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# Proposal for the digital audio processing mechanism in the real-time multipoint telecommunication

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# Outline of this presentation

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## Target of our research

Introduction of “ distance lecture “

“ sense of unity “ as keyword of our research

Technical difficulties in existing telecommunication systems such as distance lecture system

Proposal for digital audio/video processing mechanism in the real-time multipoint telecommunication

Conclusion and future work

# Target of our research

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Realization of  
real-time telecommunication  
with **natural and smooth conversation**  
through video screens  
in the case of **multipoint connections**

Assumptions: teleconference, distance lecture

Notice point: Audio quality is very important  
as well as video quality

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# Define of “ distance lecture “

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It is important to attend with concentration  
and to discuss freely

Distance lecture enable instructor and students  
to do questions and answers during lecturing  
such as general lecture of university

It gives students some credits as regular lecture

# Existing distance lecture system

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There are many kinds of distance lecture  
by many universities, company, ..., and so on.

- Using satellite broadcasting
- Using PC/WS
- Using commercial TV conference system  
and so on.



The quality of audio/video is growing up recently

Realizing a natural conversation is not enough  
because of long transmission delay-time  
including encoding/decoding time

# Distance lecture trials between JAIST and CRL

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Real-time distance lecture by using JGN  
and DV real-time transmitting system

High quality of audio/video information

- NTSC TV broadcasting quality
- 16 bit PCM signals with 48kHz sampling

Small time-delay with no inter-frame compression

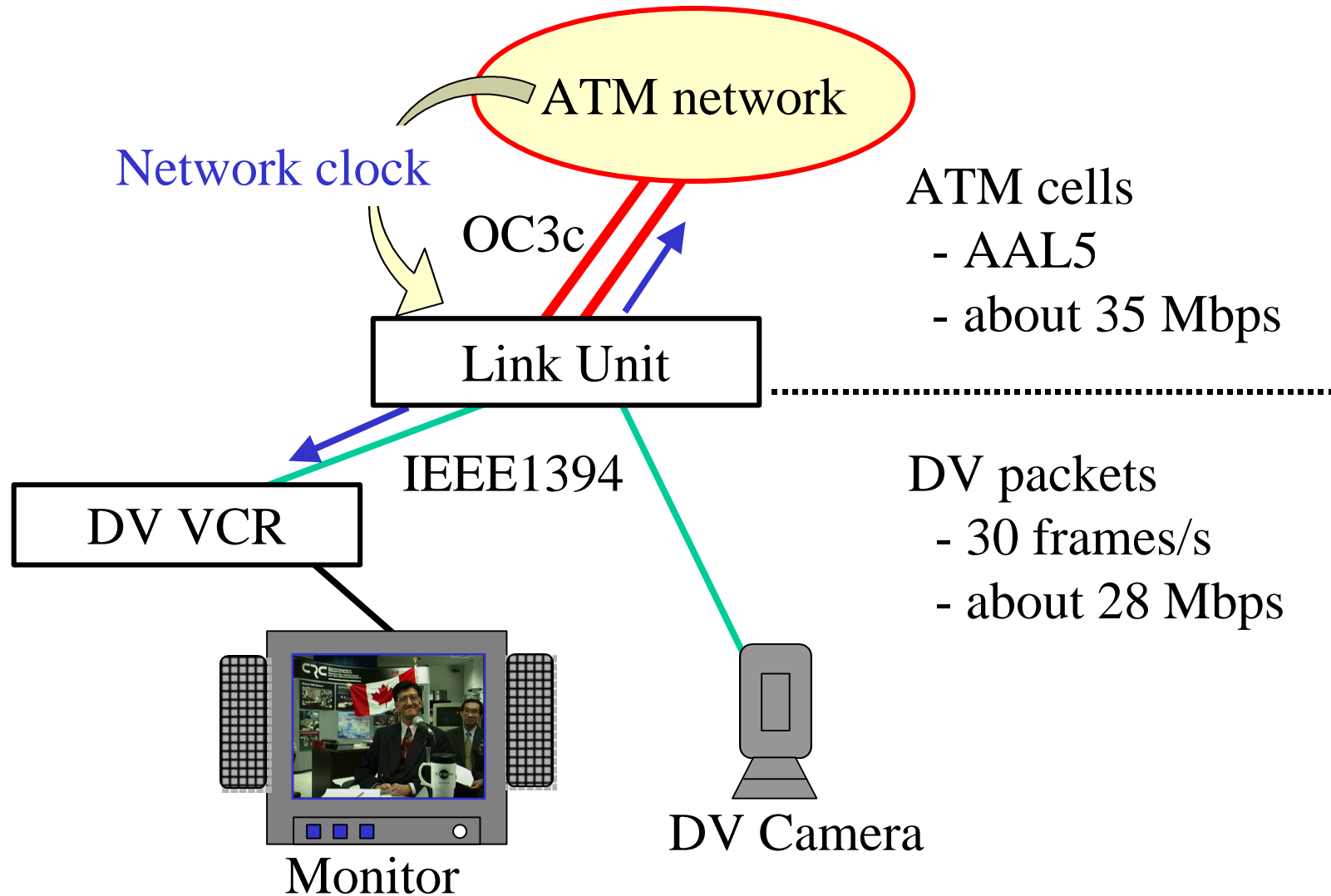
It gives students some credits as regular lecture

