



HEVC – READY TO GO LIVE ?

Michel SKORUPA – Senior Account Manager Nordics

AGENDA



- › HEVC Development Timelines – Video Benefits - Applications
- › HEVC – How Much power is needed/Hardware Implications ?
- › HEVC for Mobile application
- › HEVC for UHD/4K
- › So is HEVC ready to GO LIVE ?



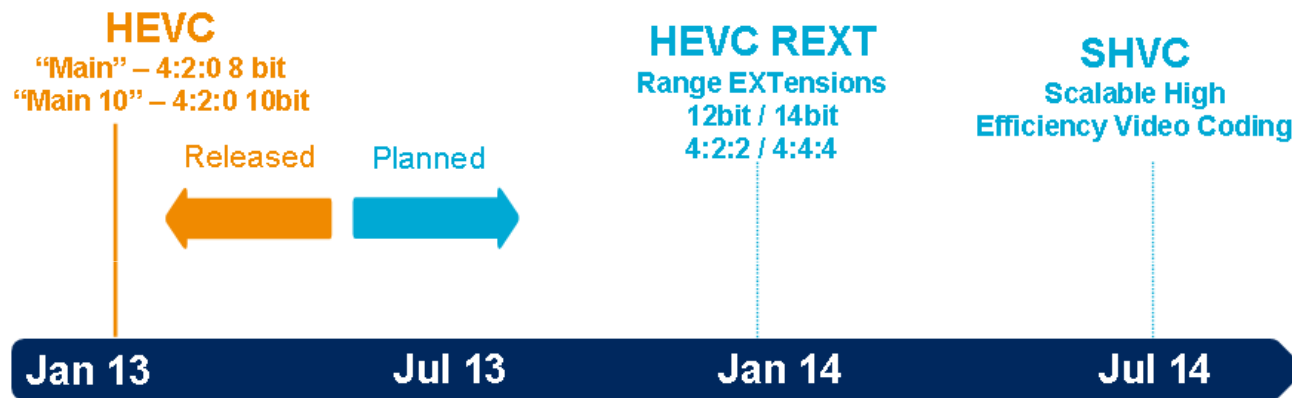
HEVC DEVELOPMENT TIMELINES – VIDEO BENEFITS - APPLICATIONS



HEVC development timelines - Objectives

- › Broadcast ready profiles now released
 - ITU-T H.265 and ISO/IEC 23008-2

- › Bit rate improvement vs Pic quality
- › Address the ever hungry consumers for video (>90% of IP traffic to be Video) by 2015.



Decoder Timescales

- › Software Decoders – 2013
 - Multi-core ARM processors
 - Smartphones, Tablets, Smart TVs products announced for 2013 release
- › Hardware decoders - end 2013 / mid 2014
 - STBs estimated mid-end 2014

