

# Location-Sharing Technologies: Privacy Risks and Controls

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<http://cups.cs.cmu.edu/>

# Location-Sharing Applications



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## Google Latitude Spurs Privacy Backlash

**A consumer-advocacy group already sees five scenarios in which the Google Maps add-on could be abused.**

By [Thomas Claburn](#)  
**InformationWeek**

February 5, 2009 06:25 PM

Google's new [Latitude](#) location-sharing service "could be a gift to stalkers, prying employers, jealous partners, and obsessive friends," [Privacy International](#) warned Thursday.

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Google introduced Latitude on Wednesday. It's a new Google Maps feature that lets users share location data with friends, using either a mobile phone or [Google](#) Gears-equipped computer.

Google knows well that it has a privacy problem, exemplified by



Google (NSDQ: [GOOG](#)) Latitude  
(click for larger image)

# Motivation

- What exactly are people's privacy concerns?
- Are these location-sharing applications addressing these concerns?

# Objectives

- Conduct a risk/benefit survey
  - Determine user's specific concerns
- Evaluated existing location-sharing applications
  - Evaluate privacy controls

# Outline

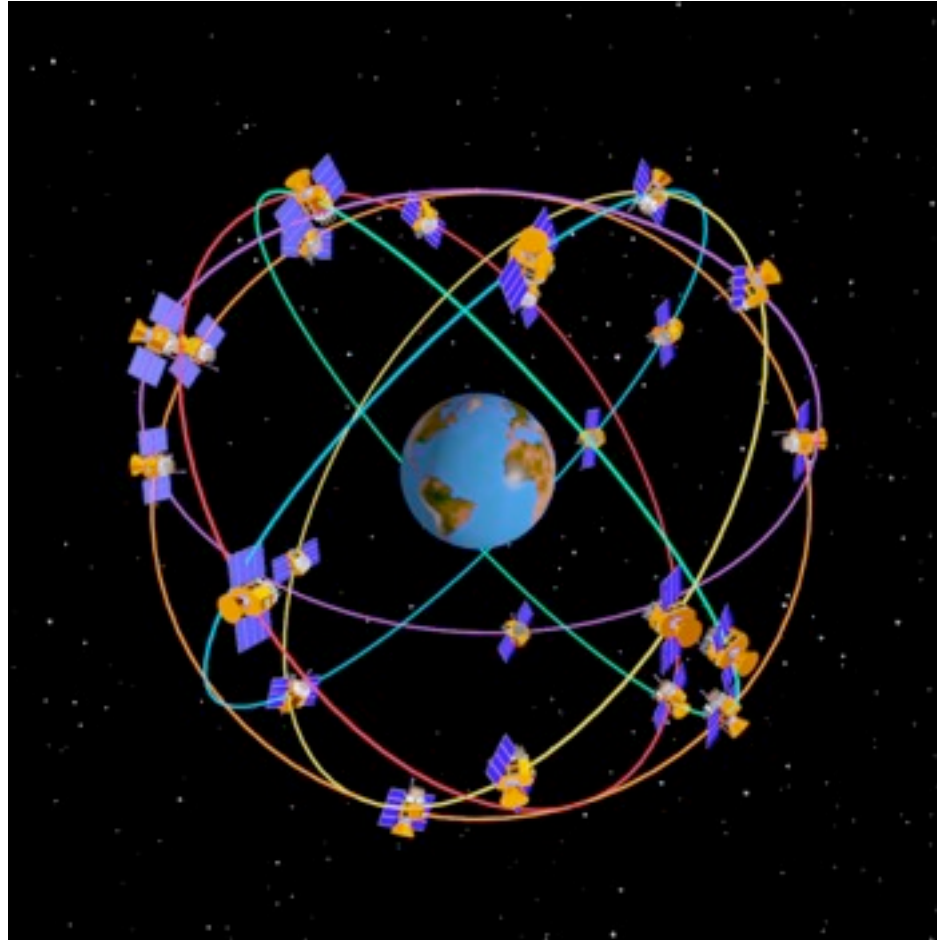
- Locating Technologies
- Location Risk/Benefit Survey
- Location-Sharing Applications
- Addressing Perceived Risks
- Conclusion



