The Open Microscopy Environment

11th Annual User's Meeting

University of Dundee

Jason Swedlow

The OME Consortium

Centre for Gene Regulation & Expression
College of Life Sciences, University of Dundee
Dundee, Scotland, UK

GLENCOE SOFTWARE

Seattle, WA, USA

Talk Outline

- Thank you!
- This Meeting…
- The Problem
- Our Progress
- Funding…
- Future Priorities…

Thank you!!!

Wilma Woudenberg June Matthew

Thank you!!!

wellcome trust

bbsrc
biotechnology and biological sciences research council

CORBEL

GLOBAL BIOIMAGING
growing collaboration

EURO-BIOIMAGING

MULTI MOT

Dundee OME Team & Glencoe Software

The OME Consortium

Paul
French

Gaudenz
Danuser

Ilan
Davis

Gianluigi
Zanetti

Peter
Sorger

Spencer
Shorte

Alvis
Brazma

Rafael
Carazo-Salas

Edouard
Bertrand

THIS MEETING.....

Meeting Purpose

11th Annual User's Mtg

- Attendees
  - OME Consortium
  - Invited Speakers
  - Broad cross-section of users

- *Day 1:* Presentations
  - Lightning Talks
  - Project Overview
  - Invited Speakers

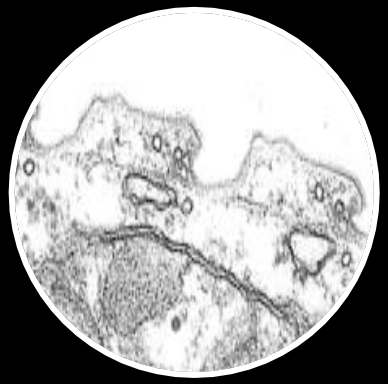
- *Day 2:* Workshops & Demos

- Day 3: UnConference

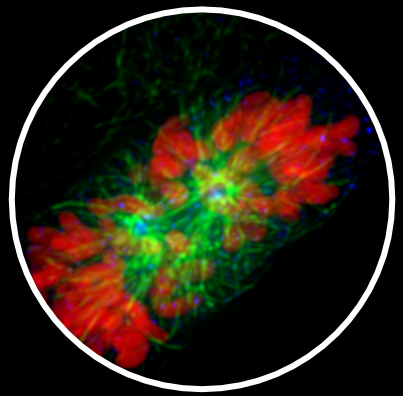
- Progress Report
- Future development priorities, funding & planning

THE PROBLEM

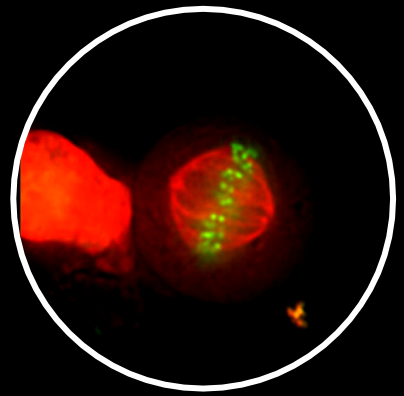
The Image Problem…
is Ubiquitous



Organelles

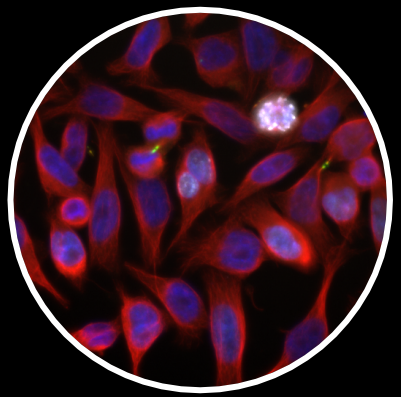


Cells

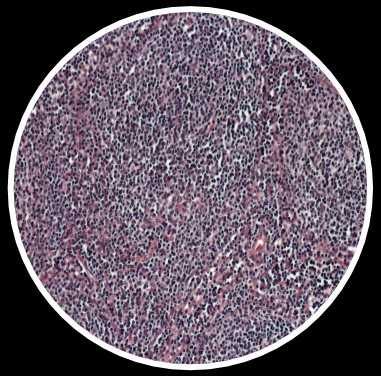


Dynamics

Physiology



Lead Discovery
Target Validation



Pathology

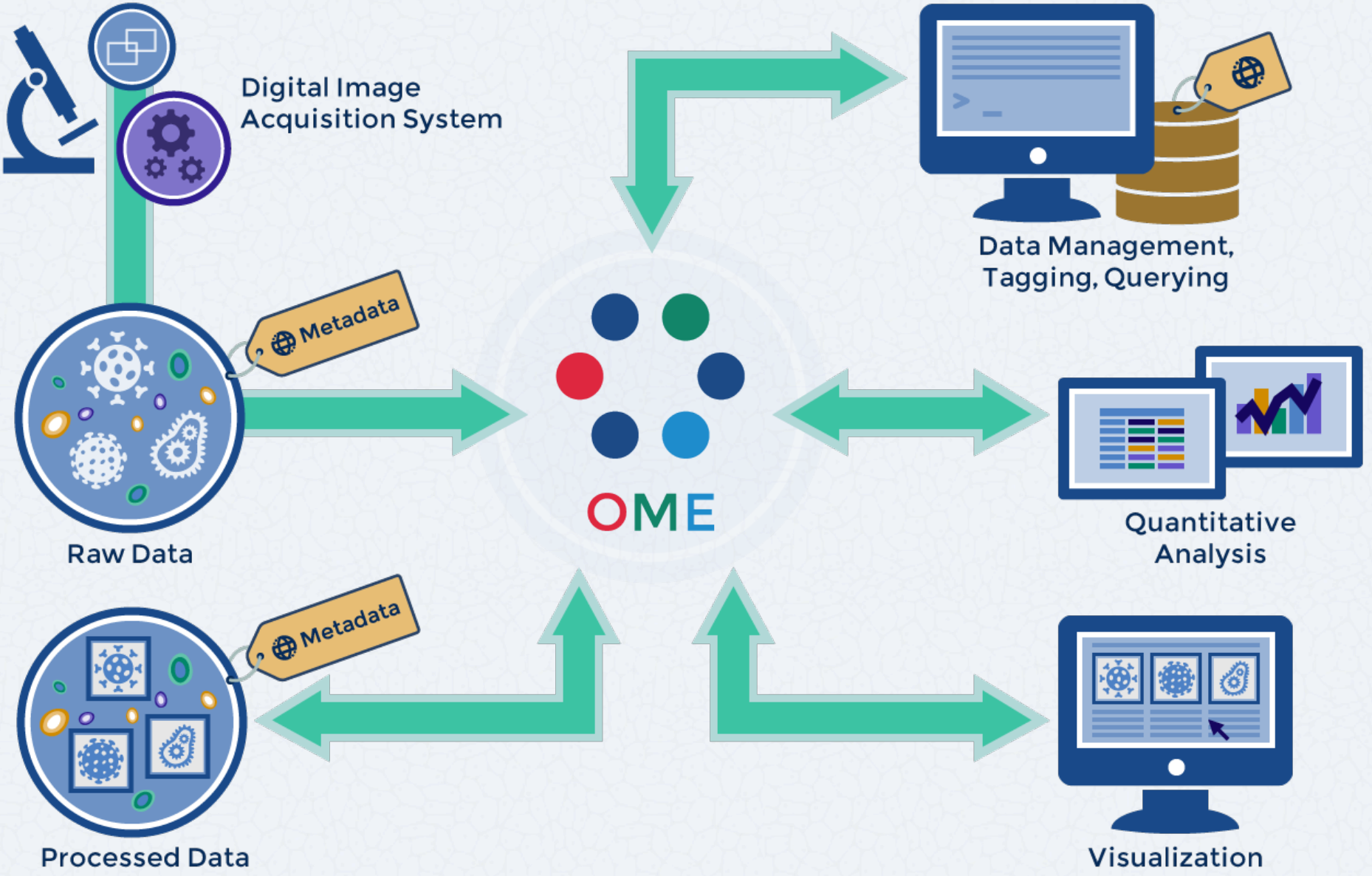
In Vivo

A pretty picture?

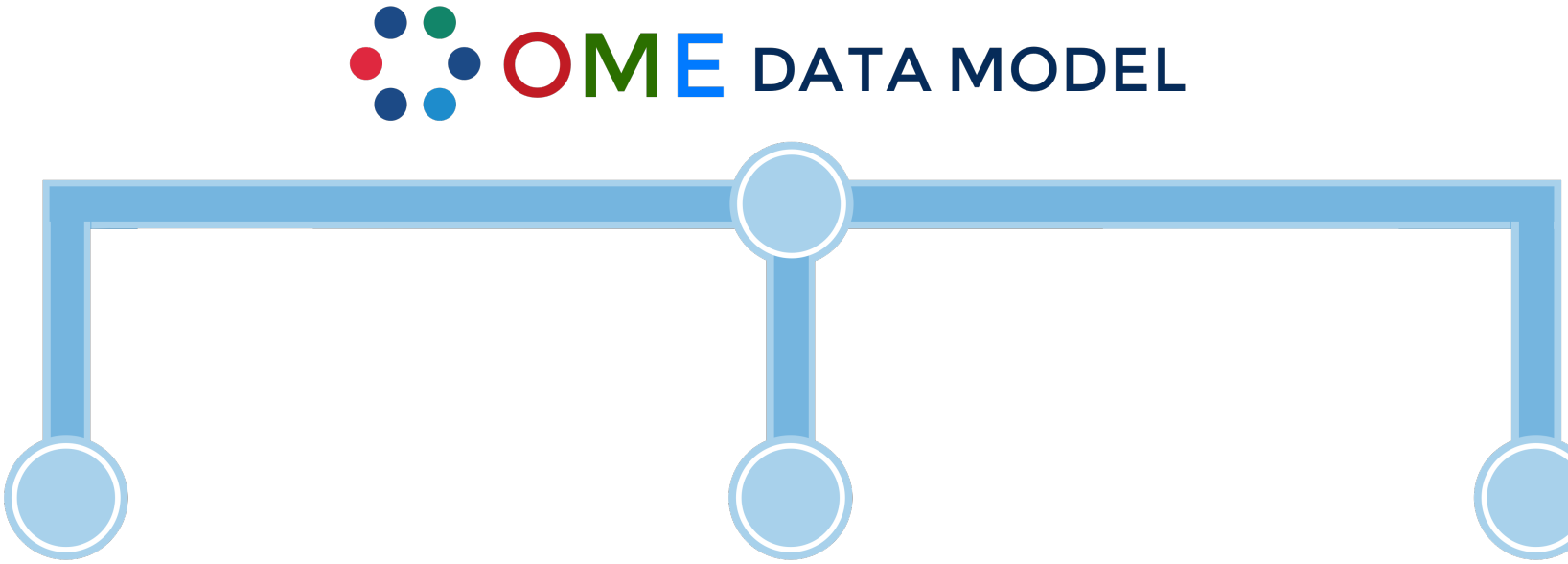
A measurement?