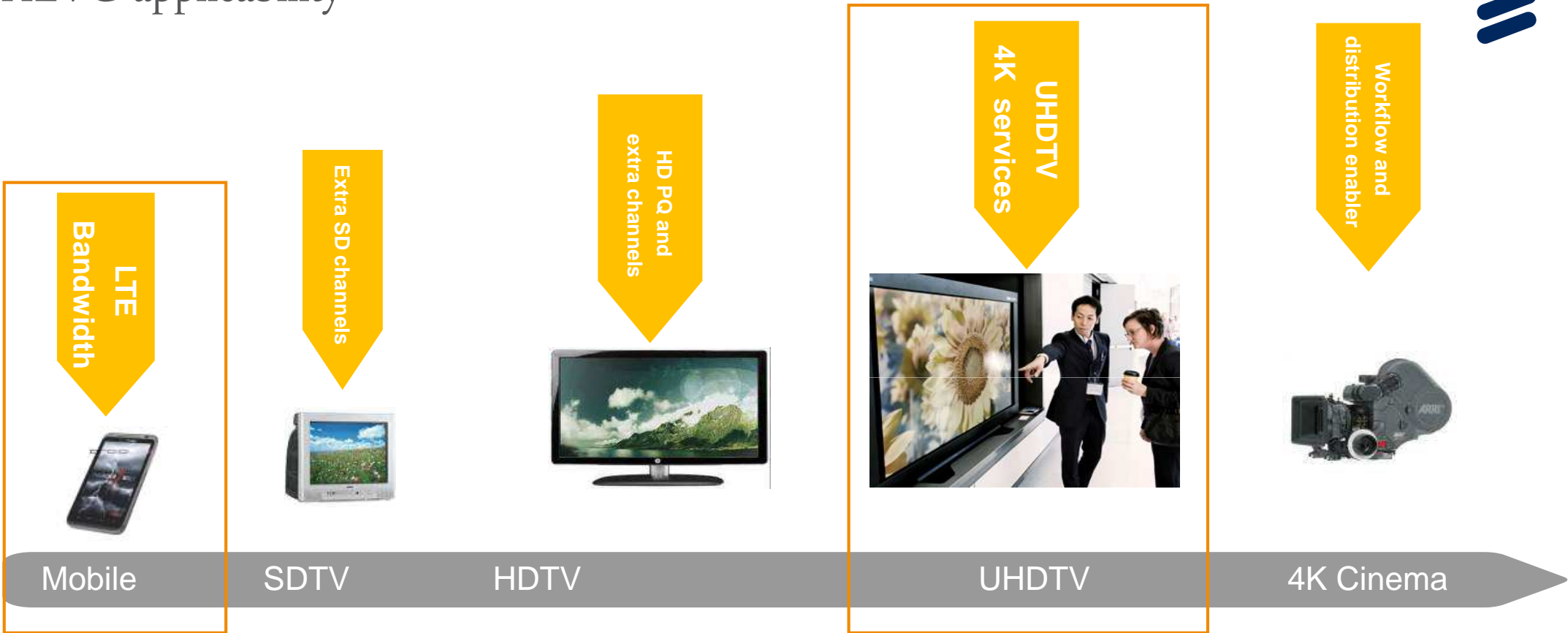
HEVC STANDARD – VIDEO BENEFITS



50% bitrate saving target !

	AVC (H.264)	HEVC (H.265)	EFFICIENCY
Bandwidth (Mbps)	▶ SD: 1.5 - 2.5 HD: 6.0 - 9.0 4K UHD: 16-24	▶ SD: 0.8 - 1.5 HD: 3.0 - 4.5 4K UHD: 8-12	▶
Better quality of experience/ same bandwidth	▶ Standard Definition	▶ High Definition	▶
More channels/ same Bandwidth	▶ 10 channels	▶ 20 channels	▶

HEVC applicability





HEVC – HOW MUCH POWER IS NEEDED/ HARDWARE IMPLICATIONS ?

HEVC – HOW MUCH POWER is needed ?



AVC

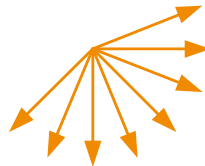
16X16 block size



Various Inter partitions
down to 4x4



9 intra modes



8x8 and 4x4
transform sizes



HEVC

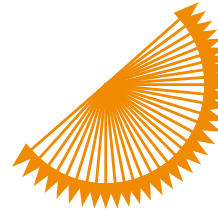
64x64 block size



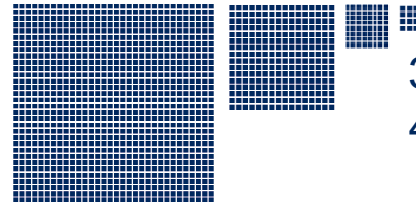
Hierarchical quad-tree
partitioning down to 8x8
+ 4x4 Transform Units



35 intra modes



32x32, 16x16, 8x8 and
4x4 transform sizes



At Least **10X More Horsepower** for Full Benefit of HEVC Compression algorithm (depends on the application, UHD/4K is even higher !)

Hardware & HEVC at SD and HD

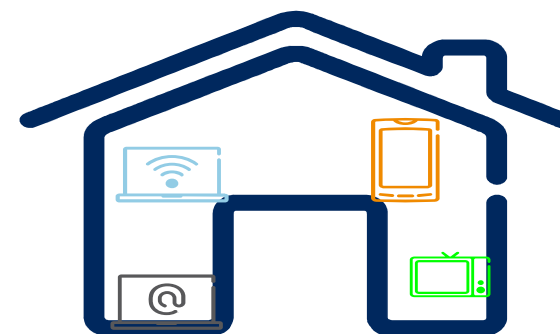


- › Hardware products designed for MPEG-4 AVC 'could' be upgraded to HEVC
- › But there are many practical issues
- › HEVC encoding even at SD needs a lot more horsepower
- › That means potential power, heat, density issues
- › Also, if there is no 'headroom' in the encoder, there may be trouble in the future
- › Its like pushing an old car to it's limits

