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Enhanced Video Services for Access Grid

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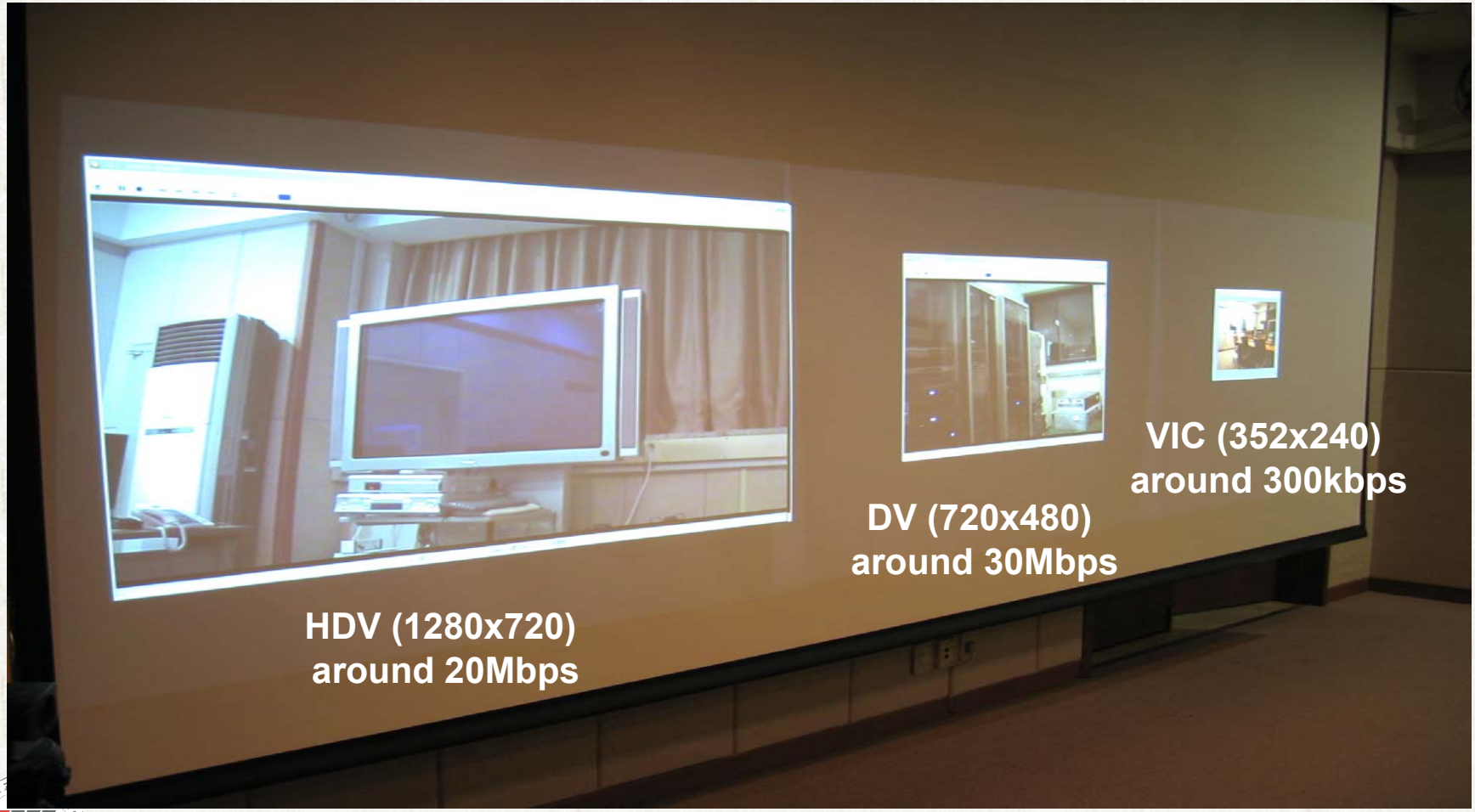
Contents

- Review on high-quality video support for AG: "AG with HDV/DV (2004)"
- Enhanced Video Services for AG (Improvement Trials in 2005)
  - Versatile video support & Network-adaptation Capability
  - Decomposable decoding/render capability
  - Improved Network Connectivity

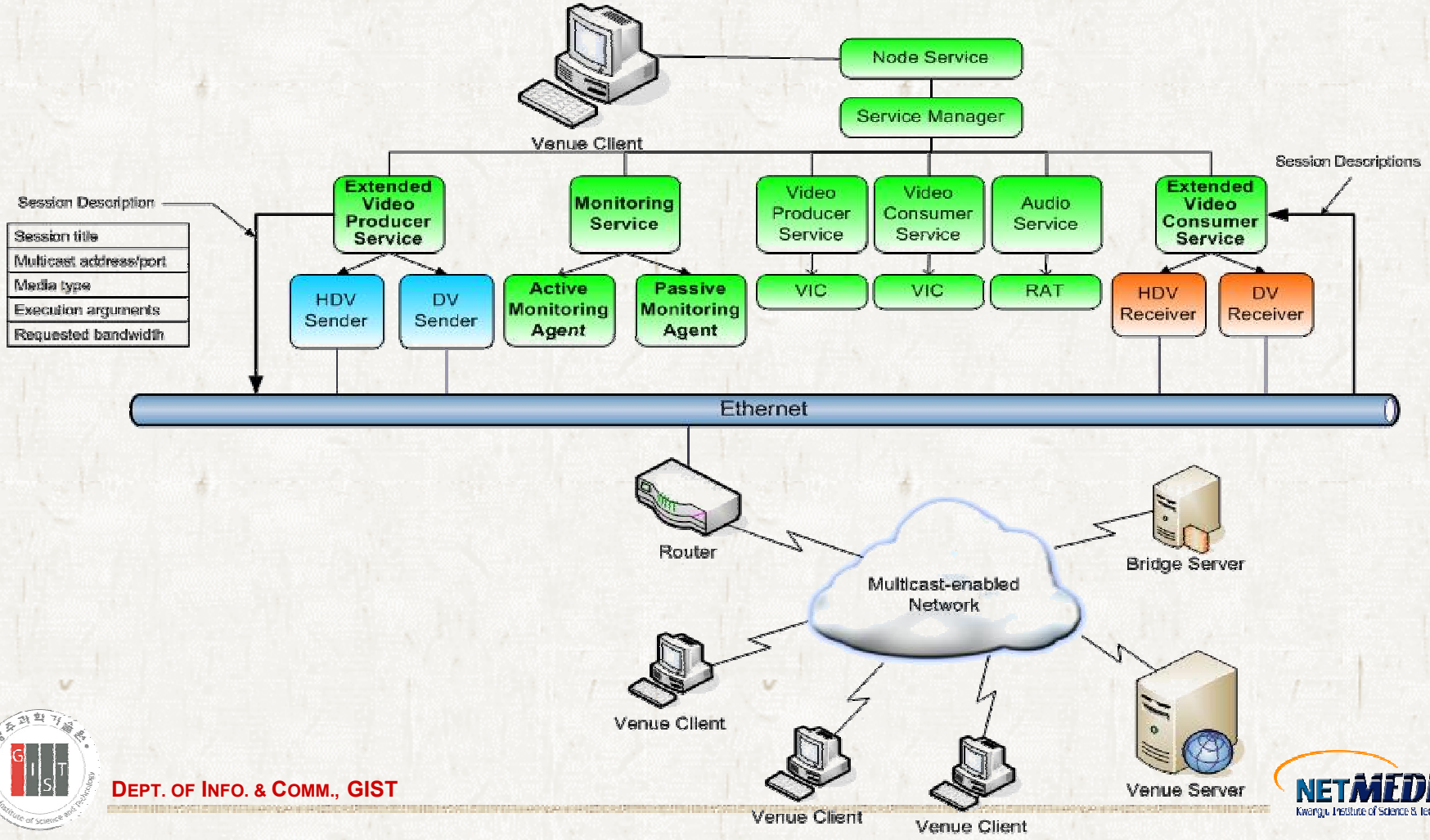
Review on high-quality video support for AG: AG with HDV/DV (2004)

Comparison of HDV, DV, VIC



Toward Network-adaptive Video Services for AG (2004)

