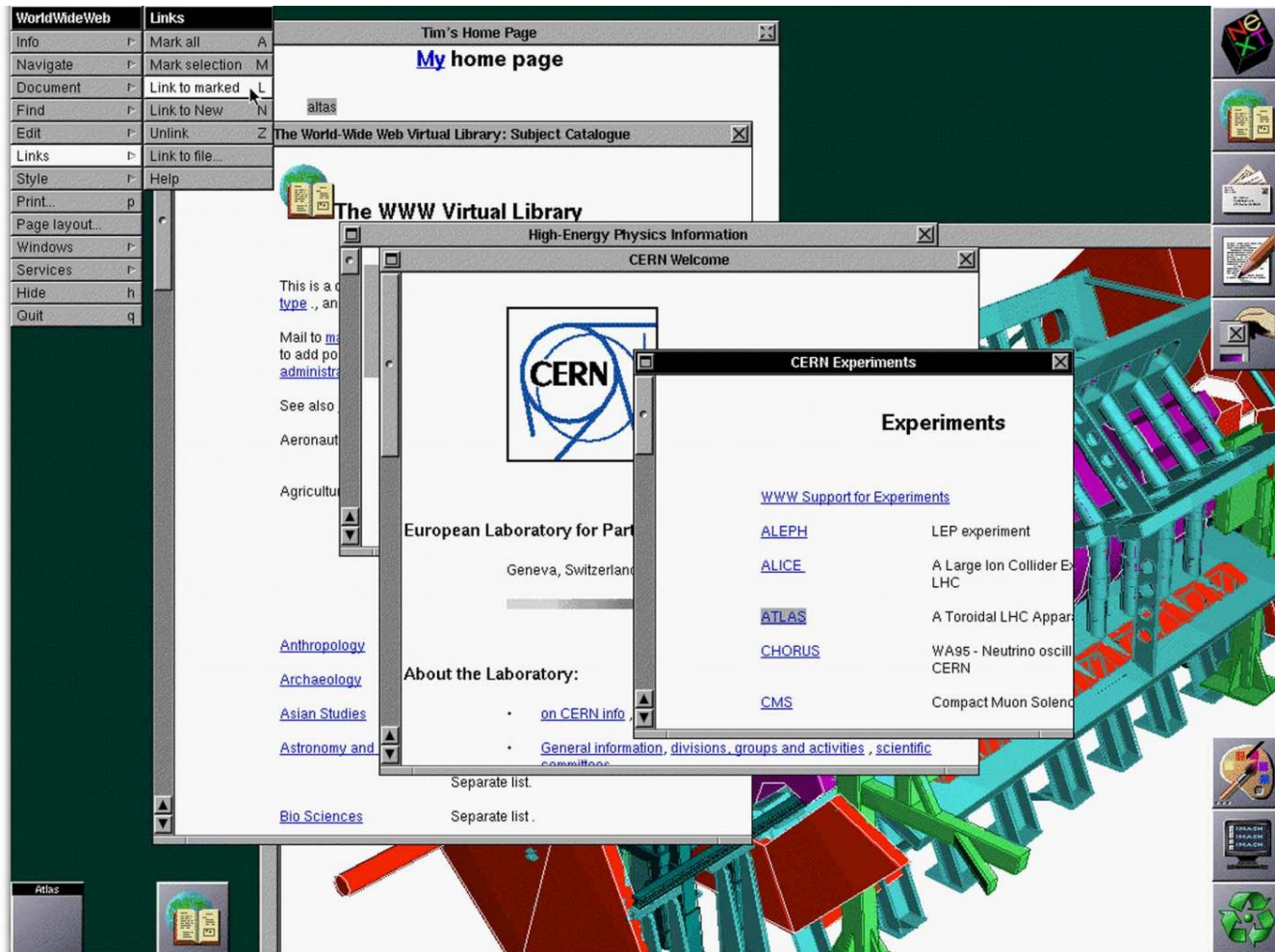
CERN's httpd server

- Código do servidor em C
 - Reprogramado do original

libwww

- Hoje é a biblioteca de Protocolo W3C
- API de referência para aplicações WWW
 - Facilitou o desenvolvimento de browsers
- libcurl

