Signaling in AMnet

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1. Introduction
2. AMnet Signaling
3. Prototype Implementation
4. Interdomain Signaling
5. Summary and Outlook
1. Introduction – What is AMnet?

- Many new evolving applications based on group communication
  - Need of flexible and rapid introduction of group services for communication support, but
    - Long global standardization processes
    - Inflexible network infrastructure
  - Problem of heterogeneous service requirements

- **AMnet: Active Multicasting Network**
  - Rapid service creation in the context of heterogeneous group communication
  - Based on Active and Programmable Networking technologies
  - Overlay network
  - Provision of application-specific services
  - Based on IP and its multicast extensions
1. Introduction – Concept of AMnet

- Placement of additional functionality inside the network
- Adaptation via dynamically loadable service modules on AMnodes
- Receiver-oriented approach
- Typical applications:
  - Mobile communication
  - Reliable multicast
  - Tele-collaboration

QoS A > QoS B > QoS C
1. Issues of Service Control in AMnet

- **Goal of AMnet:**
  - Dynamic placement of application-dedicated functionality

- **Problems:**
  - Management of different services within a session
  - Establishment and maintenance of services
  - Association between receiver and service
  - Localization of services

  ⇒ **AMnet Signaling: flexible signaling protocol**
2. AMnet Signaling: Management of Different Services

- Service level group:
  - Receivers with similar service demands are logically grouped into distinct multicast receiver groups
- AMnodes provide different service levels
- Adapted service available in service level group
- Hierarchy of services
2. AMnet Signaling: Issues of Service Control

- Problems to solve:
  - Management of different services within a session ✓
  - Establishment and maintenance of services
  - Association between receiver and service
  - Localization of services
2. AMnet Signaling: Service Establishment and Maintenance

- AMnode
- service module
- repository
- data stream
- session announcement
- session control group
- is member of
- sender
- receiver
- service announcement group
- is member of
- service module
- group
- data stream
2. AMnet Signaling: Issues of Service Control

- Problems to solve:
  - Management of different services within a session ✓
  - Establishment and maintenance of services ✓
  - Association between receiver and service
  - Localization of services
2. AMnet Signaling: Association between Receiver and Service

- AMnode
- service module repository
- data stream
- session announcement
- service announcement
- service module
- selection
- data stream
- service announcement group
- is member of
- is member of
- receiver
- + performance meter
- match of description
- session control group
- is member of
- sender
2. AMnet Signaling: Issues of Service Control

- Problems to solve:
  - Management of different services within a session ✓
  - Establishment and maintenance of services ✓
  - Association between receiver and service ✓
  - Localization of services
2. AMnet Signaling: Localization of Services

- Desired service is already provided
  - Active evaluation packet to all providing AMnodes
  - AMnodes evaluate and respond
  - Receiver chooses best matching AMnode

![Diagram of AMnet Signaling](image)
2. AMnet Signaling: Association between Receiver and Service

AMnode

service module repository

sender

data stream

session announcement

service module

localization

AMnode

receiver

+ performance meter

is member of

is member of

data stream

session control group

service announcement group

service announcement

match of description

service module

repository

session control group
2. AMnet Signaling: Issues of Service Control

- Problems to solve:
  - Management of different services within a session ✓
  - Establishment and maintenance of services ✓
  - Association between receiver and service ✓
  - Localization of services
2. AMnet Signaling: Localization of Services

- Desired service is already provided
  - Active **evaluation packet** to all providing AMnodes
  - AMnodes evaluate and respond
  - Receiver chooses best matching AMnode

- No appropriate service available
  - Basic Tree Search
    - Active **evaluation packet** to the closest AMnode
    - AMnodes evaluate and forward
    - Last AMnode determines best match
    - AMnode announces service
  - Extended Tree Search
    - Considers AMnodes beyond the multicast tree
2. AMnet Signaling: Issues of Service Control

- Problems to solve:
  - Management of different services within a session ✓
  - Establishment and maintenance of services ✓
  - Association between receiver and service ✓
  - Localization of services ✓

- Concepts have to be evaluated and tested
3. Prototype Implementation

- Java Development Kit 1.2 of SUN

- Signalling components on session sender, receivers and AMnodes:
  - Java classes

- Session control and service announcement group:
  - IP multicast groups

- Service Module Repository:
  - LDAP server
    - Ryan, Seligman and Lee: Approach to record Java objects into the LDAP directory information tree
    - Service description
3. Prototype Implementation: Testbed

- Testbed within the FlexiNet project (Berlin, Munich, Karlsruhe)
- Filtering of an audio data stream

![Diagram of the testbed setup](image)

- RTP/32 kHz/Stereo/L16
- 32 kHz to 16 kHz
- Tunnel KA ↔ B
- Tunnel B ↔ KA

Amnet1.tm.uka.de

Wav27.tm.uka.de

Romulan.tm.uka.de

Turin.ee.tu-berlin.de

Roma.ee.tu-berlin.de

Wugs.ee.tu-berlin.de

Code-Server

mono, stereo
3. Prototype Implementation: Session Announcement

```
v=ASAP/SCA/1.0
n=19112074-141003070073-1.1
d=Music
i=FCM audio stream: Queen
o=amnet3@tm.uka.de
s=141.3.70.73
a=225.0.0.1/40000
p=141.3.71.74
t=19.11.2074 11:00 19:00
```
3. Prototype Implementation: Service Announcement
3. Prototype Implementation: Service Module Repository
3. Prototype Implementation: Service Announcement
4. Extension of AMnet Signaling: Interdomain Signaling

- Service module repository: Access to service modules from all domains
  - Local storage of addresses in other domains
  - Download of service module on local repository
  - Information about access rights or costs

- Service announcement group: Announcement of local services across domain boundaries
  - SLP’s wide area network service location (Rosenberg, Schulzrinne and Suter)
  - Service type specific wide area multicast group for service announcement
  - Wide area service level group on demand, only
5. Summary and Outlook

- **Summary:**
  - AMnet: Approach for flexible and rapid service creation
  - AMnet Signaling for location and announcement of services provided by AMnodes
  - Applicability of prototype implementation tested in FlexiNet testbed with media filters and error control

- **Outlook:**
  - Resource management mechanisms on AMnodes
  - Advancements in service localization and description
  - Simulations of interdomain signaling mechanisms
  - Extension of prototype implementation