VID25 TRANS

JPEG XS in Media Live Production Sharing Practical Experiences Beyond Greenwashing

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Let's Level Set: What is Greenwashing?

- Greenwashing is when a company or organization exaggerates or falsely claims to be environmentally friendly to improve its public image while continuing practices that harm the environment
- ► This can include:
 - misleading advertising,
 - vague or
 - > unverified sustainability claims, and
 - > superficial environmental initiatives that don't lead to real change.

The goal is often to attract eco-conscious consumers without making meaningful efforts to reduce environmental impact.



Sustainability Goals

- The United Nations Sustainable Development Goals (SDGs) emphasize reducing environmental impact.
- Focus areas: carbon footprint, energy efficiency, waste reduction, and sustainable resources.
- > Media industry's role: adopting green practices, reducing emissions, and promoting awareness.
 - > Many new practices can also involve costs reduction, both on fixed and operational costs
 - > Green practices does not have to mean more expensive



Sustainability in Live TV Production Today

- Reducing Carbon Footprint: Using renewable energy, LED lighting, and energy-efficient equipment to reduce the amount of power used in media.
- **Remote Production**: Fewer travel needs, reducing emissions.
- > Sustainable Set Design: Reusing materials and minimizing waste. Leveraging LED walls to create virtual sets.
- Eco-Friendly Broadcasting, such as cloud-based workflows to centralize tools and resources to cut energy consumption from multiple sites with dedicated equipment at each site. Flexibility in equipment to support multiple workflows.



JPEG XS Enhancement: Increase Efficiency, Sustainability with Lower Power

GOAL WAS TO CREATE THE MOST ADVANCED STANDARDIZED LIGHTWEIGHT CODEC TO REPLACE UNCOMPRESSED VIDEO

				4	2 2	JPEG xs
VISUALLY LOSSLESS	CONSTANT QUALITY		PLATFORM AGNOSTIC CPU	NO LATENCY MICROSECONDS	WAVELET SCALABILITY MULTI-RESOLUTION Easy Proxy at zero Dr latency	STANDARDS BASED OPEN SPECIFICATIONS & INTEROPERABILITY
		HIGH SPEED HIGLY PARALLELISABLE	GPU FPGA ASIC	Down to 16 lines of latency to encode or decode		



JPEG XS Enhancement: Increase Efficiency, Sustainability with Lower Power



First ISO Compression Standard Designed with Sustainability In Mind: Low complexity, low power consumption, and minimal processing requirements were the primary values to create the JPEG XS algorithm.

Energy-Efficient Processing & Transmission: Uses less computing power and less memory thus reducing carbon footprint to Encode and Decode. Less bandwidth needed reducing the energy throughout the complete broadcast workflow. Proxy capabilities can further decrease the bandwidth needed.

Remote & Cloud-Based Workflows: Supports sustainable media production through more efficient and flexible use of hardware supporting multiple sites at lower bandwidth.

Aligned with the 3Rs (Reduce, Reuse, Recycle):

- > Reduce: Less bandwidth and energy required for high-quality streaming vs uncompressed.
- Reuse: Extends the life of existing infrastructure with the flexibility to enhance capabilities. Upgrading FPGA functionality or deploying new software on existing hardware. J2K to JXS
- Recycle: Supports greener broadcasting workflows with minimal waste and longer life cycles Don't have to replace hardware as often and can enhance existing HW and SW solutions



Some Real-World Applications of JPEG XS in Live TV Production, Highlighting how they align with the principles of Reduce, Reuse, and Recycle



Remote Production with JPEG XS

Real-World Example : In 2024, China Media Group (CMG) utilized JPEG XS compression with a LDX 150 camera during the live broadcast of the "New Archaeological Discoveries at Wuwangdun" program. By integrating JPEG XS with SD-WAN technology, CMG achieved high-quality, low-latency video transmission over public networks (Source: theiabm.org)

- **Reduce**: By enabling efficient remote production, CMG **minimized** the need for extensive **on-site equipment** and personnel, leading to **reduced travel** and associated **carbon emissions**.
- **Reuse**: The **existing public network** infrastructure was leveraged for high-quality broadcasts, showcasing the adaptability of current systems with the new JPEG XS technology.
- Recycle: While the primary focus was on reducing and reusing resources, the approach also promotes the recycling of existing workflows and existing equipment thus enhancing sustainability in live productions.