A resource?

...Towards Image Informatics



What We Do



OME-XML
OME-TIFF
OME FILES

Open
exchangeable
file formats
&
metadata

BIO-FORMATS

Open
Proprietary File
Format
Translation

OMERO

Open
Image Data
Management

OME File Formats

OME-XML ~ OME Data Model

OME-TIFF – TIFF file with OME-XML in the header

OME Files – C++-based reference implementation of the

OME Data Model

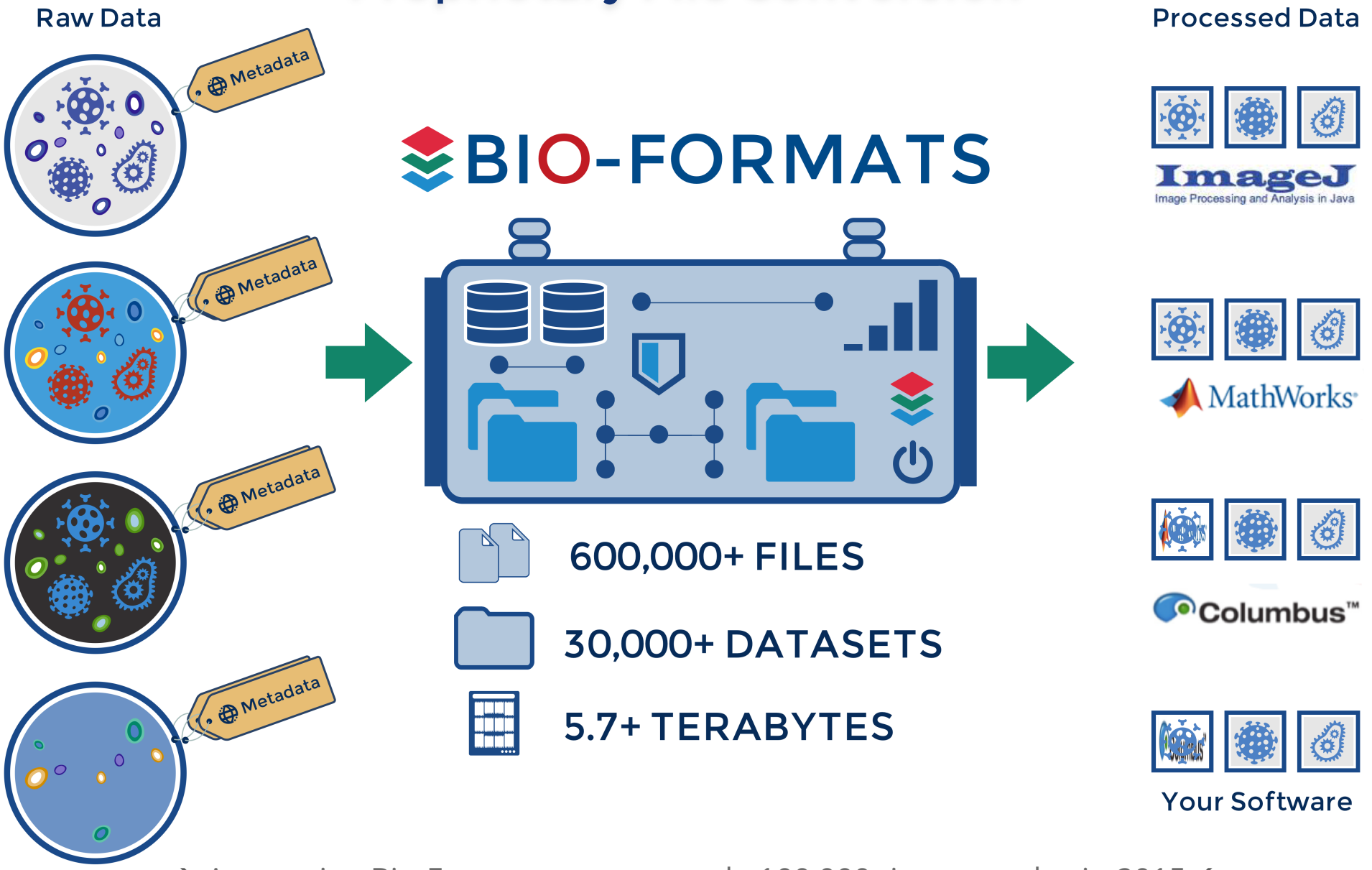
(i.e., definitive library for writing OME-XML, OME-TIFF, etc.)

