



Immersive Media for 5G

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Forewords

VR Timeline

VR Video

VR Industry Forum initiatives

VR & 5G

5G Immersive applications deployed

Conclusion

Joint Harmonic-Tiledmedia presentation*

AR & VR have different dynamics

AR for the long run, not addressed today

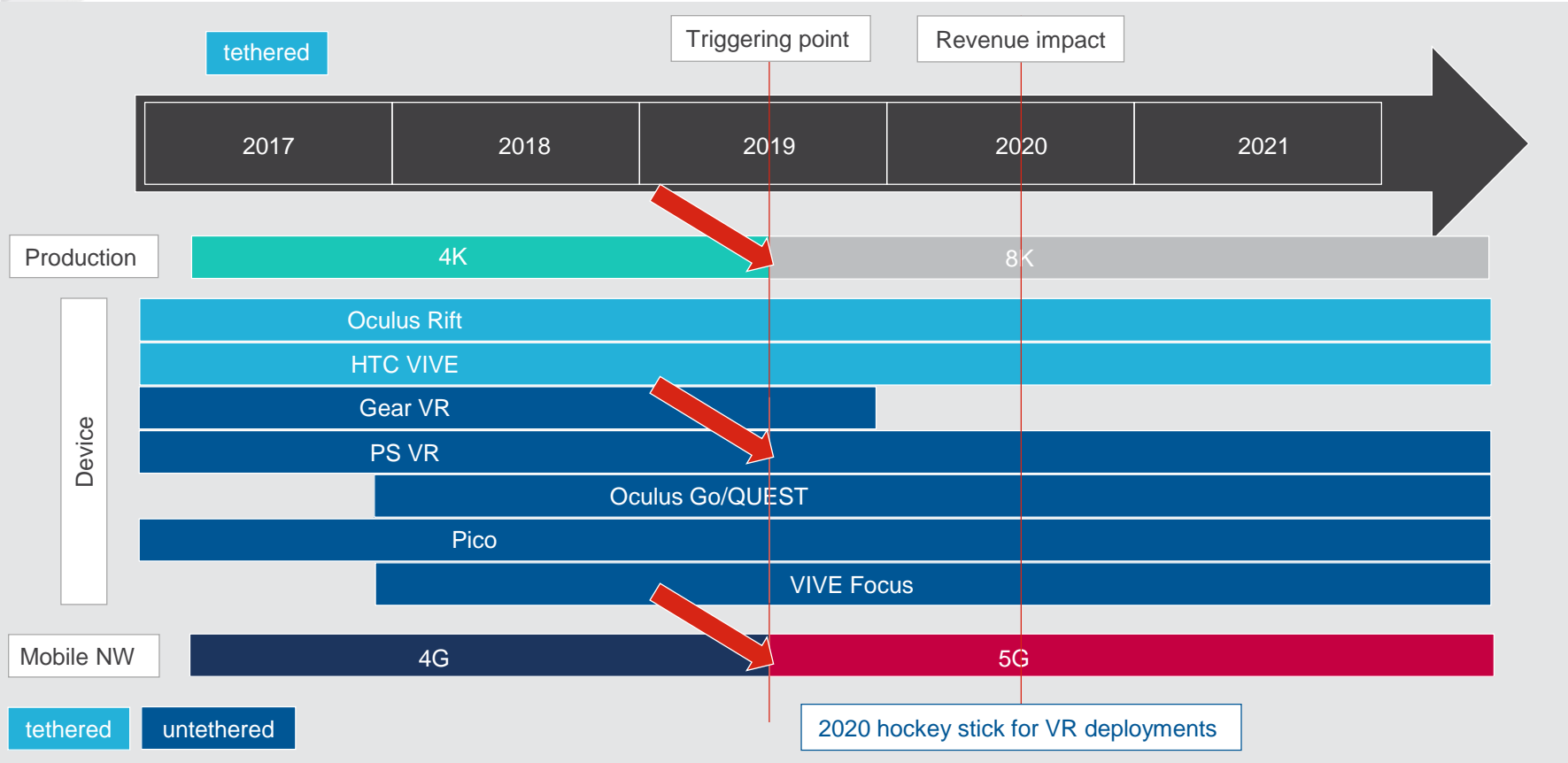
VR : 4 years of experience, what is the future ?

