

# DVTS Workshop

Internet2 Fall Conference, 2005

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DVTS Consortium  
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WIDE Project / Keio University

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September, 2005



# DVTS: Motivations



- Using the Internet
  - Realization of High Quality Video and Audio Transport
    - NTSC Television Specification requirement
      - High Quality Video Conference System
    - CD Quality Audio
  - Broadband networks and next generation protocol
    - >10Mbps
    - IPv6
  - Low cost consumer availability
    - Using consumer products
    - Realization at low cost
  - Multiple Platform (Operating System)

**Started 1998**

# DVTS Consortium

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- Consortium to develop High quality video transport/exchange system using the Internet
  - Founded October, 2002
    - Construct development environment for DVTS
    - Standardization of DVTS
    - Rights and agreement control for DVTS

<http://www.dvts.jp>

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# Agendas



- Presentation from DVTS Consortium members in Japan (2 h.)
  - Opening presentation
    - “Opening Presentation”, Hiroshi Ezaki, Professor, Tokyo University, WIDE Project
  - DVTS Consortium Update
    - “DVTS Consortium Update”, Kazunori Sugiura, Assistant Professor, Keio University, WIDE Project
  - DVTS related topics presentation
    - “Multiple DVTS Stream Synchronization”, Hisamatsu Tsuyoshi, Keio University, WIDE Project
    - “Dynamic Routing Aggregation in Stream based infrastructure”, Katsuhiro Horiba, Keio University, WIDE Project
- Break ( Demo construction 15min. )
- Presentation / Demo from Internet2 ( 1 h.)
- Demos of current DVTS ( 30 – 45 min.)
- Discussion ( 15 – 30 min.)

# Opening Presentation

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- “Opening Presentation”
  - Hiroshi Ezaki Ph.D., Professor, Tokyo University, Board member of WIDE Project.

# DVTS Consortium Update



- “DVTS Consortium : The First International Workshop”
  - Kazunori Sugiura Ph.D., Assistant Professor, Keio University, WIDE Project member, Board member of DVTS Consortium

# Many Thanks

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- Thank you for coming today!
- The First International Workshop held by DVTS Consortium
- Internet2 is the majority group of DVTS users
- We all need to have a good collaboration
  - Interoperability issues
  - Advanced application for video streaming

# DVTS Consortium summary

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- Founded: October, 2002
  - Keio Research Institute at SFC
  - Industrial and commercial
    - 500,000 Yen / Year
  - Academic and Research Organization
    - Free
- <http://www.dvts.jp>

# DVTS Consortium



DVTS Consortium Website - Microsoft Internet Explorer

ファイル(E) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

戻る 検索 お気に入り

アドレス(D) <http://www.dvts.jp/en/index.html> 移動 リンク

カスタマイズ 検索 サイト検索 ハイライト マイ・オークション ブックマーク My Yahoo!

Contact | Site map | Japanese

**DVTS** DVTS Consortium

- About Us
- What's DVTS?
- Our Activities
- Links
- TOP

**Collection**

**Member Only**

Industry-University Joint Study on High-Quality Image Distribution System on the Internet.

## DVTS Consortium

**What's New**

- 2002.12.05**  
DVTS workshop was held on December 5th.
- 2002.11.06**  
DVTS Consortium webiste has been inaugurated.



# Industrial and Commercial cooperatives

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- 12 companies
  - Allied Telesis k.k.
  - Cisco Systems, Inc.
  - Fujitsu Laboratories Ltd.
  - HAMAMATSU PHOTONICS K.K.
  - IIGA Co.,Ltd
  - KeelNetworks, Inc.
  - NTT ADVANCED TECHNOLOGY CORPORATION
  - NTT Communications Corporation
  - POWERPLAY, Inc
  - TOKYO ELECTRON LTD.
  - VICTOR COMPANY OF JAPAN, LTMITED
  - System Development Center Professional Systems Company

# Academic and Research Organizations / Domestic



## ■ 25 Organizations

- The Advanced Media Network Center of Utsunomiya University
- College of Science and Engineering, Ritsumeikan University
- Department of Information Engineering, University of The Ryukyus
- Ehime University
- General Information Processing Center, Akita University
- Information Technology Center, Nagoya University
- Information WEB Laboratory, Aoyama Gakuin University
- Japan Advanced Institute of Science and Technology
- Japan Science and Technology Agency
- Keio University
- Keio Yochisha Elementary School
- Kurashiki University of Science and the Arts
- Meio University
- Nagasaki Institute of Applied Science
- National Institute of Advanced Industrial Science and Technology
- Nara Institute of Science and Technology
- Saga University
- Shinshu University, General Information Processing Center
- Tohoku Institute of Technology
- Tokyo University of Agriculture and Technology
- Tokyo University of Agriculture and Technology,  
Graduate School of Bio-Applications and Systems Engineering
- The University of Tokyo
- University of Tsukuba
- Wakayama University

