

Complex data at MRI

Volker Baecker
Montpellier RIO Imaging
MRI-TIGR

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MRI - the facility

- regional imaging facility
- 3 departments – optics, cytometry, microtomography rx
- 11 locations
 crbm, inm, iurc, cirad, igh, lagaillarde, igmm, dbs, irb,
 ircm, isem
- 2010 – 620 active users, 189 groups, 67 machines
- 2011 – 641 active users, 226 groups, 65 machines
 (46 acquisition, 12 cytometer)
- 23 staff members

MRI - the facility

3 departments
12 sites
23 staffs

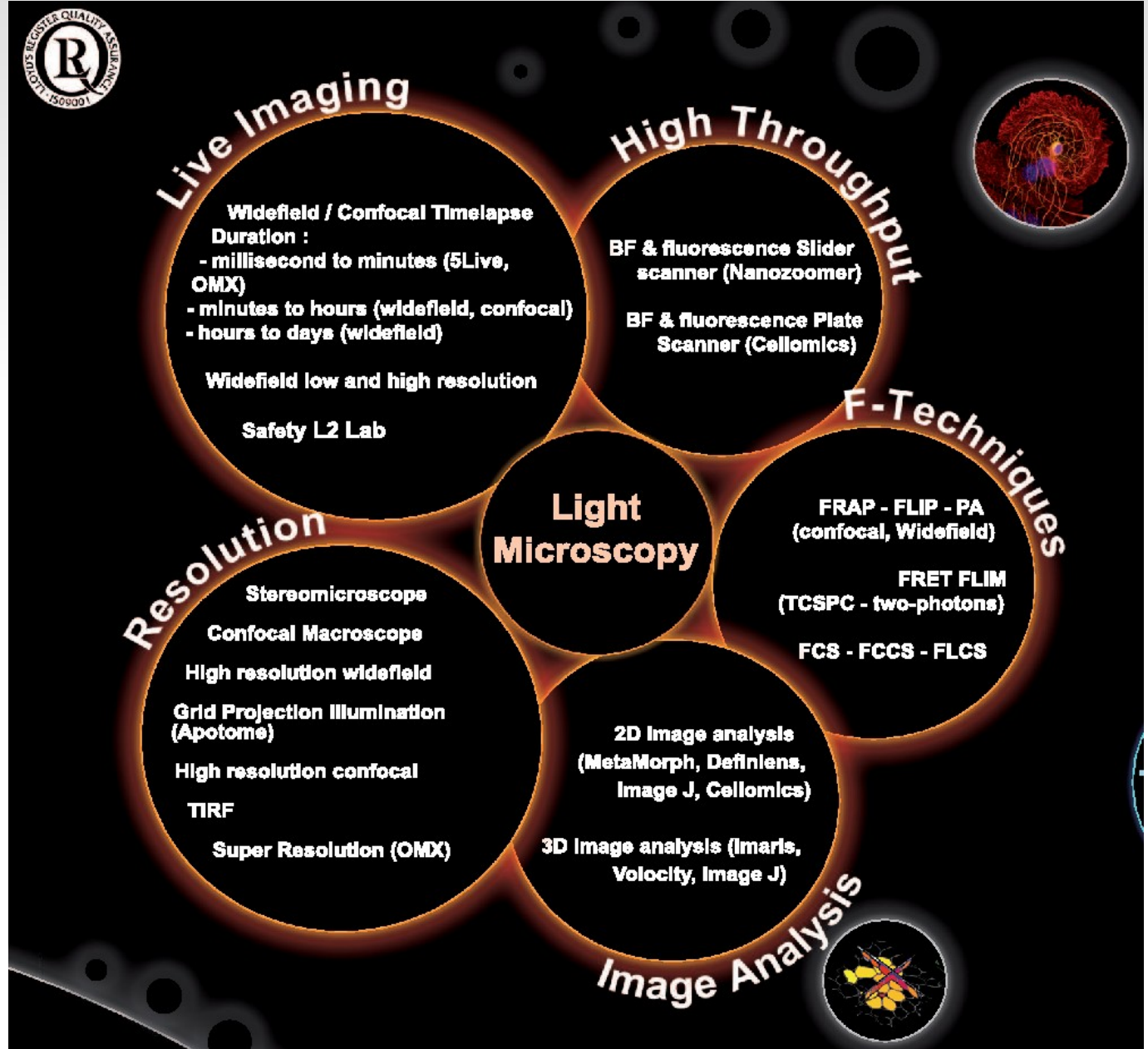
~ 37 000
worked
hours/year

470
training
sessions

45
equipments

17
PC analysis

630
users



MRI - the facility

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23 staffs

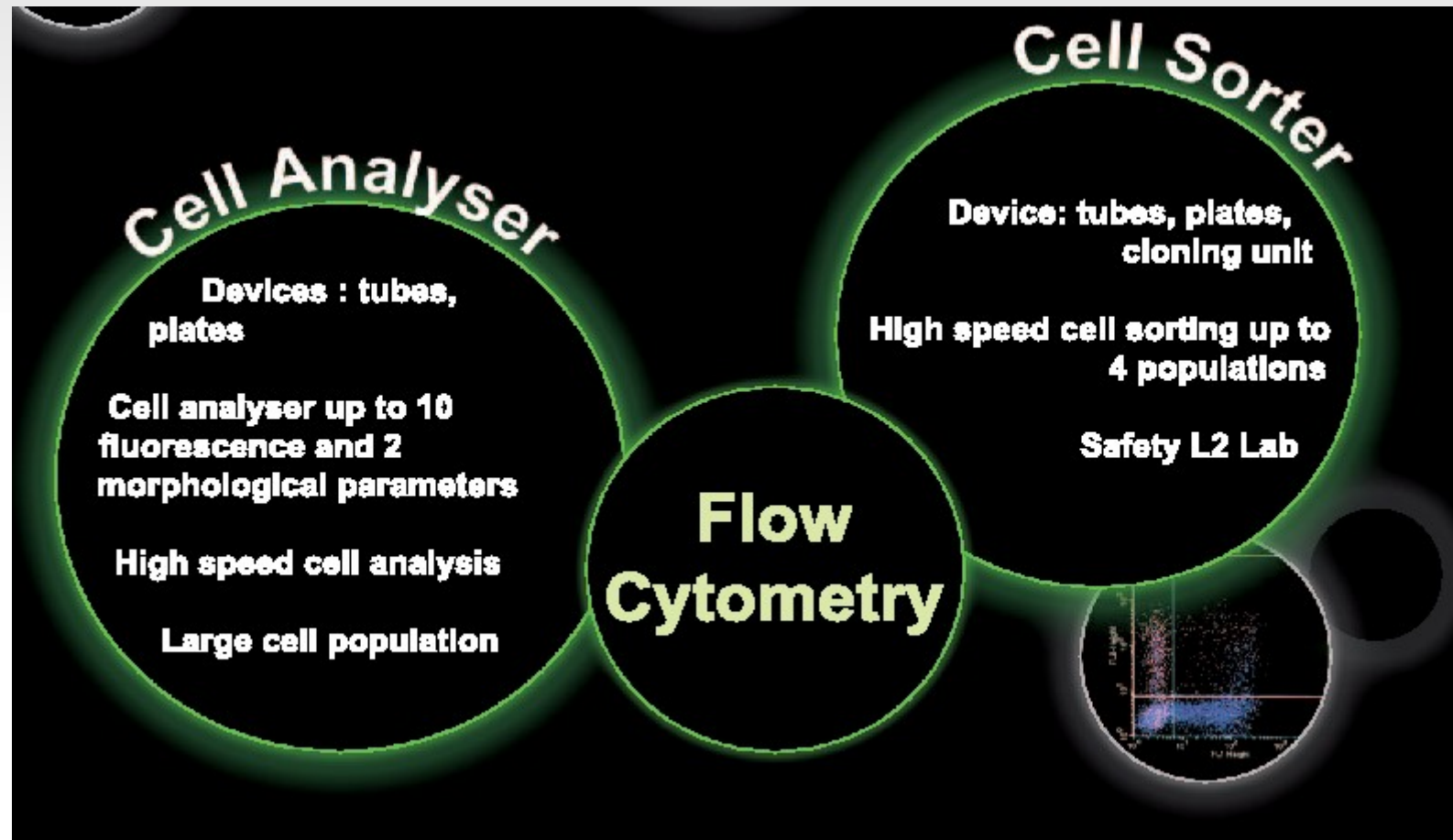
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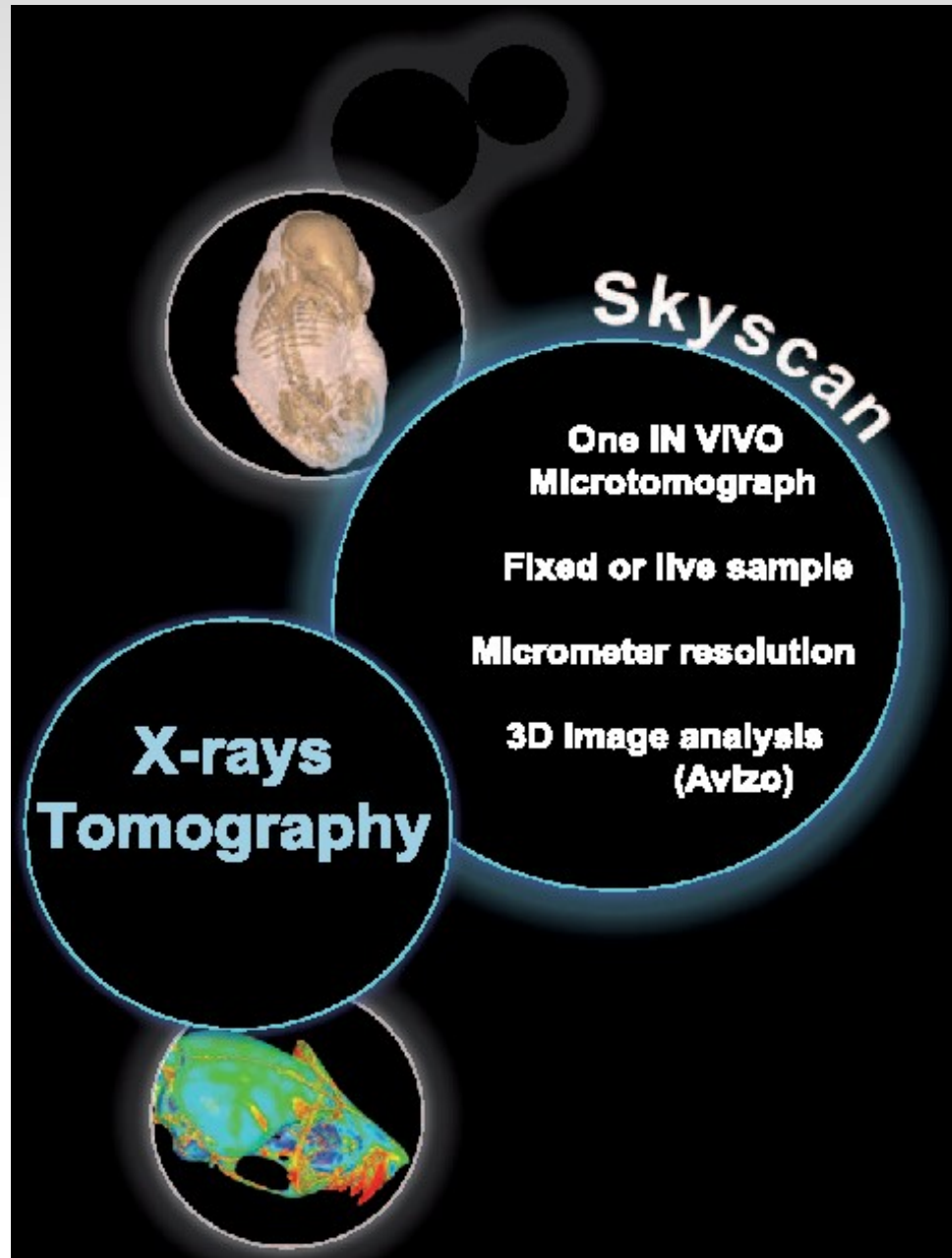
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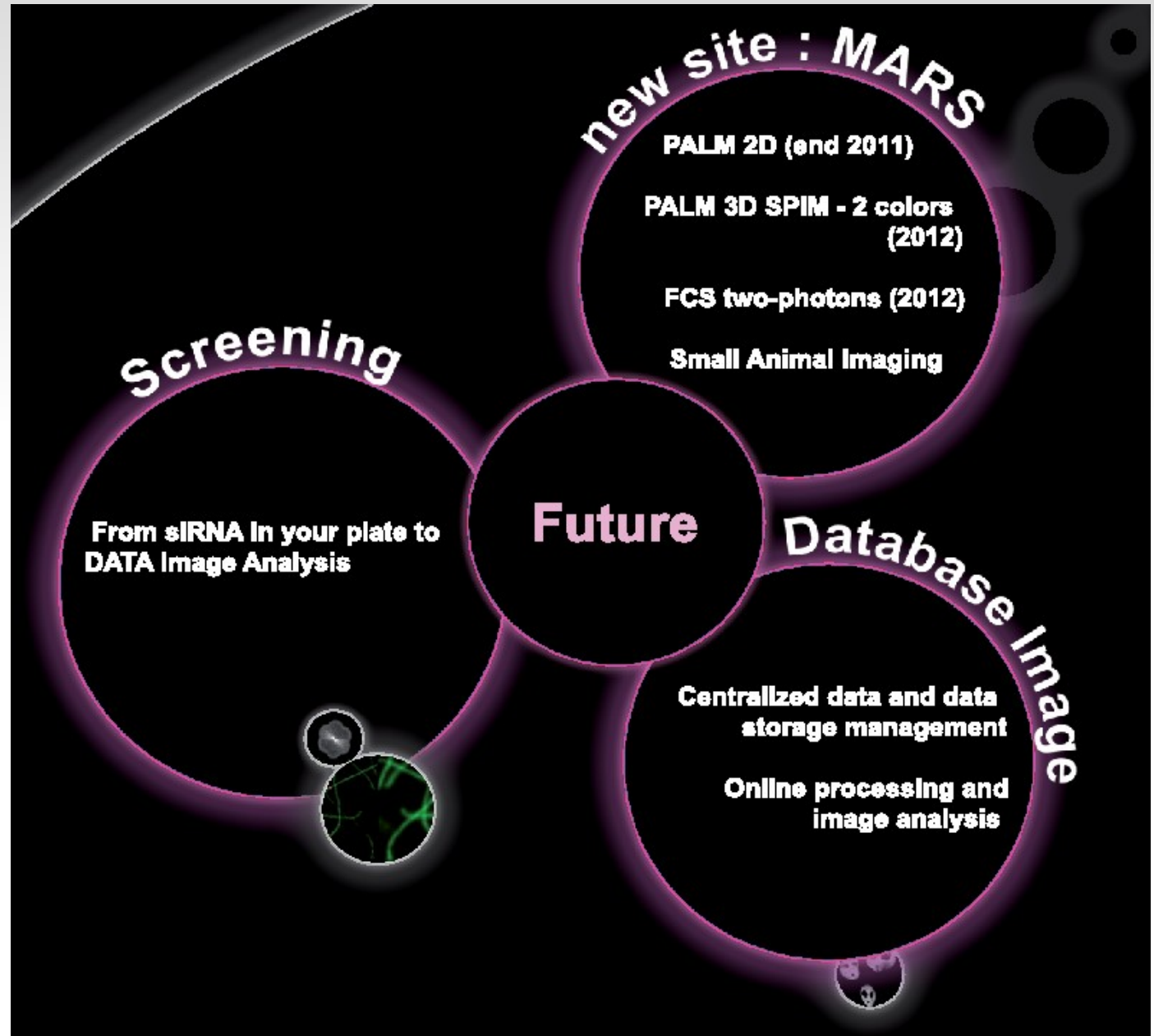
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MRI - systems