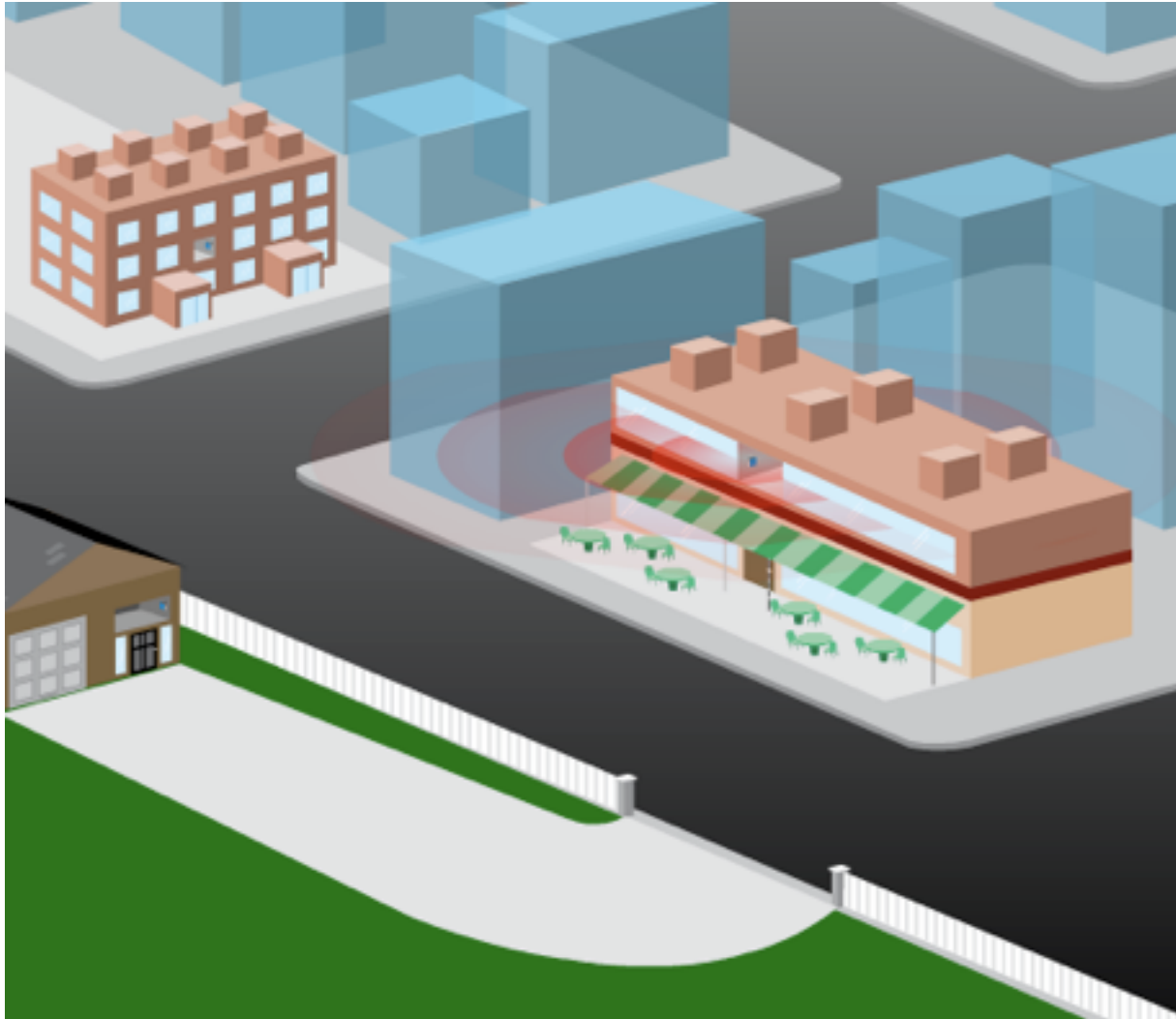
# Locating Technologies



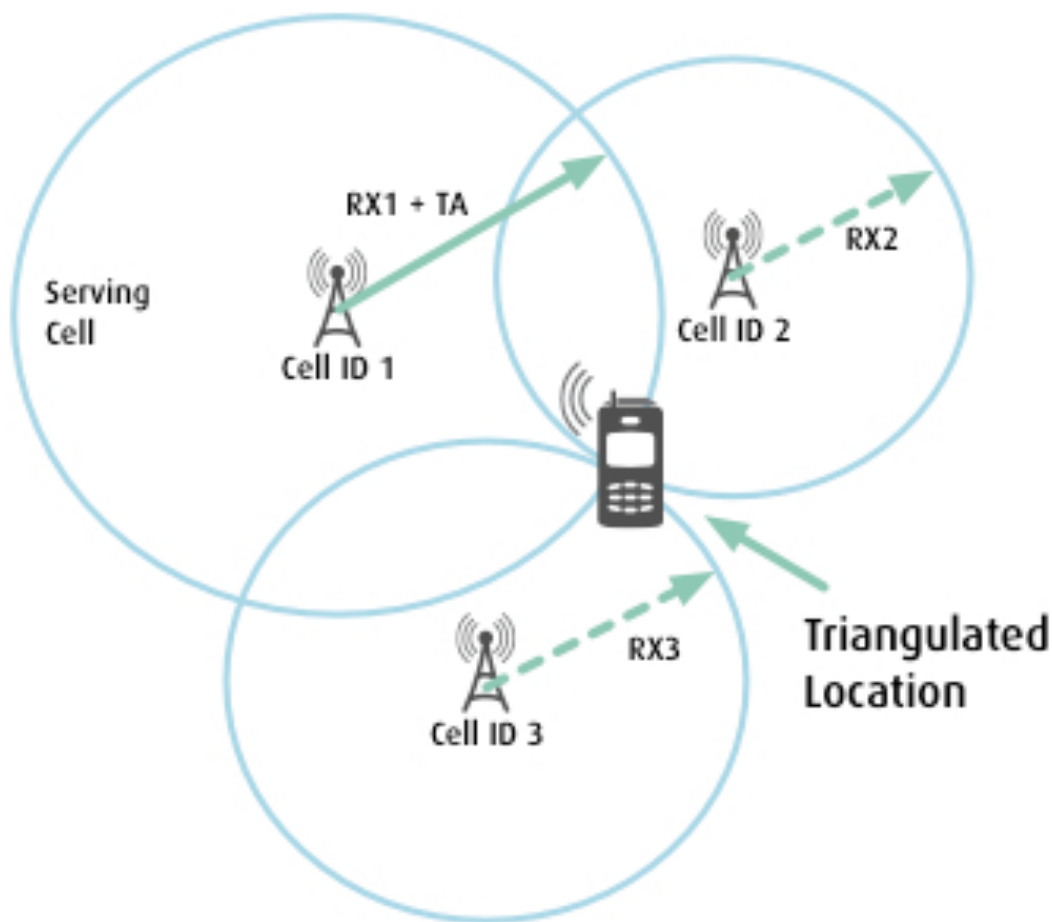
# Global Positioning System



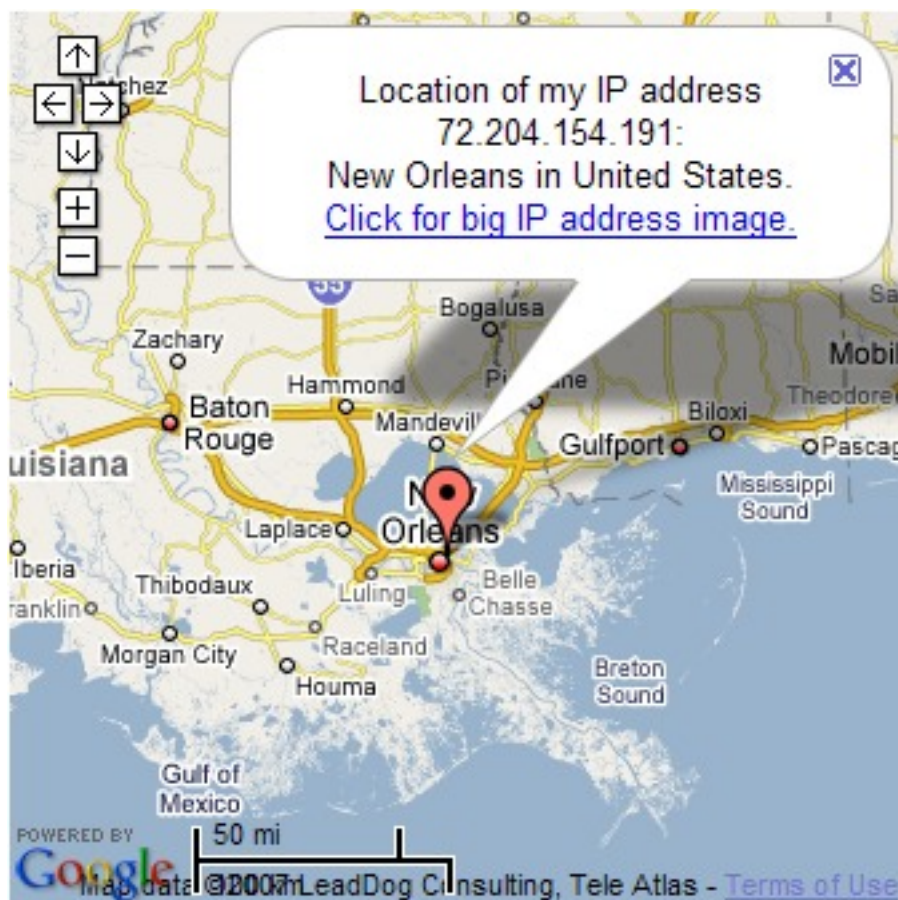
# WiFi Positioning



# Cellular Triangulation



# IP Location



# Locating Technologies

- Platforms
  - Laptop computers
