



LabKey Software™  
PARTNERS IN SCIENCE

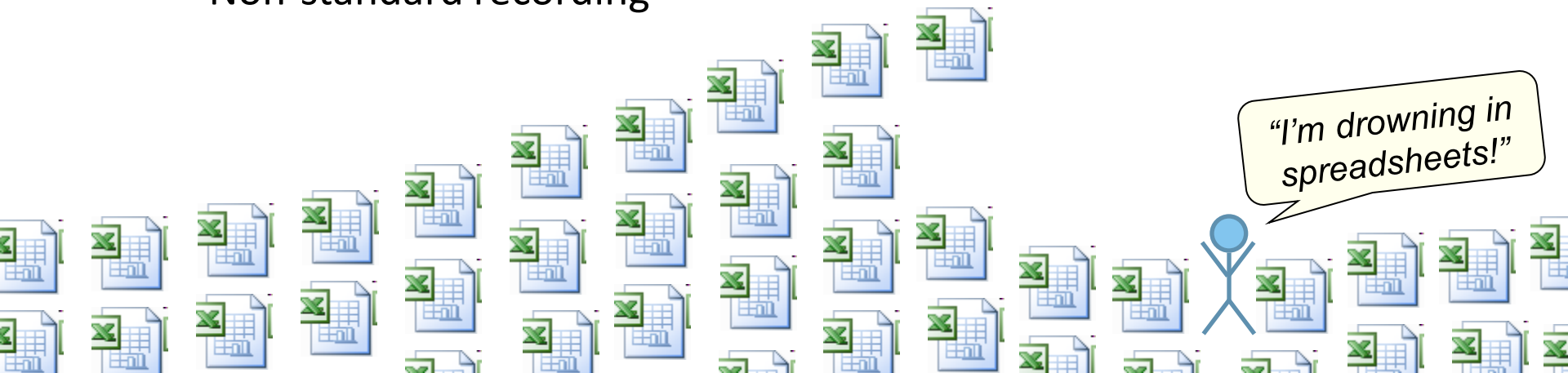
From the Lab to the Network...

Management of Lab, Clinical and Specimen Data  
Using the  
Open Source LabKey Server Platform

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Scientific Outreach Director  
[eknelson@labkey.com](mailto:eknelson@labkey.com)