HEVC needs New HEVC HARDWARE



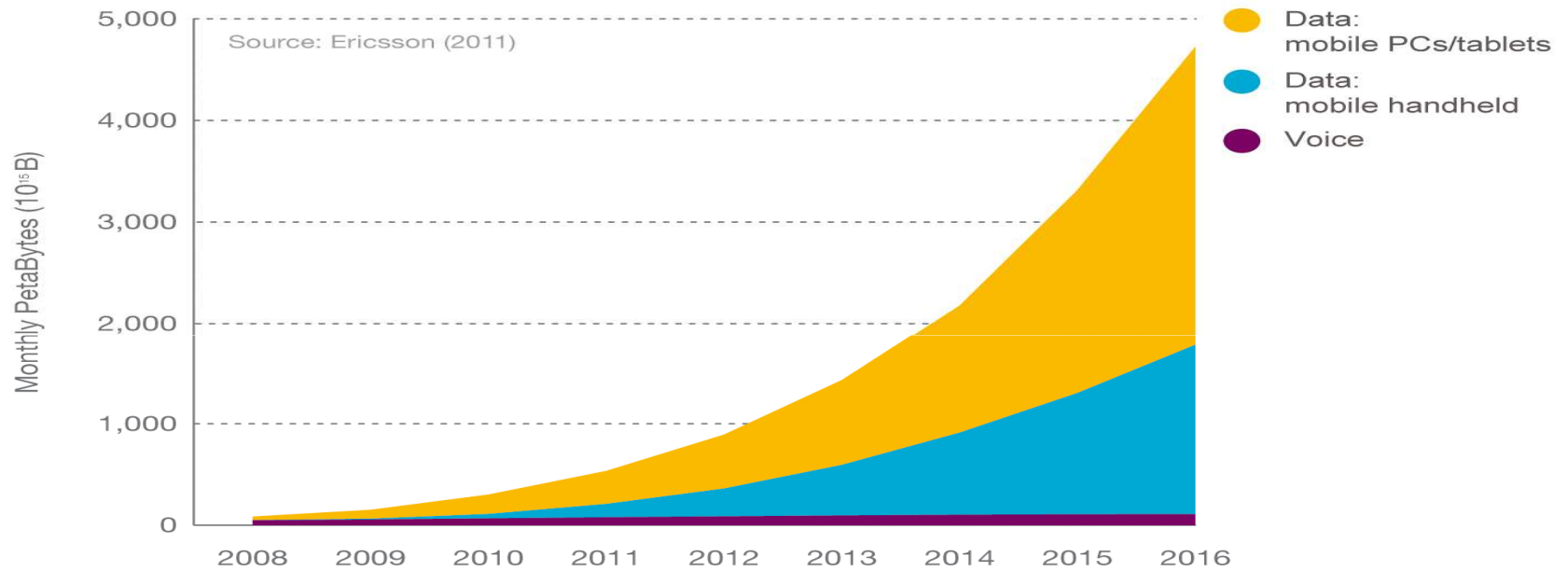
- › For demanding HD and below applications, the very best HEVC performance will require HEVC hardware
- › Building compromised MPEG-4 based hardware products that can just about do HEVC is not enough
- › We need to get close to or beyond 50% savings
- › It will be costly to change the fixed SD and HD ecosystem (for example set top boxes)
- › We have to build products that do HEVC without compromises
- › This is even more important for UHD TV (4K) which we will discuss later





