中山大學
SUN YAT-SEN UNIVERSITY

Lecture 1
Internet and World Wide Web

SE-805 Web 2.0 Programming

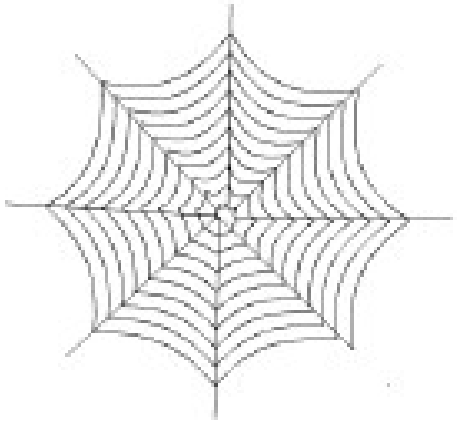
(http://my.ss.sysu.edu.cn/wiki/display/W2PSC/Home , **supported by Google;**
using some slides of & inspired by Marty Stepp's CSE 190 M courseware)

School of Software, Sun Yat-sen University

Outline

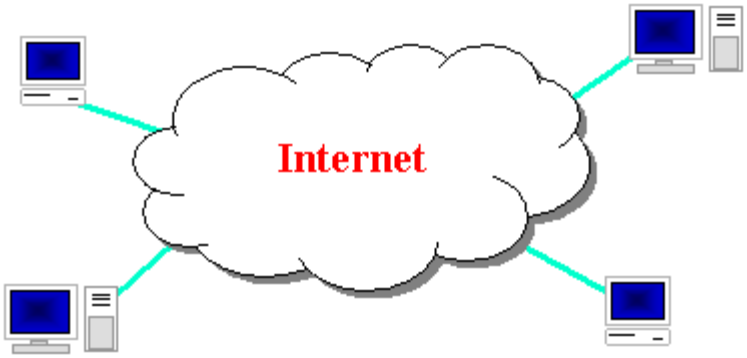
- **The Internet**
- The World Wide Web (WWW)
- Web 2.0

What's the Internet?



- A Chinese town officer
  - *"The Internet is an English agents' net"*
- A U.S. Senator
  - *"series of tubes" (explanation)*
- How many internets are there, anyway? Is The Google one of them?

The Internet



- Wikipedia: http://en.wikipedia.org/wiki/Internet
- a connection of computer networks using the Internet Protocol Suite (TCP/IP)
- What's the difference between the Internet and the World Wide Web (WWW)?
- WWW = HTML* + HTTP(S)

* *including CSS, JavaScript, and other browser enabled content*

Brief History

- began as a US Department of Defense network called ARPANET (1960s-70s)
- initial services: electronic mail, file transfer
- opened to commercial interests in late 80s
- WWW created in 1989-91 by Tim Berners-Lee
- popular web browsers released: Netscape 1994, IE 1995
- Amazon.com opens in 1995; Google January 1996
- Chinese First Connection with Internet：Chinese Academics Net, by Computer Applying Technology Institute of Beijing1986，
- First email, Sep. 14 1987, from CATIB, “Across the Great Wall we can reach every corner in the world”
- Chinese First Full Internet Connection：NCFC (National Computing and Networking Facility of China) 1994
- Baidu 1999；Taobao 2003

Who can shut down the Internet?

GFW

Key aspects of the Internet

- Internet is for freedom of information
- internet Vs. Internet
- subnetworks can stand on their own
- computers can dynamically join and leave the network
- built on open standards; anyone can create a new device
- lack of centralized control (mostly)
- everyone can use it with simple, commonly available software

