XILINX

Live Video Transcoding Launch

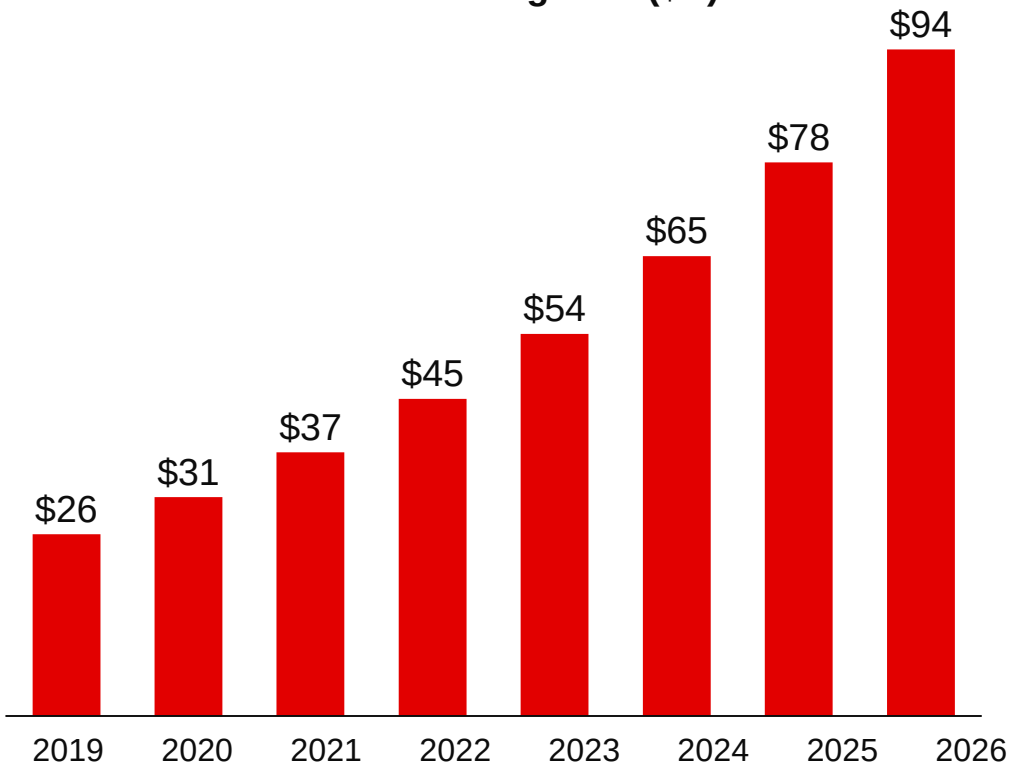
Aaron Behman
Director of Video Product Marketing,
Data Center Group