Society for Clinical Trials Conference  
May 21, 2013

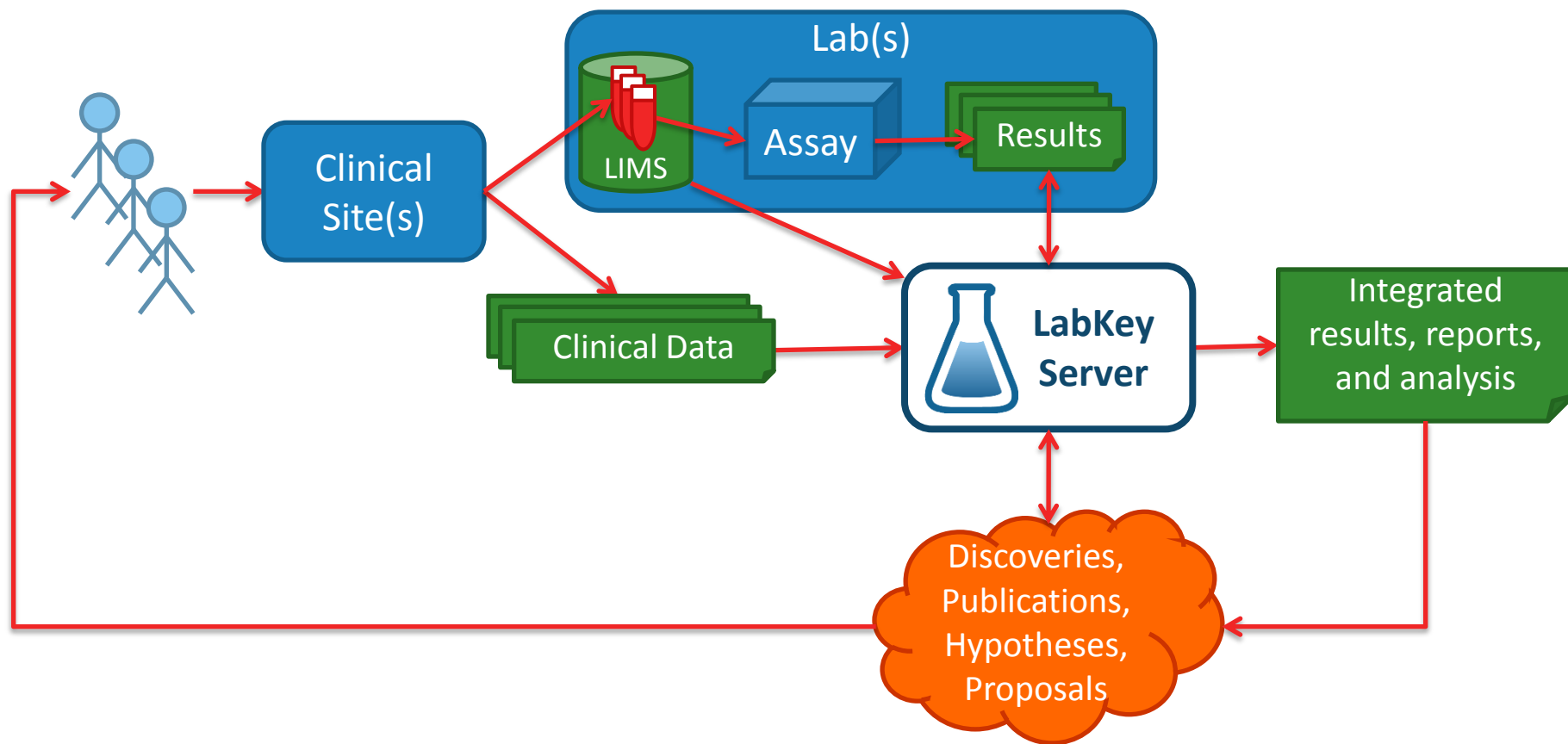
- **Data volume**
  - Hundreds of millions of results from thousands of high-throughput assay runs
- **Data variety**
  - Clinical, demographic, assay, specimen data
  - Annotations, metadata, provenance
- **Data variability**
  - Non-standard recording
- **Evolving analyses**
  - Complex, domain-specific
  - Must be replicable, auditable, validate-able
- **Collaboration**
