

Point Cloud Compression in MPEG

Masterclass in VR Technology and Industry
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What a Point Cloud is and why we should care about?

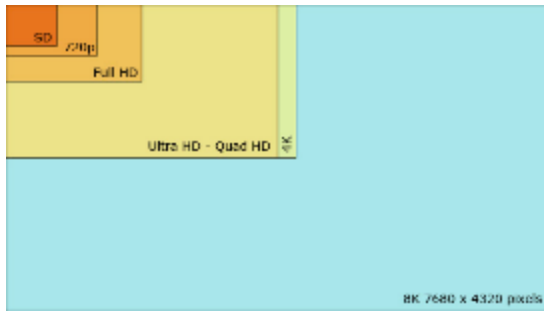
**Visual
capture**

**Visual
synthesis**

PX vs PC

What a Point Cloud is and why we should care about?

Visual capture



HD, Full HD, 4K, 8K



LDR, HDR



Multi-camera



Stereoscopy

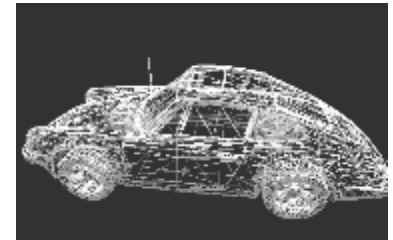


Visual
synthesis

What a Point Cloud is and why we should care about?

Visual capture

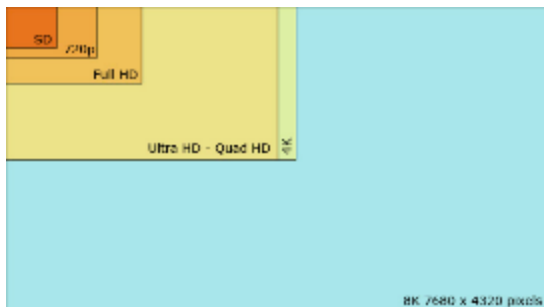
Geometric primitives



Visual synthesis

What a Point Cloud is and why we should care about?

Visual capture



HD, Full HD, 4K, 8K



LDR, HDR

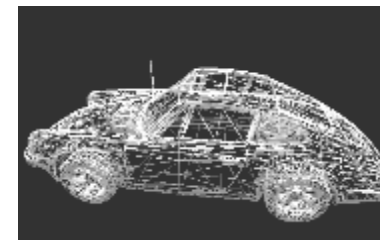
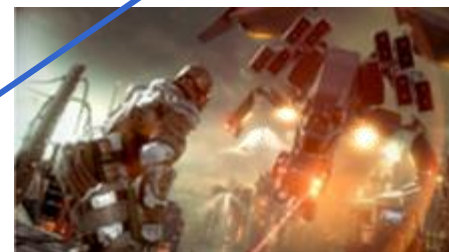


Multi-camera

Geometric primitives



Stereoscopy

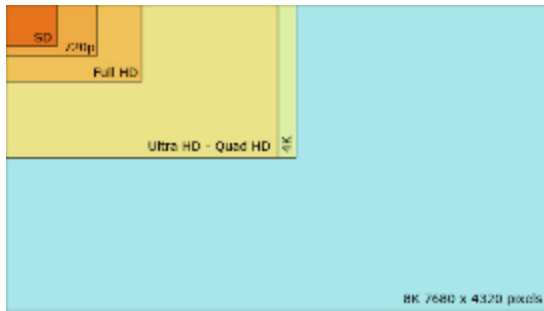


Visual synthesis



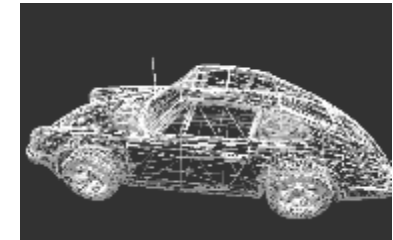
What a Point Cloud is and why we should care about?

