MPEG WORKSHOP
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Digital Video Broadcasting

A short weather report on DVB and VR.

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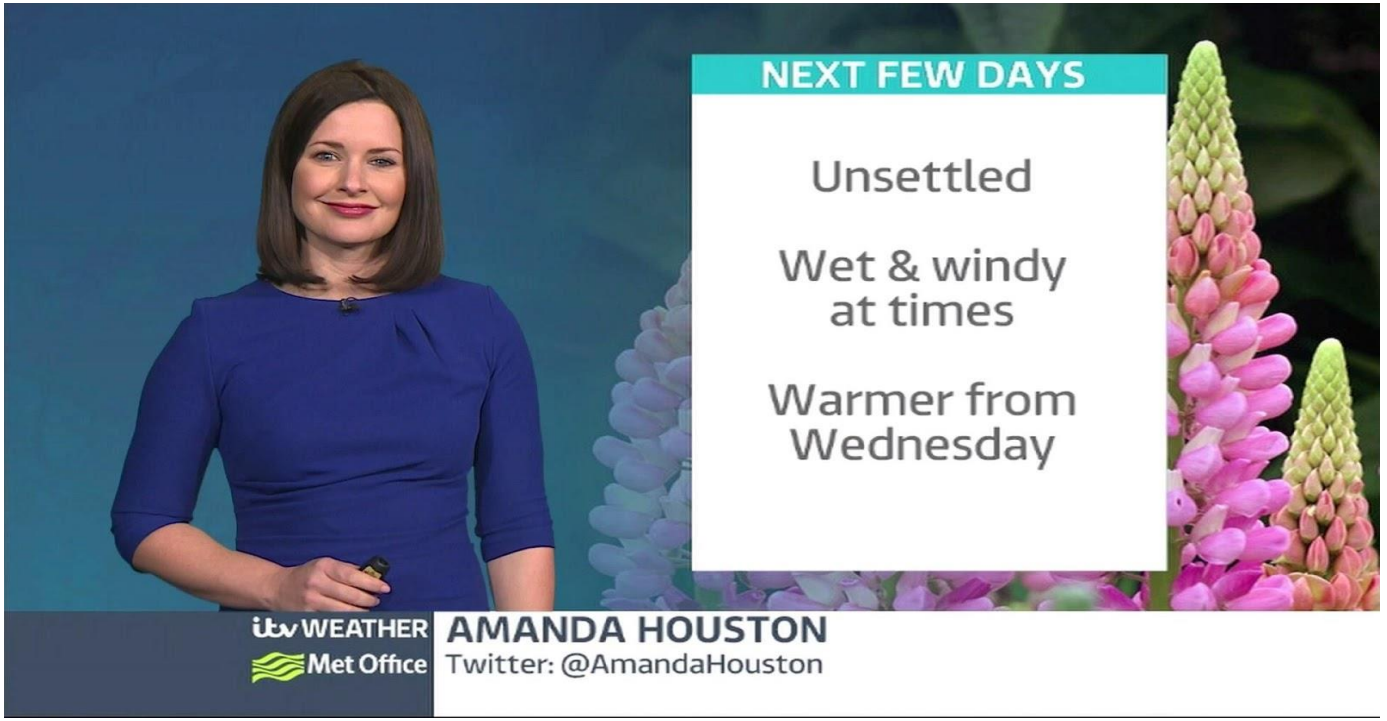
VR – still unsettled times!