- Extended Video Services & Monitoring Service -

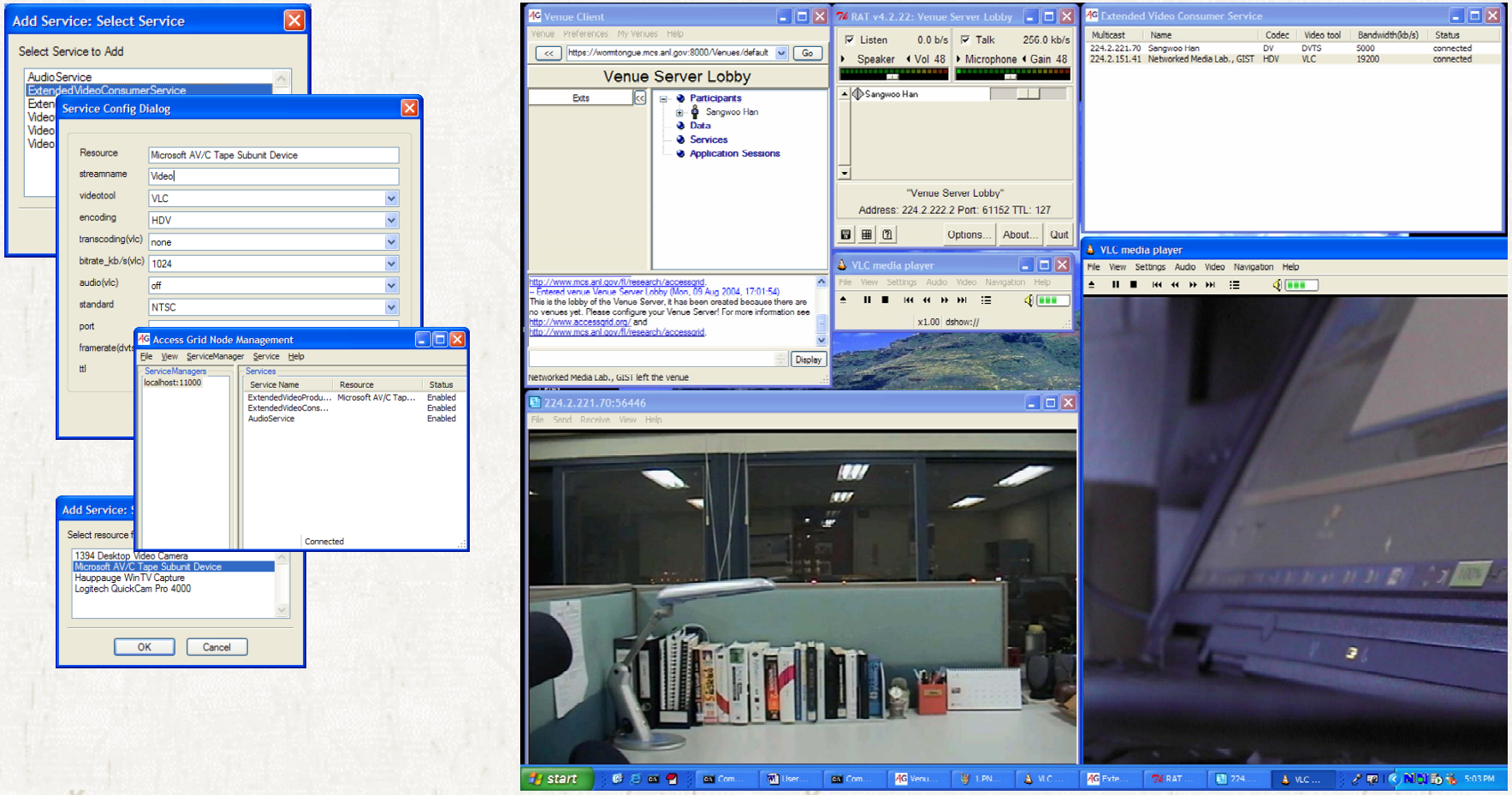


Main Components (2004)

- Versatile video supports for AG (including high-quality video):
  ExtendedVideo{Producer,Consumer}Services
  - Unified video program interfaces for AG
  - Flexible multicast address allocation and management

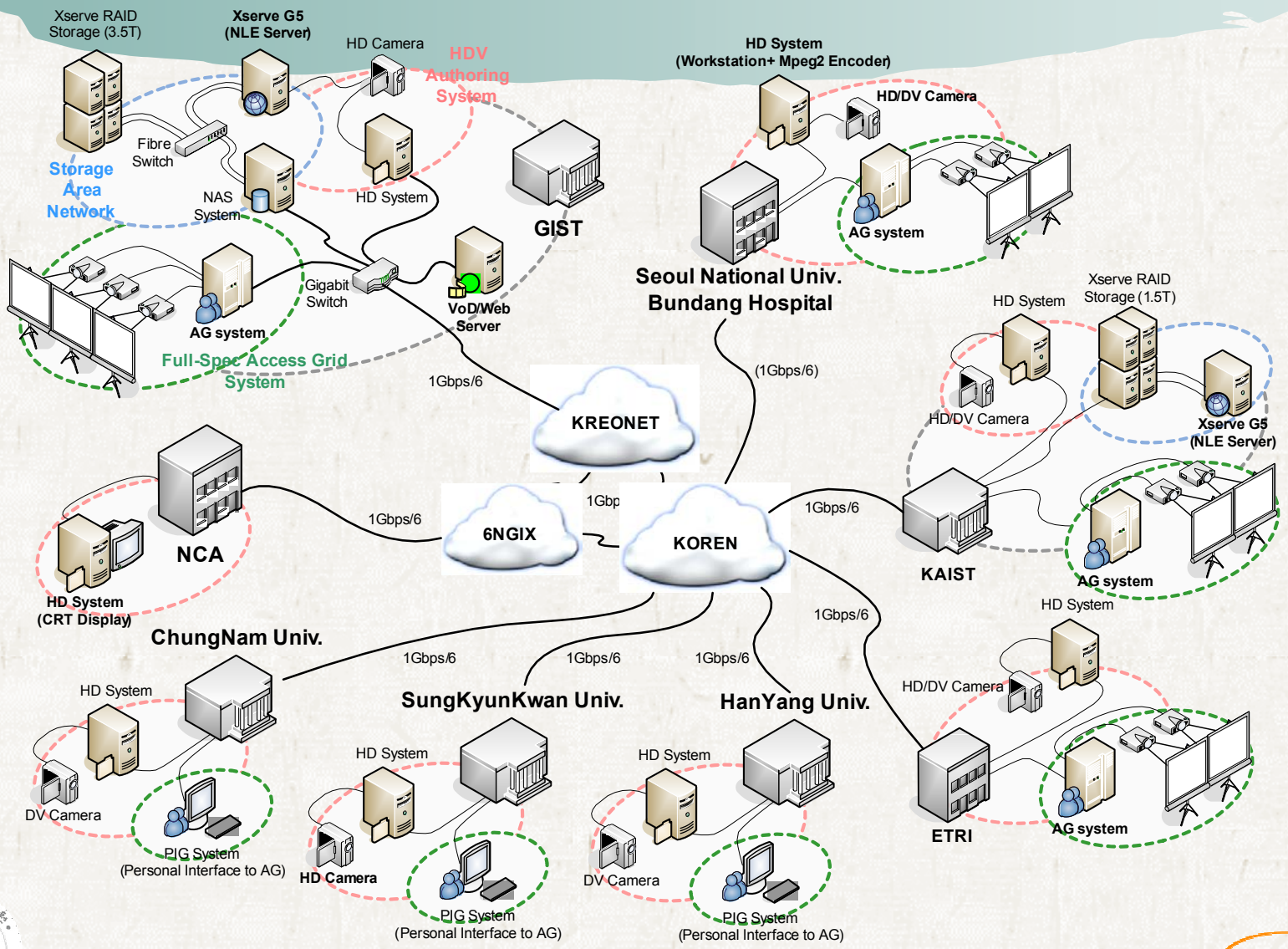
- Support Network-adaptation of AG media services:
  Monitoring Service (with Control Coordination?)
  - Hybrid monitoring to check both network & system status
    - Passive (RTCP and system) and Active (Multicast Beacon)
  - Monitored status will guide the required network adaptation
    - Needs network-adaptive media services
    - Will coordinate the adaptation based on the given policy

