5 Communities, the Web, and Multimedia

5.1 Evolution of the Web
5.2 Social Networks and Social Media
5.3 Web Content Aggregation and Integration
5.4 Virtual Worlds in the Web
5.5 Web of Data and Things

Literature:

## Outline

1. Introduction and Motivation
2. Interactive Web Applications
3. Web Paradigms and Interactivity *
4. Technology Evolution for Web Applications *
5. Communities, the Web, and Multimedia
6. Digital Rights - Definition and Management
7. Cryptographic Techniques
8. Multimedia Content Description
9. Electronic Books and Magazines
10. Multimedia Content Production and Distribution
11. Web Radio, Web TV and IPTV
12. Multimedia Conferencing
13. Signaling Protocols for Multimedia Communication *
14. Visions and Outlook

* = Nicht für Nebenfach!
Meet Sir Timothy John Berners-Lee

https://www.youtube.com/watch?v=OM6XIIICm_qo

2009
The Key Idea of the Web

  “CERN is a model in miniature of the rest of the world in a few years time.”

• Discussions on Mosaic browser, 1993:
  “I ... made my now-standard case for making the Mosaic browser an editor, too. Marc [Andreessen] and Eric [Bina] explained that they had looked at that option and concluded that it was just impossible.”
  (Weaving the Web p. 77)

• Tim Berners-Lee on the future of the Web:
  “My hope and faith that we are headed somewhere stem in part from the repeatedly proven observation that people seem to be naturally built to interact with others as part of a greater system.”
  (Weaving the Web p. 223)
What is the Meaning of "Web 2.0"?

• 1999 – 2003: Occasional usage of "Web 2.0", inconsistent meaning

• 2004: First O'Reilly "Web 2.0" conference
  – Tim O’Reilly, Dale Dougherty, John Battelle
  – After the burst of the dot-com bubble: Collecting surviving ideas

• September 2005:
  Tim O’Reilly: What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software

• Web 2.0 is a buzzword, not a technology!
  – Still used in varying meanings nowadays

Generations of the Web

- Web 0.5
  - 1988-1995
  - Only predecessors of WWW exist
- Web 1.0
  - 1996
  - Static HTML pages, few publishers - many readers
- Web 1.5
  - 1996-2001
  - Dynamic Web pages, E-Commerce
- Web 2.0
  - 2005?
  - Collaboration, communities
  - Openness, standardization, liberty

Web 0.5, 1.0, 1.5 are *retronyms*!
Web 2.0 Meme Map

Strategic Positioning:
- The Web as Platform

User Positioning:
- You control your own data

Core Competencies:
- Services, not packaged software
- Architecture of Participation
- Cost-effective scalability
- Remixable data source and data transformations
- Software above the level of a single device
- Harnessing collective intelligence

“An attitude, not a technology”

The Long Tail

Data as the “Intel Inside”

The perpetual beta

Software that gets better the more people use it

Hackability

The Right to Remix “Some rights reserved”

Emergent: User behavior not predetermined

Play

Rich User Experience

Granular Addressability of content

Trust your users

Small Pieces Loosely Joined (web as components)

Flickr, del.icio.us: Tagging, not taxonomy

PageRank, eBay reputation, Amazon reviews: user as contributor

Google AdSense: customer self-service enabling the long tail

Wikipedia: Radical Trust

BitTorrent: Radical Decentralization

Tim O’Reilly
Two Aspects of Web 2.0

• Technical Aspect
  – Rich Internet Applications (multimedia)
  – Web browser as application platform
  – Increasing interactivity in the browser

• Social Aspect
  – Collaboration
  – User-Generated Content
Comparison by Examples

Web 1.0
- DoubleClick
- Ofoto
- Akamai
- mp3.com
- Britannica Online
- Personal homepage
- Personal bookmarks
- Content management
- Taxonomy

Web 2.0
- Google AdSense
- Flickr
- BitTorrent
- Napster
- Wikipedia
- Blogging
- Del.icio.us
- Wikis
- Folksonomy
Find the Betas!

Web 2.0 Principles

- *Harnessing collective intelligence!*
- Reach out to the entire Web (including edges)
- Service *automatically gets better* by more people using it
- Build *value as a side-effect* of the ordinary use of their application.
- Race *to own certain classes of core data* (e.g. location, identity, calendaring, product identifiers)
- Consequences for software development:
  - "*Perpetual beta*"
  - Users as co-developers
  - Design for *remix-ability*
2.0 Everywhere!

