



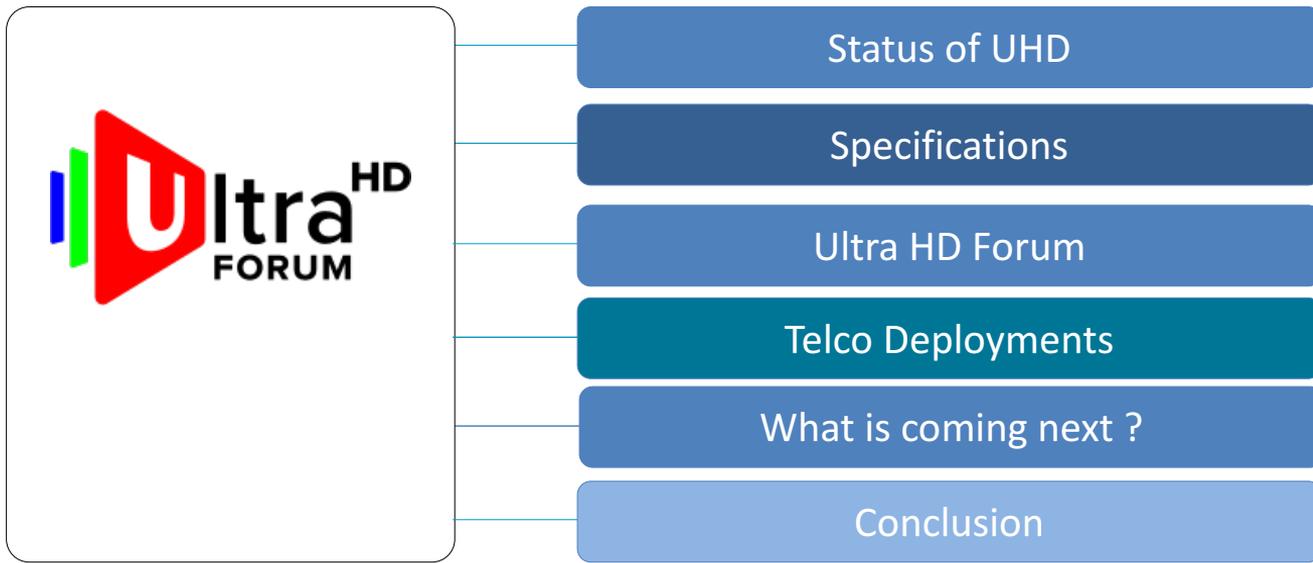
Ultra HD Forum

State of the UHD Union

Benjamin Schwarz
Ultra HD Forum Communications Chair
November 2017



Agenda



The pillars of UHD



4K
Resolution

Clearer, crisper and more detail-rich picture than HD



WCG
Wide Color
Gamut

More vibrant colors



HDR
High Dynamic
Range

Greater range contrast



HFR
High Frame Rate

Motion rendering closest to real



NGA
Next Generation
Audio

Sounds are perceived as coming from infinite points around

Key UHD Forum Definitions



4K Resolution

- UHD-1 Phase 1 : 3840 x 2160 x 60 (Level 5.1)
- UHD-1 Phase 2 : 3840 x 2160 x 120 (Level 5.2)



WCG Wide Color Gamut

- BT 2020 color space



HDR High Dynamic Range

- Non Backward Compatible : HDR10/PQ10 (BDA-CTA/DVB)
- Backward Compatible (BT 2020) : HLG (ITU-R/DVB)
- Backward Compatible (BT 709) : Technicolor
- Backward Compatible (PQ10) : Dolby Vision



