V-NOVA

Introducing MPEG-5 Part 2 LCEVC

A codec to improve other codecs

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Geneva, ITU Workshop on the Future of Media

8/10/2019

Why a Low Complexity Enhancement Video Coding Standard?

David Ronca

Director of Video Encoding
Facebook
(previously Netflix)

> “
> (…)
>
> Encoder complexity is outpacing Moore’s law.
>
> (…)
>
> The longer-term answer to video encoding can not be to simply add more CPU capacity. This is an unsustainable model; both financially, and environmentally.
>
> (…
>
> Codec research must emphasize compression efficiency AND computational efficiency.
> Here's a thought exercise: If the next video encoder maintained the efficiency of VVC/AV1 but reduced computational complexity by 50%, would we consider that a successful new codec?
>
> ”

(from “**Encoder complexity hits the wall**”, 7/10/2019)

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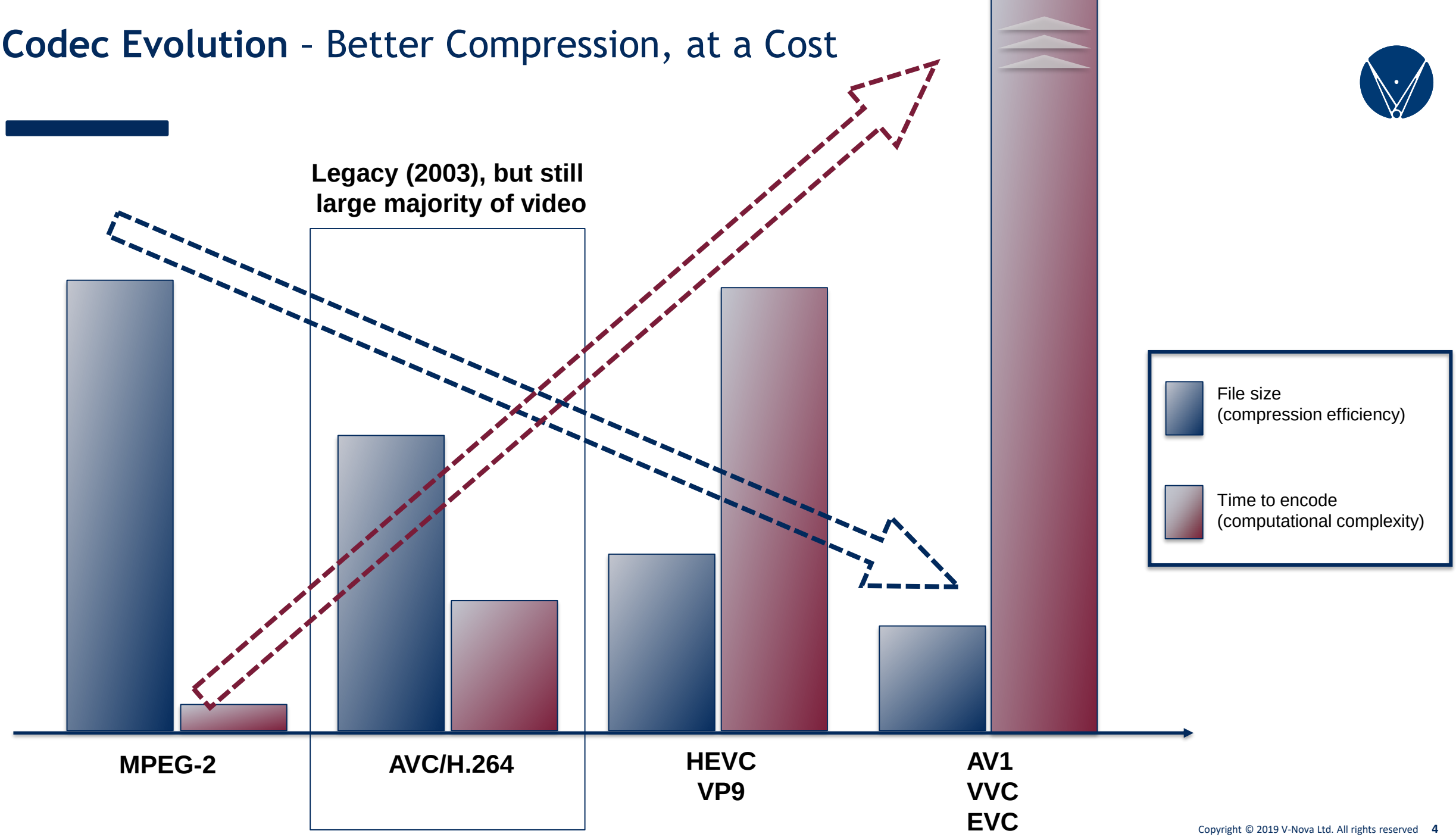
Codec Evolution – Better Compression, at a Cost



