Ultra HD Forum Masterclass @ *IBC 2019*

9:30 **Welcome**
- Thierry Fautier, President, Ultra HD Forum

9:35 **LIVE UHD SERVICES TODAY**

Lessons learned by operators from early commercial deployments of live UHD services

- Ben Schwarz, Ultra HD Forum, *Moderator*
- Phil Layton, BBC
- Dolf Schinkel, KPN
- Matthieu Parmentier, France TV
- Emili Planas Quintana, Mediapro
- Simon Jones, BT

10:35 **DVB SPECIFICATION FOR HDR**

How DVB came to consensus for the final set of HDR options.

- Peter Siebert, DVB

10:55 **Break**

11:10 **STATE OF THE UHD MARKET**

September 2019 worldwide consumer TV market.

- Maria Rua Aguete, IHS Markit

11:30 **ULTRA HD ENCODING WORKSHOP**

Video encoding techniques for UHD, impacts of spatial and temporal resolutions on bit rates & quality. Emergence of CAE, 8K, latest up-conversion technologies, …

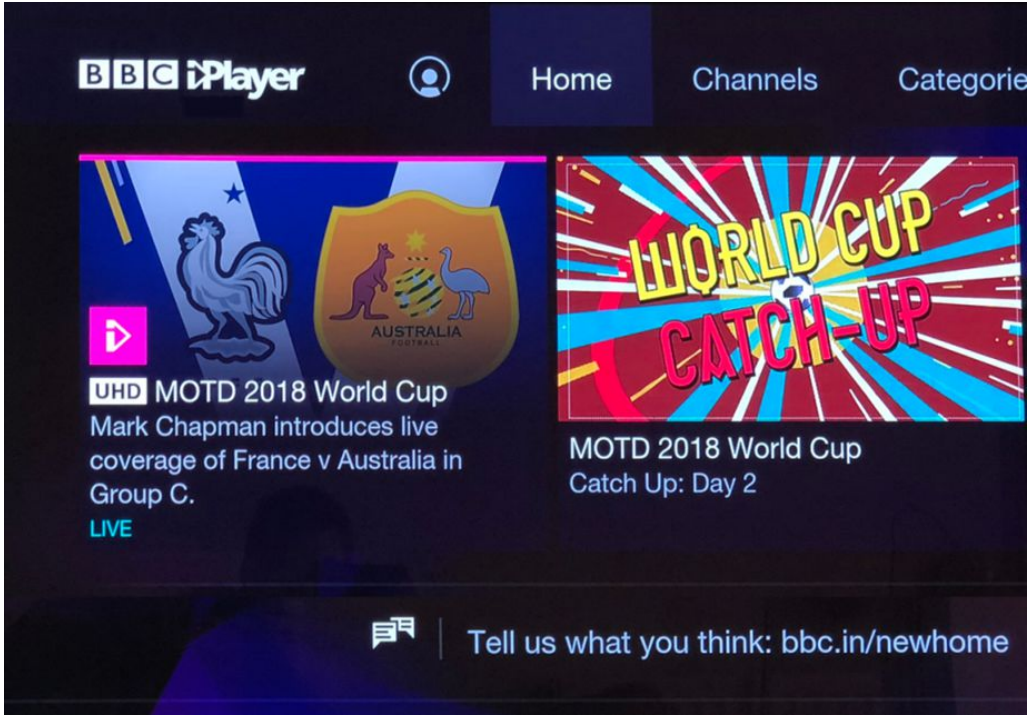
- Skip Pizzi, NAB, *Moderator*
- Guillaume Arthuis, BBright
- Mark Donnigan, Beamr
- Thierry Fautier, Harmonic
- Madeleine Noland, ATSC
- Mickael Raulet, Ateme
- Yuriy Reznik, Brightcove

12:15 **Close**

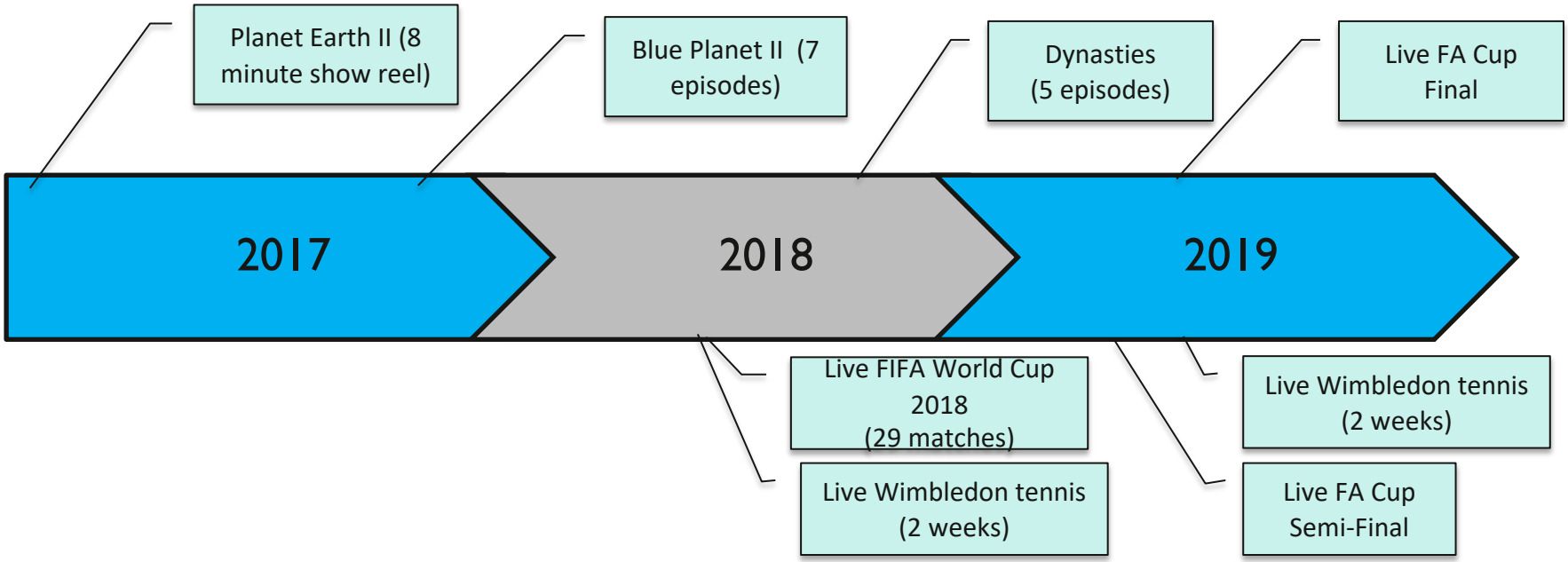
Ultra HD Forum Presentation

Phil Layton
Head of Broadcast & Connected Systems
BBC, Research & Development
Phil.Layton@bbc.co.uk