HFR High Frame Rate

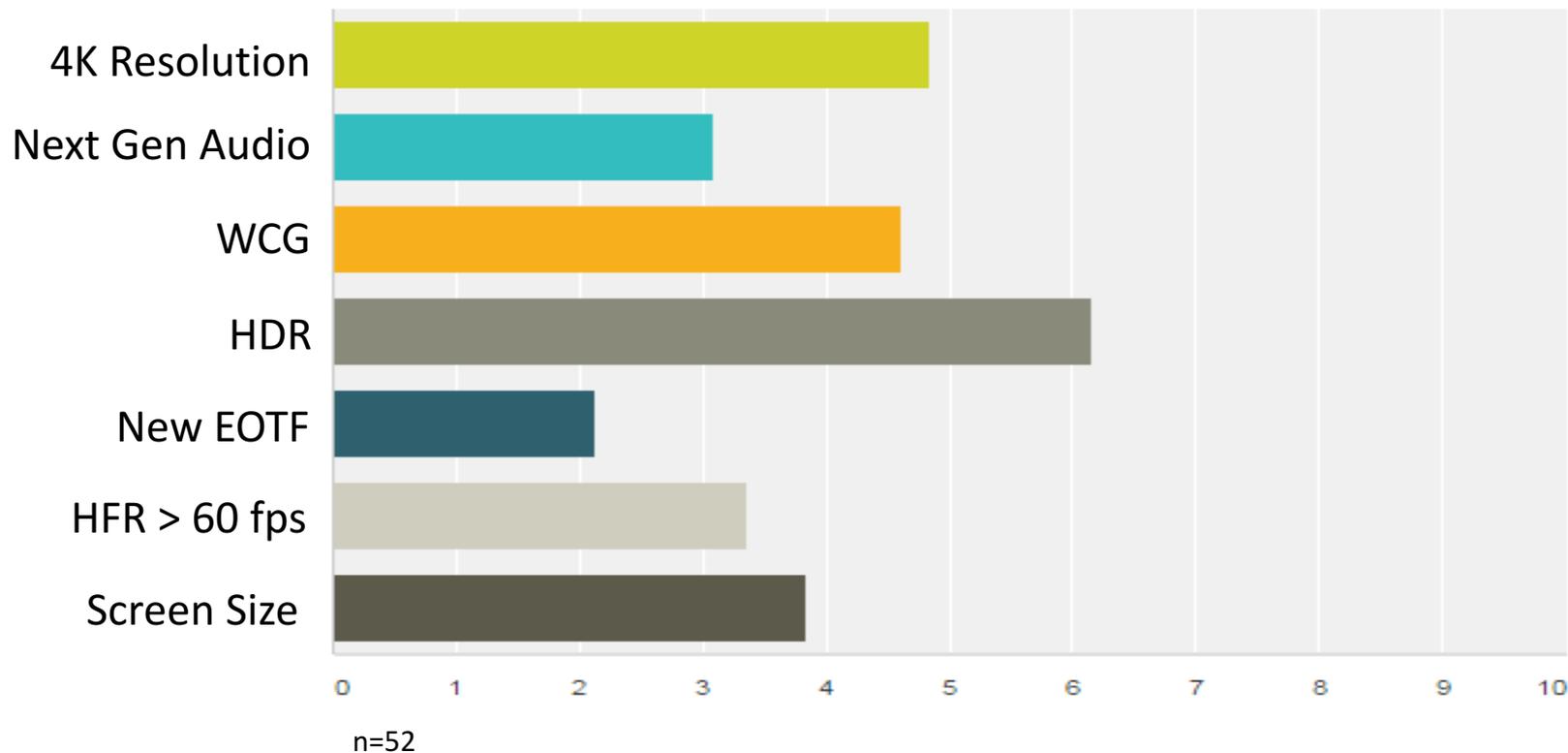
- 100 / 120 fps for any resolution :
 - 1920 x 1080 x 100 / 2560 x 1440 x 100 (level 5.1)
 - 3840 x 2160 x 100 (Level 5.2)



NGA Next Generation Audio

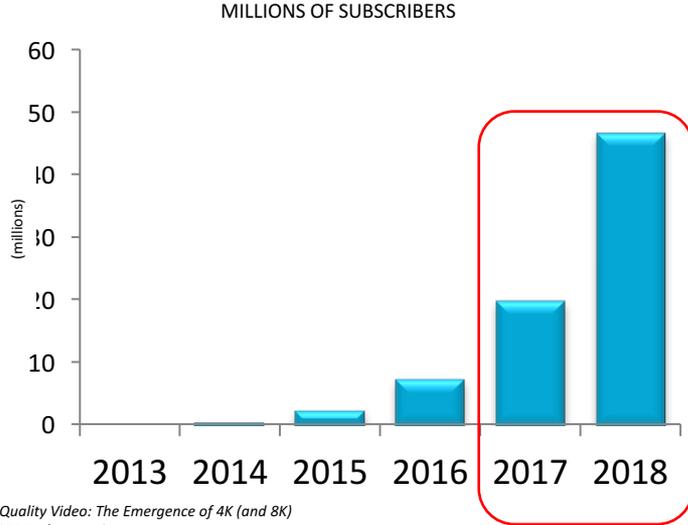
- Object based coding
- Immersive audio
- Interactive audio

