Future video coding

Presentation for ITU Workshop on
"Standardization and innovation for multimedia and cable TV ecosystems"

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Agenda

1. Video coding – current state
2. Future video coding – demands and applications
3. Future video coding – technology
4. Conclusions

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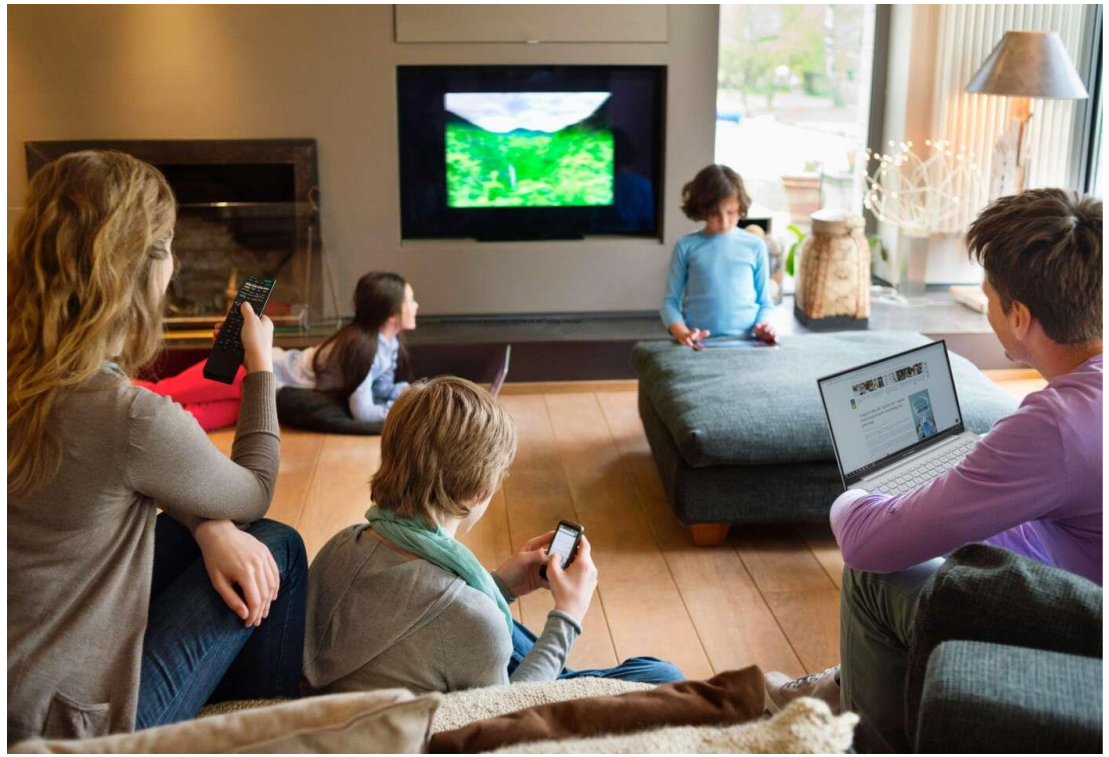
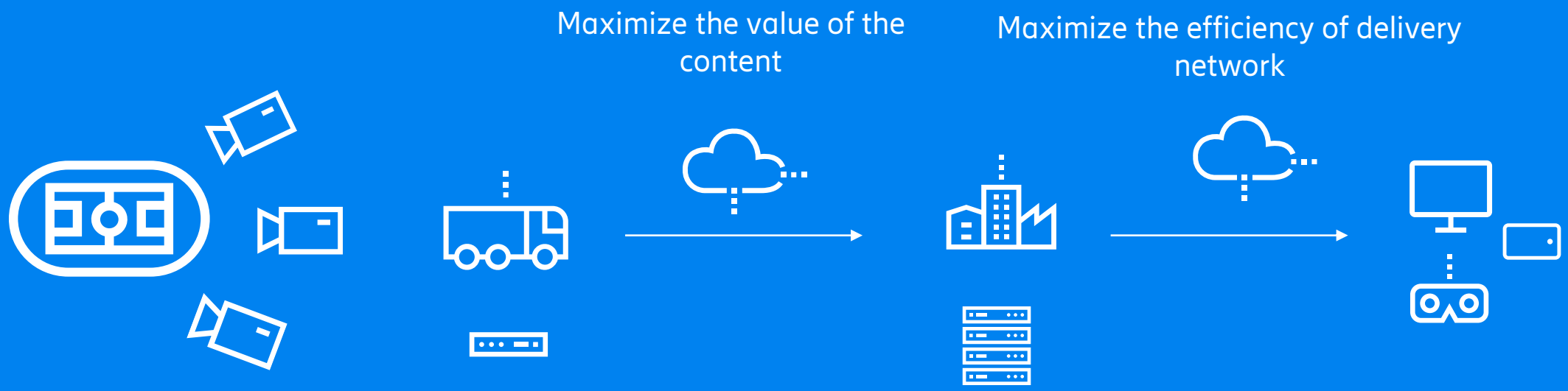
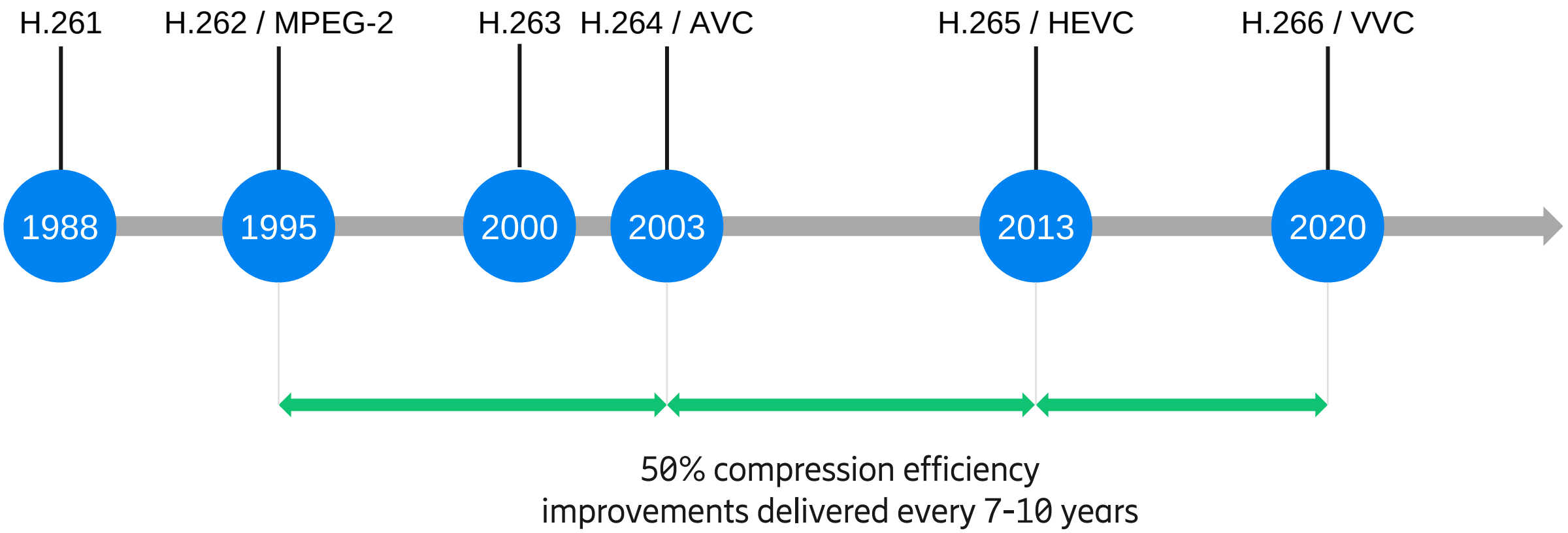
1. **Video coding – current state**
2. Future video coding – demand and applications
3. Future video coding – technology
4. Conclusions



