CASCON [2007]

The Future of User Interfaces in Web 2.0

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Outline

- **Analysis & extrapolation of a few trends**
  - Web 2.0: the new Desktop?
  - Collaborative computing in Web 2.0
  - Offline applications & storage in Web 2.0
- **Implications & predictions**
  - Changes to development process
  - A few observations & predictions

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Why is Web 2.0 successful?

- **Web 2.0 offers services**
  - Not applications
- **Any time, any platform, any location**
- **Users are in control**
  - Control access to their data
  - Choose their services, add to them, collaborate via them,…
- **Harness collective intelligence**
  - E.g. transition from Taxonomy ⇒ "Folksonomy" & Tagging
- **Offers real advantages to many people**

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Web 2.0: The New Desktop?

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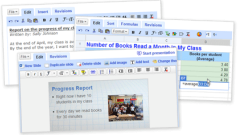
Web 2.0: The New Desktop?

- **Most traditional applications available in Web 2.0**
  - Gmail, Google Calendar
  - Google Docs
  - …



- **Seems to obviate need for traditional "desktop"**
- **Web Operating System**
  - Operating system under browser still necessary
    - But a blurry boundary (iPhone)

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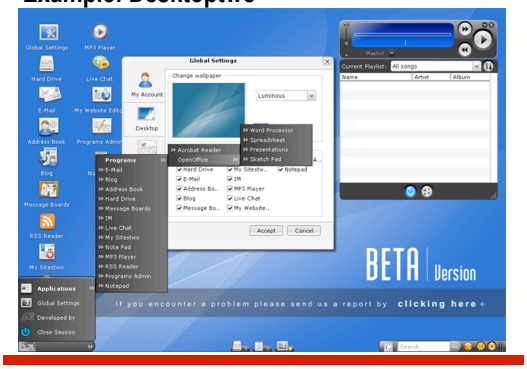
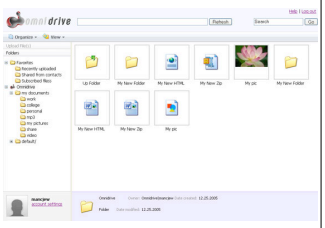
Example: Desktoptwo



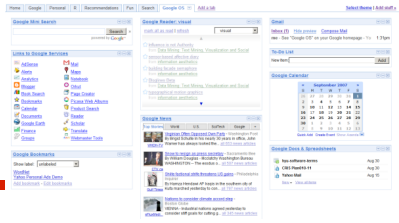
Web Desktop with Files

- **Clone Desktop Idea**
  - Advantage: familiarity
  - Disadvantages
    - UI performance hit
    - Speed performance hit
    - Files - again?
    - Not really "Web 2.0"
      - Web 2.0 is about *services*
      - Also no collaboration support - desktop is inherently single user



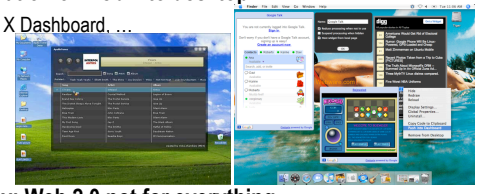
Web 2.0 Equivalent: Service Aggregation

- **Different mental model**
  - Clean break better (less confusion)
- **Example: iGoogle**
  - Configurable by user, everybody's needs are different!



Another way: Desktop Widgets

- **Integration of Web into desktop**
  - OS X Dashboard, …



- **Finally: Web 2.0 not for everything**
  - Most 3D games, high-performance computing, big simulation, visualization, etc.

Collaborative Computing in Web 2.0

Collaborative Systems - CSCW / Groupware

- **Collaboration**
  - Group of people with common goal
  - Goal large enough so that it can't be tackled individually
- **Computer Supported Collaborative Work (CSCW)**

- **Lot's of *collaborative* services on Web 2.0**
  - Email, encyclopedia, scheduling, office applications, …
  - CVS, bug tracking, feature requests, …
  - Internal company information systems, …

CSCW/Groupware Development

- **Different from software for individuals**
  - Developers can *never* know all potential users & their jobs
    - Many different target users
    - Managers are biased, too
- **Critical mass issue**
- **CSCW apps must support**
  - Information sharing (easy on Web)
  - Awareness (hard on Web)
  - Coordination (hard on Web)

