

# Parallel HDF reading for Imaging Techniques

**CNPEM / Brazilian Synchrotron Light Laboratory  
Sirius**

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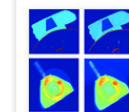
**2022 European HDF5 Users Group**



■ Data processing  
■ Segmentation/Visualization



RESEARCH PAPERS  
*J. Appl. Cryst.* (2020). **53**, 1550-1558  
<https://doi.org/10.1107/S1600576720013886>  
 Cited by 1  
 Part of a special issue



## Fast reconstruction tools for ptychography at Sirius, the fourth-

G. L. Baraldi, C. S. B. Dias, F. M. C. Silva, H. C. N. Tolentino and E. X. Miqueles

Described here are image reconstruction optimizations for ptychographic coherent X-ray fluorescence, which have been developed for the new fourth-generation synchrotron, at the Brazilian Synchrotron Light Laboratory. The optimization strategy has a standard experimental strategy for ptychographic and fluorescence experiments of use of high-speed continuous scans (fly scans) for a fast acquisition time over large areas.

## Proceedings of the 2020 SIAM Conference on Parallel Processing for Scientific Computing (PP)

### Fast image reconstruction at a synchrotron laboratory

Eduardo X Miqueles, Gilberto Martinez Jr., and Patricio P. Guerrero

pp. 24 - 34

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## A Backprojection Slice Theorem for Tomographic Reconstruction

Publisher: IEEE

Cite This

PDF

Eduardo Miqueles, Nikolay Koshev, Elias S. Helou, All Authors

JACoW.org

## Journals of Accelerator Conferences Website (JACoW)

'Journal of Accelerator Conferences Website' (JACoW) is a publisher in Geneva, Switzerland that publishes the proceedings of accelerator conferences held around the world by an international collaboration of editors.

<https://doi.org/10.18429/JACoW-ICALEPCS2021-FRBL05>

Title RemoteVis: An Efficient Library for Remote Visualization of Large Volumes Using NVIDIA Index

Authors T.V. Spina, D. Alnajjar, M.L. Bernardi, F.S. Furusato, E.X. Miqueles, A.Z. Peixinho, L.N.S. Camoimas, Brazil

SpringerLink

Latin American High Performance Computing Conference  
 CARLA 2021: High Performance Computing pp 3-18 | Cite as

## TEPUI: High-Performance Computing Infrastructure for Beamlines at LNLS/Sirius

Fernando S. Furusato, Matheus F. Sarmiento, Gustavo H. O. Aranha, Luciano G. Zago & Eduardo X. Miqueles

Conference paper | First Online: 12 April 2022

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Results in Applied Mathematics  
 Volume 6, May 2020, 100088  
 ELSEVIER Applied Mathematics

## Automatic regularization for tomographic image reconstruction

Eduardo Miqueles, Patricio Guerrero

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## Iterative Reconstruction in X-ray Fluorescence Tomography Based on Radon Inversion

