

**Can/How do we put data  
intensive biology in the picture?**



[www.crs4.it](http://www.crs4.it)

# Centro di Ricerca, Sviluppo e Studi Superiori in Sardegna



- Interdisciplinary research center focused on computational sciences
- Located in the POLARIS Science and Technology Park (Pula, Sardinia, Italy)
- Operational since 1992
- RTD staff of about 150 people

# CRS4 & medical informatics

- ▶ More than ten year experience in research and development in ICT application for clinical practice, medicine and biology focused on:
  - Clinical domain interconnection and traceability
  - Semantic and computable management of biomedical data
  - Telemedicine and distributed medicine

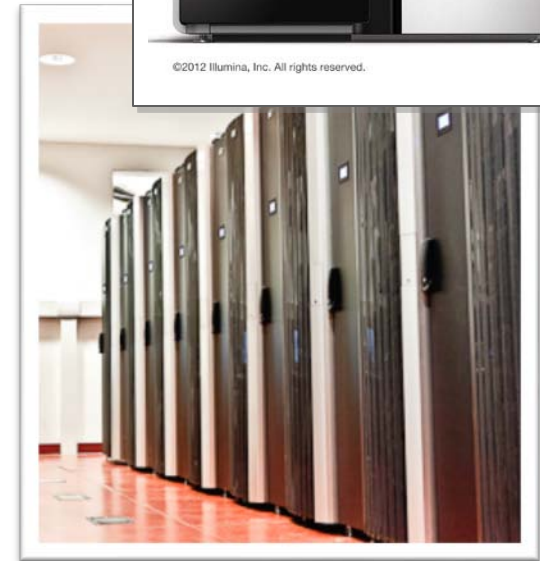


# CRS4 & IHE

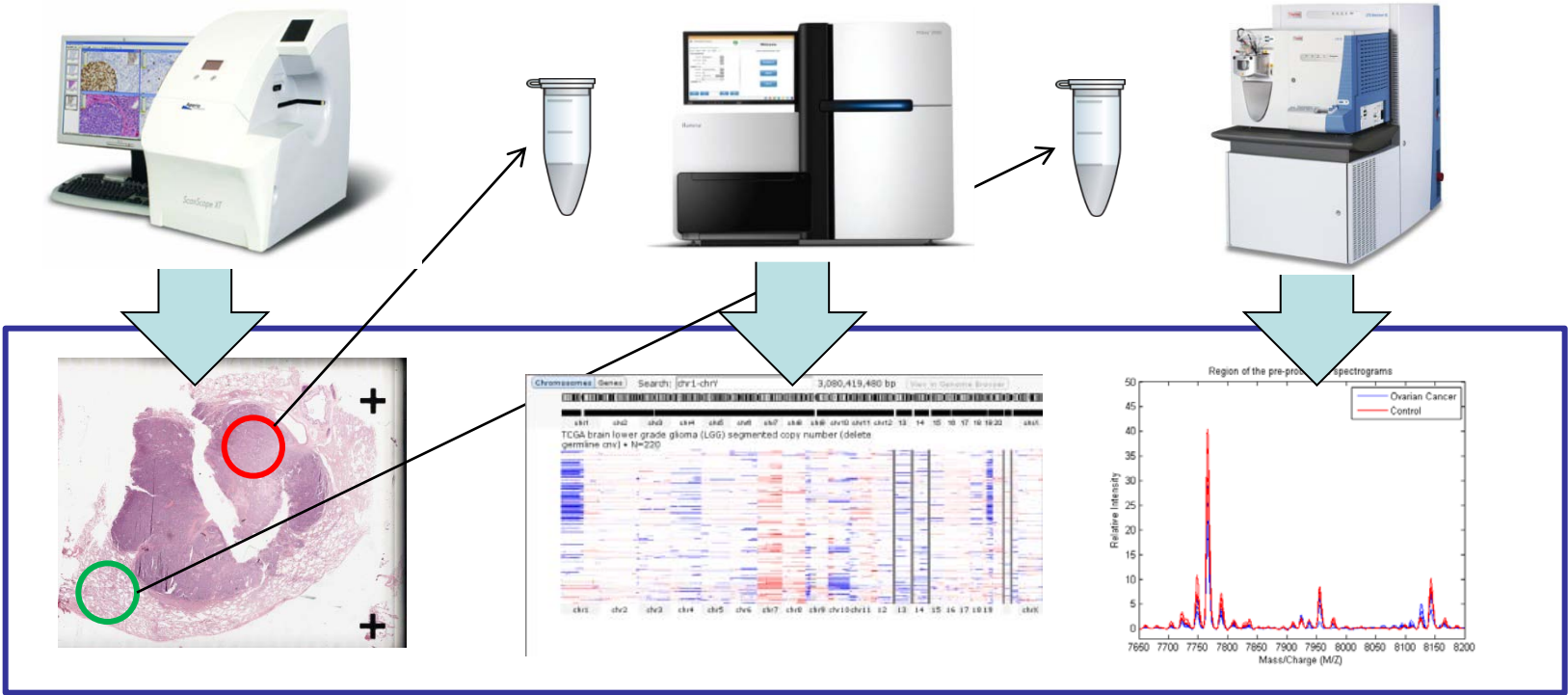
- Main experience on the Laboratory and ITI domains
  - Many years of experience in hospital integration architectures based on IHE and open source HL7 gateways (Mirth-connect)
- Technical framework supplement for laboratory specimen barcode labeling
- One CRS4 monitor @ Connectathon 2013