HEVC – FOR MOBILE APPLICATIONS

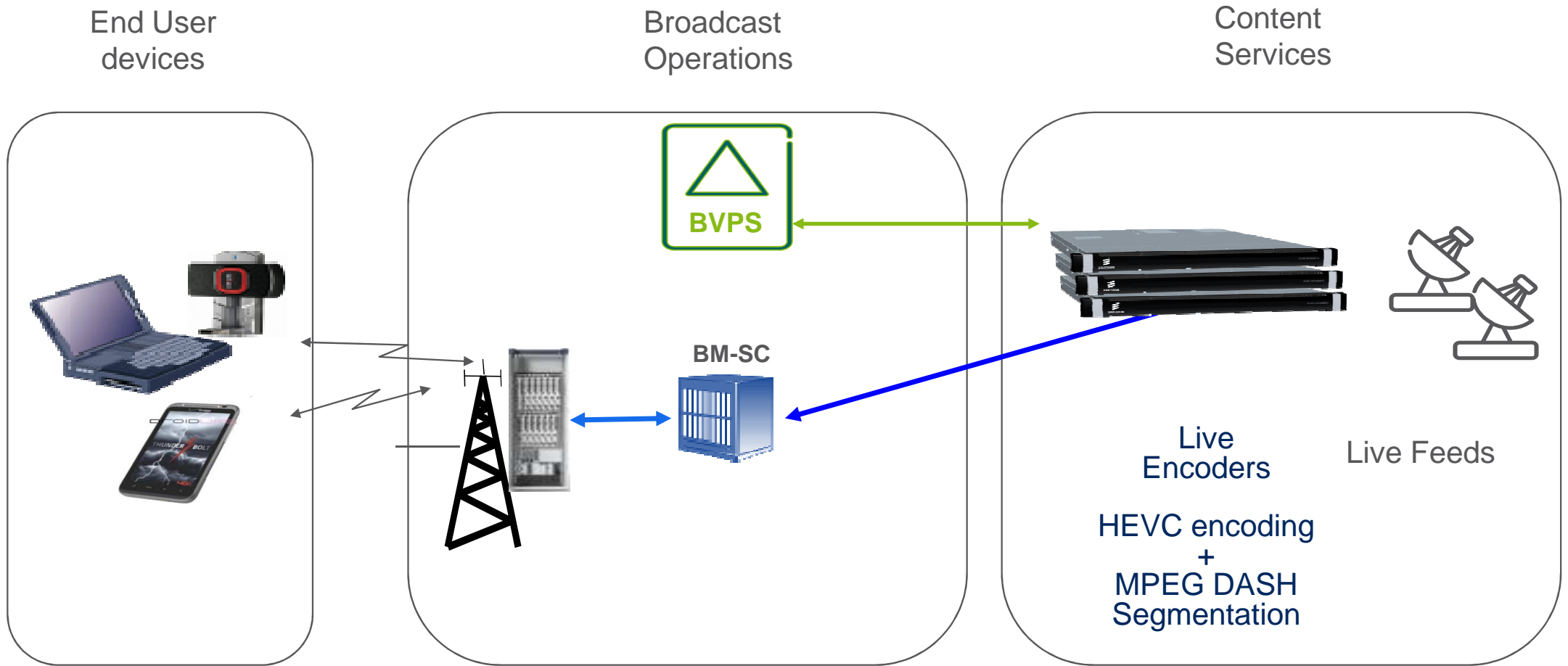
Increasing Data traffic in mobile networks



Mobile data traffic
will grow by 10 fold (2011-2016)
Mainly driven by Video

Source: Ericsson Traffic and Market data Report, Nov.2011

LTE BROADCAST video sub-System



HEVC FOR MOBILE APPLICATIONS



- › Silicon Vendors are releasing HEVC decode chip for mobile devices (Broadcom, Qualcomm...)
- › Next Gen Smartphones/tablets to implement HEVC decode (2014 ?)
- › HEVC Encoders for Mobile devices from different vendors are coming to the market
- › Probably further announcements to expect from key players during IBC 😊...

HEVC Software for SD and HD



- › Ericsson SVP 5500 series is a software HEVC product :

- World 1st HEVC Encoder for Mobile
- Designed for Mobile
- Fast to market
- Flexible (could be used for offline)
- Integrated with Ericsson's eMBMS LTE system.



- › Main profile encoding

- Support HD and SD SDI inputs, up to 800 x 600 output resolutions and up to 2Mbps TS.

- › But we need a realistic view of software based full HD HEVC encoding

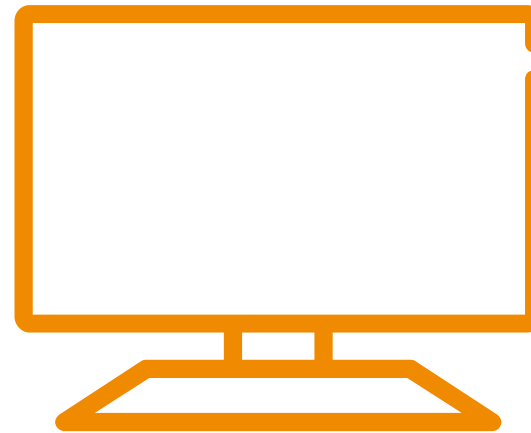
- Especially power, heat, density etc.

