

# Status report of JVET & MPEG meeting in Macao

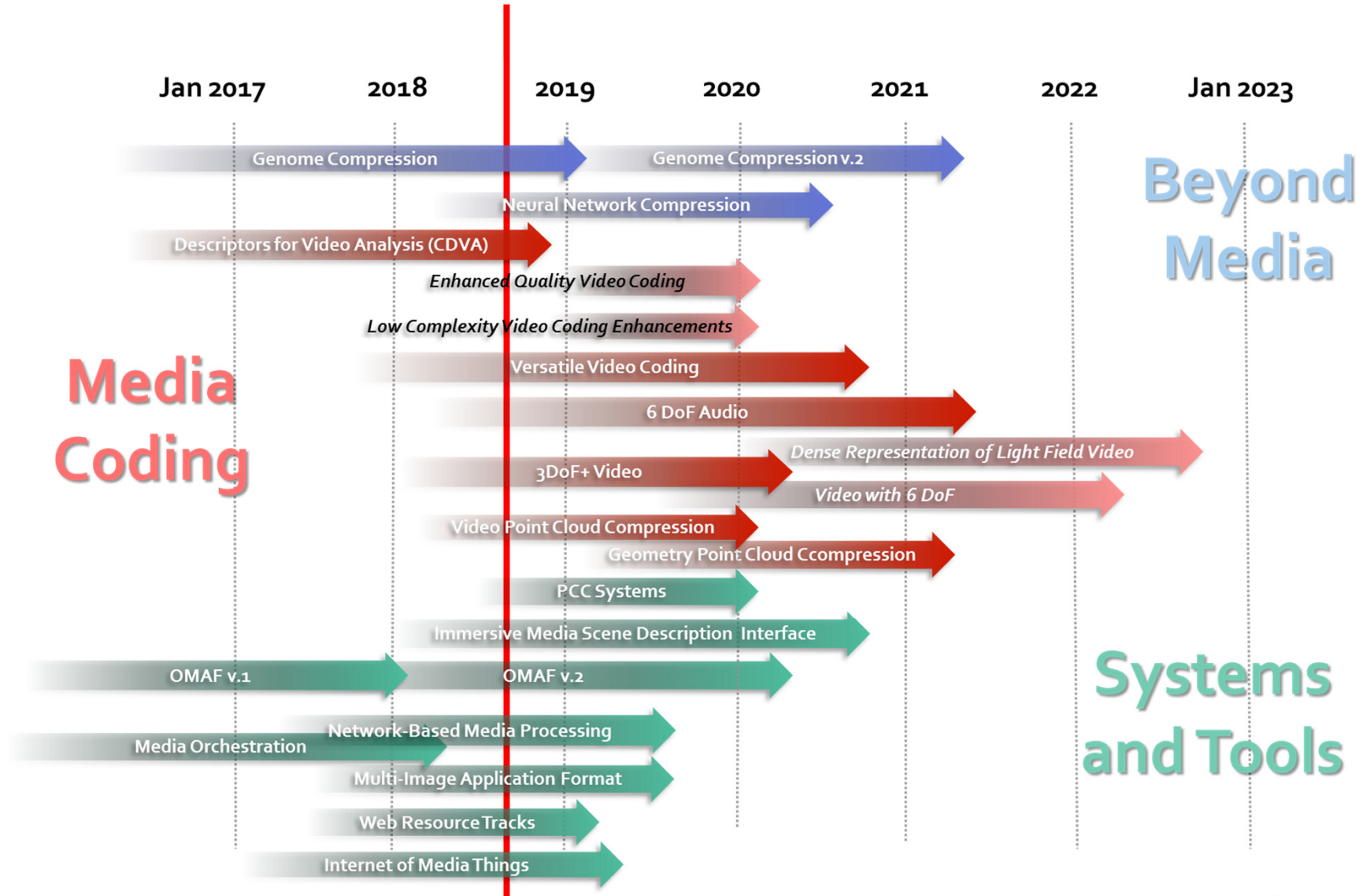
Speaker:  
Chun-Lung Lin

# Outline

- MPEG Roadmap
- JVET activities
- Point Cloud Compression(PCC)
- Other MPEG activities