Implementation of Extended Video Service (2004)

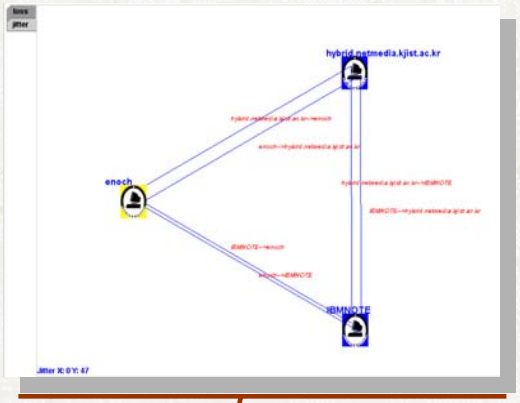


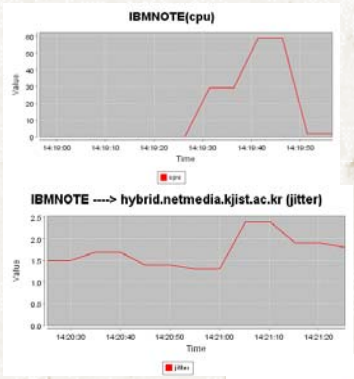
Demonstration of AG with HDV (2004)

AG Meetings for KoreaV6 HDTV@IPv6 (2004)



Preliminary Implementation of AG Monitoring Service (2004)

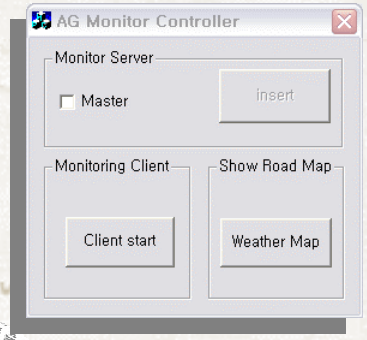




Database Server

Multicast Network

Monitoring Service Manager



Venue Client

Venue Client

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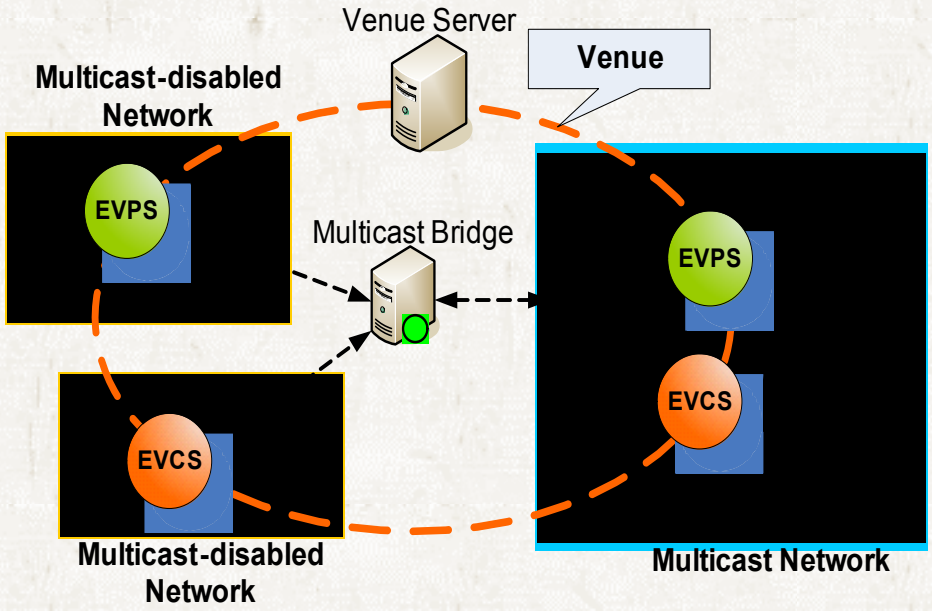
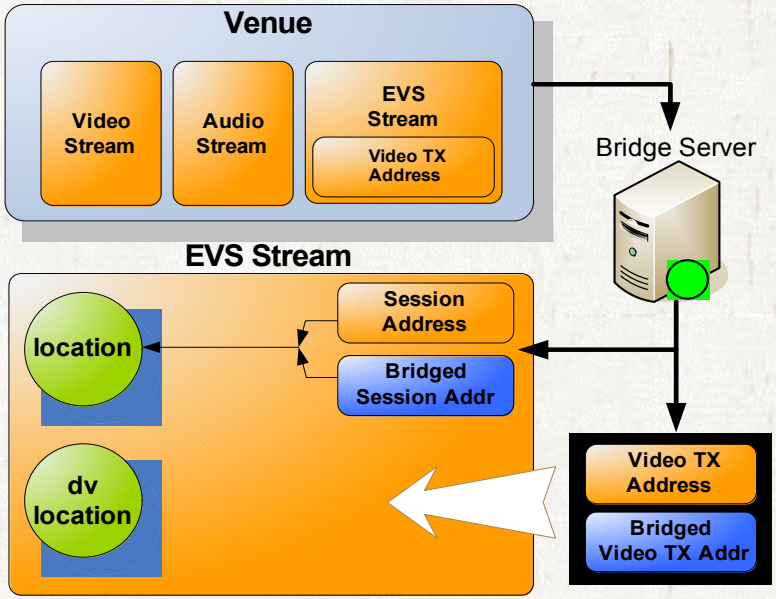
Multicast Bridge for HDV/DV Video (2004)

- Multicast Bridge modification to support AG with HDV/DV





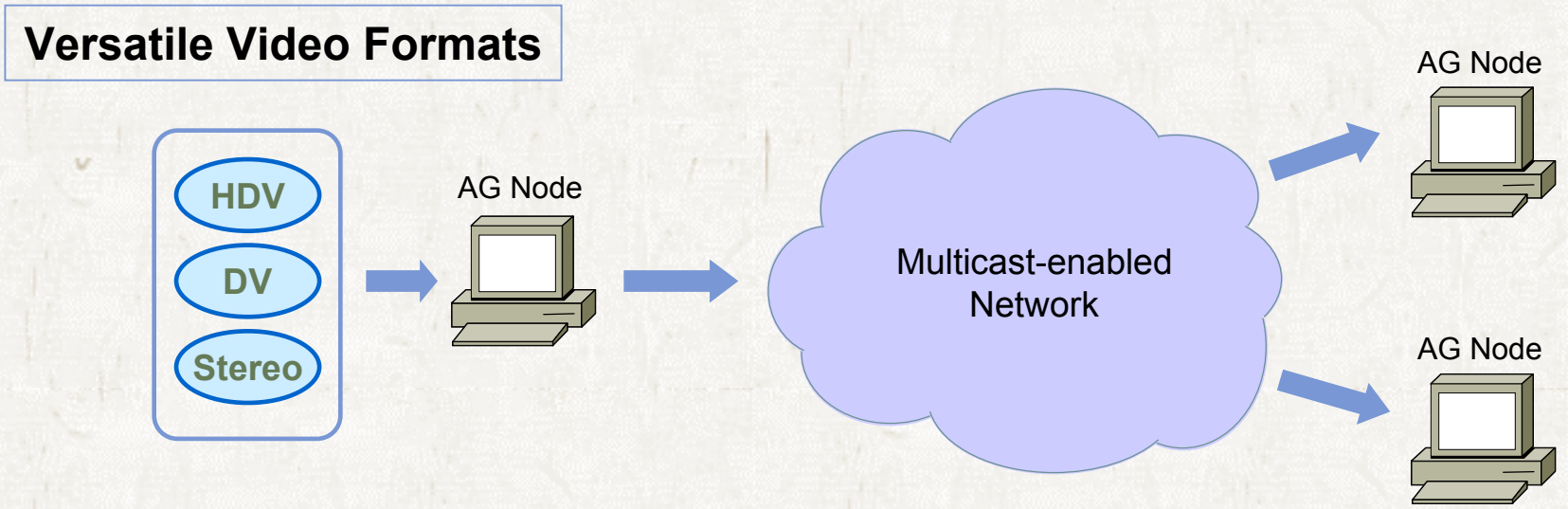
Enhanced Video Services for AG
- Issues and Trials in 2005 -