  - Mobile phones
- Applications
  - Advertising/Marketing
  - Information services
  - Friend-finding



# Industry Guidelines

- CTIA Best Practices
  - User Notice:
    - Information use, disclosure, protection
  - Consent:
    - Choice of information disclosure to third parties

# Location Risk/Benefit Survey



# Method

- Conducted April 2008,  $n = 587$
- Provided list of use scenarios
  - Rate the likelihood of scenario
  - Rate the magnitude of harm or benefits
- Ranked each risk/benefit

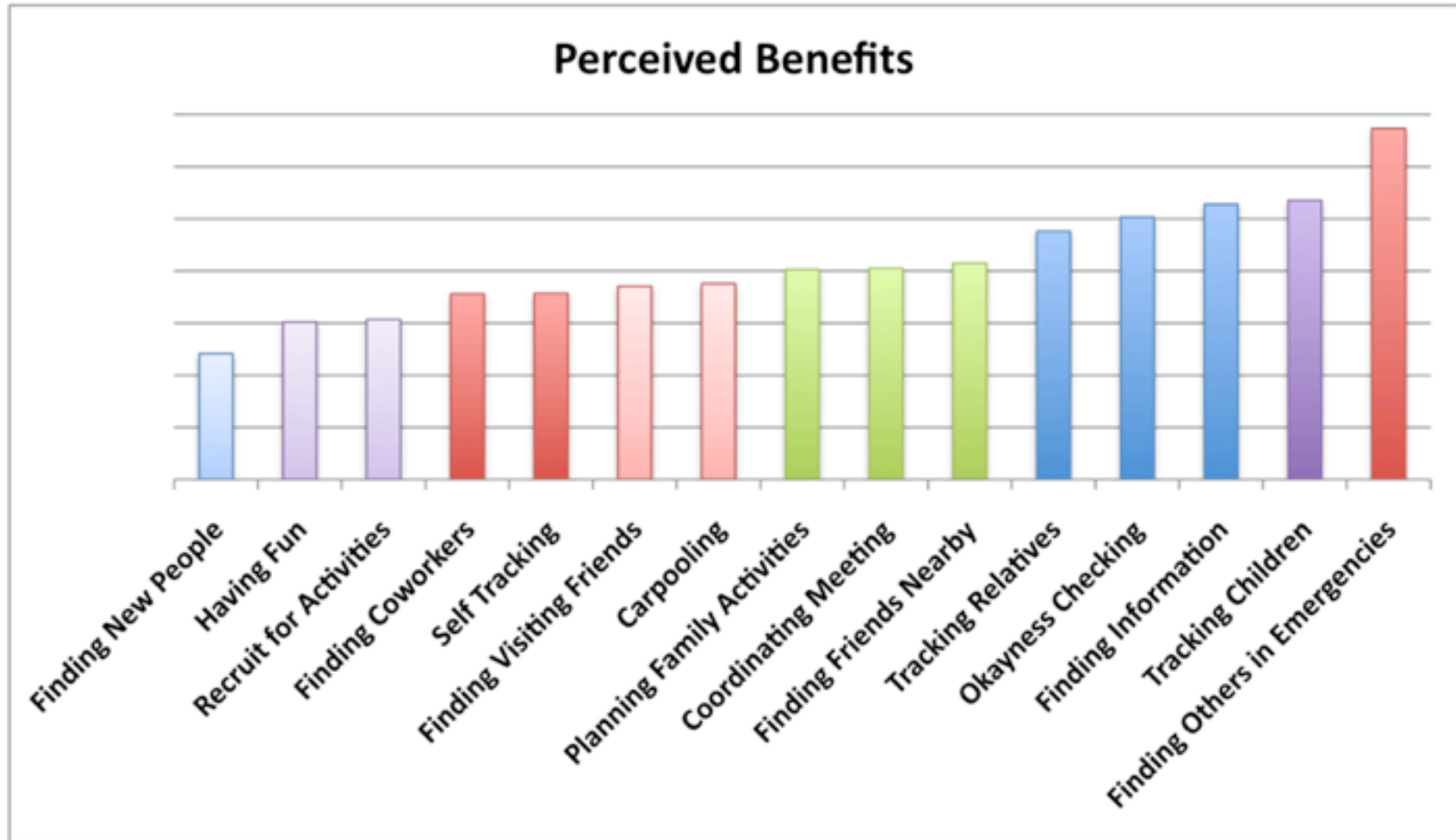
Expected Utility = Likelihood \* Magnitude