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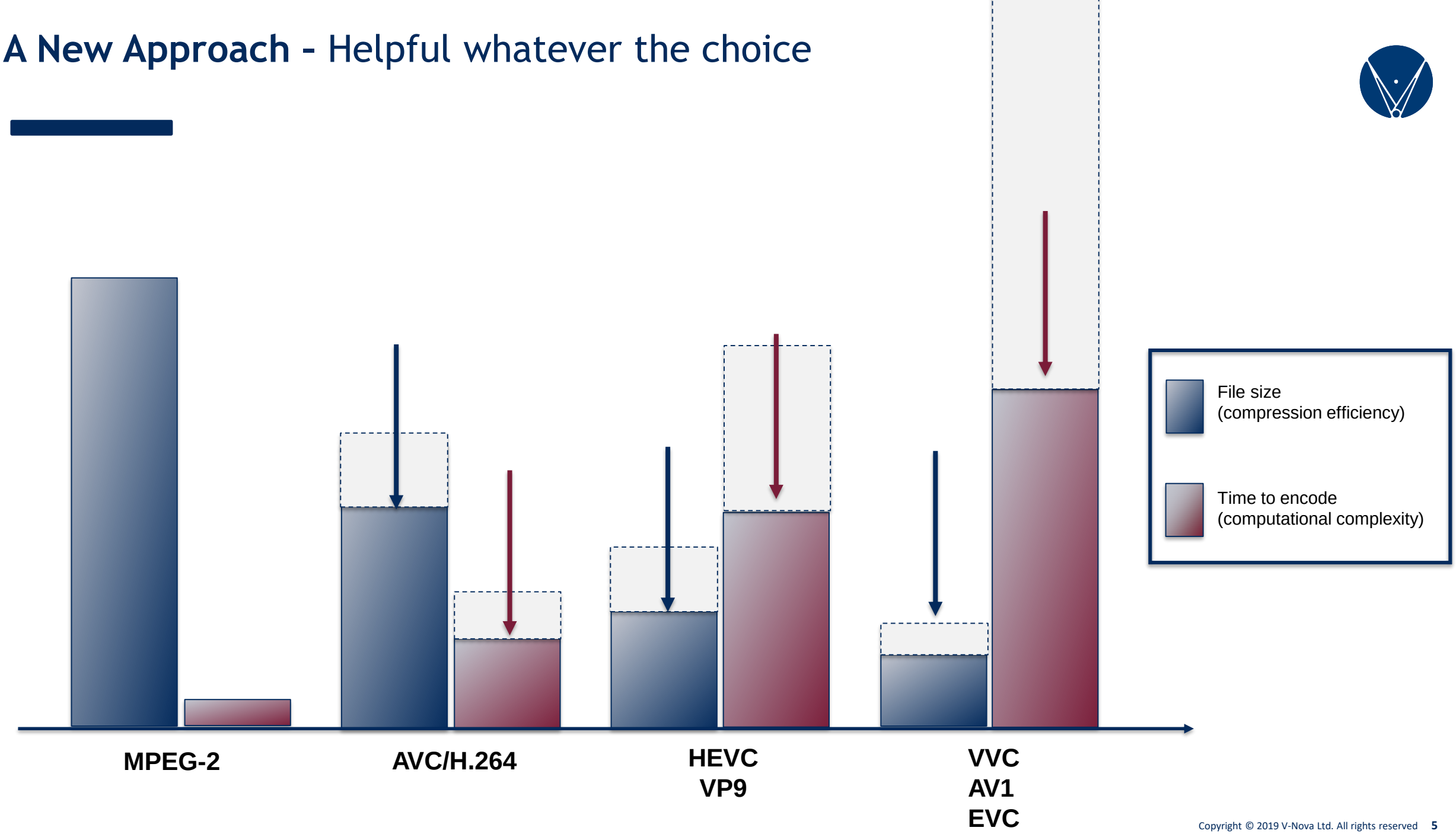
A New Approach - Helpful whatever the choice



