caBIG®
cancer Biomedical Informatics Grid®

caLIMS2: cancer Laboratory Information Management System

caLIMS2

A Brief Overview

Presentation for
TBPT-ICR Joint F2F
May 4, 2010

Overview

Presentation includes:

- caLIMS2 project description and goals
- caLIMS2 and the caBIG® suite of applications
- caLIMS2 targeted users
- caLIMS2 models, workflow, examples, and integration plans
- caLIMS2 timeline and development process
- caLIMS2 Wiki: Additional information about the caLIMS2 project

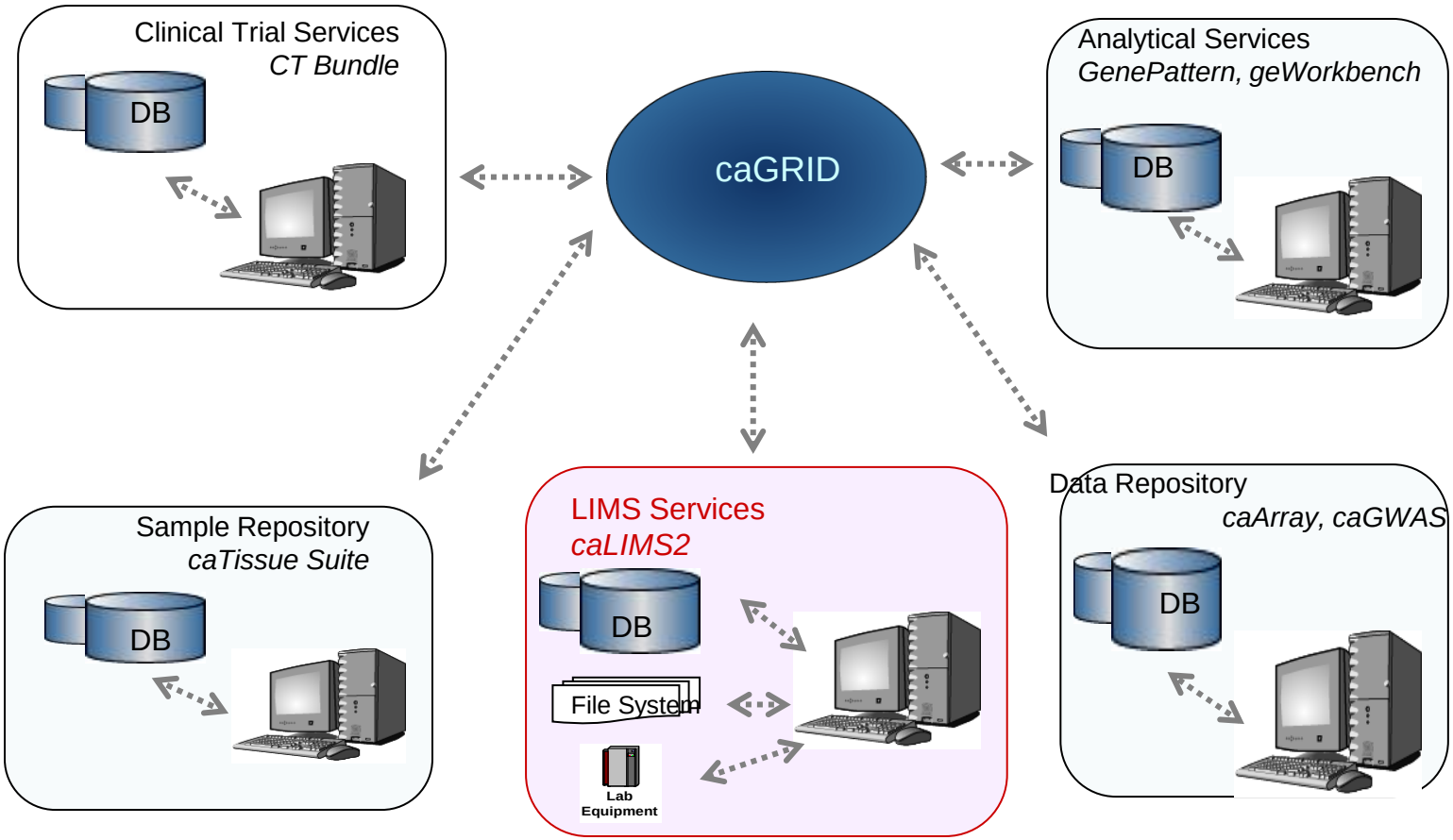
What is caLIMS2?

Need: *An application is needed for recording and exchanging research laboratory experimental data and metadata. This application should seamlessly integrate with caBIG® specimen repositories, data portals, integrative services and analytical tools to facilitate translational research.*

- caLIMS2 is a web-based Laboratory Information Management System designed according to CBIIT/caBIG® principles to support Life Sciences research laboratories and core facilities
  - caLIMS2 will consume of some CBIIT/caBIG® services
  - caLIMS2 will provide new data services for the caBIG® communities

caLIMS2 and caBIG®

Life Science communities have identified the need for a caBIG® compliant laboratory information management system (LIMS)



caLIMS2 Overall Project Goals

The purpose of the caLIMS2 project is to create a research Laboratory Information Management System (LIMS) that is interoperable within established caBIG® standards and guidelines and will track a complete laboratory workflow that uses materials from a specimen management service (*e.g.* caTissue) to generate experimental results for one of the caBIG® data management services (*e.g.* caArray).

Primary goals for caLIMS2 include:

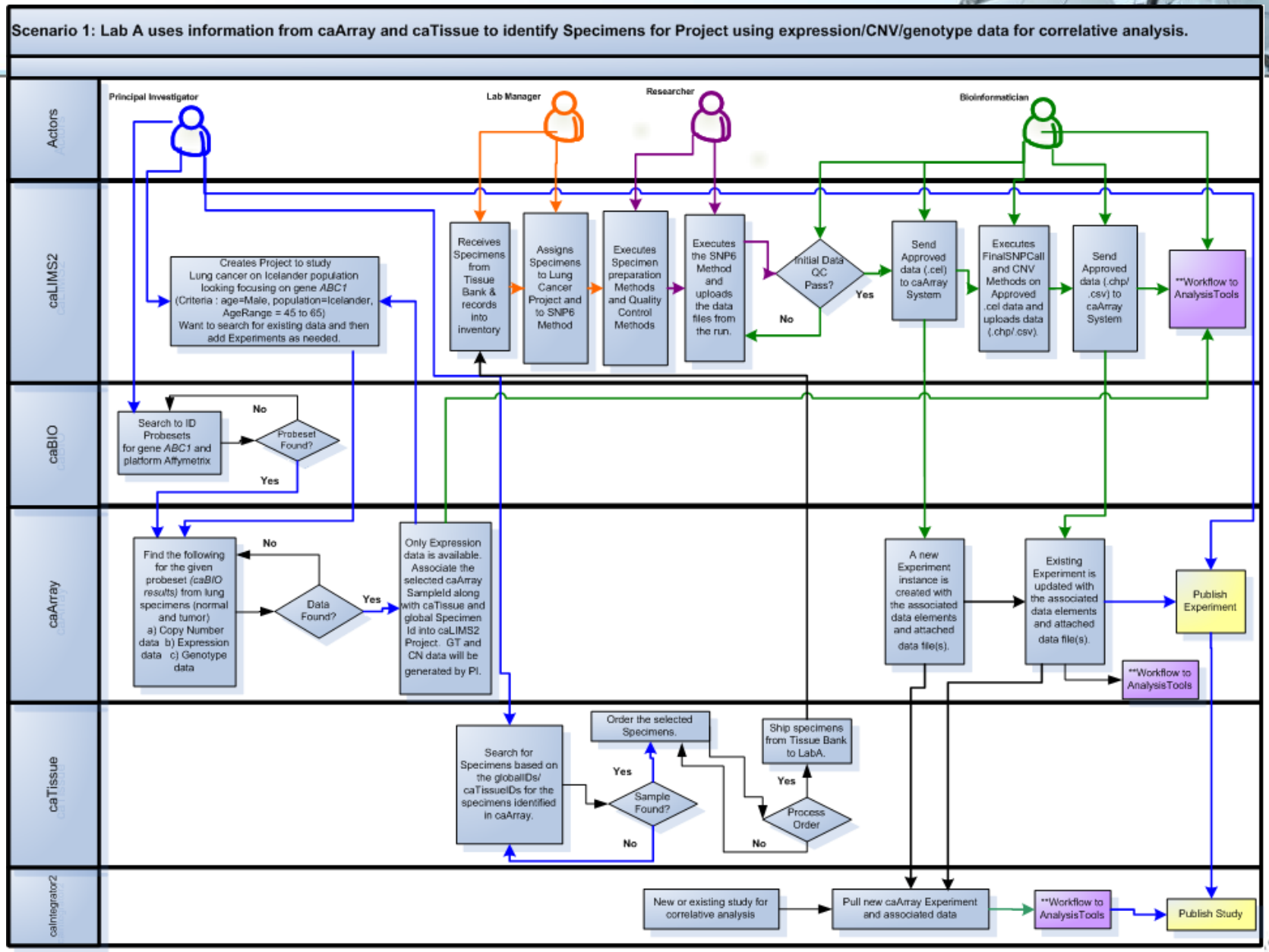
- To create an Open Source "near" commercial grade LIMS application that allows laboratories to focus on scientific research and scientific investments.
- To create a general-purpose LIMS application that seamlessly integrates with caBIG® data management systems and analytical tools.
- To develop a generic core LIMS infrastructure that can be used by multiple laboratory types.
- To build a basic LIMS that allows easy customization for a specific Laboratory domain.
- To establish an Open Development Initiative (ODI) that allows LIMS developers to contribute LIMS customizations and enhancements to the end user community.

caLIMS2 Project Goals – v1.0

Functional objectives for the initial implementation of the caLIMS2 are:

- to use existing caBIG® tools to programmatically search caTissue for specimens with particular characteristics
- to track laboratory activities involving these specimens and all metadata necessary for submitting data files to caArray
- to facilitate the programmatic submission of laboratory data and metadata to caArray
- to record laboratory workflow-specific information - such as sample generation and storage conditions, key reagent lot numbers, and parameters for experiments, equipment and software - which may be important for establishing provenance of data submitted to caArray.

LS integration Use Case



caLIMS2 candidate Services

Equipment Service

Query Equipment by Keywords

(*e.g.*, name, public identifier, equipment type, propertyID, serialNumber, model, manufacturer, vendor, location, operatingSystem, operatingSoftware, contactPerson, method type, software type, reagent type, Equipment input type, Equipment output type, status)

Copy Template Equipment Information

Experiment Service

Query Experiments by Keywords

(*e.g.*,name, public identifier, experiment type, method type, equipment type, reagent type, experiment input, experiment output, status)

Copy Template Workflow data

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caLIMS2

Design Principles and Features

- Model Driven Architecture (roundtrip UML artifacts)
- Service Oriented Architecture
- Semantically (caDSR/EVS), syntactically interoperable APIs
- Security – fine-grained with CSM/UPT
- Reuse of existing caBIG® tools / functionalities / components
- Workflow management – import/export standard workflows
- Usability standards based UIs built on proven Open Source frameworks.

- Extensible model - allows addition of custom objects to provide expanded, lab-specific functionality.
- Examples:
  - new assay/experiment types
  - new equipment interfaces
  - new sample types
- FileTransporter tool – import/export, format, parse, and map
- Platform independence

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caLIMS2 Targeted Users

Laboratory Types:

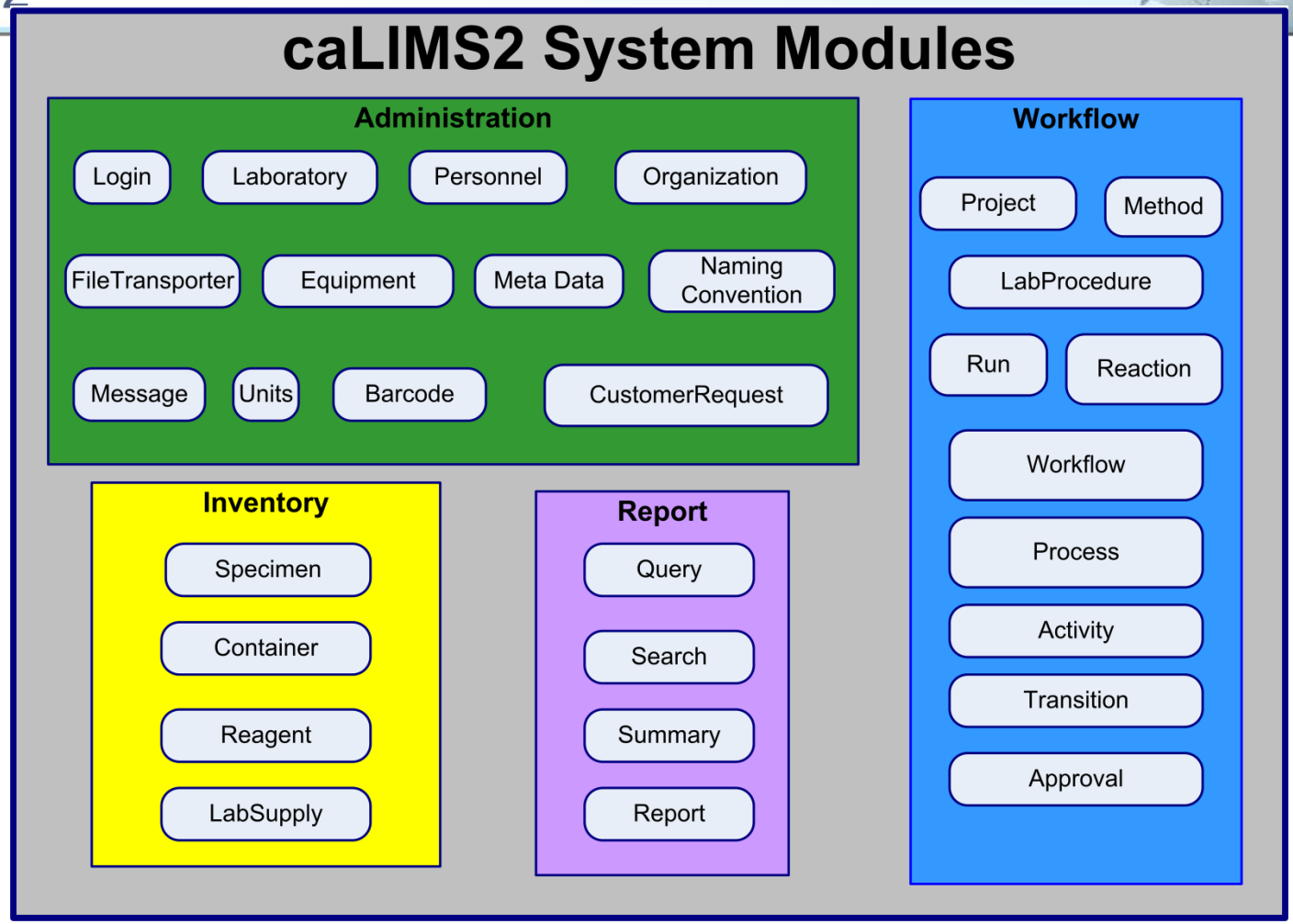
- **Research laboratory**
- **Core laboratory facility**
- **BIG-Health disease research laboratory (not cancer specific)**

Research Domains:

- **Genomics***
- **Proteomics**
- **Nanotechnology**

Basic system with adaptive workflow and generic experimental method framework allows flexibility to support current, new, and future technologies

caLIMS2 Core Modules



Common classes: Audit, Status, Type, Document, Notes, SOP, EnvironmentalCondition, Events, ExternalIdentifier, Safety, Scheduling.