- › We know we will need about 10x more horsepower for HEVC even at SD



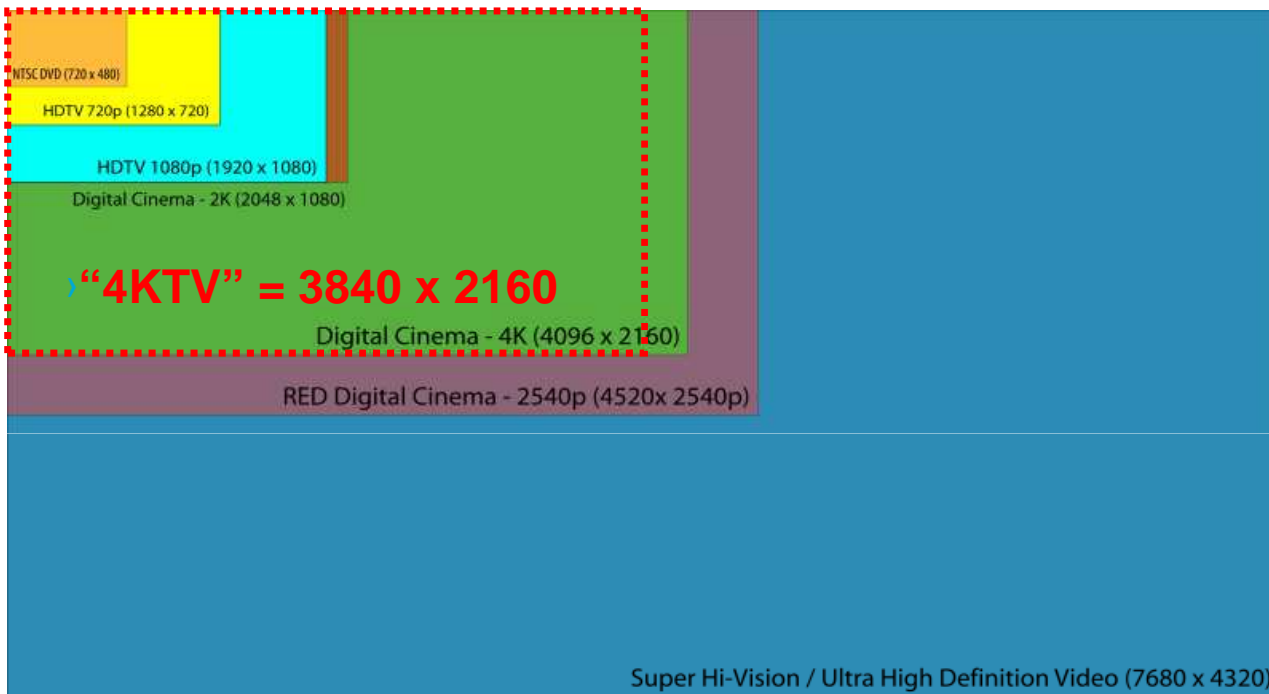
HEVC for UHD/4K

Visual experience



UHDTV is an immersive experience (fuller field of view) but the bigger the screen the bigger the artefact. So, we need to do UHDTV well.

What is UHDTV?



In context of broadcast television,
“4KTV” is UHDTV Level 1 or
4K UHDTV



› UHDTV as a standard

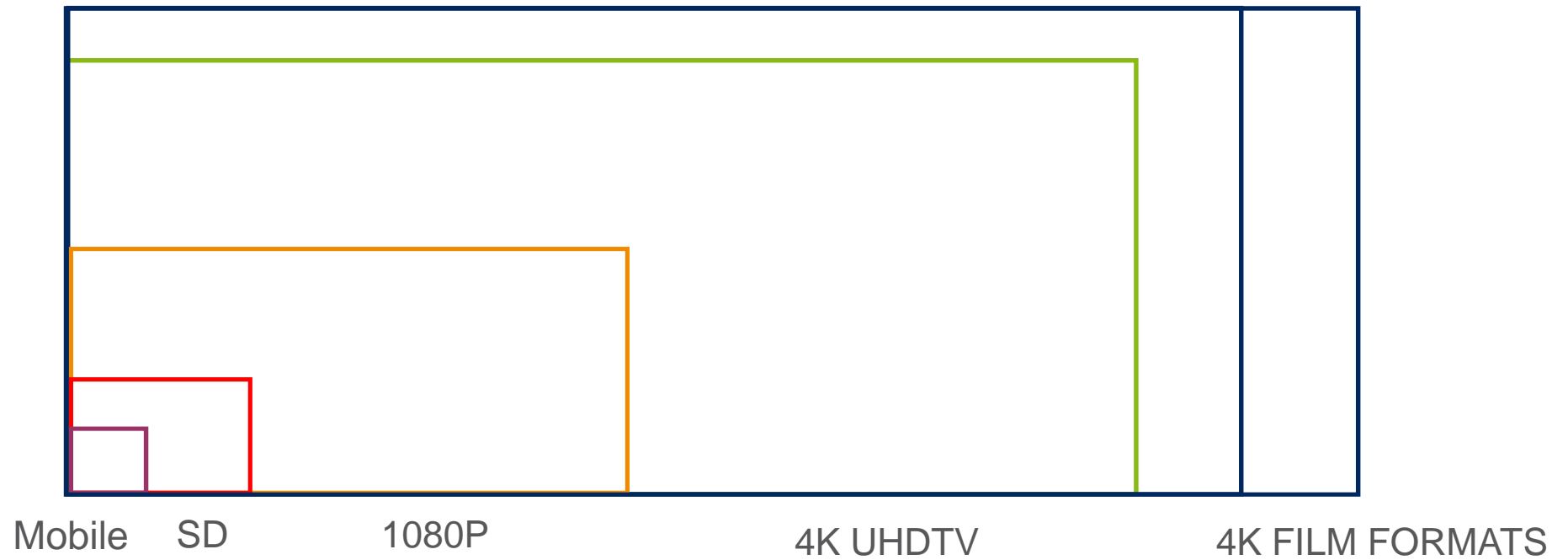
- ITU-R BT.1769 defines
 - › UHDTV Level 1 = 3840 x 2160
 - › UHDTV Level 2 = 7680 x 4320
- ITU-R BT.2020 defines colorimetry