- First case among national universities in Japan

Technical difficulties:

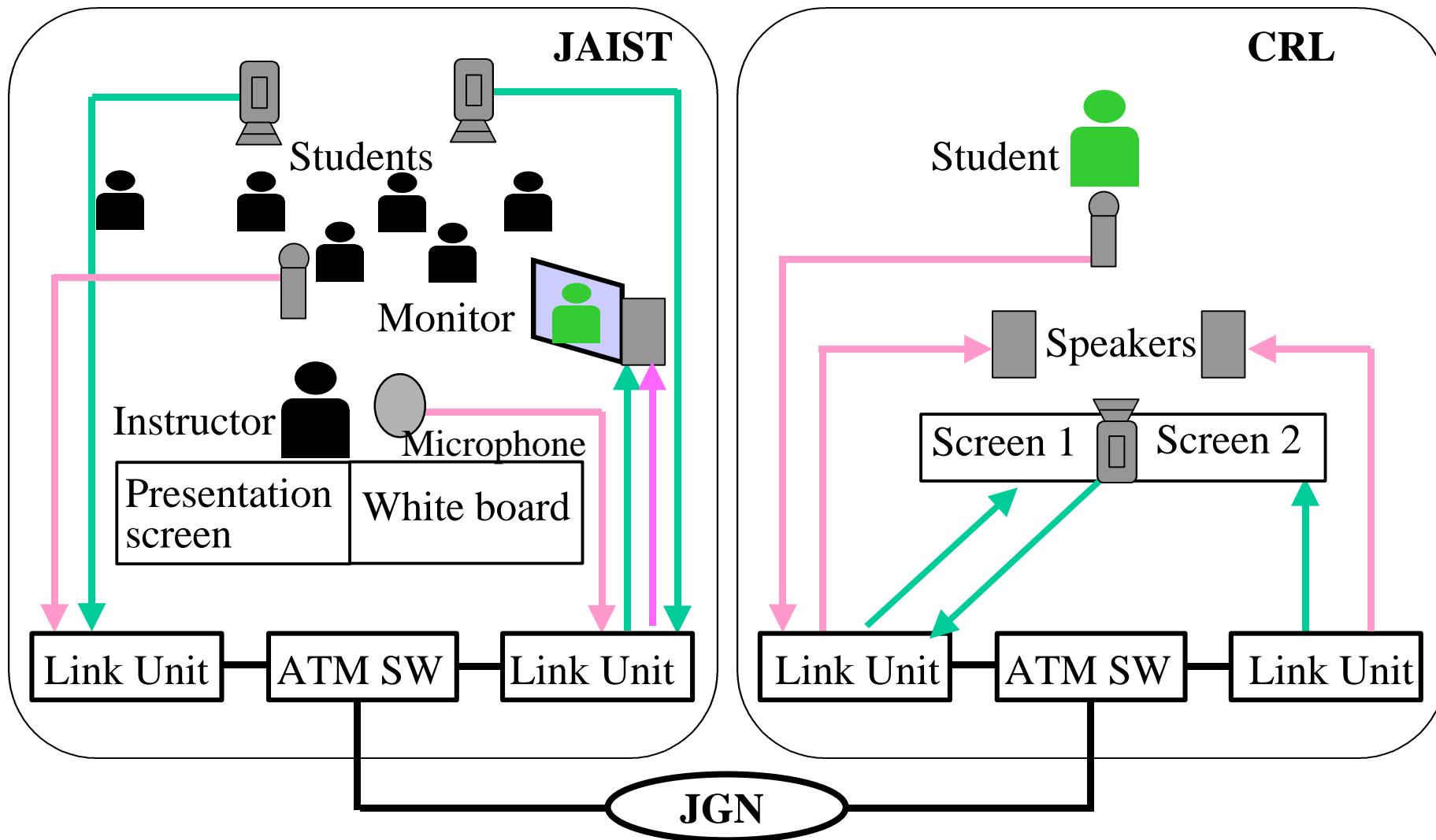
- Hard to establish a natural conversation  
in case of multipoint connection

