Carnegie Mellon University
Silicon Valley

sv.cmu.edu

Survivable Social Network

Bob Iannucci, Ph.D.
Director, CyLab Mobility Research Center
Distinguished Service Professor
February 6, 2013

Project team: J. Cali, R. Caney, and S. Kennedy
Future mesh networking concepts: P. Tague
Interoperability exercises: S. Rosenberg, M. Griss, and their teams
Sponsorship by the City of Palo Alto

Agenda

- The Problem
- Design Principles
- Our Approach
- Early Evaluation
- Future Work

The Problem – Network

- 1989 Loma Prieta Earthquake
  - 154 of 160 telephone central offices in lost primary power
  - Some lost backup power as well
- "Gold plated" network still suffered outages

Now, 20+ years later…

- Infrastructure is less robust
  - Inherent limitations of wireless communications
  - Implementation shortcomings (*e.g.*, base stations with limited battery backup)
  - Competitive marketplace, lower engineering standards

The Problem – Expectations

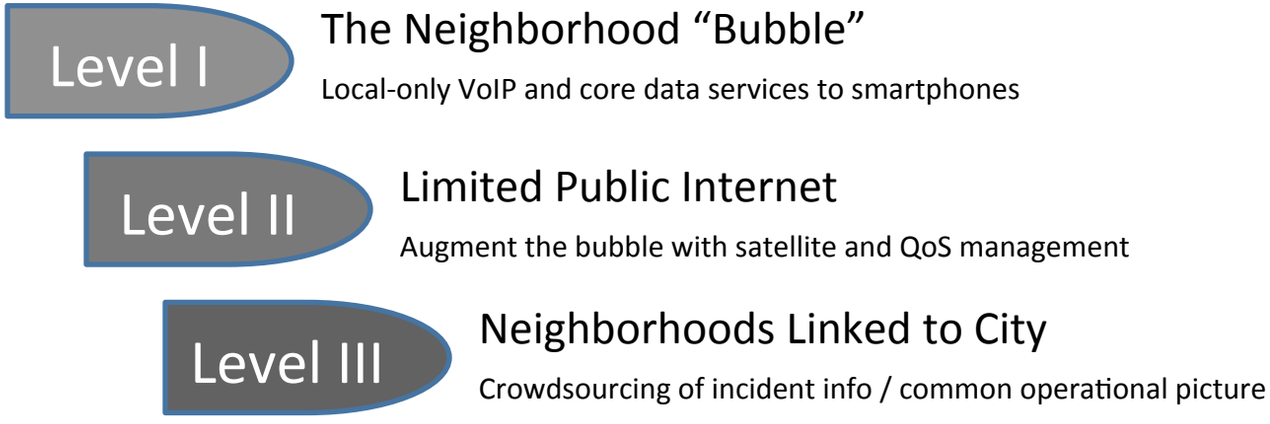
- Citizens are more reliant on communications than ever
  - Substantial shift to IP-based data and *away from voice*
- The rise in importance of Social Networks
- Rising trust of cloud services generally
  - *e.g.*, for banking, healthcare
- But these both make us even more vulnerable to infrastructure disruption

Design Principles

- Citizen-targeted: *best-resource-is-closest-resource*
- Supports HTML5 smartphones as clients
  - Social networking as a metaphor
  - Minimal or no installation
  - Training-less (or nearly so) with automated admin
- Crowd-sourced infrastructure
  - COTS-based server technology – low power!
  - Easily-deployed wireless network
  - Designed for minimal energy requirements
  - Designed-in means of scaling-up
  - Simple QoS controls

