Lecture

CS571 - Course Introduction

CS571: Web Technologies

- Instructor: Prof. Marco Papa
- office: RTH 512
- email: papa@usc.edu
- office hours: Thursday 4:30-5:15 PM (by appointment only)
- 24/7 access: Piazza, 7 min. average response time
- quick way to ask a "personal" question: Private message to Instructors on Piazza

General Rules

NO D-CLEARANCE

Unless you are a "superstar" undergrad ☺

NO COURSE OVERLAP

Fixed dates:

Midterm Exam: Feb. 19

Mobile Lab: Apr. 25

Final Exam: May 2

No Exam re-grading. No Exam pickup.

Course Objectives

- This course focuses on the phenomenon known as the World Wide Web
- Core technologies are:
  - HyperText Markup Language (HTML) and Cascading Style Sheets (CSS)
  - HyperText Transfer Protocol (HTTP)
  - Web servers, their configuration and performance properties
  - Server-Side programming using PHP and JavaScript
  - Client-side programming using JavaScript
  - Ajax Development Style
- Newer Technologies of Interest
  - Responsive Website Design (Bootstrap, etc.)
  - JS Frameworks (Angular and Node.js)
  - Web Services (REST)
  - Web security, TOR
  - Native Mobile frameworks (Java / Android and Swift / iOS)
  - React (native) and Firebase
  - Cloud computing (AWS, GCP, Azure)
  - Serverless Applications
  - AWS Lambda, Google Cloud Functions, Azure Functions

General Information

- Lectures:
  - Section 1: Tuesday – Thursday ("retired")
  - **Section 2: Tuesday – Thursday 5:30PM – 7:20PM**
  - **Section 3: Tuesday - Thursday 7:30PM – 9:20PM**
- After session lectures: hands-on demonstrations (a.k.a. "Discussions")
- Producers: office hours on course website
- Course website: http://csci571.com
- Assignments - yes
- Two **Exams**, one in week 7 and one towards the end. Exam "rules" on Course Info class website
- Mobile Application final assignment
- Attendance – up to you
- Source code storage: **GitHub Classroom**
- Top students in each section offered available Grader/Producer positions at end of semester. **BY INVITATION ONLY**

Software and Storage

- **Student Disk space on aludra.usc.edu (and cs-server.usc.edu):**
  - Upgraded from 500MB to 1GB (no longer needed)
  - Used only for homework 2, 3 and 4
- **Website / Web Services in the cloud**
  - Amazon's Elastic Compute Cloud (AWS)
  - Google Cloud Platform (GCP) App Engine
  - Microsoft Azure
  - AWS Lambda
  - Google Cloud Functions
  - Azure Functions
  - Serverless.com
  - Node.js

Reading Materials

- No required textbook
- Class Slides are available online on the class website
  Click on the  or  icon
- Videos, Example and Links online on the class website
- Recommended reading
  - the W3C site contains the formal specifications for many of the technologies; www.w3c.org
- O'Reilly & Associates publishes many relevant books:
  - *Too many to mention*
- For PHP:
  - *Learning PHP, MySQL, JavaScript, CSS & HTML5* by Robin Nixon, O'Reilly & Associates
- For Mobile SDKs:
  - Online material at developer.apple.com, developer.android.com
  - Several books on iOS and Android

Other Issues

- Class Sign up list
  - On "Home" page click on "Sign Up" at right of your Section; fill in the form; record your Class ID.
  - Use the Class ID in "grades" page to modify your Sign Up data, when making a a mistake, and look up your scores.
- Class news group
  - We use Piazza. **7 minutes average response time!**
  - Activate your membership by joining at:

    piazza.com/usc/spring2019/csci571/homw
- Academic Integrity Policy
  - Do NOT submit the same program; you can discuss the project with fellow students, but do not develop code with other students; do not download code online; do not post code online; we use MOSS to check for plagiarism (similar code). We scan all the exams. See "Academic Integrity Policy".
- Downloading course slides and software
  - Class slides access. Username: **csci571**, password: **notes1**
  - All software and installation instructions can be downloaded from the class website.

Student Evaluations

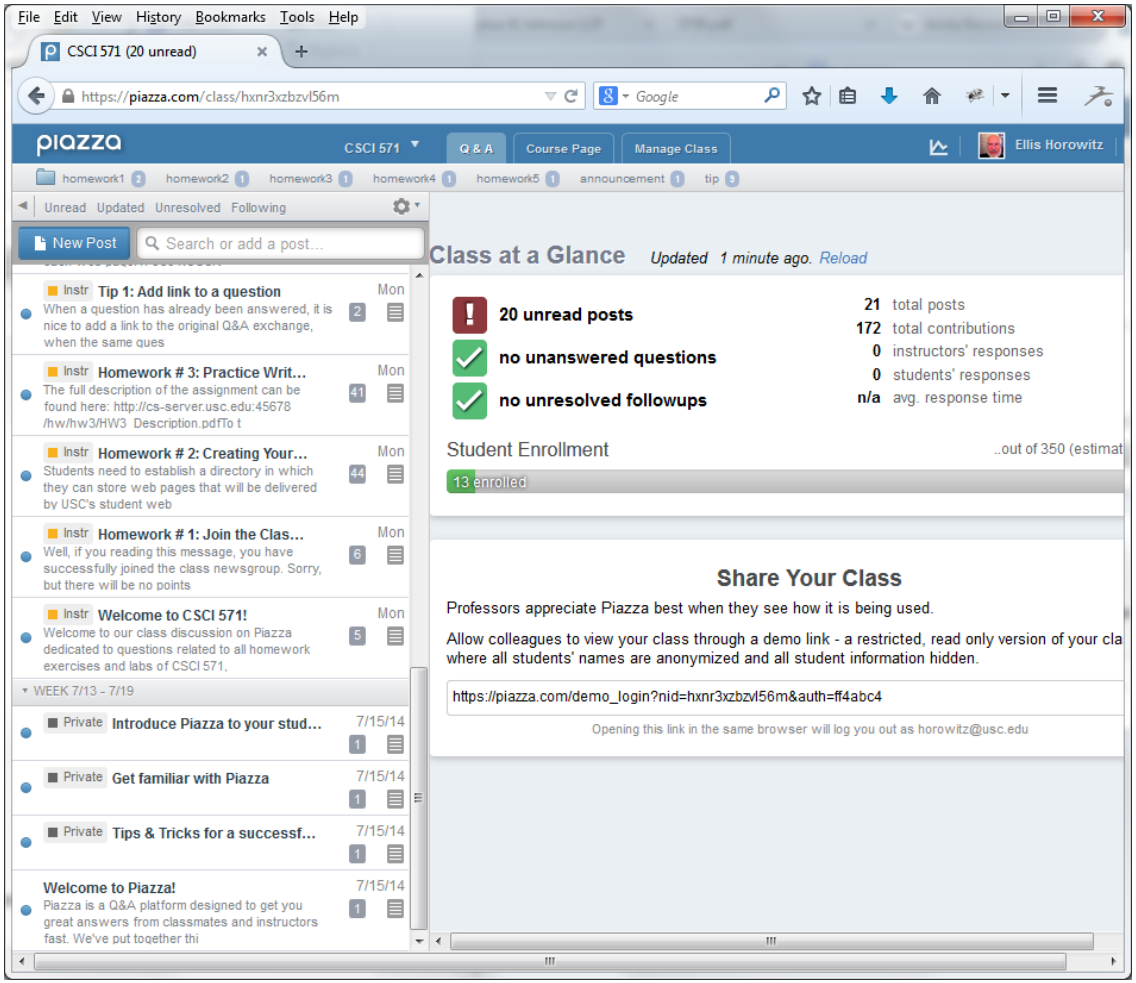
- Comments:
  - "Amazing assignments. Learnt a lot on the course."
  - "Projects seemed similar to an actual client for web development would ask for."
  - "Even though the assignments were hard I learnt a lot from them."
  - "It is not a fair game for beginners. I've spent almost 3 weeks to do a homework, and I still can not finish it on time."
  - "Course projects are impressive!"
  - "This class has posted assignments easily x10 times larger than other classes."
  - "HW8 and HW9 take *forever*."
  - "The homeworks are so difficult."
  - "I had to do so much googling on my own to learn about concepts used in the homework assignments."
  - "Tough class with a lot of valuable assignments."
  - "Massive assignments."
  - "The workload of this course is too much, especially the last two homework."

Academic Integrity Violations

- Spring 2018 violations:
  - Referred to Academic Integrity Coordinator: 16
  - Sanctioned: 16
  - Appeals to Engineering Panel Review: 8
  - Appeals to Engineering Dean: 2
  - Changes by Panel or Dean: 0
  - Sanctioned with F in course: 12
  - Sanctioned with 0 in assignment and full letter grade reduction: 4 (C-, C-, C-, B-)
- Fall 2018 violations
  - None!
- Read carefully Academic Integrity Policy page
  - Learn examples of Academy Integrity Violations
  - In most cases, the appropriate sanction is a grade F for the course
  - Collaboration will result in a grade F for the course

Piazza

general advice retrieved from last semester →



Covered in "discussions" session

Characterizing the Web

- How many web sites are there?
- How many web pages are there?
- Invisible Web - what is missing
  - Searchable Databases - Most of the invisible web is made up of the contents of thousands of specialized searchable databases that you can search via the Web.
  - Excluded Pages - There are some types of pages that search engine companies exclude by policy.
- For more information on the invisible web see,

  http://www.robertlackie.com/invisible/index.html

  http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/InvisibleWeb.html

Characterizing Web Content

There are very few studies that examine the types of content on the web, however . . .

(From IEEE Spectrum, Jan. 2004, pp. 75):

- Claim: 30% of the web is porn
- Claim: 30% of the web is duplicate information
- 50,000,000 pages are either new or changed *each day*
- 65% of the web pages are in English

(From Personal Computer World, Optenet, Sep. 2008):

- Claim: 35% of the web is porn, 11% is e-commerce
- http://www.optenet.com/en-us/new.asp?id=162

(From Forbes, Sept. 2011):

- Claim: 4% is porn, 13% are porn Web Searches
- http://www.forbes.com/sites/julieruvolo/2011/09/07/how-much-of-the-internet-is-actually-for-porn/

(From BBC, July 2013):

- Claim: is porn 4% or 37%?
- http://www.bbc.com/news/technology-23030090/

Sample Web Sites (Modest Size)

- Running a web site can get complicated; here is one example.
- The facts:
  - **www.fogdog.com**, online sale of sporting goods
  - Revenues: $5 million per year
  - 2.2 million page views per month
  - average of 20,000 unique visitors per day
- The solution (in-house):
  - Commodity hardware
  - Linux server running Apache 2.0 web servers
  - Using MySQL data base
  - They moved to Ebay!
    - https://www.ebay.com/str/fogdog
    - Citrix Netscaler OS, Apache-Coyote/1.1 web server

Sample Web Sites (Medium size)

- Here is a popular, alternate strategy for maintaining a web site
- The facts:
  - **www.autobytel.com**, new and used cars
  - Market Cap: $50M (March 2018)
  - Yearly Revenues: $137M (March 2018)
  - 500,000 purchased vehicles in 2013
  - Mobile version launched in 2012
  - Stock symbol: used to be on Nasdaq. Now **Private.**
- Original Microsoft solution:
  - Microsoft Windows Server
  - Microsoft IIS 7.5 web server
  - Microsoft SQL server database
  - Akamai CDN
- Today:
  - Linux OS, MI/7.5 web server
  - Akamai International CDN (Netherland)

Sample Web Sites (large size)

- The facts:
  - **www.etrade.com**, online investing services and resources
  - Market Cap: $11.75B (Dec 2018)
  - Yearly Revenues: $2.7B (7/2018)
  - 60 million page views per month
  - average of 53,000 unique visitors per day
  - 4.9 million accounts (Jan. 2015)
  - 25,000 new retail accounts opened (Oct 2015)
  - 1,952,000 customer transactions per month
  - Stock Symbol: ETFC (Nasdaq)
- The solution:
  - IBM 90 xSeries running Linux/Citrix Netscaler, Apache and Tomcat web servers
  - Hardware facility for load balancing and redundancy
  - Oracle database system
  - Proprietary programming systems

Web Server Farms

- Until recently all serious web sites were maintained using web server farms;
  - A group of computers acting as servers and housed in a single location;
  - Internet Service Providers (ISP's) provide web hosting services using a web server farm
- Hardware and software is used to load balance requests across the machines
- Other issues addressed by web server farms include:
  - **Redundancy** eliminates single point of failure; backup and failover strategy is required
  - **Security**, secure areas are placed behind firewalls which monitor web traffic, network address translation, port translation, SSL

Popular Web Hosting Services

- ***For individuals and small business***:
  - **1&1**
    http://www.1and1.com/linux-web-hosting?__lf=Static&linkOrigin=&linkId=ct.tab.hosting&stage=hosting
  - **GoDaddy.com**
    http://www.godaddy.com/products/secure-hosting.aspx?ci=72738
  - **Yahoo**
    http://www.iwebhostingplans.com/yahoo/yahoowebhosting.asp