Enhanced Video Services for AG

- Versatile video support & Network-adaptation Capability: AG Media Project
- Decomposable decoding/render capability: AG SVC Shared Application
- Improved Network Connectivity: AG Connector Project

Versatile Video Support

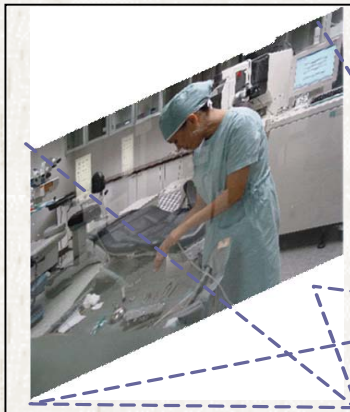
- **Unified Video Program Interface** to enable AG to support various video programs and formats

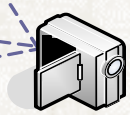


AG Media Shared Application - Network-adaptive Coordinated HDV/DV Video Support

Low-cost Stereo HDV over IP

(GIST 2004-2005 in progress)





Right Image

Left Image

3D Image creation

Mixed Stream

DeMux

Right Decoding

Left Decoding

Interlaced Side by Side Top Down

Frame Buffer

Video

Audio

Depacketizing 3D decoding

IP Network

MPEG2-TS, IEEE1394
Two 19.2Mbps Streams

Muxing two streams
Packetizing

- Composition of 2 HDV images (Using TS packet header)
- Real-time 3D HDV Transmission

- RTP RFC 1889
- RTP Payload format for MPEG1/M

Network adaptation capability

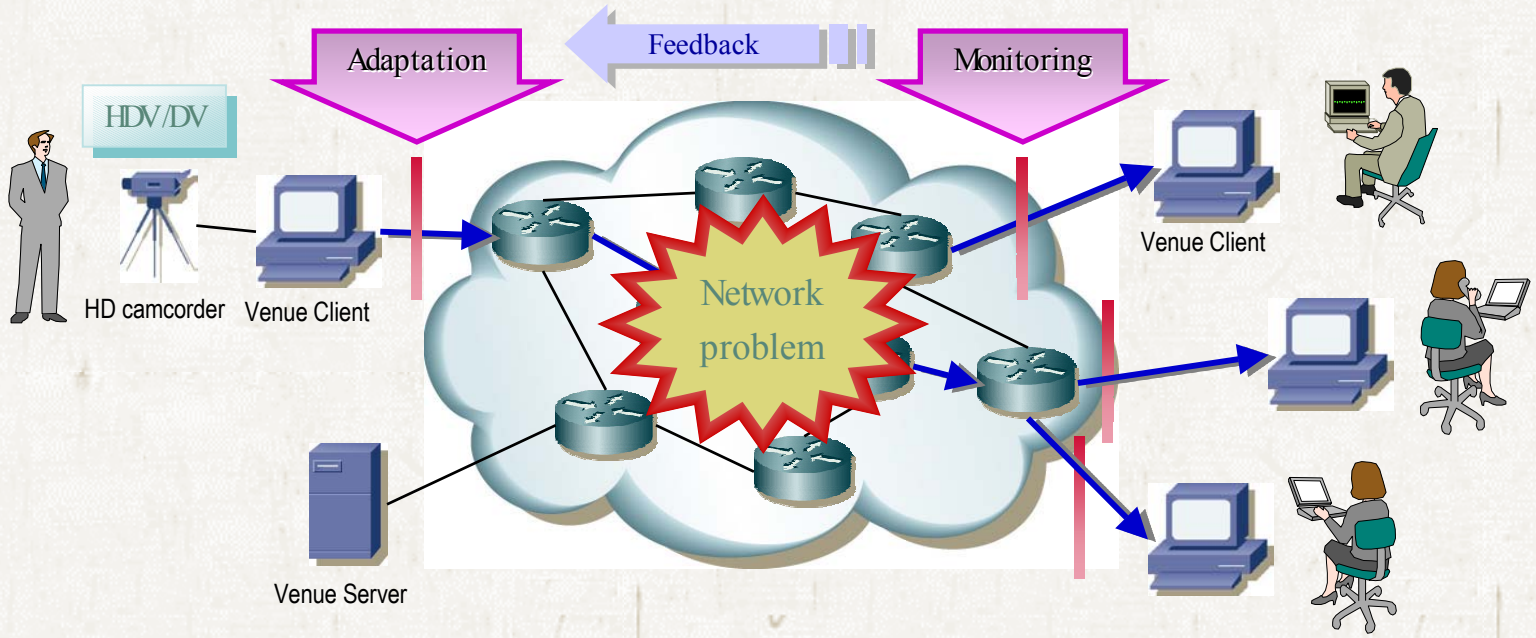
- The required bandwidth (20 to 30 Mbps per single video stream) and network quality (in terms of loss/delay) is putting so much burden. That is, an effective network-adaptive transmission capability is required to provide and maintain high-quality video service over time-varying and heterogeneous networks. This feature enables users on the poor network to use high-quality AG video service. By combining with network/system monitoring, the video producers can control the sending rate in a network-adaptive manner.

AG Media Shared Application - Network-adaptive Coordinated HDV/DV Video Support

AG Media Shared Application

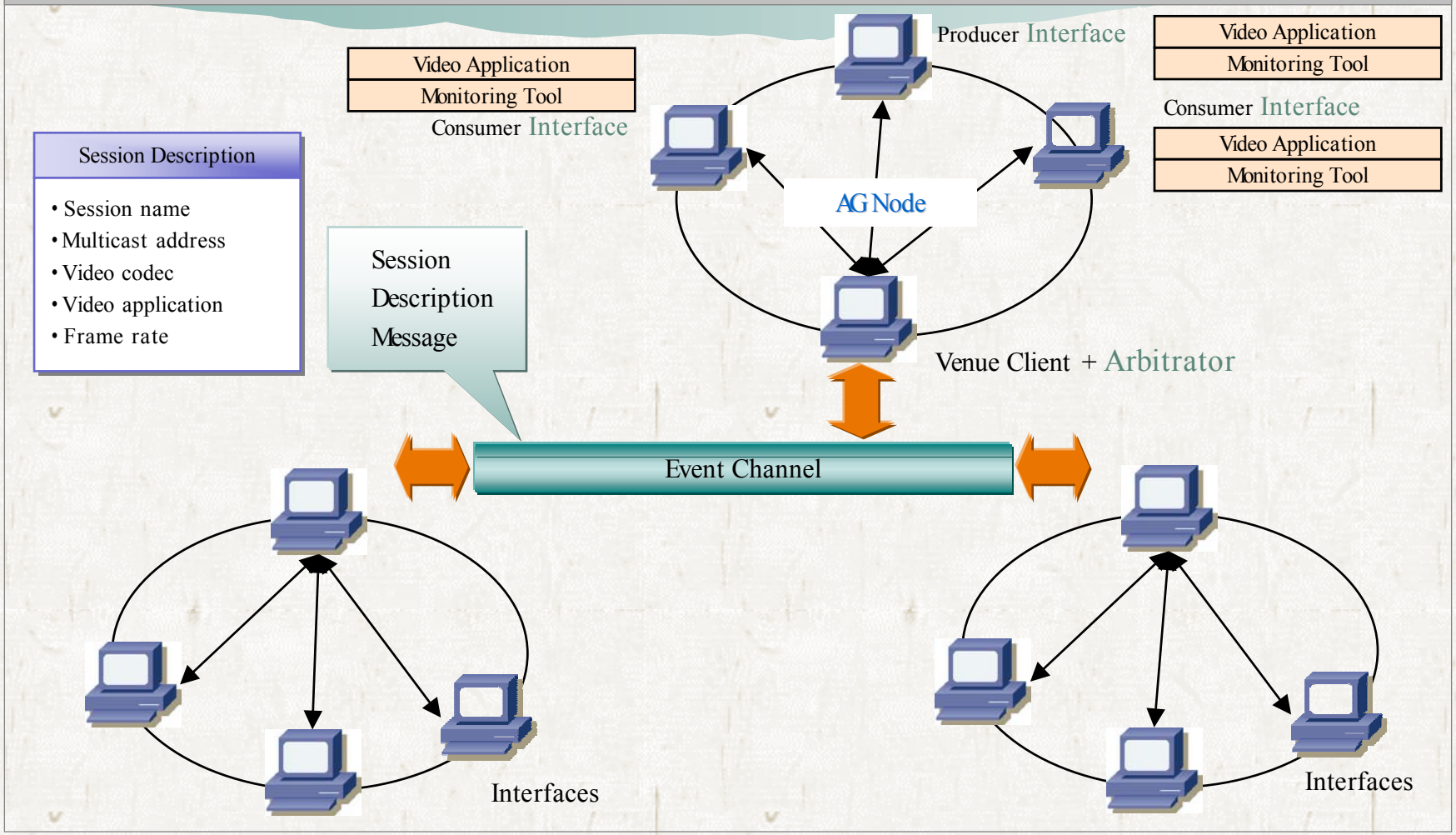
- Offering high-quality video contents to foster realistic presence among AG nodes
- Network-adaptive video transmission over multicast-based one-to-many distribution environments
- Designed and Implemented as a shared application tailored to AG toolkit