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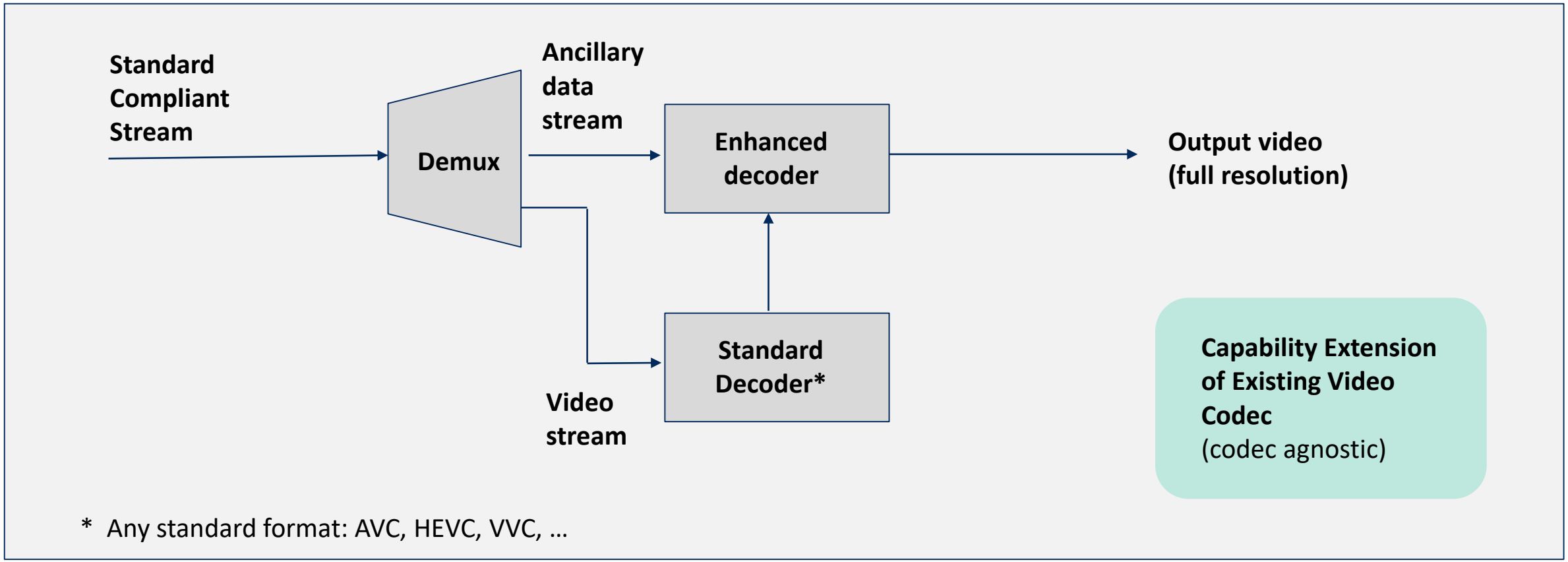
Low Complexity Enhancement Video Coding – What it is

- **Codec-agnostic codec of enhancement data**, where **enhancing n-th generation codec** results in
  - ✓ **Compression performance** as close as possible to (n+1)-th generation codec
  - ✓ **Encoding and decoding complexity** in line with n-th generation codec



What is a sub-layer of enhancement residual data?

