Design of Software Architecture for Smart Meeting Space

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Contents

- Smart Meeting Space (SMeet)
- Requirements of SMeet
  - User-centric collaboration
  - Flexible organization of meeting space
- Software Architecture of SMeet
  - Component service layer
  - Service manager layer
  - Task layer
  - SMeet Mediator
- Implementation result
- Conclusion
Smart Meeting Space

- **SMeet (Smart Meeting Space)**
- A collaboration space targeting ACE (Advanced Collaborative Environments)
Objectives

- Software architecture design for Smart Meeting Space (SMeet)
  - Service composition approach for constructing complex collaboration service
  - To clarify what is the level of services that divides a component service
Requirements of SMeet SW Architecture

- How to provide user-centric collaboration using context sharing?
  - It is necessary to clearly understand all the context related to the collaboration session and apply the interpreted collaboration context to configure the given SMeet node.

- How to flexibly organize SMeet node based on the capabilities of nodes?
  - Component-based approach gives us the flexibility to select collaboration services to best match the capability of given SMeet node.
User-centric Collaboration

- Provide a collaboration environment customized for a user

- A user come into the meeting space
  - Call remote users or connect to a meeting server
    - Based on the meeting reservation
  - Turn on services that one prefers
    - Use 720p HD video for transmitting his video
    - Display received videos on preferred screen
    - Use a laser pointing device to control display result
  - Turn on services to increase quality of the meeting
    - Monitor the performance of meeting, e.g. network delay, frame rate of video, etc.
    - Run services that complements the quality of the meeting
Flexible Organization of Meeting Space

Each meeting space has different capabilities
- Video cameras
- Display devices
- Interaction devices
- Network characteristics

A meeting space can be configured according to the various purpose of meeting
- What kind of interaction service will be activated for a meeting?
  - Small meeting room: Use traditional keyboard and mouse
  - Large meeting room: Use a laser pointing device
Key Issues in SW Architecture Design

User-centric collaboration
• Define collaboration context

Flexible organization
• Define atomic component services
• And support composition among services
SMEET
SOFTWARE ARCHITECTURE
Layered Description of SMeeet SW Architecture

SMeeet Node

Task Layer

- Task 1
- Task 2
- Task 3

Service Manager Layer

- Media Arbiter
- ACE Connector
- Display Manager
- Interaction Manager

Component Service Layer

- Media Producer Service
- Media Consumer Service
- Interactive Graphics Producer Service
- Interactive Graphics Consumer Service
- File Sharing Service
- Data Adaptation Service
- Network Marketing Service
- Multicast Connector Service
- Interactive Display Control Service
- Networked Display Service
- Networked Endpoint Adapter Service
- Printer Service
- Location Tracking Service

Media & Data

Networking

Display

Interaction

DEPT. OF INFO. & COMM., GIST
Component Service Layer

Definition of Component Service

- An atomic unit in the application layer for composing an end-to-end service, and it is described with corresponding meta-data. [Klara@MM2004]

- We define several component services and classifies those services according to their functionality.

Component Service Classification

- Media & data component service category
  - provide real-time media transmission to support seamless audio and video communication among participants

- Display service category
  - Presents the decoded video or rendered graphics to the tiled display via network and controls the display device based on user interaction (e.g. pointing)

- Multimodal interaction service category
  - User-friendly interaction with tiled display such as pointing service, hand motion tracking service, and location tracking service

- Networking service category
  - Monitors network performance and removes networking barriers such as multicast connectivity problem and NAT/firewall traversal
Service Manager Layer

- Service manager manages component services
  - To handle service composition request from SMeeMed Mediator
  - Manage contexts from each component service
  - Cooperate with other service managers
  - Share the contexts with other service managers

- Each service manager takes charges in its service category
  - Media Arbitrator: Media & data component service category
  - Display Manager: Display service category
  - Interaction Manager: Multimodal interaction service category
  - ACE Connector: Networking service category
Task Layer

- Task is the application that a user wants to achieve during the collaboration session.
SMeet Mediator

SMeet Mediator

- Representative of a SMeet node
- [Inter SMeet node] Creates a collaboration session by cooperating with other SMeet node
- [Intra SMeet node] Discover/Configure/Manage services in a SMeet node
  - Service configuration: Configuring component services and customized tuning of service parameters
  - Service matching: Matching the heterogeneity of component services
  - Service composition: Composing a new extended services

![SMeet Mediator Diagram]
IMPLEMENTATION
SMeet Node Structure

- **SMeet Mediator**
  - Service & container discovery
  - Service & container operation
  - Communication with other nodes

- **Service GUI**
  - User interface for meeting node operation

- **Service Container**
  - Service holder placed on every host
  - Service registration and launch

- **Service**
  - Abstract code to access multimedia tools

- **Service Instance**
  - Instantiated service activated by user
Conferencing Session

- Session is a logical set having various services which have users communicate with other participants.
- Service GUI helps users to create sessions and announce them to other users. It also enables users to join existing session.
Session creation wizard UI
Current Prototype of SMeet Node

- Location Tracking
- Pointing Interaction
- Tiled Display
- Hand Tracking Interaction
Conclusion and Future work

Conclusion

The proposed architecture supports flexible organization of SMeet node by integrating a set of component services.

- Design of software architecture supporting flexible service composition

Future work

- Define collaboration context
- Implement smart configuration functionality of SMeet
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