

The Ultra High Definition View

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Centre for Advanced Software Technology Limited

Contents

- What is UHD?
- Technology
- Experience at Technium CAST
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What and Why?

What is UHD?

- Resolution & Colour Depth (& Audio)
- Expensive
- UHD is ?
 - 4K
 - Digital Cinema is 4096x2160
 - 8K
 - Super Hi-Vision
 - NHK Experimental
- We'll say $\geq 4K = \text{UHD}$

NTSC DVD (720 x 480)

HDTV 720p (1280 x 720)

HDTV 1080p (1920 x 1080)

Digital Cinema - 2K (2048 x 1080)

Digital Cinema - 4K (4096 x 2160)

RED Digital Cinema - 2540p (4520x 2540p)

Super Hi-Vision / Ultra High Definition Video (7680 x 4320)

Lots of Data

Format	Size	Colour Depth	Frame Rate	Frame Size	Stream Rate
1080p	1920x1080	24	30	6.2MB	1.5Gb/S
2k	2048x1080	24	24	10MB	1.2Gb/S
SHD	3840x2160	36	30	25MB	6Gb/S
4K	4096x2160	36	24	40MB	7.6Gb/S
8K	7680x4320	36	24	150MB	36Gb/S

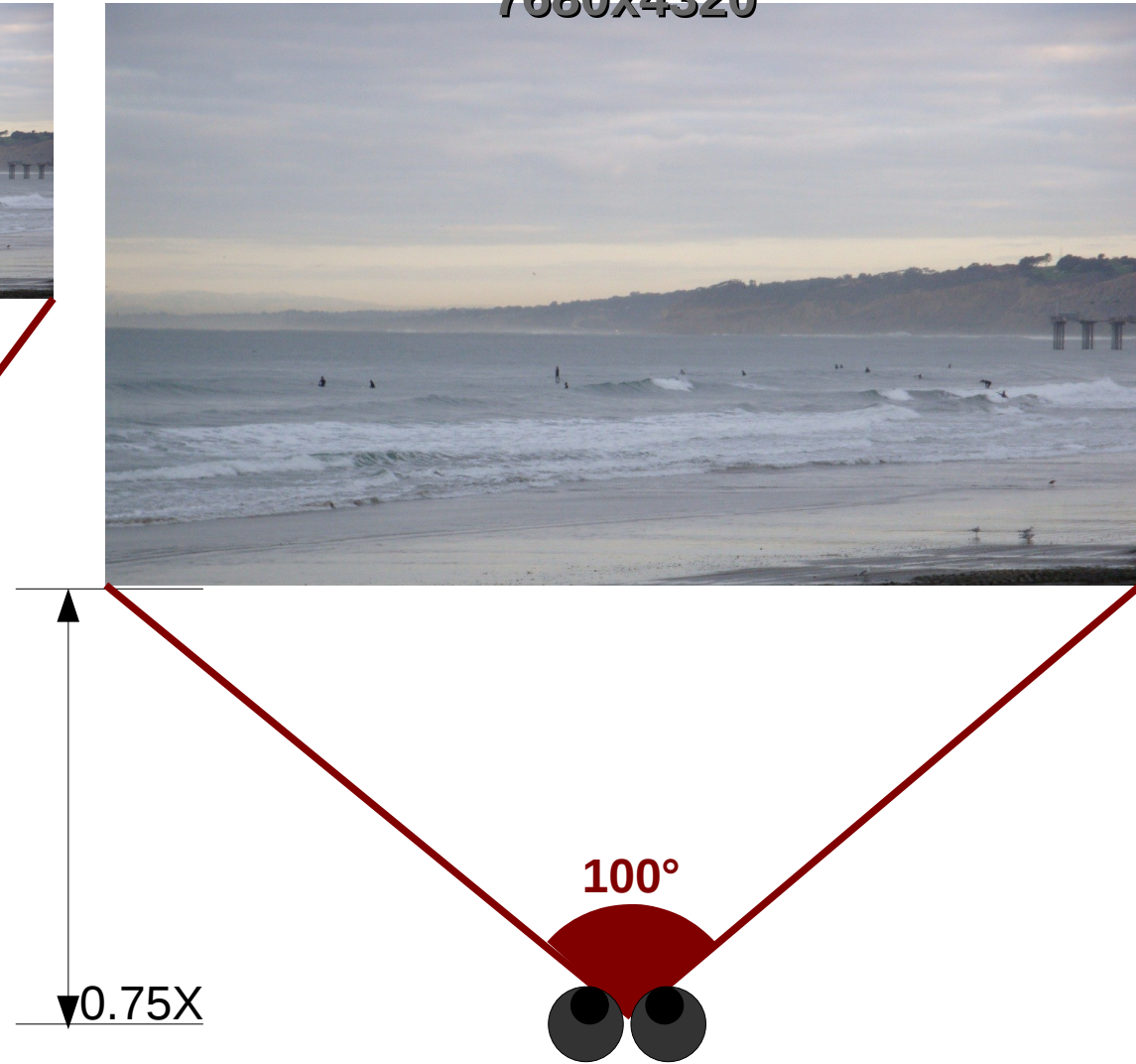
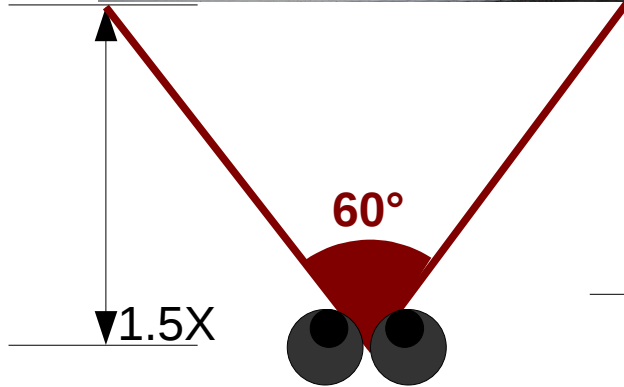
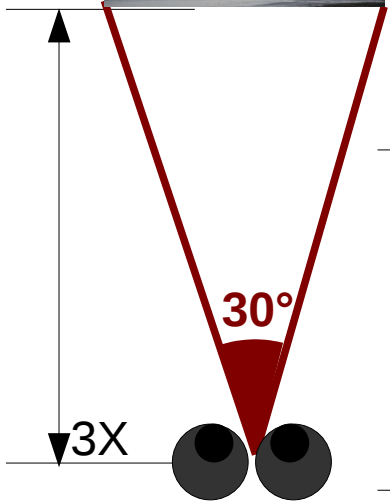
RAW image data rates, no overhead, no sound.