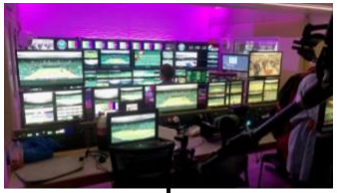
BBC UHD Trials



BBC iPlayer UHD Content



Simplified Live Architecture



Gateway

Decoder

Matrix

Downconverter

Monitoring

Gateway

Other broadcasters

Encoder

Packager

CDN Origin

CDNs

Viewers

Audience Reaction

BBC have run surveys for every event

- Many thousands of varied responses
- Very many happy viewers who want more
- Equally viewers reporting issues related to ISP, WiFi, home device
  - Not all ISPs are equal
- Long latency (~40s) was a common comment

Audience sizes typically 40000-50000 concurrents

- Need to protect our standard services
- Demand only exceeded our capacity once, our capacity has increased

Over 700 (and growing) devices certified for iPlayer UHD

Our To-Do List

Better audio

- Remains an issue mainly due to receiver issues
- Testing NGA solutions
- May need to wait for HbbTV to complete work on APIs

Audience perception

- Still get reports of poor picture quality on certain TVs
- Often driven by SDR modes on TVs being very bright

Production

- Craft skills still learning how to make good HDR and SDR simultaneously
- Apply single production workflow to different camera suppliers
- Some optimisations in cameras and workflows

Distribution Encoding

- Reduce live UHD video rates closer to VoD (36Mbit/s to 22.7Mbit/s)
- Reduce VoD video rates

KPN:

Introduction of Ultra HD TV service

Dolf Schinkel

kpn

Why launch Ultra HD?

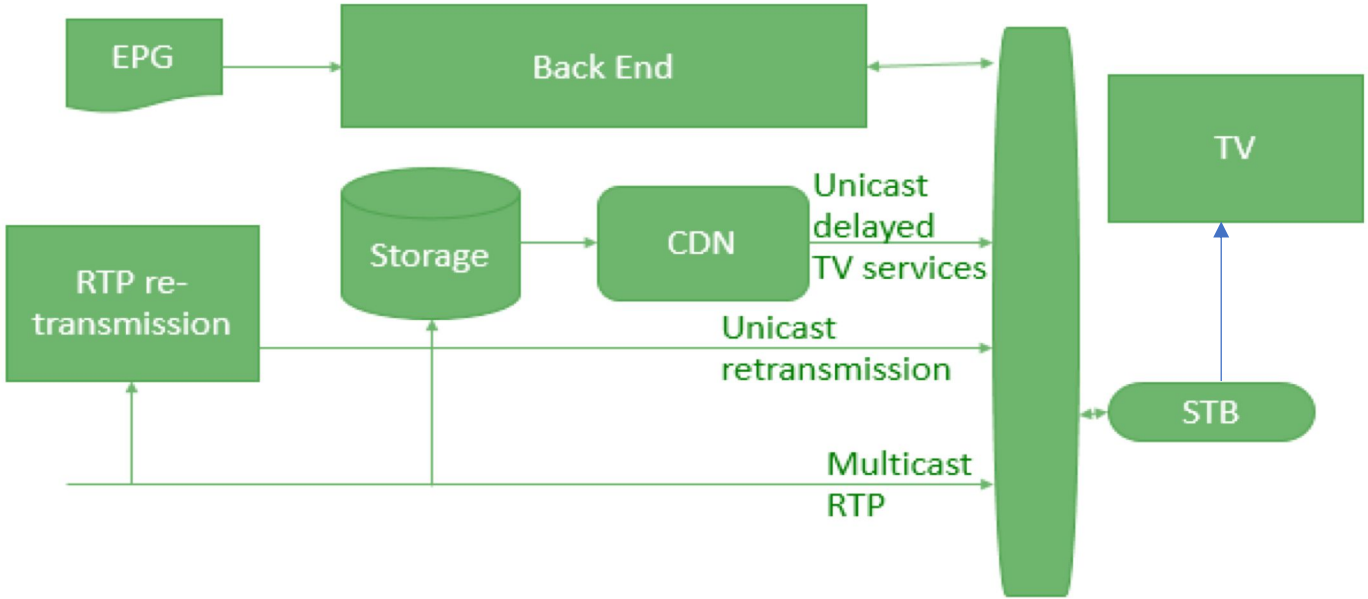
2016: KPN introduces 4K STB & 4Ksubscription around European Football Championship

2017: STB upgraded with HDR-HLG, PQ10 and HDMI 2.0B support

2018: 4k event channel for FIFA World Cup and Eurosport tennis

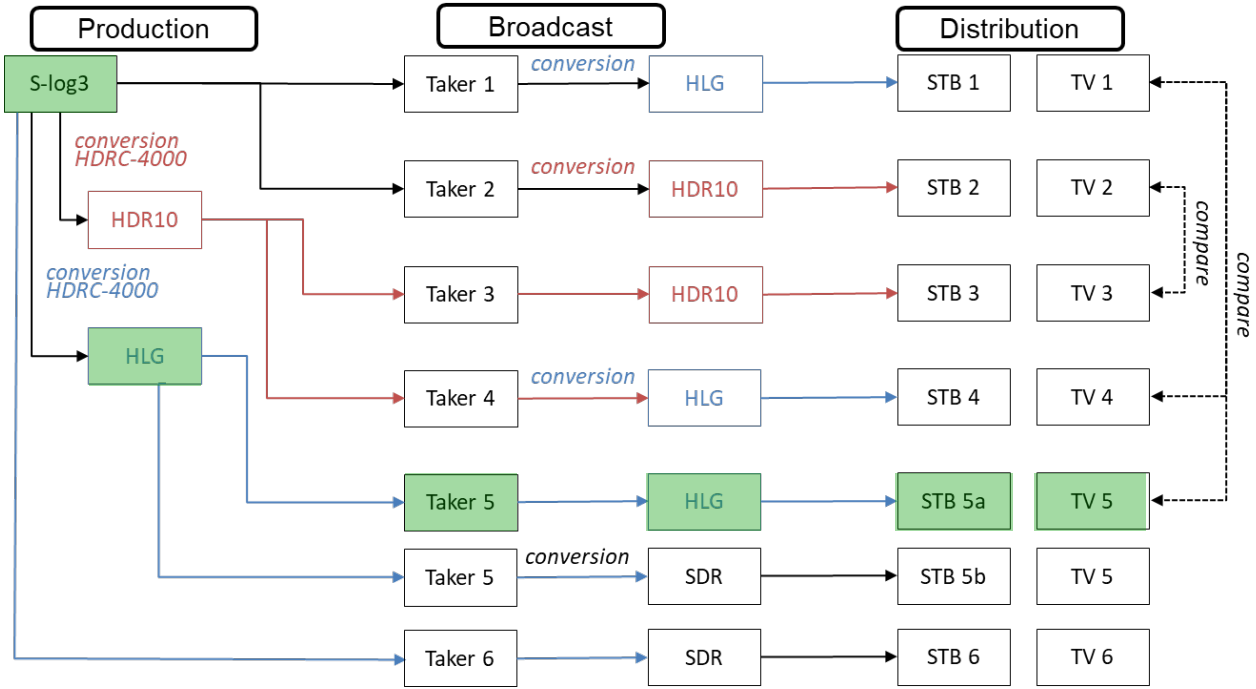
2019: New STB with full 4K HDR support and immersive audio