Roger
Leigh

Sebastien
Besson

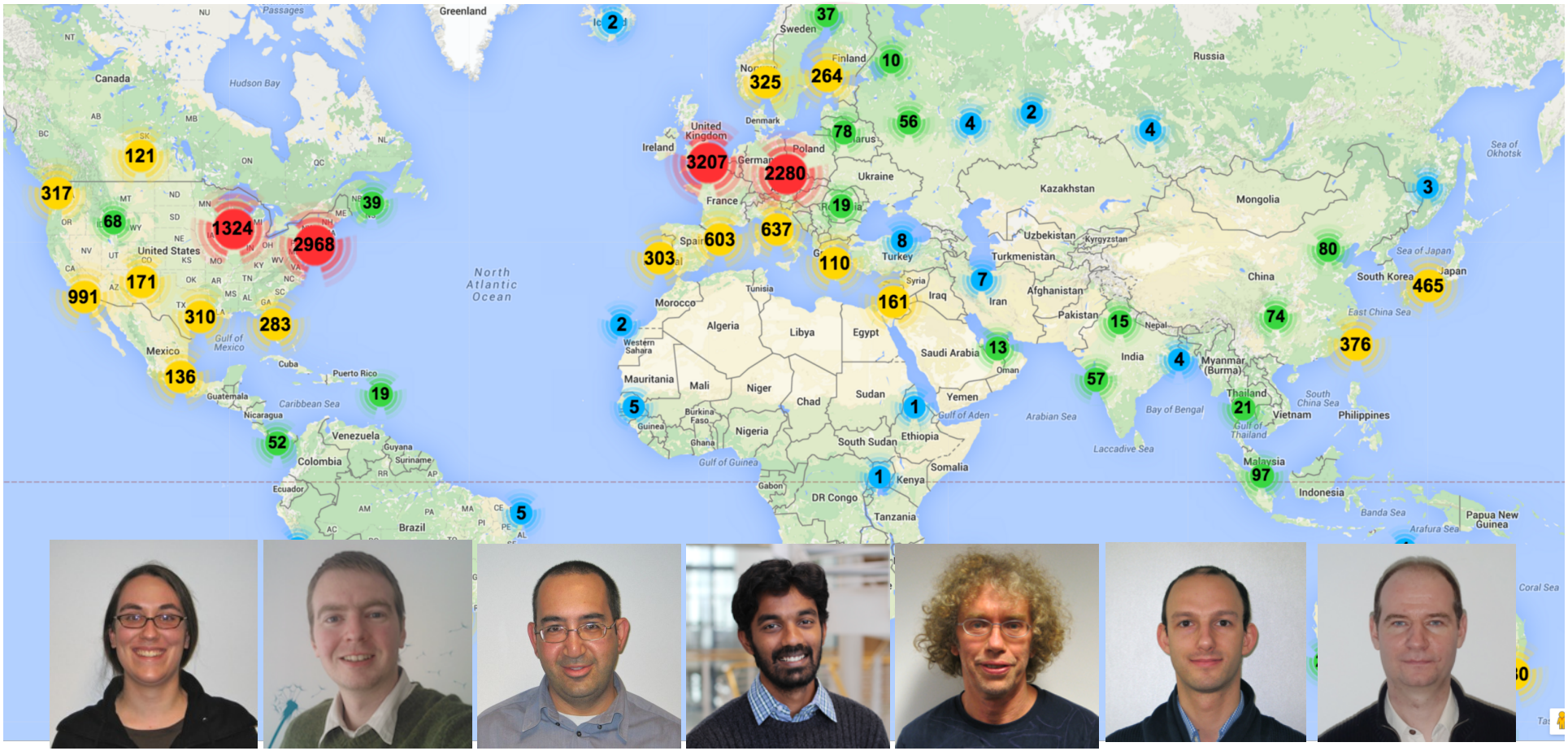
David
Gault

BIO-FORMATS: Proprietary File Conversion



→ Apps using Bio-Formats were started >100,000 times per day in 2015 ←

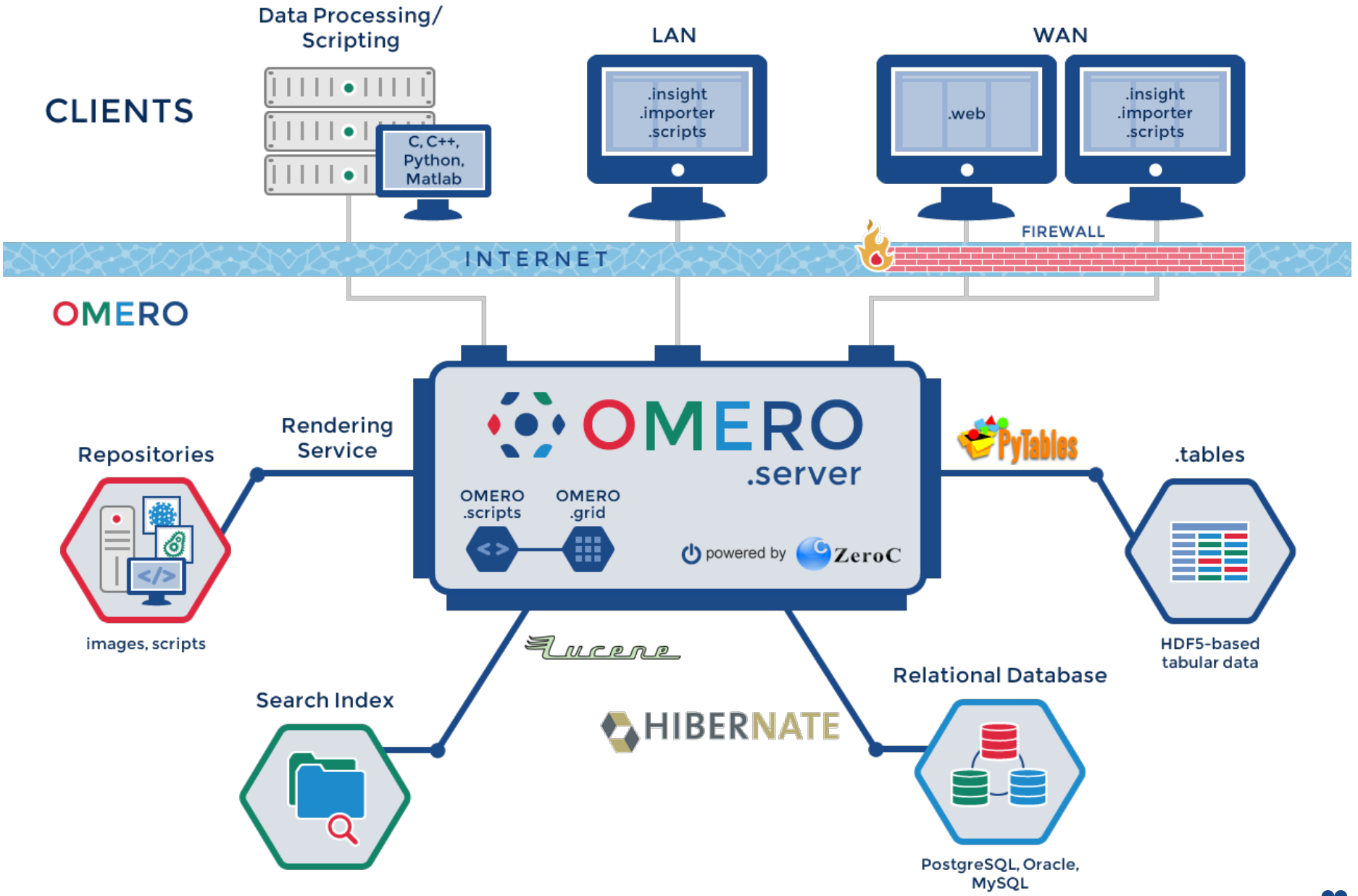
Bio-Formats 5: Worldwide Impact



Melissa Linkert | David Gault | Simone Leo | Balaji Ramalingam | Ian Munro | Sebastien Besson | Petr Walczysko

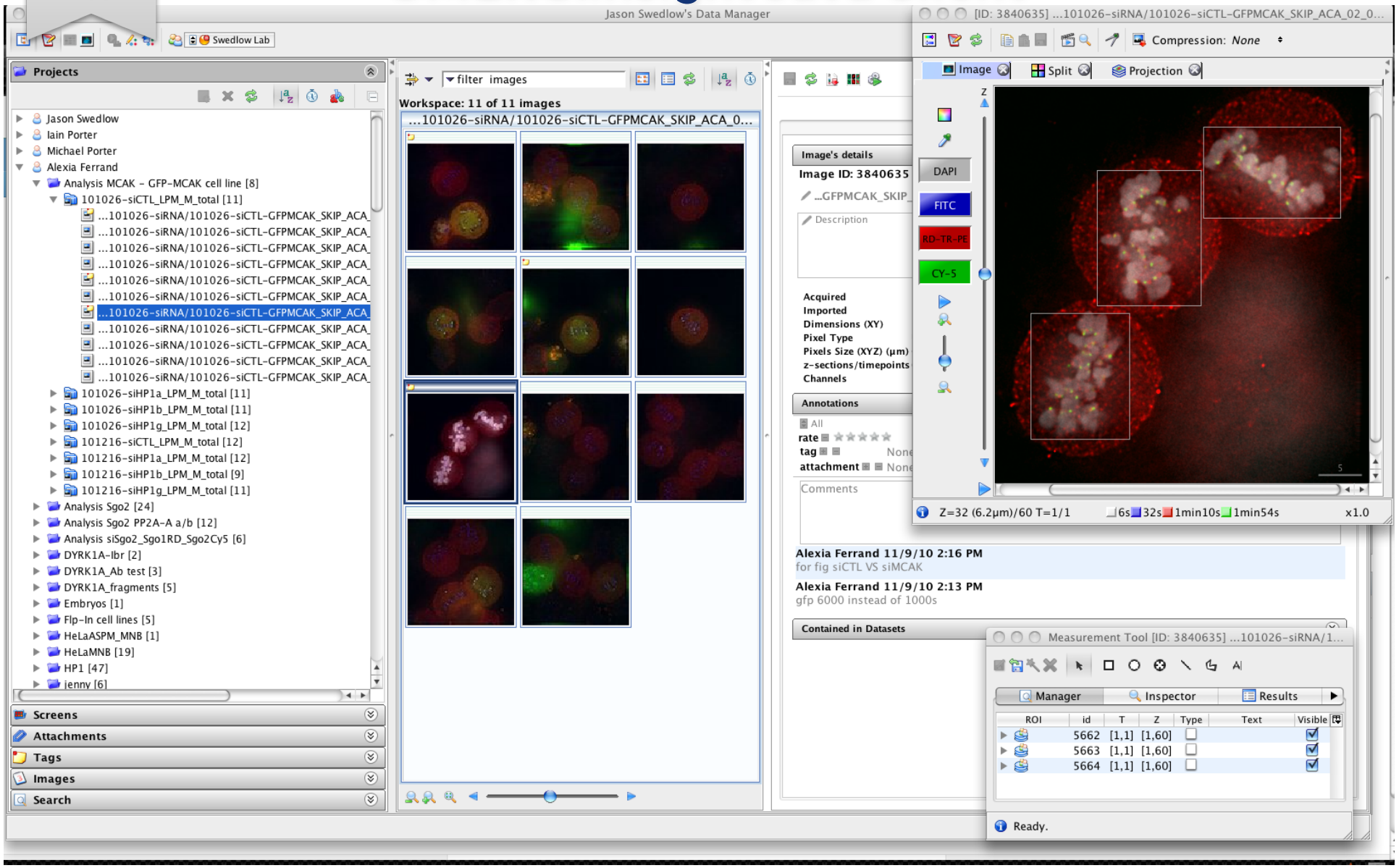
Unique IP Addresses Jan 1 – Dec 31, 2015 2015

