WWU
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Low entry barrier, user oriented image metadata annotation workflow for OMERO

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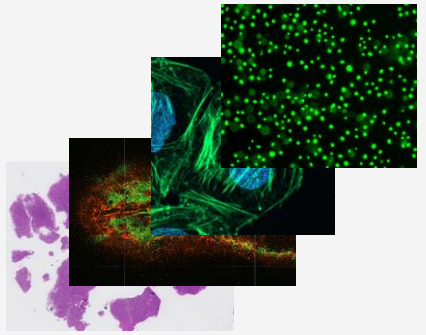
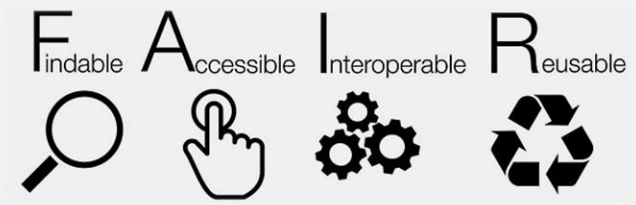
MiN
Münster Imaging Network

Research Data Management, Why and How

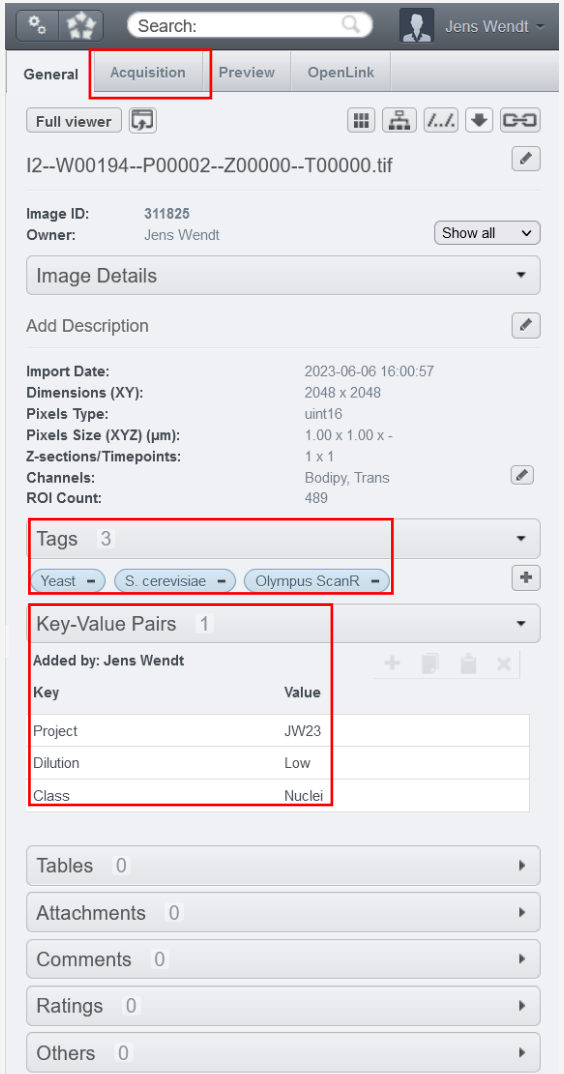


- Research Data Management (RDM) → how to handle large amounts of (image) data
- Implementing FAIR principle → 

- Open-source OMERO as community accepted gold-standard solution

OMERO and Metadata

- Metadata → **F**indability + **R**eusability
- Technical metadata ←→ Experimental metadata
- Metadata implementation in the form of Tags and Key-Value pairs



