



COMP 4021

Internet Computing

Browsers

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Every computer on the Internet has an IP address

Basic Browser Operation

An IPv4 address (dotted-decimal notation)

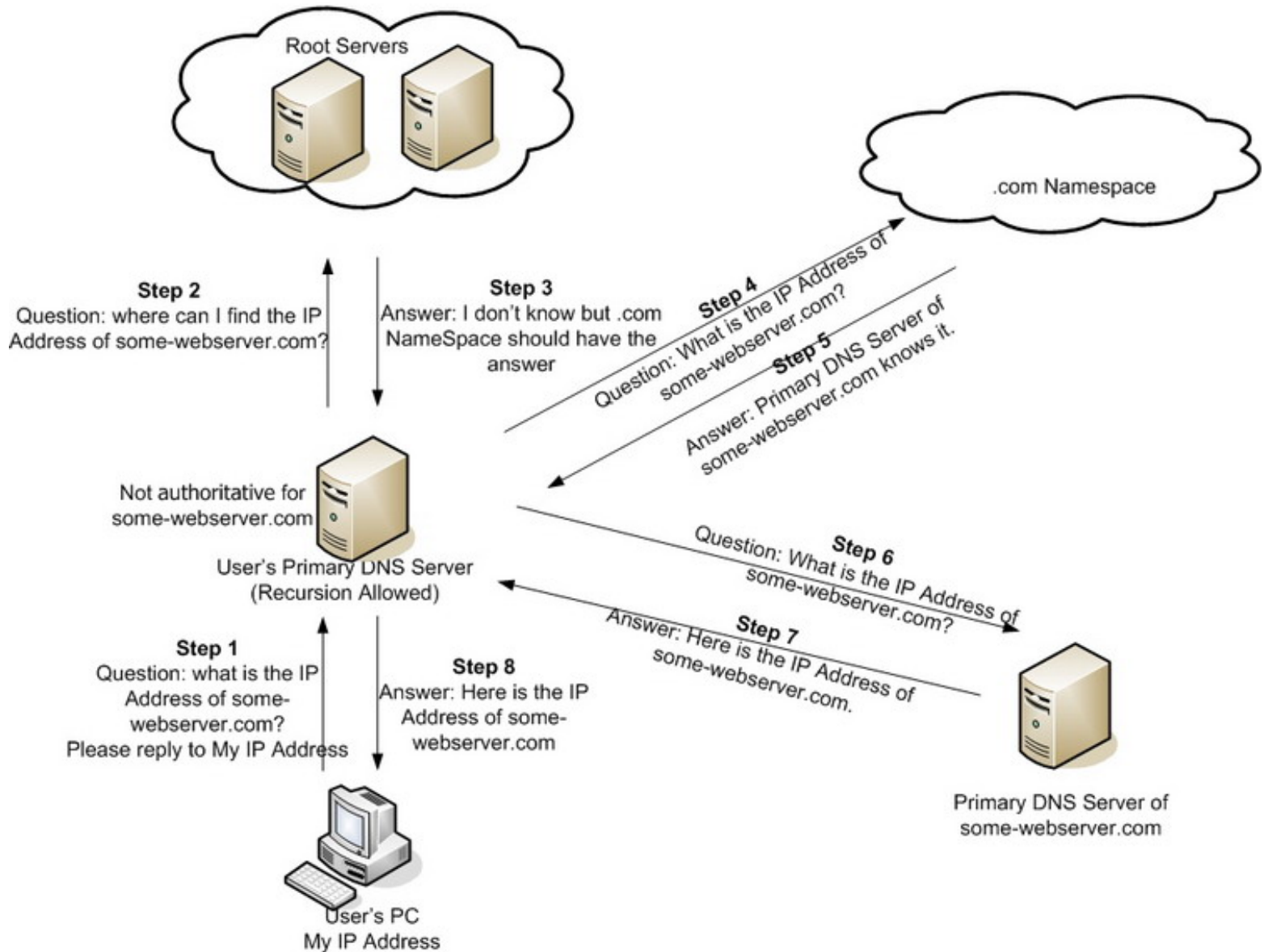
| | | | | | | |
|--|----------|-----------|----------|------------|----------|----------|
| 172 | . | 16 | . | 254 | . | 1 |
| ↓ | | ↓ | | ↓ | | ↓ |
| 10101100.00010000.11111110.00000001 | | | | | | |
| └──┘ | | | | | | |
| Thirty-two bits (4 * 8), or 4 bytes | | | | | | |

- A browser does the following:
 - Wait for user instruction, such as clicking on a link
 - Convert web site name into IP address
 - Ask the DNS system what the IP address is, if doesn't know
 - Send http request to server with that IP address
 - Examples: send a GET request for a web page, send a POST request to a program running on that server, etc
 - Receive output from server
 - Convert output into screen display (colours, pixels, etc)

Domain Name System (DNS)

- The domain name system is a system which is used for converting a web address (such as `http://www.ust.hk`) into the IP address (such as `143.89.14.34`)
- The DNS system is actually made up of a lot of different computers around the world that are used to reply with the information that gets requested
- Any program, such as a browser, can ask it for information, such as the IP address of a web site

