

# Image Data Integration and Publication at Scale

## Update on the IDR

Josh Moore  
OME, University of Dundee  
@openmicroscopy & @IDRnews



University of  
**BRISTOL**

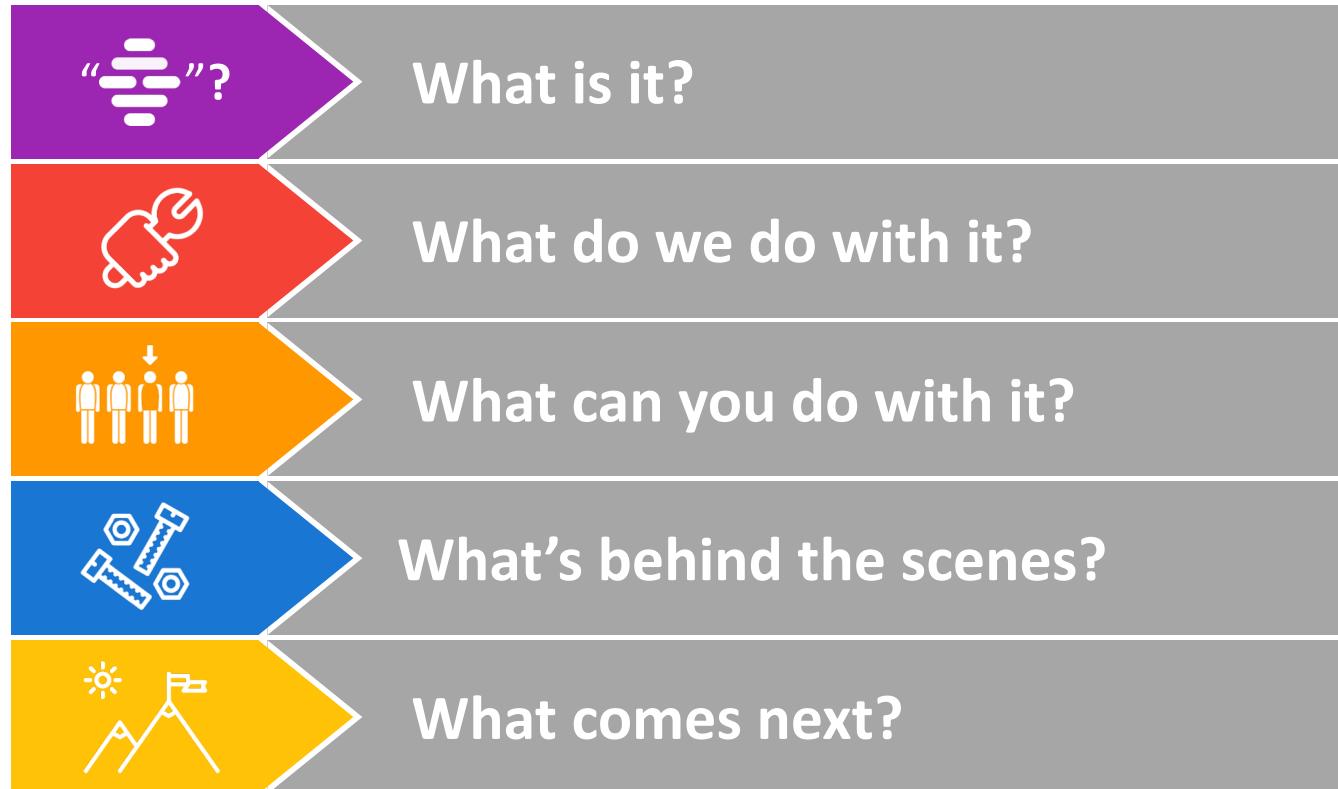


University  
of Dundee

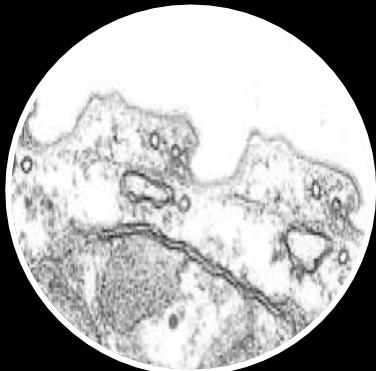
EMBL-EBI



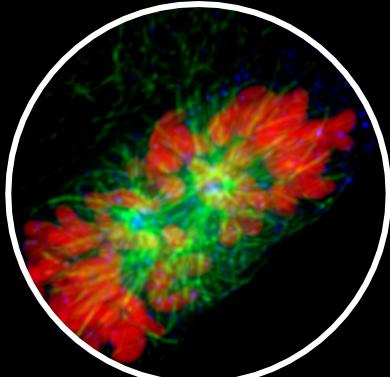
# Outline



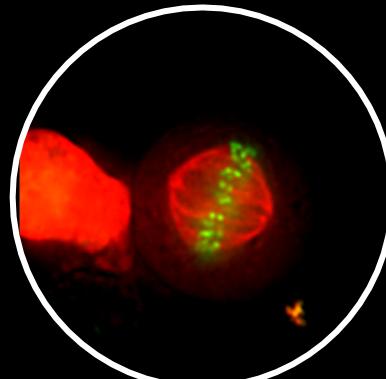
# The Image Problem is Ubiquitous



Organelles



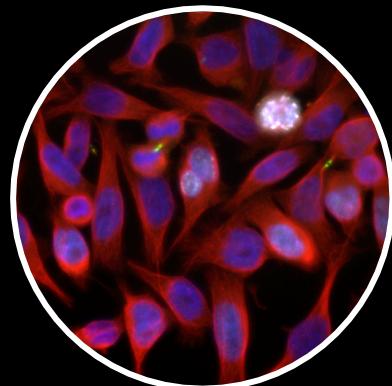
Cells



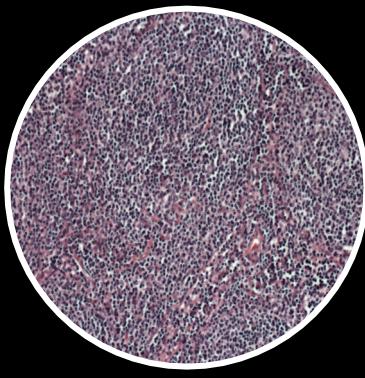
Dynamics



Physiology



Lead Discovery  
Target Validation



Pathology

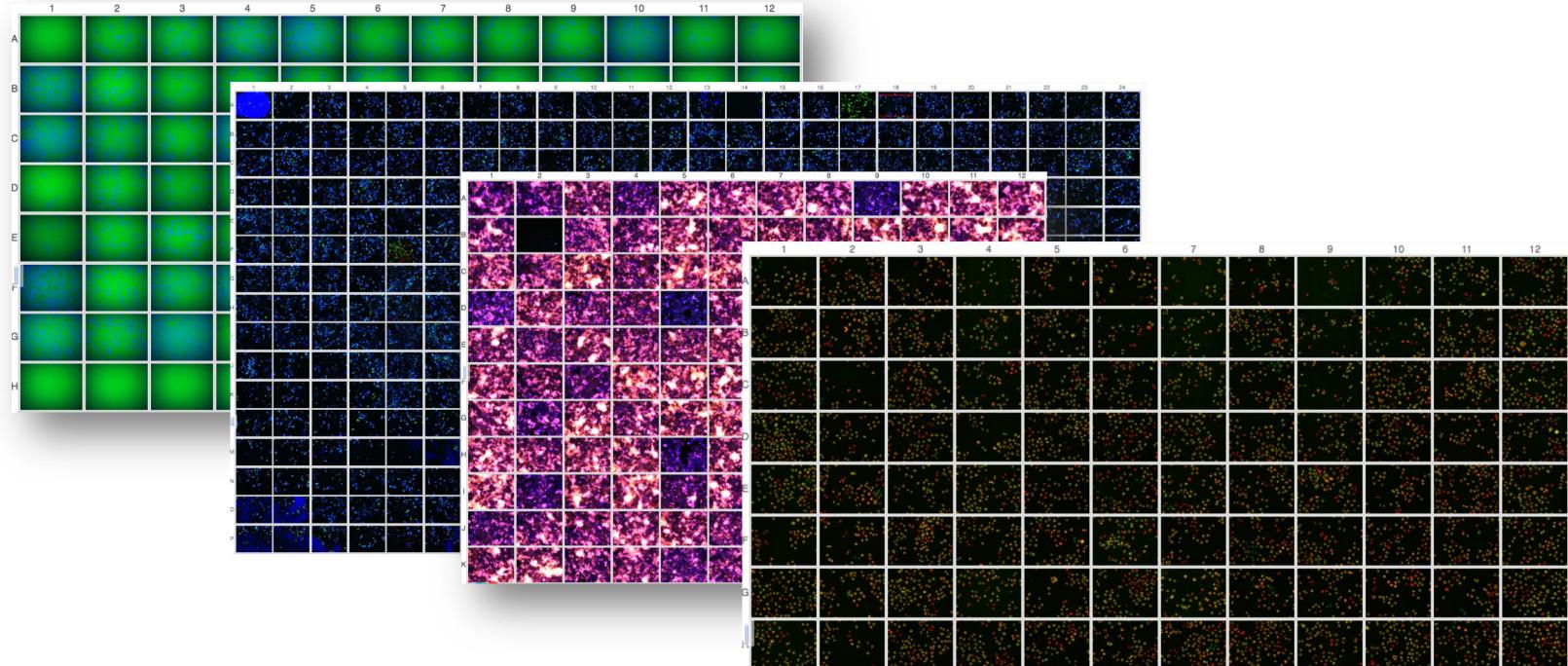


In Vivo

A pretty picture?  
A measurement?  
A resource?



# Data Sharing in OMERO



JCB

LINCS

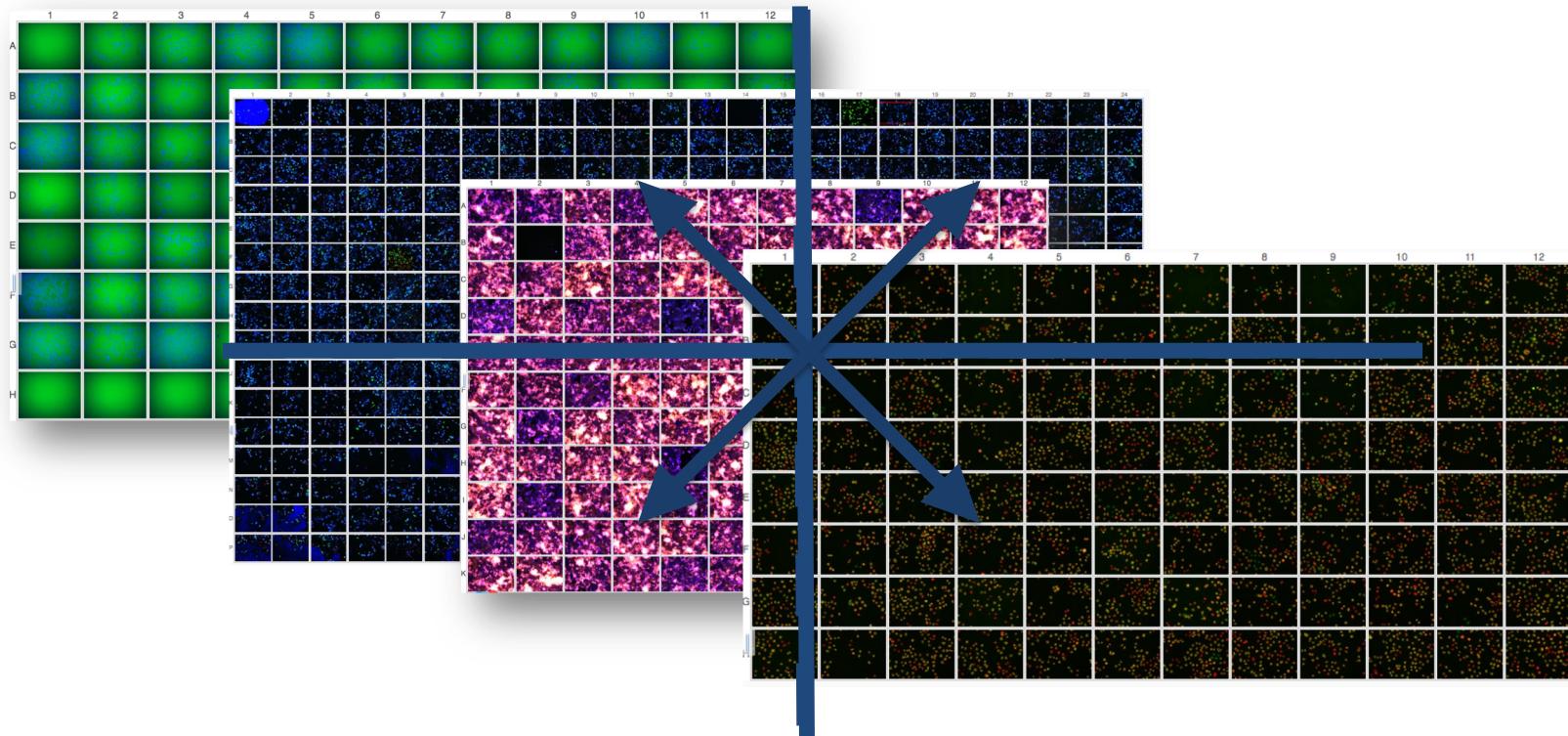
QBI

SSBD

SYSGR



# Data Integration in OMERO



Findable



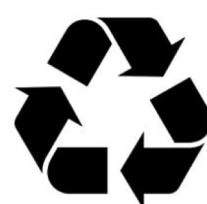
Accessible



Interoperable



Reusable



A public image data resource!

# Image Data Resource (IDR)



The screenshot shows the IDR homepage. At the top, there's a navigation bar with the IDR logo, a "ABOUT US" link, and menu items for "SUBMISSIONS", "ANALYSIS", and "DEPLOYMENT". Below the header is a large banner featuring a microscopy image of cells with red and blue staining. Overlaid on the banner is the IDR logo and the text "Image Data Resource". A subtext reads: "Welcome to the Image Data Resource (IDR). This online, public data repository seeks to store, integrate and serve image datasets from published scientific studies." A yellow button labeled "Take a look at the data" is centered in the banner area. Below the banner, a section titled "Goal" contains text about the IDR's mission to make datasets publicly available and promote validation and reuse. It also mentions the "Nature Methods paper" for more information. At the bottom of the page, there's a footer with links to "NATURE METHODS | RESOURCE" and the paper's title: "Image Data Resource: a bioimage data integration and publication platform".