# Academic and Research Organizations / International



- 23 Organizations
  - Bradley University
  - Canada's National Arts Centre
  - Carleton University
  - Chungnam National University
  - Columbia University, Academic Information Systems
  - Delft University of Technology
  - Federal University of Paraiba - UFPB
  - Gwangju Institute of Science & Technology
  - INRIA, Project PLANETE
  - Internet2
  - La Salle
  - Masaryk University
  - Ohio State University, BUCKITV (Student Television)
  - Portsmouth Public Schools
  - Queensland University of Technology Creative Industries Precinct
  - Saint Francis University
  - Society for Arts and Technology
  - Sogang University
  - Seoul National University
  - University of California, San Diego( SRTV)
  - University of Miami School of Communication
  - University of Sydney, VISLAB
  - York University

# Core DVTS Consortium staffs



- DVTS / Stream Working Group
  - Keio University, Shonan Fujisawa Campus
  - Faculty
    - Me 😊
  - Active members
    - Graduate Students
      - 5 master students  
( 3 will be in Doctors degree next year)
      - Bachelor Students
        - 1 Bachelor student ...
  - Secretary
    - DVTS Consortium

# Internationalization

## What we have to think seriously

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- We are the Research Organization
  - We have published 2 Yearly reports ( 3 on its way)
    - Japanese...
  - Web Pages
    - We have English pages
      - Japanese page has many contents, but ... ☹
  - Workshops and Conferences
    - Mostly held in Japan / Japanese
- This first Workshop is important for us!

# Current DVTS Distribution

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# Slow distribution periods...



- We are veeeeeeeeerrry sorry for the delay ☹️
  - We are focusing on new distribution of DVTS
  - Format support
  - Signaling support
  - Multicast Group
- Major developer of DVTS staffs are
  - Getting busier to finish their master degree
  - But... DVTS is highly related to their master theme 😊
- Please be patient 😊
  - We are doing our best, we are not lazy 😊

# Implementation of DVTS

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## ■ Supported Environment

- FreeBSD 4.X
- FreeBSD 5.X, FreeBSD 6.X, FreeBSD 7.X
- NetBSD 1.5.X
- Linux 2.4.X
- Windows ME
- Windows 2000
- Windows XP
- Mac OS X

# DVTS for Windows

DVTS for Windows Ver 0.0.2



CM67 Special Edition

DVTS for WindowsXP (ComicMarket Special Edition)

DVTS for WindowsXP (ComicMarket Special Edition) interface showing DV Send and DV Receive settings. The interface includes fields for IP Version (IPv4 selected), Port Number (8000), Multicast TTL (1), and Interface (ワイヤレス ネットワーク接続 5(203.178.149.168)). It also features a 'Start Receive' button and status indicators for Packet Count, Packet Lost, and VideoType (Unknown).

DVTS for WindowsXP Ver.0.0.1 interface showing DV Send and DV Receive settings. The interface includes fields for IP Version (IPv4 selected), Port Number (8000), Multicast TTL (1), and Interface (ワイヤレス ネットワーク接続 6(65.74.218.239)). It also features a 'Start Send' button and a 'Start Receive' button. A red arrow points to the 'Start Receive' button, highlighting the 'Multicast Capability'.