Video coding in a video service life-cycle



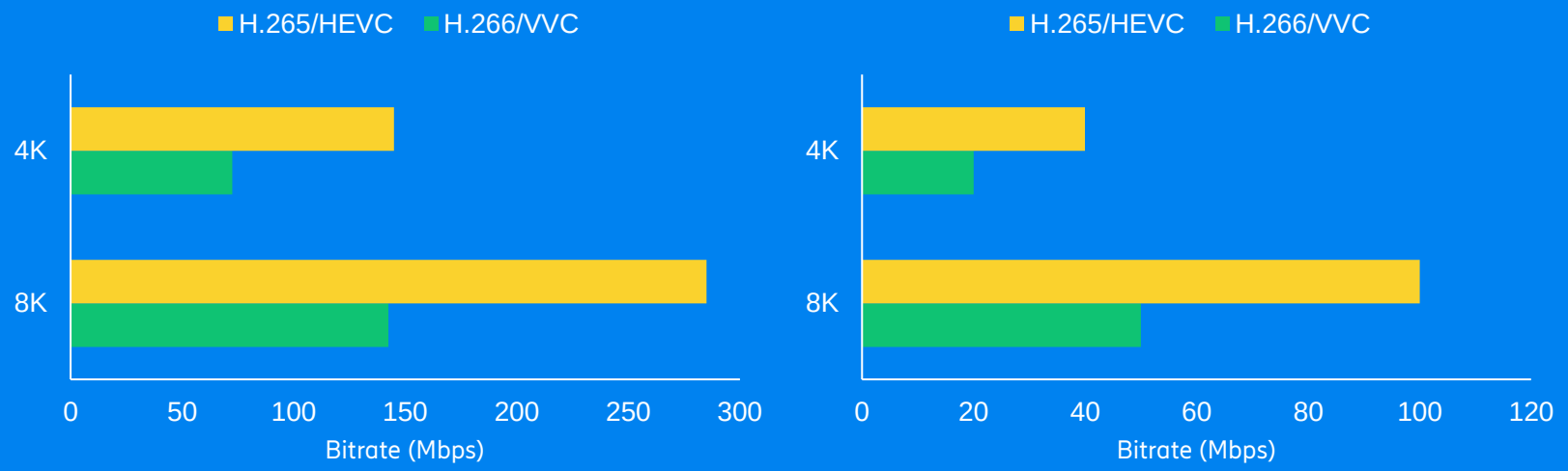
History of video coding standards development



Video coding in a video service life-cycle

4K

8K



Estimated (maximum) bitrates required for critical content after Rec. ITU-R BT.2073-2.