Book by Angelika Fleckinger 2011

Museum Brandhorst 2015

Ethikzentrum LMU 2015
The Long Tail

- Clay Shirky 2003, Chris Anderson 2004:
  - “The future of entertainment is in the millions of niche markets at the shallow end of the bitstream” (Anderson)
- Business models for online sales:
  - Create large revenue out of low individual sales for many niche products
  - Driven by low production and distribution costs

- Theory:
  - Zipf/Pareto style of distribution
  - Traditional Pareto principle: 20% of products give 80% of sales volume
  - Different ratios in online business?
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Literature:

Brian Solis: The Essential Guide to Social Media

Hana S. Noor Al-Deen, John Allen Hendricks (eds.):
Social Media -Usage and Impact, Lexington Books 2012
Social Networks, First Generation

• College traditions:
  – Class listings, alumni listings, freshman listings
  – Personal profiles
  – Keeping in touch (classmate reunions)
• 1995: Classmates.com
  – German version: stayfriends.de
• Many similar platforms
  – E.g. Original facebook.com
Social Networks, Second Generation

• From documentation of existing relationships to creation of new relationships
• General platform for self presentation
  – Easy way to personal homepage
• Examples:
  – MySpace.com
  – Friendster.com
  – StudiVZ.de
  – Xing.com (OpenBC)
• Establishment of “friend” link by mutual agreement
• Tracing of social network
  – 2nd degree contacts
  – Former colleagues

Quelle: netzeitung.de

spiegel.de, 11.06.2012
Example: facebook.com

• History:
  – Mark Zuckerberg and friends, Harvard, October 2003:
    » Facemash: Comparing student photos
  – Mark Zuckerberg, February 2004:
    "The Facebook" for Harvard students
  – Stepwise expansion to other universities, colleges and high schools
  – Sept, 2006: Open to everybody of age 13 and up

• Popularity:
  – Alexa.com:
    Number 2 globally and in USA, Number 3 in Germany
  – Socialbakers.com:
    936 million users daily
    83% outside USA
    87% mobile users
  – Fb: > 1 billion daily average users on average for September 2015
Facebook Growth in the World between 2013 Q1 and 2015 Q1

Source: Internet World Stats - www.internetworldstats.com/facebook.htm
Facebook daily active users worldwide, retrieved on April 26, 2015
Copyright © 2001-2015, Miniwatts Marketing Group
Facebook Historical and Projected Growth

Source: Tim McCaffery, 2012
http://bylimedesign.com/blog/?p=43
A Glimpse at the Financial Side of Facebook

- History:
  - 2007: Microsoft buys 1.6% share for $240 million
  - September 2009: First time positive cash flow
  - IPO: May 2012, offering price $38.00
  - Share price Nov 14: $75
  - Current price (Nov 15): $106
Based on other sources, e.g.
http://www.financedegreecenter.com/facebook/
http://www.pewinternet.org/2013/05/21/
teens-social-media-and-privacy/
Social Networks, Third Generation

- Battle for market share
- Single universal platform vs. specialized platforms?
- Long-term archive vs. short-living information?
### Usage of Social Networks by US Teens

#### Facebook, Instagram and Snapchat Top Social Media Platforms for Teens

<table>
<thead>
<tr>
<th>Social Media Platform</th>
<th>% of all teens 13 to 17 who use ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>71%</td>
</tr>
<tr>
<td>Instagram</td>
<td>52%</td>
</tr>
<tr>
<td>Snapchat</td>
<td>41%</td>
</tr>
<tr>
<td>Twitter</td>
<td>33%</td>
</tr>
<tr>
<td>Google+</td>
<td>33%</td>
</tr>
<tr>
<td>Vine</td>
<td>24%</td>
</tr>
<tr>
<td>Tumblr</td>
<td>14%</td>
</tr>
</tbody>
</table>

Different social media site 11%


#### Girls Dominate Visually-Oriented Social Media Platforms

- Instagram: GIRLS 61%, BOYS 44%
- Snapchat: GIRLS 51%, BOYS 31%
- Online pinboards like Pinterest: GIRLS 33%, BOYS 11%
- Tumblr: GIRLS 23%, BOYS 5%

#### Boys Are More Likely to Play Video Games

- Have or have access to a game console: GIRLS 70%, BOYS 91%
- Play video games online or on their phone: GIRLS 59%, BOYS 84%

Social Networks, Fourth Generation?