General iTV architecture



Architecture

UHD Distribution varieties



Customer segmentation

The Ultra HD services have up to this moment been addressed to:

- Customers with High Bandwidth availability subscribed to the 4K package
- Small fraction of tv-customers has 4K
- Active migration
- At least half of all customers penetration goal for 4K STB

Customer Feedback

- Customer satisfaction with 4K/HDR high
- Contradiction in the market:

  impact of HDR vs. 4K customer recognition

Technical issue

- STB’s are forced in HDR mode when changing to HDR channel

  TV set SDR/HDR switching confuses customers

Issues still faced

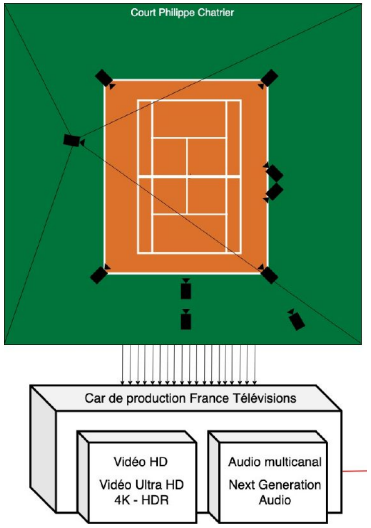
- Mix of 50 Hz and 60 Hz content
- Backward compatibility
- Lack of Premium Content holds success back
- Mitigated issues
  - HDR/SDR switching
  - Colour space backward compatible

HDR on road map

- 4K and HDR services are available since 2018
- Expansion of HDR services
- Set Top Box is there!

Roland Garros 2019
UHD

Video production



France TV OBvan – Toulouse

- 14 UHD native cameras
- 3 HD upconverted cameras (super-slow-motion)
- 6 HD slow-motion servers
- 1 single switch on the video mixer, 2 logical layers:
  - HD 1080p50 SDR
  - UHD 2160p50 HDR (HLG)

The OBvan chief control center / UHD-HDR + HD-SDR

RG2019 specificities

- 15 days to let many occasions for improving the result
- FTV is the International Signal producer:
  - 1080i25 signal of each camera remains mandatory
  - no possibility to run only one UHD-HDR production then down-convert the others
- Same number of technicians
- Very passionate and motivated team, mostly self-trained to manage 2 video dynamic and 2 color gamuts at the same time
- Panasonic cameras are ideal for this kind of double production HD/UHD

Immersive/interactive audio production (NGA)

Roland Garros NGA specificities

- 3D ambience (5.1 + 4) / 5.1 compatible, also binauralized
- Shotgun digital microphones AES42
- Live descriptive metadata
- Allows the adaptation of the rendering depending on the device skills
- Same number of audio technicians
- Another very passionate and motivated team!

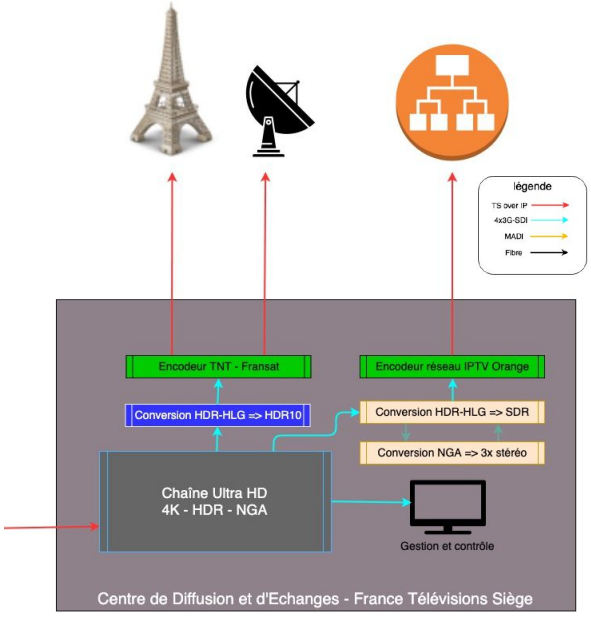
NGA configuration, transport and encoding

- Commentaries are considered as object, switchable on demand
- IP contribution link was kept uncompressed (16 PCM streams / 16 Mbps)
- Descriptive metadata could be edited/corrected at MCR
- Each content/programme can run its own metadata config
- 3 NGA codecs available: Dolby AC-4, DTS-X et MPEG-H audio
- Only MPEG-H is used, as production tools are available and successfully tested on a 24/7 basis

Master Control Room - UHD

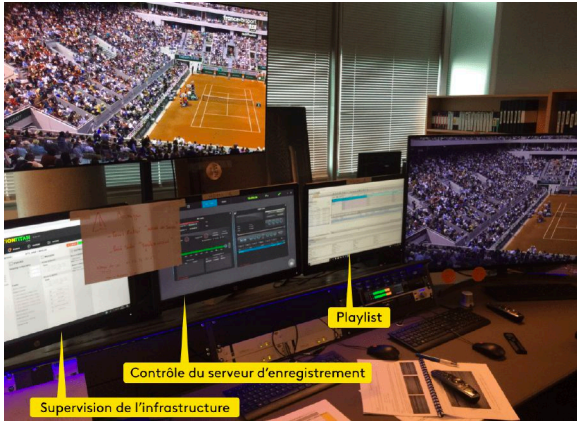
UHD MCR – HDR10 – NGA

- Playlist, automation, graphics
- Record/playout servers
- Live contribution link UHD – HDR – NGA
- Operated by the regular MCR team
- Full IP configuration targeted (ST.2110 / 25 GbE ports to support 2 UHD real-time streams) but several 4x3G-SDI units had to be used instead



Overall project in 3 phases

1. 4x3G-SDI spare equipments to run Roland Garros 2019
2. Deployment of ST.2110 equipments during Summer/Fall 2019
3. Full IP redundant configuration for RG2020 then Tokyo Olympics



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User experience

4 distribution networks

- Terrestrial broadcasting over Paris grand area, Nantes et Toulouse using 4K-HDR10-HE-AAC+MPEG-H et 2K-HDR10-HE-AAC+MPEG-H
- Satellite broadcasting on fransat (Eutelsat), over the whole country, using 4K-HDR10-HE-AAC+MPEG-H then 4K-SDR-HE-AACx3
- IPTV broadcasting over the Orange fiber network using 4K-SDR-HE-AACx3
- OTT tests towards AndroidTV, AppleTV 4K and ChromeCast Ultra in 4K-HDR10-HE-AAC+MPEG-H, 4K-HLG-HE-AAC et 4K-SDR-HE-AAC