Centralized Video Assistant Referee(VAR) Systems

- Real-World Example : Slomo.TV with JPEG XS in Video Assistant Referee (VAR) systems has transformed sports broadcasting. By transmitting high-quality, low-latency video feeds from stadiums to centralized VAR centers, officials can make real-time decisions without being physically present at the venue.
 - **Reduce: Centralizing** VAR operations decreases the need for **multiple on-site** setups, **cutting down** on equipment and travel requirements.
 - Reuse: Existing network infrastructures are utilized to transmithigher quality compressed video feeds, maximizing the use of current resources.
 - Recycle: The approach repurposes traditional broadcasting workflows, integrating them with modern technology to enhance efficiency and sustainability.





Nationwide Media Network Upgrade JPEG2000 to JPEG XS for Contribution Applications



- Real-World Example : Vast, expansive country-wide network transitioning to JPEG XS using existing media gateway equipment allows for painless upgrades, enhanced overall broadcast performance, lower power consumption and increased reliability.
- Close to 1000 equipment chassis supporting several thousand activated services at any moment







> Reduce:

- Power Consumption (Average reduction of 20 Watts per 4 port video card across multiple 1000's of cards represents a considerable energy savings
- Codec Latency to virtually undetectable amounts compared to JPEG 2000, giving an uncompressed video experience
- Reuse: Existing infrastructure can be upgraded without major overhauls, and channel counts can be increased 2x on the same HW



> **Recycle**: Existing FPGA's can be **re-flashed / updated** with new firmware

Extending Lifecycle of Existing Hardware:

Up to 10x power reduction with JPEG XS HIGH profile and JPEG XS TDC profile

➢ Ripple Effect

- > JPEG-XS's low latency & **bandwidth efficiency** greatly contributes to more **robust** Remote Production
- > Fewer people are needed to travel, lowering overall costs and associated CO₂ travel-related emissions.
- One US broadcaster citing a recent major global sporting event, said that remote production applications resulted in a **10% reduction** in on-site staff, representing more than **150 people** not having to travel.
- Up to 10x power reduction compared to JPEG2000, enabling PoE and low-power designs
- 3x to 4x fewer logic elements compared to JPEG2000 with JPEGXS in FPGA
- NO DDR needed with JPEG XS HIGH or Light DDR usage in JPEG XS TDC w/ adjustable Frame Buffer Compression



External DDR Bandwidth (in Gbps)

ST 2110/TR-08 4K/8K over Existing 1G/10G Infra

Real-World Example: Village Island in Japan -Upgrading to 4K or 8K video requires significant bandwidth, often necessitating **new cabling** infrastructure, **new switches,...**

Replacing existing infrastructure can be costly and disruptive. The World has deployed billions of meters of CAT5E cables ...JPEG XS enables 4K/8K workflows on 1G/10G and CAT5E & CAT6 network

streams on a 10 Gigabit Ethernet

Capable of transmitting two 8K video

Reduce: Preserve a **reasonable** bandwidth, it is not necessary to go over to new 100GbE, over Fiber, and new Ethernet Switch. **4K zero latency** and **visually lossless** video goes over **1GbE**, **8K over 2.5GbE**

Reuse : Promotes the **reuse** of existing materials, **reducing** electronic and building wastes

Recycle: Legacy infrastructure, **maintains** current setups, preventing operational interruptions.



ALL AND ALCOME THE REAL

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Sustainable Cloud Production with JPEG XS

Real-World Example: NHL's cloud-based broadcast using JPEG XS for efficient 4K video transport to the cloud, reducing on-site equipment and associated energy consumption in collaboration with Appear JPEG XS & AWS Elemental Media Connect, enabling low-latency, visually lossless video contribution to the cloud, improving scalability while reducing resource usage.



