Intel® Stress Bitstreams and Encoder 2016 - VP9
Release Notes
(Version 2.2)

Overview

The **Intel® Stress Bitstreams and Encoder 2016 – VP9** is designed to ensure decoder compliance with VP9* format. Streams cover all the feature sets and profiles of VP9 format.

Features

The **Intel® Stress Bitstreams and Encoder 2016 – VP9** offers the following features:

Stress Bitstreams for decoder validation. Stress Bitstreams are provided in three main buckets: INTRA, INTER and EXTRA. INTRA and INTER sets are designed for validation of the features related to intra and inter prediction, respectively, while EXTRA set contains streams covering other VP9 format features not directly related to intra or inter prediction.

There are three types of streams: Syntax, Stress and Smaller. Syntax streams are designed to test a certain subset of features. Stress streams include all the features covered by the bucket. A Smaller stream is similar to a Stress stream of INTER bucket, its major purpose is to test the decoder's ability to handle very small resolutions. The only exception for Syntax streams is the stream dedicated to tile testing, which in addition has 16384×240 version to test vertical tiles of maximum width.

Random Encoder, a highly configurable and flexible syntax (VP9) encoder tool. Unlike regular encoders, it is not intended to achieve compression but only designed to create a valid specification-compliant stream.

Compliant streams contain only allowed combinations of syntax elements and their levels to test decoder for unusual cases or boundary stress cases.

As an input, Random Encoder accepts a *YUV file* and a *PAR file* describing test settings: features to utilize, fixed values, random values. As an output, Random Encoder produces encoded bitstream and optionally writes a *YUV file* with internal reconstruction data. This file is used to validate that Random Encoder generated a proper compressed file and that the resulting bitstream is valid.

Error Resilience Encoder, a tool based on Random Encoder intended to generate non-compliant streams for decoder error resilience testing.

The package also includes the **libvpx reference decoder**, with all SIMD optimizations disabled. This decoder is used to test all the provided bitstreams.

Changes History

Version 2.2

Random Encoder improvements:

- Add option to control the distribution of transform coefficients by tokens
- Fix end-of-block distribution in randomized transform mode
- Add option to disable zero-height tile generation

Parfiles and streams:

- Update Smoke Test Streams set: improved coverage with 2x lesser memory footprint
- Add new streams to reach 100% context coverage
- Add new broken streams for Profile 0 and Profile 2

Version 2.1

Random Encoder improvements:

- Add ability to iterate parameters (Start, Step, End) for most of the parameters

Parfiles and streams:

- Add new Smoke Test Streams and parfiles for Profile 0 and Profile 2 (small set of streams for fast smoke testing)
- Add new broken streams for Profile 0 and Profile 2

Version 2.0

- Add Visual Packs for Profile 0 and Profile 2
- Add Broken Packs for Profile 0 and Profile 2
- Add feature_info utility (counts occurrences of certain values of each syntax element and then dumps this statistics to a .csv file)

Random Encoder improvements:

- Add ability to override distributions for specified frames
- Improve transform coefficients randomization
- Add option to explicitly specify refresh mask
- Add option to set frame size in pixels
- Add ability to separately set sign bias for last, golden and altref frames
- Fix issue when intra-only frame with zero refresh mask and partially enabled scaling caused encoder to crash
- Fix uninitialized distributions in residual randomization

- Fix default distribution values

Parfiles and streams:

- Add new parfiles to showcase overriding distributions
- Changed streams with transform coefficients randomization

Version 1.7

Random Encoder improvements:

- Fix small chance of inter frames with no valid references
- Fix vertical tile parameter handling when requested values are outside of range allowed by frame resolution

Parfile (streams) changes:

- Three new parfiles: for testing the worst performance cases
- New visually clean parfiles: for generation of bitstreams with no visual artifacts

Version 1.6

Random Encoder improvements:

- New option "min_frame_size" in parfile to limit minimum frame size for streams with variable resolution
- Fix problem with parsing parfiles with Linux* line endings in Windows* environment

Parfile (streams) changes:

- Three new parfiles with the same settings as 204th, 205th and 250th, but with additional minimum frame restriction of 64×64

Version 1.5

Random Encoder improvements:

- Support intra-only as the first frame in bitstream
- Don’t allow randomized residual to yield inverse transform overflow
- Support bit-depth and chroma-sampling change at intra-only frames (previously at key frames only)
- Allow one or two reference frames in header to have invalid resolution (out of 1/16..2x range)
- Special command-line option for memory-bandwidth configuration, increasing number of memory reads by 12%
- Special option for visually clean streams allowing to repeat invisible frames with show_existing_frame flag

Parfile (streams) changes:

- Two new parfiles: one for testing start with intra-only frame and another one is 250_extra_stress with disabled frame scaling
- New parameter “start_w_intra_only” defining the chances that stream will begin with intra-only frame instead of key one
- New parameter “mv_joint_zero” helping to reach more uniform coverage of MV_JOINT_TYPE element
- Change distribution of “error_resilient” parameter to provide better chances for taking motion-vector candidates from the previous frame
- Change distribution of randomized residual to full span (invalid results of randomization are discarded by default)

Version 1.4

- Add Profile 1 and Profile 3 support (4:2:2, 4:4:0 and 4:4:4 and mixed)

Version 1.3

- Add new Memory-bandwidth stress bitstreams, which are targeted to maximize the amount of reads of reference frame surfaces.