- ***For companies willing to pay MUCH higher costs***:
  - **Rackspace**
    http://www.rackspace.com/index.php?CMP=Google_hosting
  - **Network Solutions**
    http://www.networksolutions.com/web-hosting/index.jsp
- ***Reviews and price comparisons***:
  - http://www.hosting-review.com
    - See next slide
  - http://www.pcmag.com/category2/0,2806,2269,00.asp

Web Hosting Services

TOP 10 WEB HOSTING PROVIDERS - Updated December 2018

RANK	SHARED WEB HOST	PRICE	SALES INDEX	TREND	UPTIME SPEED	CUSTOMER REVIEWS	VISIT
1	HOSTPAPA MORE	$3.95		↑		★★★★★	Visit Site
2	webserve MORE	$1.99		↑		★★★★☆	Visit Site
3	iPage MORE	$3.25		↑		★★★★☆	Visit Site
4	HOSTGATOR MORE	$3.95		↑		★★★★☆	Visit Site
5	1&1 TRUSTED BY OVER 10 MILLION CUSTOMERS MORE	$4.99		↑		★★★½☆	Visit Site
6	GoDaddy MORE	$6.29		↑		★★★½☆	Visit Site
7	TMD Hosting MORE	$2.95		↑		★★★★☆	Visit Site
8	bluehost MORE	$3.95		-		★★★★☆	Visit Site
9	YAHOO! Aabaco Small Business MORE	$3.99		-		★★½☆☆	Visit Site
10	A2 HOSTING MORE	$3.92		↑		★★½☆☆	Visit Site

Cloud Computing

- **Cloud computing** is Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices **on demand**, like the electricity grid.
- Users no longer have need for expertise in, or control over, the technology infrastructure "in the cloud" that supports them.
- It typically includes web-based tools or applications that users can access and use through a web browser as if it were a program installed locally on their own computer.
- Typical cloud computing providers deliver common business applications online that are accessed from another Web service or software like a Web browser, while the software and data are stored on servers.
- The major cloud service providers include Amazon, Google, Microsoft, Salesforce, Skytap, HP, IBM, Amazon, Google and Apple (iCloud).

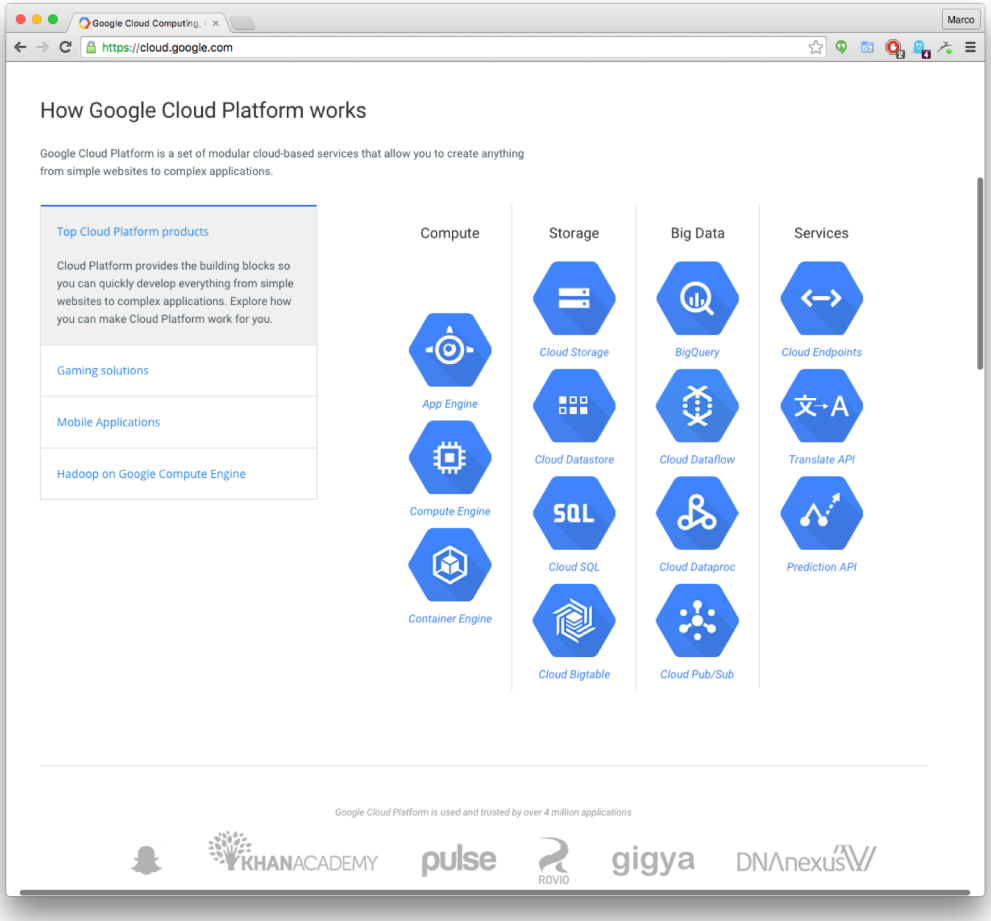
An Example – Amazon's Elastic Compute Cloud

- A web service providing resizable compute capacity
- The "elastic" nature means the service instantly scales to meet demand with no up-front investment
- Users create an Amazon Machine Image (AMI), a virtual computer running your selected operating system (Linux, Windows, etc)
- Users use Amazon's Simple Storage Service (S3) for large-scale, persistent storage
- You only pay for running AMI
- All accounts are limited to 5 Elastic IPv4 addresses per region
- See: aws.amazon.com/ec2

Amazon currently runs in 8 regions: US East, US West (Oregon), US West (Northern CA), Ireland, Asia Pacific (Singapore), Asia Pacific (Tokyo), Asia Pacific (Sydney), South America (Sao Paulo)

An Example – Google Cloud Platform

- A web service providing basic Compute, Storage, Big Data and Services.
- Additional services for massively scalable Gaming solutions, Mobile Applications backend, and Apache Hadoop.
- App Engine – A platform for building scalable web applications and mobile backends. App Engine scales applications automatically in response to the amount of traffic it receives.
- Compute Engine - Offers predefined virtual machine configurations:Debian, CentOS, CoreOS, SUSE, Ubuntu, Red Hat, FreeBSD, or Windows 2008/2012.

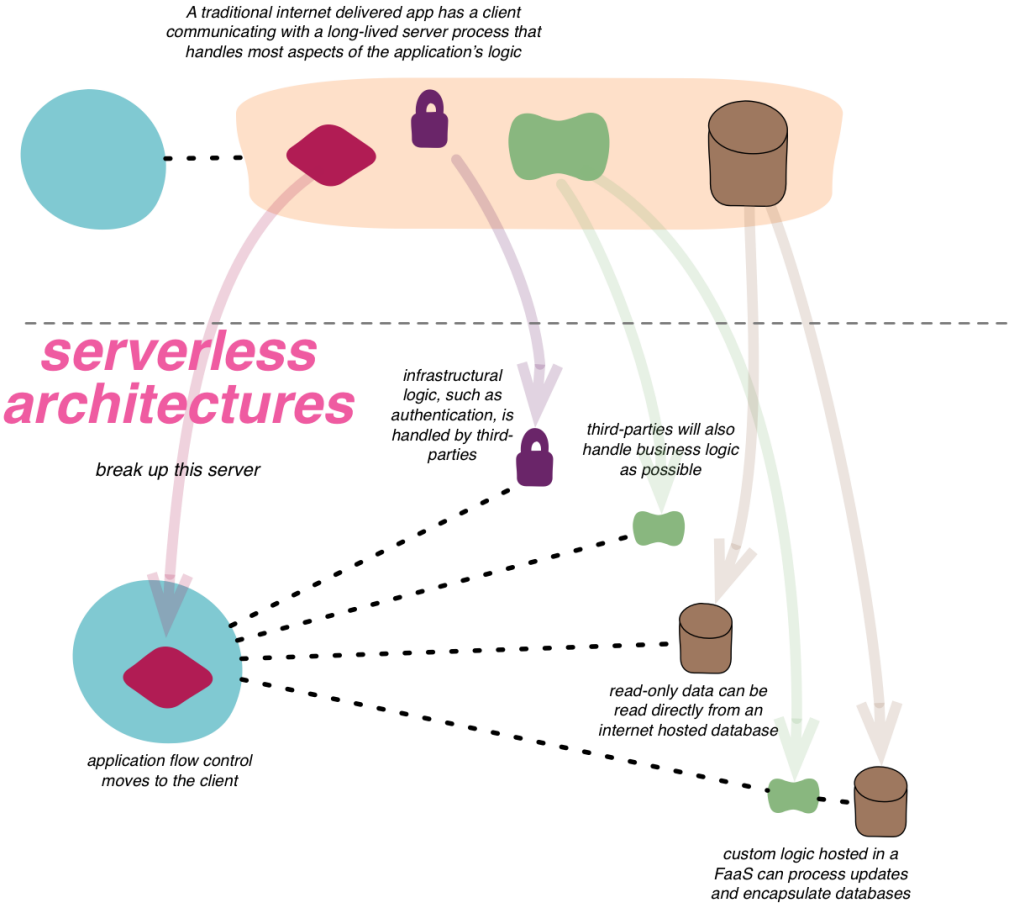


Google uses software-defined networking technology to route packets across the globe and enable fast edge-caching so that data is where it needs to be to serve users.

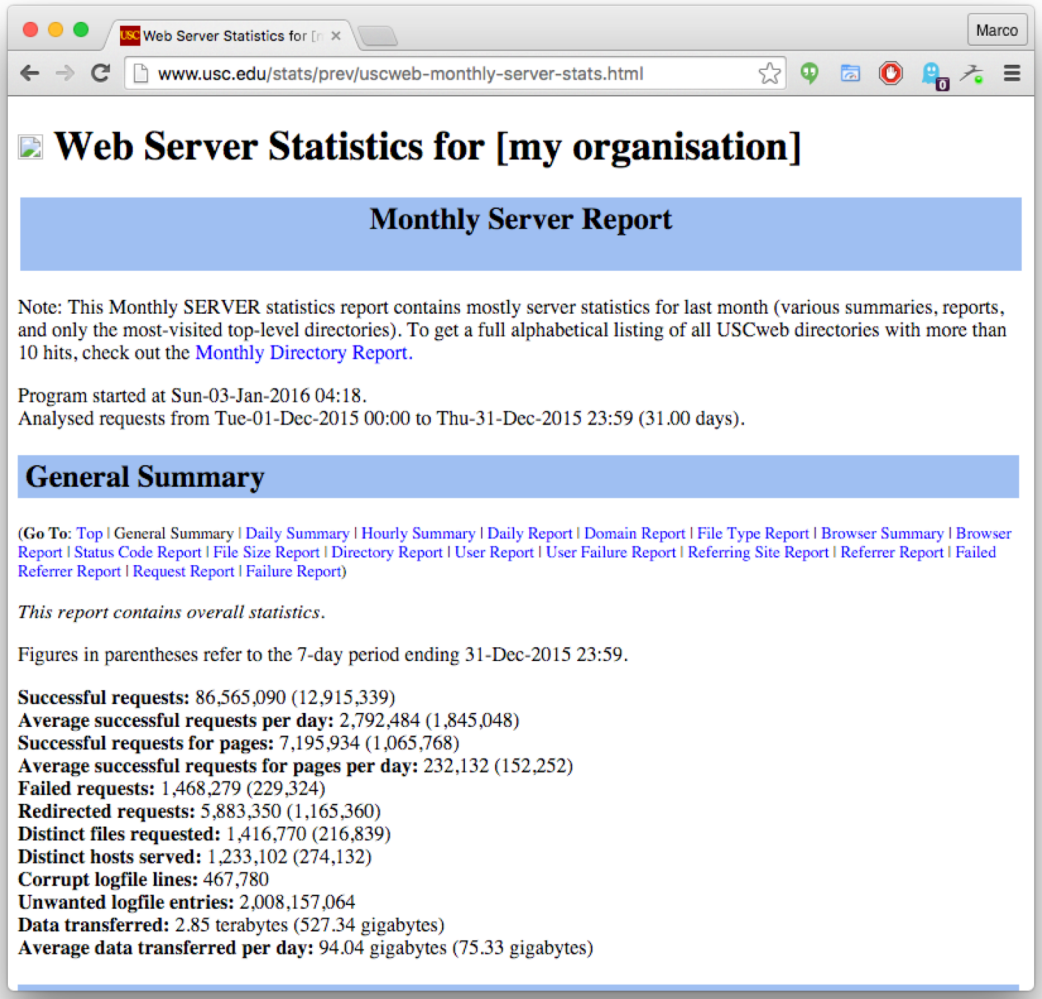
Serverless Architecture

- Internet based systems where the application development does not use the usual server process.
- They rely solely on a combination of:
  - third-party services, or Backend as a Service (BaaS)
  - client-side logic
  - service hosted remote procedure calls, or Function as a Service (FaaS).
- AWS Lambda is one of the most popular implementations of FaaS at present, but there are others. See:

  https://aws.amazon.com/lambda/



A Familiar Sample Web Site - USC



86 million page requests and approx 2.7 million requests per day for the 7-day period ending in Dec, 2015

