

Video coding specification for ISDB-T3

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Fujitsu

Chair, Video Coding Technology WG, ARIB

Kimihiko Kazui

Summary

- ISDB-T3 introduces VVC (ITU-T H.266 | ISO/IEC 23090-3) for video coding, as specified in ARIB STD-B32 (version 4.0).
- ARIB STD-B32 specifies
 - video format and profile/level of VVC
 - Support of 8K/120 Hz, multilayer coding
 - operational guideline of VVC for interoperability and better quality
 - 120 Hz/60 Hz Temporal scalability
 - Dynamic resolution change
 - Dynamic HDR metadata

Supported video format and profile/level

- Up to 8K, 120 Hz, HDR
- Multilayer Main 10 profile for advanced television services
 - Note: decoding of Multilayer Main 10 bitstream is optional, considering possible delay of its market introduction.

Input video format	Chroma format, Bitdepth	Resolution	Frame rate [Hz]	Dynamic range	Main 10 Profile (Level)	Multilayer Main 10 Profile (Level)
1080/60/P	4:2:0 10-bit	1920x1080	59.94/60	SDR-TV HDR-TV	Supported (4.1)	Supported (5.1)
2160/60/P		3840x2160	59.94/60		Supported (5.1)	Supported (6.1)
2160/120/P		3840x2160	119.88/120		Supported (5.1)	Supported (6.2)
4320/60/P		7680x4320	59.94/60		Supported (6.1)	Supported (6.3)
4320/120/P		7680x4320	119.88/120		Supported (6.2)	<i>Not supported</i>

Scalability supported by Multilayer Main 10

- Typical scalability types – combination is possible
 - Spatial scalability
 - Quality scalability
 - Content scalability
- Features
 - Decoding of Multilayer Main 10 is implementable by extending DPB management of a Main 10 receiver.
 - Motion prediction in Main 10 has spatial-scaling functionality.
 - Bitrate increase from Main 10 profile is expected to be minor.
 - Effective prediction of enhance layer from base layer
 - Backward compatibility
 - Main 10 receiver can decode the base-layer of Multilayer Main 10 bitstream.

Spatial/Content scalability

Layer ↑



Enhanced video
4K



Base video
2K

Spatial scalability

Layer ↑



Enhanced video
4K + P-in-P



Base video
4K

Content scalability

Layer ↑



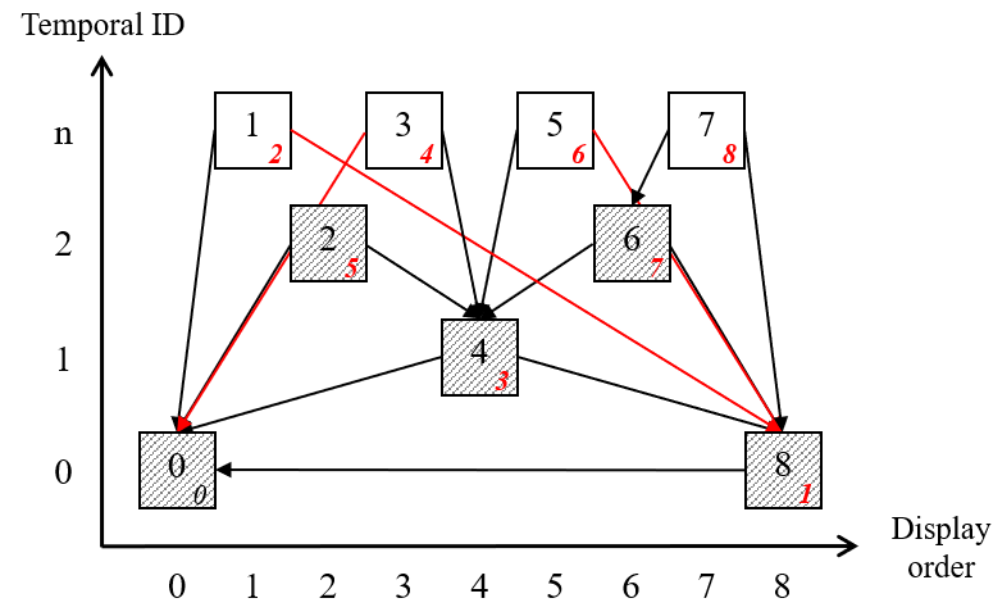
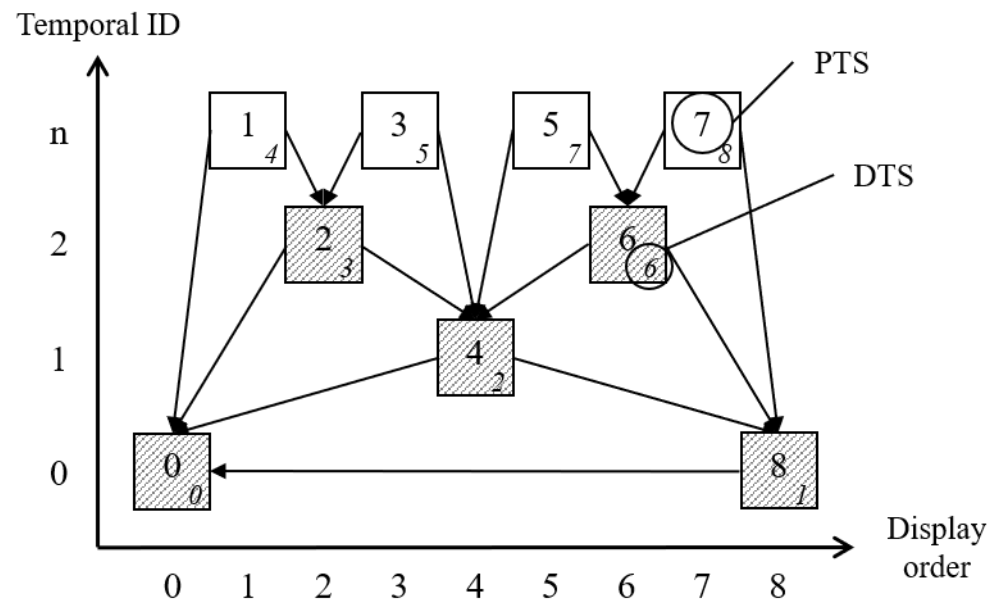
Enhanced video
4K + L-shaped ticker



