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Evolution of **4K point-to-point** video conferencing.

4K Point-to-Point Available only on PC

- There are **no legacy VC codecs** capable of 2160p30 point-to-point video calling as of today.
- There are **plenty of solutions** which can display 4K or higher resolutions **for multipoint** conferences.

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Let me explain why...

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Part 1. Camera challenges

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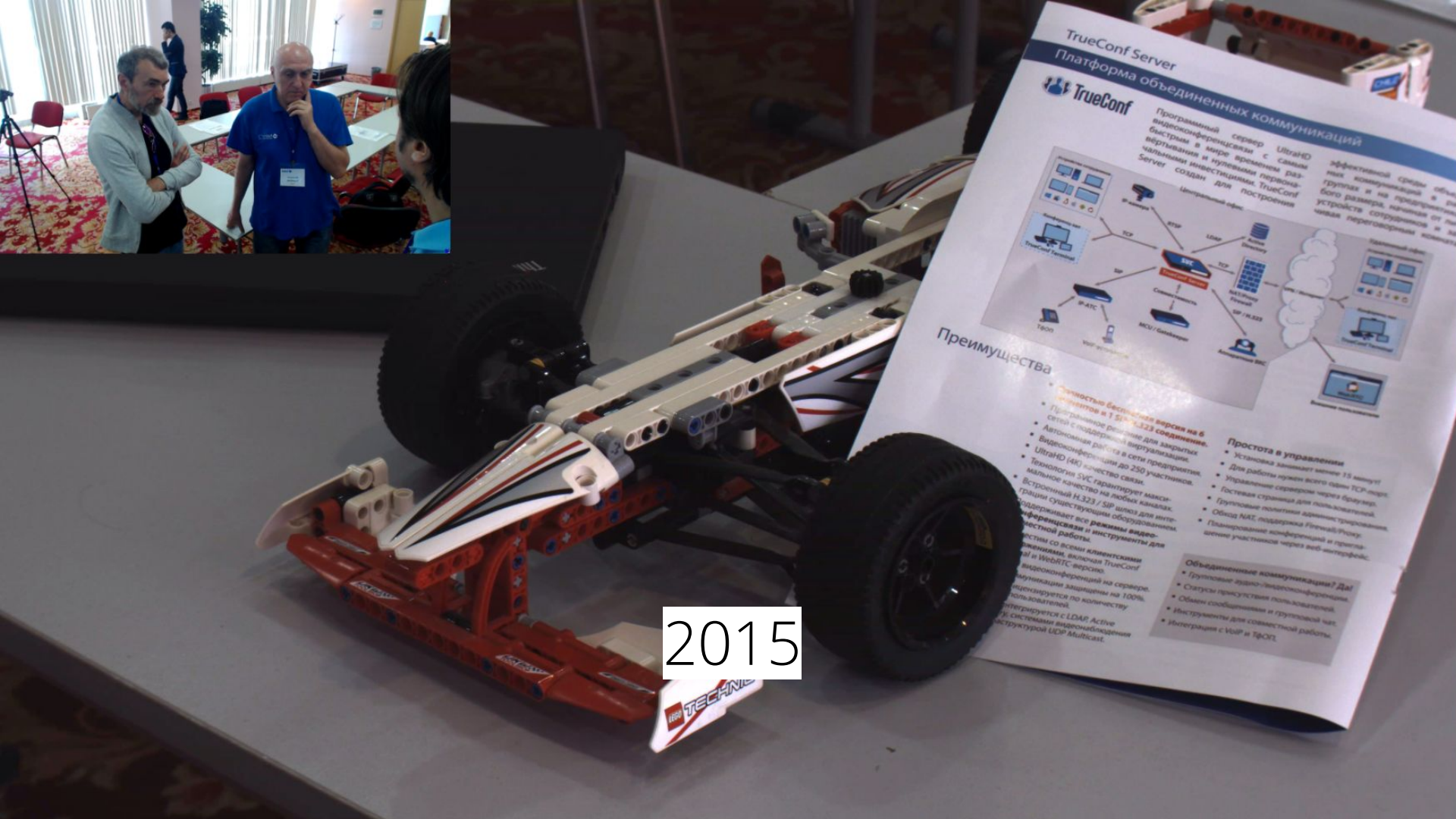
2015


TrueConf Server
Платформа объединенных коммуникаций
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Преимущества
2015

1. No optics.
2. No autofocus.
3. Huge bandwidth.
4. Top CPU + GPU required.

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2016


Unified
Communications
in 15 minutes
DisplayNote Technologies
Collaboration Tools
for Productive
Meeting Spaces &
Huddle Rooms
Want Wireless Presentation that
works In & Out of the room?
BlueJeans
TrueConf UltraHD
Panasonic
AVerMedia

2016

1. In-camera latency.
2. Real frame rate < 30fps.
3. Camera price > PC price.
4. Capture card required.
5. Decent GPU still required.