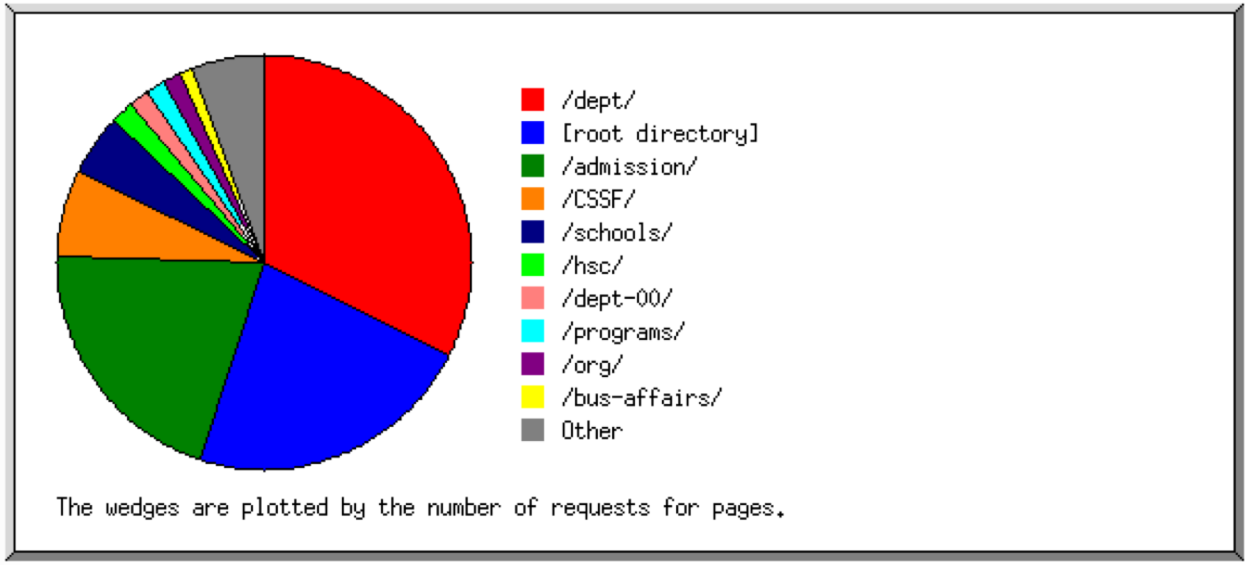
`http://www.usc.edu/stats/prev/uscweb-monthly-server-stats.html`

www.usc.edu server – Directory Report

Directory Report

(**Go To**: Top | General Summary | Daily Summary | Hourly Summary | Daily Report | Domain Report | File Type Report | Browser Summary | Browser Report | Status Code Report | File Size Report | Directory Report | User Report | User Failure Report | Referring Site Report | Referrer Report | Failed Referrer Report | Request Report | Failure Report)

This report lists the directories from which files were requested. (The figures for each directory include all of its subdirectories.)



www.usc.edu server – Daily Summary

Daily Summary

(**Go To**: Top | General Summary | Daily Summary | Hourly Summary | Daily Report | Domain Report | File Type Report | Browser Summary | Browser Report | Status Code Report | File Size Report | Directory Report | User Report | User Failure Report | Referring Site Report | Referrer Report | Failed Referrer Report | Request Report | Failure Report)

This report lists the total activity for each day of the week, summed over all the weeks in the report.

Each unit () represents 40,000 requests for pages or part thereof.

day	pages	%pages	
Sun	732006	10.17%	++++++++++++++++++++
Mon	867403	12.05%	++++++++++++++++++++++++
Tue	1364925	18.97%	++++++++++++++++++++++++++++++++++++++
Wed	1345239	18.69%	++++++++++++++++++++++++++++++++++++
Thu	1213021	16.86%	++++++++++++++++++++++++++++++++
Fri	962051	13.37%	++++++++++++++++++++++++++
Sat	711289	9.88%	++++++++++++++++++++

Busiest day is Thursday

www.usc.edu server - Hourly Summary

Hourly Summary

(**Go To**: Top | General Summary | Daily Summary | Hourly Summary | Daily Report | Domain Report | File Type Report | Browser Summary | Browser Report | Status Code Report | File Size Report | Directory Report | User Report | User Failure Report | Referring Site Report | Referrer Report | Failed Referrer Report | Request Report | Failure Report)

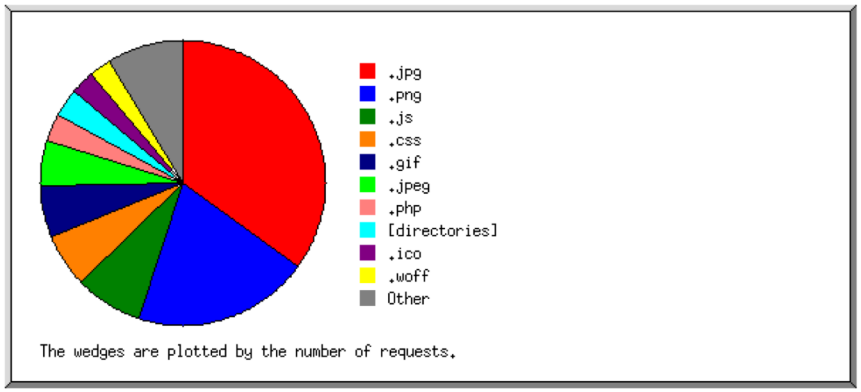
This report lists the total activity for each hour of the day, summed over all the days in the report.

Each unit (+) represents 10,000 requests for pages or part thereof.

hour	pages	%pages	
0	250696	3.48%	++++++++++++++++++++++++++
1	224118	3.11%	++++++++++++++++++++++
2	202032	2.81%	++++++++++++++++++++
3	286419	3.98%	++++++++++++++++++++++++++++
4	325238	4.52%	+++++++++++++++++++++++++++++++
5	230540	3.20%	++++++++++++++++++++++
6	248610	3.45%	++++++++++++++++++++++++
7	272650	3.79%	+++++++++++++++++++++++++++
8	312770	4.35%	+++++++++++++++++++++++++++++
9	354727	4.93%	++++++++++++++++++++++++++++++++++
10	371446	5.16%	+++++++++++++++++++++++++++++++++++
11	366253	5.09%	++++++++++++++++++++++++++++++++++++
12	338097	4.70%	+++++++++++++++++++++++++++++++
13	340064	4.73%	+++++++++++++++++++++++++++++++
14	332571	4.62%	+++++++++++++++++++++++++++++++
15	349152	4.85%	+++++++++++++++++++++++++++++++
16	314820	4.37%	+++++++++++++++++++++++++++++
17	300479	4.18%	++++++++++++++++++++++++++++
18	304097	4.23%	++++++++++++++++++++++++++++
19	303599	4.22%	++++++++++++++++++++++++++++
20	300673	4.18%	++++++++++++++++++++++++++++
21	298898	4.15%	+++++++++++++++++++++++++++
22	287526	4.00%	++++++++++++++++++++++++++++
23	280459	3.90%	++++++++++++++++++++++++++++

Heaviest usage
occurs around
10:00am and 3-4:00pm

www.usc.edu server - File Type Report

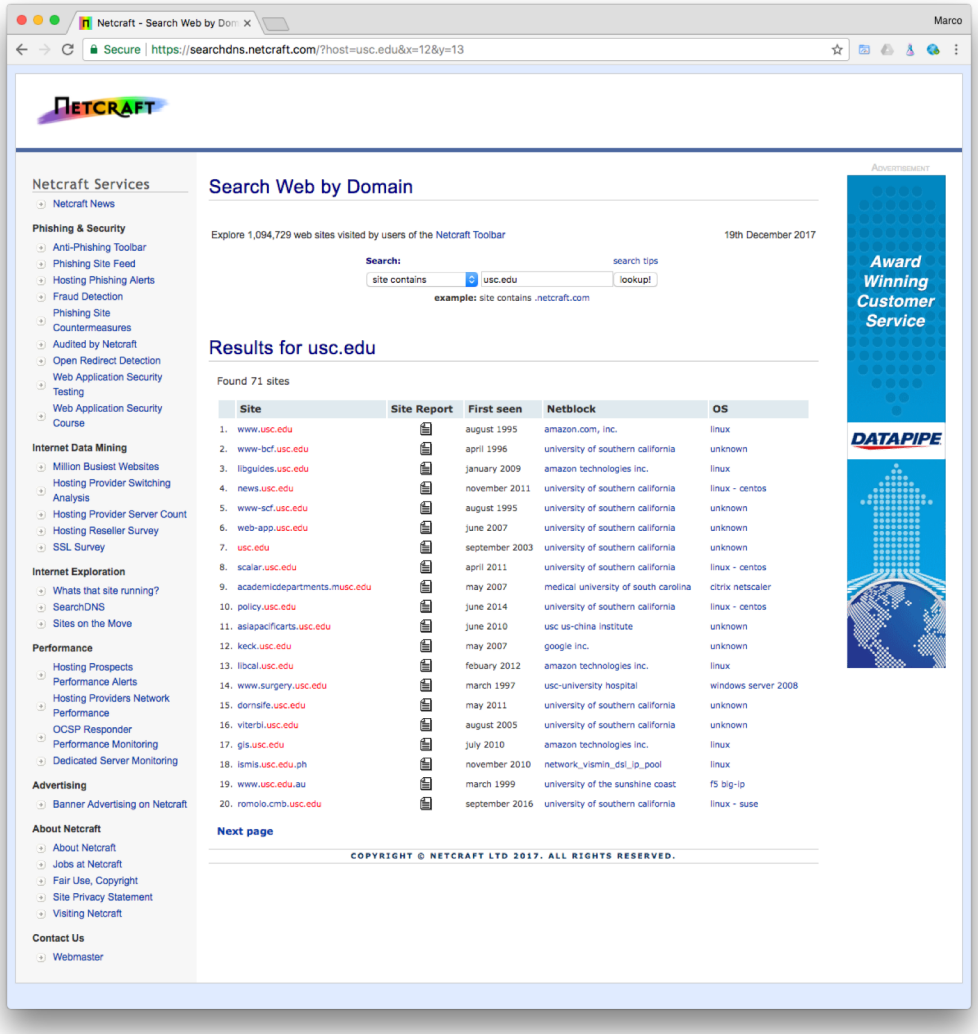


Listing extensions with at least 100 requests, sorted by the number of requests.

reqs	%reqs	extension
30281917	34.98%	.jpg
17335800	20.03%	.png
6587858	7.61%	.js
5336069	6.16%	.css
5092427	5.88%	.gif
4380596	5.06%	.jpeg
2791088	3.22%	.php
2743043	3.17%	[directories]
2336201	2.70%	.ico
2284802	2.64%	.woff
1813001	2.09%	.html
1457093	1.68%	.pdf
939910	1.09%	.html
864324	1.00%	.xml
838308	0.97%	.svg
386244	0.45%	.15
243588	0.28%	.eot
219621	0.25%	.ttf
165153	0.19%	.htm
144583	0.17%	.xls
52259	0.06%	.txt
42058	0.05%	.JPG
38769	0.04%	[no extension]

gif/jpg/png account
For 62% of files
requested

USC Has Many Web Servers Running



- Netcraft lists **71** separate web servers with usc.edu in their name, e.g.
- www.usc.edu
- mat.usc.edu
- www.cs.usc.edu
- dornsife.usc.edu
- web-applusc.edu
- www-scf.usc.edu
- However, some may not be connected to USC, e.g.
- www.usc.edu.au

