Mobile Mashup with HTML5
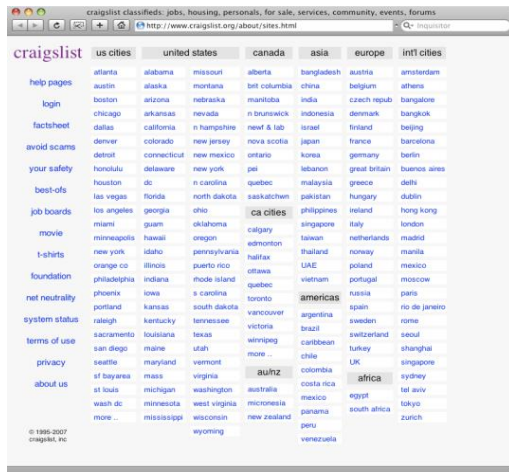
Two mainstream computing shifts, mobile computing & programmable Web, are fundamentally impacting how humans *interact*, *socialize*, and *access information*

Web Mashup

Integrate/remix/compose Web data and services

to create novel and situational Web applications

Web APIs Mashup

http://sfbay.craigslist.org/search/apa

Web APIs Mashup

Light-weight version of SOA (Service Oriented Architecture)

Combine data and services from more than one source

across the Web, *like a music mash-up*

ProgrammableWeb.com 💬

- Launched summer 2005

- API & mashup directory

- Over 14,000 Web APIs (search engines, map apps, IM, weather, blogs, RSS aggregators, image/video sharing, social networking, PIM, social bookmarking, wikis, auctions)

- Over 7,200 mashups

ProgrammableWeb.com

Browse APIs by Category

Advertising (160)	Entertainment (48)	Music (165)
Security (149)	Answers (25)	Events (76)
News (71)	Shipping (60)	Auctions (2)
Fax (16)	Office (81)	Shopping (272)
Backend (50)	Feeds (38)	Other (202)
Social (429)	Blog Search (11)	File Sharing (48)
Payment (206)	Sports (85)	Blogging (64)
Financial (322)	Photos (181)	Storage (79)
Bookmarks (41)	Food (49)	PIM (30)
Tagging (15)	Calendar (25)	Games (103)
Politics (9)	Telephony (255)	Catalog (1)
Goal Setting (5)	Portal (1)	Tools (527)
Chat (48)	Government (251)	Project Management (106)
Transportation (118)	Database (66)	Internet (499)
Real Estate (60)	Travel (159)	Dating (2)
Job Search (45)	Recommendations (59)	Utility (125)
Dictionary (16)	Mapping (284)	Reference (292)
Video (183)	Education (133)	Media Management (46)
Retail (51)	Weather (62)	Email (157)
Media Search (11)	Science (236)	Widgets (31)
Enterprise (319)	Medical (95)	Search (209)
Wiki (17)	Entertainment (48)	

Top APIs for Mashups

- GoogleMaps (38%)
- Twitter (12%)
- YouTube (10%)
- Flickr (9%)
- Amazon (6%)
- Facebook (6%)
- Twilio (5%)
- LastFM (3%)
- EBay (3%)
- Google (2%)
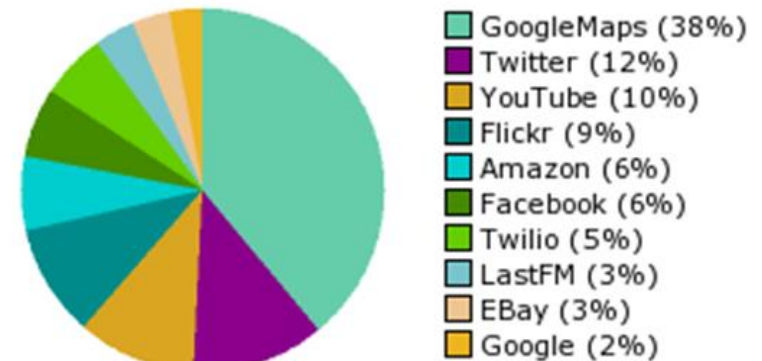
ProgrammableWeb.com 11/04/12

