



ALLEGRO

Digital Video Technology

Implementing AV1 video IPs Opportunities and Challenges

IP-SOC DAYS Shanghai - Sep 13th 2018

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

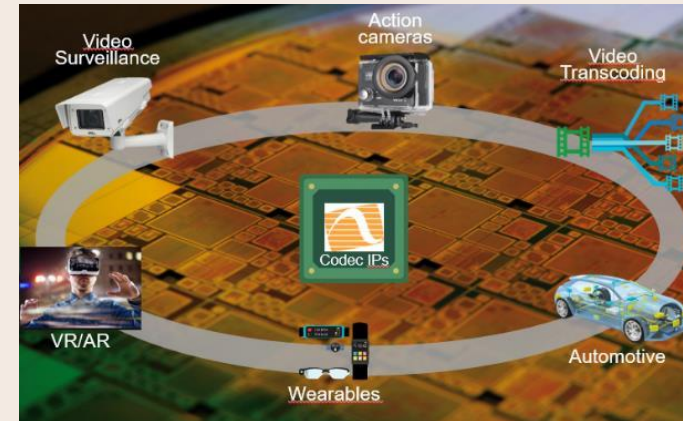
CS product line

- ❑ 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

Elementary streams

AV1

AVS2

H.264 / AVC

H.264 / MVC | SVC

H.265 / HEVC

HEVC Rext

SHVC | MV-HEVC

HEVC-SCC

VP9

System streams

DVB-HEVC

DVB-T

DVB-IP

DVB-3D

ATSC

ISDB

HDR

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



Video IPs Product Line



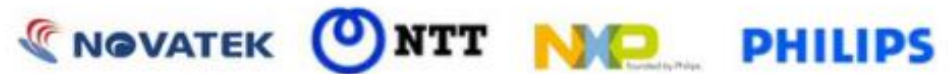
- ❑ Multi-format encoder IP for
 - H.264, H.265, VP9, JPEG, AV1
- ❑ Multi-format decoder IP for
 - H.264, H.265, VP9, JPEG, AV1
- ❑ WiGig IEEE 802.11ad WDE CODEC IP



- ✓ 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

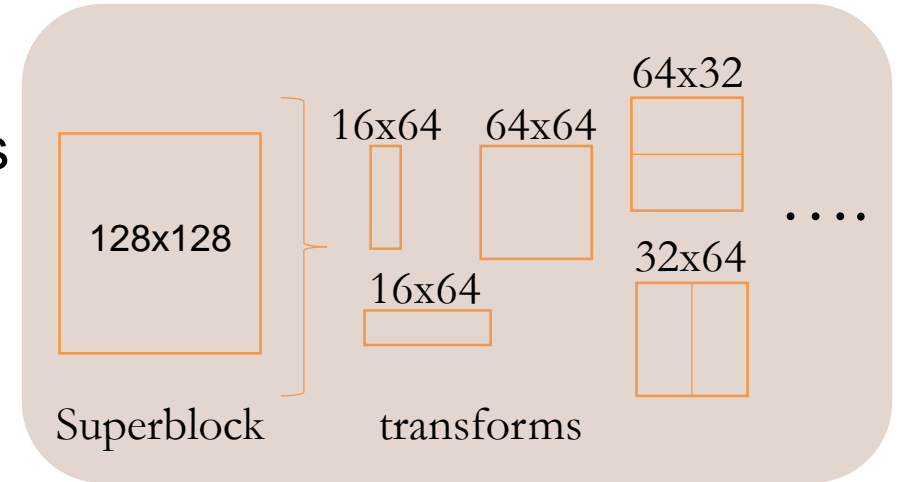


AV1 Complexity



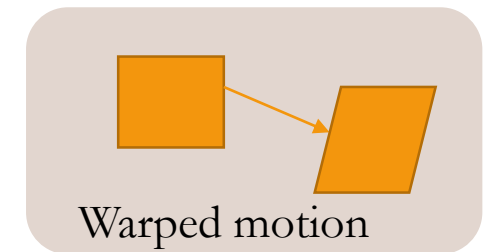
□ AV1 adds a new level of complexity compared to previous codecs