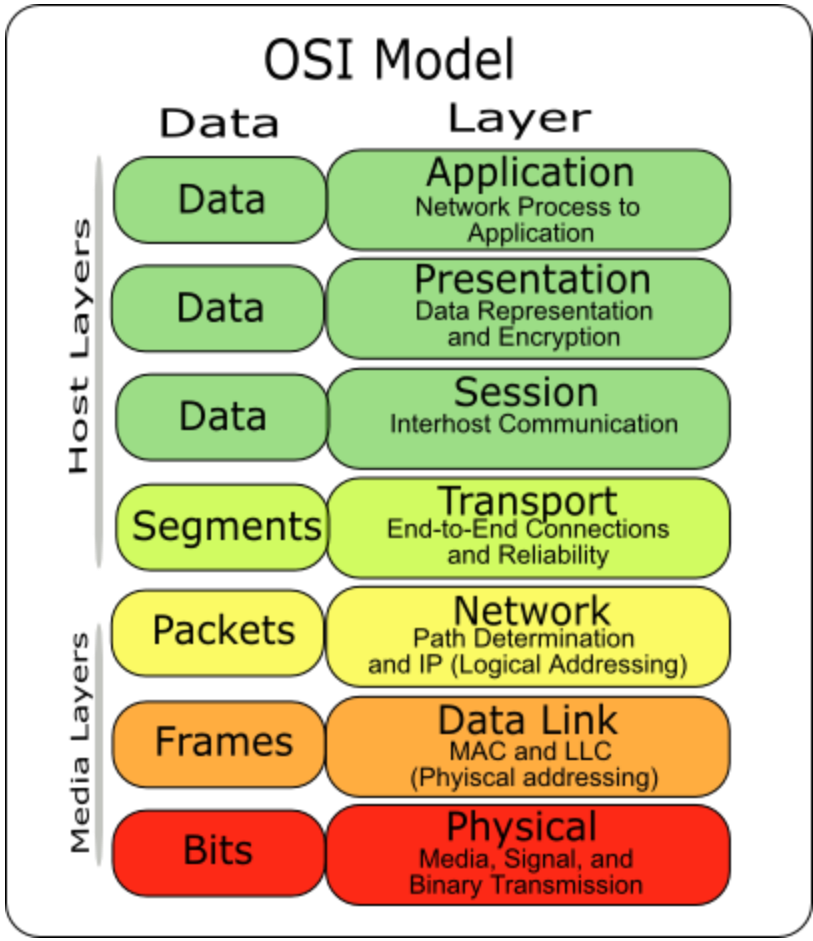
People and Organizations

- Internet Engineering Task Force (IETF): internet protocol standards
- Internet Corporation for Assigned Names and Numbers (ICANN): decides top-level domain names
- World Wide Web Consortium (W3C): Web standards

Layered architecture

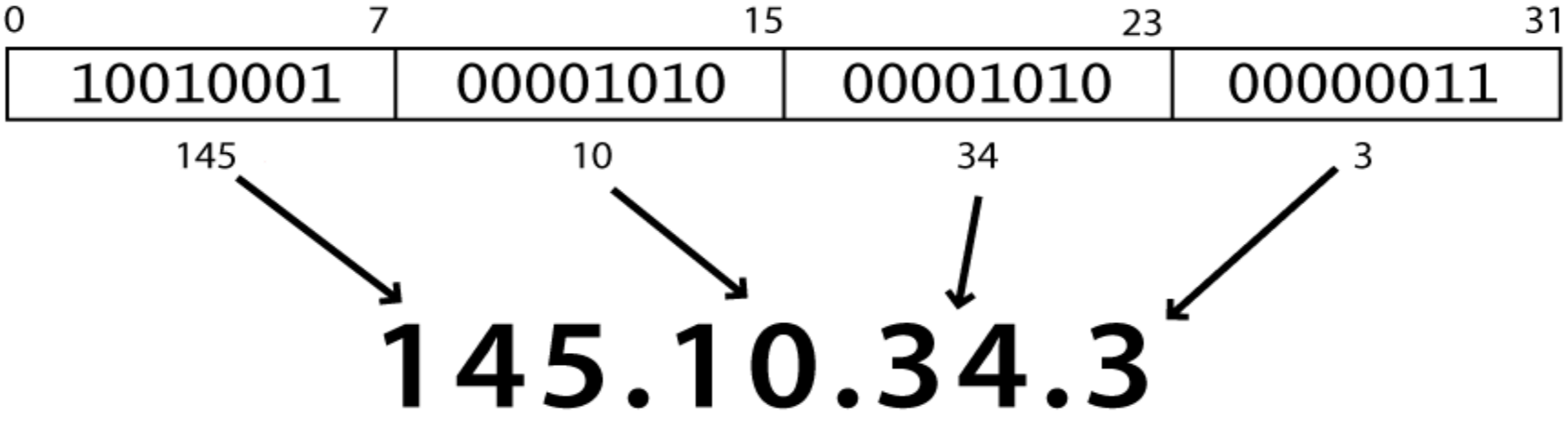
The internet uses a layered hardware/software architecture (OSI model):