# DV video real-time communication system



← : Transmission based network clock

# Distance lecture trials between JAIST and CRL



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## “ sense of unity “ as keyword of our research

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We define “ sense of unity “ as the keyword to realize natural and smooth conversation through video screens

“ sense of unity “ means a kind of feelings that enable all attending members having a sense of same purpose for telecommunication to spend the same period of time and to attend or study together

The enhancement of “ sense of unity “ leads attending members to create a tense atmosphere such as local lecture and to keep high concentration

# How to enhance “ sense of unity “

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## Decrease in round trip time of audio/video information

- Realization of natural and smooth conversation through TV telephone
- Max. permission is about 400 ms.

## Keeping audio/video quality

### in the case of multipoint connections

- Improvement of audio/video editing and switching mechanism
- Improvement of echo canceling mechanism

## Making use of some value-added information

- Virtual Reality, CG, 3-dimensional audio, .....

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# Technical difficulties

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## Long time-delay by encoding/decoding process

- MPEG2 encode & decode: 200 – 500 ms

## Long time-delay by Analog/Digital or Digital/Analog conversion process

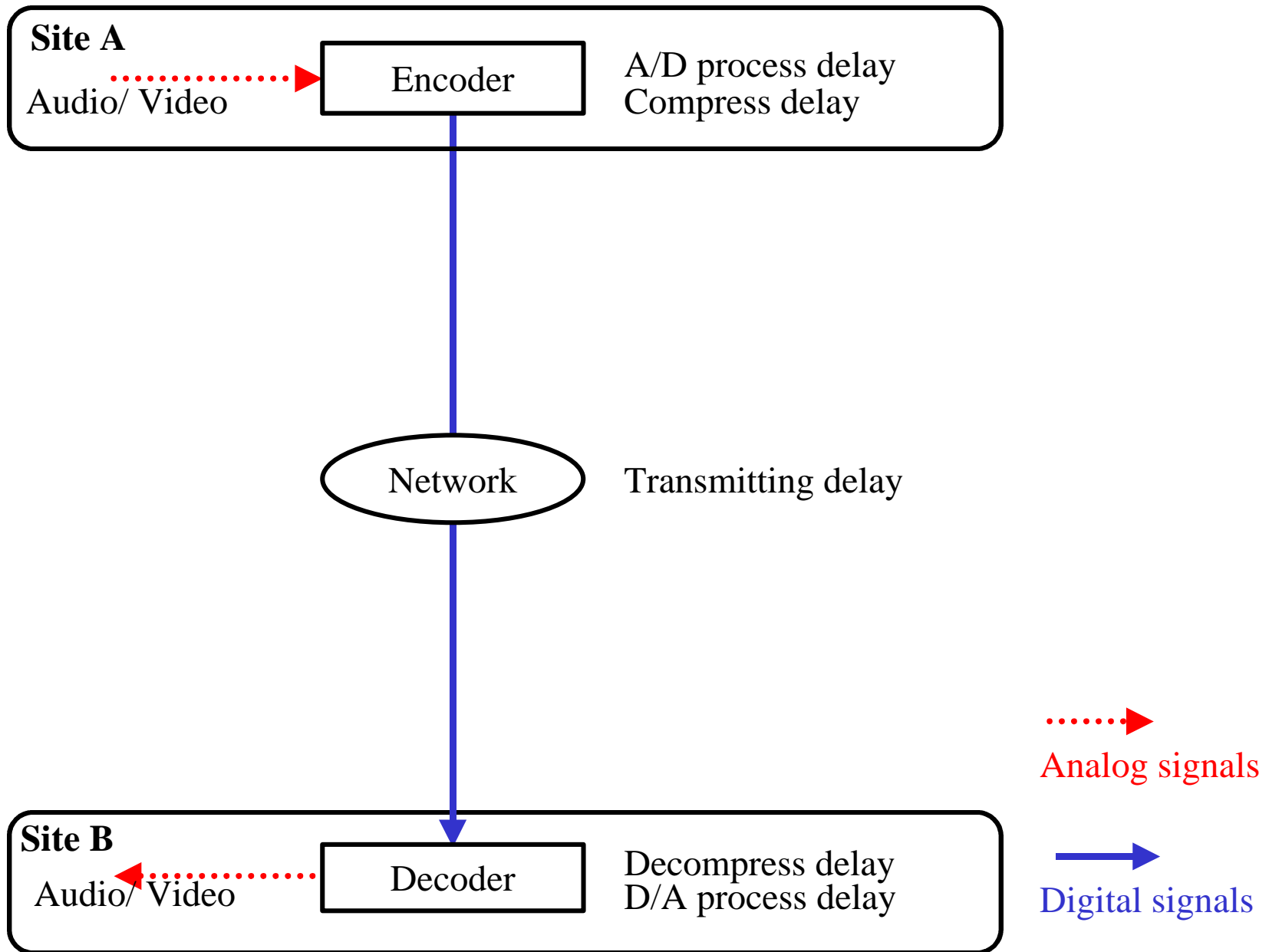
- Audio/video editing and switching mechanism in the case of multipoint connections uses a lot of A/D D/A conversion