Issues found

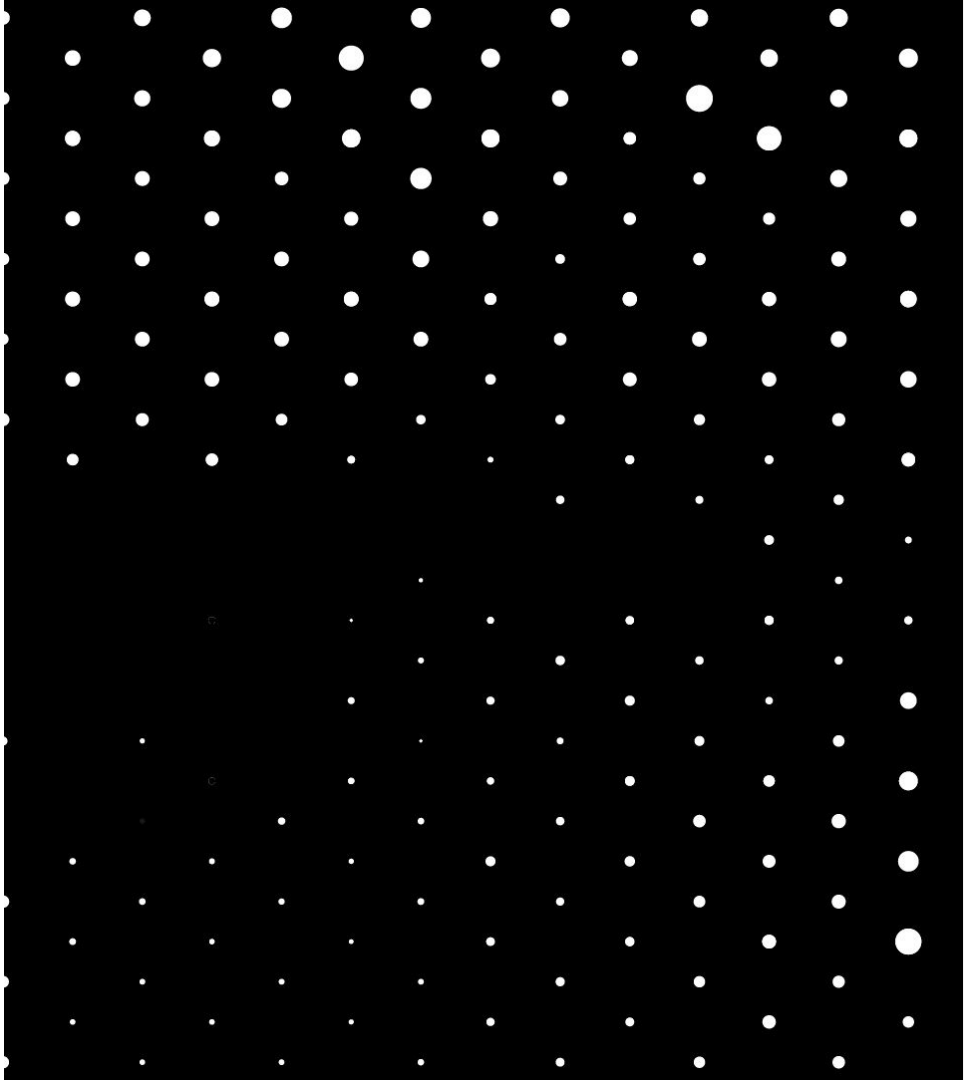
Video – HDR10

- Correct display over recent UHD-TVs > 2015
- No display over older UHD-TVs
- Wrong display over older (or bugged) UHD-TV when the reception is done with another equipment + HDMI link.

Audio – MPEG-H

- Short range of products on the EU market
- MPEG-H decoders in TVs are not plugged on RF inputs => manufacturers' decision in favor of Dolby AC-4 codec for DVB
- No end-to-end NGA solution for now
- A « NGA-like » UX is possible but cost-effective, by offering:
  - 1 French Version
  - 1 French Version with enhanced commentaries
  - 1 International Version - ambience only
  - 1 Internationale Version binauralized for headphones
  - etc.

Thank You



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UHD-HDR Live Sports Production

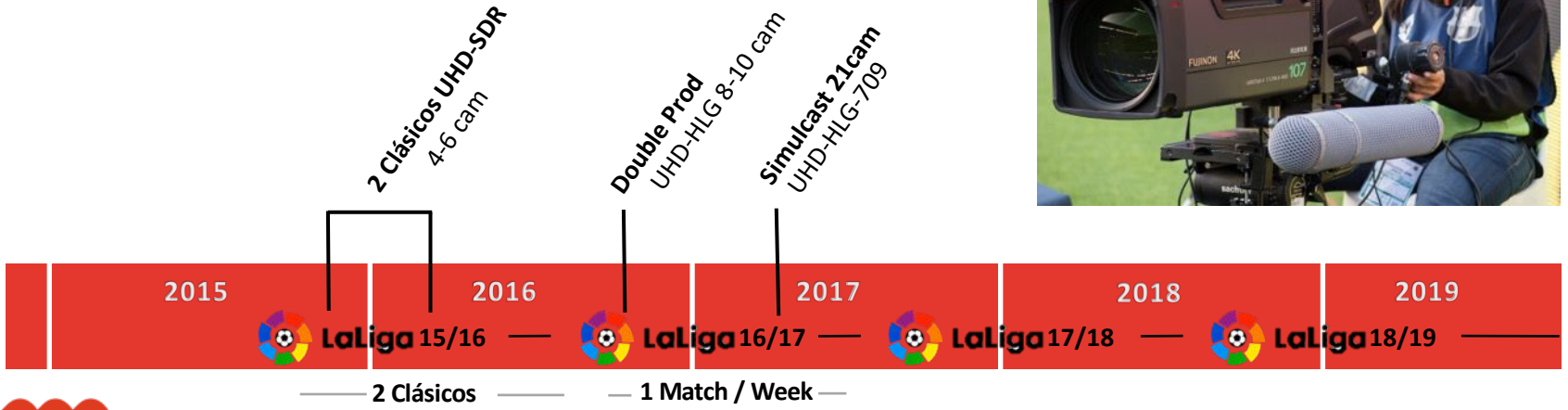
Emili Planas
CTO and Operations Manager
Mediapro
[eplanas@mediapro.tv]

Why: Launch Rationale for UHD Service

- **2015-16. Start first UHD Live Prod using Cinema cameras and lenses (Sony F55) -2 Matches-**

