Building a Social Networking Future without Big Brother

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Part of POMI (Programmable Open Mobile Internet 2020), an NSF Expedition
Biggest (Last?) Personal Computer Revolution

10x cheaper, 10x more users
3-Tier Architecture

服务器

data

My key, cache, window into my digital cloud: ID, personality, assets, and the internet

Personalize the generic PC, borrow the power, display, keyboard, memory, etc

PC, TV
at home, on the road, in hotels, on the plane

天
Tian
(Heaven)

人
Ren
(Man)

地
Di
(Earth)
Ad-Supported Social Networking
Ownership, Privacy?

EULA reserves the right to change the EULA
Convenience? Data silos

Our Personal Cloud

Web
- facebook
- myspace.com
- Gmail
- shutterfly
- iTunes
- LinkedIn
- Loopt
- dropbox

PC
- Photos
- Music
Economics of Super-Giant Star Topology?

YouTube May Lose $470 Million In 2009: Analysts
Credit Suisse Report Estimates Video Site Will Generate $240 Million In Revenue

Todd Spangler -- Multichannel News, 4/3/2009 3:43:00 PM EDT
Openness?

Apple blocks competitive products from iPhone App Store--surprised?

Google Voice Thoroughly Banned From the iPhone; So Much for an Open Platform

July 28th, 2009 | by Stan Schroeder

53 Comments
The Omniscient Monopoly

GEORGE
1984
ORWELL

CHARLES' GEORGE ORWELL LINKS

MONOPOLY
Ad-Supported Social Networking

- Privacy
- Data ownership
- Data silos
- Cost of infrastructure for super-giant star technologies
- Closed proprietary systems
Decentralized Open Trustworthy (DOT) Social Net

Online social networking without reservations!

**Decentralized** across different administration domains
- Choice of **privacy**—owned home server, paid vendor, ad-supported vendor

**Open** API for distributed applications across administration domains

**Trustworthy:** Sharing with fine-grain access control

Inter-operability between MySpace & Facebook
Challenges & Hypotheses

An open, high-level API and platform makes decentralized applications easy to develop.

A safe haven with access control PAYS
- in situ social networking
- privacy-sensitive apps

Decentralization is more scalable and cost effective.
Research Strategy

- Infrastructure
- Applications
- In Situ Social Networking

- Research Consortium
- Open API
- Release apps & experiment

- Privacy apps
- Affordable
- Easy to use

- Easy to develop
Decentralized Social Networking Architecture

Unencrypted Data & Computation

Big-Brother Portal

Web Browser

Web Browser

3rd Party

Junction Platform

Encrypted & Anonymous Data, Computation, Messaging

PrPl (Private-Public) Infrastructure

Unencrypted Data & Computation
Personal Cloud Butler: Mediates access to personal data
Manages a semantic index pointing to data hosted anywhere
- A distributed declarative social database language
- Based on Datalog: programs are declared as rules
  - Example:
    FOAF(?p) :- FRIEND(?p)
    FOAF(?p) :- FRIEND(?x), FOAF(?x)(?p)
    FOAF-CurrLocation(?p,?l) :- FOAF(?p), CurrLocation(?p)(?l)
  - Supports composition, recursion
- Hides distribution details: Messaging, credentials
- Declarative: easy to optimize: caching, approximation, incrementality
Basic Application: Peops

- Friends all run their own Butlers
- Harvested friends from Facebook
- Display selected friends photos, GPS locations
- Single query → personal Butler
  - Butler contacts other Butlers to return results
- Appstore for server apps
In-Situ Social Networking

**Extract groups from email**
**Ask users for group names**
**Pre-populate with email attachments**
**Access control: OpenID**
**Suggest new group members**
**Add new contents**
Music Social: Jinzora

Share and discover music
Buy music
Proof of Concept on Planetlab

Distributed SociaLite query of tagged photos over the planet with 100 nodes (20,000 photos total from Facebook)
Junction: Platform for Ad Hoc P2P Apps

- Server-side scripting

- Poker Portal
  - http://poker/sessionid=234
  - http://poker/sessionid=123

- Web Browser
- Web Browser

- Activity Director
- Activity Director
- Activity Director

- Switch Board
  - junction://sb/sessionID=234 (by invitation)

- Cross-Platform Native app
wePoker’s Activity Script

```
{ ad: "edu.stanford.prpl.poker",
  friendlyName: "wePoker",
  roles: { "player": {platforms: {
    android: {package: "edu.stanford.prpl.poker",
    web: {url: "http://prpl.stanford.edu/poker/play" }}},
  "table": {platforms: {
  "dealer": {platforms: {
```
weBluff

Start Activity
Invite: QR code

Accept with a snap
Download software
Join activity
Rolling Dice (with Replacement)

1. Commit
   Each picks a random \( r \), declares \( g^r \mod p \)
   where \( g, p \) are agreed upon.

2. Give to owner
   If not owner, reveal \( r \). Owner calculates value of die as
   \((r_a + r_b + r_c) \mod 6\).

3. Reveal
   Owner makes his \( r \) public.

4. Verify
   A revealed \( r \) is only valid if \( g^r \) matches \( g^r \) from step 1.
weTube

Easy to use

Easy to develop

Scan In
Local Activities
Recent Activities

Open YouTube
To play a video, first open the YouTube application. Once you've found a video to play, long-press it and select 'share', followed by 'JunctionTube'.