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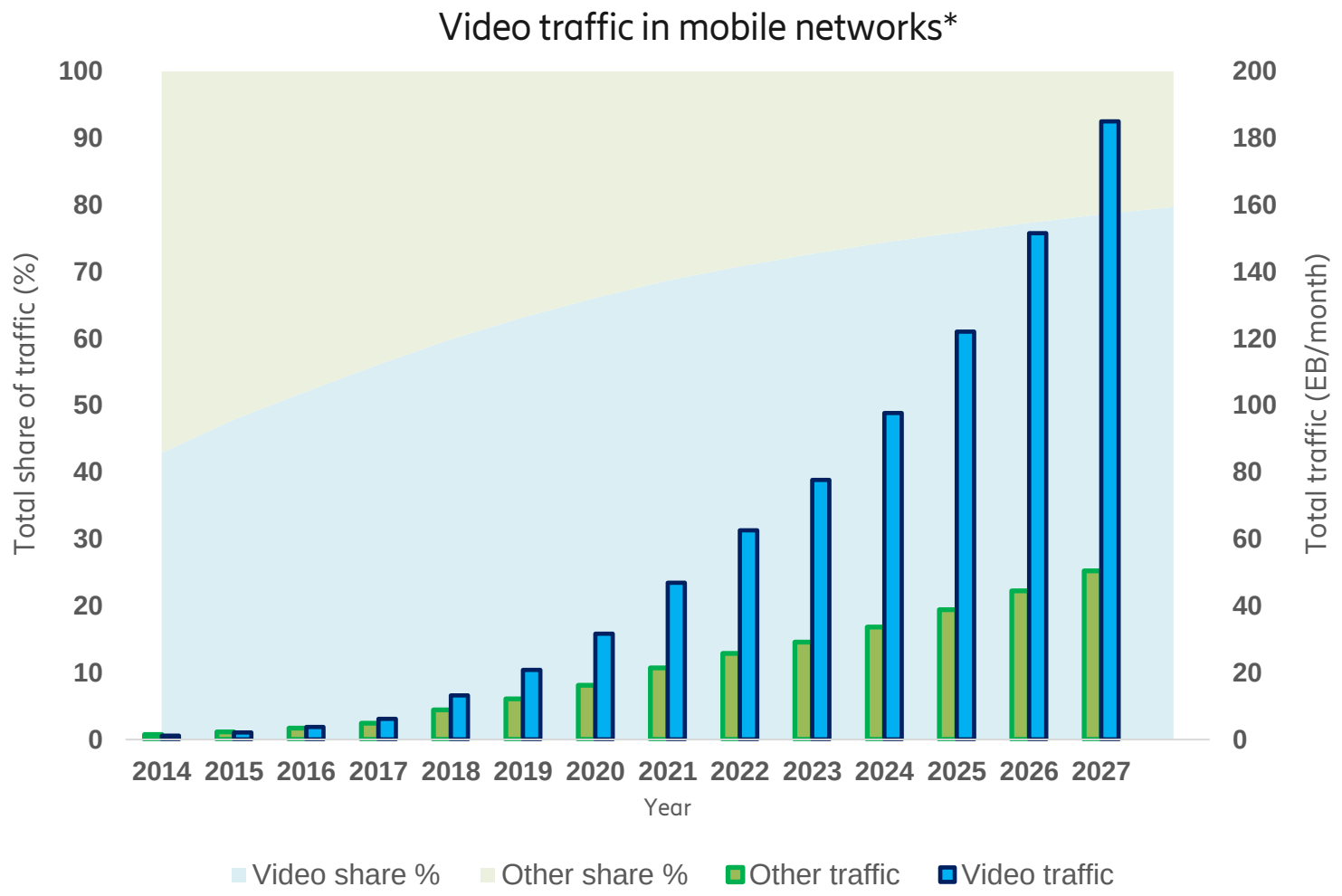
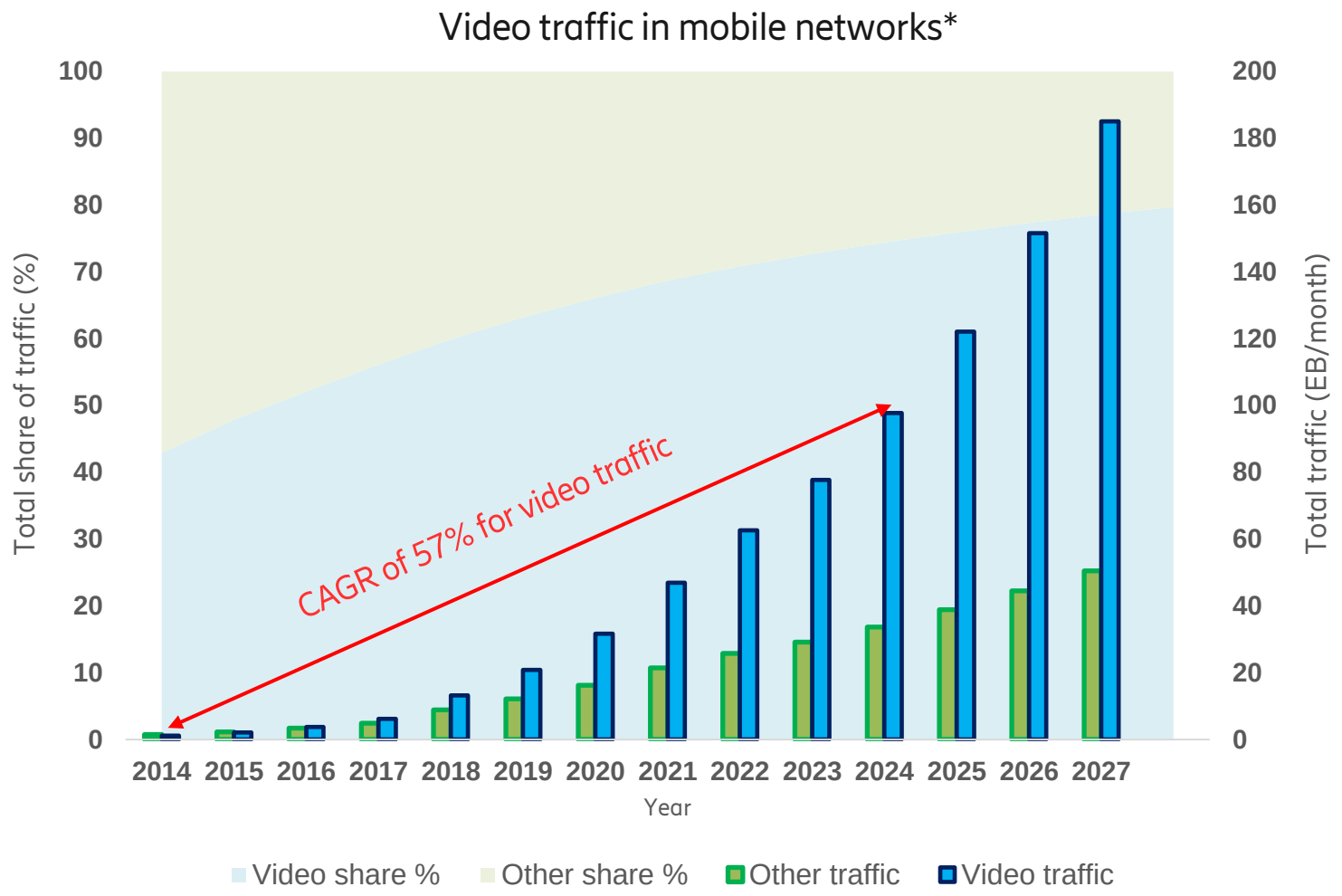
Future video coding - demands