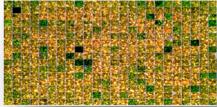


<https://idr.openmicroscopy.org/>



# The IDR @ EBI Embassy

Gene Product  
Targeting HCS



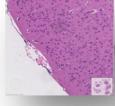
Genetic HCS



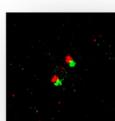
Geographic HCS



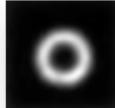
Chemical HCS



Histopathology



3D-Sim



Super-resolution

**Integrated studies**

**Experimental metadata**

**Biomolecular annotations**

**Analysis results**

**Thumbnail (of 5D Images)**

This figure illustrates the IDR platform's integrated analysis of various microscopy datasets. It shows a central interface displaying a grid of 5D microscopy images (thumbnails) corresponding to a specific experiment. To the left, a sidebar lists the study details, including the study name ('Demo'), screen names ('screenA' and 'screenB'), and individual experiment IDs. To the right, detailed experimental metadata is provided, such as acquisition date, import date, dimensions, pixel size, sections, channels, and ROI count. Biomolecular annotations are shown for specific genes and ORFs, including their identifiers and taxon information. Analysis results are summarized at the bottom right.



Cross-data  
browsing

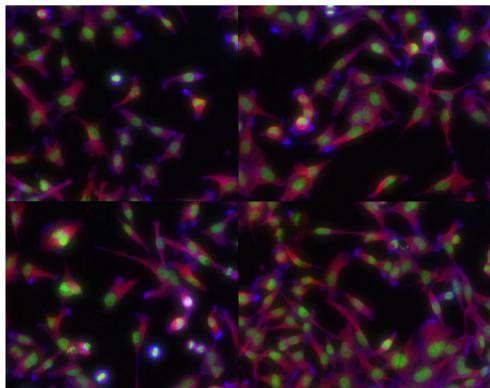


Cloud  
analysis



Download  
(local analysis)

# Linked data



idr0012

IDR

Studies Genes Phenotypes Cell Lines siRNAs Antibodies

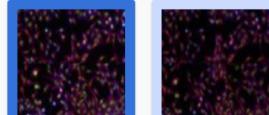
demo

Type Gene Symbol... Match case ?

Gene 1

- ASH2L (38) 5 
  - ↳ idr0006-fong-nuclearbodies/screenA (16) 1
  - ↳ idr0009-simpson-secretion/screenA (12) 6
  - ↳ idr0013-neumann-mitocheck/screenA (6) 3
  - ↳ idr0012-fuchs-cellmorph/screenA (2) 1
    - ↳ HT28 2
      - HT28 [Well G13, Field 1]
      - HT28 [Well G13, Field 2]
    - ↳ idr0010-doil-dnадamage/screenA (2) 1

Filter Images



Attributes 8

Cell Lines

Added by: Public data

Cell Line HeLa

Gene

Added by: Public data

Gene Identifier 9070 

Gene Symbol ASH2L

Phenotype

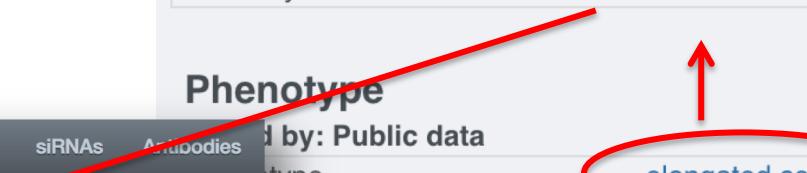
Added by: Public data

Phenotype

Phenotype Term Name elongated cells

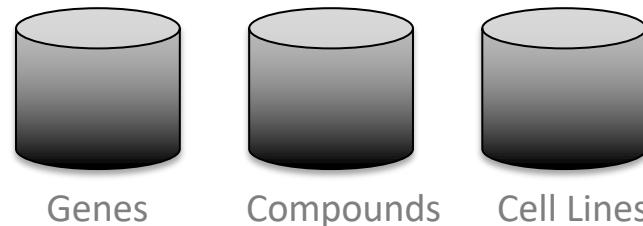
Phenotype Term Accession CMPO\_0000077 

elongated cell phenotype

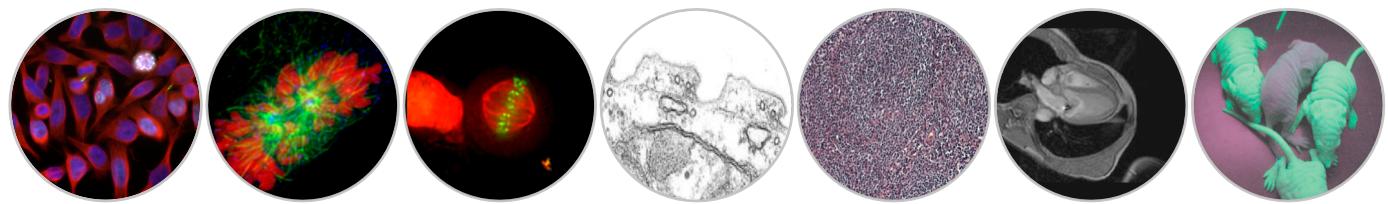


# Reference images

## Biomolecular Resources



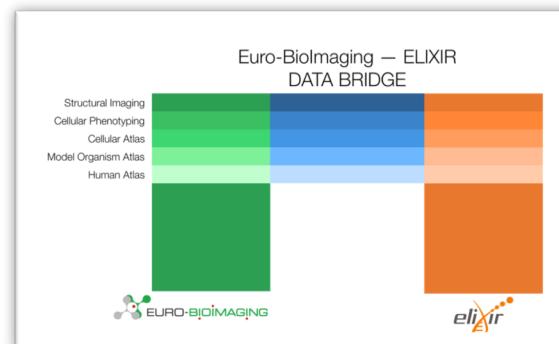
## Imaging Domains



## Controlled Vocabularies



Google: "Euro-BioImaging/Elixir Data Strategy"



# Breadth of domains

Lawo et al, 2013

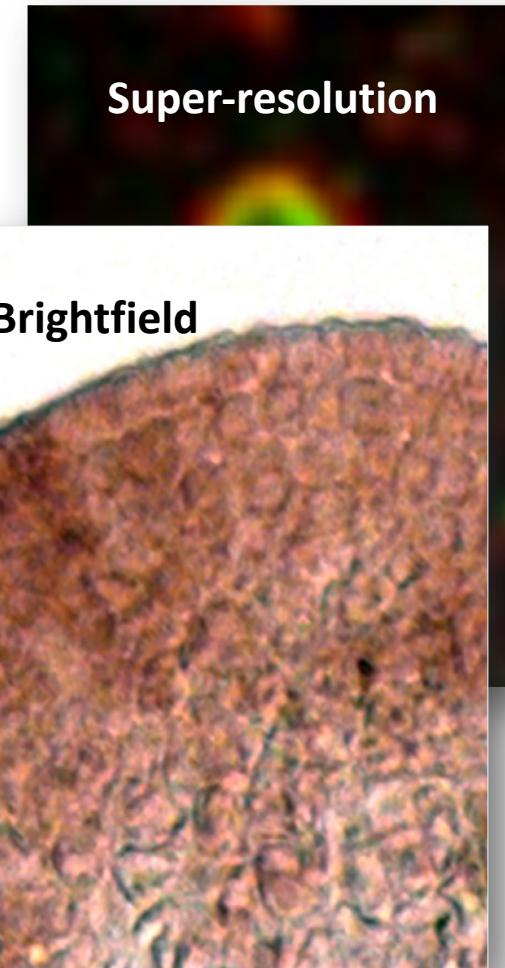
Neff et al, 2013

Dickerson et al, 2015

Super-resolution

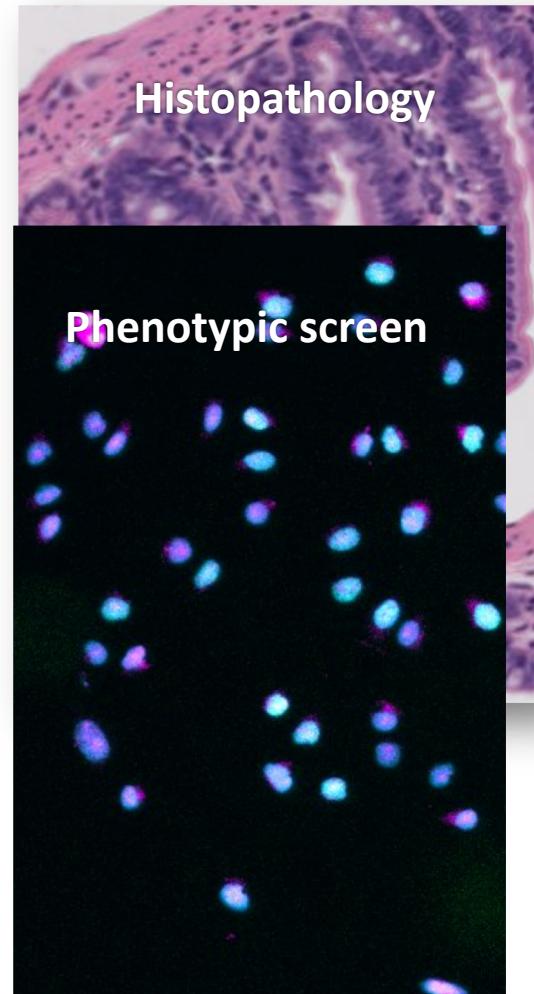
Brightfield

Yang et al, 2016



Histopathology

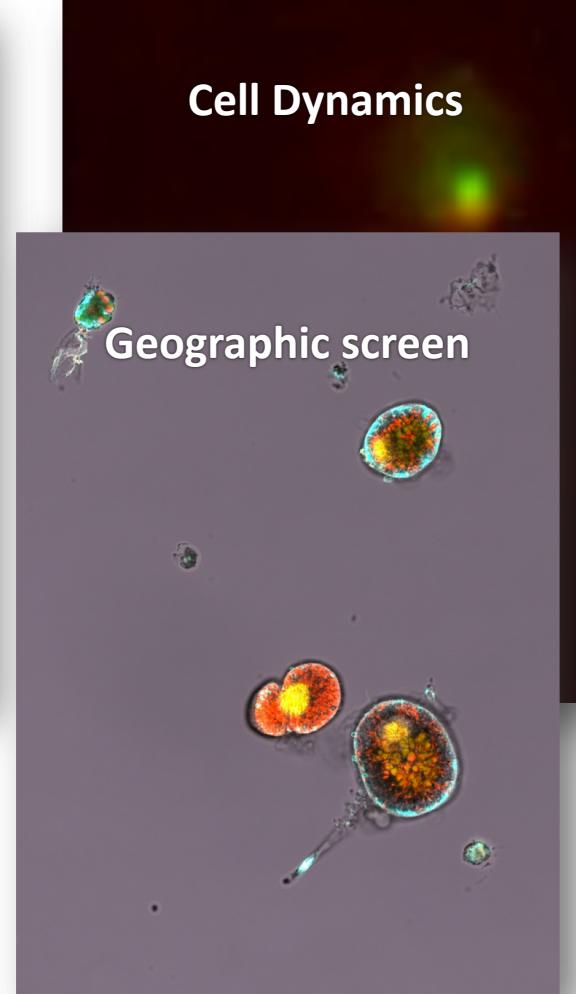
Phenotypic screen



Kilpinen et al, 2017

Cell Dynamics

Geographic screen



Tara Oceans



# Vital Stats

Metric	May 2018
Image data size	46.9 TB
Image files	15.4 M
Total images (5D)	2.89 M
Planes (2D)	42.2 M
Experiments	1.04M
Genes	19K
Phenotypic Classes	161



# Vital Stats

## 46 Studies

Datasets &  
papers linked  
via DOIs

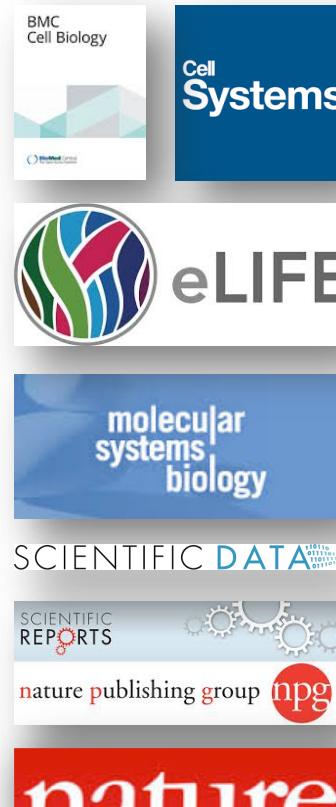
## Models:

*S. cerevisiae*  
*S. pombe*  
*Drosophila*  
*Arabidopsis*  
*Mus*  
Human  
Plankton

## Projects:

Mitocheck  
Sysgro  
HPA  
MULTIMOT  
BBBC  
Tara  
HipSci  
...

## Cross-published:



# By the way

IDR News on Twitter: "EXCITING NEWS! #IDR is now a @ScientificData recommended image data repository! [blog.openmicroscopy.org/community/2018...](http://blog.openmicroscopy.org/community/2018...) #OpenSc

Following

Exciting news! #IDR is now a @ScientificData recommended image data repository! [blog.openmicroscopy.org/community/2018...](http://blog.openmicroscopy.org/community/2018...) #OpenSc

Secure | https://www.nature.com/sdata/policies/repositories#imaging

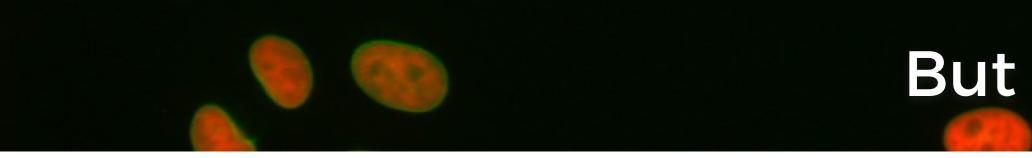
SCIENTIFIC DATA

## Imaging

<a href="#">Image Data Resource</a>	<a href="#">view FAIRsharing entry</a>
<a href="#">The Cancer Imaging Archive</a>	<a href="#">view FAIRsharing entry</a>
<a href="#">SICAS Medical Image Repository</a>	<a href="#">view FAIRsharing entry</a>
<a href="#">Coherent X-ray Imaging Data Bank (CXIDB)</a>	<a href="#">view FAIRsharing entry</a>

<https://www.nature.com/sdata/policies/repositories#imaging>





But

what about the rest?