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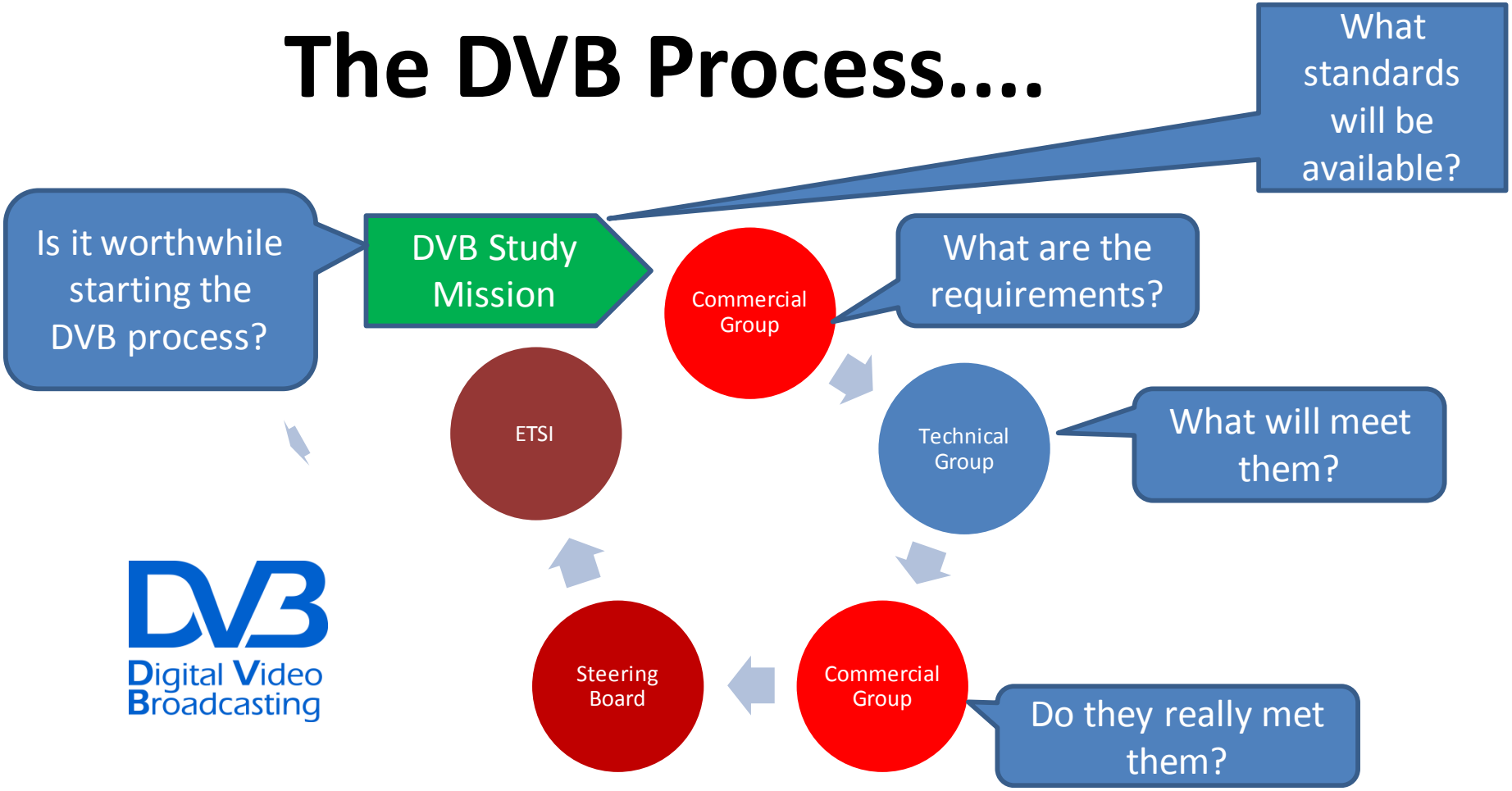
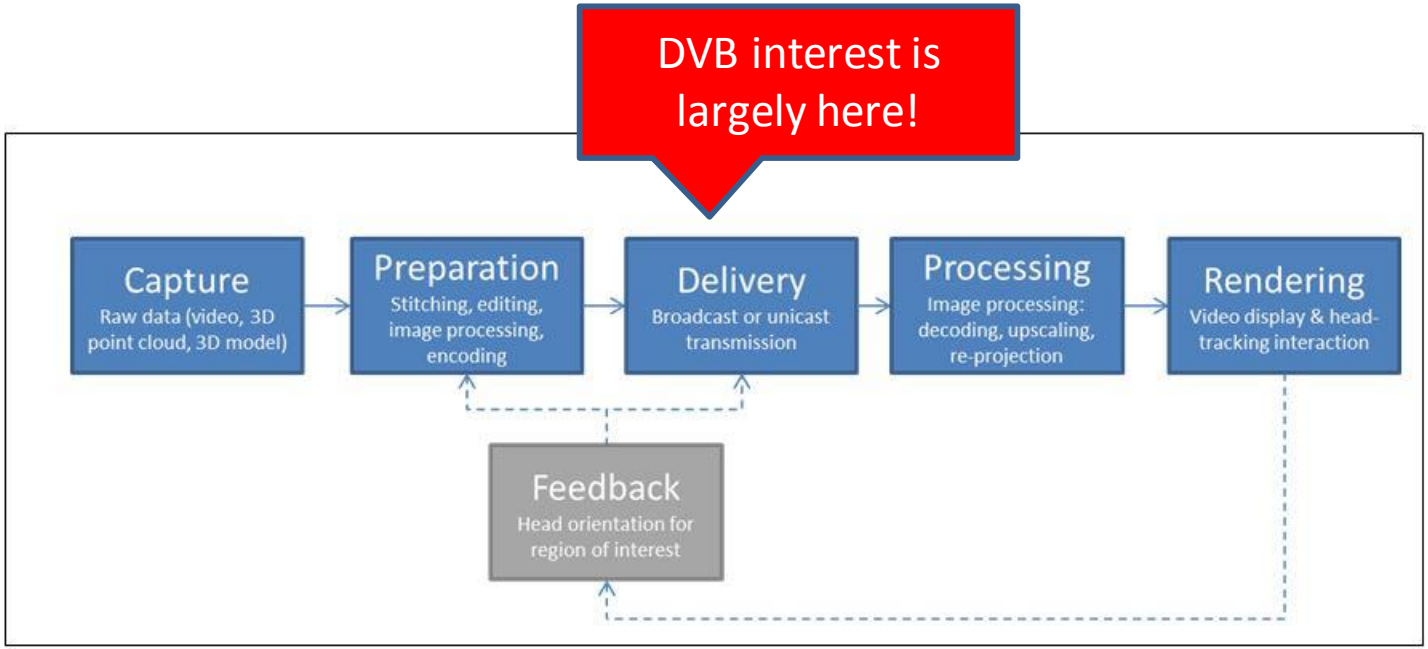
The DVB Process....