## Deterioration of audio/video quality

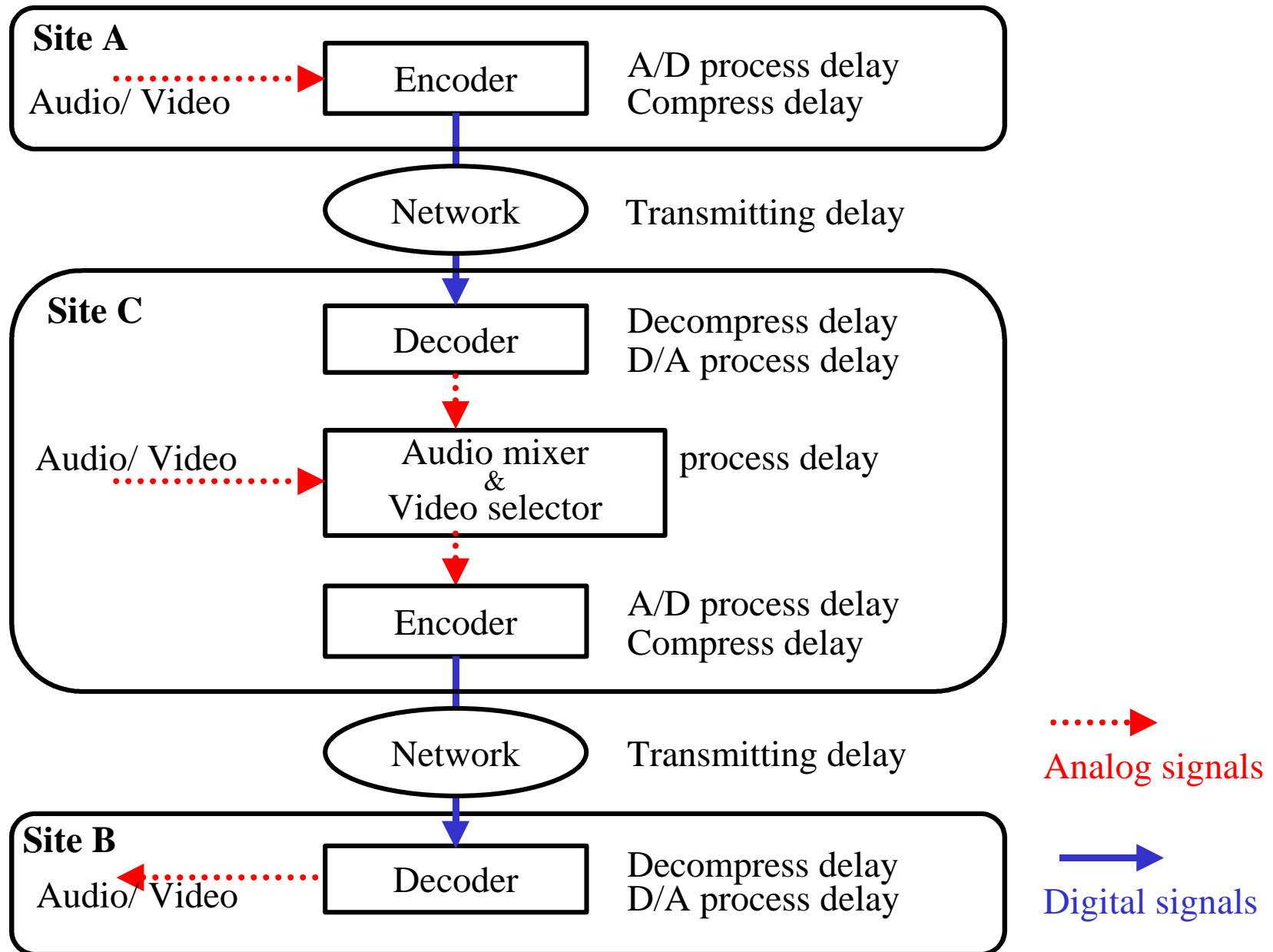
- A/D or D/A conversion process has some possibility to deteriorate the quality