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2017

Cisco has 5K sensors, but uses them only for zoom and ePTZ

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1. Affordable.
2. Real 2160p30.
3. USB 3.0 ready.
4. No GPU required.
5. 8Mbps is OK.

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Part 2. Encoding challenges

Industry lacks decent hardware DSP encoder with:

1. Good compression
2. Output bandwidth tuning
3. Low control latency

That's why mobile camera DSPs are not good for 4K conferencing.
That's why legacy VC endpoints still don't adapt 4K.

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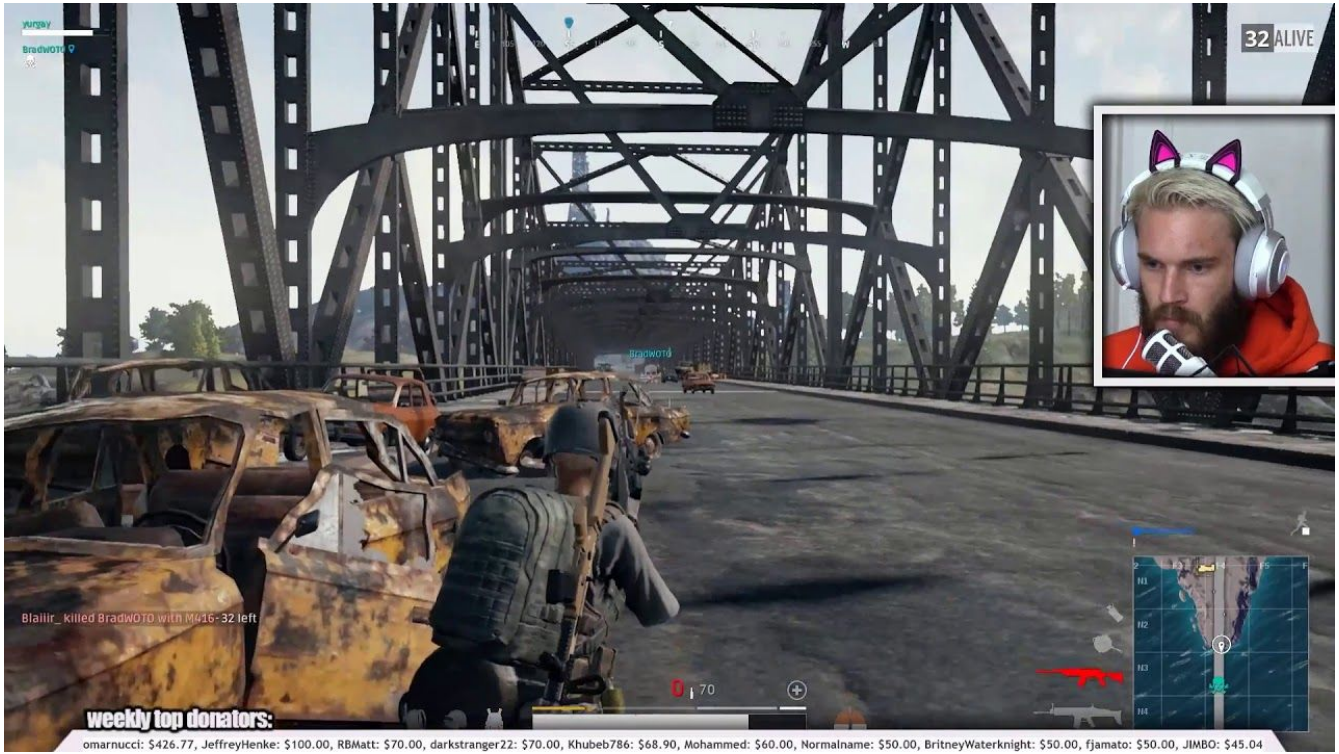
The only encoding option today is...

1. GPU in CPU: Intel Quicksync

OR

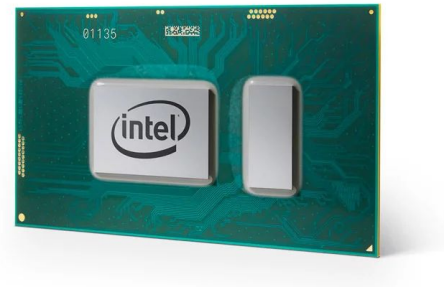
2. GPU: NVIDIA NVenc

These are hardware co-processors designed for video editing and optimized for streaming.



