

ITU WORKSHOP
19 JANUARY 2017



Virtually Certain?

A report on DVB and VR.

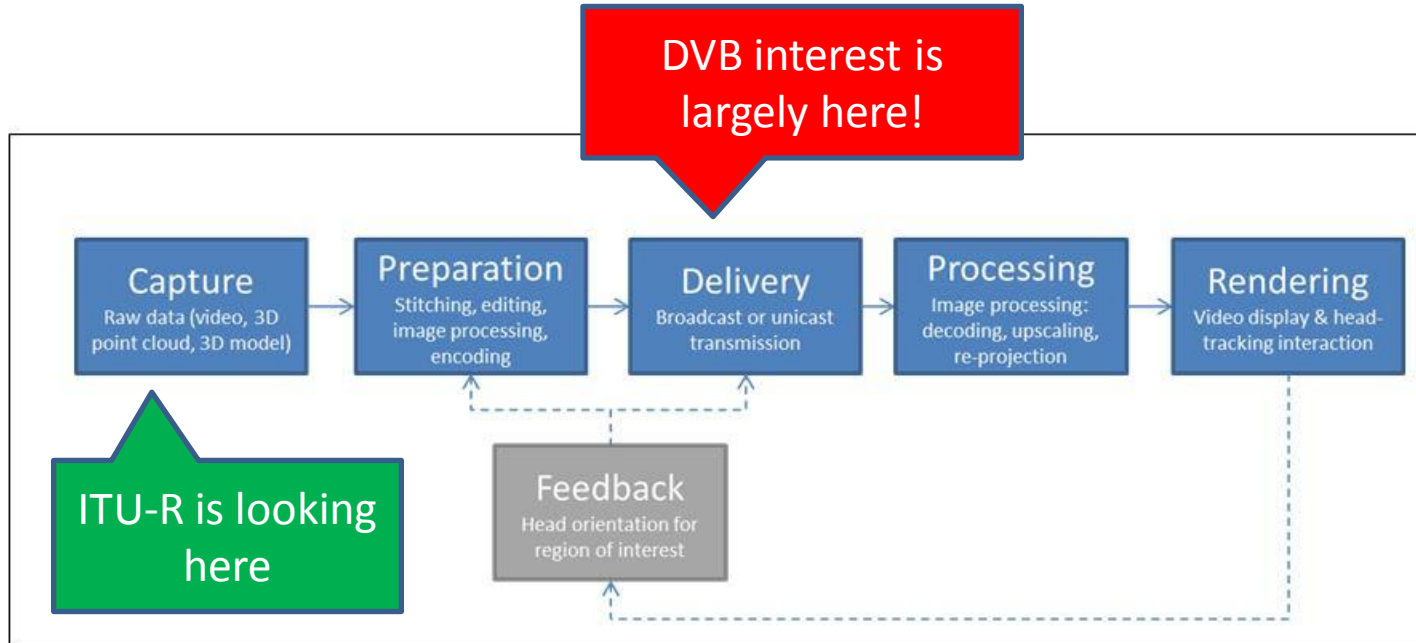
David Wood

Consultant, EBU Technology and Innovation

Standardisation/Interoperability?

- Principal bodies: ITU-T, ITU-R, JTG MPEG, DASH-IF, VR Interest Group?,.....
- MPEG are developing the Omni Directional Media Applications Format (OMAF) standard as well as the Media Orchestration Interface (MORE) for video stitching and encoding
- JPEG developing JPEG XT (omni directional photographs), JPEG XS (low latency compression formats for VR) and JPEG PLENO (light field video format).
- 3GPP are investigating VR for possible use for 5G
- DASH-IF planning tests and trials
- VR Interest Groups....
- DVB, ATSC, ARIB.....

The VR chain



The DVB VR Report



- Aim is to assess whether VR is likely to be commercially successful and the role DVB can play.
- Primary interest is entertainment, informational, and educational content
- 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.

The VR quality of experience

- A wide variety of VR experiences are being developed and technology is evolving
- Important parameters include frame rate, field of view, resolution. Head tracking latency, and information overlay.
- Three type of content: 2D fixed viewpoint 3DOF, 3D fixed viewpoint 3DOF, 3D free viewpoint 6DOF.

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?



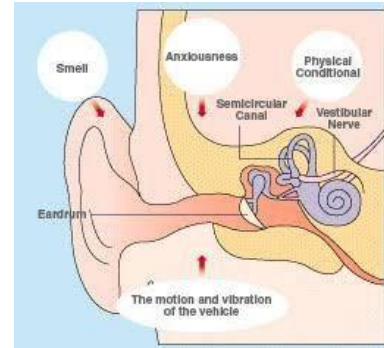
The three key questions...

- 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?



Some factors affecting 'Sensory Sickness'

- Flicker of the displayed view
- Refresh Rate
- Display width
- **System latency**
- 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



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.

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 DVB 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

What should VR be, for commercial success?

- What 'user experience'?
- What technical image and sound quality?
- How compatibility with HDTV and UHD TV?
- How compatibility with NGA (Next Generation Audio)?



What would the CRs include?

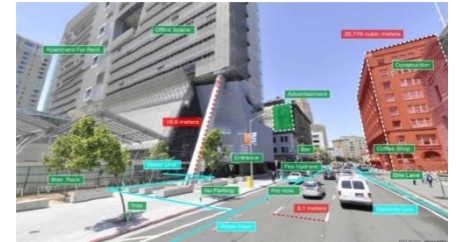
- **Frame Rates.** Maybe 50-90 Hz to avoid juddering, blurring, flickering etc?
- **Delivery bit rates.** Type A might be 10-12 Mbit/s
- **Horizontal Field of View.** Maybe at least 100 degrees?
- **Resolution.** 10-15 sub pixels per degree, 2K by 1K?, 4K by 2K?
- **Geometrical congruency** between source 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.**

Conclusions on VR

- The main commercial driver for Type 2 VR will probably come from gaming, and for Type 1 VR from immersive sports and music events.
- DVB should consider developing requirements for a Type A delivery system drawing on the work of the standards bodies.
- We should try to work together to ensure common specifications for stream delivery of VR content – maybe a ‘VR standards alliance’
- VR Audio can draw on NGA but may need additional work
- DVB needs to check the level of member commitment to use such a system before commencing work.

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?





Thank you for listening.

David Wood
wood@ebu.ch