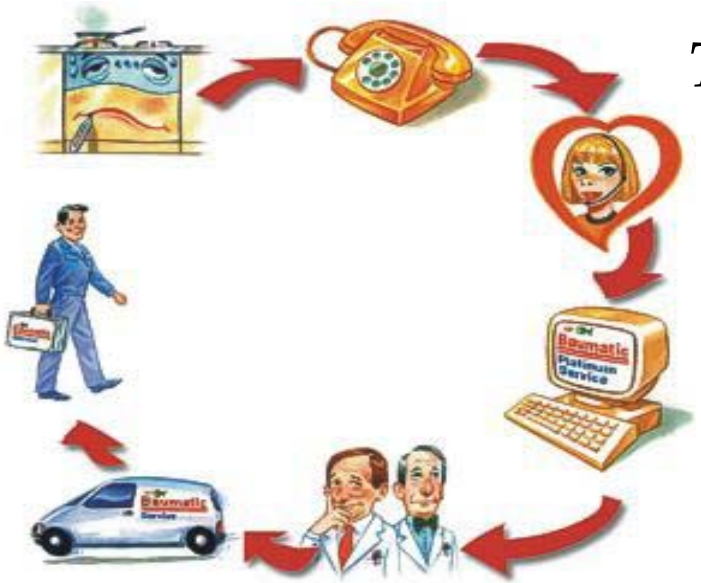
Smart Instant Messenger *in* Pervasive Computing Environments



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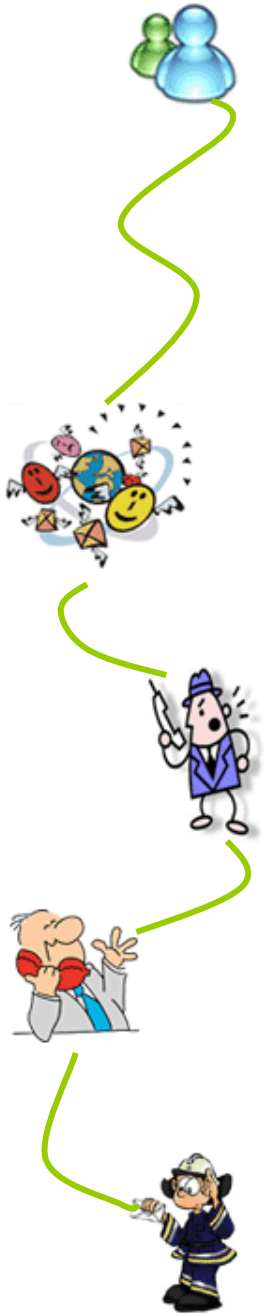
Agenda

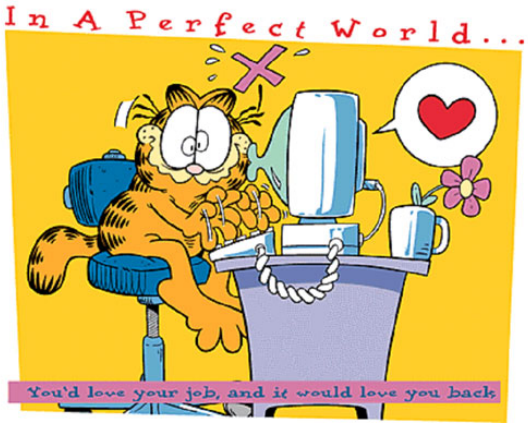
- Introduction
  - Vision, Background, Motivation
- SIM@HKU
  - Design, Implementation, Demo
- Related work
- Conclusion and Outlook

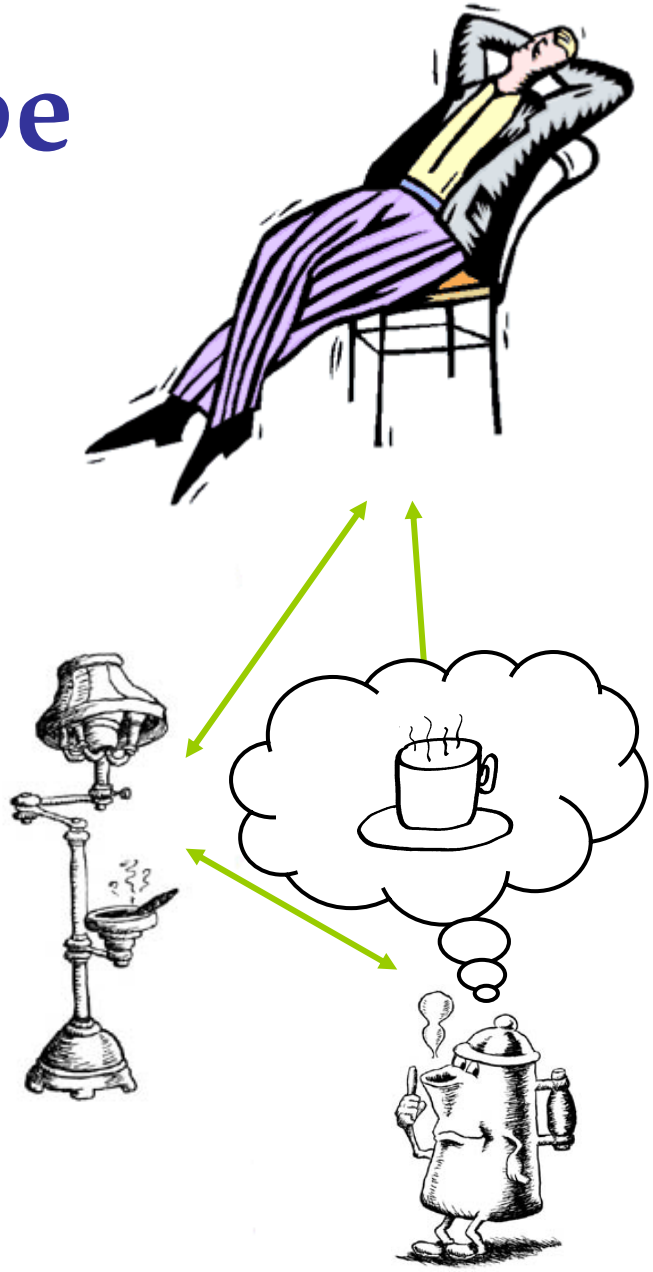


Introduction

The Future Landscape

- Everything becomes *smart* and *connected*
  - The pen, the toy, the wall, the sitting room and "you"
  - They "talk" and cooperate to make your life better