- **physical layer**: devices such as coaxial cables, fiber-optic lines, modems
- **data link layer**: basic hardware protocols (Ethernet, Wi-Fi, DSL, ATM, PPP)
- **network / internet layer**: basic software protocol (IP)
- **transport layer**: add reliability to network layer (TCP, UDP)
- **application layer**: implements specific communication for each kind of program (HTTP, POP3/IMAP, SSH, FTP)



Internet Protocol (IP)

- the **IP** is the underlying system of communication for all data (packets) sent across the internet.
- each device has a 32-bit IP address as four 8-bit numbers



- find out your internet IP address: whatismyip.com
- find out your local IP address:
  - in a terminal, type: ipconfig (Windows) or ifconfig (Mac/Linux)
- IP v4 vs. IP v6 (32-b vs. 128-b)

Transmission Control Protocol (TCP)

- adds multiple, guaranteed message delivery on top of IP
- **multiplexing**: multiple programs using the same IP address
  - **port**: a number given to each program or service
  - 80: Web browser (443 for secure browsing)
  - 25: email
  - 22: ssh
  - 21: ftp
  - more common ports
- some programs (QQ, games, streaming media programs) use simpler UDP protocol instead of TCP
- find out ports used:
  - in a terminal, using **netstat** (Windows) command
  - using CurrPorts

Outline

- The Internet
- **The Word Wide Web (WWW)**
- Web 2.0

Web servers and browsers

- **Web server**: software that listens for Web page requests
  - Apache
  - Microsoft Internet Information Server (IIS) (part of Windows)
- **Web browser**: fetches/displays documents from Web servers
  - Microsoft Internet Explorer (IE)
  - Mozilla Firefox
  - Apple Safari
  - Google Chrome
  - Opera

Domain Name System (DNS)

- a set of servers that map written names to IP addresses
  - Example: www.sysu.edu.cn → 202.116.64.9
  - using Windows command **nslookup** to find out IP address
  - non-English languages in domain name IDN ccTLD Fast Track
- many systems maintain a local cache called a host file
  - Windows: C:\Windows\system32\drivers\etc\hosts
  - Mac: /private/etc/hosts
  - Linux: /etc/hosts

Uniform Resource Locator (URL)

- an identifier for the location of a document on a web site
- a basic URL:
  http://my.ss.sysu.edu.cn:8080/display/W2PSC
  ~~~ ~~~~~~~~~~~~~~~~ ~~~~ ~~~~~~~~~~~~~~~~
  protocol host port path

- upon entering this URL into the browser, it would:
  - ask the DNS server for the IP address of `my.ss.sysu.edu.cn`
  - connect to that IP address at port 8080
  - ask the server to GET `/display/W2PSC`
  - display the resulting page on the screen
  ~~~

More advanced URLs

- **anchor**: jumps to a given section of a web page
  http://www.textpad.com/download/index.html**#downloads**
  - fetches index.html then jumps down to part of the page labeled downloads

- **port**: for web servers on ports other than the default 80
  http://my.ss.sysu.edu.cn:8080/display/W2PSC/Syllabus

- **query string**: a set of parameters passed to a web program
  http://www.google.com/search**?q=miserable+failure&start=10**
  - parameter q is set to "miserable+failure"
  - parameter start is set to 10

Hypertext Transport Protocol (HTTP)