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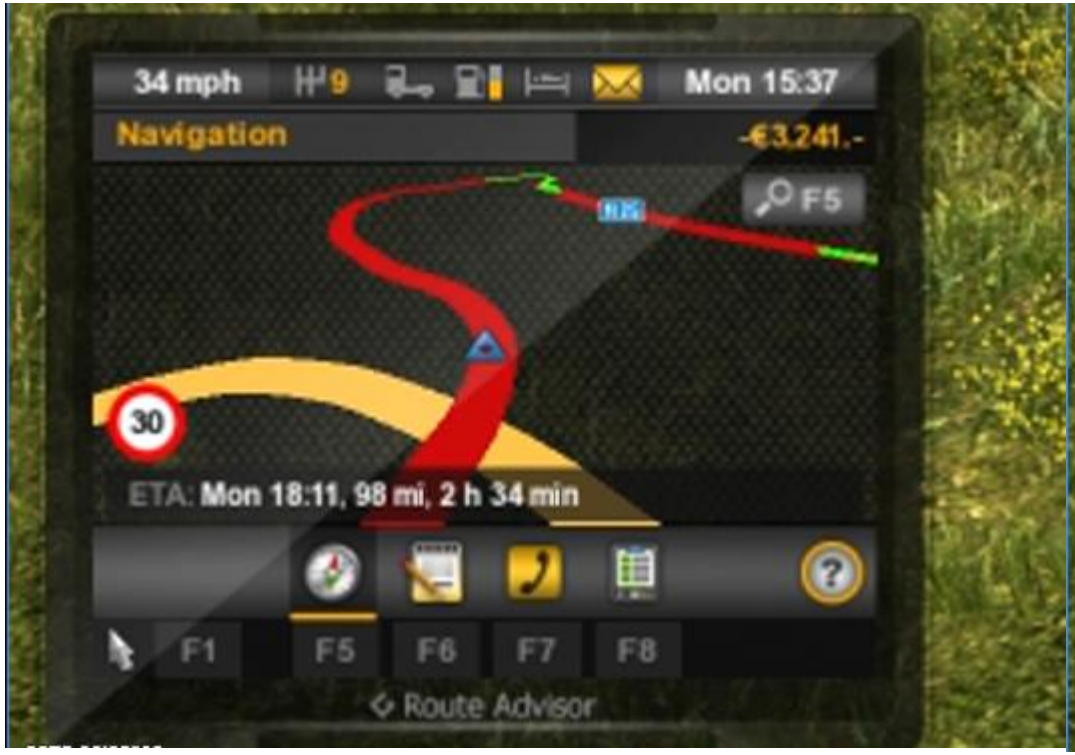
Beware of super-resolution, fidelity requires the actual data



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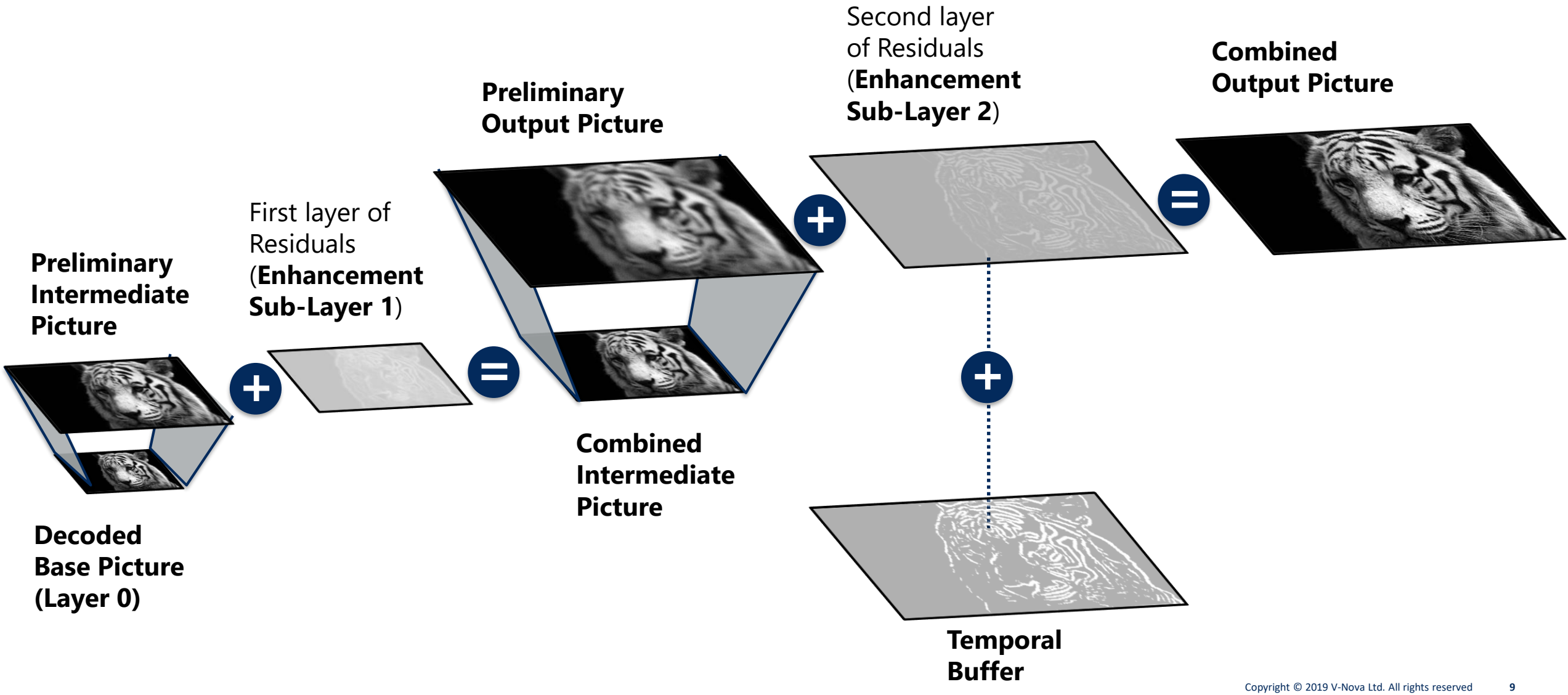
How LCEVC works: Two Sub-layers of Residual Data



