

Live Production System to Handle Video Signals with Various Aspect Ratios

Yoshitaka Ikeda

Tomohiro Nakamura Kosuke Nomura Kenichiro Masaoka

Yuichi Kusakabe Satoshi Oode Takayuki Yamashita

NHK Science & Technology Research Laboratories, Japan

Background

- Since the launch of high-definition TV systems, the aspect ratio for broadcasting has been fixed at 16:9
- A wide variety of aspect ratios are available in other video production industries (film or OTT etc.)
- Live-streaming distribution to online media using non-16:9 are expanding among broadcasters
 - E.g. Bundesliga testing mobile orientated vertical game streams
- Problem
 - In a broadcast video production environment, there are significant equipment barriers to shooting in aspect ratios other than 16:9



Objective

- Develop a new system that allows to handle video signals with various aspect ratios at broadcast stations
- We studied the system requirements and specific transmission methods for live production in this report

“Format-Opened” Broadcast Service

- Contribute to maximizing the range of visual expression and content value for producers by ensuring the selectability of video formats for programs
- Provides a new viewing experience with shape-changeable display devices

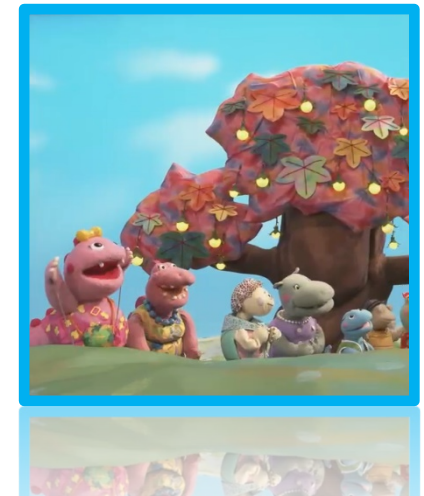
16:9
(News, Sports)



2.35:1 (Drama)



1:1 (puppet show for OTT)
(for personal study)



Design considerations

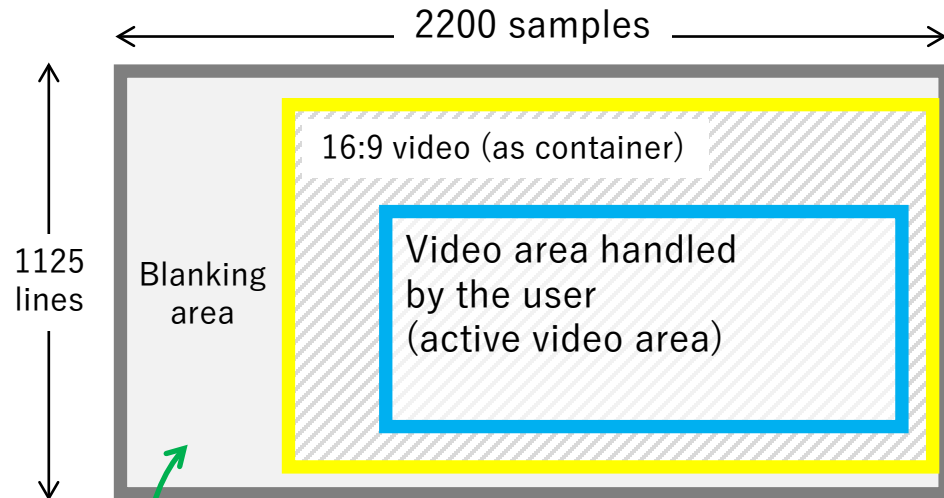
- Installation of new I/Fs will require many converters during the system transition period, which will increase the scale and cost of the facility
→ Retain the current I/Fs
- Changing the bit rate and system clock of each I/F will increase the cost of implementation and debugging for each device
→ Use a fixed bit rate and clock
- Consider scalability to support the transmission of images that exceed the bandwidth → Ensure scalability with multi-link transmissions

Realize a transmission path
with minimal signaling changes based on the current I/F

