Getting started with DVTS

Streaming for the Internet

Keio University

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Our Motivations

- Developing
  - High Bandwidth applications
  - Real time application
    - Isochronous and collaborated packet forwarding
  - Scalable application
    - Considering next generation infrastructure
- Consumer availability
  - High Technology at low cost

Video Streaming Everywhere

- Development in device technology
- Broadband network infrastructure
- IPv6 Ubiquitous Computing
- Wireless Network
- Digital Broadcast contents
- Copyright Control

Stream based communication and collaboration

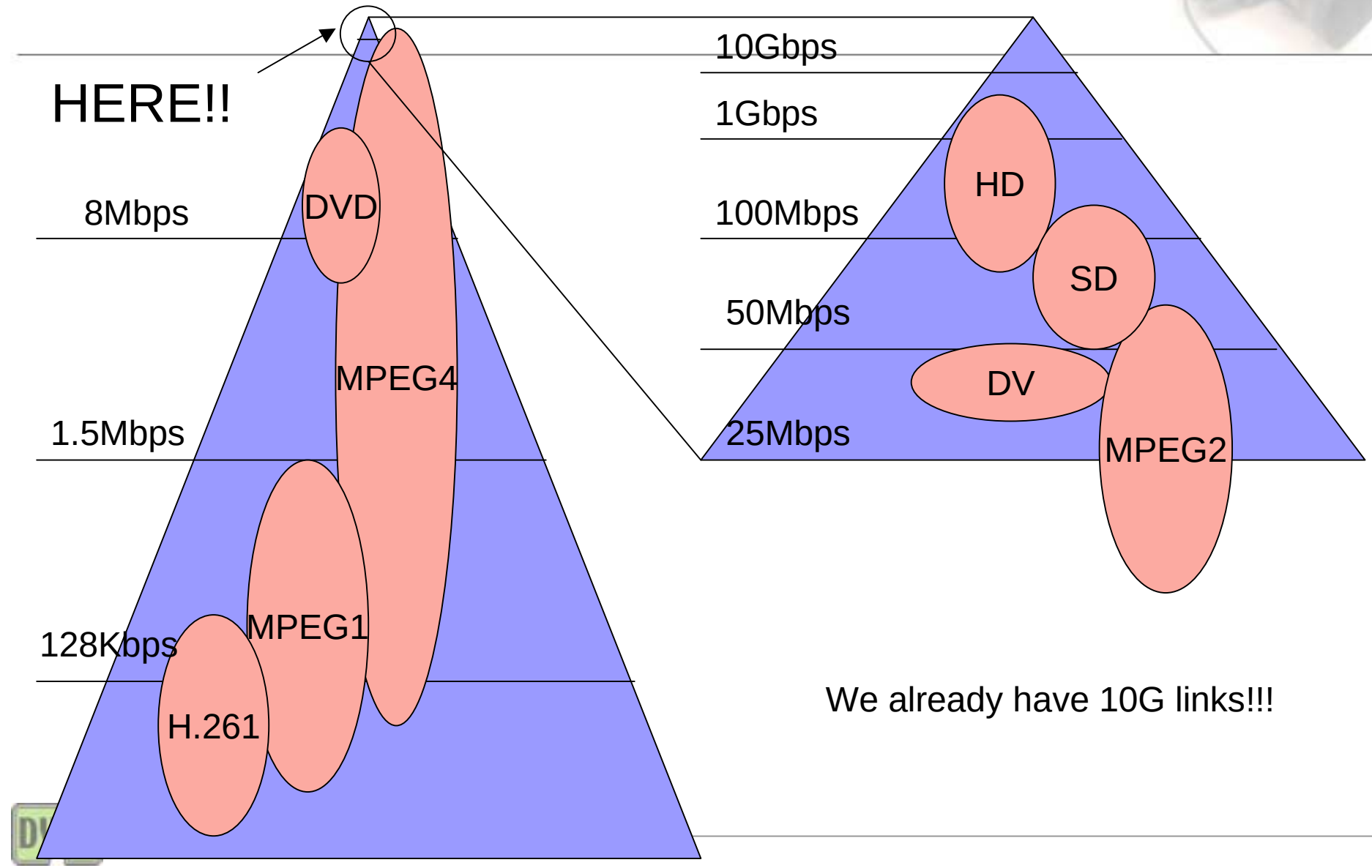
- Debate
- Drama
- Collaborative works
- Speech
- Presentation

Superior Quality + Superior Scalability

Superior Quality Streaming

- Open source
- Publicity
- Expansion
- Possibilities
- Applied use

Where we focus:



We already have 10G links!!!

Video Streaming

- 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

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

Our system Design

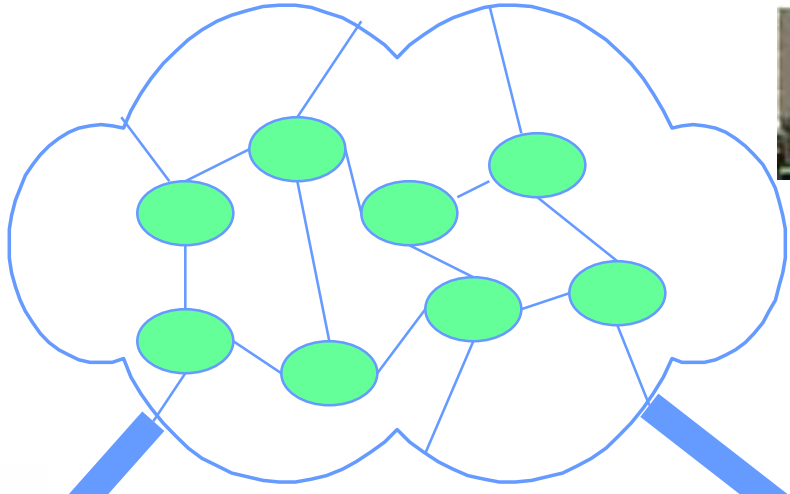
- Ease of Availability
  - Consumer DV products
  - Simple IEEE1394 to IP encapsulation
- Network conservation technique
  - Frame discarding method
- packet loss, delay and jitter adaptation
  - Simple buffering/discarding technique