Survey: What's Important in UHD ? *

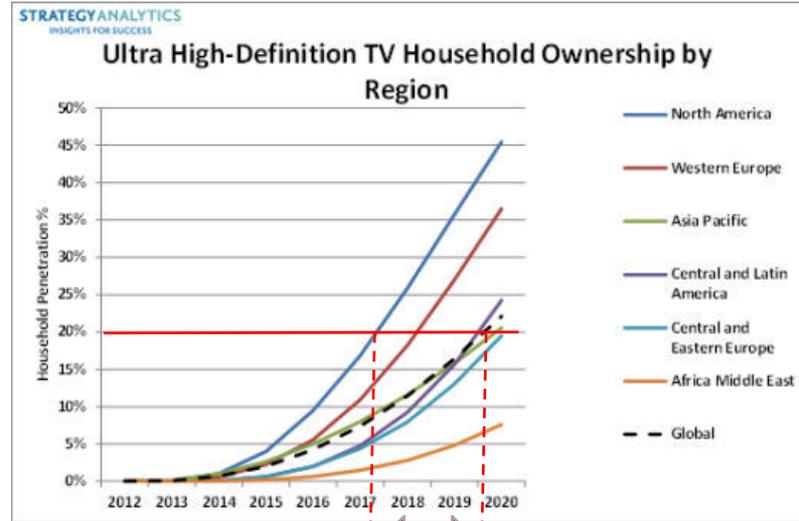


Key Numbers

Global Subscribers of
4K Pay TV Services (2013 – 2018)

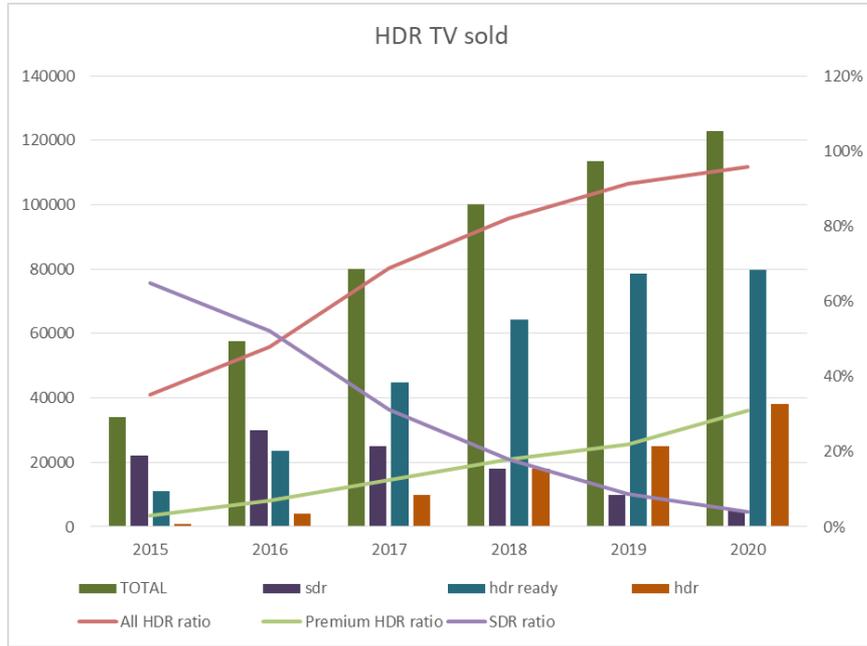


Top Quality Video: The Emergence of 4K (and 8K)
© 2014 Parks Associates



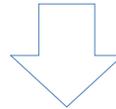
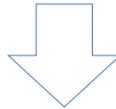
UHD timing is now