© Copyright 2020 Xilinx

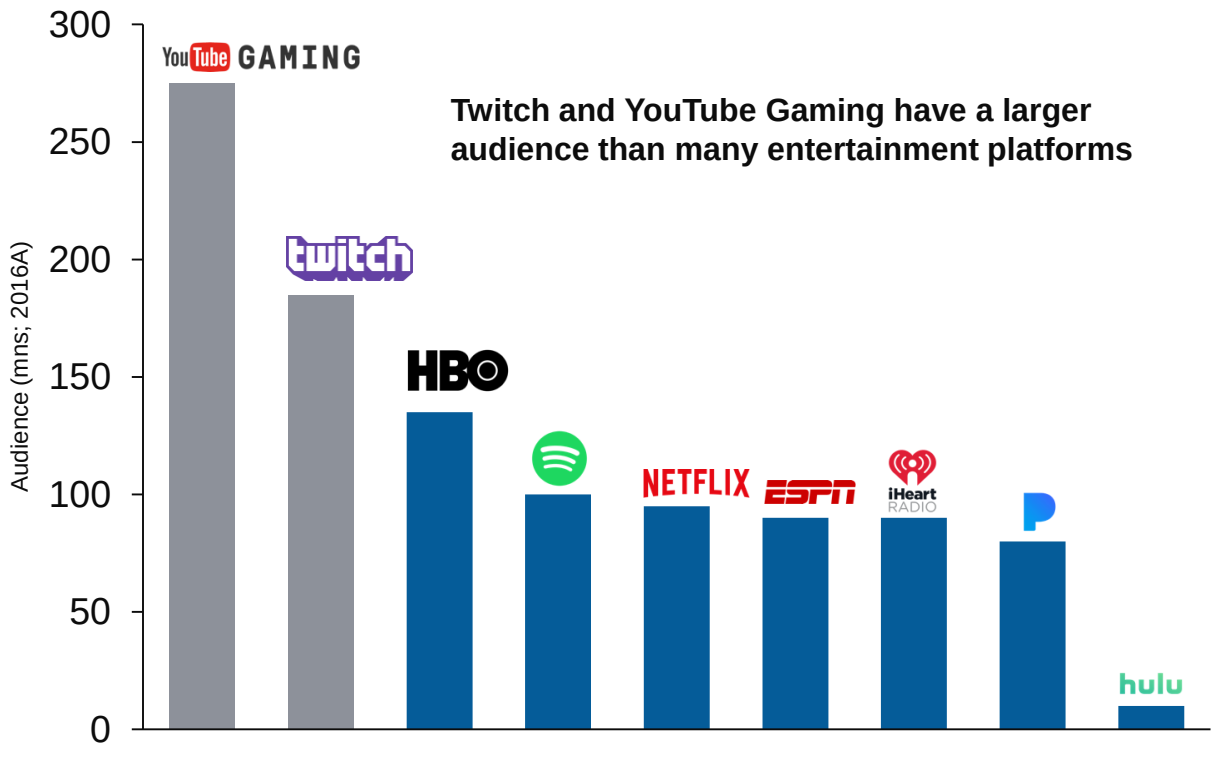
Live Video Streaming Sees Meteoric Growth

COVID-19 Will Drive Additional Demand

Global Live Video Streaming TAM ($B)



Source: https://mhojhosresearch.com/2020/05/01/global-virtual-event-market-is-growing-annually-by-22/



Source: SuperData, Goldman Sachs Global Investment Research

Video is 90%+ of the network, the live component is BIG and the computationally INTENSE, this is Xilinx's domain

© Copyright 2020 Xilinx

XILINX

30% Less Bandwidth Saves Millions of Dollars

Encoded Bitrate	Data Per Mth. (TB) Per Stream	Cost Per Mth. ($0.05 per GB)	Monthly Cost @ 100K Streams	Annual Cost (100K Streams)
4Mbps	1.21	$60.48	$6,048,000	$72,576,000
2.8Mbps	0.85	$42.34	$4,234,000	$50,808,000
			Annual Savings	**$21,768,000**

© Copyright 2020 Xilinx

Why Bits Matter: Bandwidth = Cost

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 6-K

REPORT OF FOREIGN PRIVATE ISSUER
PURSUANT TO RULE 13a-16 OR 15d-16
UNDER THE SECURITIES EXCHANGE ACT OF 1934

For the month of November 2018

Commission File Number: 001-38482

HUYA INC.

Building B-1 North Block of Wanda Plaza
No. 79 Wanbo 2nd Road
Panyu District, Guangzhou 511442
People's Republic of China
(Address of principal executive offices)