Visual capture



**Easy to produce
High quality**

**Interactivity
Immersion**

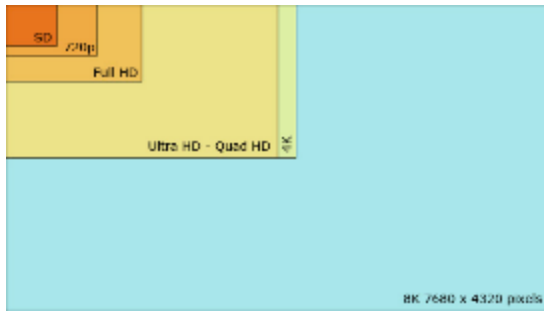


**Visual
synthesis**



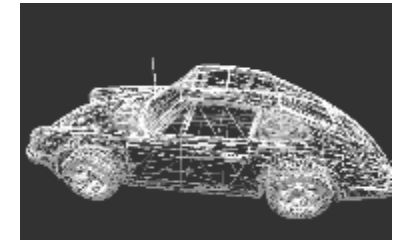
What a Point Cloud is and why we should care about?

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What a Point Cloud is and why we should care about?

**Visual
capture**

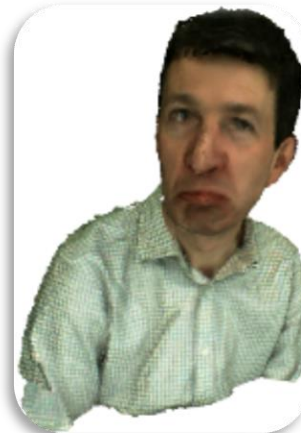
Point Cloud –
a convergence between 2 worlds



**Visual
synthesis**

Point Cloud

- A set of 3D points
 - not ordered,
 - without relations between them
- Each point is defined by
 - (X, Y, Z)
 - (R, G, B) or (Y, U, V)
 - reflectance, transparency, ...



PC



PC



PX vs PC

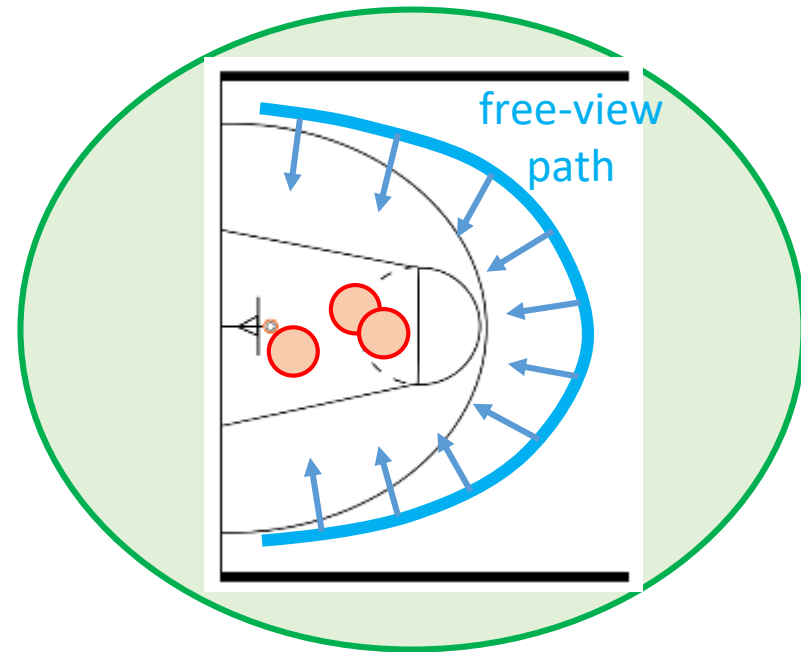
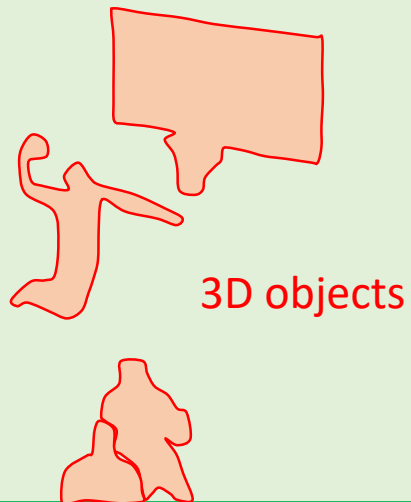
Point Cloud