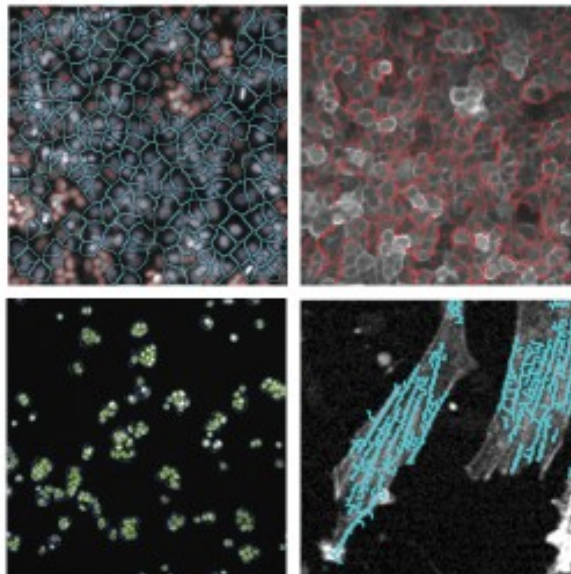
- celloomics - fully automated microscope - high content screening
- widefield/confocal mosaic acquisition
- widefield/confocal time-lapse acquisition
- nanozoomer - slide scanner
- omx – structured illumination microscopy (superresolution)
- skyscan – microtomography rx

