IP SHOWCASE THEATRE

CURATED BY VSF VIDEO SERVICES FORUM

BBC Wales Cardiff Central Square Project Update

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BBC cymru wales

IP SHOWCASE THEATRE AT IBC – SEPT. 14-18, 2018

IP SHOWCASE THEATRE

About BBC Wales

BBC cymru wales

S4C

- Content production in Welsh and English across all platforms
- TV for BBC1 / BBC2 / S4C including co-productions with network
- BBC Radio Wales, BBC Radio Cymru & Network radio
- Online/mobile: e.g. BBC News, BBC Sport, BBC iPlayer, Cymru Fyw
- BBC National Orchestra of Wales
- Production facilities – supporting all network and local programming and services
- Largest BBC newsroom outside of London
- Drama production at Roath Lock – the BBC's largest drama studio site

Why Is BBC Wales Moving

- Technology at the current site in Llandaff is dated and needs a complete refresh
- The buildings and office spaces are poorly configured
- Many options were investigated (including refurbishment) - relocation the best option
- Moving to a more efficient and effective building
- City centre location will allow new opportunities to engage with our audience
- Catalyst for major regeneration of the city centre, independent estimates show it will add more than £1bn economic value over the next decade

The Site

- In the centre of Cardiff, regenerating the heart of the city
- Adjacent to Central Railway Station & new bus station
- Close to the Principality Stadium

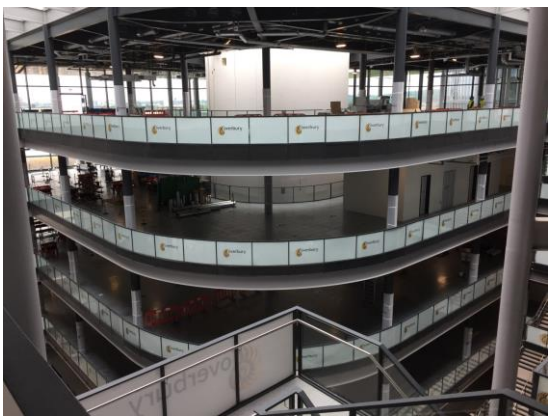
Project Facts and Figures

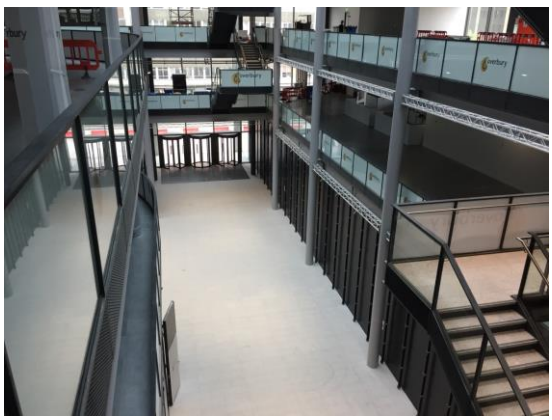
- Building Size: 150,000ft2 (~14,700m2, 72x72x33m)
- Studio Height 6.3m or 5.5m, Office Floor Height 3.5m
- 1x large general purpose studio with AR (230m2, 8 cameras)
- 1x flexible production area (168 m2, lit and gallery controlled)
- 1x VR/AR news studio (168m2, 3 cameras)
- 1x bulletin/social media studio (45m2, 2 cameras)
- 22x edit suites
- 3x dubbing suites with associated VO booths
- 2x tracklaying suites
- 4x multi purpose suites (audio & TV)
- 6x flexible media areas
- 4x news edits with VO booth
- Numerous live to air radio studios/workshops (incl. band area)
- 10x audio editing booths
- 1x operational support area with viewing rooms

How It Will Look…

And How It Looks Now…

Atrium & Interior

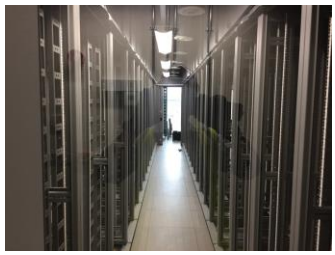




Garden Space

Studio Spaces

Apparatus Rooms



Opportunities

- New technology to support production and creativity
- New ways of working – open plan, collaborative, agile
- Flexible production spaces
- Audience engagement

Challenges

- New technology will require new skills to be learnt
- Change can be difficult - whether it is people moving offices or introducing new technology, and we're doing both at the same time!
- Personal changes for staff (reduced car parking, agile working etc.)
- Balancing public access with security in a City Centre environment