Point Cloud



360°
background

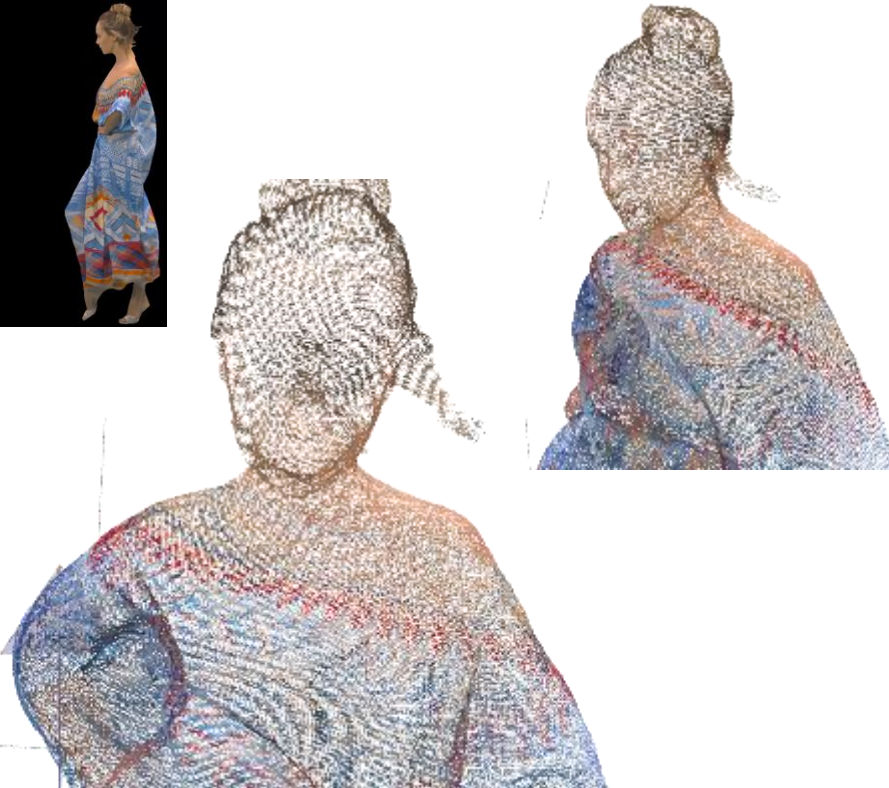


Point Cloud





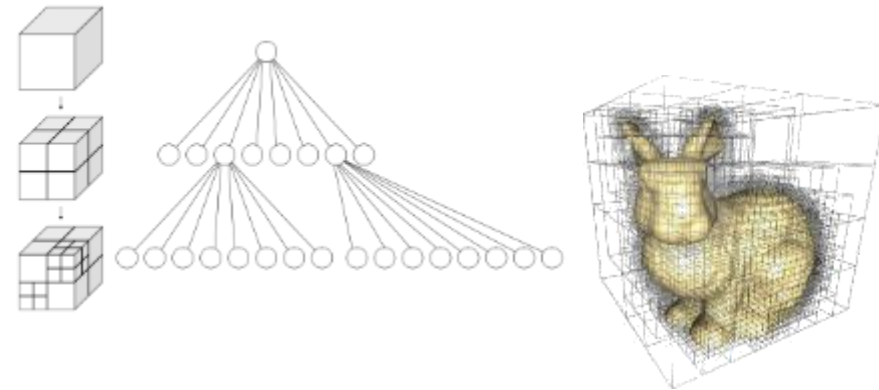
800,000 points -> 1 000 Mbps (uncompressed)



