

# Geo-location in the Mobile Web



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# Overview

- Privacy, trust and legal considerations
- Location sensing technologies
- Deployment choices
- What is it being used for?
- What standards are there?
- Considerations
- Where next?

# Mobile location privacy, law and policy

- USA has a laissez faire approach
  - 1996 Telecommunications Act, seen by FCC as requiring opt-in consent, complicated by E911 Act
  - but overturned by courts in U.S. West vs FCC
    - carrier's First Amendment rights in commercial speech
  - Subsequent to introduce laws to require opt-in have failed
  - 2003 CTIA proposes “consumer code” for self-regulation
  - E911 requiring location of emergency callers
    - prompting carrier's to install location technology

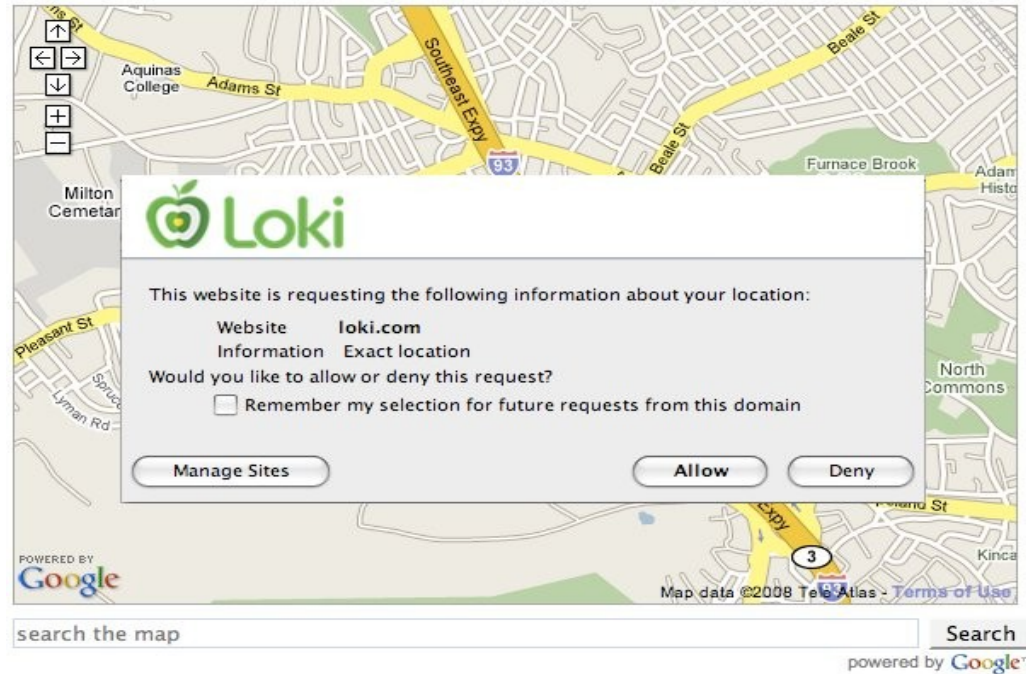
# Mobile location privacy, law and policy

- Much clearer situation in Europe
  - Article 9 of Directive on Privacy and Electronic Communications (2002) requires opt-in
  - Subscribers must be able, without charge, to withdraw their consent for the collection or processing of their location information at any time
  - But it is up to each EU member country to determine what is meant by “consent”
  - EU E-112 regulations mandating location of emergency callers (2003)
    - $\leq 100\text{m}$  67% of time,  $\leq 300\text{m}$  95% for network based sensing
    - $\leq 50\text{m}$  67% of time,  $\leq 150\text{m}$  95% for device based sensing

# Mobile location privacy, law and policy

- Most advanced in Japan
  - 1989 Ministry of Posts and Telecommunications issues guidelines on protection of personal data
  - Requires opt-in and defines clear standard for “consent”
  - 2003 the Diet passes Personal Data Protection Law
  - Clear legal and regulatory standards has boosted consumer confidence and encouraged strong growth in location-based services