Protocol Usage by APIs

- REST (69%)
- SOAP (22%)
- JavaScript (5%)
- XML-RPC (2%)
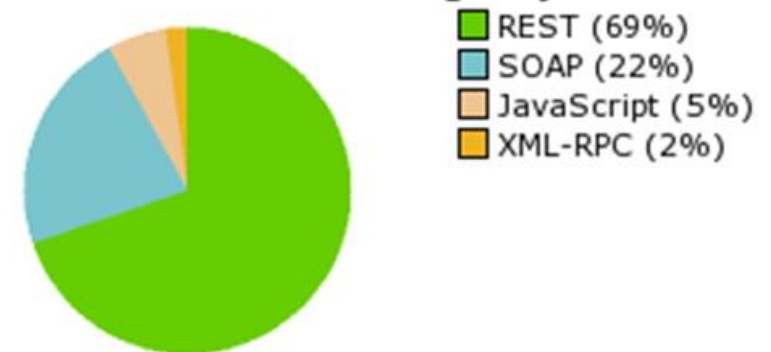
ProgrammableWeb.com 11/04/12

ProgrammableWeb.com

- API Billionaires Club

Google	5 billion API calls / day *(April 2010)*
facebook	5 billion API calls / day *(October 2009)*
twitter	3 billion API calls / day, 75% of all traffic *(April 2010)*
ebaY	8 billion API calls / month *(Q3 2009)*
bing	3 billion API calls / month *(March 2009)*
npr	1.1 billion API-delivered stories / month *(March 2010)*
salesforce.com *Success On Demand.*	Over 50% of all traffic via API *(March 2008)*
amazon web services	Over 100 billion objects stored in S3 *(March 2010)*

ProgrammableWeb.com

Mashups Tag Search: mobile

Get Latest Mashups

All
mapping (2632)
deadpool (1376)
search (998)
social (996)
photo (771)
shopping (768)
video (666)
travel (523)
music (508)
mobile (465)
messaging (441)
reference (402)
news (381)
visualization (308)
telephony (293)
sports (284)
fun (251)
microblogging (251)
realestate (248)
widgets (224)
[View as Tag Cloud]

See also: APIs tagged mobile

Track these

Hide Filters   Sort [Name] [Date] [All Time Popular] [Recent Popular]

APIs			
Tags	mobile		
Date	All ▼		

Type ☑ Mashups ☐ Source Code and Other Resources

◉ Any   ○ Mashup of the Day

Search

1 to 20 of 465 mashups   ◀◀ ◀ Previous **1** 2 3 4 ... Next ▶ ▶▶

Name	Description	APIs
3TDM by Telephone Data Management	Check your email via text message □ a service provided by Telephone Data Management and uses the Twilio API.	TwilioSMS, Twilio