- 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



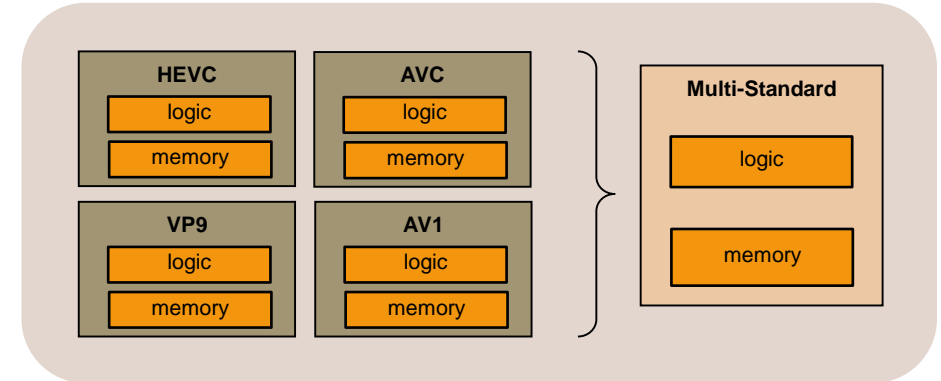
HW acceleration is needed to address AV1 encoding complexity

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

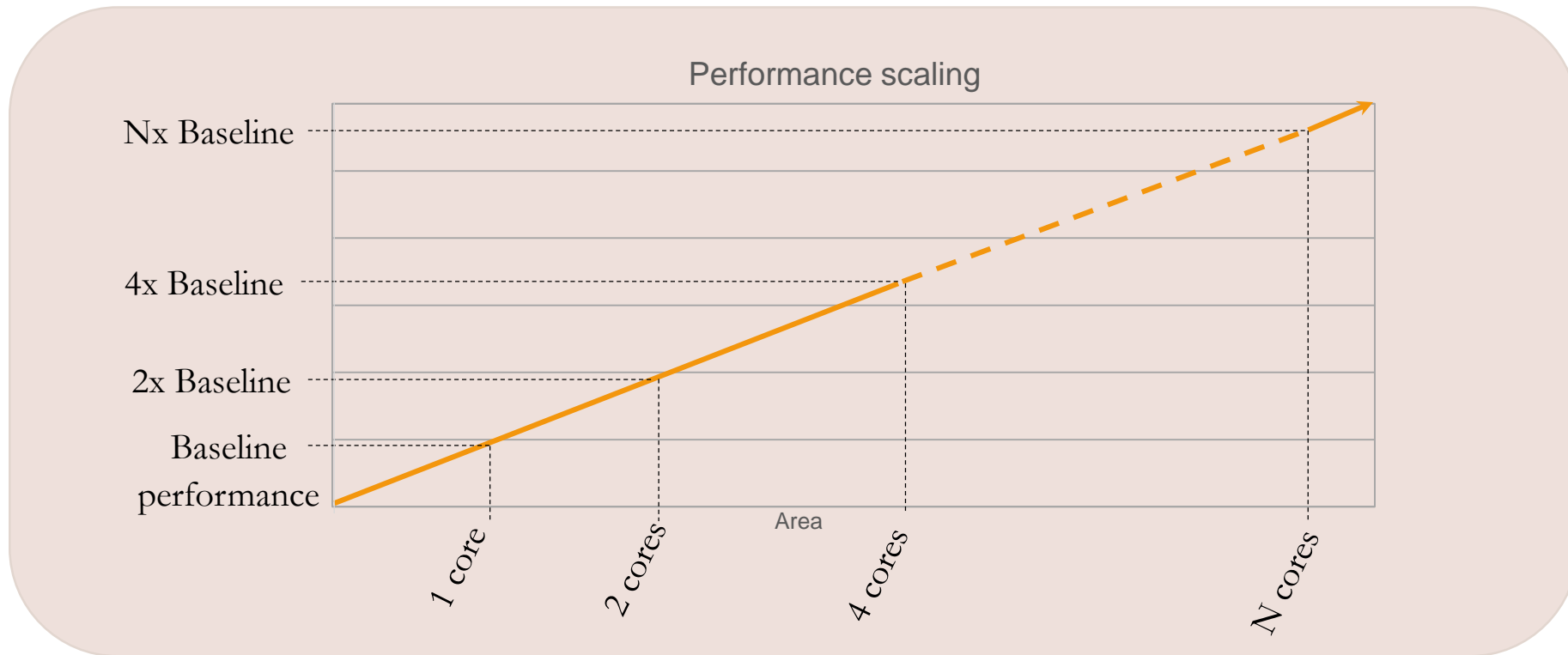
- Intra prediction
 - VP9 close to AVC
 - AV1 close to HEVC
- Transform
 - AV1 close to VP9

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



ALLEGRO

Digital Video Technology