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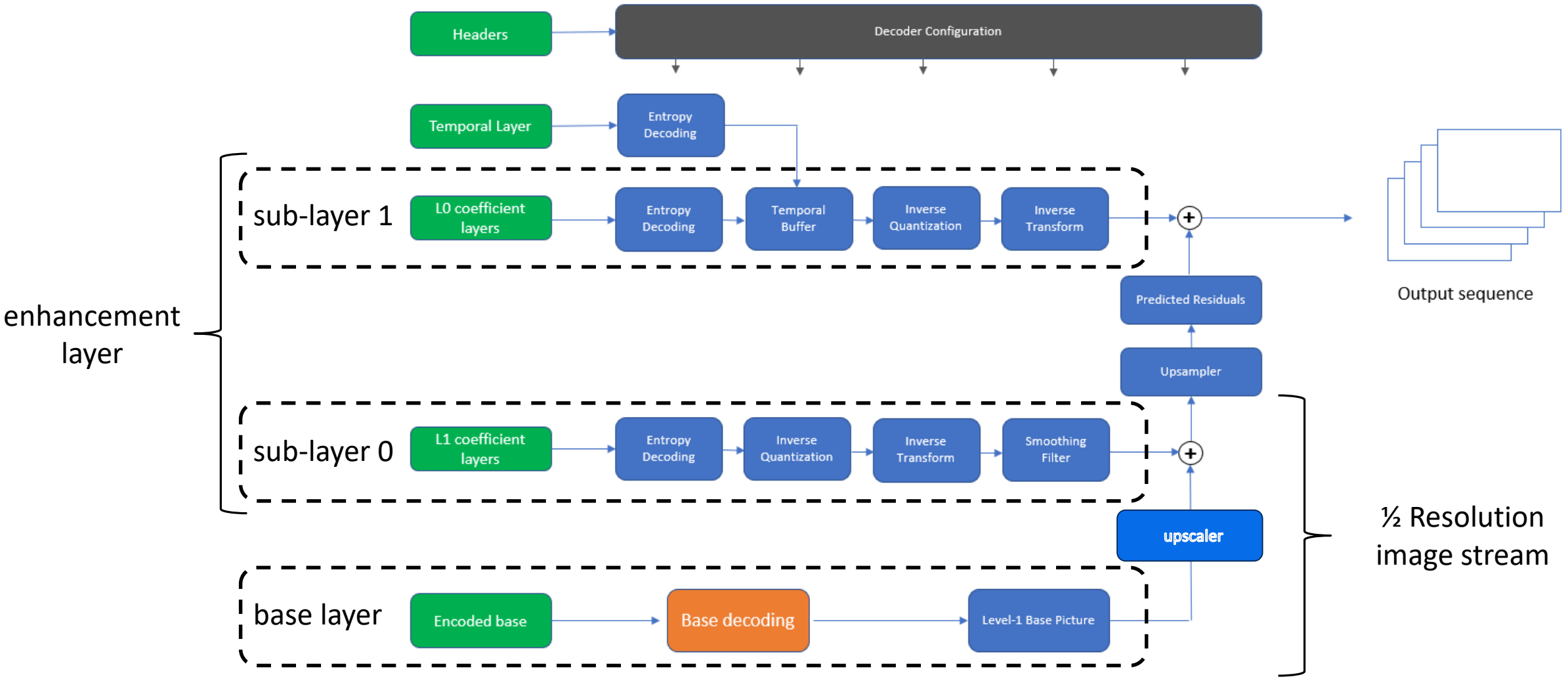
Signal flow