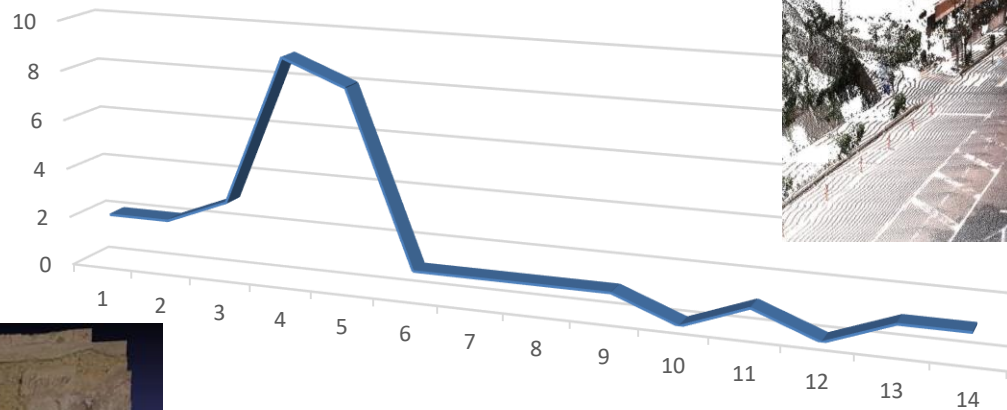
Compression is required in order to make PC useful

Point Cloud Compression

- MPEG initiated the work on PCC in 2014
- In April 2017 MPEG issued a Call for Proposals on PCC
- 9 technology leading companies responded and MPEG evaluated them in October 2017
- First Committee Draft expected for October 2018

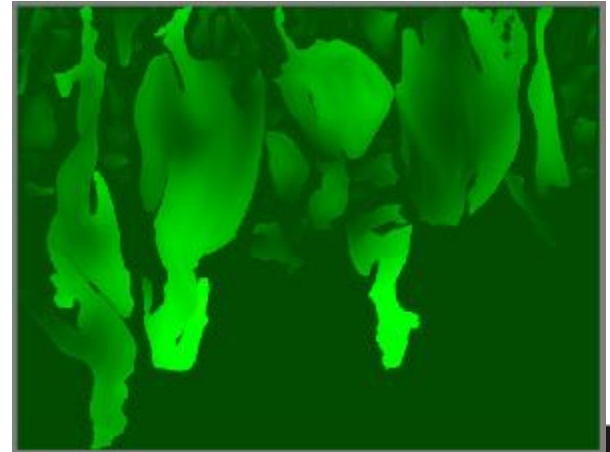
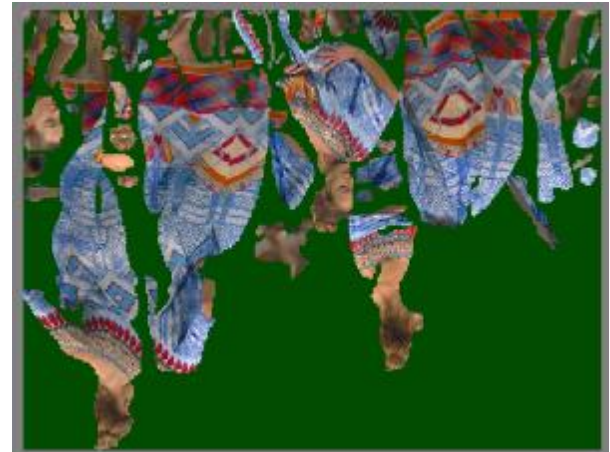