Multicast Capability

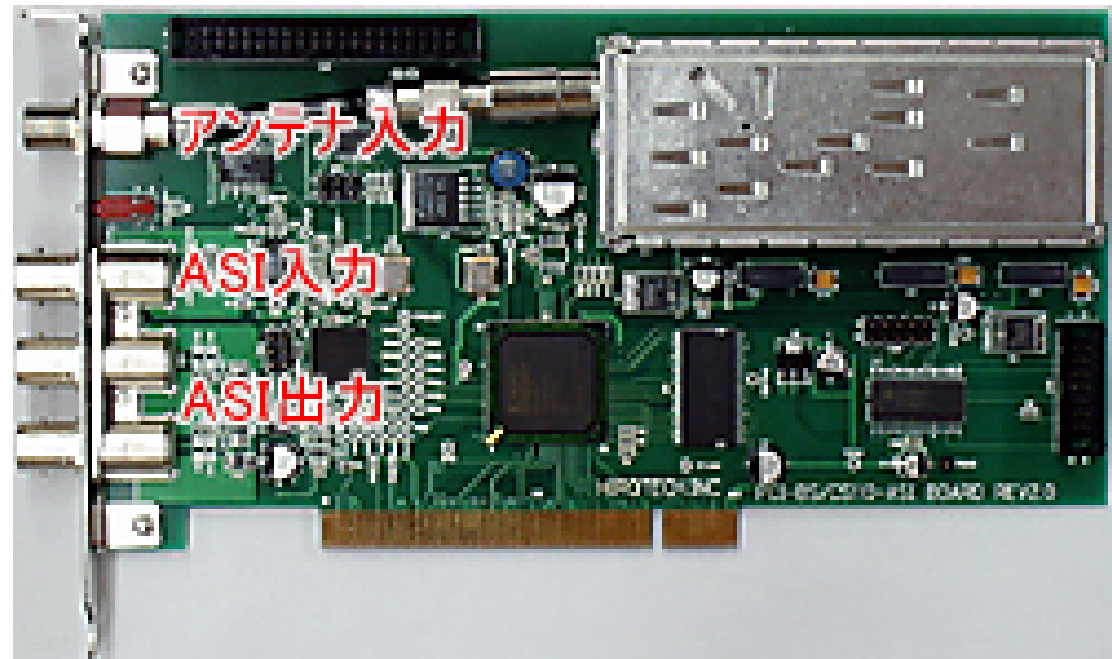
# DVTS for MacOS X

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- Multicast support
- Coding issues,
  - We need to have a good collaboration with Apple.
  - We will be getting an development kit for Quicktime in the beginning of October

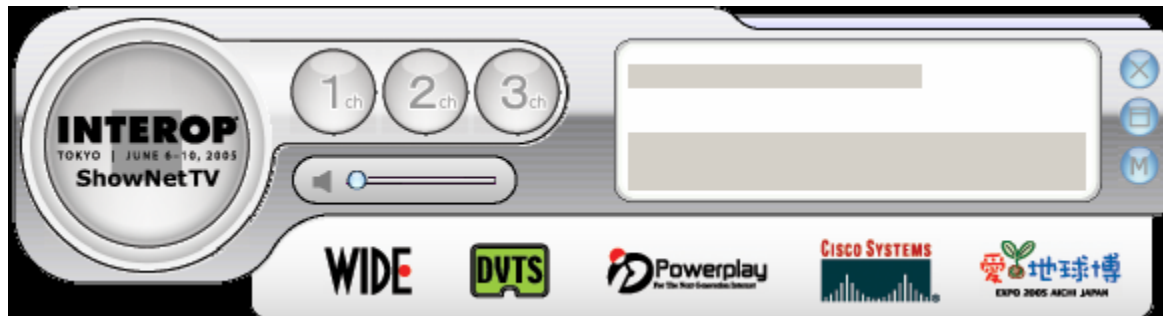
# Digital Broadcasting Tuner



# Custom DVTS



- Custom DVTS
  - For INTEROP ShowNetTV
    - IPv6 Multicast
    - 3 channel





# Enhancing DVTS

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# DVTS Future



- High Quality, Broadband, Low Latency

- Resolutions

- 120 x 80 / 160 x 120 / 240 x 160 / 320 x 240 / 480 x 320
    - 640 x 480
    - 720 x 480
    - 1024 x 768
    - 1080 x 720
    - 1920 x 1080
    - 1600 x 1200
    - 1960 x 1200
    - 3820 x 1200
    - 3820 x 2400
    - 7640 x 4800

- Frame Rate

- 5/12/15/25/30(29.97)/60
    - 90/120/150/180

- Colors

- 8 bit
    - 15 / 16 bit
    - 24 / 32 / 64 bit

1996 July, Stream Works Live



# Windows XP



- Completely new coding from scratch
- PAL people ? NTSC people? JOIN!
  - PAL support added
- IPv6 Multicast? IPv4 Multicast? No problem!
- Dual output support
  - IEEE1394 output
  - Display output (supports full screen output)
- RTCP supported
- Flow control / Synchronization
  - Better lip synchronization problem
- DIF Block configuration for MTU adjustment
- New user interface
- SDP (send, receive)

Kazuhiro Mishima ([three@sfc.wide.ad.jp](mailto:three@sfc.wide.ad.jp))

# MPEG2TS



- BS Digital Broadcast
- Recording Medium
  - D-VHS (Digital VHS)
- Video Camera
  - MICROMV(Sony)
- DV-HD
  - 720p Hi vision
  - 1080i Hi vision
- IEEE1394 Interface
  - Merge **DVTS**



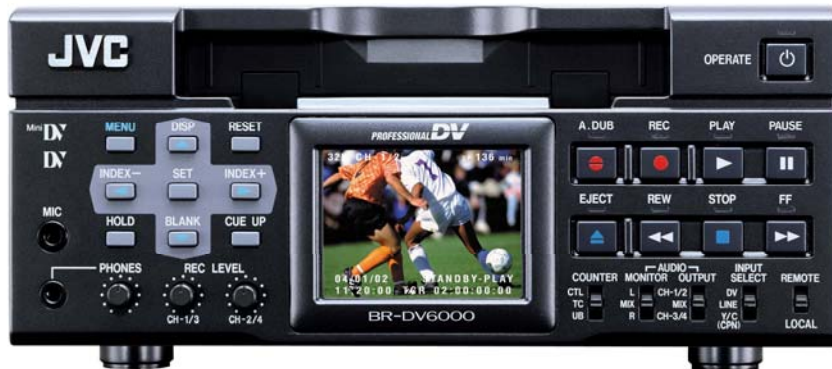
# Linux Release

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- Supports MPEG2TS
  - MPEG2 based DV
  - MPEG4 based DV
- HDV Support
- HDVTS
- Interoperability support with VIDEO Lan