› Consumer Electronics Association (CEA) October 2012

- “Ultra High Definition” or “Ultra HD”
 - › >8 million active pixels
 - › At least 3840 (H) x 2160 (V)
 - › At least 16:9 aspect ratio
 - › At least 1 digital input capable of carrying and displaying native 3840x2160 resolution without relying on up-conversion

TIME TO PLAY

Relative resolutions



UHD TV is effectively 4xHD resolution – but that's not all the story

data and Bandwidth challenges



- › Four times the resolution so x4 times the data
- › Doubling the frame rate so another x2 the data
- › Increased bit depth and colour space (maybe more data)
- › So, UHD TV is not '4xHD'
- › Actually much more



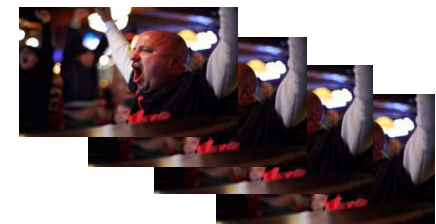
Input challenges

- › Compressing 'Live' UHDTV will be very demanding
- › Uncompressed input signal to the encoder will be huge
- › Around 48x more data per second than SD
- › Camera / switcher connectors not yet agreed

Understanding High frame Rate

Minimum

50-60 frames/sec to minimize motion judder for sports and other content with complex motion



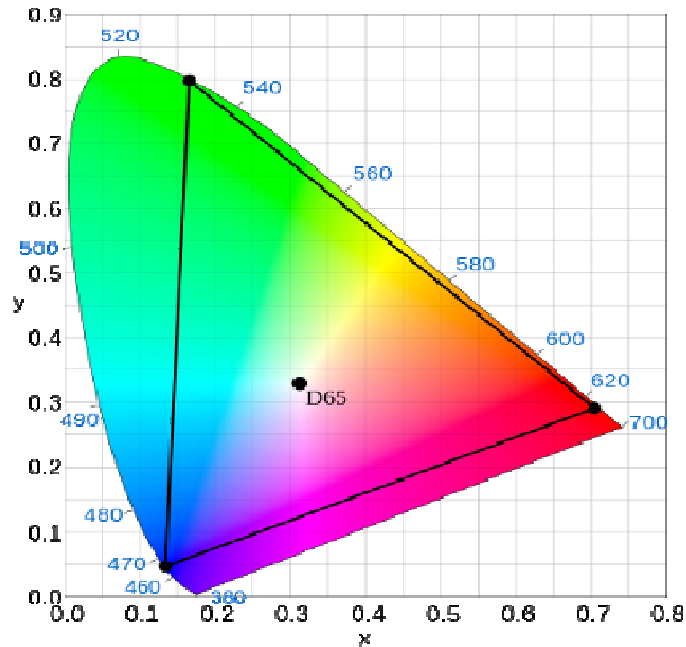
25/30 frames/sec



50/60 frames/sec

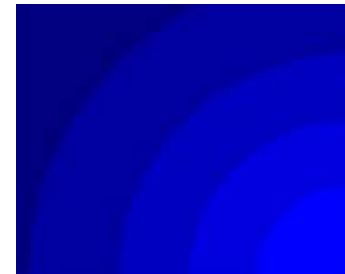


New colourspace, 10 Bit operation

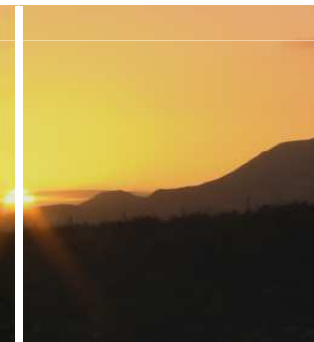
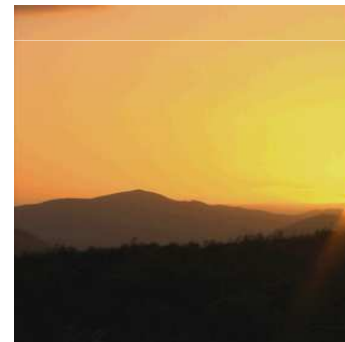