# MPEG Roadmap

# MPEG Roadmap

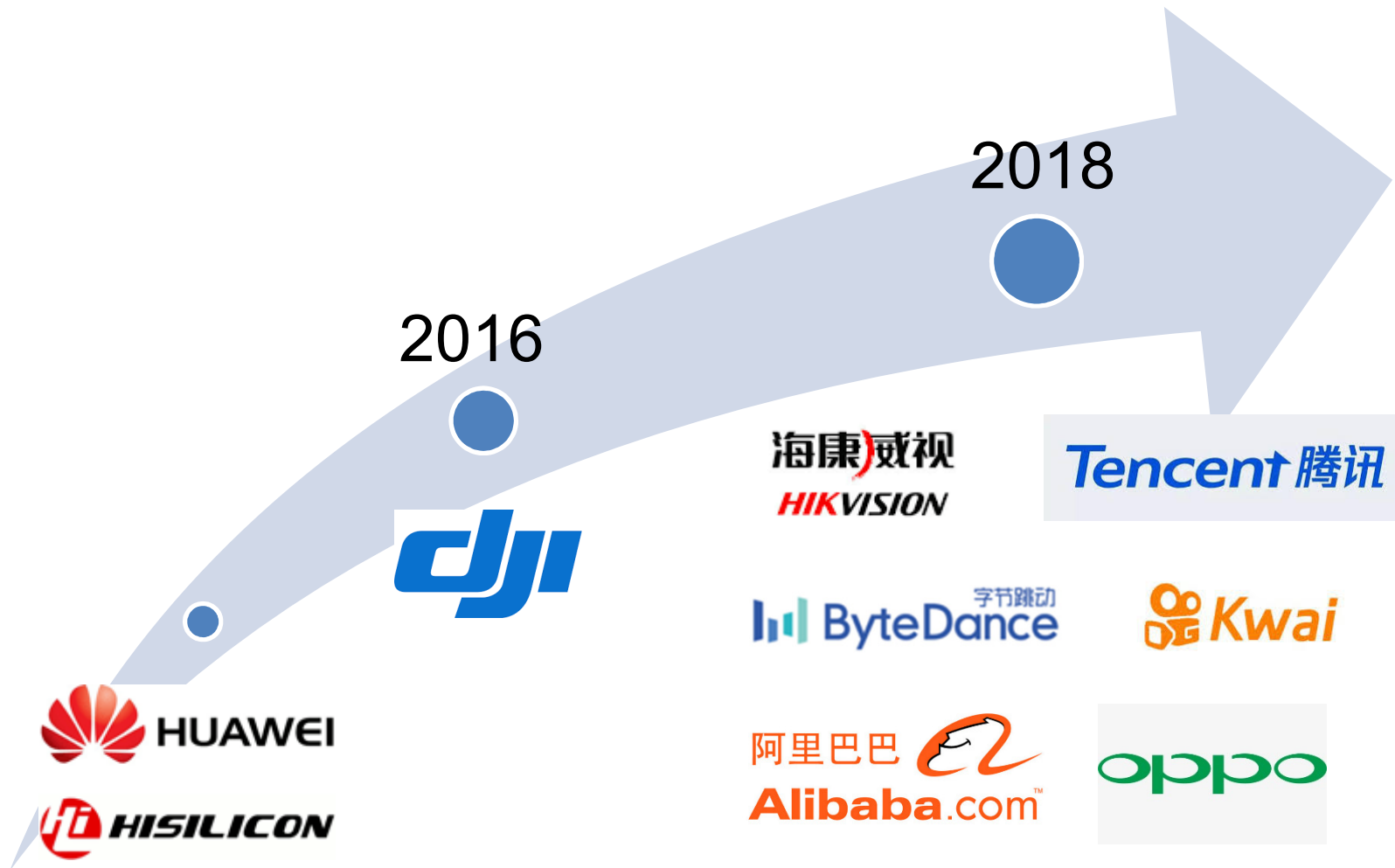


# Joint Video Exploration Team

# Joint Video Exploration Team

- 12<sup>nd</sup> Meeting of JVET
- Date: 3~ 12 October, 2018
- Approximately 400+ participants
- Approximately 650+ proposals
  - 180+ CE proposals
  - 200+ non-CE/CE-related proposals
  - Others: Project development, Test material, reports
  - Meeting notes of approx. 300 pages

# More China companies...



# Performance of VTM 2.0.1

All Intra Main10					
Over HM-16.19					
	Y	U	V	EncT	DecT
Class A1	-21.06%	-34.57%	-30.32%	1159%	173%
Class A2	-19.69%	-21.89%	-15.92%	1875%	173%
Class B	-16.13%	-21.05%	-26.44%	1968%	169%
Class C	-15.91%	-20.04%	-22.88%	2659%	163%
Class E	-19.35%	-24.07%	-26.37%	1432%	152%
<b>Overall</b>	-18.03%	-23.72%	-24.53%	1812%	166%
Class D	-13.46%	-16.38%	-17.33%	3005%	162%
Class F (optional)	-16.25%	-22.40%	-24.46%	1600%	157%

Random Access Main 10					
Over HM-16.19					
	Y	U	V	EncT	DecT
Class A1	-25.28%	-39.70%	-39.66%	375%	134%
Class A2	-28.23%	-35.57%	-30.28%	367%	141%
Class B	-22.87%	-36.14%	-36.37%	357%	123%
Class C	-17.84%	-27.96%	-29.42%	397%	114%
Class E					
<b>Overall</b>	-23.08%	-34.56%	-33.96%	373%	126%
Class D	-16.96%	-24.96%	-26.30%	394%	135%
Class F (optional)	-19.10%	-27.29%	-28.48%	216%	105%

All Intra Main10					
Over [vtm-1.0][tags][VTM-1.0][R34][VTM-withF]-v0.7					
	Y	U	V	EncT	DecT
Class A1	-16.86%	-27.90%	-22.51%	133%	162%
Class A2	-15.66%	-11.98%	-4.49%	201%	155%
Class B	-13.28%	-9.83%	-15.03%	203%	148%
Class C	-13.12%	-9.76%	-12.87%	236%	129%
Class E	-14.96%	-12.96%	-15.85%	164%	143%
<b>Overall</b>	-14.52%	-13.71%	-14.17%	188%	146%
Class D	-11.22%	-6.27%	-6.80%	267%	127%
Class F (optional)	#VALUE!	#VALUE!	#VALUE!	#DIV/0!	#DIV/0!