Basic Idea of DNS

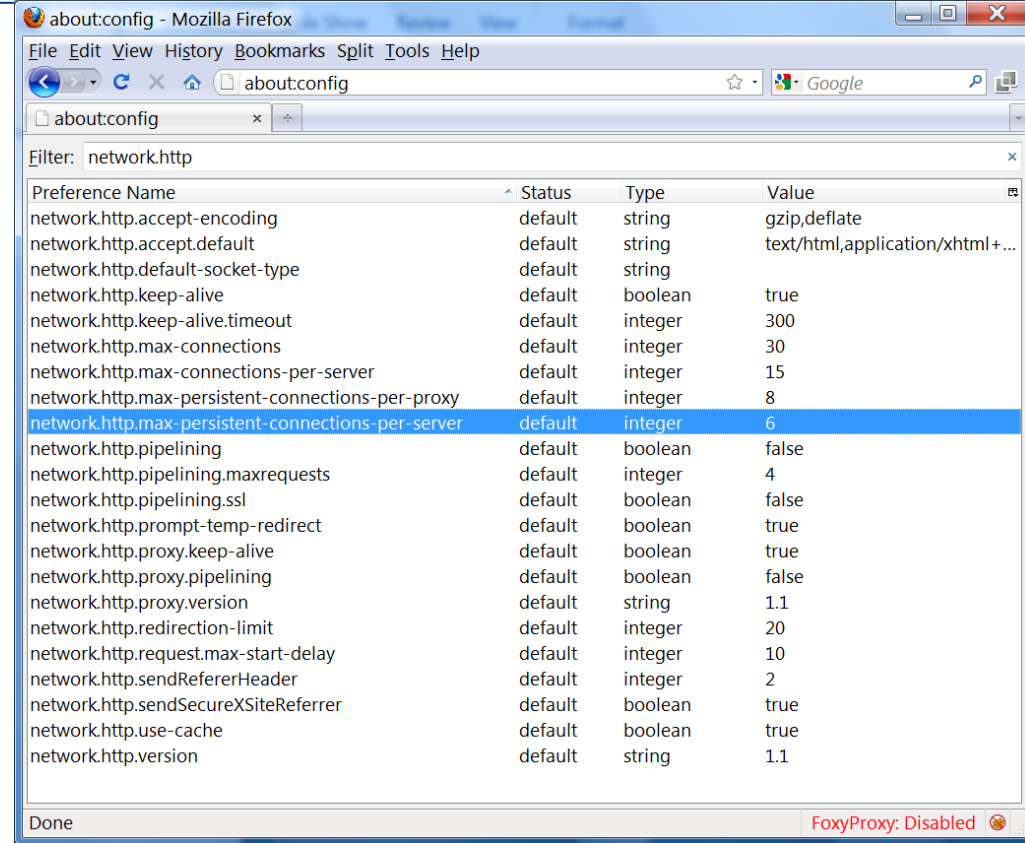


Browser File Processing

- After the page is retrieved, the browser may have further work before the page can actually be rendered
 - If the page has any kind of links to further files, the browser needs to get these elements. Examples: there may be links to CSS files, JavaScript files, image files, and so on, all need to be downloaded
 - If the received page has embedded scripting (JavaScript or VBscript) this needs to be executed using the appropriate scripting engine (such as Rhino or SpiderMonkey)

Browser Configurability

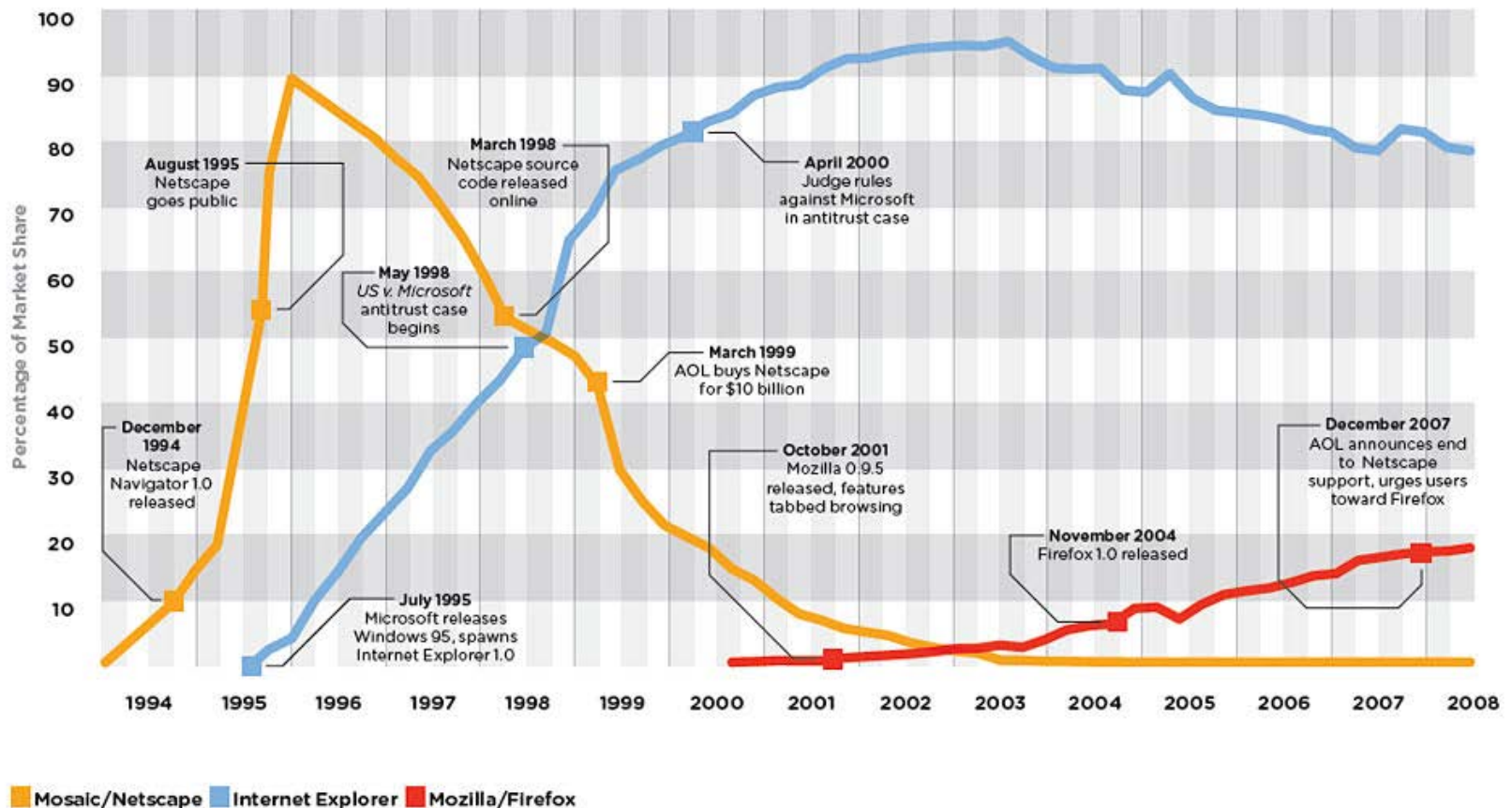
- For example:
 - In Firefox enter *about:config* in the location bar
 - Change maximum possible number of simultaneous
 - Default value is 6, can increase it
 - With these ‘tricks’ can increase browser speed, in some situations