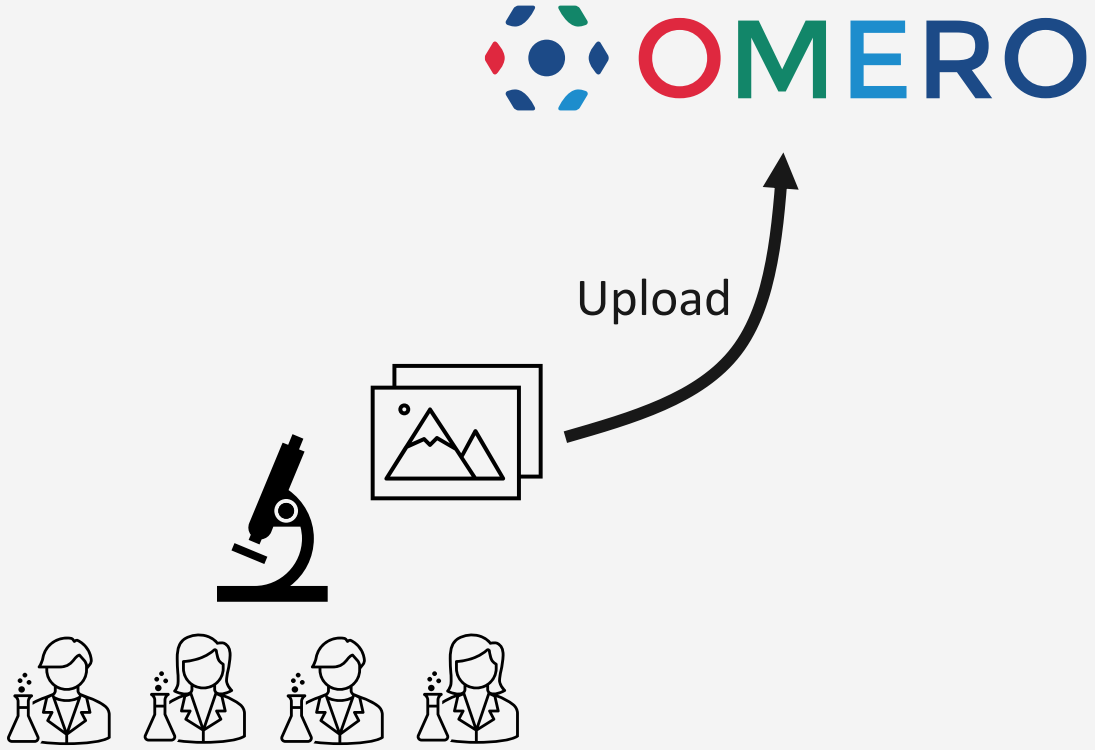
Metadata standards

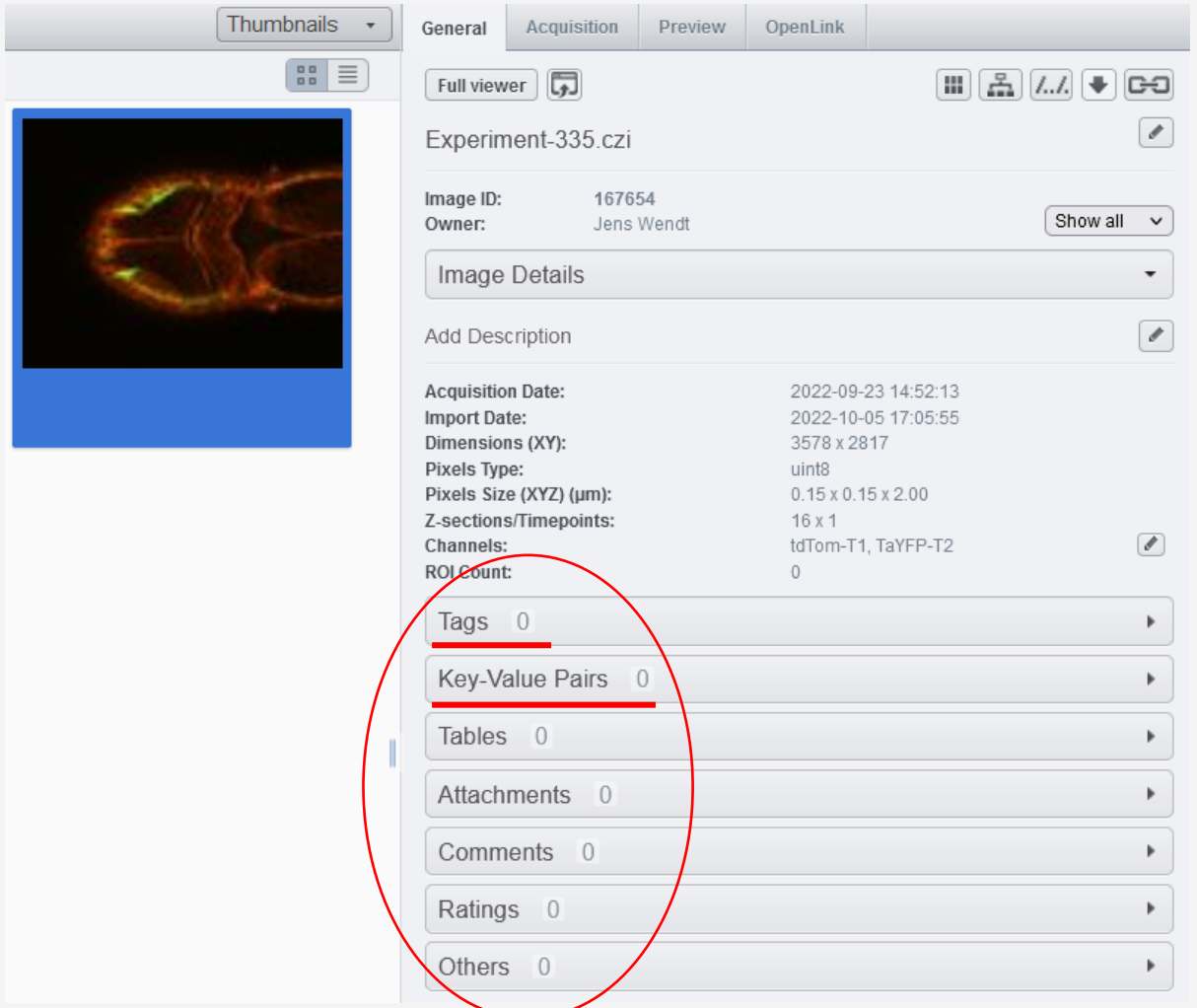
- Recommended Metadata for Biological Images (REMBI)