# Embedded DVTS by JVC



Embedded DVTS



Extension Module



Embedded Linux



# Another JVC Embedded DVTS



- With Collaboration of DVTS, JVC, and Aloka

- First medical appliances

- Aloka echo ultra sonography system

- DVD recorder embedded DVTS

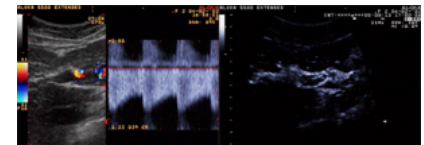


Figure 1

Figure 2

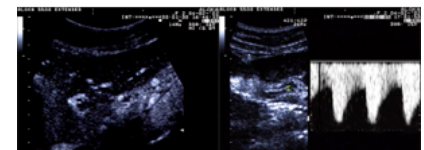
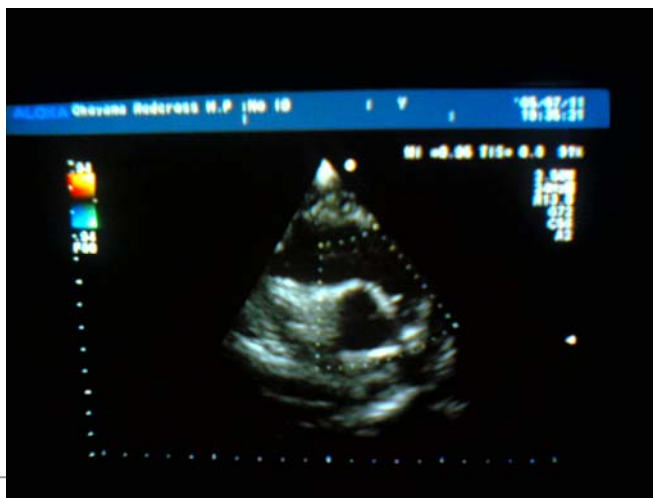
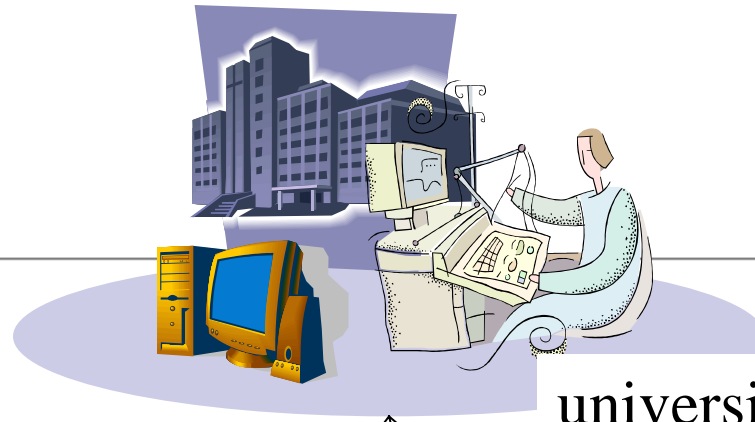