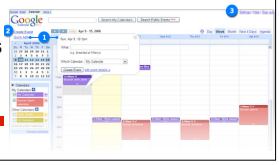
Four CSCW/Groupware Design Principles

- **Maximize Personal Acceptance**
  - Visible benefits, no training, …
- **Minimize Requirements**
  - Any time, location, platform, unobtrusive collaboration, …
- **Minimize Constraints**
  - Support roles, allow exceptions, …
- **External Integration**
  - Data exchange, …

Based on [Cockburn94, Grudin94]

Maximize Personal Acceptance (1)

- **Address disparity in work and benefit**
  - CSCW often more work for those who don't benefit
  - Example: group calendars
    - Manager able to control your time
      - ⇒ People don't use it (rejection)
      - Or people block days at a time (subversion)
  - Reduce burden to non-beneficiaries
    - Easy-to-use, efficient to use
  - Generate personal (!) benefits
    - E.g. private use of Blackberry



Maximize Personal Acceptance (2)

- **Facilitate adoption**
  - Example: hospital, only 1 of 5 nurses uses SW ⇒ disaster
  - Low entrance threshold
    - Easy-to-learn design
- **If training required, make it painless**
  - On site, multiple times, user's schedule
  - Alternative: Screen videos/tutorials
    - Need to be done well, too

Minimize Requirements & Overhead

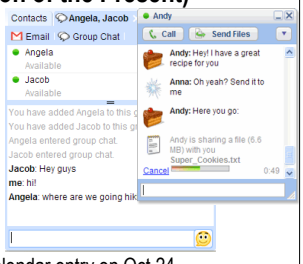
- **Any time, any location, any platform, …**
  - Web 2.0 good at that (except not offline)
- **Unobtrusive CSCW features**
  - Information sharing *and* editing
    - Mostly reading, but *encourage* contribution
  - Awareness
    - What are others currently doing?
  - Coordination
    - Identification of ownership, changes, etc.
- **Features must be present but *never* predominant!**

Information Sharing & Editing

- **Example: Wikis**

Awareness (Coordination of the Present)

- **Well known in Chat**
  - "Jill is typing …"
- **Helps avoid conflicts**



- **But can be much more**
  - Jack is currently adding calendar entry on Oct 24
  - John is currently editing part X of project Y
  - Jim started editing "Future plans" on current page at 3pm

Coordination of the Past

- **Who did what, when?**
  - Not just retrieval, but also comparisons, etc.

Coordination of the Future

- **Who is planning what?**
  - Example: Wiki discussions, roadmaps, …

Minimize Constraints

- **Support roles and exceptions**
  - Organizations have both formal & informal work patterns
- **CSCW applications tend to flatten hierarchies**
  - May disadvantage some users & threaten their "domains"
- **Exception handling**
  - "This needs to be authorised by Ms. S but she is away for 3 weeks" … "I'll see if I can get Mr. J to sign for her"
  - Humans good at exception handling & improvisation
  - Flexibility is key here!

External Integration

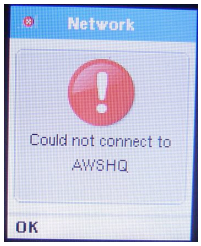
- **Permit other tools**
  - Bi-directional data exchange with other systems
    - Another way to ease adoption
    - Helps with emergency back-out
      - If your system is fulfills user's needs well, this will never happen
      - Reassurance factor
    - Web 2.0 services must allow users to retrieve *all* their data
      - Otherwise: lot's of workarounds

More Reflections on Collaboration in Web 2.0

- **One of the key features of Web 2.0**
  - Increasingly more collaborative features
    - In the future more: reviewing, commenting, …
- **What works**
  - Leave individual user in control
    - Flexibility is key
    - Otherwise abandonment or lot's of workarounds
  - Do one service well
    - Don't try to do everything at once
  - Support user fully in their tasks