# Flowchart of audio/video information to site B in case of 2 point's telecommunication

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# Flowchart of audio/video information to site B in case of 3 point's telecommunication



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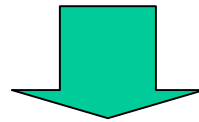
Conclusion and future work

# Summary of our proposal system

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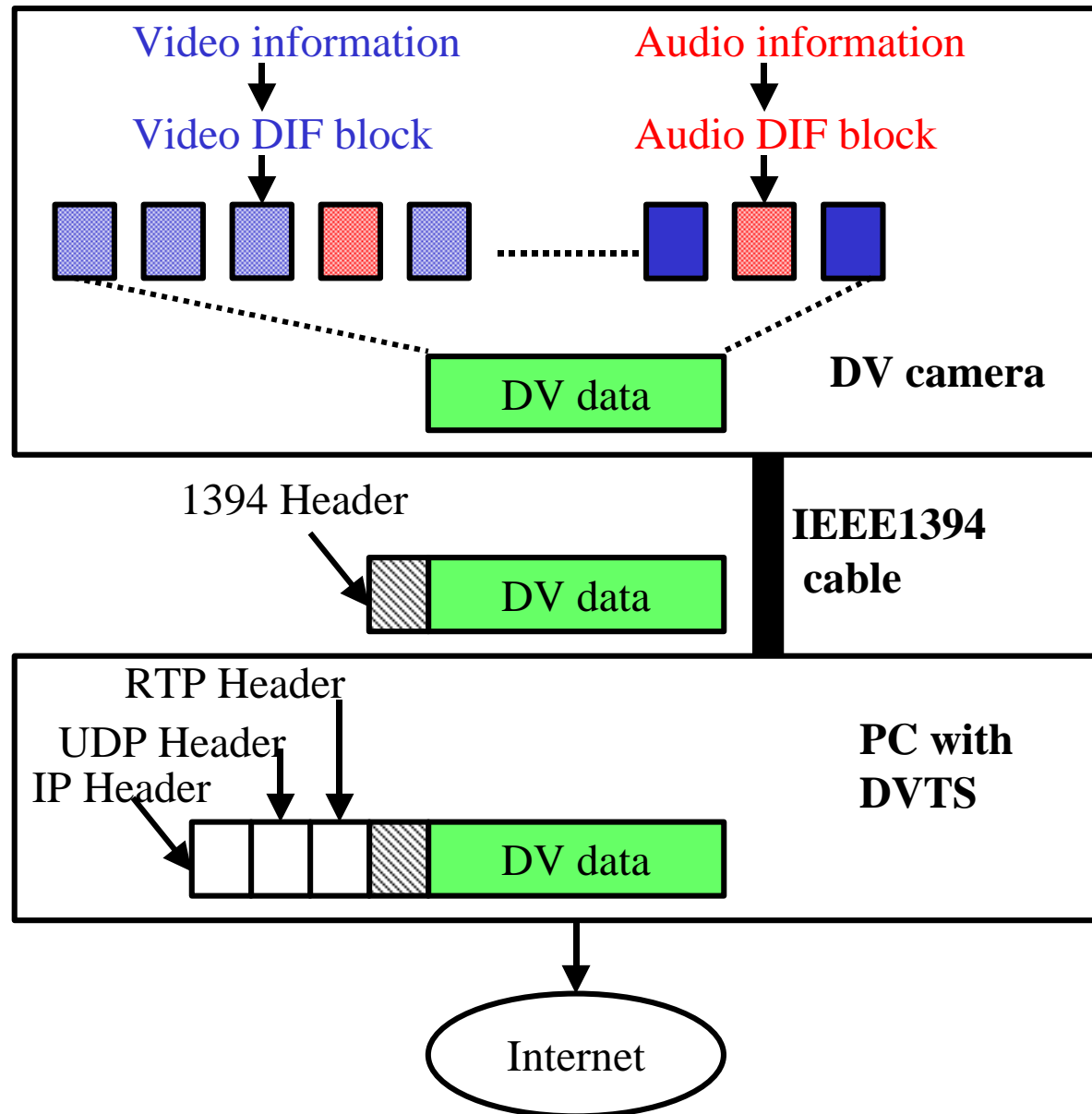
Use of Digital Video Transport System (DVTS)