# Submission

# Submission



The screenshot shows the IDR Submission page at [idr.openmicroscopy.org/about/submit.html](https://idr.openmicroscopy.org/about/submit.html). The page features a header with the IDR logo, navigation links for SUBMISSIONS, ANALYSIS, and DEPLOYMENT, and social media links for @IDRnews and @IDRstatus. The main content area has a background image of cells stained with red and blue. A title "Submission of datasets to the IDR" is centered over the image. Below the title, a text block explains the purpose of the IDR: "The Image Data Resource (IDR) publishes ‘reference image’ datasets supporting conventional peer-reviewed publications and integrates them with other imaging datasets for cross-dataset querying of metadata (e.g. genes, phenotypes, small molecules) and re-analysis." A link to "Submission Guidelines v1.0 - last modified: March 2017" is also present. The section "What we are looking for" is described below.

**What we are looking for**

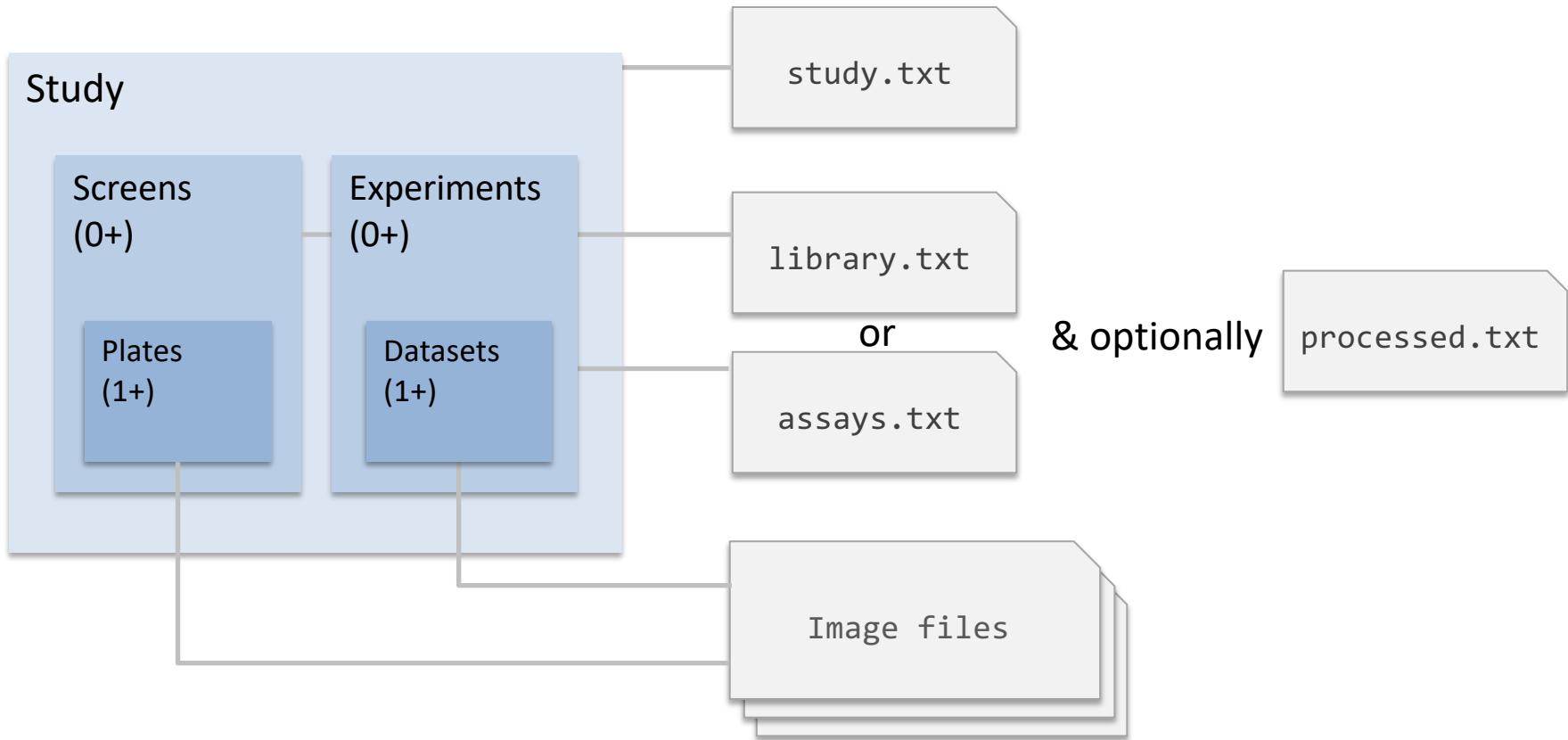
We aim to publish reference image datasets, which have value beyond simply supporting an original publication according to the [Euro-BioImaging - Elixir Image Data Strategy](#). This includes:

- Datasets **associated** with an existing or upcoming publication
- **Complete** datasets - not just images supporting one figure in the publication
- Datasets whose metadata can be **integrated** with other datasets via identifiers from well-known biomolecular resources (Ensembl, NCBI Entrez Gene, RefSeq, PubChem, ChEBI etc)
- Datasets generated using new imaging **methods** or new analysis methods
- Datasets that are likely to be **re-analysed** or **incorporated** into other studies or integrated with other imaging datasets

<https://idr.openmicroscopy.org/about/submit.html>

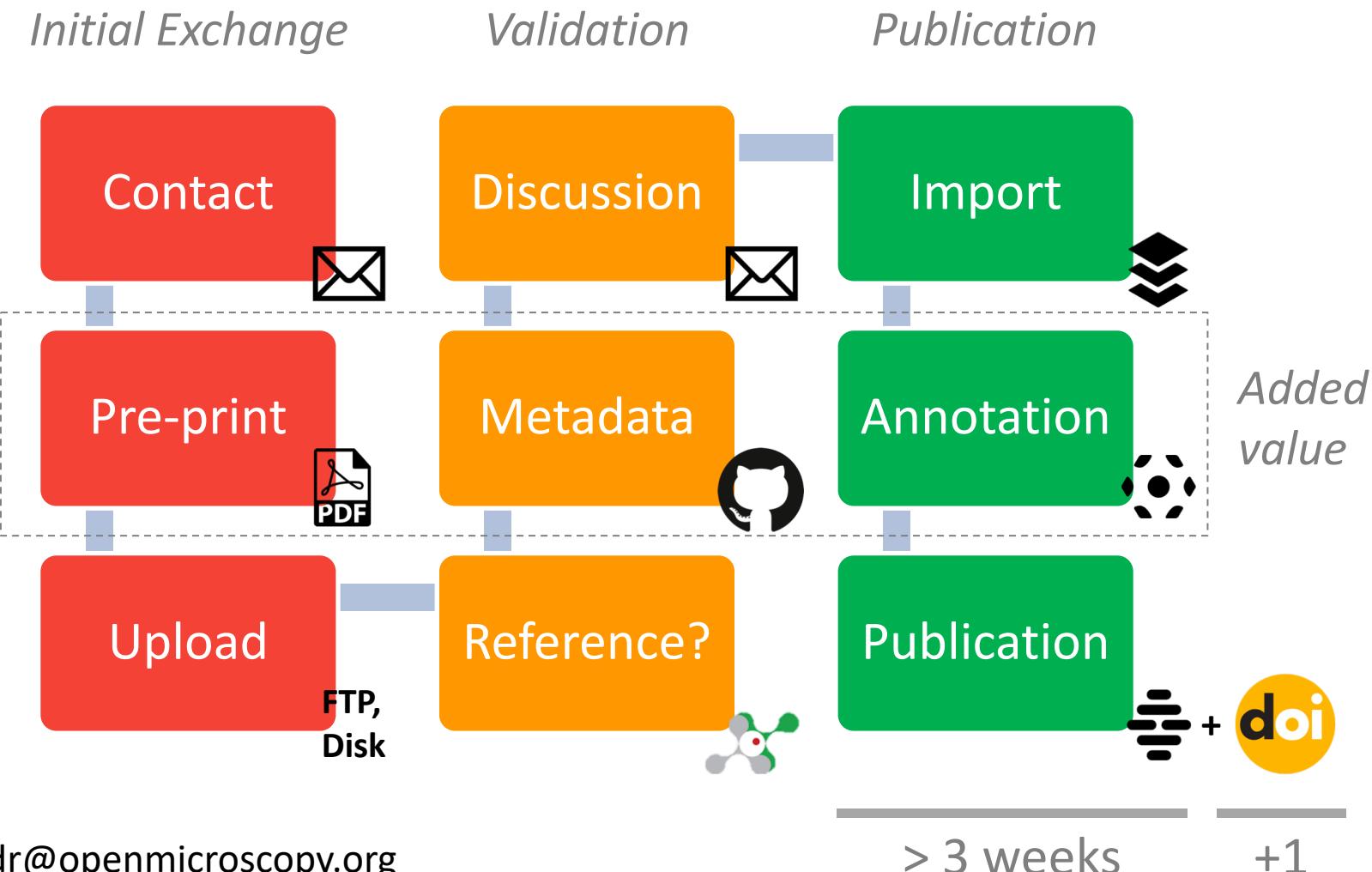


# Submission Contents



“” : metadata specification

# Submission Pipeline



[idr@openmicroscopy.org](mailto:idr@openmicroscopy.org)

> 3 weeks

+1



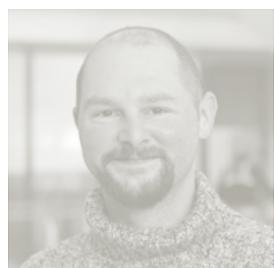
# Curators & Data Wranglers



**Eleanor Williams**



**Sébastien Besson**



**Dominik Linder &**



**Petr Walczysko**

Winner of the 2018 Biocuration Career Award!

The screenshot shows a Twitter post from the account @biocurator. The post reads: "This year's deserving winner of the Biocuration Career Award, Dr Eleanor Williams, tells us about her career to date and gives a hint as to what will be in her presentation at the International Biocuration Conference in Shanghai in April". Below the text is a link to [biocuration.org/eleanor-williams...](https://biocuration.org/eleanor-williams...). At the bottom of the post is a fluorescence microscopy image of a cell with green and blue staining.

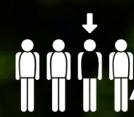
The screenshot shows a news article on the International Society for Biocuration (ISB) website. The headline reads "ELEANOR WILLIAMS ON WINNING THE BIOCURATION AWARD 2018". The article was published on March 1, 2018, by Rob Davidson. Below the headline is another fluorescence microscopy image of a cell.

<https://twitter.com/biocurator/status/969373280313409536>



- Full team effort
- Drives development of OMERO,  
Bio-Formats & File Formats
- With added funding for  
Human Cell Atlas  
and EBI's BioStudies
- Looking for new curators and  
data wranglers.



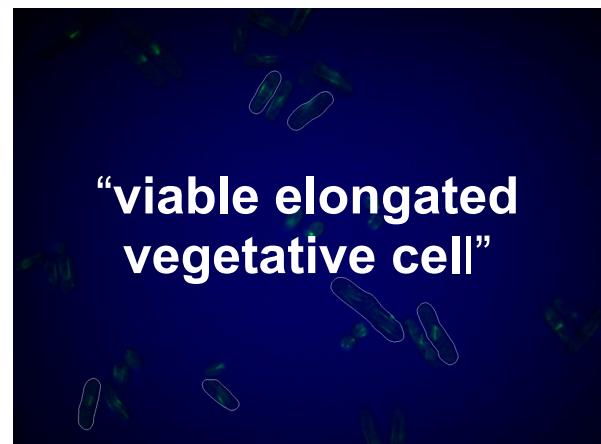
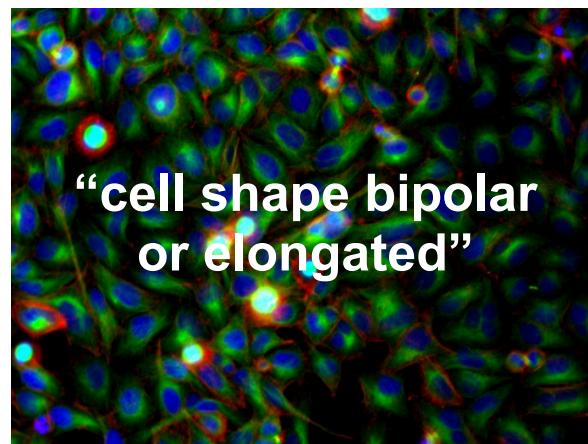


# Analysis & Discovery

# IDR Phenotype: elongated cells



Screenshot of the IDR (Integrating Data Resources) web interface. The top navigation bar includes links for Studies, Genes, **Phenotypes** (which is highlighted with a red circle), Cell Lines, siRNAs, Antibodies, Compounds, Organisms, and Help. A user profile icon for 'demo' is visible on the left, and a 'General' filter is applied on the right.