The OMERO Platform



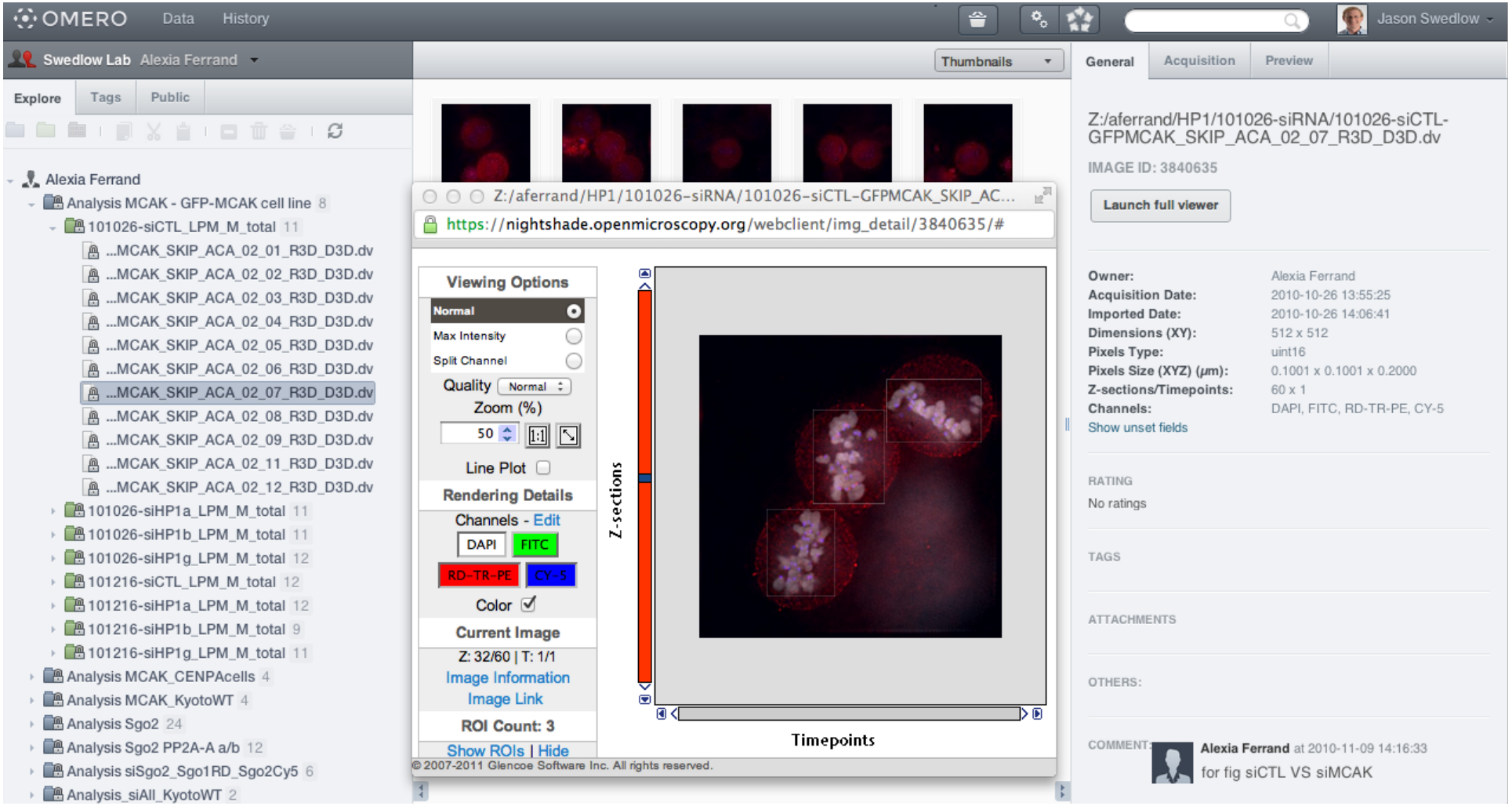
Allan et al, 2012, Nature Methods

OMERO & BIO-FORMATS: OMERO.insight Java Client



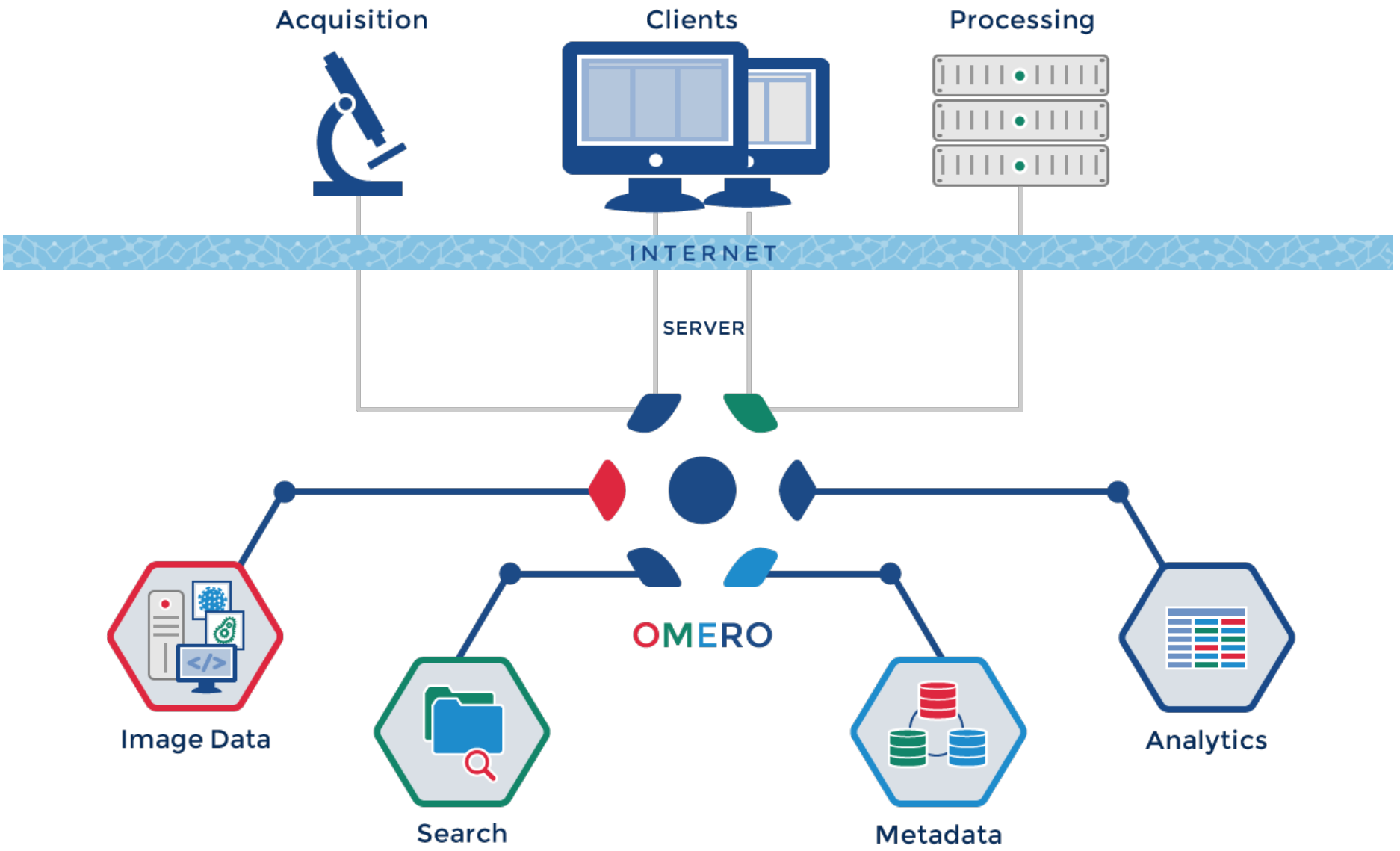
Allan et al, 2012, Nature Methods

OMERO & BIO-FORMATS: OMERO.web Client

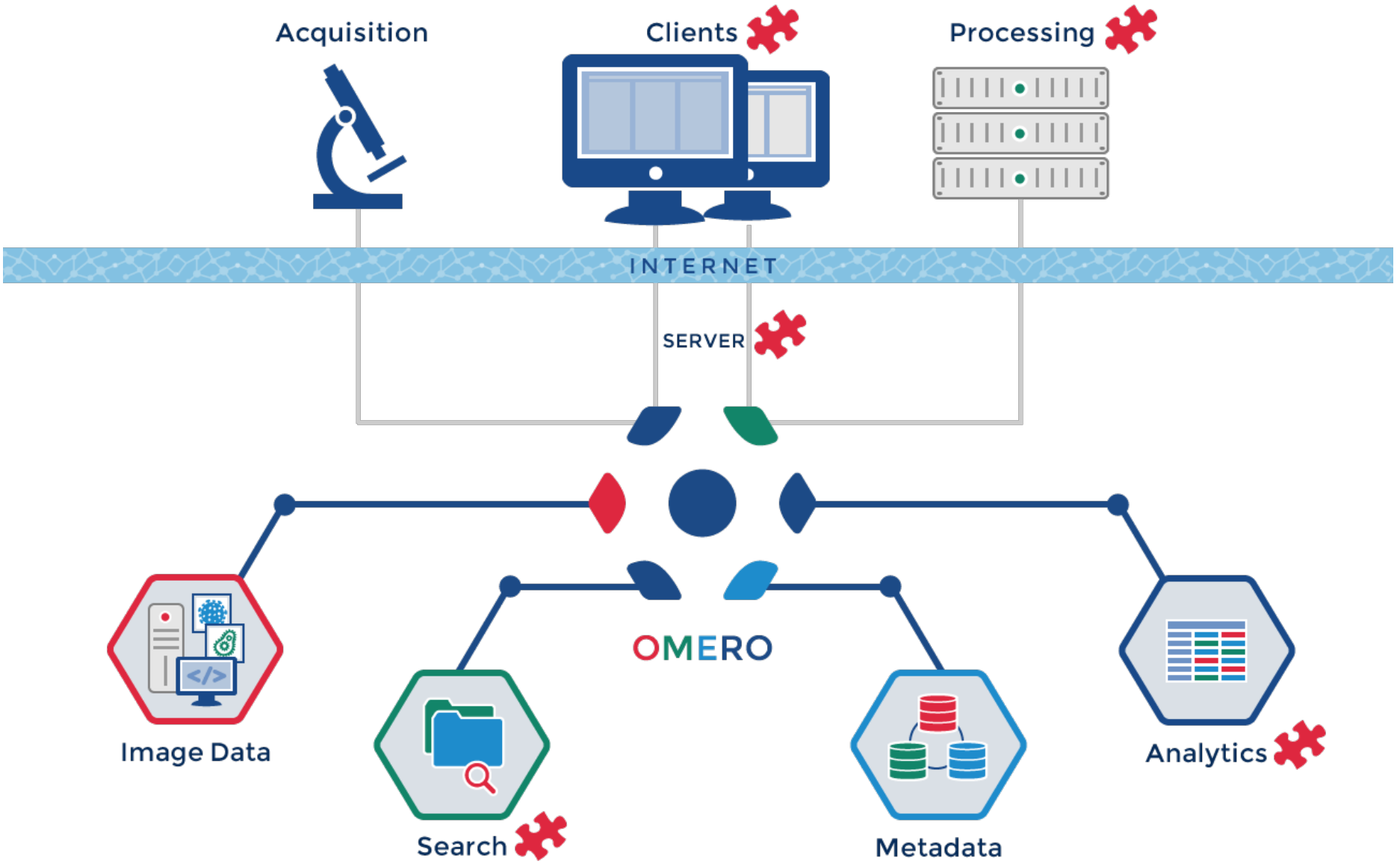


Allan et al, 2012, Nature Methods

The OMERO Platform

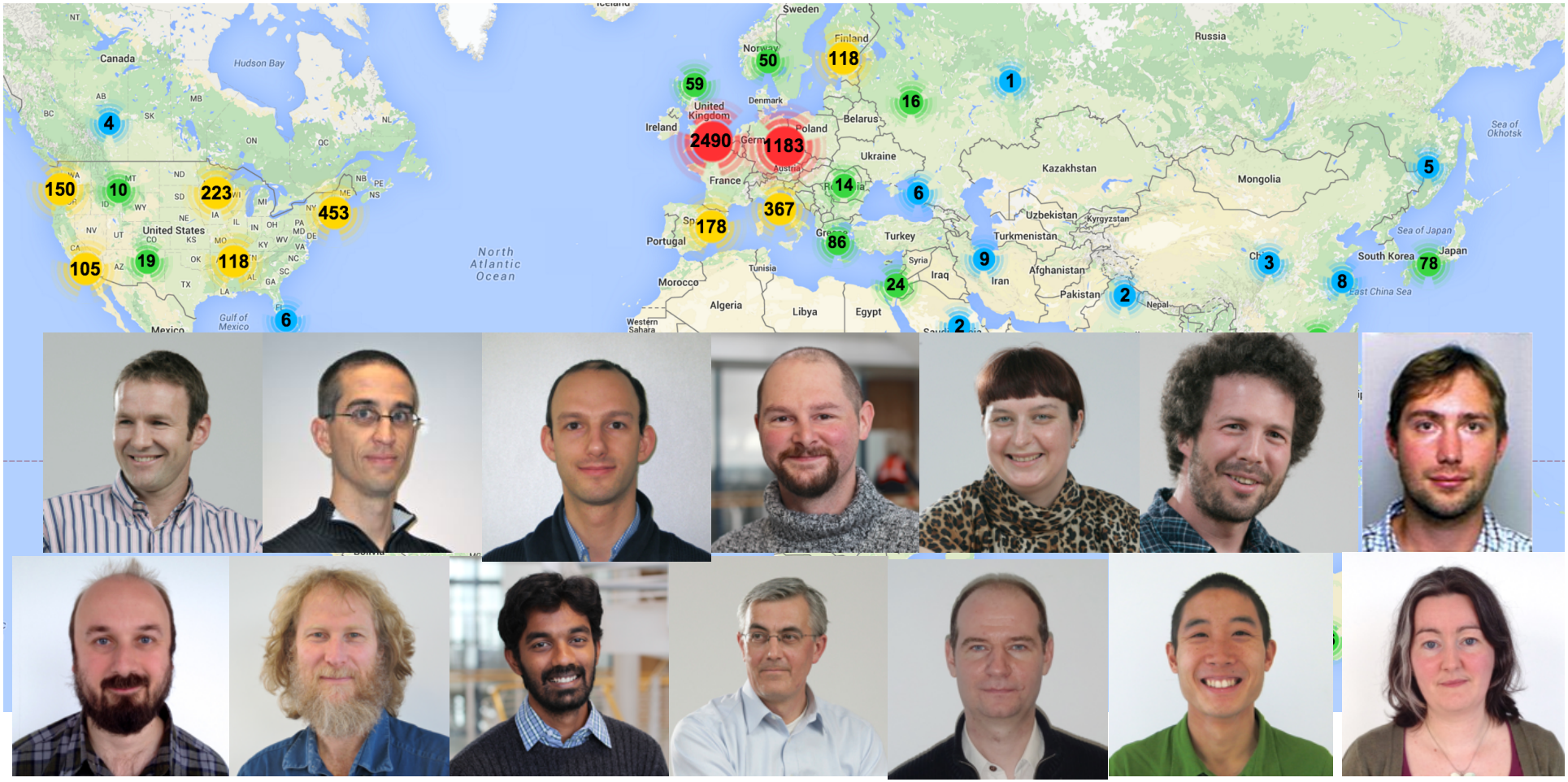


The *Extensible* OMERO Platform



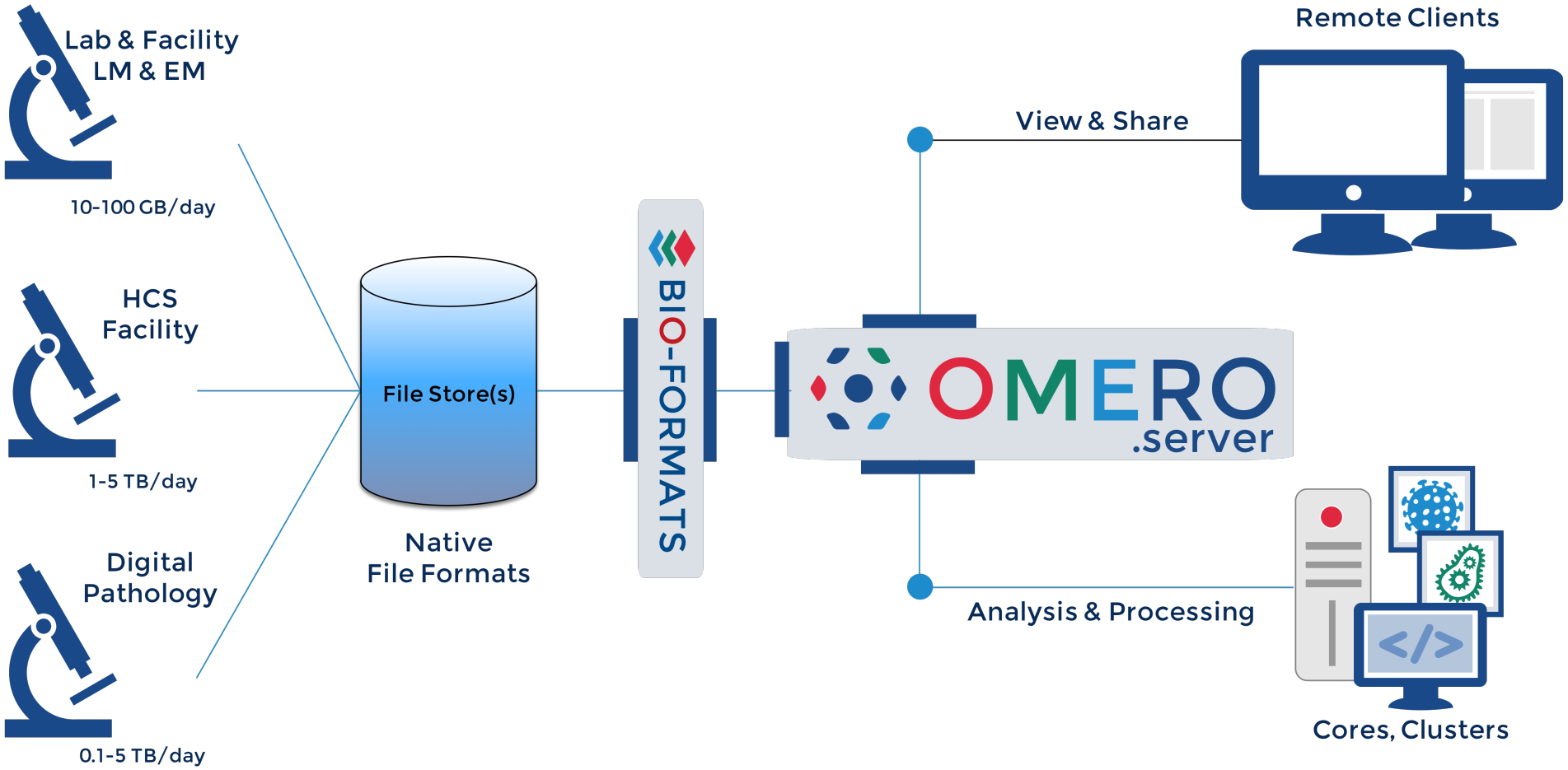
Plugins Welcome

OMERO 5:
Worldwide Impact



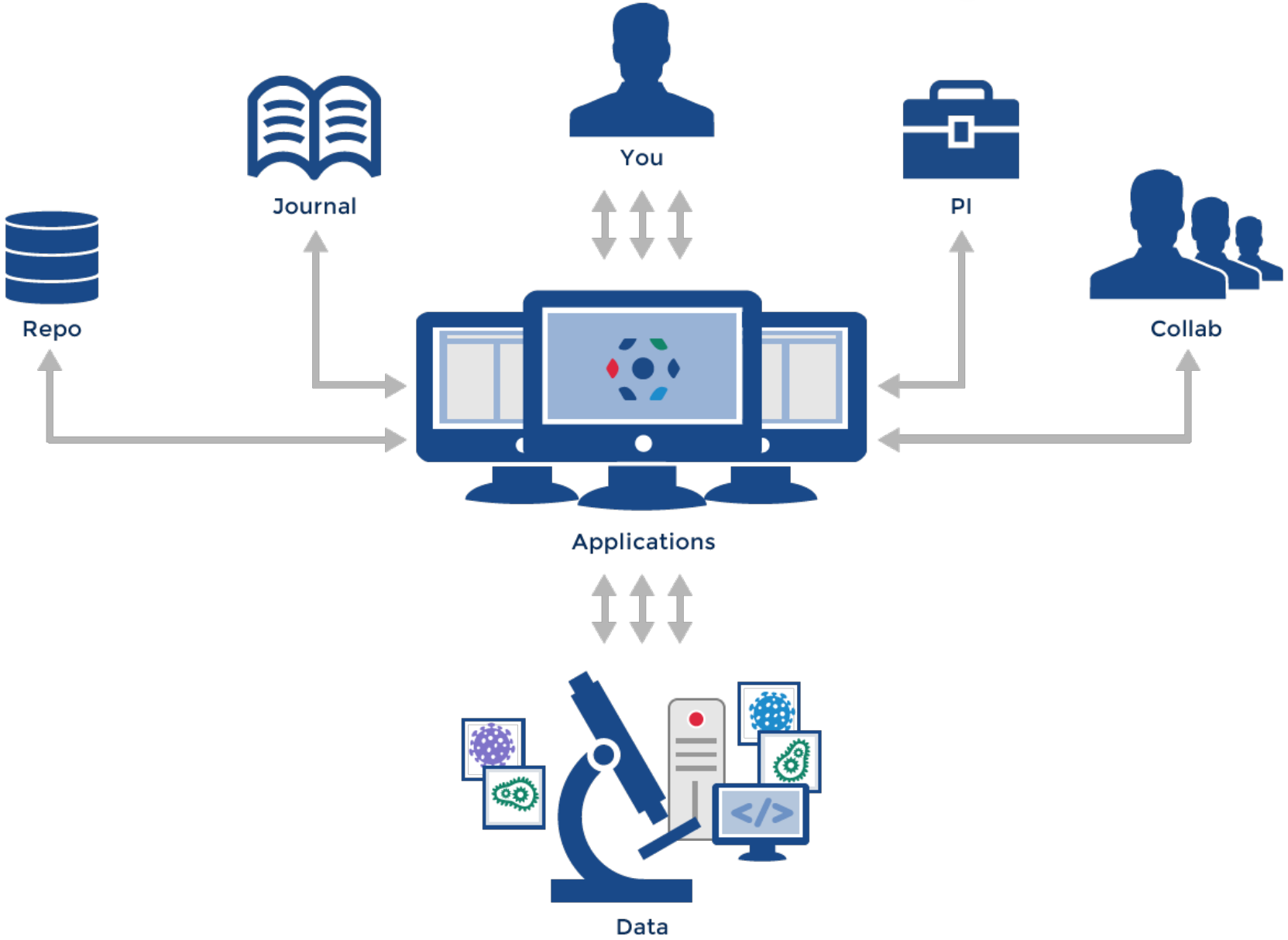
Unique IP Addresses Jan 1 – Dec 31 2015

OMERO & Bio-Formats: Interfaces for Image Data Access



The Standard Paradigm

The "Scientific Data" Paradigm



Gray et al, 2005, Scientific Data Management in the Coming Decade, Microsoft Research

INTEGRATING ANALYSIS...

Examples of Analysis Integration

FLIMfit– fluorescence lifetime fitting (Matlab)

WND-CHRM-- weighted nearest neighbor machine learning (Python)

ThunderSTORM and PALMSiever– Localisation SRM (ImageJ, Matlab)

OMERO2CV– LSFM Multi-View Reconstruction (C++, OpenCV, ITK)

uTrack– Globally optimised object tracking (Matlab)

CellProfiler– HCS segmentation and features (Python)

mTools– Otsu, basic segmentation (Matlab)

ImageJ/Fiji, Icy– Pluggable, desktop Image processing tools (Java)

Coumbus Acapella®-- commercial Big Data processing…

→ *See Webinars at glencoesoftware.com for Matlab, Jupyter examples*

HETEROGENEOUS METADATA ...