  - Investigators distributed, specialized
  - Data in separate silos
- **Data reuse**
  - Ancillary studies



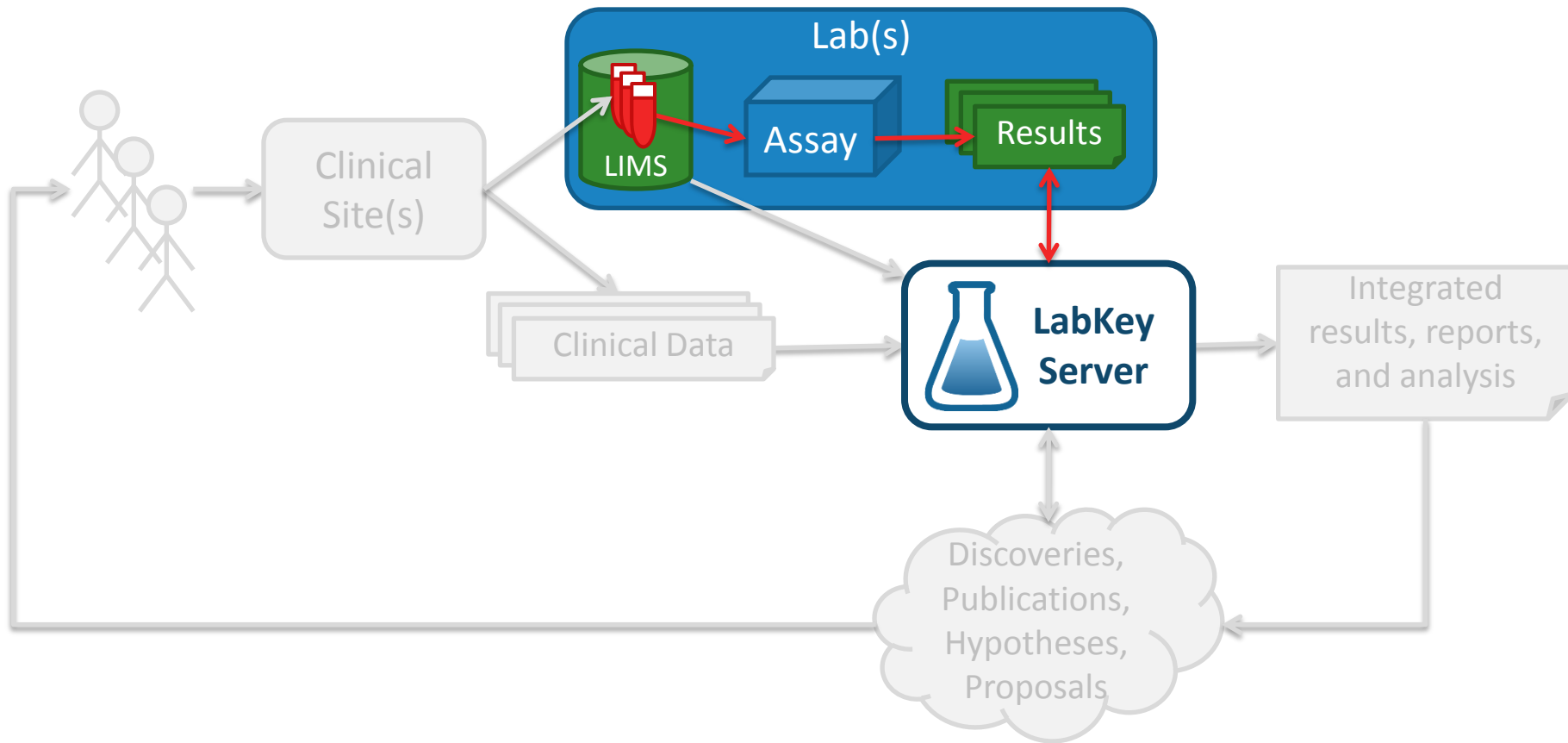
- Open source platform for data integration and collaboration
  - Freely downloadable
  - No license fees; Apache 2.0 license
- Proven, supported
  - Active installations: 100+
  - First release: 2005
  - Investment in the platform to date: \$15+ million
  - Professionally supported by LabKey Software