DV Transport System

Consumer DV Camera

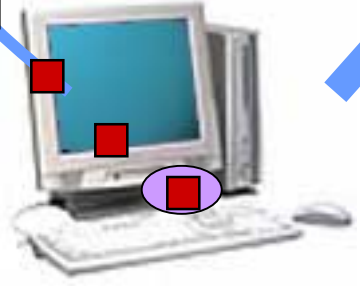
Consumer DV

IEEE1394



Internet

IEEE1394



DV→Internet PC

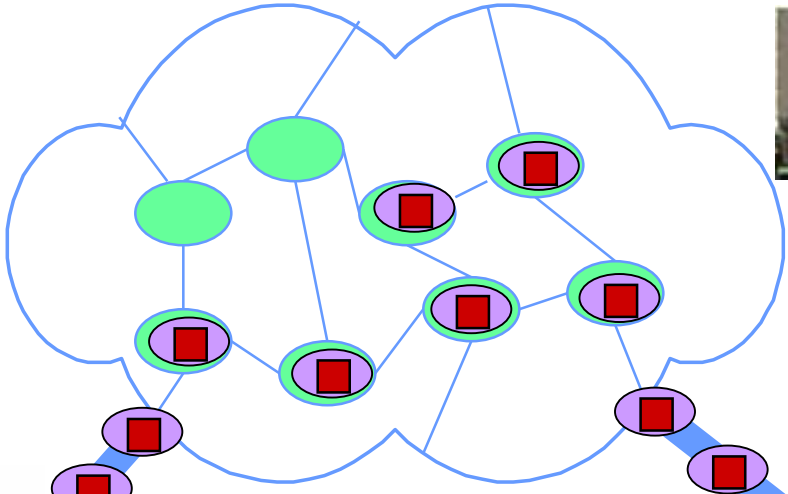
Internet →DV PC

DV Transport System

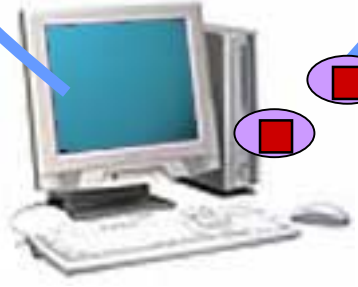
Consumer DV Camera

Consumer DV

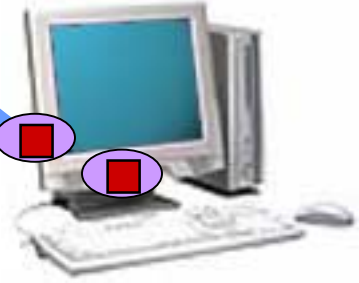
IEEE1394



IEEE1394



Internet



DV→Internet PC

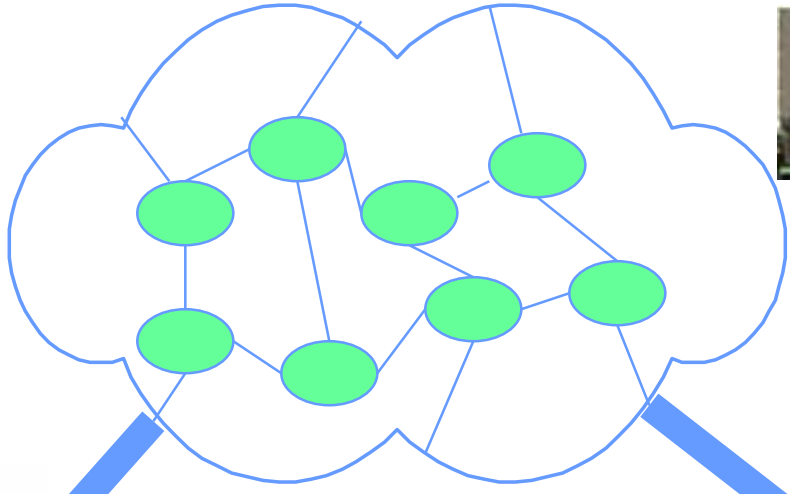
Internet →DV PC

DV Transport System

Consumer DV Camera

Consumer DV

IEEE1394



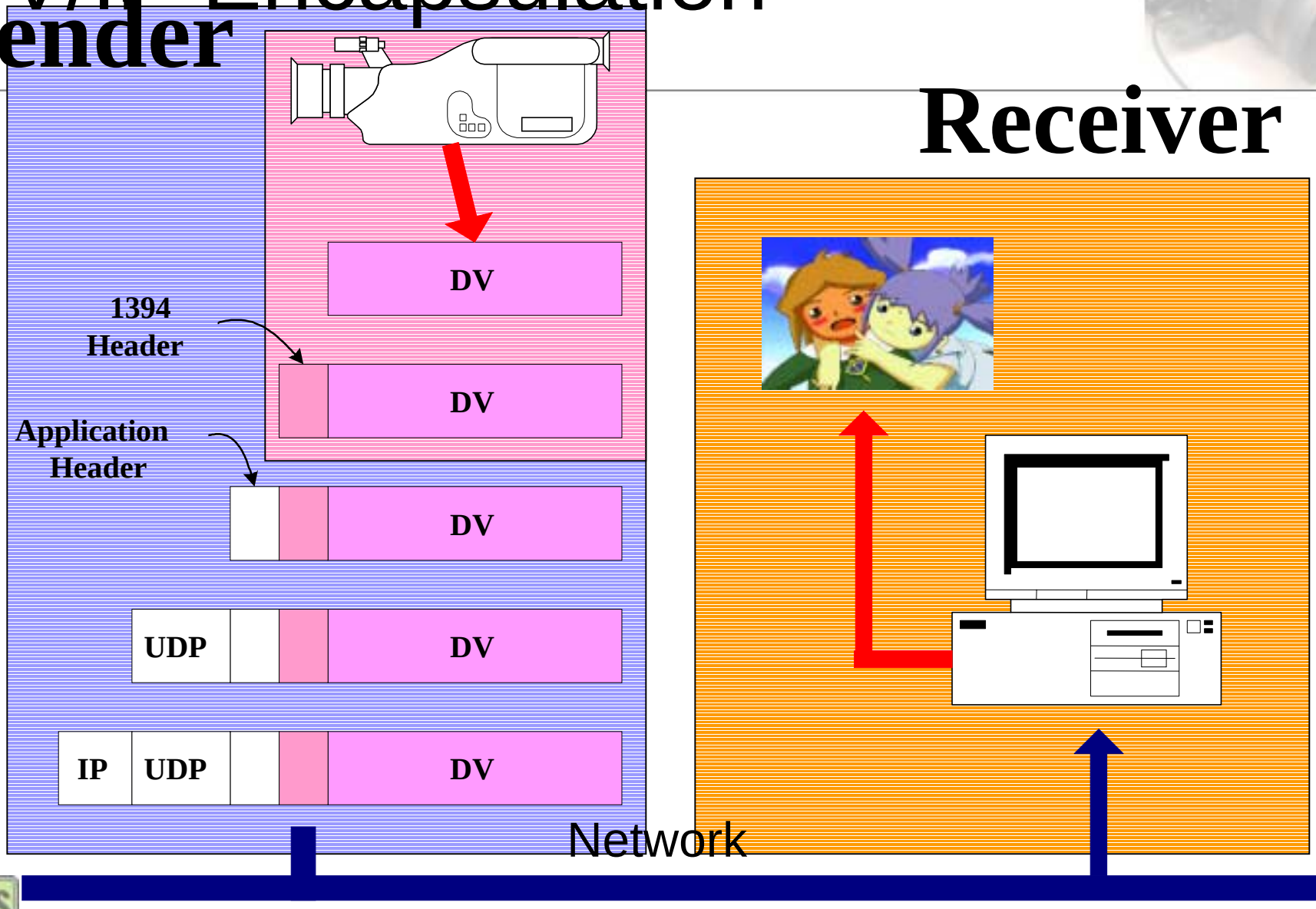
IEEE1394

Internet

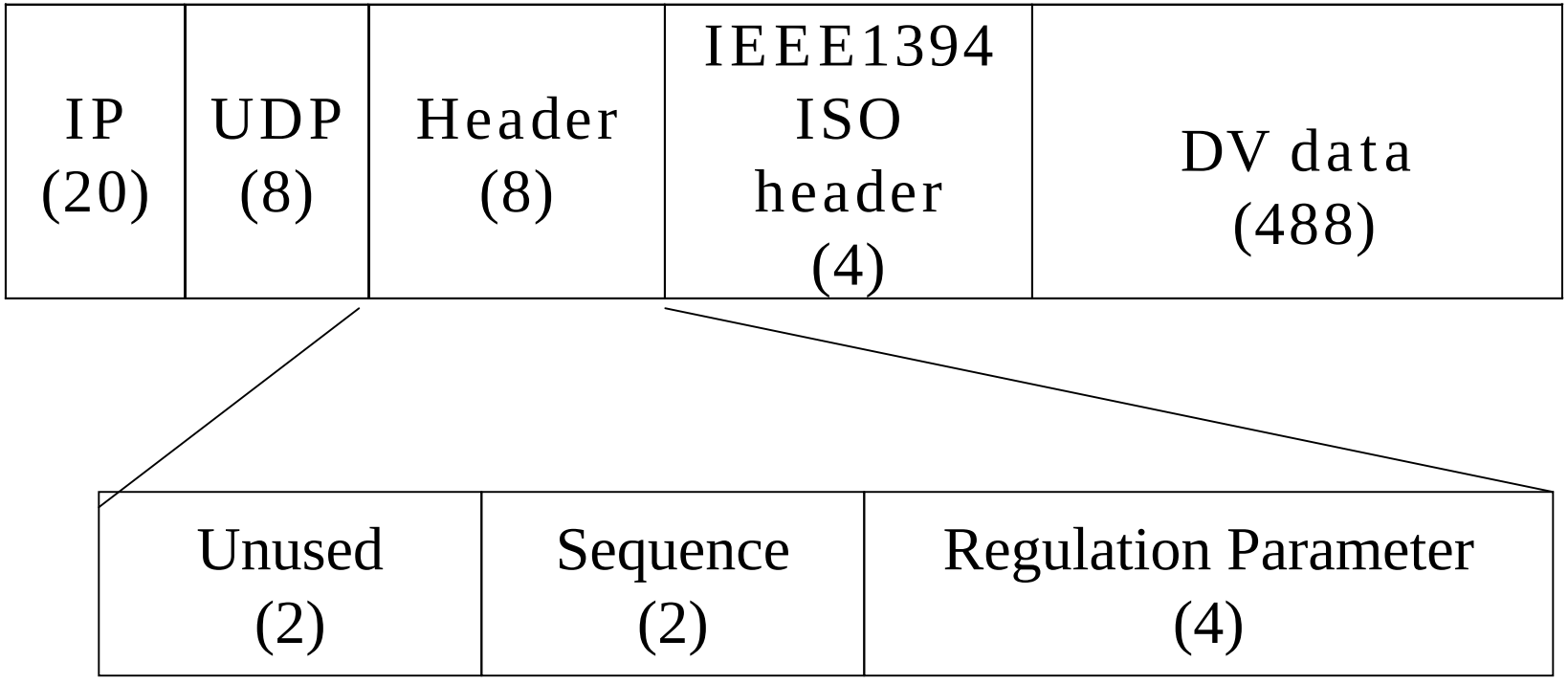
DV→Internet PC

Internet →DV PC

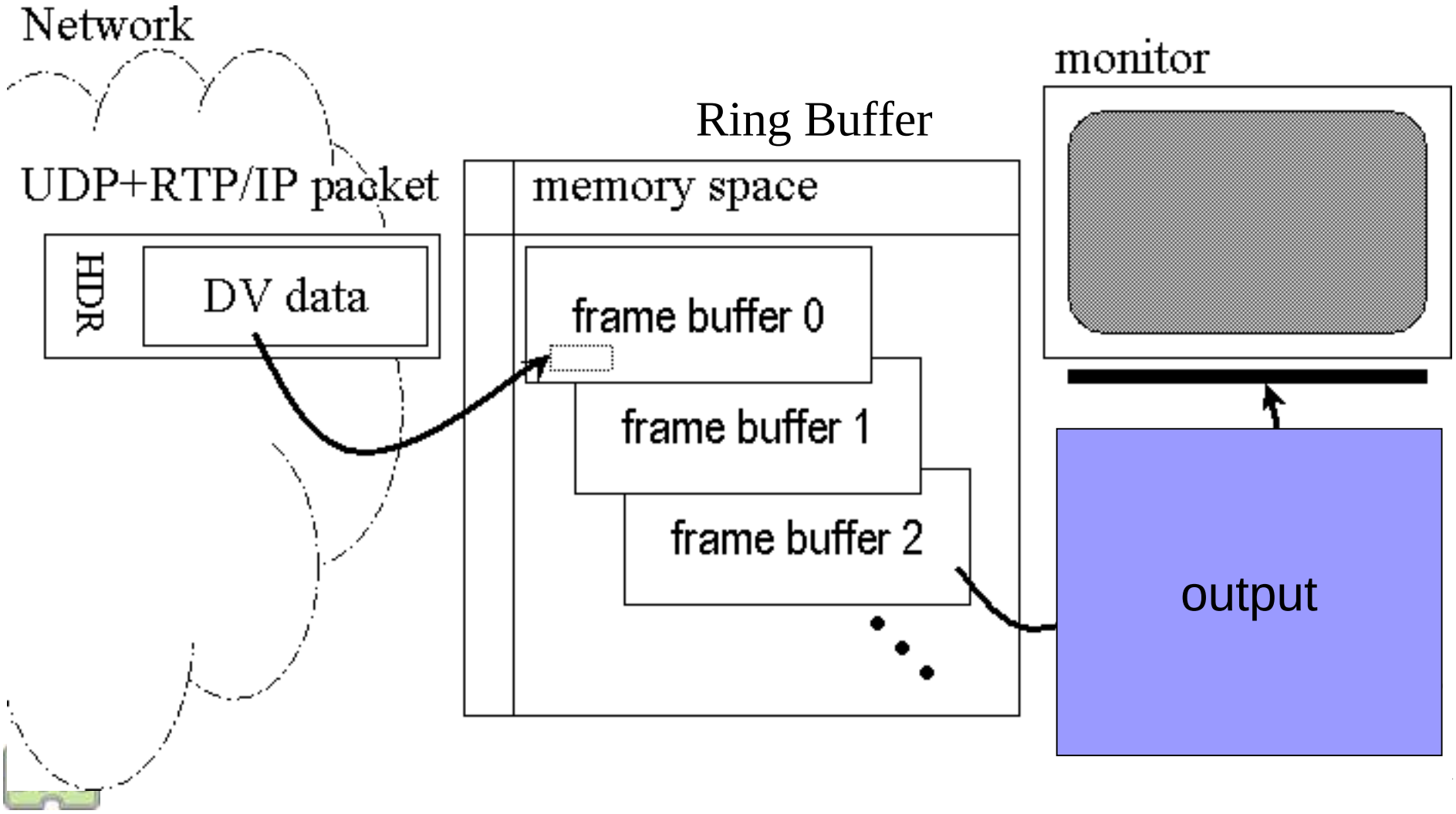