Metadata Support in OMERO

Case, Treatment, Conditions, Experiments… (K-Vs)

Files- DOC, PDF, XLS, …. (Blobs)

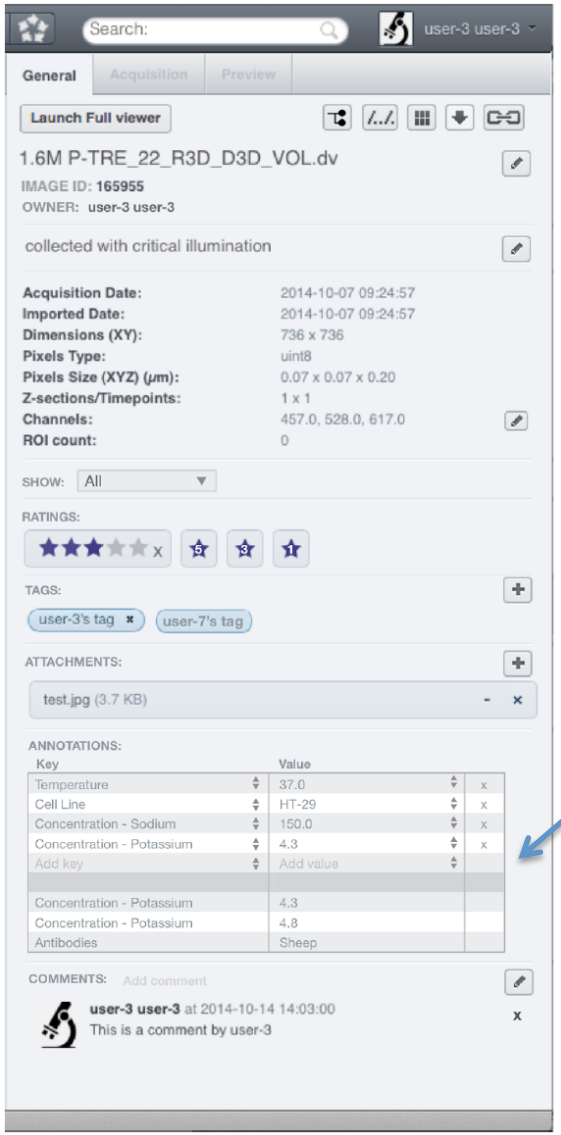
Image Acquisition (Bio-Formats)

Large Tables… (HDF5)

Hierarchies… (Folders, Regions, Ontologies…)*

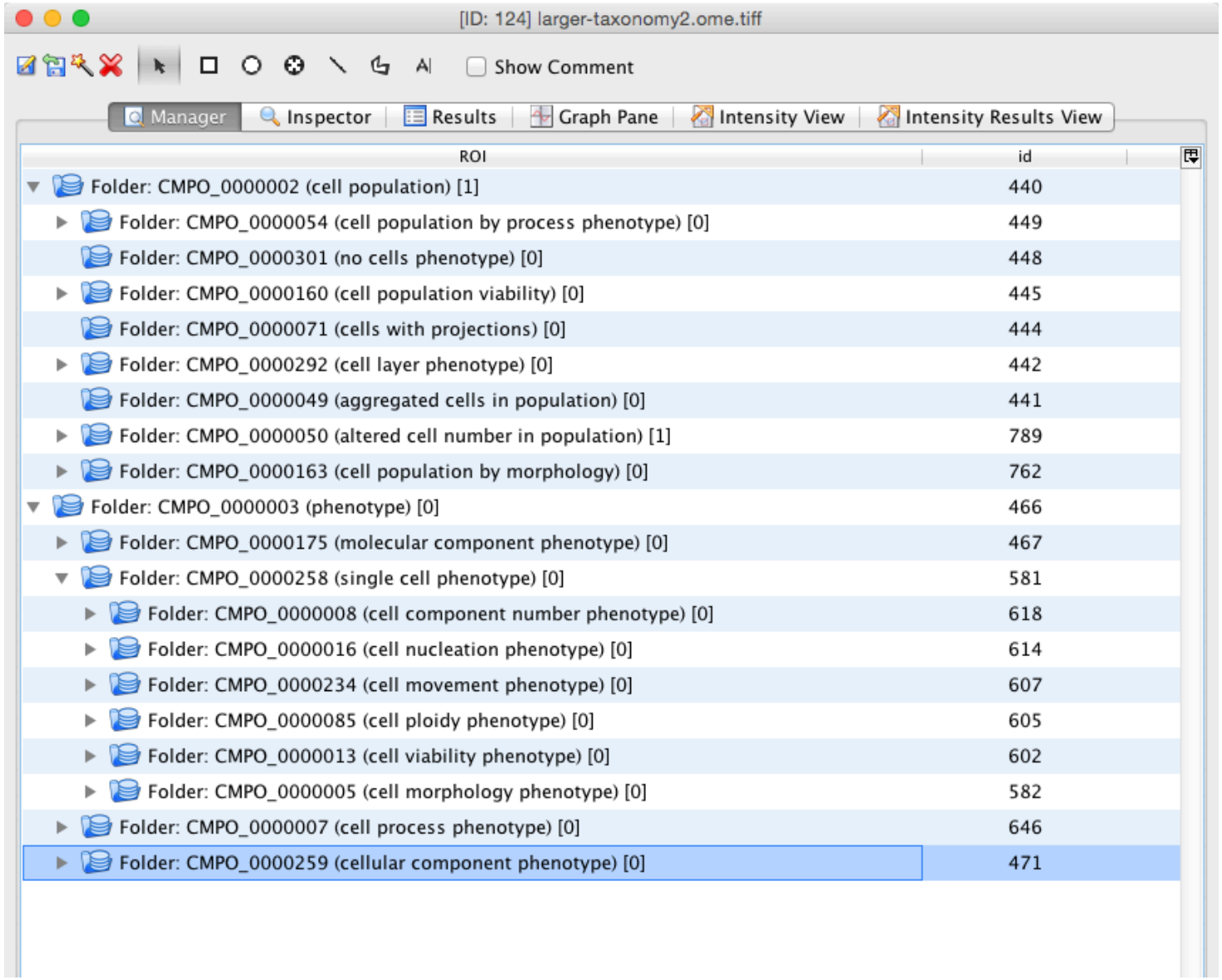
** See blog.openmicroscopy.org for work on "Folders"*

OME 5.1: Map Annotations



Ordered, non-unique, key-value pairs

Folders: Regions, Ontologies, …



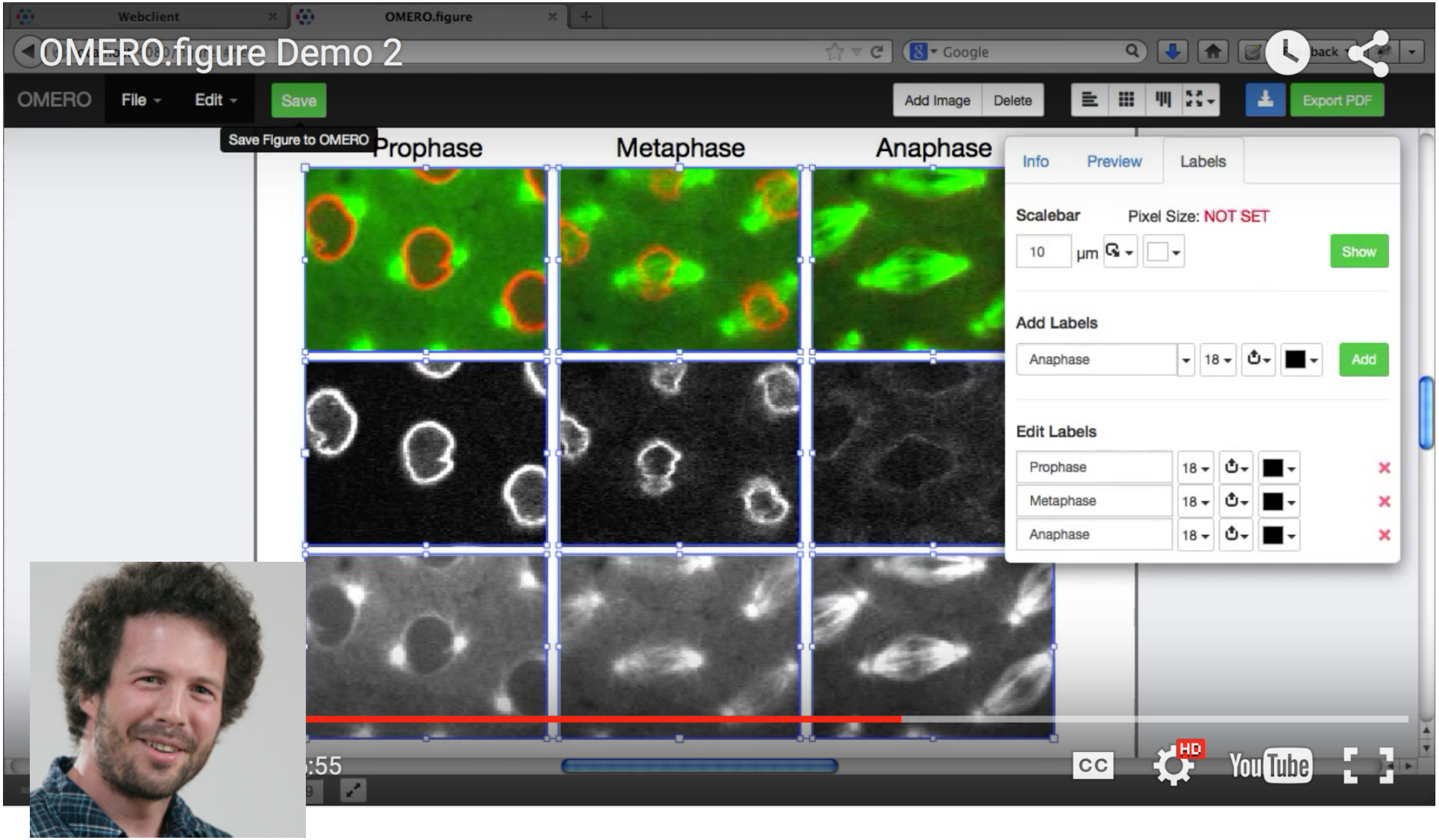
Google: OMERO Folders, coming in OMERO 5.3, Summer 2016

DATA SHARING...