Why UHD?

2K
1920x1080

4K
3840x2160

8K
7680x4320



- Closer Viewing of Larger Images
 - Increased viewing angle
 - More involvement & emotional engagement

Super Hi-Vision

- 33 megapixels (7680 x 4320 pixels)
- 10 bit colour
- 60 frame/second sequential scanning
- 22.2 multichannel sound

- NHK Experimental

Technology

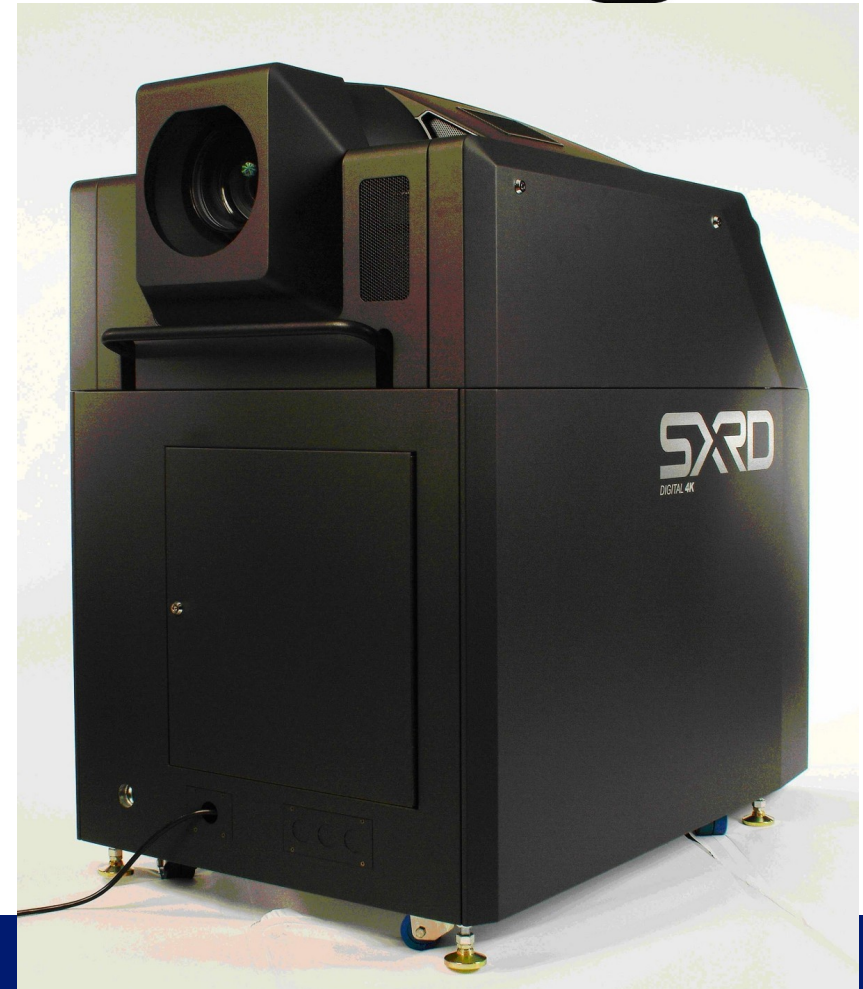
Technology

- Cameras
 - RED
 - JVC
 - Arri
- Complications
 - Setup time
 - Size, distance from storage



Technology

- Projectors



Technology

- Codecs
 - JPEG2000 is the standard
 - NTT (Japan)
 - IntoPIX (Belgium)
 - Not currently compatible with each other
- JPEG2000 compressed 4K image
 - 250-750Mb/S
 - Essex <-> Poznan

Technology

- Playback
 - Doremi DSV-J2
- Storage
 - Sun X4540 Thumpers
- Smaller Screens
 - Astro 3400 56" LCD



Experience @ CAST

Technium CAST

- Technium is a Welsh Assembly Government initiative
 - Creating a sustainable engine for economic development in Wales
- Technium CAST
 - ~£11m - Completed August 2005, 6500 sq m High-Tech Space
 - Startup Incubation, 'Software Hotel', Conference/Events Facilities
 - Visualization Facilities
- CAST Limited
 - Wholly-owned by Bangor University
 - Business development & assistance for incubated companies
 - Fairness Testing
 - Visualization

Projection

- Sony SRX S-105
 - Early in production
 - 4 DVI feeds
 - In-built scaling
- Issues
 - No EDID
 - Firmware
 - Colour Balance
 - Refurbishment