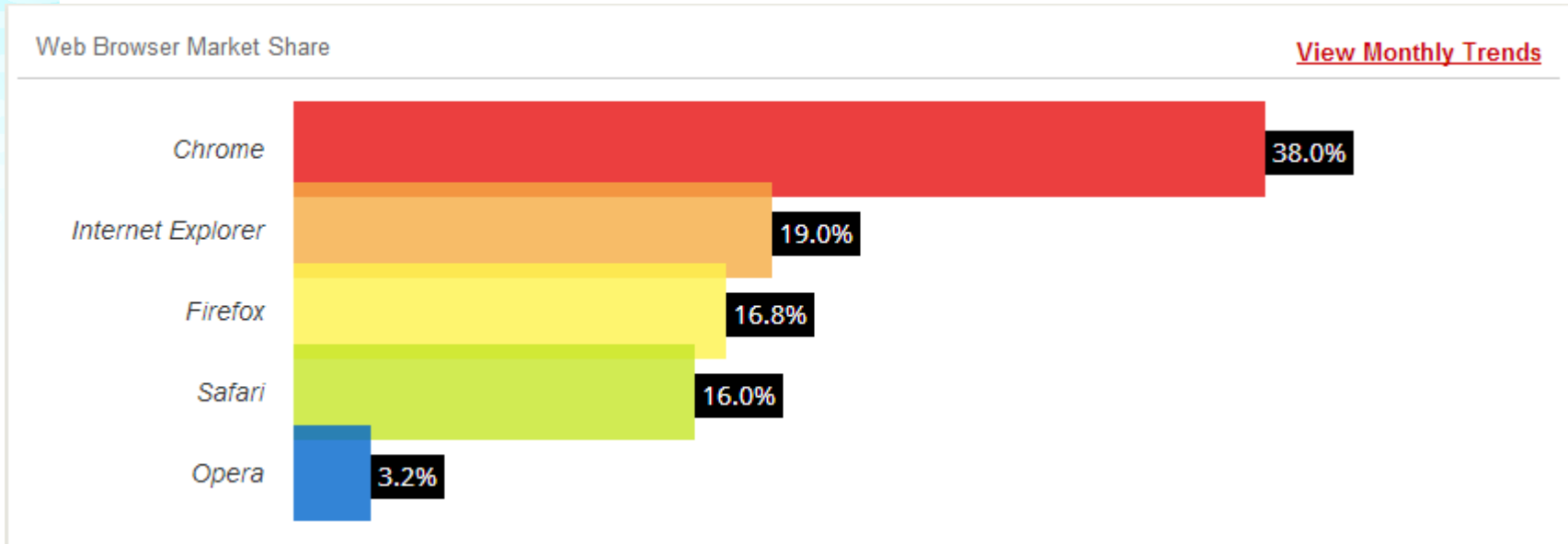
Browser Popularity

- It is important to have a good idea of the various browsers that people are using
- But it is not so easy to get exact information
- Different web sites may have a different 'profile' of people that visit them
- For example, visitors to a 'technical' site may be more likely to be 'early adopters' = the first people to try out new things, such as new browsers
- So, for example, some web sites may be more likely to 'see' the relatively new Chrome or Firefox browsers being used

Most Popular: Netscape then IE, soon FF



Browser Usage – W3Counter



From <http://www.w3counter.com/globalstats.php>

Browser Usage – W3School

Browser Statistics

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What is the trend in browser usage?

Browser Statistics and Trends



Statistics are important information.

From the statistics below (collected from W3Schools' log-files since 2002), you can read the long term trends of browser usage.

We see that Google Chrome, Firefox, and Internet Explorer are the most used browsers today.