Scope of caLIMS2 version 1.0

- **Integration with caTissue**

  Search for Specimens, Generate an order document in caLIMS2

- **Integration with caArray**

  Search for Experiments, Submit data to caArray

- **Administration**

  Security, Personnel, Organizations, Laboratories, Equipment, Storage/Location

- **Inventory tracking**

  Specimens, Reagents, Lab Supplies

- **Workflow tracking**

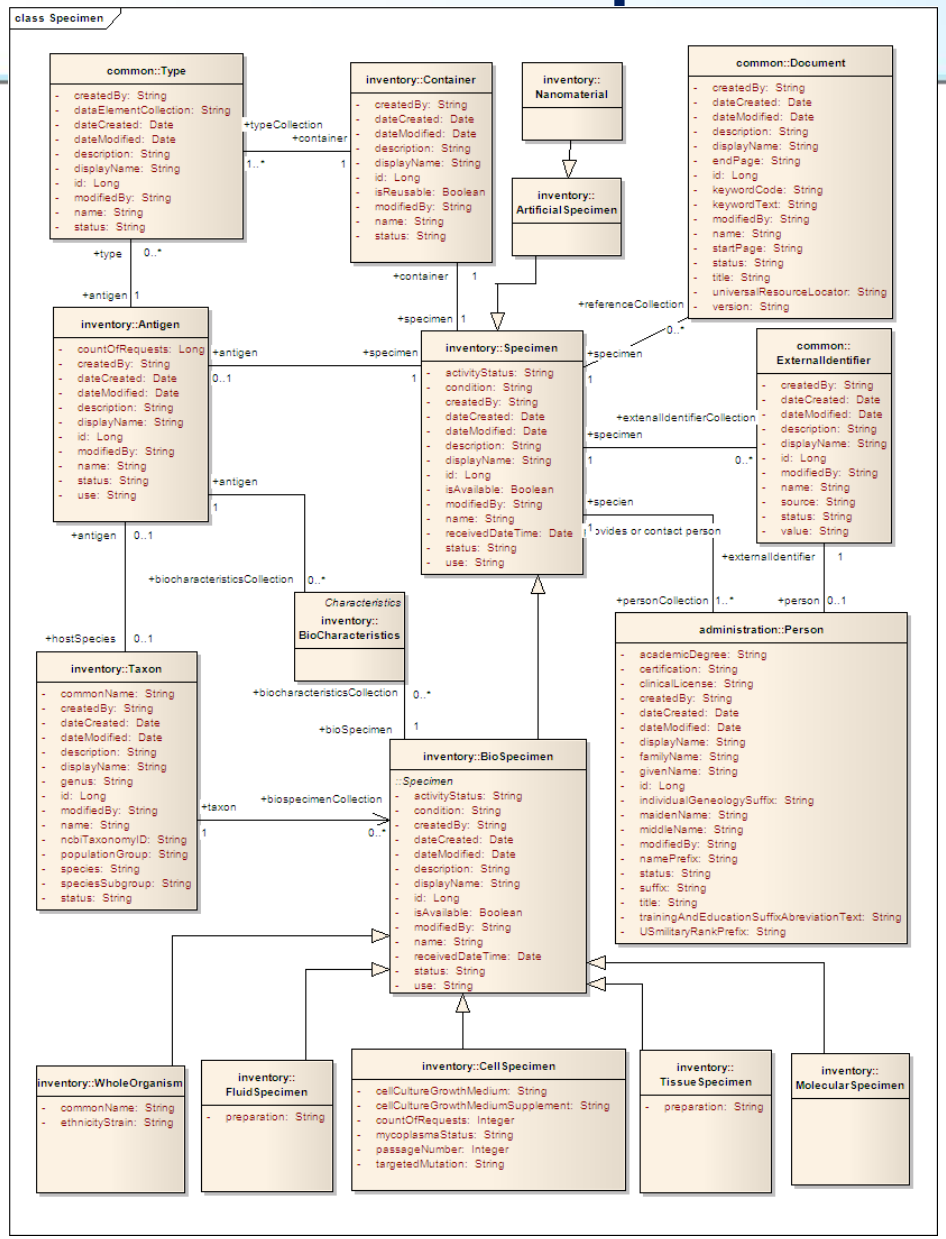
  Projects, Experiment/Methods, Lab Procedures, Runs, Approval

