Implementing AV1 video IPs
Opportunities and Challenges

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www.allegrodvt.com
Allegro DVT Overview

- Founded in 2003, privately owned, based in Grenoble (France)
- Strong and recognized expertise in video compression standards
- 2 product lines
  - CS: Compliance Streams
  - IP: Video compression and decompression IPs

**CS product line**
- Industry de-facto standard video compliance streams

**IP product line**
- Leading semiconductor video compression and decompression IPs
Compliance Streams Product Line

- **H.264/AVC, H.265/HEVC, AVS2, VP9 and AV1** compliance streams, allowing extensive testing of video decoders
- Syntax, performance and error resilience streams
- System compliance streams

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**Most Extensive Compliance Streams Portfolio in the Industry**
More than 100 world-class customers
Video IPs Product Line

- Multi-format encoder IP for ▪ H.264, H.265, VP9, JPEG, AV1
- Multi-format decoder IP for ▪ H.264, H.265, VP9, JPEG, AV1
- WiGig IEEE 802.11ad WDE CODEC IP

✓ Best-in-class video quality
✓ Ultra-low latency
✓ Minimal silicon area
✓ Scalability through ▪ multi-core architecture and ▪ selectable video codecs

10+ years of experience in high quality H.264/H.265/VP9 IPs
Worldwide Customer Base
Alliance for Open Media

- Alliance formed in September 2015
- Members across the entire ecosystem
  - Browser vendors, content providers, hardware vendors...
AV1 Codec

✓ Next-generation video format
✓ Royalty-Free
  ▪ Interoperable and open
✓ Target Improvement of 30% over VP9/HEVC
  ▪ with reasonable increases in encoding and playback complexity
✓ Optimized for the web
✓ Scalable to any modern device at any bandwidth
✓ Flexible for both commercial and non-commercial content
  ▪ including user-generated content
AV1 Complexity

- AV1 adds a new level of complexity compared to previous codecs
  - Number and type of transform sizes
  - Number and types of intra/inter prediction modes
  - New features: warped motion…
  - Superblock size

- Significant SW processing overhead, however:
  - SW complexity different from HW complexity
  - SW to be optimized by AOM

HW acceleration is needed to address AV1 encoding complexity
Multi-format architecture

- Take advantage from resource sharing between codecs
  - AVC, HEVC, VP9, and now AV1
  - In a single IP

- Leverage similarities in Codec algorithms
  - Intra prediction
    - VP9 close to AVC
    - AV1 close to HEVC
  - Transform
    - AV1 close to VP9
Multi-core architecture

- Scalable architecture
  - Baseline optimized for smaller resolutions
  - Adding cores enables higher performance points (resolutions and frame rates)
Conclusions

- AV1 is a cutting edge, next generation codec
  - Backed by major video industry players
  - Expected to play a major role in online video industry

- HW acceleration is needed to tackle encoding complexity

- Chip vendors need to choose Multi-Format and Scalable encoder IPs to
  - ensure implementation flexibility
  - customize IP configuration for target applications