Study	
(contains 1or more Study components)	Study type
	Study description
	General dataset info
Study component	
(contains Image data and Analysed data)	Imaging method
	Study component description
Biosample	
	Identity
	Biological entity
	Organism
	Intrinsic variable
	Extrinsic variable
	Experimental variables
Specimen	
(linked to Biosample)	Experimental status
	Location within Biosample
	Preparation method
	Signal/contrast mechanism
	Channel - content
	Channel - biological entity
Image acquisition	
(linked to Specimen)	Instrument attributes
	Image acquisition parameters
Image data	Type
	Format & compression Dimension
	Channel information
	Image processing method Contrast
Image Correlation	
(linked to 1or more Image data)	Spatial and temporal alignment
	Fiducials used
	Transformation matrix/ other info
	Related images and relationship
Analysed data	
	Analysis result type
	Data used for analysis
	Analysis method and details

Sarkans, U., Chiu, W., Collinson, L. *et al.* REMBI: Recommended Metadata for Biological Images—enabling reuse of microscopy data in biology. *Nat Methods* **18**, 1418–1422 (2021).

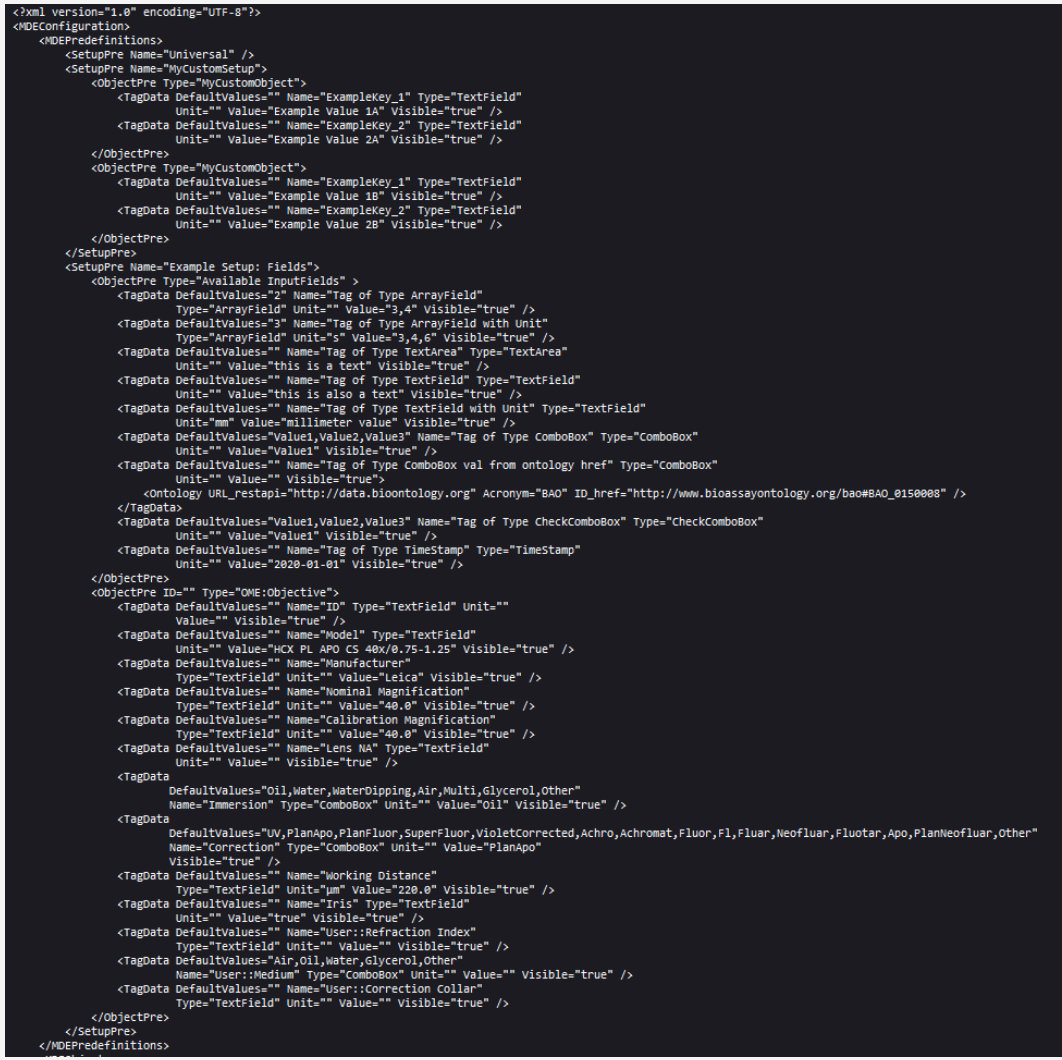
The first step, and then… ?