# Opt-in Consent



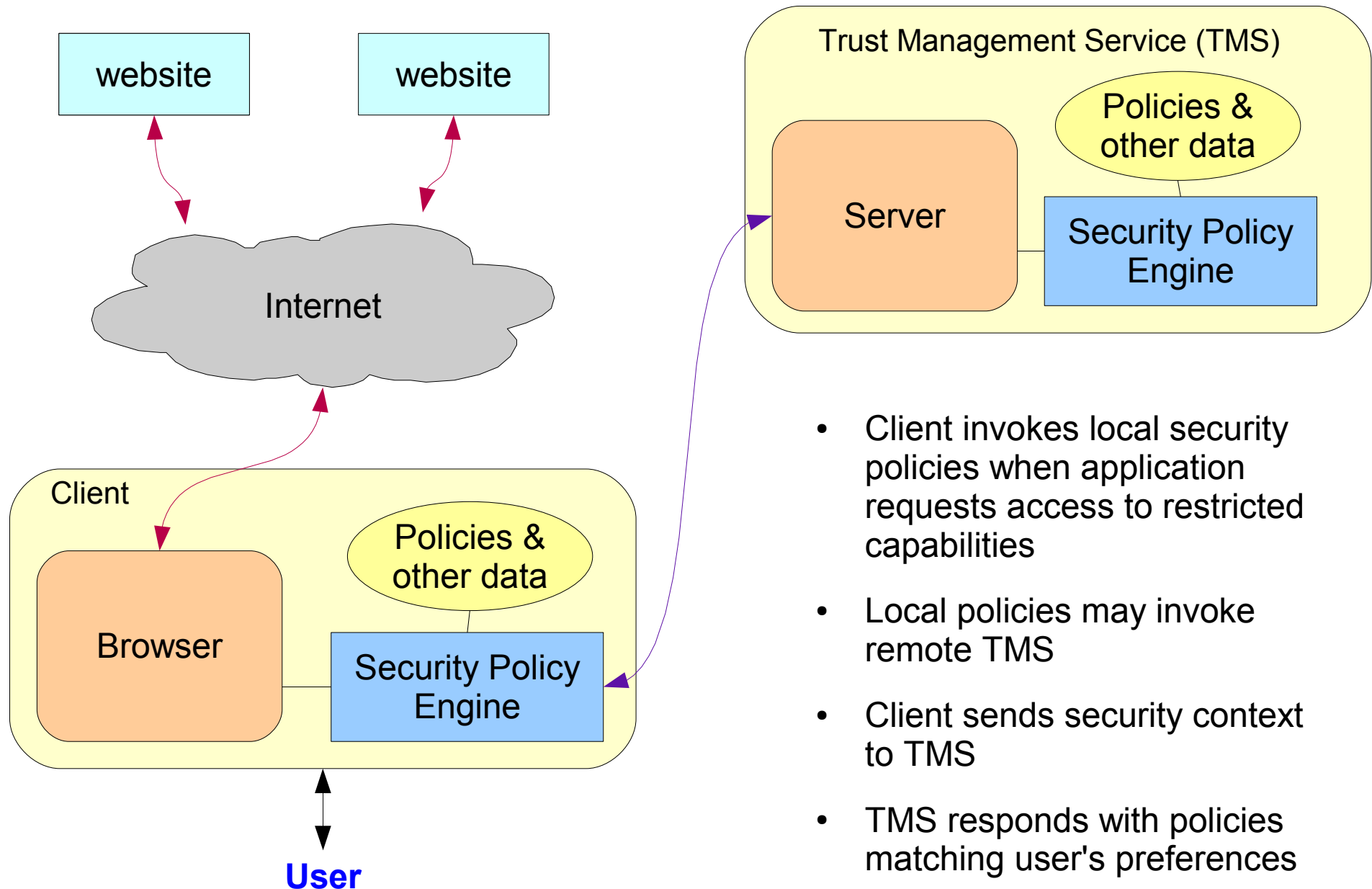
loki.com is requesting your exact location:

- Would you like to allow or deny this request?
  - Would you like to remember this decision for future requests?
  - Would you like to manage sites?
- No indication of what the website wants the location for
  - No means to offer location only at reduced accuracy
  - No way to ask for a second opinion on whether this website is trustworthy

# Trust Management

- How do users know when it is reasonable to give their consent?
  - The click through dialogue offers poor usability
  - Users may have little knowledge of the track record of the website they are giving consent to
  - Some sites may have been vetted by operator
- Requirement for a means to delegate trust management
  - Ask a friend or trusted authority
  - Wisdom of crowds

# Trust Management



- Client invokes local security policies when application requests access to restricted capabilities
- Local policies may invoke remote TMS
- Client sends security context to TMS
- TMS responds with policies matching user's preferences