Source: Ericsson Mobility Report June 2024.

1EB = 1M terabytes (TB)

Future video coding - demands



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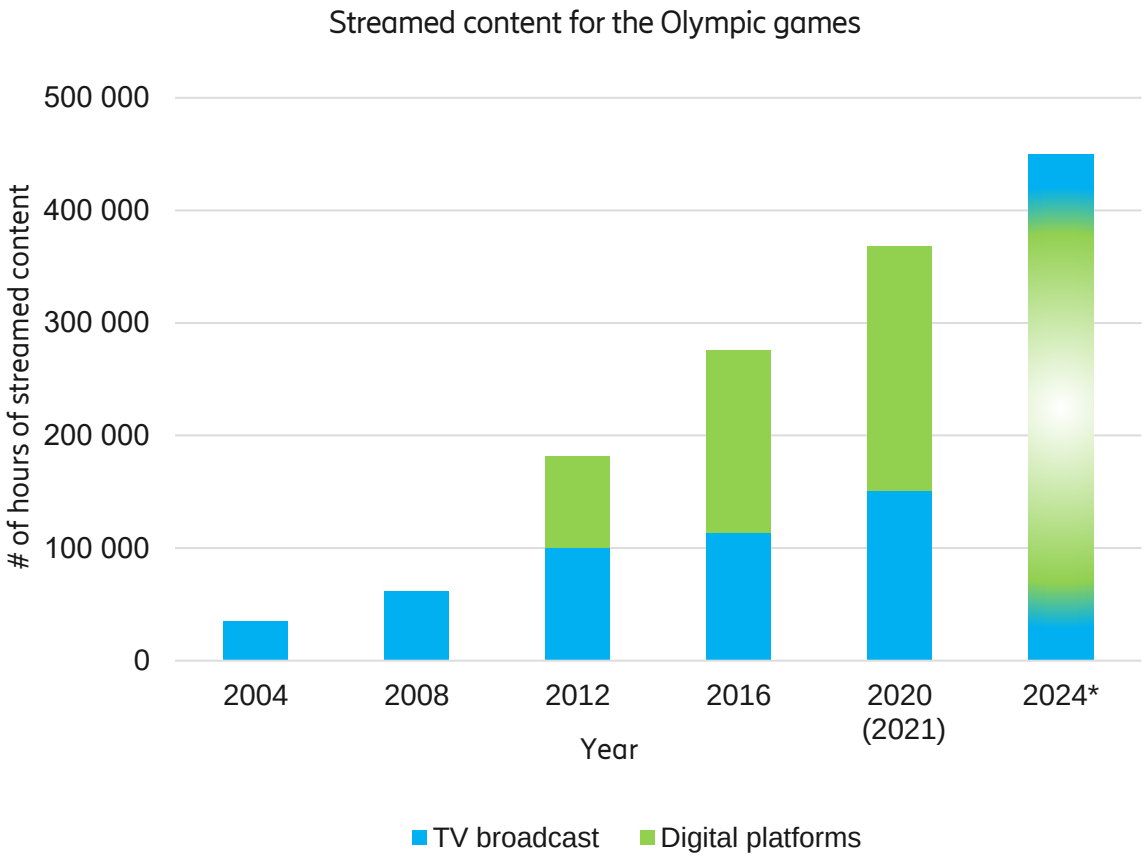
What has been driving video traffic growth? Olympic games case study



Source: IOC @ olympics.com

More content

Increase from 3800 hours (2004 Athens) to 10 200 hours (2020/21 Tokyo) of footage available to broadcasters.