- the set of commands understood by a web server and sent from a browser
- some HTTP commands (your browser sends these internally):
  - GET *filename* : download
  - POST *filename* : send a web form response
  - PUT *filename* : upload
  - DELETE *filename*: remove entity
  - HEAD *filename*: only status information, not entire content
- simulating a browser with a terminal window:

```
$ telnet www.sysu.edu.cn 80
Trying 202.116.64.9... Connected to 202.116.64.9
(202.116.64.9). Escape character is '^]'.
GET /2009/xxgk.html
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0
..."> <html> ...
```

HTTP error codes

- when something goes wrong, the web server returns a special "error code" number to the browser, possibly followed by an HTML document
- common error codes:

Number	Meaning
200	OK
301-303	page has moved (permanently or temporarily)
403	you are forbidden to access this page
404	page not found
500	internal server error
complete list	

Internet media (MIME) types

- sometimes when including resources in a page (style sheet, icon, multimedia object), we specify their type of data

MIME type	file extension
text/html	.html , .htm, shtml, .shtm
text/plain	.txt
image/gif	.gif
image/jpeg	.jpg
video/quicktime	.mov
application/octet-stream	.exe

- Lists of MIME types: by type, by extension
- .html vs. .htm

Web languages / technologies

- Hypertext Markup Language (HTML): used for writing web pages
- Cascading Style Sheets (CSS): stylistic info for web pages
- PHP Hypertext Processor (PHP): dynamically create pages on a web server – *of course, there are may other languages and scripts can do this …*
- JavaScript: interactive and programmable web pages
- Asynchronous JavaScript and XML (Ajax): accessing data for web applications
- eXtensible Markup Language (XML): metalanguage for organizing data
- Structured Query Language (SQL): interaction with databases
- Resource Description Frame (RDF): describing web resources semantically
- ……

Terms

- **Internet Service Provider (ISP)**
  - enterprises or organizations who provide Internet access to you,
  - who? please identify your ISPs
- **Web Hosting**
  - provide a place for consumers to store pages designed to be consumed by the Web surfing public
  - ISPs often offer Web hosting services along with their standard connectivity packages.
- **Client/Server** vs. **Browser/Server**
- **Presentation Layer**
  - often refers to the top tier of enterprise application architecture
  - in Web, it includes both codes of Web pages and codes of producing Web pages.
- **Client Side Scripting/programming**
  - writing codes consumed by browsers to render Web pages and to respond to user's interactions
- **Server Side Scripting/programming**
  - writing codes used to generate the codes consumed by browsers