Random Access Main 10					
Over [vtm-1.0][tags][VTM-1.0][R34][VTM-withF]-v0.7					
	Y	U	V	EncT	DecT
Class A1	-16.64%	-29.98%	-28.63%	150%	171%
Class A2	-20.04%	-21.75%	-16.23%	165%	173%
Class B	-16.61%	-22.76%	-23.80%	172%	148%
Class C	-12.15%	-15.95%	-17.23%	176%	136%
Class E					
<b>Overall</b>	-16.11%	-22.18%	-21.50%	167%	154%
Class D	-12.37%	-12.84%	-14.47%	190%	138%
Class F (optional)	#VALUE!	#VALUE!	#VALUE!	#DIV/0!	#DIV/0!



# Performance of BMS 2.1 compared to VTM 2.0.1

	All Intra Main10				
	Over BMS-2.0.1 VTM cfg				
	Y	U	V	EncT	DecT
Class A1	-0.62%	-2.15%	-1.77%	323%	96%
Class A2	-0.83%	-2.37%	-1.84%	318%	98%
Class B	-1.15%	-2.09%	-3.10%	343%	96%
Class C	-1.27%	-2.15%	-2.74%	344%	101%
Class E	-1.92%	-2.67%	-4.39%	351%	98%
<b>Overall</b>	-1.16%	-2.26%	-2.80%	337%	98%
Class D	-1.24%	-1.99%	-2.34%	345%	104%
Class F (optional)	-18.40%	-18.86%	-19.16%	375%	94%
	Random Access Main 10				
	Over BMS-2.0.1 VTM cfg				
	Y	U	V	EncT	DecT
Class A1	-3.59%	-3.83%	-4.37%	192%	134%
Class A2	-5.22%	-4.99%	-4.31%	188%	137%
Class B	-4.00%	-4.78%	-5.56%	208%	147%
Class C	-3.73%	-3.59%	-4.28%	225%	152%
Class E					
<b>Overall</b>	-4.09%	-4.31%	-4.73%	205%	144%
Class D	-4.76%	-4.54%	-4.33%	227%	153%
Class F (optional)	-16.23%	-16.61%	-16.88%	232%	136%

# Further investigation...

- Some proposed technology still too complex to justify gain
  - Secondary transforms
  - Post-reconstruction filters (bilateral/Hadamard domain)
  - Non-linear and matrix-based intra prediction
  - Template matching based methods in intra and inter
- Implementation study on tools
  - Impact of small block sizes in inter and intra
  - Fast algorithms on MTS transforms, unification
  - Throughput of CABAC improvements

# Core Experiments

- CE1: Partitioning
- CE2: Subblock motion compensation
- CE3: Intra prediction and mode coding
- CE4: Inter prediction and MV coding
- CE5: Arithmetic coding engine
- CE6: Transforms and transform signalling
- CE7: Quantization and coefficient coding
- CE8: Screen content coding tools
- CE9: Decoder side MV derivation
- CE10: Combined and multi-hypothesis prediction
- CE11: Deblocking
- CE12: Mapping functions
- CE13: Coding tools for 360° omnidirectional video

# AHGs

- Project Management (AHG1)
- Draft text and test model algorithm description editing (AHG2)
- Test model software development (AHG3)
- Test material and visual assessment (AHG4)
- Memory bandwidth consumption of coding tools (AHG5)
- 360° video conversion software development (AHG6)
- Coding of HDR/WCG material (AHG7)
- 360° video coding tools and test conditions (AHG8)

# AHGs

- Neural networks in video coding (AHG9)
- Encoding algorithm optimizations (AHG10)
- Screen content coding (AHG11)
- High-level parallelism and coded picture regions (AHG12)
- Tool reporting procedure (AHG13)
- Progressive intra refresh (AHG14)
- Bitstream decoding properties signalling (AHG15)
- Implementation (AHG16)
- High-level syntax (AHG17) (new)

# Schedule of Future Meetings

#	City	Country	Year	Month
121	Gwangju	KR	18	01
122	San Diego, CA	US	18	04
123	Ljubljana	SI	18	07
124	Macao	CN	18	10
125	Marrakesh	MA	19	01
126	Geneva	CH	19	03
127	Gothenburg	SE	19	07
128	Geneva	CH	19	10
129	Brussels	BE	20	01
130	Alpbach	AT	20	04
131	Geneva	CH	20	07
132	Rennes	FR	20	10