The Vision

- Pervasive Communication
  - Anytime, anywhere
  - "Anything"
  - In a *buddy-like* way
    - Appropriate
      - Knowing when, where, how
    - Familiar
      - "gd nite & cu tmr"
      - "分特" （晕倒, faint）
- Need for a new communication paradigm

P – Person

D – Device

S – Software

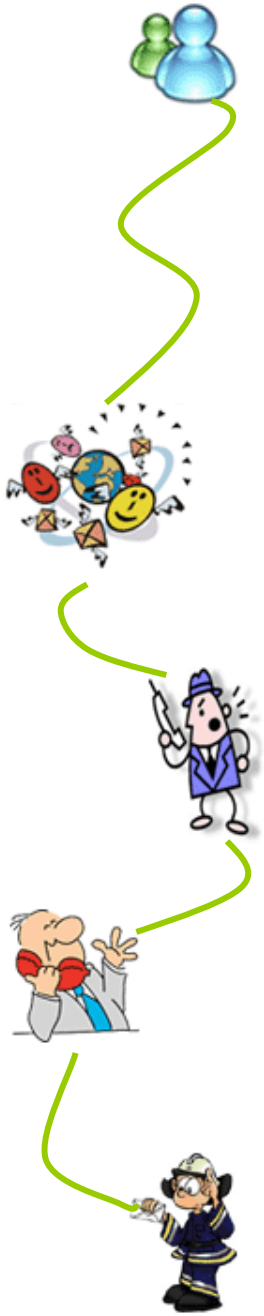
O – Other entities

	P	D	S	O
P	✓	✓	✓	✓
D	✓	✓	✓	✓
S	✓	✓	✓	✓
O	✓	✓	✓	✓

Eyes on Instant Messaging

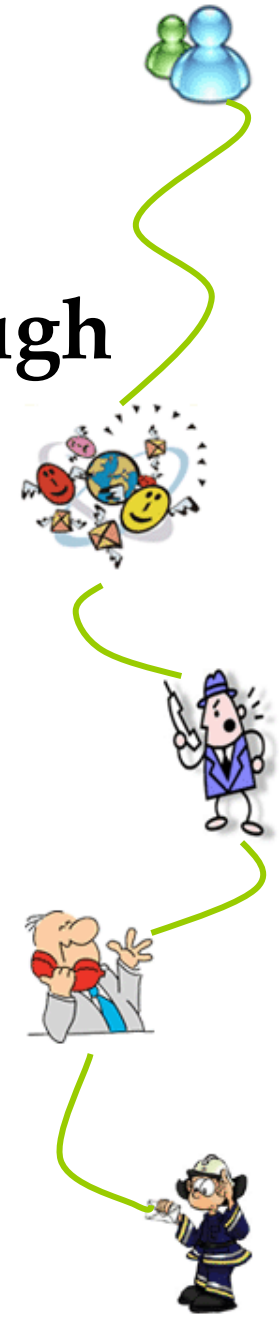
- The pervading IM
  - "*42%* of internet users report using instant messaging"
  - "*53 million* adults in U.S. trade instant messages and *24%* of them swap IMs more frequently than email"

    --- "Pew Internet and American Life" Survey 04
  - ICQ, MSN Messenger, Yahoo!, AIM, …
  - Booming wireless runners



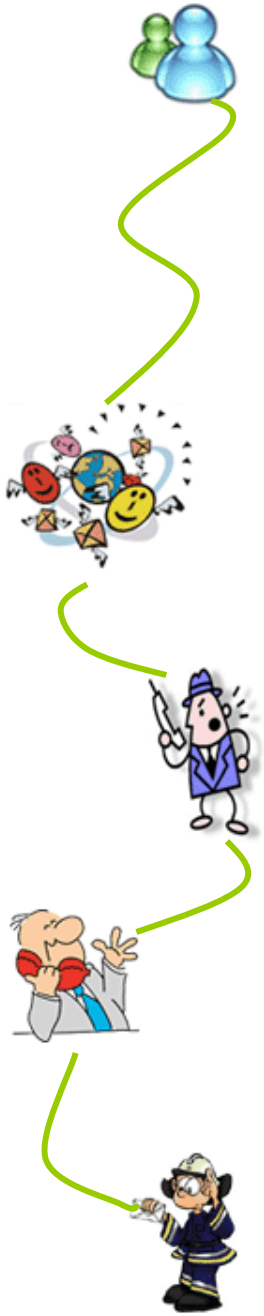
IM Peculiars

- Person-person communication through near real-time message exchange
- Presence-awareness
  - Indicates a user's *responsive status*
  - Availability or willingness
- Sense of "Buddy"
  - Stay social and connected
  - One-click distance
  - Free talk in dialect



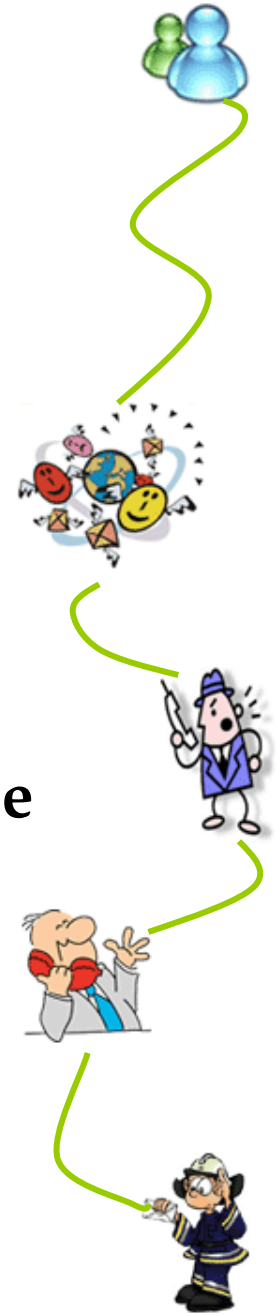
Pushing IM into PCE

- Suitability
  - Everything as your buddy
  - Awareness is key
- An appealing application to boost technology adoption and revolution



