

SONY

Point Cloud Compression

MPEG's First Standard for Immersive Media

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Sony Corporation of America**

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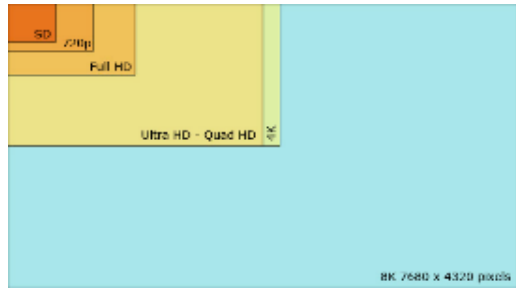
Industry trends for immersive content

<https://www.cinema5d.com/sony-venice-extension-with-tethered-sensor-block-shoots-avatar-sequels/>
<https://www.shutterbug.com/content/sony%E2%80%99s-new-rx0-tiny-waterproof-action-camera-high-resolution-stills-and-videos>
<https://www.bhphotovideo.com/explora/home-entertainment/news/ces-2018-sonys-keynote-address>
<https://www.youtube.com/watch?v=kQaygYspsh8>

Video
Tech.



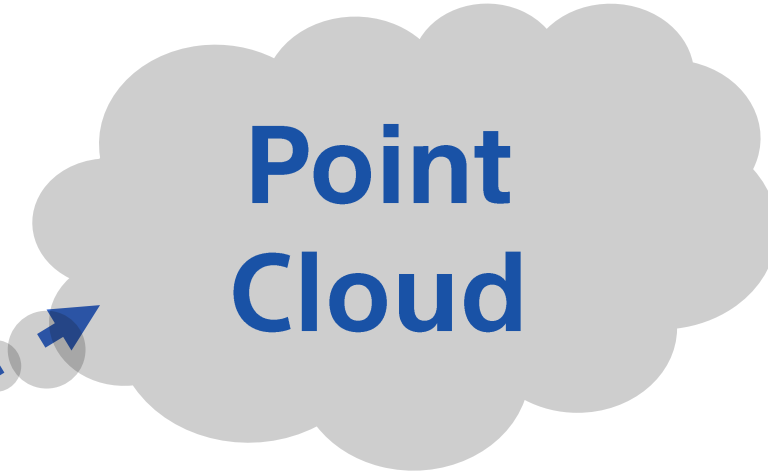
LDR, HDR



HD, Full HD, 4K, 8K



Multi-camera



Easy to produce
High quality



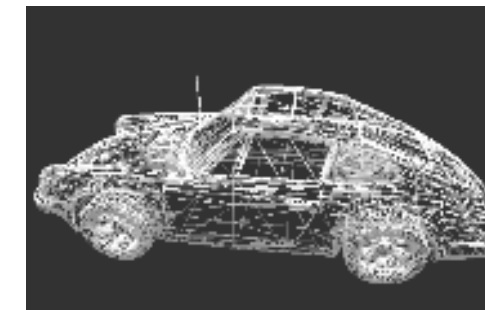
Stereoscopy



Interactivity
Immersion



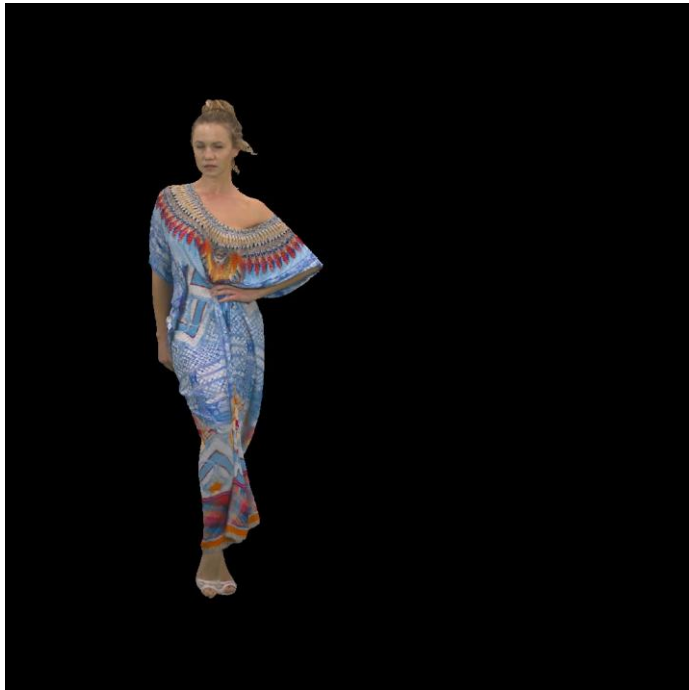
Geometric
primitives



Gaming
Tech.