Focus on Tech, not Biz

5G / VR deployments in Korea/China already

* *Founding members of the VR Industry Forum*

VR Video Timeline



Evolution of capturing the world around us



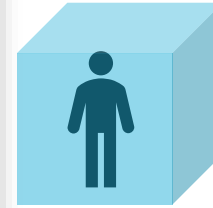
1816



2013



2017



Single view

I see the scene through a **fixed window** as captured by the camera

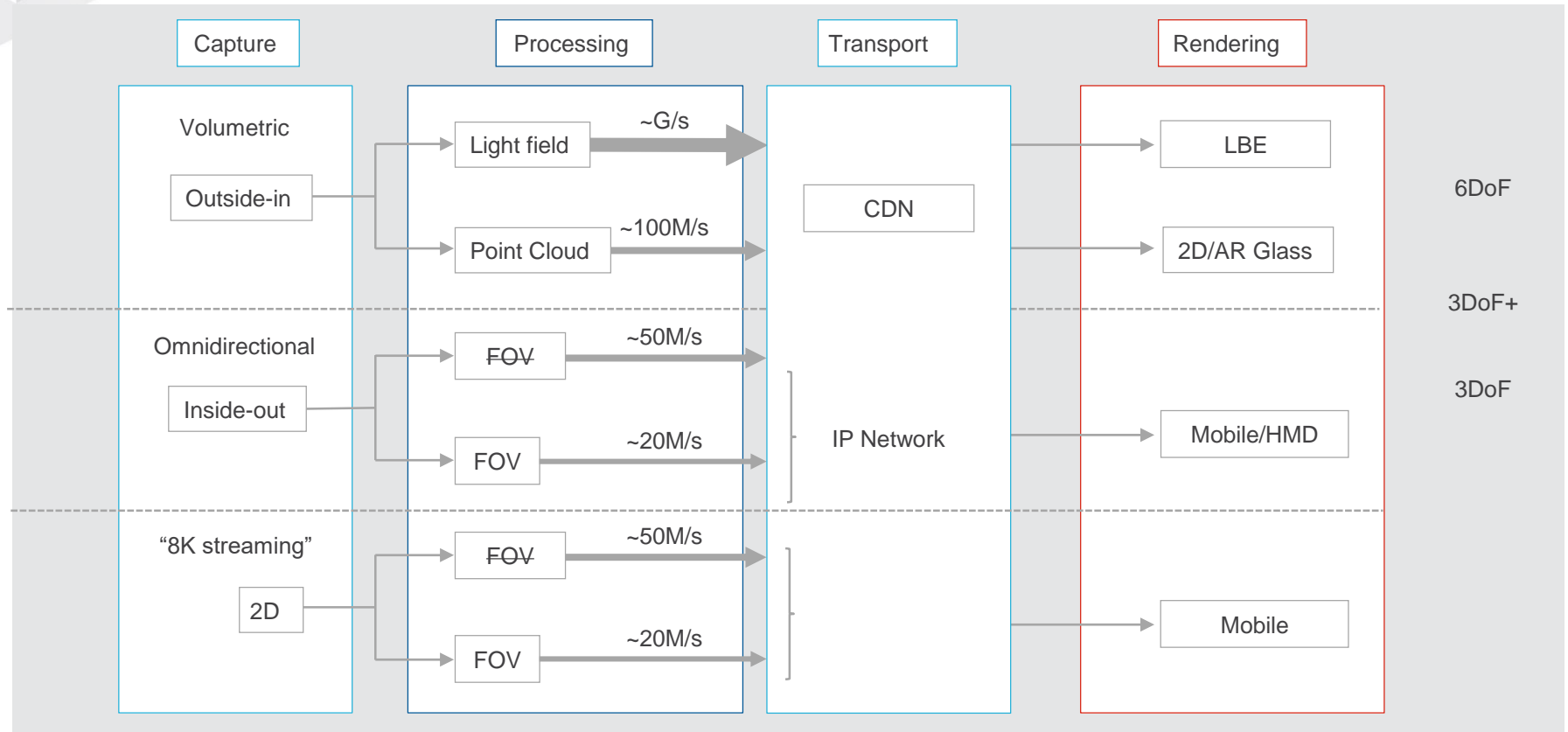
Omnidirectional

I see the scene from a **static bubble** as captured by the camera

Volumetric

I **walk** into the scene inside a **volume** as captured by the camera

XR Video Technologies



Broad range of technologies at stake

VR-IF Proposed work items for 2020



- VR360
 - Production, OMAF, 3DOF, Security, Streaming,
 - Live Production and Distribution
- Volumetric
 - Capture & Production, 6DOF
 - Storage & Compression: Point cloud and Mesh formats
 - Distribution
- 5G Cloud
 - How to use 5G capabilities to reach low complexity devices (thin) devices
 - Edge based processing: stitching, pre-rendering, transcoding, analytics
- Social VR
 - Telco aspect of real-time VR communication
 - Virtual representation of the users, realistic vs. avatar
 - Sharing live experiences

Live and 5G key to VR Future

Issues

High cost / low quality production

Poor HMD quality

High latency on 4G

Low QoE

Lack of attractive HQ content

Lack of consumer push

Low Network Bandwidth

3DoF "not enough" (Studios)

How 5G can help ?

Low cost/high quality 8K production

2K/eye expected in 2020

5G low latency (e.g. for cloud rendering)

8K FoV over 5G

5G operators start to invest in content

5G operator start to promote XR services

5G capacity

6DoF possible over 5G (2023)

5G operators key to XR success

3DoF VR (Korea)

Capture

Processing

Transport

Rendering

CDN

Features	Details
Resolution	4Kp60
Method	Seamless multi view (FoV)
2D service on HMD	Direct mapping
Video clips	
Sports (multi view)	
eSports (multi view)	
MEC started	To scale service

"3DC



Inside

4K

8K Streaming (Korea)

Capture

Processing

Transport

Rendering

Features	Details
Resolution	8Kp30
Method	Non FOV, display 4K window out of 8Kp30 decoded
Bitrate	40M/s
Schema	DASH SBR
Content	Pro baseball
Limitation	Not working on 4G (no ABR) Not working on 4K decoder devices Battery usage (8K decode + 5G)

"8K Strea

2D

FOV

S10



Immersive media has multiple flavors

Short term ('20) 3DoF/4K+/FOV on 4K devices

Mid term ('21-'22) 8-12K/3DoF(+) on 4K & 8K devices

Long term ('23+) 6DoF on 8K+ devices

5G will create a blast for VR Video market

Lots of milestones still to be passed before declaring victory

Industry at large believes 5G is key in success of immersive media



Thank You.



harmonic