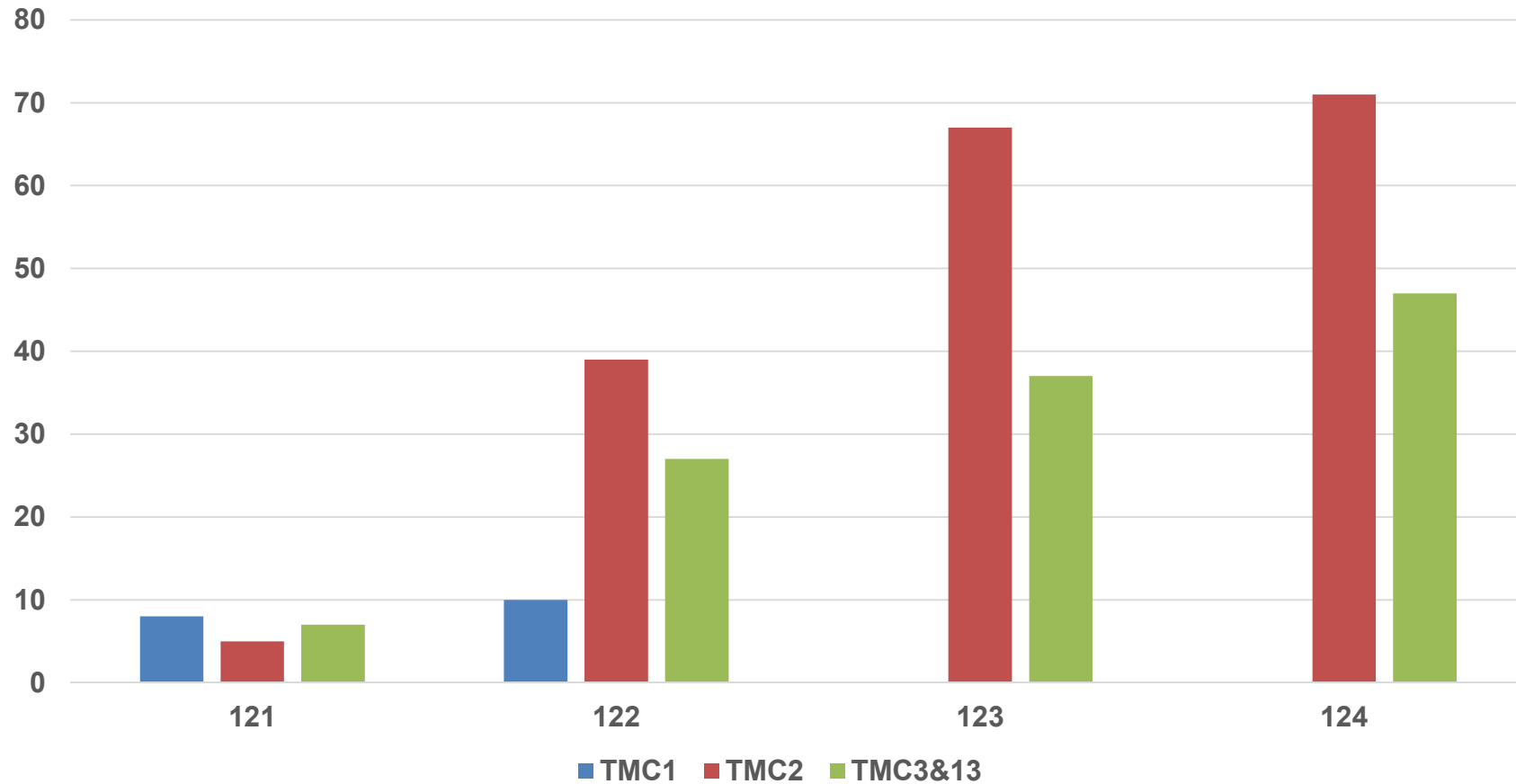
# Point Cloud Compression

# PCC

- 5<sup>th</sup> F2F Meeting of PCC after CfP
- Date: 8 ~ 12 October, 2018
- Approximately 60+ participants
- 150 contributions