Use of full digital editing/switching mechanism  
with digital audio/video signals

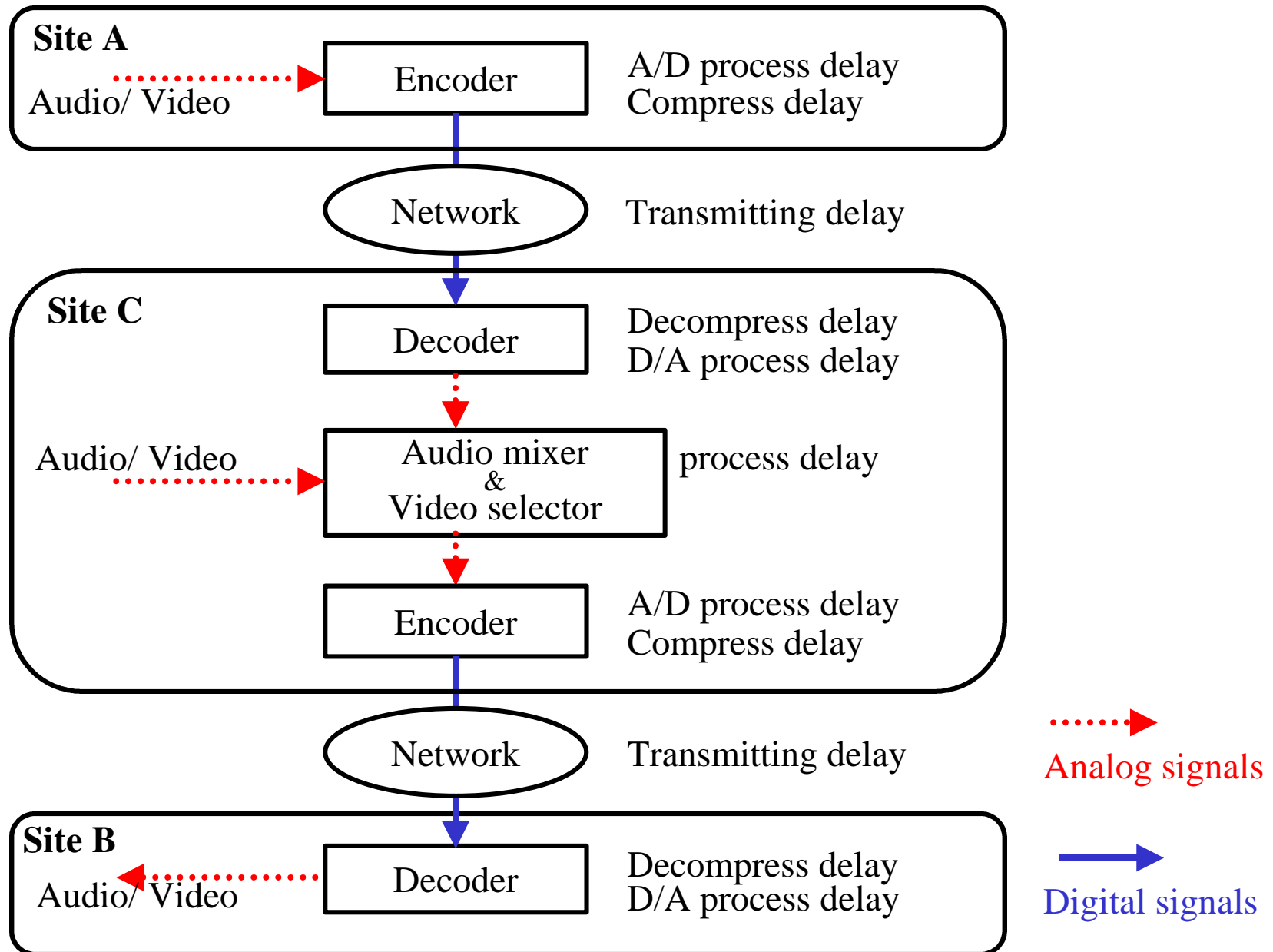


- Decrease in transmission time-delay of audio/video information
- Keeping audio/video quality
- Possibility of adding another process with digital signals