HCS - cellomics

High Content Analysis/Screening for thousands to millions of objects



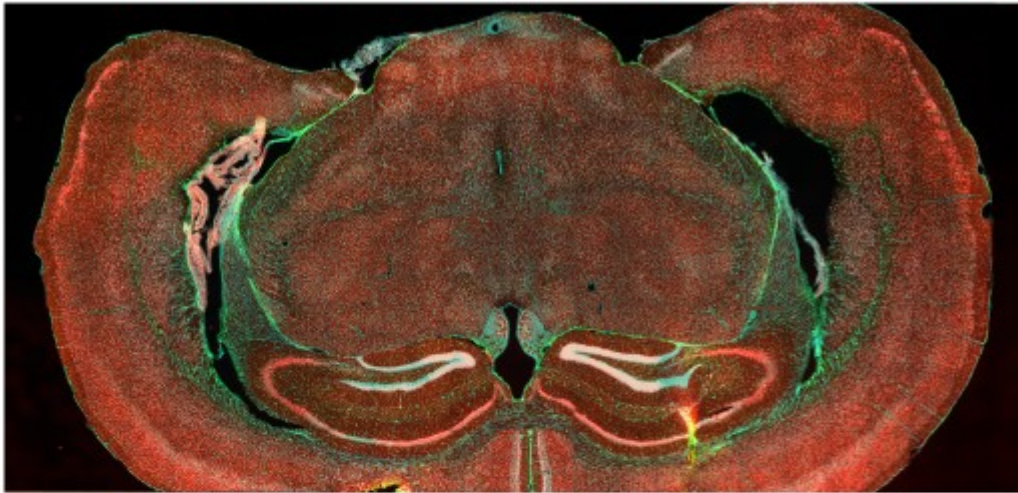
disk array
with 4 TB



ValidObjectCount	169.0
SelectedObjectCount	169.0
%SelectedObjectCount	100.0
MeanNucArea	176.3
MeanNucInten(NucCh)	436.7
MeanNuc-CytolIntenDiff(TargetCh)	261.5
StdDevNucArea	85.7
StdDevNucInten(NucCh)	68.8
StdDevNuc-CytolIntenDiff	219.2
StdErrNucArea	6.6
StdErrNucInten(NucCh)	5.3
StdErrNuc-CytolIntenDiff	16.9
CVNucArea	0.5
CVNucInten(NucCh)	0.2
CVNuc-CytolIntenDiff	0.8
AvgCellDensity/Field	169.0
MeanNucInten(TargetCh)	891.2
MeanCytoRingInten(TargetCh)	629.7
StdDevNucInten(TargetCh)	203.5
StdDevCytolInten(TargetCh)	54.3
#ValidFields	1.0

Mosaic acquisition

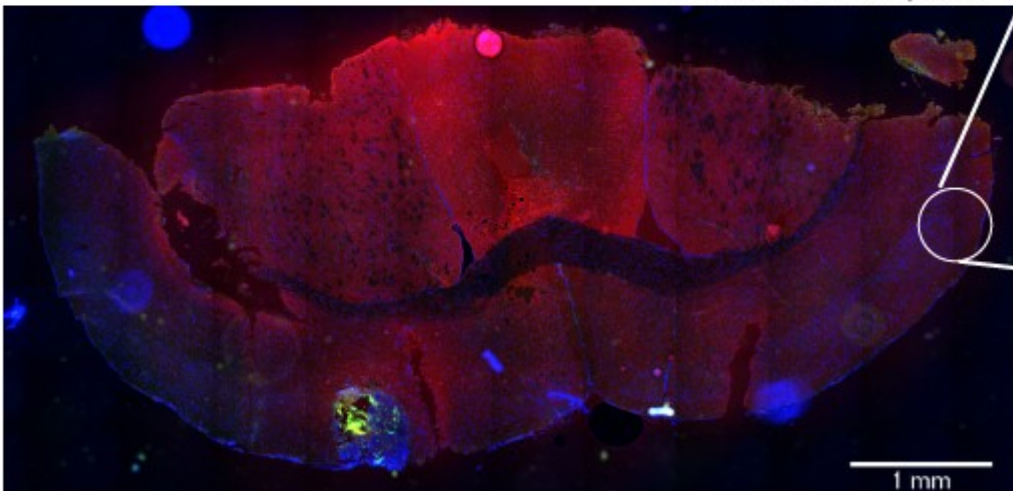
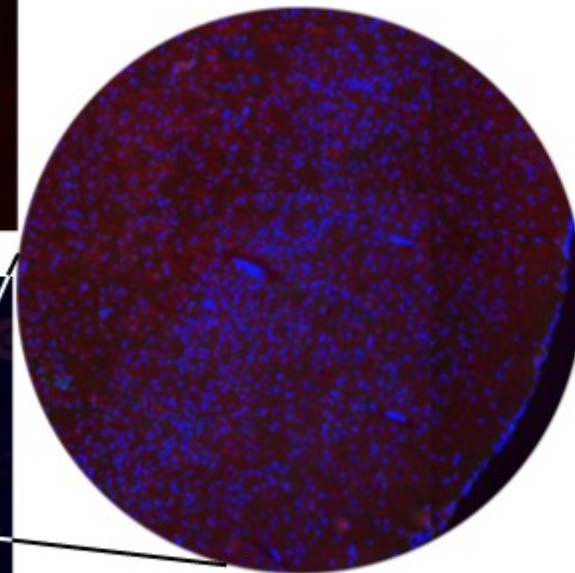
Mosaic acquisition with a standard widefield microscope (Leica DM6000)