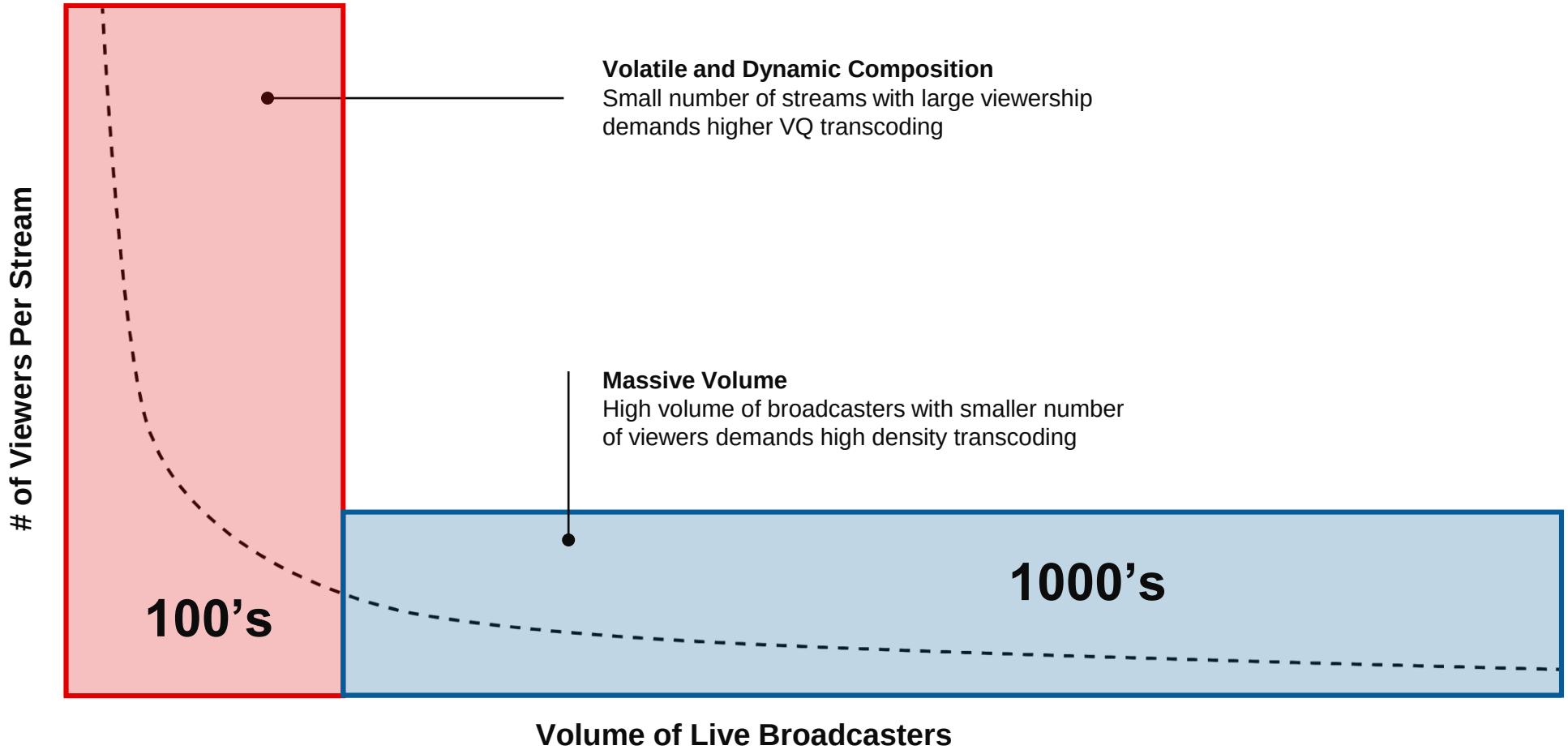
"Bandwidth costs rose by 40% to **$32.4 million during last QTR 2019**.
This was due to an increase in users and effort to improve video quality."

No. 1 Game Live Streaming Platform in China

© Copyright 2020 Xilinx

XILINX.

The Live Video Transcoding Problem



Note: Twitch has publicly shared numbers that they deal 30,000 live broadcasters on average and stream to millions of viewers (circa 2015)

https://blog.twitch.tv/twitch-engineering-an-introduction-and-overview-a23917b71a25#.on6z0qngl

© Copyright 2020 Xilinx

XILINX.

