UHD Immersive Media Service Status and Product Preparation

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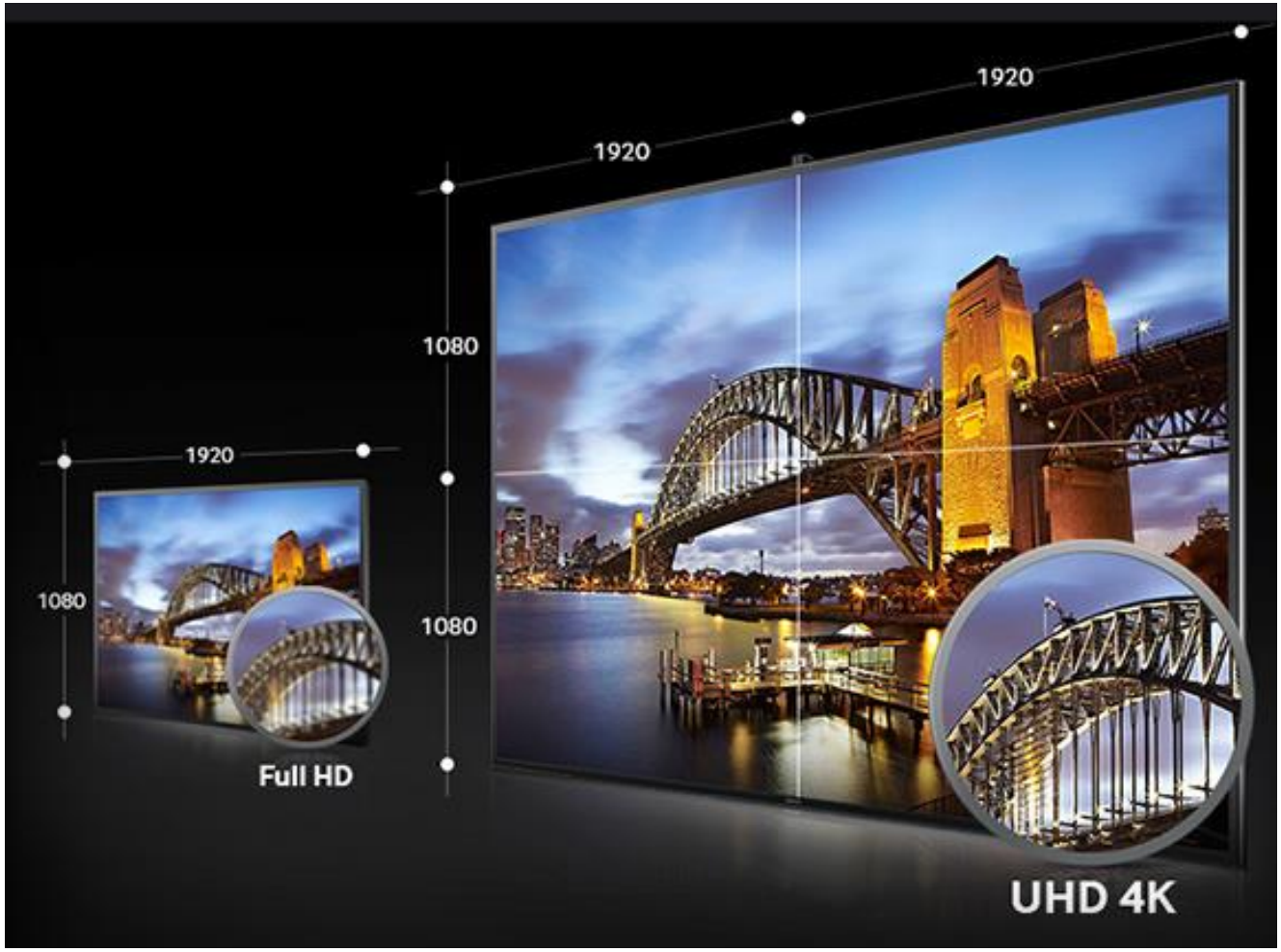
LG
Life's Good

4K UHD Terrestrial Broadcasting Started

2017, May, 31
4K UHD TV

- Ultra High Quality Video
- Immersive Audio
- Indoor Reception and SFN
- IP Interactive …