HDR Penetration



Difference between HDR ready & PREMIUM HDR

SDR large installed base decreasing



Need proper market communication

Need backward compatible scheme with SDR UHD TVs

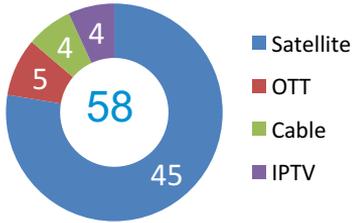
UHD Quality & BC are key

UHD Deployments World Wide*

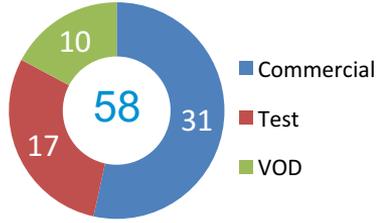
58
UHD channels on air

Channels

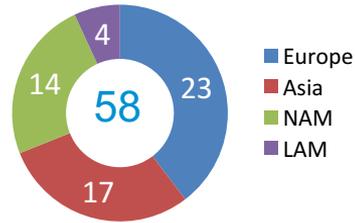
By Infrastructure



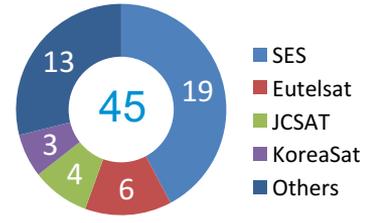
By Type



By Region



By Sat Operator



Consumer Equipment

* Updated list on <https://ultrahdforum.org/resources/list-of-commercial-uhd-or-4k-services-that-are-live/>

UHD (HDR) content still lacking



Specifications

High Dynamic Range (HDR)

- Extends the luminance range:

SDR	100 nits (Cd/m ²)
Film	48
Digital Cinema (DCI) (laser projector)	108
HDR (CES16)	~1,000 to 1,800
Grading Suite	~4,000
Maximum Specified	10,000

- Immersive “real life” video
 - Deeper darks and shadows
 - Brighter speculars and highlights
- Creates the **WOW** effect, especially when compared to HD
- HDR needs to be implemented along with WCG to gain full benefit



Where Are We At With HDR?

	PQ10	HLG10	Dolby Vision	HDR10+	Technicolor
Standard	CTA/ITU-R/DVB	CTA/ITU-R/DVB	Dolby	In progress	Technicolor
Application	VoD/Live	Live	VoD/Live	VoD	Live
HDMI	2.0a	2.0b	1.4 and above	2.1 ?	2.0
Color space	BT 2020	BT 2020	BT 2020	BT 2020	BT 2020
EOTF	ST 2084/ST 2086	Hybrid Log Gamma	ST 2084	ST 2084	ST 2084
Meta data	Static	NA	Dynamic	Dynamic	Static/Dynamic
Backward compatible	No	SDR (BT 2020)	HDR10	HDR10	SDR (BT 709)

(Too) many HDR options

Live HDR Summary

HDR	Standard				Legacy STB	TVs	VOD	Live
	DVB	CTA	SMPTE	ITU-R				
PQ10 / HDR10	✓	✓	✓	✓	UHD1 – Phase 1	2015	✓	✓
HLG10	✓	✓		✓	UHD1 – Phase 1	2016	X	✓
Dolby Vision			✓	✓	Not supported	2015	✓	✓
Technicolor					Not supported	2017	X	✓

Phase A

Phase B

Phased HDR approach for Live



Ultra HD Forum



Global Advocacy for Next-Gen A/V Delivery

CHARTER (17)



CONTRIBUTOR (13)