Conceptual picture



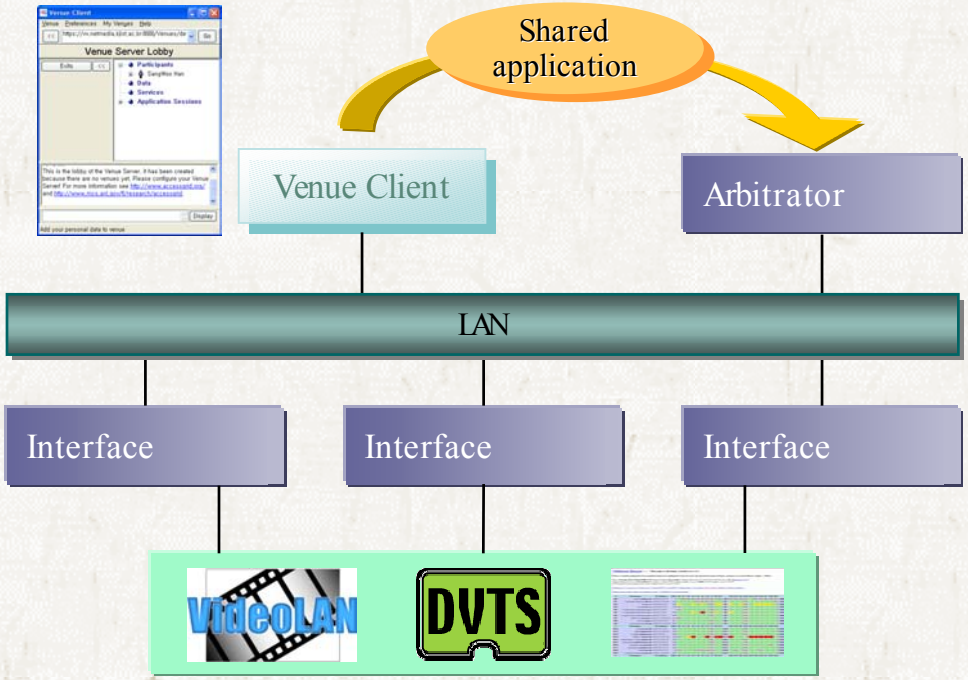
AG Media Shared Application (Cont.)

Focusing on the relation among AG nodes



AG Media Shared Application (Cont.)

Focusing on the relation among components



- VideoLAN: 720p, 1080i HDV Support
- Modified DVTS: 720x480 DV Support
- Modified Multicast Beacon Client (WIN32)

AG Media Arbitrator

- Interface control
- Session announcement
- Decides adaptation scheme

AG Media Interface

- Interface registration
- Video application control
- Network monitoring

Video/Monitor Applications

- Encoding and decoding
- RTP-based transport
- Frame rate control

Decomposable decoding/render capability

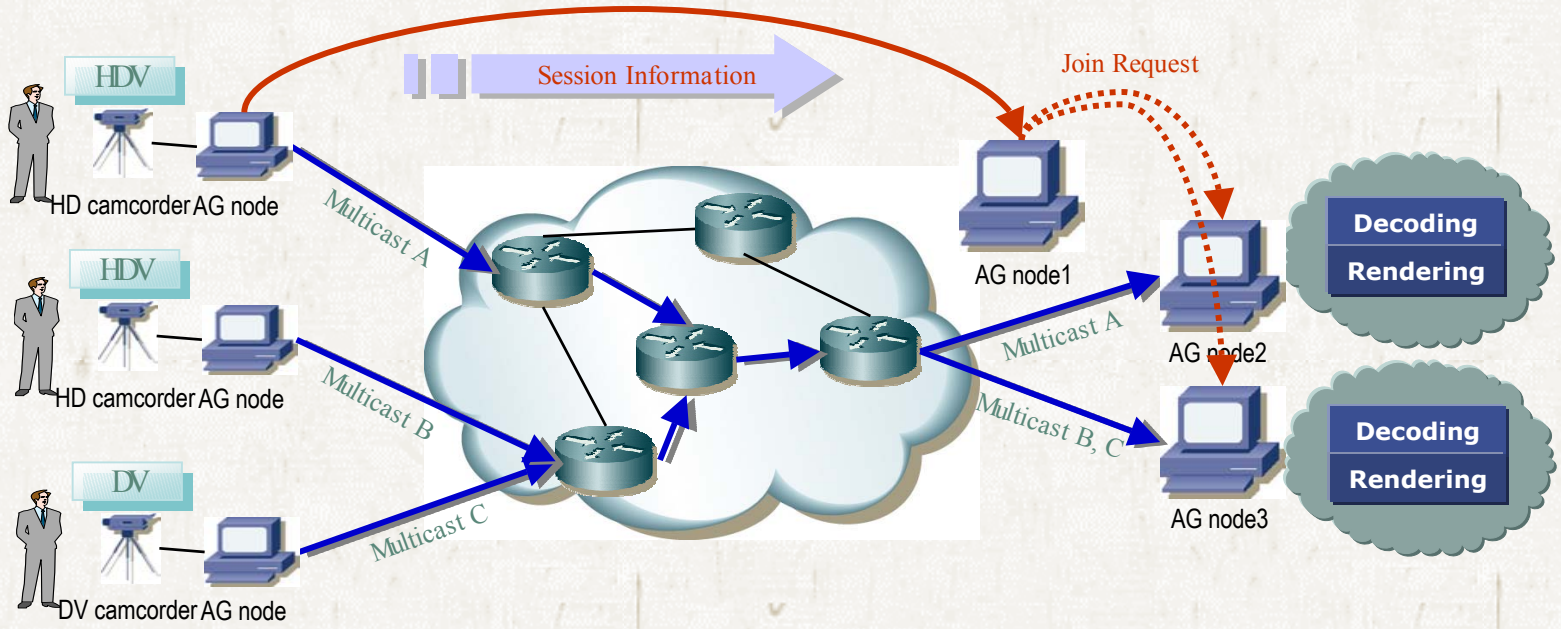
- Support for DV/HDV video also requires increased CPU for decoding and rendering power. Also, current AG display PC is usually overloaded when it needs to serve big-scale meetings with large participants. Thus, we need to decompose the task of decoding/rendering and assign the decomposed task to the pool of AG PCs. To help this situation, we are designing ways to achieve scalable decomposition of video consumer services to the pool of AG PCs (under the name of "Scalable Visualization Consumer").

AG SVC (Scalable Visualization Consumer) Shared Application ?