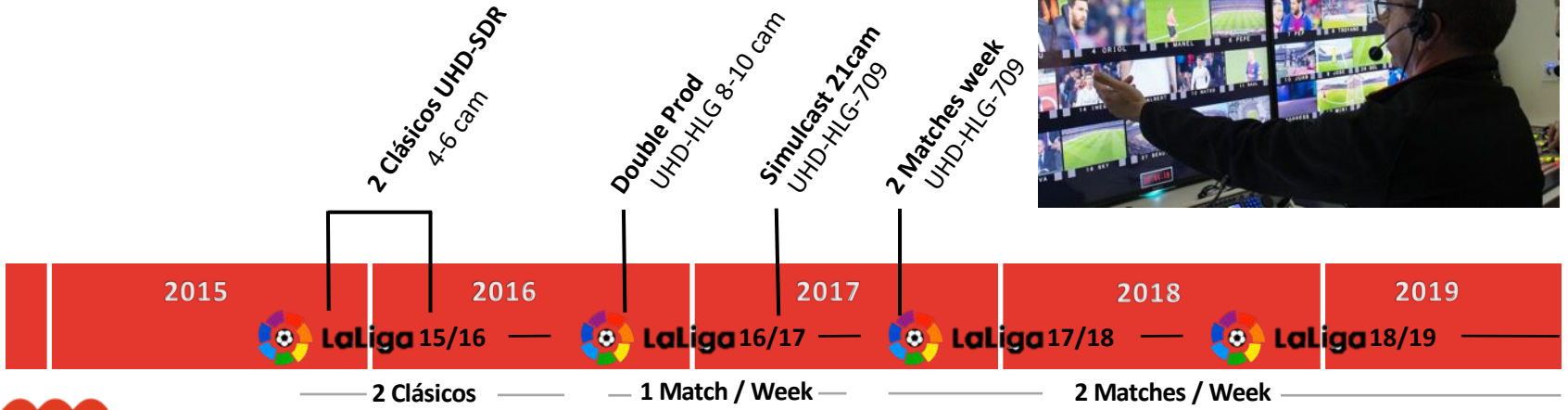
16-17: A complete season for learning!

- 2015-16. Start first UHD Live Prod using Cinema cameras and lenses (Sony F55) -2 Matches-
- 2016-17. UHD-HDR double production, -35 Matches-. Start of Simulcast production -3 Matches-



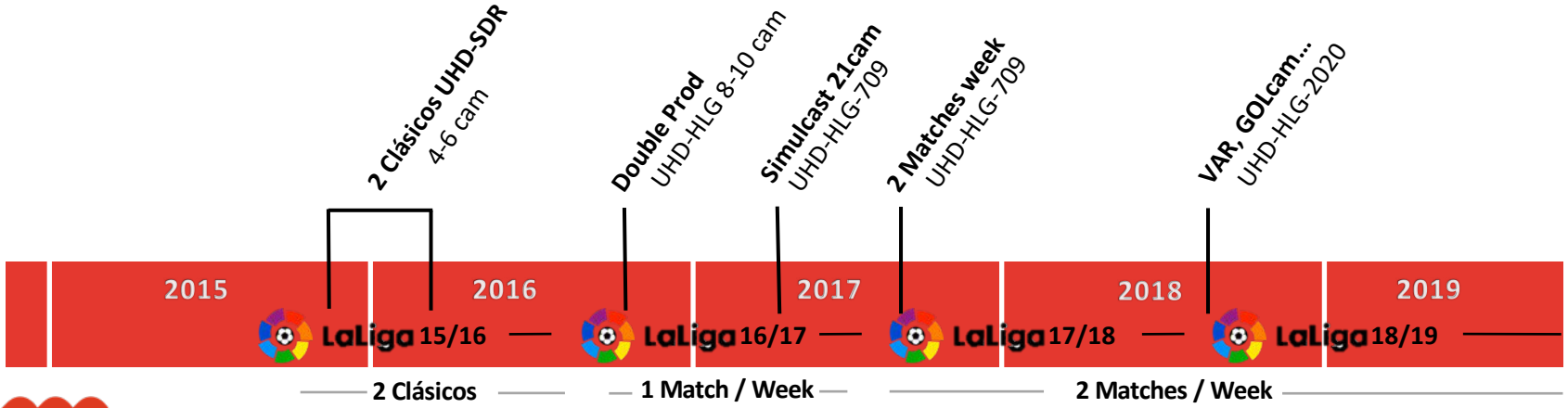
17-18 Two HDR productions per week

- 2015-16. Start first UHD Live Prod using Cinema cameras and lenses (Sony F55) -2 Matches-
- 2016-17. UHD-HDR double production, -35 Matches-. Start of Simulcast production -3 Matches-
- 2017-18. Simulcast UHD-HDR Live Production -72 Matches-

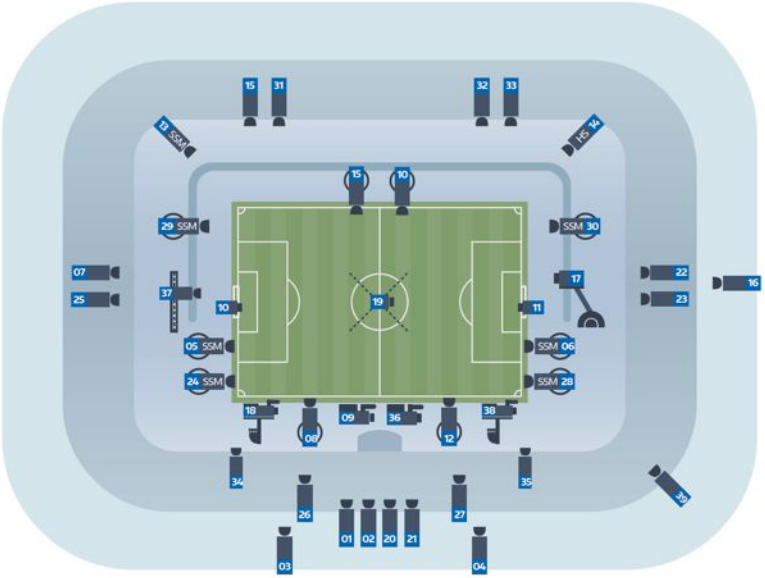


Don’t Stop!