Primeiro Browser



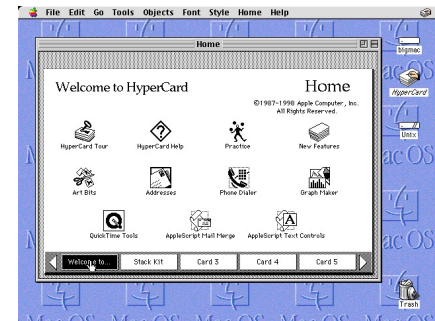
W3C

- Padrões
- Guidelines
- Crescimento
- Princípios
 - Web para todos
 - Web em tudo
- Visão
 - Web de autores e consumidores
 - Dados e serviços
 - Confiança

O Caminho do Sucesso

As tecnologias estavam todas lá

- Hipertexto
- TCP/IP
 - Internet
 - Usenet
 - ftp
- NeXT
 - Orientação a objeto
- Interfaces Gráficas
 - X
 - MacOS
 - Windows
- Padrões de imagem, som e vídeo
- SGML
- CERN tinha um problema de documentação



Hipertexto e Internet ainda eram Comunidades Distintas

- As comunidades de Hipertexto e de Internet eram distintas
 - Em 90, empresas com produtos não aceitam a ideia de colocar o hipertexto de forma distruída na Internet
 - Guide, Owl, Electronic Book
 - O difícil, a apresentação, estava feito. O fácil, buscar na rede, não interessava.
 - Na Hipertext'91 nenhuma apresentação utilizava a rede
 - Na seguinte, a rede dominava o Hipertexto
 - **Hipertexto estava na “crista da onda”**
 - **Internet ainda crescia**
- 



A Lição do Gopher/GPL

- Um protocolo para distribuir, buscar e recuperar documento
 - Alternativa e predecessor ao WWW
 - University of Minnesota
 - Mais hierárquico, com outras funções, orientado a texto
 - Usava menos recursos da máquina
 - Hierarquia de Documentos + Mecanismos de Busca
 - WAIS, Archie e Verônica
 - Menos flexível
 - Em Fev. 1993 a universidade declarou que cobraria licenças de uso
- A primeira ideia era liberar o código via GPL
 - GNU Public License
 - A licença GPL tem um porém: todo o código gerado a partir de um código GPL tem que ser GPL
 - A IBM não aceitaria nenhum código GPL
- 30/4/93 CERN coloca em domínio público
- Vários outros sistemas da época possuíam alguma restrição ao seu uso ou extensão
 - Licenças complicadas