DV/IP Encapsulation



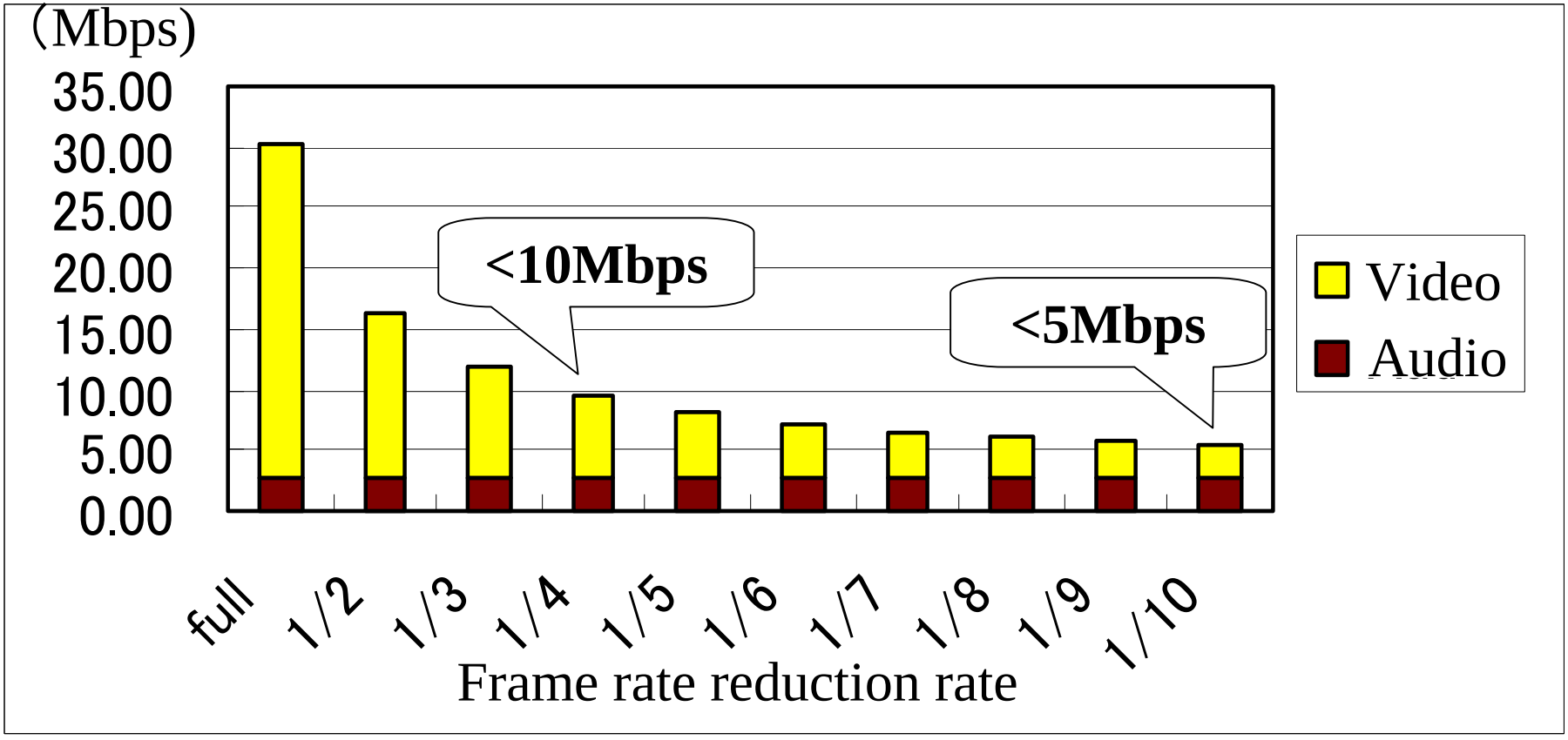
Packet Format



Receiving and showing it to the monitor: Frame Buffering

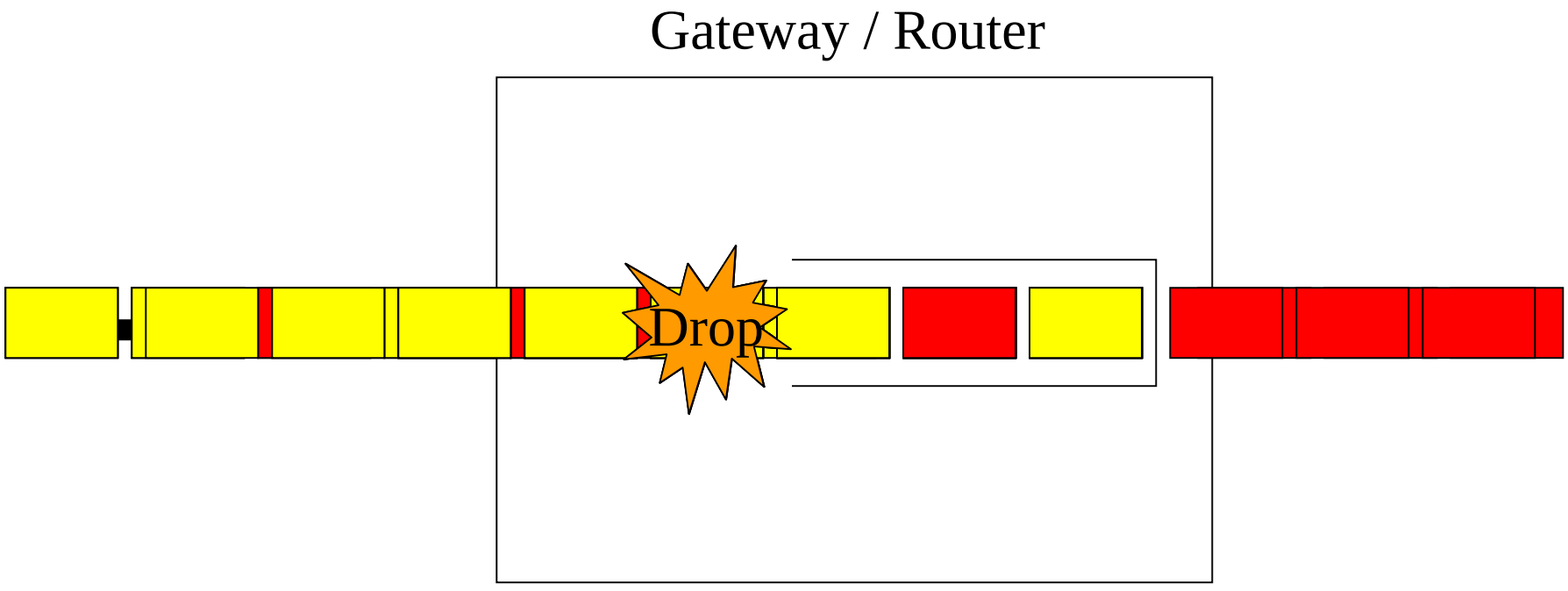


Bandwidth Required for DV

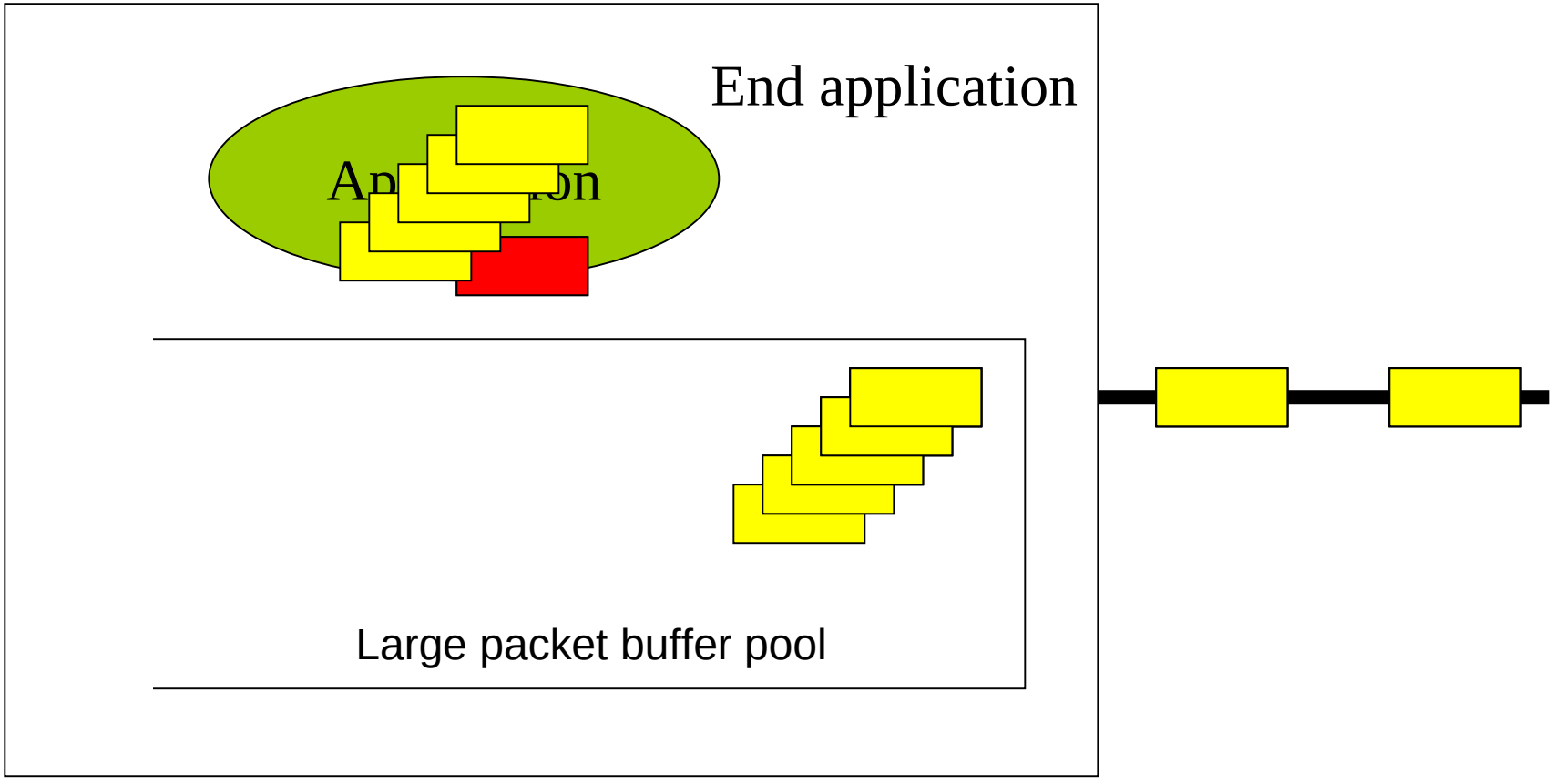


3. 56Mbps(1fps)

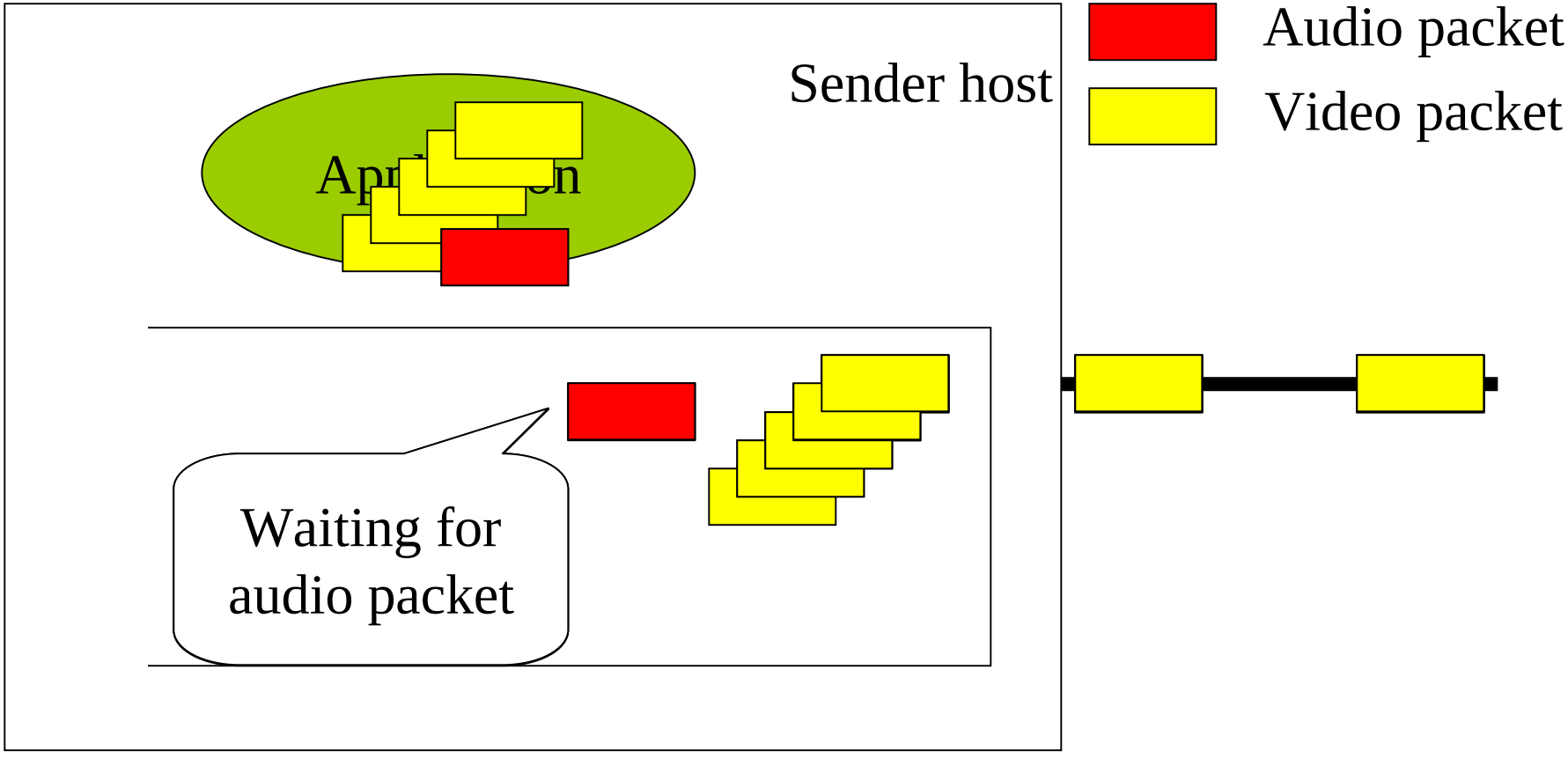
Congestion mechanism



End application based packet shaping (Avoiding burst traffic)

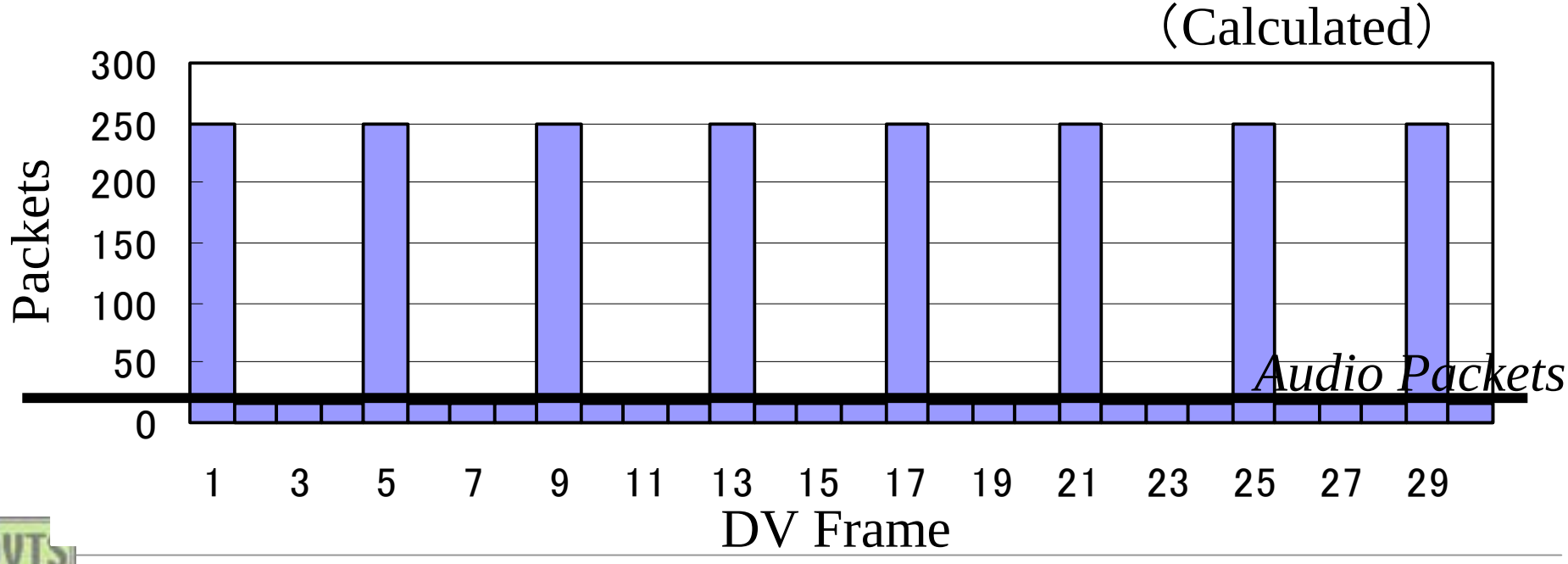


Jitter caused by priority mismatch



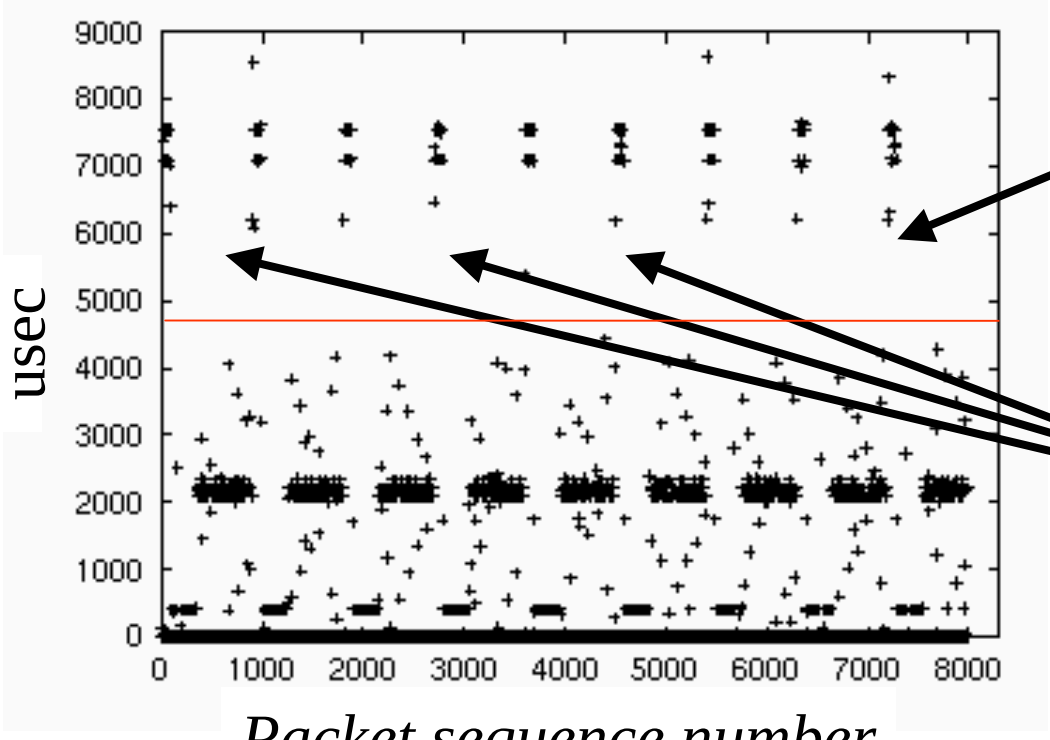
Burst Traffic of CBR

- Periodic burst traffic caused by CBR UBR
  - Caused by frame reduction method
- Traffic measurement of ¼ frame reduction