Introducing the Xilinx Real Time (RT) Server Reference Architecture - Transcoding Editions

Bitrate Optimized

XILINX ALVEO™

High Channel Density

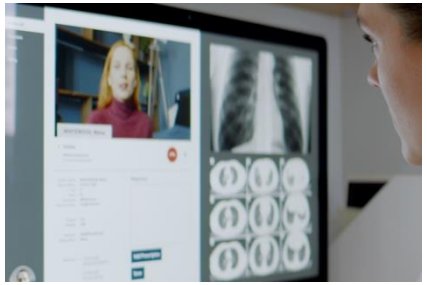
© Copyright 2020 Xilinx

Application Focus

- Live Broadcast
- Telemedicine
- Distance Learning
- eSports / Live Gaming
- Live Streaming
- Social Video Networking
- Live Sports Broadcast

Live Broadcast

Telemedicine



Distance Learning

eSports

Live Streaming (UGC)

Social

© Copyright 2020 Xilinx

Xilinx Has A Solution For All Video Workloads

Xilinx: Two Pronged Strategy

Cost per bit optimized

Lowest Bitrate

Video Quality

Transcoding

eSports

Live Video

Alveo U50

Bitrate Optimized

Minimize Cost/Stream (recurring cost)

Lower Gbps for Same Quality $/GB

OPEX

Cost per channel optimized

Reduce CAPEX

High Channel Count

Alveo U30

High Channel Density

Overwhelming cost is buying enough accelerator cards to support 1000's of streams that need to be encoded.

$/Channel

CAPEX

Safe City

Smart Retail

eSports

Live Video

© Copyright 2020 Xilinx

XILINX

U30 High Density PCIe Solution

- High density media processing & machine learning
  - Half Height / Half Length, Single Slot
- Supports:
  - 2 x 4kp60 simultaneous transcodes per card
  - 8 x 1080p60 simultaneous transcodes per card
  - 16 x 1080p30 simultaneous transcodes per card
  - 36 x 720p30 simultaneous transcodes per card
- Support for both H.264 & HEVC
- HDR and 10 bit support
- Ability to support ultra low latency encoder/decoder
- Low power full solution sub 40W
- *Future support for Machine Learning and AI*

XILINX ALVEO™

© Copyright 2020 Xilinx

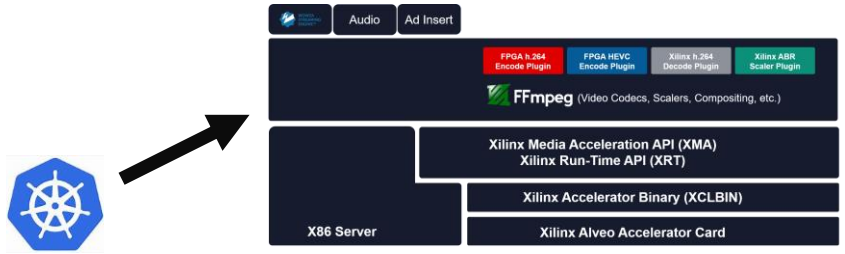
XILINX

Solution Delivery

	Bitrate Optimized		High Density
Targeted Appliances			
Validated Containers	XILINX HEVC (H.265) • 1080p100 • Full ABR Ladder • x265 Slow	XILINX AVC (H.264) • 1080p120 • Full ABR Ladder • x264 Very Slow	XILINX HEVC & AVC • 16 1080p30 channels • x264 Faster • x265 Faster
Deploy OnPrem or Cloud	Deploy or Evaluate Now! NIMBIX OnPrem	Deploy or Evaluate Now! NIMBIX OnPrem	Deploy or Evaluate Now! NIMBIX OnPrem

© Copyright 2020 Xilinx

Optimized Software Solution Stack



docker

WOWZA STREAMING ENGINE™

Audio

Ad Insert

FPGA h.264 Encode Plugin

FPGA HEVC Encode Plugin

Xilinx h.264 Decode Plugin

Xilinx ABR Scaler Plugin

FFmpeg (Video Codecs, Scalers, Compositing, etc.)

