

OME-TIFF and Bio-Formats

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<http://www.loci.wisc.edu/ome/>



Who is LOCI?

- LOCI is the Laboratory for Optical and Computational Instrumentation
- Biophotonics instrumentation laboratory at University of Wisconsin-Madison
- Collaborative laboratory involving several investigators: John White, Patti Keely and others
- Co-directed by Kevin Eliceiri

LOCI's mission

- Improve in vivo imaging techniques to provide as much information as possible about a specimen
 - Develop optical instrumentation to facilitate studies of the dynamics of living specimens
 - Develop software for the acquisition, visualization and analysis of these dynamic events

What is OME-TIFF?

- A way of storing OME-XML metadata inside TIFF
- Designed to allow whatever image organization you prefer
 - One master OME-TIFF file
 - Distributed across multiple files

Why OME-TIFF?

- Combines power and flexibility of OME-XML metadata with compatibility and performance of TIFF
- Provides an example of using OME-XML within a container format

What is Bio-Formats?

- A library for reading and converting biological file formats
- Most importantly, a tool for standardizing metadata into a common language

What does Bio-Formats do?

- Reads many popular biological file formats
 - Pixels
 - Metadata in original, format-specific form
 - Metadata into a standard interface: the OME data model
- Writes data in several forms
 - Exports to QuickTime and AVI movie
 - Writes TIFF and OME-TIFF format
- Abstracts the source of the data
 - Can work with files on disk or over HTTP
 - Can communicate with OME database

How can Bio-Formats be used?

- As a collection of plugins for ImageJ
 - Bio-Formats Importer and Exporter
 - Download from OME, Upload to OME
 - 4D Data Browser
- As part of OMERO
 - OMERO server uses Bio-Formats to import data
 - OMERO team is thoroughly testing each format to verify it works with OMERO
- As part of our VisBio application
 - VisBio uses Bio-Formats to work with data on disk
- With your own application, as a library



(Bio-Formats + 4D Data Browser demo)

OME server not required

- LOCI clients deliver the same functionality both “inside” and “outside” the database
- Users can take advantage of database features if desired
- Users can work with the files directly, saving results as OME-XML metadata

Philosophy of interoperability

- Software tools should work together
- OME-XML is the central means of interoperability
- Bio-Formats can be a cornerstone (at least in Java)
- Leverage open-source solutions such as ImageJ
- Record data as OME-TIFF with our acquisition software
- Use OME Notebook to store OME-XML metadata along side proprietary acquisition
- Read third party formats with Bio-Formats
- Use Bio-Formats within all our software
- Transfer data to and from OME and OMERO servers

2007 directions: Bio-Formats

- Integration with OME 2.6.1
- OME ImageJ Java Web Start link using 4D Data Browser
- Data Converter application for end users to convert between file formats
- More documentation and example code
- Native solution for deploying Bio-Formats and OME-TIFF with C/C++ (e.g., IKVM)

2007 directions: OME-TIFF

- Revise and expand OME-XML specification
- Implement additions to OME-TIFF
- More documentation and sample data
- Investigate container format for high-dimensional “non-planar” data such as spectral-lifetime
- Explore multi-dimensional compression schemes

2007 directions: OME Notebook

- Tool for users to view and manage metadata
- Augments physical lab notebook
- Templating engine allows users to arrange notebook as desired
- Works with metadata stored at acquisition
- Allows addition of metadata after acquisition

Websites

- **Available –**
 - Overview of our OME-related efforts – <http://www.loci.wisc.edu/ome/>
 - Master list of available software from LOCI – <http://www.loci.wisc.edu/software/>
 - Detailed documentation for some projects
 - OME-TIFF – <http://www.loci.wisc.edu/ome/ome-tiff.html> – with sample code
 - Bio-Formats – <http://www.loci.wisc.edu/ome/formats.html>
 - 4D Data Browser – <http://www.loci.wisc.edu/browser>
 - VisBio – <http://www.loci.wisc.edu/visbio/>
 - Roadmap of our goals for 2007 and beyond – <http://www.loci.wisc.edu/ome/roadmap.html>
- **Upcoming –**
 - Web site redesign using Drupal CMS to provide easier access to and documentation for our software
 - A dedicated page for OME Notebook

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