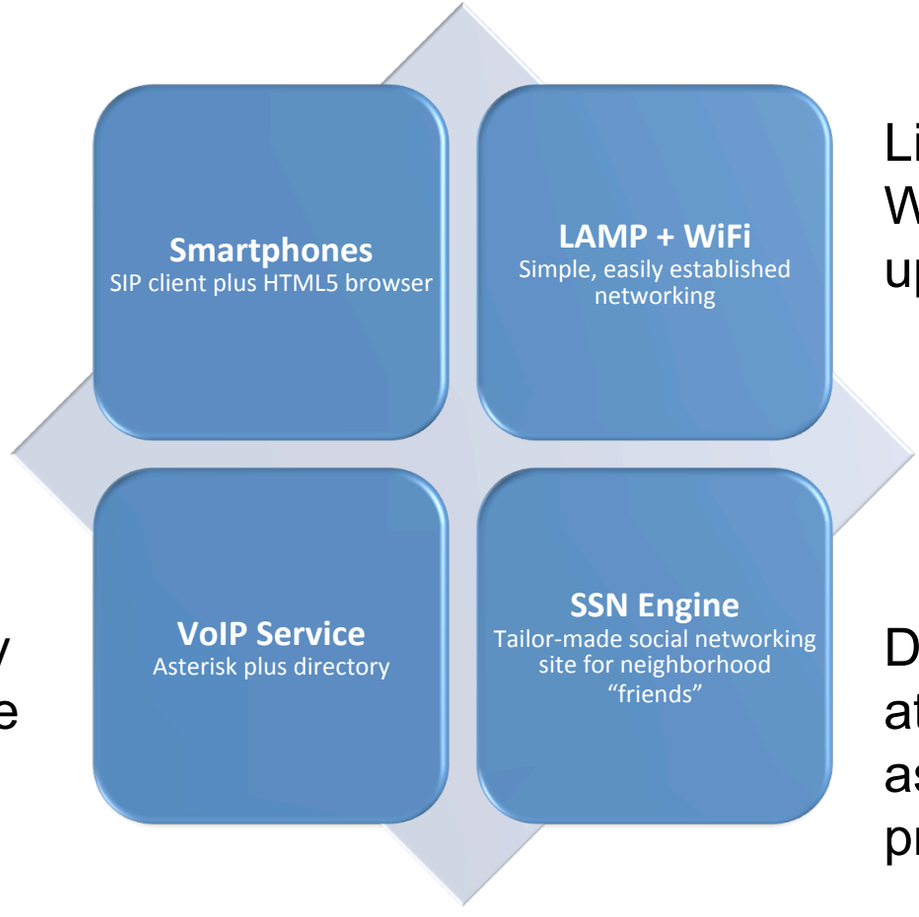
Survivable Social Network

An "internet" when all else fails



Underlying Technologies

"Use what you've got at hand"



Linux SBC plus WiFi AP – "run it up the flagpole"

Basic functionality that is easy-to-use

Developed initially at CMU, planned as an open-source project

Functionality and Features

- Social Network on smartphones – no installation
- Familiar-feeling messaging tools
  - Pre-populated “friends” network
  - Means to tag, escalate critical messages to authorities
- Voice Dialing
  - Pre-configured, friend-list-based
  - SIP and/or HTML5-based approaches

Simplified Maintenance

- While the “lights are on”
  - Neighbor enrollment
  - Syncs with popular social network(s)
  - Self-updating software, networking tools
- During emergency
  - Smartphone via WiFi
  - Information cached from social network
- After emergency
  - Information created on the SSN can be exported

Early Evaluations – Level I

- Quakeville, Palo Alto
  - Rapid prototyping approach
  - Observed users interacting with system
  - Interviewed users
  - Built requirements for v.2

Early Evaluations – Level III

- CMU Disaster Management Initiative Workshop
  - Expanded core functionality
  - Consumer-grade satellite link
  - Added interoperability with other EmComm systems
    - Neighborhood / CERT – filtering
    - Local city – situational awareness
    - (simulated) Air National Guard
  - Visualization via Hyperwall

Future Work

- Re-engineering core software (Spring, 2013)
  - Developing ”one-click" setup and auto-updating
- Exploring more sophisticated RAN approaches
  - WiFi: automated pattern optimization
  - GSM/3G/LTE: requires experimental licenses and/or STA’s
- Integrating inter-neighborhood mesh network
  - Standards-based IP meshing (802.11s)
  - Integration with other resilient networking projects
- Adding role-based functionality
- Planning integration with CERT training
- Begin fostering a development community

Learning More

- Search for “Survivable Social Network”

or

- http://www.cmu.edu/silicon-valley/dmi/workshop2012/ssn.html