Browser Statistics

| 2014 | <u>Chrome</u> | <u>Internet Explorer</u> | <u>Firefox</u> | <u>Safari</u> | <u>Opera</u> |
|----------|---------------|--------------------------|----------------|---------------|--------------|
| May | 59.2 % | 8.9 % | 24.9 % | 3.8 % | 1.8 % |
| April | 58.4 % | 9.4 % | 25.0 % | 4.0 % | 1.8 % |
| March | 57.5 % | 9.7 % | 25.6 % | 3.9 % | 1.8 % |
| February | 56.4 % | 9.8 % | 26.4 % | 4.0 % | 1.9 % |
| January | 55.7 % | 10.2 % | 26.9 % | 3.9 % | 1.8 % |

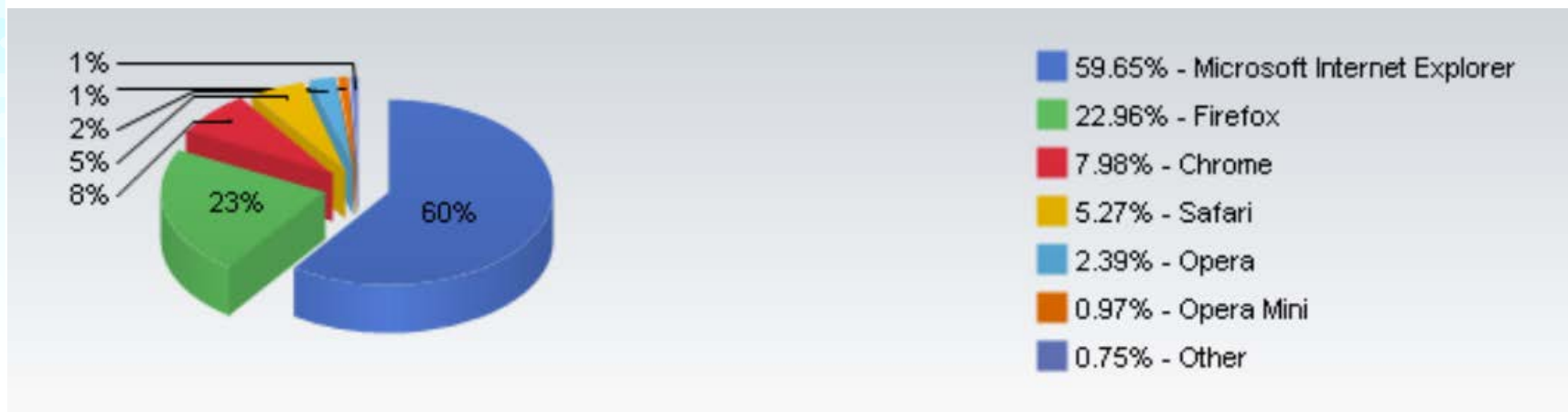
- This is for one particular web site –
<http://www.w3schools.com> (technical info)

Data from http://www.w3schools.com/browsers/browsers_stats.asp

Another Survey – Oct 2010



An example of the Alexa toolbar



- This data is obtained automatically from browsers that have the Alexa Toolbar installed (<http://www.alexa.com/site/download/>)
- But this toolbar is removed by anti-spyware programs – so the people who use it probably don't use anti-spyware programs, they may be less 'technically aware' users

Browsers

- Internet Explorer - most used browser, at the moment
- Mosaic, Netscape - historically important
- Firefox - very commonly used browser
- Chrome - browser from Google
- Safari - Mac browser, also on Windows
- Amaya - test software from W3C
- Lynx - text only