# CRS4 & data intensive biology

- Currently dealing with production, managing and analysis of data intensive biology outputs
  - NGS, proteomics, ... (~400TBytes)
  - Moving toward the confluence of above and digital pathology
- We are building a biobank system
  - to provide a consistent computable platform (omero + galaxy) capable of handling both image and non image data
  - to support a scalable error propagation/graph of dependency data model (traceability and reproducibility)



# => Next Gen Pathology



coming soon

We do now

# Why do we do these things?

- Support to biomedical research projects
  - Support to large scale population studies
    - *OMERO: flexible, model-driven data management for experimental biology*, Nature Methods (2012), *Low-Pass DNA Sequencing of 1200 Sardinians Reconstructs European Y-Chromosome Phylogeny*, Science 2013
  - Genic Therapy quality control
    - *Lentiviral Hematopoietic Stem Cell Gene Therapy Benefits Metachromatic Leukodystrophy*, Science 2013
- Industrial consulting
  - Pre analytical automation systems
  - Clinical lab automation
  - Clinical standards (HL7/IHE, OpenEHR, ...)
- Support to the Regional Healthcare System
  - HL7/IHE integrations
  - Clinical processes modeling
  - Real time telemedicine systems

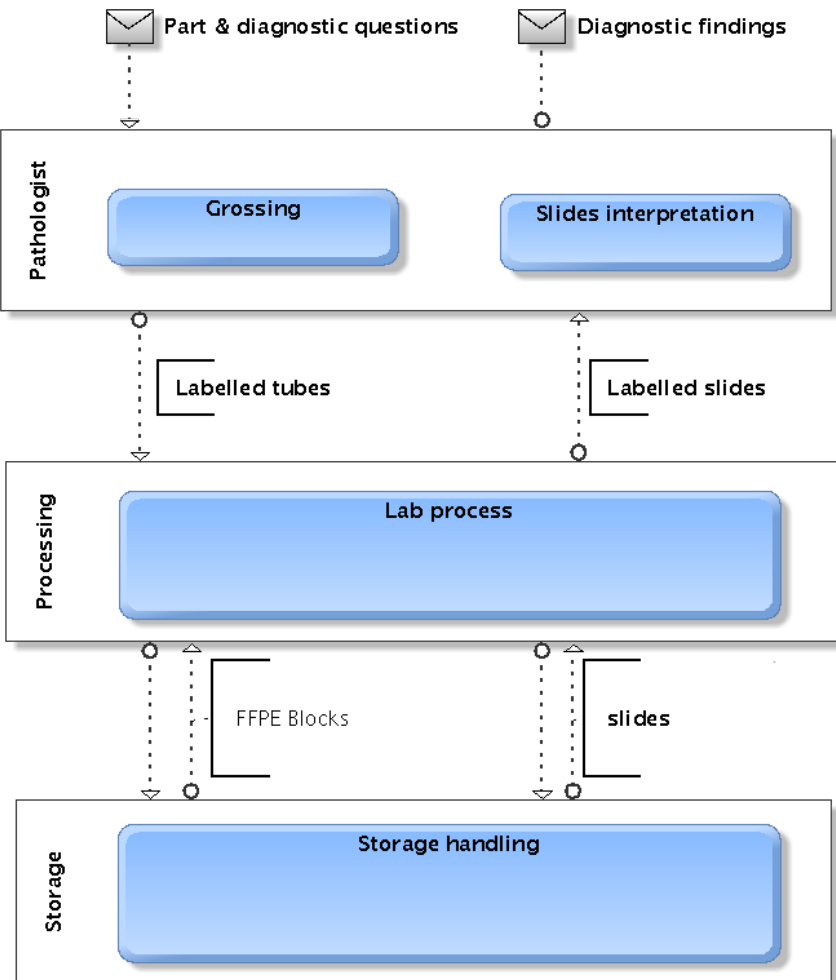
# Why are we here?