# Location Sensing Technologies

- GPS with accuracy of 5-30m
  - A-GPS reduces power consumption and boosts reliability, but requires network support
    - Reduces search time from minutes to seconds
  - Doesn't work well indoors or high rise urban areas
- Triangulation between base stations
  - U-TDOA which measures time of arrival at each base station, 30m-50m accuracy in urban areas
- Other approaches
  - Bluetooth, Infrared, WiFi neighborhood, Barcodes, RFID, Cell ID (few hundred metres to kilometres)

# Application Platforms

- Native apps, e.g. S60 or BREW
  - Typically pre-installed
- Java, J2ME and JSR 179
  - User installable, digitally signed by device vendor
- HTTP based
  - Browser detects markup extension
  - Location passed via HTTP to web server
  - No need for client-side scripting
- Exposed to client-side web page scripts
  - Not yet available, but great for mashups

# What is location used for?

- Navigation on foot, car or bicycle
  - maps with turn by turn directions
- Finding nearby bars, restaurants, shops
  - location based advertising
- Meeting up with friends (location-based dating)
- Tracking children or employees
- Location tagging of photos and mo-blogs
- Location-based post-its for you and others
- Location-based games and tours

# Navigation



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©NAVITIME JAPAN  
地図:昭文社/住友電工

- NTT DoCoMo i-appli
- KDDI/AU EzNaviWalk
- Nokia Maps

- Diageo Guinness navi for Tokyo area on St. Patrick's day 2007



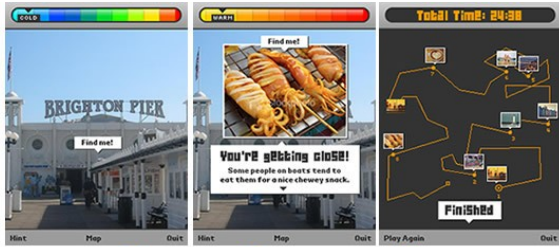
- Use QRCode to add browser bookmark
- Location-based search

# Location-based Advertising



- Points of interest
  - based on location and bearing
  - select to get coupons
- Get discounts by presenting your phone at point of sales

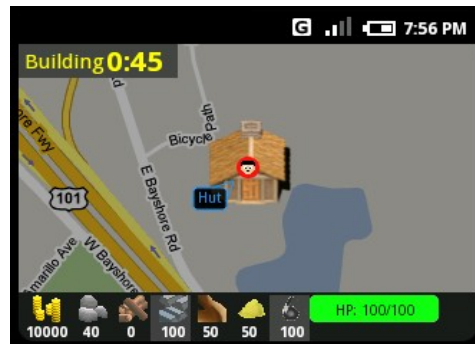
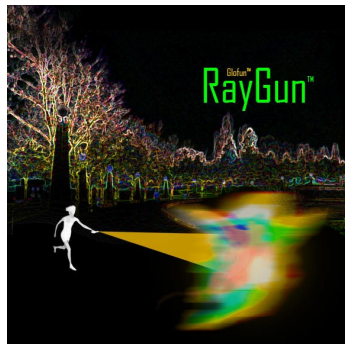
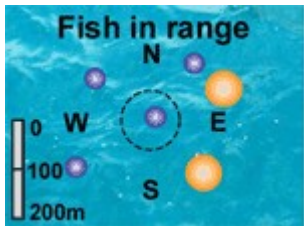
# Location-based Games