- Introduce changes from libvpx:
  - libvpx g899585e: reference frame size restrictions
  - libvpx g29071a4: invalid memory access on 2x downscale
  - libvpx gbefc36d: invalid memory access in convolve() function
  - libvpx gd237d48: condition for border extension
- Don't force block with zero coefficients to skip flag at SB level.
- In transform randomization mode, allow to fill the rest of block with zero coefficients instead of putting an EOB token.
- Allow empty horizontal tiles at small resolution.
- Change default range for random residual from (-255..255) to (-127..127) to avoid overflows in inverse transform
- Change offset in color bit-depth up-conversion according to changes in behavior of --output-bit-depth option in libvpx decoder
- Fix:
  - random residual not being used for intra blocks;
  - avoid unnecessary MV clamping;
  - "frame_context_idx" setting not being read from parfile;
- Add new options to Random Encoder:
  --extreme_residual=BOOL (use only extreme values for random residual);
  --idct_overflow_hw=BOOL (enable Emulate-Hardware-Highbitdepth behavior for iDCT calculation);
- Add new report: Branch and Syntax Static View
- Update MD5 check sum for Plum_VP9_432x240_301_idct_rounding.vp9 stream (see Known Limitations section)

Version 1.2

- Added High Bit Depth (HBD) support for Profile 2 (10 and 12 bits 4:2:0)

Version 1.1

- New approach to frame resolution randomization to satisfy new restriction on reference frame size introduced by commit g9f37d14 in libvpx repository.
- Previously it was allowed to pick any references as last, golden and alt-ref frame, if they are not used for actual inter prediction. Now decoder checks ref-frame size prior to superblock decoding, so encoder have to pick frame resolution giving at least one valid reference in existing ref-frame pool. Parfile settings for frame size randomization also changed.
- Change of probability model used for intra-only frame handing according to commit 7c43fb6 in libvpx repo. This commit makes reference decoder incompatible with older bitstreams containing intra-only frames and vice versa, new bitstreams are incompatible with old decoders.
- All bitstreams utilizing frame scaling or intra-only frames have changed

System Requirements

Hardware

- Bitstreams: no limitations.
- Reference Decoder: systems based on IA-32 architecture or Intel® 64 architecture.

Software

- Bitstreams: no limitations.
- Reference Decoder: Microsoft* Windows* 7, Microsoft Windows 8, Microsoft Windows 8.1, Microsoft Windows Server 2012 or Microsoft Windows Server 2012 R2 for 64-bit architecture, Ubuntu* 12.04 LTS for 64-bit architecture (currently 12.04.3) or SUSE* Linux* Enterprise Server 11 for 64-bit architecture, OS X* 10.9 (currently 10.9.3)
- Random Encoder: Microsoft* Windows* 7, Microsoft Windows 8, Microsoft Windows 8.1, Microsoft Windows Server 2012 or Microsoft Windows Server 2012, Ubuntu* 12.04 LTS for 64-bit architecture (currently 12.04.3) or SUSE* Linux* Enterprise Server 11 for 64-bit architecture

Package Contents

Note: `<install-folder>` - folder where **Intel® Stress Bitstreams and Encoder 2016 – VP9** is installed.

`<install-folder>\`	Contains **Intel® Stress Bitstreams and Encoder 2016 - VP9** Release Notes (this file), End User License Agreement (EULA), spreadsheet with detailed description of every bitstream, history document for each bitstream, Getting started document, Using Branch and Syntax Coverage Static View document, HEVC Syntax Coverage Report and User Guide document.
`<install-folder>\Branch and Syntax Coverage Static View\`	Contains "`Branch and Syntax Coverage Static View`" report (`basecov.html`) for libvpx decoder
`<install-folder>\decoder`	Contains **VP9 Decoder (Reference)** for Windows*, Linux* and OS X* and readme file.
`<install-folder>\streams`	Contains compliance **VP9 bitstreams**, their MD5 check sums and MD5 check sums for decoding results of each encoded file.

`<install-folder>\encoder`	Contains **VP9 Random Encoder** for Windows* and Linux*.
`<install-folder>\encoder\parfiles`	Contains parfiles for Intel® Stress Bitstreams and Encoder 2016 – VP9 Encoder.

Installation

- Extract files from archive to the target hard drive.

Known Limitations

- Due to different definitions of tran_low_t in default and high-bit-depth configurations (int16_t vs int32_t), these configurations produce different results for the 301st stream. We calculated md5 sums using decoder with high-bit-depth option enabled. For the 301st stream we put into package additional md5 file named Plum_VP9_432x240_301_idct_rounding_1.1_dec_hbd_disabled.md5, so you can verify against configuration without high-bit-depth support.

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