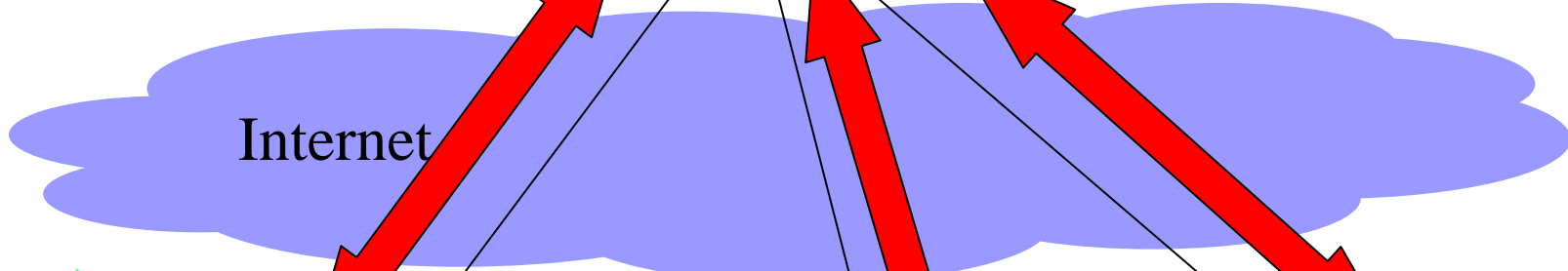
Figure 3

Figure 4





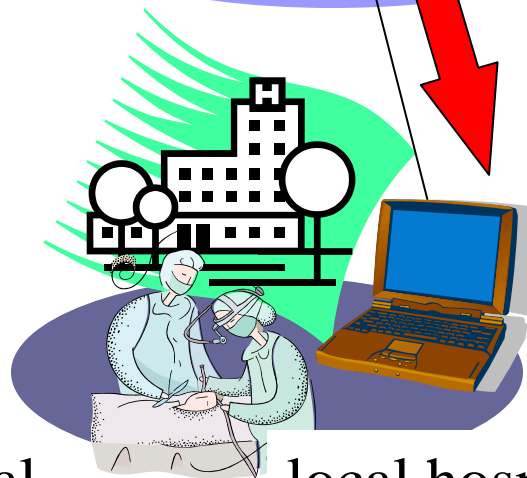
university hospital



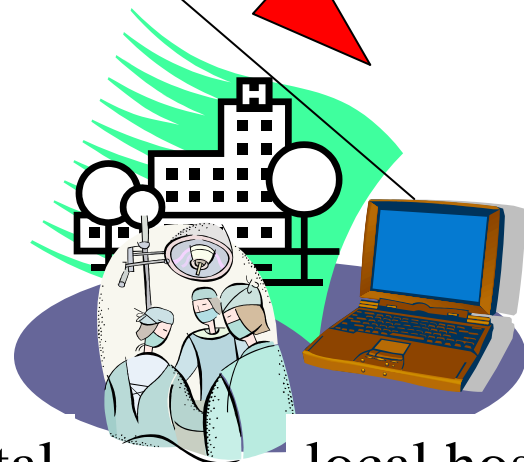
Internet



local hospital



local hospital

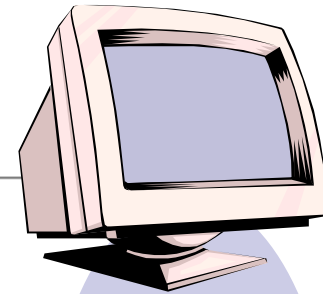


local hospital





ultrasonograph



DVTS



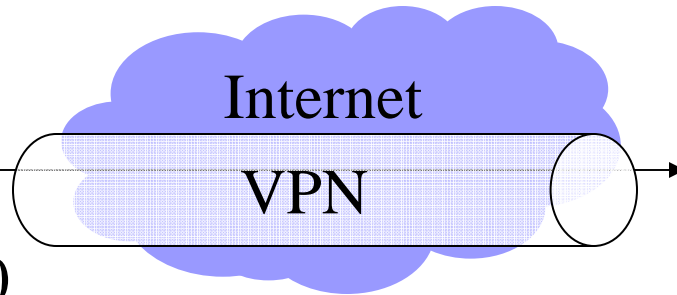
Embedded DVTS



Embedded DVTS



IX2010



IX2010



# Research and Development

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# Doing Math..

- Sending Uncompressed Raw HD streams

- $1920 \times 1080 \times 32 \times 24 = 1.59\text{Gbps}$   
 $= 199\text{MB / Sec}$

vs.

- PCI Bus (32Bit)

- $33.3\text{MHz } 32\text{Bit} = 33.3 \times 32 / 8 = 133\text{MB/Sec}$

- HDD – Memory – Screen – Network

- Limitation in Bus Bandwidth

- Sending Q-HD

- $3840 \times 2400 \times 32 \times 24 = 7.08\text{Gbps}$   
 $= 885\text{MB / Sec}$