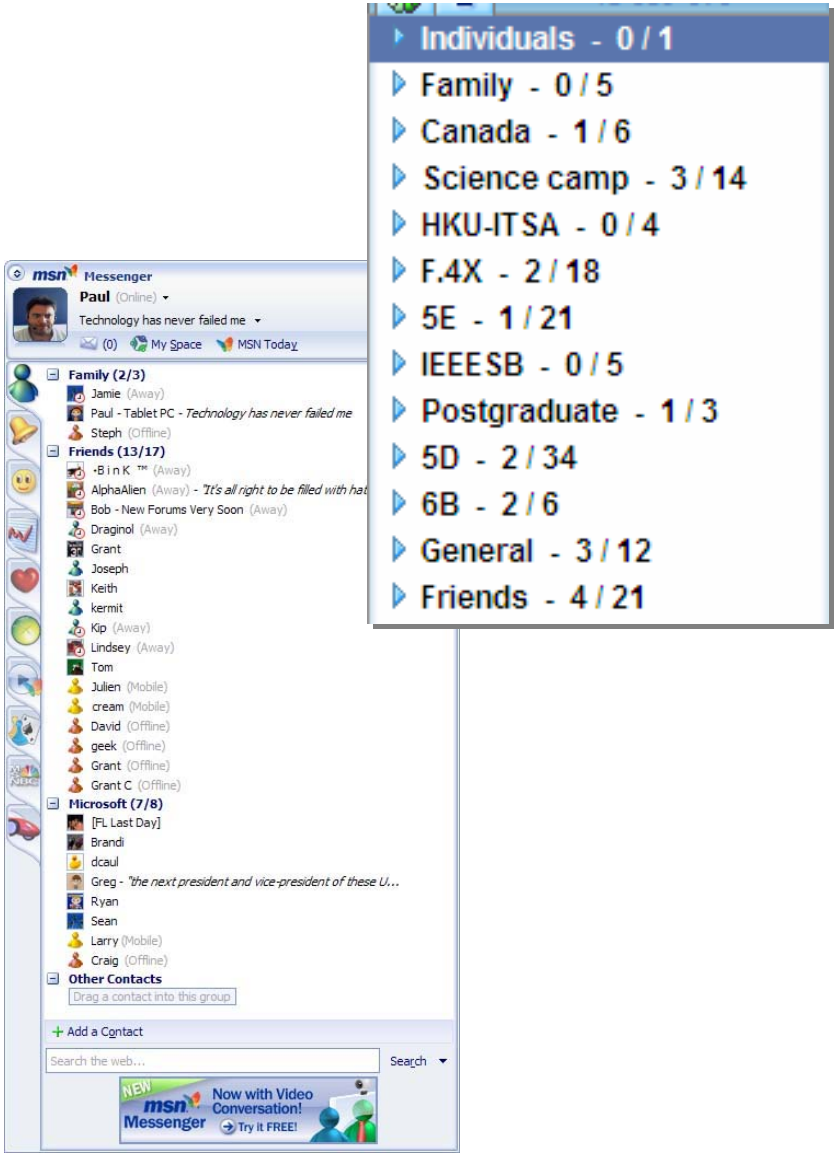
Current Limitations – (1)

- Presence vocabulary is limited
  - E.g. Online/busy/away
  - Lack in meaning
  - May not be appropriate
- Presence is displayed same to all
  - Determined by the "Presentity" alone
  - Could not reflect the real situation and diverse relationships
- Presence is manually set
  - Troublesome, error-prone
  - Formidable for mobile users



Current Limitations – (2)

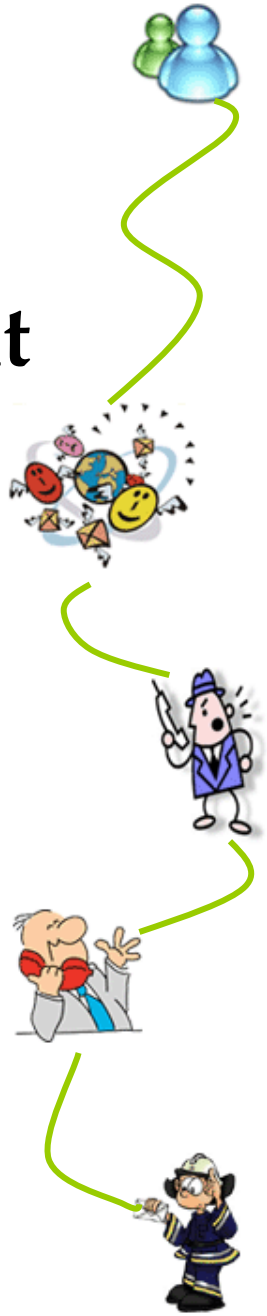
- Person-to-Person Communication Only
  - Excluding the smart things
- Grouping is set and fixed
  - Relationship in reality – dynamic, serendipitous, multi-fold
  - If too many buddies squeeze into the list, locating a buddy is not that easy



SIM@HKU

SIM in Action

- Context-aware presence management
- Resource buddy services
- Dynamic grouping

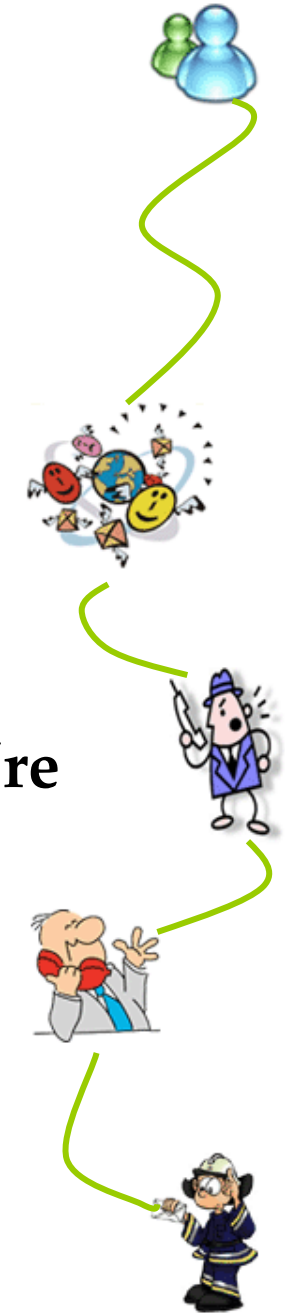


1. Context-aware Presence Management

- Context as presence
  - Location, activity, with whom you're…
  - Extended, richer vocabulary
- Adaptive presence distribution
  - Different buddies see different status
    - E.g., available to the people here; yet "busy" to the outliers;
  - Based on current situation and the relationships
- Automatic update
  - Let the system infer the user's presence