Thank you gamers for GPU power!

https://www.youtube.com/user/PewDiePie



Mobile **Intel i3-7100U** CPU is enough
for 4K conferencing!

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OR cheap **NVIDIA GTX1050** GPU with any decent Intel CPU.

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Terra Incognita

AMD

Pure software encoding on CPU for 4K is better, however not possible until CPUs reach 6Ghz freq.

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Part 3. Auxiliary processes

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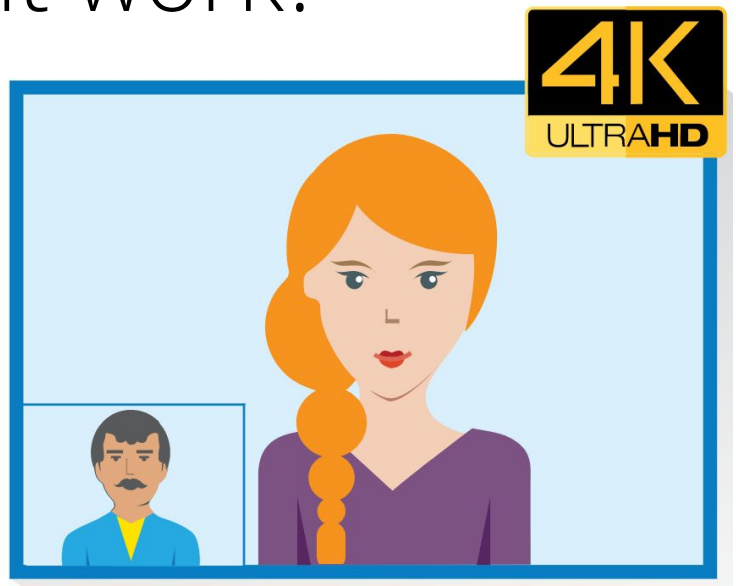
How does it work?

4K Camera

MJPEG



H.264

H.264

Network

1. Camera: MJPEG encoding over USB3.0.
2. CPU: camera MJPEG stream decoding.
3. **GPU: outgoing H.264 stream encoding.**
4. GPU: incoming H.264 stream decoding.
5. GPU: incoming stream displaying.

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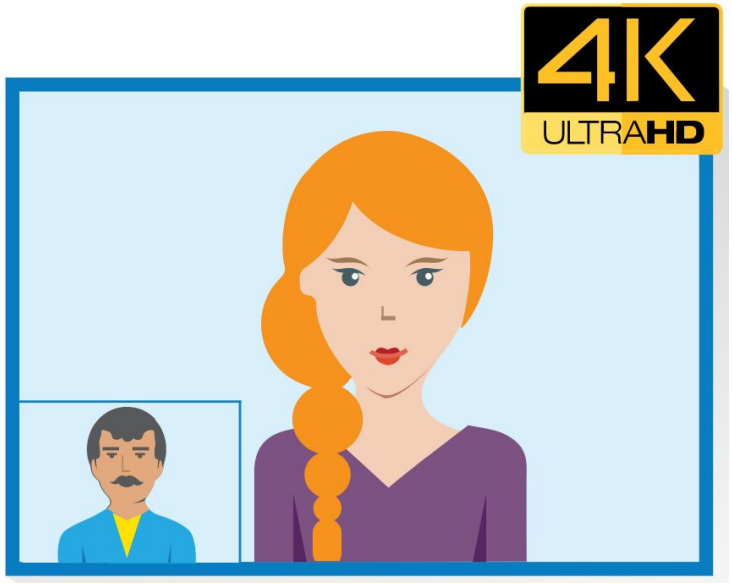
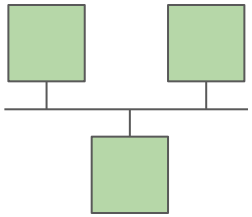
Why not?



H.264



Network

4K Camera

H.264

- Camera bitrate control has latency.
- Output bandwidth selection is limited.
- However, it’s possible and works fine.

