How the Cloud can Activate The First Billion Users in AR/VR

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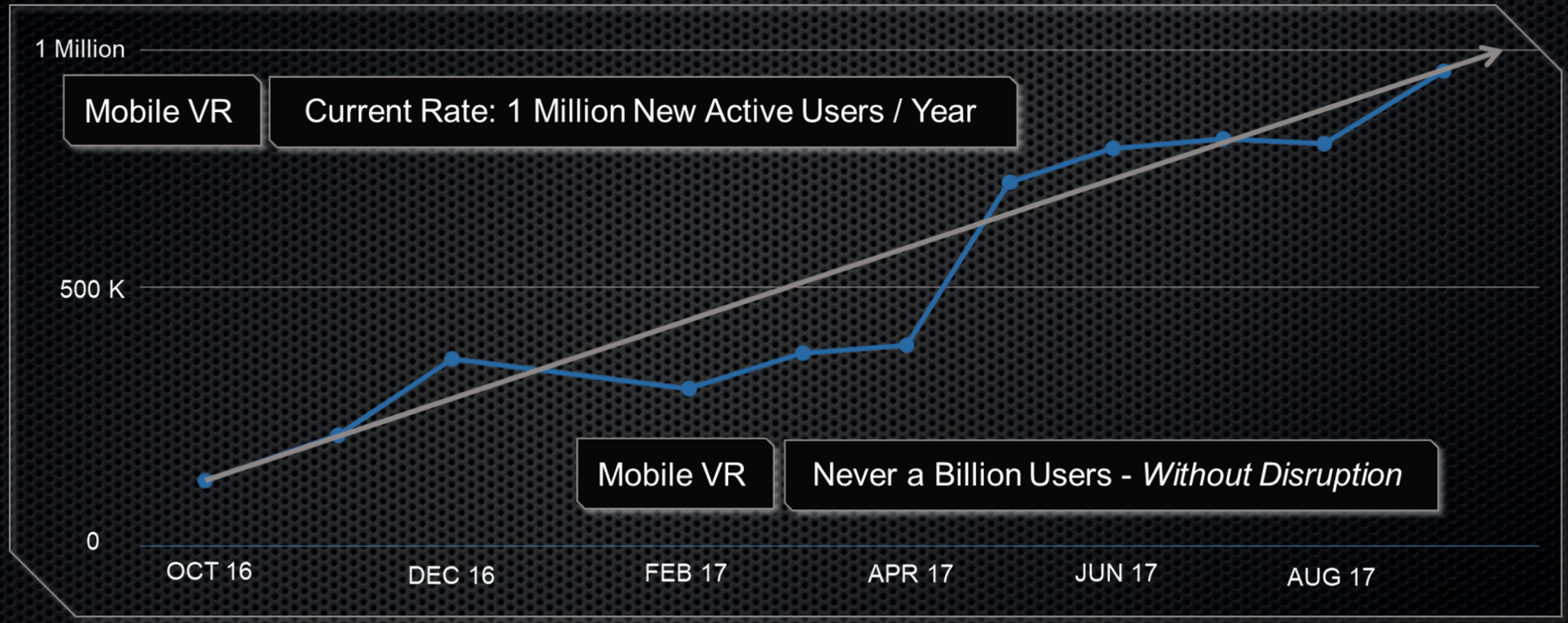
Source: Unity