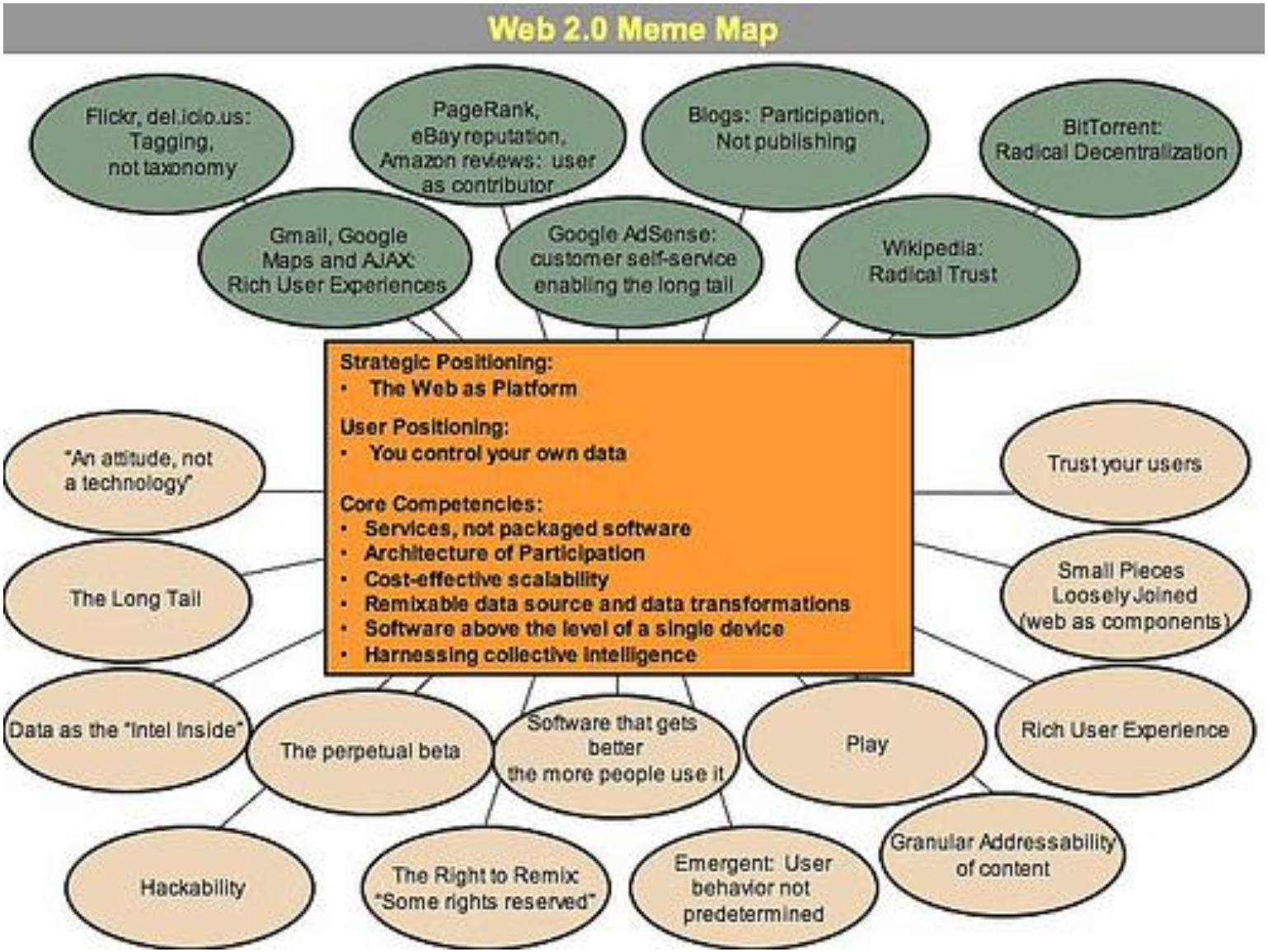
Outline

- The Internet
- The Word Wide Web (WWW)
- **Web 2.0**

Web 1.0 vs. Web 2.0

- **Web 1.0** is about publishing
  - users are limited to the passive viewing of information that is provided to them
- **Web 2.0** is about interaction
  - allows its users to interact with other users or to change website content
  - information sharing, interoperability, user-centered design and collaboration
  - hosted services, web applications, social-networking sites, video-sharing sites, wikis, blogs, mashups and folksonomies.
  - coined by Tim O'Reilly because of the O'Reilly Media Web 2.0 conference in 2004

Web 2.0 memo map



Web 2.0 examples

Web 1.0		Web 2.0
DoubleClick	-->	Google AdSense
Ofoto	-->	Flickr
Akamai	-->	BitTorrent
mp3.com	-->	Napster
Britannica Online	-->	Wikipedia
personal websites	-->	blogging
evite	-->	upcoming.org and EVDB
domain name speculation	-->	search engine optimization
page views	-->	cost per click
screen scraping	-->	web services
publishing	-->	participation
content management systems	-->	wikis
directories (taxonomy)	-->	tagging ("folksonomy")
stickiness	-->	syndication

2.0 flurry

- Library 2.0, Classroom 2.0, Publishing 2.0,
- Social Work 2.0, Enterprise 2.0, PR 2.0,
- Medicine 2.0, Telco 2.0, Travel 2.0
- Government 2.0
- and even Porn 2.0
- these 2.0s refer to Web 2.0 technologies as the source of the new version in their respective disciplines and areas.