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Part 3. Capture challenges

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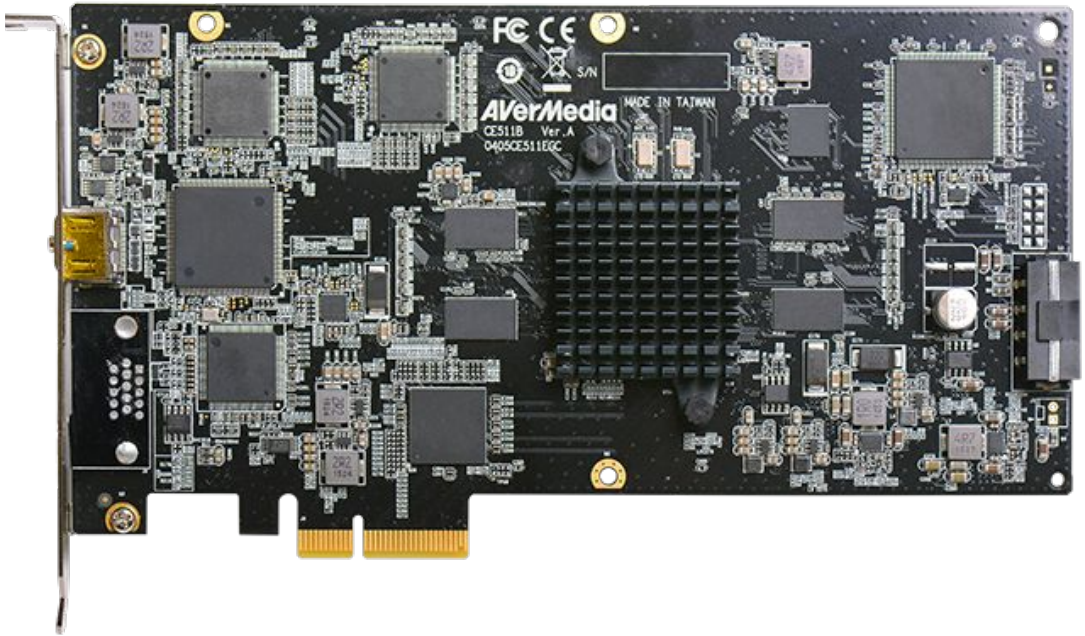
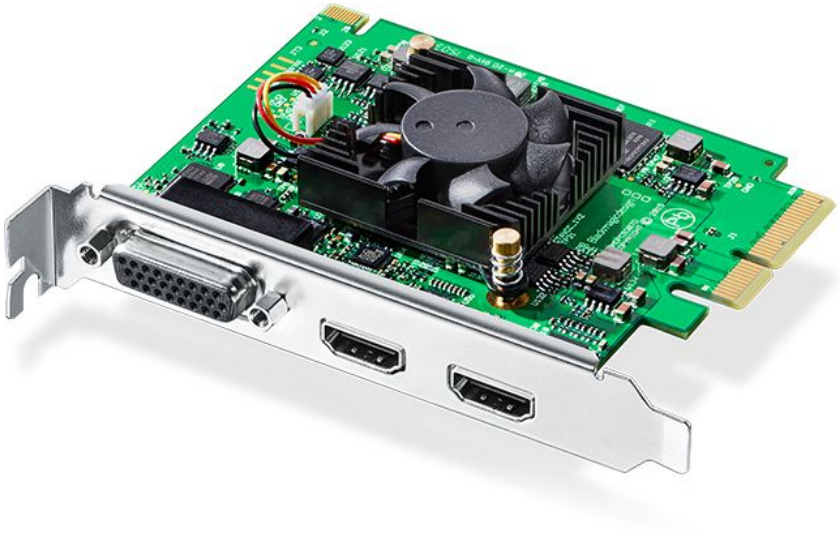
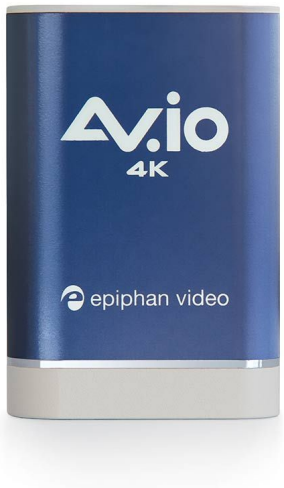


2015





2016

HDMI Sources

- Wrong HDMI cable version (<1.4b).
- HDMI cable is too long.
- Slow capture rate.
- Picture freezes unexpectedly.

USB Sources

- USB 2.0 is not an option for 4K.
- Non-compatible USB 3.0 chipset on PC board.
- USB 4K webcams still have optics and light sensitivity of webcams.

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Part 3. Network challenges

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No challenges at all

8Mbps is okay
10Mbps is recommended

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4K conferencing rise today

Many challenges have been solved: *cameras*, *capture cards, data interfaces, codecs, GPUs, CPUs* and **software**.

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Thanks! Check out example at *11D-126* →

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