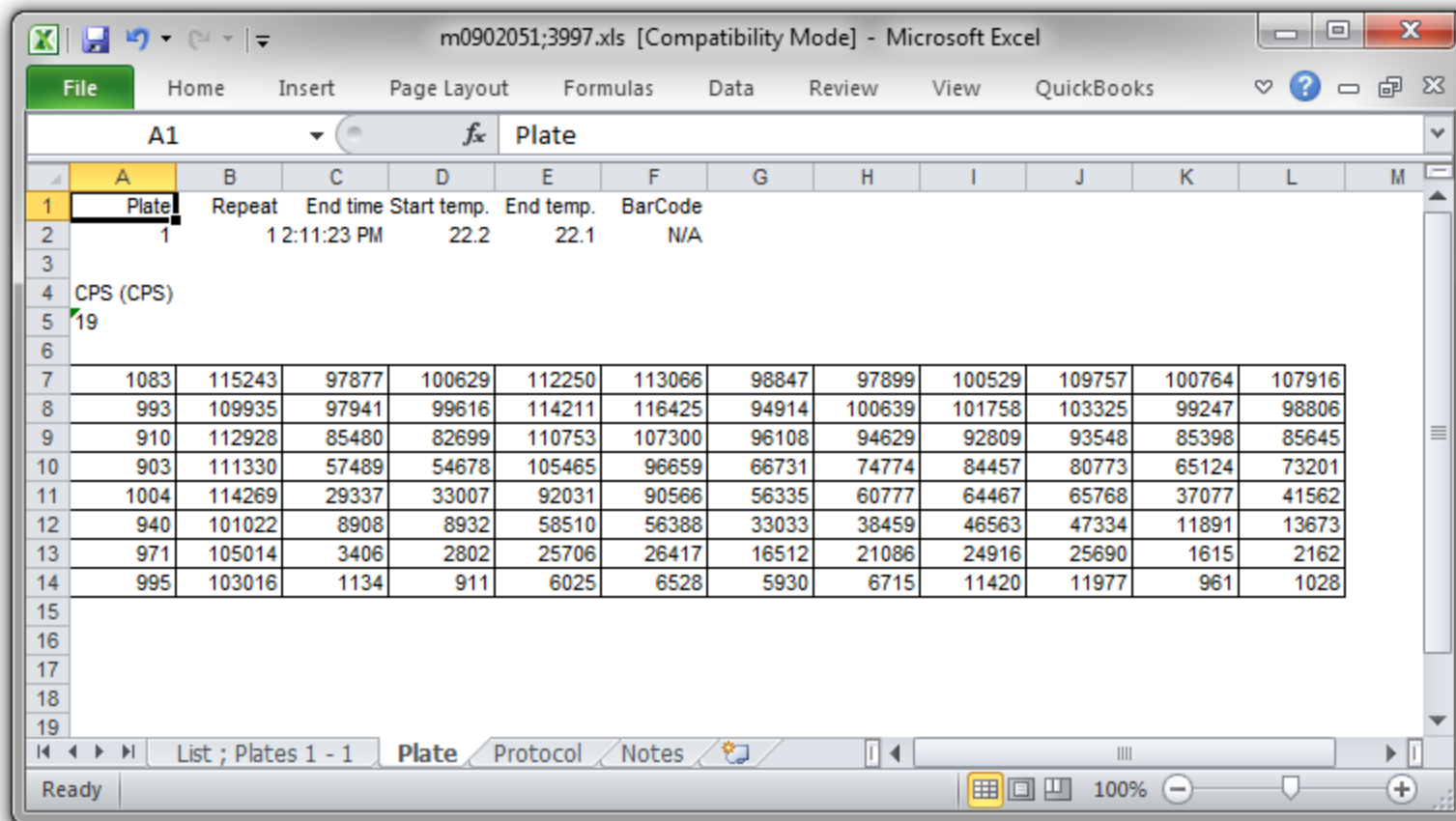
# A typical platform use



# Assays



# Assay data upload example



The screenshot shows a Microsoft Excel spreadsheet titled "m0902051;3997.xls [Compatibility Mode] - Microsoft Excel". The spreadsheet has a single sheet named "Plate". The data is organized as follows:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Plate	Repeat	End time	Start temp.	End temp.	BarCode							
2	1	1	12:11:23 PM	22.2	22.1	N/A							
3													
4	CPS (CPS)												
5	19												
6													
7	1083	115243	97877	100629	112250	113066	98847	97899	100529	109757	100764	107916	
8	993	109935	97941	99616	114211	116425	94914	100639	101758	103325	99247	98806	
9	910	112928	85480	82699	110753	107300	96108	94629	92809	93548	85398	85645	
10	903	111330	57489	54678	105465	96659	66731	74774	84457	80773	65124	73201	
11	1004	114269	29337	33007	92031	90566	56335	60777	64467	65768	37077	41562	
12	940	101022	8908	8932	58510	56388	33033	38459	46563	47334	11891	13673	
13	971	105014	3406	2802	25706	26417	16512	21086	24916	25690	1615	2162	
14	995	103016	1134	911	6025	6528	5930	6715	11420	11977	961	1028	
15													
16													
17													
18													
19													

# Assay data upload example

## Run Properties

Fields marked with an asterisk \* are required.

Assay Id? 2012-08-23, run 4

Comments? Re-run with new reagent batch (received 8/17/2012)

