

OpenJPEG

An open-source JPEG 2000 reference implementation



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Outline: *OpenJPEG* is ...

- ... A software
 - License
 - Compliance
 - Features
 - Performances
 - Work in progress
 - ... An open-source project
 - Versioning, build system & testing
 - Hosting & issue tracking system
 - ... A community
 - Some indicators
 - Users and contributors
 - Support
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Goals

1. To provide an efficient, robust, free, open-source alternative to JPEG 2000 proprietary softwares (like Kakadu).
2. To build a wide community around JPEG 2000 and to encourage people to use this powerful standard in their applications

- Started in 2001 as an initiative of the *Signal and Image processing Group* (ICTEAM, UCL, Belgium)
- License: *2-clauses BSD*
 - Permissive license: commercial use is allowed
 - Only the copyright has to be retained in source code and in binaries doc

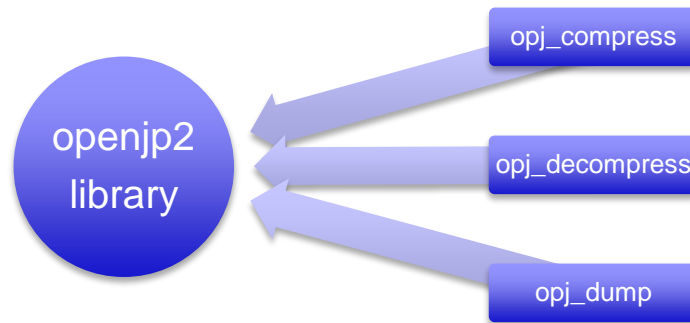


A new reference software for JPEG 2000 Part-1

- Fully compliant with JPEG 2000 Part-1
(*aka* ISO/IEC 15444-1:2004)
- Nightly tested against tests described in JPEG 2000 Part-4
(*aka* ISO/IEC 15444-4:2003, Conformance testing)
- OpenJPEG v2.1 approved 2 weeks ago in Strasbourg by JPEG
Committee as an additional reference software for JPEG 2000
Part-1
(*aka* Amendment 2 of ISO/IEC15444-5:2003, Reference SW)



core component: the *openjp2* library



- *JPEG 2000 Part-1 options*: lossless & lossy, DWT 53 & 97, tiling, quality layers, precinct size, cblk size, progression orders, SOP & EPH markers, mode switches, *etc.*
- JP2 file format
- Target compression ratio
 OR target quality (psnr)
- Digital Cinema profiles
- Mega-images handling
- Customizable MCT (< J2K Part-2)
- TIF and PNG support through third-party libraries
- Raw input:
 - Needs size, bitdepth, signedness, subsampling parameters.
 - Example: allows for YUV subsampled images input
- Folder input: takes all images from a given folder
- *opj_dump* outputs info about markers encountered in codestream

Additional components have been implemented since 2001 ...

... But most of them are obsolete now and should be updated ...

... (or not)

- **openjpip: JPEG Interactive Protocol library (JPIP)**
 - JPEG 2000 Part-9: client-server protocol to browse J2K images remotely
 - **openmj2: Motion JPEG 2000 library (MJ2)**
 - JPEG 2000 Part-3: encapsulation of time-based series of J2K codestreams
 - Still works but links against an old version of the library
 - MJ2 has actually not been adopted by industries: MXF or IMF is preferred.
 - **openjpwl: JPEG Wireless library (JPWL)**
 - JPEG 2000 Part-11: tools to improve robustness to transmission errors
 - Still works in version 1.x but has not been ported in version 2.x
 - Rarely used in industries
 - **openjp3d: JP3D library**
 - JPEG 2000 Part-10: volumetric extension of JPEG 2000 Part-1
 - Standalone library based on OpenJPEG but not maintained anymore
 - **JNI: OpenJPEG java bindings**
 - **OPJViewer: JPEG 2000 viewer based on wxWidgets**
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OpenJPEG

performances: a lot of improvements ...