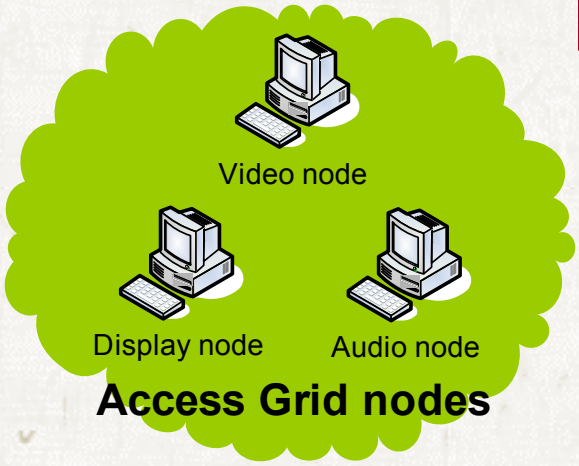
SVC (Scalable Visualization Consumer)

- Configurable visualization environment with increasing display nodes
- Support various media formant for visualization
- Increase utilization of resource on limited environment

Conceptual picture



AG SVC (Cont.)

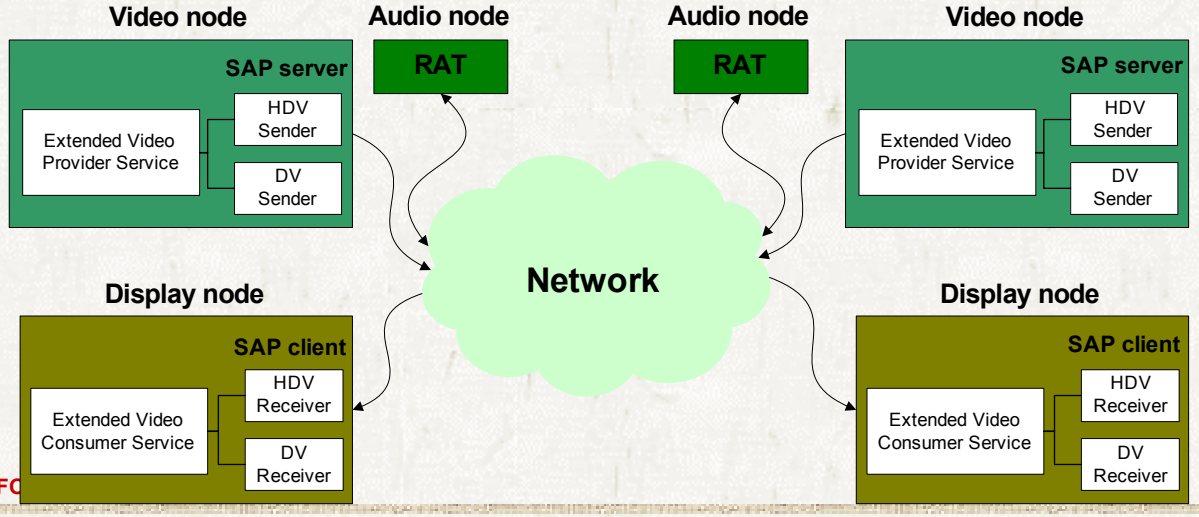


Configuration for Extended Video Service

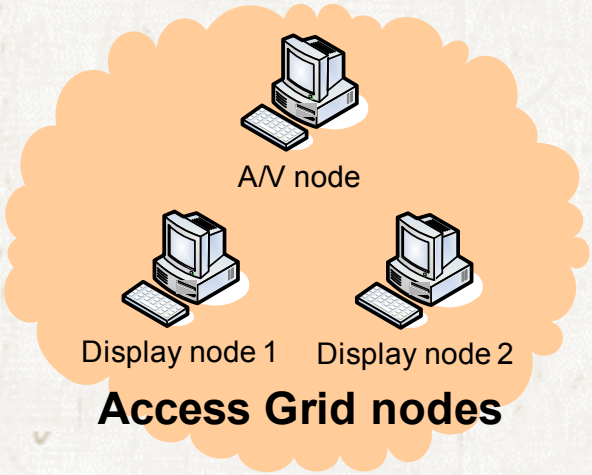
- Audio node: Handling audio stream through rat
- Video node: Sending video stream through SAP server
- Display node: Receiving video stream through SAP client

Problems

- Interoperability
  - Difficulty in releasing updated version of S/W
- Scalability
  - Limited decoding and rendering capacities of a display node



AG SVC (Cont.)



Configuration of AG nodes

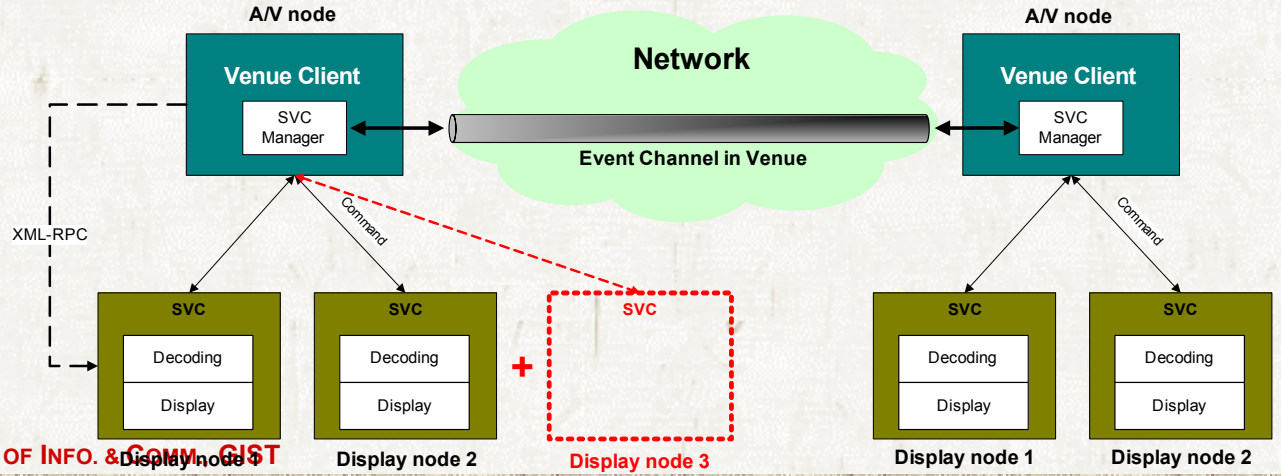
- Audio/Video node: sending A/V stream
- Display node: decoding and rendering A/V stream

SVC Manager

- Shared Application for interoperability
- Control interface between SVC
- Exchange of session information through event channel