- PCI-X

# Interoperability Symposium



- July 21<sup>st</sup> – 23<sup>rd</sup>, 2004
- Keio Univ. SFC





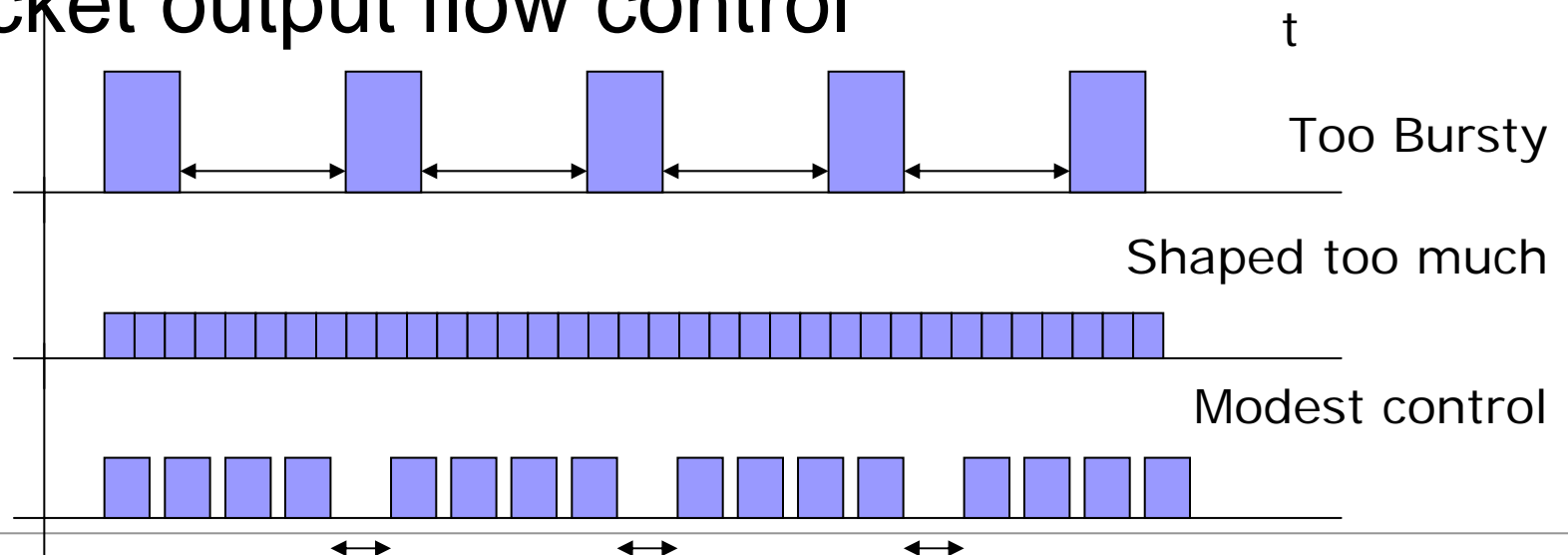
# Packet Flow Control

## ■ Packet output jitter

### ■ Interoperability issues in

- Hardware embedded systems
  - Has low buffer availability / Causing buffer overflow with burst traffic
- Buffer overflow and buffer under run