- Huge amount of bugfixes and security fixes
- Conformance with JPEG 2000 Part-1
- Digital cinema profiles updated
- OpenJPEG API improved

performances: ... still (much) slower than kakadu

A benchmark is currently setup to properly compare OpenJPEG to Kakadu in a wide number of contexts and options

Meanwhile:

(< MacBookPro, 2.8GHZ, IntelCore i7)

- Encoding: ~ 6-15 times slower than Kakadu
- Decoding: ~ 4-6 times slower than Kakadu

- **Speed & memory**
 - Multi-thread execution
 - Code optimization
 - Algorithmic optimization
- **Robustness**
 - Fuzz engine is used to spot potential overflows or security issues
- **Colour space management**
- **Improve java bindings (JNI)**
- **Javascript port to enable browser support**

work in progress: GPU implementation

- “Roger”, an OpenCL port of OpenJPEG (Affero GPL v3)
 - Started and developed by Aaron Boxer, an OpenJPEG contributor
 - Targets heterogeneous systems like CPUs, GPUs, DSPs, FPGAs
 - Goal: 30 FPS encoding of 12 bit lossy 4:4:4 4K (4096 x 2160) images
- Roger accessed by OpenJPEG through a plugin mechanism
 - Takes care of MCT (*done*), DWT (*done*), Quantization (*done*), EBCOT (80%) and MQ (10%)
 - OpenJPEG still does the packaging and rate allocation
- Current status:
 - On entry-level graphic card (AMD7700), 30ms for 4096x4096 RGB, 8 bit, single tile, 32x32 code block, lossy encoding (full encoding should be 60ms)
- Timeframe: alpha release in Spring 2015
- More info:

<https://github.com/CodecCentral/roger>

- Hosting, repository, issue tracking system:

Googlecode 

- Cross-platform build system: CMake
 - Builds on any platform supported by Cmake
- Automatic nightly testing with CDash and Ctest, against
 - Conformance tests
 - Non-regression tests

- Website
 - Slowly increasing average of 4500 visitors per month since 2011
 - Downloads hosted @ SourceForge since May 2014
 - ~ 3400 monthly downloads of OpenJPEG 2.1
 - ~ 2800 monthly downloads of OpenJPEG 1.5.2
- Mailing-list : openjpeg@googlegroups.com
 - 667 subscribers (steady average of 7-8 new comers each month since 2011)
 - Average of ~40 messages per month since 2011.

Audio-visual	Medical	Geospatial	Misc
3DTV	kitware	cnes	jmicrovision
Barco	gdcm	orfeo-toolbox	artifex
Motionpicturesolutions	telemis		digipix
Optushome			cs
encoreelectronics			
Sonotec			
maasdigital			
versatel			
celebrationcinema			
condor			
visualdomains			
aeon			
comcast			
Fearlesstv			
intoPIX			

- Known users

- Debian
- Chromium (through pdfium and foxit software)
- Ghostscript
- ImageMagick
- ...

- Contributors

- Only ~ 4-5 active contributors are actually fixing the provided bugs
- ... Who wants to join ?

OpenJPEG community: support



in the preservation field: the PREFORMA project

PREFORMA aims to establish a set of tools and procedures for gaining full control over the technical properties of digital content intended for long-term preservation by memory institutions.

- Co-funded by the EU (FP7-ICT programme)
- Practically: implement an open-source platform with conformance checkers for
 - Images: TIFF
 - Text: PDF/A
 - Audiovisual: [JPEG 2000 / Dirac / FFV1] + [MKV / OGG] + LPCM
- UCL and OpenJPEG have been selected to provide conformance checkers for the trio [JPEG 2000 + MKV + LPCM]

<http://www.preforma-project.eu/>

OpenJPEG take-home message:
Please try, use (and contribute) !

OpenJPEG is now a mature and reliable
open-source code for JPEG 2000 Part-1

... Approved by ISO as reference software ...

... But it lacks optimization in speed and memory ...

... So it needs a wider community to try, test, and
contribute.

Thank you !

Website: <http://www.openjpeg.org>

Repository: <http://www.googlecode.com/p/openjpeg>

Mailing-list: <http://groups.google.com/group/openjpeg>

Info and contact: info@openjpeg.org