X86 Server

Xilinx Media Acceleration API (XMA)
Xilinx Run-Time API (XRT)

Xilinx Accelerator Binary (XCLBIN)

Xilinx Alveo Accelerator Card

© Copyright 2020 Xilinx

XILINX.

No FPGA Experience Needed!

```
ffmpeg \
-f rawvideo -pix_fmt yuv420p -s:v 1920x1080 -r 30 -an -i
/home/ffmpeg/VU9P/TestSequences/Kimono1_1920x1080_24.yuv  \
-frames 240 -c:v libx264 -preset medium -profile:v high -crf 23 -bf 4 -refs 3 -g 30 -b:v 4000k -
maxrate 4000k -bufsize 8000k -f h264 -r 30 -y ./sw_outdir/x264_medium_out0_br4000k.h264
```

```
$ ffmpeg \
-f rawvideo -pix_fmt yuv420p -s:v 1920x1080 -r 30 -an -i
/home/ffmpeg/VU9P/TestSequences/Kimono1_1920x1080_24.yuv \
-frames 240 -b:v 4000k -g 30 -c:v xlnx_h264_enc-hq -f h264 -y ./hw_outdir/out0_br4000k.h264
```

```
$ ffmpeg \
-f rawvideo -pix_fmt yuv420p -s:v 1920x1080 -r 30 -an -i
/home/ffmpeg/VU9P/TestSequences/Kimono1_1920x1080_24.yuv \
-frames 240 -b:v 4000k -g 30 -c:v xlnx_HEVC_enc -f h265 -y ./hw_outdir/out1_br4000k.h264
```

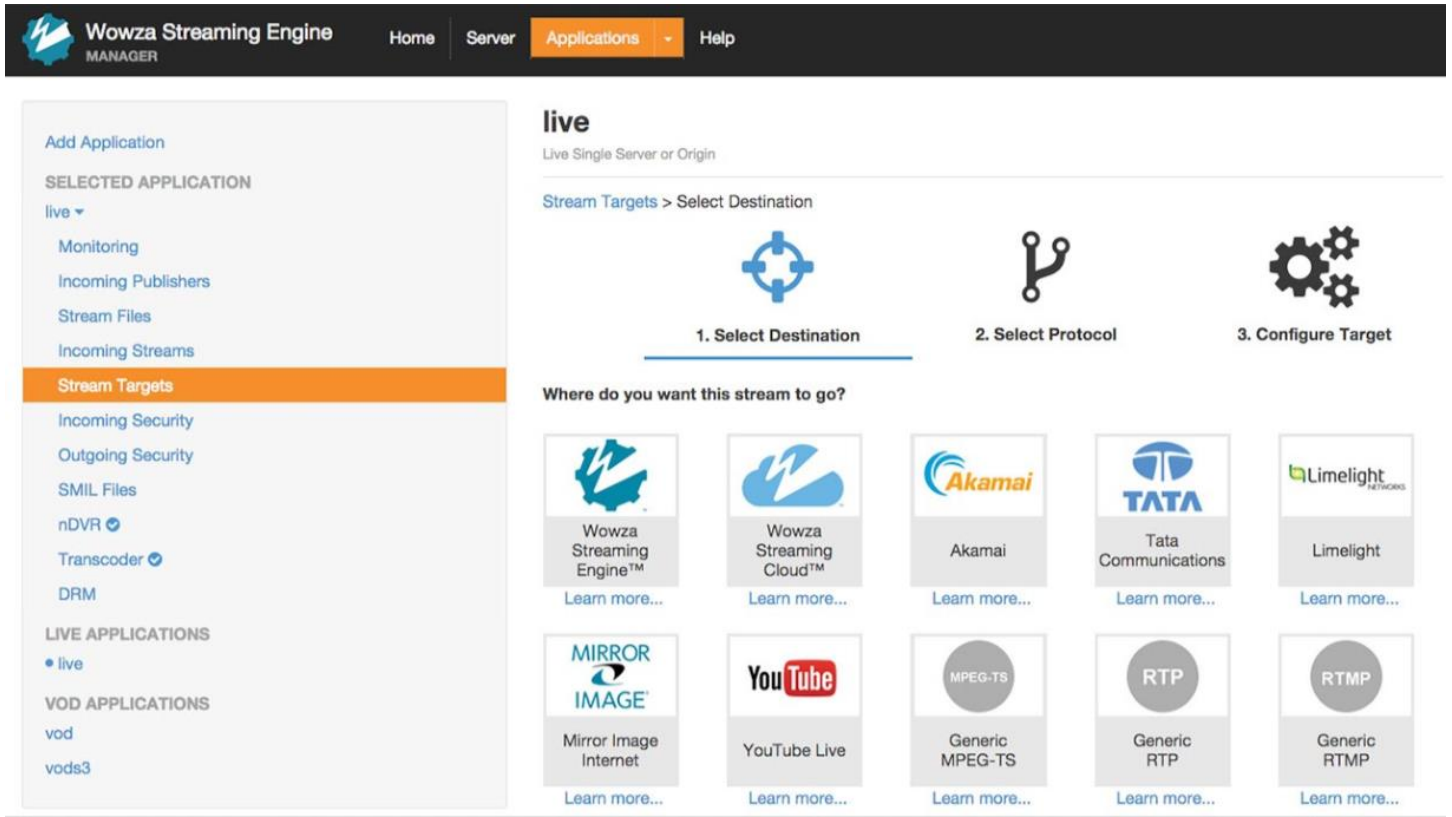
As simple as changing 20 characters to get acceleration

