Note Well

Any submission to the IETF intended by the Contributor for publication as all or part of an IETF Internet-Draft or RFC and any statement made within the context of an IETF activity is considered an "IETF Contribution". Such statements include oral statements in IETF sessions, as well as written and electronic communications made at any time or place, which are addressed to:

- The IETF plenary session
- The IESG, or any member thereof on behalf of the IESG
- Any IETF mailing list, including the IETF list itself, any working group or design team list, or any other list functioning under IETF auspices
- Any IETF working group or portion thereof
- Any Birds of a Feather (BOF) session
- The IAB or any member thereof on behalf of the IAB
- The RFC Editor or the Internet-Drafts function

All IETF Contributions are subject to the rules of RFC 5378 and RFC 3979 (updated by RFC 4879).

Statements made outside of an IETF session, mailing list or other function, that are clearly not intended to be input to an IETF activity, group or function, are not IETF Contributions in the context of this notice. Please consult RFC 5378 and RFC 3979 for details.

A participant in any IETF activity is deemed to accept all IETF rules of process, as documented in Best Current Practices RFCs and IESG Statements.

A participant in any IETF activity is deemed to accept all IETF rules of process, as documented in Best Current Practices RFCs and IESG Statements.

A participant in any IETF activity acknowledges that written, audio and video records of meetings may be made and may be available to the public.
Activity to date

- IETF 84 (Vancouver): Bar BoF
  - video-codec mailing list created
- IETF 85 (Atlanta): Actual BoF
  - Pretty strong consensus to go forward
- Drafts
  - draft-grange-vp9-bitstream
  - draft-egge-videocodec-tdlt
  - draft-terriberry-codingtools
  - draft-valin-videocodec-pvq
- IPR Declarations
  - https://datatracker.ietf.org/ipr/2389/
  - https://datatracker.ietf.org/ipr/2390/
- Post-BoF list discussion
  - Google decided to finalize and deploy VP9 quickly, did not want to submit it to an SDO in its current form
  - Xiph’s Daala technology still “maturing”
  - A number of charter issues were raised, never fully resolved
  - No charter sent to the IESG
Proposed Plan

- Have a new BoF in Honolulu
- (If successful) Form a WG in time for Dallas
- Bitstream freeze by the end of 2015
Daala

- Two major goals
  - Better than state-of-the-art compression
  - Defensible IPR strategy

- Strategy
  - Replace major codec building blocks with fundamentally new technology (or old technology used in new ways)
    - Not incremental evolution
  - Be sufficiently different from existing approaches to avoid large swaths of patents
    - Boundaries of IPR uncertain in the best case
    - Means lawyers don’t have to be perfect
Daala Building Blocks

- **Non-binary Arithmetic Coding**
  - Better throughput/cycle
  - Avoids binary context modeling

- **Lapped Transforms**
  - No blocking artifacts, better coding gain
  - Avoids adaptive loop filter (among others)

- **Frequency-domain Prediction**
  - Can do interesting things easier than in the spatial domain (blurring, texture prediction, etc.)
  - Avoids many spatial-domain specific things

- **Pyramid Vector Quantization**
  - Simple perceptual parameters: energy preservation, prediction efficacy, activity masking without signalling
  - Codes blocks with a predictor without subtracting and coding a residual (avoids anything that uses a displaced frame difference)
Still Image Performance

- This was our focus for the first part of this year
  - Walk before we run
- Same tools also used for motion-compensated frames
- Area where HEVC/VP9 have not improved as much over prior generations
Still Image PSNR, January 1

![Graph showing PSNR vs Bits/Pixel for different codecs]
Still Image PSNR, Yesterday
We need better metrics

- We are not tuning for PSNR
  - Many of our changes actively hurt it
- Who are you going to believe? Metrics, or your lying eyes?
VP8 Example
0.537 bpp, PSNR = 33.04 dB
Daala Example
0.531 bpp, PSNR = 30.89 dB
Still Image Fast SSIM, Yesterday

![Graph showing dB vs. BitsPerPixel for different compression methods]

Legend:
- daala-master (FAST SSIM)
- vp8 (FAST SSIM)
- vp9 (FAST SSIM)
- x264 (FAST SSIM)
- x265 (FAST SSIM)
Video Performance

• Basic algorithms in place since first coding party (May 2013)
  – At this point we were just happy video came out smaller than it went in

• Real work started in earnest in June
Video PSNR, January 1
Video PSNR, Yesterday
Video Fast SSIM, January 1
Video Fast SSIM, Yesterday
Lots of work to do

• These results are with
  – No B-frames or altref equivalents
  – No transform units or prediction units larger than 16x16
  – No intra mode in our motion search!
Getting Involved

- Git: https://git.xiph.org/?p=daala.git
- IRC: #daala on irc.freeonode.org
- Code review: https://review.xiph.org/
- Mailing List: daala@xiph.org

Next Coding Party
- 17...22 August, Mozilla SF office
- https://daala.etherpad.mozilla.org/coding-party-201408