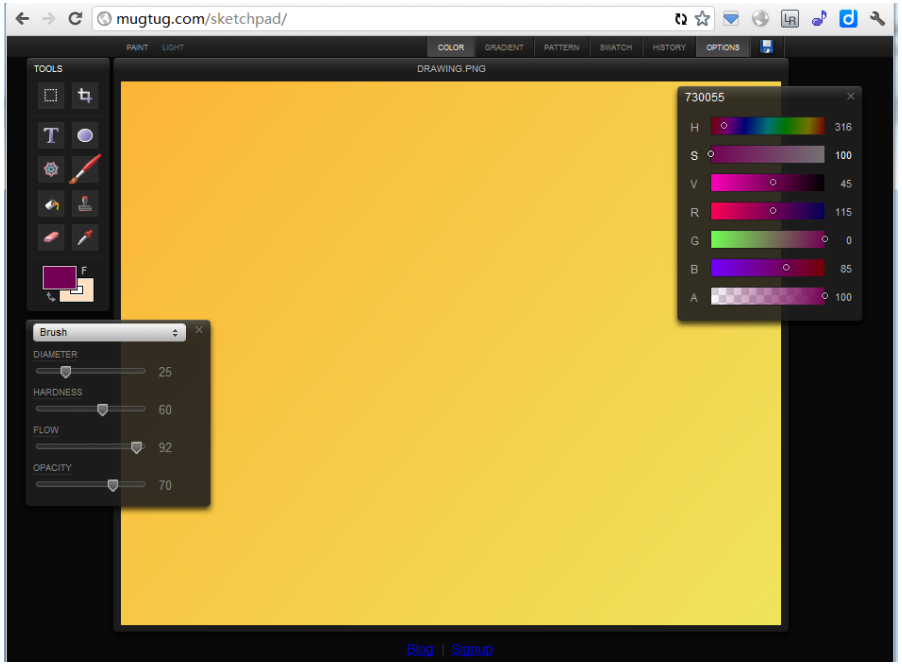
Web 2.0 technologies

- **browser side**
  - Asynchronous JavaScript and XML (Ajax),
  - RIA
    - Adobe Flash
    - JavaScript/Ajax frameworks
      - Prototype, script.aculo.us, Yahoo! UI Library, Dojo Toolkit, MooTools, jQuery, ExtJS, …
    - others
      - XUL, JavaFX, Silverlight, OpenLaszlo, …
- **server side**
  - many of same technologies as Web 1.0
    - PHP, Ruby, ColdFusion, Perl, Python, JSP, Servlet, and ASP
  - addition with providing data in different format
    - XML, RSS, and JSON , why?

HTML5

- Web: text → Multimedia → App.
- HTML5
  - HTML5 language, a new version of HTML
  - HTML5 + CSS3 + JavaScript 1.8 + new HTML / Browsers API, NEWT

http://www.benjoffe.com/code/demos/canvascape/textures



http://mugtug.com/sketchpad/

Summary

- The Internet
  - history
  - key aspects
  - people and organizations
  - layered architecture
  - protocols: IP, TCP
- The World Wide Web (WWW)
  - servers and browsers
  - protocols: DNS, URL, HTTP, MIME
  - web langauges / technologies
- Web 2.0
  - features, competences, applications, and technologies

Exercises

- use a terminal shell on your computer to fetch the homepage of our Software School of SYSU

- install the Firefox and the Firebug add-on

Reading materials

- A Brief History of the Internet
  http://www.isoc.org/internet/history/brief.shtml
- http://en.wikipedia.org/wiki/Web_2.0
- http://oreilly.com/web2/archive/what-is-web-20.html

Thank you!


unintended uses
user contributions
effortless scalability
trust
tagging
beta
radical decentralization
customer self-service
mass service of micromarkets
software as a service
right to remix
participation
blogs
wikis
VOIP
podcasting
filtering
sharing
social search
collaboration
social bookmarking
RIAs
Ajax
SSE
RoR
BitTorrent
KatrinaList
Wikipedia
Skype
Hard to Recreate Data
Enrichment & Annotation
Copyrighted & IP Content
Unique Formulas
Software That Gets Better The More People Use it
Face
HTML, Ajax, Flash, etc.
OpenSim
Services (API)
RSS, REST, SOAP, JSON etc.
user control
small pieces
permalinks
http
two-way interaction
tcp stream
people
World-Wide Web
data
mash-up
Web 2.0