

UltraGrid 1.1 and Future Plans

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UltraGrid Platform

- Technology
 - affordable platform for high-quality interactive image transmissions
 - use of commodity hardware
 - ◆ Linux PC and Mac platforms
 - ◆ commodity video capture cards
 - ◆ commodity GPU cards
 - ◆ 10GE is a plus but not necessary
 - as low latency as possible on commodity hardware
 - open-source software
- Applications
 - medicine
 - cinematography
 - education



UltraGrid Platform

Mac Pro

Mac Pro

10GbE

Kona 3

Kona 3

dual-link HD-SDI

dual-link HD-SDI



BaseLight Four



SONY SXR4 4K



UltraGrid Platform

- Available inputs
 - HD-SDI, SDI
 - HDMI
 - component/composite HD and SD
 - screen capture
- Available outputs
 - HD-SDI, SDI
 - HDMI (including stereoscopic HDMI 1.4a)
 - component/composite HD and SD
 - computer screen (VGA, DVI, HDMI via OpenGL/SDL)
 - SAGE
 - specialized display filters



UltraGrid Platform

Line-interlaced stereoscopic video



UltraGrid Platform

SAGE display with various compressions



Features as of UltraGrid 1.1

- Video support
 - HD/2K video support (4:2:2, 4:4:4)
 - tiled SuperHD video support (with Linsys Quad/i and DeckLink Quad)
 - native SuperHD/4K (with Kona 3G)
 - stereoscopic video support
- Audio support
 - full audio support: ALSA, CoreAudio, PortAudio, Jack, audio embedded in HD-SDI
 - multi-channel audio
 - support for mono-audio (e.g., echo-canceling mics)
- Full-duplex operation (both sender & receiver)
- Embedded UDP/RTP packet reflector



Features as of UltraGrid 1.1

- Available compressions
 - DXT1: CPU-based
 - DXT1, DXT5: OpenGL Shader Language (GLSL) based
 - JPEG: NVidia CUDA based
- Forward error correction (FEC)
 - shifted multiplication
 - Low Density Generation Matrix (LDGM)
- GUI
 - with persistent parameter storage
 - works both on Linux and Mac



1.1-RC to 1.1-RELEASE Updates

- Audio features
 - channel mixer/spitter
 - volume adjuster
 - software acoustic echo canceller (mono)
- Improved IPv6 and multicast support
 - support for IPv6 zone ID (RFC 4007)
 - multicast interface selection
- LDGM – profiles
 - `uv ... -f LDGM:<max_loss>% ...`



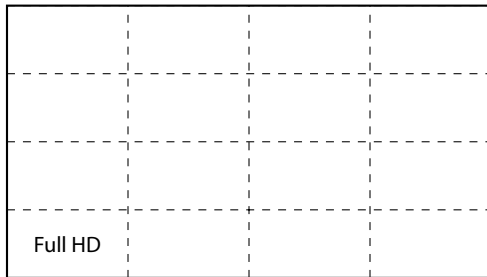
Post-1.1 Features

- File I/O
 - storing of received streams
 - playback from files
- High-performance screen capture for dummy X server
 - 32 fps for SuperHD/4K desktop
 - can be used even for local playback over 4× HD-SDI/3G-SDI/HDMI
 - with or without cursor
- DXT compression in CUDA
- Interlacing processor (50p → 50i)
- Performance optimizations
- Improved structure of wiki-based docs



Post-1.1 Features

8K video support (GLIF 8.-11.10.2012)



GPU-Based Compressions

Making High-Quality Affordable!

- Updated compression performance numbers (including transfer from GPU)
 - DXT1 GLSL: 798 Mpix/s (NVidia 580GTX), 593 Mpix/s (ATI 6990)
 - DXT5 GLSL: 349 Mpix/s (NVidia 580GTX), 305 Mpix/s (ATI 6990)
 - JPEG CUDA: up to 1.580 Mpix/s = 4.740 MB/s (NVidia 580GTX, 4:4:4)



GPU-Based Compressions Making High-Quality Affordable!

uncompressed

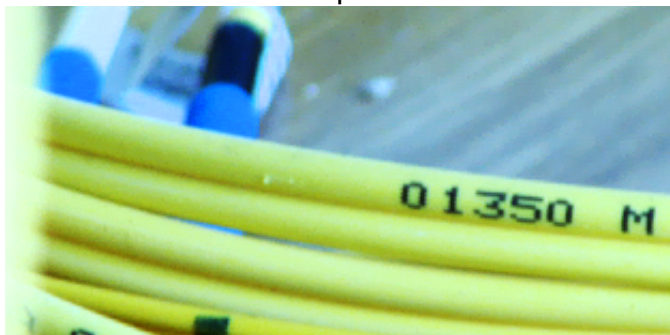


(full size vs. the crop)



GPU-Based Compressions Making High-Quality Affordable!

uncompressed



(enlarged crop)

GPU-Based Compressions Making High-Quality Affordable!