Publisher: IEEE

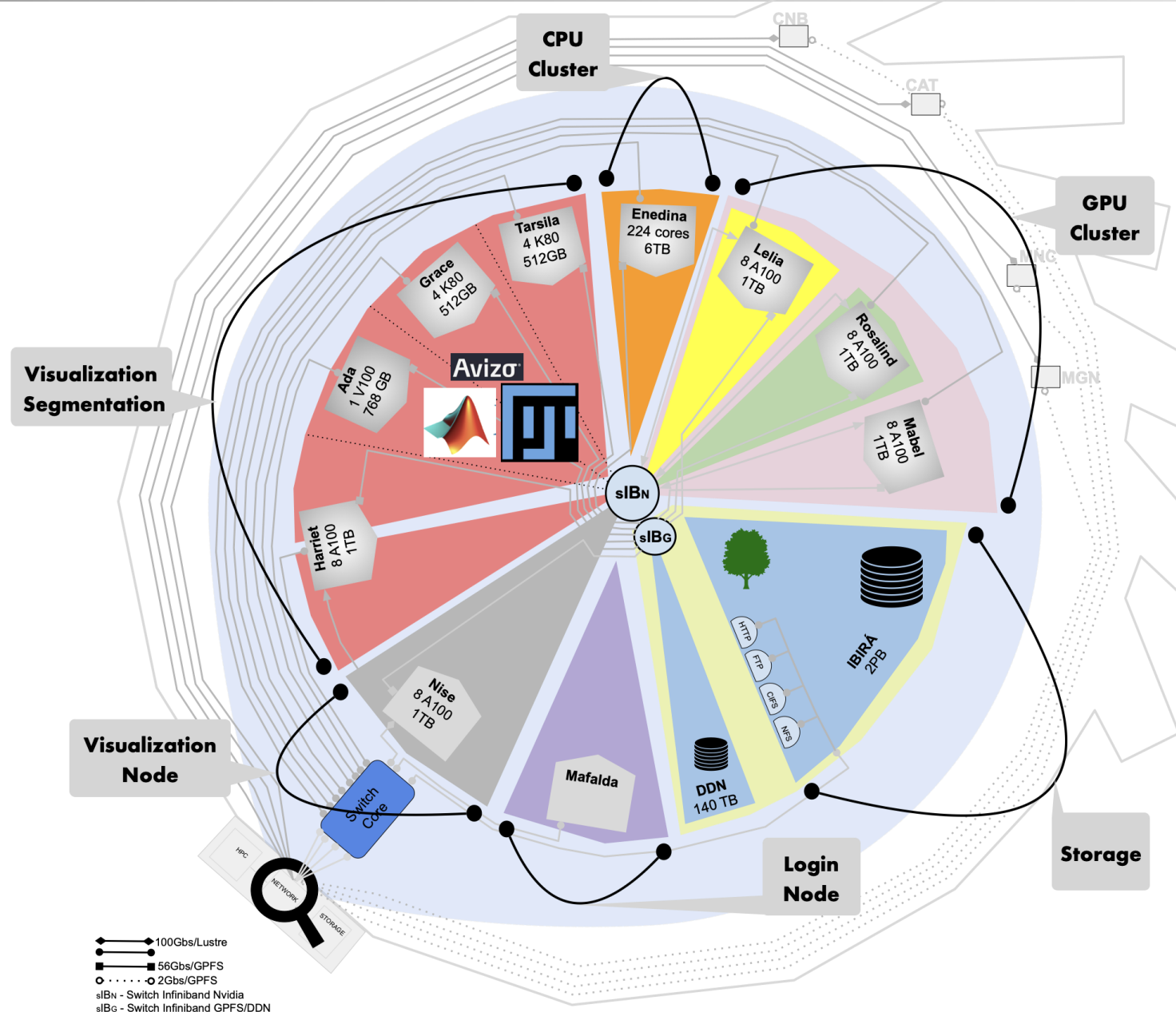
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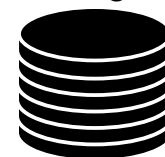
Eduardo X. Miqueles, Alvaro R. De Pierro, All Authors