Web Browsers Use Standard Layout Engines

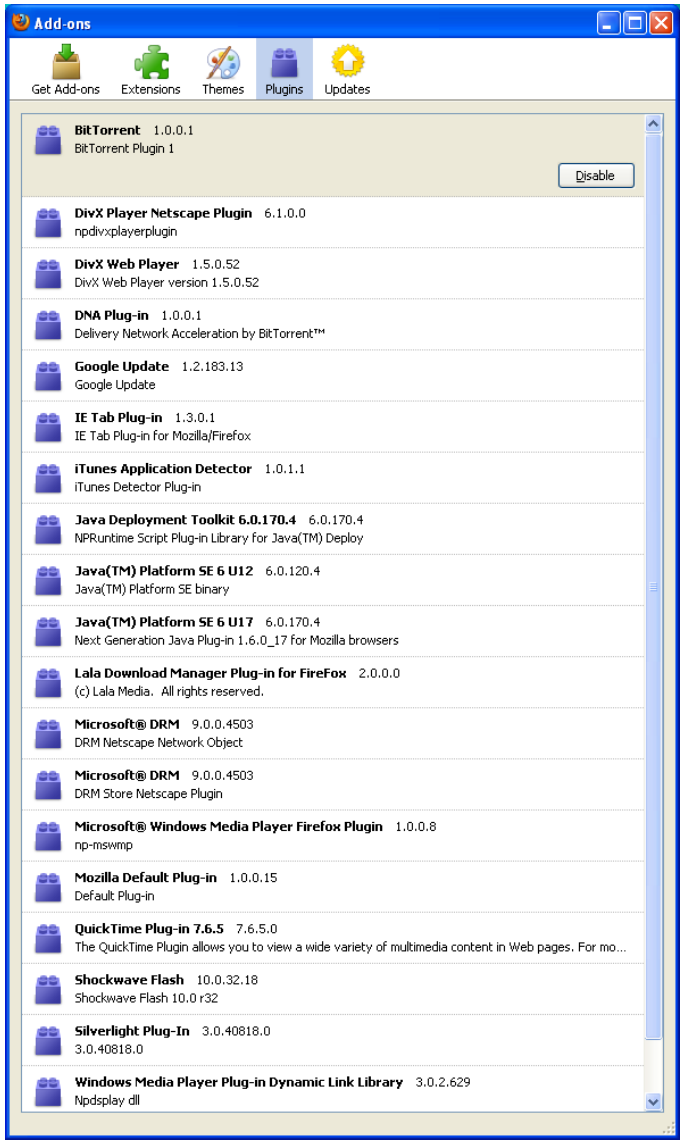
- **WebKit** is a software component used to render web pages; it is open source.
  - It is used by Google's Chrome and Apple's Safari web browsers
  - WebKit is also the name of the Mac OS X system framework version of the engine that's used by Safari, Dashboard, Mail, and many other OS X applications;
- **Gecko** is a layout engine developed by Mozilla Corporation, known as the layout engine of the Firefox web browser.
  - It is used to display web pages and, in some cases, an application's user interface.
  - It offers a rich programming API that makes it suitable for a wide variety of roles in Internet-enabled applications, such as web browsers
  - Its development originated with Netscape Communications Corporation
- Some web kits and the browsers that use them
  - **Gecko-based**: FireFox (Mozilla), Flock, Netscape
  - **Trident-shells**: Internet Explorer (Microsoft)
  - **EdgeHTML**: Edge (Microsoft), fork of Trident 7
  - **WebKit-based**: Chrome and Android (Google), Midori, Safari and Mobile Safari (Apple), Symbian^3 (Nokia) and many others
  - **Presto-based**: Opera, Nintendo DS, Opera Mini, Opera Mobile
  - **Java-based**: HotJava, Lobo

Capabilities of a Browser

- Web browsers fetch and display documents from other WWW sites; their capabilities include:
  - A mouse-driven graphical user interface
  - Display of
    - Hypertext documents conforming to latest HTML standard
    - Text with fonts, styles, and varying point sizes
    - Foreign-language character sets conforming to ISO-8859
    - Forms composed of edit boxes, check boxes, radio boxes, lists, text areas, etc.
    - Graphics in different formats (GIF, JPEG, MPEG, PNG, XBM) including monochrome, color

GIF = graphic interchange format, MPEG = Motion Picture Experts Group, JPEG = Joint Photographic Experts Group, PNG = Portable Network Graphics, XBM = x bitmap

Capabilities of a Browser



- Ability to invoke helper applications and plug-ins, (**Obsoleted in HTML5**) e.g.
  - *Adobe Acrobat* – used to view pdf files
  - *Windows Media Player* to play digital *sound files*
  - Adobe Flash Player, used to display video e.g. YouTube, etc.)
- Ability to communicate over a secure channel, using SSL
- Ability to maintain and exchange digital certificates
- Ability to run scripts in JavaScript
- Ability to run Java applets and Active X components (**also obsoleted in HTML5**)

The Browser Wars - Desktop Statistics

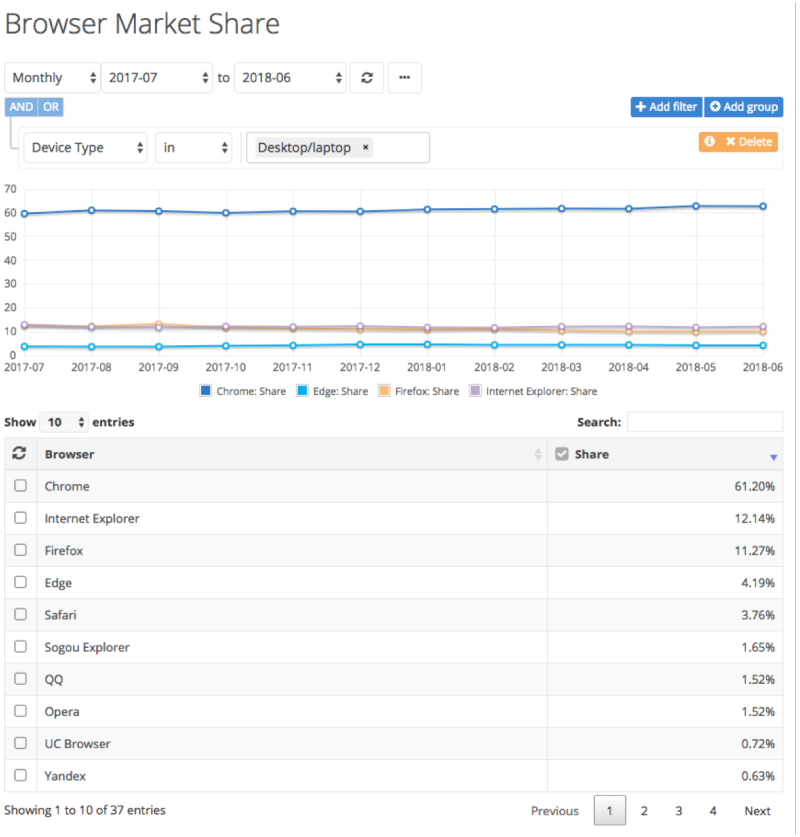
2018	Chrome	Edge/IE	Firefox	Safari	Opera
November	79.1 %	4.1 %	10.2 %	3.8 %	1.6 %
October	79.6 %	4.0 %	10.1 %	3.5 %	1.5 %
September	79.6 %	3.9 %	10.3 %	3.3 %	1.5 %
August	79.9 %	3.7 %	10.6 %	3.0 %	1.5 %
July	80.1 %	3.5 %	10.8 %	2.7 %	1.5 %
June	79.4 %	3.8 %	10.9 %	3.0 %	1.6 %
May	79.0 %	3.9 %	10.9 %	3.2 %	1.6 %
April	78.6 %	3.9 %	11.2 %	3.3 %	1.5 %
March	78.1 %	4.0 %	11.5 %	3.3 %	1.6 %
February	77.9 %	4.1 %	11.8 %	3.3 %	1.5 %
January	77.2 %	4.1 %	12.4 %	3.2 %	1.6 %

2017	Chrome	IE/Edge	Firefox	Safari	Opera
December	77.0 %	3.9 %	12.4 %	3.3 %	1.6 %
November	76.8 %	4.3 %	12.5 %	3.3 %	1.6 %
October	76.1 %	4.1 %	12.1 %	3.3 %	1.2 %
September	76.5 %	4.2 %	12.8 %	3.2 %	1.2 %
August	76.9 %	4.3 %	13.1 %	3.0 %	1.2 %
July	76.7 %	4.2 %	13.3 %	3.0 %	1.2 %
June	76.3 %	4.6 %	13.3 %	3.3 %	1.2 %
May	75.8 %	4.6 %	13.6 %	3.4 %	1.1 %
April	75.7 %	4.6 %	13.6 %	3.7 %	1.1 %
March	75.1 %	4.8 %	14.1 %	3.6 %	1.0 %
February	74.1 %	4.8 %	15.0 %	3.6 %	1.0 %
January	73.7 %	4.9 %	15.4 %	3.6 %	1.0 %

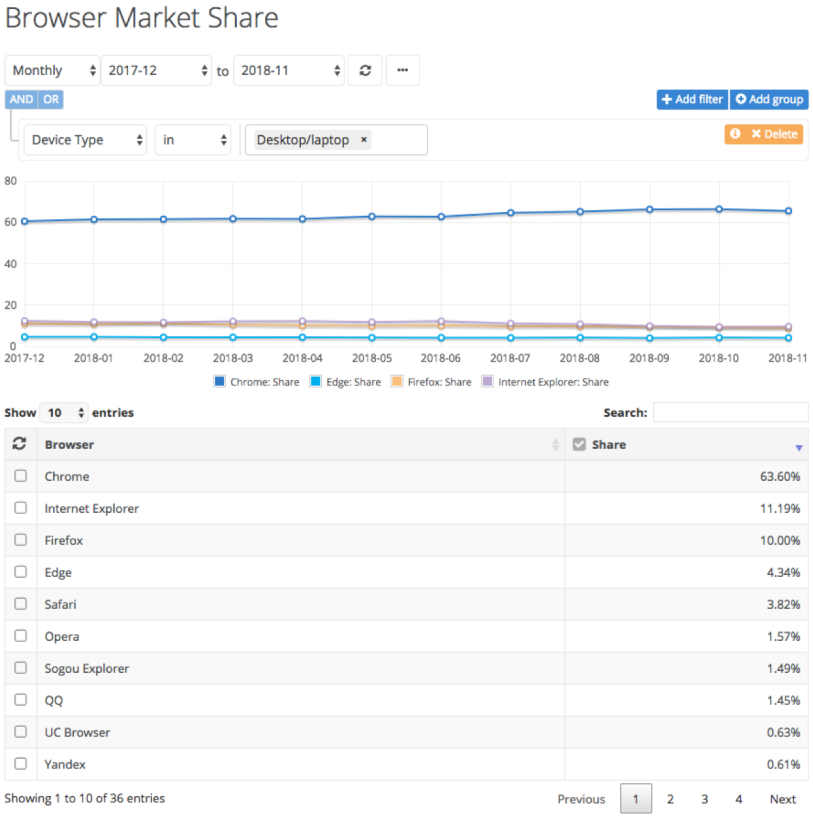
Conclusion of the above study:
- Chrome is the clear winner
- Firefox comes second, but losing ground
- Internet Explorer is on the way out
- Safari and Opera having small percentages
- WebKit total over 80%

- See http://www.w3schools.com/browsers/browsers_stats.asp
- See also http://www.upsdell.com/BrowserNews/stat.htm

Mobile/Tablet Browser Market Share Statistics



July, 2018

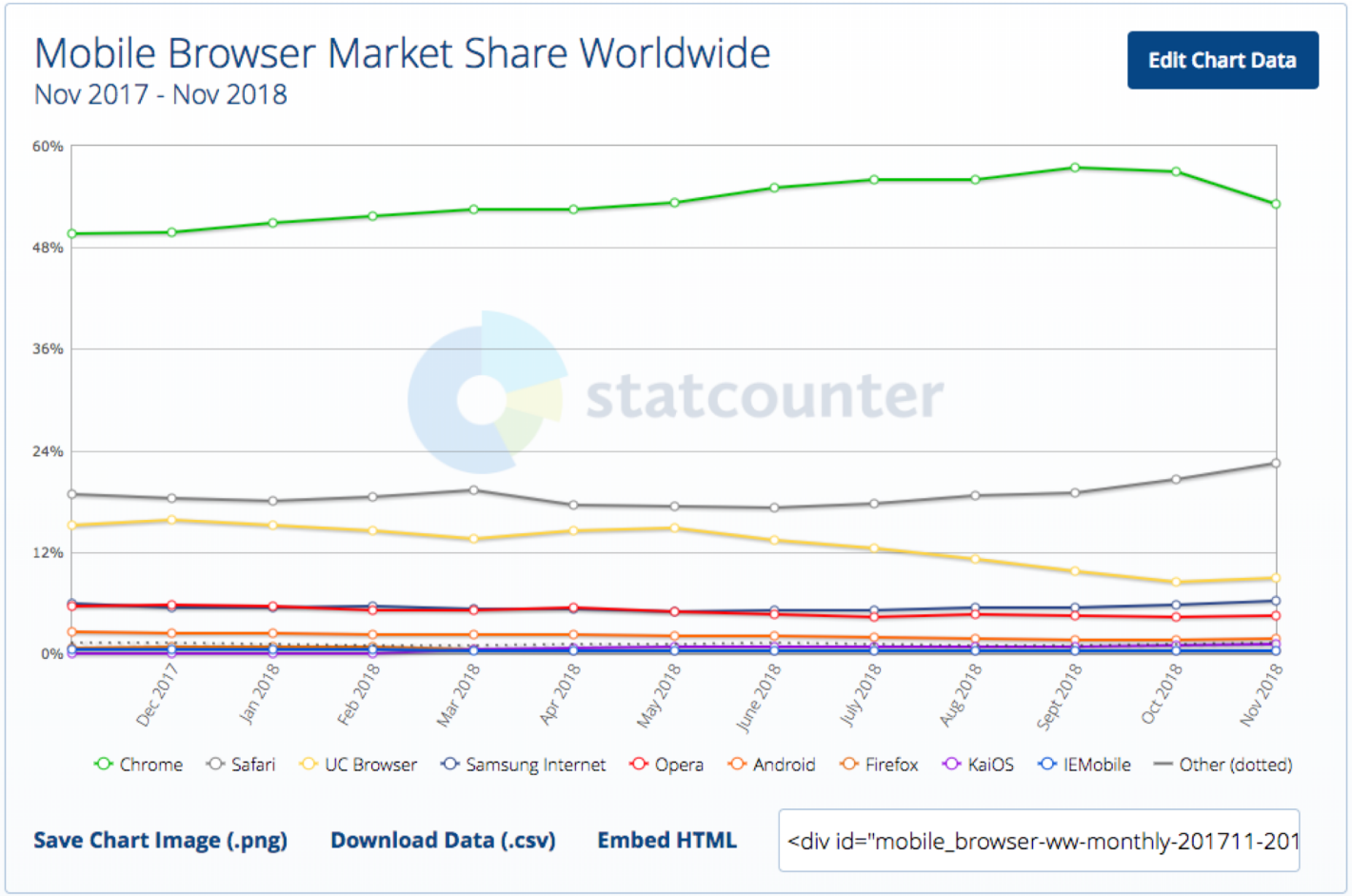


November, 2018

http://www.netmarketshare.com/

Android / Chrome leads with about 63% market share. Webkit (used by iOS, Android & Chrome, Blackberry & others) has over 70% market share