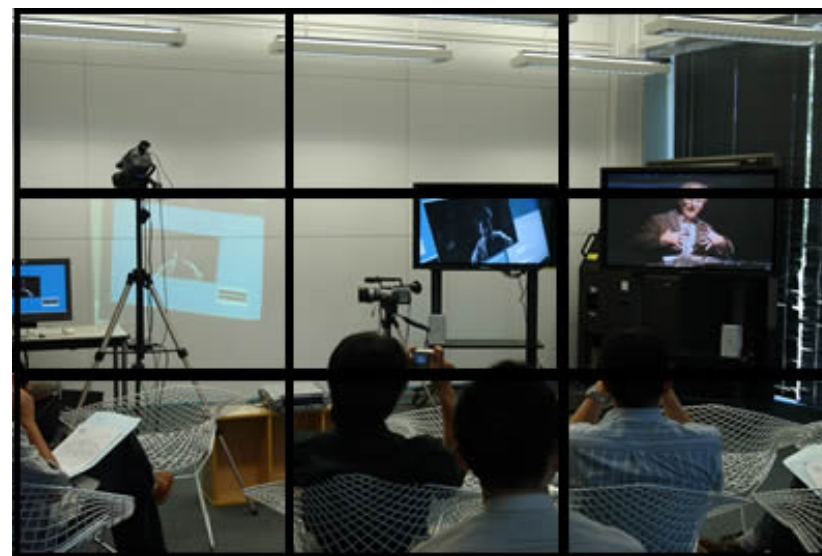
## ■ Packet output flow control



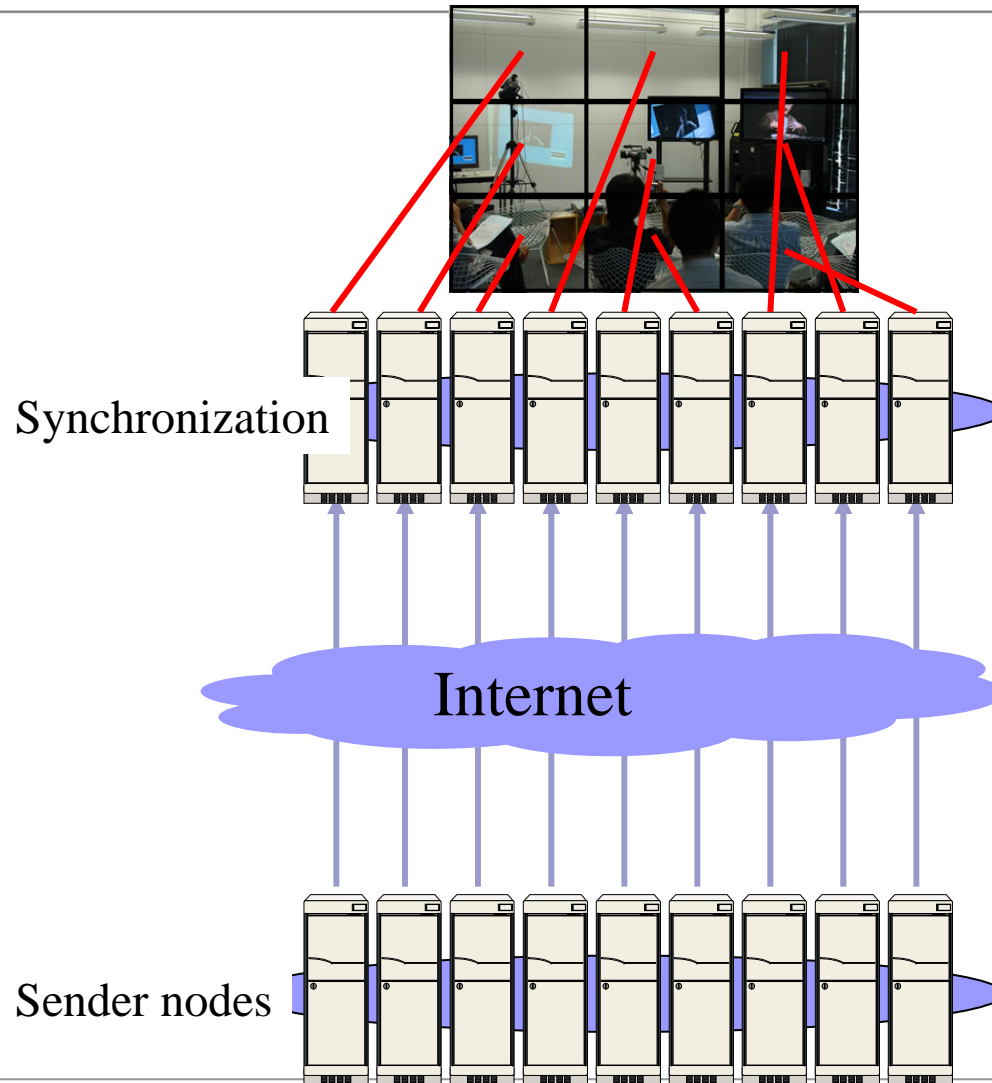
# Multi-vision DVTS



- Multi-vision
  - Multiple Display
    - 3x3, 4x4
  - High resolution



# M-DVTS



# Technology Requirement

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- Packet Streaming
- Synchronization
- Isochronous transport
- Jitter control
- Real time accessibility
- Collaborative packet flow control

# HD @ Minimal Cost

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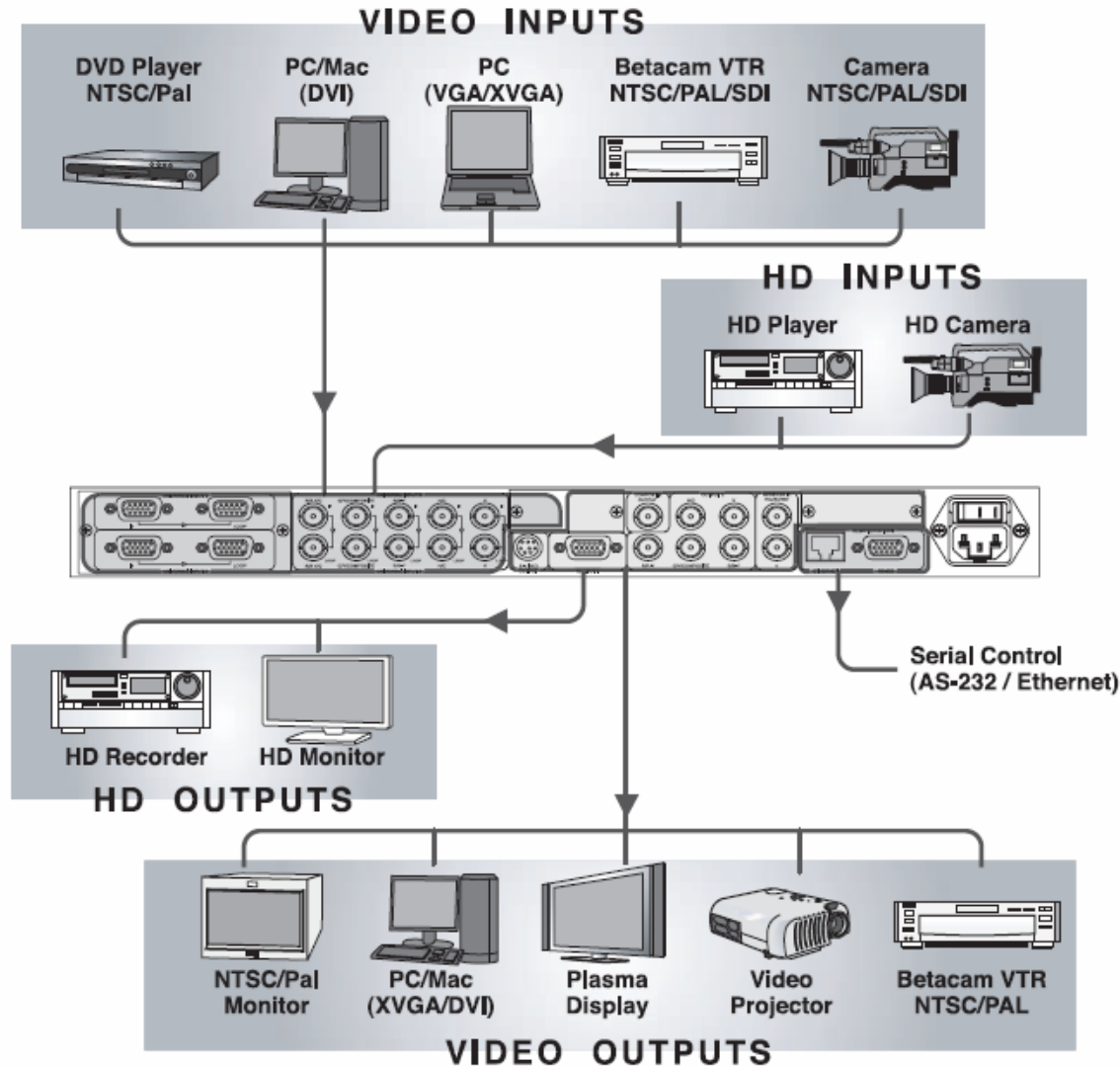