Broadcasting Service spec. : FHD Broadcasting to UHD Broadcasting

MPEG-H Std. is adopted to new UHD broadcasting

	ATSC1.0 FHD Broadcasting of Korea	ATSC3.0 UHD Broadcasting of Korea	
System	MPEG2 TS	MPEG DASH Route / MMT	
Video	MPEG2 8bit 60i 2K/4K SDR	HEVC 10bit 60~120P 2K/4K SDR/HDR	
Audio	AC3	MPEG-H 3D Audio	
Terrestrial Broadcasting Start	2001 Nov. ~	2017 May ~	

Korean ATSC3.0 Service Status and Plan

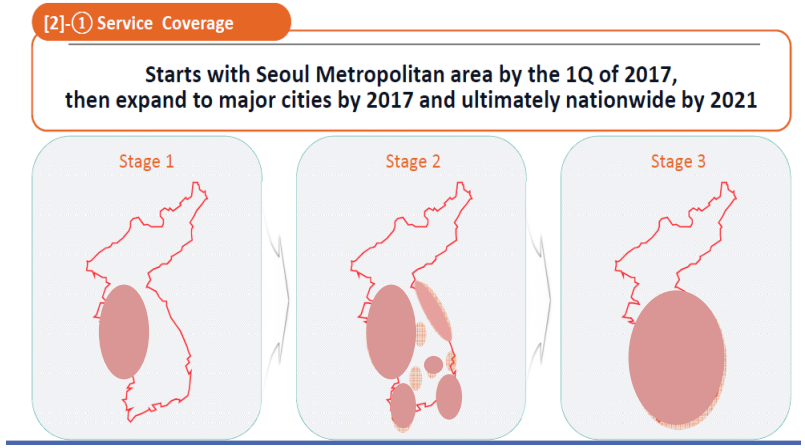
Korean Status & Plan

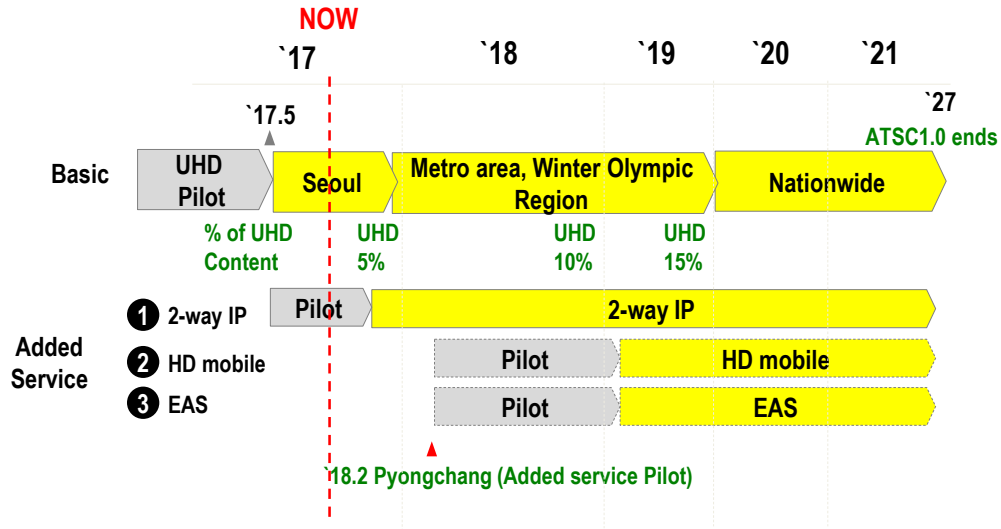
4K UHD Broadcasting Service

- Government led initiative to launch ATSC 3.0 → `16.12 Standardization and `17.05 live broadcasting, nationwide in progress
  - `17 in Seoul region, nationwide by `21

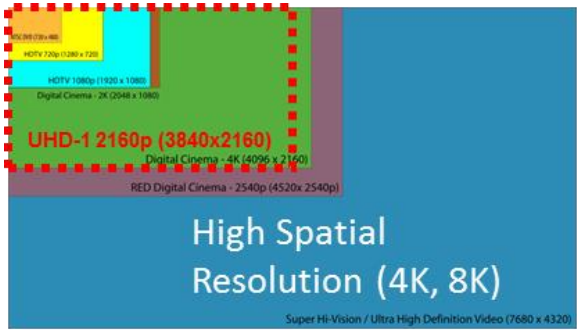
Additional Broadcasting Service

- In addition to UHD broadcasting, government and broadcasters are collaborating add additional services
  - Basic Service:
    4K UHD + MPEG-H Audio + AESG + Caption
  - Added Service:
    2-way IP, HD mobile broadcasting, EAS
  - 2-way IP broadcasting was started in `17.10 and expecting HD mobile broadcasting and EAS by `19