Internet Explorer



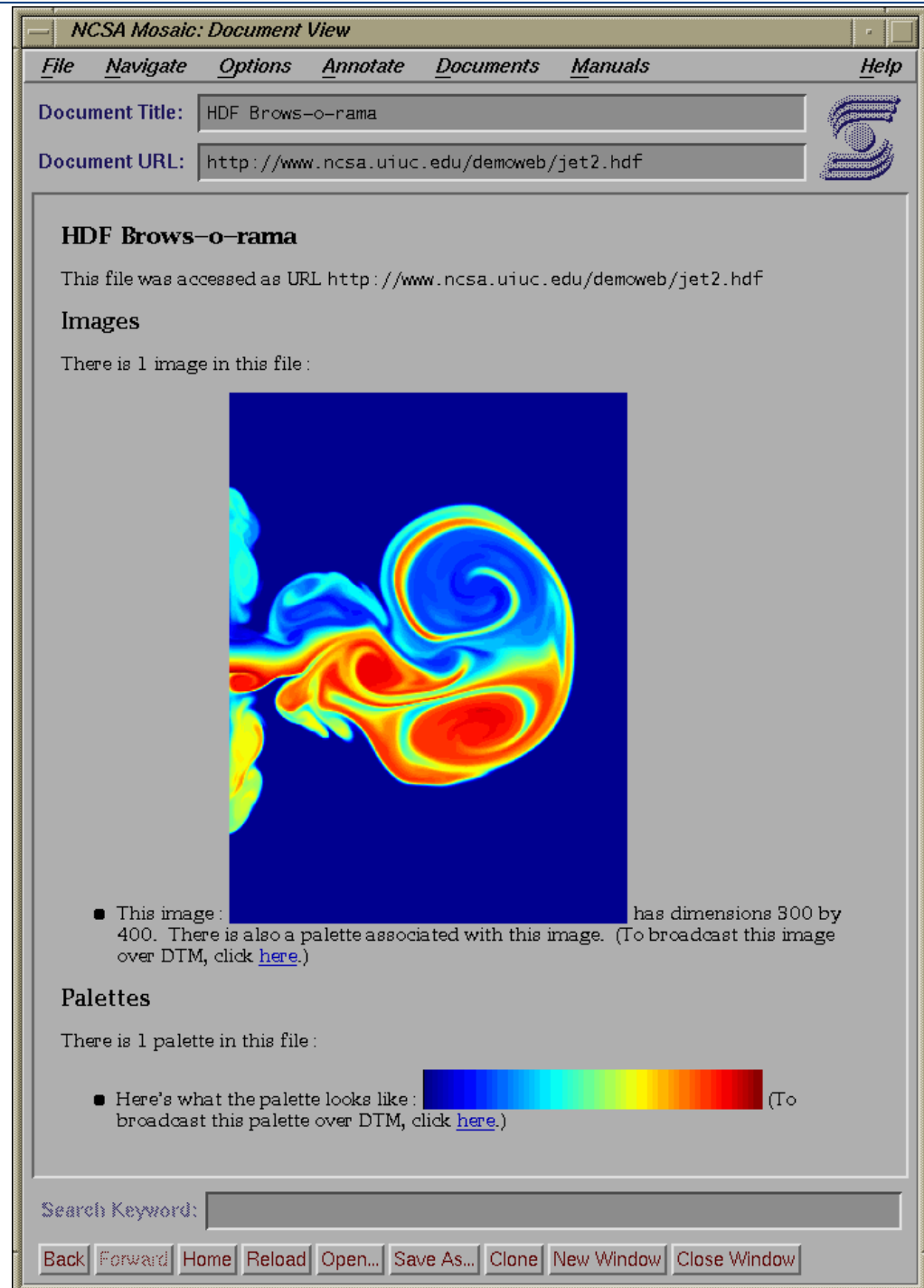
- At first, Netscape was the browser everyone used
- Then IE was included in every release of Windows from Windows 98 onwards
- It therefore became the most popular browser
- However, in the last 10 years IE and Windows have come under attack for a number of reasons i.e. many security hacks of IE and Windows
- 2004: 'United States Computer Emergency Readiness Team' says should not use IE, because of security concerns

Historically Important - Mosaic

- The browser which got people noticing the web was *Mosaic*
- Written by a student called Marc Andreessen
- He released it free, the browser became very popular
- Businessman Jim Clark sent him an email and suggested making a company
- He left the University, they used the source code, made the Netscape company, released the Netscape browser
- IPO 16 months later, Andreessen valued at US\$112m
- Mosaic itself isn't developed any more
- Netscape become a kind of open source project, from which the Mozilla/ Firefox browsers were developed

Mosaic

- This was the browser that got the world excited about the web, around 1992
- Mosaic became Netscape



Firefox

Feature Spotlight



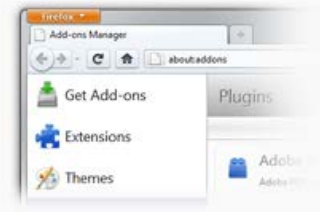
Stay in Sync

Synchronize your settings, passwords, bookmarks, history, open tabs and other customizations across multiple devices so you can take Firefox with you wherever you go.



Organize Your Tabs

Reclaim your browser from tab clutter! Drag and drop your tabs into manageable groups that you can organize, name and arrange in a fun and visual way.



Manage Your Add-ons

An easier way to manage your add-ons and discover new options for personalizing your browsing.

- <http://www.mozilla.com/firefox/>
- After Mosaic, Netscape was developed and for a few years was very popular
- Firefox arises from the Netscape (=mozilla) project
- Firefox is the main browser for 'advanced' users

Firefox Add-ons

Add-ons for Firefox - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Mozilla Corporation (US) https://addons.mozilla.org/en- Google

Add-ons for Firefox

mozilla Register or Log in Other Applications

2,147,502,074 add-ons downloaded
165,681,152 add-ons in use

Categories

Alerts & Updates 948
Appearance 1143
Bookmarks 991
Download Management 539
Feeds, News & Blogging 1053
Games & Entertainment 33
Language Support 485
Photos, Music & Videos 943
Privacy & Security 734
Shopping 43
Social & Communication 1456
Tabs 453
Toolbars 1315
Web Development 1191
Other 2146

Collections
Dictionaries & Language Packs
Personas
Plugins
Search Tools
Themes

What are Add-ons?

Choose from 5000 free extras to make your browser look and function the way you want.

An add-on can be a new time-saving toolbar button, a shortcut to search, a themed look, and more. Add-ons make browsing easier.

Choose add-ons for the way you browse. Install in a few clicks and they stay up to date with easy reminders.

Introduction Rock Your Firefox Best of 2 Billion Web Development Travel

Browse Add-ons

Featured Popular Recently Added

Recently Updated

Feedly by feedly

Add to Firefox

Featured

Your magazine-like start page. A fast and stylish way to read and share the content of your favorite sites and services. Provides seamless integration with Google Reader, Twitter, Delicious, YouTube and Amazon.

★★★★★ 514 reviews 16,086 weekly downloads

Collections

Collections are groups of related add-ons that anyone can create and share.

