OME-TIFF and Bio-Formats

H. Ansari, K. Eliceiri,
M. Linkert, and C. Rueden
http://www.loci.wisc.edu/ome/

GLENCOE SOFTWARE · LOCI · ome

Open Microscopy Environment Overview

- OME is a collaborative effort to establish an open image informatics framework for the biological microscopy community.
- OME is an umbrella term that stands for "Open Microscopy Environment" and covers:
  - The OME file formats, including OME-XML and OME-TIFF, and the Bio-Formats Java library
  - The OME data model, expressed as an XML schema
  - The OME database systems for microscopy data management and analysis: the OME Perl and OMERO Java servers
  - The OME project as a whole, including all of these components
  - The OME consortium, the group behind these efforts

OME Overview (cont)

The OME partners include 4 main academic sites (LOCI at UW-Madison, Goldberg Lab at NIA/NIH, Swedlow Lab at U. Dundee, and Sorger Lab at Harvard).

Additional collaborators include academic and commercial partners (such as Improvision, Prairie Tecnologies, Applied Precision)
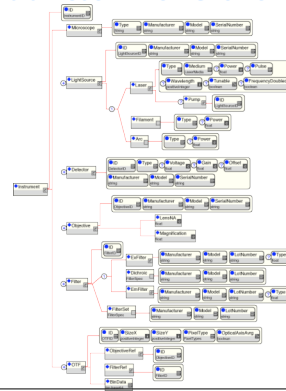
OME development over past year has concentrated on the following aims:
- Biological format accessibility (Bio-formats, OME-TIFF)
- Image server focusing on performance and security (OMERO)
- Continuing efforts on distributed analysis with OME Server

OME is designed to be a community resource. We encourage and need active participation from the academic and commercial microscopy community.

The OME Data Model: The Instrument Element

What is OME-TIFF?

- OME-XML inside a TIFF file
- Allows flexible image organization
  - 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
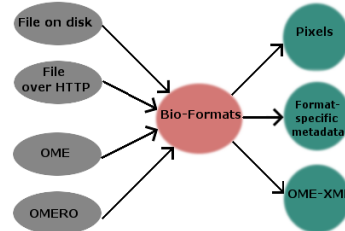- Provides an example of using OME-XML within a container format

What is Bio-Formats?

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

What does Bio-Formats do?

File on disk, File over HTTP, OME, OMERO → Bio-Formats → Pixels, Format-specific metadata, OME-XML

Over 50 formats supported, sampling of a few with metadata referenced to OME-XML fields

Bio-Rad .pic
MetaMorph STK
Zeiss LSM (Laser Scanning Microscope) 510 LSM
Zeiss Axiovision ZVI
Olympus FluoView TIFF
Olympus FluoView FV1000 (OIF, OIB)
IPLab Scanalytics IPL
Openlab LIFF
Improvision
Deltavision
Gatan Digital Micrograph DM3
Leica Image File (LIF)
Leica Microsystems LEI (TIF)
PerkinElmer UltraView (TIF)
Media Cybernetics Image-Pro Sequence (SEQ)
Media Cybernetics Image-Pro Workspace (IPW)
Image Cytometry Standard (ICS)

Complete List at http://www.loci.wisc.edu/ome/formats.html
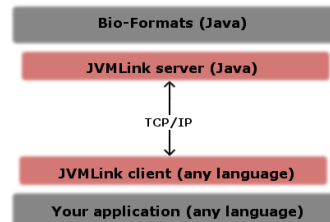Email us with additions and corrections

How can Bio-Formats be used?

- As a collection of plugins for ImageJ
- As part of OMERO
  - OMERO server uses Bio-Formats to import data
- As part of OME server
- As part of several existing applications
- With your own application

JVMLink

Bio-Formats (Java)
JVMLink server (Java)
TCP/IP
JVMLink client (any language)
Your application (any language)

2008 directions: Bio-Formats

- Expansion into microscopy-related fields
- More robust OME-XML conversion
- Graphical application to convert between formats
- More documentation and example code

2008 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

Websites

- Available –
  - Overview of our OME-related efforts – http://www.loci.wisc.edu/ome/
  - Master list of LOCI software – 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
- OME/OMERO plugins for ImageJ - http://www.loci.wisc.edu/ome/imagej.html
- Data Browser – http://www.loci.wisc.edu/browser.html
- VisBio – http://www.loci.wisc.edu/visbio/
- JVMLink - http://www.loci.wisc.edu/ome/jvmlink.html
  - Roadmap of our goals for 2008 and beyond – http://www.loci.wisc.edu/ome/roadmap.html