S. Sakkaki, IGF, Montpellier

Image size 100MB-5000MB

6088×7667×119×8bit

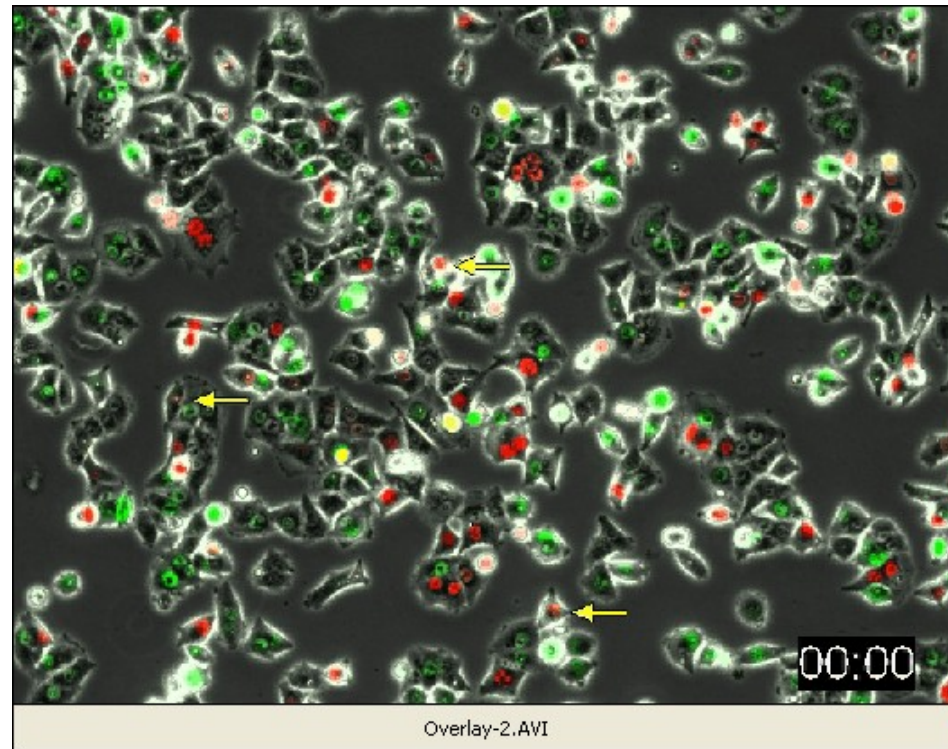


E. Savary, INM, Montpellier



Time-lapse acquisition

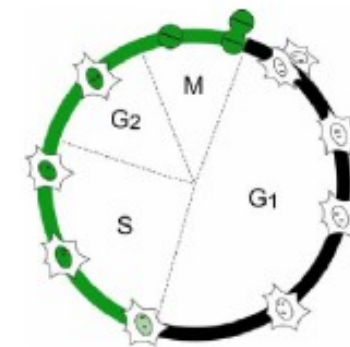
Wide-field Time-lapse acquisition



multichannel
timelapse
~20 GB



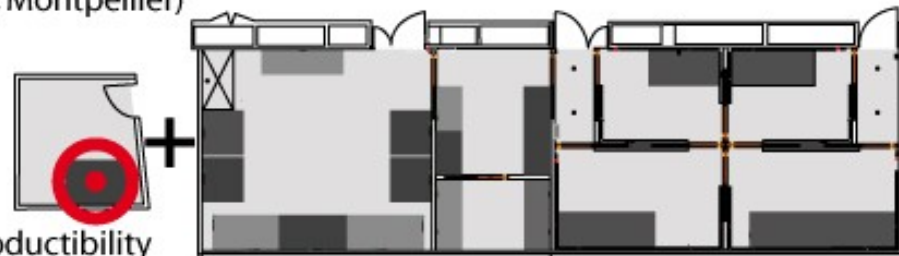
mKO2-Cdt1 (30-120)



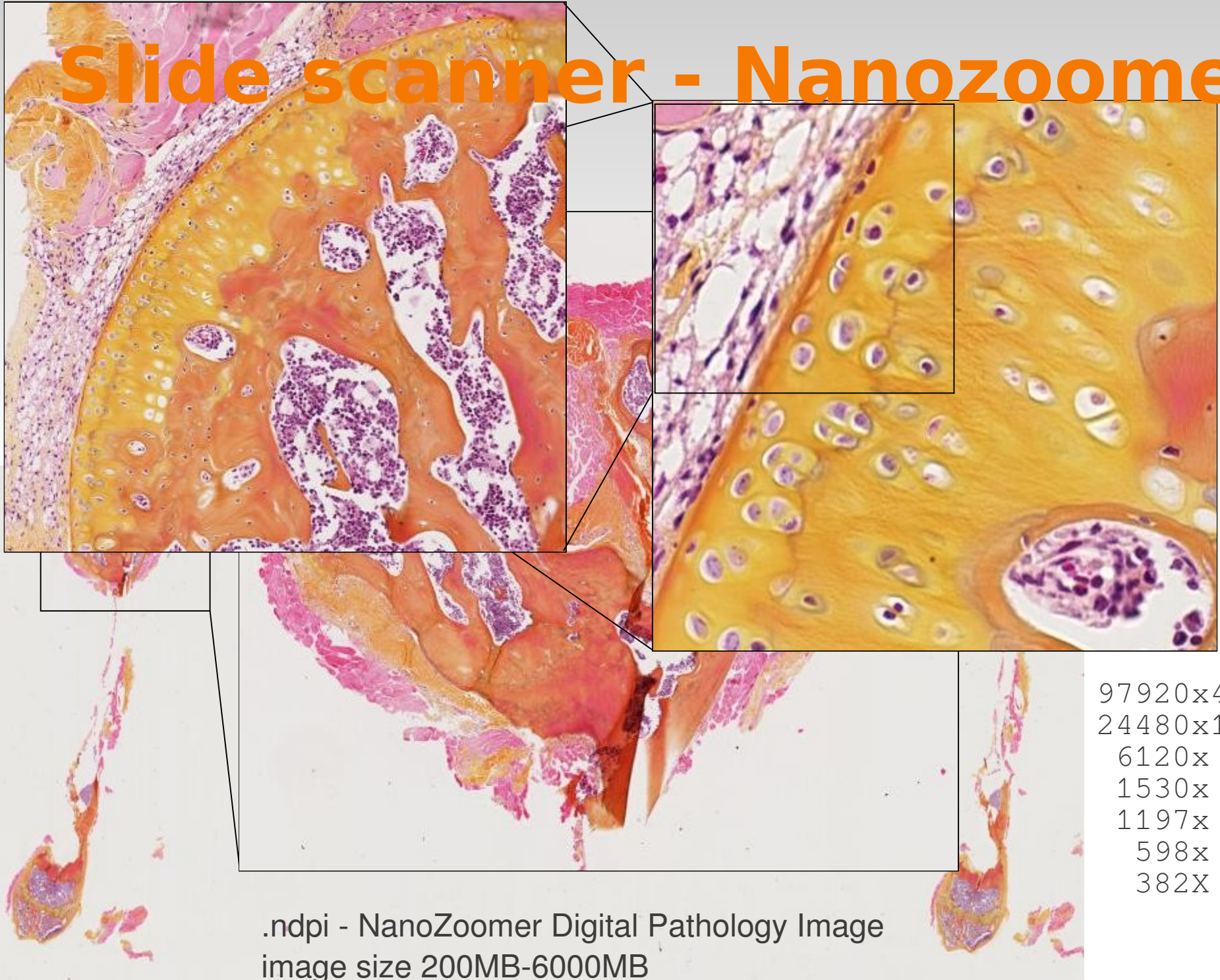
hmAG1-Geminin (1-110)

