

# The xvc video codec

draft-samuelsson-netvc-xvc-01

Jonatan Samuelsson, Per Hermansson (Divideon)

IETF 102, Montreal, July 2018



# Outline

- ♦ What is xvc?
- ♦ Technology in xvc
- ♦ News since IETF 101
- ♦ Results
- ♦ Results for the royalty-free baseline profile
- ♦ xvc as candidate for NETVC

# What is xvc?

- ♦ A next-generation video codec, first released in September 2017
- ♦ Second version released in July 2018
- ♦ Higher compression performance than all other codecs
- ♦ Developed by Divideon
- ♦ Software-defined open source video codec
- ♦ One-stop shop commercial license available
- ♦ Well defined framework for handling evolution of the codec
- ♦ Efficient decoder implementation: [demo page](#)

The xvc codec at 120 kbps

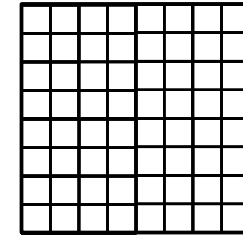


The h.264 codec at 120 kbps

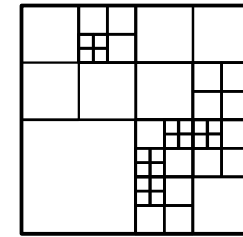


# Technology in xvc

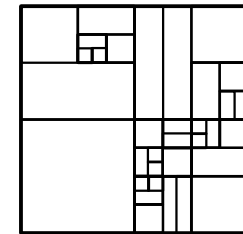
- ♦ Version 1.0 of xvc (Sept. 2017) included 62 coding tools
- ♦ Version 2.0 includes 76 coding tools, for example:
  - More intra directions and intra predictors
  - Cross component prediction
  - Adaptive full-pel motion vectors
  - Affine motion prediction
  - High precision motion vectors
  - Local illumination compensation
  - RDO based transform selection
  - Advanced coefficient coding
- ♦ All tools have restriction flags and can be disabled directly in the bitstream



AVC/H.264



HEVC/H.265



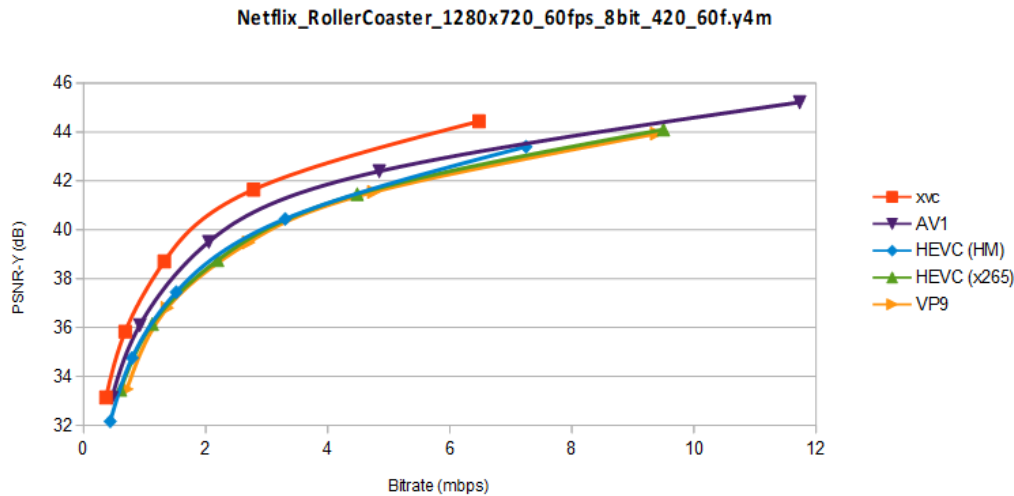
XVC

# News since IETF 101

- ♦ Software change:
  - Multi-threaded encoding with bit exact result as single-threaded encoding
    - Can for example give 12x speedup on 16 core CPU
- ♦ Version 2 of xvc released:
  - Improved coding of quantization parameters (~1% gain for common use cases)
  - Royalty-free baseline profile defined
    - Pure subset of the full xvc codec
    - Includes 25 coding tools
  - Dual licensing option for the software (LGPL and commercial)
- ♦ IPR declaration for the xvc ID:
  - Royalty free with reciprocity

