

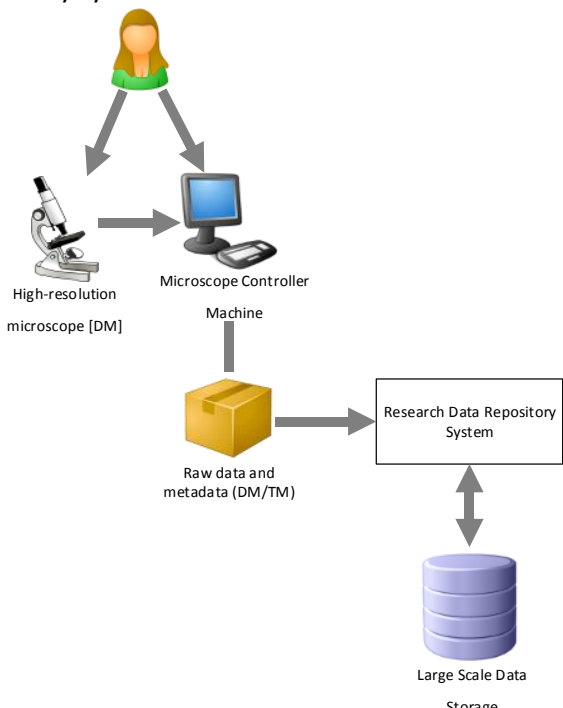
Use Case	Authors
Localization Microscopy, Nanoscopy	Ajinkya Prabhune, Volker Hartmann, Rainer Stotzka

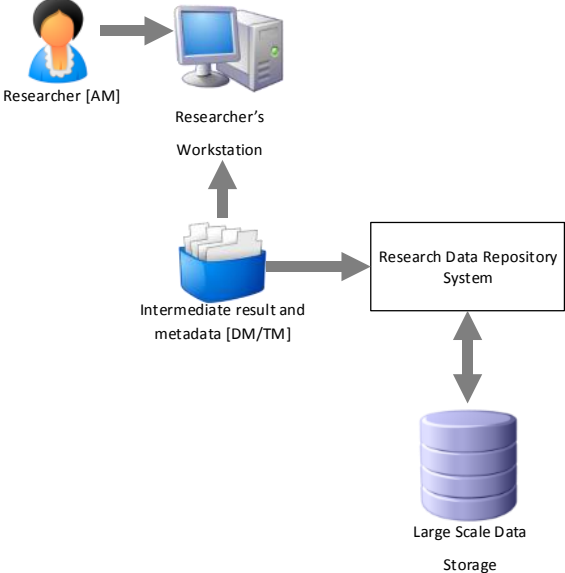
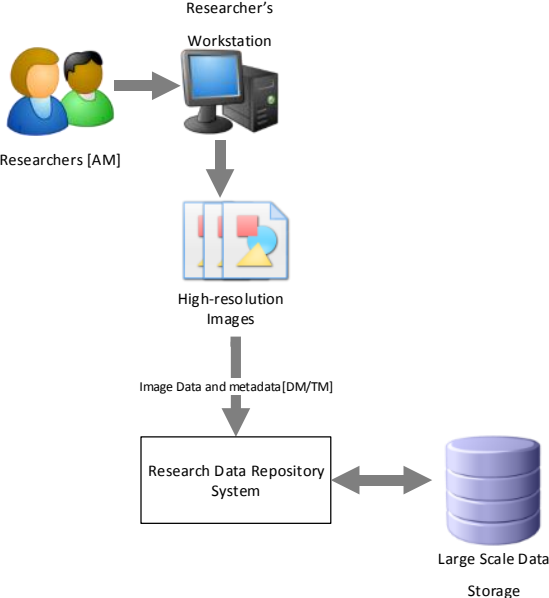
Use Case Description:

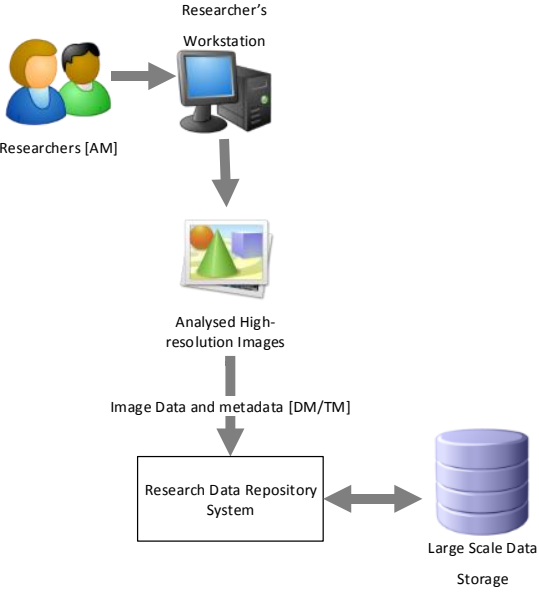
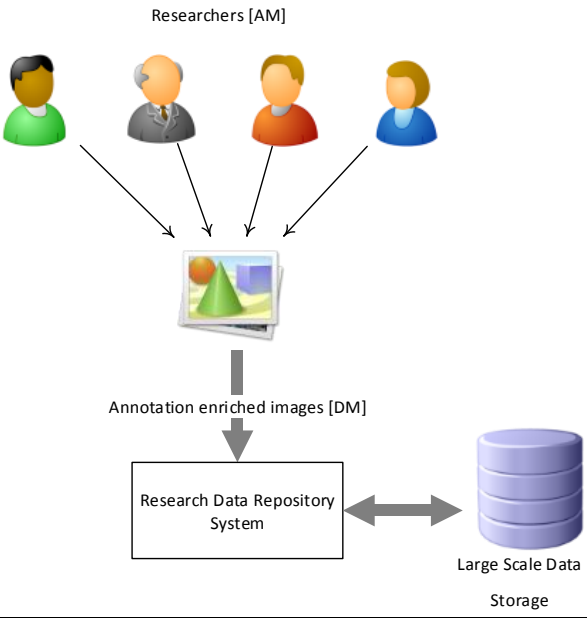
The metadata associated with the large datasets in Localization Microscopy (LM) is of vital importance to the researchers. Nanoscopy is a novel imaging technique wherein sub-molecular structures easily viewed via high-resolution images. The generation of the high-resolution images is not a single step process but rather an arduous and work-expensive process. The dataset size for a complete series of measurement can go up to 150-200TB. Therefore it is necessary to correctly identify the metadata which is generated either from the high-resolution microscope or by the researchers. The complete workflow of the LM experiment and the metadata for each step is presented below:

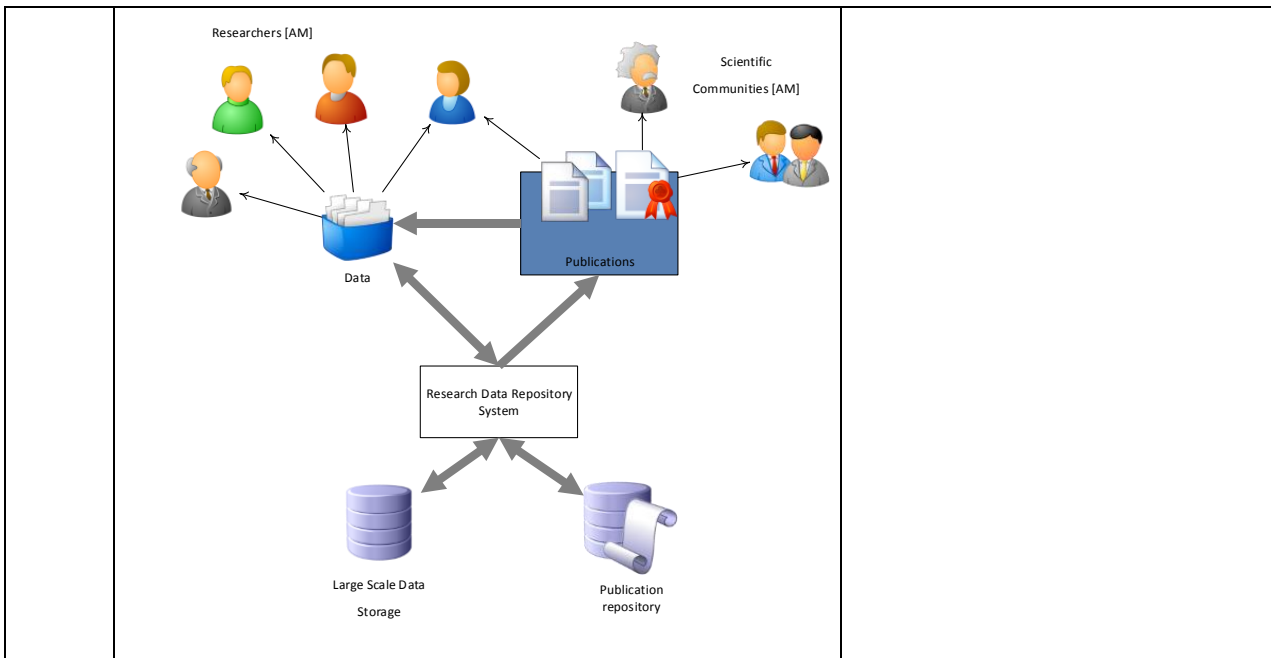
The metadata produced at various stages will be categorized as below [1]:

- Descriptive Metadata – DM
- Structural Metadata – SM
- Administrative Metadata/Technical Metadata – AM or TM

Step #	Description	Corresponding Metadata
1	<p>Raw-datasets</p> <ul style="list-style-type: none"> • The Raw datasets are produced from the high-resolution microscopes. • For reuse purpose the raw datasets must be archived in large scale data storage using a research data repository system. 	<ol style="list-style-type: none"> 1. [AM] User Authentication metadata (username, password or certificate) 2. [DM] For the raw datasets, Study, Investigation, digital-data description and unique-ID for referencing the datasets. 3. [TM] For describing the setup of the high-resolution microscope (for example : Camera setup details) 4. [AM] Experimenter, Organization specific metadata
2	<p>Intermediate Results</p> <ul style="list-style-type: none"> • The intermediate datasets are generated from the raw-datasets • Again for reuse purpose the intermediate results are archived in the repository system 	<ol style="list-style-type: none"> 1. [TM] Description of software/algorithm used to produce the intermediate result (for example : algorithm and software details) 2. [AM] Researcher information

	 <p>Researcher [AM] → Researcher's Workstation → Intermediate result and metadata [DM/TM] → Research Data Repository System ↔ Large Scale Data Storage</p>	<p>who was responsible for producing the intermediate results</p> <ol style="list-style-type: none"> 3. [DM] Metadata describing the intermediate results and unique-ID for referencing the datasets
<p>3a</p>	<p>Generating high-resolution images:</p> <ul style="list-style-type: none"> • Producing final high-resolution images from the intermediate datasets • For sharing and reusing the high-resolution images are archived in the repository system  <p>Researchers [AM] → Researcher's Workstation → High-resolution Images → Image Data and metadata [DM/TM] → Research Data Repository System ↔ Large Scale Data Storage</p>	<ol style="list-style-type: none"> 1. [AM] Researcher's information that is responsible for producing the high-resolution images from the intermediate results. 2. [TM] Description of software/algorithm used to generate the final high-resolution images 3. [DM] Metadata describing the high-resolution images and unique-ID for referencing the images
<p>3b</p>	<p>Miscellaneous analysis:</p> <ul style="list-style-type: none"> • Various algorithms are executed on the intermediate results to determine specific attributes of the investigation. • The high-resolution images with the analysis information is generated 	<ol style="list-style-type: none"> 1. [AM] Researcher information who was responsible for producing the Analysed images 2. [TM] Description of software/algorithm used for analysis 3. [DM] Metadata describing the analysed high-resolution images

	 <p>Researcher's Workstation</p> <p>Researchers [AM]</p> <p>Analysed High-resolution Images</p> <p>Image Data and metadata [DM/TM]</p> <p>Research Data Repository System</p> <p>Large Scale Data Storage</p>	
4	<p>Image Annotation:</p> <ul style="list-style-type: none"> Annotation of images for sharing new insights from the high-resolution images (scientific expertise)  <p>Researchers [AM]</p> <p>Annotation enriched images [DM]</p> <p>Research Data Repository System</p> <p>Large Scale Data Storage</p>	<ol style="list-style-type: none"> [AM] Researcher's information who are annotating the images with scientific content. [DM] Annotating the images with scientific information (for example : vocabulary controlled metadata or free-text)
5	<p>Sharing Data (Raw, Intermediate, High-resolution images + annotations)</p> <ul style="list-style-type: none"> Raw dataset, intermediate result, high-resolution images including the annotations needs to be shared between the communities and also published in future. 	<ol style="list-style-type: none"> [AM] Researchers/Scientific community's details. Data sharing metadata (access rights), publication metadata



References

- [1] (2004) NISO "Understanding Metadata". [Online] Available: <http://www.niso.org/publications/press/UnderstandingMetadata.pdf>