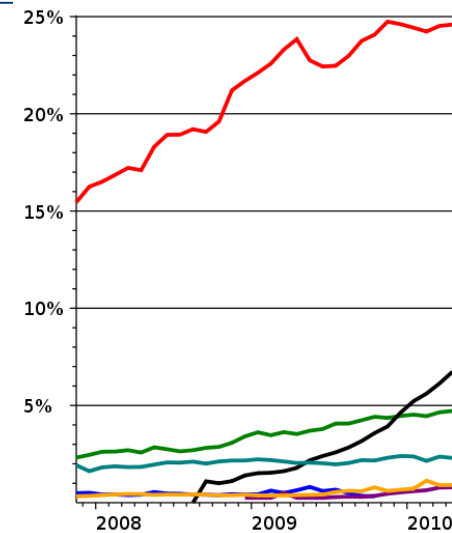
Popular Collections

Windows 7 Theme for Firefox 3.5 by Enkei

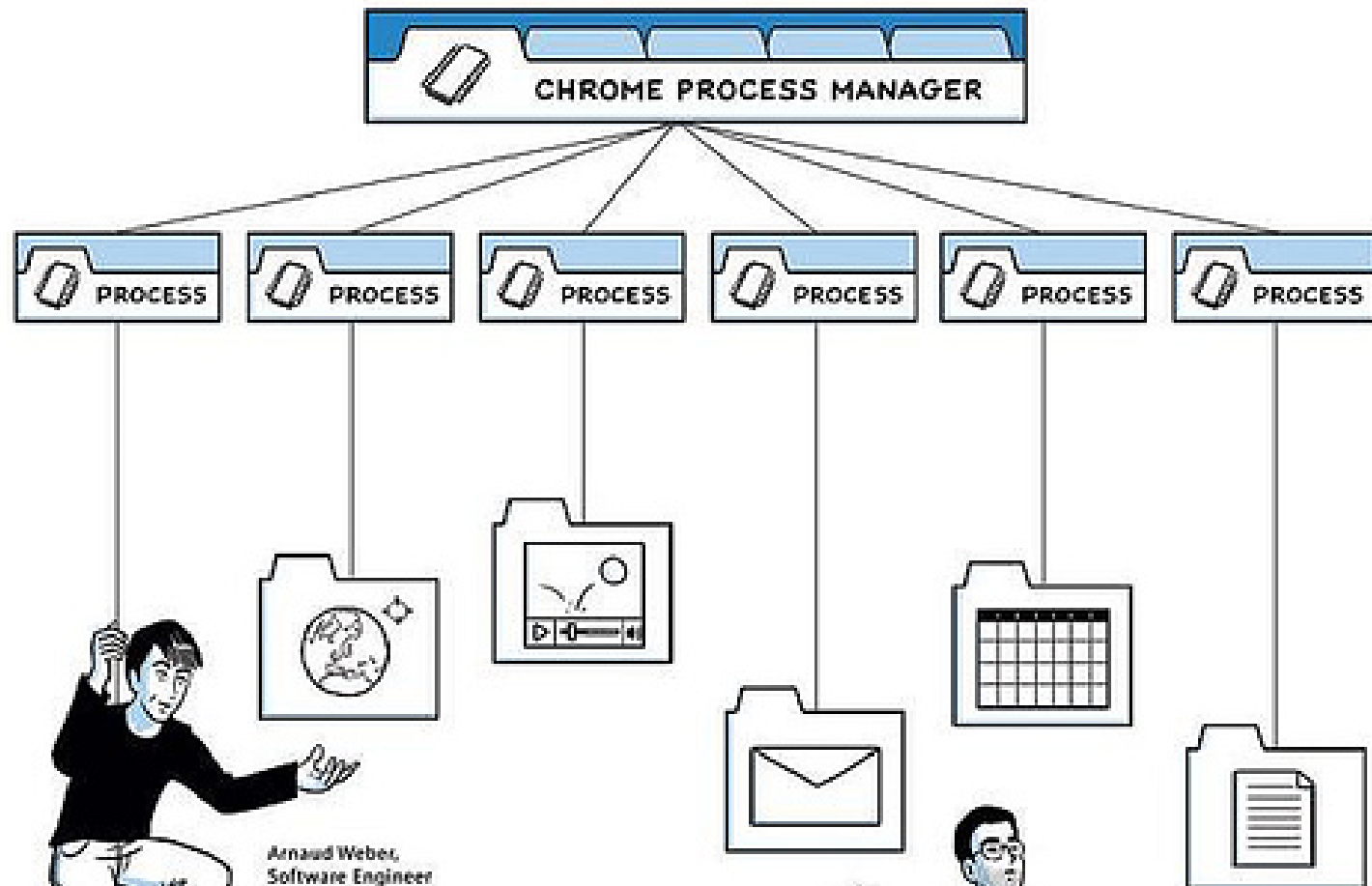
https://addons.mozilla.org/

Chrome

- <http://www.google.com/chrome>
- An open source browser created by Google
- Chrome has a different infrastructure compared to other browsers
 - Each tab is executed using a dedicated process
 - even JavaScript is running in a separate process
 - This eliminates the problem of the whole browser crashing when one tab crashes
 - This idea is now copied by other browsers



Chrome has had a fast adoption rate since being released



Arnold Weber,
Software Engineer

WE'RE APPLYING
THE SAME KIND OF
PROCESS ISOLATION YOU
FIND IN MODERN
OPERATING SYSTEMS.

SO,
SEPARATE PROCESSES
RENDERING
SEPARATE
TABS.