6 wells plate containing HCT116 cells expressing G1 and S-G2-M fluorescent markers
(A. Coquelle, IRCM, Montpellier)

Low light illumination = increased cell survival
Software autofocus = no gross focus loss during 2 days
Motorized stage = increased sampling and conditions/reproducibility



Slide scanner - Nanozoomer

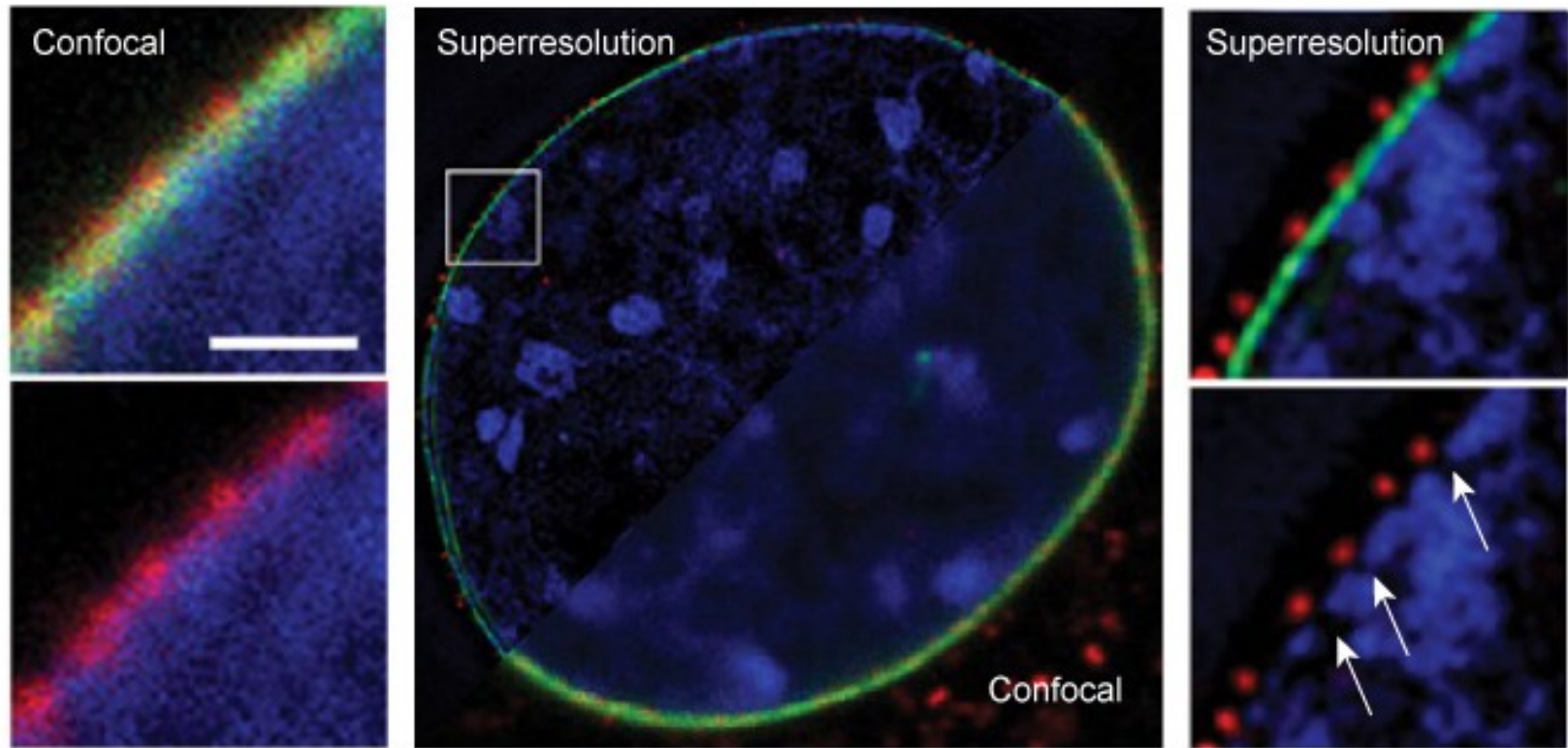


97920x	47872
24480x	11968
6120x	992
1530x	748
1197x	409
598x	204
382x	187

.ndpi - NanoZoomer Digital Pathology Image
image size 200MB-6000MB

spim - omx

Superresolution microscopy surpasses confocal microscopy and provides new insight for the understanding of cellular processes