Burst Packet in 10Mbps

- Packet jitter in 10Mbps networks(in 1/5 mode)



Delay caused by video frame

IEEE1394 bus deadline

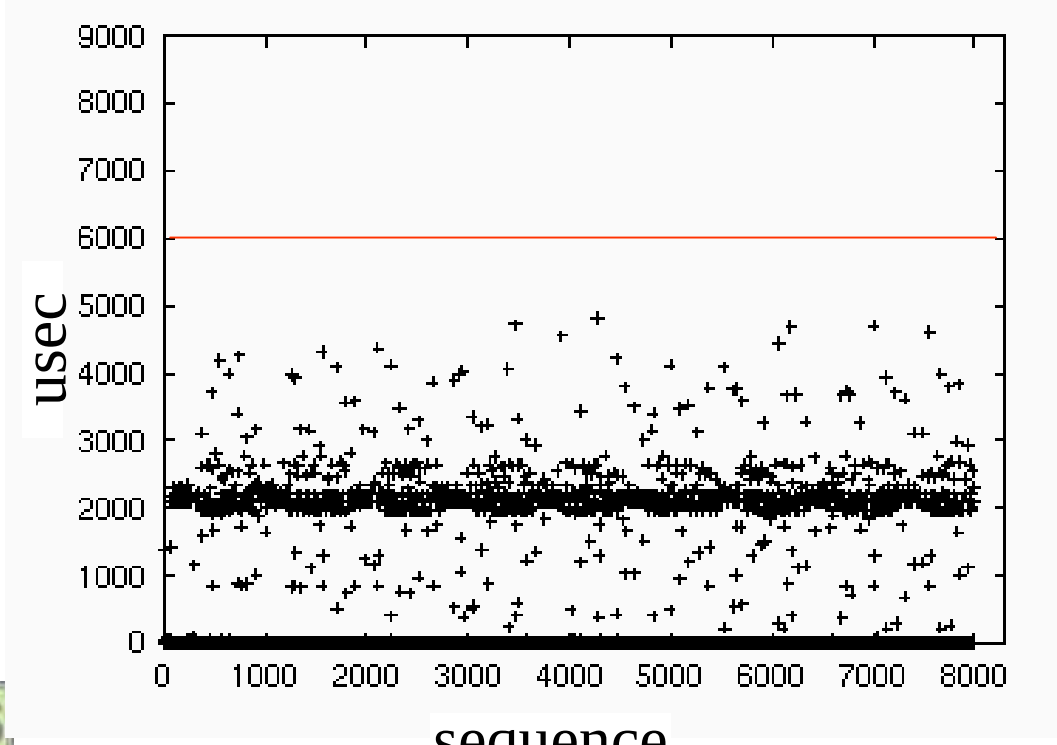
Periodic delay

Shaping the Burst Packets

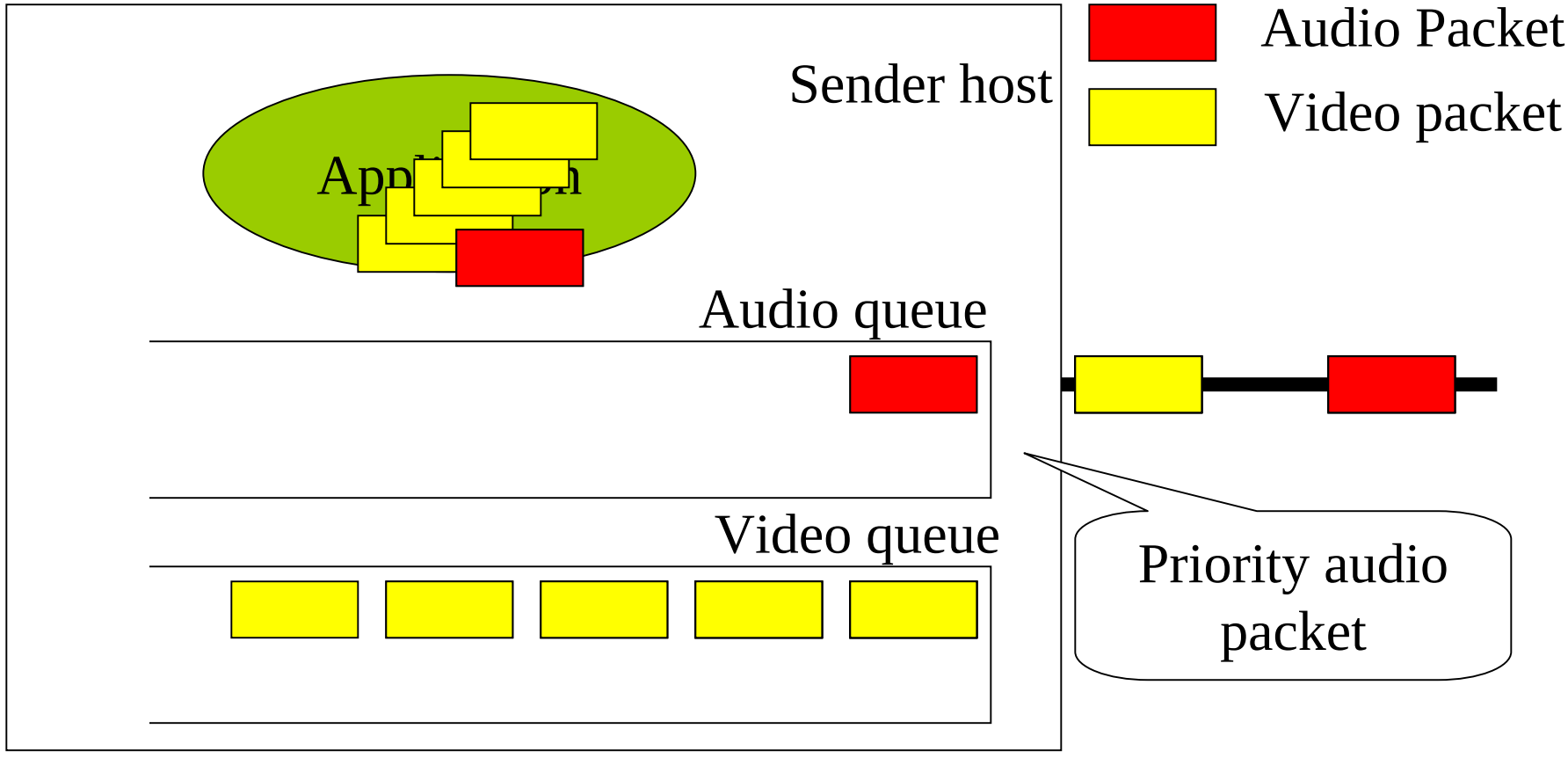
- Smoothing the burst UBR packet flow
  - Shaping, flow control
    - Using CBQ as a shaper
- Separation of Audio, Video packet
- Priority control of Audio Packet
  - Adapting audio jitter
- Collaborative frame rate control
  - Using RTCP/RTP

10Mbps with CBQ

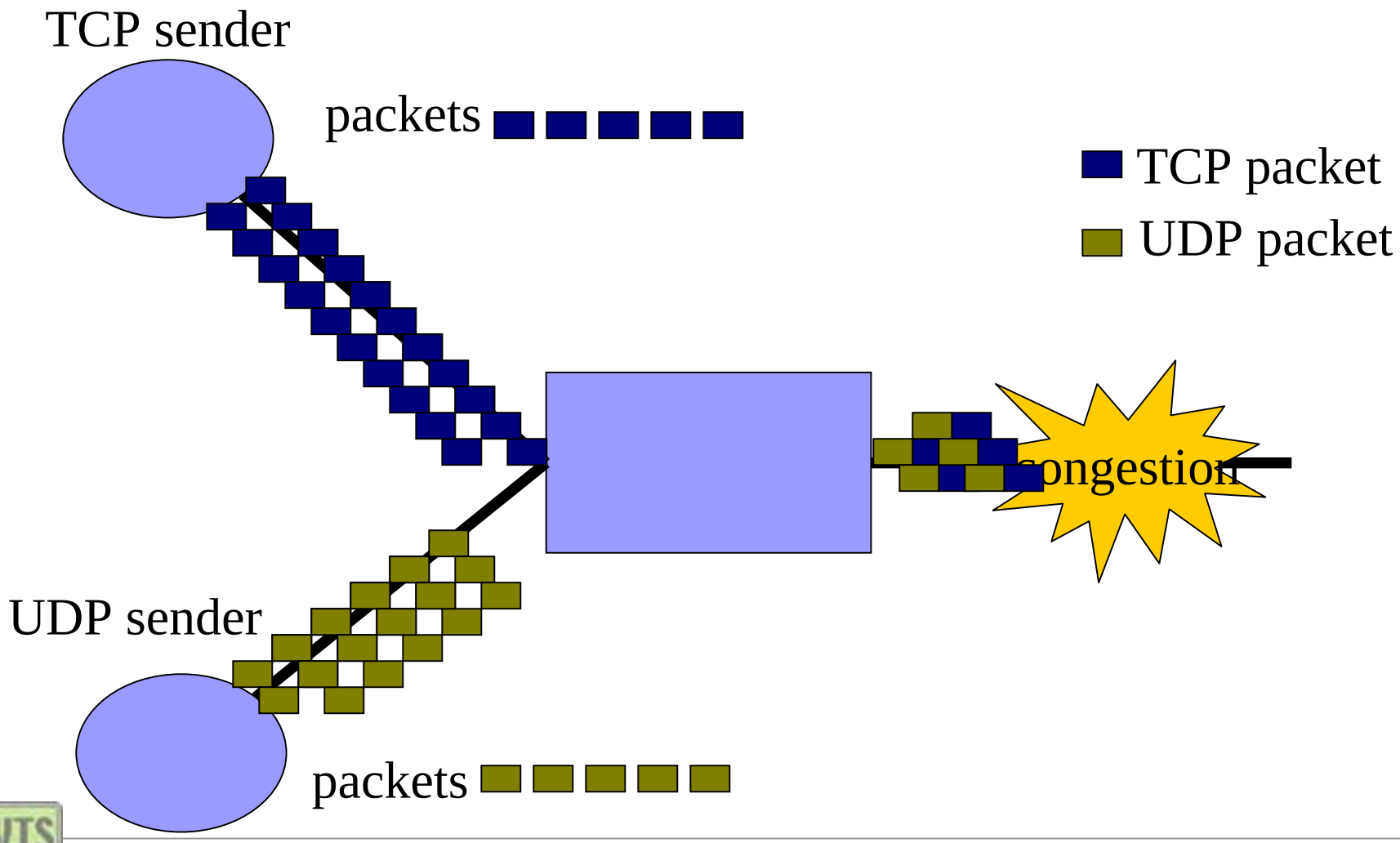
- Audio packet priority control with CBQ packet shaping