A live sports production of this size would typically require at least one production truck and at least 20 people to manage a single broadcast, generating an estimated 2.05 metric tons of carbon. That environmental impact compounds with each additional truck as well as for international exhibitions.

- > Reduce:
 - Minimizing energy consumption through optimized software implementations of encoding & decoding, lowering costs in on-premise and cloud-based systems.
 - > **Reduces** the need for high-bandwidth infrastructure, leading to **lower carbon emissions**.
- Reuse: Enables broadcasters to reuse existing cloud infrastructure and video workflows, optimizing resource usage without additional hardware investments, by extending media production resources.
- Recycle: Reduces the need for on-site equipment, promoting the reuse of cloud-based resources and reducing e-waste



Sustainable SW Cloud Production with JPEG XS

- JPEG XS encoding with Single-Core performance is already hyper efficient : current implementations can encode HD video at more than 60fps on a single CPU core.
- This makes JPEG XS particularly appealing for low-latency applications / live cloud transmission where fast processing times and low CPU consumption are critical
- On top, the wavelet proxy capability brings further CPU consumption benefits at the encoder side or decoder side with even lower bandwidth transmission. 1K vs 4K
- > Summary versus other technology on 100% CPU.
- AVC/H.264 Encoding: 4-8 cores for HD; more for higher quality.
- HEVC/H.265 Encoding: 8-18 cores for HD; 20+ for 4K.

Note : Depending on your specific use case, workload characteristics, and performance requirements, these numbers may vary. You may also want to consider testing with your specific encoding scenarios to get a precise understanding of performance needs in your infrastructure.



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Estimated Core Requirements	s for 10-bit HEVC Encoding	(60 fps)
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1920x1080 (Full HD)

6-8 cores

8-12 cores

14-18 cores

18-24 cores

32-48 cores

1280x720 (HD)

4-6 cores

6-8 cores

10-14 cores

14-18 cores

24-32 cores

Preset

Fast

Slow

Ultrafast

Medium

Veryslow

Conclusion : No Greenwashing Sustainable Innovation with JPEG XS Today

JPEG XS has already led to significant improvements in **bandwidth efficiency**, **power reduction**, and **environmental sustainability** improvements in live media production.

While precise carbon footprint figures for JPEG XS are not readily available today, the real use cases, its design principles and operational efficiencies suggest a positive contribution to environmental sustainability.

- Energy Efficiency: Reduces power consumption with low-latency, low-complexity compression.
- **Optimized Resources:** Enables reuse and upgrade of existing infrastructure extending its lifetime, lower bandwidth transmission minimizes the needs for the staff to travel.
- Real-World Impact: Proven in live broadcasts (e.g., remote production in China, real time use in live sports (referee), 8K over CAT5e & CAT6).
- Sustainable Practices: Long-term benefits with reduced bandwidth requirements, lower power and minimal waste.
- **Beyond Media**: Seeing similar sustainable innovation in other markets like Automotive, Medical and Machine Vision for JPEG XS.



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Thank you

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Please reach out if you have additional examples to share

Sources

- Remote Production with JPEGXS : <u>https://theiabm.org/a-brief-discussion-on-jpeg-xs-light-compression-remote-production</u>
- Centralized Video Refereeing (VAR) Systems : <u>https://www.svgeurope.org/blog/headlines/changing-the-tv-world-slomo-tv-on-affordable-broadband-data-connections-with-low-latency-and-the-jpeg-xs-standard</u>
- JPEG2000 to JPEG XS Energy / FPGA improvements: <u>www.intopix.com</u>, <u>www.medialinks.com</u>
- ST 2110/TR08 4K / 8K over existing 1G/10G Infra: <u>https://www.intopix.com/blogs/post/Introducing-8K-JPEG-XS-CODEC-for-live-production-using-Village-Island-CODEC</u>.