- Our research interests:
  - Bioscience driven: confluence of data intensive biology and digital pathology data
  - Industry driven: automation of current clinical lab and (future) Next Generation Pathology lab
- Their intersection:
  - Heavy automation (where possible)
  - Standard based process modeling
  - Handling of Image and non Image Data
  - Transition to clinical applications
- Thus => we would like to understand:
  - If we are in line with the IHE picture
  - If what we are learning could be a base for a new IHE profile

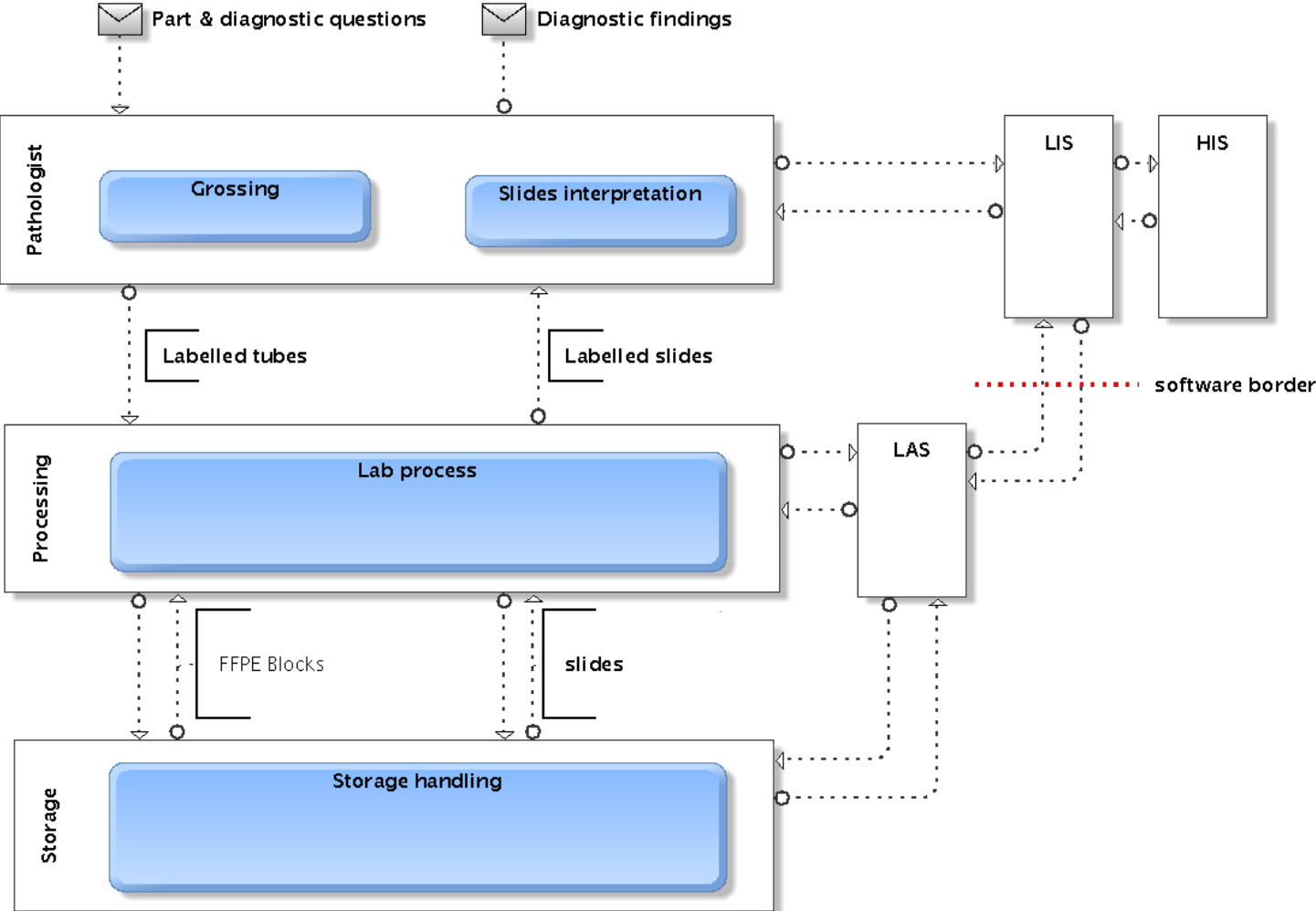
# In other words

- We have extensively used IHE Laboratory domain profiles.
- We are now starting a large scale R&D project on Next Generation Pathology:
  - Fusion of data intensive molecular biology with digital pathology
  - Extensive automation of pathology lab
    - Tissue transport (FFPE blocks, slides)
    - Slides processing and imaging
    - Next generation sequencing & Mass spectrometry
    - Archiving and storage of FFPE blocks and slides
- We would like to start on the right foot.