2. Resource Buddy Services

- Explicitly include resources
  - Device, Software, Widget…
  - Anything that is of certain usage
- Resources appear on the buddy list
  - Just like your buddy
  - When you need, when you're near, what you're fond of/interested in
- User-centric configuration
  - Buddy understands your dialect
  - E.g., A and B see different GUIs for the same printer, or maybe speak different commands

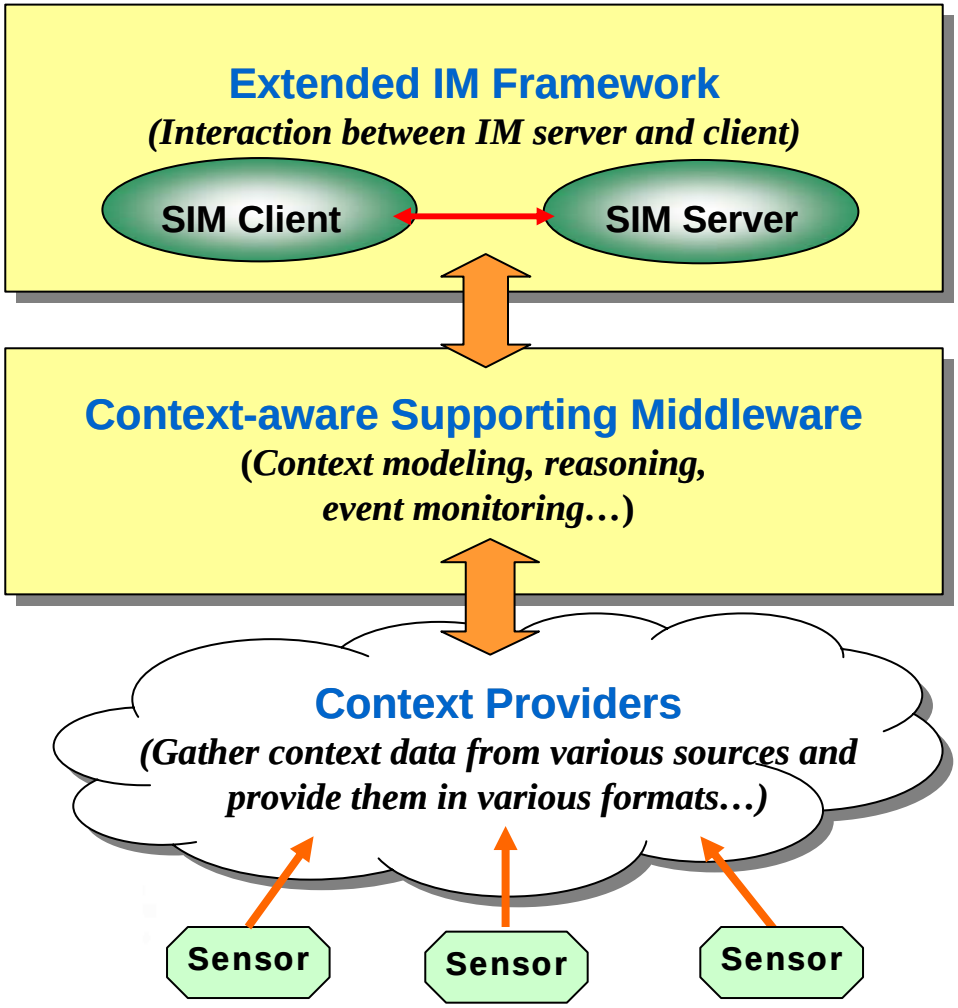


3. Dynamic Grouping

- Location-based Grouping ("buddy discovery")
  - Group the buddies according to the same location
  - Effectively help you "bump into" a nearby buddy and initiate a serendipitous interaction
  - Keep you aware of the surrounding resources, and of what are readily for usage
- Activity-based Grouping ("task centric")
  - Facilitate the collaborative work by grouping the activity partners, electronic resources and desired devices into a single group

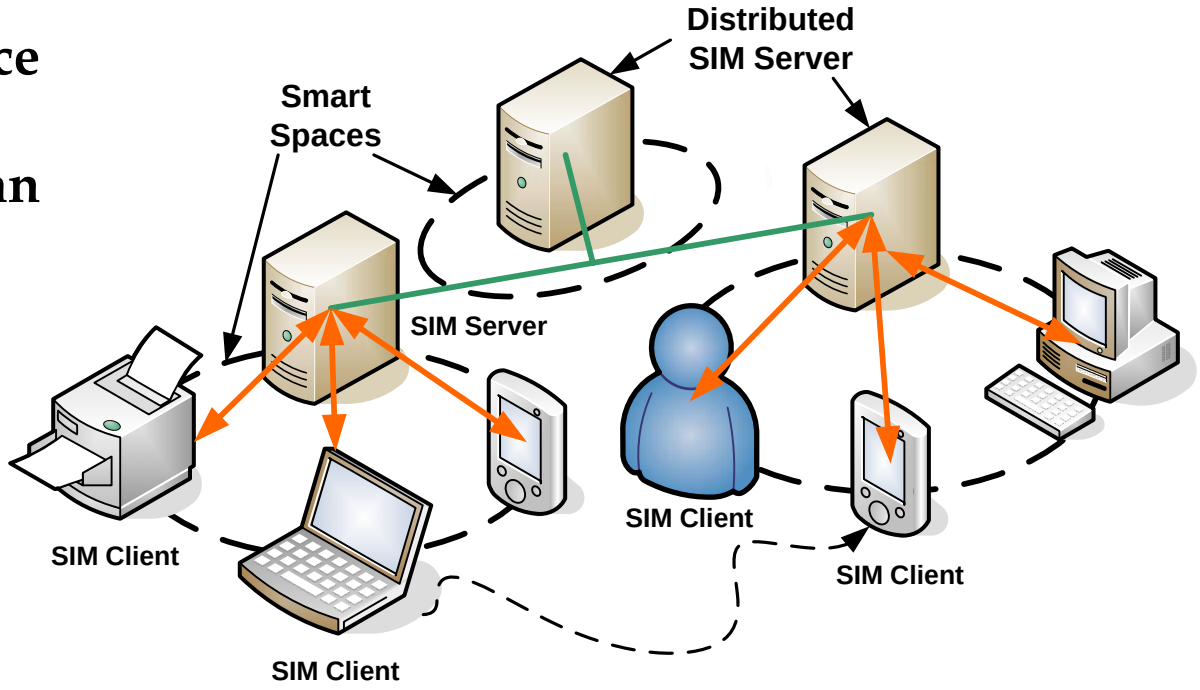
SIM - Tiered Overview

- Extend the IM framework and implant context-aware behaviors
- Separate context provision from context consumption