A small sample

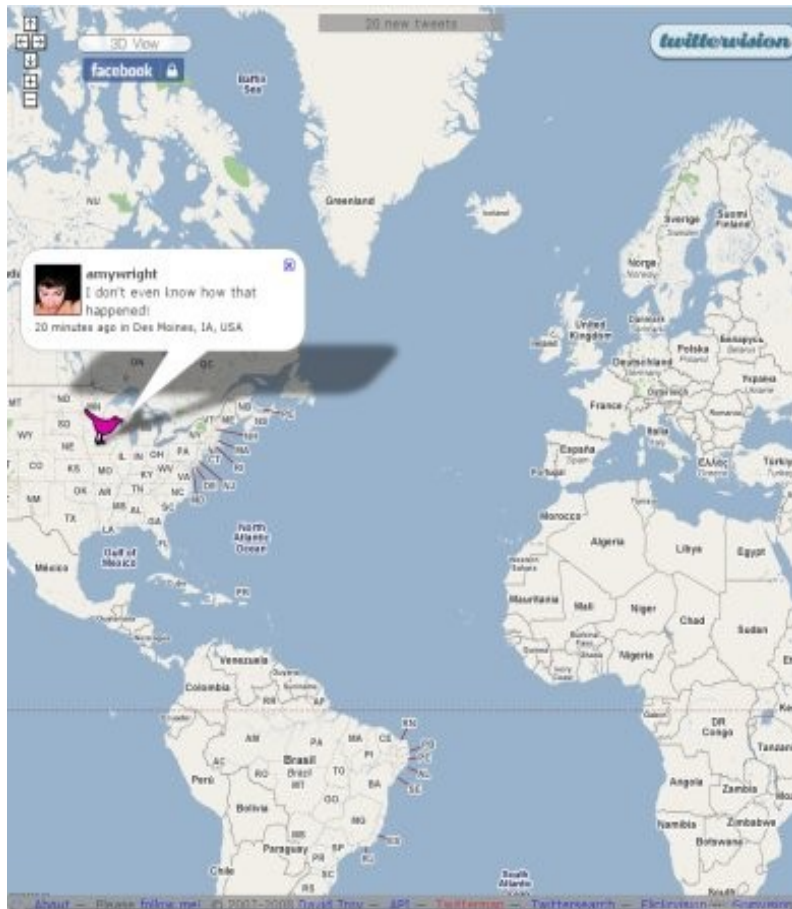
- Geocaching
- Pacmahattan
- Citygames
- Ghosttown
- Navball
- Locamatrix
- Swordfish
- Parallel Kingdom
- HPLabs mscapers

Location-based games lure kids off the couch



*a whole new world of fun on every street corner ...*

# Sharing your location



- DoCoMo's imadoco
  - find loved ones
- MobileLocate
  - track employees
- Twittervision mashup of twitter and google maps
- Fire eagle, Yahoo! service for sharing your location with websites, whilst controlling your privacy

# What “standards” are there?

- Points of Interest
  - GPX (XML-based) and several proprietary formats
- JSR 179 Java API for exposing location
  - Widely used for J2ME applications
- Passing location along with HTTP requests
- Google's recent location API proposal
- Location as part of the UWA Delivery Context Ontology and bindings through DCCI
- IETF GeoPriv working group



# Deployment Issues

- Some location sensing technologies rely on hardware and software additions to devices
  - GPS, E-TDOA, WiFi neighbourhood, ...
  - Only a limited fraction of deployed devices
  - This limits the customer base at any time
- Others are network based and will work on existing devices, and only require upgrades to the network infrastructure
  - TDOA, U-TDOA, Cell ID, ...
  - This makes such techniques easier to deploy
    - U-TDOA is widely deployed in USA for E911

# Considerations

- Location sensing may require network access
  - Server is needed in some way to compute location
    - e.g. A-GPS, U-TDOA, WiFi neighbourhood
- How does that server pass location to others?
  - via client device
  - direct to websites, but controlled how?
- Location APIs shouldn't be tied to GPS
  - not all devices will include GPS support
  - doesn't work well in shadow of tall buildings
  - doesn't work in enclosed urban environments

# Considerations

- Decimal latitude/longitude in WGS-84
  - obvious choice and widely supported for GPS
- Altitude and bearing
  - Lower accuracy for altitude in most cases
  - Bearing determined from location tracking
    - Useful for games and points of interest
- What format and what accuracy does the application need?
- Allowing for variations in location naming
  - postal addresses in USA, UK, France, ...

# Where next?

- Need to address trust management issue
  - simple opt-in consent dialogues are insufficient!
- W3C workshop on security and access control planned for late 2008
  - details to be announced
- W3C work on ontology and APIs
- Potential work on standardizing markup extensions based upon Japanese experience
  - used by browser to determine when to send location to website as part of HTTP request

# Geo-location

Questions?

# Browser extensions for LBS

*Multiple approaches and lack of consensus on details*

- User clicks on link with special URL scheme

```
<a href="device: location?url=http://server/location.cgi">navi-  
service</a>
```

Also: device:location location:gps location:cell

- Browser asks user for consent to send location
- Browser sends HTTP GET with params

```
http://server/location.cgi?datum=AAA&unit=BBB&lat=XXX&lon=YYY
```

May use additional HTTP headers, e.g. x-jphone-geocode

- Use of forms with special action+hidden fields

```
<form action="location:gps" method="post">  
  <input type="submit" value="data" />  
  <input type="hidden" name="url"  
    value="http://www.example.com/example/example" />  
  <input type="hidden" name="param1" value="1234" />  
  <input type="hidden" name="param2" value="data" />  
</form>
```