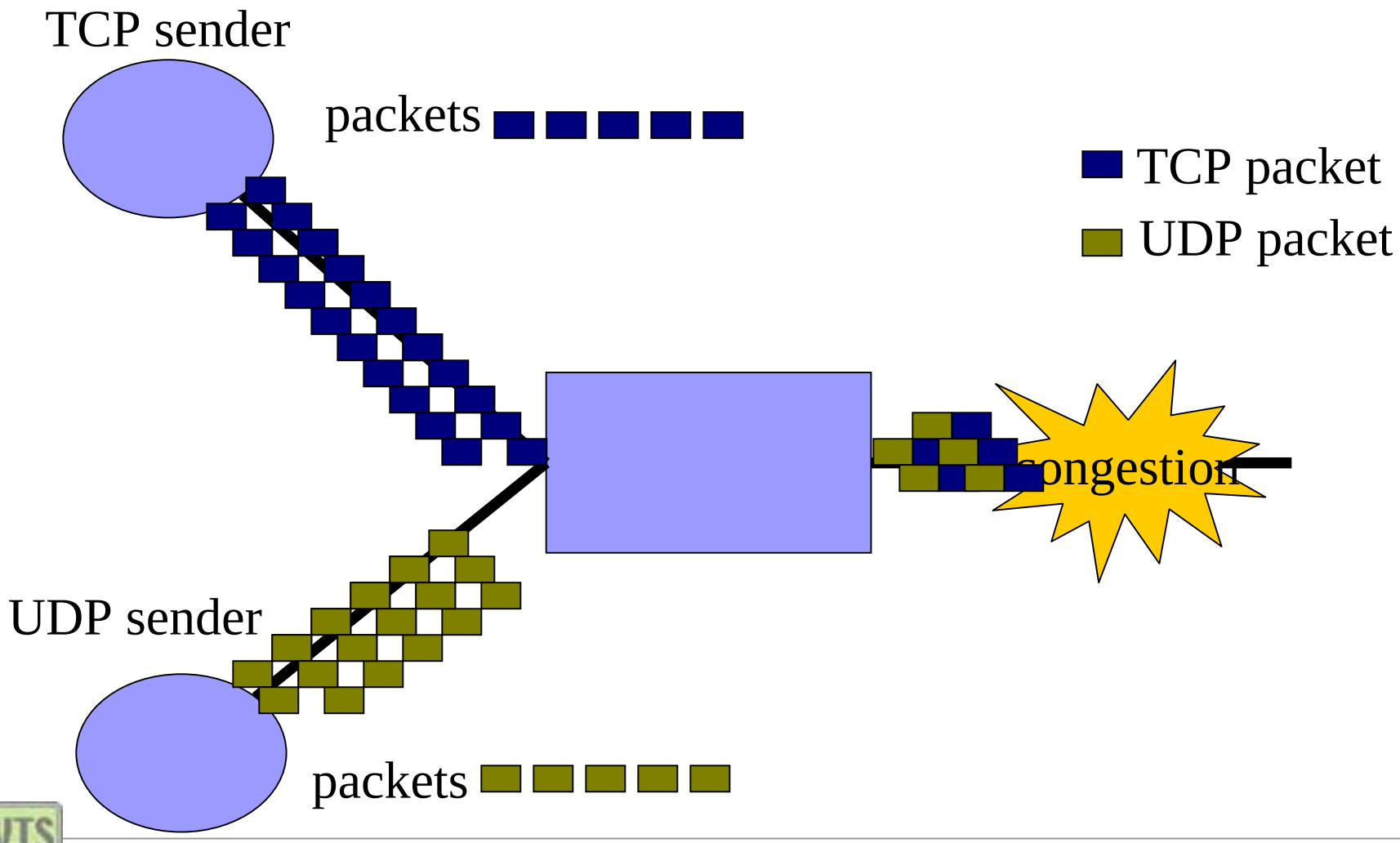
Separation of packet



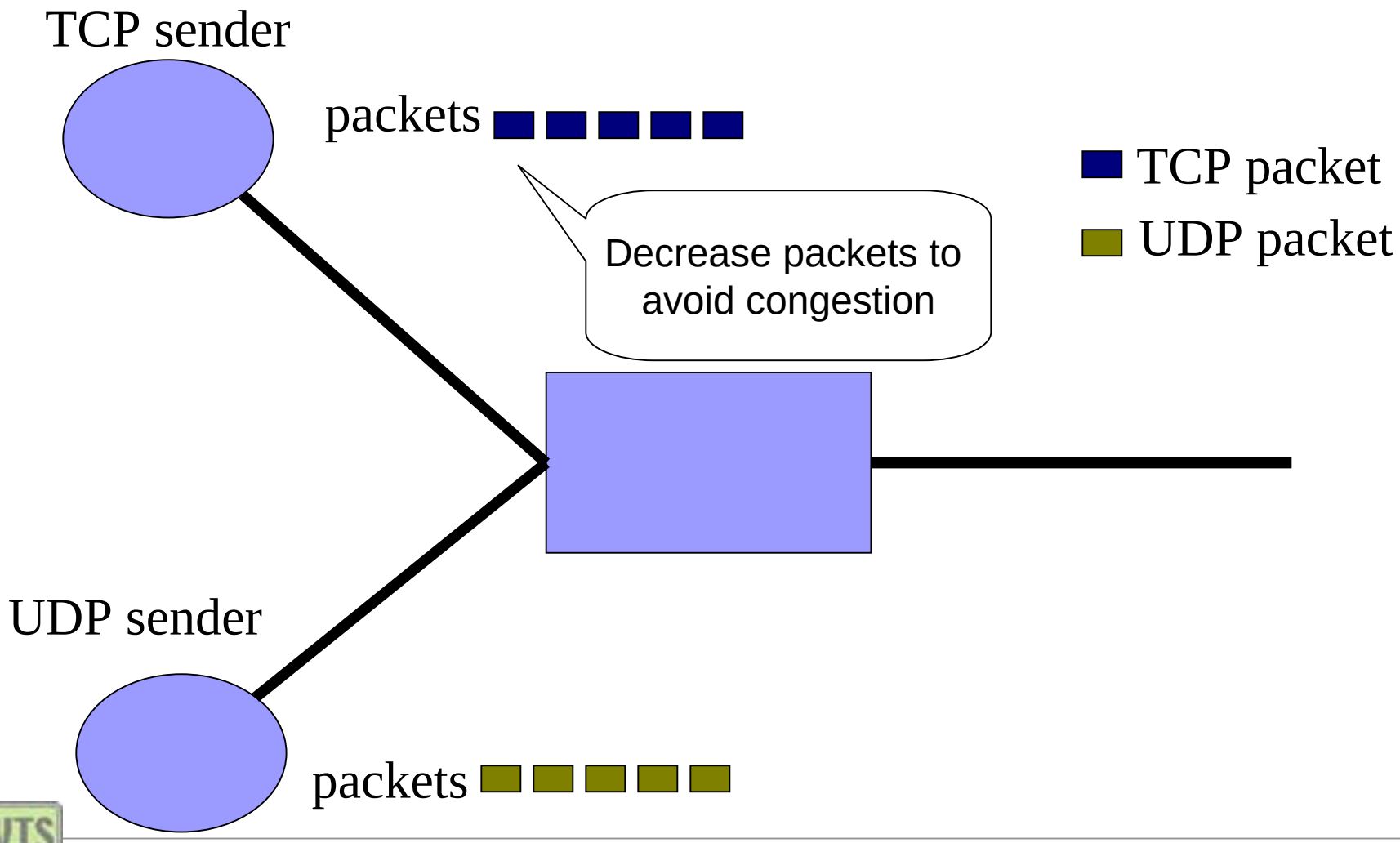
TCP＋UDP Traffic



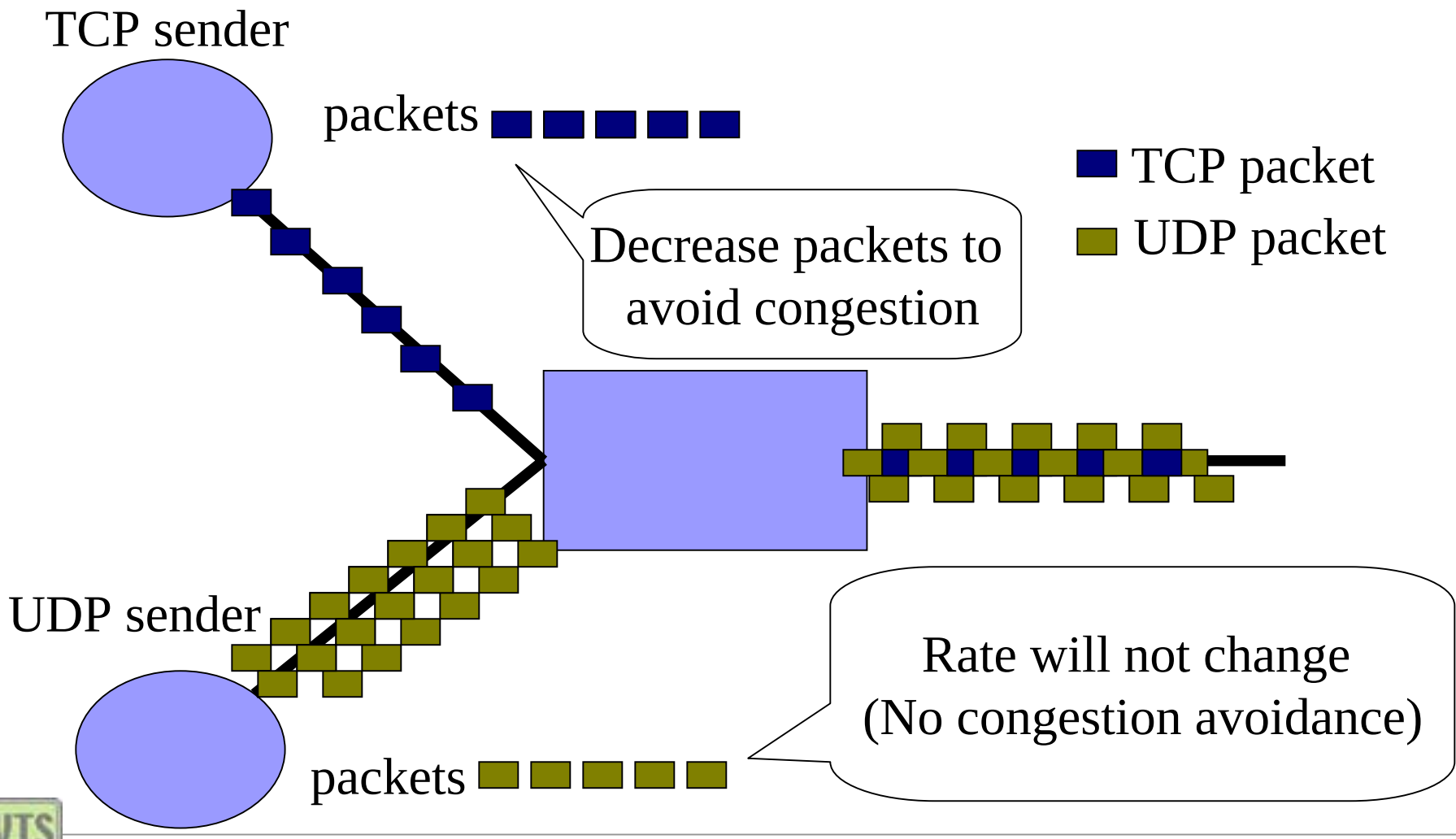
TCP＋UDP Traffic



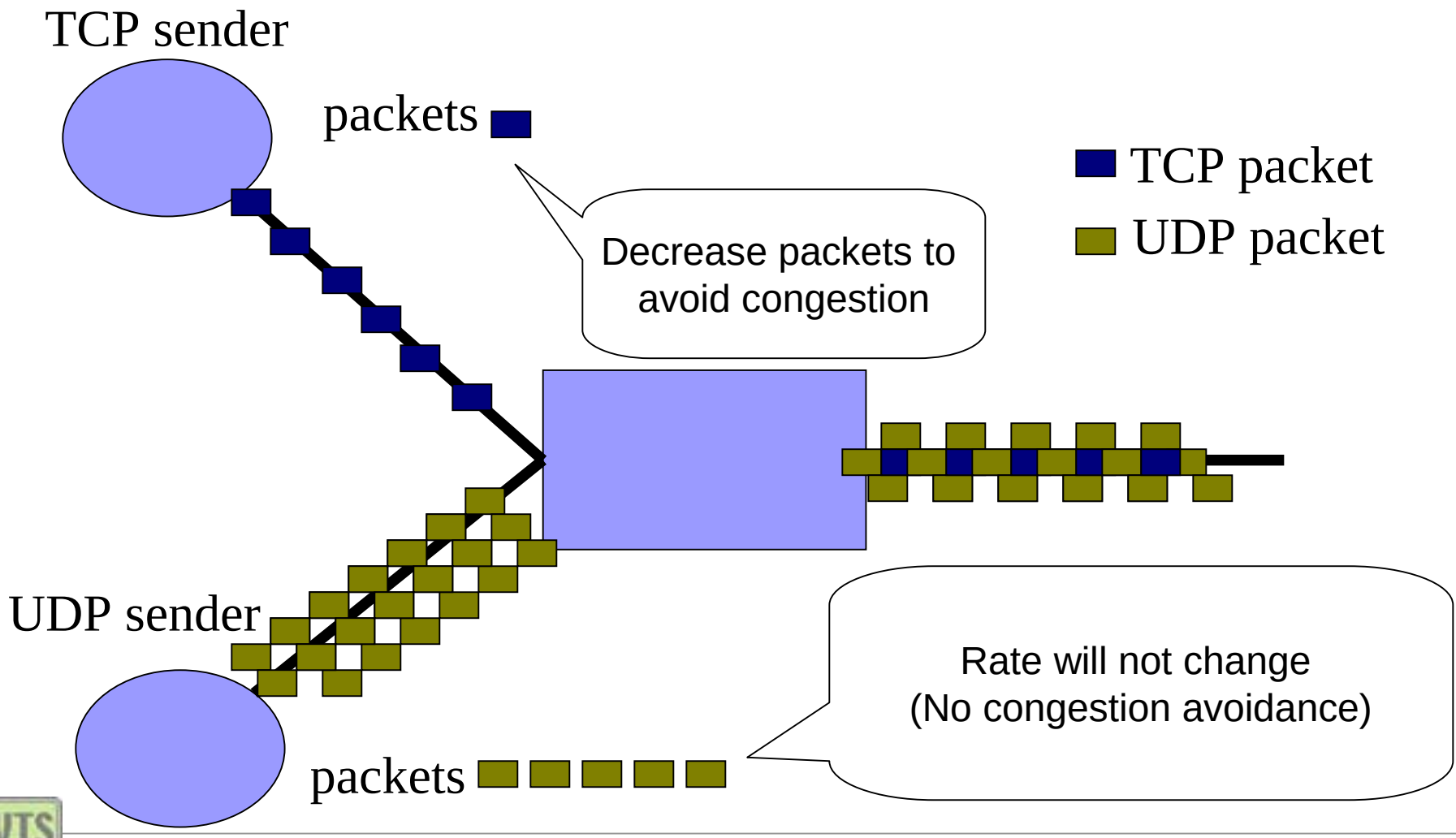
TCP＋UDP Traffic



TCP＋UDP Traffic



TCP＋UDP Traffic



Maximum throughput availability of TCP

- By S. Floyd
  - TCP friendly traffic

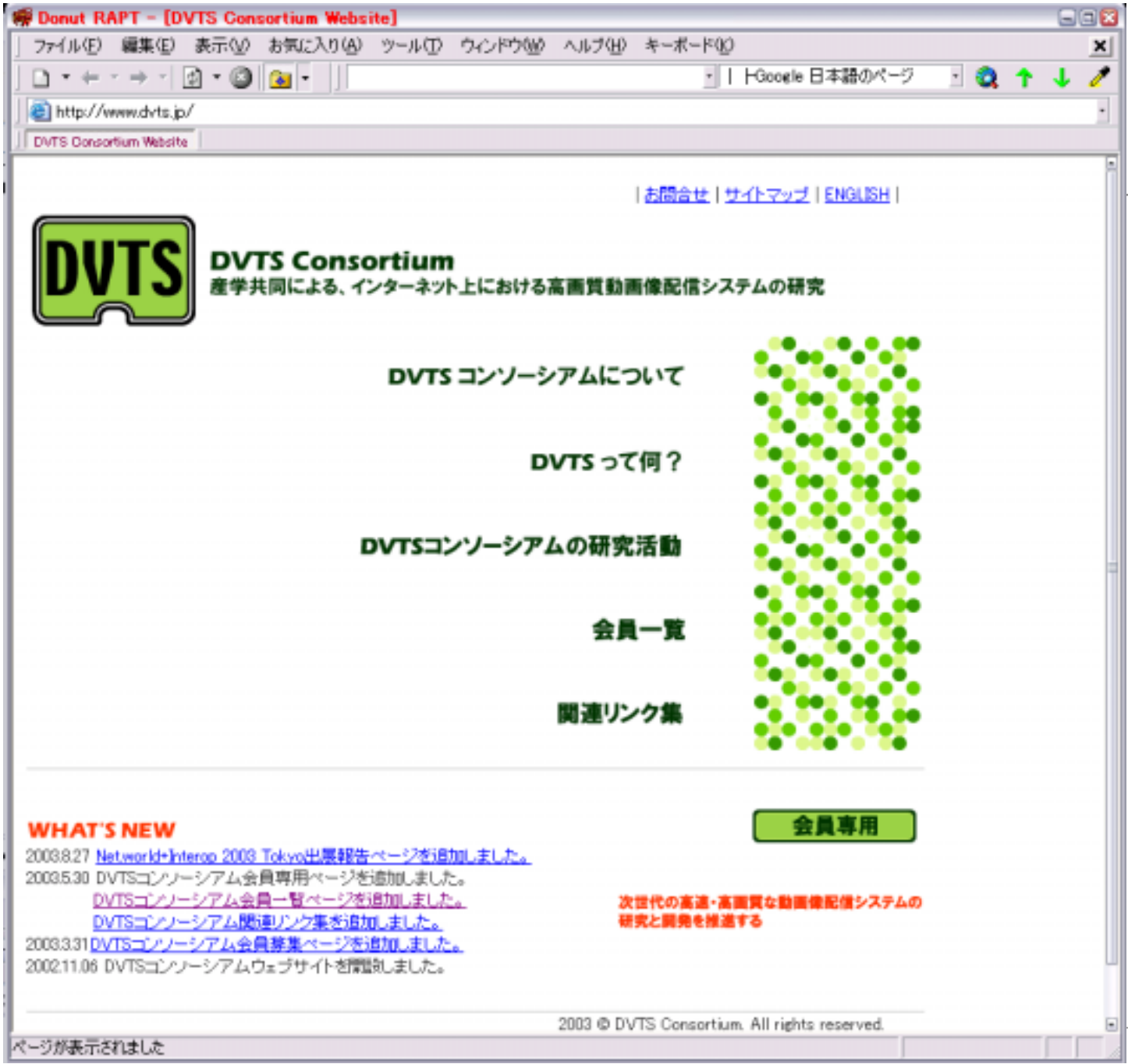
$$T < \frac{1.5\sqrt{2/3} * B}{R * \sqrt{p}}$$

T : Traffics
B : Packet size
p : Packet losses
R : RTT

DVTS Consortium

- 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


Donut RAPT - [DVTS Consortium Website]
ファイル(F) 編集(E) 表示(V) お気に入り(A) ツール(T) ウィンドウ(W) ヘルプ(H) キーボード(K)
Google 日本語のページ
http://www.dvts.jp/
DVTS Consortium Website
| お問合せ | サイトマップ | ENGLISH |
DVTS
DVTS Consortium
産学共同による、インターネット上における高画質動画像配信システムの研究
DVTS コンソーシアムについて
DVTS って何？
DVTSコンソーシアムの研究活動