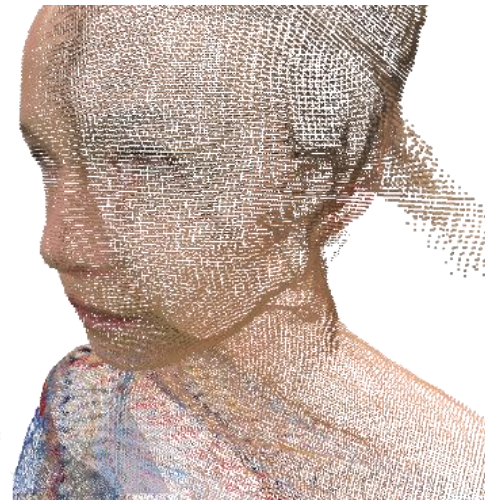
Point Cloud

2D media content

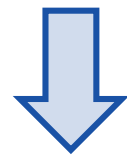


HD @ 30fps → 1.5 Gbps
(fixed viewpoint)

3D media content

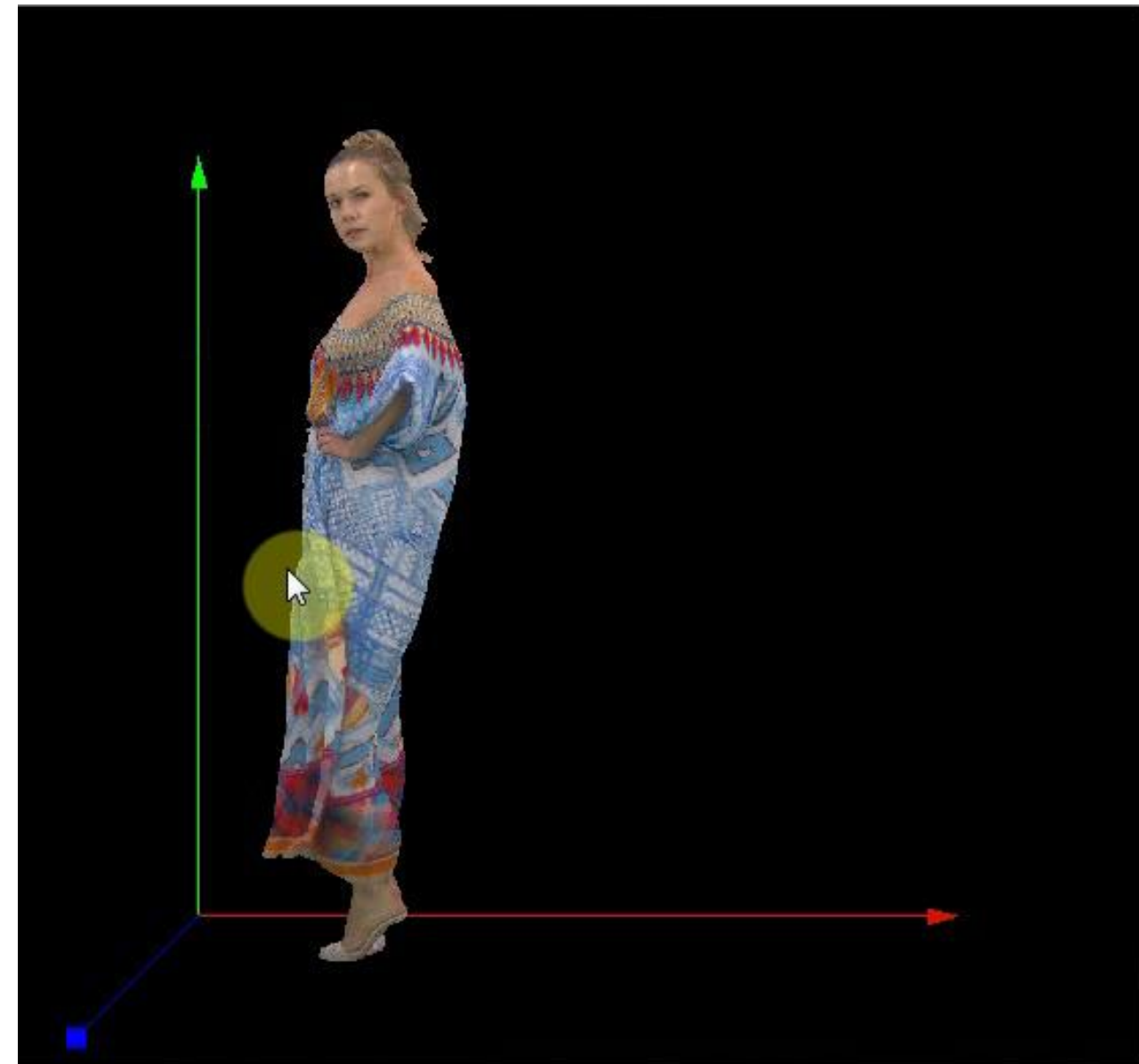


3D point cloud



A set of **unordered** 3D points:

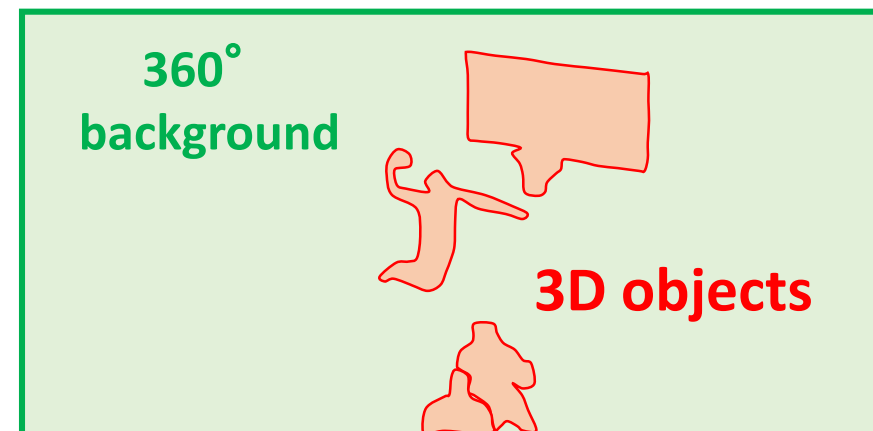
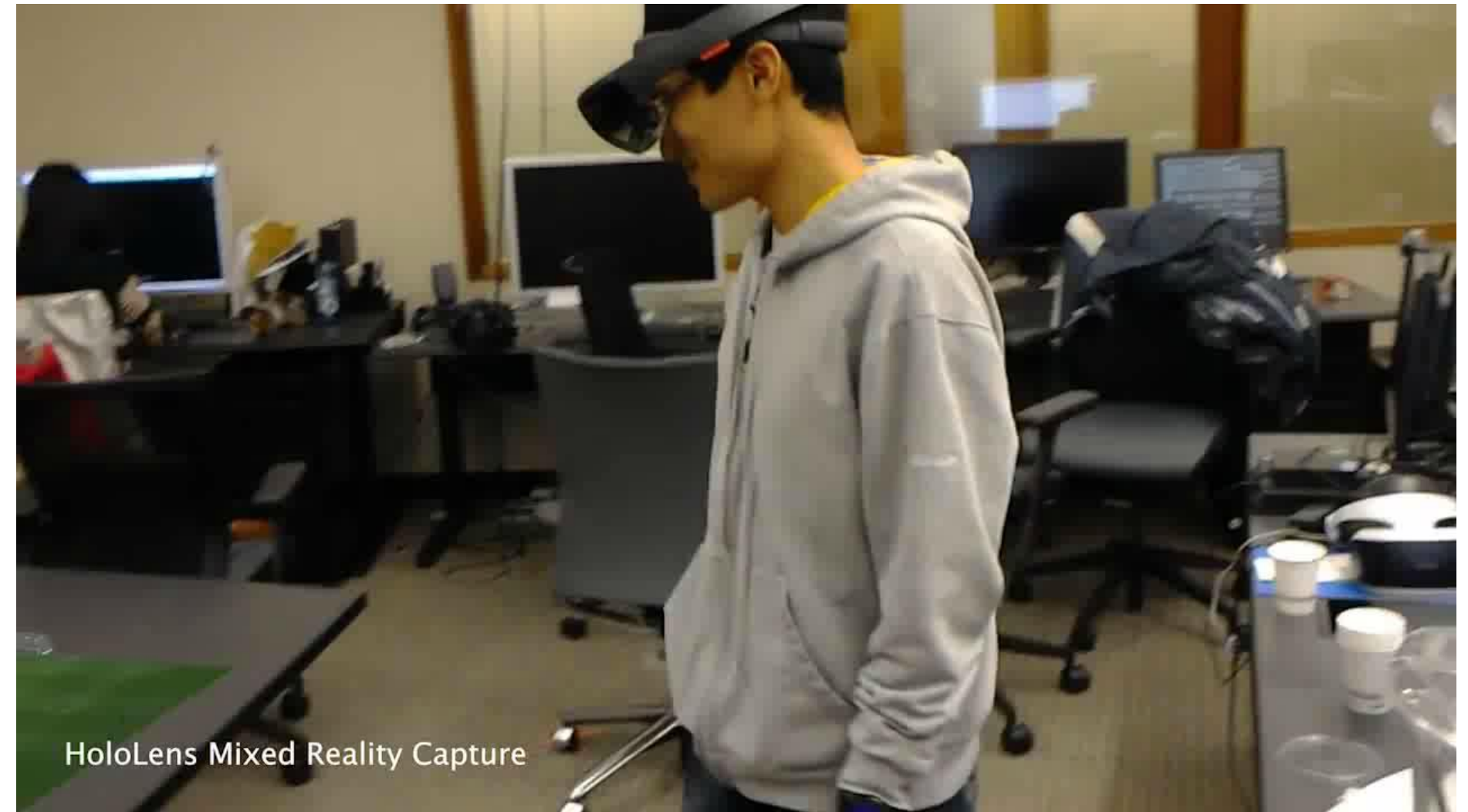
- (X, Y, Z)
- (R, G, B) or (Y, U, V)
- reflectance, transparency, ...