- **Queries and Reports**

  Searches, Summaries, Reports

caLIMS2

caLIMS2 OM – Specimen



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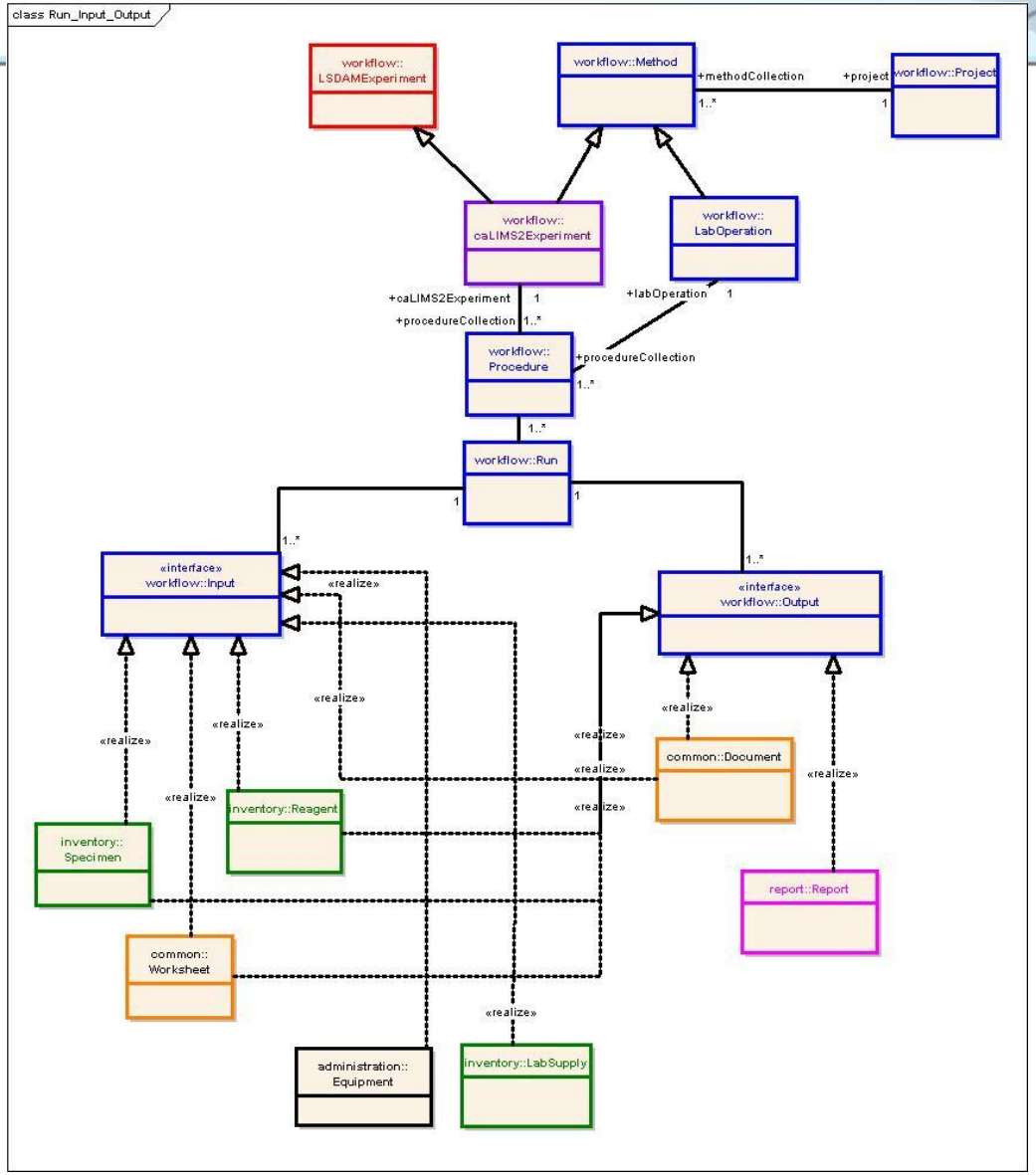
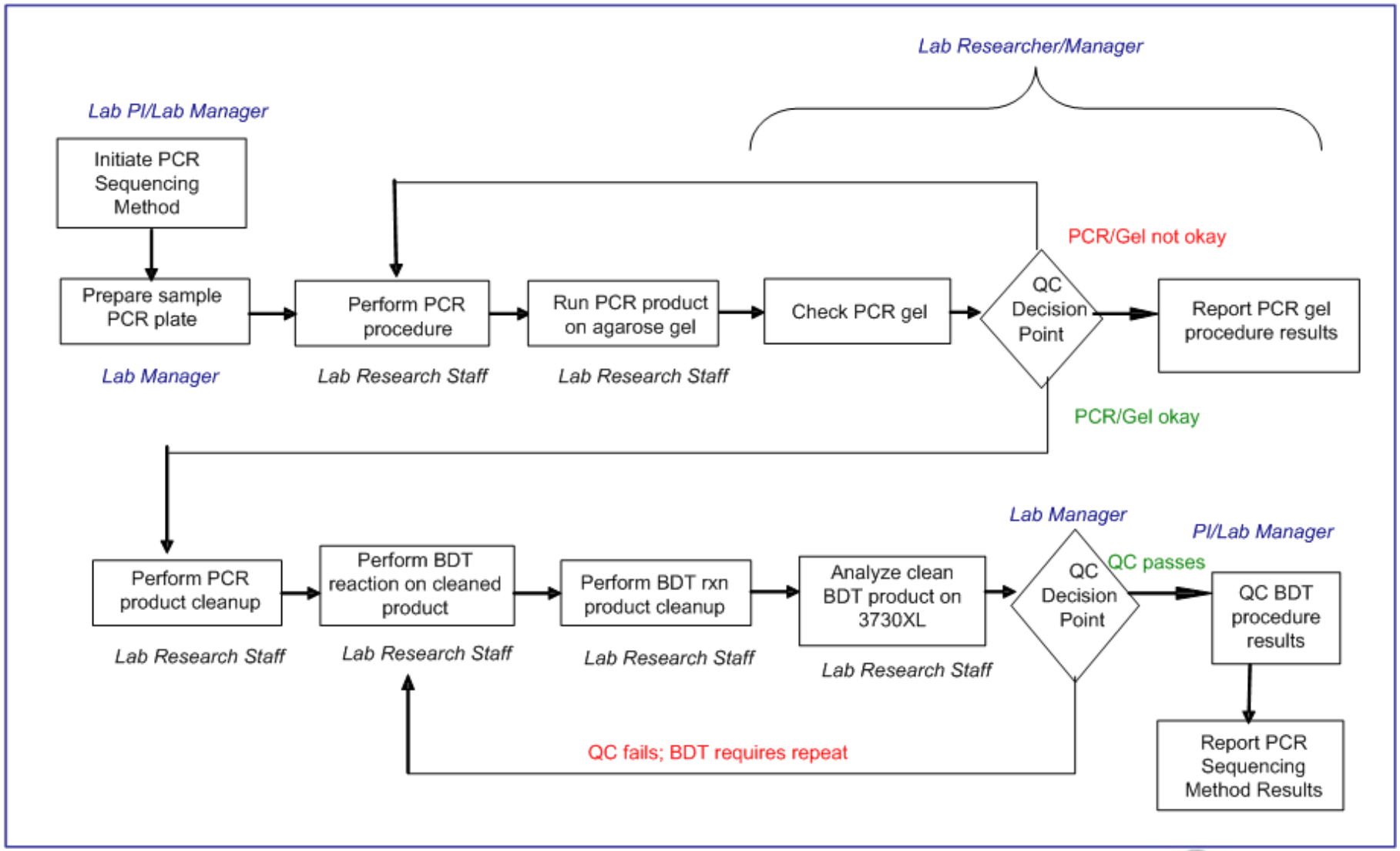
caLIMS2 OM – Experiment