## Number of PCC contributions

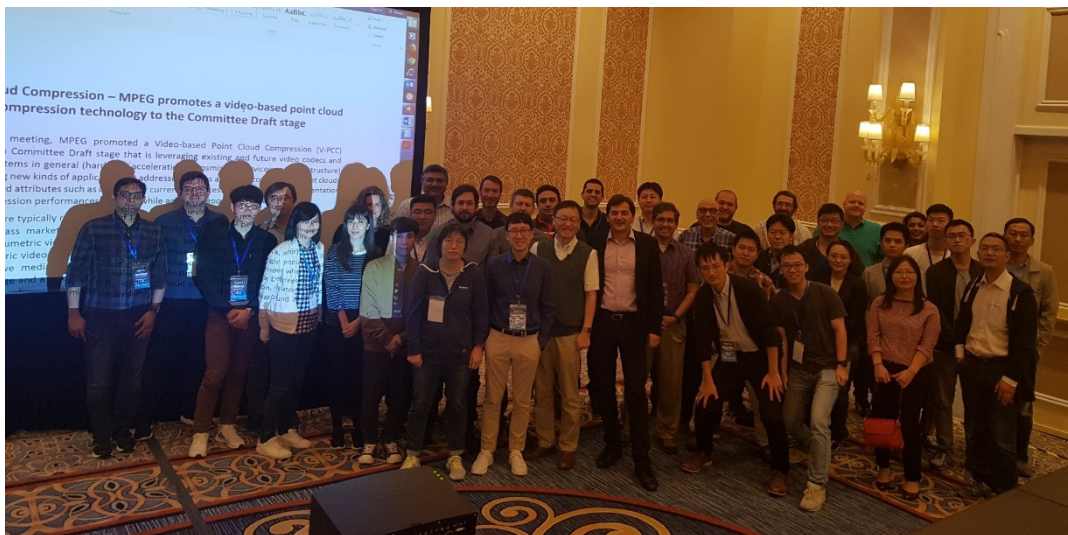


# PCC Participants



30 organizations

# PCC Participants



# PCC categories

Test model 13

Category 1 : Static  
Cultural Heritage



Category 3 : LIDAR  
Autonomous driving

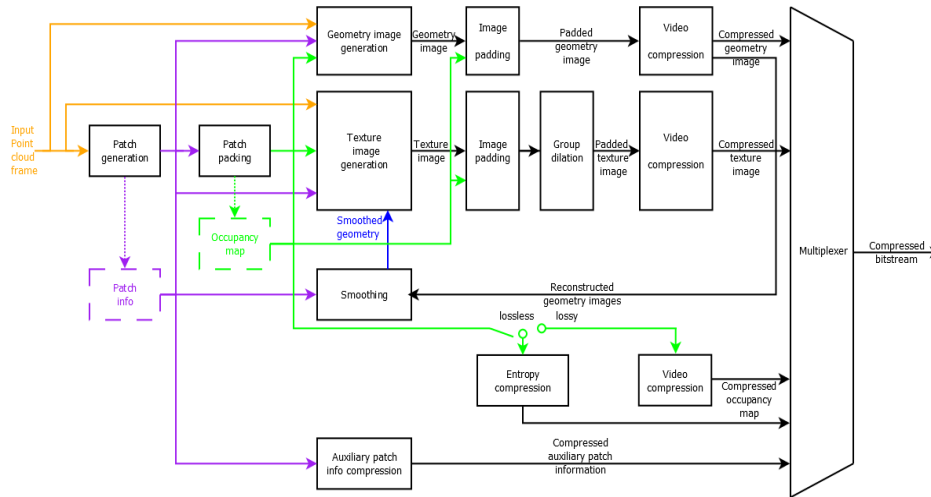


Test model 2

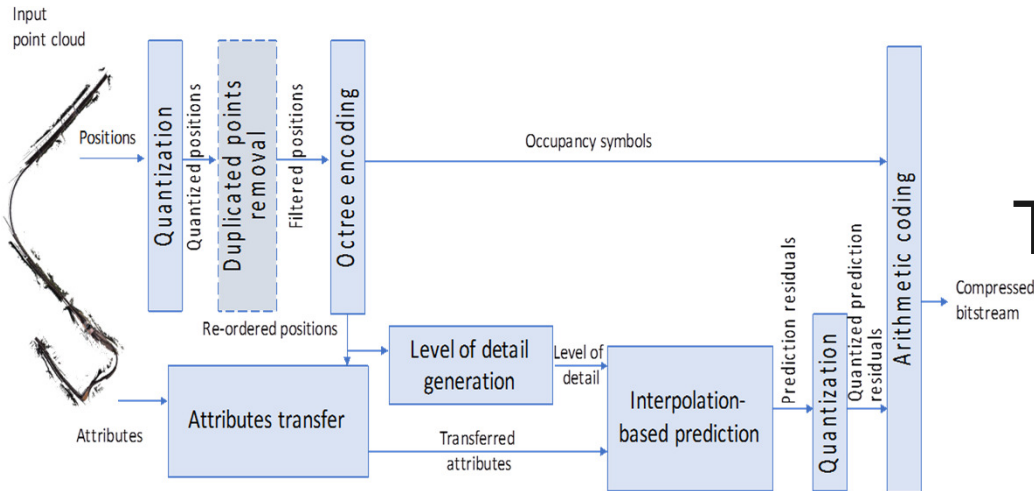
Category 2 : Animated  
AR/VR



# PCC categories



TMC2 becomes **V-PCC**  
Video-based PCC

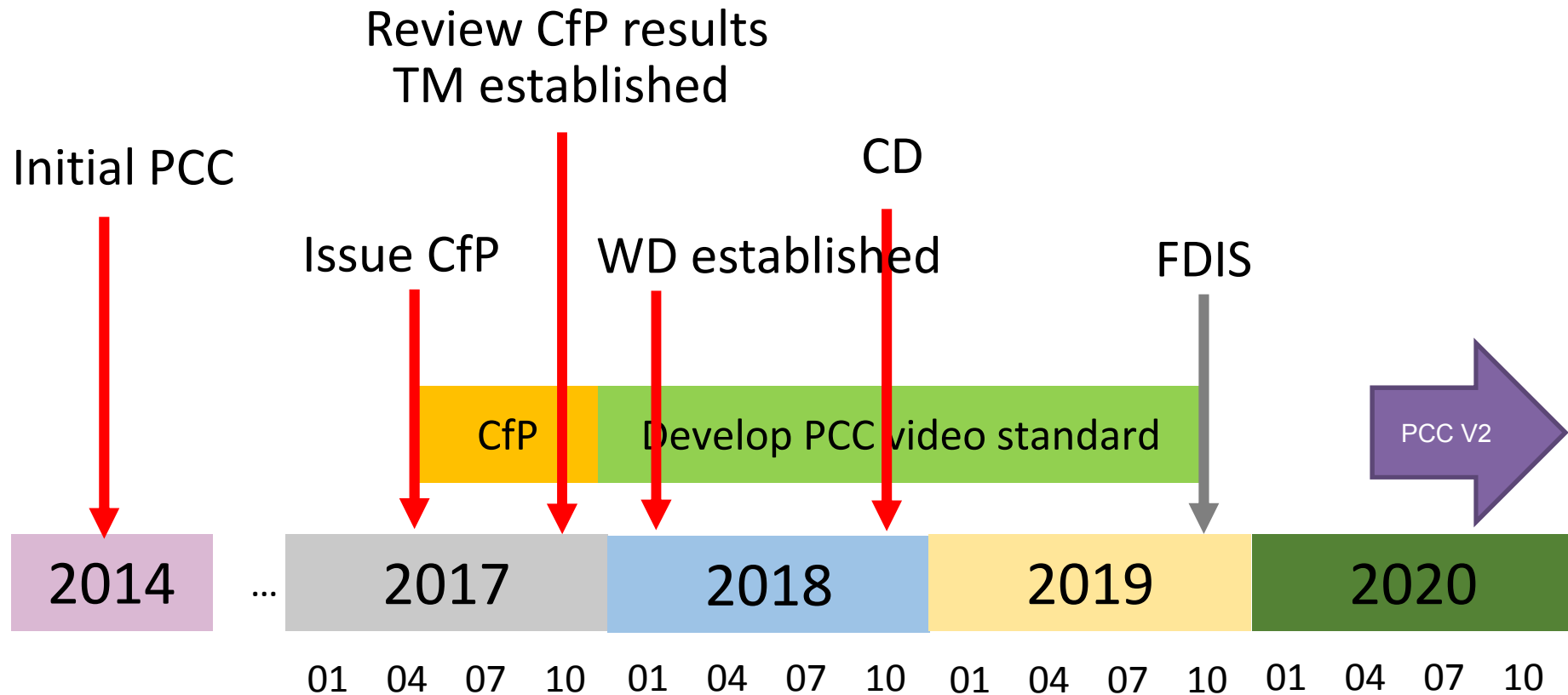


TMC13 becomes **G-PCC**  
Geometry-based PCC

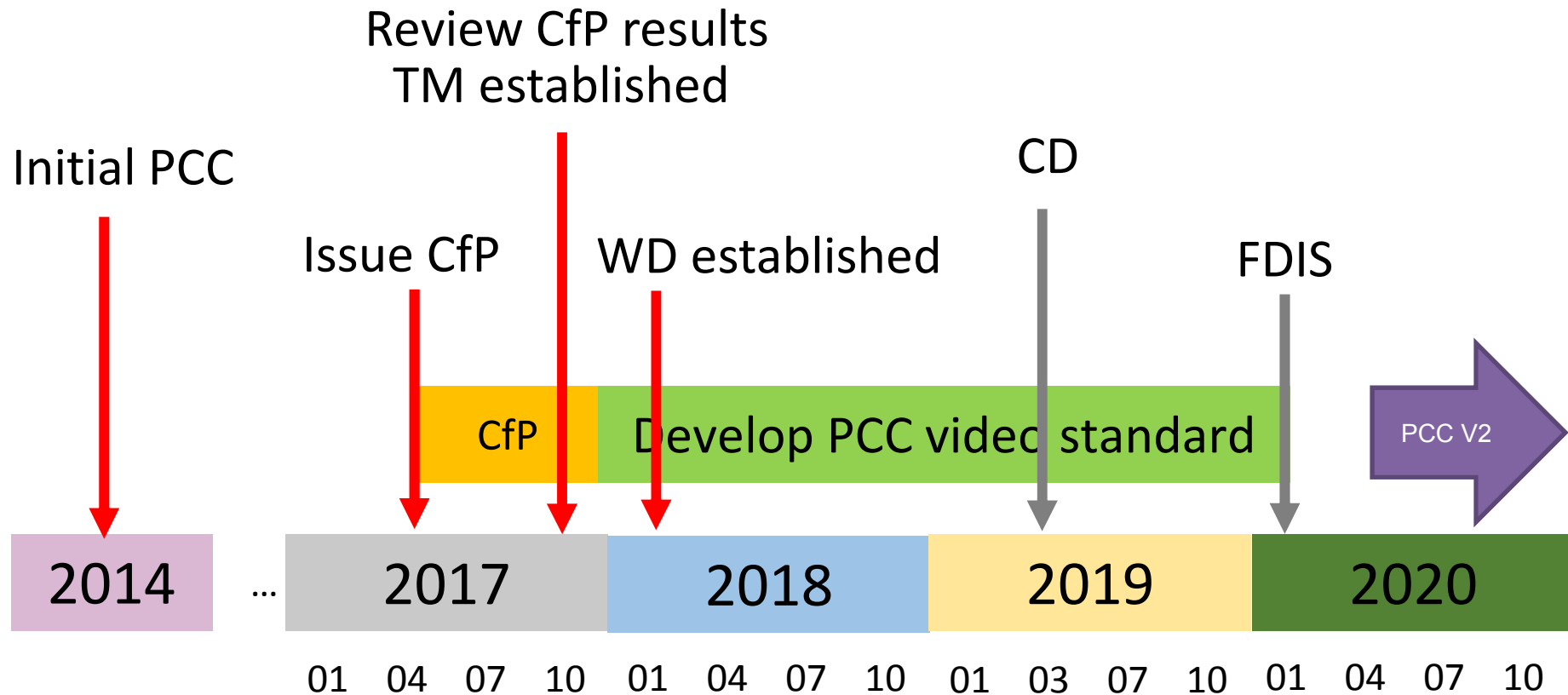
# Significant results

- Subdivide of MPEG-I to create independent parts for V-PCC G-PCC