https://trac.ffmpeg.org/wiki/EncodingForStreamingSites

© Copyright 2020 Xilinx

Wowza Streaming Engine
Xilinx ISV Partner

- Web GUI solution to manage live streaming workloads
- Integrated into RT Server and VAR offerings*
- Enables a complete turnkey solution for live video streaming



* Integration planned for Q3 this year

© Copyright 2020 Xilinx

Alveo Live Transcoding Features

Alveo U50: H.264 and/or HEVC

- 2x Full HD (1080p60) encoding (AVC/H.264)
- 2x Full HD (1080p100) encoding (HEVC/H.265)
- 32x Channels of sub-resolutions for ABR

VQ Equivalent to x264 very slow (H.264), x265 slow (HEVC)

12x Faster encoding speed than the comparable software-based x264/x265 on x86

8x Lower power vs software equivalent
8x Lower price vs software equivalent

Latency: High Quality – 1 Second; Balanced – 100ms; Ultra-Low Latency: Sub 25ms (same for U30)

Alveo U30: H.264 and HEVC

- 2x 4KP60 Ultra-HD transcoding in real-time
- Subdivide resolutions to support up to 48 channels

VQ equivalent to x264, x265 Faster

Highest density and better compression efficiency over ASIC or GPU solutions

FPGA Architecture Extends Product Life
- Future support for HDR, HDR to SDR and SDR to HDR
- Machine Learning and AI supported late 2020

Sub 40W power enables higher density per RU and effective for “Edge Solutions”

Bitrate Optimized

Note: VQ measured in both objective and subjective tests

4KP30 also supported on the Alveo U200 card.