The Browser Wars Comparison(cont'd)

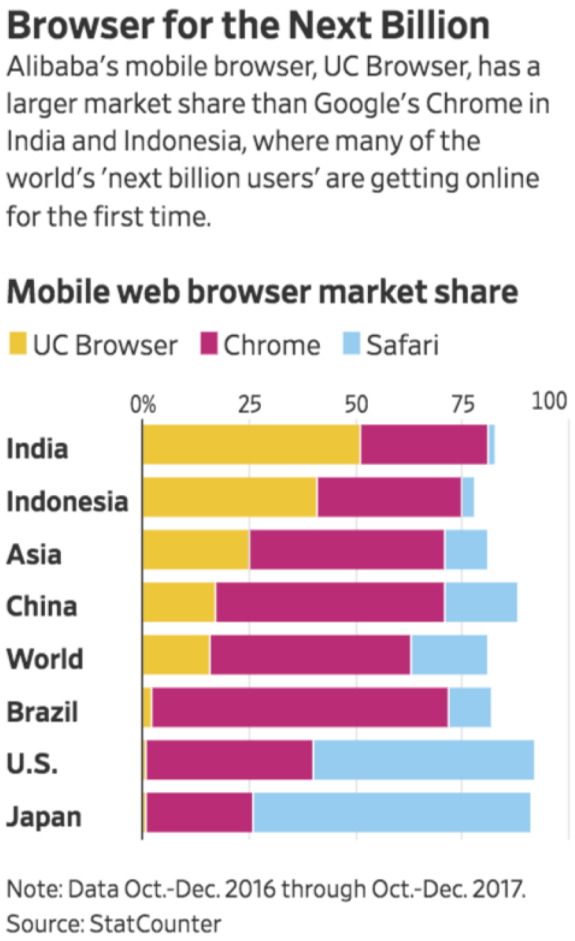


StatCounter Global Stats, Nov. 2017 – Nov. 2018, See http://gs.statcounter.com

Chrome has the lead with about 53% followed by Safari at 22%

UC Browser (new!) from UCWeb of Alibaba Group of China at 9%

The Browser Wars Comparison(cont'd)



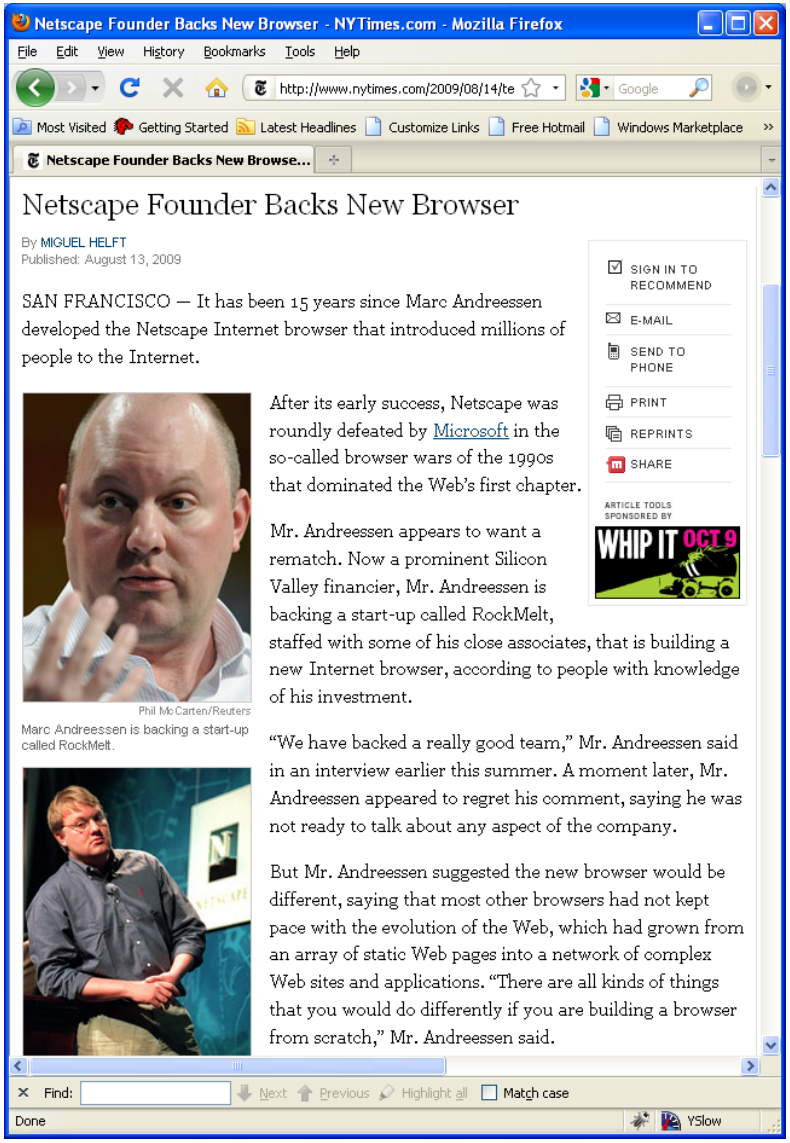
StatCounter Global Stats, Oct.-Dec. 2016 through Oct.-Dec. 2017, See https://www.wsj.com/articles/a-browser-youve-never-heard-of-is-dethroning-google-in-asia-1514808002

Browsers are the Gateway to the Web/Internet

Despite Netscape's failure, there is now a new business model for browsers; Google will pay Mozilla $300 million/year for 3 years to keep Google its default search engine. (Dec. 25, 2011)

Similarly, Google is rumored to have been paying Apple $1 billion in 2011 to keep Google the default search engine for Safari on iOS devices and OS X. (http://articles.businessinsider.com/2012-03-09/tech/31138467_1_google-maps-ben-schachter-google-searches)

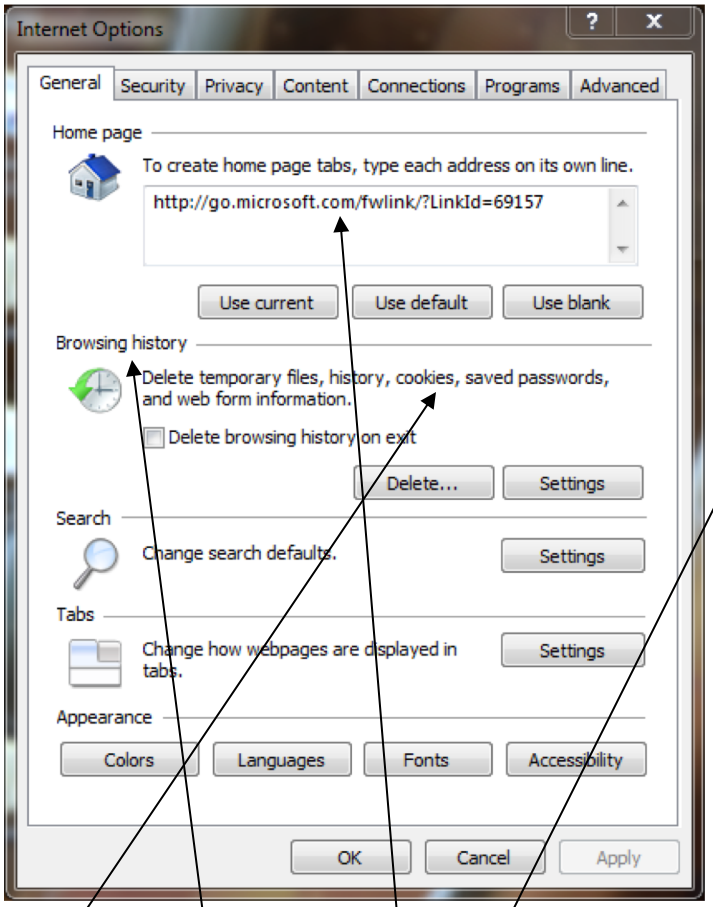
June, 2014: Apple announces DuckDuckGo will be another built-in search engine on Safari (no user tracking)



http://www.nytimes.com/2009/08/14/technology/internet/14browser.html?_r=1&scp=1&sq=browser%20wars&st=cse

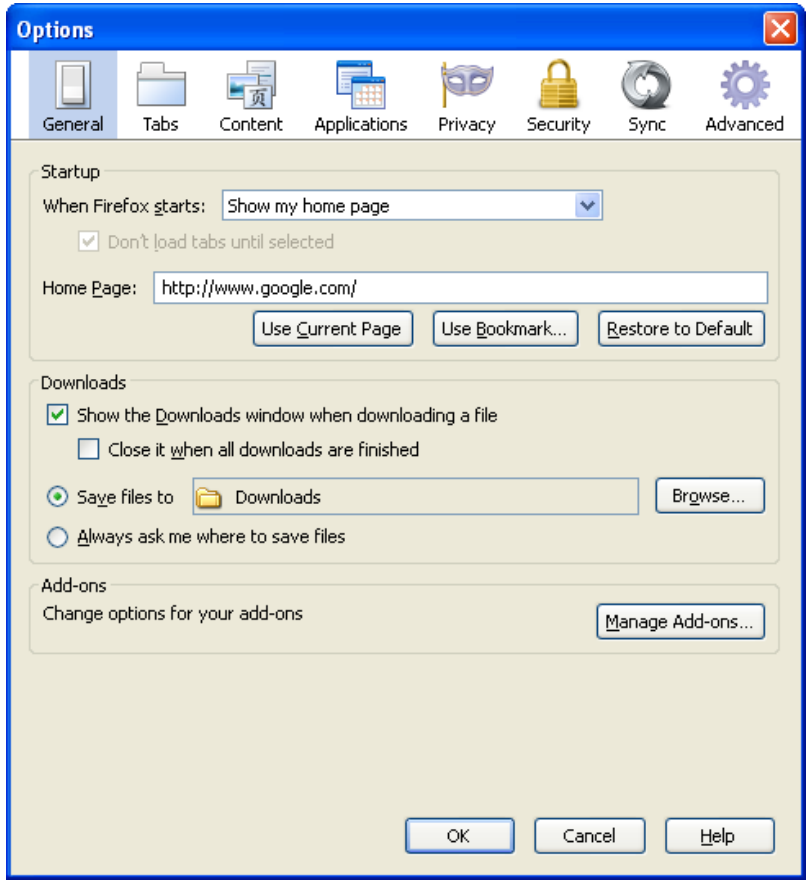
Browser Options Menus for IE and Firefox