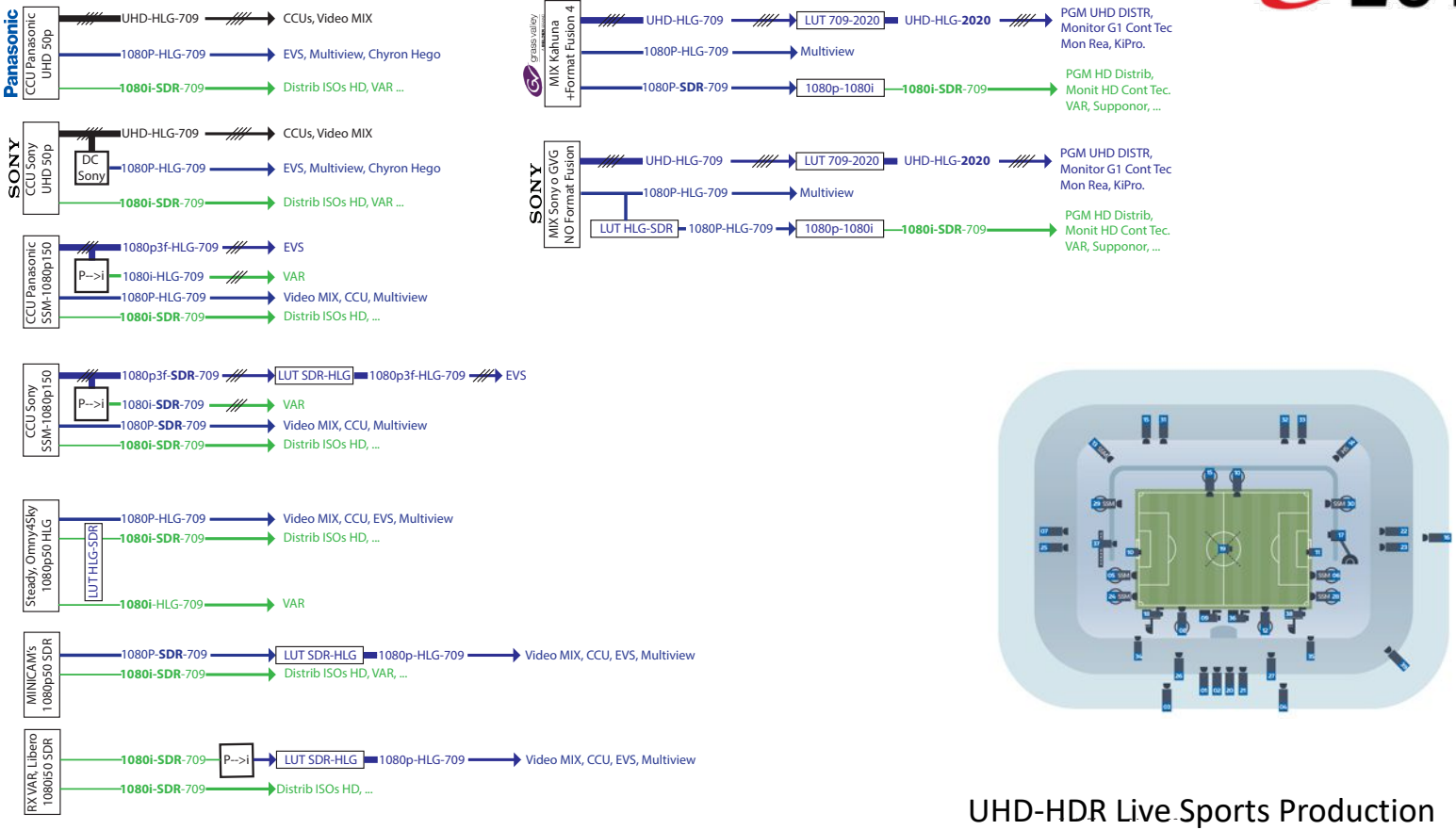
- 2015-16. Start first UHD Live Prod using Cinema cameras and lenses (Sony F55) -2 Matches-
- 2016-17. UHD-HDR double production, -35 Matches-. Start of Simulcast production -3 Matches-
- 2017-18. Simulcast UHD-HDR Live Production -72 Matches-
- 2018-19. Simulcast UHD-HDR Live Production, including VAR and GoalCams -HLG + bt.2020 - 72 Matches-
- Total matches produced in Simulcast UHD-HDR/HD-SDR: -154- (12th Sept 2019)



- **Production needs to be SIMULCAST**
  - **Same number of cameras, replays, … for both HD and UHD-HDR**
  - **Same or better Quality of Service than for HD productions**
    - **Reliability**
    - **Time to solve**
    - **No limitations to accept new requirements or novelties**
    - **HDR can't be excuse if something goes wrong**
  - **Same or better Picture Quality for the HD feed than in a native SDR production**