# HPC Infrastructure – TEPUI Group



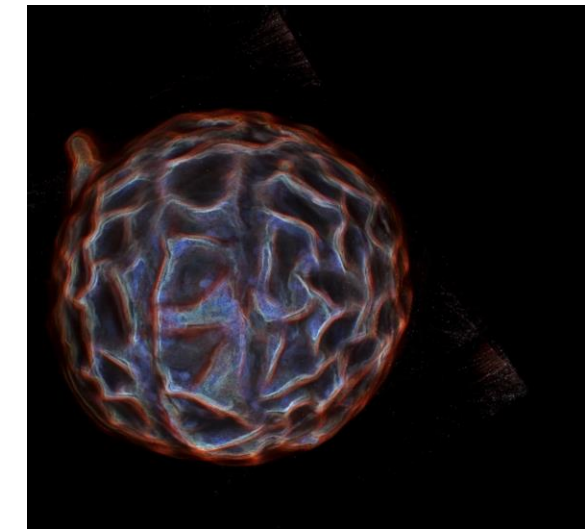
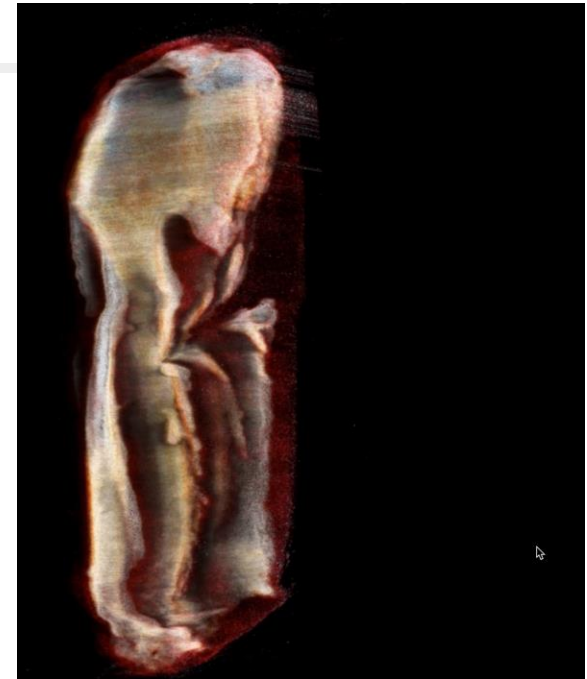
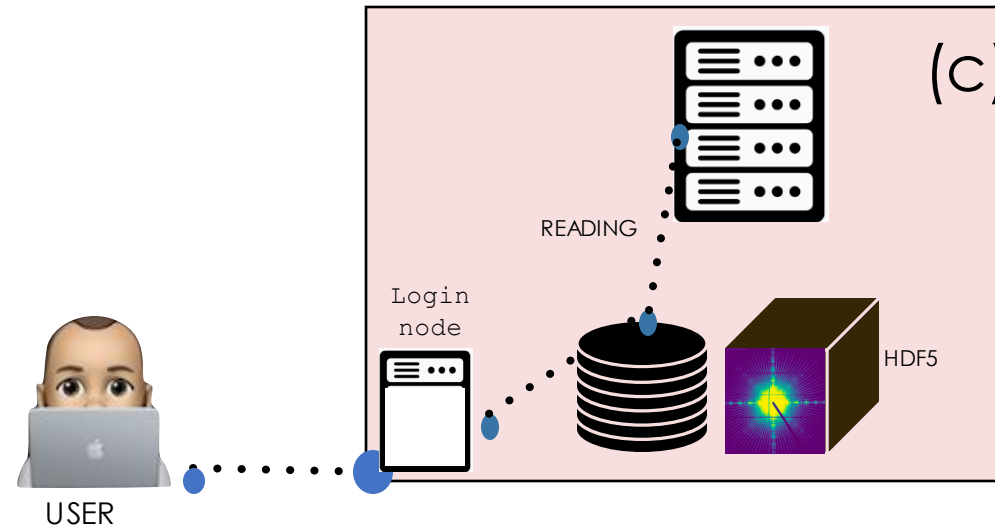