Click on Tools -> Internet Options



Internet Explorer

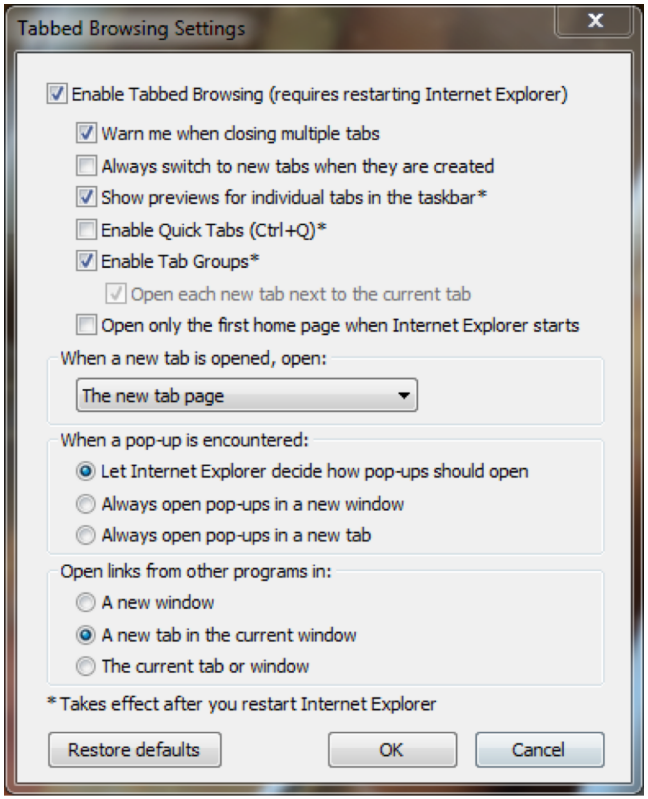
Click on Tools -> Options

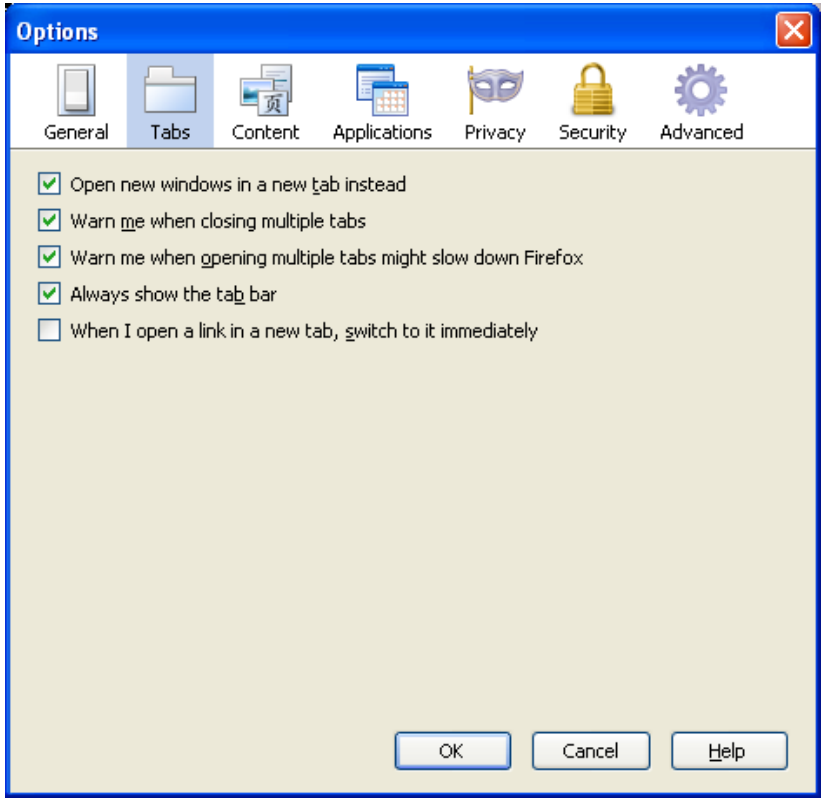


Firefox – Tools | Options

Cookies, History, default opening page

IE and Firefox Tab Control Options

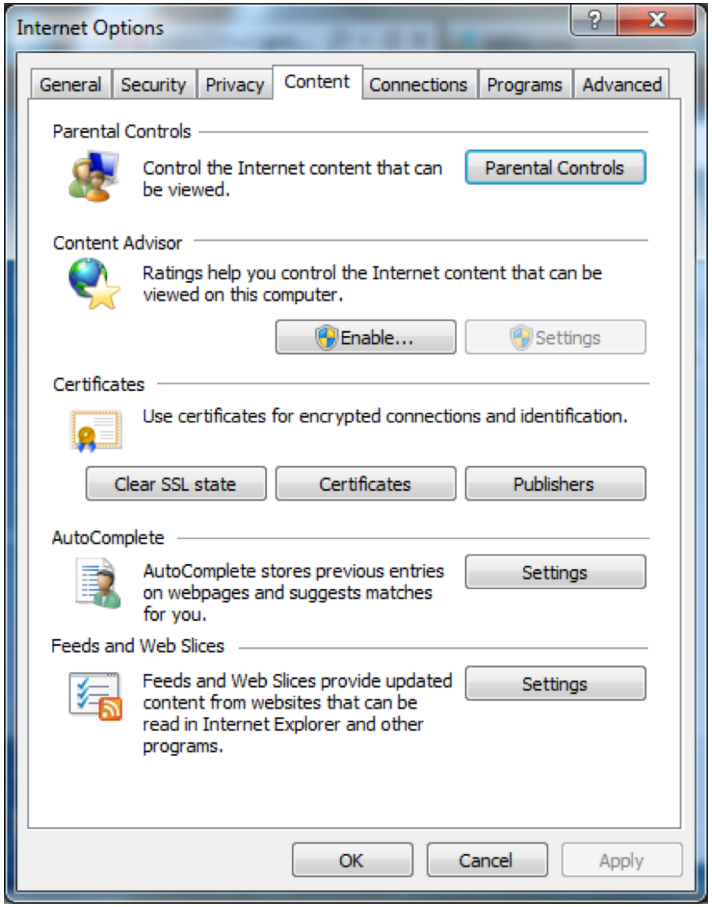


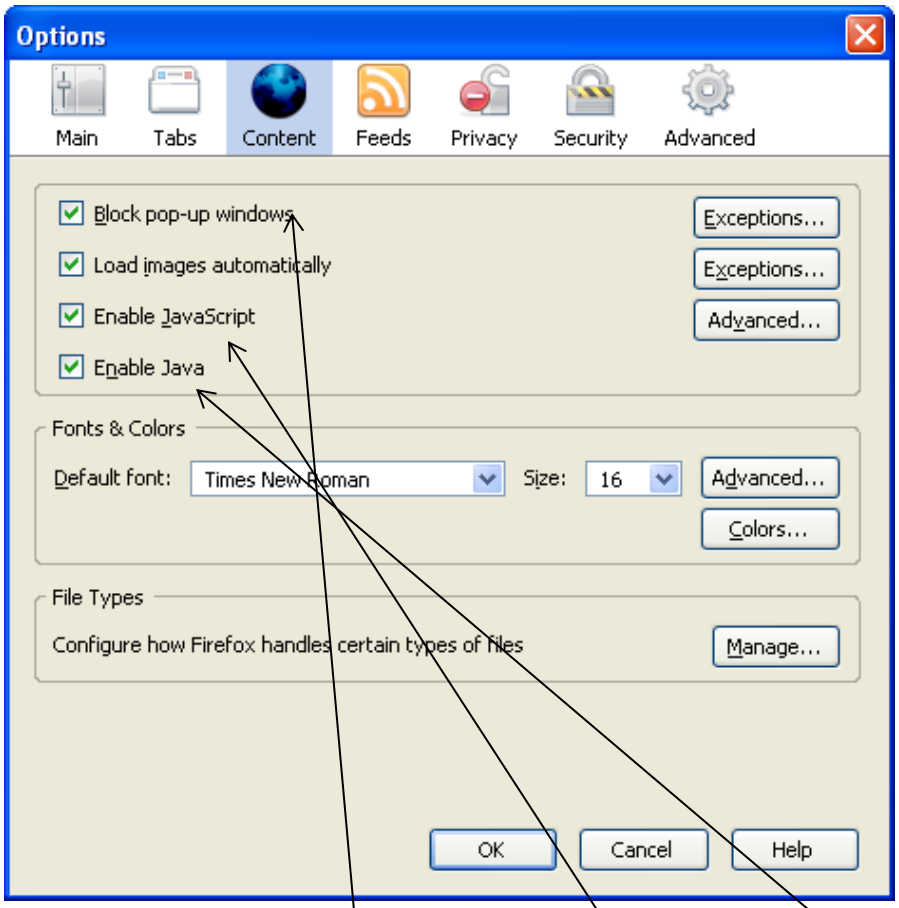


Internet Explorer

Firefox

IE and Firefox - Content Options

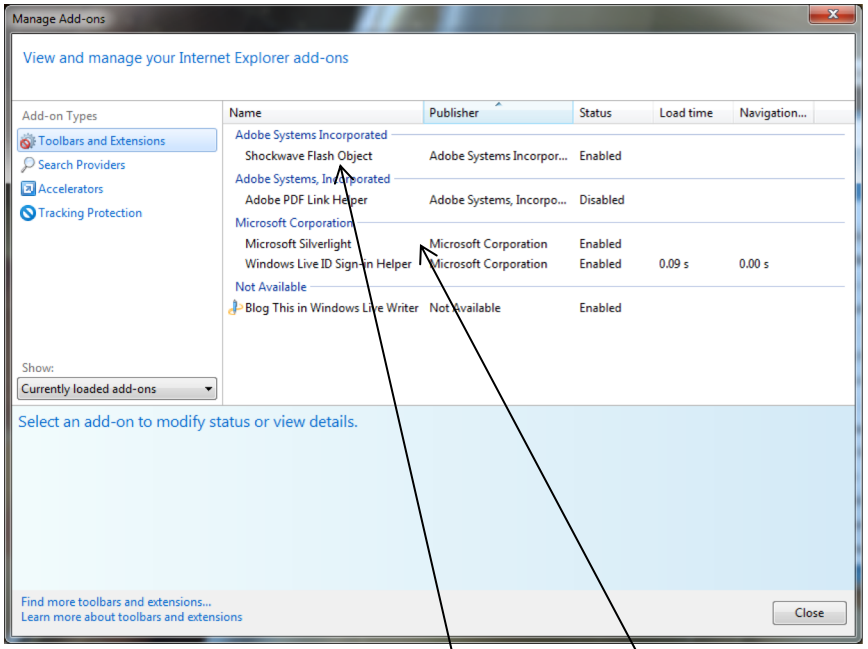


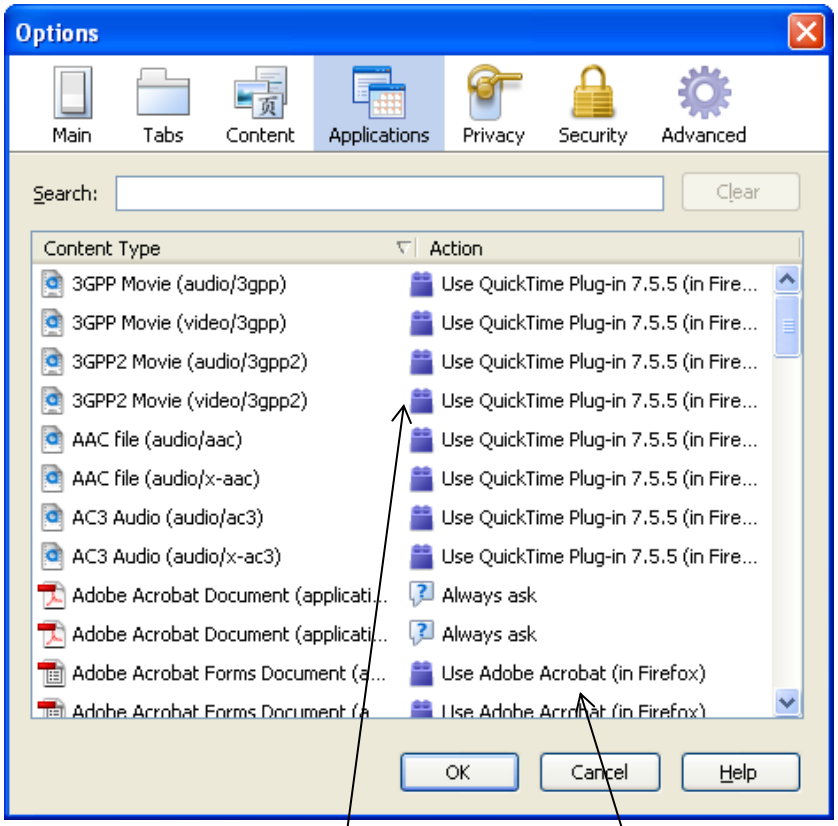


Internet Explorer

Firefox (PopUps, JavaScript, Java)

IE and Firefox Applications Options



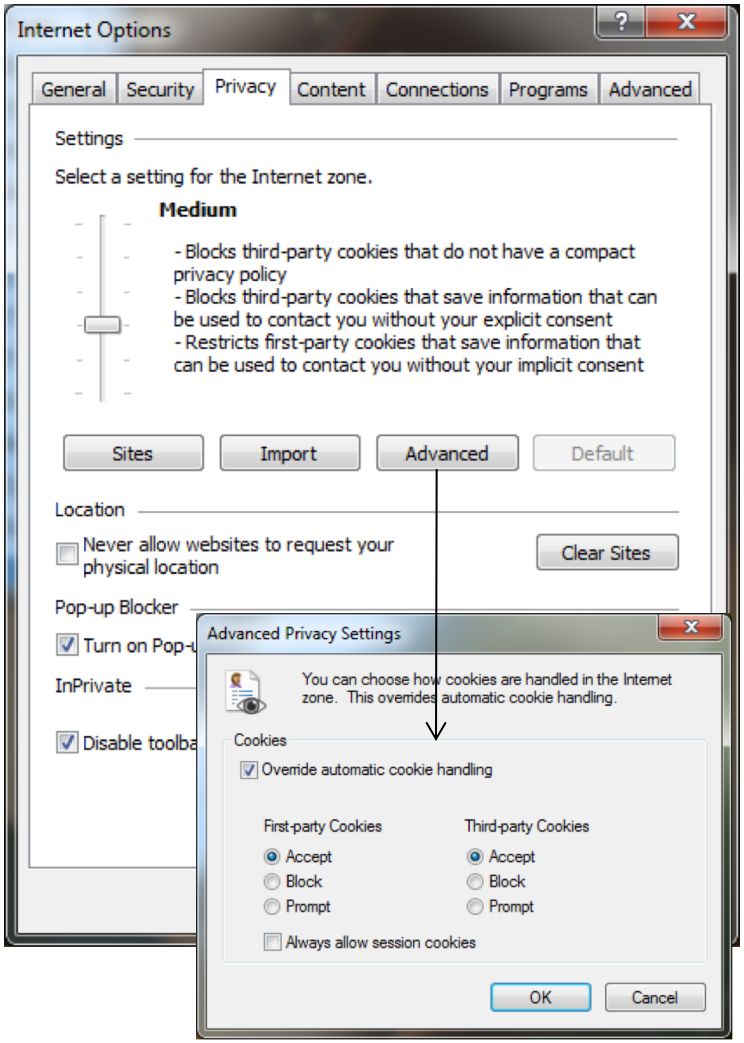


Internet Explorer (Adobe, Silverlight)