A Billion Users Requires Disruption



TIRIAS RESEARCH

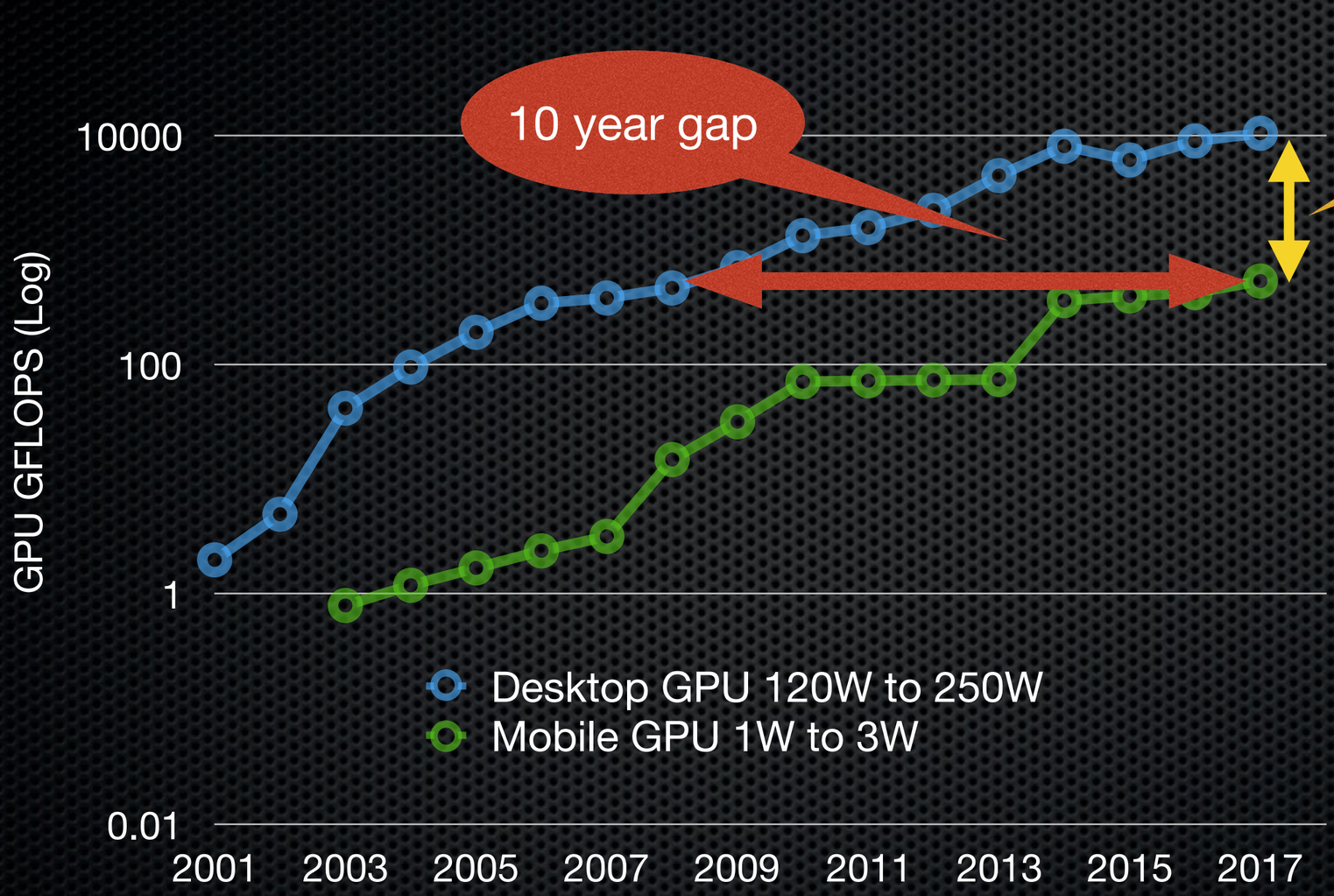
Consumer Industrial Design
All day battery life