800,000 points @ 30fps → 2.88 Gbps

Compression is required in order to make PC useful

Sport viewing with point clouds



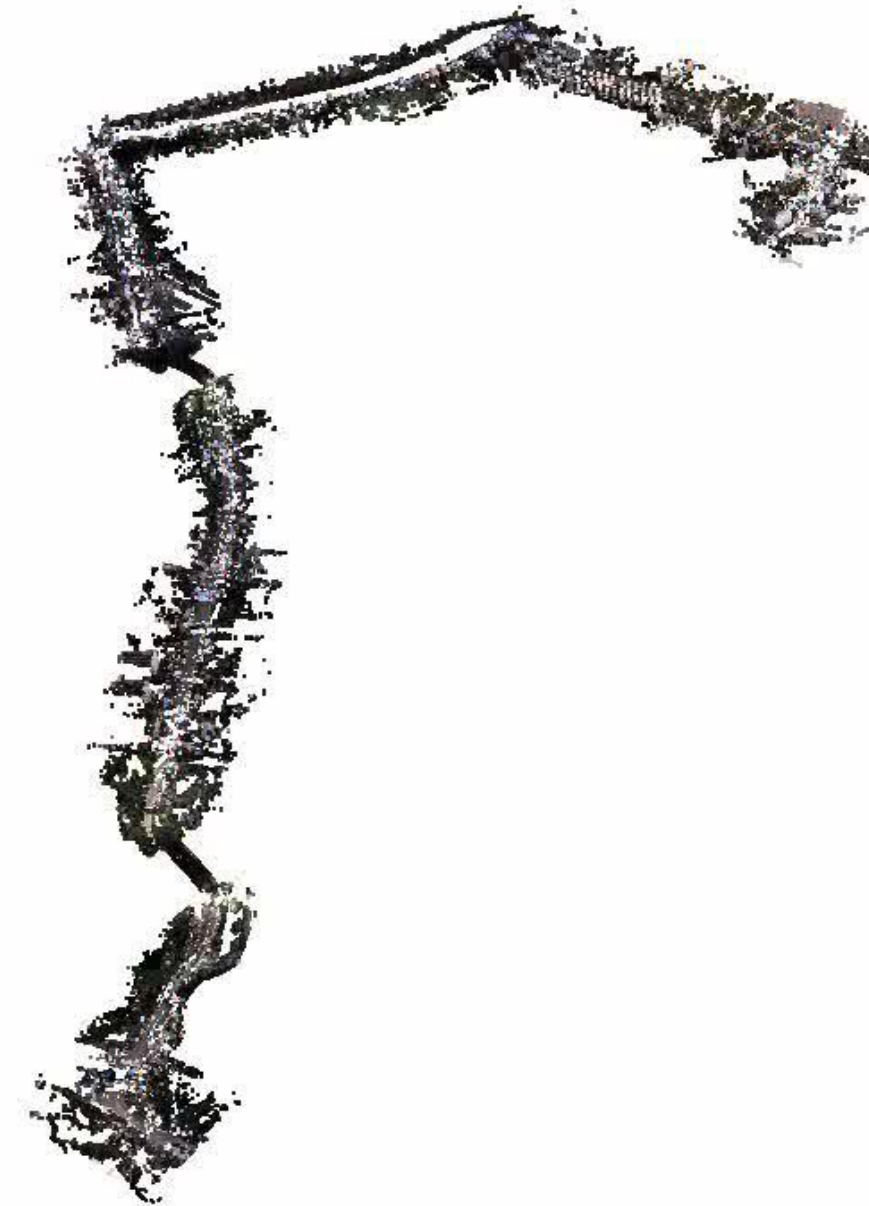
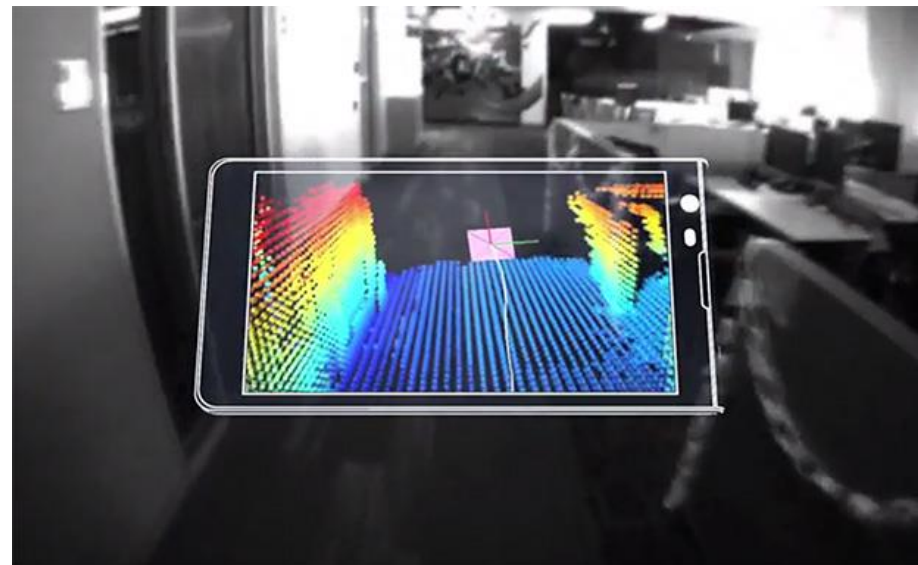
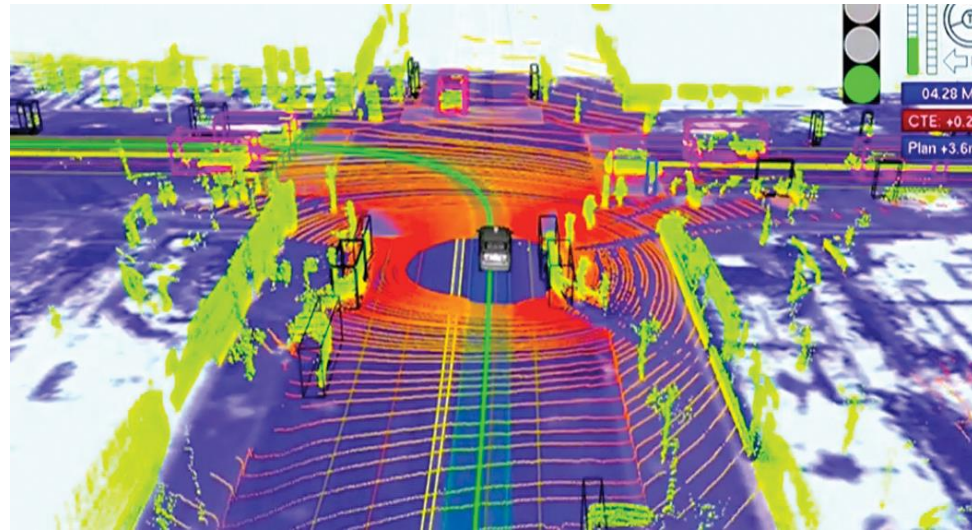
3 Gbps per object



