Multipoint Video Communication System with 3D Virtual Space

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Point of this talk.

• Deployment of "Small Group Multicast".

• **New application** area for the "Scalable Adaptive Multicast"

Proposal:

• 3D Virtual Space Multi-Point Video Comm. App.
  – Implementation for Online conference over **1000**

• **Dynamic selection/classification** of destinations.
Background

• **Small Group Multicast (SGM)** is one of the ‘**Desirable**’ technology in the Internet. Small Group = 2~30 people...

• XCAST6 is one of the candidates to support it.

• There might be **several technologies** which will support “**Small Group Multicast**”.

• So, we have developed a **middleware** to enable easy migration of protocols.
- Scalable Adaptive Multicast Toolkit
- **Multi-platform / Open Source** Toolkit for Multipoint Communication (in C++ with Qt)  
  (Windows/ Mac/ Linux / BSD)
- Under development since 2006

- Support s _easy_ programming for multi-point communication applications.
SAMTK Architecture

SAMTK Core Module

- Protocol Interface
  - XCAST Plugin
  - IPv4

SAMTK Group Web Server
(Apache / PHP)

Group Interface
- Group Management Module

SAM Applications

Application Interface

OS (Windows / Mac / Linux / FreeBSD..)
“Killer App” for Multipoint Comm.

- We are looking for “Killer App”.
- 3D Virtual space Comm. might be the one.
- Demo on CCNC2009

“Nat Free 3D Video Conf.”
Group management on 3D space

• “SAMTK Group Server” with Group Manager
  – Currently only supports “Static” group management

• We want “Dynamic” change of the member through the ‘Position’ and ‘Orientation’ of the each client.
  – It is now not a simple “Group”.

New 3D Virtual Space App

• Develop a Virtual Space Server (tcp-connected)
  – Space server “Dynamically” form the destination members.
  – Classify the ‘Visible’ and ‘Audible’ members.

• Virtual Server do not transfer media streams
• May supports 1000~ clients.
  – Not really tested yet...
SAMTK Architecture

SAMTK Group Web Server
(Apache / PHP)

HTTP/XML

SAM Applications

Group Interface
Group Management Module

SAMTK Core Module
Application Interface
Protocol Interface

XCAST Plugin
XCAST6

ALM Plugin
IPv4

OS (Windows / Mac / Linux / FreeBSD..)
New 3D Video Comm. Architecture

Virtual Space Server

3D Video Comm. Client

Application Interface

SAMTK Core Module

Group Interface
Group Management Module

Protocol Interface

XCAST Plugin

ALM Plugin

XCAST6

IPv4

OS (Windows / Mac / Linux / FreeBSD..)
Classification of destinations in 3D

Classification of Audio

Distance $d$ controls volume

Orientation $\theta$ also controls volume (if $\theta > 180$, less volume)

Classification of Video

Distance $d$ controls frame rate.

Limit the destination member by $\theta_1 < 45$ and $\theta_2 < 90$
Evaluation of the Current Impl.

Current Implementation uses just Multi-Unicast
Classifying Destinations

- Audio -> volume / compression rate
- Video -> frame rate / compression rate
Conclusion

• Development of “Killer App” for SGM. 3D Virtual Space Video Comm.

• Dynamic configuration of “Destinations” through 3D Virtual Space positioning.
  – Can reduce the bandwidth of media stream.

• By dividing “Destination Control” with media stream, the server can handle 1000~ clients.
Future Works

• Currently, we only control destinations, audio volume and video quality through the “Position” and ”Orientation”.

• We need to figure out the receiver’s side of bandwidth / congestion.

• SICC (Sender initiated Congestion Control) may one of the solutions.