# Higher Quality, Higher \$\$\$

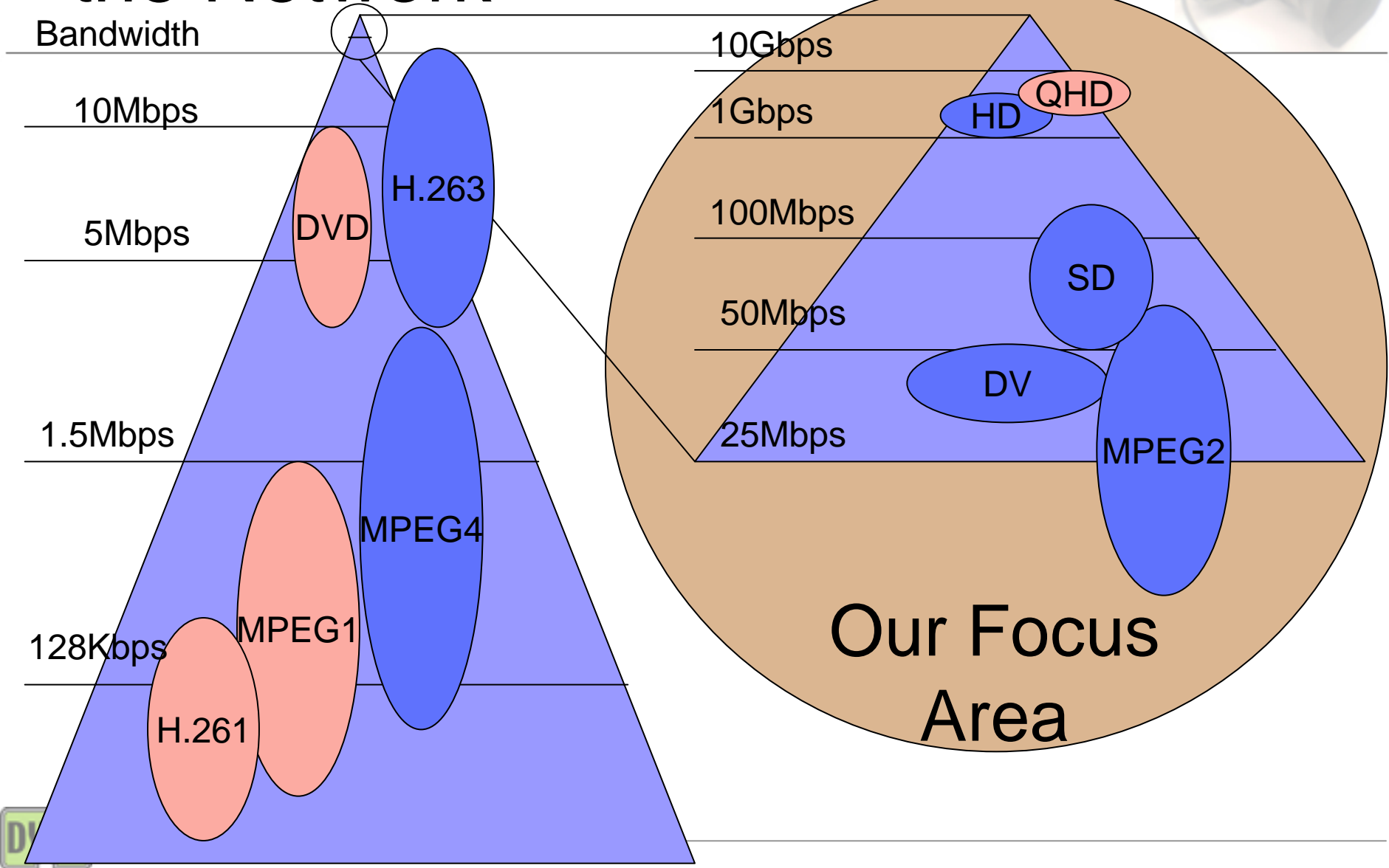


- Higher resolution requires higher bandwidth
  - Equipment costs
    - HD Cameras
    - HD Video recorders...
- Low cost solutions
  - Using Media conversion unit ( Media Scalar )
    - Indie 400
      - Conversion between
        - Composite, Component, IEEE1394, SD, HD, SDI...

# Highly integrated video mixing and channeling



# Video Streaming Over the Network



# FYI

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<http://www.sfc.wide.ad.jp/STREAM>

<http://www.dvts.jp/>