More quality

Transition to HD distribution in 2000's.

Transition to UHD-4K HDR distribution in 2010's.

Transition to UHD-8K distribution in 2020's?

More formats

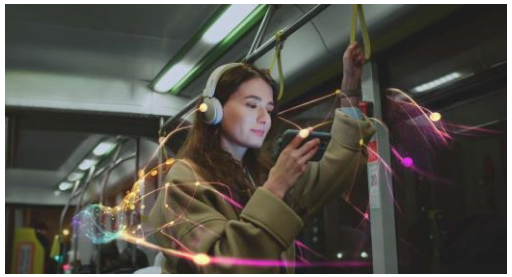
Distribution on digital platforms surpassed traditional TV broadcast in 2016.

New formats such as stereoscopic 3D video, 360° VR video and 8K were introduced and tested.

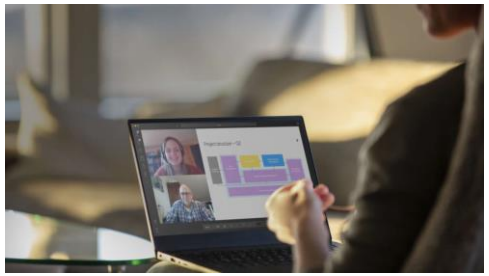
Future video coding - applications

Professional content

Video **consumption anywhere**



Real-time communication



Video for **industrial use**

User-generated content

Video **interaction anywhere**

Immersive communication

Video for **machines**

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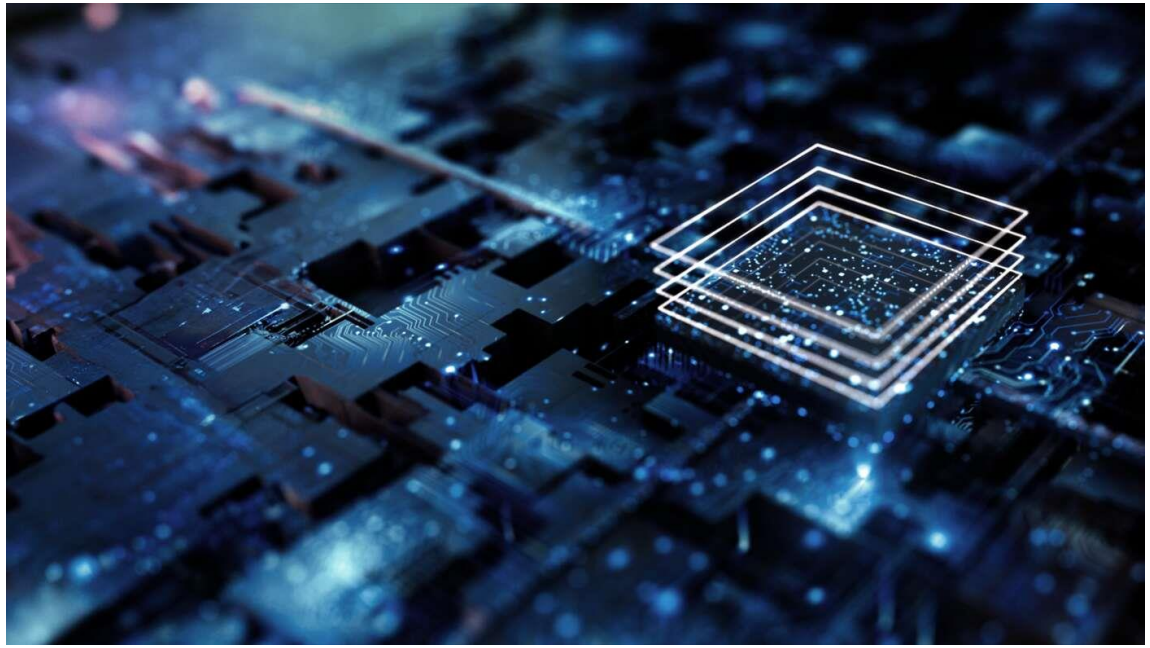
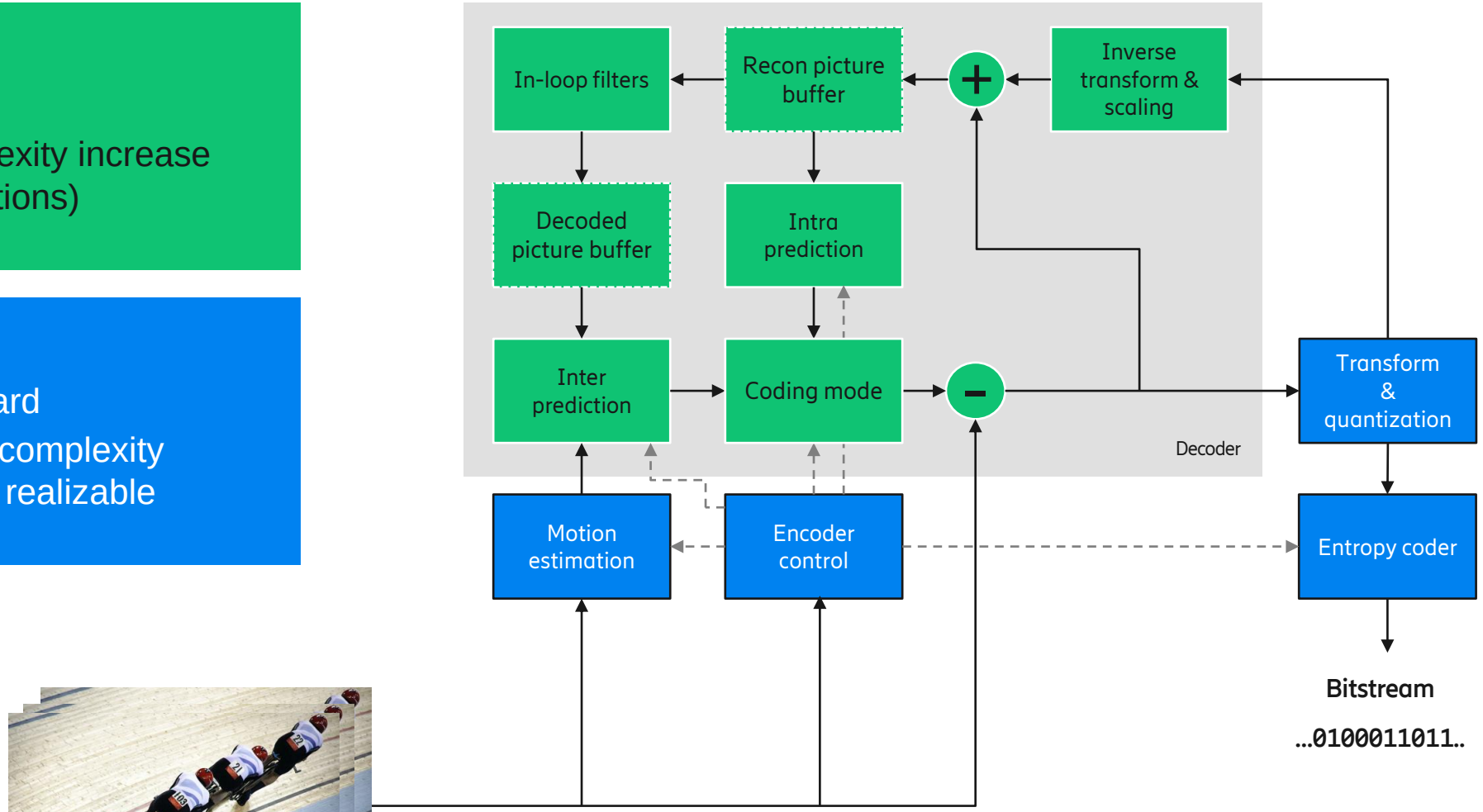