Environment mapping for autonomous driving

~20 million points

- 2,020,734,515 bytes



Point Cloud Compression

V-PCC
01/2020

G-PCC
4/2020

2014

2015

2016

2017

2018

2019

2020

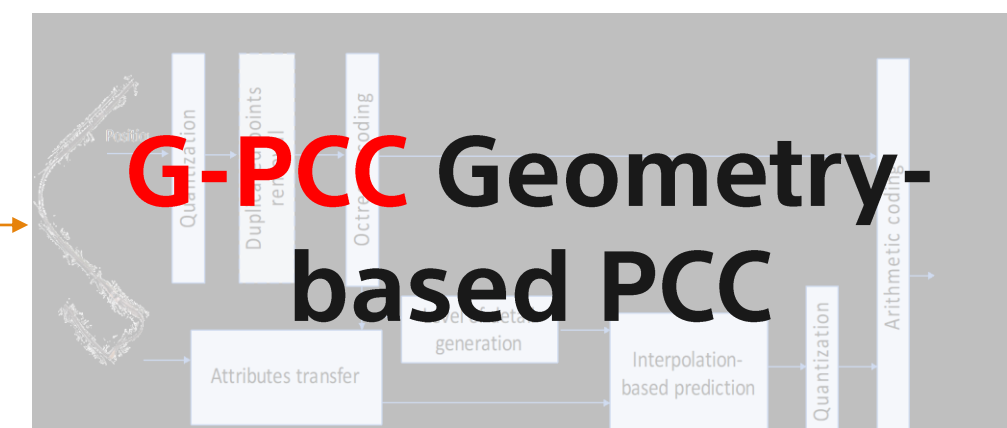
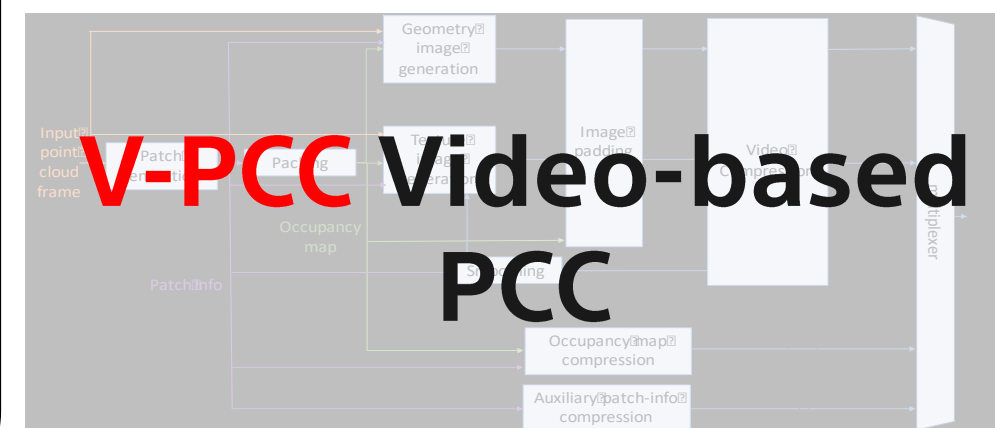
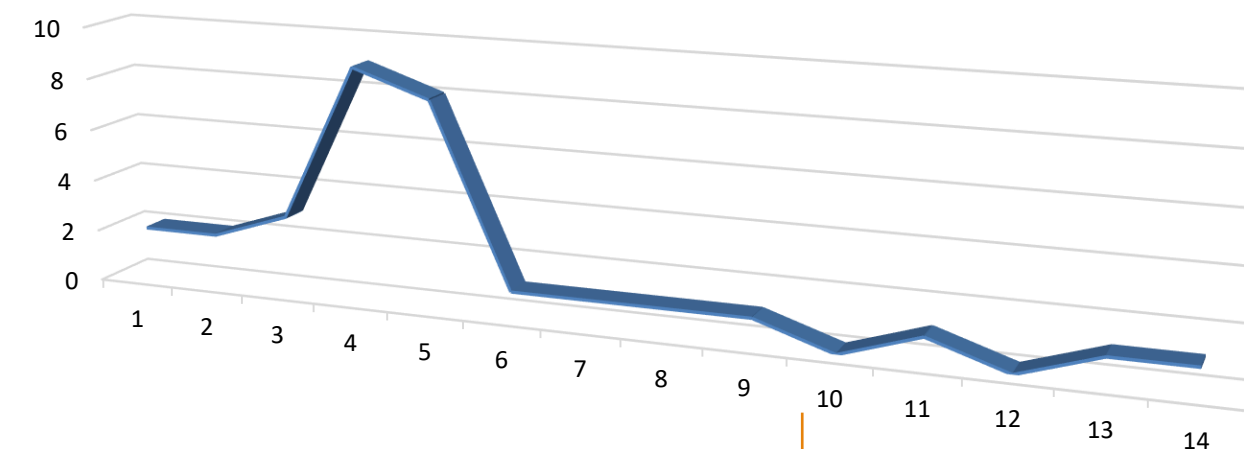
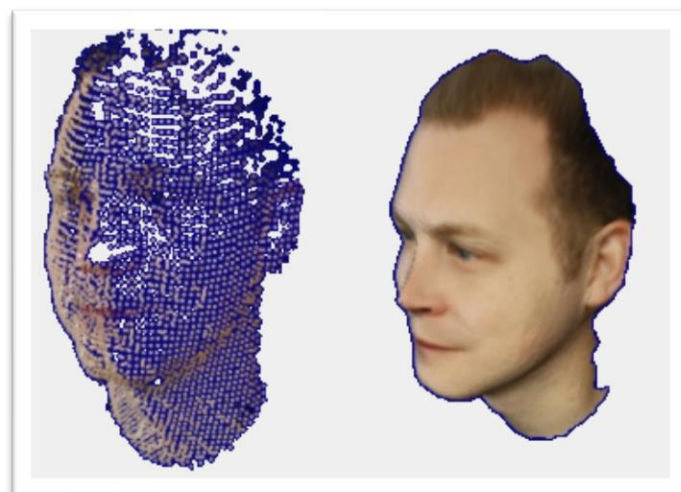