Point Cloud Compression



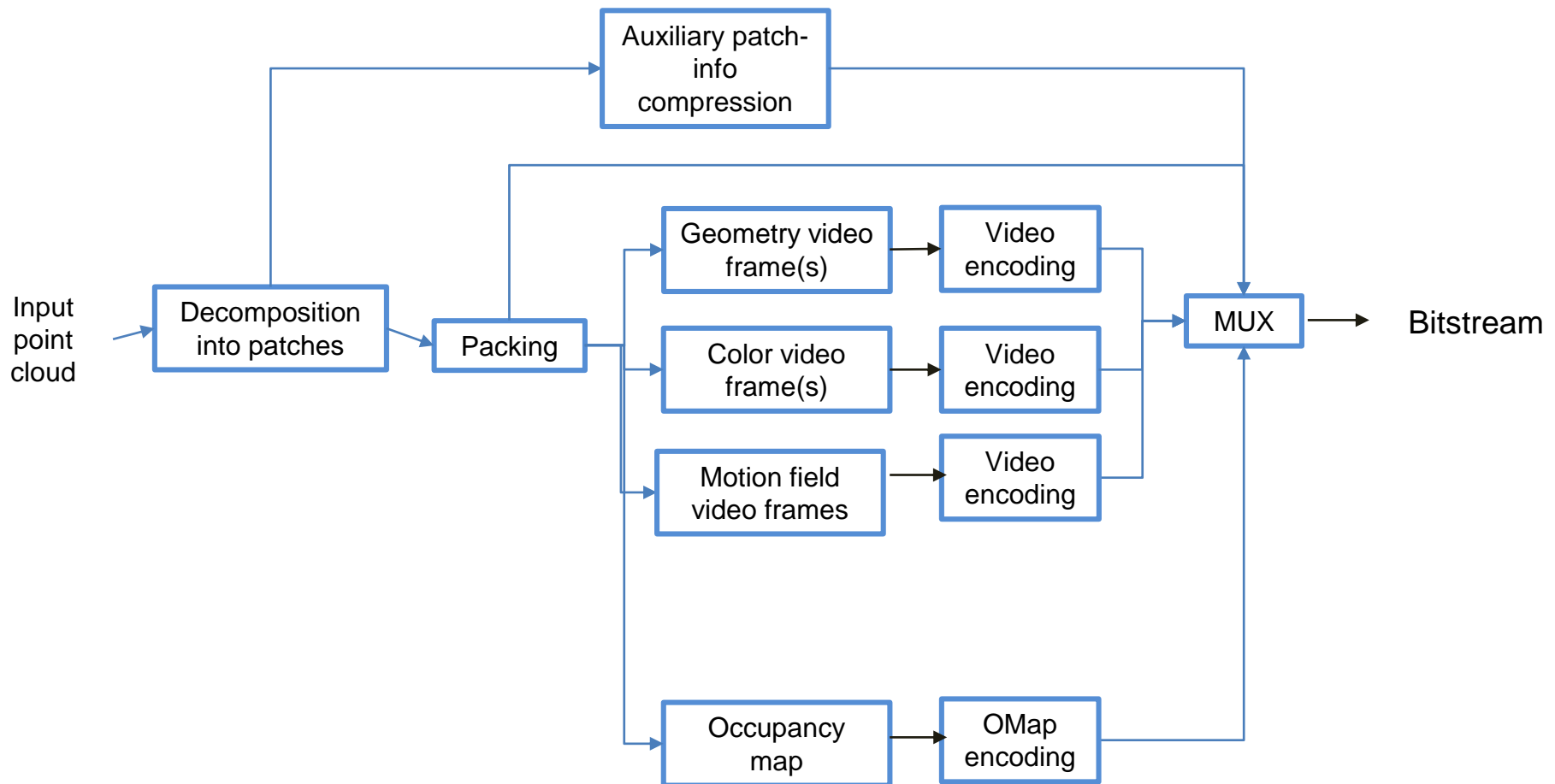
Main outcome

■ Decomposition of PC into 2D patches



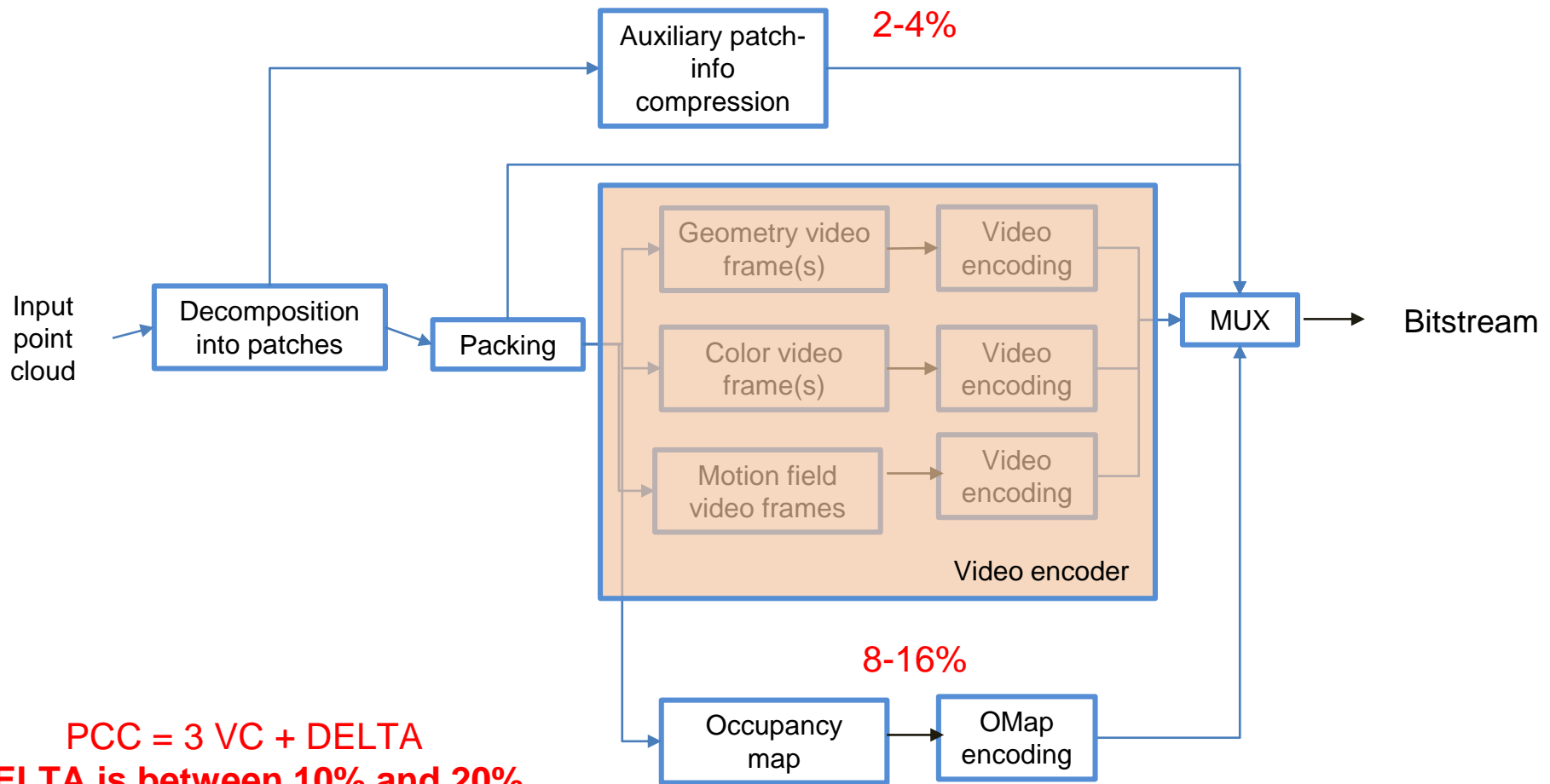
Main outcome

■ Decomposition of PC into 2D patches



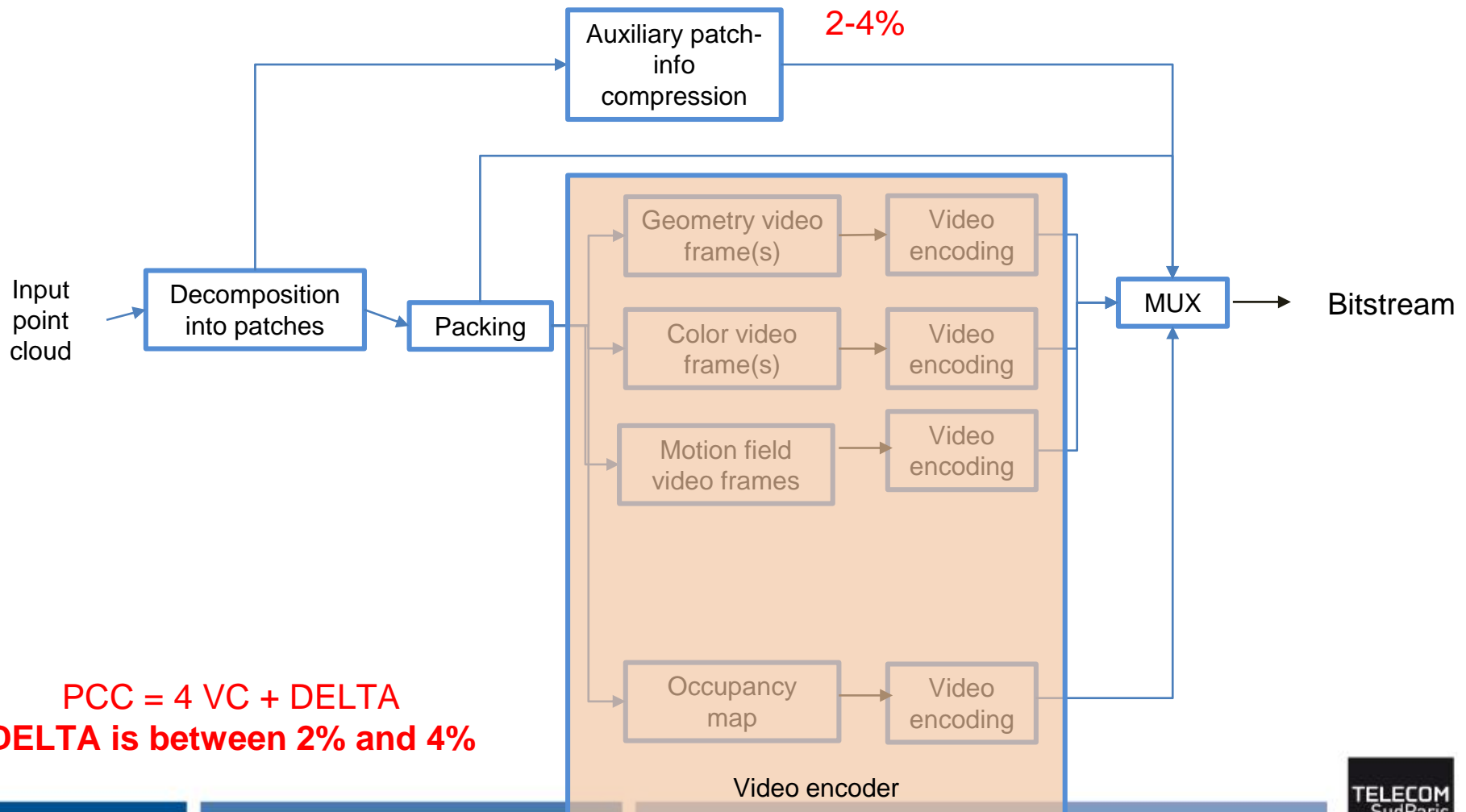
Main outcome

■ Decomposition of PC into 2D patches



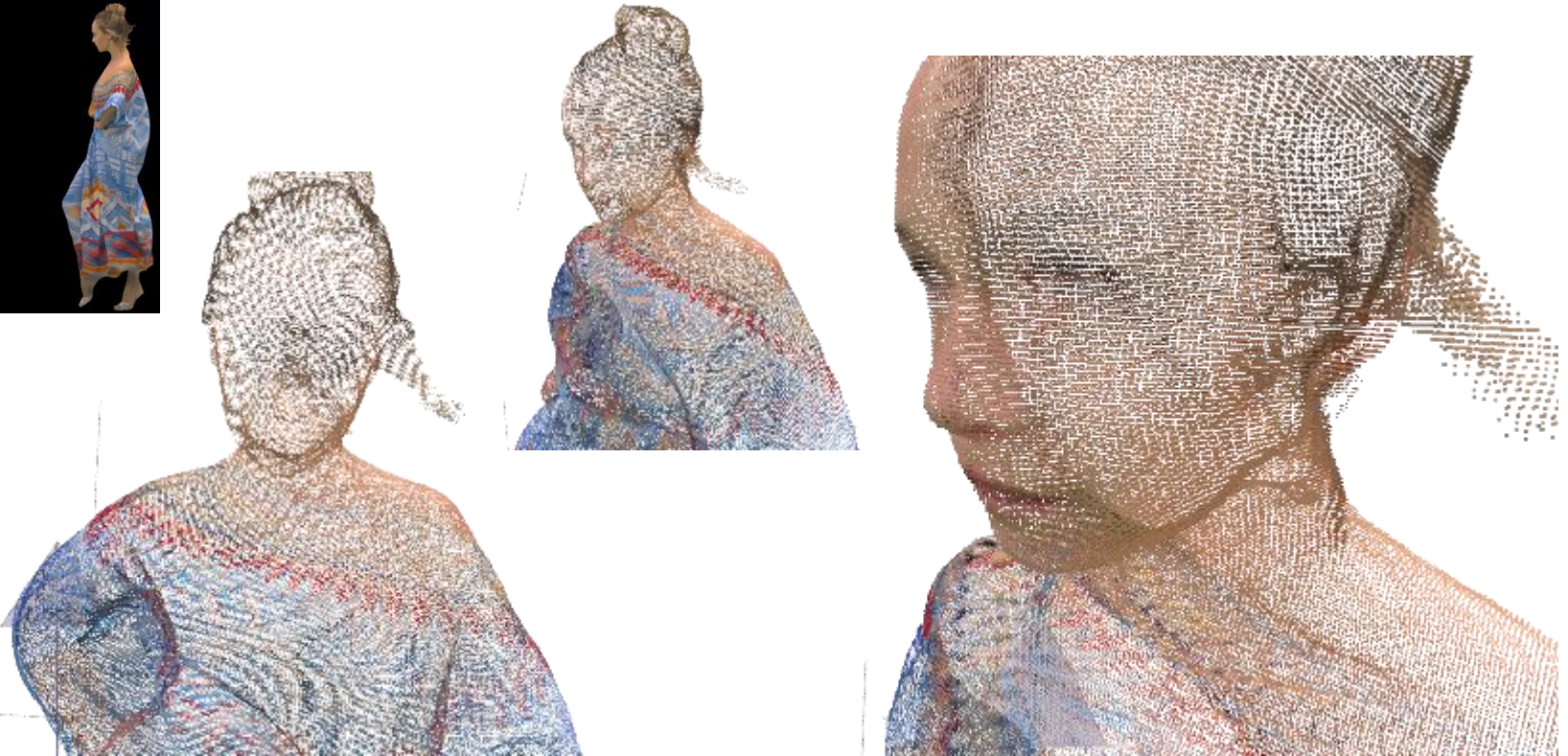
