

Universal Access Service Architecture for Mobile Devices in a Collaborative System

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Sangyoon Oh
Sunghoon Ko
Geoffrey C. Fox

PTLIU for Community Grids Lab.
Indiana University, IN, USA



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Outline

- Introduction
- Idea
- Collaborative system and messaging system
- Design Objects
- Architecture
- Future work
- Conclusion

Introduction

- Importance of network-ready personal devices in **collaborative systems** is becoming apparent.
 - Mobile devices overcome **physical constraint**
 - Raise the **degree** of collaboration
 - Universal access allows users to access information system regardless of device type and its capability.

Idea

- But integration of **disparate** devices is difficult
 - Limitations of computing power (CPU, memory, and display), connectivity (unstable and various network protocols) and developing environment (various OS)
- A dedicated **middleware architecture** that supports universal access, event mapping, user management, and content adaptation

Collaborative system

- Collaborative Systems supports **coordination and cooperation** of two or more people who attempt to perform a **task** or **solve** a problem together
- **Sharing states** (resource)
- Examples: distance education, collaborative computing and building electric communities.

Garnet Collaboration System

- Garnet system
 - Uniform XML event (message) based architecture
 - All data structures defined in XML Schema Garnet XML Object Specification: GXOS
 - Build on publish/subscribe messaging model
 - customization to different client character
 - Support collaborative features : basic interactive features (textchat, whiteboard, etc.), shared resources (shared display, shared export), AV conferences
 - Grids (web) service interface: future

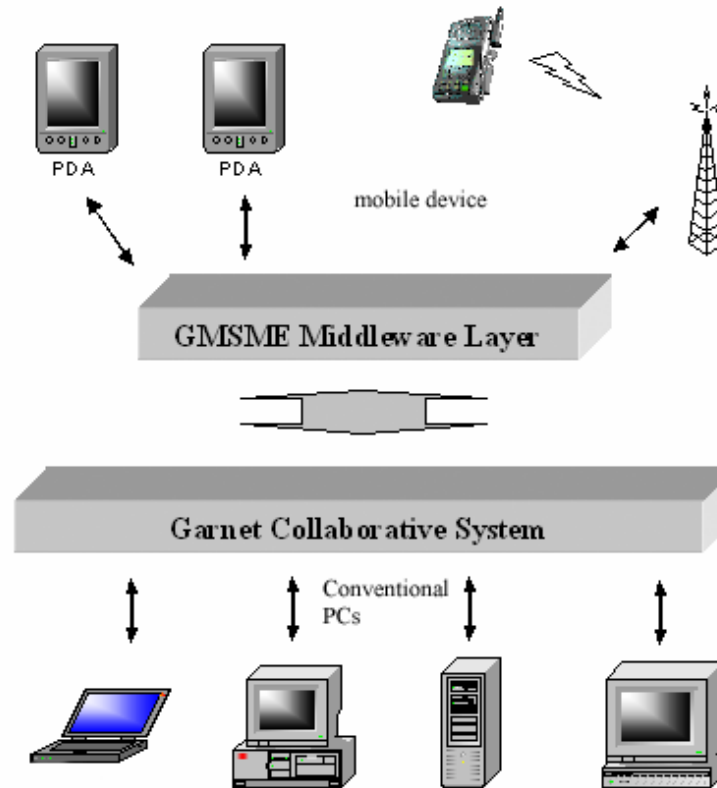
NaradaBrokering

- **NaradaBrokering system**
 - A distributed event service infrastructure developed for a large network of cooperating broker nodes
 - Supports publish-subscribe model for clients, JMS compliant

Design Objects

- Efficiency
 - Server side computing
 - Move computation to Server side
 - Deliver only vital parts of the message
 - **Minimum computation on user device**
 - Hand Held Message Service Protocol (HHMS)
 - Byte oriented event message
 - Contains machine type, topic type, application type, event type, and event data
- Heterogeneity
 - Core concern of ubiquitous computing environment
 - **Content adaptation**
 - **Transcoding: customize contents for limited capable mobile device**
 - User Profile: GXOS based