- Mobile device centered
- Real-time
- Media-Rich
- Anonymous
Social Bookmarks

• Sharing platform for links to information in the Web
  – Examples: Delicious, diigo.com, digg.com, reddit.com

• Tagging (folksonomy):
  – Adds a semantic dimension to Web search
Weblog, Blog

Definition: A collection of chronologically (backwards) ordered, regularly added contributions to an umbrella topic. (adapted from Ebner/Baumann/Krcmar)

• Technical view:
  – Simple content management system, often push notifications (RSS feed)
• History:
  – First online diary by Simon Gisler 1994 (according to Wikipedia)
  – John Barger 1997: Term “Weblog”; Term “Blog” since 1999 (Peter Merholz)
  – Huge popularity since 2002
• Platforms: e.g. wordpress.com, blogger.com
  – Links point to individual contribution and are permanent (“permalink(s)"
• Variants by media type:
  – Vlog, linklog, photoblog, moblog
• Problematic issues:
  – Borderline between advertisement, propaganda, free speech
Blog as an “Oscillation Medium”

• Traditional web sites (including online versions of traditional media):
  – Closed content, mostly internal links
• Bookmark collections:
  – Completely open content, mostly outward links
• Oscillation media:
  – Both closed and open
  – Blog comments on a link and contains external links
  – Reader is “oscillating” between open and closed reading
    » Shall I follow the link?
    » Shall I read on?
  – Hypertextuality as a media creation force
  – Invites creation of User-Generated Content

From: Eigner/Leitner/Nausner/Schneider: Online-Communities, Weblogs und die soziale Rückeroberung des Netzes, Nausner & Nausner 2003
Blog Search

- Blog search engine
  - Combining information from many blogs
  - Including tagging, rating etc.
  - (Historic) examples: Technorati.com, blogsearch.google.com
  - Variant: Media rating (e.g. Hype Machine)
Diversity of Blog Topics

What Topics Do You Blog About?

Technorati.com State of the Blogosphere 2011 (last edn.)
Microblogging

• Tumblelog:
  – Relatively unstructured "stream of consciousness"
• Simplified blogging platforms
  – Tumblr (2006)
• Microblog:
  – Short text or small media units
  – Often submitted from mobile devices
• Trend towards pictures, video

April 2005: Term "tumblelog"
Real Time Media

- *Everything in the world is now real time on the Web.*
- Current main example: Twitter
  - Social analytics built around real-time communication
  - Triggering innovations:
    - Shorthand URLs
- Other applications
  - Notify manufacturer *immediately* if a certain product is not selling at a certain shop.
  - "Houdini" system used by Obama campaigners
Location-Based Services and Communities

• Driven by mobile networked devices like Smartphones
  – Geographical location through satellite navigation, cellular network, WLAN identification, …
• Long-term research topic ("restaurant finder" example)
Suggestions for Top Picks

Show me places ...
- I haven’t been to
- My friends have been to
- I have been to before
- With Foursquare specials

Pommes Boutique
8.6
Amalenstraße 46
Fast Food

Die Pommes sind wirklich extrem lecker. Sehr interessant sind zudem die reiche Auswahl an verschiedenen Dip-Möglichkeiten. Gerne wieder - hmm lecker! - Joachim B.

You and 8 friends have been here

Cafe Flower
Amalenstraße 33
Other - Food

Der Koch/Besitzer des Soul Kitchen ist nun hier zu finden. Wer es schon vermisst hat, nichts wie ab ins Cafe Flower!!! - Alexander D.

A new spot in the neighborhood

Zum Koreaner
7.7
Amalenstr. 51
Korean - 1 here now
Podcasting

• “History”: iPod & Broadcasting
  – Discussed since 2000, massive use since 2003
  – Word of the year of the New Oxford American Dictionary 2005

• Media file distributed regularly (paid or unpaid)
  – Subscription or individual download
  – Originally mainly audio

• User-Generated Content (UGC):
  – Amateur (audio)podcasts: minimal hardware/software requirements
Context-Sensitive Advertisement

• Important source of revenue in Web 2.0 sites
  – Advertisement precisely targeted at customer

• Market leader: Google AdSense
  – Ad server operated by Google
  – Websites register with Google
    » Advertisement placed based on analysis of content of page to be shown (Javascript)
    » Generate revenue per click or per thousand impressions
  – Selection among relevant ads and order of ads by real-time auction
    » Ads creating highest revenue are shown
    » Using bid price of advertised and quality score of the ad (e.g. Click-Through-Rate)
    » Paid price may be lower than the bid (minimal price to keep position on the list)
  – Advertisers arrange fixed budgets in advance

• See: http://www.google.com/adwords/displaynetwork/control-your-costs/pricing.html
Improper Placement of Advertisement

http://img34.imageshack.us/img34/7545/bilddefail.jpg
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Literature:
R. Yee: Pro Web 2.0 Mashups, Remixing Data and Web Services, Apress 2008
Content Aggregation, Indexing, Curation

• Content aggregation:
  – Combination of content on specific topics from various sources
  – Finding content (indexing), filtering content, publishing combined content

• Indexing:
  – Different types of source (web, blogs, local sources)

• Filtering:
  – Automatic filtering
  – Careful manual selection of content: *Curation*
  – Community-based automatic filtering (voting, tagging, counts)

• Publishing
  – User-configurable content (personal news)
  – Syndication to other online media
  – Basis for non-online media (e.g. print media)

Curation

Steven Rosenbaum's Curation Nation

"With the explosion of content, curation is the next great frontier."