Main outcome

■ Decomposition of PC into 2D patches (ongoing work)



MPEG PCC v0

800,000 points -> 1 000 Mbps (uncompressed)



800,000 points -> 8 Mbps (MPEG PCC 2018)

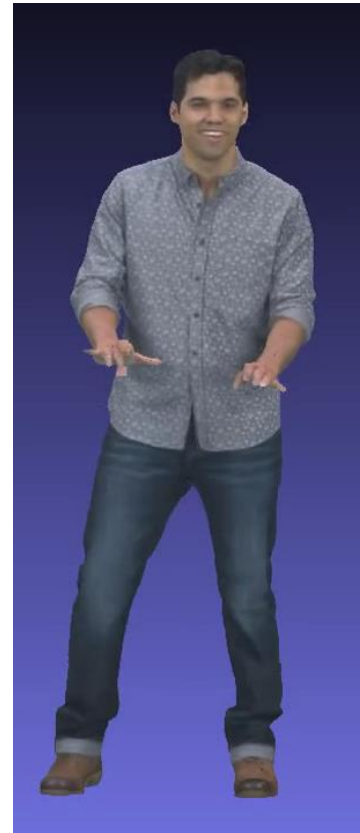
MPEG PCC v0

100,000 points -> 125 Mbps (uncompressed)

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



7,7 Mbps



5,7 Mbps

Conclusion

- **State-of-the-art point cloud compression can be significantly improved by leveraging decades of 2D video coding technology development**
- **By combining 2D and 3D compression technologies, PCC provides synergies with existing hardware and software infrastructure for rapid deployment of new immersive experiences**
- **MPEG PCC is a solid basis for the next few decades in 3D graphics compression**

Conclusion

- We are at the beginning of a new era when humanity will re-gain its third dimension in the digital space!



Disclaimer

- **Several pictures and videos used in this presentation are provided by**
 - **8i,**
 - **Owli**
 - **Intel RealSense**