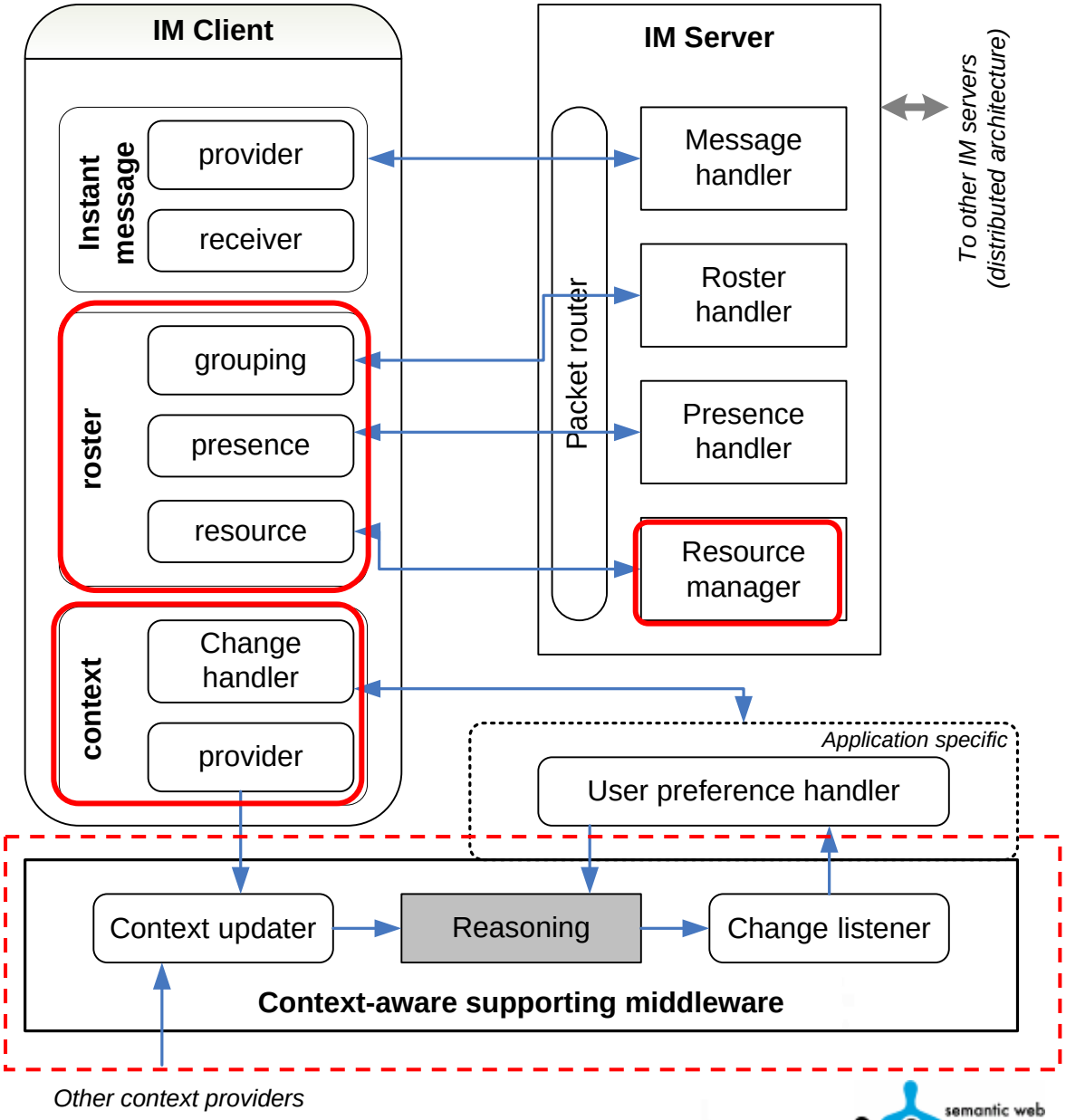


System Deployment

- SIM as the unified communication interface
- Everything's behind an SIM client
- Distributed Servers Architecture



Components & Interactions



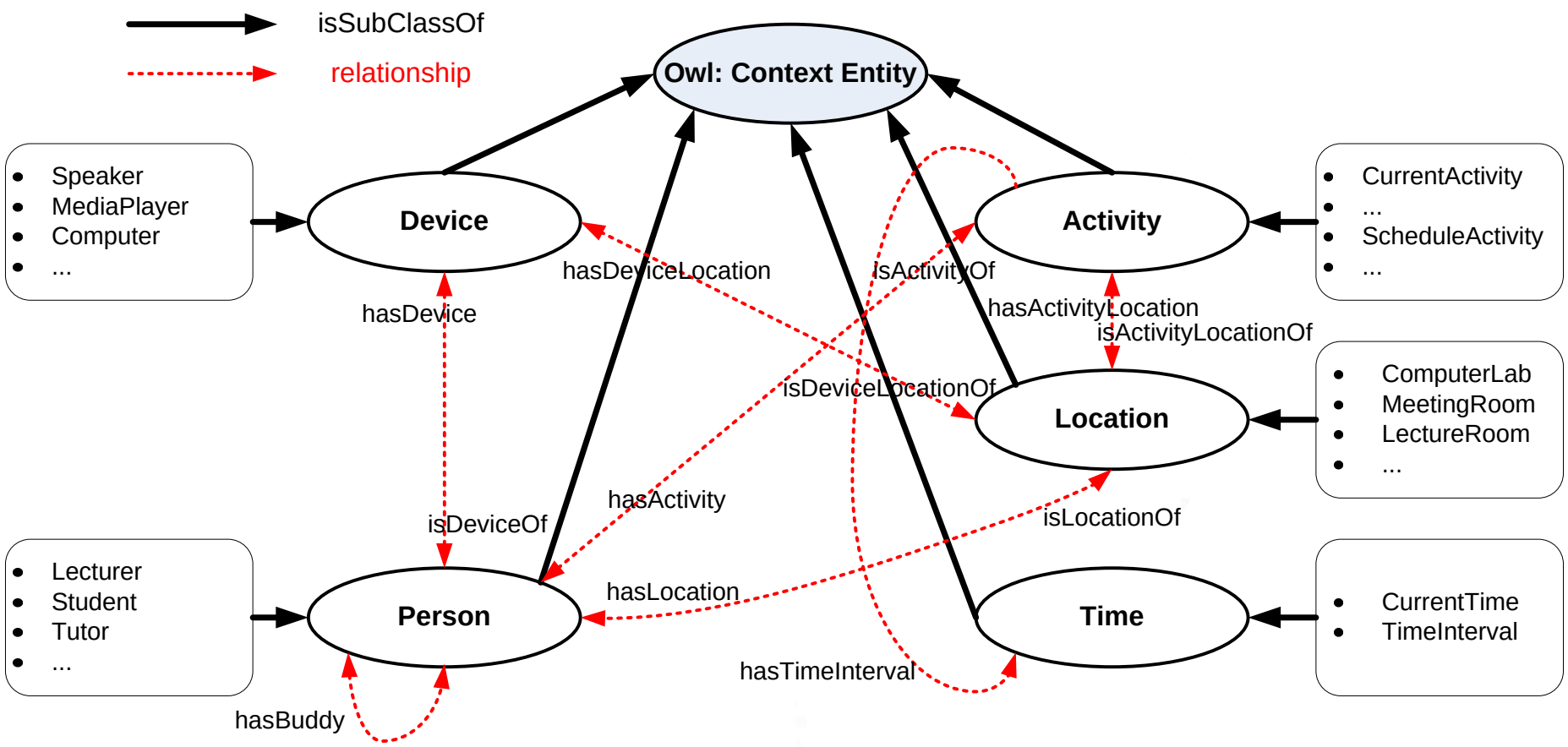
- Extend *Jabber* framework and protocols
- Resource manager
- Context module
- Roster module