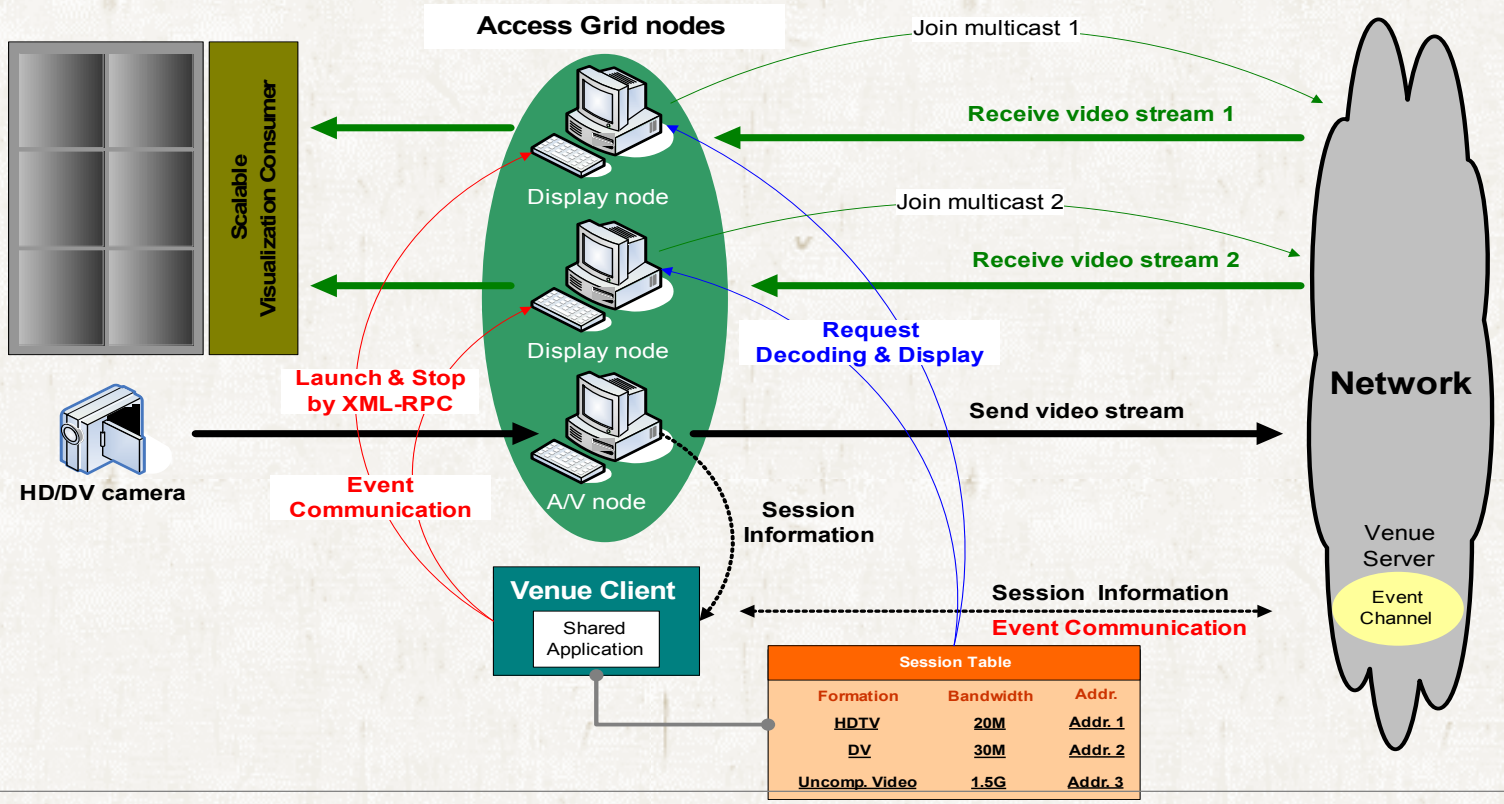
SVC

- Join and receive multicast streams
- Decoding and rendering various media formats



AG SVC (Cont.)

Basic scenario



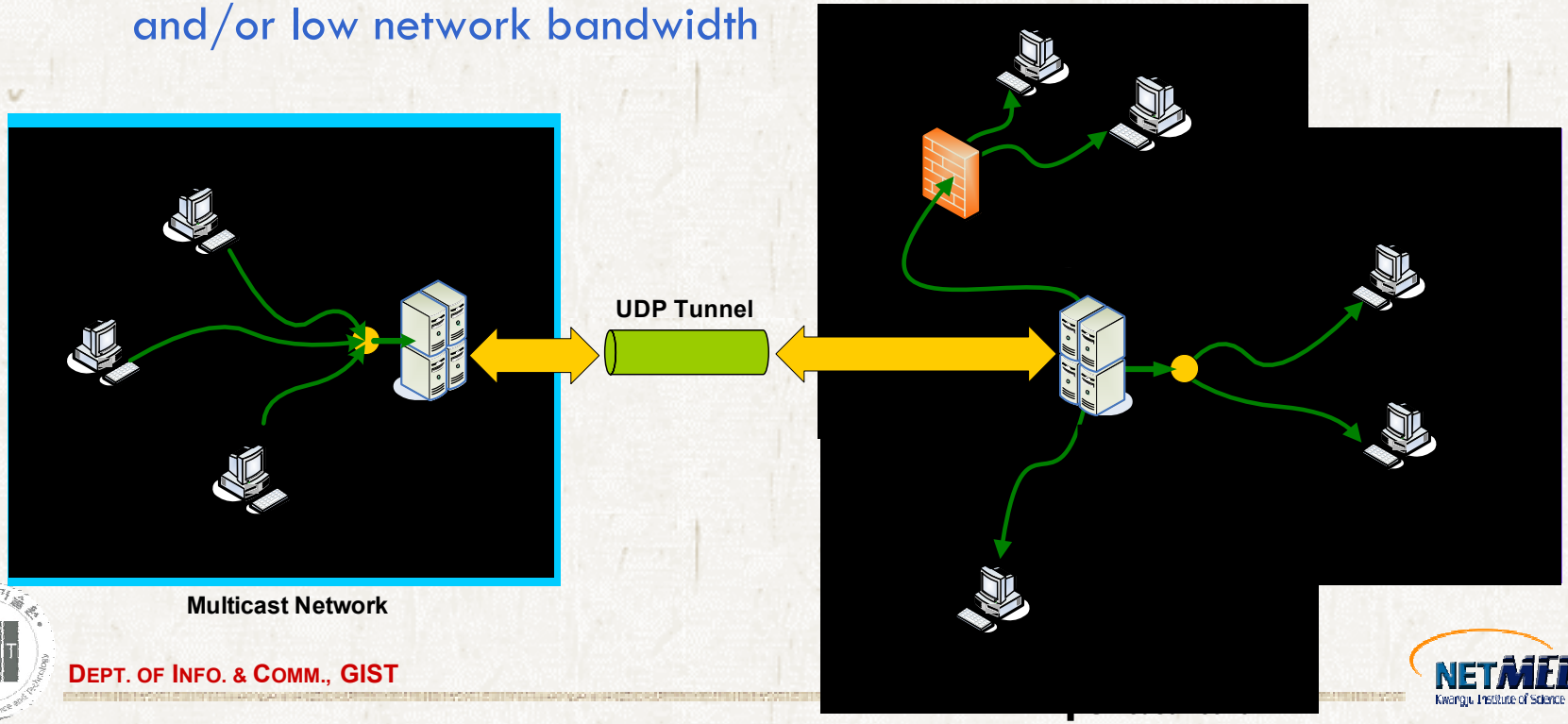
Improved network connectivity

- Current AG multicast bringing solutions cannot support the proposed AG with DV/HDV (due to change in multicast address allocation). Modification to Quickbridge is implemented in 2004 to handle this addressing limitation. From this year, improved connectivity solution (nicknamed "AG Connector") is being designed and partially implemented to address this limitation and other NAT/firewall issues. For example, UMTP (UDP multicast tunneling protocol)-based multicast bridging solution is realized to provide better multicast connectivity.

AG Connector – Improved Connectivity Solution

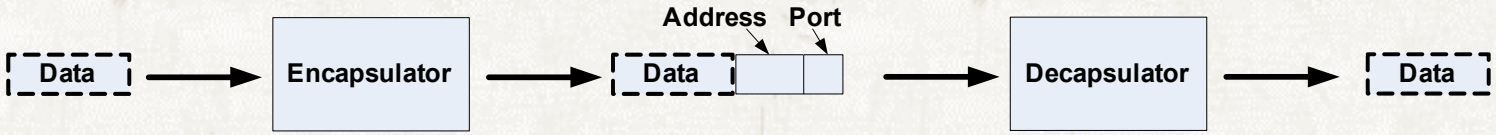
AG Connector

- Solves all kinds of connectivity problems in AG
  1. AG Connector for unicast peers
  2. AG Connector for networks behind firewall or NAT
  3. AG Connector as a proxy: For users with low system performance and/or low network bandwidth



UMTP (UDP Multicast Tunneling Protocol)