会員一覧
関連リンク集
WHAT'S NEW
2003.8.27 Networld+Interop 2003 Tokyo出展報告ページを追加しました。
2003.5.30 DVTSコンソーシアム会員専用ページを追加しました。
DVTSコンソーシアム会員一覧ページを追加しました。
DVTSコンソーシアム関連リンク集を追加しました。
2003.3.31 DVTSコンソーシアム会員募集ページを追加しました。
2002.11.06 DVTSコンソーシアムウェブサイトを開設しました。
会員専用
次世代の高速・高画質な動画像配信システムの研究と開発を推進する
2003 © DVTS Consortium. All rights reserved.
ページが表示されました

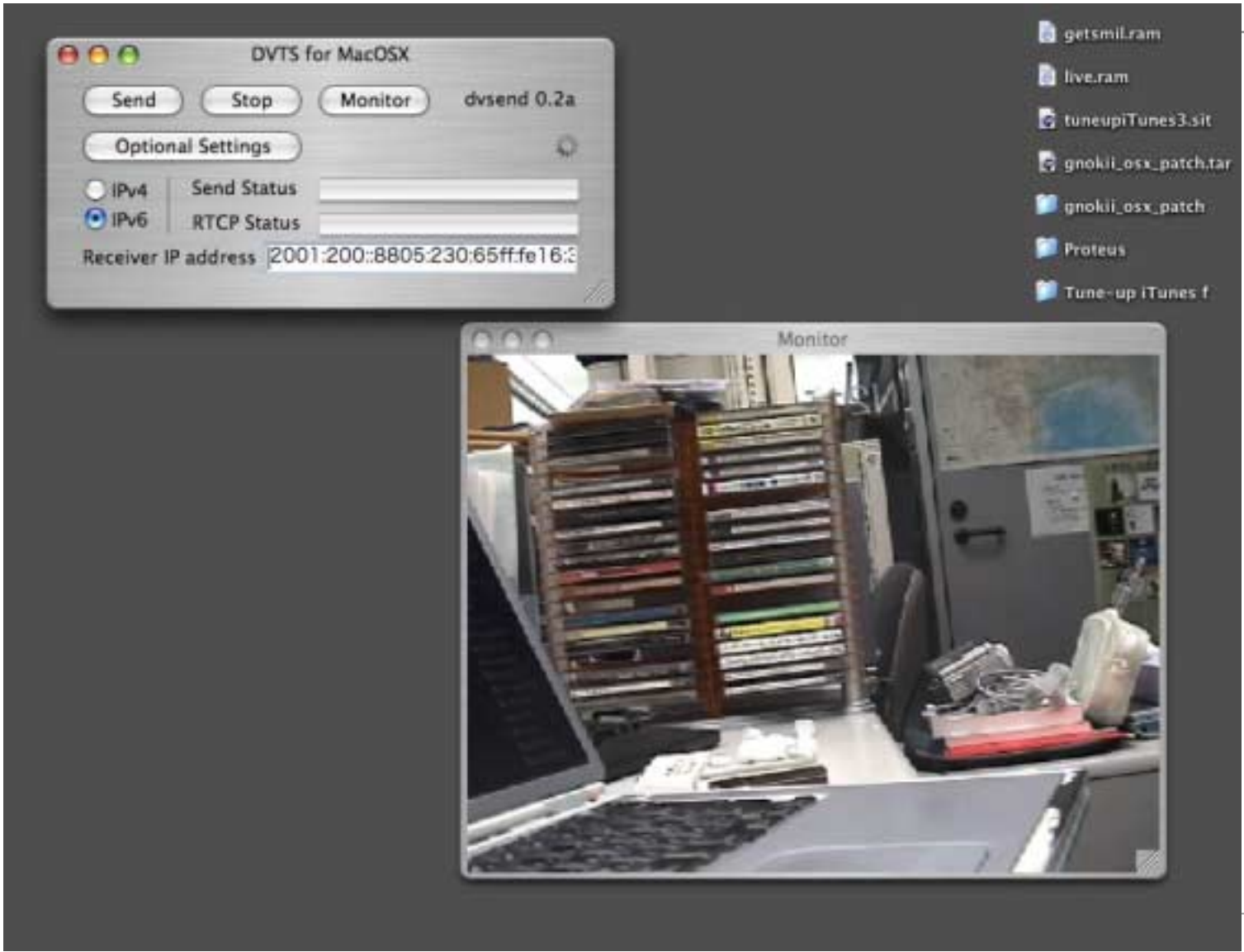
Implementation of DVTS

- Supported Environment
  - FreeBSD 4.X
  - FreeBSD 5.X
  - NetBSD 1.5.X
  - Linux 2.4.X
  - Windows ME
  - Windows 2000
  - Windows XP
  - Mac OS X

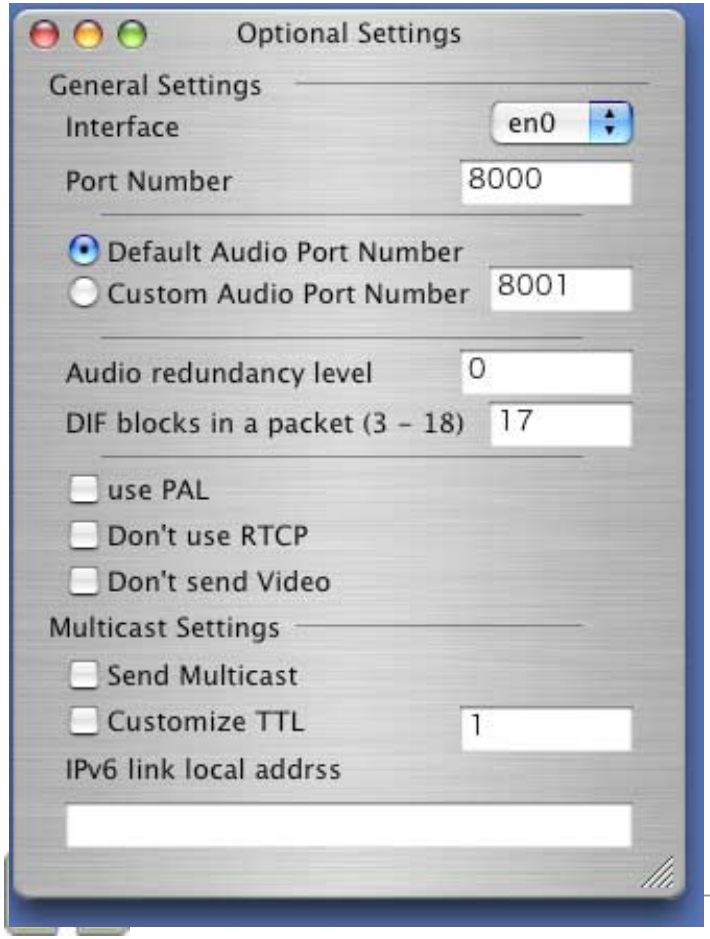
Development of DVTS

- New Release
  - Mac OS X release
  - Windows new release
- Consortium Members' Contributions
  - Session manager
  - Hardware DVTS
    - IIGA solution
    - JVC solution
- Consortium Activities
  - DVTS Interoperability Symposium
    - July 21st – 23rd Japan