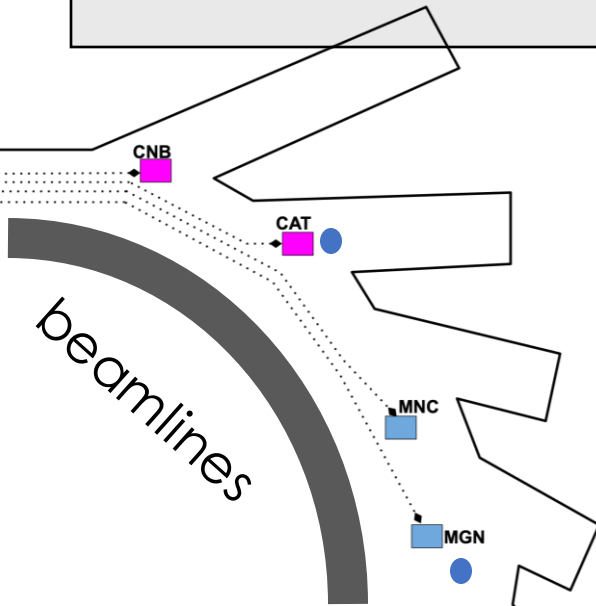
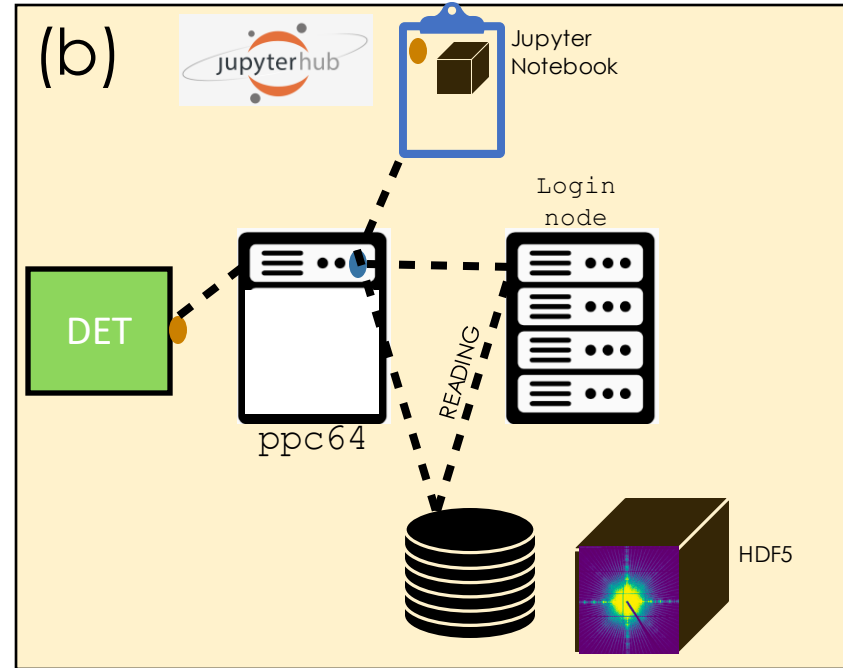
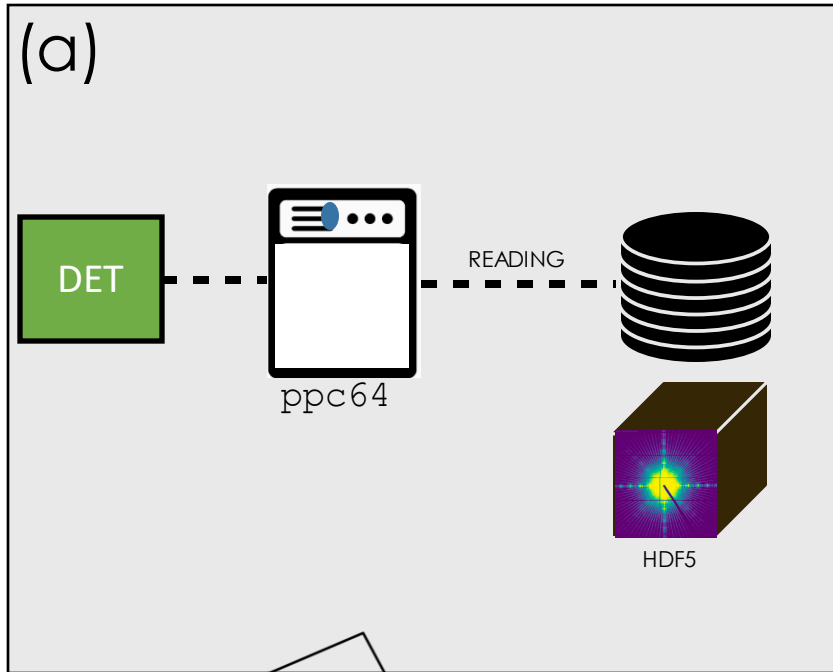
Storage