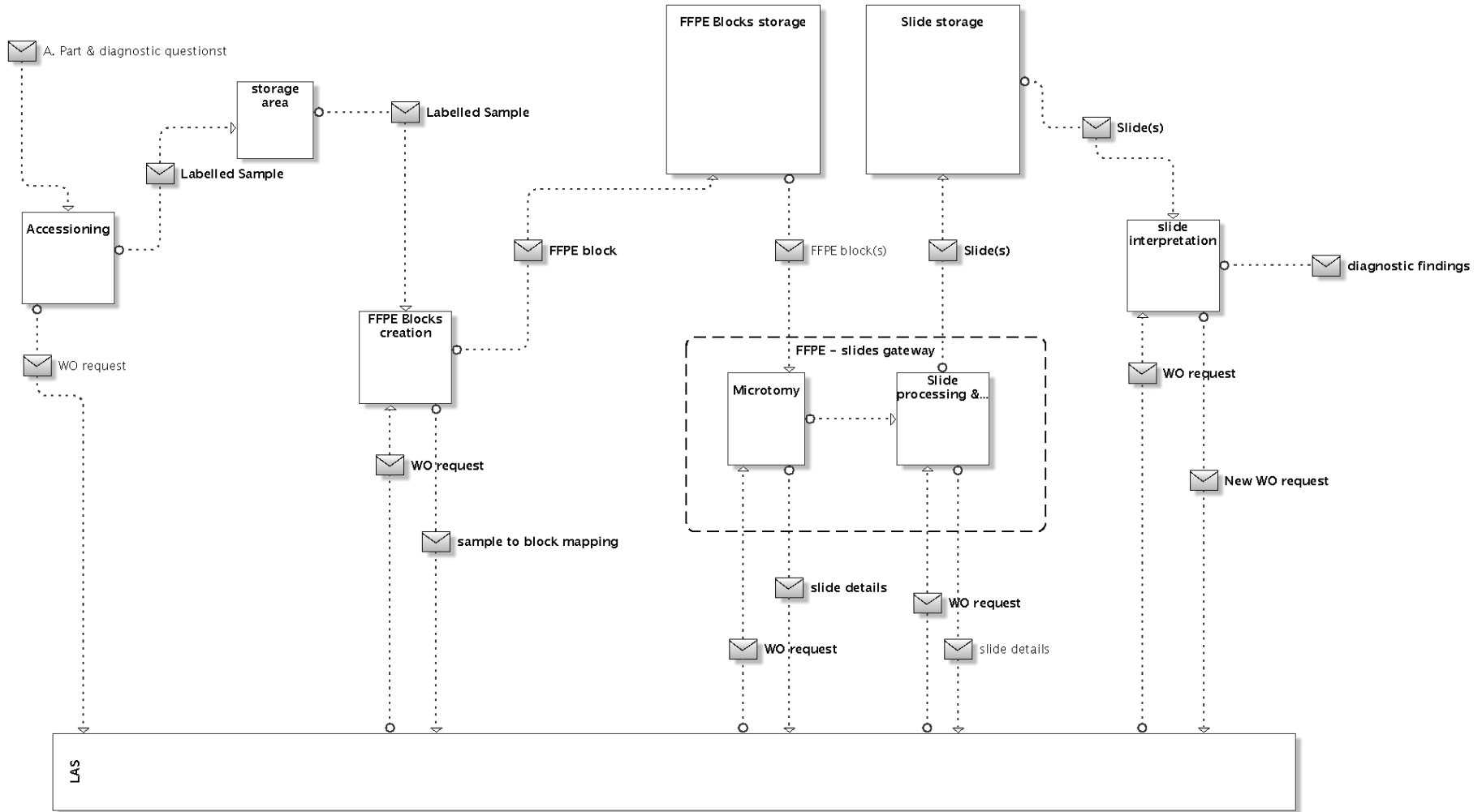
# ANAPATH Macro view



# ANAPATH LIS/LAS Actors



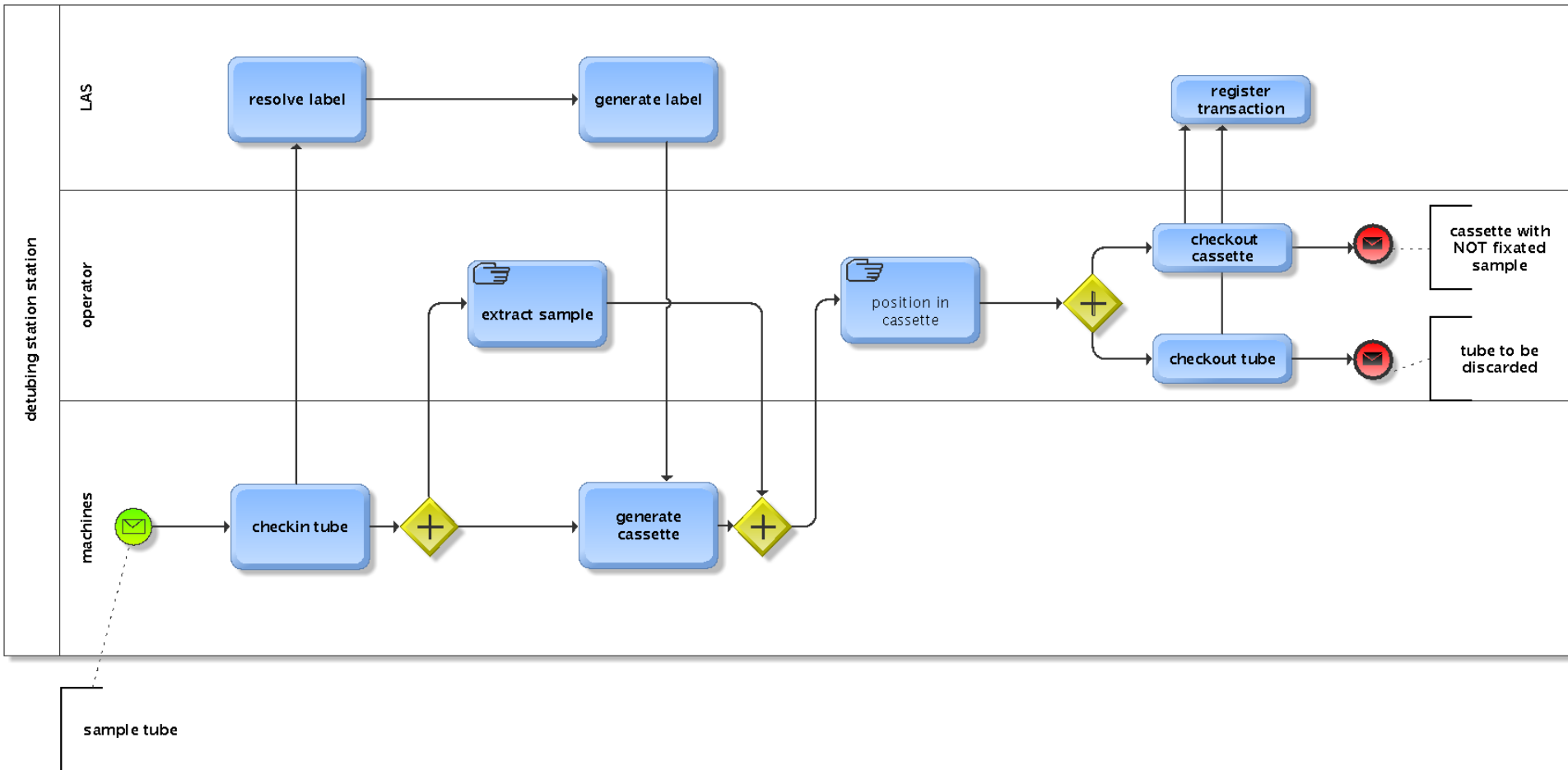
# ANAPATH Macro view -- exploded



# Rough list of modules

INPUT	OPERATION	OUTPUT
anatomical sample + query	grossing	tubes with subsamples
tube with subsample	detubing	Non-fixated cassette
Rack of non fixated cassettes	fixation	Fixated cassettes
A FF cassette	casting	a FFPE block
FFPE block(s)	microtomy	slides
slide	staining	slide
slide	cover slipping	slide
Group of slides	Slide interpretation	Report, new WO
	....	

# An exploded module



# Discussion

- Do you know anybody with similar interest?
- How much other IHE profiles can be re-used for Anatomic Pathology automation (e.g. LAW)?
- How will this fit in IHE general plans?
- Is there any space/interest for collaboration?