The new disruptive visually lossless light video compression, Extremely Tiny in FPGA

A technology serving the global AV industry

TICO compression is new patent-pending visually lossless light compression specifically designed for the industry. This revolutionary technology is extremely tiny in FPGA fitting the smallest Altera Cyclone devices, robust for real-time operation with no latency.

Up to now, image and video are sent or stored uncompressed into many displays and systems such as cameras, videos servers or recorders. TICO is a smart upgrade path to manage higher resolutions (4K, 8K ...) and frame rates while assuring visual quality, keeping power and bandwidth at a reasonable budget and reducing significantly the complexity and cost of the system.

Technology benefits

- Visually Lossless quality from 2:1 to 4:1
- Robust over multiple generations
- Fixed latency: down to microseconds
  - Selectable from 1 to x pixel lines
- Small complexity and ultra-compact codec: easy to implement in low-cost FPGA, Limited internal memory - no external memory required
- Powerful, Real-time or faster than real-time in CPU
- Compatible with different resolutions, from mobile, HD to 4K/8K UHDTV, via multiple usual transport schemes
- Designed to be a standard for industry-wide support: TICO compression technology is available on multiple software and hardware technologies. Code, hardware IP-cores and software libraries are licensable from intoPIX
TICO is a smart solution to

- Support higher Data stream (4K, 8K... in existing systems or networks using the available pipeline bandwidth
- Increase the number of streams or the stream resolution that could be supported in a multi-stream configuration
- Reduce significantly the internal video bandwidth (and power consumption) in systems such as mobile devices, cameras, video servers and displays
- Increase with cost-effectiveness the storage or video buffer capacity
- Solve display link limitation on TV, monitor and mobile panel to carry larger resolutions than could be support by a display link with uncompressed images and video in real time
- Reduce the number of lanes needed to transport a stream in a display interface in order to save power, cost, or both. Or even enable the use of a lower link rate for applications where high link rates may not be possible

Image features

- Color modes: 422 and 444, RGB, YCbCr, XYZ
- Bit Depth: 8, 10 or 12
- Resolutions: Any up to 8K (8192 x 8192)
- Frame Rates: Any (depending on intoPIX IP-core configuration)

Compression

- (Sub) Intra-frame
- Real-time operation guaranteed (no overflow or underflow)
- Latency - Selectable from 1 to X lines

Quality and Bit Rate Control

- Adjustable compression rate for Lossy/Visually lossless/lossless
- CBR (constant bit rate) operation (optional VBR mode)

FPGA

- Low cost implementation in any Altera FPGAs: very low FPGA logic and internal RAM usage
- Fit in the smallest Altera Cyclone FPGAs
- Encoder and decoder have approximately the same complexity

Typical applications from HD to Ultra HD

- Digital Video Recorders
- Video Servers, mixers, routers and switchers
- Cameras (high-res, real-time or high speed)
- Video monitor and displays
- Frame grabbers and video capture devices
- Video over IP systems (ST2022, AVB, ...)
- Industrial and surveillance
- Cable extenders
- ...

TICO supports:

- Support higher Data stream (4K, 8K ... in existing systems or networks using the available pipeline bandwidth
- Increase the number of streams or the stream resolution that could be supported in a multi-stream configuration
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ALTERA FPGA implementation

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- Bit Depth: 8, 10 or 12
- Resolutions: Any up to 8K (8192 x 8192)
- Frame Rates: Any (depending on intoPIX IP-core configuration)

Image/Video Interface

- Avalon ST (or AXI4)
- Avalon ST (or AXI4)
- Avalon MM (AXI4)
- Avalon MM (AXI4)

CTRL

TICO Encoder

CODESTREAM INTERFACE

TICO Enc/Dec

DMA

Memory Controller

DDR

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IP-Cores releases

IPX-TC UHD-4K ENC/DEC

IMAGE/VIDEO INTERFACE

Avalon ST (or AXI4) input

CTRL

TICO Encoder

CODESTREAM INTERFACE

Avalon ST (or AXI4) output

Avalon MM (or AXI4)

IPX-TC MLS ENC/DEC

IMAGE/VIDEO INTERFACE

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CTRL

TICO Enc/Dec

DMA

Memory Controller

DDR

Max FPS

Max Resolution

Max Buffering

Quality Profile Support

Availability

IP-core Reference #*  | Visually Lossless with 444 Bit (in bpp***) | Visually Lossless with 422 10bit (in bpp) | Max FPS | Max Resolution | Max Buffering | Quality Profile Support *** | Availability
--- | --- | --- | --- | --- | --- | --- | ---
IPX-TC1-UHD4K-Enc | max 6bpp (4:1) | max 5bpp (4:1) | 60 | 4K UHD1 | 4 lines | TC1 | 2014
IPX-TC1-UHD4K-Dec | max 6bpp (4:1) | max 5bpp (4:1) | 60 | 4K UHD1 | 4 lines | TC1 | 2015
IPX-TC2-UHD4K-Enc | max 6bpp (4:1) | max 5bpp (4:1) | 60 | 4K UHD1 | 16 lines | TC1 & TC2 | 2015
IPX-TC2-UHD4K-Dec | max 6bpp (4:1) | max 5bpp (4:1) | 60 | 4K UHD1 | 16 lines | TC1 & TC2 | 2015
IPX-TC1-MLS-Enc | Lossless (1.2:1 to 1.8:1) | Lossless (1.2:1 to 1.8:1) | 60 | 4K UHD1 | 4 lines | Math. Lossless | 2014
IPX-TC1-MLS-Dec | Lossless (1.2:1 to 1.8:1) | Lossless (1.2:1 to 1.8:1) | 60 | 4K UHD1 | 4 lines | Math. Lossless | 2014

* Ask for your flavor.
** bpp = bit per pixel. Example: a 444 8 bit picture equals to 24 bit per pixel (bpp). Compressed at 12bpp, it is equivalent to 2:1 compression.
*** At 4:1, TC2 provides better quality than TC1 at short viewing distance (< 60 pixels per degree).

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