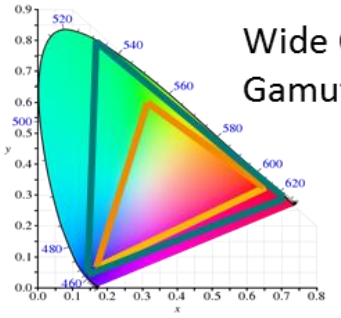




Immersive Viewing Experience

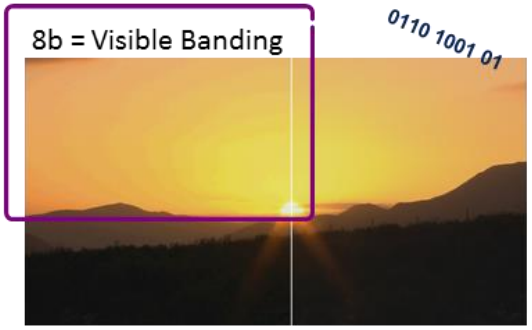


High Dynamic Range



Wide Color Gamut

10-bit Sampling



High Frame Rate

Immersive Audio

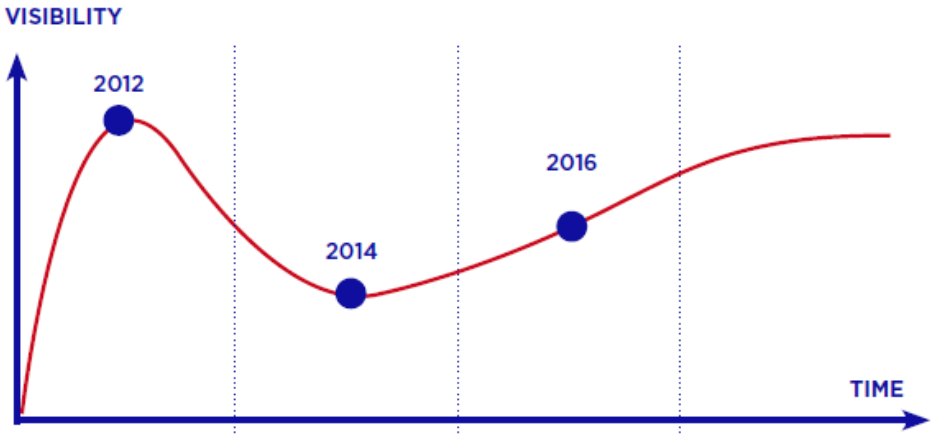
Muti-Channel
Object Based
Interactive

Summary of current immersive media status

- 4K TV Product 2014~ : with OTT application service of smart TV
- Netflix, Amazon, YouTube … : 4K service 2014 ~
- Cable TV, IPTV , Salttlite 1 or 2 Channel service started 2015~
- Test Broadcasting : Brazil Worldcup 2014 ~, Several Country 2015~
- HDR : Service from 2016 / 2017
- HFR : Some Product Ready 2018
- 8K Broadcasting : JAPAN ARIB2.0 4K/8K Broadcasting would be started 2018/12~

EBU
OPERATING EUROVISION AND EURORADIO

THE TIME IS NOW TO MOVE BEYOND HDTV!



"Peak of inflated expectations"
In 2012 the industry introduced «4k» as the next big thing for beyond HDTV leading to a huge hype and unrealistic expectations.

"Trough of disillusionment"
In 2014 the industry realized that 4k only provides limited immersive experience for the viewers. Understanding what makes better pixels was deemed as a necessary step.

"Slope of enlightenment"
In 2014 investigations made by EBU and others showed that HDR and HFR could be the game changers to go successfully beyond HDTV.
Four possible scenarios are now considered.

"Plateau of productivity"
The industry has reached agreement on standards on HDR and HFR.
It is now time for broadcasters to produce conwtent accordingly.