"Curation Nation is a must-read to succeed in this hyper-connected age where community and contribution is of utmost important to creating value and relevancy."

-Shira Lazar,
Creator / Host "What's Trending" CBS News

curationnation.org
curatethisbook.com
News Curation Tools and Services: Examples

A content marketing solution customized just for you.

newscred.com

The future of search
Curated Content. All at your fingertips.

storycrawler.com
Video Curation and Aggregation: Example

enterprise.waywire.com

videos.nymag.com
Mashup

- **Mashup**: Web application that uses content from more than one source to create a single new service displayed in a single graphical interface. (https://en.wikipedia.org/w/index.php?title=Mashup_(web_application_hybrid)&oldid=692257036)

- **Architectural components**:
  - Presentation (new layout or based on existing Web presentation)
  - Mashup logic (Application program interface (API) to Web services)
  - Data transfer and integration

- **Basic alternatives**:
  - Client-side mashup
  - Server-side mashup

- **Various technologies for transmission/invocation**:
  - REST
  - SOAP
  - XML-RPC

---

Server-Side Mashup Architecture

Source: Daniel/Matera 2014
### World of Web

See programmableweb.com

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**ProgrammableWeb: the world's largest API repository, GROWING DAILY**

Search Over 12,344 APIs

![ProgrammableWeb](https://www.programmableweb.com)

<table>
<thead>
<tr>
<th>API Name</th>
<th>Description</th>
<th>Category</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Maps</td>
<td>The Google Maps API allow for the embedding of Google Maps onto web pages of outside developers, using a simple JavaScript interface or a Flash interface. It is designed to work on both mobile...</td>
<td>Mapping</td>
<td>12.05.2005</td>
</tr>
<tr>
<td>Twitter</td>
<td>The Twitter micro-blogging service includes two RESTful APIs. The Twitter REST API methods allow developers to access core Twitter data. This includes update timelines, status data, and user...</td>
<td>Social</td>
<td>12.08.2006</td>
</tr>
<tr>
<td>YouTube</td>
<td>The Data API allows users to integrate their program with YouTube and allow it to perform many of the operations available on the website. It provides the capability to search for videos, retrieve...</td>
<td>Video</td>
<td>02.08.2006</td>
</tr>
</tbody>
</table>
Web Service APIs

• Example: Flickr API
• Existing methods are grouped in packages
• For each method, allowed parameters are defined
• Often a registration key is required which has to be obtained from the service provider
REST (Representational State Transfer)

• REST: One method to call a Web Service API
• History:
• Main features which made the Web architecture successful:
  – Identification of resources (in most cases by URIs)
  – Manipulation of resources through these representations
  – Stateless operation of server (regarding application state)
  – Hypermedia as base engine
• Applying REST to Web Services:
  – All resources on the server are identified by URI strings
    » API method plus parameters coded in URI
  – Client uses only standard HTTP methods, mainly GET
Example: REST Request/JSON Response

- Request:
  
  http://api.flickr.com/services/rest/?method=flickr.blogs.getList&api_key=8c...93&format=json

- Response:
  
  jsonFlickrApi({
    "stat": "ok",
    "blogs": [
      {"id": "73",
       "name": "Bloxus test",
       "needspassword": "0",
       "url": "http://remote.bloxus.com/"},
      {"id": "74",
       "name": "Manila Test",
       "needspassword": "1",
       "url": "http://flickrtest1.userland.com/"}
    ]
  })

http://www.flickr.com/services/api/response.json.html
SOAP and XML-RPC

• Remote procedure call (RPC):
  – Technology to execute a procedure (method) with certain parameter values on a different (remote) computer
  – Various technologies exist (e.g. CORBA, DCOM) outside the Web area

• Web Service Invocation:
  – Invoking a Web Service using Web standards

• SOAP (earlier acronym: Simple Object Access Protocol)
  – XML-based syntax for messaging between applications
  – Independent of transport protocol
  – Web Services are a special application of SOAP
  – W3C standard