Evolução dos Browsers

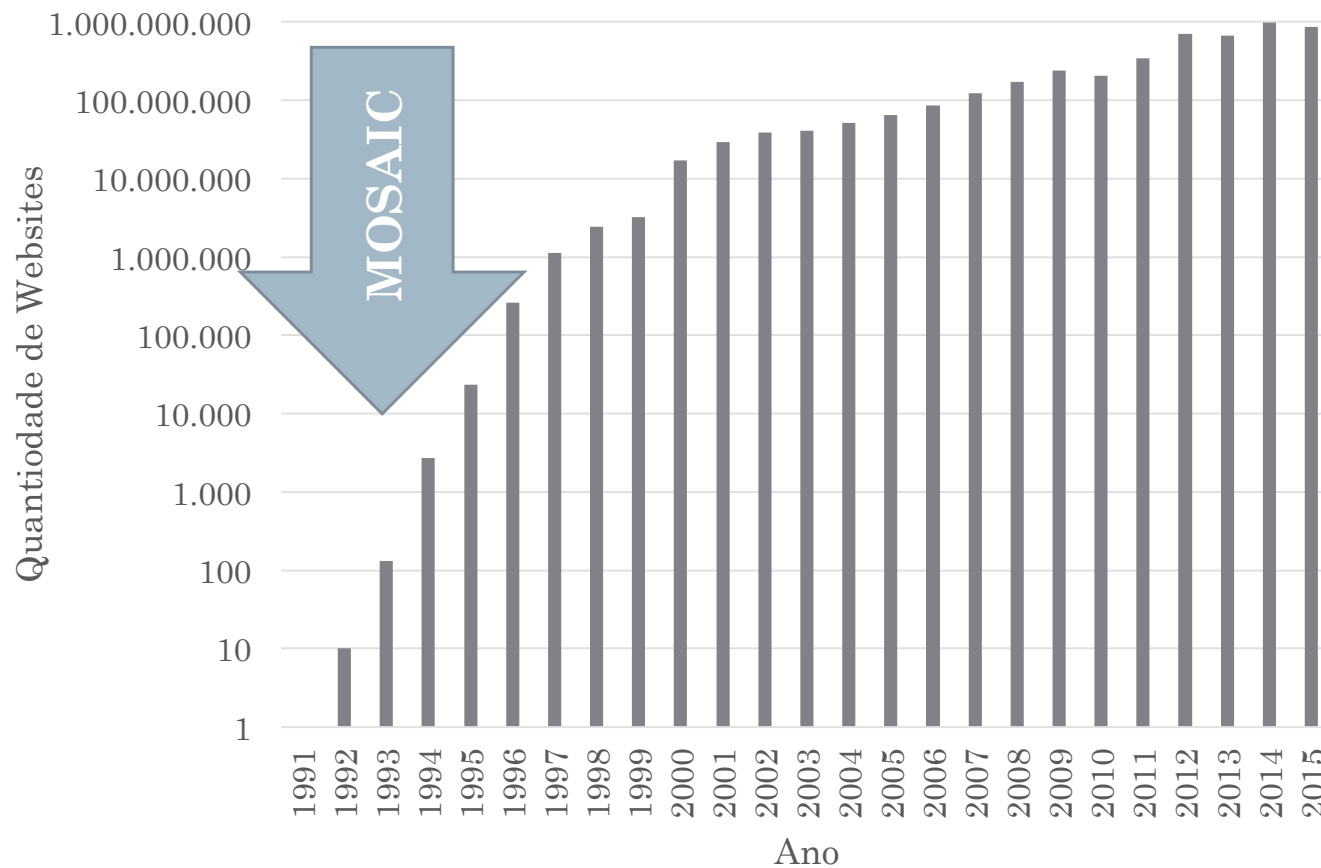
- ViolaWWW, tkWWW, MidasWWW, Erwise... (acadêmicos)
- Samba (Robert Caillau, para Mac)
- Mosaic
 - NCSA busca protagonismo
 - Tinha um projeto próprio chamado Collage, faz um browser
 - Em encontra na NCSA, TBL acha que o laboratório buscava ser o “nome por trás” da Web
 - Há mesmo uma entrevista onde a NCSA mostra o browser e nem toca na questão do WWW
 - Não falam do servidor
 - Não falam dos outros browsers
 - Segunda geração da Web
- Netscape
 - Terceira Geração – comercial
- Início da Guerra dos Browsers

O Momento Certo

- O WWW nasce no centro da Internet original (acadêmica) na Europa
- Nasce no momento para estar madura no crescimento da internet comercial
- Não coloca nenhuma restrição ao seu uso
- Protocolos simples e leves
- Linguagem simples de escrever, mesmo sem editores
- Reutiliza todos os documentos existente como links externos
- Tudo estava lá, era só colocar junto (da maneira certa) e estar disponível na hora certa

Número de Websites

Hostnames únicos



25% ativos

POR QUE O
SUCESSO?

Domínio Público
Simplicidade
Descentralização
Distribuição
Resiliência
Re-enforço

Tecnologias

httpd server

libwww

Tecnologias de outros

NCSA Mosaic

Netscape

Padrões

HTTP – HTML - URI

Contexto Inicial CERN HEP

FIM

Outros Concorrentes

Carac.	WWW	Hyper-G	Microcosm
Links	Simples	Todos-Dinâmicos	Todos
Simples	Sim	Não	Não
Escalável	Sim	Não	Não
Open	Sim(URI)	Não	Não
Formato	Sim	Sim	Sim
Mark-up	HTML	HTF	Não
Proprietário	Não	Sim	Sim