Supporting Mobility in a Publish Subscribe Internetwork Architecture

Varvara Giannaki, Xenofon Vasilakos, Charilaos Stais, George C. Polyzos, George Xylomenos
Mobile Multimedia Laboratory, Dept. of Informatics
Athens University of Economics and Business
Outline

• Introduction
• The PSI Architecture
• Mobility Support in PSI
• Handover Management in PSI
• Smart Cache Selection
• Conclusion
Introduction

• End-to-end (E2E) Internet Architecture
  – Endpoint centric, based on telephony
  – Accused as the root of all evil (NAT, CDN, MIP)

• Publish/Subscribe (Pub/Sub) Internet Architecture
  – Information Centric Networking (ICN)
  – Information decoupled from location

• The PSI Architecture
  – The Pub/Sub architecture of PSIRP/PURSUIT
  – Supports multicast, anonymity and asynchrony
  – Seamlessly supports mobile nodes (MNs)
The PSI Architecture

- Publisher: advertises availability of information items
- Subscriber: expresses interest on information items
- Information identifiers: Statistically unique pair
  - Rendezvous ID (RID): application derived
  - Scope ID (SID): access control and policies
- Rendezvous Network (RENE)
  - Consists of Rendezvous Nodes (RN)
  - Each information item handled by an RN
    - The Rendezvous Point (RVP) of the item
  - RENE matches publishers and subscribers
    - Instructs publishers where to send the data
The PSI Architecture

Bob <Bob_Sld, Bob_RId, metadata>

Smart Cache <Bob_Sld, Bob_RId>

Router

<Bob_Sld, Bob_RId, metadata>

RV Point <Bob_Sld, Bob_RId>

AP2

Alice

AP1

Bob RV Point
Mobility Support in PSI

• Forwarding ID (FID): sent by RVP to the publisher
  – Source routing path to subscribers (multicast)
    • Expressed as a Bloom filter of path links
  – Publishers do not know subscribers (anonymity)
  – Pub/Sub decoupled in time (asynchrony)

• Caches and Smart Caches (SC)
  – In PSI caches are just alternative publishers
  – SCs enhance mobility management
    • Selected to reflect current and future MN position
  – Information explicitly delivered in two stages
    • One FID towards the SC and another towards the MN
Mobility Support in PSI

![Diagram showing network components and connections](image-url)
Handover Management in PSI

- What happens when the MN moves?
  - A new subscription is issued
  - The RENE may serve it from the SC
    - Sends a new FID to the SC
    - The SC adds the FID to its multicast tree
      - Multiple MNs are served transparently
  - The FID to the SC does not change
    - Rerouting is a local procedure
- Smart Caches are not an extension to PSI
  - SCs are simply alternative publishers
  - MNs benefit by a built-in feature of PSI
Handover Management in PSI

Bob

RV Point

RENE

Router

Smart Cache

Fid (SC, Alice@AP1)

Alice’s previous position

Alice’s new position
Smart Cache Selection

- RVP forecasting (RVPf)
  - RVP is aware of topology around the MN
  - The RVP forecasts future MN positions
  - SCs are designated in advance by the RVP
- AP based (APb)
  - APs forecast handovers via signal strength
    - Works only for wireless networks
  - The AP notifies the RVP about the handover
    - The AP sends information about nearby APs
  - Extra control messaging compared to RVPf
  - Helps RVP to make SC selection
Conclusion

• Mobility handling in PSI
  – Based on multicast, anonymity, asynchrony
  – Exploits embedded support for caching
  – Does not require new mechanisms
  – Relies only on mobility support policies

• Future work
  – Investigation of correctness and effectiveness
  – Comparison of SC selection policies
  – Investigation of other SC uses
    • Transport protocol mediators
    • Node anonymity enhancers