UHDTV can offer more realism via color
But, we need technology with the right
colourspace

8-bit



10-bit



Digital film & cinema no longer uses 8 bit
for quality reasons.

UHDTV is likely to be 10 bit to the home

Audio experience



- Final UHDTV audio format (or formats) not decided yet. Existing audio DSPs may or may not be suitable

HEVC UHD TV/4K encoding



Up to **80X** More Horsepower Total Needed for UHD TV

1080i HDTV

1920x1080 resolution



Up to 30 fps



8 bit to the home/
Rec. 709 colorspace



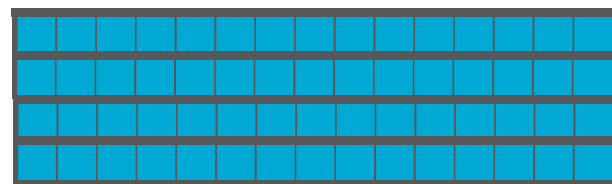
Typical Audio payload typically stereo or 5.1

UHD TV

3840x2160 resolution



50/60 fps
(possibly more)



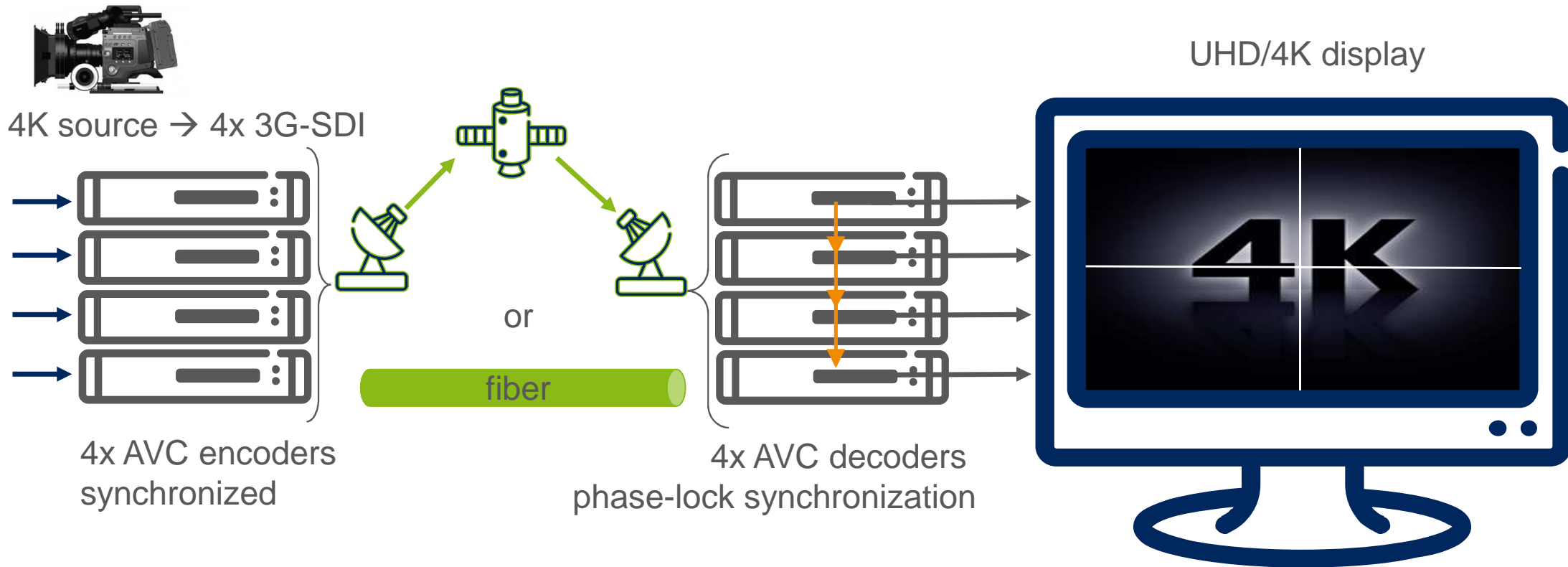
10 bit to the home/
Rec. 2020 colourspace



Typical Audio payload may be different

Until HEVC is ready ... 4K UHD Contribution using AVC

Note: This is not a business yet!