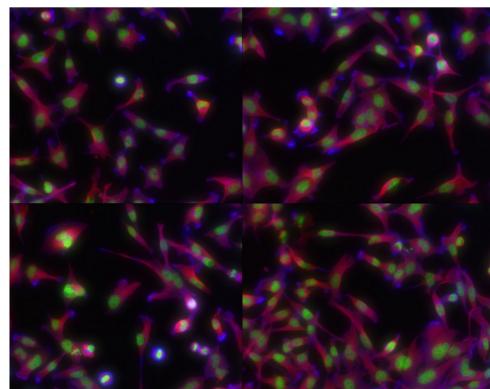


## elongated cell phenotype

[http://www.ebi.ac.uk/cmpo/CMPO\\_0000077](http://www.ebi.ac.uk/cmpo/CMPO_0000077)



# IDR Phenotype: elongated cells



idr0012

Attributes 8

**Cell Lines**  
Added by: Public data  
Cell Line HeLa

**Gene**  
Added by: Public data  
Gene Identifier 9070   
Gene Symbol ASH2L

**Phenotype**  
Added by: Public data  
Phenotype elongated cells  
Phenotype Term Name elongated cell phenotype  
Phenotype Term Accession CMPO\_0000077

IDR

Studies Genes Phenotypes Cell Lines siRNAs Antibodies

demo

Type Gene Symbol... Match case ? Filter Images

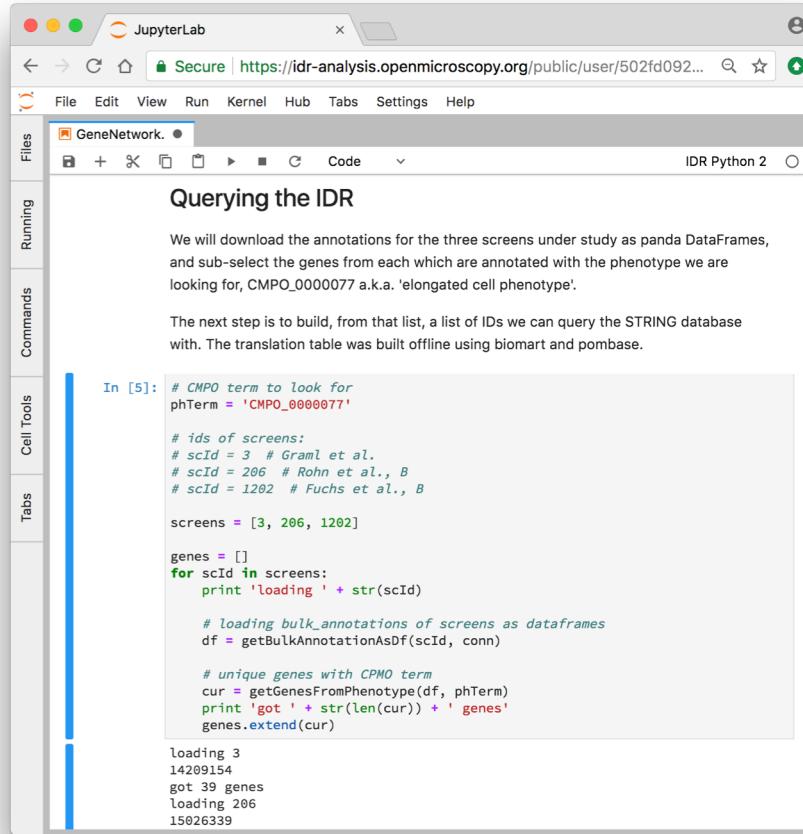
Gene 1

- ASH2L (38) 5
  - idr0006-fong-nuclearbodies/screenA (16) 1
  - idr0009-simpson-secretion/screenA (12) 6
  - idr0013-neumann-mitocheck/screenA (6) 3
  - idr0012-fuchs-cellmorph/screenA (2) 1
    - HT28 2
      - HT28 [Well G13, Field 1]
      - HT28 [Well G13, Field 2]

idr0010-doil-dnадamage/screenA (2) 1



# IDR Phenotype: elongated cells



The screenshot shows a JupyterLab interface with a tab titled "GeneNetwork". The main area displays a Python code cell under "In [5]". The code is used to query the IDR database for genes associated with the phenotype "CMPO\_0000077" (elongated cell phenotype). It loads annotations from three screens (scId 3, 206, 1202) and prints the number of unique genes found.

```
# CMPO term to look for
phTerm = 'CMPO_0000077'

# ids of screens:
# scId = 3 # Graml et al.
# scId = 206 # Rohn et al., B
# scId = 1202 # Fuchs et al., B

screens = [3, 206, 1202]

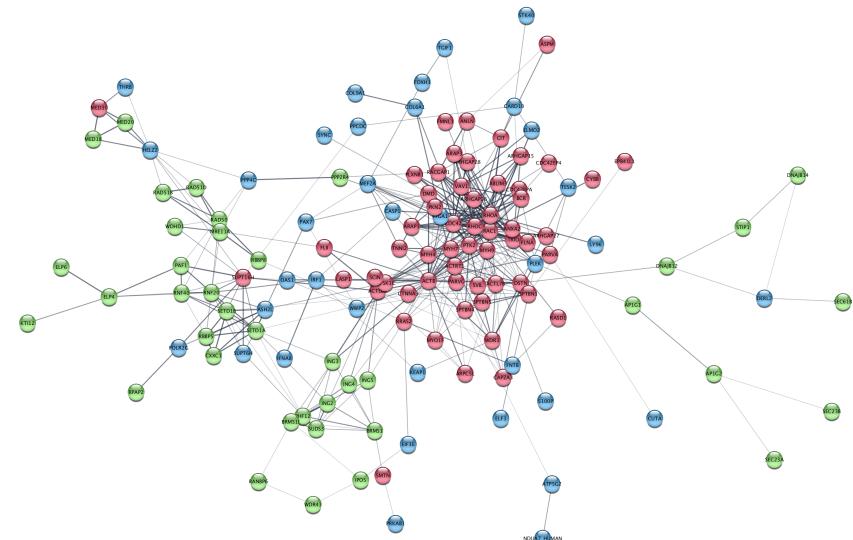
genes = []
for scId in screens:
    print 'loading ' + str(scId)

    # loading bulk_annotations of screens as dataframes
    df = getBulkAnnotationAsDf(scId, conn)

    # unique genes with CMPO term
    cur = getGenesFromPhenotype(df, phTerm)
    print 'got ' + str(len(cur)) + ' genes'
    genes.extend(cur)

loading 3
14209154
got 39 genes
loading 206
15026339
```

```
def getGenesFromPhenotype():
```



SYSGRO (*S. pombe*)  
Actinome (HeLa)  
CellMorph (HeLa)



# Genes $\leftrightarrow$ Phenotypes



jupyter ARP2-3Complex Last Checkpoint: 09/08/2017 (autosaved)

File Edit View Insert Cell Kernel Widgets Help Not Trusted | OMERO Python 2 | Control Panel Logout

### Query IDR for Phenotypes

```
In [4]: session = create_http_session(idr_url.value)
organism = org_sel.value
idr_base_url = idr_url.value

[query_genes_dataframe, screen_to_phenotype_dictionary] = get_phenotypes_for_genelist(idr_base_url, session, go_gene_list)
display(HTML(query_genes_dataframe.to_html( escape=False)))
```

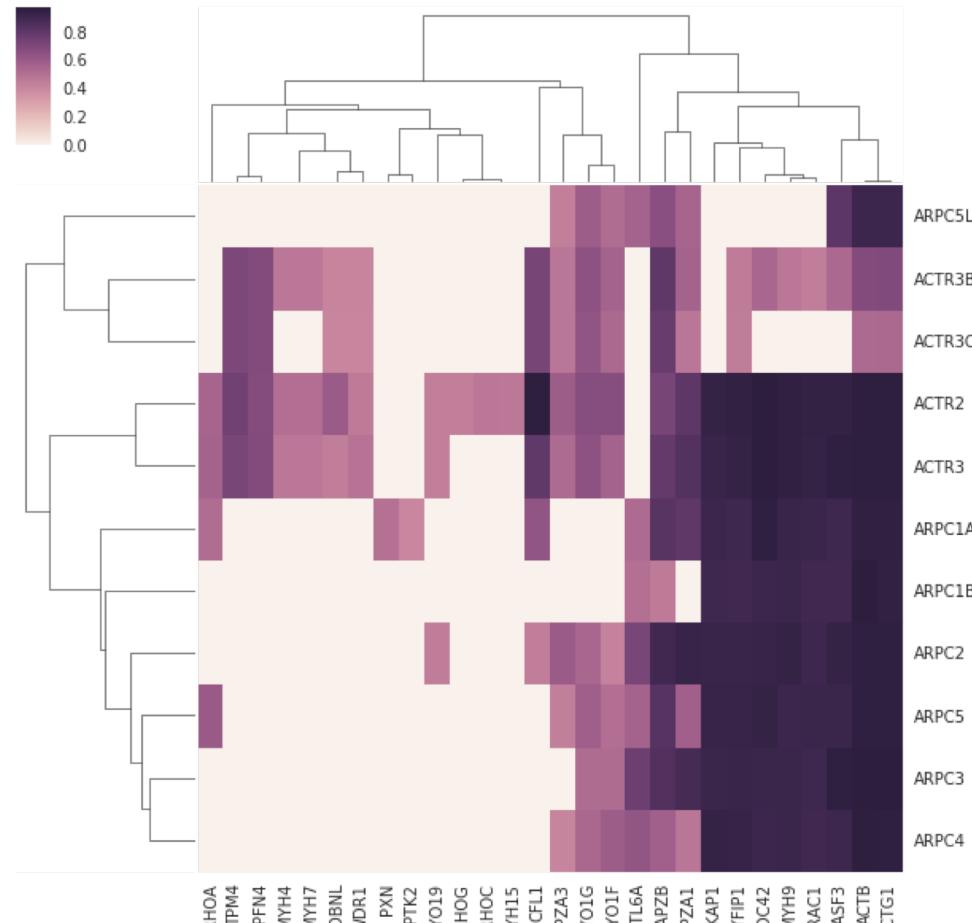
[=====] 100.0% ...Iterating through gene list

Entrez	Ensembl	Key	Value	PhenotypeName	PhenotypeAccession	ScreenIds	
ARPC2	[10109]	[ENSG00000163466]	GeneName	ARPC2	[decreased cell numbers, geometric cell phenot...]	[CMPO_0000274, CMPO_0000299, CMPO_0000276, CMP...]	[206, 206, 206, 206, 206, 206, 206, 206, 206,...]
ARPC1A	[10552]	[ENSG00000241685]	GeneName	ARPC1A	[strong decrease in rate of protein secretion]	[CMPO_0000319]	[251]
ARPC5L	[81873]	[ENSG00000136950]	GeneName	ARPC5L	[increased actin localised to the nucleus, elo...]	[CMPO_0000261, CMPO_0000287, CMPO_0000288, CMP...]	[206, 206, 206, 206, 206, 206, 206, 206,...]
ACTR3C	[653857]	[ENSG00000106526]	EnsemblID	ENSG00000106526	[cell death phenotype, mitosis delayed phenotyp...]	[CMPO_0000305, CMPO_0000348, CMPO_0000307, CMP...]	[1101, 1101, 1101, 1101, 1101, 1101, 1101, 1101]
ACTR3B	[57180]	[ENSG00000133627]	GeneName	ACTR3B	[binuclear cell phenotype]	[CMPO_0000213]	[1101]
HEL-68	[10552]	[ENSG00000241685]	EnsemblID	ENSG00000241685	[strong decrease in rate of protein secretion]	[CMPO_0000319]	[251]
ARPC4	[10093]	[ENSG00000241553]	GeneName	ARPC4	[mild decrease in rate of protein secretion]	[CMPO_0000318]	[251]
ACTR3	[10096]	[ENSG00000115091]	GeneName	ACTR3	[strong decrease in rate of protein secretion,...]	[CMPO_0000319, CMPO_0000319]	[251, 803]



# Genes ↔ Phenotypes

**StringDB  
Significance**



**Arp2/3  
“Query”**

**Primary Interactors**

# Virtual Analysis Environment (VAE)



The screenshot shows a web browser window for the IDR Virtual Analysis Environment (VAE). The URL in the address bar is <https://idr-analysis.openmicroscopy.org>. The page features a dark background image of a fluorescence microscopy slide showing red and blue stained cells. In the center, the IDR logo is displayed above the text "Virtual Analysis Environment". Below this, a paragraph explains the purpose of the VAE: "The IDR Virtual Analysis Environment (VAE) supports the open and reproducible analysis of data in the IDR. It is built on [JupyterHub](#) and is available to anyone interested in exploring and mining the diverse and vast range of image data and metadata in the IDR." Further down, there is a note about notebook session limitations and a link to the GitHub repository for support. A "Public access" section highlights Jupyter Notebooks that can be run without login, with a button to "Click here to obtain a temporary session". Finally, a "GitHub login" link is provided.

All notebook sessions are subject to available resources, are limited in the network resources they can access, and will automatically terminate after a period of inactivity. Do not store anything you wish to keep.

If you have any queries about the VAE, including questions about usage, API access and available data, please open an issue on the [idr-contrib/community GitHub repository](#).

**Public access**

We have a set of Jupyter Notebooks that can be run by anyone without a login.

[Click here to obtain a temporary session](#)

[GitHub login](#)



<https://idr-analysis.openmicroscopy.org/>



# Virtual Analysis Environment (VAE)



We have a set of Jupyter Notebooks that can be run by anyone without a login.

[Click here to obtain a temporary session](#)

- **Public access:** anonymous  
no storage

If you have an Elixir AAI account you can use it to access the analysis platform. This is currently a demonstrator, and is identical to the public access. Please note that we are unable to investigate authentication errors between your chosen identity provider and Elixir AAI.

[Login with Elixir AAI](#)

- **Elixir AAI:** institution-based  
(demo)  
no storage yet

If you are interested in developing your own data analysis notebooks on our analysis platform please contact us with your GitHub username. This will give you more computational resources including scratch storage space than is available through the public access.

We will do our best to maintain this scratch space across upgrades of the VAE, though in the event of unforeseen issues we may need to delete all scratch space, and you should consider it as suitable for temporary storage only. Your scratch space may be deleted without warning if you have not logged in for over a month.

If as part of a planned update we need to delete our existing storage we will give at least one week's notice on [idr-contrib/community](#) and the [@IDRstatus Twitter feed](#).

[Login with GitHub](#)

- **GitHub:** account-based  
requires admin  
storage *within reason*



# Previous and ongoing efforts



Download  
(local analysis)



Cross-data  
browsing



Cloud  
analysis

Google AI



European Molecular  
Biology Laboratory



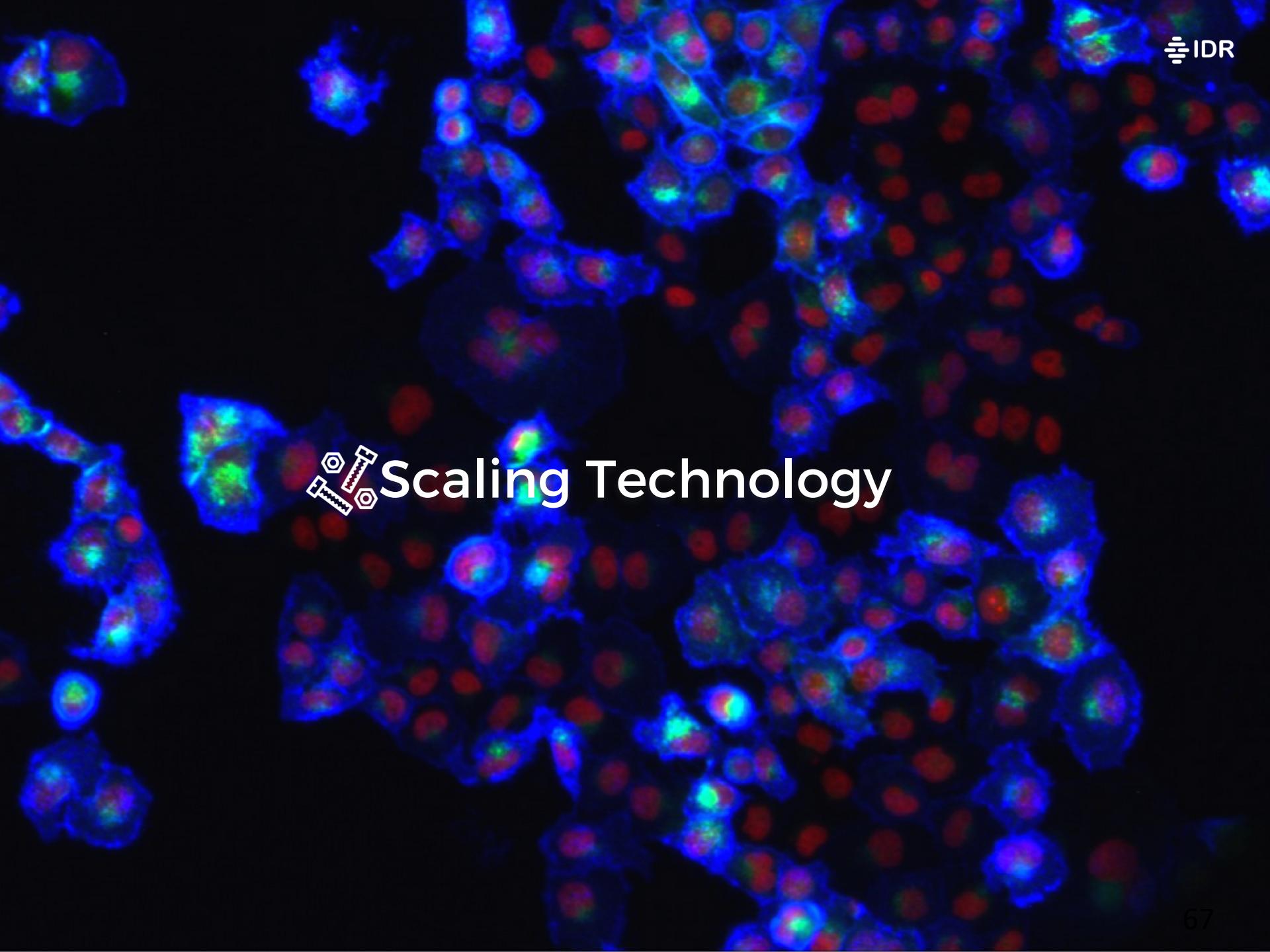
EOSC pilot  
The European Open Science  
Cloud for Research Pilot Project



Open for Innovation

et al.