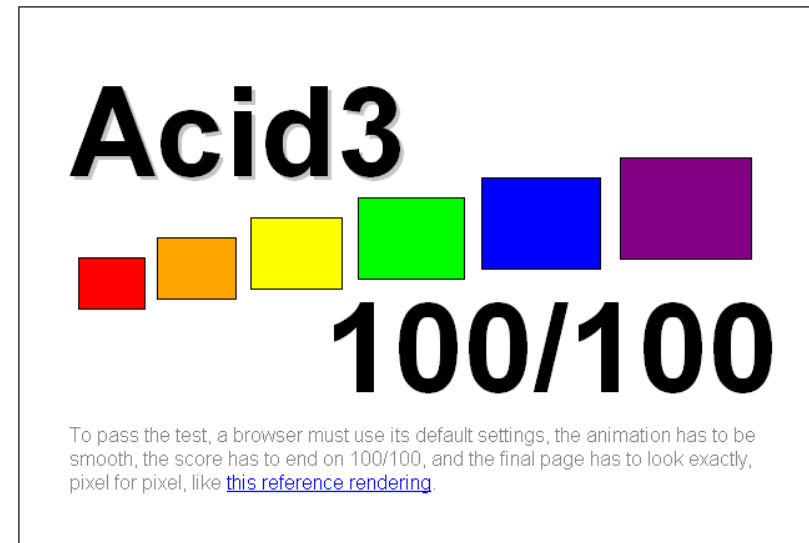
Safari Browser

- <http://www.apple.com/safari/>
- From Apple - for years this was the main Mac browser
- Now available for Windows
- Safari on the iPhone







The Acid3 Test

- How 'good' is a browser?
- The Acid3 test is a page which checks how well a browser handles web standards
- It uses JavaScript to perform 100 tests which includes some DOM handling, HTML, CSS, and SVG
- If the test is perfectly executed by the browser, this will be created in the web page:



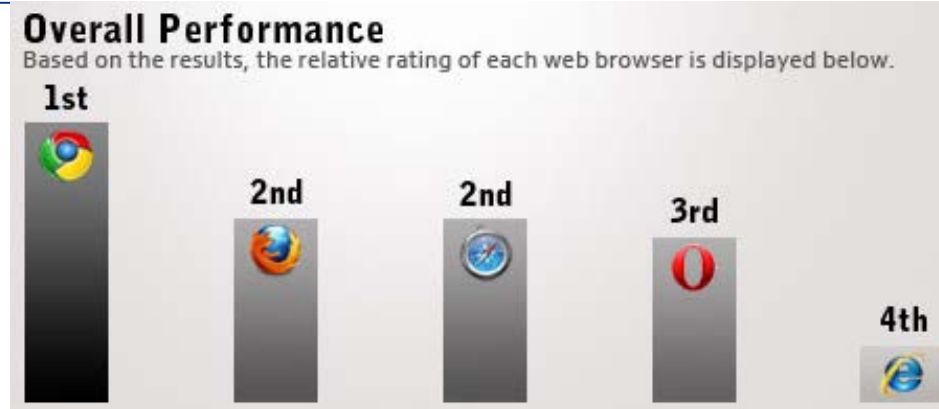
Some Acid 3 Results

Desktop browser progress for the Acid3 test

| Layout engine | Browser | Screenshot of a current release | Screenshot of a preview release |
|---------------|-------------------|--|--|
| Gecko | Mozilla Firefox |  <p>94/100</p> <p>Mozilla Firefox 3.6.10</p> |  <p>97/100</p> <p>Mozilla Firefox 4.0b8pre ^[48][49]</p> |
| Trident | Internet Explorer |  <p>20/100</p> <p>Internet Explorer 8.0</p> |  <p>95/100</p> <p>Internet Explorer 9 Beta, 9.0.7930.16406 ^[51]</p> |

The Acid 3 test is very useful but does not consider the speed of a browser

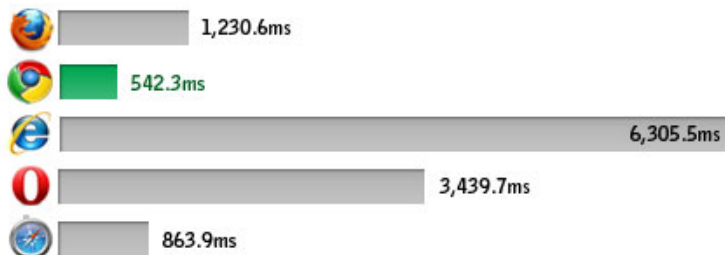
Which Browser is Fastest?



- Possible ways to measure the speed of a browser:
 - JavaScript execution speed
 - CPU usage
 - DOM handling speed
 - CSS rendering speed
 - Page load time
 - Browser cache performance
- These are some possible ways to assess which browser is 'fastest'- example results shown in the next slide
(from <http://sixrevisions.com/infographs/browser-performance>)

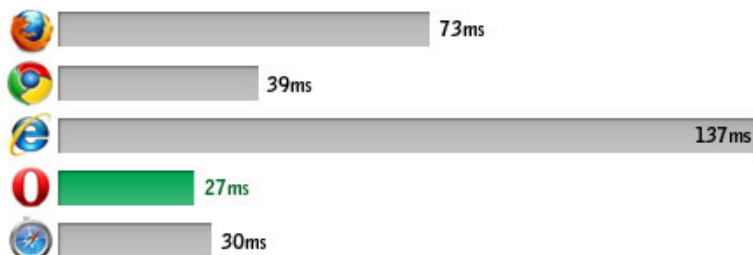
JavaScript Speed

Faster JavaScript execution times means that Ajax-heavy sites like Digg and webapps like Gmail will be **more responsive to user actions**. To test core JavaScript function execution speeds, SunSpider JavaScript Benchmark was used.



