

# JVET-U0089

## 8-bit profiles for VVC

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# Motivation

- HDR and 10-bit video have seen commercial success in recently years, mainly in professional generated content
- Today, many consumer video applications still rely *solely* on 8-bit 4:2:0 video content
  - Internet video, user generated content, e-commerce, gaming, etc
- Volume of such content is huge and needs to interoperate on very diverse devices, and must depend a mix of hardware and software implementations
- Request to establish Main 8 and Main 8 Still Picture profiles for VVC
  - 8-bit 4:4:4 profiles also for discussion

## *8-bit VVC profiles = win-win*

**VVC wins:** more accessible, opportunity for wider and swifter commercial adoption

**8-bit application wins:** much needed bandwidth savings at a favorable price performance ratio

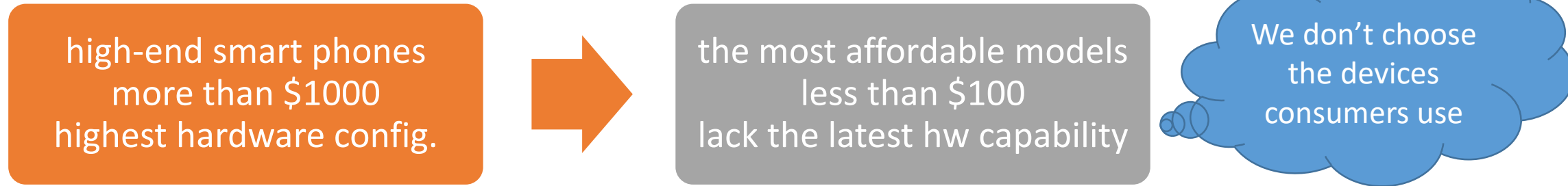
# Content

- Vast volume of internet, e-commerce, and user generated content, **solely in 8-bit 4:2:0 domain**
- Mobile video applications:
  - Short videos, e-commerce live streaming, user generated content, etc
  - **Billions of DAUs**, on average **more than 80 minutes a day**
- Live game streaming:
  - In December 2020 alone, more than **9 million DAU on Twitch**, on average **2 hours/day**
- Bandwidth cost is the most significant portion of business cost
- Can significantly benefit from **VVC's stellar compression capability**

Mobile Apps	DAU (millions)	Company
Taobao Live	300	Alibaba
Douyin	600	Bytedance
Kuaishou	300	Kwai
Baidu, Haokan	200	Baidu
Mi Live		Xiaomi

# Device

- Mobile devices, regardless of tier, constitute the most important platform



- Two critical requirements to deal with device diversity
  - well-defined interoperability & favorable price-performance ratio
- Conformance point should be defined in the most relevant manner, so that customers of all tiers can interoperate most efficiently and seamlessly

8-bit video → 8-bit profiles

# Hardware and software implementations

## hardware encoder/decoder

- most power-efficient solution
- 8-bit profile incurs little, if any, additional cost for hardware encoder/decoder implementation

## software encoder/decoder

- indispensable due to device diversity
- 8-bit makes software implementation lighter and faster
- significant reduction in memory usage
- improved ability to parallelize using SIMD instructions

# Market confusion – what market confusion ?

- H.264/AVC, the most successful and most widely adopted video standard, ubiquitous in all devices, has a multitude of profiles (8-bit and beyond)
- Many of H.264/AVC's profiles are still widely used in different types of real-world applications 17 years after v1 finalization
- Having more profiles *does not necessarily* confuse the market or hinder commercial adoption
- Proponents represent a large span of the video industry, it is our collective assessment that 8-bit VVC profiles will not cause significant market confusion

## Market will sort out what is needed

8-bit profiles will not hinder VVC's commercialization, quite to the contrary, they will foster wider and more rapid VVC commercial adoption

# Proposed 8-bit profiles

- **Main 8 and Main 8 Still Picture profiles** to define conformance for 8-bit 4:2:0 video
- Two options for profile definition (proposed text changes in two corresponding attachments):
  - *Option 1: each profile using its own value of profile\_idc (similar to VVC v1)*
  - Option 2: some profiles share the same value of profile\_idc (similar to HEVC)
- Option 1 is favored by the proponents:
  - Player can configure the appropriate decoder conformance more quickly
  - Consistent with existing VVC profile definition philosophy
- Consideration for two other related 8-bit profiles: Main 8 4:4:4 and Main 8 4:4:4 Still Picture
  - Useful for applications such as video conferencing, particularly when screen sharing
  - HEVC defines these two profiles

# Summary

- Propose to add 8-bit profiles to VVC, same set of tools as Main 10 profiles
  - Main 8 and Main 8 still pictures → main proposal
  - Main 8 4:4:4 and Main 8 4:4:4 Still Pictures → for discussion
- Proponents are industry leading companies serving billions of users
  - Span the space of content companies (UGC, gaming, e-commerce, and internet video), mobile chip vendors, and handset manufacturers
- Huge volume of 8-bit video used in mainstream applications justifies 8-bit conformance point, which should be defined here, *not* as sub-profiles through external entity
- *Win-win: not only benefit applications motivated to use VVC, but also (very importantly) VVC itself*