Research Data Management for Bioimage Data at the HHU

OMERO explained: How does the platform work in more detail?

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I3D:bio
Information Infrastructure for BioImage Data

Adapted from: Schmidt C., Bortolomeazzi M., Boissonnet T., Fortmann-Grote C. *et al.* (2023). I3D:bio's OMERO training material: Re-usable, adjustable, multi-purpose slides for local user training. Zenodo. DOI: 10.5281/zenodo.8323588

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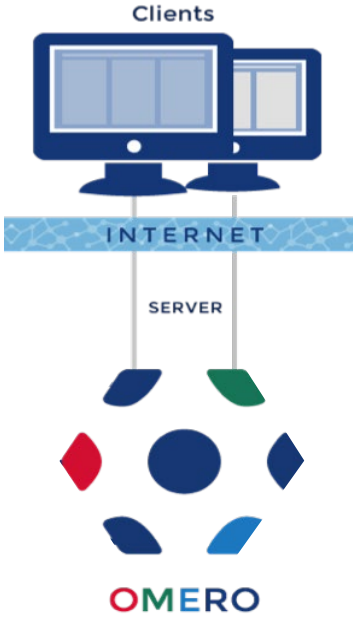
OMERO – a platform consisting of a server with clients

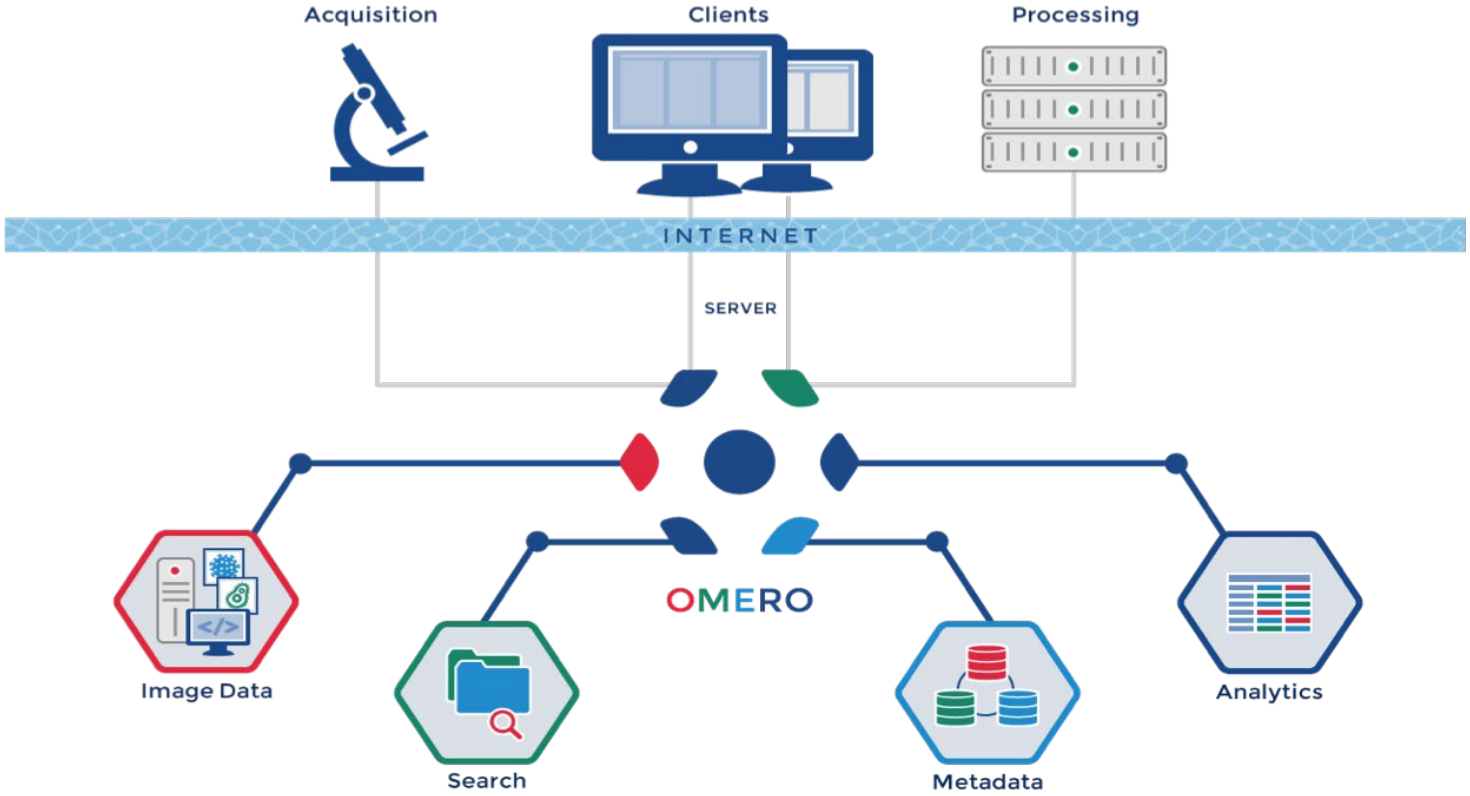
In this chapter, we explain features of OMERO that are handled by the IT staff and by the OMERO administrator.

