The Case for Opportunistic Communication

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Outline

- Vision
- Taxonomy
- Requirements
- Architecture
- KioskNet
- Challenges
Vision (2002)

- Untethered mobile devices will communicate with resource-rich data centers over wireless and wireline networks

- Why?
  - Computing costs are plummeting
  - Wireless networks are proliferating
  - Data centers aggregate resources
Opportunities

Assume that any mobile node can communicate \textit{opportunistically} with any other node, fixed or mobile.

New applications:
- Wireless P2P content dissemination
- Mobile social networking
- Opportunistic/mobile blogging
- Drive through Internet
- ...
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Categories

- One hop
  - Campaignr

- One hop to a ferry
  - KioskNet, GaTech message ferry, Data Mules

- More than one hop
  - Haggle, DieselNet, ZebraNet
What is common?

- Non-intrusive opportunistic communication
- Disconnection, disruption, and delay tolerance
- High bandwidth
- Low cost
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- **Requirements**
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Communication Requirements

- Legacy compatible
  - Minimal change to clients and servers
- Maximum use of communication opportunities
- Support for single- and multi-hop communication
- Over-the-air security
- Session persistence despite mobility and disconnection
System Requirements

- Autonomous NIC management
  - Find and use the best NIC, now and in the future
  - Turn costly NICs on, only when there is an opportunity to save power
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OCMP

1. Access network
2. 3G access network
3. WiFi coverage area
4. Email server

3G coverage area
Proxy
Internet
Software Architecture
OCMP Applications

- Each app has two parts:
  - The client side
  - The proxy plug-in

- Example applications:
  - OMail
  - OTube
  - OFlickr
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KioskNet
Software Architecture
Implementation

- Solar panel to recharge battery
- External antenna for connection to vehicle
- Recycled PC provides applications
- Kiosk controller provides file system and user management
- Car battery to power kiosk during power outages
- Ferry with on-board computer and external antenna
KioskNet Apps

- **OMail**
  - To send and receive emails to any Internet user or KioskNet user

- **OTube**
  - To subscribe to and download videos from YouTube or any other video feed

- **OFlickr**
  - To upload photos on Flickr
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Multiple NICs

- Scheduling over multiple NICs

![Graph showing CDF vs Utility for different scheduling algorithms: Optimal, HUF, and EDF.](image-url)
Enabling the NIC

- When to turn on costly NICs
Open Problems

- Cooperative scheduling
- Routing
- Credibility
Summary

- Opportunistic communication allows new classes of applications
- OCMP provides a platform for opportunistic communication
  - Interesting research problems
  - Ease of mobile application development
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