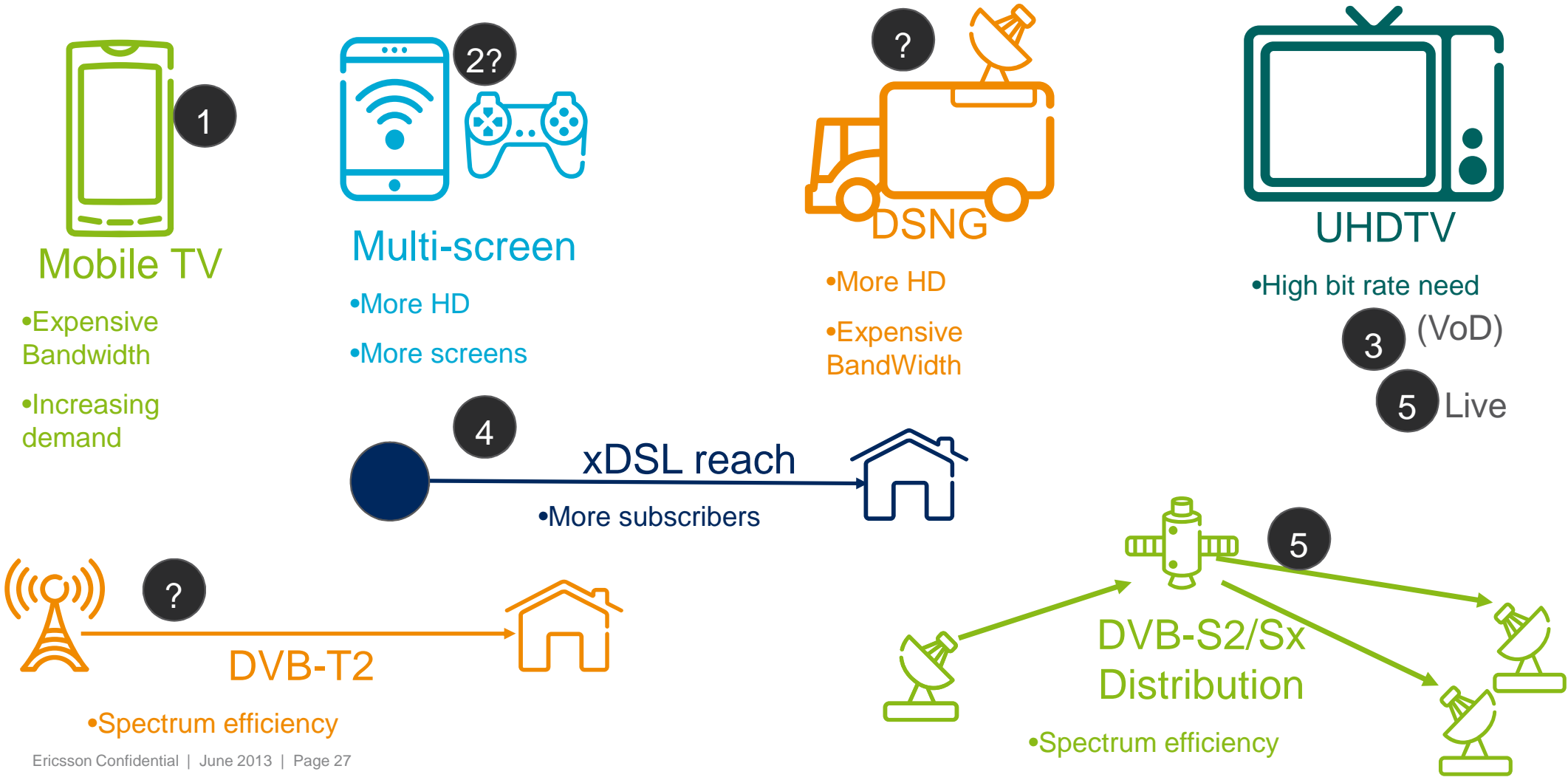
- › Customers can trial UHDTV now with AVP & RX (MPEG-4)
 - › Shipping products, 10 bit , 50/60 fps support
- › Successfully used by EBU, Turksat, Measat, Russia

SO is HEVC ready to GO LIVE ?



Well, for Mobile applications yes (as soon as Mobile devices implement & support it), but for other applications, it will take time...

HEVC applicability – estimated sequencing





ERICSSON

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