caLIMS2 Sample Lab Workflow – PCR Resequencing



PCR: Use Case to Workflow

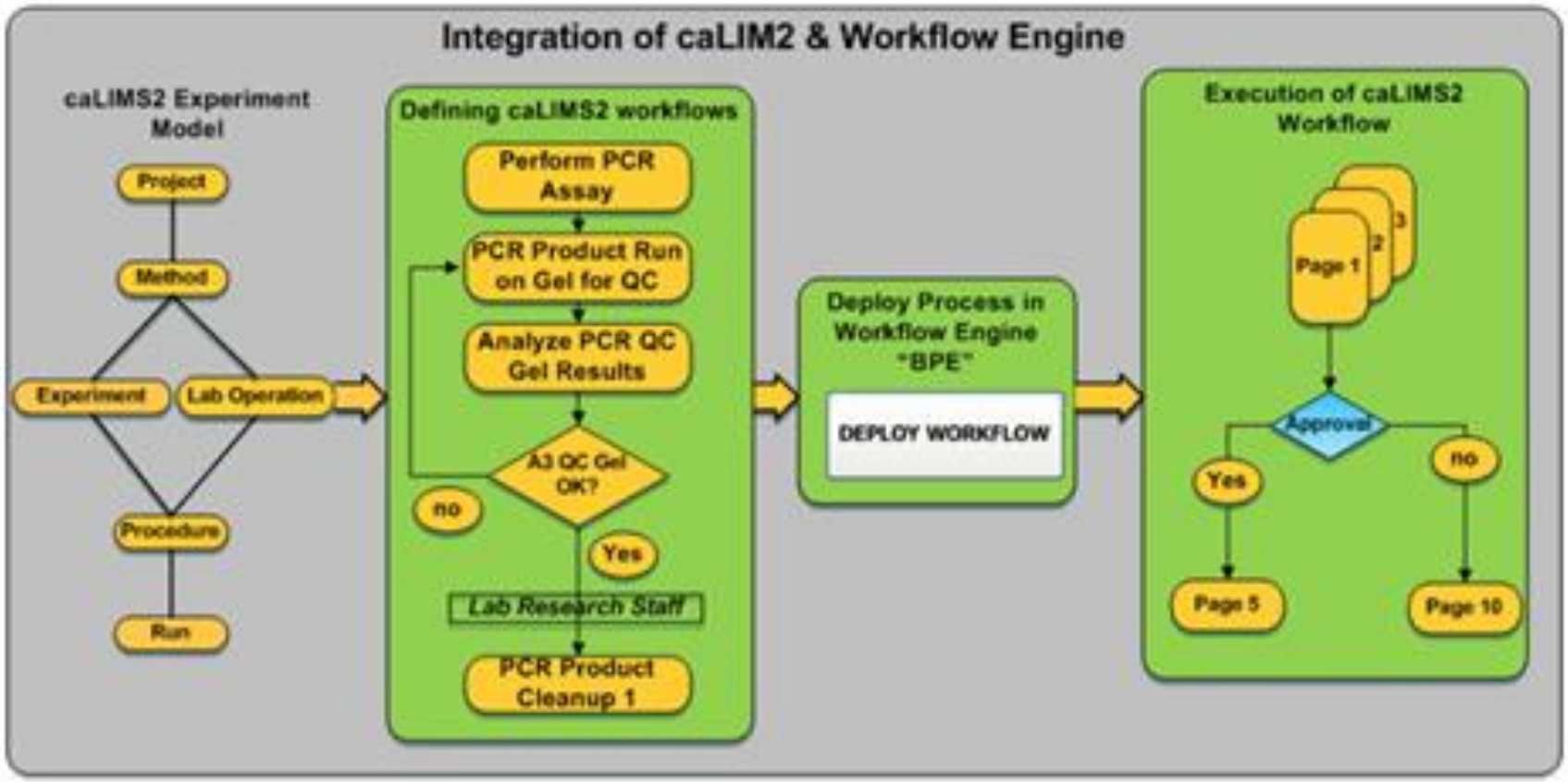
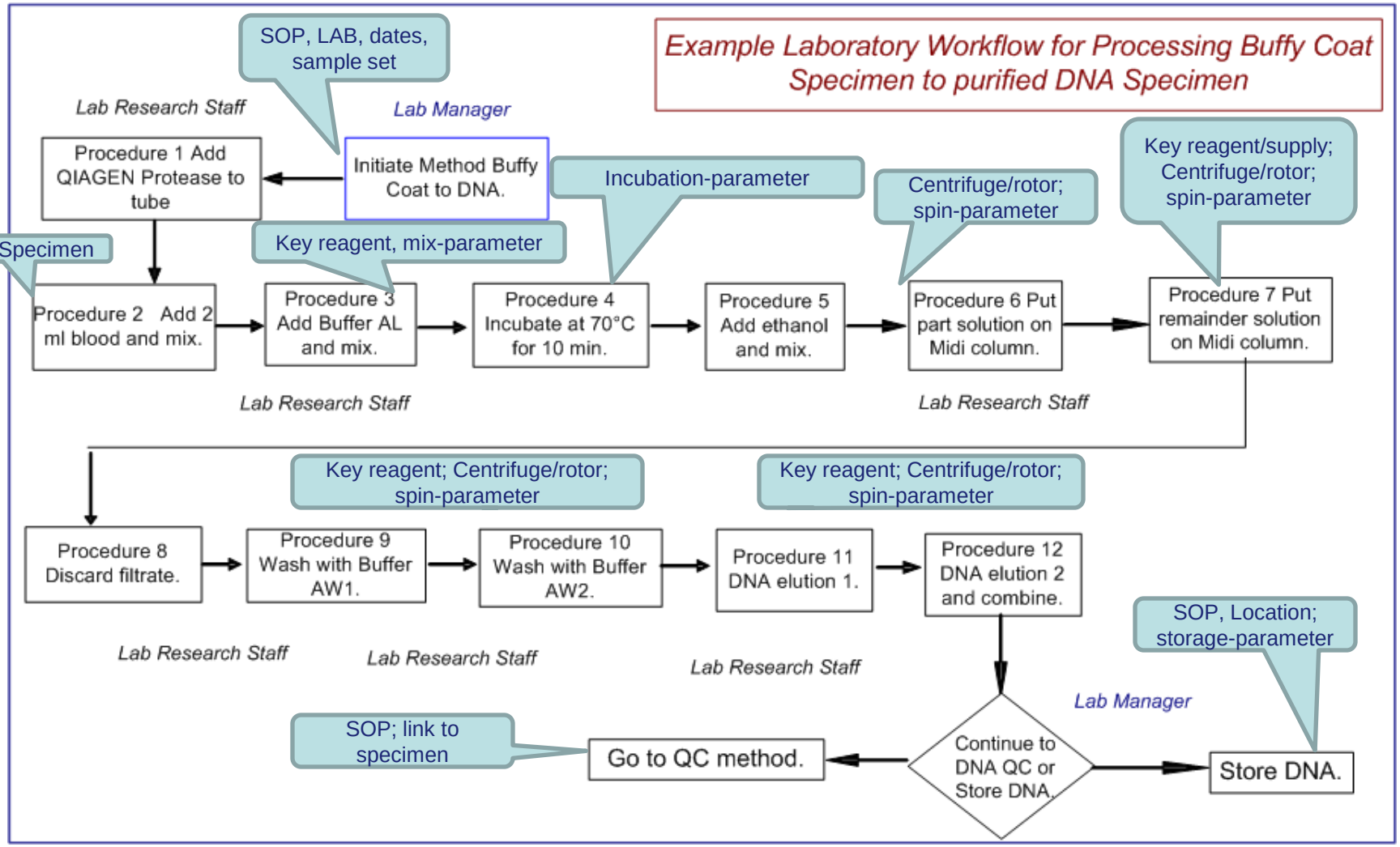
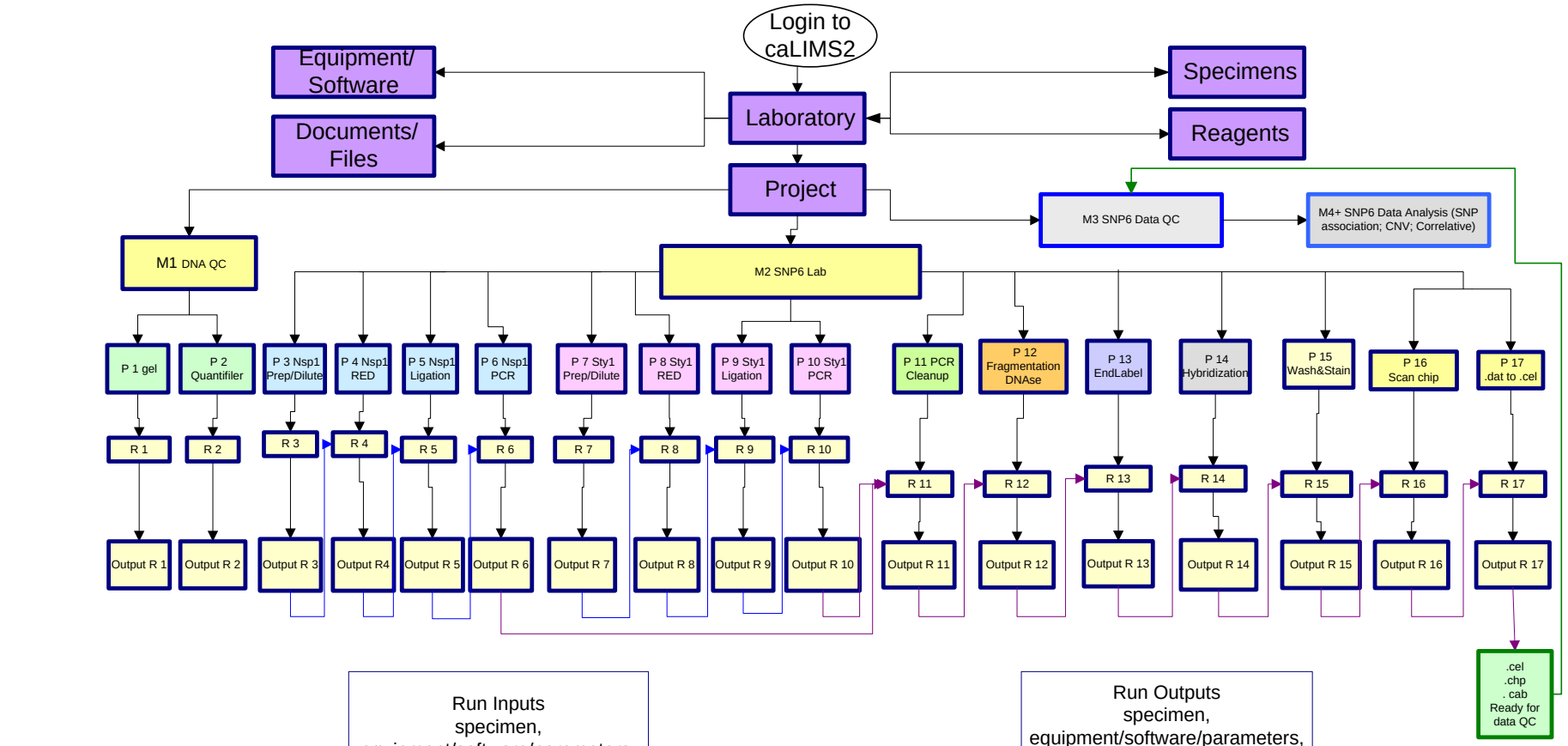