- CASM handles the chore of retrieving, processing, interpreting and reasoning over context information

- Ontology-based context modeling approach

- Support context query/reply and context event subscription

Campus Ontology Model

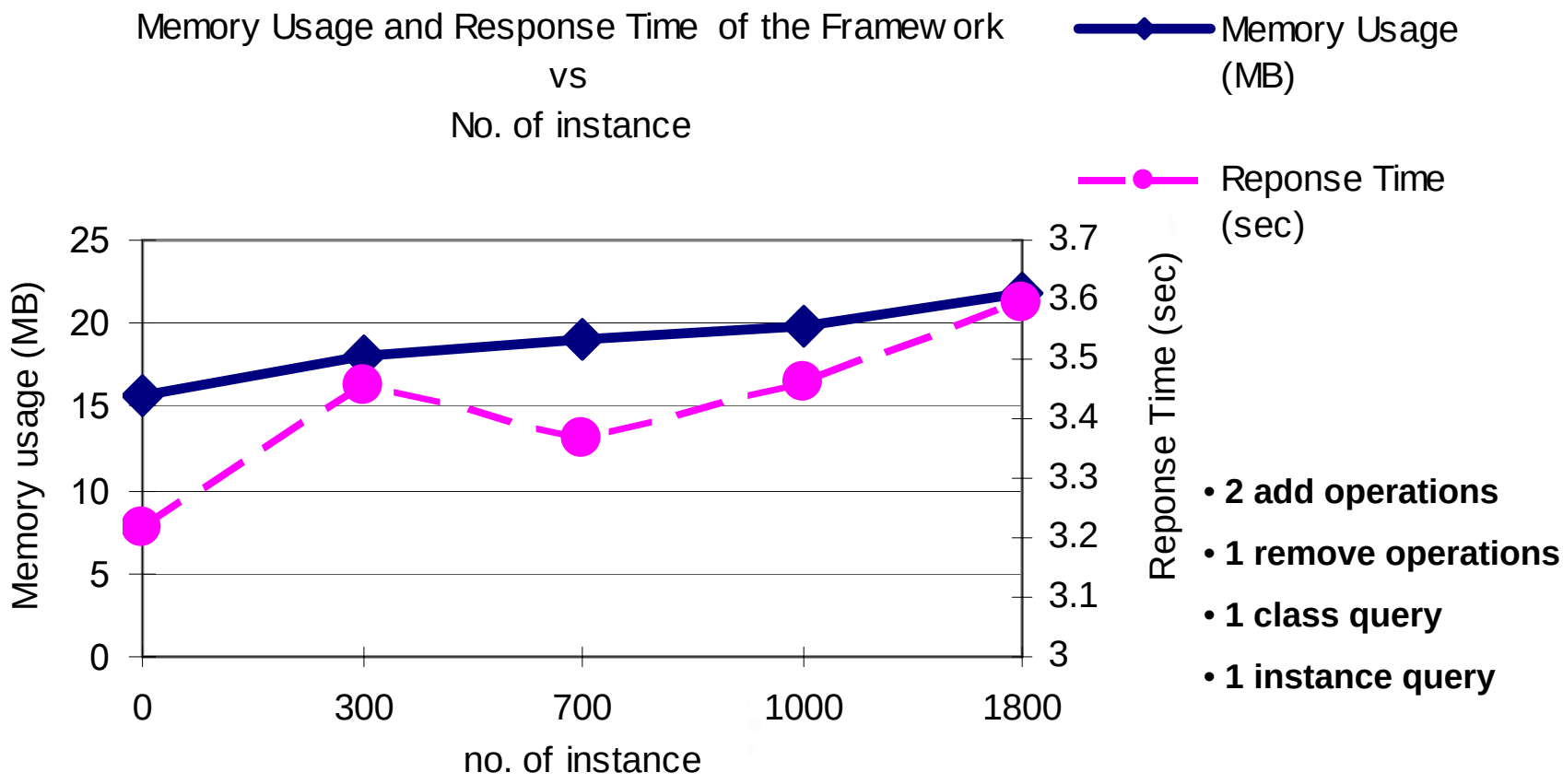


Protocol Extension

- All communication is done through XML-formatted message exchange
- *Jabber* protocols are extended to deal with the presence, context, resource and grouping features
  - Jabber:presence; Jabber:iq;