# Scaling Technology

# Tools for increasing value

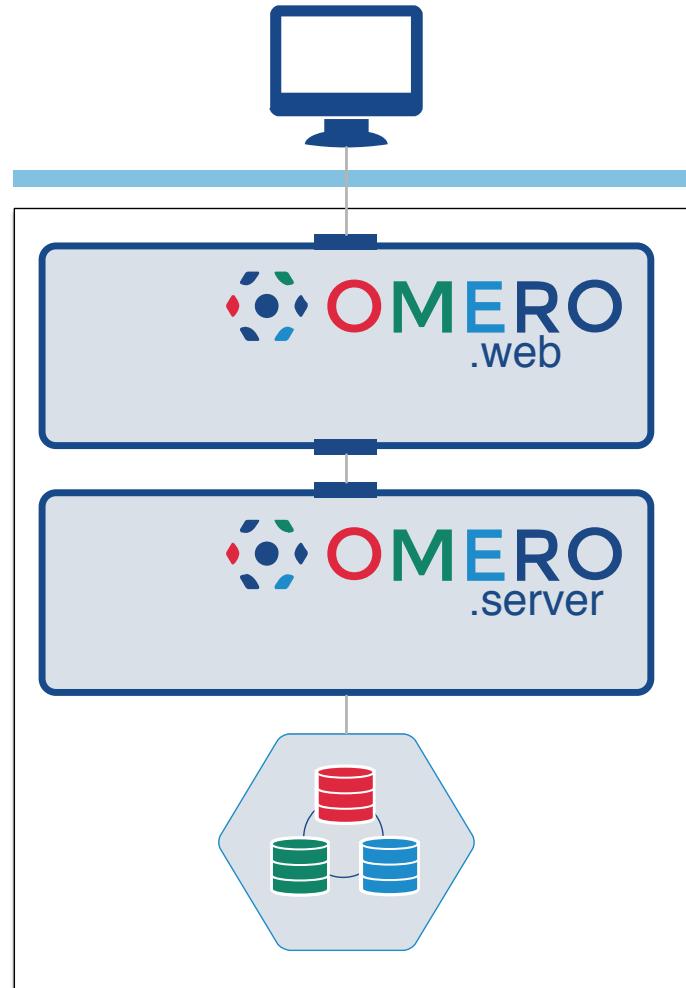


**OME-FILES**  
 **BIO-FORMATS**  
 **OMERO**

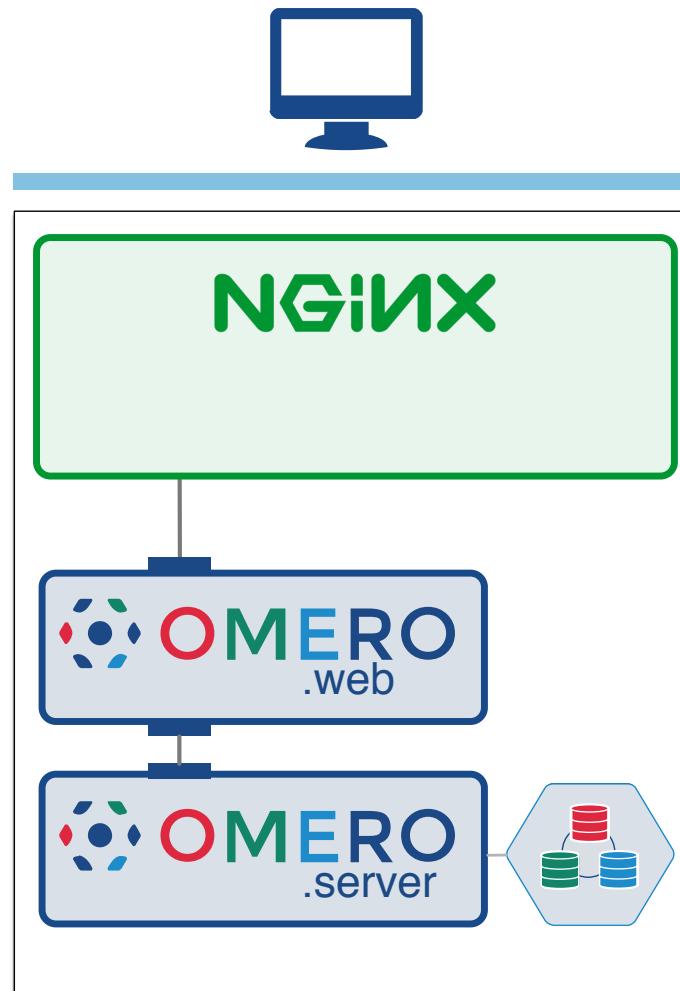
<https://openmicroscopy.org>



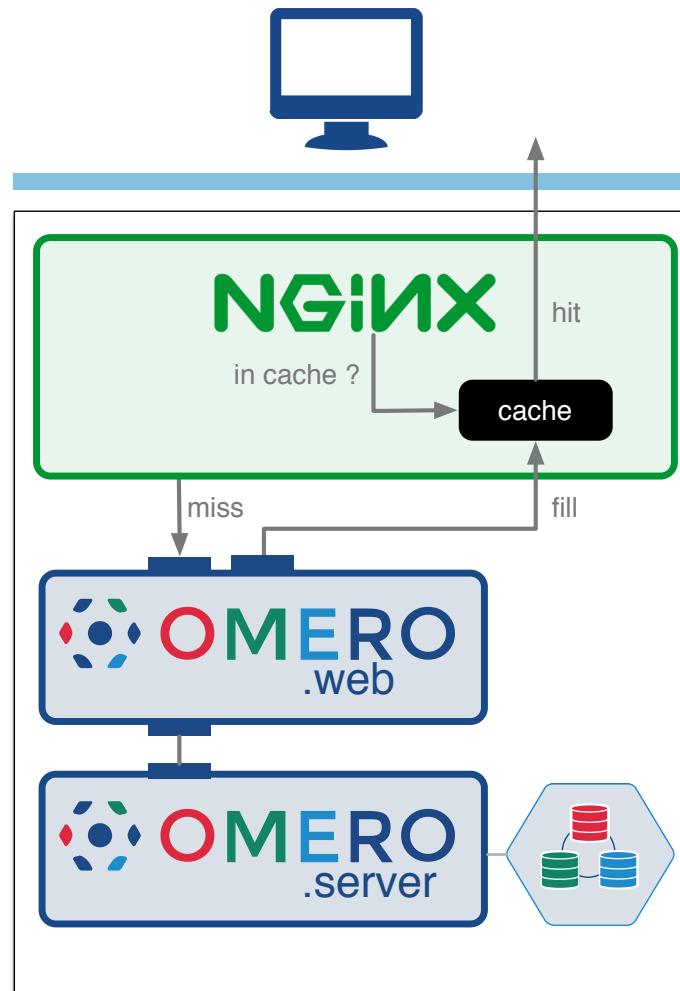
# OMERO 5.4



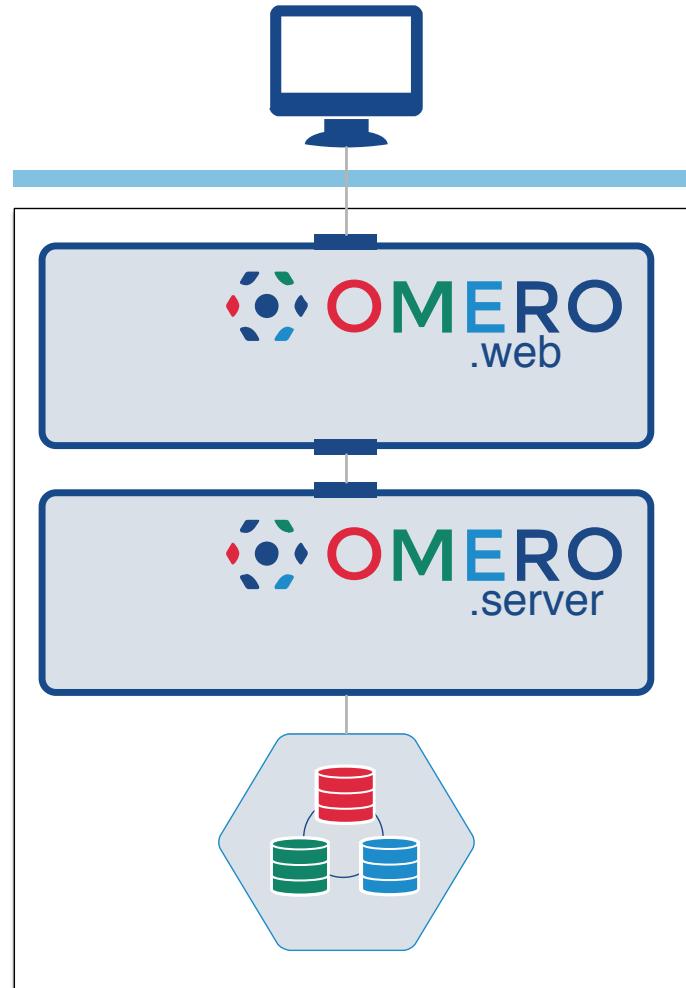
# OMERO 5.4



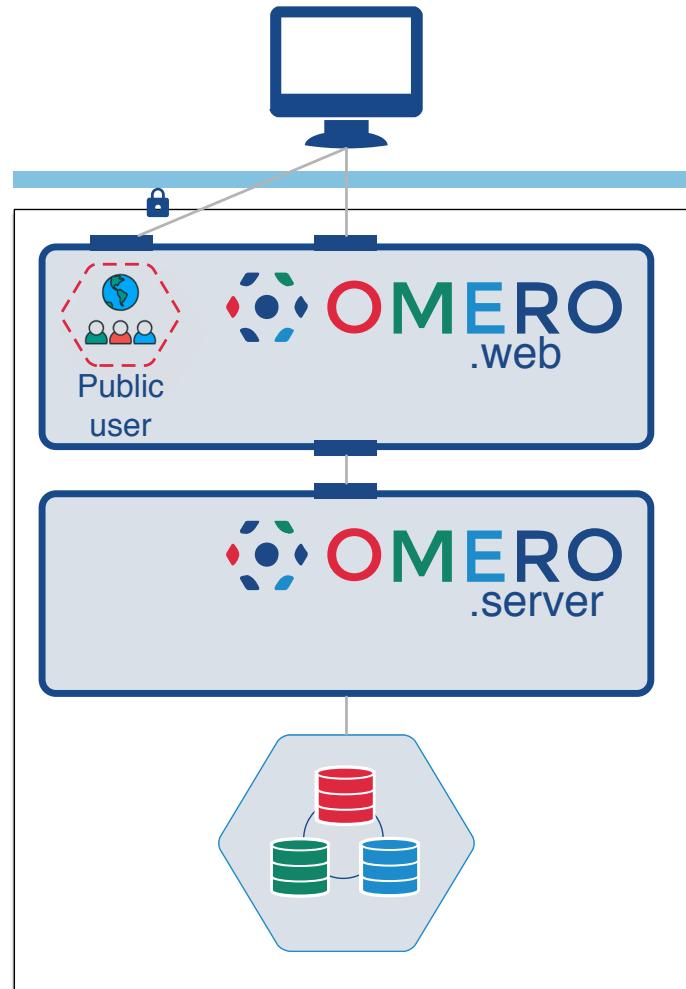
# OMERO 5.4



# OMERO 5.4

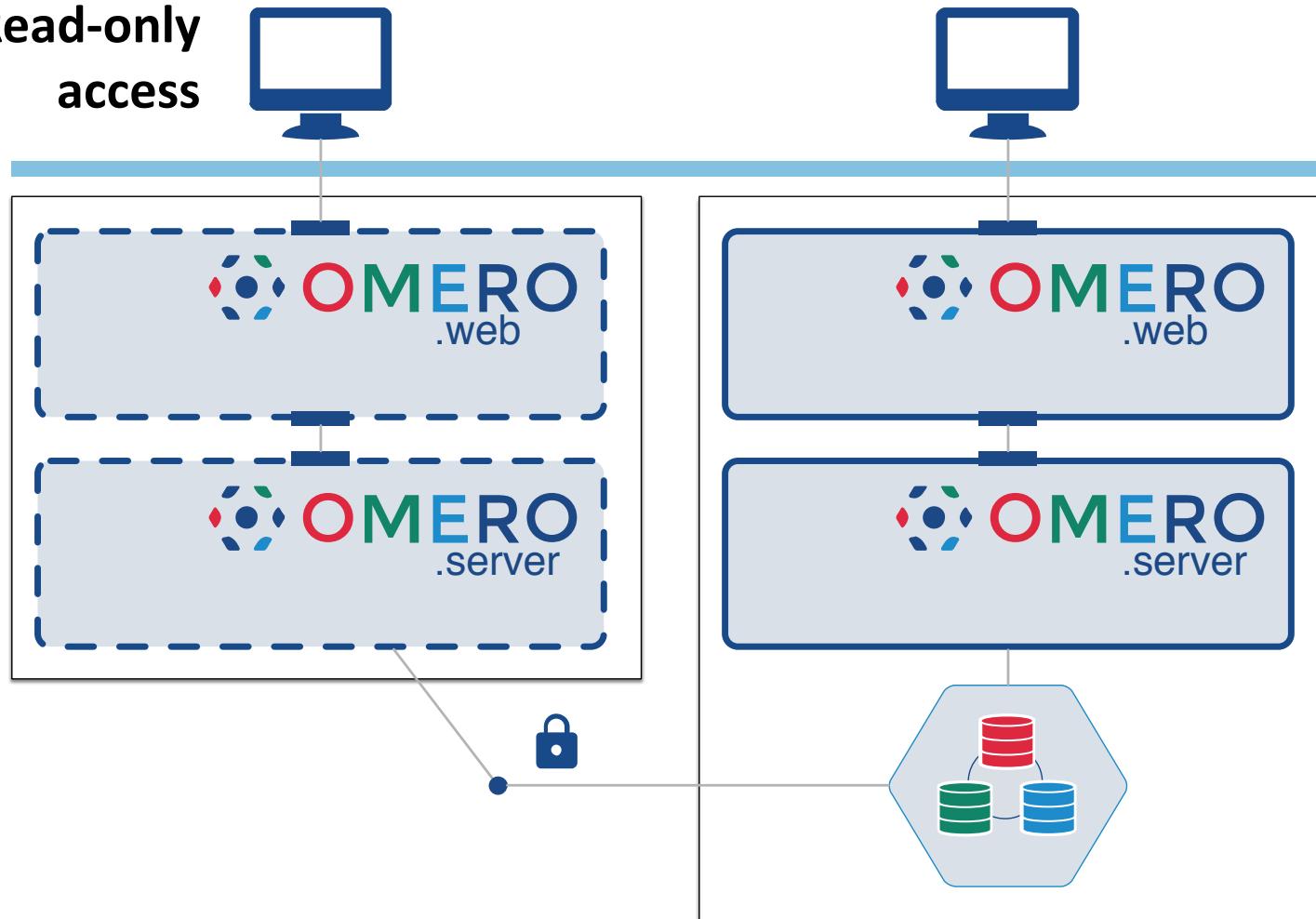


# OMERO 5.4



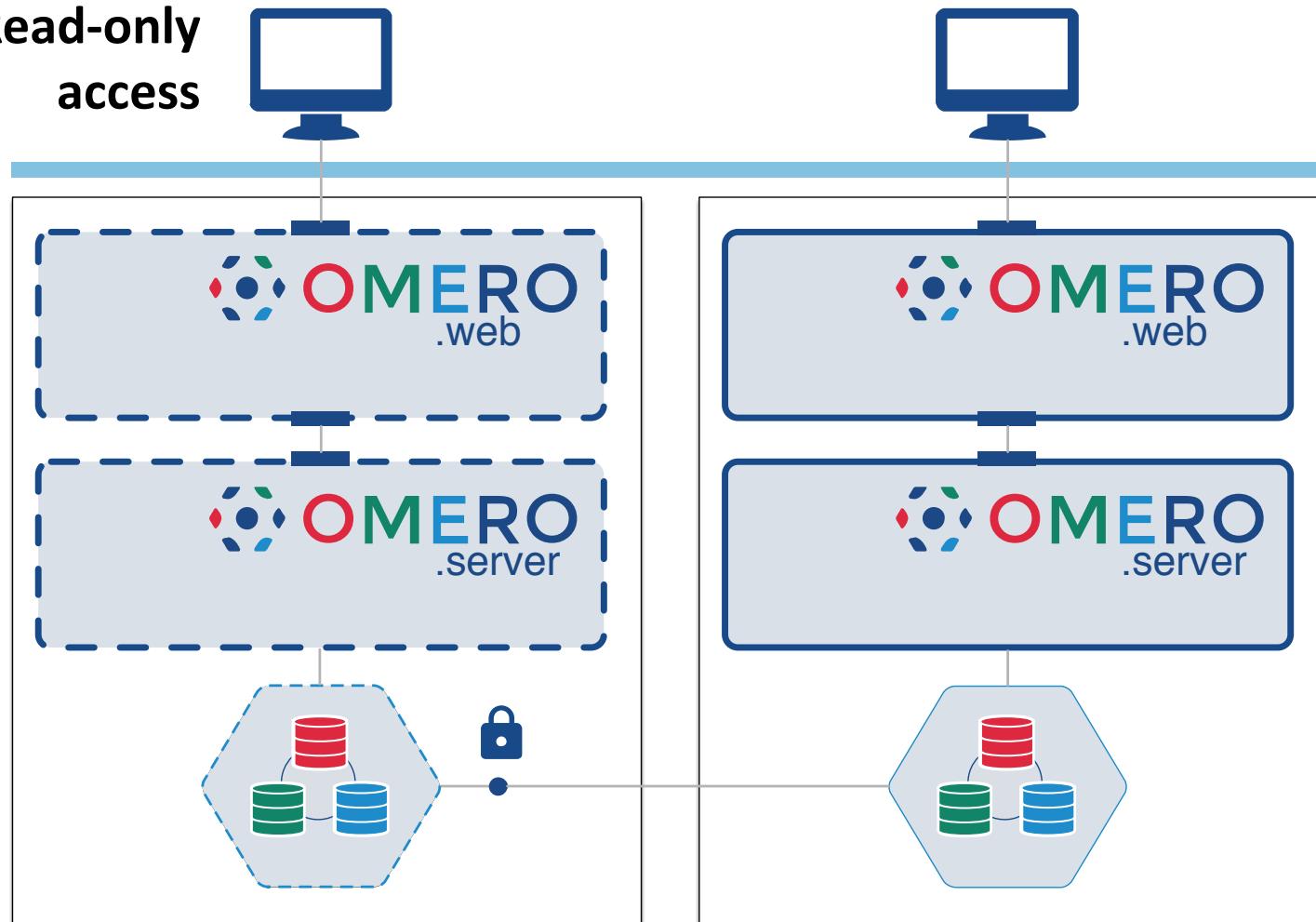
# OMERO 5.4

Read-only  
access



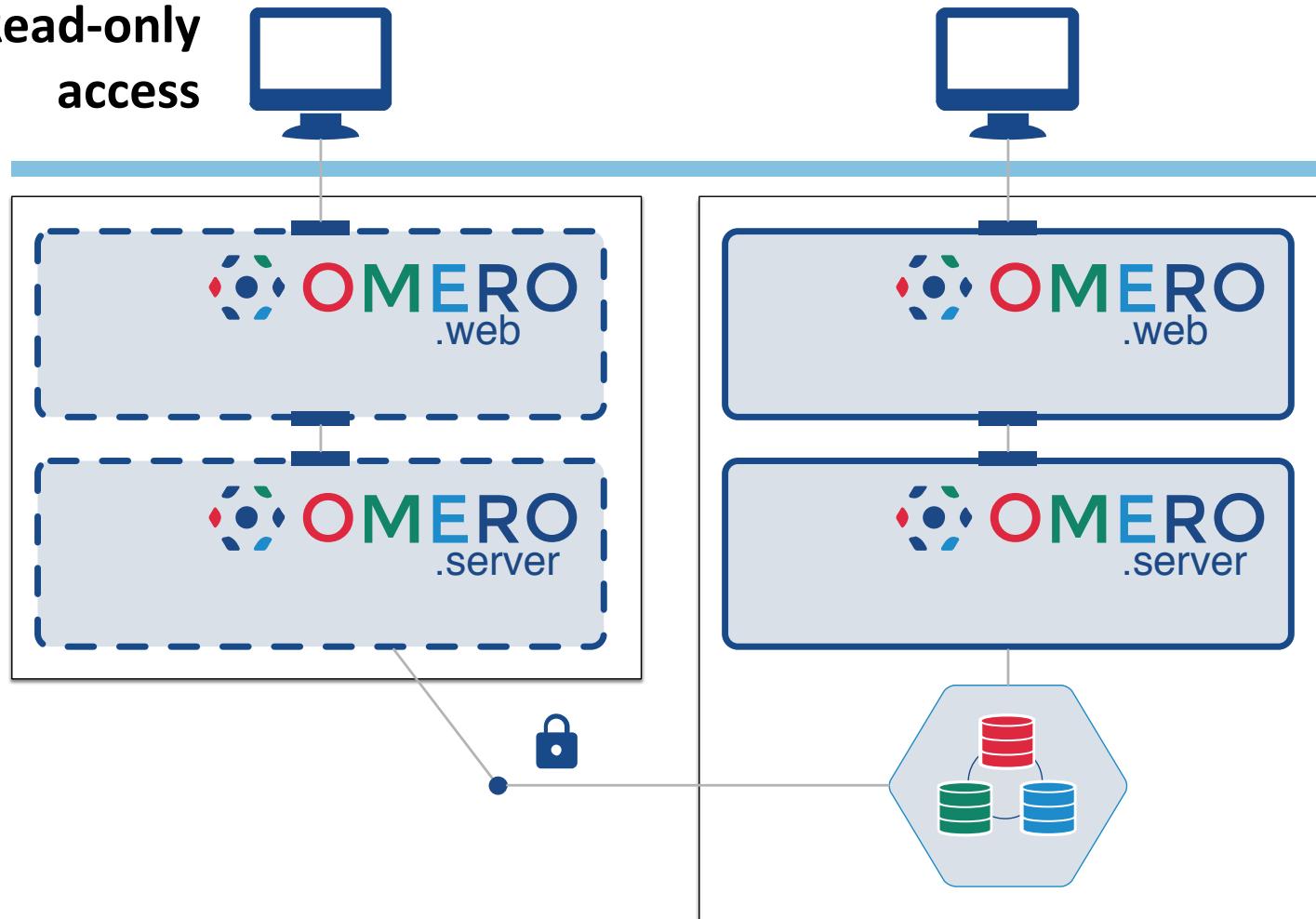
# OMERO 5.4

Read-only  
access



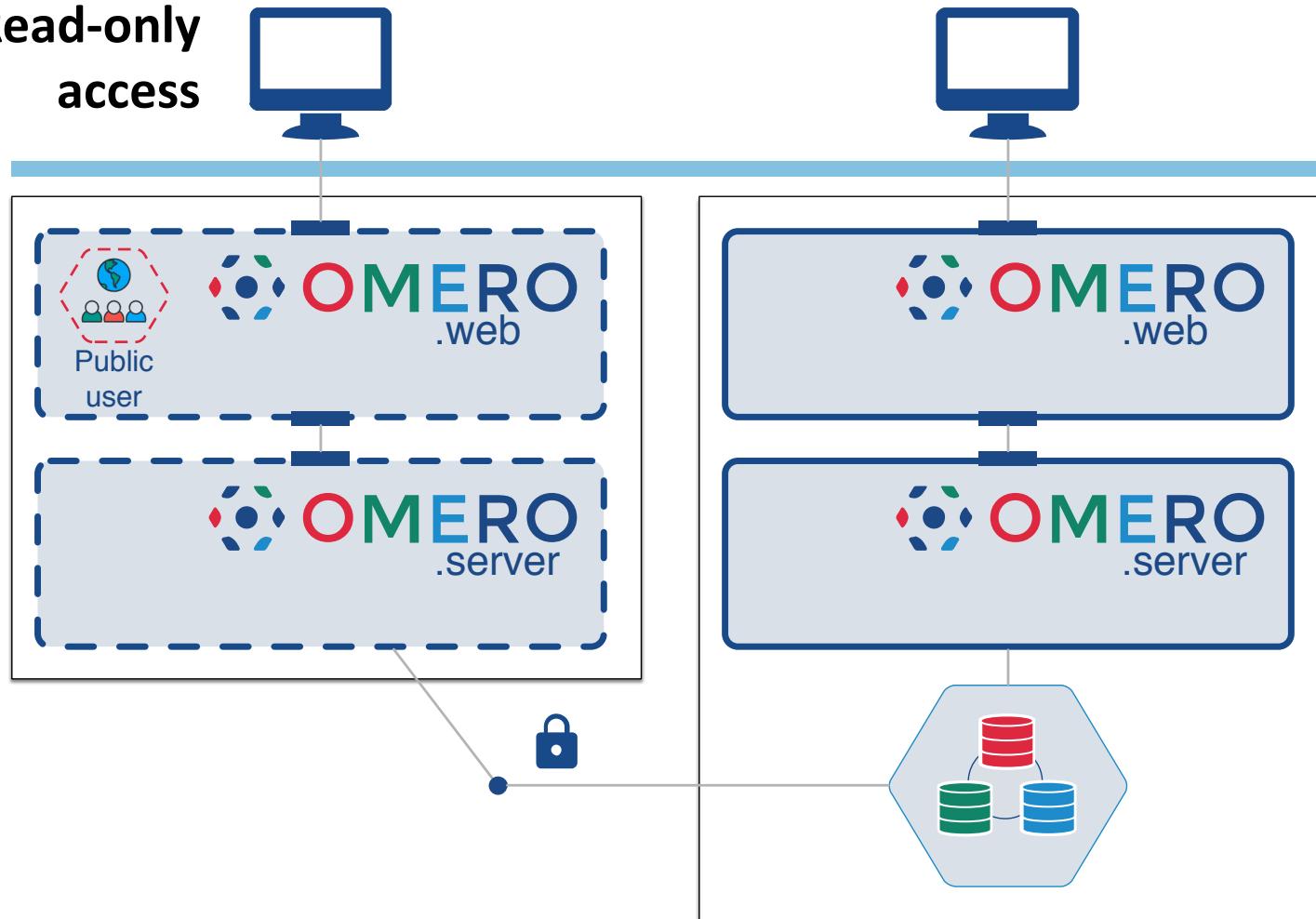