Cutoff Percentage (1) \*? 40

Cutoff Percentage (2)? 60

Virus Name? SDDM4

Host Cell? TZM-BI

Study Name? SOT-17

Experiment Performer? Britt Piehler

Incubation Time? 48 hours

Curve Fit Method \*? Five Parameter ▾

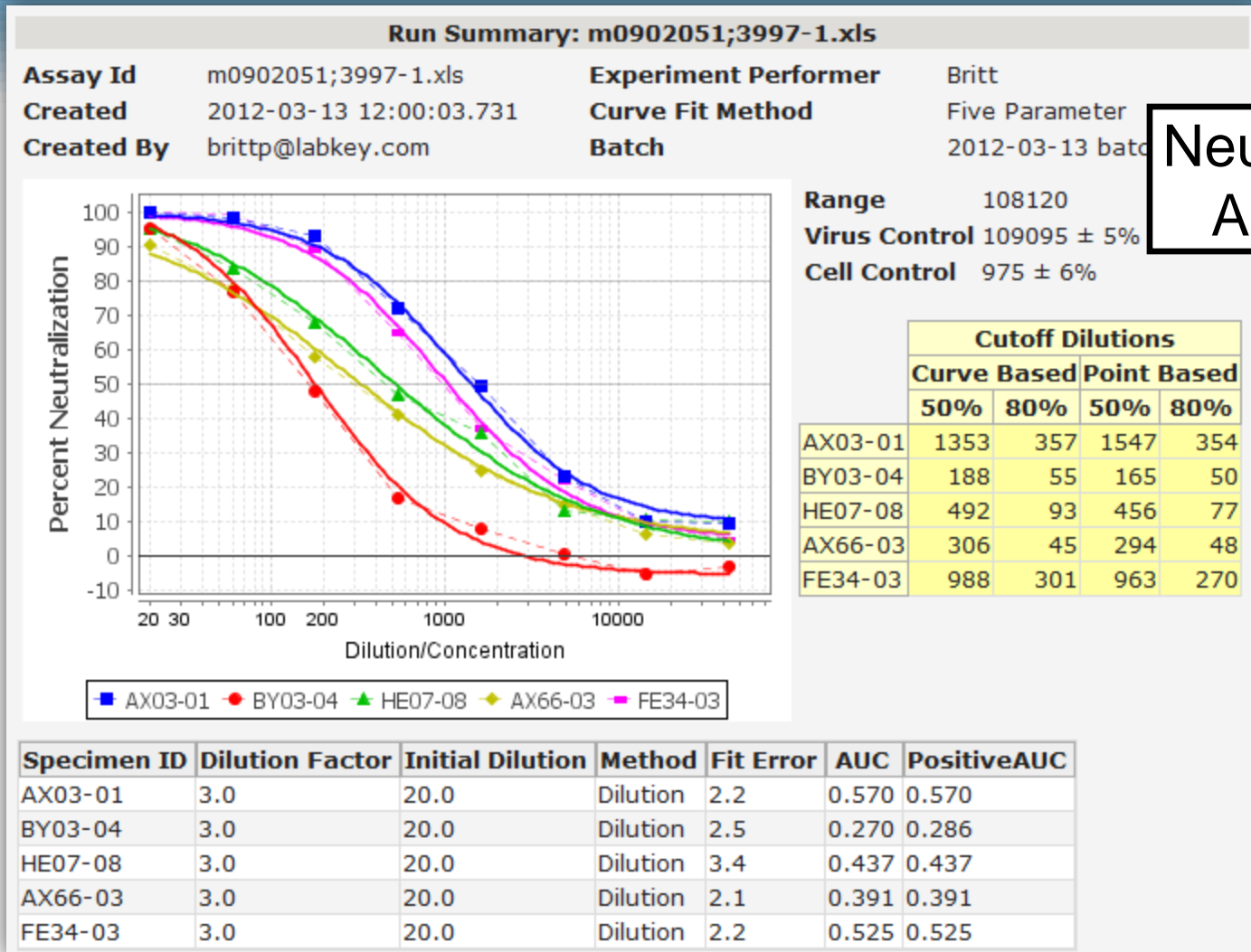
Run Data \*

The NAb data file is a specially formatted Excel 1997-2003 file with a .xls extension.  
Upload a data file