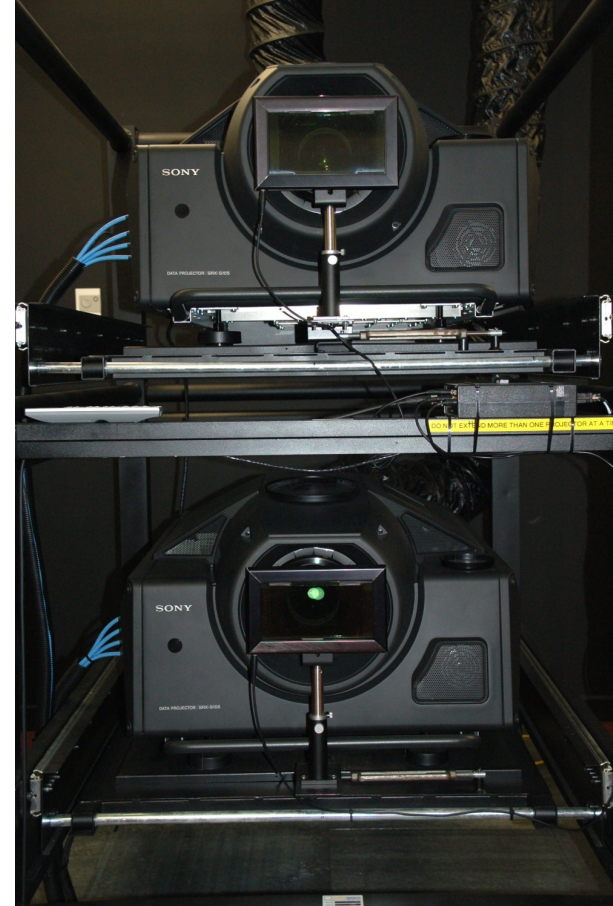
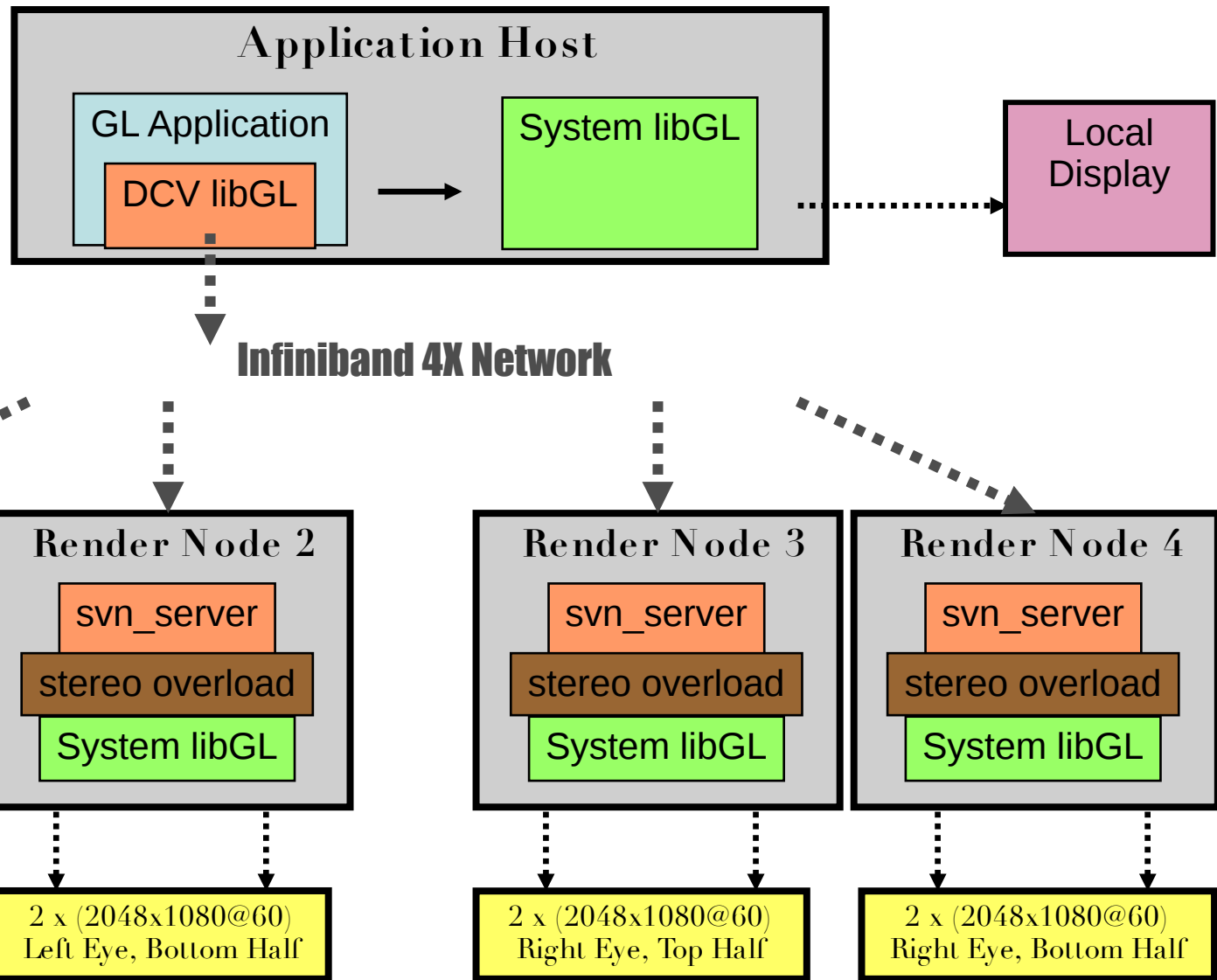