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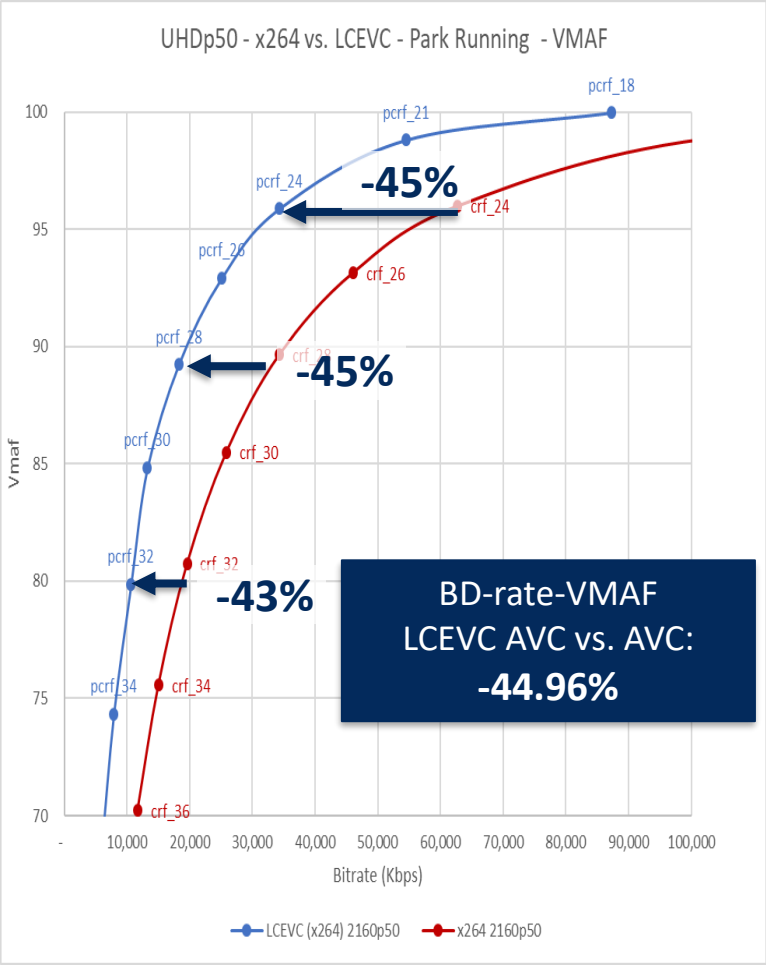
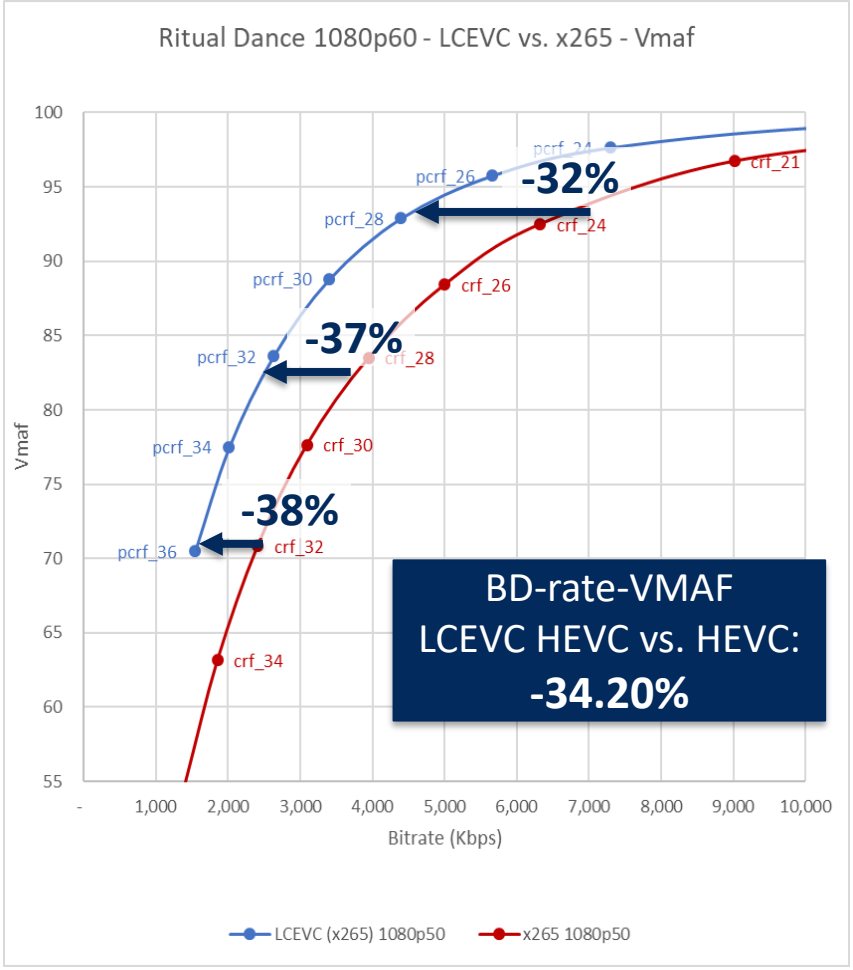
A standard that it helpful for the old, the current, and the future