MPEG initiated the work on PCC

In April 2017 MPEG issued a Call for Proposals

First Committee Draft issued in October 2018

9 technology leading companies responded and MPEG evaluated them in October 2017

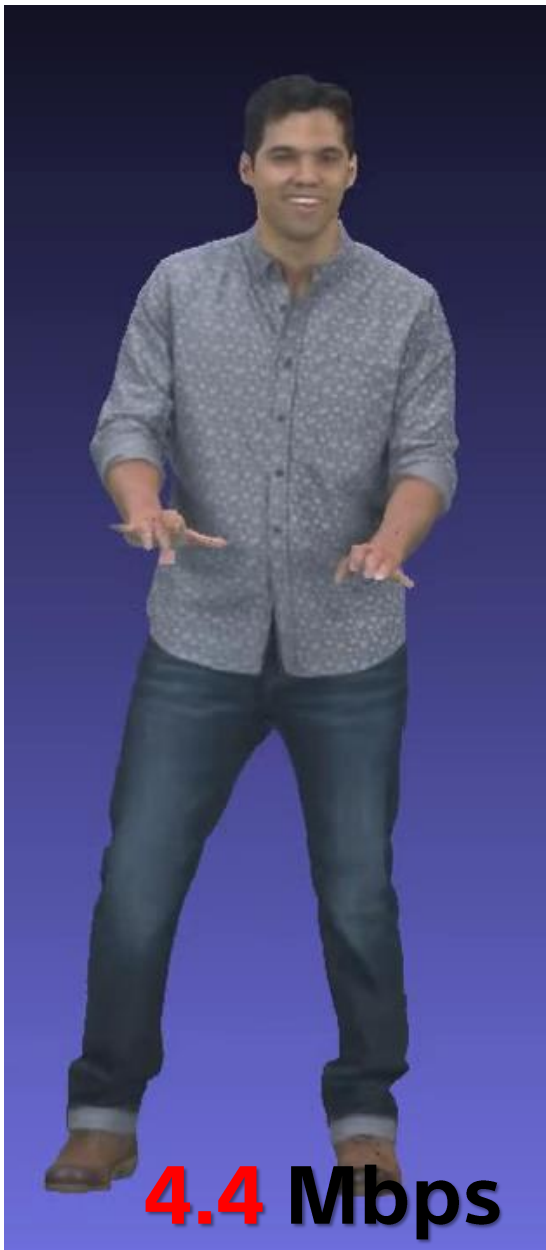
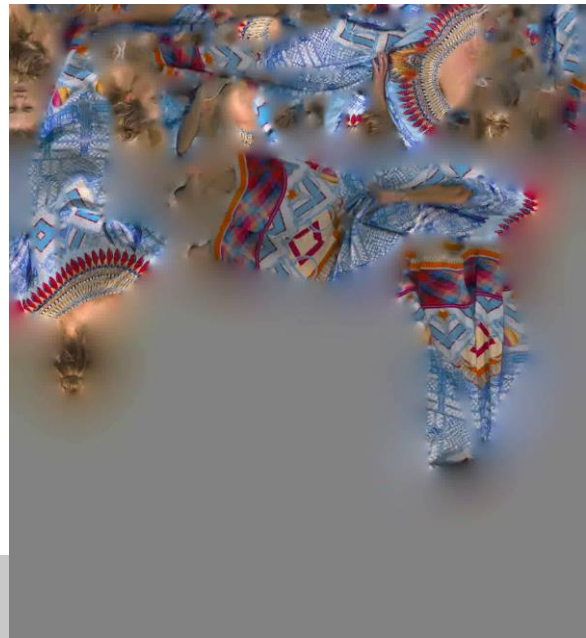
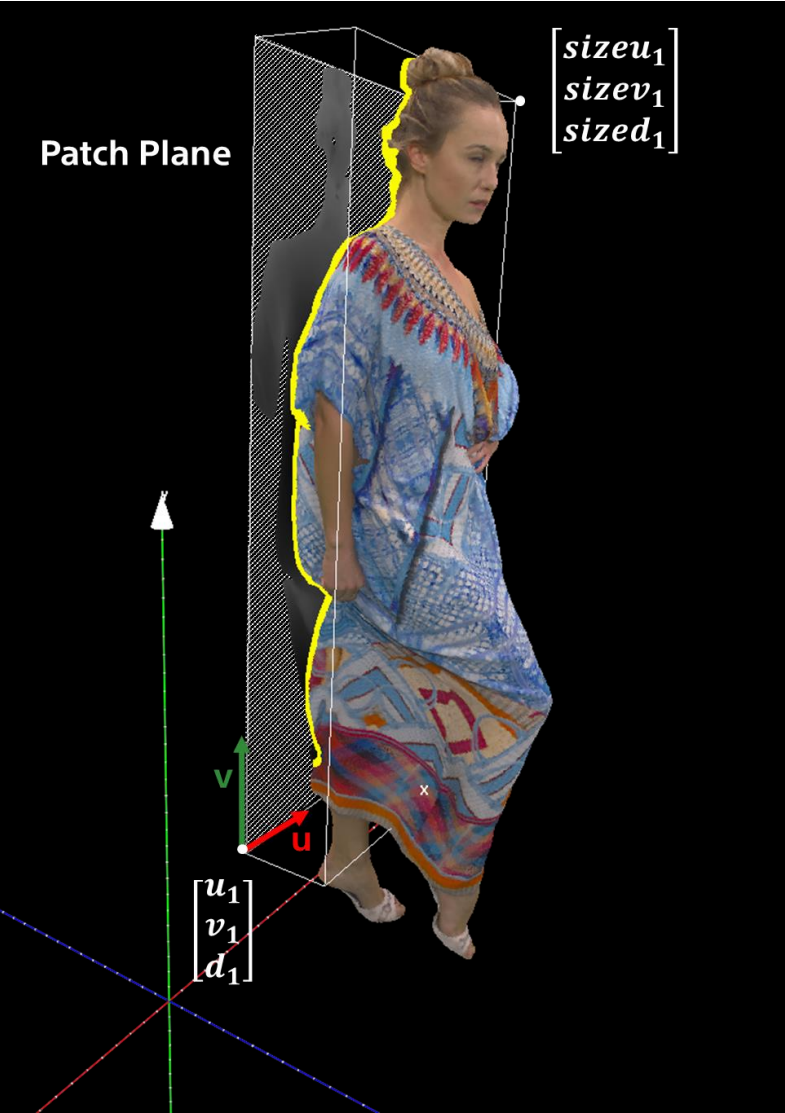


Video-based Point Cloud Compression (V-PCC or ISO/IEC 23090-5)