Security Model

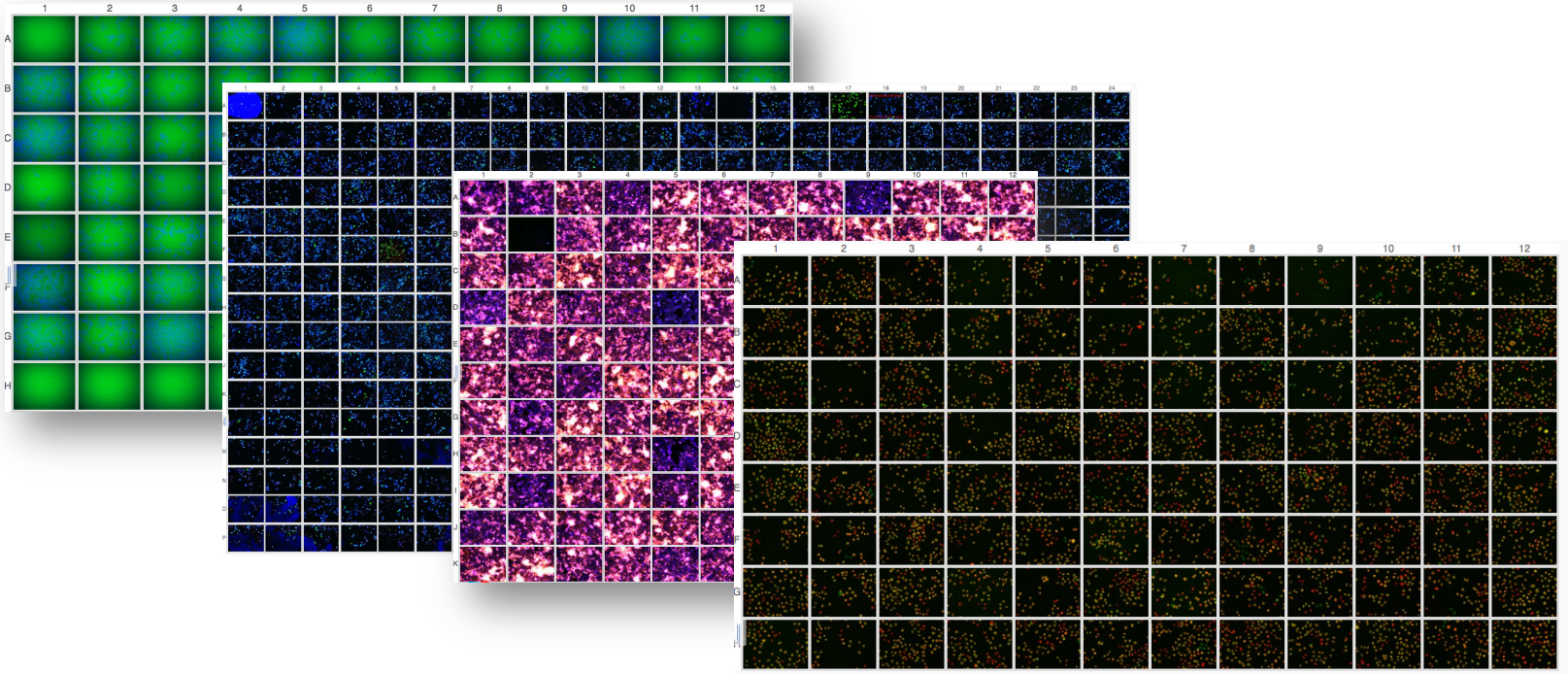
PERMISSIONS	Read	Annotate	Write	Privacy
Private	✓	✓	✓	You
Group-Read	✓	✗	✗	
Group-Annotate	✓	✓	✗	Your Group
Group-Write	✓	✓	✓	
Public-Read	✓	✗	✗	
Public-Annotate	✓	✓	✗	Anyone
Public-Write	✓	✓	✓	

OMERO.figure

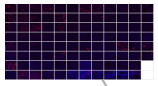


Will Moore (Google: “OMERO figure”)

Data Sharing with OMERO

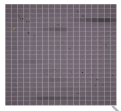


A Vision...

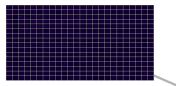


Gene Product Targeting HCS

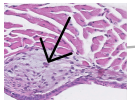
Genetic HCS



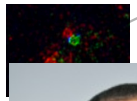
Geographic HCS

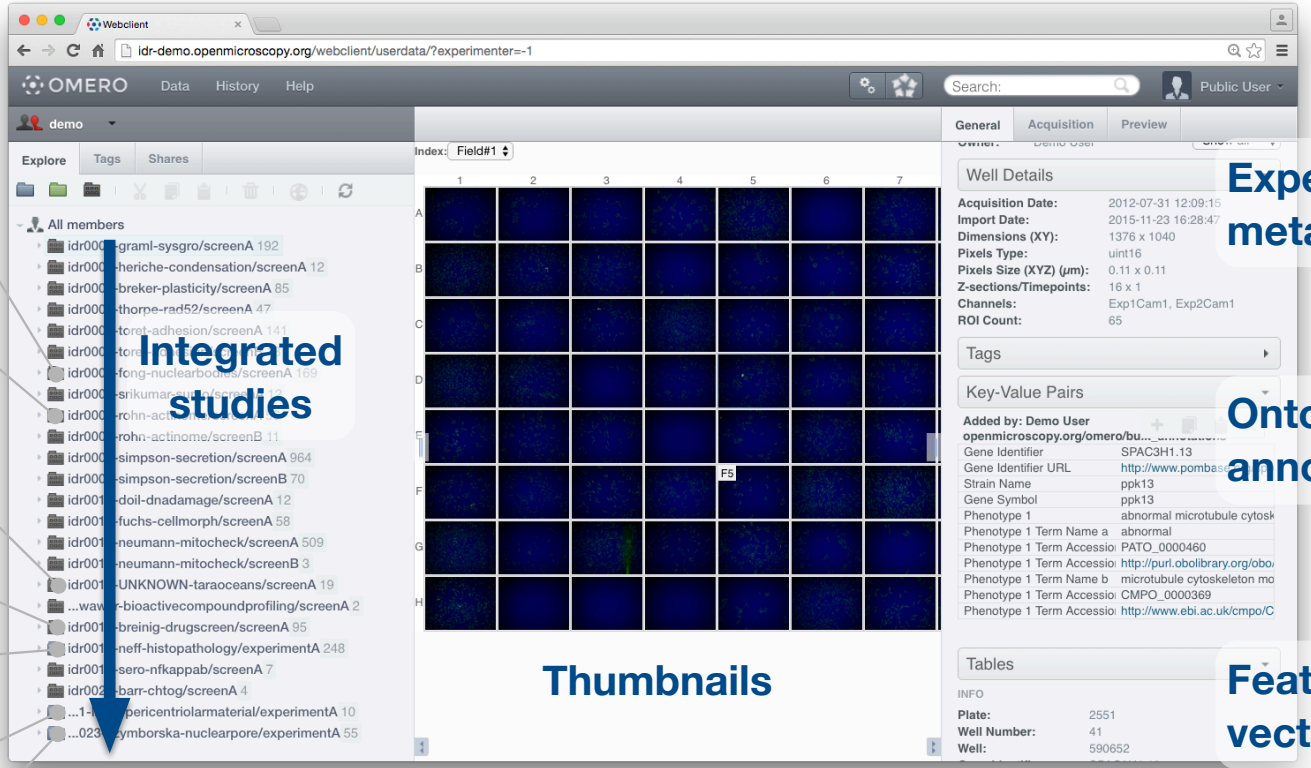


Chemical HCS



Histopathology





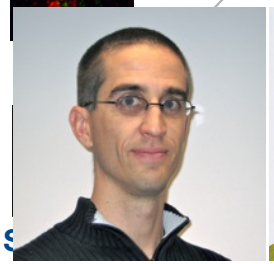
Integrated studies

Thumbnails

Experimental metadata

Ontological annotations

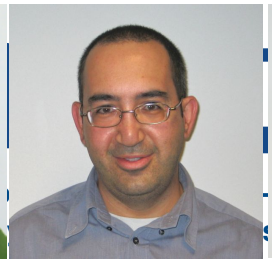
Feature vectors



Josh Moore

Eleanor Williams

Simon Li



Simone Leo

Gus Ferguson

Gabriella Rustici

Anatole Chessel

TAKING CARE OF USERS

OME Help

OMERO

User Help

OMERO User Help - Home Page

Current OMERO Version: 5.2.4

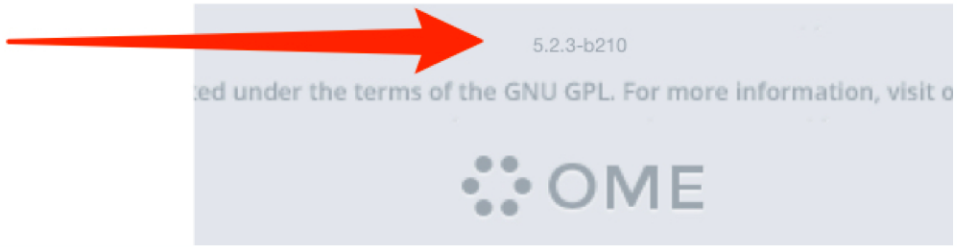
These pages contain the User Help for applications which can connect to an OMERO server or use OMERO plugins.

The User Guides for the current versions are listed in the main menu, for all OMERO applications, including OMERO.insight, OMERO.web, OMERO.figure and OMERO in ImageJ and Fiji.

The Guides for Previous Versions page has links to archives of older versions.

The Training Course Material page contains links to material for printing out and using in training sessions, ZIP archives of the PDFs for all the current versions, customised versions of some of the Guides and other resources such as Omnigraffle® and Word® files.

The current release version of OMERO.insight is 5.2.4. You can tell what version of OMERO you are using by looking at the login screen, or selecting **About OMERO.insight** from the Help menu in OMERO.insight.



All the Version 5 material on the User Help website applies to both version 5.1.4 and version 5.2, with the exception of the new features mentioned below, but note that version 5.1 is now unsupported and will not be updated.

OME QA, Docs & Outreach

OME

Welcome, Jason! Logout
Last login: 2016 05 31 00:48:00

Home | Validator | Feedback | Send files | Statistics | Registry | Demo

Feedback

Status: new **Date:** 2016-04-01 **Text:** **User/email:**

Filter Clear All

Filter tips:

- **Date:** Pick a date from the calendar or type in format **"yy-mm-dd"**. Calendar appears while you click the field. Filtered records are from the picked date up till now.
- **Text:** Type the string that will be searched in: version, comment, error or selected file.
- **User email:** Type a username, first or last name or email address.

| All | Importer Comment | Importer Bug | Insight Comment | Insight Bug | Test Engine Bug | Web Bug | QA Bug | CLI Bug |

ID	Status	User/email	Type	Created	Selected file	Comment	Error
17212	new	lando.wark@g...	Insight 5.2.3-ice3	2016 05 30	-	Trying to view original metada...	java.lang.Exception: omer...
17210	new	ufana2002@gm...	QA	2016 05 29	-	-	-
17195	new	shaun.hare@n...	QA	2016 05 23	-	-	-


Petr Walczysko


Gus Ferguson


Helen Flynn


Balaji Ramalingam


Colin Blackburn

OME Senior Management

Jason Swedlow	Jean-Marie Burel	Sebastien Besson	Josh Moore	Chris Allan

REVIEW OF 2015/2016

A Year of Work in One Slide

OME Data Model

- Folders (ROIs, etc)

OME Files C++

- Full release, 2015 Data Model

Bio-Formats

- File format fixes, doc updates, OMERO decoupling, prep for 5.3.x

OMERO

- Web and graph improvements, prep for 5.3.x

IDR

- Data ingest, Prototype releases, migration to EMBL Embassy

GOING FORWARD

Our Funding Proposals (Status)

Bio-Formats

- Native Application Support
- Stateful
- Object Stores
- Experimental and Analytic Metadata Resources

OMERO

- Extended Metadata (tables, graphs, ontologies…)
- IDR Data Publication (part funded)
- Federation
- Modernizing Client Framework
- Rendering Engine Update
- Permissions and Search Update
- Publication

Consortium

- Outreach and Training (funded)