Compression benefits

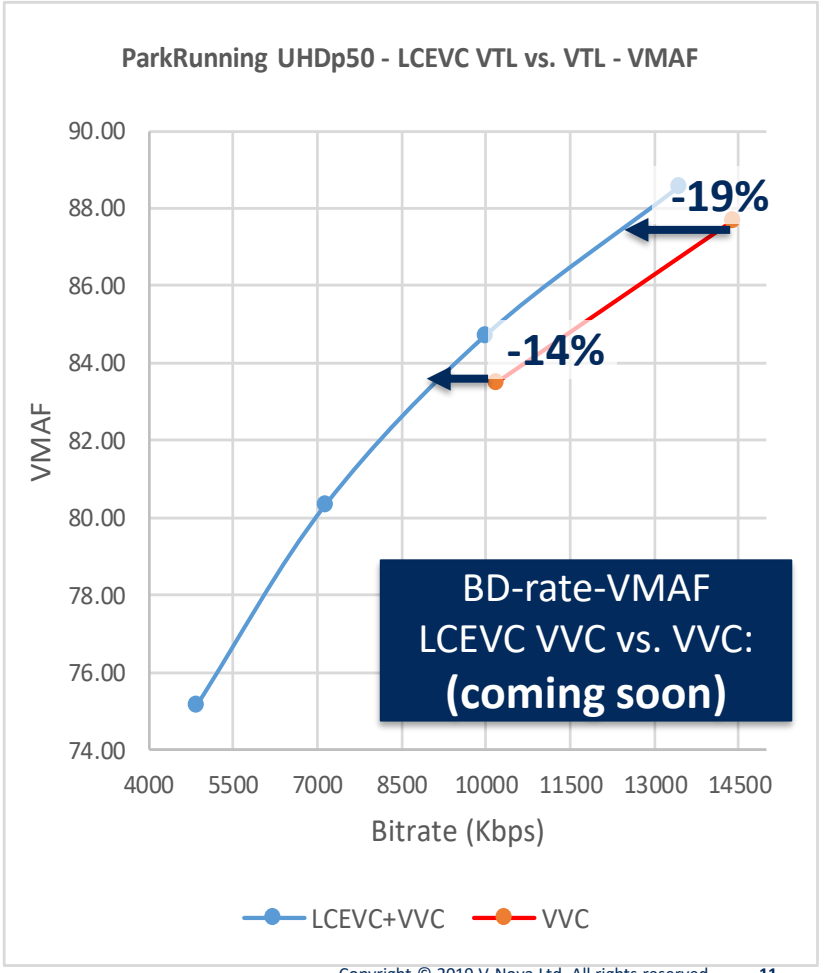
Improving the quality of AVC …



… as well as HEVC …



… as well as VVC



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What it means in practice – Example CampFire sequence