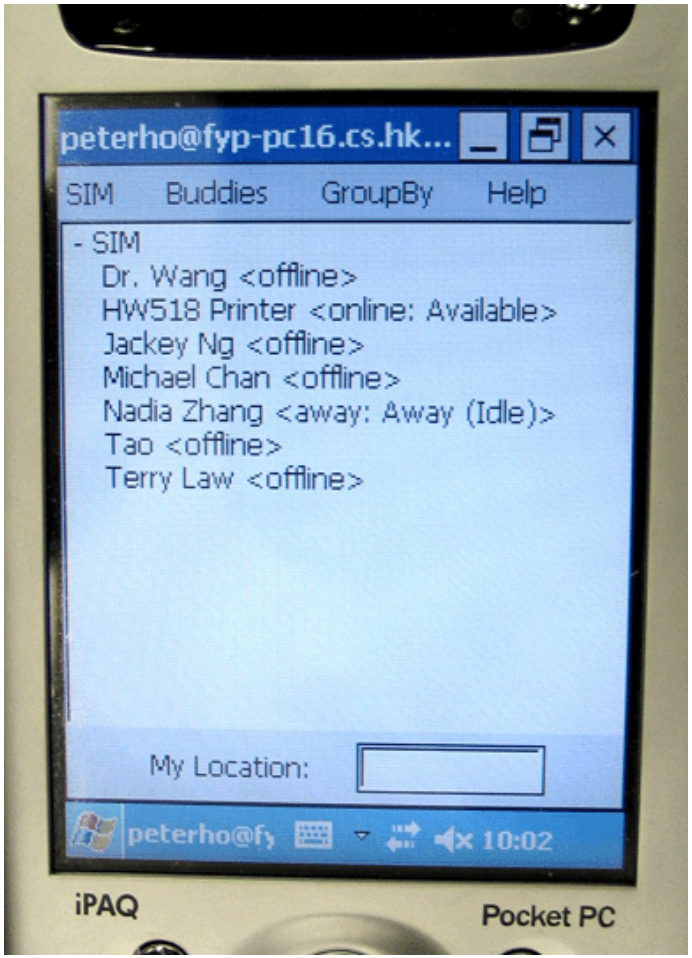
Performance & Screenshots

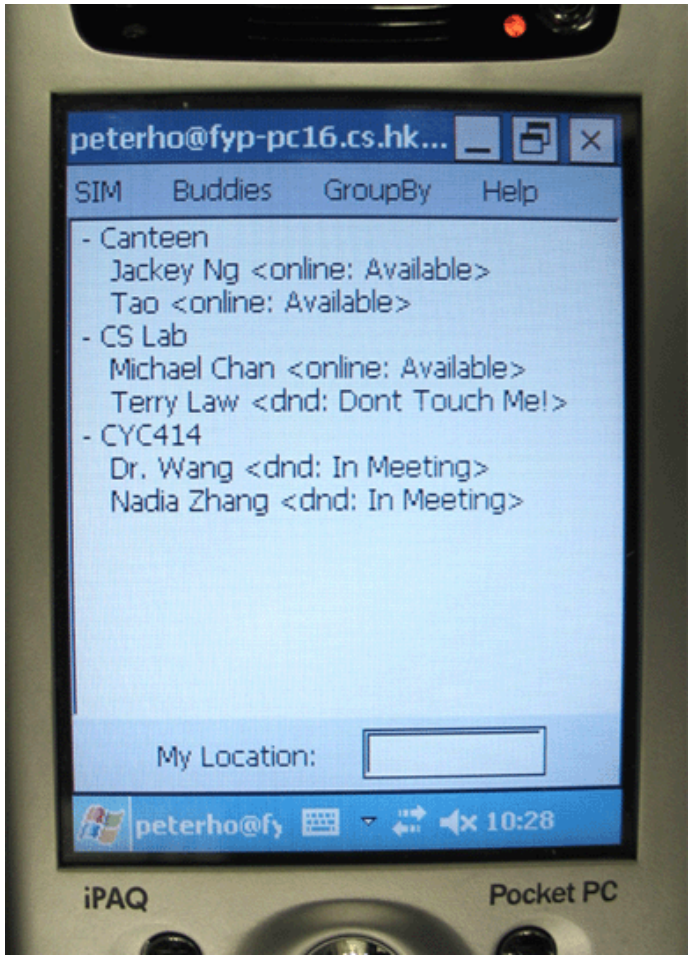
Performance Evaluation



- **2 add operations**
- **1 remove operations**
- **1 class query**
- **1 instance query**

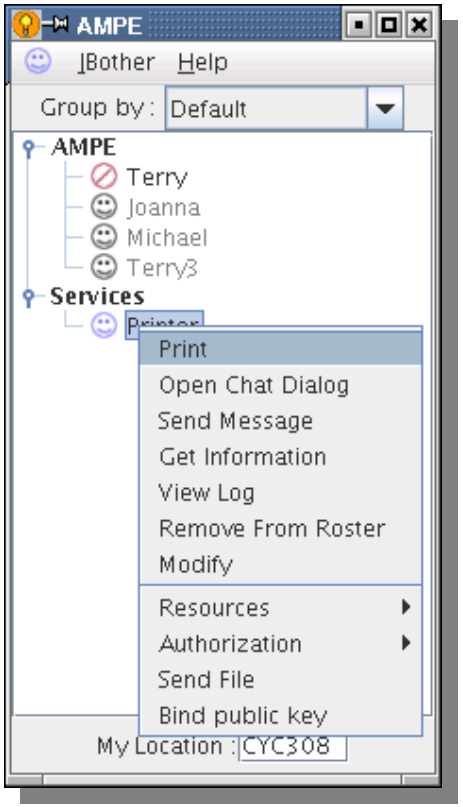
Screenshots (1)