Presence (VR)
Graphics, Sensors, Compute

Consumer Pricing
HMD & Service

DISRUPTION

Performance Gap - 10 Years & More Than 20X



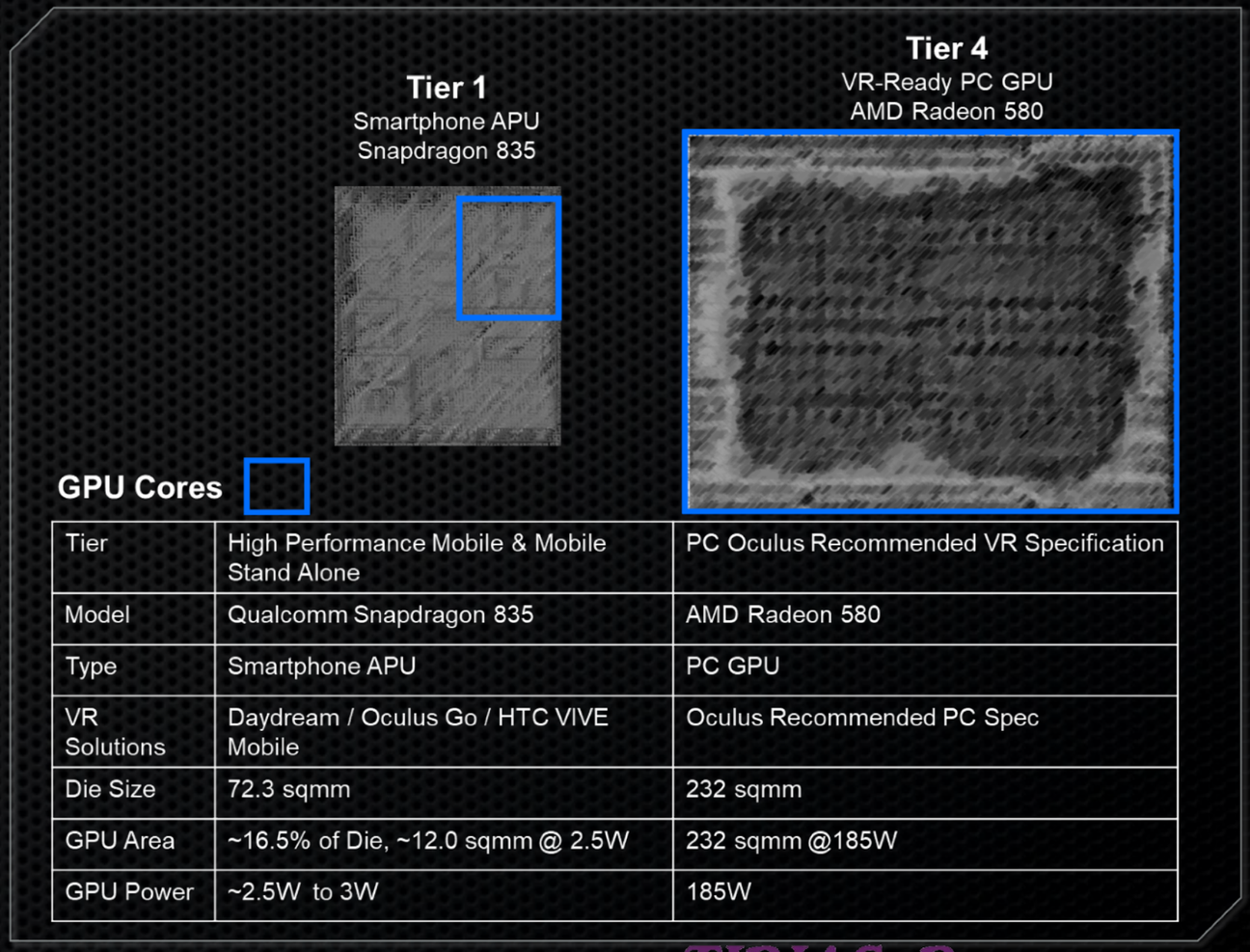
"The notion of mobile devices *catching up* to desktop PC GPUs is absurd—Moore's law works for all silicon devices"

JPR
Jon Peddie Research

Understanding the Mobile VR Gap

Mobile GPUs are a small fraction of PC GPU die size, transistor count, power and performance compared to PC VR recommended specs

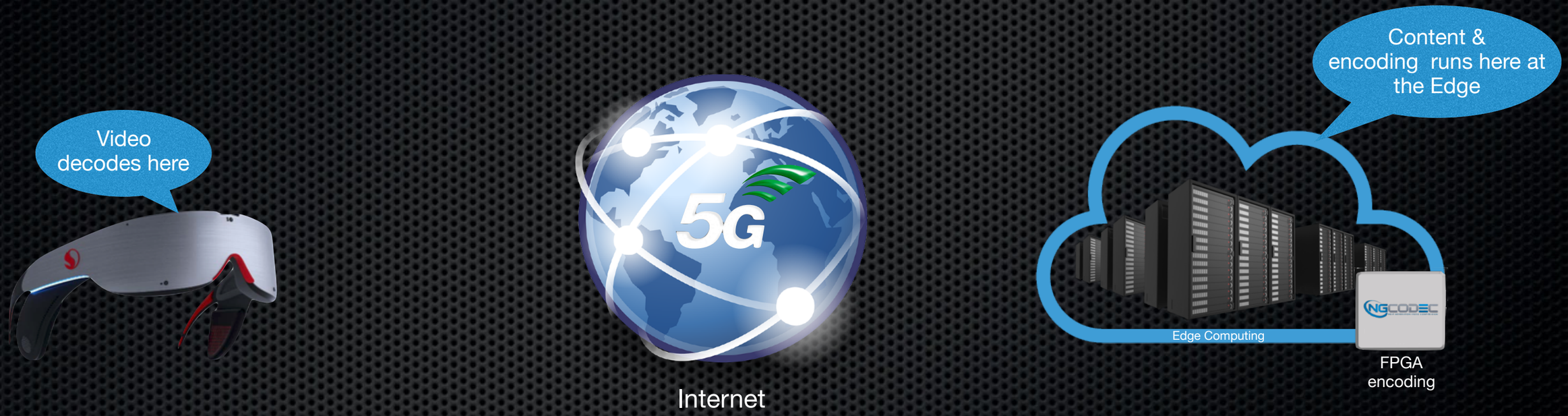
- 1/20th the die size
- 1/60th the power
- 1/20th to 1/50 the performance
- Huge range in GPU performance