# OMERO 5.4

Read-only  
access

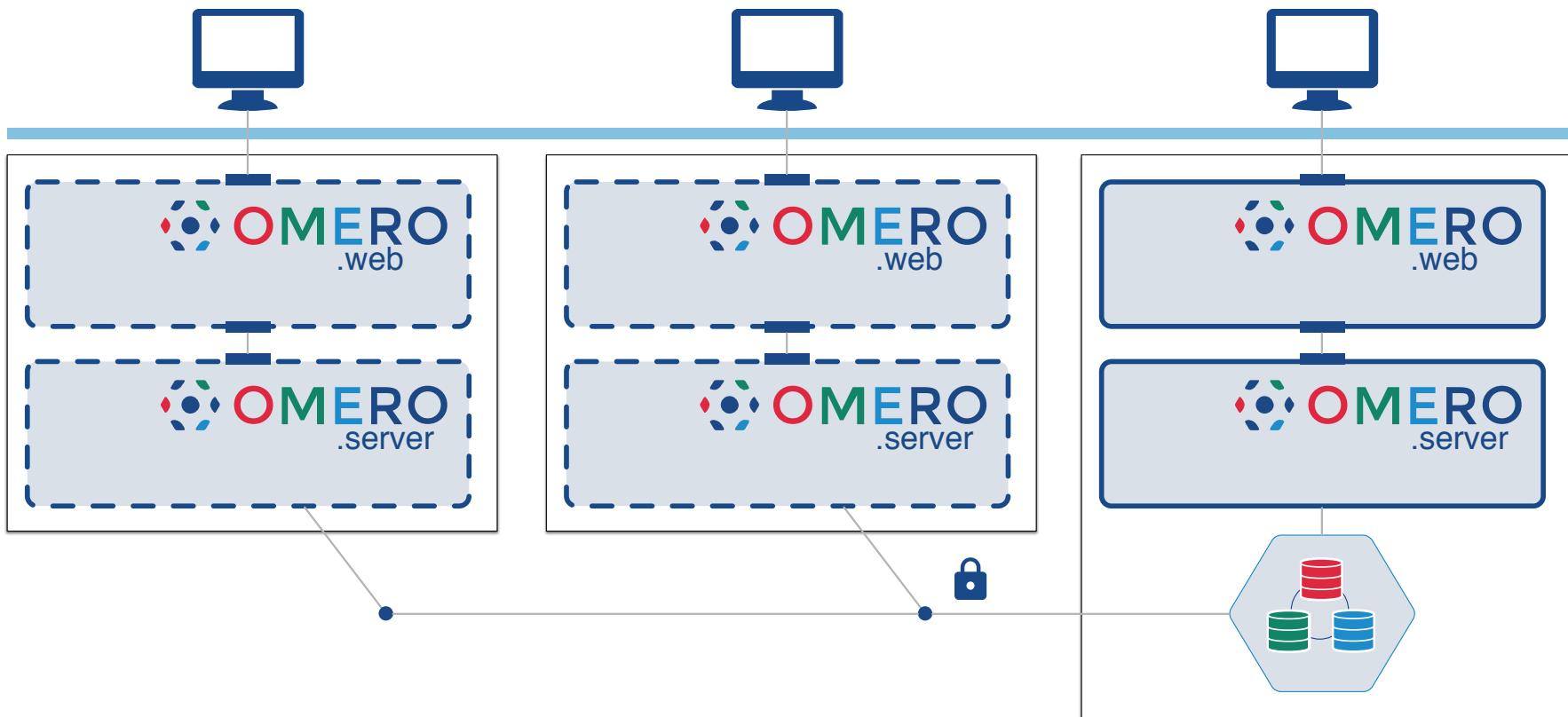


# OMERO 5.4

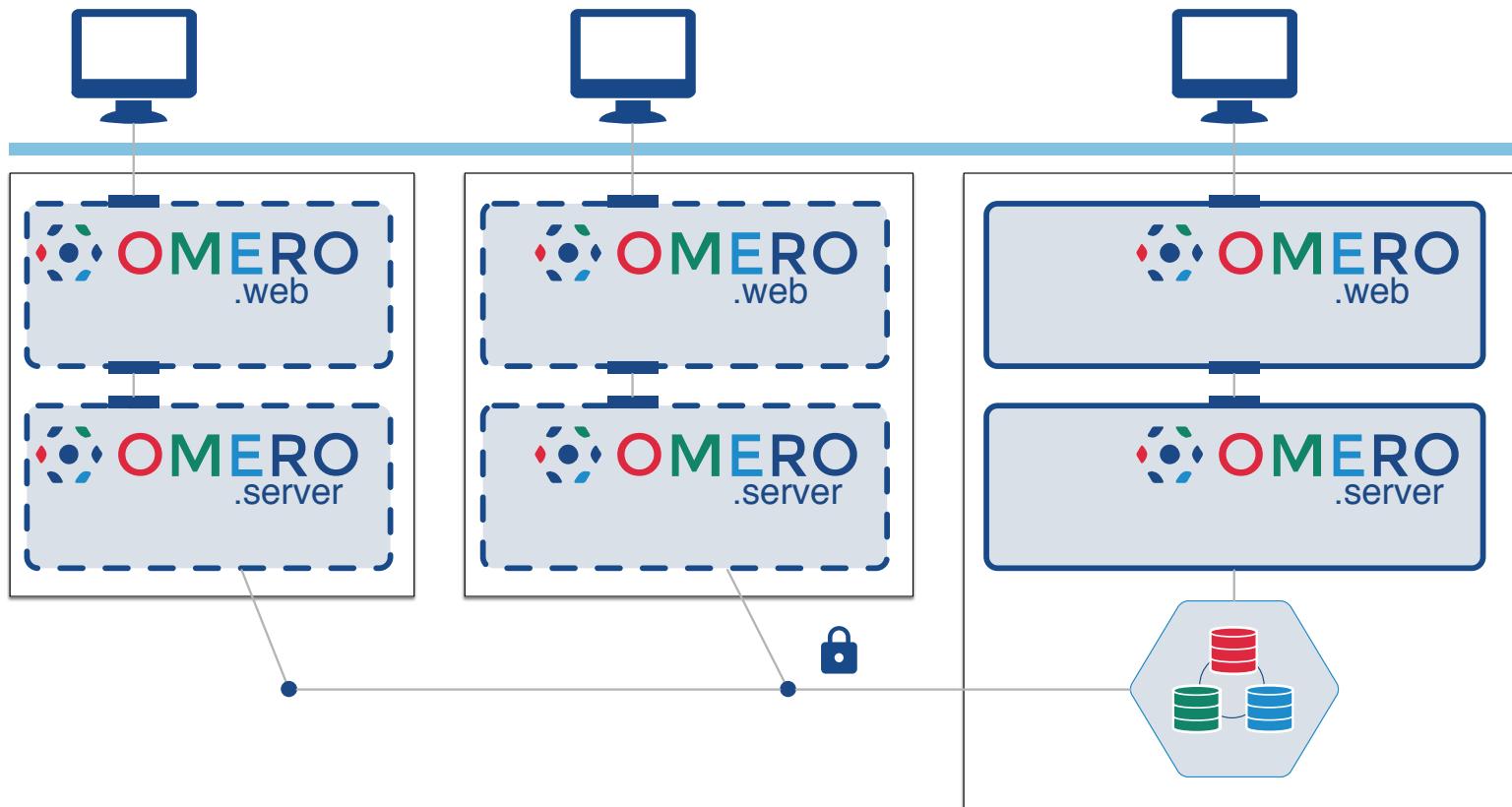
Read-only  
access



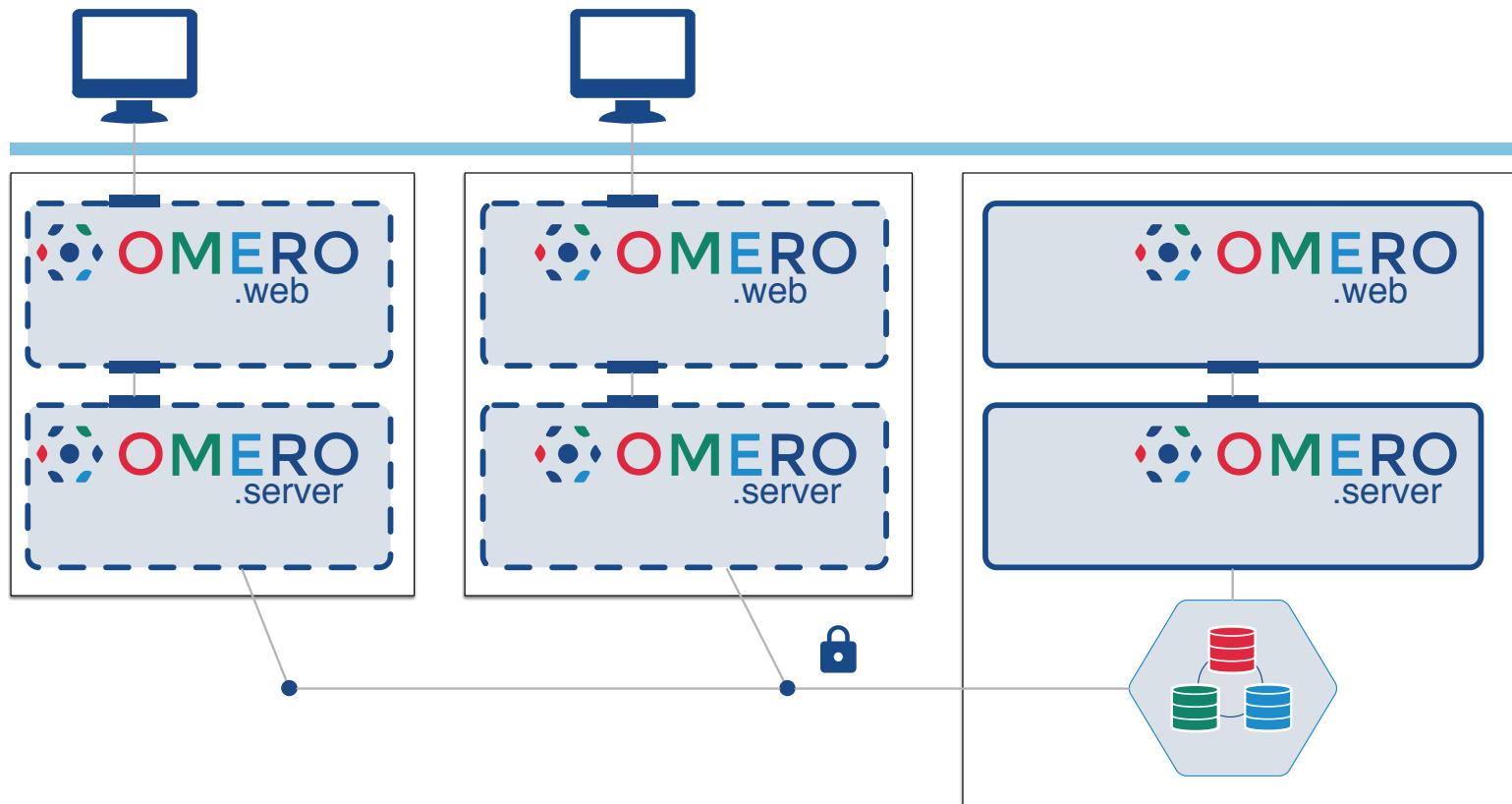
# OMERO 5.4



# OMERO 5.4

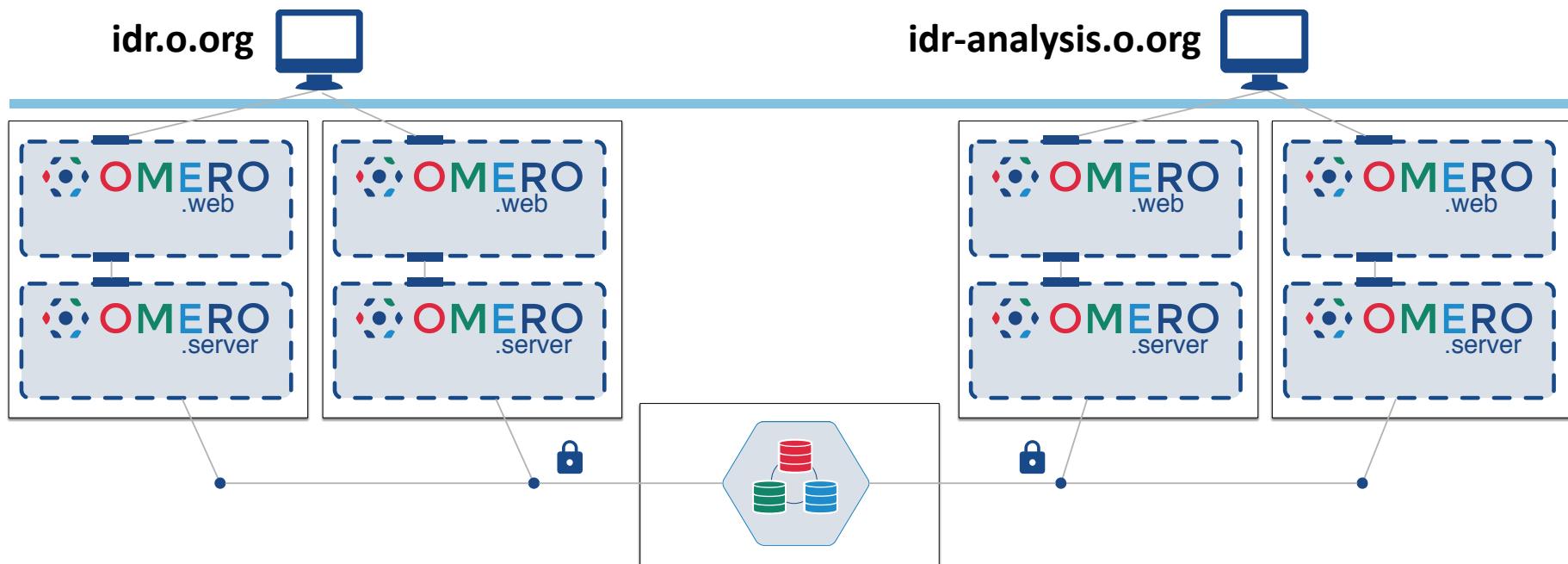


# OMERO 5.4



# We're ready for you!

^hopefully



**User:** public

**Password:** public

**Port:** 4064



# Connection details

## Logging in (standard)

```
$ conda install -c bioconda python-omero  
  
$ ipython  
  
In [1]: import omero  
  
In [2]: c = omero.client("idr.openmicroscopy.org")  
  
In [3]: s = c.createSession("public", "public")
```

## Logging in (better)

```
$ conda install -c bioconda idr-py  
  
$ ipython  
  
In [1]: from idr import connection  
  
In [2]: c = connection("idr.openmicroscopy.org", "public", "public")
```

“” : a library

# Connection details

## Downloading with Aspera

```
$ docker run -ti --rm -v /tmp/data:/data imagedata/download \
idr0001 20151116-verified/JL_120731_S6A /data/JL_120731_S6A

001009001.flex          100%   87MB  363Mb/s    00:02
...
002007002.flex          100%   87MB  562Mb/s    28:56
Completed: 103114111K bytes transferred in 1736 seconds (486305K bits/sec), in
1152 files, 6 directories.
```