Live IP – Top Benefits

- **Future proofing**, in particular the ability to adopt new formats
- **Flexibility**, supports new ways of working with more dynamic assignment of resources. Allows facilities to be scaled up more easily
- Will be the **industry standard** in roughly the same timescale as Central Square
- Will eventually be the lowest cost model due to adoption of **COTS** hardware and ability to move broadcast functions onto a more generic **platform** with a **distributed** routing core

Live IP - Top Risks

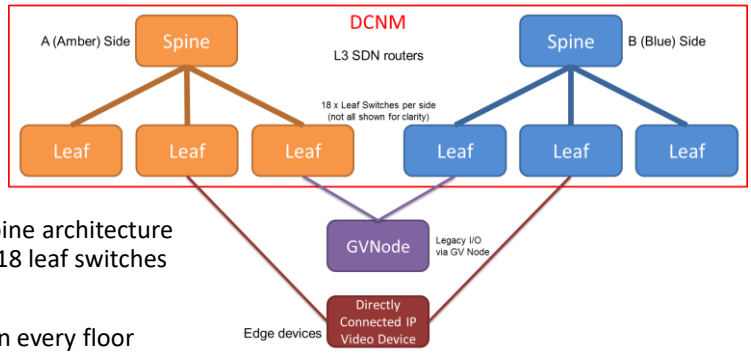
- Interoperability still not proven standards are very new
- There is an obvious Cybersecurity risk
- New skills are required to deliver and support Live IP. There is a possibility of change saturation and also an overspend on training
- More resources may be required to support delivery of Live IP than planned (this includes resources and capabilities of Systems Integrators)
- Refresh cycles are much faster and don't align well with traditional capital plans

Live IP Progress

- Main contract awarded to Grass Valley
- Control network topology designed and procured
- Control methodology for integration with BNCS agreed
- Control virtualisation confirmed
- ST2110 media network topology agreed
- Familiarisation System built and used for testing and training
- Specialist training underway
- 4 rounds of intensive formal testing completed
- Core I/O topology agreed although this is still evolving to fit the wider design

ST2110 Media Topology

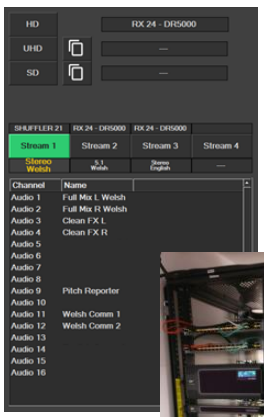
- There are 2 separate (A/B) media networksfor IP video and audio flows
- There is another separate control network
- The media networks will use a leaf-spine architecture with 1 spine switch (Cisco 9508) and 18 leaf switches (Cisco 9236) per side
- There will be a pair of leaf switches on every floor
- The media networks will be fibre based running at up to 100Gbps
- Network will be controlled using Cisco DCNM (a form of SDN)
- There will be no direct connection to the BBC's business networks

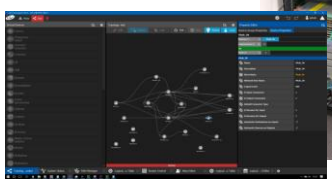


Control Methodology

- Separate & secured control network
- BNCS control interface to GV Convergent using NP0017
- GV Convergent controls the network fabric via Cisco DCNM
- GV Convergent connects edge devices via GVC API
- Intention is to integrate NMOS IS-04 and IS-05

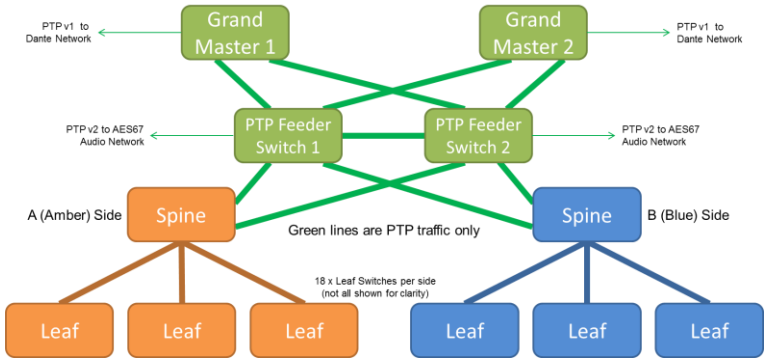
Vendors are adopting different approaches regarding in-band or out-of-band control and this is causing complications, especially where NMOS control traffic is on an interface also used for other traffic