Internet Programming   Slide 9

Yahoo Pipes
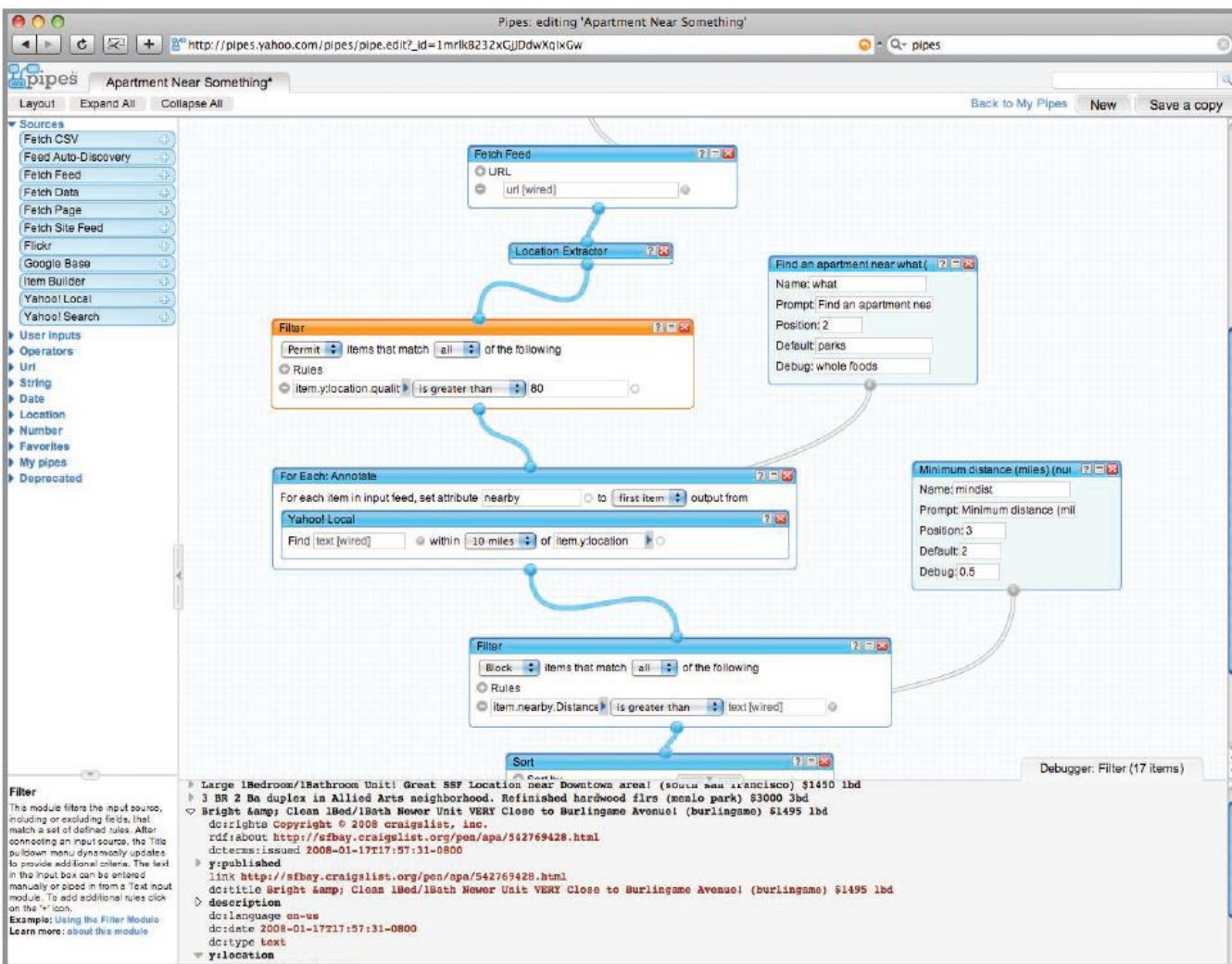
Developers drag *modules* (high-level data processing functions such as geocoding* locations in feed items or translating from one language to another) from a toolbox onto the Pipes canvas.

Modules are configured directly on the canvas, and data flows through them via *wires*

http://pipes.yahoo.com/pipes/ **(defunct)**

*주소(예: '1600 Amphitheatre Parkway, Mountain View, CA')를 지리적 좌표(예: 위도 37.423021, 경도 122.083739)로 변환하는 프로세스

Mobile Mashup

- Make use of *mobile information* to dynamically construct relevant mashups

- Social, dynamic, and location-aware mashups

- Have technical & social challenges

  - The *privacy* implications are severe since the information is mobile, changing, accurate

Motivation through use cases

Mobile devices provide contextual information (e.g., location) that in turn provides a richer ground for mashups

Explore HTML5's impacts on mashup development and how HTML5 can be possibly employed to enhance current best practices for mashup development

HTML5 Leads a Web Revolution

Propelled by a *proliferation of mobile devices* ("we want to write once and deploy everywhere") and *social networks* ("we can reach many more customers"), an enhanced family of Web specifications is bringing new power to developers and new capabilities to users

What is HTML5

- A technological tipping point for bringing desktop application capabilities to a browser

    - Empowers a browser to become a programming platform

- Reached a completion of its standardization process

    - https://www.w3.org/TR/html/

- Most recent browsers support many innovative features

    - Has even more potential for *mobile* browsers

        - The most popular mobile browsers have already adopted and implemented many significant parts of the HTML5 specification

What is HTML5

- Both a single specification and a whole set of technologies
  - Evolution of HTML4 and DOM Level 2
  - Removal of presentational markup
    - Conveys *meaning*, rather than presentation
  - Formalized foundation-level APIs
    - Offline (provide a manifest which lists the files that are needed for the Web application to work offline), Drag and Drop (to make an element draggable, give the element a *draggable* attribute), Video and Audio, etc.