  - G-PCC delay 2 meeting cycles for CD
- Commit draft for V-PCC

# V-PCC Timeline



# G-PCC Timeline

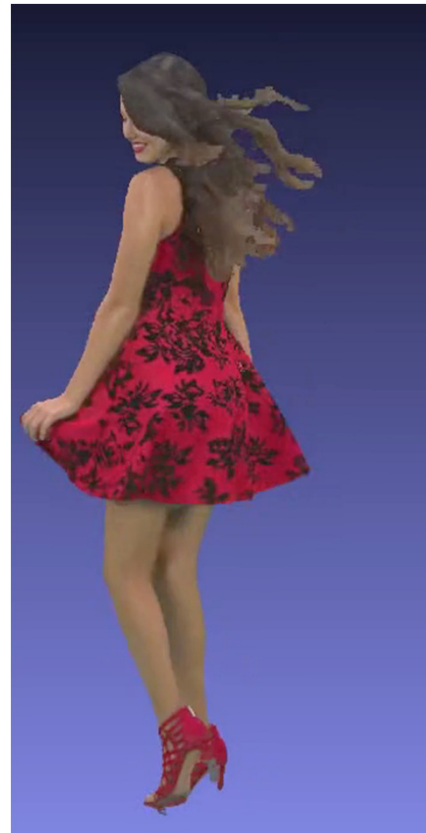




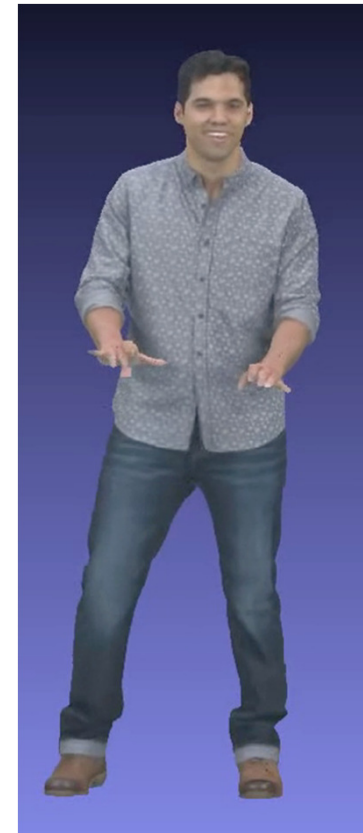
# PCC results until MPEG124

100,000 points -> 125 Mbps (uncompressed)

100,000 points -> 1 Mbps (MPEG PCC 2018)



7,7 Mbps



5,7 Mbps

# Core Experiments for G-PCC

- CE 3.4 on neighbor-dependent entropy coding in G-PCC
- CE 13.1 on lossy attributes coding
- CE 13.2 on point cloud tiles and slice based coding
- CE 13.5 on inter-prediction on geometry coding
- CE 13.6 on attribute prediction strategies
- CE 13.10 on entropy coding evaluation
- CE 13.14 on fixed point implementation
- CE 13.15 on LOD generation
- EE 13.1 on prediction strategies for lifting transform

# Core Experiments for V-PCC

- CE 2.9 on occupancy map coding
- CE 2.10 on metadata coding
- CE 2.11 on spatial adaptive reconstruction
- CE 2.12 on visual quality
- CE 2.15 on attributes coding
- CE 2.16 on upsampling and downsampling
- CE 2.18 on patch packing
- CE 2.19 on tiles and slices
- CE 2.20 occupancy map 2D filter
- CE 2.21 on duplicated points
- CE 2.22 on missing points encoding for lossless
- CE 2.23 on video frame size modification
- EE 2.1 on 3D motion estimation