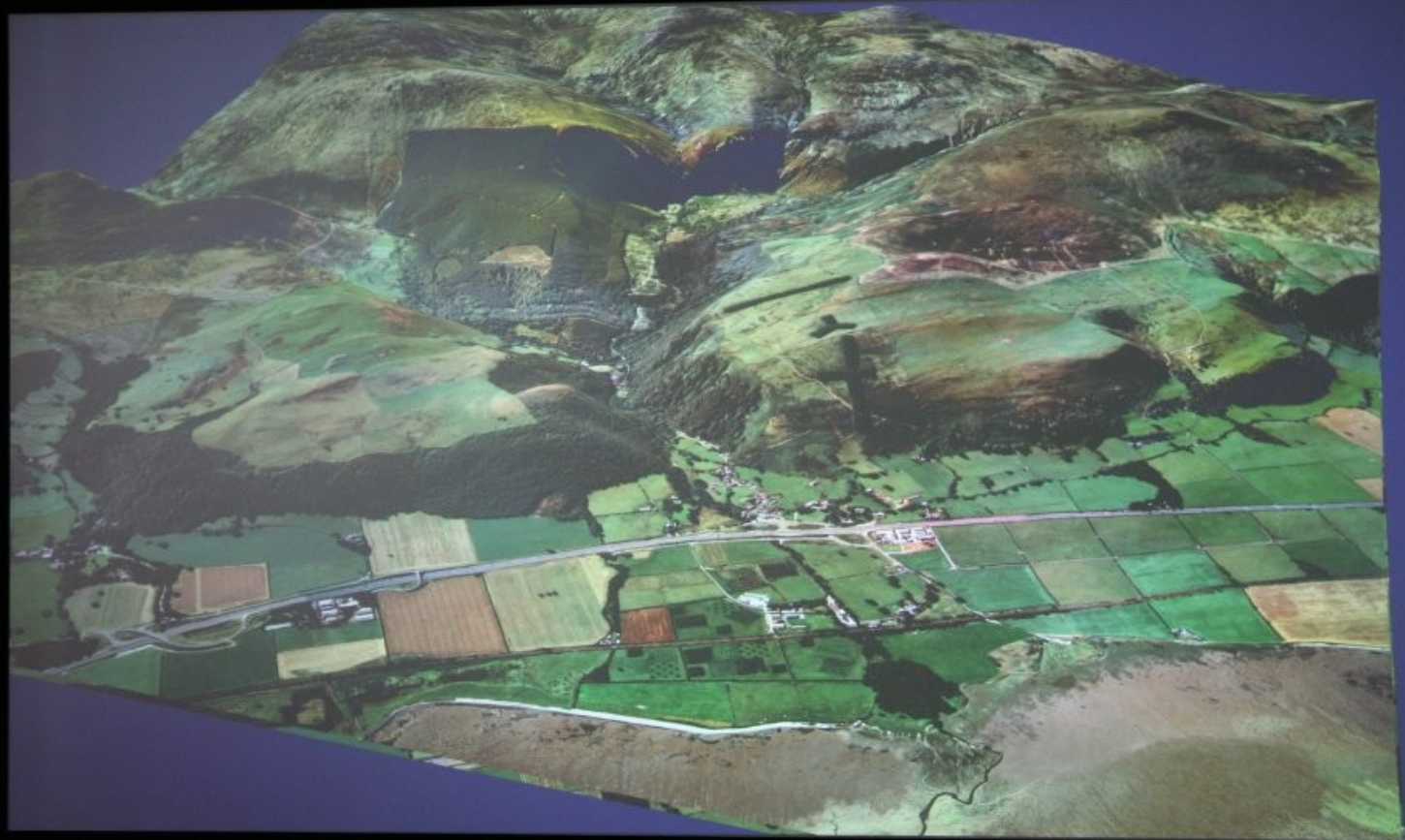
Image Generation

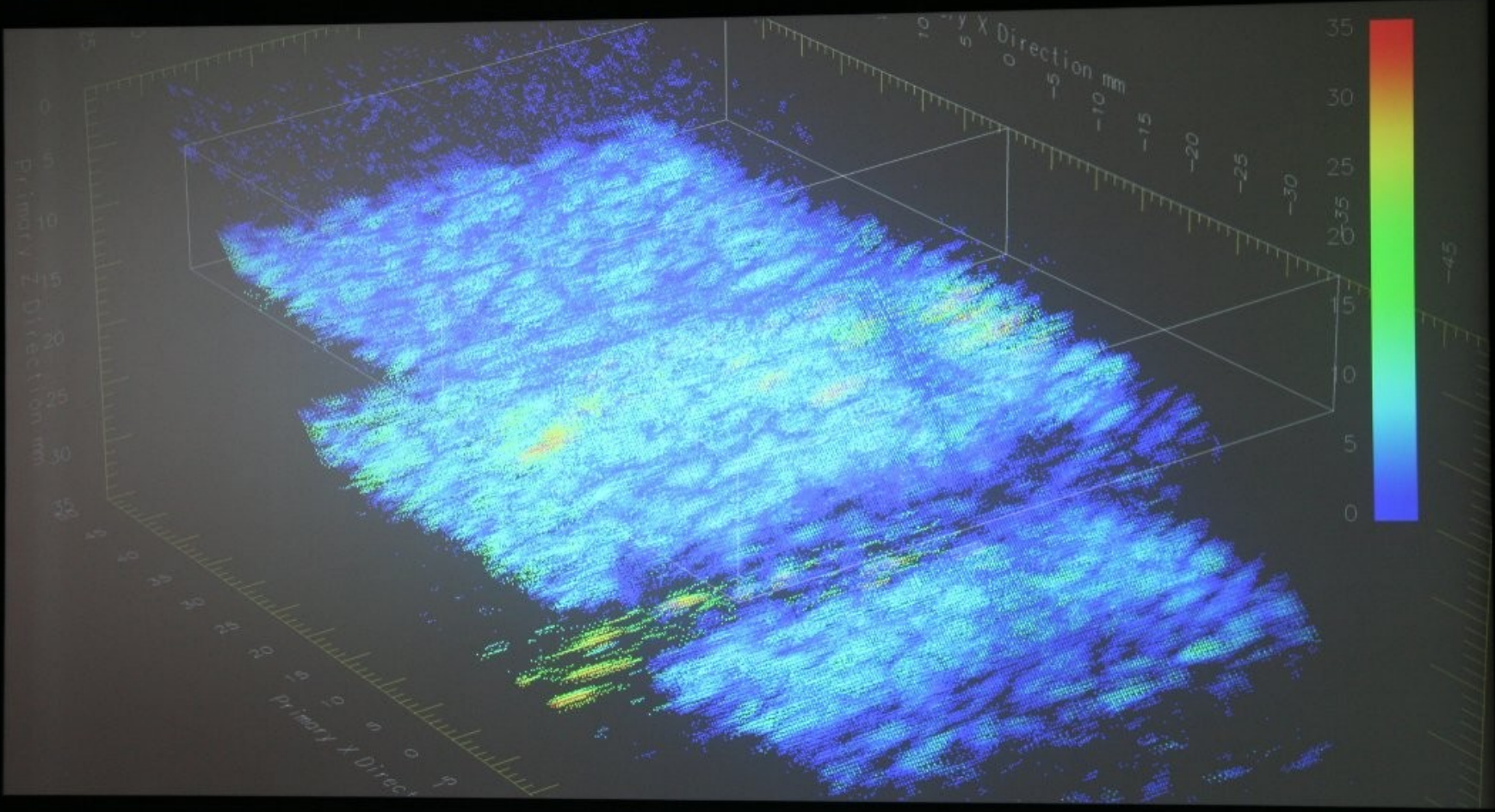
- Linux Graphics Cluster
 - 5 machines via Infiniband
 - nVidia Quadro FX4500 & G-Sync
 - 4K Stereo
 - Sync Issues
- IBM DCV
 - Cluster(SVN) & Remote (RVN) Graphics
 - Active feedback to developers
 - Bug fixing
 - Now pretty good



SVN
4K Stereo







CineGrid

CineGrid

CineGrid is a non-profit international membership organization administratively based in California.

CineGrid's mission is to build an interdisciplinary community focused on the research, development and demonstration of networked collaborative tools, enabling the production, use and exchange of very high-quality digital media over high-speed photonic networks.

“Learning by Doing”

CineGrid



Founders

Members



CineGrid Exchange


- Need to store and distribute media assets
 - Members need for demonstration & experimentation
 - Open source asset control and access
 - The 'Grid' in 'CineGrid'
- iRODS
 - A rule oriented data management system
 - Flexible and adaptive approach
 - Rules to explicitly control system specialization

CineGrid Exchange

- Phase One, 2008-2009
 - Extend iRODS to handle appropriate media metadata
 - Multi gigabit networks
 - San Diego, Amsterdam, Tokyo – 2008
 - Toronto, Prague, Chicago – 2009
- Phase 2 – 2010
 - Automated format transcoding
 - To open formats
 - Including to low-res preview variants
 - Improved integrity checking
 - Policy handling for addition & deletion of assets

