Peer-to-Peer Knowledge Exchange in Mobile Adhoc Networks

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Overview

1. Motivation
2. Challenges
3. SHARK - Mobile Knowledge Exchange
4. Outlook
Ad hoc Information Exchange

1 „Interesting!“
2 „I agree.“
3 „There’s a movie about it. Would like to see more information about it?“
4 „Yes, please.“
5 „Cool! I’d like to buy it …“

We would like to automate this interaction: Project Shark
Challenges

1. Specify interests  → topic maps
2. Compare interests  → topic map matching
3. Check authorization  → security mechanisms and policies
4. Peer-to-peer exchange  → exchange protocol
5. Accounting  → payment and incentives

... pretty much typical P2P questions ...
+ integrated into middleware platform for resource-constrained mobile computers in ad hoc networks
1 Topic Map Example

Info Set = Opera

Associations

Topics

Occurrences
(monograph, article, picture, commentary, clips, etc.)
Why Topic Maps?

Topic Maps ... (from ISO 13250)

“... link topics together in such a way as to enable navigation between
them.”

“... filter an information set to create views adapted to specific users or
purposes.”

“... enable multiple, concurrent views of sets of information objects.”

“... facilitate the creation of topic-oriented user interfaces that provide
the effect of merging unstructured information bases with
structured ones.”
Representation and Matching of Topic Maps

> Topic Maps (ISO/IEC 13250)
  > generic support for annotation of documents

> XML Representation of Topic Maps
  > XTM 1.0

> Matching of XML documents
  > open question
  > computing intensive

> Mobile devices
  > limited storage and processing capabilities
3 Security

> Ad hoc networks: no central security infrastructure
  > access decisions based on trust

> Propagation of trust
  > transitive

> Networks of trust
  > establish trusted communities
  > size of trust database?
  > trust lifetime?
Peer to Peer Exchange

> Support mobile, resource-constrained devices

> Build on ad hoc network connections

> Protocol based on *Knowledge Ports*
  > topic map extension
  > *Incoming* Knowledge Port = topic wanted
  > *Outgoing* Knowledge Port = topic offered

> Protocol Interactions
  > negotiation: interest / offer / accept
  > knowledge exchange: insert / stop
Accounting

> Find suitable rewards / incentives
  > why should I provide information?
  > what is the value of information?
  > does it all work with a “P2P spirit”?

> How does this all work in mobile, ad hoc environments?
  > even more difficult than in conventional P2P networks
Shark: Components

- Central Station
  - XTM
  - SyncML
  - Fixed network, GSM, UMTS

- Local Station
  - XTM
  - SyncML

- Mobile Station
  - Local KB
  - Bluetooth, W-LAN

- Mobile Station
  - Local KB
  - Bluetooth

http://ivs.tu-berlin.de/Projekte/Shark/
Status and Future Work

> prototype operational
  > Palm, Bluetooth, J2ME

> ongoing work
  > context awareness
  > security
  > accounting

> future work
  > monitor knowledge flows
  > self-organising knowledge dissemination
Vielen Dank.

Fragen und Kommentare sind herzlich willkommen.

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