Agent Based Adaptive Management of Non-Homogeneous Connectivity Resources

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Summary

- Pervasive Environment
- The Mobility Management issue in Heterogeneous Network
- Overall Architecture
- Design e Implementation
- Sperimental Results
- Conclusion
Pervasive Environment

Ubiquitous Computing
- Computer everywhere
- Invisibility
- Context-aware

Main Threads in Ubiquitous Computing

*Ubiquitous computing (one person many computers)*
*PC (one person, one cpu)*
*Mainframe (one computer many people)*

Your phone is beeping...
Lock, it remembers!
Pervasive Environment
(Heterogeneous Networks)

- Need
  - QoS (User side)

Mobility Management

Location
- Positioning
- Routing

Network side
- Handoff

Horizontal
- Vertical
Problems and Expected Advantages

Vertical HO Management between GPRS-Bluetooth

**Problems**
- Handoff Latency
- Application Invisibility

**Advantages**
- Increase of bandwidth /m$^3$
- Differential Traffic Classes (voice and data)

NEW MIDDLEWARE
CAPNET Based
CAPNET Project

CAPNET: Context Aware Pervasive NETworks
Context Aware Management in Pervasive Network: Hardware and software development for AmI services (Ubicomp)
Overall Architecture

CMA opens channel
evaluation
running
close
closed
switching
new best
re-valuation
no valid
disconnected

event
persist

Overall Architecture

Application Layer

CAPNET Layer

Core-components

Connectivity Management

Component Management

User Interface Component

Context-Based Storage

Messaging Component

Service Discovery

Layer of business supporting solutions

XML-RPC

JINI

DB2

System Layer
Overall Architecture

Client SIDE: Symbian Series 60

Server SIDE Java

Application for Non-Homogeneous Network

CAPNET MIDDLEWARE

CORE COMPONENTS

CONNECTIVITY MANAGEMENT

Other CAPNET components

Bluetooth Socket Engine

GPRS Socket Engine

RFCOMM/SDP

TCP

L2CAP

IP

Bluetooth Interface

GPRS Interface
Design and Implementation

Scenario

1: RFID
2: *Channel Creation* (2 connections)
3: User Mobility (no BT anymore)
4: *Switch* on GPRS connection

Project MIMOSA
(prototype mobile phone)

*Microsystems platform for MOBILE Services and Applications*
Design and Implementation

Dynamic Diagram

- Channel Creation
- Switch
Design and Implementation

- Block System

Diagram: Block System with λ, μ, and S nodes, and a sequence of events labeled 1 to 9, including 'Connected', 'Receiving', and 'Sending'.

ConnectionListener window: Comparison of BT data and GPRS data with the total number of bytes received: 60000 for BT and 345532 for GPRS.
Sperimental Results
Transmission Latency

Without Handoff

With Handoff
Sperimental Results

PDR and Bandwidth

Packet delivery ratio variando la dimensione del buffer

Banda variando la dimensione del buffer
CONCLUSIONS

- **Heterogeneous Network**
  - New Middleware: Mobility Management between GPRS and Bluetooth for Mobile Phone with RFID
  - Different Traffic Classes Management: Voice and Data

- **Future Developments**
  - Connectivity Management Engine who enables others technologies CO or Connection-less
  - Hard Handoff Application Development
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