m0902053;3999.xls

 m0902053;3999.xls

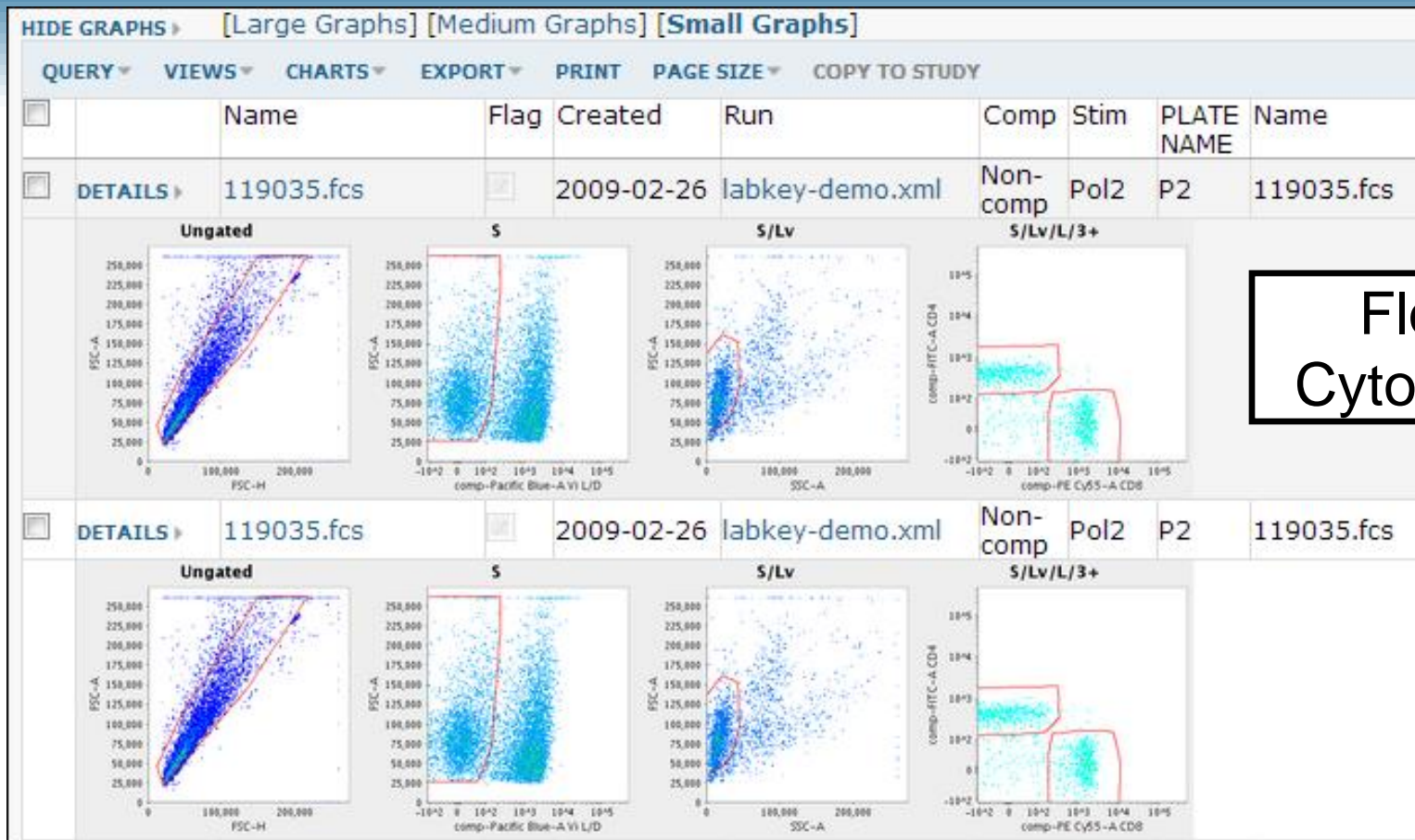
# Assay data upload example



[Piehler et al., BMC Immunology 2011](#)