The VR chain



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The DVB VR Report

- 9 months in preparation
- Executive Summary of DVB Report available.
- The DVB Report in full. Detailed review of the DVB landscape, including technology, market prospects, sensory sickness, and much more. 140 pages. Copies available on request to members of relevant organisations such as MPEG and ITU-T

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The two main VR approaches

- **Type A**
- **“panoramic/3DOF”**
- Container + smart phone
- Low cost + convenience

- **Type B**
- **“panoramic/6DOF”**
- PC or games machine.
- High cost + less convenience
- Strong experience

The two main VR approaches

- **Type A**
- Potential 4G broadband delivery (6-10 Mbit/s?)
- Help smart phone sales.
- Technical specs?
- Sensory sickness?
- Content?

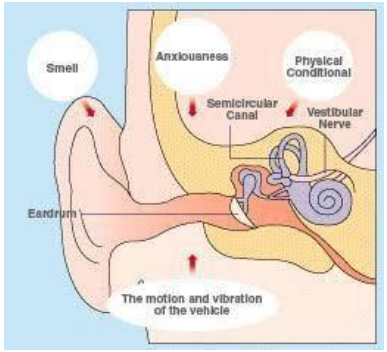
- **Type B**
- Games
- Possible future 5G delivery?
- Medical uses, theme parks, museums?
- Technical specs?
- Sensory sickness?
- Content?

The VR road ahead?

- DVB technical report available.
- Sky publish requirements for Type A content and delivery.
- VR standards situation is still said to be the “wild west”.
- Many alliances and forums are being established to help make VR successful.
- MPEG, JPEG, ITU-R, ITU-T are involved in VR standards.
- DVB considering whether to develop standard for Type A VR.

Some factors affecting ‘Sensory Sickness’

- Flicker of the displayed view
- Refresh Rate
- Display width
- System lag
- Duration of exposure
- Personal sensitivity
- Motion control
- Health
- Genetic background, Sex, Age, Mood, anxiety, postural stability



VR Content Possibilities?

- **Short form** comfort up to about 20 minutes
- **Bonus for 2D movies** View from the actor? Promotion?
- **Documentary** Nature, war zones?
- **Concerts** VR audio important?
- **News** Panoramic filming?
- **TV shows** Mobile consumption interesting?
- **Short form movies** Good for mobiles?
- **Live sports** Addition to the broadcast?
- **Sports highlights** Post produced?
- **Mesh video** Use game technologies

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Sound for VR..