Base video
4K

120 Hz/ 60 Hz Temporal scalability

- Applicable to both Main 10 and Multilayer Main 10 profile
- 60 Hz receiver can decode 60 Hz sub-bitstream in 120 Hz bitstream without changing decoding/output timing.

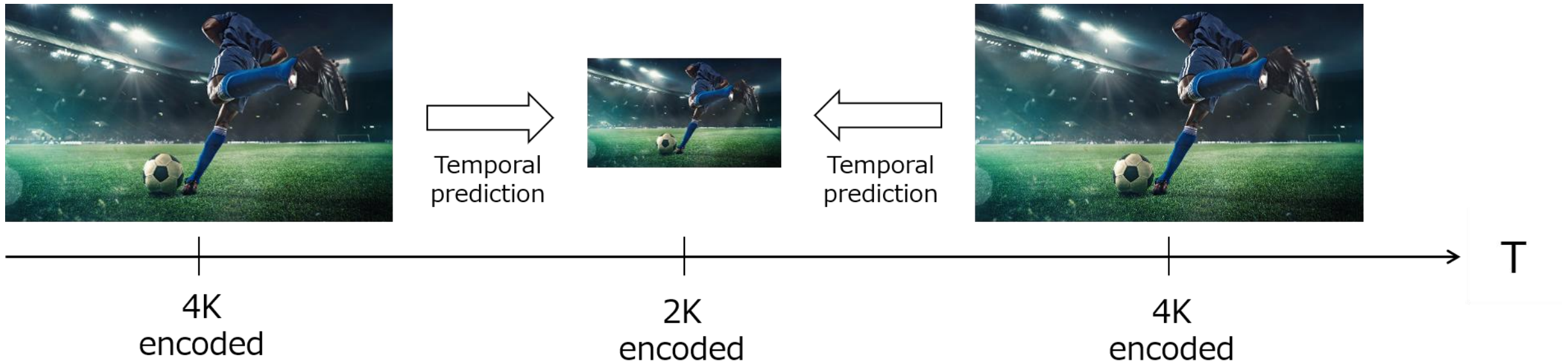


Typical 120 Hz bitstream
Unequal DTS interval in 60 sub-bitstream

Recommended 120 Hz bitstream
Equal DTS interval in 60 sub-bitstream

Dynamic resolution changes

- New functionality introduced to VVC
 - Each input frame can be scaled down to increase subjective quality, especially in high-motion scene.
 - Temporal prediction with scaling maintains coding efficiency.
- Guideline for interoperability in ARIB STD-B32
 - Set of possible resolutions, minimum interval (2 min.) of change, metadata relating to sampling position



Dynamic HDR metadata

- Dynamic HDR metadata specified in SMPTE ST 2094-10 and 2094-40 can be signaled in the bitstream.
 - Applicable both to HDR-PQ and HDR-HLG video
 - For scene-based automatic luminance and color adjustment

Conclusion

- Use of VVC for video coding in ISDB-T3
 - State-of-the-art compression performance for UHDTV
 - Low-implementation cost of scalability
- ARIB STD-B32 specifies video format and profile/level, guideline for interoperability and better quality.
 - Spatial/Quality/Content scalability of Multilayer Main 10 profile
 - Temporal scalability, dynamic resolution change, dynamic HDR metadata