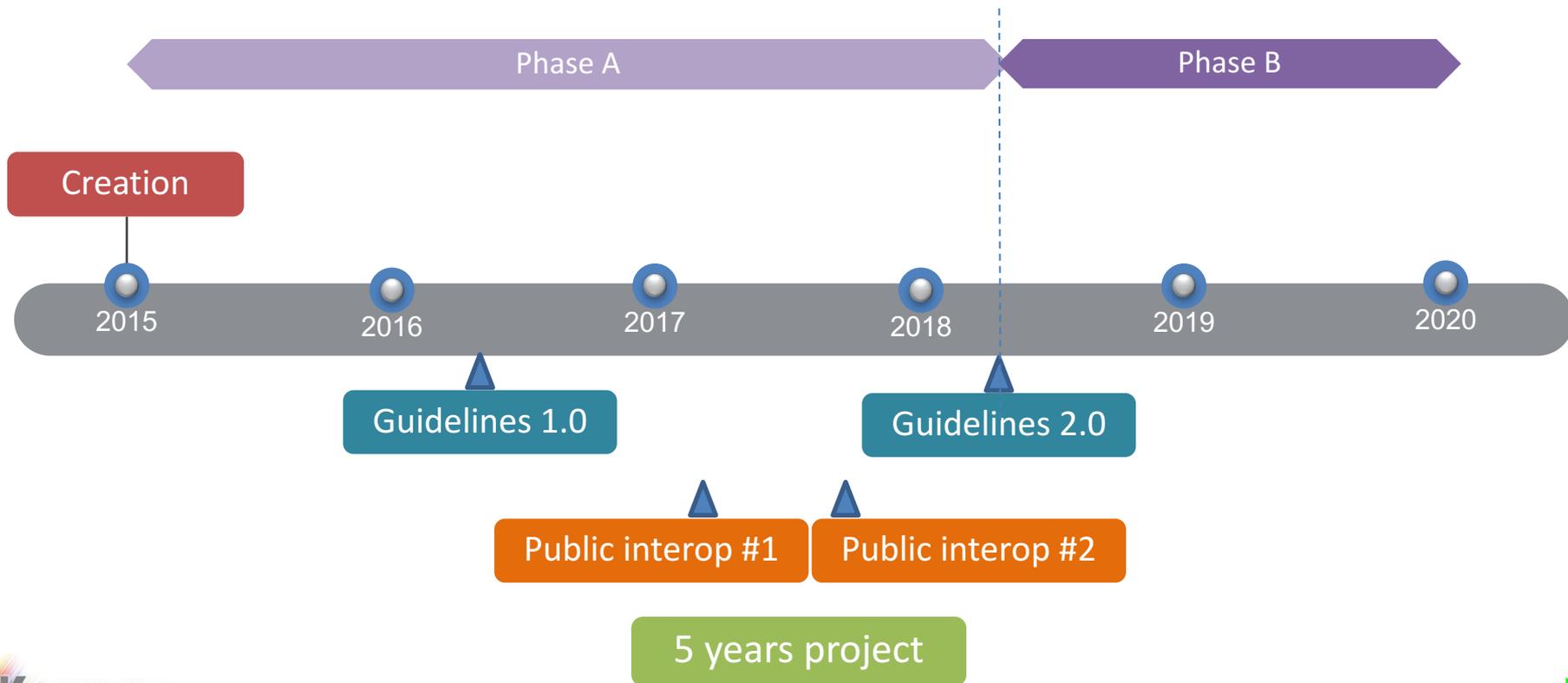
ASSOCIATE (23)