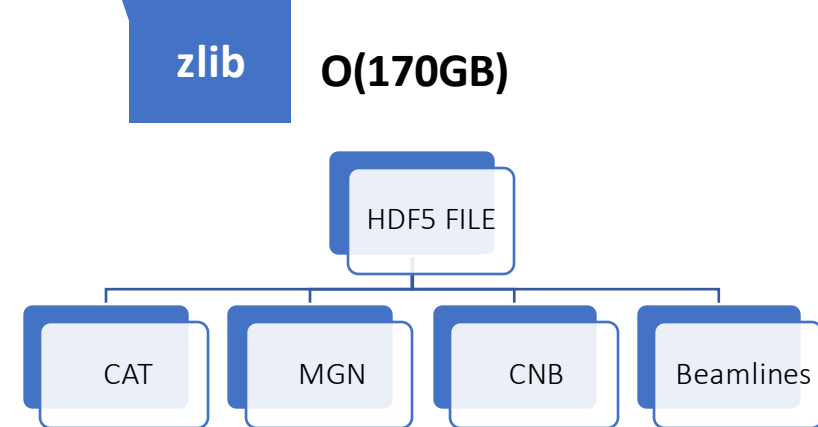
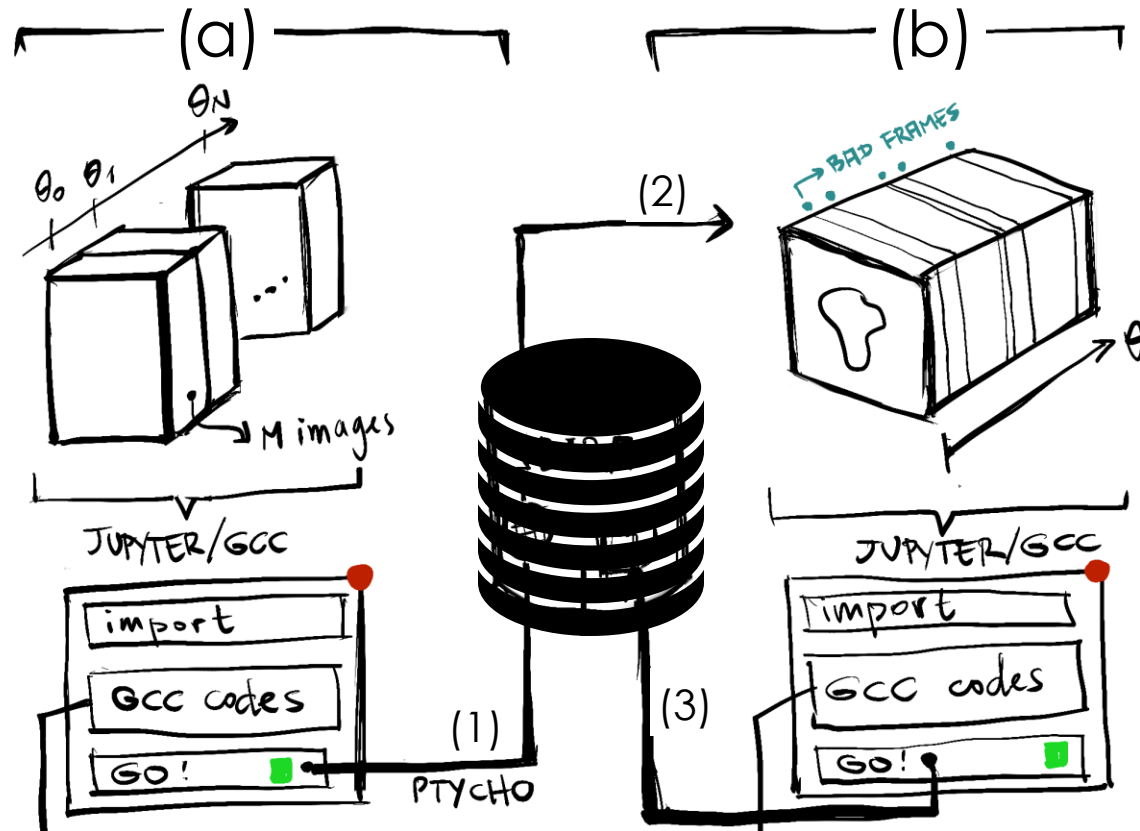
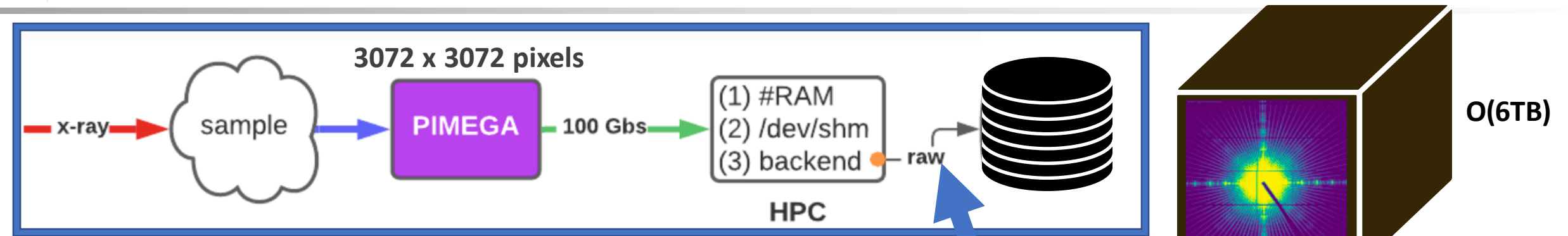
Usage policies