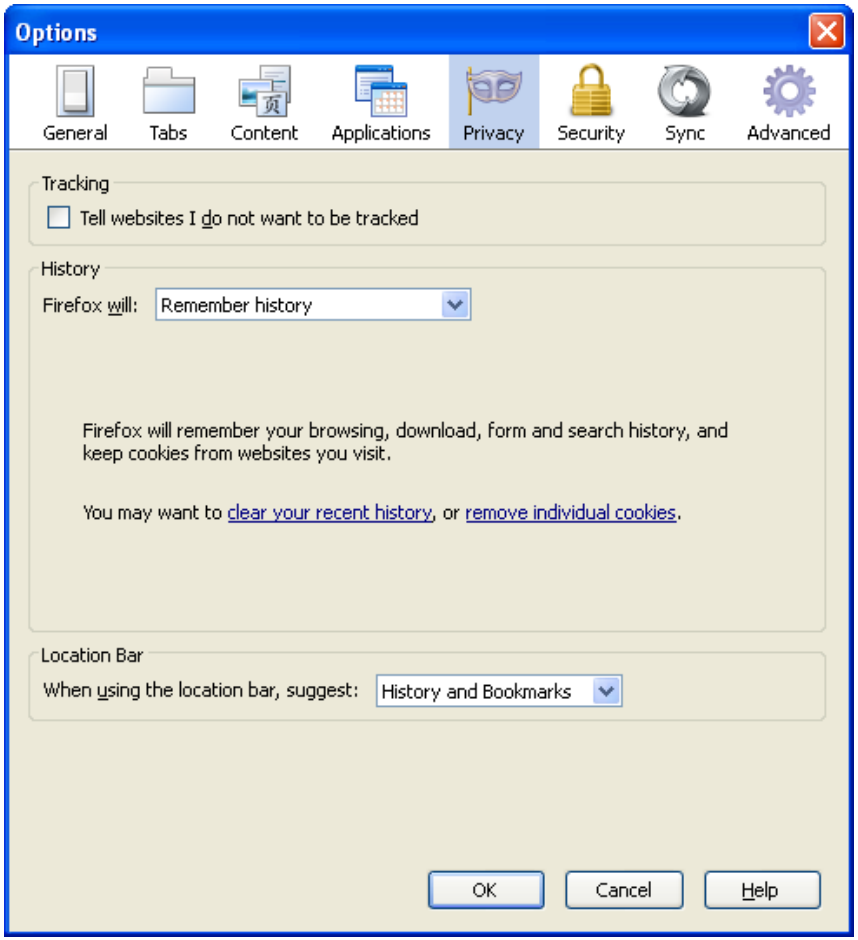
(Microsoft has now dropped Silverlight)

Firefox (Quicktime, Acrobat)

IE and Firefox Privacy Options

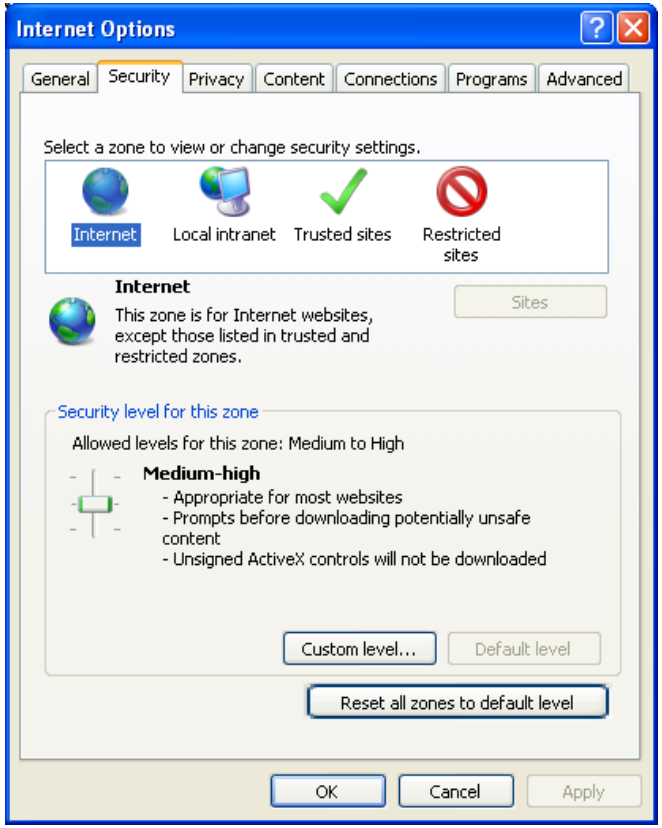


Internet Explorer (Cookies)

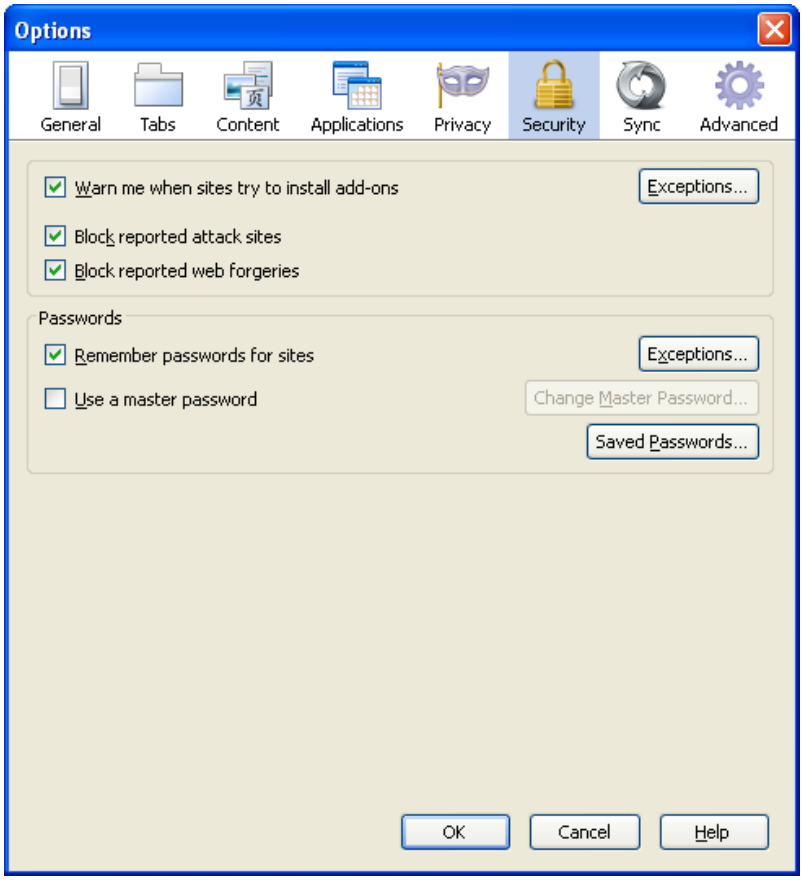


Firefox (History, Cookies)

IE and Firefox Security Options

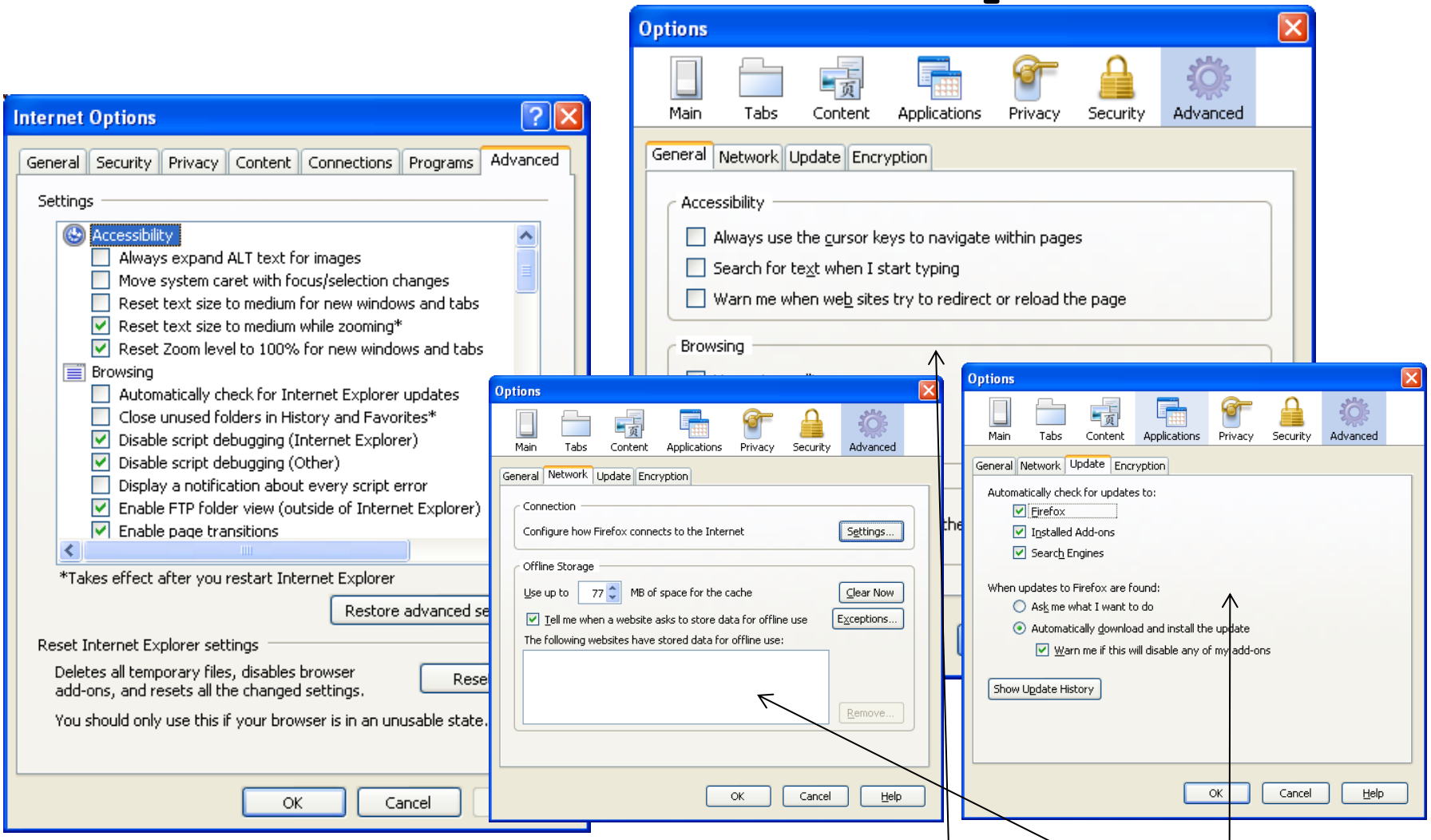


Internet Explorer



Firefox

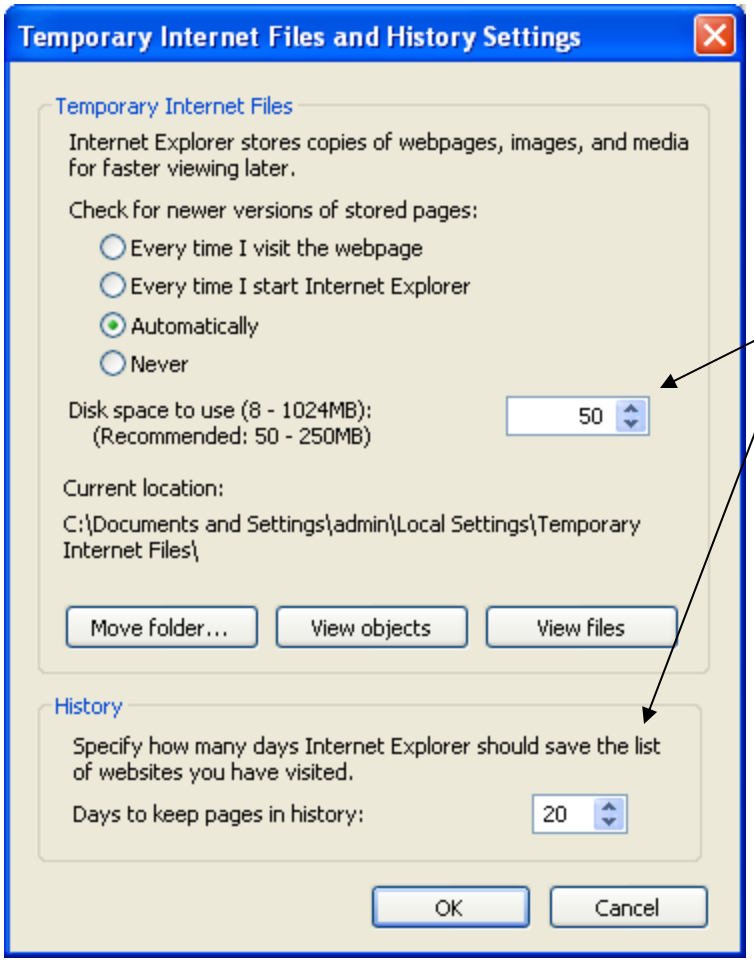
IE and Firefox Advanced Options



Internet Explorer

Firefox (General, Network, Update)