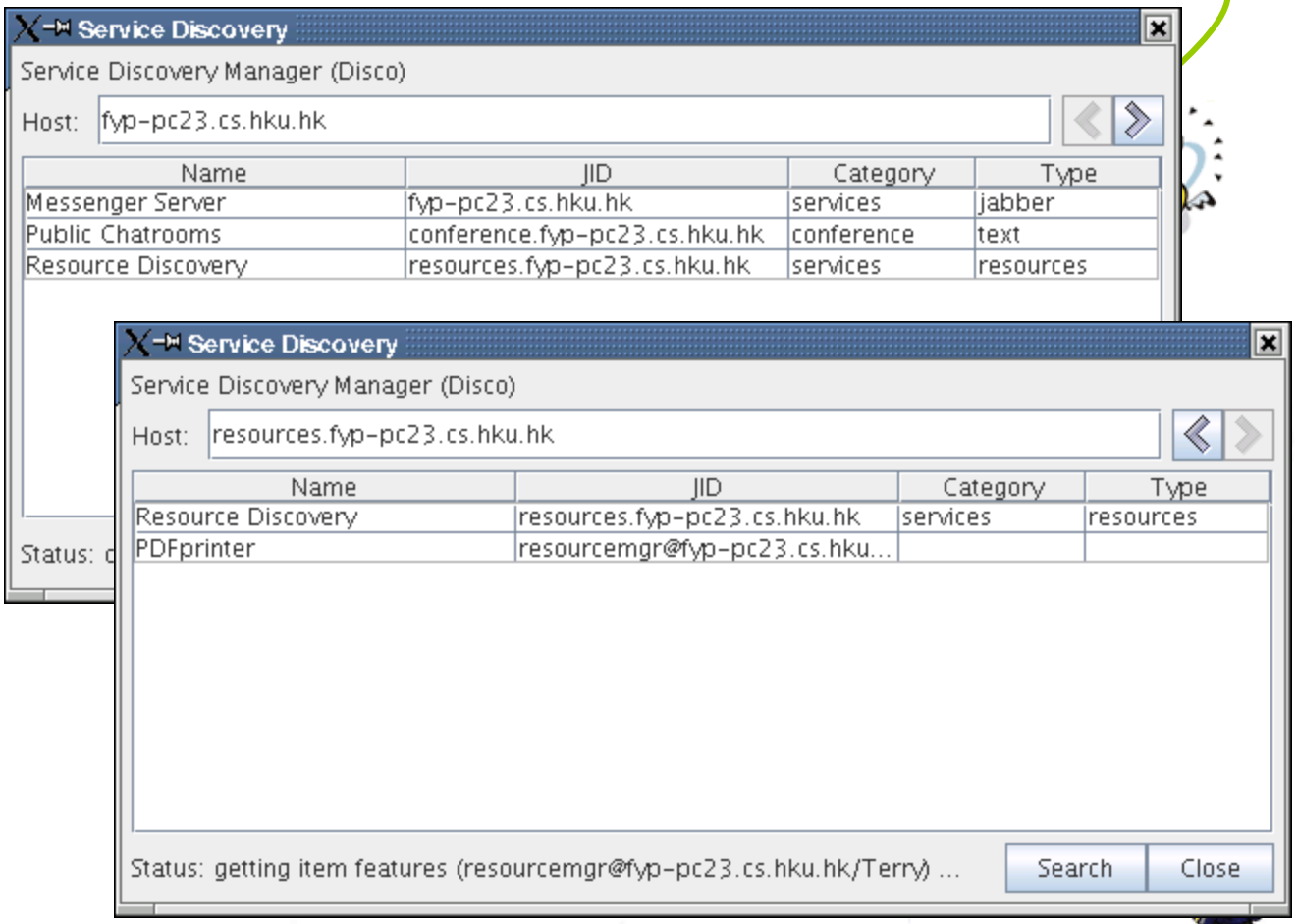


Dynamic grouping on PDA

Screenshots (2)



(a) Menu for printer buddy



b) Discover a PDF printer

Demo

Related Work

Related Work

- Origins: Media space, awareness systems
  - Mainly focus on human collaboration
- Context-aware Delivery
  - CybreMinder
    - Associates contextual information with to-do items and delivers them upon predefined condition
- Broaden the communication spectrum
  - ConChat
    - Allows exchanging or query of context
  - AwareNex
    - Displays activity and location information
  - PLIM
    - Combines presence, location into IM framework

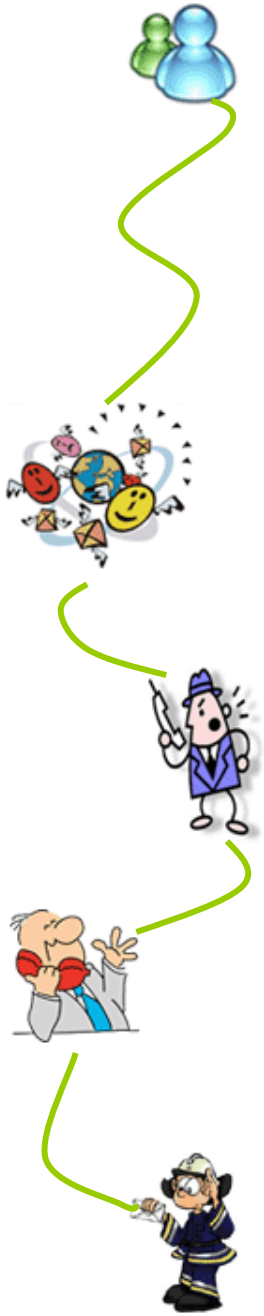
Related Work

- Similarity
  - The focus is shifting from mere interaction to awareness
- Difference
  - We emphasize on “everything as buddy”
  - Adaptive presence distribution and dynamic grouping are not sufficiently explored

Conclusion
Outlook

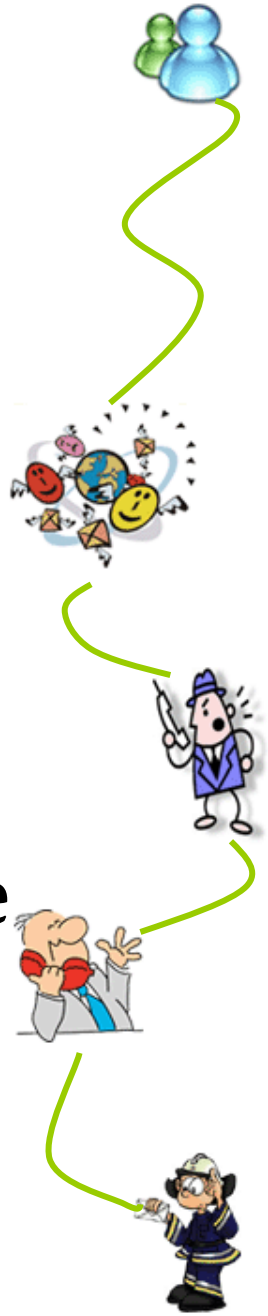
Conclusion

- Extrapolate IM usage for Pervasive Communication
  - Buddy-like interaction & awareness
- Introduce context-aware behaviors into daily application
- Separate context provision from context consumption
- Design for extensibility
- Prototype for real life usage



Future Directions

- More interesting usage scenarios on small wireless devices
  - Meaningful presence, UI design
- Activity-centered and user-centered configuration
- Optimization of CASM performance
- Matured migration support
- Privacy issues



Questions?