CYCLE CALIFORNIA TOUR SHOTS

Using Drag and Drop API

Associated APIs

- ## Geolocation API Specification

  - Defines an API that provides scripted access to geographical location information associated with hosting devices
  - W3C Recommendation Nov 2016
  - http://www.w3.org/TR/geolocation-API/
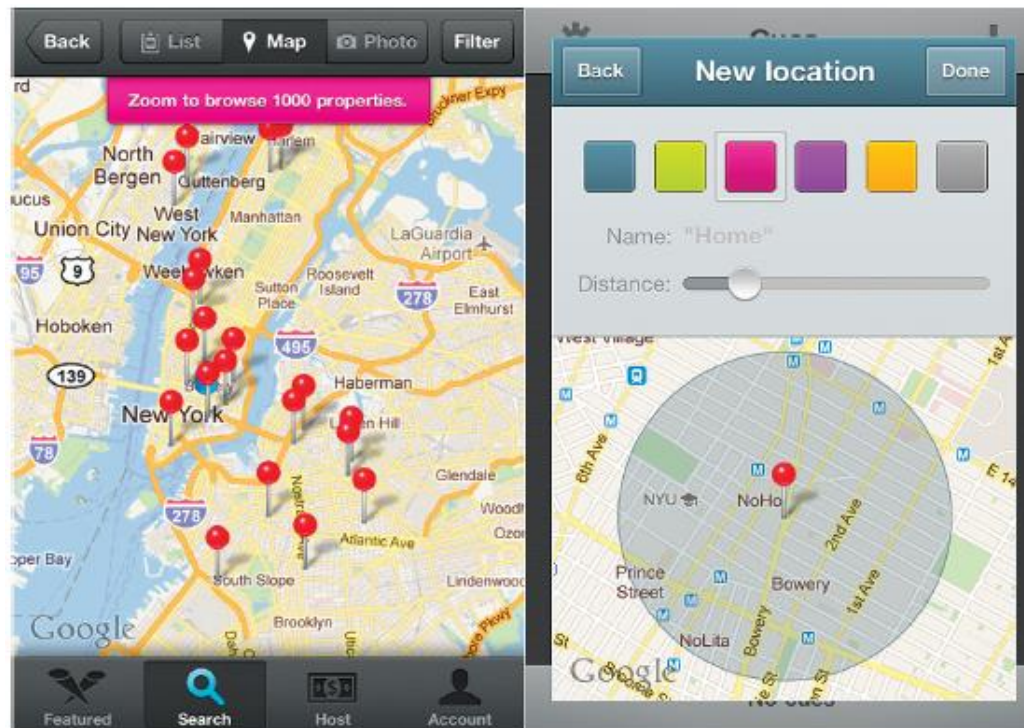
Thanks to HTML5, developers can now enable transparent access to geolocation information without having to write separate code for each browser and device.

Associated APIs

- The WebSocket API

  - Enables Web applications to maintain bidirectional communications with server-side processes

  - 실시간 양방향 통신 지원: 채팅, 게임, 주식 등

  - http://www.w3.org/TR/websockets/

    - W3C Candidate Recommendation 20 September 2012

  - Five Signs You Need HTML5 WebSockets

    - http://peterlubbers.sys-con.com/node/1551694

Associated APIs

- **HTML5 Web Messaging**

    - Defines two mechanisms for communicating between browsing contexts in HTML documents

        - *Cross-document messaging:* allows documents to communicate with each other regardless of their source domain

            - (서로 다른 도메인) 웹 페이지간 (비동기적) 메세지를 주고 받음

        - *Channel messaging:* enables independent pieces of code to communicate directly

    - http://www.w3.org/TR/webmessaging/

        - W3C Recommendation, May 2015

Associated APIs

- Web Workers

  - Defines an API that allows Web application authors to spawn background workers running scripts in parallel to their main page

  - Allows for thread-like operation with message-passing as the coordination mechanism

  - Example: 복잡한 수학 계산, 원격 리소스에 대한 액세스, 시간이 오래 걸리는 백그라운드 작업 등

    http://www.w3.org/TR/workers/

    W3C Working Draft 24 September 2015

Associated APIs

- Web Storage

  - Defines an API for persistent data storage of key-value pair data in Web clients

    - localStorage (영구저장소)

    - sessionStorage (임시저장소)

      - 탭 또는 별개의 브라우저를 실행해서 동일한 페이지를 실행할 경우, 별개의 세션 스토로지 생성 및 서로 침범하지 못함

  - W3C Recommendation Apr 2016

  - http://www.w3.org/TR/webstorage/

Associated APIs

- Web SQL Database

  - Defines an API for storing data in databases that can be queried using a variant of SQL

  - http://www.w3.org/TR/webdatabase/

  - Storage limit is 5MB by default: Safari mobile(50MB), Android(15~?)