53 Direct members / 300+ indirect members



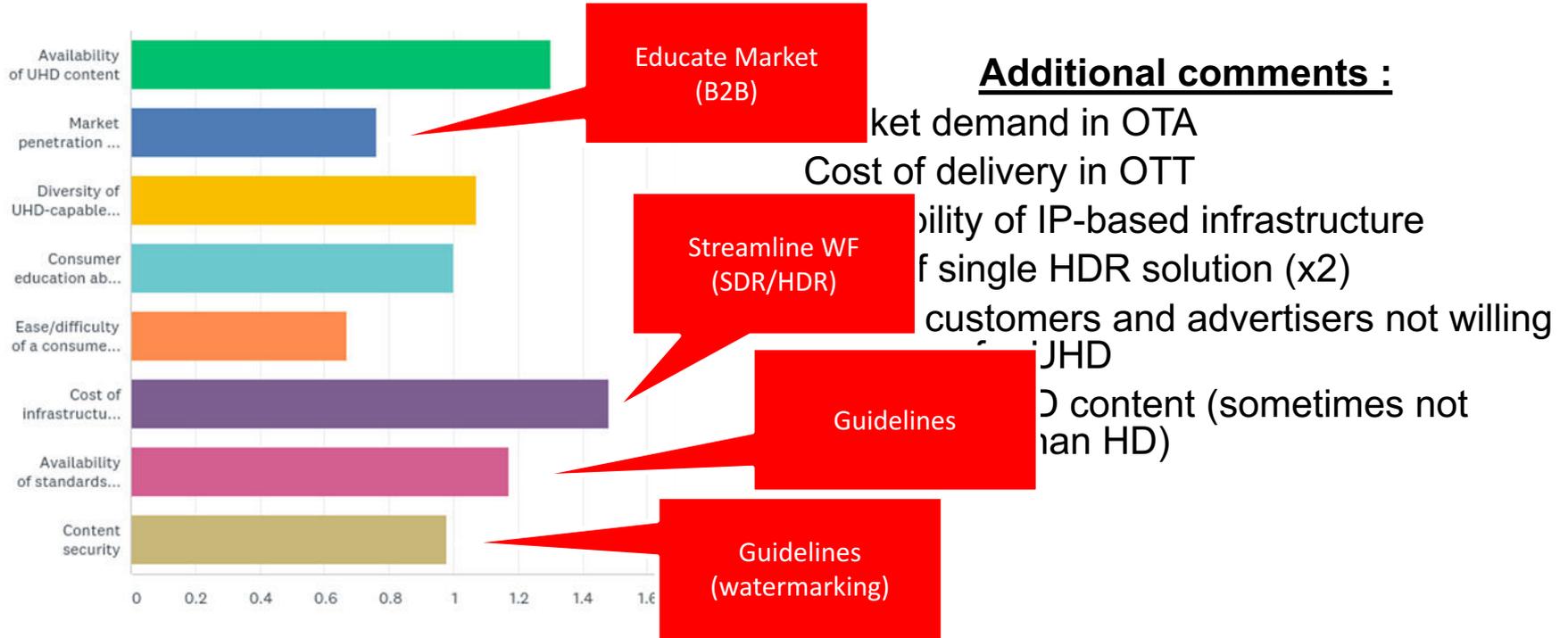
Ultra HD Forum Roadmap



Operators Members Live Deployment

Date	Operator	HDR	Audio	Status
May'16	 DIRECTV.	SDR	5.1	Commercial service
June'16	 NeuLion	SDR	5.1	Commercial service
June'16	 kpn	SDR	5.1	Friendly
Aug'16	 Comcast.	SDR / HDR10	5.1 / Atmos	Commercial service
Aug'16	 sky	SDR	5.1/ Atmos	Commercial service
Rio'16	 NBC	SDR / HDR10	5.1 / Atmos	Commercial service
Oct'16	SKY PerfectTV!	HLG	5.1	Commercial service
April'17	 DIRECTV.	HLG	5.1	Trial/Demo
May'17	 travelxp™	HLG	5.1	Commercial service

What are barriers to launching UHD services?*



Additional comments :

Market demand in OTA
 Cost of delivery in OTT
 Availability of IP-based infrastructure
 of single HDR solution (x2)
 customers and advertisers not willing
 to pay for UHD
 Content (sometimes not
 as good as HD)

Lots of work to make UHD take off

* Source : Ultra HD Forum Operators' Survey, IBC'17

Why Join the Forum ?

Network with all UHD industry players and learn from them

Interact with other operators who have already deployed Live UHD service

Participate to plug fest

Influence Spanish regulators on UHD

Help shape the future of UHD

Ultra HD Forum is here to help you deploy UHD!