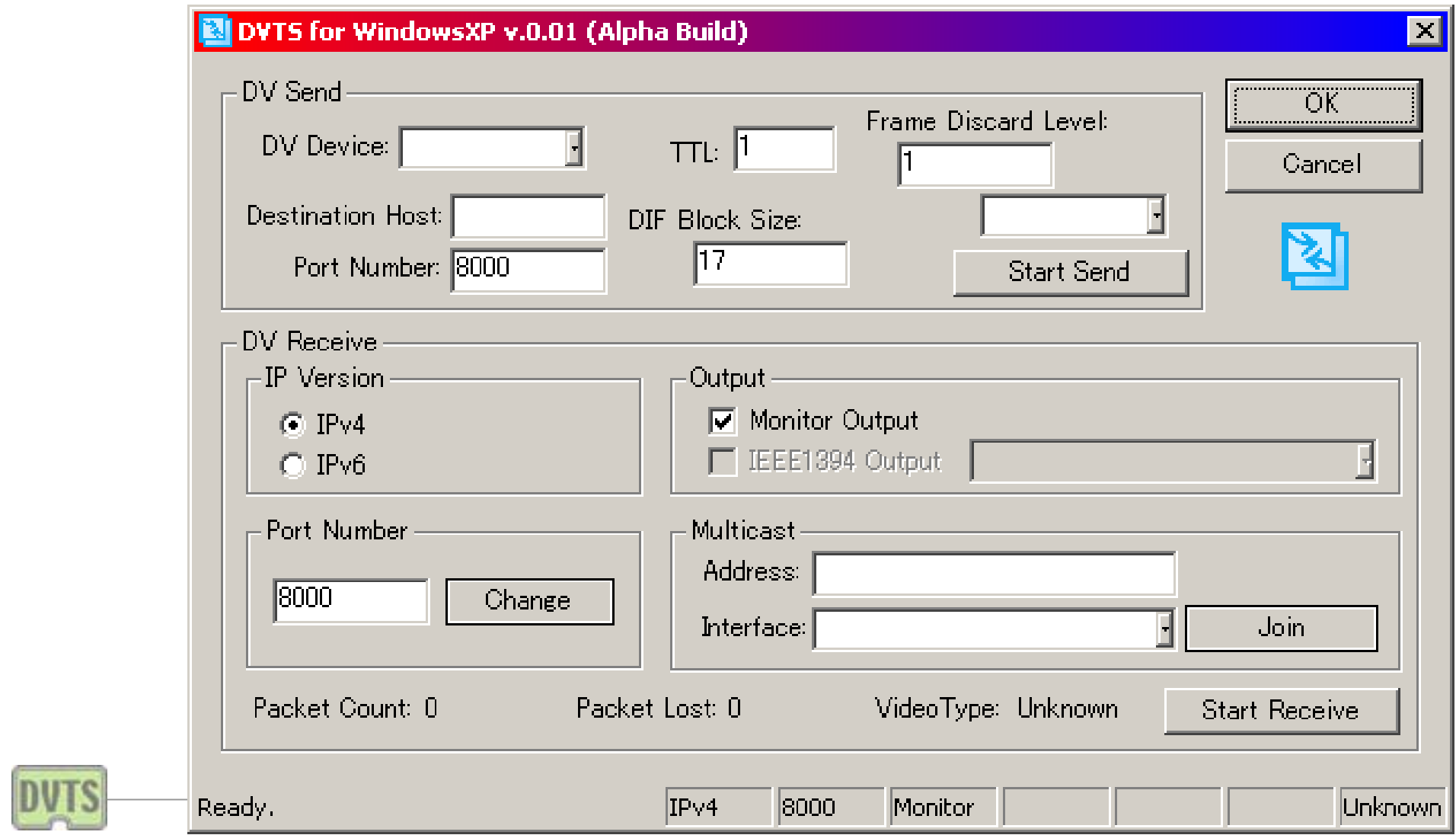
DVTS for MacOS X



DVTS for MacOS X



Windows XP New Version



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)

Linux Release

- Supports MPEG2TS
  - MPEG2 based DV
  - MPEG4 based DV
- HDV Support
- Interoperability support with
  - VIDEOLan

Embedded DVTS by Victor

Embedded DVTS

Extension Module

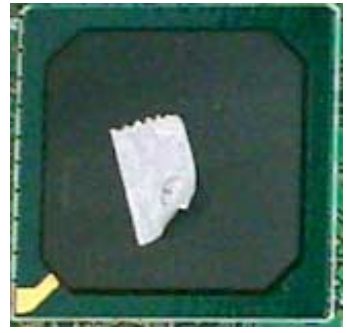
Embedded Linux

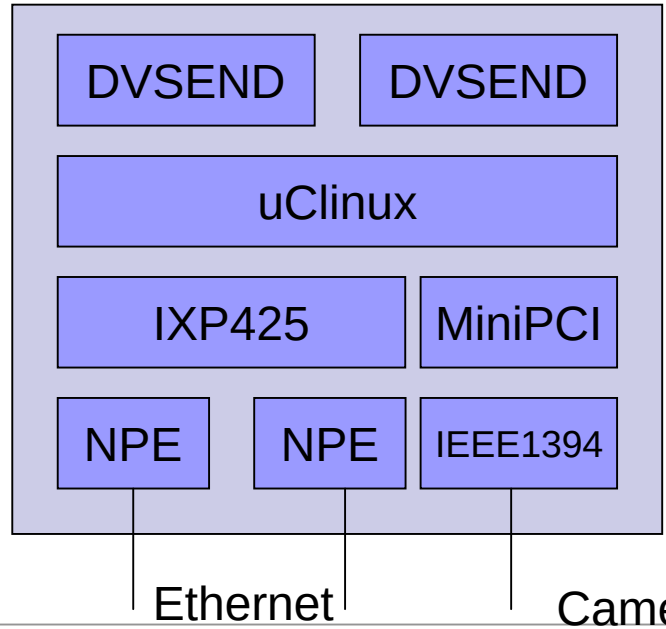

Victor · JVC
Digital Video Transport System 9

Hardware DVTS
By IIGA

IIGA Hardware DVTS

- Intel Network Processor IXP425
  - AC/DC operated
    - Battery operation possible
  - High speed
    - (2ch DVTS Stream send)
- Sells at ¥90000
  - (Around $800)

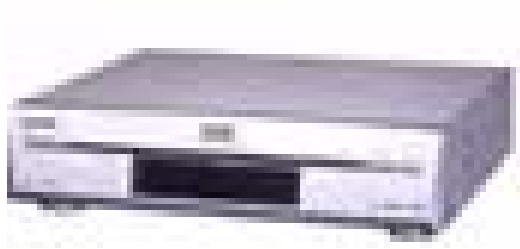




DVoD Demo

MPEG2TS

- BS Digital Broadcast



- Recording Medium
  - D-VHS (Digital VHS)
- Video Camera
  - MICROMV(Sony)

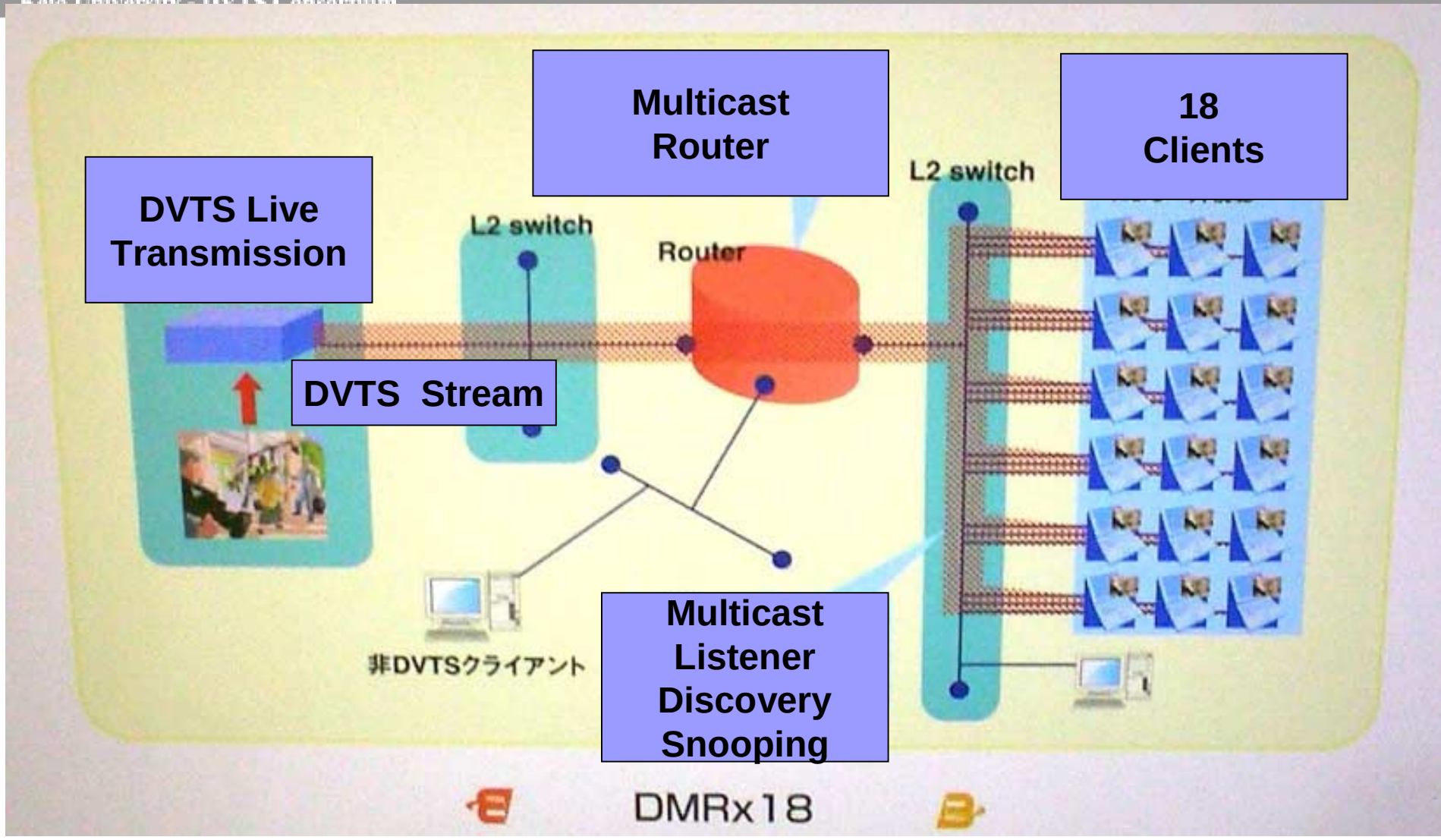
- DV-HD
  - 720p Hi vision
- IEEE1394 Interface

→ Merge DVTS

Comet DVIP
By Fujitsu

DVTS demo at Interop 2004

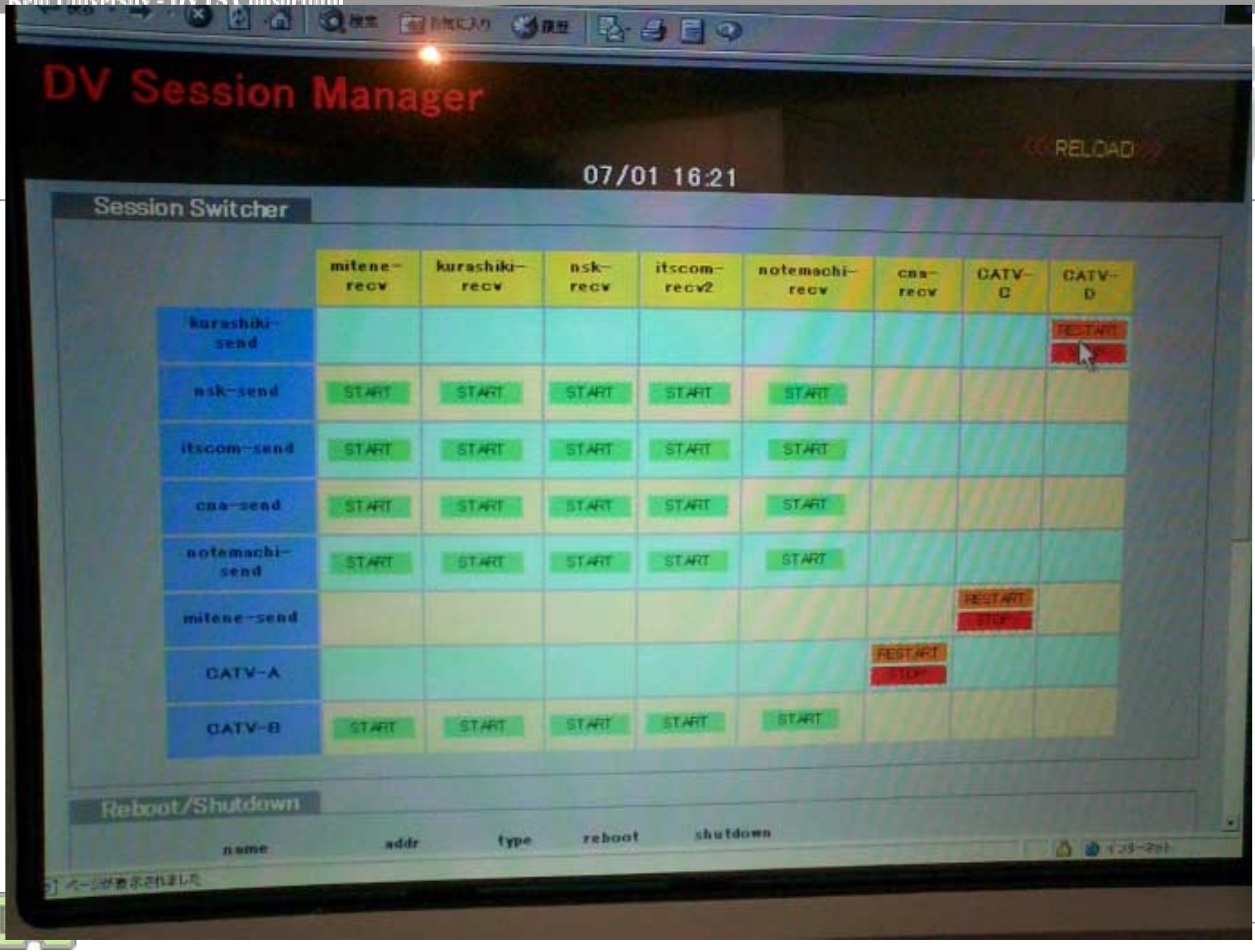
- DVTS IPv6 Multicast demo


Multicast Router
18 Clients
DVTS Live Transmission
L2 switch
Router
L2 switch
DVTS Stream
非DVTSクライアント
Multicast Listener Discovery Snooping
DMRx18