Logout

Share this video via
- Email
- Facebook
- Gmail
- Messaging
- WebPhone
Snap2Pass: Challenge-Response Authentication

- Website displays
- embeds a challenge in the QR code
- Personal phone
- captures QR
- sends a response based on secret between website and phone

No memorization of passwords
Unique secret for each website
7 seconds
<table>
<thead>
<tr>
<th>Application</th>
<th>Lines of Code Per Role</th>
<th>Days to Develop</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social apps: Privacy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weMeet</td>
<td>200</td>
<td>1</td>
</tr>
<tr>
<td>weChat</td>
<td>300</td>
<td>1</td>
</tr>
<tr>
<td><strong>Multimedia: Quick and fun collaboration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weTube</td>
<td>Player: 450, Phone: 600</td>
<td>1</td>
</tr>
<tr>
<td>weTunes</td>
<td>Jukebox: 520, Remote: 420</td>
<td>2</td>
</tr>
<tr>
<td><strong>Games: Scalable, distributed applications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weBluff</td>
<td>1500</td>
<td>3</td>
</tr>
<tr>
<td>weHold‘Em</td>
<td>Player: 800, table: 750, dealer: 1700</td>
<td>30</td>
</tr>
<tr>
<td><strong>Personal apps: use the phone and the PC together</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snap2Pass</td>
<td>Provider: 1600, web: 120, phone: 400</td>
<td>6</td>
</tr>
<tr>
<td>Snap2Web</td>
<td>Browser: 320, phone: 400</td>
<td>1</td>
</tr>
</tbody>
</table>
Online Social Networking without Reservations

- PrPL, SociaLite Junction
- Peops, Music 8 Junction Apps
- Email Mining

Research Consortium
Open API

Release apps and experiment

Privacy apps
Affordable
Easy to use
Easy to devel

Inter-operability between MySpace & Facebook
The End
Junction Applications
Real-Life Application Ideas

Edu-Games
- Easy to develop
- Easy to use
- Affordable

Campus Biggest-Loser
- Easy to develop
- Easy to use
- Privacy apps

Shopping Social
- Easy to develop
- Easy to use
- Privacy apps
- $
Example Activities

- Ad hoc P2P Applications
  - Games: Poker, Bluff, other turn-based games
  - Exchanging contact information
  - Real-time photo sharing/tagging
- Personal Remoting (cross-platform interactions)
  - Two-factor authentication
  - Browser keyring / Mobile bookmarks
  - Rich interface multimedia controller
- Authentic Social Interactions
  - Collaborative Play-listing
  - Shared YouTube experience
Strategy

- Create a prototype
- Research Consortium
- Open API
- Develop Applications
- Release Apps & Experiment

✓ Create a prototype
✓ Develop Applications
Dunbar: In Situ Social Networking

Your e-mail is a (dynamic) treasure trove of data about you!

- Dunbar: number of stable relationships (150)
- Email pattern → Profile → Strengths when relationships fade
  - Ordering of friends in display
  - Weighted social graph: contact close friends’ close friends instead

![Graph showing email data]

- Support (5)
- Old Flames (2)
- Close (5)
- Present (43)
- Past (5)
Research Agenda

1. Infrastructure technology
   - SociaLite: Social multi-database open API and platform
   - Junction: Decentralized application open API and platform

2. Basic applications: Poeps, parlor games, collaborative youtube

3. In-situ social networking: email mining
   - Demonstrates need for privacy

4. Whole applications
   - New apps
   - Affordable
   - Easy to use
   - Easy to develop
Concierge Service

- Cloud utility services embedded in network substrate
  - Computation
  - Messaging
  - Persistence
  - Concierge (directory service)
Junction: platform for ad hoc P2P apps

- Yahoo Poker
  - server-side scripting
  - http://www.yahoo.com/poker/sessionid=234
  - http://www.yahoo.com/poker/sessionid=123
  - html/css/js
  - Web Browser

- XMPP
  - generic, anonymous
  - junction://sb/sessionID=234 (by invitation)
  - Activity Director
  - Activity Director
  - Activity Director

- Cross-Platform Native app
- Activ Script
- Web Browser
Ad-Hoc Game Between Phones

Start Activity
Invite by SMS

Accept
Download software
Join activity