Agenda



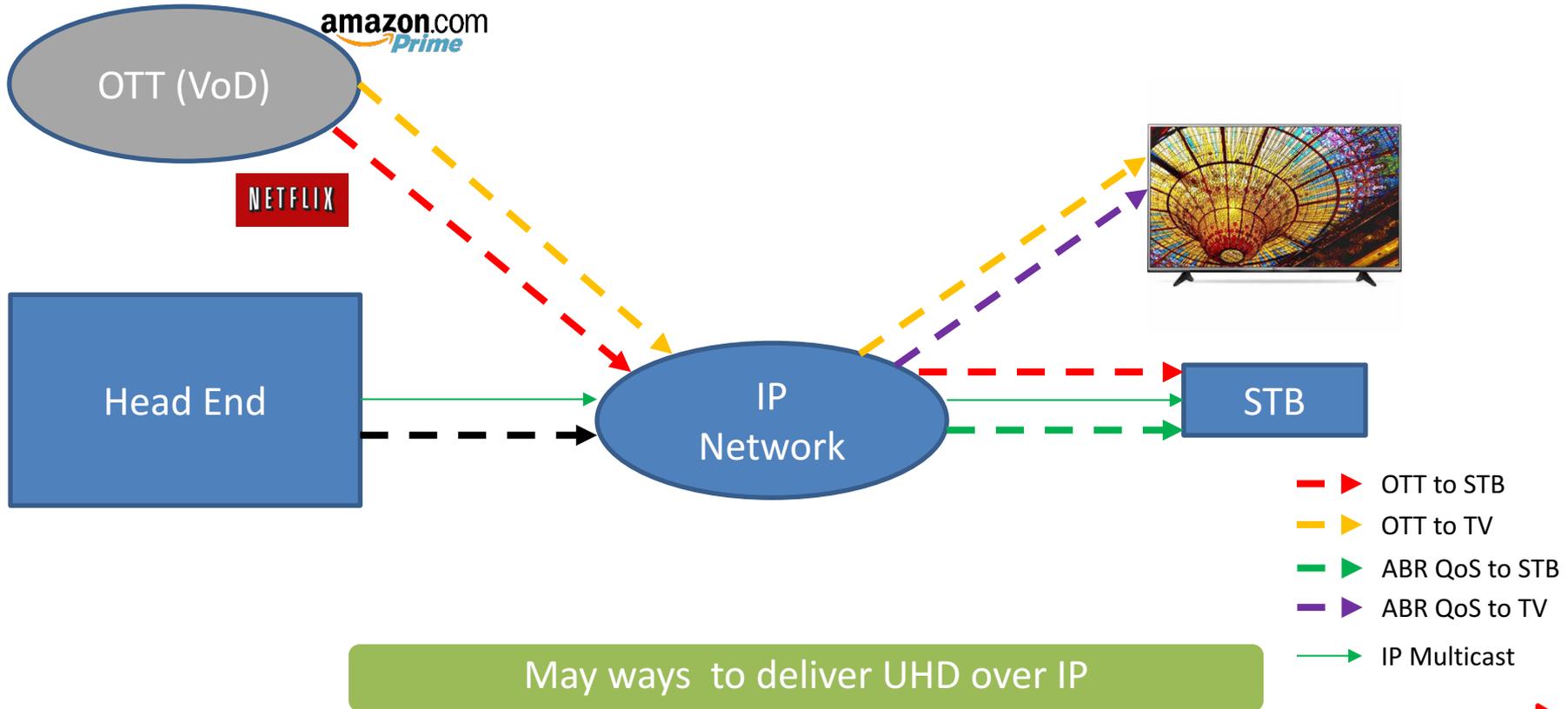
Telco Deployments

Deployed UHD IPTV Services

Delivered via	Transfer function	Frame rate	Bit depth	Color space	Audio codec(s)	Bitrate	Notes
IPTV	SDR	50fps	8 or 10-bit	BT.709	AC-3	24-30Mbps	
	PQ	59.94fps	10-bit	BT.2020	AAC, AC-3	32Mbps	
IPTV	PQ	50fps	10-bit	BT.2020	MPEG2, AC-3, DD	25Mbps	Sports content