Critiques of OME

Funder Feedback

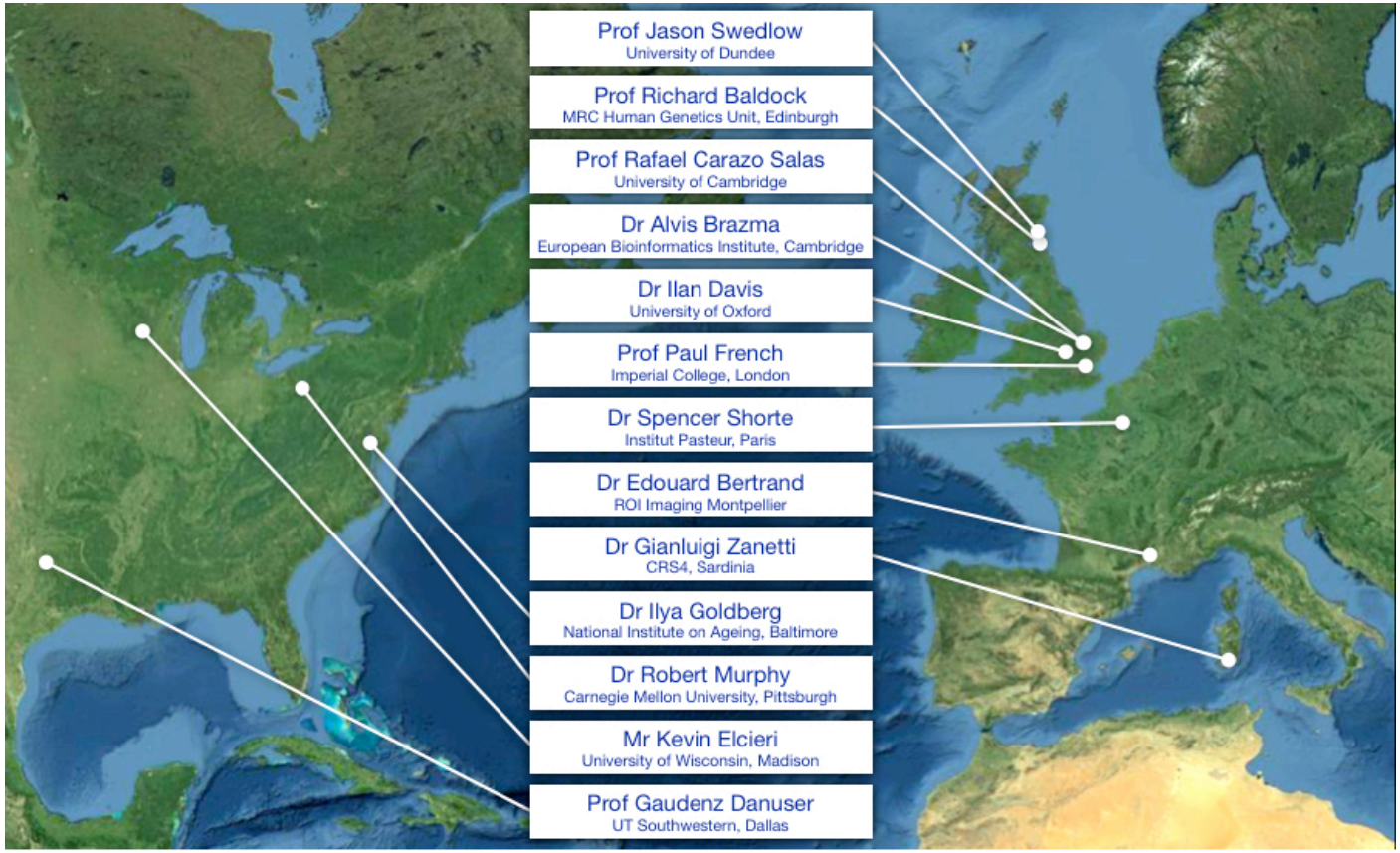
- Lack of clarity over the future directions, long-term plans and sustainable model.
- Integrate data processing tools into OMERO as opposed to supporting the interoperability of existing tools/data formats
- Usability in terms of installation– when will OMERO be easily accessible to any small lab?
- Form an ISO organization
- Be more like DICOM
- Not high enough priority

Some words to think about…

- New Modalities (MS, Raman, X-ray, etc.)
- Multi-modal/Correlative
- Federation:
  - SSO
  - Multiple data sources
- Import/Export
- Ontologies
- Gateway
- REST API
- C++ API
- Client Architecture
- Data Publication
- “Cloud”
- “Scale”
- Usability
- Sustainability
- …

THE OME CONSORTIUM

Focus on Inclusion and Contribution



- Consortium formed as part of the 2011 Wellcome Trust Strategic Award
- Now more open— anyone who is investing in working with OME tools and making contributions
- Level of interaction varies

Partnership as a Strategy

Project Philosophy

→ Build technology in the context of critical scientific problems

An Unfortunate Trend

→ OME as a Solution Provider

Key Strategic Path:

→ OME as an R&D Partner, to solve major challenges in accessing and using scientific data

→ Going beyond Github, to drive the synergies across all partners

OME Consortium

Dundee – Jason Swedlow, Sebastian Besson, Colin Blackburn, Jean-Marie Burel, Mark Carroll, Gus Ferguson, Helen Flynn, Kenny Gillen, Roger Leigh, , Simone Leo, Simon Li, Dominik Lindner, June Matthew, Josh Moore, Will Moore, Balaji Ramalingam, Gabriella Rustici, Aleksandra Tarkowska, Petr Walczysko, Eleanor Williams, Wilma Woudenberg

University of Wisconsin, Madison (LOCI) - Kevin Eliceiri, Curtis Rueden, Mark Hiner

UT Southwestern – Gaudenz Danuser

Oxford – Ilan Davis, David Pinto

Cambridge – Rafael Carazo-Salas, Bálint Antal, Anatole Chessel

CRS4 - Gianluigi Zanetti, Gianmauro Cucurru, Luca Lianas

Edinburgh – Richard Baldock, Mark Arends, Michael Cheeseman

Carnegie-Mellon – Robert Murphy, BK Cho, Ivan Cao-Berg

Imperial – Paul French, Chris Dunsby, Ian Munro, Yuriy Alexandrov

NIA, NIH – Ilya Goldberg, Chris Coletta

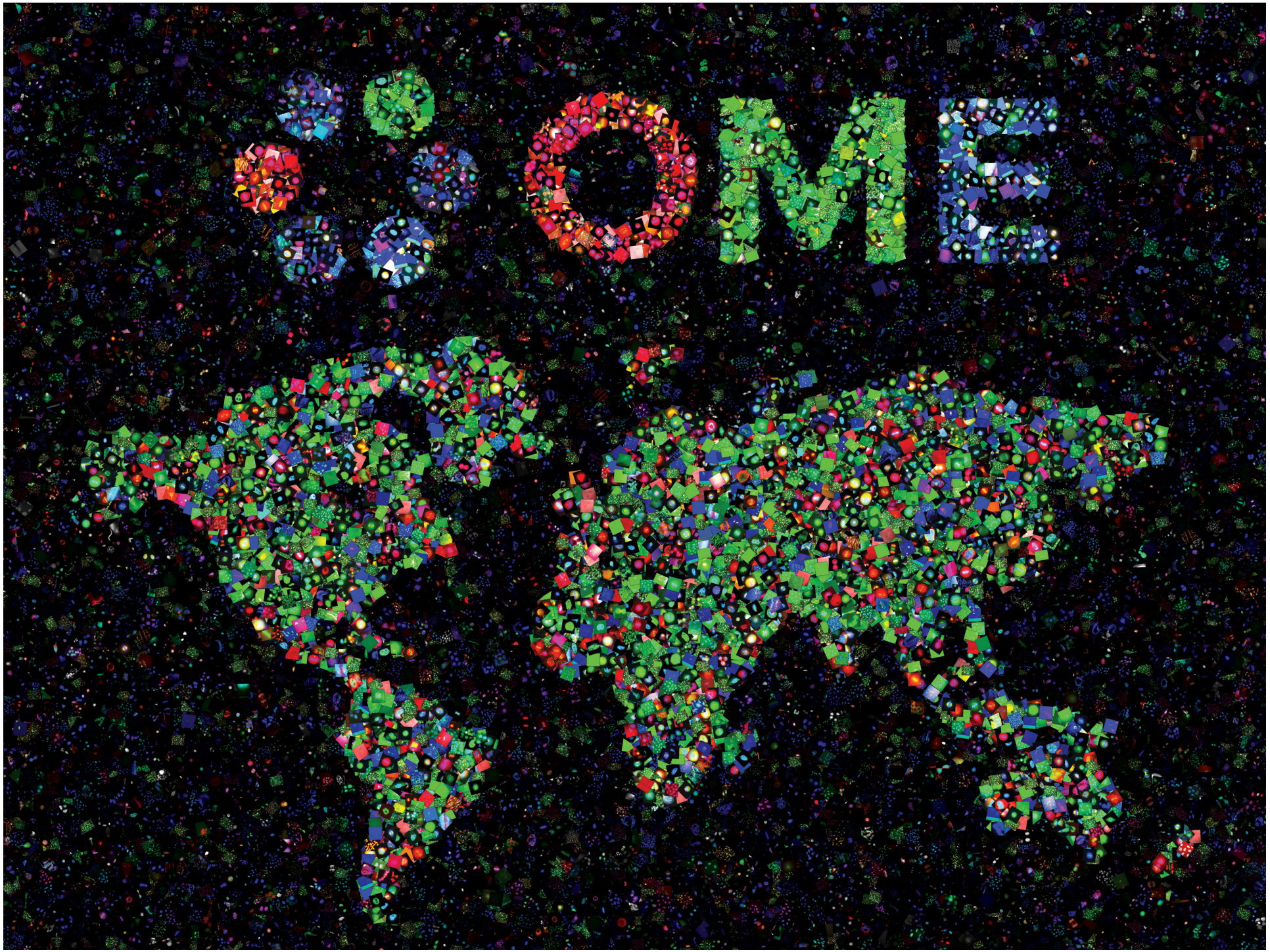
Pasteur – Spencer Shorte, SebaAnne Daenckart

HMS – Peter Sorger, Douglas Russell, Jay Copeland

MRI – Edouard Bertrand, Andrea Falconi, Julio Langerak

EMBL-EBI – Gerard Kleywegt, Ardan Patwardhan, Ingvar Lagerstedt, Alvis Brazma, Ugis Sarkans

Glencoe Software – Chris Allan, Joshua Ballanco, Andreas Knab, Melissa Linkert, Chris MacLeod, Josh Moore, Emil Rozbicki, Liza Unson, Wilma Woudenberg


SOME