1080p advanced 1
Resolution: 1080p
Frame rate: 50Hz
HDR: Yes
WCG: Yes

1080p advanced 2
Resolution: 1080p
Frame rate: 100Hz
HDR: Yes
WCG: Yes

UHD phase 2a
Resolution: 2160p
Frame rate: 50Hz
HDR: Yes
WCG: Yes

UHD phase 2a
Resolution: 2160p
Frame rate: 100Hz
HDR: Yes
WCG: Yes

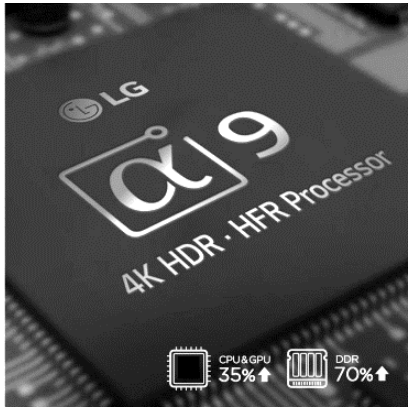
		1080p advanced 1	1080p advanced 2	UHD phase 2 a	UHD phase 2 b
Production	Cameras	●	●	●	●
	Studio interfaces	●	●	●	●
	Wireless links	●	●	●	●
	Mixers	●	●	●	●
	Graphic engines	●	●	●	●
	Professional monitors	●	●	●	●
Contribution	Encoders	●	●	●	●
	Decoders	●	●	●	●
	Modulators	●	●	●	●
	Demodulators	●	●	●	●
Distribution	Encoders	●	●	●	●
	Decoders	●	●	●	●
	Modulators	●	●	●	●
	Demodulators	●	●	●	●
Consumer	TVs	●	●	●	●
	Portables devices	●	●	●	●
	Set Top Boxes	●	●	●	●
	Consumer interfaces	●	●	●	●

Legend:
● Product available for purchase
● Specification/standard available – prototype available
● No agreed standard nor product available

Full EBU Document at EBU Site
https://tech.ebu.ch/docs/news/2016_09/Techn_2016_4k_HDTV_.pdf

LG Product Feature Preparation for Immersive Service

‘18 OLED TV with Alpha9 Processor



4K | 10 bit | HDR | 120Hz

2013 H2~ | 2016~ | 2018~

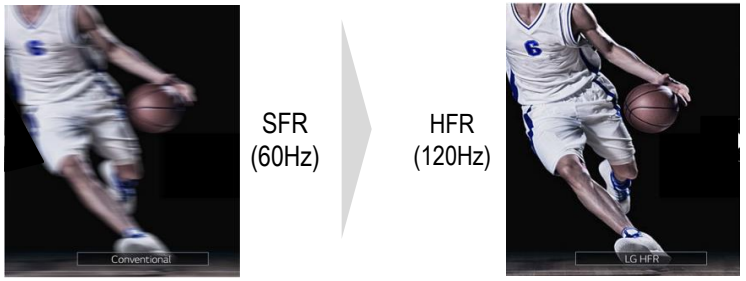
+ 4K Picture Quality Enhancement Post-Processing (incl. WCG Mapping)

NGA[1)]