• XML-RPC:
  – Similar to SOAP (somehow its predecessor)
  – Transport protocol is HTTP
  – Simpler but limited in functionality
SOAP Example

• From Flickr.com:

```xml
<s:Envelope
    xmlns:s="http://www.w3.org/2003/05/soap-envelope"
    xmlns:xsi="http://www.w3.org/1999/XMLSchema-instance"
    xmlns:xsd="http://www.w3.org/1999/XMLSchema">
    <s:Body>
        <x:FlickrRequest xmlns:x="urn:flickr">
            <method>flickr.test.echo</method>
            <name>value</name>
        </x:FlickrRequest>
    </s:Body>
</s:Envelope>
```

• SOAP makes use of XML namespaces
• Relatively high organizational overhead
• Compare equivalent REST request format

http://api.flickr.com/services/rest/?method=flickr.test.echo&name=value
XML-RPC Example

- From Flickr.com:

```
<methodCall>
  <methodName>flickr.test.echo</methodName>
  <params>
    <param>
      <value>
        <struct>
          <member>
            <name>name</name>
            <value><string>value</string></value>
          </member>
        </struct>
      </value>
    </param>
  </params>
</methodCall>
```

- Simple structure, deep nesting, also large overhead
API Kits

• Requests are constructed and responses are evaluated within scripts
  – Mostly server-side scripts, e.g. PHP
  – Constructing a request in PHP:
    $content = file_get_content($url);

• Simplifying development for specific API:
  API Kits
  – Example: phpflickr.com
  – "Wrapper" around API functions and invocation
  – Direct PHP call to required functionality
  – Response processed and data array returned
    » Example functions:
      people_findByUsername(), getPhotos()
Yahoo Pipes

- Example of a tool (Web application itself) for *data mashup* development:
  - Interactive feed aggregator and manipulator
- Graphical environment to
  - Fetch data from source
  - Extract data
  - Apply filters
  - Apply simple programming tools
HTML5 Geolocation API

• Very simple high-level JavaScript API to deal with geolocation
• Implementation automatically uses best available information source
  – GPS for mobile devices if available
  – GSM/CDMA cell
  – WLAN/Bluetooth/IP data
• Getting a position:
  – `navigator.geolocation.getCurrentPosition`
    `(successCallback, errorCallback)`
• Using location in Google Maps:
  – `navigator.geolocation.getCurrentPosition(showMap);`
  – `function showMap(position) {`
    `var latlon = position.coords.latitude + "," + position.coords.longitude;`
    `var img_url = "http://maps.googleapis.com/maps/api/staticmap?center=" + latlon + ",zoom=14&size=400x300&sensor=false";`
    `... }`
Screenscraping

• Technically the following is possible ("Screenscraping"):
  – Send HTTP request from server script to a Web site (even if it does not offer a Web Service API)
  – Analyze the returned HTML code
  – Proceed depending on the result

• The script simulates a human person using a Web browser
  – "Web Robot"
  – Frequently used by search engines

• Most Web site providers do not agree with automated access
  – Dangerous in particular in the area of authentication
  – Recommendation: Check Terms of Use carefully, or better refrain from Screenscraping
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Virtual Worlds

• Online communities and online games are merging
  – Example World of Warcraft

• Non-Game online communities with virtual world
  – Old idea, see
    » Gibson: Neuromancer
    » Stephenson: Snow Crash
  – Was tried several times, but this time a bit more successful...

• Secondlife.com
  – Created and run by Linden Labs
  – Sixteen million accounts (2009)
  – One million regular users (2014)
  – Full virtual environment, avatars, extensive creative tools

• Other virtual worlds, e.g.
  – habbo.com
Example: habbo.com
Second Life

Second Life and Business

• Large companies are/were using Second Life
  – For meetings, conferences, customer care
  – As sales channel

IBM Conferences, using Opinionator


francisanderson.wordpress.com
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Literature:
T. O'Reilly, J. Battelle: Web Squared: Web 2.0 Five Years On, 2009
Web 2.0 Five Years On: Web Squared

• Smartphones and wearables:
  – Collective intelligence
  – Driven by sensors
  – Talking to the Web (OK Google, Siri, Cortana)
  – Information shadows, Internet of Things: Web meets World
  – Geo-tagging of pictures (GPS + camera)
  – Face recognition in photo archive
  – Object recognition via smartphone
• How does the Web learn?
  – Key competency of the Web 2.0 era: Discovering *implied metadata*
  – *Mapping from unstructured data to structured data sets* will be a key Web Squared competency.
• Real-time: Web as Collective Mind
Sir Timothy John Berners-Lee, Again

https://www.youtube.com/watch?v=OM6XlICm_qo