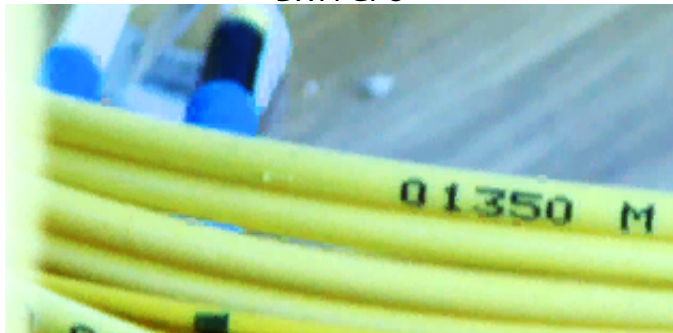
DXT1 CPU (FastDXT)



(enlarged crop)

GPU-Based Compressions Making High-Quality Affordable!

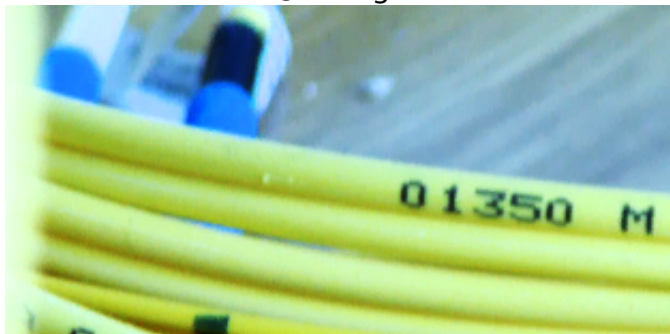
DXT1 GPU



(enlarged crop)

GPU-Based Compressions Making High-Quality Affordable!

DXT5 YCoCg GPU



(enlarged crop)

GPU-Based Compressions Making High-Quality Affordable!

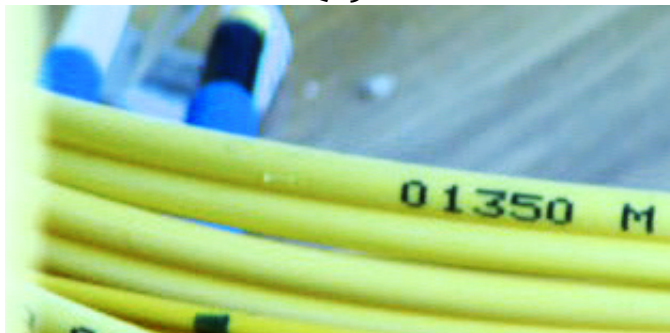
uncompressed (again)



(enlarged crop)

GPU-Based Compressions Making High-Quality Affordable!

JPEG Q=90 GPU



(enlarged crop)

GPU-Based Compressions Making High-Quality Affordable!

uncompressed (again)



(enlarged crop)

Latency Measurements

- Uncompressed
 - 2.5 frames (83 ms, DeckLink HD → DeltaCast 3G)
- Impact of compressions
 - 2.5 frames (+<16.7 ms) for JPEG
 - 3.5 frames (+33.3 ms) for DXT1/5



ABX tests

- Summary of ABX test results:
 - JPEG Q=90: undistinguishable for all the persons in test
 - JPEG Q=70: undistinguishable for some the persons in test
 - DXT5: undistinguishable for most the persons in test
 - DXT1: distinguishable for most the persons in test

Medical Applications

XX. Anniversary Congress of Czech Cardiology Society



Plans Until End of 2012

- Multi-receiver
 - aka iHDTV tiled mode, but more flexible (scalable tiled screen, more full-size windows)
 - with reflectors/without multicast
- Joint release with CoUniverse
 - support for automatic setup of multi-point distribution trees
 - automatic allocation of on-demand networks (e.g., Internet2 ION or NSI-enabled nets)
- Port to Microsoft Windows platform (may slip to early 2013)



Further Plans

- GColl functionality
 - advanced multi-point setup for group-to-group collaboration
- Recompression in a distribution tree (on reflectors)
- AES encryption
- Video-mixing capabilities
- More complex FEC codes
- Other low-latency compression schemes
 - e.g., low-latency mode of H.264
- Pipeline to ffmpeg and/or GStreamer
- Let us know if you need something else



How to get it

- Source and binary distributions
- Linux & MacOS X
- BSD-licensed software
- Available from
<http://ultragrid.sitola.cz/>
- UltraGrid is now also part of SAGE toolkit
<http://www.sagecommons.org/>



Thank you for your attention!

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