multiple GB files

MRI - current data management

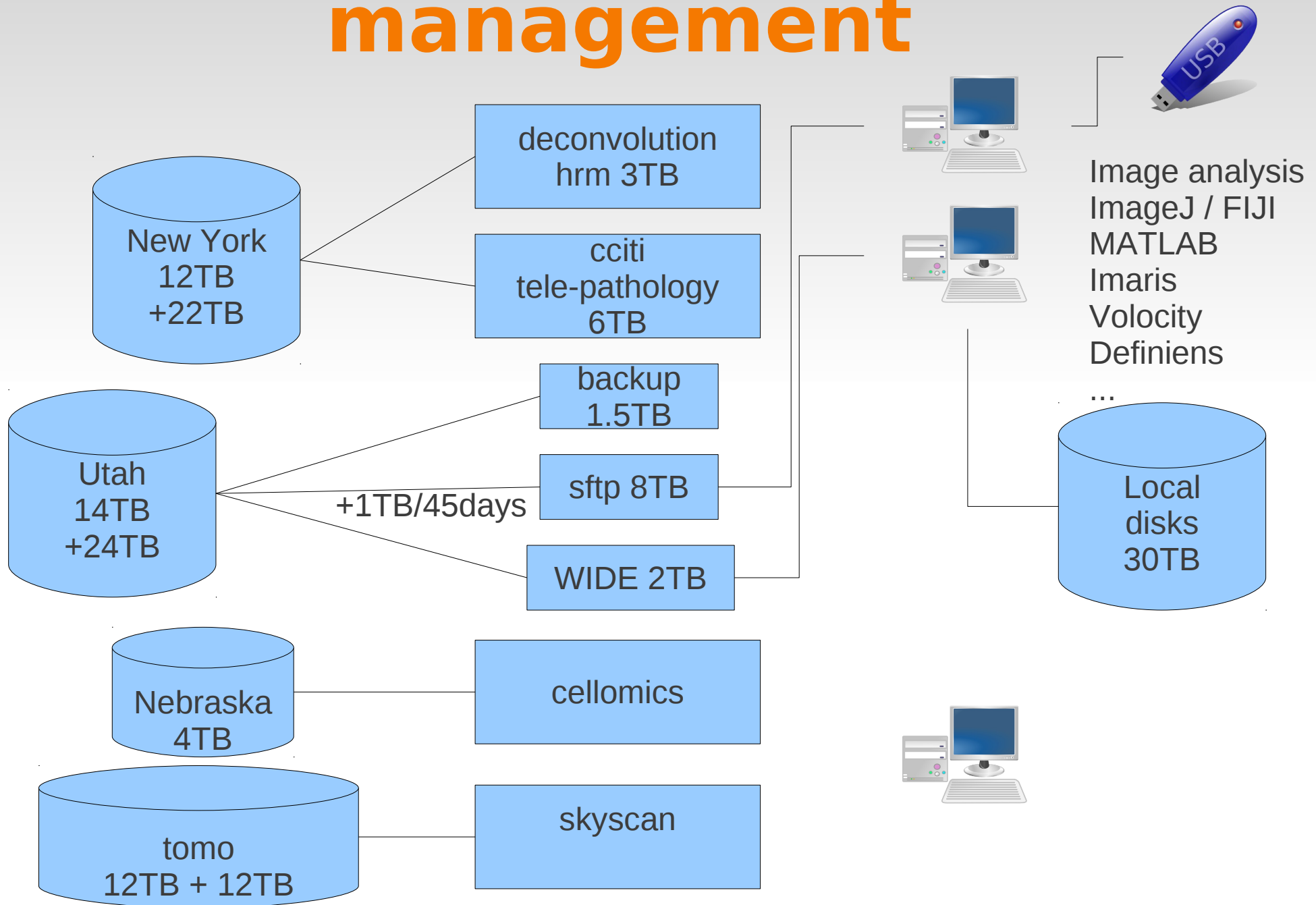
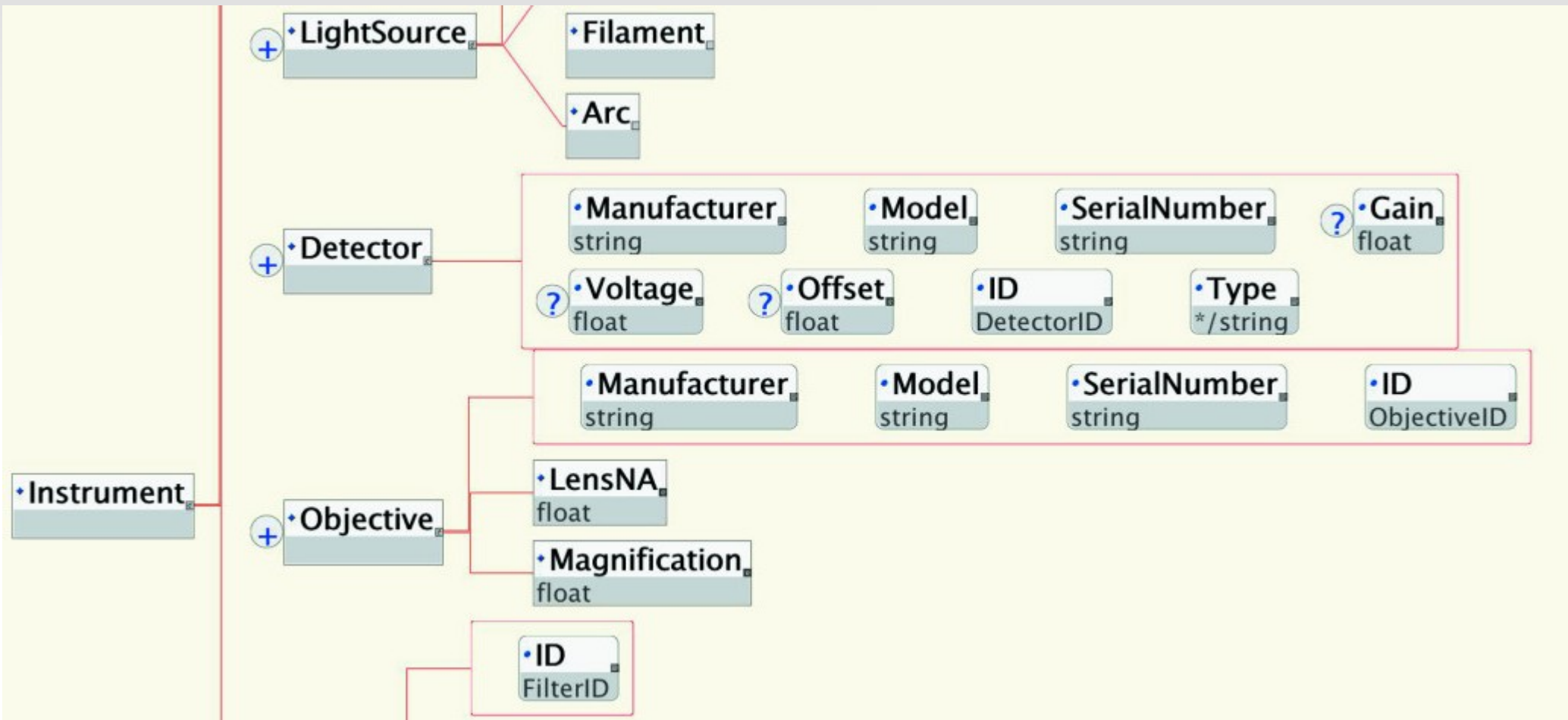