- **“not an addition, a multiplier of the experience”.**
- Significant amount of technologies exist for VR audio, but still on an exploratory basis.
- Lack of understanding of quality for VR audio, and we are not aware of any formalised quality evaluation for VR audio
- Object and scene based audio technologies are a big step forward towards solutions needed for VR Audio –NGA
- But current NGA systems such as MPEG-H or AC4 may need additional work.

The three key questions...

- Can **technology** be developed for delivering and displaying VR that is practical and economically feasible
- Can the system be made so that there manageable or no problems of **sensory sickness**?
- Can **content forms** be devised and developed and made available that consumers would want enough to pay for in perpetuity?

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What are the ‘success factors’?

- **MAIN FACTORS**
- **Quality of experience**
- **Lack of sensory sickness**
- **Comfort and Ease of use**
- **Cost of equipment**
- **Cost of Content**
- **Equipment availability**
- **Content availability**
- **Content desirability**
- **BONUS FACTORS**
- Equipment externality
- Network externality

- Type A = panoramic/3DOF
- Type B = panoramic/6DOF
- All the MAIN FACTORS need high marks
- The BONUS FACTORS also help a lot.
- Our initial scoring of Type A led to a score of 32 out of 40.
- Our initial scoring of Type B led to a score of 24 out of 40.
- **In the near term, Type A is more likely to be successful.**

The Report conclusions are...

- There is a case for preparing Commercial Requirements for Type A VR delivery (panoramic/3DOF) now.
- We need to check whether an adequate number of DVB members would support and use a specification.
- We need to continue to evaluate the situation for panoramic/6DOF and for VR and MR

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What should VR be, for commercial success?

- What ‘user experience’?
- What technical image and sound quality?
- How compatibility with HDTV and UHDTV?
- How compatibility with NGA (Next Generation Audio)?

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What would the CRs include?

- **Frame Rates**. Maybe 50-90 Hz to avoid juddering, blurring, flickering etc?
- **Delivery bit rates.** Type A might be 10-12 Mbit/s
- **Horizontal Field of View**. Maybe at least 100 degrees?
- **Resolution.** 10-15 sub pixels per degree, 2K by 1K?, 4K by 2K?
- **Geometrical congruency** between source and display image? 'isoviewing point?'
- **Degree of visual immersion**. Fixed forward view, panoramic 360 video, spherical video?
- **Degree of audio immersion .** 360 surround sound, fixed position 3D/spherical. Binaural, object based, ambisonics?
- **Head tracking latency.** Very low.
- **Information overlay.**

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Conclusions on VR

- There has been a huge investment in VR
- There are still many unresolved issues about standards, sensory sickness, and content.
- Ambitious plans from MPEG and JPEG
- Specifications for Type A delivery systems, drawing on the above, may emerge from DVB 2017/18
- There are different and rather dynamic views about how far VR will be successful – some see it as a gold mine others see it as having the same barriers to success as 3DTV

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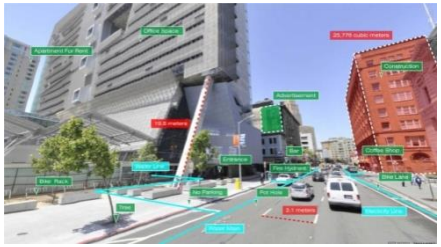
VR (Virtual Reality) AR (Augmented Reality) and MR (Mixed Reality)

- **VR** is creating a virtual world for the user via an HMD.
- **AR** is adding elements to a created virtual world. Can be via an HMD or plain-screen. It might be, for example, additional information about the items in the scene.
- **MR** is combining several worlds, that the user can experience at the same time. The worlds can be real or virtual.

Quo Vadis Augmented Reality?

- There are those who believe that AR will be more successful than VR.
- **What role does it have for media delivery?**
- **How will AR be paid for?**
- Could it be delivered by hybrid broadcast broadband such as HbbTV or Hybridcast?
- Is the standard to be Augmented Reality Mark Up Language (ARML)? Combination of XML and ECMAscript. The ARML object model consists of three main concepts: **Features, Visual Assets, Anchors.**
- Who could take the initiative?
- Should DVB be involved?



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- **Where do you think VR lies between being a major new medium and a domestic fairground attraction?**
- **How can the different organisations work together to bring success to VR?**

Thank you for listening (at least virtually)!

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