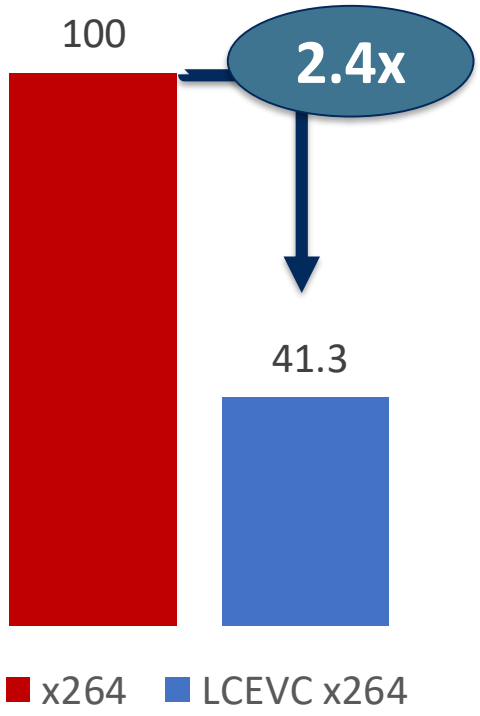
A standard that it helpful for the old, the current, and the future

Encoding complexity benefits

Reducing the complexity of AVC …

LCEVC AVC Encoding Time, as % of AVC Encoding Time

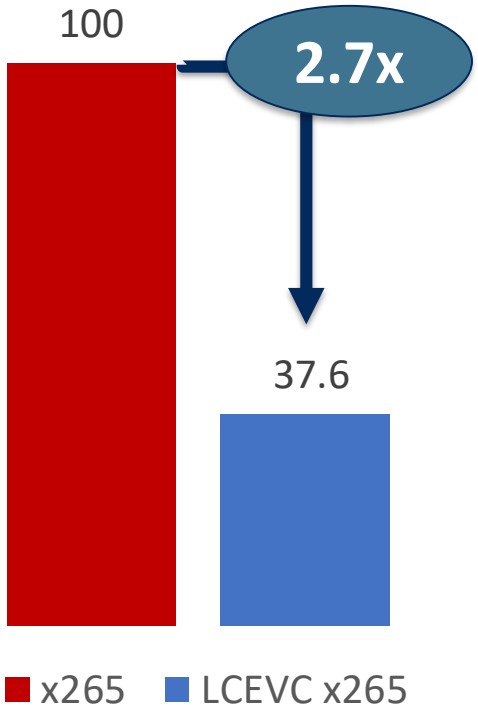
100% = 74 sec



… as well as HEVC …

LCEVC HEVC Encoding Time, as % of HEVC Encoding Time

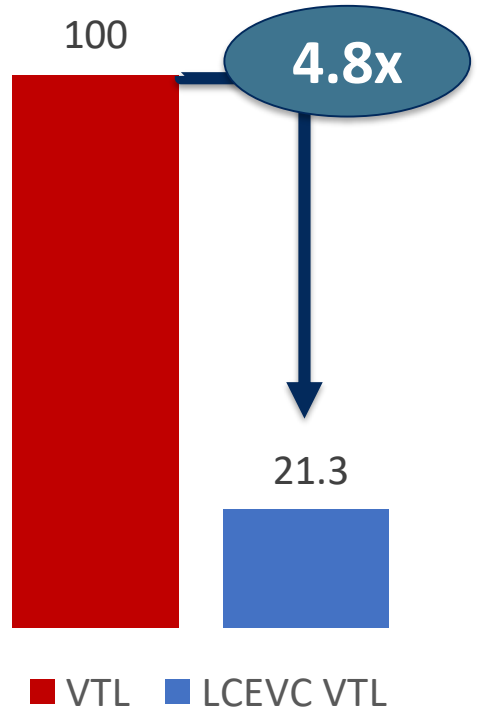
100% = 736 sec



… as well as VVC

LCEVC VVC Encoding Time, as % of VVC Encoding Time

100% = 1,412,882 sec



The collaborative work performed in the past months produced notable improvements

	V-Nova CfP Submission 1 (P11)		V-Nova CfP Submission 1 (P11)
	P11 JM vs. JM		**P11 JM vs. JM**
	BD-rate-PSNR		BD-rate-MOS
ParkRunning3	-32.68%		-51.70%
Campfire	-18.32%		-39.30%
Average Class A	**-25.50%**		**-45.50%**
	LCEVC		
	LCEVC JM vs. JM		
	BD-rate-PSNR		
ParkRunning3	-43.52%		
Campfire	-28.54%		(MOS still to be done)
Average Class A	**-36.03%**		
	LCEVC		
	LCEVC JM vs.P11 JM		
	BD-rate-PSNR		
ParkRunning3	-17.28%		
Campfire	-13.80%		(MOS still to be done)
Average Class A	**-15.54%**		

- **The good results of the CfP improved materially!**
- **Specification, definitions and overall clarity also improved significantly**

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Thank You

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