Future video coding - technology

Decoder
- Defined by a standard
- Constrained/fixed complexity increase (2x between two generations)

Encoder
- NOT defined by a standard
- Implementation-specific complexity control -> translates into realizable compression gains

Simplified hybrid video coding block diagram



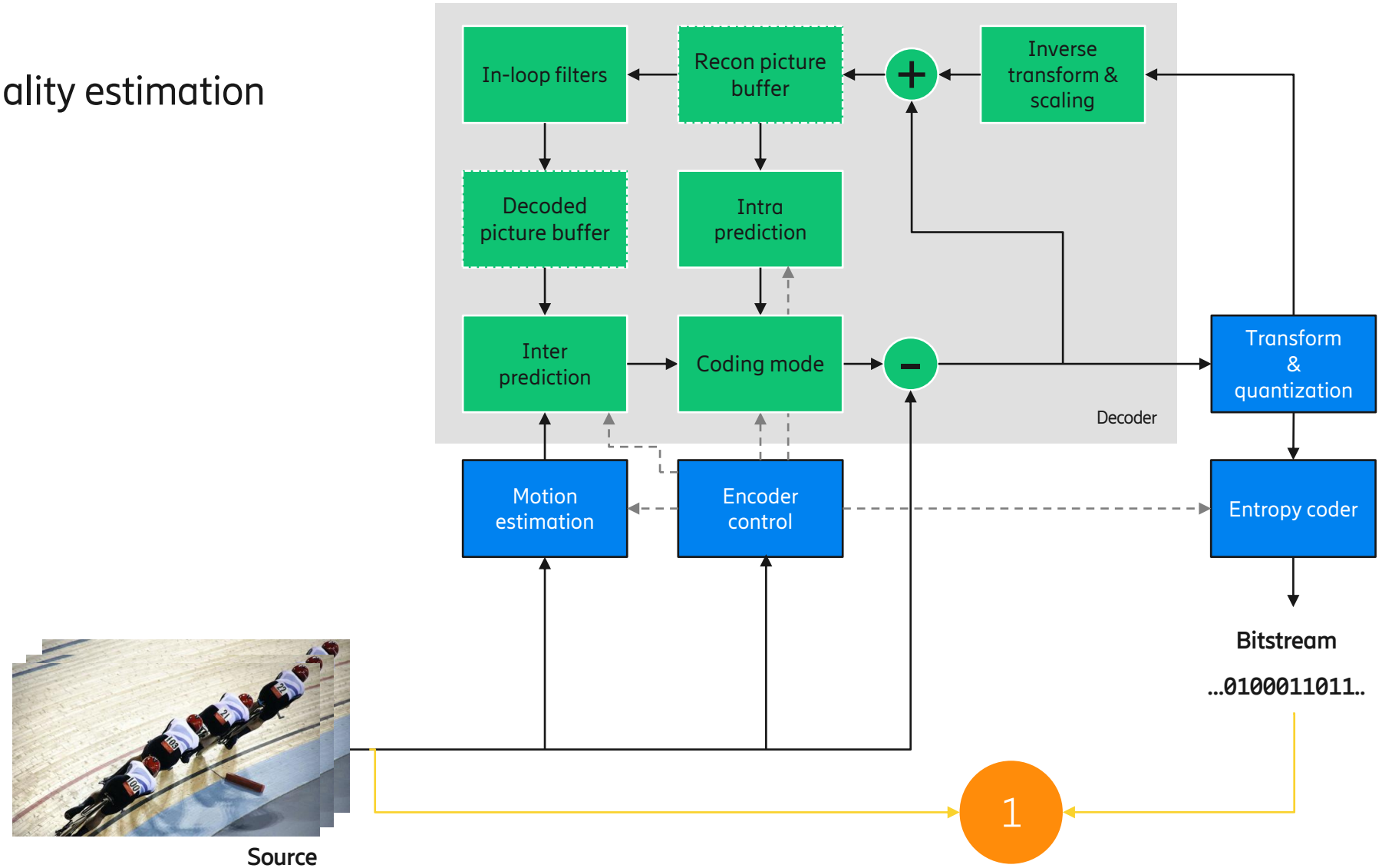
Source

Source

Future video coding - technology

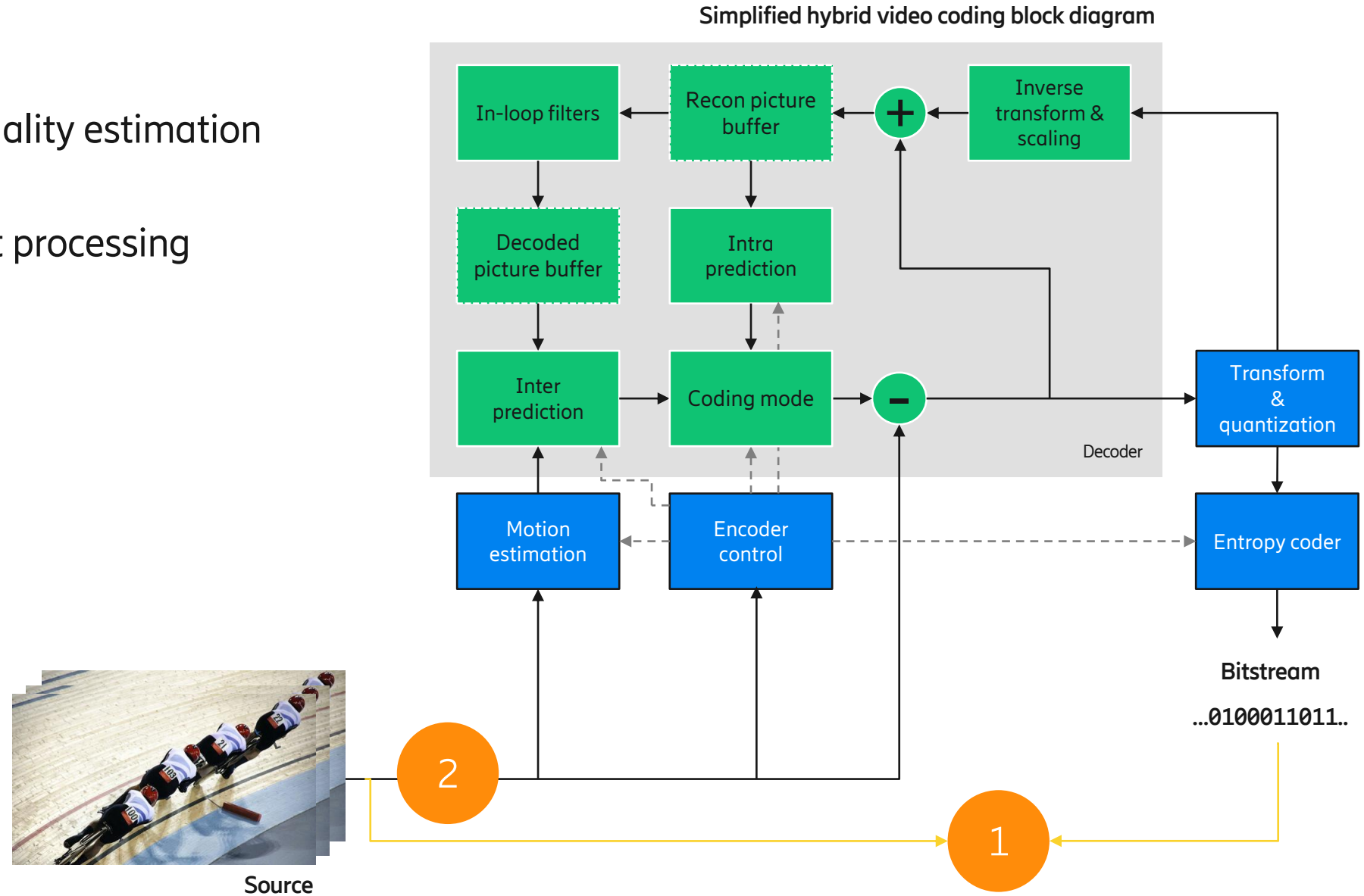
1 NN-based video quality estimation

Simplified hybrid video coding block diagram



Future video coding - technology

1. NN-based video quality estimation
2. NN-based pre/post processing



Future video coding - technology

1. NN-based video quality estimation
2. NN-based pre/post processing
3. NN-enhanced encoding

Simplified hybrid video coding block diagram

Source

Future video coding - technology

1. NN-based video quality estimation
2. NN-based pre/post processing