MPEG-H 3D Audio
Dolby AC4/ATMOS
2017~

1) NGA : next generation audio

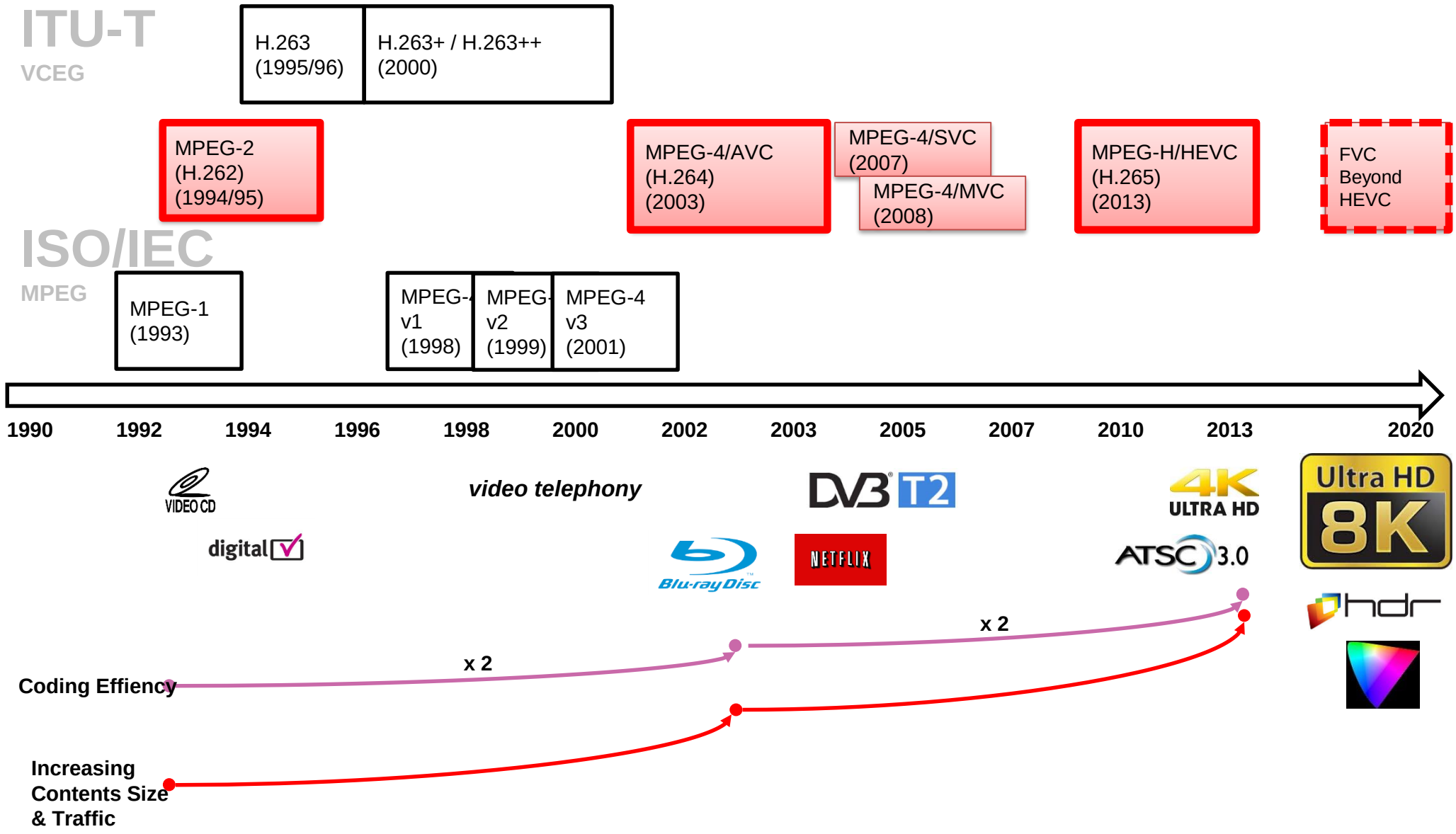
HDR Prepared :
HDR10
HLG
Dolby Vision
Technicolor Prime



SFR (60Hz) → HFR (120Hz)

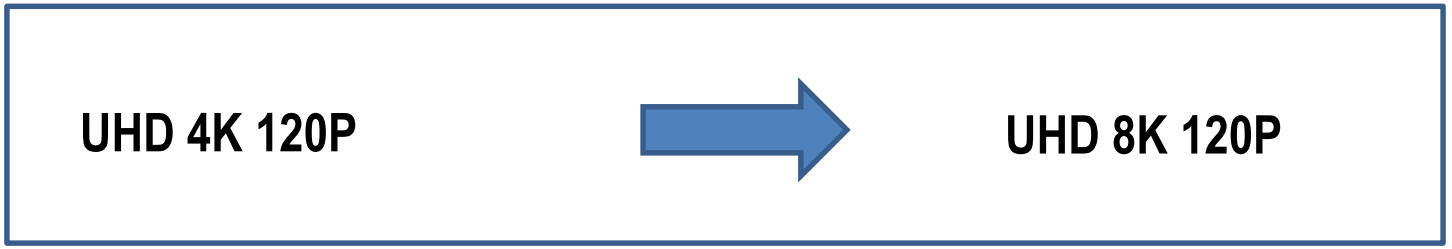
2K 120P
4K 120P

MPEG coding standard and media service



8K Preparation Consideration

To make 8K 60P or 8K 120P solution we expect MPEG-I video more than coding efficiency



Bitrate
< x 2

Computing Power
x 4

- 4K DEC
- 4K DEC
- 4K DEC
- 4K DEC

Memory Bandwidth
x 4

8K 10bit 120Hz (4:2:0)
Ex) 1 Read and 1Write

15+α Gbyte /Sec

α : map alignment cost

Memory Area
x 4 (about)

Ex)Reference and Interface Frame Buffer

63+α M Byte / frame

+ Parameter Buffer, CPB And Picture Post Processing

Conclusion

- Korea UHD broadcasting and many other immersive services have been preparing well
- 4K, 10bit, HDR, HFR immersive viewing can be experienced now.
- Many MPEG standards are adopted in Immersive service diversely
- For 8K , beside coding efficiency, we also expect memory usage and computing power reduction to next standard.

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