# Location-Sharing Applications

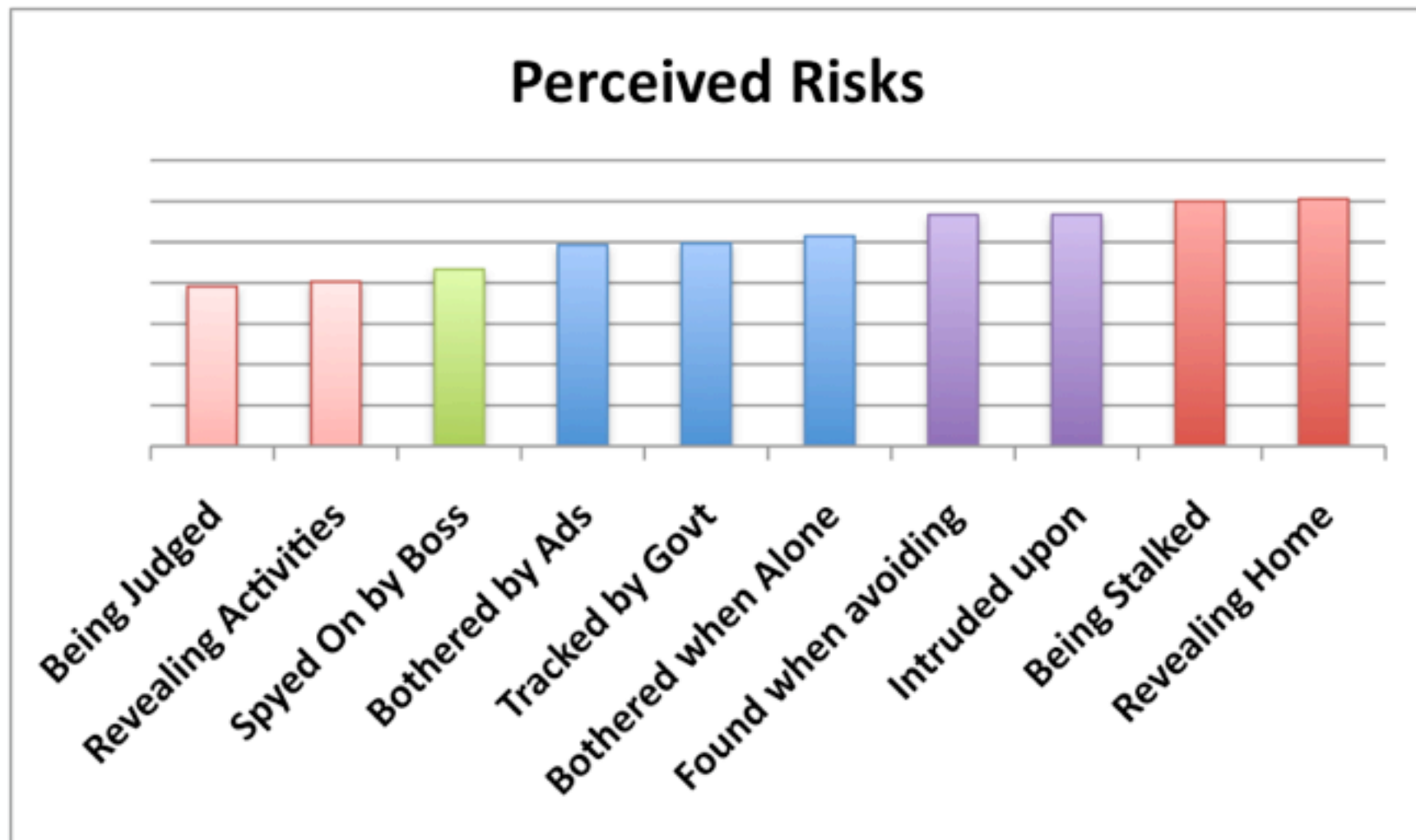
- Not very useful
- People are concerned about their privacy
- Risks outweigh benefits