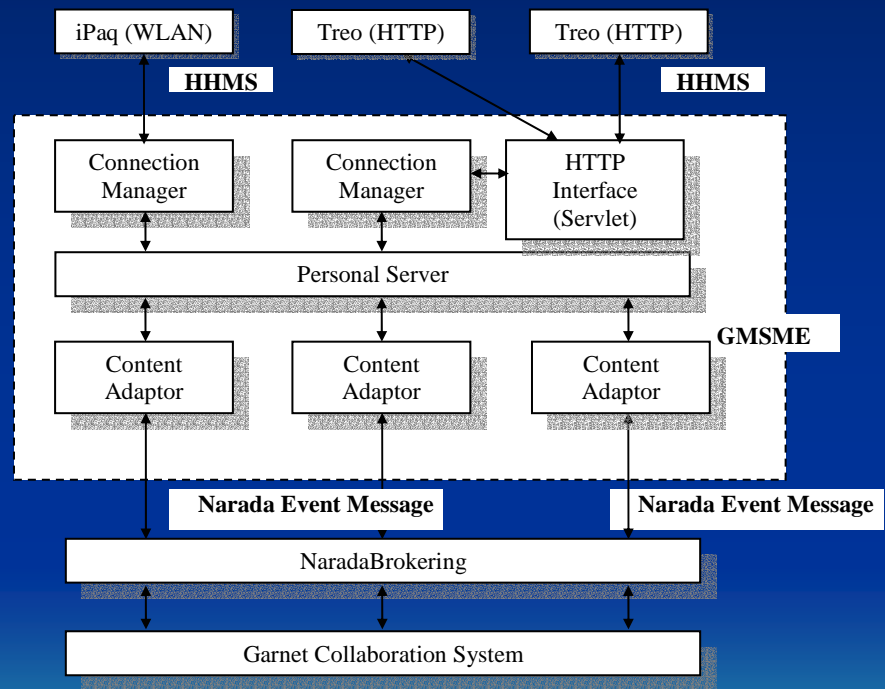
Architecture Overview



- Pure Java: J2ME and J2SE

Architecture

- Personal Server (PDA_Adaptor)
- Content Adaptor
- Connection Manager
- Applications



Architecture: Personal server and Content Adaptor

- Personal server (PDA_Adaptor)
 - Main component
 - Manage **user state**: Create Content Adaptor Module and destroy it
- Content adaptor
 - Responsible for processing **adaptation** of collaborative event message according to **user profile**
 - Each application has a process module in Content Adaptor

Architecture: Connection Manager

- Connection manager
 - TCP connection for WLAN device
 - **HTTP Tunneling** for Cellular phone
 - Tomcat Server + Servlet
 - Client polls to check incoming message
 - Servlet has a job queue for each client

Architecture: Applications

- Collaboration applications
 - **Shared Display**
 - sharing framebuffer among clients
 - Customizable picture size and resolution
 - **SVG** (Scalable Vector Graphics)
 - SVG module gets URL of SVG file and process it
 - **Session Textchat**
 - **Instant Messenger**
 - Instant messenger transport module connects Jabber open server to deliver a instant message and check presence (XML Presence Protocol: XXMP)

SVG Demo (Snapshot)



Shared Display Demo. (Snapshot)

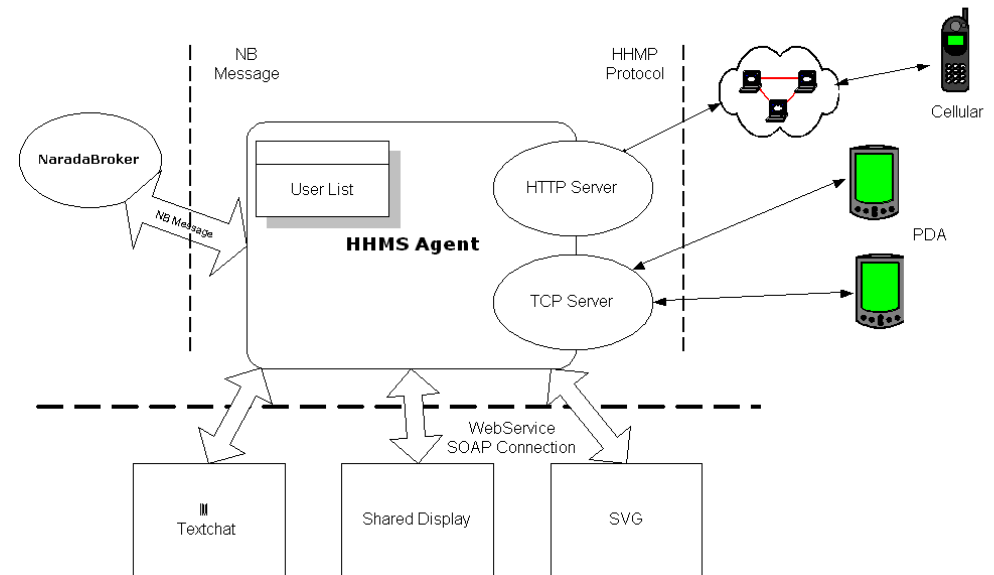


Textchat Demo. (Snapshot)



Future Work

- Integrate with message broker (NaradaBrokering)
 - Core functionality: NaradaBrokering Agent
 - Content Adaptation: Web Service



Conclusion

- Pushing down more computing on the middleware layer and use efficient protocol between a mobile application and the middleware is suitable for many pervasive computing environment
 - Content Adaptation
 - Data processing
 - Event service
 - NaradaBrokering – HHMS protocols

Relate URLs

- Community Grids Lab
 - www.communitygrids.iu.edu
- GMSME
 - grids.ucs.indiana.edu/ptliupages/hhms
- NaradaBroker
 - www.naradabrokering.org
- GXOS
 - www.gxos.org