Encoding 3D point clouds as a set of 2D videos: color, depth and occupancy map

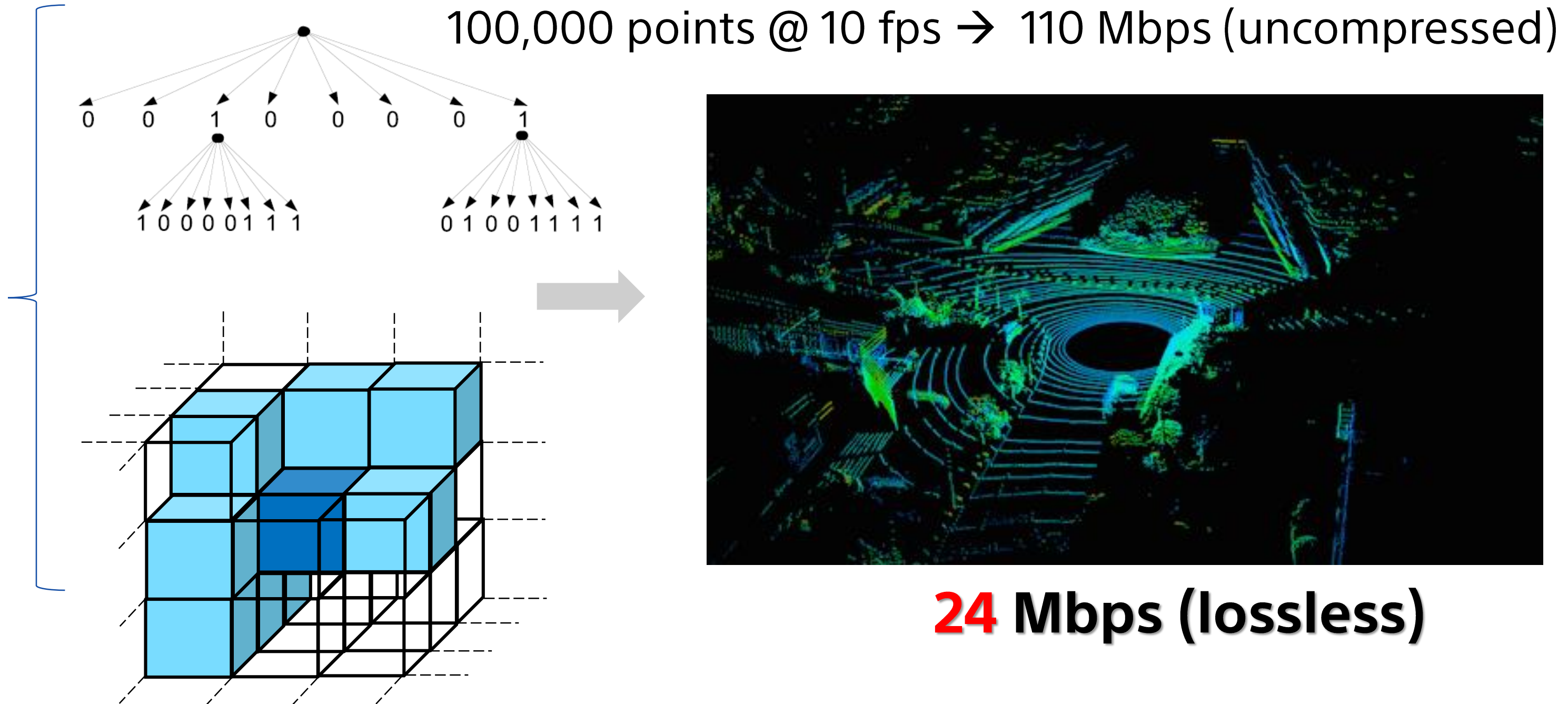
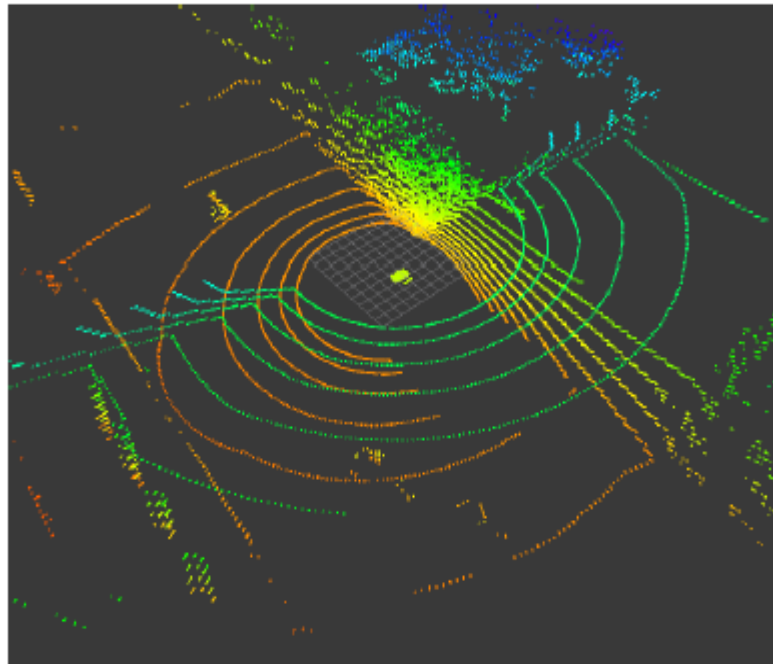
100,000 points @ 30fps → 360 Mbps (uncompressed)

→ **1 Mbps** (MPEG PCC 2018)



Geometry-based Point Cloud Compression (G-PCC or ISO/IEC 23090-9)

Encoding 3D point clouds in their native format



CONCLUSION

Novel capturing systems and interactive 3D viewing experiences are creating **new opportunities** for future networks and technologies.

Point Cloud Compression enables interactive high quality 3D content by providing manageable bitrates and also reducing requirements in creation, transmission and rendering of 3D content.

Furthermore, V-PCC leverages the **existing hardware and software** infrastructure for rapid deployment of new immersive experiences.

PCC provides a solid framework for the **convergence** between **natural** and **synthetic** 3D graphics.

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