How: workflow, architecture,…

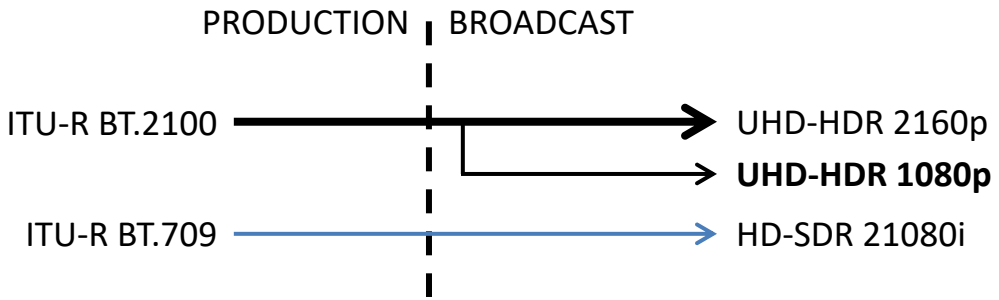


Roadblocks / Challenges

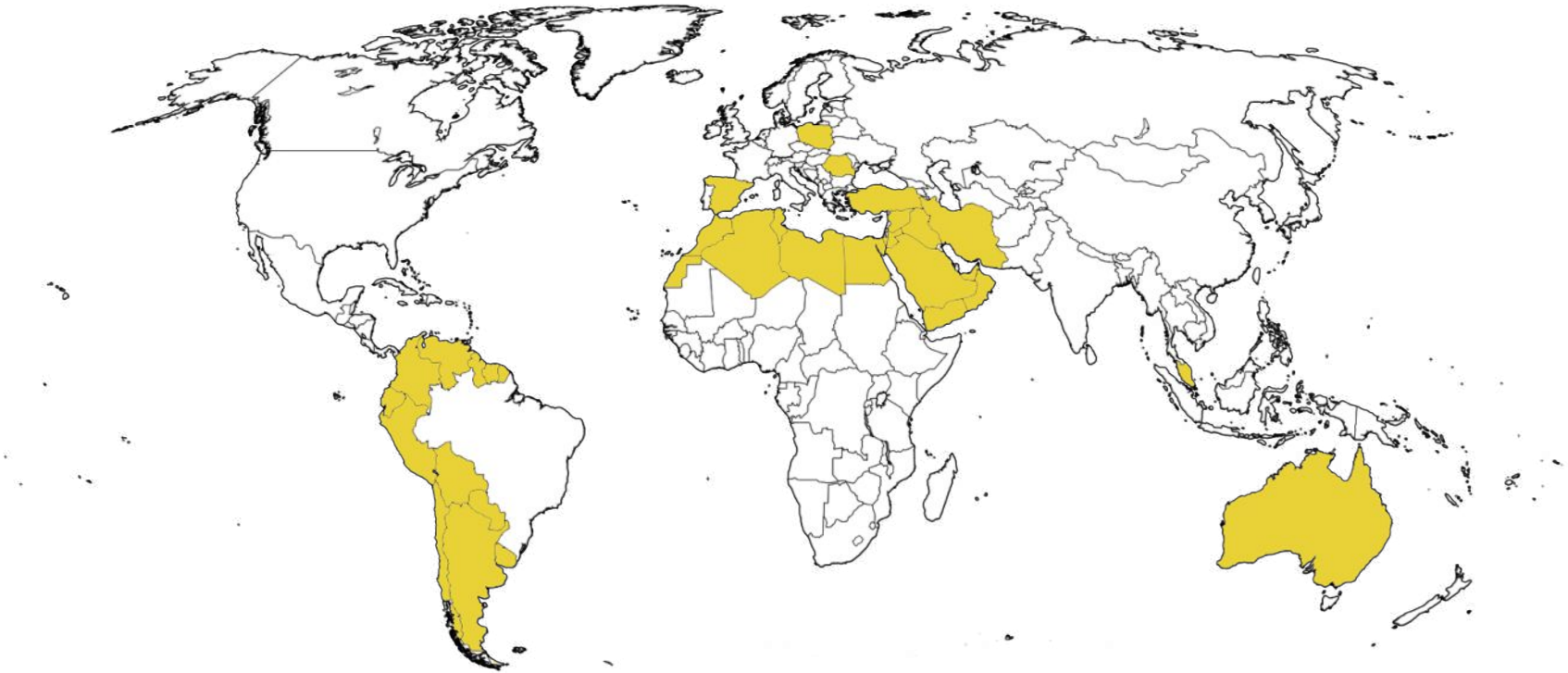
- New paradigm when shading: White and Lights are not the same
- Constant increasing on HDR quality, not affecting SDR feeds
- Complex integration with complex workflows: File sharing, …
- Market is interested but not asking for

Next scenario

SIMULCAST HDR-SDR



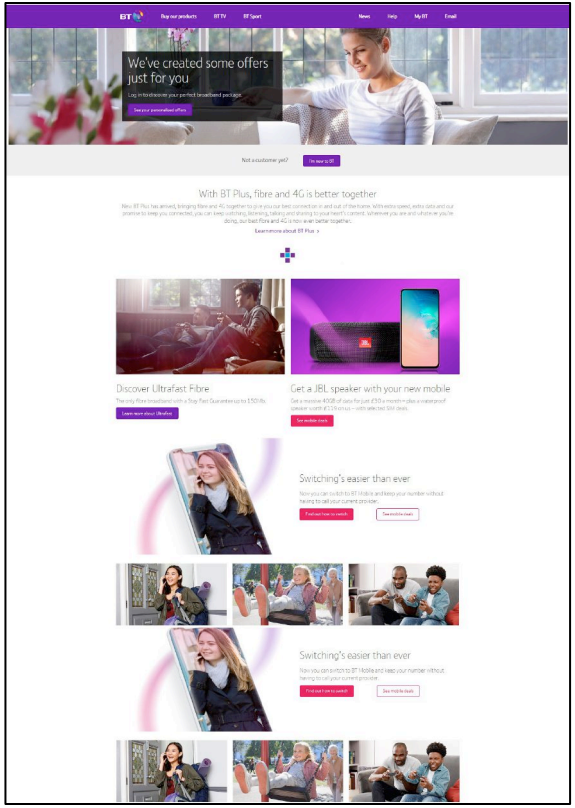
Countries where LaLiga Right Holders receive UHD-HDR

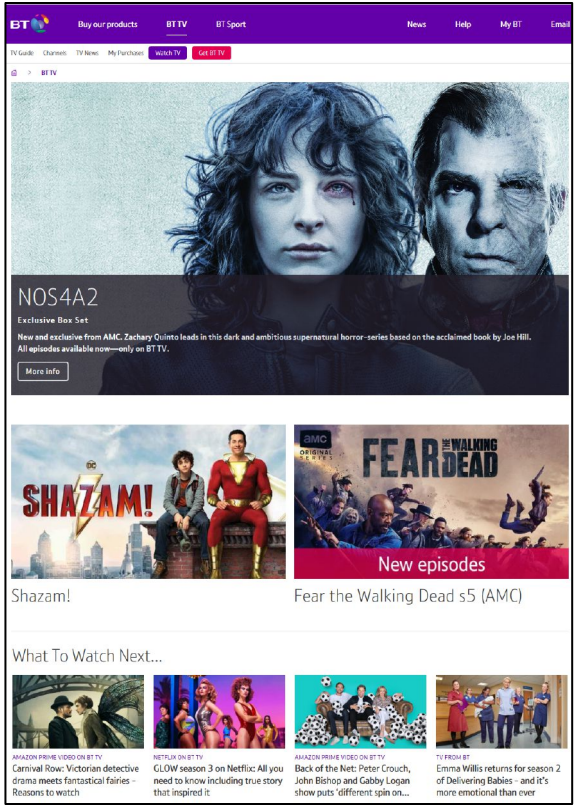


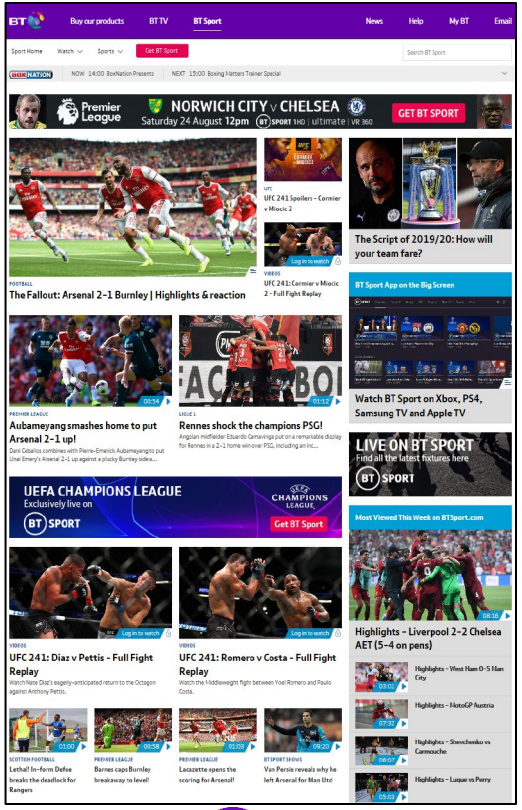
From SD to UHD-HDR

Dr Simon T Jones
TV Architect
BT

BT – UK Telco addressing UK customers







BT 1846 BT BT TV 2006 BT SPORT 2013

BT TV Evolution

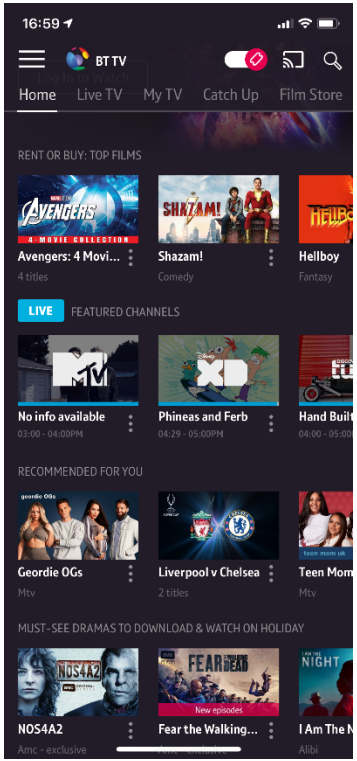
BT Vision - December 2006
- DTT SD linear TV channels
- SD Video on Demand
  - HD and 3D post launch