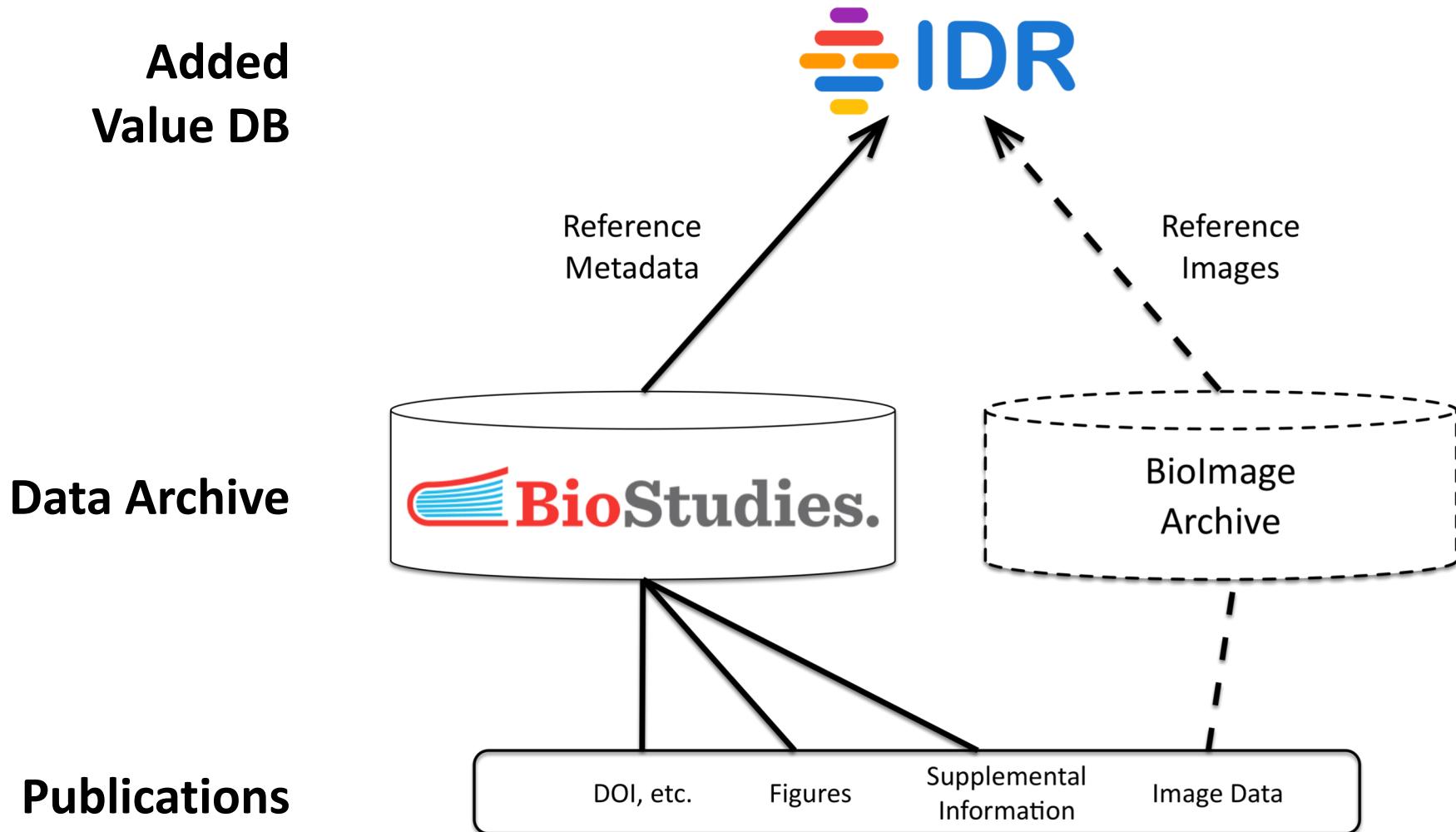


# Next Steps

Made possible by

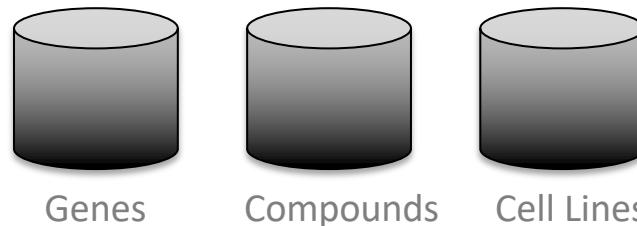


# (1) Integration with data archives

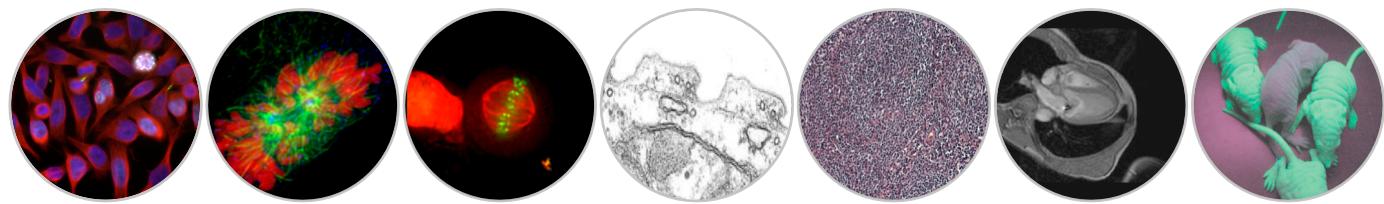


## (2) Identifying all cells in the IDR

### Biomolecular Resources



### Imaging Domains



### Controlled Vocabularies



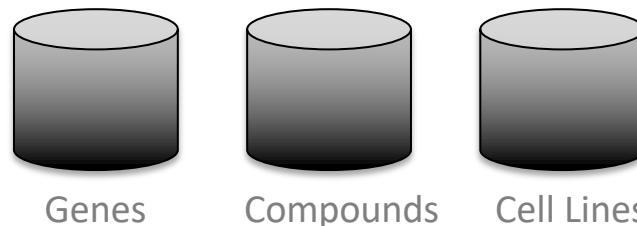
**Studies with author ROIs:**

0001\*, 0002, 0012, 0013, 0015, 0016, 0033-0038

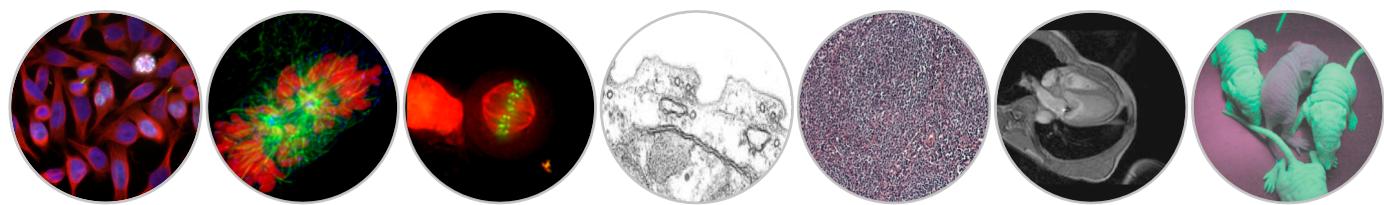


## (2) Identifying all cells in the IDR data

### Biomolecular Resources



### Imaging Domains



### Controlled Vocabularies



### Analytical Results



### (3) Enabling independent IDRs



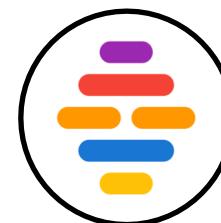
EBI / EuBI



CORBEL



Human  
Cell Atlas



Digital  
Pathology

...



...



# (3) Enabling independent IDRs

This repository Search Pull requests Issues Marketplace Explore

IDR / deployment

Code Issues Pull requests Projects Wiki Insights Settings

Branch: master deployment / README.md

manics Add doc on accessing grafana, logs, prometheus

8d29c1d on Apr 19

3 contributors

35 lines (28 sloc) 1.98 KB

[Raw](#) [Blame](#) [History](#)

### IDR systems documentation

The Image Data Resource (IDR) is an online, public data repository that seeks to store, integrate and serve image datasets from published scientific studies. The IDR is also a platform that is entirely built with open-source components and tools, and these documents describe how to build and manage your own version of the IDR.

The IDR is currently hosted on OpenStack at EMBL-EBI. At present OpenStack is the recommended platform for all deployments. It should be possible to deploy the IDR on other cloud platforms or physical hardware, but changes will be required, particularly with respect to network interfaces. Ansible (an open-source configuration management system) is used extensively for managing the IDR.

#### Prerequisites

The IDR provisioning and deployment instructions are aimed at experienced system administrators familiar with using Ansible playbooks and roles for managing multiple servers. If you are deploying the IDR platform on OpenStack you should have a good working knowledge of instances, volumes and networking.

All documents assume extensive knowledge of OMERO.

Ansible 2.3 is required. Some Ansible tasks can take a long time, such as pulling Docker images. If you see lost connections you can try setting a keep-alive in your .ssh/config file, e.g. ServerAliveInterval 30 .

#### Documents

**Provisioning:** Guidelines for provisioning compute, storage and network resources for hosting the IDR, on virtual or physical hardware.

**Deployment:** Instructions on how to install the IDR using Ansible.

**idr-ansible.sh:** An example script to provision and deploy the IDR on OpenStack.

**Operating procedures:** Administration of the IDR

**Monitoring:** Monitoring the IDR

© 2018 GitHub, Inc. Terms Privacy Security Status Help Contact GitHub API Training Shop Blog About

<https://github.com/IDR/deployment>

“” : a platform

```
$ source openstack-credentials.env

$ ansible-galaxy install -r requirements.yml

$ ansible-playbook $details \
  openstack-create-infrastructure.yml

$ ansible-playbook $details \
  idr-00-preinstall.yml idr-01-install.yml \
  idr-03-postinstall.yml
```

```
TASK [nginx-proxy : nginx | copy proxy ssl certificate] ****
changed: [test-gateway]

TASK [nginx-proxy : nginx | copy proxy ssl certificate key] ****
changed: [test-gateway]

TASK [nginx-proxy : nginx | start service] ****
changed: [test-gateway]

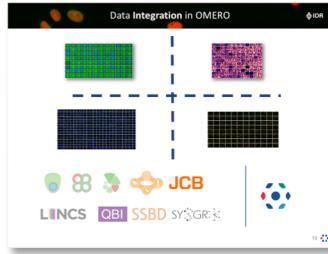
RUNNING HANDLER [nginx : restart nginx] ****
changed: [test-gateway]

PLAY RECAP ****
localhost                  : ok=25   changed=9    unreachable=0    failed=0
test-database               : ok=24   changed=10   unreachable=0    failed=0
test-gateway                : ok=33   changed=19   unreachable=0    failed=0
test-omero                  : ok=81   changed=49   unreachable=0    failed=0
```



ANSIBLE

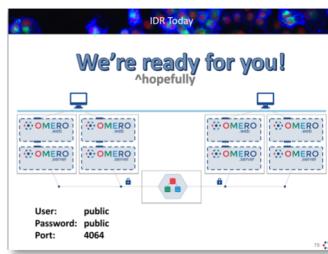
# The IDR is ...



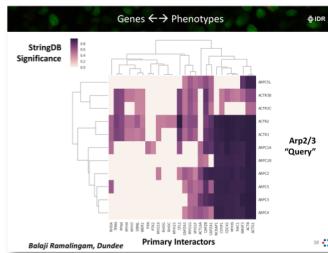
Publicly available cross-linked studies



collected from and for the community



and curated into a single, scalable OMERO



which you can explore in the cloud

(or on your own hardware).

# Questions?



@IDRnews



@IDRstatus

# Public service announcement

The screenshot shows a web browser window displaying the OME website at <https://www.openmicroscopy.org>. The page features a header with the OME logo, navigation links for About Us, News, Products, Support, Docs, and Explore, and a search bar. The main content area has a blue and white nautical-themed background with hills, clouds, and water. It announces the "Annual Users Meeting 2018" from May 30th to June 1st in Dundee, with a link to "See the schedule". On the left, there's a sidebar with links to OME Teams, Contributors, Commercial Partners, Licensing, Citing OME, and Artwork. Below the main banner, there's a section about the OME consortium and a "Learn More" button. A URL bar at the bottom contains the address <https://www.openmicroscopy.org/artwork/>.



# Public service announcement

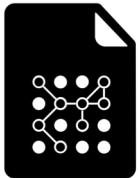
The screenshot shows a web browser window displaying the 'OME Artwork' page from the Open Microscopy website. The URL in the address bar is <https://www.openmicroscopy.org/artwork/>. The page features a header with the OME logo, navigation links for About Us, News, Products, Support, Docs, and Explore, and a search bar. Below the header is a banner with a green and red fluorescence microscopy image and the text 'OME Artwork'. A subtext below the banner reads: 'We've put together some assets so you can use our logos to link to our work and acknowledge us in presentations.' The main content area contains several download links for different OME assets:

- OME Logo (represented by a blue, red, and green circular icon)
- OME Mark (represented by a blue, red, and green hexagonal icon)
- Products Logos & Marks (represented by a blue, red, and green diamond-shaped icon)

Each asset has a corresponding 'Download' button below it.



# Icon credits



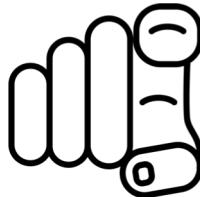
Created by Viktor Vorobyev  
from Noun Project



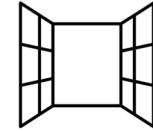
Created by Andrey Vasilev  
from Noun Project



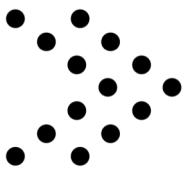
Created by Yazmin Alanis  
from Noun Project



Created by priyanka  
from Noun Project



Created by artworkbean  
from Noun Project



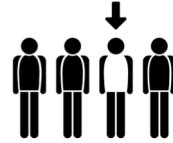
Created by Liane Kirschner  
from Noun Project



Created by 80mSymbols  
from Noun Project



Created by Beoris  
from Noun Project



Created by Marie Van den Broeck  
from Noun Project



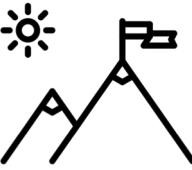
Created by luca fruzza  
from Noun Project



Created by Yazmin Alanis  
from Noun Project



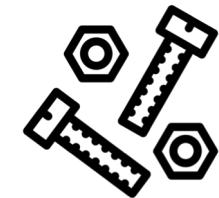
Created by bezier master  
from Noun Project



Created by lastspark  
from Noun Project



Created by Chanakya  
from Noun Project



Created by lastspark  
from Noun Project