# Local Computing nodes

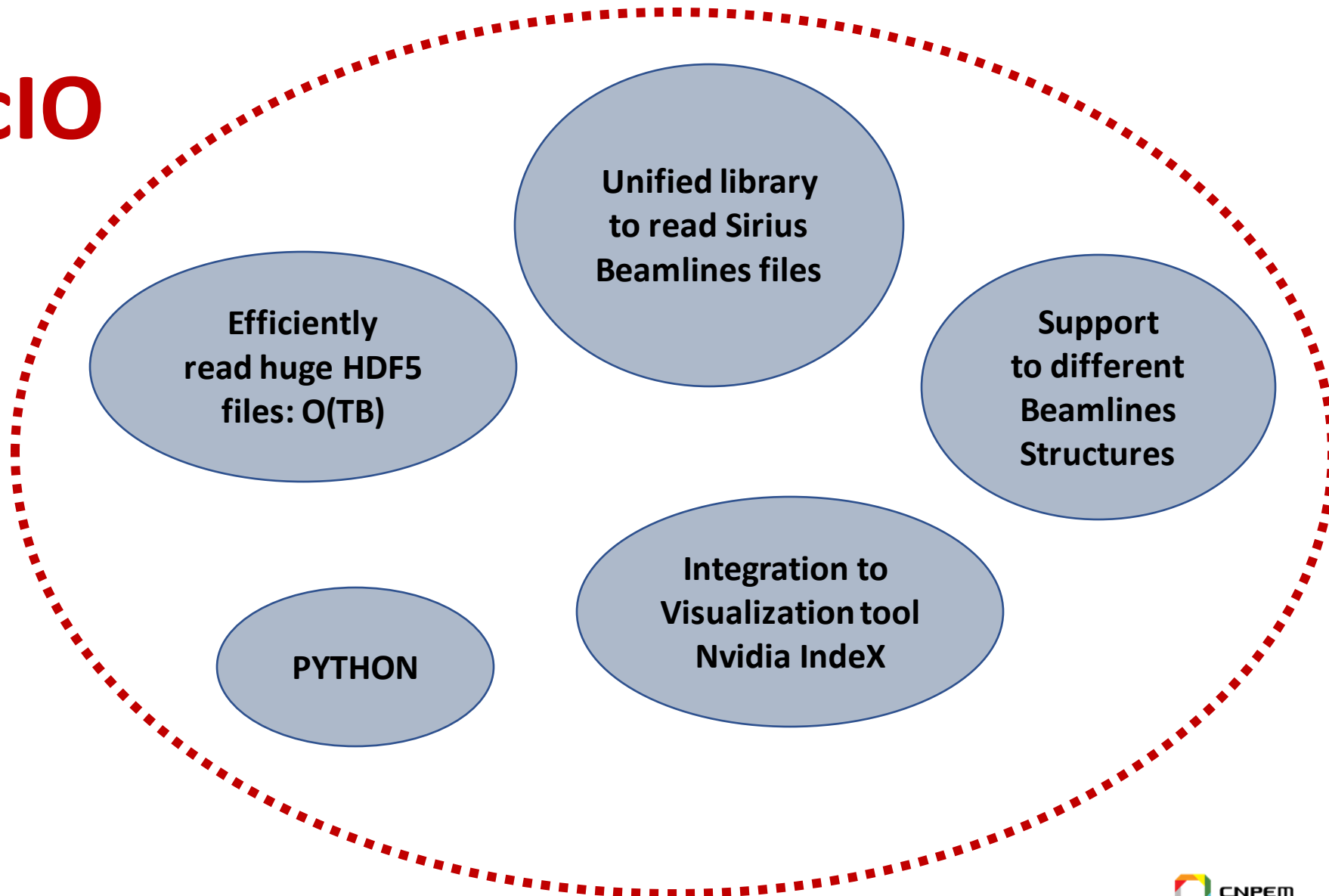


# Detectors + Compression

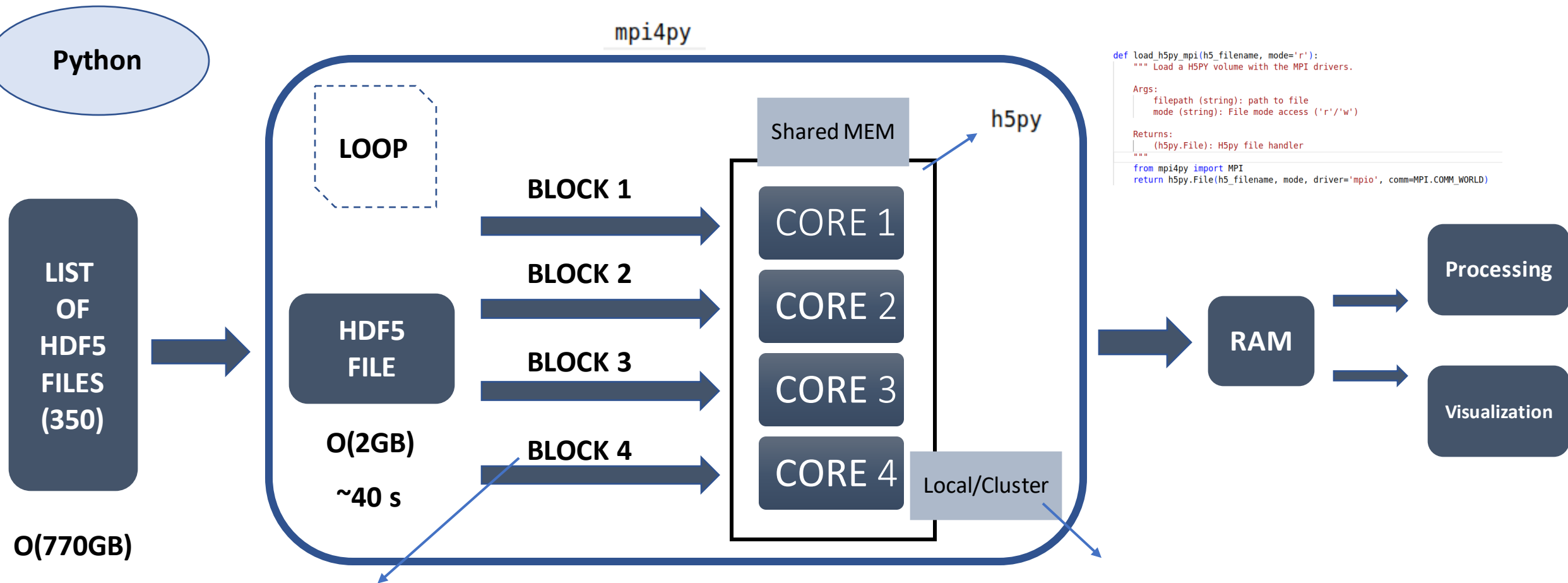


```
elif beamlines == 'mgn':
    try:
        volume, imaging_type, image_tag, error_msg = read_MGN_volume_HDF5(filename, use_MPI)
    except Exception as e:
        error_msg = 'Exception: Unable to load MGN HDF5 file! Exception: ' + str(e)
elif beamlines == 'cat':
    try:
        volume, imaging_type, image_tag, error_msg = read_CAT_volume_HDF5(filename, use_MPI)
    except Exception as e:
        error_msg = 'Exception: Unable to load CAT HDF5 file! Exception: ' + str(e)
```

