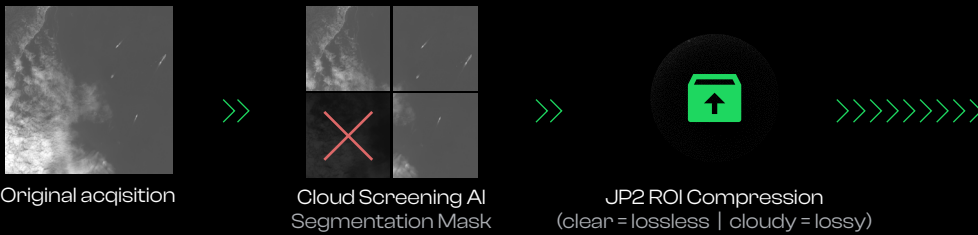


# SKAIPACK

A comprehensive suite of high-performance image compression implementations designed for space-based multi/hyperspectral imaging applications. SKAIPACK bundles an AI-based cloud screening model with intelligent JPEG2000 Region-of-Interest compression – clear areas are preserved lossless, cloudy areas are compressed aggressively. For missions requiring full data fidelity, CCSDS 123.0-B-2 lossless compression is available as a standalone alternative.



## INTELLIGENT COMPRESSION

Platforms: FPGA • CPU • GPU  
 Cloud detection accuracy: >90%

The cloud screening AI generates a segmentation mask that drives JP2 ROI compression – clear areas are preserved lossless, cloudy areas are compressed aggressively.



## FULL LOSSLESS

Power: 0.35 W  
 Throughput: 15–200 MSamples/s

For missions requiring guaranteed data fidelity, CCSDS 123.0-B-2 delivers full lossless compression as a standalone alternative.



| Implementation  | Compression Type      | Typical Compression Ratio | Bandwidth Savings     |
|-----------------|-----------------------|---------------------------|-----------------------|
| CCSDS-123.0-B-2 | Lossless              | 2:1 to 4:1                | Up to 75% reduction   |
| CCSDS-123.0-B-2 | Near-lossless         | 3:1 to 8:1                | Up to 87.5% reduction |
| JPEG2000        | Lossless              | Up to 2.5:1               | Up to 60% reduction   |
| JPEG2000        | AI-guided ROI (lossy) | 10:1 to 70:1              | Up to 98.6% reduction |

JP2 ROI requires the Cloud Screening AI licence. Standalone JPEG2000 delivers standard lossy or lossless compression without region-of-interest prioritisation. Object detection and change detection models available via SKAISEN.

## CCSDS-123.0-B-2 DELIVERY

Delivered as optimized CPU binary or configurable IP core for FPGAs, including Zynq 7000 & UltraScale+ family, with customizable generic parameters for flexible integration. The core operates at frequencies up to 200 MHz with minimal resource utilization – 3.5% LUTs and 1% Flip-Flops on UltraScale+ ZU7EG (SKAIDOCK). The implementation includes AXI4-Stream interfaces for seamless integration with existing satellite data processing pipelines. Power consumption during inference: 0.35 W. Throughput scales from 15 MSamples/s (Nz=1) to 200 MSamples/s (Nz=20).

## JPEG200 DELIVERY

SKAIPACK is delivered as an optimized CPU binary or Python package, supporting both ARM and x86-64 architectures commonly found in satellite data handling units. Pre-configured ROI presets are included for common use cases like cloud screening and object detection. Memory requirements are typically between 50-200 MB, and processing rates can achieve 2-60 MSamples/s, depending on CPU performance and selected compression settings. Furthermore, the implementation incorporates advanced coregistration software with feature-based methods for accurate multispectral band alignment to enable even higher compression ratios.

|                       | CCSDS-123.0-B-2                              | JPEG200 ROI                       | Cloud Screening AI                     |
|-----------------------|--|-----------------------------------|--|
| <b>Implementation</b> | VHDL 2003                                    | Rust                              | Python / FPGA / GPU                    |
| <b>Delivery</b>       | FPGA IP core                                 | CPU binary with Python bindings   | FPGA IP core / CPU binary / GPU binary |
| <b>Throughput</b>     | 15-200 MSamples/s (Nz=1-20)                  | 2.1 MSamples/s                    | –                                      |
| <b>I/O interface</b>  | AXI4-Stream                                  | NumPy with Python bindings or CLI | Python SDK / CLI                       |
| <b>Configuration</b>  | AXI4-Lite                                    | CLI or through Python bindings    | CLI or Python bindings                 |
| <b>Utilization</b>    | LUT: 8092* • FF: 4691* • BRAM: 30* • DSP: 7* | 1.2MB disk                        | –                                      |

## SKAIPACK Licensing

SKAIPACK is available as standalone modules or as a bundled AI + Compression licence.

### CCSDS123

Lossless / near-lossless FPGA IP core + CPU binary

### JPEG2000

Standard lossy / lossless compression

### CLOUD SCREENING AI

Cloud detection model (FPGA / CPU / GPU)

### AI + JP2 ROI BUNDLE

Cloud screening + intelligent ROI compression

Licence type: Per device (lifetime) • Per project (unlimited devices)



## CONTACT & INQUIRIES

Interested in integrating SKAIPACK into your mission?

Reach out for technical documentation, pricing, or customised support: [info@zaitra.io](mailto:info@zaitra.io)

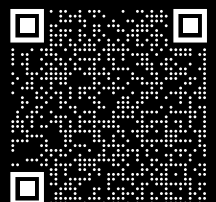
\* starting at and it's depending on configuration, for more detailed information contact us

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Version 1.2

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Zaitra s.r.o, Bauerova 491/10,  
603 00 Brno, Czech republic



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