BT TV
- Multicast Linear TV Channels

Youview – July 2012
- PSB Players
- Multiple VoD services
  - Netflix, Amazon, …

BT TV App
- iOS and Android

Customer segment
- Over 1.8m BT Broadband



BT Sport Innovation - UHD Channel

BT Sport - August 2013
- 3 HD Channels, 5.1 audio
- IPTV, satellite, cable, App

BT Sport UHD - August 2015
- BT Sport ULTRA HD
  - 3840x2160p50 10 bit BT.709
- IPTV and cable only

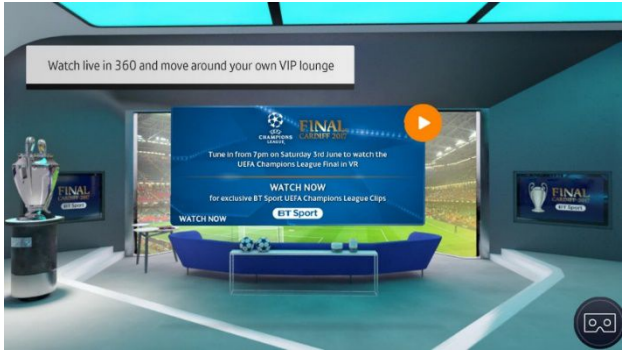
Dolby Atmos – January 2017
- Immersive 5.1.4 audio
  - UHD Channel only

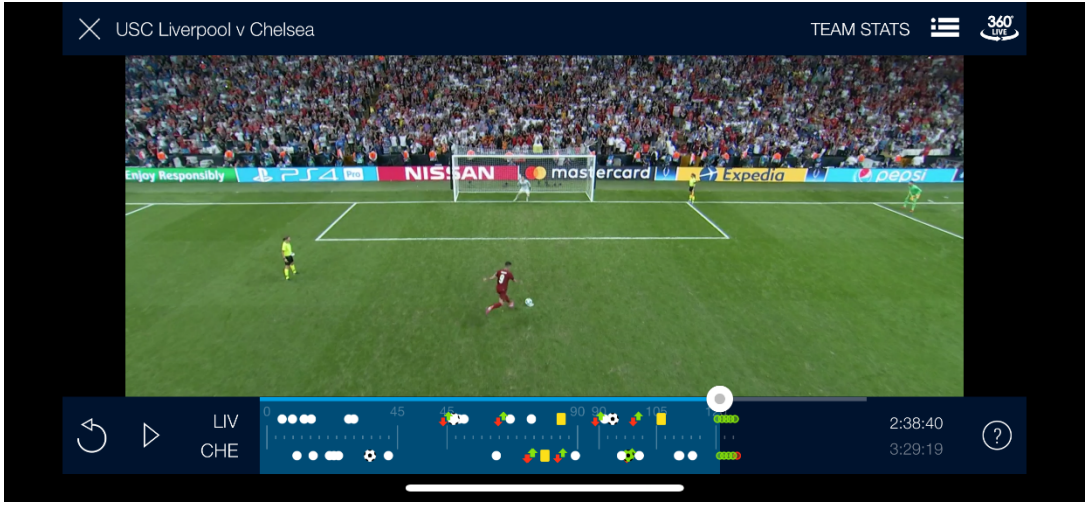
Interactive App Experience
- Timeline, restart, events and clips

360° VR Video June 2016
- Live feeds and event clips

360° VR Video - May 2019
- FA Cup final live 8K VR

Audience
- 11.3m for UCL Final 2019
  - 57% TV : 43% Digital





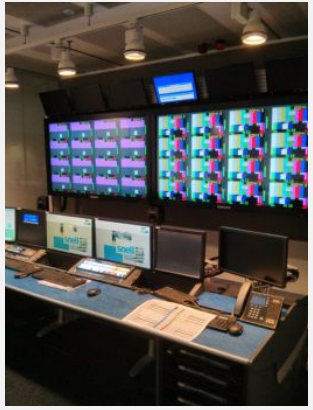
BT Sport End to End

OB Production

OB Links

Production Hub

Playout



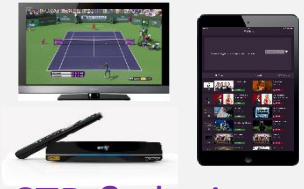
Sports Management Centre

Headend

Broadband

Access

Hub



STB & devices

BT Sport Ultimate – August 2019

Trials
- Parallel production workflow:
  - June 2017 UCL final in UHD-HDR
  - March 2018 Live HD-HDR to mobile
- Single production workflow
  - June 2019 UCL Final in HDR to mobile
    - All BT Sport App customers with HDR device

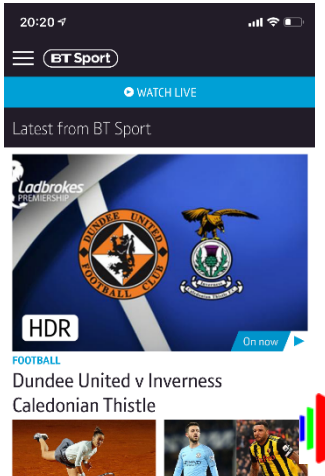
Service Launch – August 2019
- Small screen: iOS and android
- Large screen: Samsung TV, Apple TV 4K

Production
- Single UHD-HDR workflow - Primarily Slog-3 Live

Contribution
- Single UHD-HDR PQ feed OB → Studio → Playout
  - HEVC and TiCo

Playout
- Single UHD-HDR PQ input
- HDR to SDR down-mapping – under OB control
- SDR to HDR up-mapping - advertising insertion
- Parallel UHD-HDR PQ & UHD-SDR BT.709 outputs

Distribution
- HDR Format
  - PQ (HDR10)
- Encoding
  - AWS Elemental Live
    - HEVC for UHD and HDR
    - AVC for legacy devices
- Packaging
  - AWS MediaPackage in cloud
    - HLS-TS, HLS-fmp4 and DASH
  - IPTV HEVC-TS in RTP



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How DVB came to consensus for the final set of HDR options.

- Peter Siebert, DVB

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