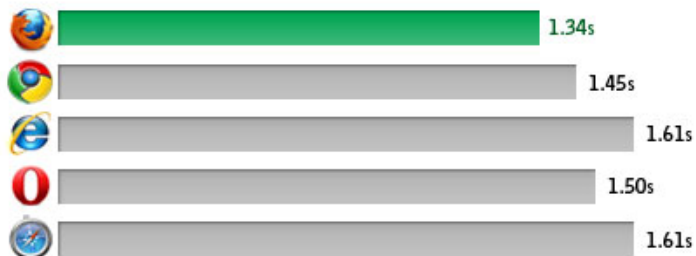
DOM Selection Speed

The faster a browser can select elements in a web page, the **more responsive** it is on asynchronous page updates (which most **Web 2.0 apps heavily rely on**). SlickSpeed was used to see how fast jQuery selects elements.



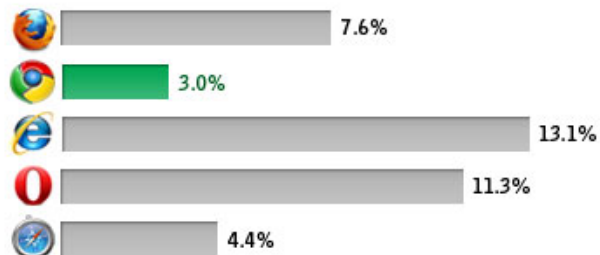
Page Load Time

The **total time it takes to load Yahoo.com's front page** was measured using Numion Stopwatch. Note that due to latency differences that occur with variable site traffic and server load, caution should be used when interpreting the results.



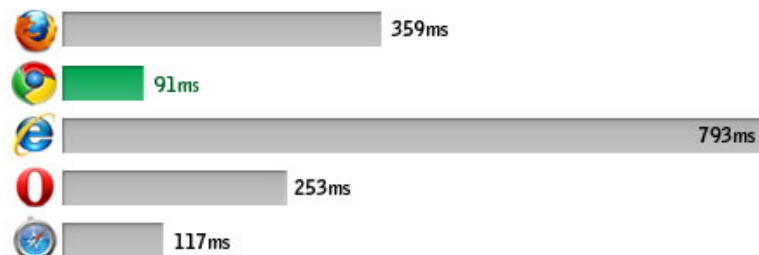
CPU Usage (Under Stress)

CPU usage reveals how much system resources a browser needs: **resource hogs show higher CPU utilization**. Windows Resource Monitor was used to obtain average CPU occupation (%) while SunSpider was running to simulate activity.



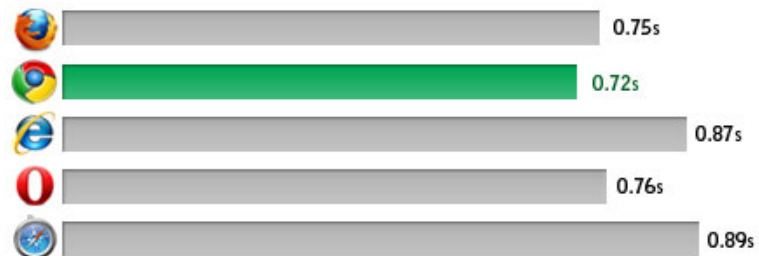
CSS Rendering Speed

Browsers with fast CSS rendering speeds have **faster page response times**. The nontroppo.org CSS Rendering Benchmark was used to measure the onLoad duration for complete table-to-div conversion.



Browser Cache Performance

Total page load times for Yahoo.com with primed caches were measured to see how well browsers perform when you have visited a website already. The same variable latency difference may be relevant here with calculating page load times.



Lynx

- <http://lynx.browser.org/>
- Free; source available
- ASCII text only - no images are displayed
- Very small size - ~700Kb
- No JavaScript engine
- (`lynx -source http:...` is a useful quick way to get any web page source when working in Unix, if the lynx program is installed there)

Lynx



A modern browser



```
Department of Computer Science and Engineering, HKUST (p1 of 4)

Skip Navigation
* Site Map
* CSE Webmail
* Faculty Intranet
* Student Intranet
  + ?UG Intranet
  + ?PG Intraneth
  + ?UST Student Intranet

莖6587U7E41U9AD4 | 莖6587U7B80U4F53

Department of Computer Science and Engineering, HKUST

Undergraduate Admissions Postgraduate Admissions Where do Our Graduates Go? Faculty Recruitment

News & Events

* In Memory of Professor Derick Wood
* CSE Alumnus Made a Record-breaking Calculation of the Digits of Pi
* ACM China Nearing Launch
* Dr. Qian Zhang's Team Achieved Breakthroughs in the Development of Cognitive Radio and Dynamic Radio Sp

? More

Faculty & Student Achievements

* PhD Student Yu ZHANG and Prof. Dit-Yan YEUNG Received Best Paper Award
* HKUST CSE Students Led the Team Winning Silver Award at the 1st Shenzhen-Hong Kong University Students

-- press space for next page --
Arrow keys: Up and Down to move. Right to follow a link; Left to go back.
H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search [delete]=history list
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Lynx