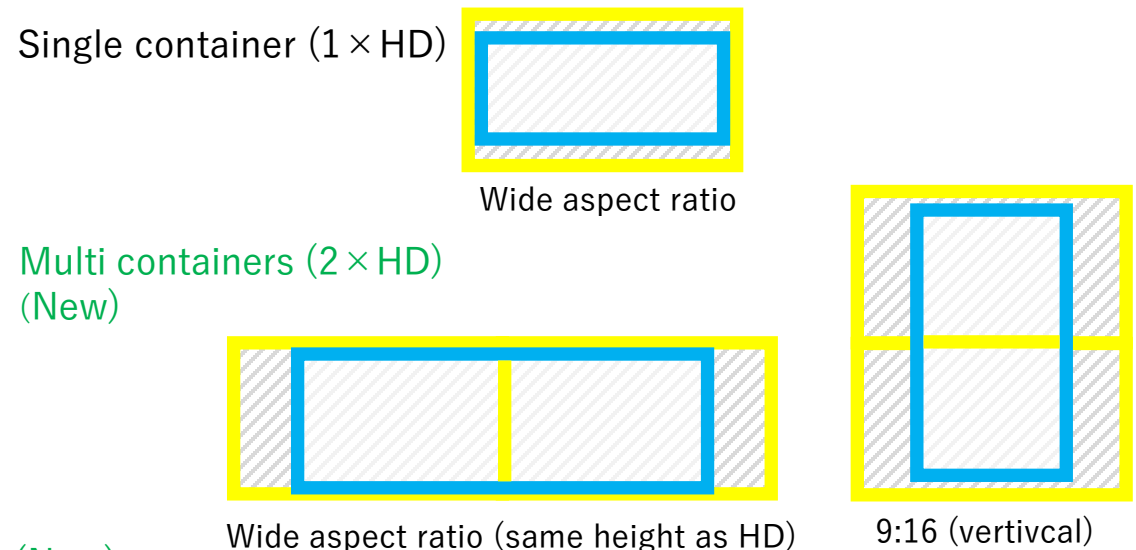
Signaling

- Use current SDI/IP, and **add metadata to specify aspect ratio**
- Arbitrarily specify the inside of the 16:9 video area (SMPTE ST2016-2, container method)
 - Number of pixels and aspect ratio can be changed without changing bit rate and system clock
- **Multi-link transmission (new)**
 - Allows selection of the number of pixels and aspect ratio that exceeds a single transmission band

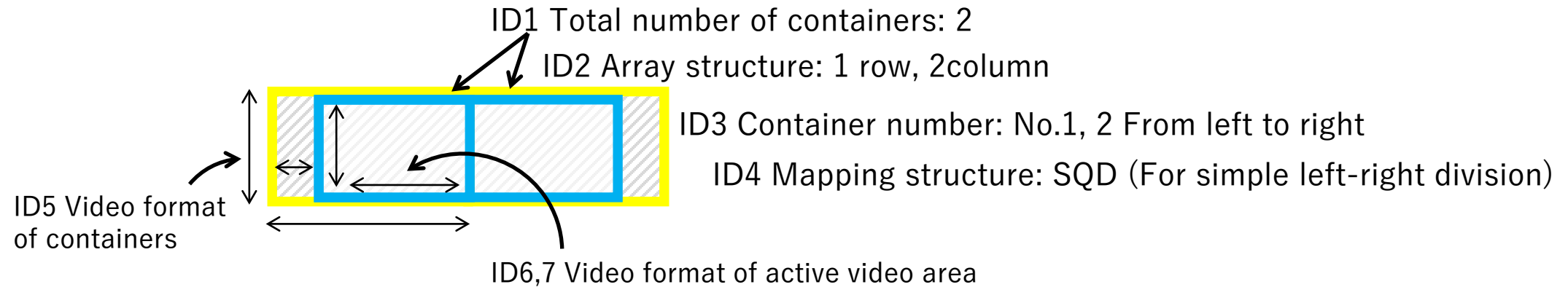
A frame of HD-SDI stream



Identifiers of container and active area is multiplexed as ANC data (New)



Requirements (for signaling)



Requirements		Explanation
A	Identification for container number and mapping structure	The following information for container must be included in the I/F ✓ Total number of containers ✓ Array structure ✓ Container number ✓ Mapping structure
B	Identification for container format	✓ Format information of the video to be used as a container shall be included in the I/F
C	Identification of active video area	The following active area information shall be included in the I/F ✓ The number of pixels of the active area ✓ Information about the position (offset) of the area in the container

