SMPTE

Study Group
On
UHDTV Ecosystem

Background

- ## UHDTV is becoming real
  - Natural evolution of TV (more immersive)
  - CE Revenue increase thru premium TV sets
  - CES introduced some 20 UHDTV TV sets
  - TV Revenue increase thru premium content outlets

- ## Mile Stones
  - ITU published ITU-R BT 2020 (Rec 2020)
  - South Korea experimental UHDTV broadcast
  - Netflix announced UHDTV streaming by 2015
  - NHK/BBC 8K Olympics Demo (8K OTA in 2020)

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- Standards Activities
  - ITU-R BT 2020 published in 2012 (Rec 2020)
  - Revision of ST2036 to harmonize with Rec 2020

- SMPTE SG established in 2012
  - Look at implementation of ST2036
  - Bi-weekly meetings (12 Web and F2F so far)
  - 97 members (attendance avg. 20 people)
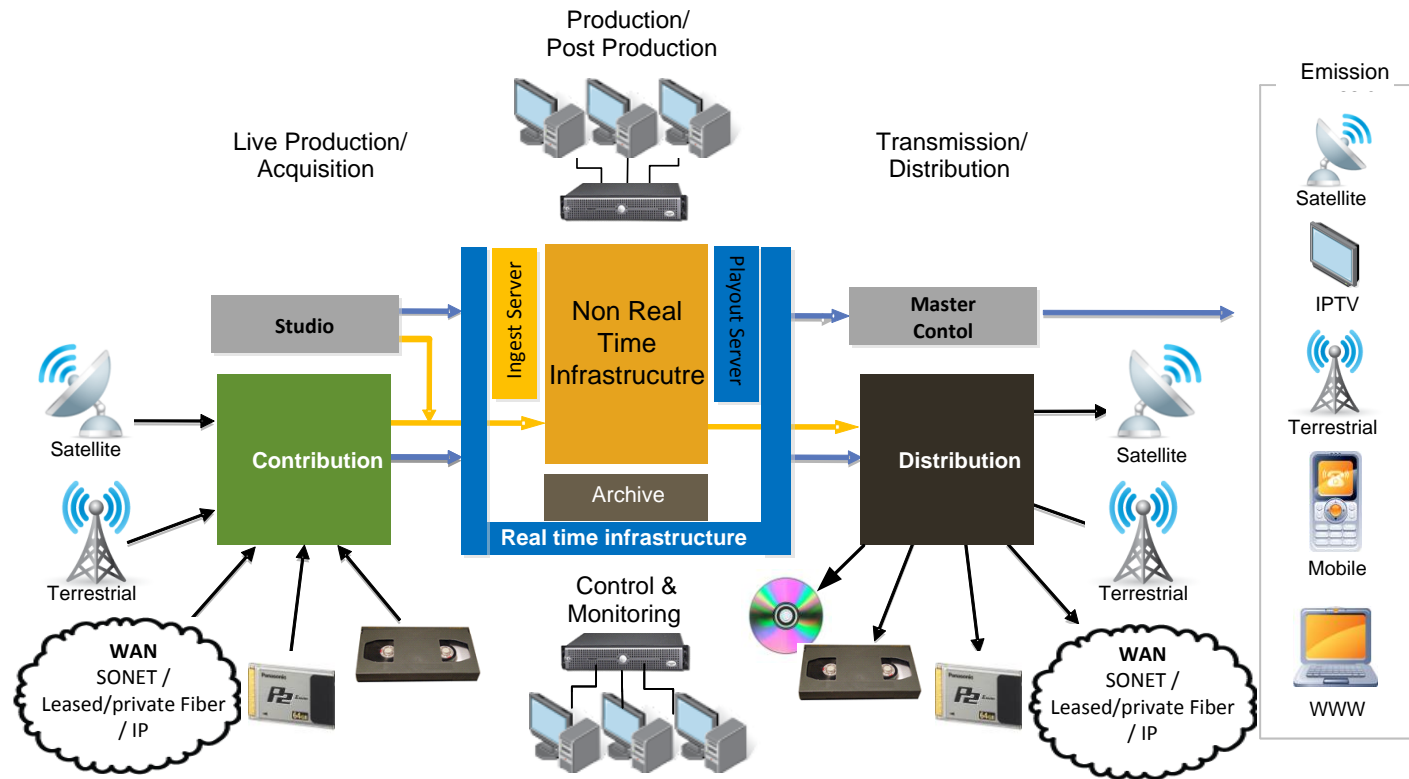 - Create report, use cases and glossary

This is an ongoing effort!

Study Group (SG)

- SMPTE SG on UHDTV Ecosystem
  - Define an UHDTV Ecosystem chart
  - What standards are missing, need revision
  - Clarify nomenclature and create glossary
  - Look at near future UHDTV issues

- Focus
  - UHDTV-1 (3840x2160) with up to 120fps
  - DCI and 4K (4096x2160) out of scope
  - Real-Time and Non-Real-Time infrastructure

UHDTV Ecosystem

- Similar or equal to HD Ecosystem!
- So what's different?

Discussion Topics

- **Frame Rate**
  - Current consumer interface 30fps (60fps)
  - UHDTV needs higher frame
    - Flicker and motion smear more obvious
  - Current standards support up to 120fps
  - Perfect motion portrayal at 300fps (!?)

- **Color Space**
  - New color space/primaries (Rec 2020)
  - Supports legacy Rec 709 HD primaries
  - Color space conversion might be tricky
  - Constance Luminance support (not in ST2036)

Discussion Topics

- **Real Time Interface**
  - Bandwidth increase requires multi link SDI
    - 2160p 60 (10bit 4:2:2) = 12Gbps (4x SDI
    - 2160p 120 (10bit 4:2:2) = 24Gbps (8x SDI)
    - 2160p 120 (12bit 4:4:4) = 48Gbps (16x SDI)
  - SMPTE Multi-Link effort
    - ST452-5: Multi Link 3G
    - ST2036-3: Single/Mulit-Link 10G
    - ST2062-1: Single-Link 25G
  - UHDTV in facility needs single wire interface
  - Move to video over IP or Ethernet (ST2022)?
  - Joint Task Force on Networked Media

Discussion Topics

- ## Mezzanine Compression
  - Enable UHDTV on existing HD infrastructure
  - SMPTE VC2 (Dirac), maybe VC5 (Cineform)?
  - RT interface needs mapping to SDI or IP
  - Others might be JPEG2000, AVC (HEVC?)
  - What compression ratio is needed (3-20x)
  - Low delay and multi-generation capable

- ## Others
  - 3D UHDTV (application of UHDTV)
  - Audio formats not discussed in depth

Resolve Legacy Issues

- Fractional Frame Rates (1000/1001)
  - Switch to integer frame rates for UHDTV
  - Could be costly due to conversion

- Non-Constant Luminance
  - NCL introduces errors in encode/decode
  - Are this errors visible and to what degree
  - Implementation of CL costly (maybe not?)

- Synchronization
  - Abandon Color Black synchronization
  - Utilize new forms of synchronization (33TS?)

The End