Figure 4: Integration of caLIMS2 & Workflow Engine

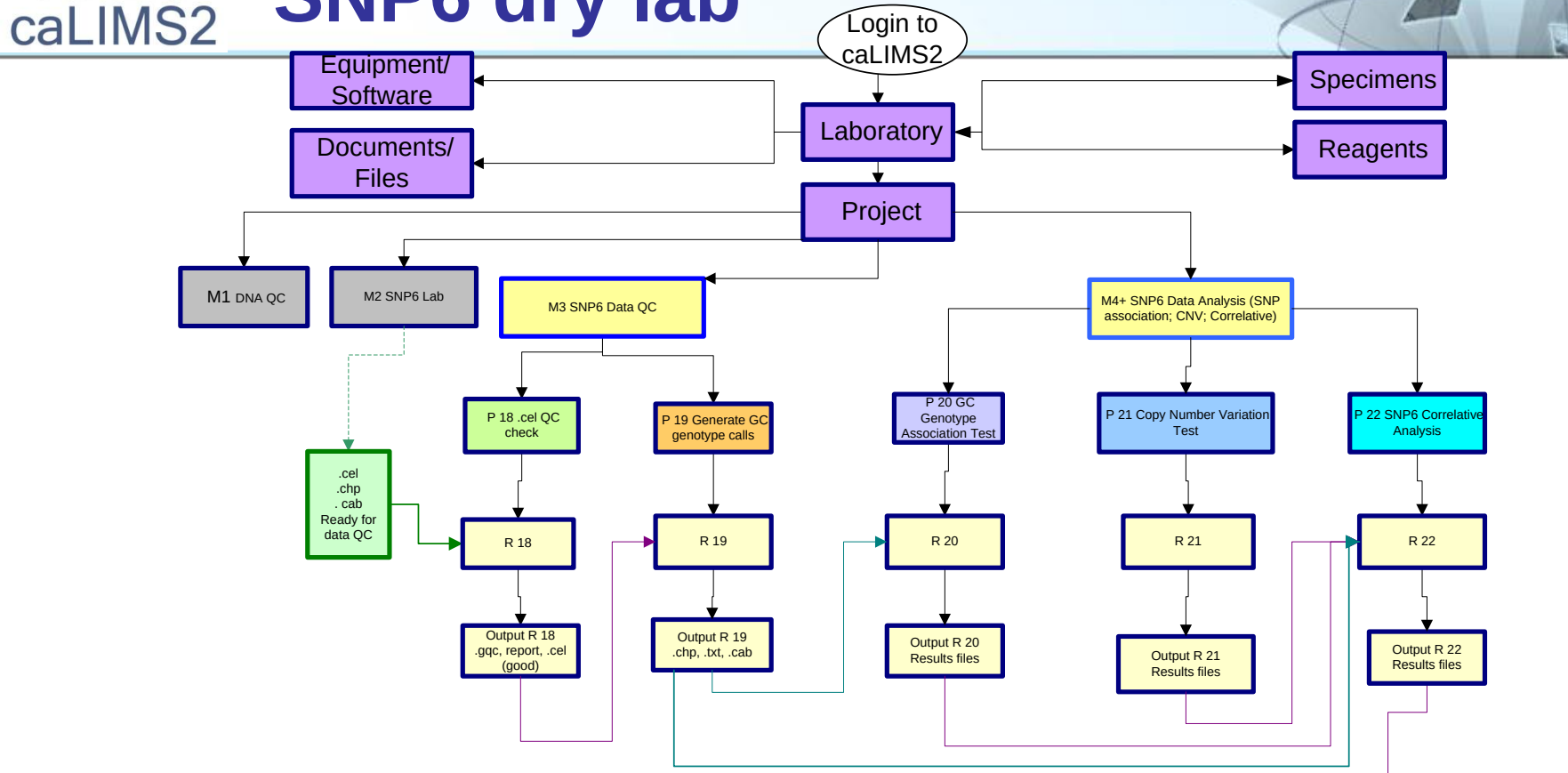
caLIMS2 Sample Lab Workflow – Specimen processing