  - This document was on the W3C Recommendation track but specification work has stopped. The specification reached an impasse: all interested implementors have used the same SQL backend (Sqlite: 경량의 관계형 DBMS), but need multiple independent implementations to proceed along a standardization path.

Associated APIs

- **Indexed Database API**

  - 객체기반의 비관계형 DB

  - Defines APIs for a database of records holding simple values and hierarchical objects

    - Each record consists of a key and some value

  - Maintains indexes over records it stores

  - W3C Recommendation 08 January 2015

  - http://www.w3.org/TR/IndexedDB/

Standardizing HTML5

- Officially, HTML5, when narrowly defined as the hypertext markup language specification, is now a full specification and an official recommendation by the W3C

  - HTML5: A vocabulary and associated APIs for HTML and XHTML

- But, associated specifications are at different maturity levels and will become standards at different times

- The scope keeps increasing

  - Includes more than 60 APIs now, and requests for additions keep coming in, e.g., the W3C recently received a request to include support for conversion between speech and text inside the Web browser

- Development of HTML will just proceed until HTML is dead

Mobile Mashups Again

- The dynamic nature of the Web environment along with the dynamically changing geographical distribution of mobile users

  - Result in the dramatically changing user needs

- As a consequence, mobile devices have become a demanding market for situational applications

  - Short life-spans, but useful for satisfying instant needs

Mobile mashup use case: tourist assistant

"John (a tourist) wants to acquire information about the *upcoming events* in Seoul. John is a SW engineer, and can manage to build a mashup to address his needs. While on vacation, he prefers to use his smartphone that can connect to the Internet, and therefore, the final mashup should be able to run on that device.

The primary types of information to be provided are the availability, location, time, and type of the *upcoming events* taking place in Seoul. Moreover, some recent *photos* of the events will be helpful when deciding which events to attend. Since he is a newbie in the city, an integrated GPS *navigator* that can lead him step by step to the location of events seems essential."

Tourist Assistant Mashup Architecture
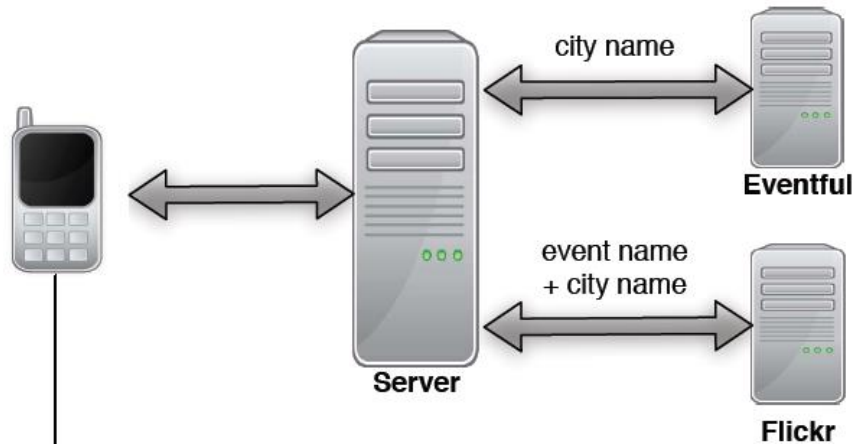
- HTML5 & Web APIs used
  - **GeoLocation**, Maps[1], EventFul[2], Flickr[3]

- Scenario
  - Extract the current location of a user
  - Retrieve a list of future events filtered by the city name
  - Project events geographically on a map widget as a set of markers
  - Select an event type (e.g., movie, music, etc) to filter markers
  - Select each event marker to load a list of relevant photos
  - Show directions from the current location to the location of the event