# Benefit Scenarios



# Risk Scenarios



# Location-Sharing Applications



# Location-Sharing Applications

- Reviewed 89 Applications
  - Date of Launch
  - Privacy Policy
  - Privacy Controls
  - Immediately Accessible Privacy Settings



## LOCACCINO

HOME

PRIVACY SETTINGS

FRIENDS' VIEWS

LOCATOR

INVITE

HELP!

The screenshot displays the LOCACCINO web application interface. On the left, a sidebar contains a user profile for 'Your location' (online), a search bar, and a list of friends: Eran Toch, Jay Springfield, Joe Locaccino, Lorrie Cranor, Lujo Bauer, Patrick Kelley, Paul Drielsma, and Tony Poor. Below the list are links for 'Show all on map' and 'Clear map'. The main area features a map of Pittsburgh with a yellow line indicating a route. A callout box for 'Janice Tsai' is positioned over the map, showing her profile picture and text: 'Near: Carnegie Mellon University, 100 Smith Hall At: 11:00 AM'. The map includes labels for various streets (e.g., Forbes Ave, Schenley Dr, Beeler St) and landmarks (e.g., Carnegie Mellon University, Schenley Park Golf Course). Map data is attributed to ©2009 Tele Atlas.



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**Your location**  
online

Search for a friend

- Eran Toch
- Jay Springfield
- Joe Locaccino
- Lorrie Cranor
- Lujo Bauer
- Patrick Kelley
- Paul Drielsma
- Tony Poor

Show all on map | Clear map

**Janice Tsai**  
Near: Carnegie Mellon University, 100 Smith Hall  
At: 11:00 AM

Map data ©2009 Tele Atlas - Terms of Use





# Privacy Overview

- Types of Applications
  - Open: Requested by anyone (52)
  - Closed: Requested by friends only (29)

Category	Yes	No	Unknown	Not Applicable
Privacy Policy	66%	34%	-	-
Privacy Controls	76%	17%	1%	6%
Accessible Privacy Settings	17%	75%	2%	6%

# Types of Restrictions

- Friends Only (49.4%)
- Granularity (11.2%)
- Blacklist (15.7%)
- Invisible (33.7%)