Image formats and metadata

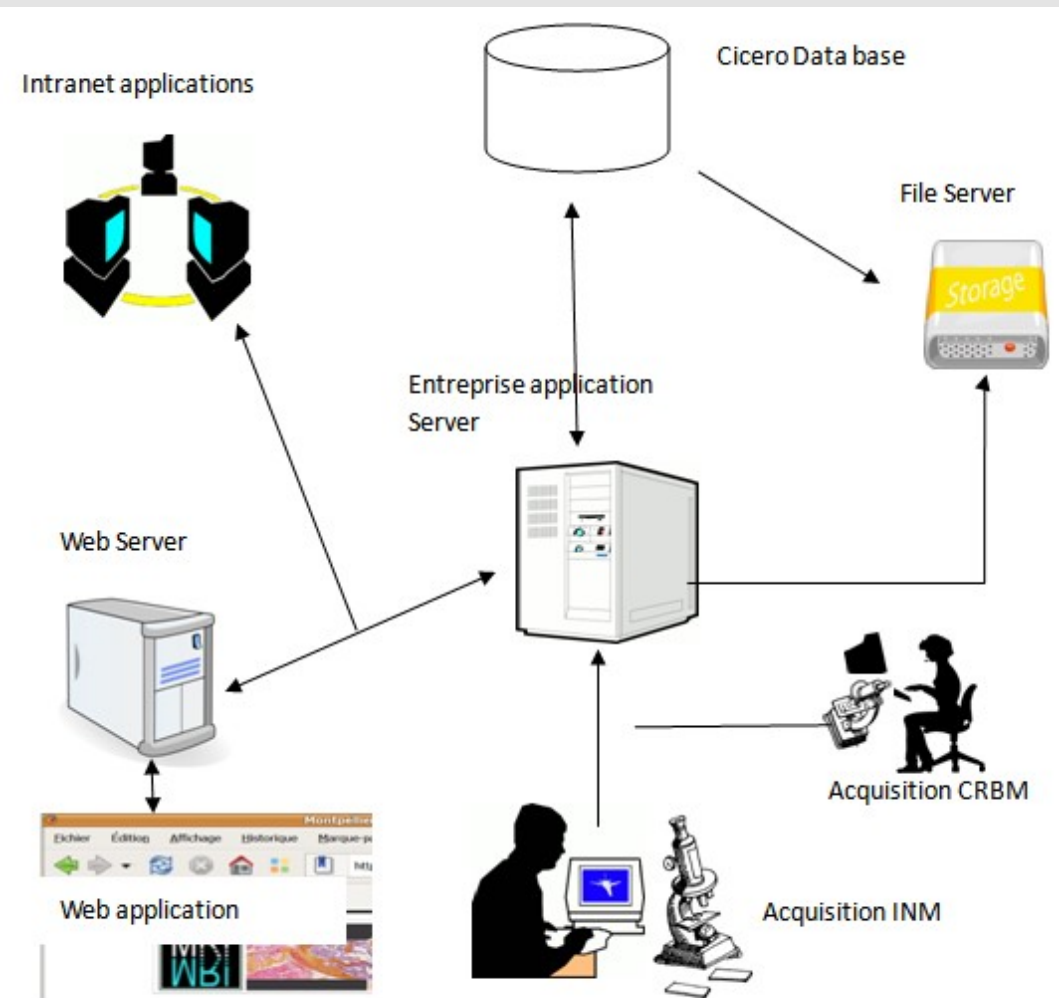
- metadata necessary to interpret image
- different file formats can handle different sets of metadata
- different applications handle different file formats
- when converting from one file format to another, metadata are often lost
- Minimal data needed:
 - data-format (8-bit, 16-bit,...), byte-order, xyzct, width, ...
 - voxel size, time interval
 - information about optical system:
 - numerical aperture, magnification, wavelength, type of microscope, pinhole size

Open microscopy environment



- OME ontology for microscopy

Web Image and Data Environment - WIDE



- upload from microscopes
- central storage
- indexed in database
- web-interface
 - online applications
 - data-management
 - sharing
 - metadata
 - history
- applications can access data on the server directly

Network speed

- sftp on gigabit net 16-25MB / sec
1GB / 40sec-60sec
- it can take hours to transfer 10GB
- do not move data around

If the mountain will not come to the prophet, the prophet will go to the mountain

- Remote terminal
 - move only screenshots around
 - application can run where the data is
 - fast
 - no help for centralizing data
 - no help with formats / metadata
 - no help for sharing data
 - no help for concurrent access

If the mountain will not come to the prophet, the prophet will go to the mountain

■ Distributed agent system

- user wants to run a job J on data D
- D is on machine M in the network N
- user tells a job manager what he wants to do
- job manager looks for an agent that can do the job in all associated networks
- job manager transfers agent J to machine M
- agent J does the job
- application can run where the data is
- no data centralization necessary
- system can help with formats / metadata
- system can provide data sharing
- system can control concurrent access
- more difficult to apply for highly interactive applications
- security concerns
- system doesn't exist (yet?)

If the mountain will not come to the prophet, the prophet will go to the mountain

- centralized data - access via web/application server
 - application can run where the data is
 - system helps centralizing data
 - system can help with formats / metadata
 - system can help with sharing data
 - system can control concurrent access
 - data needs to be moved once
 - limited interactivity
 - additional access via specific client programs possible

Thank you!

- Questions / Discussion