Tier	High Performance Mobile & Mobile Stand Alone	PC Oculus Recommended VR Specification
Model	Qualcomm Snapdragon 835	AMD Radeon 580
Type	Smartphone APU	PC GPU
VR Solutions	Daydream / Oculus Go / HTC VIVE Mobile	Oculus Recommended PC Spec
Die Size	72.3 sqmm	232 sqmm
GPU Area	~16.5% of Die, ~12.0 sqmm @ 2.5W	232 sqmm @185W
GPU Power	~2.5W to 3W	185W

TIRIAS RESEARCH

A Cloud Streaming Approach for AR/VR



Uniform Experience / Development Regardless of Client

Mobile Form Factor - Desktop Thrill Factor

Cloud VR Delivers a Superior Experience

- Industrial Design / Battery Life
  - HMD only has display, decoder, 6DoF sensors and modem
- Realistic Graphics and AI
  - Server class GPU, CPU, Memory can be used instead of Mobile class
- Consumer Costs
  - Shared infrastructure, pay on demand, no dedicated PC required

Streaming VR/AR Today & Tomorrow

Today

- 2160x1200 @ 90 FPS
- 8-bit Standard Dynamic Range (SDR)
- 6 Gb/s Uncompressed

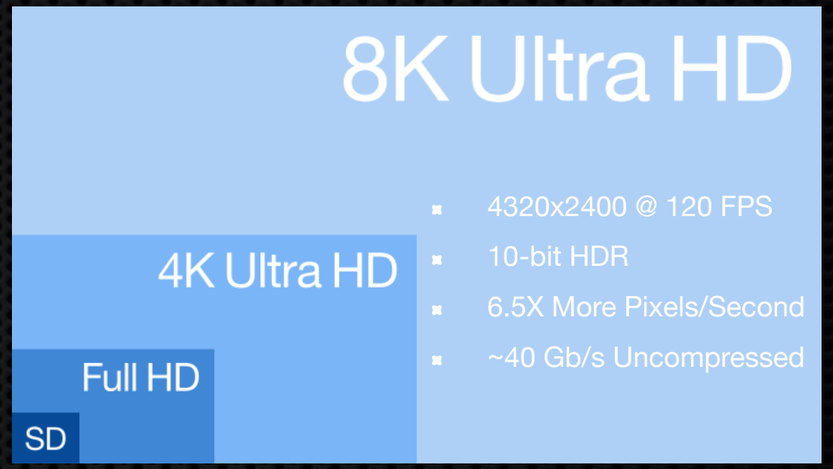
GPU Approach

- H.264 Compressed Stream 100Mb/s
- 60 ms Latency FAIL
- 50% Frame Rate Reduction @ 60 ms

NGCodec Approach

- H.265 Compressed Stream 20Mb/s
- 10 ms Latency (FPGA/NGCodec)
- No Frame Rate Reduction at 10 ms

2020 - 5G Era



NGCodec Approach

- AV1 Compressed Stream 100 Mb/s
- 3 ms Latency (FPGA/NGCodec)
- No Frame Rate Reduction

See the NGCodec Demo Here at VRX

Gaming PC

5G

Ethernet (20Mbps)

HTC Vive

- Visually lossless using H.265/HEVC RealityCodec™ (300:1)
- Compressed to just 0.3% of original video bit rate (6Gbps -> 20Mbps)
- Just 10ms of added latency today (encode & decode)
- Upcoming demonstrations on 5G hardware!

Cloud VR/AR is the Killer App for 5G

- Activates a Billion VR/AR Users
  - Mobile VR/AR needs distribution
  - ID/Battery Life/Realistic Graphics/Costs
  - Now testing on 5G hardware

See our demo in the exhibition

PDF of slides

https://ngcodec.com/vrx