Multiple as ANC data

→ ID 1

→ ID 2

→ ID 3

→ ID 4

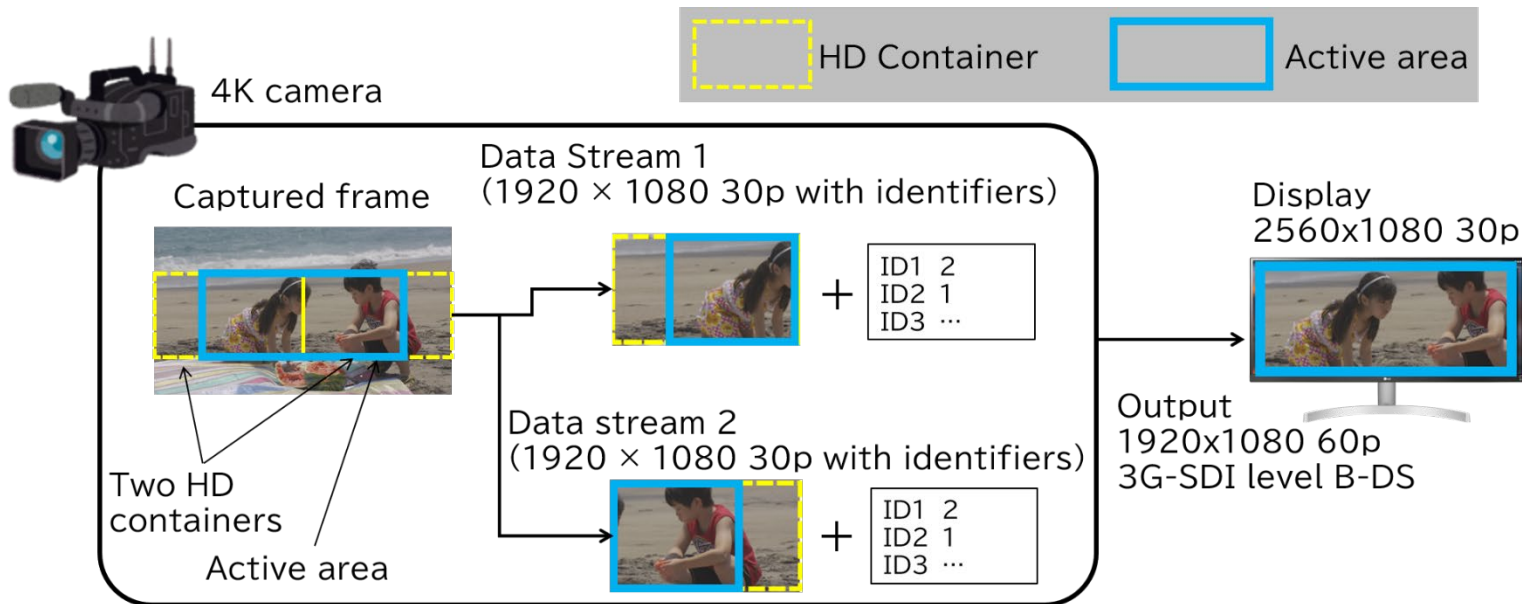
→ ID 5

→ ID 6

→ ID 7

Implementation: 2560 × 1080 (2.4:1) carried by two HD containers

- Allocate two container areas for 1920 × 1080 and 30p
- Specify 1280 × 1080 as the active area in each container area
 - Set ID 1 to ID 7 in accordance with requirements A-C
 - Multiplex the identifiers into each stream as ANC data
- Multiplexed and transmitted on a single 3G-SDI stream (1920 × 1080, 60p)



ID	Parameters	Container No.	
		No.1 (Stream 1)	No.2 (Stream 2)
ID 1	Total number of containers	2	2
ID 2	Array structure	Row	1
		Column	2
ID 3	Container number	1	2
ID 4	Mapping structure	Square Division	Square Division
ID 5	Number of pixels (container)	H	1920
		V	1080
ID 6	Number of pixels (active area)	H	1280
		V	1080
ID 7	Offset	H	320
		V	-320

Discussions

- Selection of mapping structure for 2SI and SQD
 - SQD requires a large amount of internal memory to draw the transmitted video frame compared to 2SI
 - Desirable that the mapping structure of sub-images stored in containers as the active area be based on 2SI
- Need for standardization
 - To avoid vendor lock-in for transmission methods, it is desirable to have a common method for transmitting arbitrary number of pixels and aspect ratios
- Future prospects
 - Consider the proposed system to be a transitional one until the future production system based on IP and software becomes common

Conclusions

- Develop a new system that allows to handle video signals with various aspect ratios at broadcast stations
- Proposes signaling that enables transmission of video signals with various aspect ratios using the current I/F
 - Signaling of variable aspect ratio video using container method based on SMPTE ST2016-2
 - By adding the multi-link function, video with arbitrary number of pixels and aspect ratio can be transmitted

Thank you for your kind attention!



Launched
in 2018