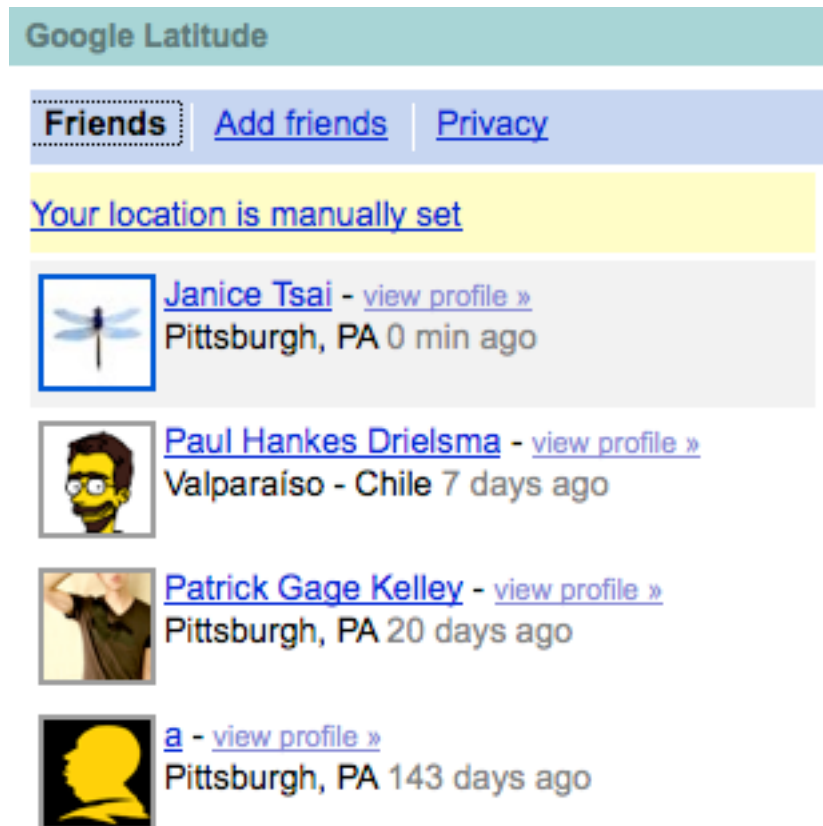
% of applications



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% of applications

## Google Latitude

**Friends** | [Add friends](#) | [Privacy](#)

**Patrick Gage Kelley**  
patrickgage@gmail.com  
Pittsburgh, PA 20 days ago



[Send an email](#)

[Remove friend](#)

### Sharing options

- ☒ Share best available location
- ☐ Share only city level location
- ☐ Hide location from this friend

[« Return to friends list](#)



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## Google Latitude

[Friends](#) | [Add friends](#) | **Privacy**

### Location sharing

- ☐ Detect your location [Learn more](#)  
Your location is updated automatically
- ☐ Set your location  
Manually select a location on the map
- ☒ Hide your location  
Friends can not see your location



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Your location

online

Search for a friend



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Show all on map | Clear map

Janice Tsai



Near: Carnegie Mellon  
University, 100 Smith Hall  
At: 11:00 AM

Carnegie Mellon  
University

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## My Rules

Add New Rule

Rule1

## Rule Editing

Cancel

Save changes

Rule name

Who

Who can see my location?

New Locaccino Friend List

Click for all lists and networks

Show all

This rule applies to all my friends

When

When can they see my location?



I can be seen all the time



I can be seen part of the time...

Where

Where can they see my location?

e.g. my friends can see my location only when I'm in the Carnegie-Mellon University campus



I can be seen in all locations



I can be seen in these locations...

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Where can they see my location?

☒ I can be seen in all locations☐ I can be seen in these locations...

on University campus

# Types of Restrictions

- Per-Request (2.25%)
- Time-Expiring (2.25%)

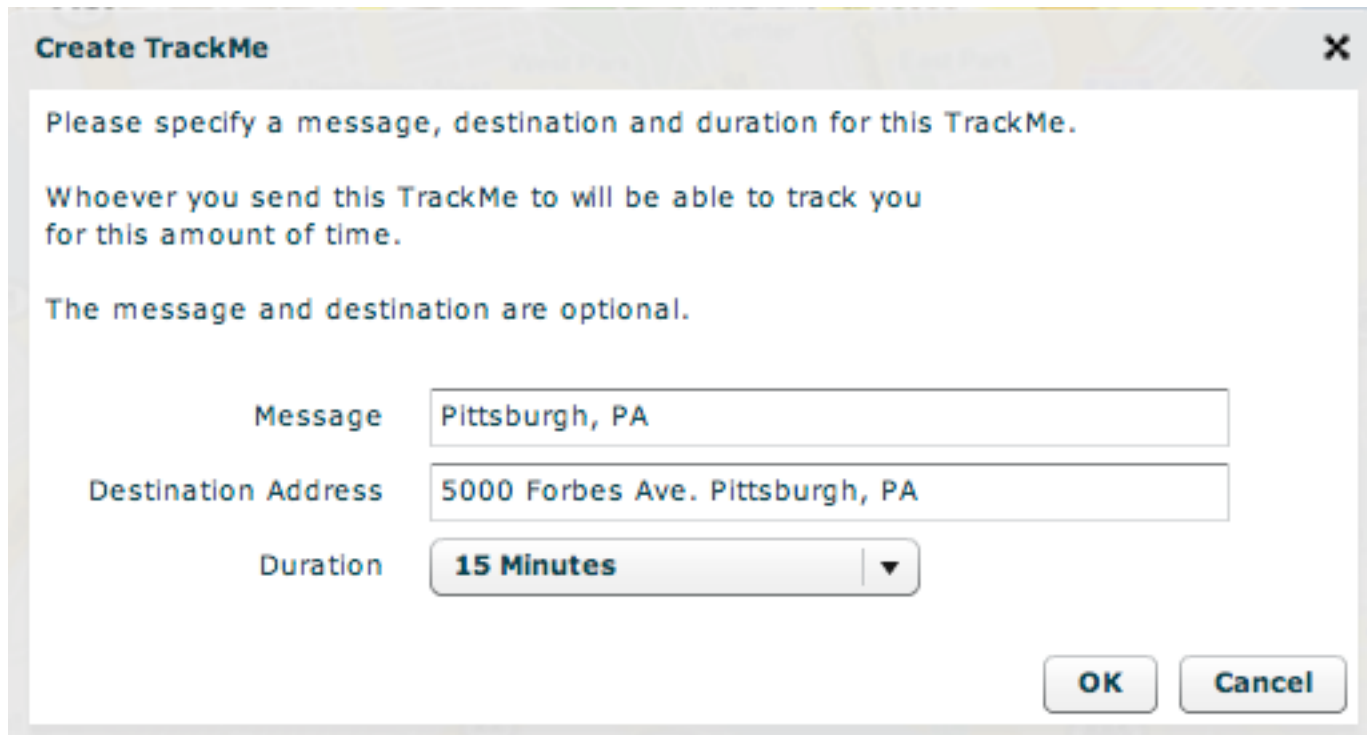
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- Time-Expiring (2.25%)