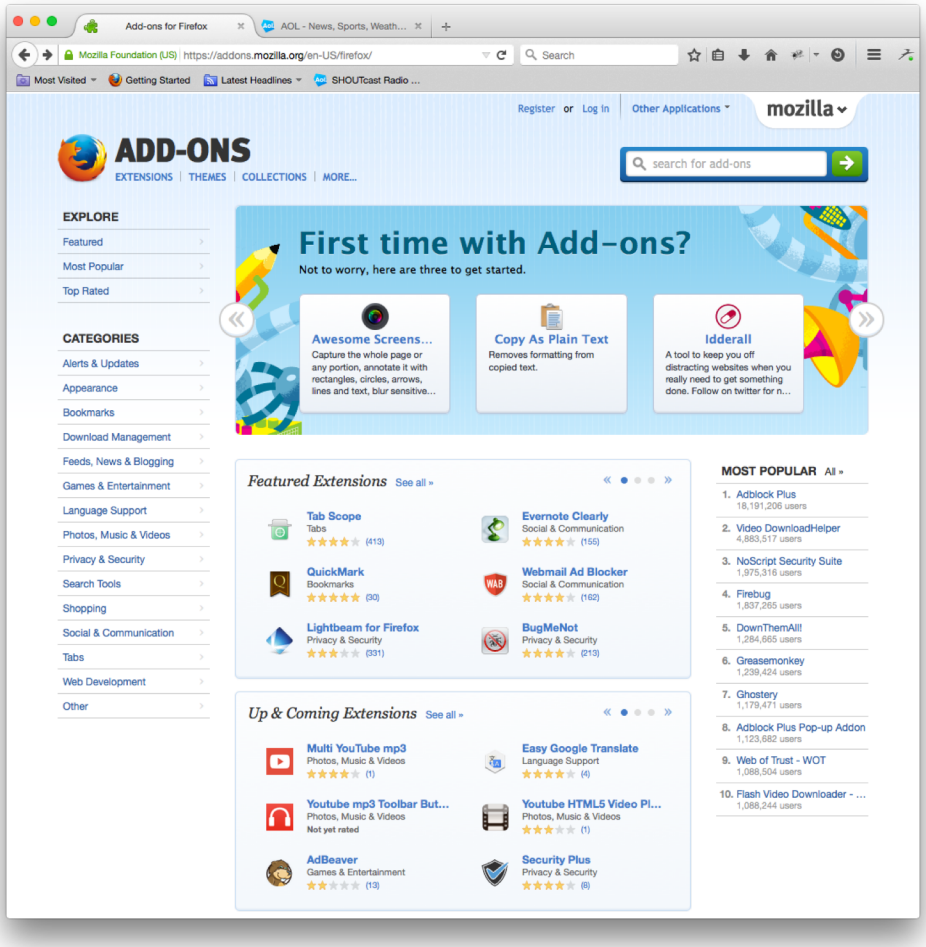
Internet Explorer Browser Caching



- History
  - Links and URLs that have been accessed by the browser over a period of time
- Disk cache
  - Temporary internet files, a folder on the disk that contains cached copies of files
- Memory cache
  - Session-based information that is cached during the session
- Offline content
  - Web content is downloaded when online and viewed offline

IE caching options screen (Tools | Options | General | Browsing History)

Browsers Have Many Plugins Available

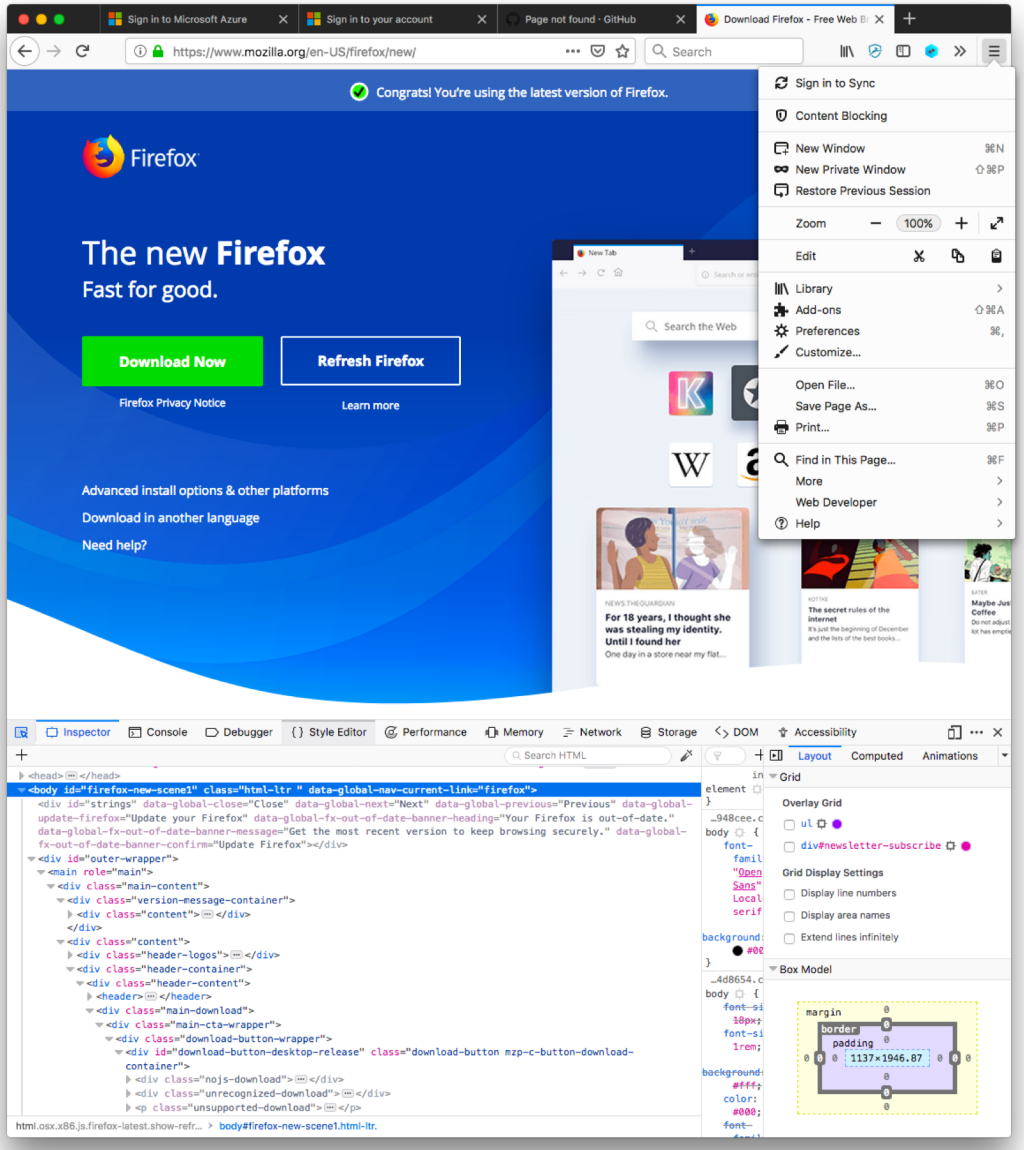


- Three Firefox plug-ins that will be especially useful in this course are:
  - Live HTTP Headers
  - Firebug
  - YSlow
- Available at:
  - addons.mozilla.org
- More about them

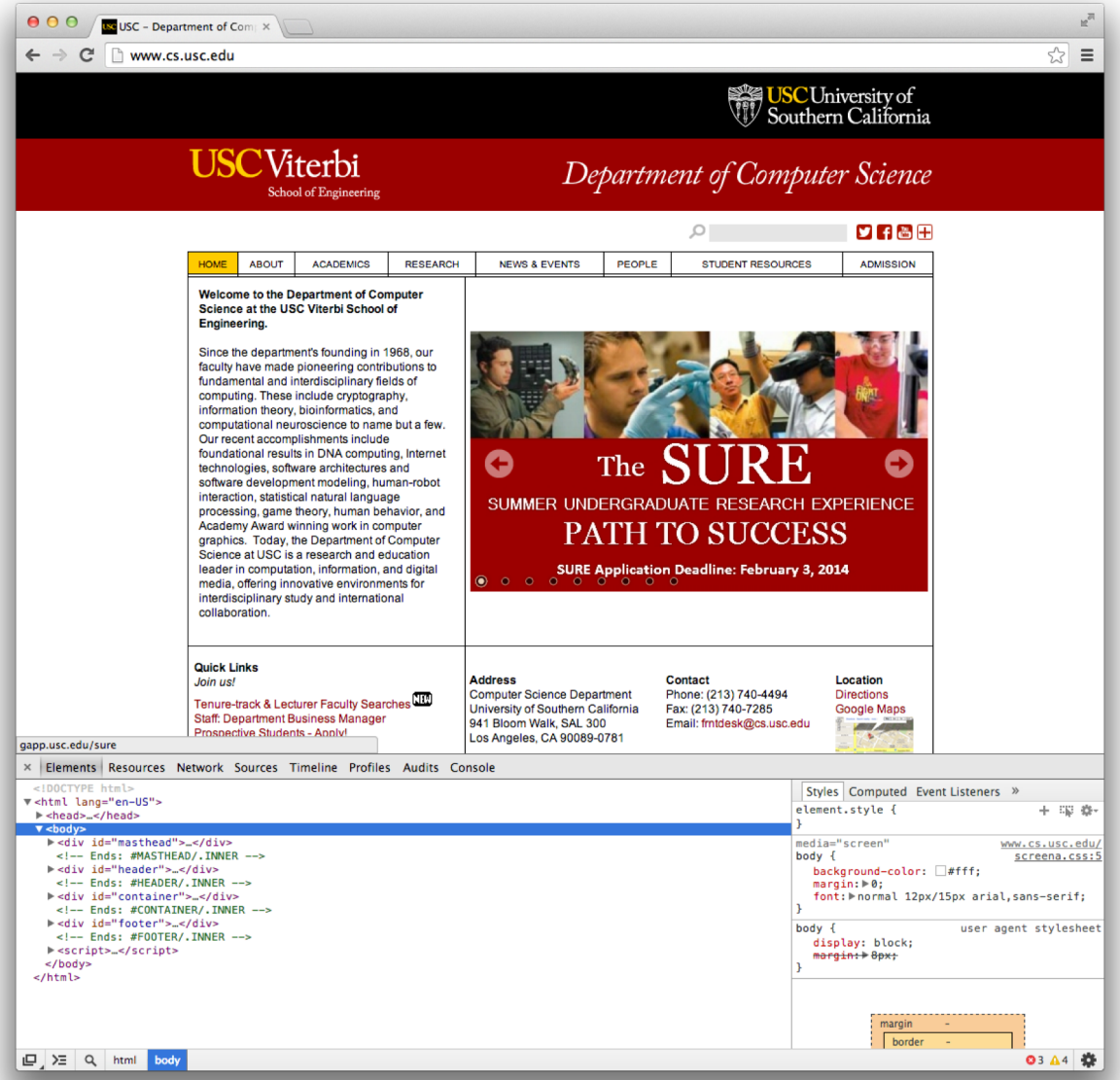
later on in the semester

- HTML5 does away with most plugins

Firefox: Tools | Web Developer



Chrome: Menu| More Tools | Developer Tools



Evolution of Web Sites

1st gen	2nd gen	3rd gen	4th gen	5th gen	6th gen
Client-centric Static	Server Applications Databases Dynamic web pages	Web services Multiple layers Business and service Integration	Service Oriented Arch. (SOA) Client-centric	Multi-platform (desktop, tablet, phone) Client-centric	IoT, Wearables, Cloud computing, Serverless Arch. (BaaS, FaaS)
HTML Scripts CGI	ODBC, JDBC ASP Applets, ActiveX	XML, WML, SQL, .NET COM+, Beans	Ajax, Web 2.0, JSON	HTML5, CSS3, JS gestures navigation	JS Frameworks AWS, Google Cloud, Azure microservices
1991	1997	2000	2005	2008	2014