## sscIO



# sscIO – Python Parallel (MPI) library to read HDF files



```
def load_h5py_mpi(h5_filename, mode='r'):
    """ Load a H5PY volume with the MPI drivers.

    Args:
        filepath (string): path to file
        mode (string): File mode access ('r'/'w')

    Returns:
        (h5py.File): H5py file handler
    """
    from mpi4py import MPI
    return h5py.File(h5_filename, mode, driver='mpio', comm=MPI.COMM_WORLD)
```

```
index_last = int(min(index+chunk_size-1, slice_range[0] + output_shape[0]-1))

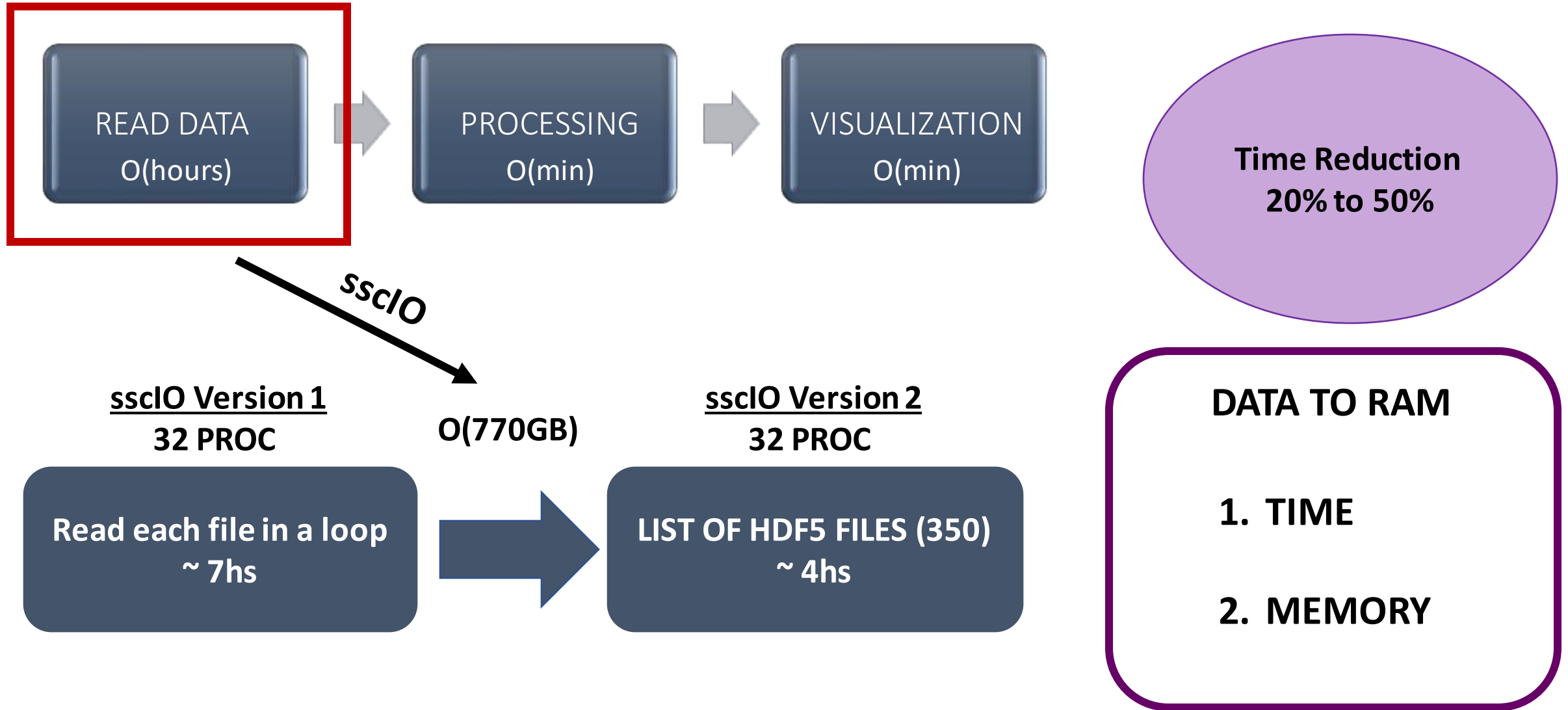
# print('MPI Slice range:',(index,index_last),y_range,x_range)

arr, imaging_type, image_tag, error_msg = read_volume(filename, beamlines, dic = None,
```

```
# Adjusting the number of processes for reading of SLURM is being used
if 'SLURM_NTASKS' in os.environ:
    nprocs = min(nprocs, int(os.environ['SLURM_NTASKS']))

# Checking file properties before MPI
# logger.info('Reading file metadata')
volume_props, error_msg = io_info.get_volume_info(filename, beamlines, dic, **kwargs)

if volume_props['shape'] is None or error_msg is not None:
    logger.exception(error_msg)
```



SERVERS: 2 sockets/18 cores per socket/4 threads per core



# THANK YOU

## Questions?

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Sirius**

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