Easy integration with FFmpeg

High Channel Density

© Copyright 2020 Xilinx

XILINX

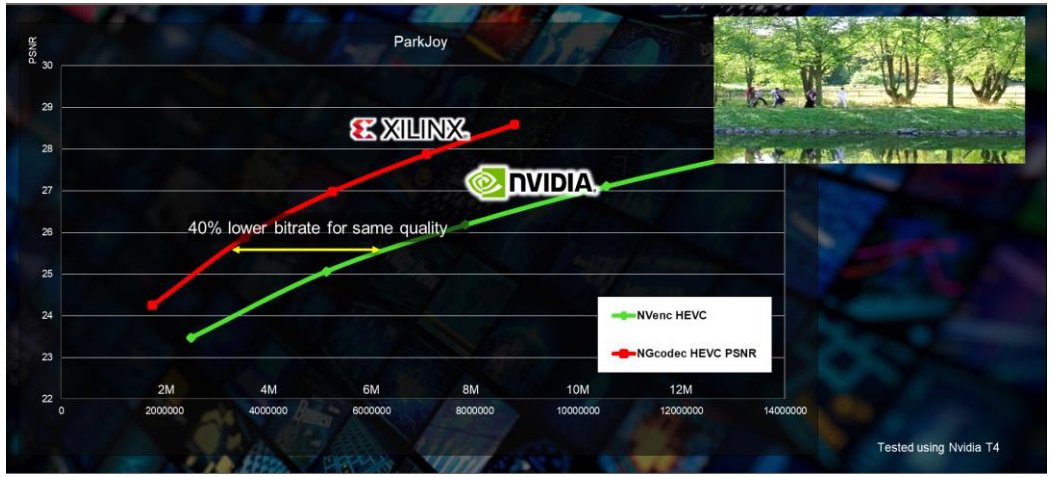
TCOs & Value Proposition

Quality/Bitrate Optimized (U50)

- Highest Quality, real-time streaming
- 30% bitrate reductions vs any real-time competitor
- “Few sources with many viewers”

Density (U30)

- Equivalent to NVIDIA T4 on Quality
- Higher Density
- 20% the Power of a T4
- “Many sources with few viewers”



Device	H.264	HEVC
NVIDIA T4	10 strm	4 strm
Xilinx U30 (2x ZU+)	16 strm	16 strm

https://developer.nvidia.com/nvidia-video-codec-sdk#NVENCPerf
(accessed 3 Jun 2020)

© Copyright 2020 Xilinx

XILINX

U50 Live Video Transcoding – 1080p120 HEVC

x265 Slow

5x **Throughput Per Node**

6x **Lower Hardware Cost**

3x **Lower Power**

Alveo HEVC Supports Up To 60 FPS Ladder

5x HPE ProLiant DL380 Servers

10x Intel 8275CL 3.0GHz CPUs

'Slow' Quality HEVC

14x ABR @ 1080p30

One HPE ProLiant DL385 Server with Alveo U50

8x Alveo U50s, Dual AMD EPYC 7262

'Slow' Quality HEVC

14x ABR @ 1080p30

© Copyright 2020 Xilinx

XILINX.

U30 Live Video Transcoding – 1080p480 HEVC

NVENC "medium"

CAPEX Savings

4x **Throughput Per Card**

6x **Lower Hardware Cost**

5x **Lower Power Cost**

4 HPE ProLiant DL380 Servers

32x Nvidia T4 Accelerators, Dual Intel

'medium' Quality HEVC

64x ABR @ 1080p30

58W / Card

One Xilinx RT Server

8x Alveo U30 Accelerators, Dual Intel

'Medium' Quality HEVC

64x ABR @ 1080p30

35W / Card

© Copyright 2020 Xilinx

XILINX.

Where to Buy?

VAR/OEM	Configuration	Market	Availability
Hewlett Packard Enterprise 	▸ ProLiant Gen 10+ ▸ DL380 / DL385 ▸ 8x Alveo U50s	Worldwide	Available Now!
wistron 	▸ Transformer G2E ▸ 8x Alveo U30s	APAC	Available Now!
Hypertec 	▸ Edge 2U Appliance – 7x U30s ▸ 2U Appliance – 10x U30s	Worldwide	Summer 2020
BOSTON Servers | Storage | Solutions 	▸ Supermicro 1RU ▸ 8x Alveo U30s	EMEA	Summer 2020

© Copyright 2020 Xilinx

Introducing the Xilinx RT Server

Transcoding Editions

Evaluate the RT Server Today!

or start on NIMBIX

© Copyright 2020 Xilinx

Thank You

© Copyright 2020 Xilinx