Current solutions

- OMERO.insight extension MDE
- OMERO.forms (OMERO.web plugin)
- OMERO.web script ‘KeyVal_from_csv’
- …



```
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                <TagData DefaultValues="" Name="ExampleKey_2" Type="TextField"
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            </ObjectPre>
            <ObjectPre Type="MyCustomObject">
                <TagData DefaultValues="" Name="ExampleKey_1" Type="TextField"
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                <TagData DefaultValues="" Name="ExampleKey_2" Type="TextField"
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        </SetupPre>
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                       Visible="true" />
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                <TagData DefaultValues="" Name="Iris" Type="TextField"
                        Unit="" Value="true" Visible="true" />
                <TagData DefaultValues="" Name="User::Refraction Index"
                        Type="TextField" Unit="" Value="" Visible="true" />
                <TagData DefaultValues="Air,Oil,Water,Glycerol,Other"
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                        Type="TextField" Unit="" Value="" Visible="true" />
            </ObjectPre>
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    </MDEPredefinitions>
```

Our solution

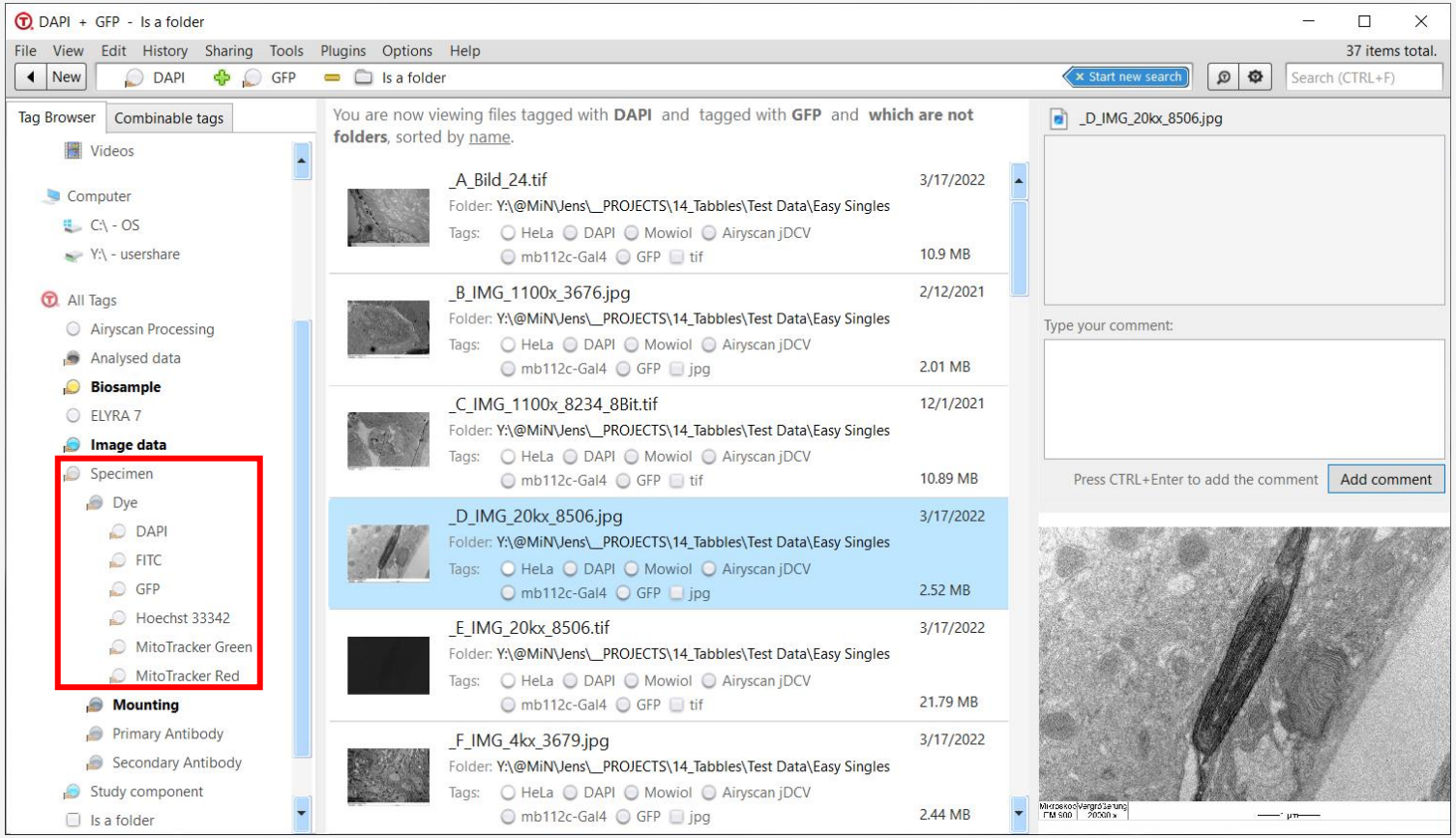
- Focus on low entry-barrier → high user adoption
- Still provide as much functionality as possible
- Two simple steps:
  - Annotate Images with Tags via context menu in the Explorer
  - Run an OMERO.web script

How do we do it?

- File tagging software Tabbles

- Tags can be shared/synchronized between groups/workstations
- Elaborate auto-tagging rules possible for folders and sub-folders
- Data is stored in a Microsoft SQL database
- Nested Tags possible

Tag Structure



Category-level

└ Key-level

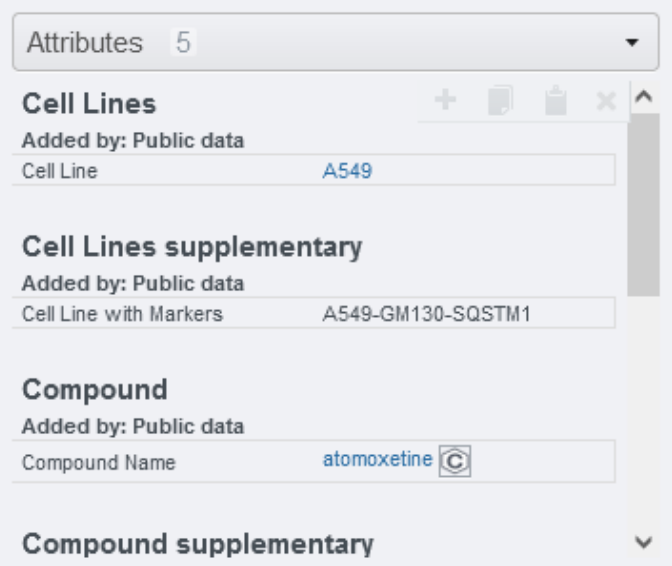
└ Value-level

- Adopt REMBI structure
- Allows implementation of OMERO.mapr with different Namespaces