[1]http://code.google.com/apis/maps/documentation/javascript/

[2]http://api.evdb.com/
[3]http://www.flickr.com/services/api/
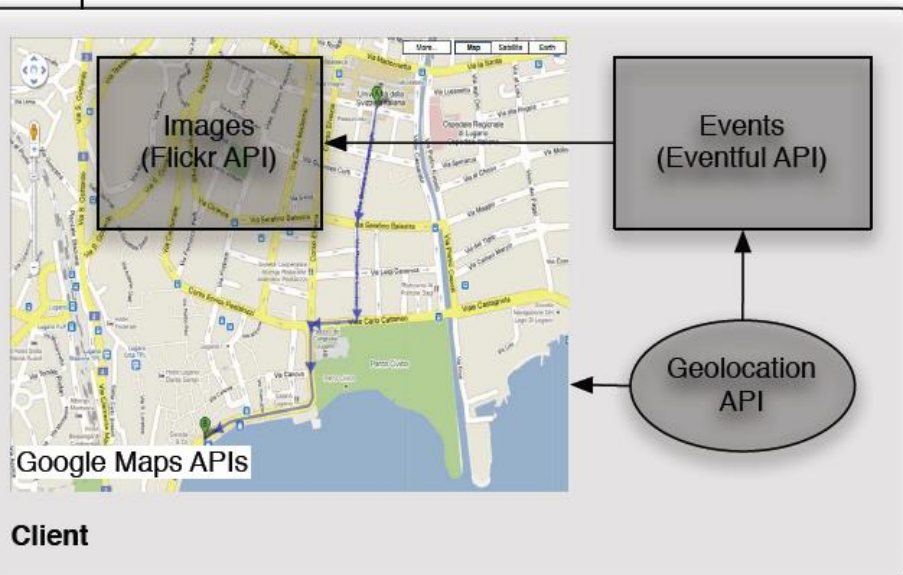
Enhanced Tourist Assistant Mashup

- Upgrade the functionality by adding an *online chat* feature

  - So that people in the same city can discuss upcoming events

Enhanced Tourist Assistant Mashup

"John has already developed an online chat mashup using the **HTML5 WebSocket API**[1], using which users, in the same city, can chat with each other in their own native language. The latter feature is delivered by the Google Translate API[2], that detects the language of the received message and translates it to the language selected by the user.

To be able to *chat* with other users, a user should first *register* into the WebSocket server. Once the registration is accepted by the server, the mashup should *send* the current location of its user to the server. This is because the server determines the chat rooms based on the similarity of users' locations."

[1]**http://www.w3.org/TR/websockets/**

[2]**http://developers.google.com/translate/**

Enhanced Tourist Assistant Mashup

"When embedding the chatroom widget within the mashup, makes use of the HTML5 cross-window **postMessage API**[1]. This feature enables the chatroom widget to send a notification to the parent mashup upon a new message is arrived. All outgoing messages contains the geographical coordinates of the message as well as its content. Each message can be shown as a marker on the parent mashup map widgets, with an info-window that displays the message itself."

Enhanced Tourist Assistant Mashup
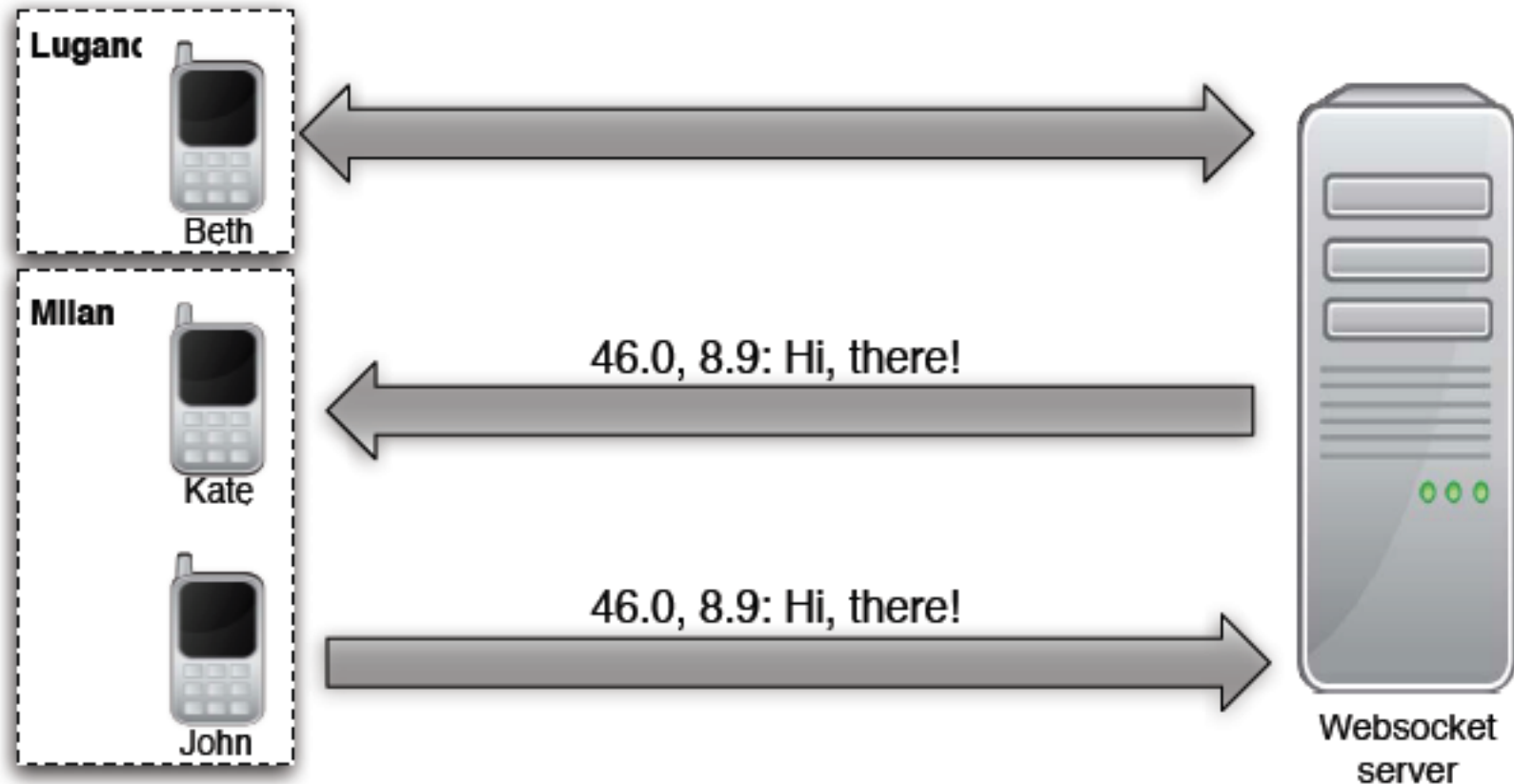
WebSocket-based Chatroom