caLIMS2: Experiment – Ex. SNP6 wet lab



caLIMS2: Experiment – Ex. SNP6 dry lab

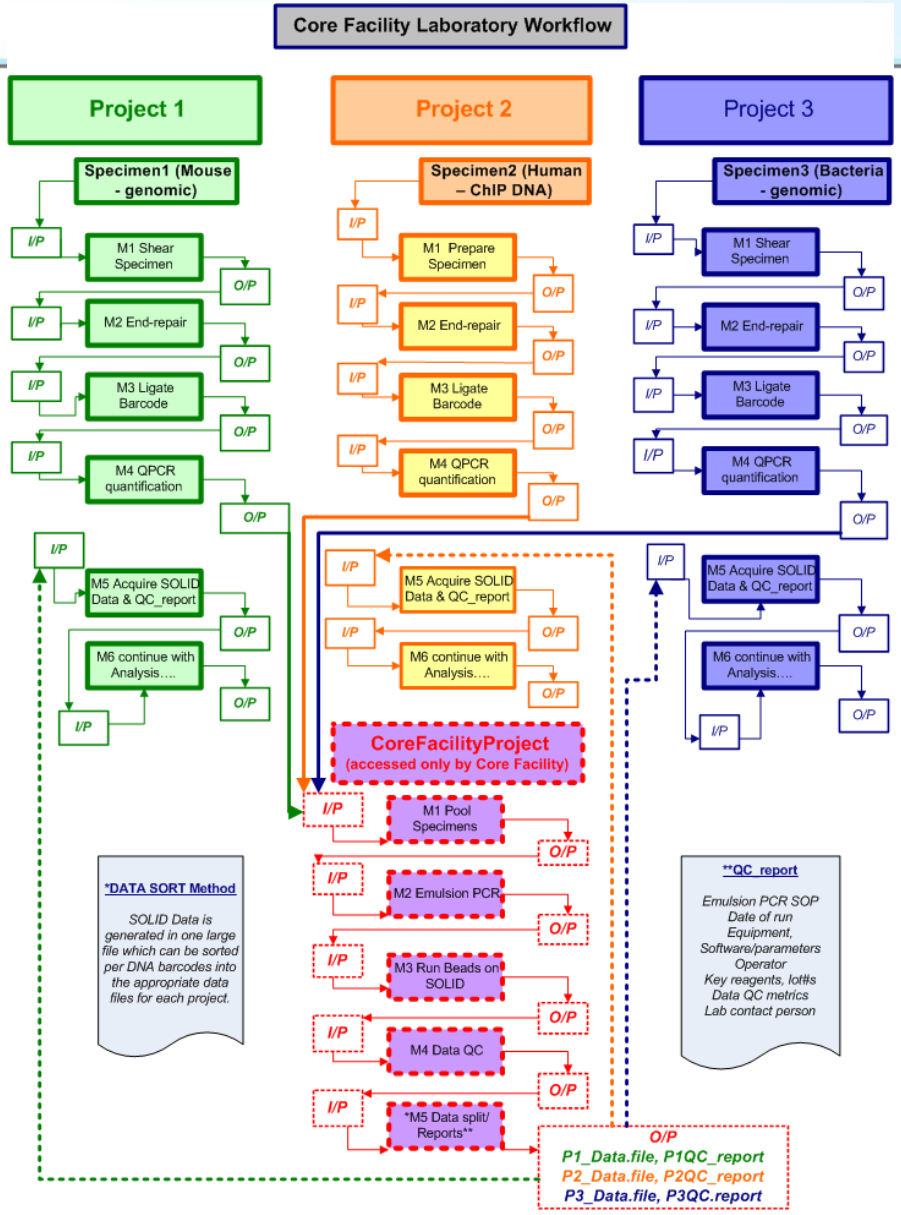


Run Inputs
specimen,
equipment/software/parameters,
reagent, reaction, labSupply,
document/file

Run Outputs
specimen,
equipment/software/parameters,
reagent, reaction, labSupply,
document/file (data, image, results), report

caLIMS2

NexGen Sequencing Workflow



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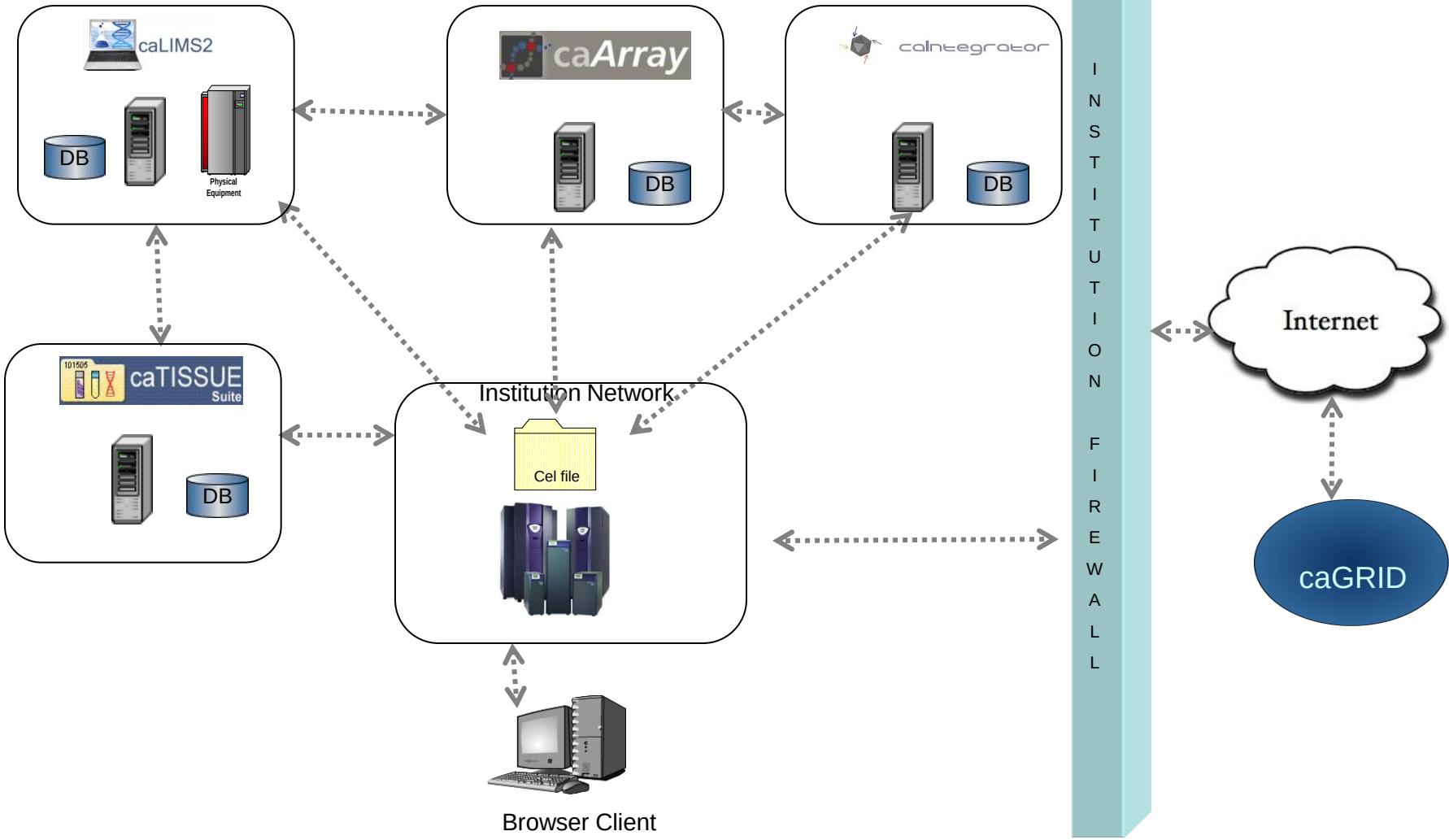
caLIMS2 Architecture: File Management

- Laboratory Best Practices: always maintain an archive copy of the data
- Many data files today are very large and hard to transfer
- caLIMS2 will have several options for handing files
  - Upload to caLIMS2 server
  - Server to server transfer
  - Internal system pointers to files

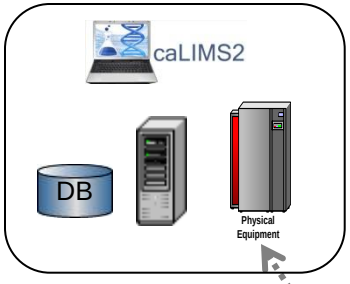
Possible installations – Scenario 1

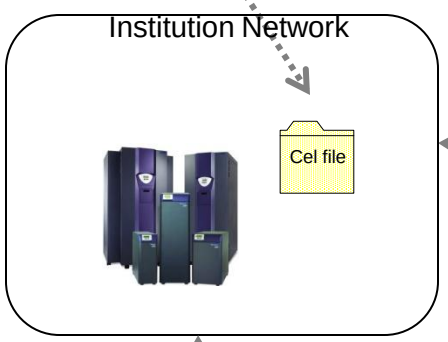
caLIMS2 installed as part of Life Science Bundle.