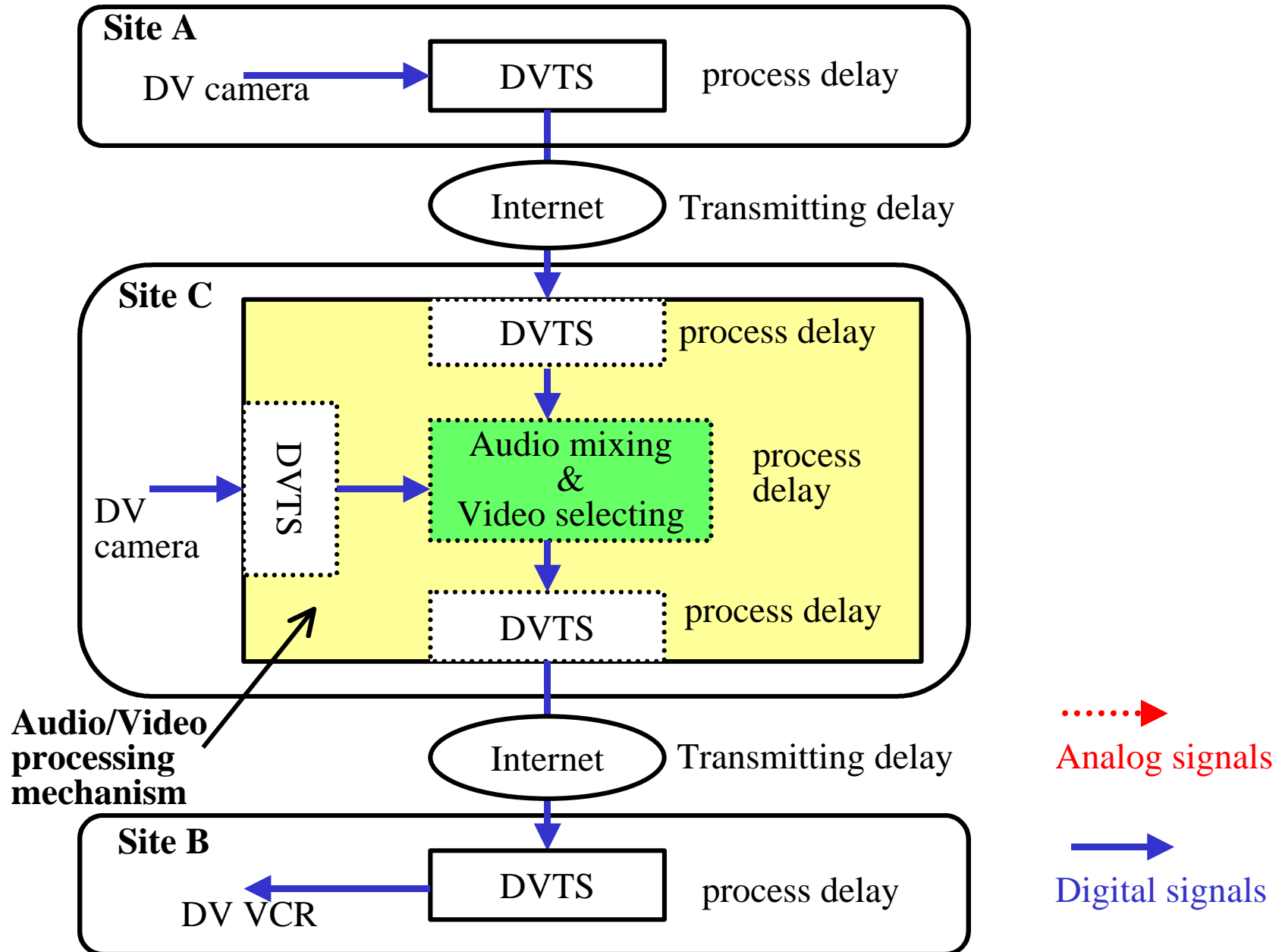
# Data structure of DVTS



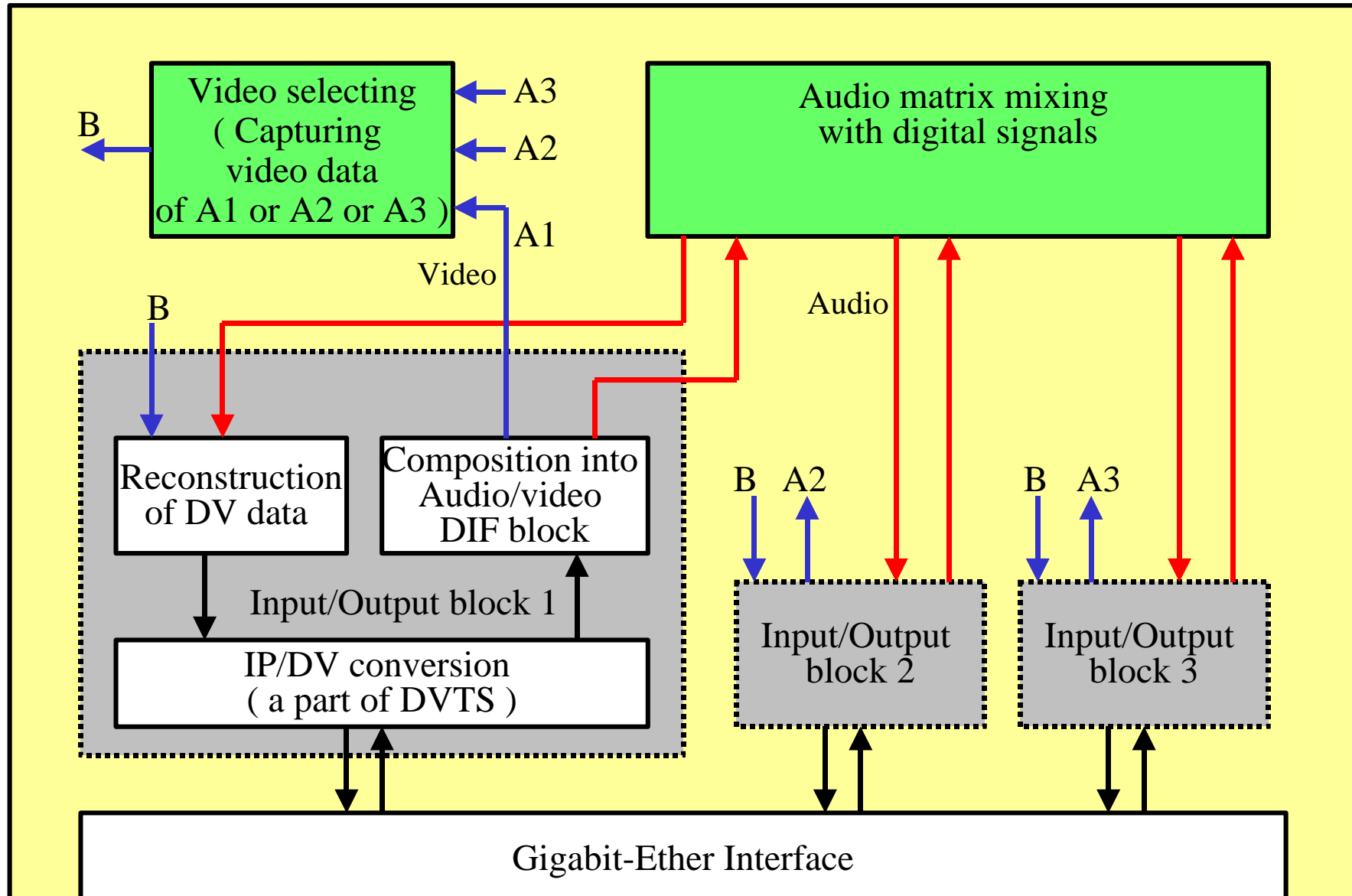
# Flowchart of audio/video information to site B in case of 3 point's telecommunication



# Flowchart of audio/video information to site B by using our proposal system



# Overview of audio/video processing mechanism with digital signals



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**Conclusion and future work**

# Conclusion

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## Our target:

Realization of natural and smooth conversation through multipoint telecommunication

## Keyword “sense of unity”:

It needs short transmission time-delay and high quality of audio/video information

## Proposal mechanism:

Audio/video processing mechanism that realize audio matrix mixing and video selecting with digital signals by making use of DV features

# Present state and future work

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We intended to develop our proposal mechanism.

Implementation based on software programs on PC is underdevelopment at present.

For the future, we will evaluate its performance.

Also, we'd like to challenge to add adding another process with digital signals, such as digital echo canceling.