Hybrid App vs Mobile Mashups

- Hybrid App as situational applications
  - Run natively on mobile devices but take advantage of Web APIs
  - Two limitations
    - Platform-dependent, meaning that each platform offers its own SDK
      - Users of a particular platform, like Android, are limited to use Android-specific apps, and therefore, will be deducted from the benefits they can derive from interesting apps built for a different platform
    - Requires programming skills
      - This is, therefore, an important hurdle that can discourage creation of many *costly* hybrid apps, having short life-spans, but are useful for satisfying instant needs

Hybrid App vs Mobile Mashups

- Mobile mashups

  - Platform-independent: can be accessed from any browsers on any platform

    - Enables portability across different mobile platforms

  - Require much less effort as opposed to hybrid apps

    - Can be possibly developed using emerging mashup end-user programming tools

  - Even, the constraints of mobile computing, to which mobile mashups should be adapted to, have been made accessible by HTML5

    - Variable location, intermittent connectivity (connection status), and small size screen

Location-based mashups

- User expectations from mobile mashups are greatly affected by geographical location

  - E.g., users could expect the tourist assistant mashup to realize and react according to their location, e.g., showing relevant events and giving accurate directions

  - E.g., users may also want to search for tweets within a given radius of their location

- HTML5 exposes access to all sources of information regarding the location of a device, using Geolocation API

  - IP address, GPS, WI-FI with MAC address, CDMA, cell phone IDs

Performance improvement

- Improving the speed is a critical factor in slower mobile connections

- Local caching via WebStorage API

  - Avoids waiting for potentially slow calls back to servers and minimizes the amount of data needed from servers

    - E.g., while querying against the Twitter search API, users can make the querying even more efficiently by only asking for results that you do not already have in the local storage (by using the ID of the newest tweet found in cache)

Offline mashups

- Challenges arise when users get dropped from the Internet due to mobility

- Offline-enable your mobile Web app

  - By detecting when your application goes from offline to online and vice versa

- Offline capabilities bring mobile Web closer to parity with native apps

  - Allows users to keep interacting with the (cached) Web application while in an offline mode

Conclusions

- Mashup development still requires HTML5 to continue following the path towards letting browsers know more about the contextual information of the users, and further providing mashups with such information in a streamlined manner

- The context of the user can be characterized by more parameters such as the client computational power that are not yet formally accessible by HTML5

- Therefore, the more browser can make such context information visible to a mashup, the better the mashup can respond and adapt

- In order to empower mobile mashup to compete with native hybrid apps, HTML5 should allow browsers to have access to such mobile features