For OMERO users, this content is background information. However, no detailled knowledge is required on the user side.



Adapted from https://omero.readthedocs.io/en/stable/users/index.html

More details about the structure of the OMERO platform



Adapted from https://omero.readthedocs.io/en/stable/users/index.html

Four OMERO components in focus

These components have been set up / implemented by the responsible IT administrator. Together, they provide the OMERO platform functionality.

OMERO.server	OMERO.server		PostgreSQL Database
OMERO.web	OMERO.web		File Storage Location

Adapted from https://omero.readthedocs.io/en/stable/users/index.html

OMERO.server

The core component of OMERO

OMERO.server

- Middleware software
- Amalgamates all tasks that the system has to fulfill
- Communicates with the other OMERO components via their IP addresses and ports

Adapted from https://omero.readthedocs.io/en/stable/users/index.html

OMERO.web

The front-end application faced to the users

- Allows users to access and interact with their data in OMERO using a web-browser
  - Generates the HTML code behind the browser frontend based on its interaction with OMERO.server (via IP address and port)

OMERO.web

Adapted from https://omero.readthedocs.io/en/stable/users/index.html

OMERO‘s relational database

A relational database* that holds all necessary information about the users and the data

PostgreSQL Database**

Keeps track of & allows linking between

- Data locations
- Users
- Projects
- Annotations
- Attachments
- Metadata
- …

* A relational database is a specific type of database in which related data points are referenced to one another in a table.
** PostgreSQL is an example of a relational database management software.

Adapted from https://omero.readthedocs.io/en/stable/users/index.html
Details (advanced): https://omero.readthedocs.io/en/stable/sysadmins/unix/server-postgresql.html

The data storage location

The location where the original imaging data files are physically stored and accessed from

- File storage system located in the ZIM
- Backed-up data storage for secure data deposition
- Scalable storage space
- Storage space for researchers
- Access by users via client software, not with a file explorer
- Original raw data is not changed!