UHD Live

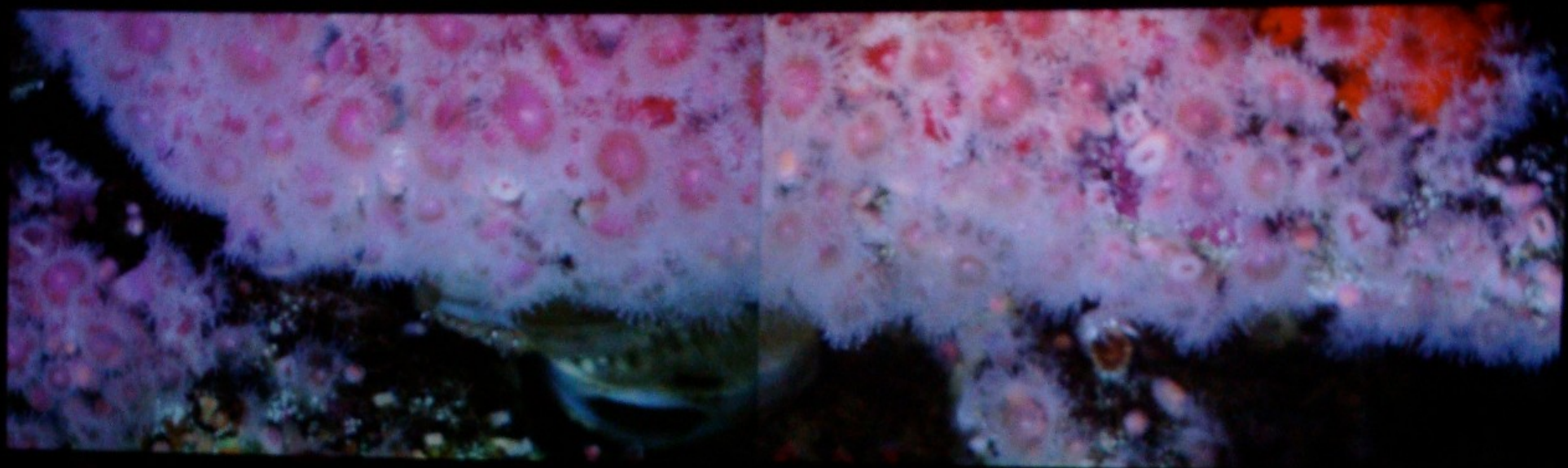
- 2009 Eclipse
 - In-bound
 - Uncompressed 2K from China
 - Compressed 4K, 2K from Amami Island
 - 3 x uncompressed 2K from NTT @ Iou Island
 - Out-bound
 - 4K dome projections
 - 4K uncompressed
 - 2K uncompressed
 - Polycom HD video conference
 - TV broadcast

A photograph capturing a total solar eclipse. The sun is completely obscured by the dark, silhouetted disk of the moon, which is centered in the upper half of the frame. The sky is filled with wispy, grey clouds, and the overall scene is dimly lit, characteristic of a total eclipse. The text is overlaid in the bottom right corner.

奄美大島 2009年7月22日
Total eclipse of the sun, Amami Oshima
July 22, 2009

UHD Live

- Monterey Bay Aquarium
 - 2 JVC 4K prototype cameras
 - 2 NTT JPEG2000 codecs
 - New ability to synchronise developed by NTT
- Result
 - 2 live, synchronized 4K compressed streams



Film Production

- Modern Movie Production
 - Immense process
 - Highly distributed
 - Edit, VFX, CGI, Sound, Colour
 - Huge demands on Director
 - Need cinema-levels of fidelity to judge accurately
 - Ever shorter deadlines
 - Less post-production time for increased effects work
 - Time to distribute

Movie Edit



Skywalker via Lifesize HD



AVID Media Composer



ProTools



Local Calibrated Desk





Director of Photography

Live 4K from Czech

Recolourist via Lifesize HD

Also...

- Opera
- R Rated UHD
- Digital Media Preservation
 - Bits & bytes degrade
- Artistic Interpretation
- Distributed Music Making & Teaching
- Colour Sync on Different Display Technology
 - Is it supposed to look like that?

Future

Present & Future

- Cinemas
 - Mostly 2K (now)
 - Two major US chains going Sony 4K
 - With RealD single-projector 3D solution
- Industry
 - Car makers, etc
- Technology matured
 - Large push
 - Non 4K manufacturers playing catch-up

Challenges

- Cross-platform compatibility
 - End-to-end workflow
- Cost
 - Demonstrate the value added?
- Network
 - Bandwidth/wavelength availability

-fin-

Questions?

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