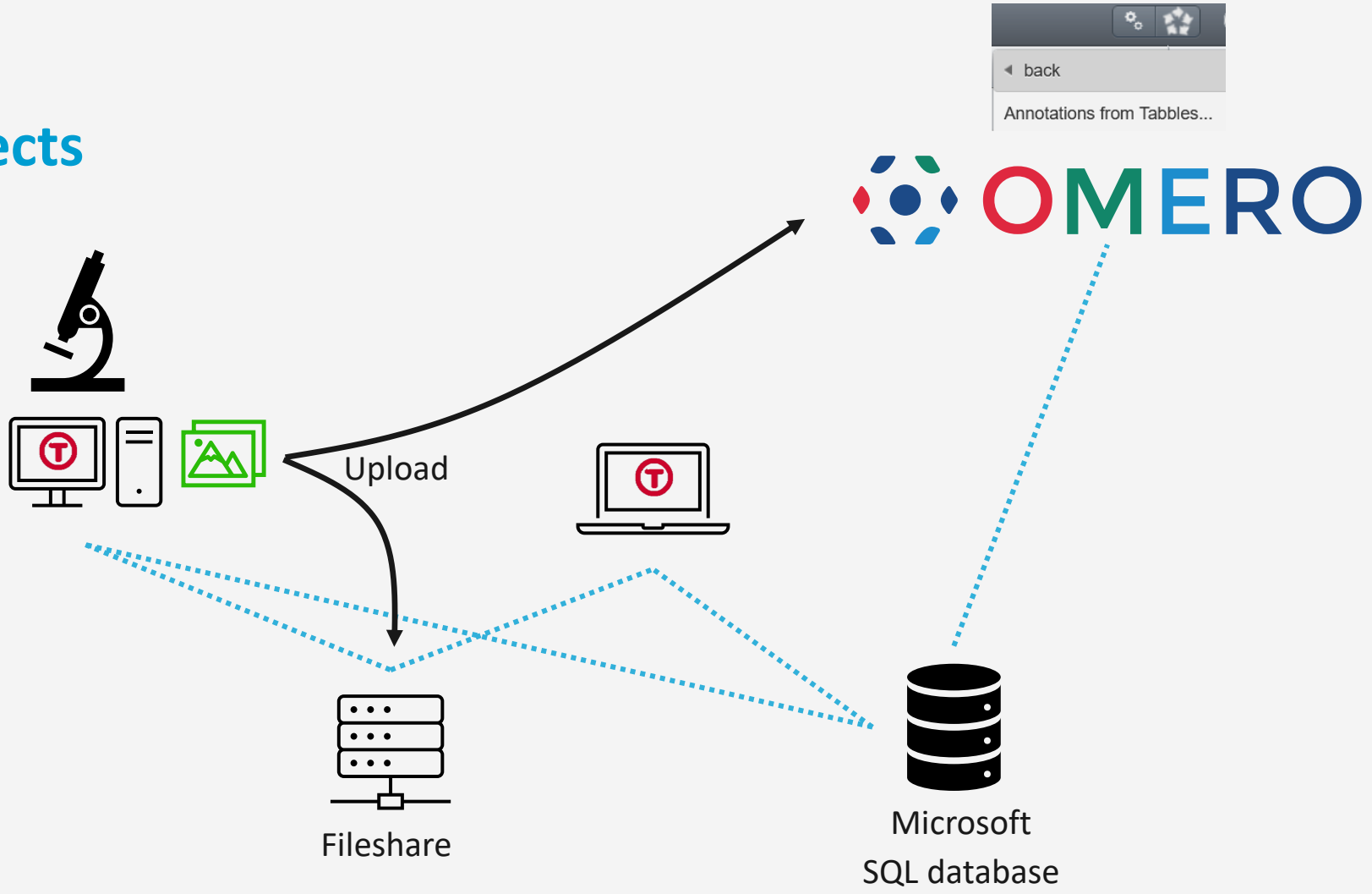
What is the OMERO.web script doing exactly?

- OMERO.web script queries the SQL database and resolves the Tabbles Tags into OMERO MapAnnotations (Key-Value pairs) and TagAnnotations (Tags)

- Use OMERO.mapr plugin to create structured Key-Value pairs like IDR
  - Thumbnails with Hyperlinks
  - Implemented search function for Values



How it all connects



Advantages

- Only two intuitive, quick steps
- Supports not only Key-Value pairs but also Tags
- If you are doing in-place import, the script could be run automatically after the import
- (Detailed) auto-tagging rules can create the majority of tags automatically
- Tags are synchronized/shared between different workstations/groups
- You can update Metadata at a later time

Disadvantages

- Tabbles is a proprietary Software (modest licensing fees)
- Tabbles only support Windows (most Microscope workstation run Windows)
- Initial setup of SQL database and OMERO.mapr needed (~2-3h)
- Some limits for tag naming conventions
- Not providing all the in-depth functionality OMERO.forms and OMERO.insight MDE have

Questions?

https://github.com/MuensterImagingNetwork/annotations_from_tabbles/tree/dev