ShowNetTV
channel 1
channel 2
channel 3
channel 4
supported by
Powerplay
DVTS

DV Session Manager

- Mixer
- Channel control



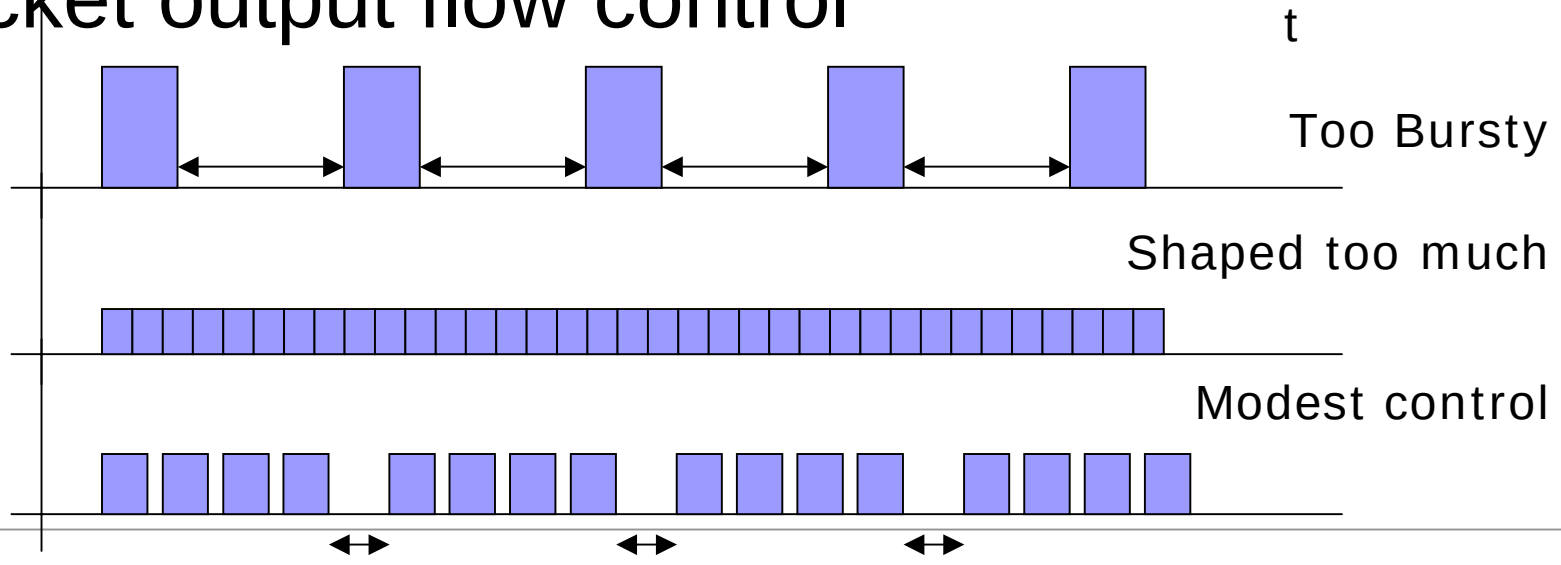
Interoperability Symposiom

- July 21st – 23rd
  - At Keio University Shonan Fujisawa Campus
  - Interoperability testing
    - Using traffic testers, generators
      - Packet flow stability
      - Jitter allowance
  - Discussion on new protocol release
    - BoF s'
  - Testing infrastructure contribution
    - Fujitsu, Anritsu, IIGA, WIDE Project etc…

Interoperability Symposium

Since Interoperability Symposium

- 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



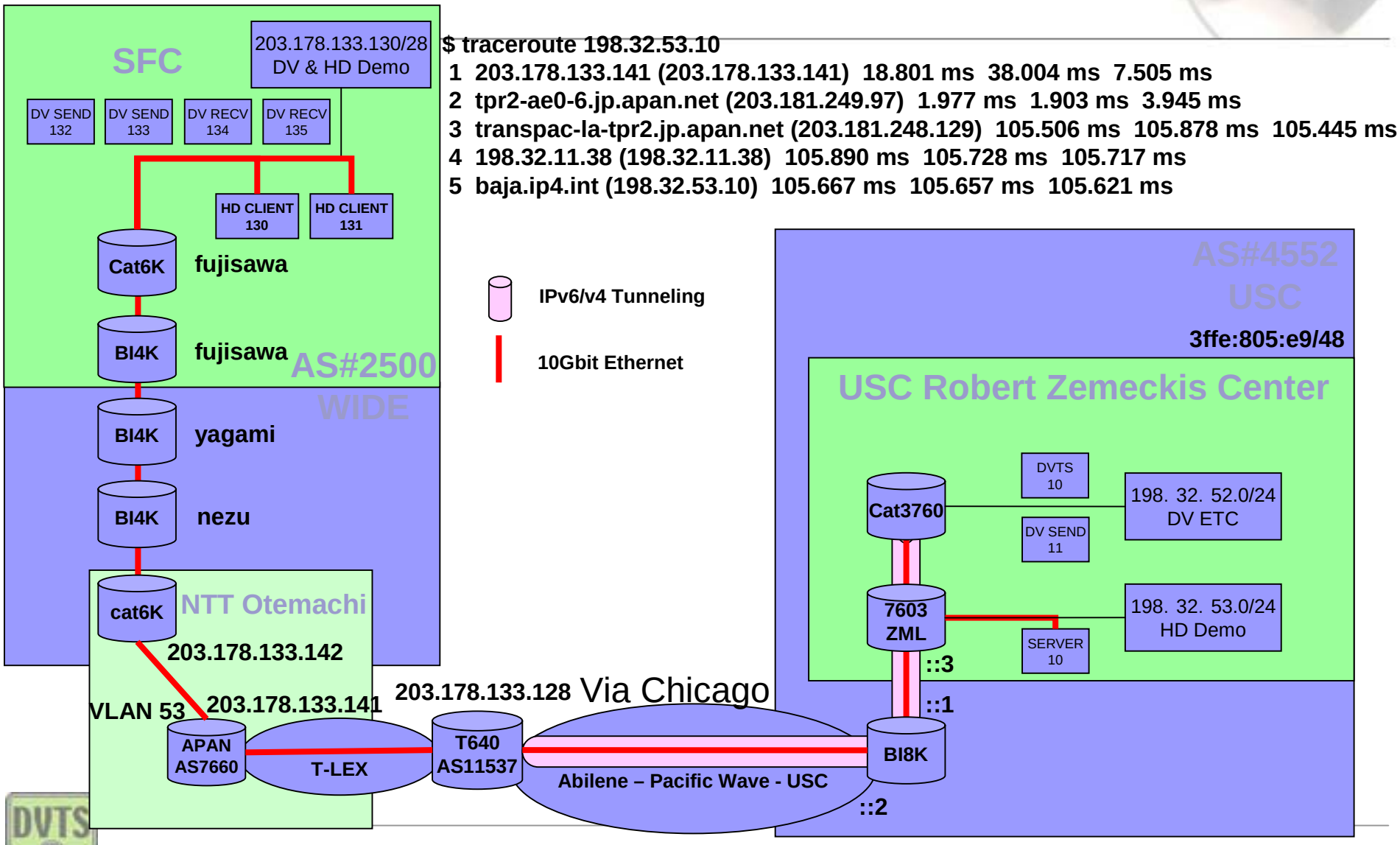
iHD demo in Interop 2004

HD Editing System (BAJA)

Baja System

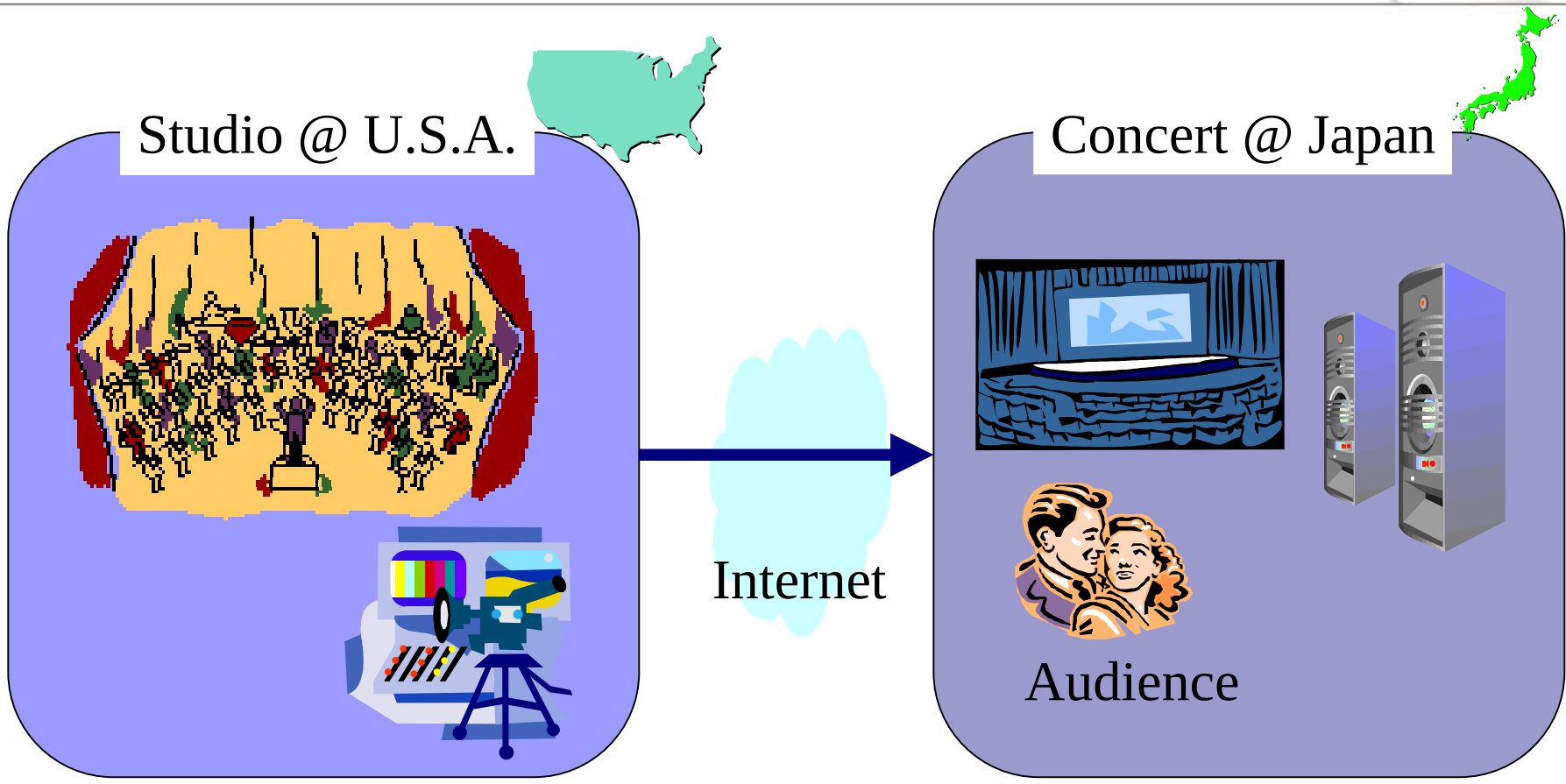
- 3840x2800 QHD Display
  - Collaborative HD editing system
  - Raw HD Streaming
    - 1.2Gbps
  - Demo at Robert Zemeckis Center
    - South California University
    - Sept 14th, 2004
  - IPv6 network

Network Topology




```
$ traceroute 198.32.53.10
1  203.178.133.141 (203.178.133.141)  18.801 ms  38.004 ms  7.505 ms
2  tpr2-ae0-6.jp.apan.net (203.181.249.97)  1.977 ms  1.903 ms  3.945 ms
3  transpac-la-tpr2.jp.apan.net (203.181.248.129)  105.506 ms  105.878 ms  105.445 ms
4  198.32.11.38 (198.32.11.38)  105.890 ms  105.728 ms  105.717 ms
5  baja.ip4.int (198.32.53.10)  105.667 ms  105.657 ms  105.621 ms
```

Virtual Concert



Technology Requirement

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

FYI

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

http://www.dvts.jp/