# Results

- ◆ The xvc codec has been tested using the test conditions from draft-ietf-netvc-testing-06
- ◆ The AreWeCompressedYet? framework has been used
- ◆ All results available at [awcy.divideon.com](http://awcy.divideon.com)



Single pass Random-Access xvc relative to HM:

	PSNR	PSNR Cb	PSNR Cr	PSNR HVS	SSIM	MS SSIM
1080p	-16.8	-29.9	-28.9	-15.0	-17.9	-16.8
1080psc	-13.7	-44.5	-40.4	-15.4	-16.7	-17.0
720p	-20.8	-30.0	-32.6	-20.1	-23.8	-22.7
360p	-26.1	-24.7	-28.8	-26.4	-30.2	-29.6
Average	-19.5	-30.7	-31.3	-19.1	-22.0	-21.2

Single pass Random-Access xvc relative to AV1:

	PSNR	PSNR Cb	PSNR Cr	PSNR HVS	SSIM	MS SSIM
720p	-13.3	-0.8	-4.4	-16.4	-20.2	-20.5
360p	-19.7	-9.6	-3.4	-22.5	-23.0	-26.1
Average	-16.5	-5.2	-3.9	-19.4	-21.6	-23.3

Multi-pass Random-Access xvc relative to AV1:

	PSNR	PSNR Cb	PSNR Cr	PSNR HVS	SSIM	MS SSIM
1080p	-6.0	-4.5	-3.2	-5.6	-10.9	-9.7
1080psc	8.3	18.5	15.8	5.9	6.2	3.9
720p	-0.5	0.4	4.8	-1.4	-6.0	-5.5
360p	-15.9	-6.2	11.2	-19.9	-19.0	-21.2
Average	-5.1	-0.7	4.6	-6.4	-9.4	-9.6

# Results for the royalty-free baseline profile

- ◆ The xvc codec has been tested using the test conditions from draft-ietf-netvc-testing-06
- ◆ The AreWeCompressedYet? framework has been used
- ◆ All results available at [awcy.divideon.com](http://awcy.divideon.com)

Single pass Random-Access full xvc relative to baseline xvc:

	PSNR	PSNR Cb	PSNR Cr	PSNR HVS	SSIM	MS SSIM
1080p	-11.6	-14.6	-14.4	-10.9	-11.9	-11.5
1080psc	-15.1	-23.8	-24.4	-11.5	-12.7	-12.0
720p	-10.2	-14.7	-15.8	-9.9	-11.4	-10.6
360p	-14.9	-18.6	-21.4	-15.0	-16.4	-15.6
Average	-12.5	-16.8	-17.7	-11.7	-12.9	-12.3

Multi-pass Random-Access full xvc relative to baseline xvc:

	PSNR	PSNR Cb	PSNR Cr	PSNR HVS	SSIM	MS SSIM
1080p	-11.5	-14.8	-14.1	-10.6	-11.5	-11.1
1080psc	-15.8	-23.7	-24.7	-12.6	-14.1	-13.1
720p	-10.3	-14.0	-15.1	-10.3	-12.0	-11.1
360p	-14.3	-17.7	-18.5	-14.1	-15.7	-14.7
Average	-12.5	-16.5	-16.8	-11.6	-12.9	-12.2

# xvc as candidate for NETVC

- ♦ The xvc codec is brought as a candidate proposal for NETVC
- ♦ We believe that xvc is well positioned to meet the objectives:
  1. Is competitive (in the sense of having comparable or better performance) with current video codecs in widespread use.
  2. Is optimized for use in interactive web applications.
  3. Is viewed as having IPR licensing terms that allow it to be widely implemented and deployed.



# Thank you!

Info and code at [divideon.com](http://divideon.com) and [xvc.io](http://xvc.io)