File Storage Location

Adapted from https://omero.readthedocs.io/en/stable/users/index.html

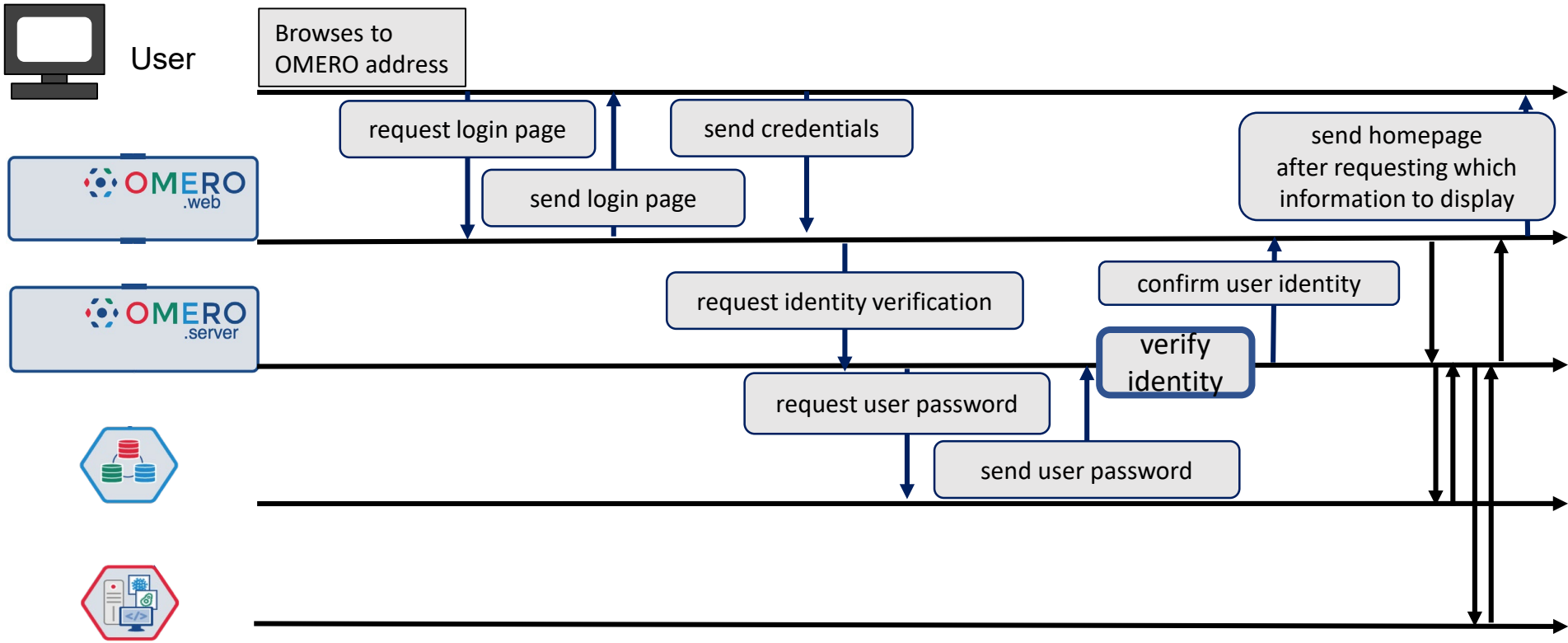
Analogy: OMERO as a custom supermarket

Think of the platform as a custom supermarket where the staff arranges custom shelves from items in the warehouse for each customer.

OMERO.server	OMERO.server Supermarket staff		PostgreSQL Database Catalogue with all information about what belongs to who
OMERO.web	OMERO.web Shelves for display		File Storage Location Warehouse holding items

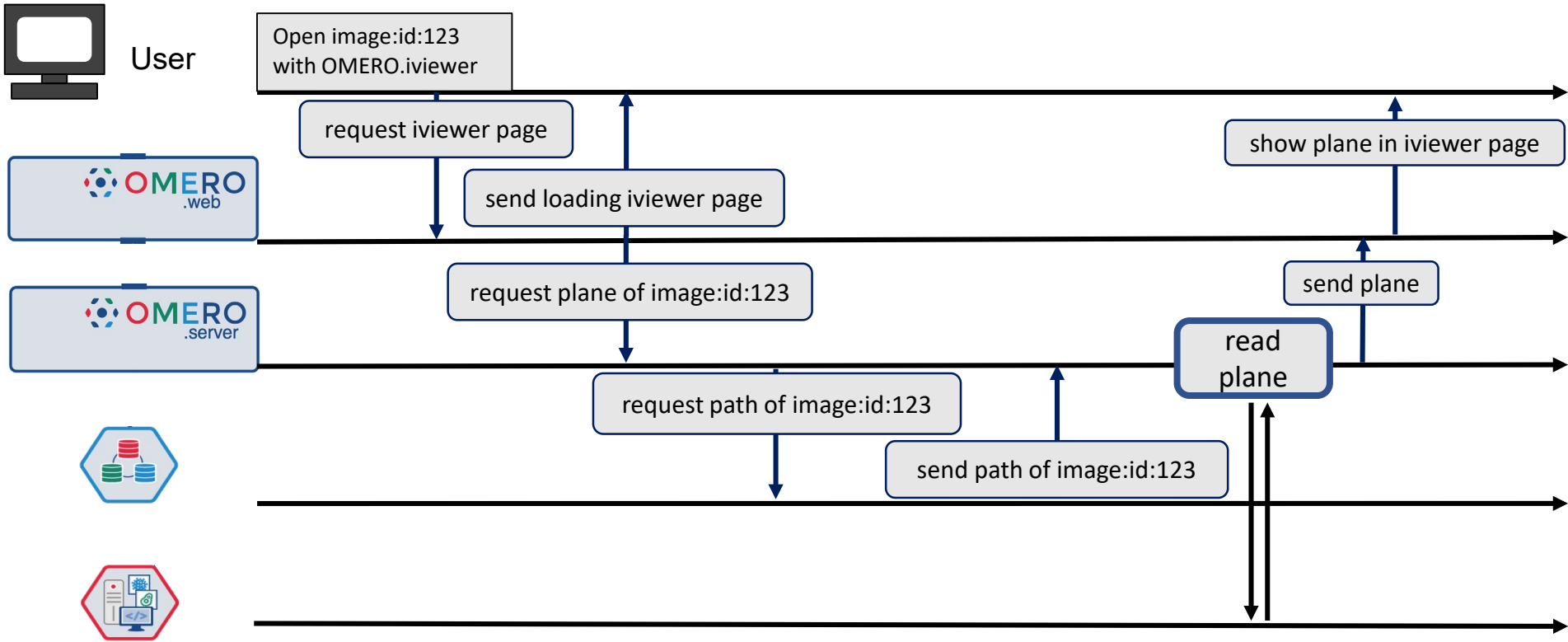
Images adapted from https://omero.readthedocs.io/en/stable/users/index.html. The analogy was contributed by Tom Boissonnet.

Simplified example - How it works: Login to OMERO



Images adapted from https://omero.readthedocs.io/en/stable/users/index.html

Simplified example – How it works: Display an image in OMERO.iviewer



Images adapted from https://omero.readthedocs.io/en/stable/users/index.html