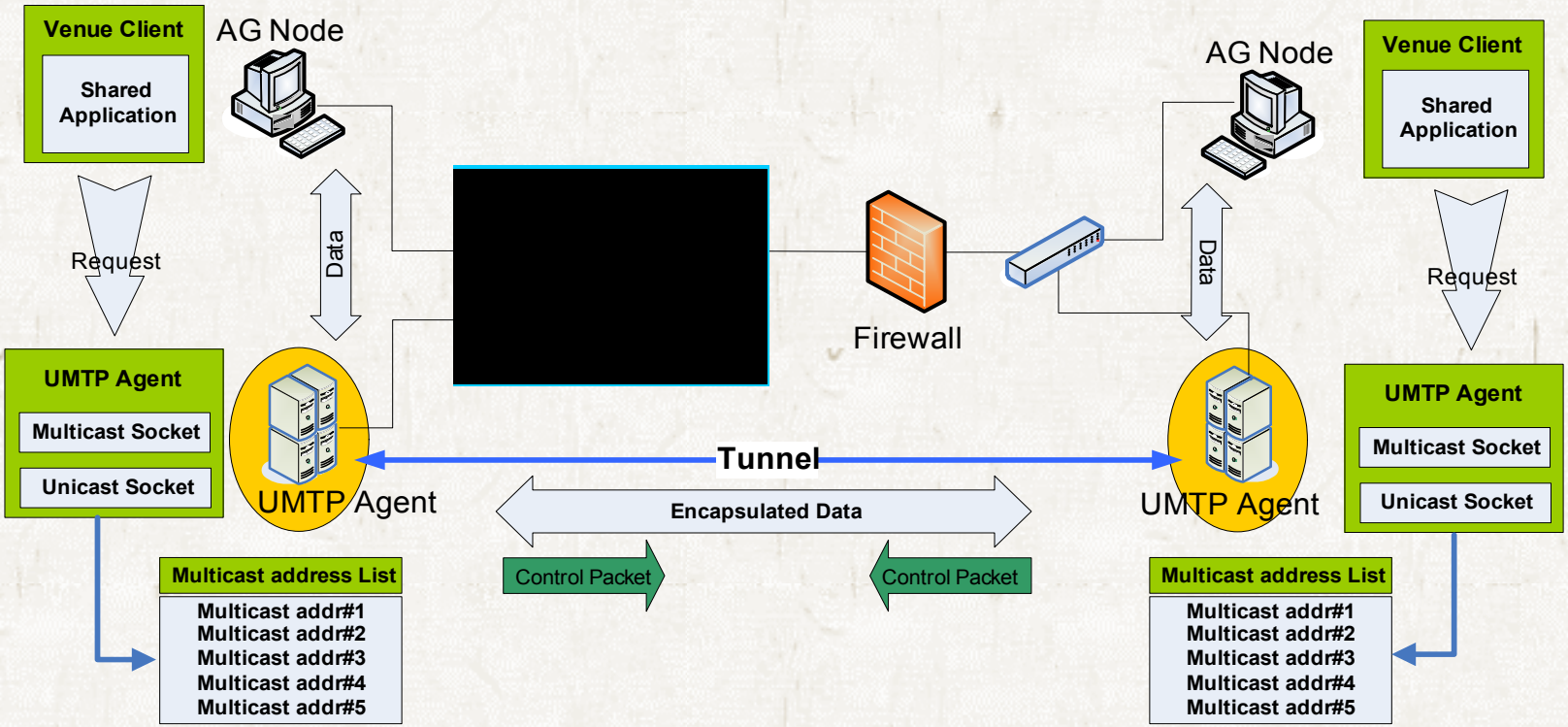
- An application-level tunneling protocol
- UMTP operates using UDP datagram between pairs of nodes
  - Creates UDP tunnel between two nodes
  - Two tunnel endpoints are in separate networks without multicast connectivity
- Multicast data is encapsulated in UDP datagram packets
  - Each tunnel endpoint receives multicast data in its network
  - Encapsulated data is sent over the unicast UDP connection



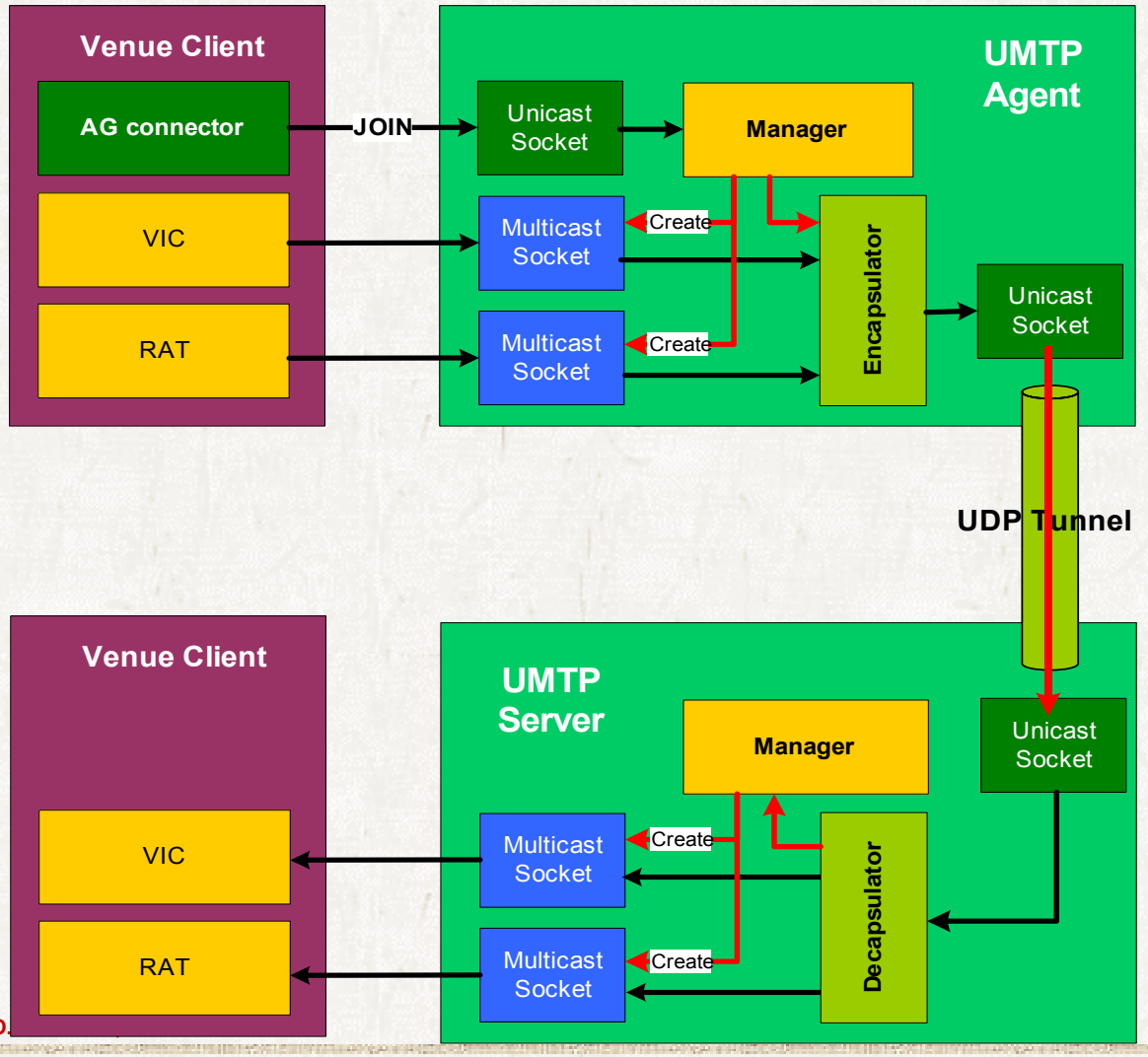
Why & How "UMTP for Multicast Bridge"

- Better multicast accessibility to end users
  - Scalable: Performance and bandwidth efficient
  - Transparent to AG: Multicast-only applications also can work
- Simplified port management by using encapsulation
  - Uses single port number ➔ Easily applicable to Firewall and NAT
  - Connection request goes out from the inside of the network
- Implementation Issues (How?)
  - To connect with UMTP master
    - Tunnel endpoint should be aware of which group/port is used by AG media application; Does not need to allocate a new multicast address; Must know multicast address list in a venue
  - Shared application
  - Reliability: Provide a backup structure to cope with server crash

AG Connector for Multicast Bridging (Cont.)



AG Connector for Multicast Bridging (Cont.)



Concluding Remarks

- Aims to provide "Enhanced Video Services" to the AG community
  - Various high-quality (HDV/DV/Stereo) video programs and formats with different QoS requirement over (partially) heterogeneous networks and node systems.
- Extended Video Services with different AG support levels
  - Level 0: basic inter-working with AG
  - Level 1: + network-adaptation capability (AG-coordinated)
  - Level 2: + A/V synchronization with speaker node identification
- Needs to be refined further to reflect more aspects of AG media services: Audio, Media security, …

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Thank you!

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