Possible installations – Scenario 2

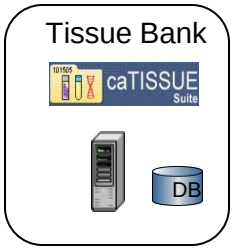
caLIMS2 installed as ala carte



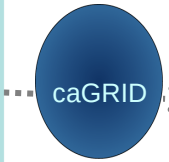


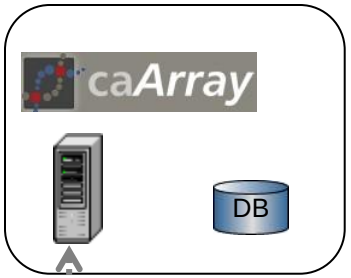

Browser Client

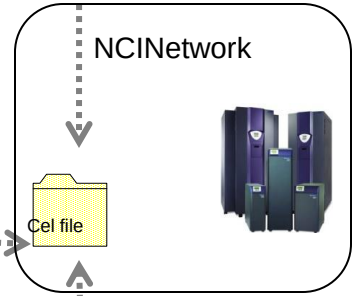
INSTITUTION FIREWALL

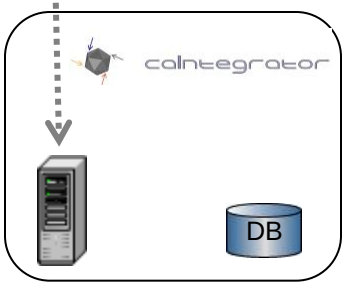


NCI FIREWALL







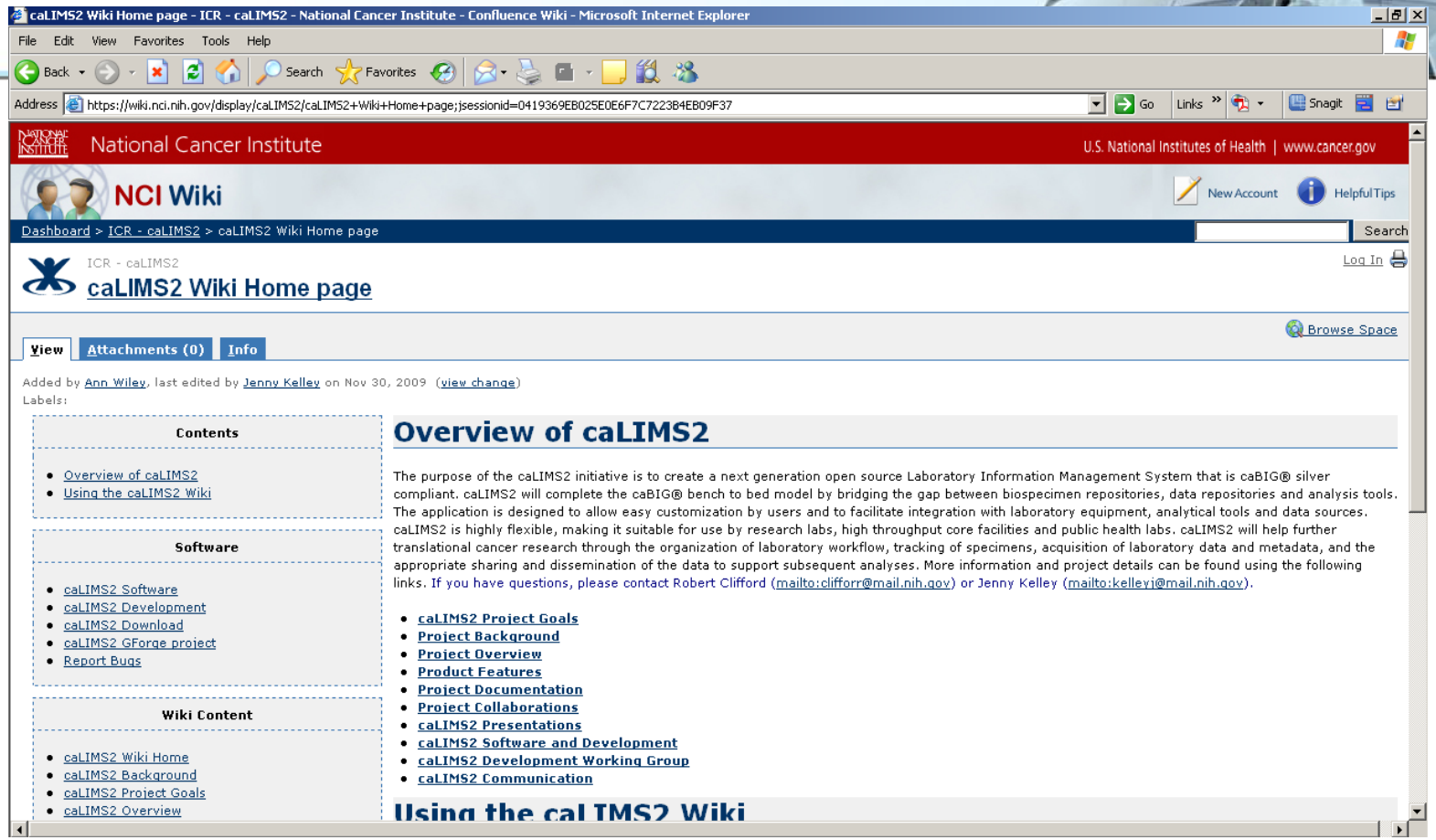


caLIMS2: timeline

- **Use case model - completed**
- **Logical model – completed and submitted to caDSR**
- **caLIMS2 v0.5M1 (sample inventory search only) – released**

- **caLIMS2 v1.0**
  - **Funding for FY2010: 1 lead architect + 2 full time resources**
  - **Q1 – completion of v1.0 OM and submission to caDSR- done**
  - Q2 – Administration module
  - Q3 – Inventory module
  - Q4 – Workflow module
  - 2011 Q1 - release v1.0 with features in scope and basic workflow plus report functionalities (caLIMS2 Development Working Group members/early adopters)

caLIMS2 - communication



caLIMS2 Wiki:

https://wiki.nci.nih.gov/x/2oMYAQ

GForge site:

http://gforge.nci.nih.gov/projects/calims2

Contacts:

Bob Clifford[1] : clifforr@mail.nih.gov

Jenny Kelley[1] : kelleyj@mail.nih.gov

Sashi Thangaraj[2] : sashi@moxieinformatics.com

1) NCI Laboratory of Population Genetics, 2) Moxie Informatics

END

Comments and suggestions are welcome!

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