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4. NN-based coding tools

Simplified hybrid video coding block diagram

Source

Future video coding - technology

1. NN-based video quality estimation
2. NN-based pre/post processing
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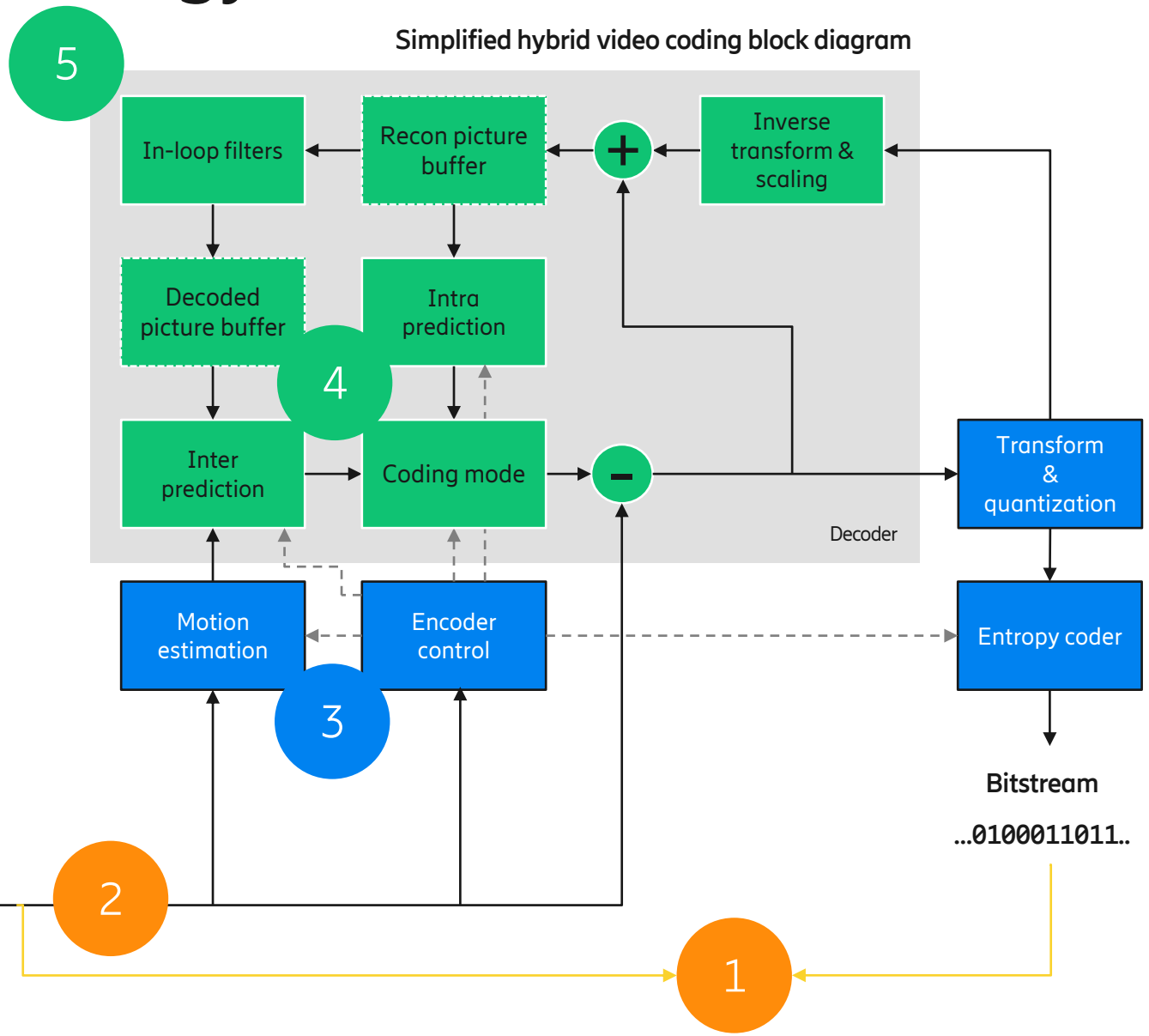
4. NN-based coding tools
5. End-to-end NN video coding



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Conclusions

- Video coding standards enabled immense growth of video-based applications and services.
- Video-based traffic is expected grow further with more applications, formats and content.
- Established video coding frameworks enabled long innovation cycles for deployed codecs as well as are a proven foundation for building new generations of video coding standards.
- Deep neural networks show promising opportunities for further advancement of video coding technologies.

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