The screenshot shows a 'Create TrackMe' dialog box with a close button (X) in the top right corner. The dialog contains the following text and fields:

Please specify a message, destination and duration for this TrackMe.

Whoever you send this TrackMe to will be able to track you for this amount of time.

The message and destination are optional.

Message: Pittsburgh, PA

Destination Address: 5000 Forbes Ave. Pittsburgh, PA

Duration: 15 Minutes (selected from a dropdown menu)

Buttons: OK, Cancel

# Most Frequent Controls

- Friends Only (49.4%)
- Invisible (33.7%)

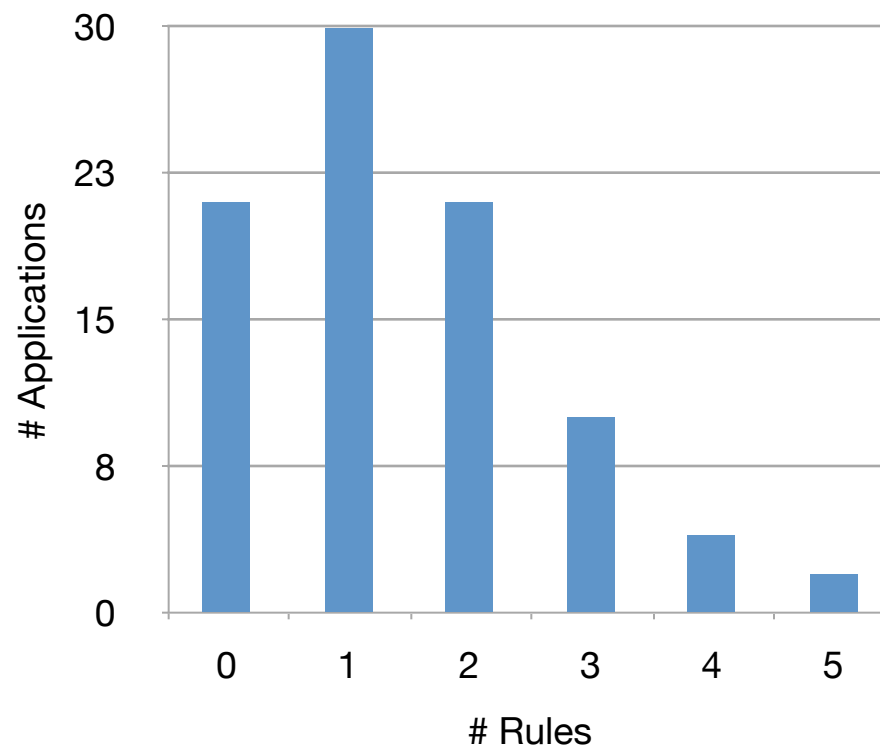
% of applications



# Privacy Controls

- Frequency of Restrictions

**Restrictions Per Application**



# Addressing Perceived Risks



# Privacy Controls

- Best mitigate the greatest expected risks
  - Blacklist (16%)
  - Granularity (12%)
  - Group-based rules (12%)
  - Location-based rules (1%)
  - Time-based rules (1%)

% of applications

# Conclusions

- Industry guidelines do not address privacy concerns
- Systems lack expressive privacy controls
- No one application fully addresses the largest risks

# Recommendations

- Providing expressive controls could reduce concerns
- Developers must balance expressiveness and user burden



# CMU Usable Privacy and Security Laboratory

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