PTP Timing

- Getting the PTP design correct is difficult!
- 2 separate Meinberg master clocks with GPS and GLONASS antennas
- Each master clock has multiple PTP v2 outputs connected to feeder switches
- The feeder switches connect to the spine switches
- All switches operate as boundary clocks
- Separate PTP v1 feeds are used for the Dante network
- *PTP is expensive to implement!*



Lessons Learned From Testing

- New skills and new test equipment are required which are not always available
- A formalised approach using IT techniques (in our case TestRail) is essential to manage regression testing and to track progress between test runs
- Large ST2110 systems are very complex to find faults in & it's very easy to get stuck trying to fix issues
- Manual setup is required because configuration tools are immature
- Configuration errors can be missed by vendors which cause key tests to fail
- The testing approach can unexpectedly break the system under test
- Testing takes much longer than expected, timelines based on legacy planning need extending
- Involvement from the Systems Integrator is essential
- ST2110 still has some way to go before it is anywhere near 'plug and play'

Training

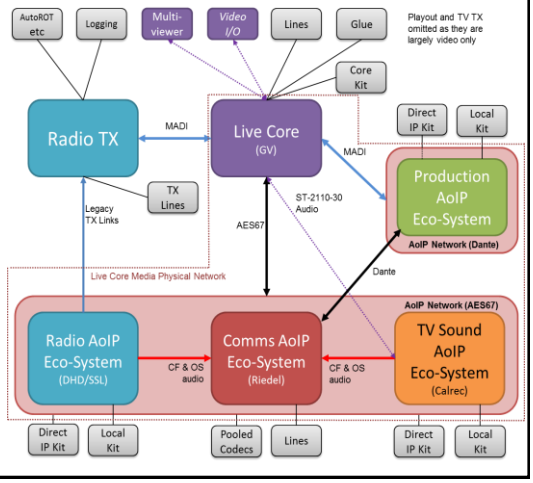
- The biggest impact is on support and engineering staff.
- Operational staff will not see a lot of differences because the BNCS user interface will remain the same
- Our 'Familiarisation System' has already been used for advanced training
- We are working with suppliers and the BBC Academy to deliver training including:
  - Network Fundamentals
  - TCP IP Networking
  - Network Technologies for Broadcast
  - Cisco including DCNM
  - GV including GV Convergent, iControl and GV Nodes
  - Fibre Optics
  - Information Security

What's Keeping Us Awake?

- ST2110 equipment is still hard to obtain
- Very little test equipment is available
- New tools are required to monitor the system
- ST2110 interop is worryingly limited, nothing works together without significant effort
- There are too many options in ST2110 and this hinders interop
- We're working with Grass Valley to address some concerns with the GV Nodes
- NMOS implementations are not yet widely available but are essential to make ST2110 work
- Configuration tools are immature and too much manual setup is required
- Control from BNCS still depends on legacy protocols
- Audio interop is a particular problem

Audio Issues

- ST2110-30 and AES67 are almost compatible but there are differences.
- There are a lot of different profiles and details that hinder interoperability (16 channel C 125µs, 1-8 channel A 1ms)
- Video vendors are adopting NMOS control but Radio vendors already have LiveWire, Dante & EMBER+
- Our media network is dual presented via 2022-7 but a lot of audio kit uses a different resilience model
- We also have to deal with Dante for much of our post production audio. Dante needs a different PTP profile
- We are building two separate audio networks for AES67 and Dante, bridged to the Live Core ST-2110 networks



ST-2110 & NMOS Interop

dB Broadcast are testing candidate equipment

Product availability is constraining end-to-end ST-2110 use:

- Vision mixer I/O
- Studio cameras
- Waveform Monitors & AMUs
- Back of Monitor connections
- Multiviewers (integrated within Grass Valley Nodes)
- Graphics
- Media Production edit machines to edit suite monitoring – format flexibility and UHD capabilities required.

Thoughts On ST-2110 Readiness

- ST2110 promises to be the 'go to' IP standard for broadcast signals but it's still got some way to go before it is a simple and universal proposition
- Vendors need to work on configuration & management tools to provide 'plug and play' functionality
- NMOS integration is key to enabling systems to function together but it isn't widely available yet
- There needs to be a confident leap from the R&D labs to available product
- The more projects that specify and install ST2110 equipment the sooner all this will happen

The IABM IP Showcase is a clear demonstration that ST2110 works!

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Thank You

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