Offline Web 2.0 Applications

Offline Web Applications



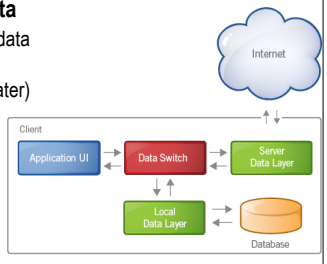
- **Main deficiency of Web 2.0**
  - No support for *offline* work
    - I.e. when no network connectivity
      - Algonquin park
      - Subway
      - Foreign country
      - No network
      - Insecure environment
      - …
- **Offline apps already available today**
  - E.g. OS X dashboard "widgets" are Javascript!
- **Problem: no persistency**

Source of Inspiration

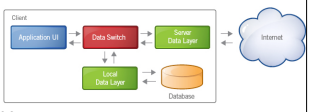
- **Mobile Computing Platform**
  - PDA's & Smartphones
    - Palm/Treo, WM6, Blackberry, iPhone, etc.
  - Addition of wireless networks serious "boost"
    - "Crackberry" addiction
    - Some people use mobile computing more than desktop!
  - Best user interfaces: iPhone, Palm

How to Enable Offline Work

- **Keep local copy of data**
  - Usually only "touched" data
    - Cache
  - Better a bit more (see later)
- **If network**
  - (Upload local updates)
  - Use network directly
    - Cache requests
- **If no network**
  - Use local copy
  - Store updates



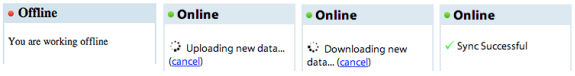
Synchronization



- **Local copy**
  - User edits data when offline
  - Changes to be uploaded on re-connect
  - Also download recent changes by others
- **Conflict resolution**
  - Easy if only one side updated since "time of last sync"
    - Newest change wins
    - Better ideas … (later)
- **Maps well to Web 2.0 - AJAX!**

User Interface for Synchronization (1)

- **User's view syncing as a bug, not a feature.**
- **Need basic UI that sync is occurring**
  - Diagnosis when network is acting up or sync is failing



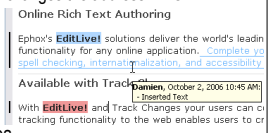
- **Sync should happen automatically**
  - On first load, network (re-)connect, periodically (autosave)
  - Users rarely can predict when they will be offline
    - Local copy of "essential", "owned", and "touched" data

User Interface for Synchronization (2)

- **Users don't understand diff/merge interfaces**

User Interface for Synchronization (3)

- **System needs to make *reasonable* sync decisions**
  - Ideally fine-grained
    - E.g. A changes title of contact, B changes the address ⇒ OK!
  - For longer documents
    - Annotate each change
      - E.g. "Track Changes" in Word



  - In conflicts, last change survives
    - However, overwritten version must be stored in history
      - Note: history anyways necessary for collaboration!

Problems with Synchronization

- **Issues to think about**
  - Network delays (async!)
  - Many changes (async!)
  - Partial syncs due to network drop, crashes (both sides)
  - New changes can occur during a sync

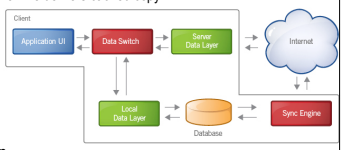
- **User should never loose data**
  - System never in unusable or inconsistent state

Offline Technologies: "Hacks"

- **Store data in Cookies**
  - Well-known problems
- **Store data via Adobe Flash (shared object), ActiveX (COM), XPCOM (Firefox), …**
  - Limited amounts, not platform/browser independent
- **Form data storage**
  - Limited amounts
- **Internet Explorer DHTML feature**
  - Limited to 60k
- **Store application/data as URL's**
  - Fairly good, up to limit of browser URL cache

Offline Technologies: Google Gears

- **Three main parts**
  - Local Server
    - Stores all Web requests, if offline delivers cached copy
  - Database
    - SQL lite (variant)
  - Worker Pool
    - for long(er)-running tasks



  - Also: Sync Engine
    - Worker for synchronization
- **Available for PC, Mac, Linux**
  - Currently not yet on Palm, iPhone, WM6, …

Offline Technologies: Others

- **Dojo Offline Toolkit**
  - Part of Dojo AJAX framework
  - Support for offline storage
    - DojoSQL and DojoStorage (key-value pairs)
    - Encryption for stored data
  - Support for synchronization
- **HTML 5 (draft standard)**
  - Offline storage of key-value pairs as well as SQLite
  - Will be available in Firefox 3, …
    - Most probably also in IE
  - No support for synchronization, yet