UHD mainly on Fiber today

UHD IP delivered

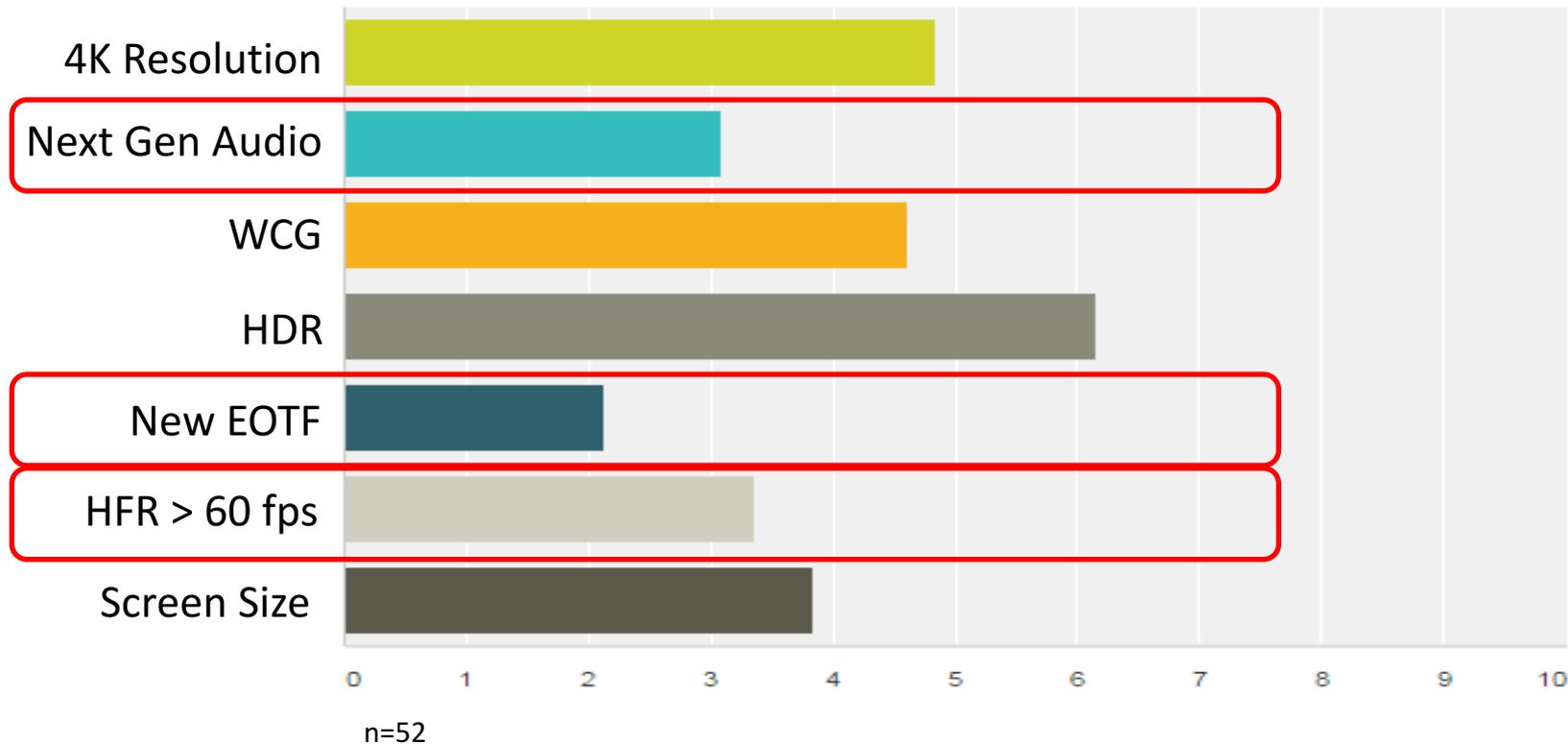


May ways to deliver UHD over IP



What is coming next ?

What's covered in Phase B



Phase B

Topics	Details
NGA	Object based
New HDRs	Dolby, Technicolor, HDR10+, ST 2094- X , China ,...
HDR Dual Layer Technology	Backward compatibility
HFR	P100 & 120
HDR Conversion Tools	HDR10 <> HLG
HDR “Brightness” Control	Regulatory impact
Applications : OTT	Live & VoD
Applications : OTA	ATSC 3.0 / DVB-T2 / ISDB-T
Applications : MVPD	Broadcast / IP Unicast & Multicast

Phase B Operator's Survey

- Survey topics included:
 - UHD in general, including spatial resolution, color space and dynamic range
 - HDR, including transfer function (PQ/HLG) and metadata
 - Phase B technologies
 - Video codecs
 - Information about the respondent's operation
- Results available online at : <https://ultrahdforum.org/resources/ibc-2017-masterclass-slides-available-for-download-here/>

Survey Summary

Timing	Phase A still not deployed
HDR	Too many HDRs, meta data valued though, BC?
HFR	1080p120 preferred , need E/E workflow
Needs	Detailed production specification
Gaps	HDR over SDI/IP, HDR seamless switch on TV

Forum's 12 months roadmap



Conclusion

Conclusions

Ultra HD is a long journey : content, standards, devices, business model

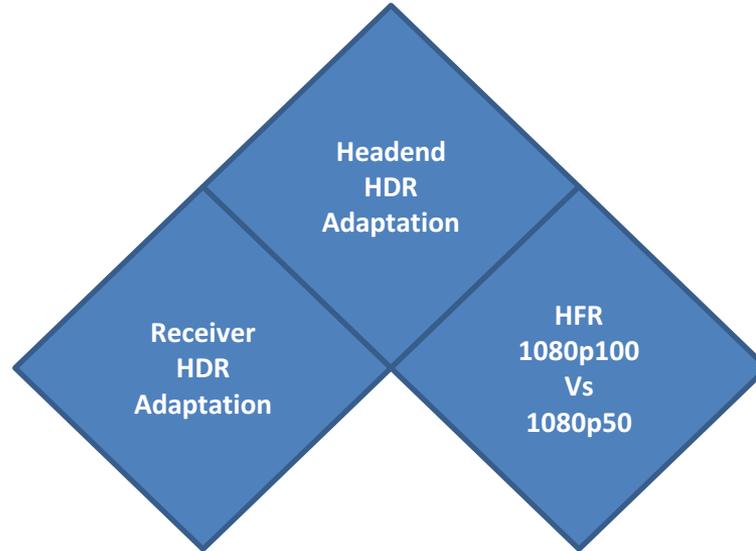
2018 will be the year of HDR commercial deployments

UHD : higher ARPU and gain market share in HE segment

China #1 is UHD TV set production, last in UHD content production

Ultra HD Forum is here to help you deploy UHD!

4K Summit 3 Demonstrations



Thank You



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www.ultrahdforum.org