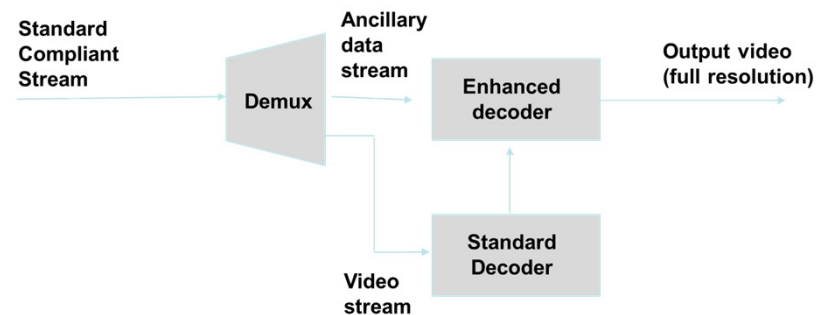
# Other MPEG Activities

# Coded Representation of Neural Networks

- Results of CfE: 3 responses, more than 75% training model size reduction
  - PKU, KAU, Nokia
- CfP information
  1. Compression of weights and parameters  
CfP at MPEG 124, evaluation at MPEG 126
  2. Update of weights and parameters  
Cfp at MPEG 128?

# Low Complexity Video Coding Enhancements

- Capability Extension of Existing Video Codecs
- CfP at 124, JM and HM as standard video codec
  - No legacy decoder output viewing
  - Registration prior to MPEG 125
  - Formal subjective test at MPEG 126
  - PSNR
  - VCEG will not contribute



# New Video Coding Standard

- Goal: Provide solution to those that want to use an ISO standard but cannot use HEVC
- Performance of the new standard will be similar to HEVC.

## Approach

- Make Requirements public
  - Baseline AVC Main 10 performance
  - Enhancement HEVC performance
- CfP this meeting
- No contribution from VCEG

# New Video Coding Standard

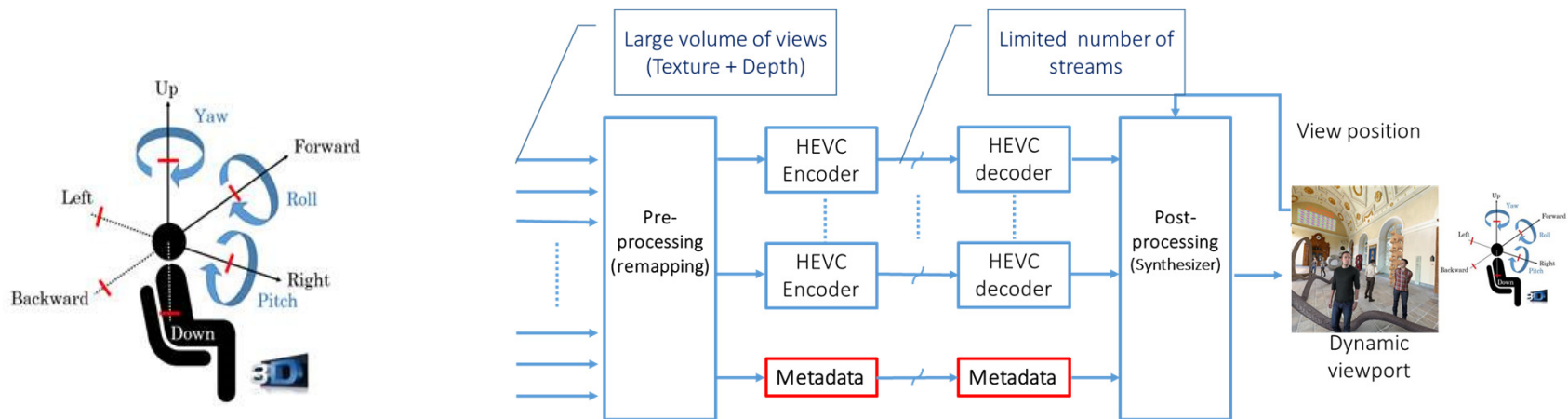
- **Timeline**

- 2018/10/31: Final Call for Proposals (public release)
- 2018/11/30: Anchor bitstreams will be available
- 2019/01/09: Submission of documents describing the proposals
- 2019/01/10: Submission of bitstreams and binary decoders
- 2019/01/12: Cross-checking of bitstreams and binary decoders
- (participation mandatory for proponents)
- 2019/01/12-17: Evaluation of proposals in AHG and at MPEG meeting 125
- 2019/01/18: Initial Test Model
  
- Anticipated tentative timeline after CfP:
  - 2019/01 Working Draft
  - 2019/03 CD
  - 2019/07 DIS
  - 2020/01 FDIS



# MPEG-I 3DoF+ Visual

- Legacy codec with new metadata
- Timeline
  - 2019/01/18 MPEG 125: Final CfP
  - 2019/02/23 Formal registration end
  - 2019/03/22 Expert viewing start
  - MPEG 126 Evaluation of responses, and WD1 (MPEG-I Part 7 Metadata)
  - MPEG 131 FDIS(2020/7)



# Thank You