Changes on SW Development in Web 2.0

Effects on Development

- **Shift from applications to services**
  - More users ⇒ more beginners
- **Hence, usability #1 priority, not more features**
  - Design for user's needs
  - Do not maximize functionality, *minimize* it
    - More features make *everything* harder to find
    - User has no time for tutorials, documentation,…
      - "Ballons" may work well
    - Alternatively, 3 different levels of service
      - Beginner, intermediate (most users), expert (a few)
  - Back button = undo for everything
    - Store changes even across sessions
  - Good visual design, avoid web terminology, KISS, …
    - Allow bookmarking of screens

Safety / Security / Availablility

- **Services should be always available**
  - Google already "world-wide critical infrastructure" :-)
  - 99.999+% availability
    - Offline support helps here
  - Ideally no crashes (server & client)
- **Encrypt data**
  - Transmission
  - Local cache
  - Never share user's data without explicit permission

Technical Web 2.0 Trap

- **Update everybody's "program" at almost any time**
  - Advantage & disadvantage
    - Fix everybody's service immediately
    - Break everybody's service immediately
      - Hard for user to revert in this case, as no local copy (!)
        - » Disaster
    - Another problem: caches not always updated immediately
      - Can be months: 4 week vacation, 2 week conference, 2 week sick
- **Necessitates good version management**
  - Must always allow upgrade "old" data versions
    - With *no* user effort (or at the worst minimal effort)

Web 2.0: Opportunity

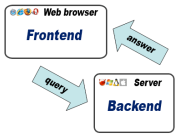
- **Get immediate feedback from actual use**
  - Continuous feedback
  - Fast identification of problems
    - Is a feature actually used?
      - Monitor successes
    - When & where do users abort / fail?
      - Monitor partial "transactions"
  - Fast adaptation possible
- **Key aspect of Web 2.0 business model**

Future Web 2.0 Toolkits

- **Collaboration support**
- **Offline & sync support**
- **Encapsulate Web 2.0 UI "look & feel"**
- **Current examples**
  - Dojo
  - Google Web Toolkit + Google Gears
- **Future**
  - Web 2.0 UI toolkits
  - Web 2.0 CSCW toolkits
  - Web 2.0 Offline & sync toolkits

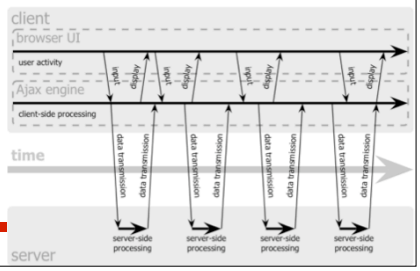
Effects on Development Teams

- **Web 2.0 necessitates "back-end" & "front-end"**
  - Front-end: Focus on users & their tasks
    - Mix of IT, UI, CSCW designers
    - Typically more code here than at backend
  - Back-end *supports* front-end
    - Must not dictate front-end development
    - Focus on system stability, data security, performance
    - Often shared among different projects
  - Both need to collaborate to succeed
    - Special needs back-end code similar to "middleware"



Web 2.0 SW Development Model Change

- **AJAX fundamentally changes code**
  - In particular: "Asynchronous"
    - Hence, back-end cannot control UI



Closing Thoughts

My Advice for Web 2.0

- **#1: Test your user interface**
  - Even more important than on desktop
- **#2: Get the basics right (standard Web UI guidelines)**
  - Simple design, consistent UI, clear navigation, good feedback, error resistant, as simple as possible, CSCW, offline & sync, …
- **#3: Communicate clearly**
  - Users want to spend minimum time
    - Quickly & easily convince them that your site is worthwhile
- **#4: Provide what users need**
  - Match their expectations & needs
    - Research requirements most carefully

Technological Advice for Web 2.0

- **Technical advice**
  - None (on purpose)
    - Technology is just a means, not an end!
  - Support collaboration
  - Support off-line storage & synchronization
    - Both will become common in Web 2.0
- **Remember: the "invisible" computer wins**
  - See your *parents* car, cell-phone, etc.
  - Our job to make Web 2.0 as invisible as possible

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