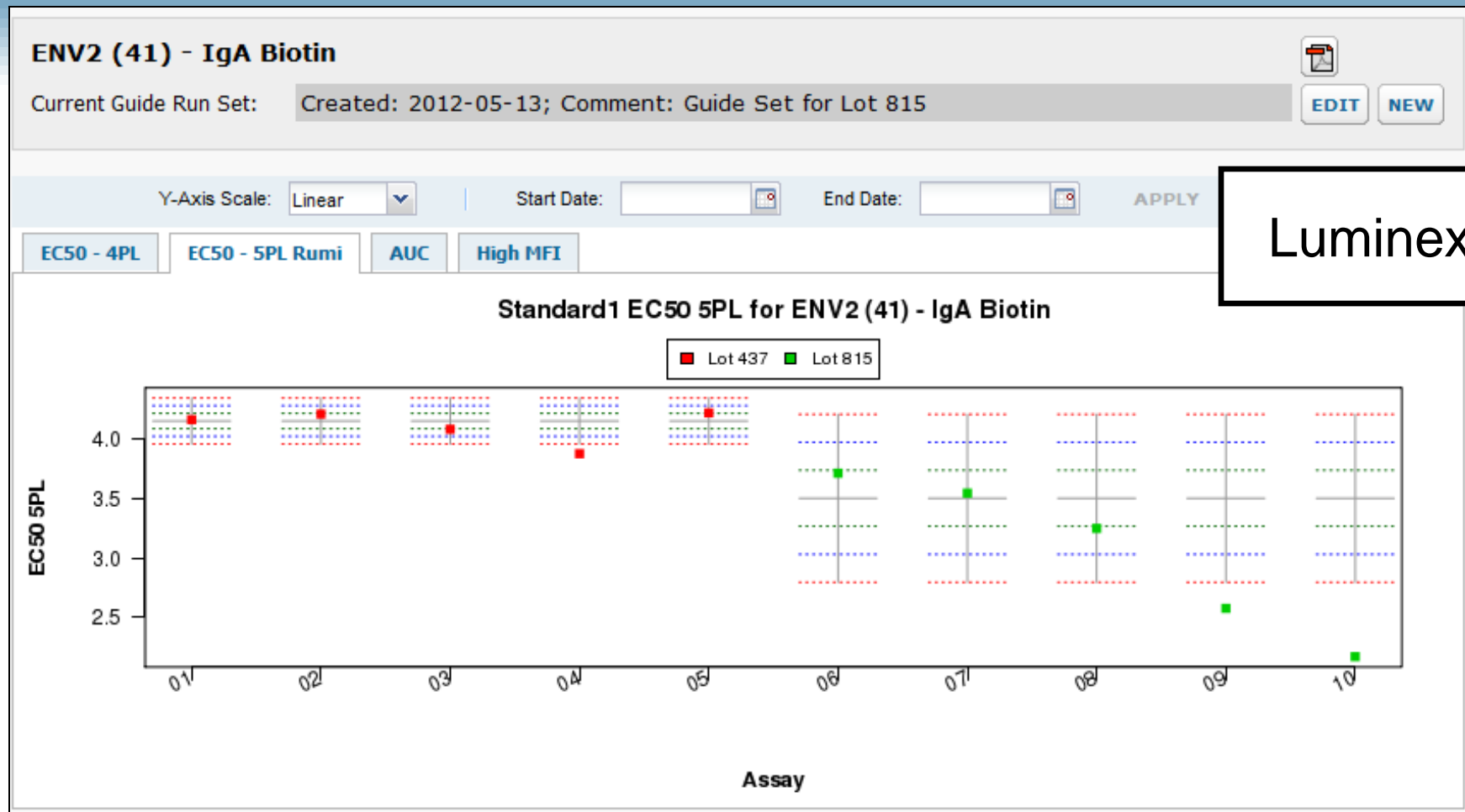
... and more assay data



Flow  
Cytometry

Shulman et al., Cytometry 2008

# .... and more assay data



Luminex®

[Eckels et al., BMC Bioinformatics 2013](#)

# Private and shared spaces



Study Folder (Less Private)

Lab #1 Folder  
(Private)

Neutralizing  
Antibody  
Dataset

Lab #2 Folder  
(Private)

Luminex®  
Dataset

# Private and shared spaces



Study Folder (Less Private)

Neutralizing  
Antibody  
Dataset

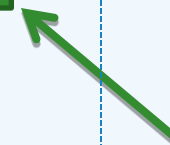
Luminex®  
Dataset

Lab #1 Folder  
(Private)

Neutralizing  
Antibody  
Dataset

Lab #2 Folder  
(Private)

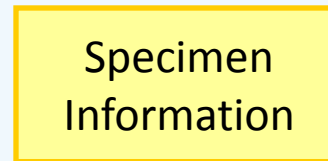
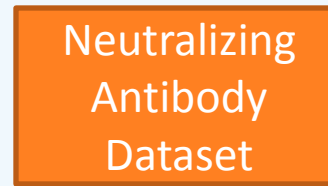
Luminex®  
Dataset



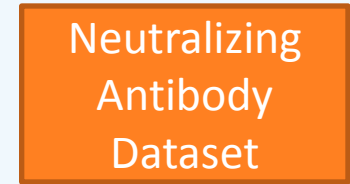
# Private and shared spaces



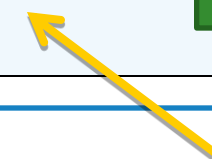
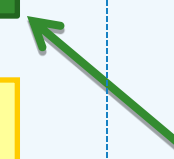
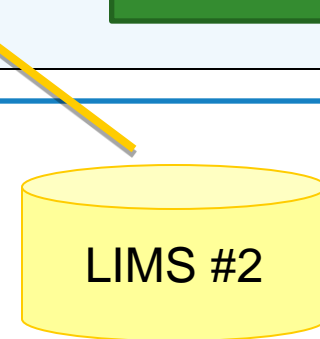
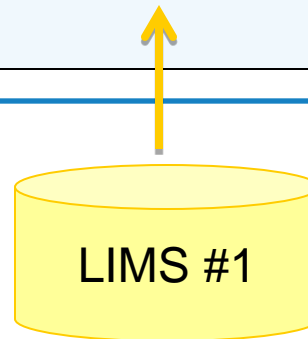
## Study Folder (Less Private)



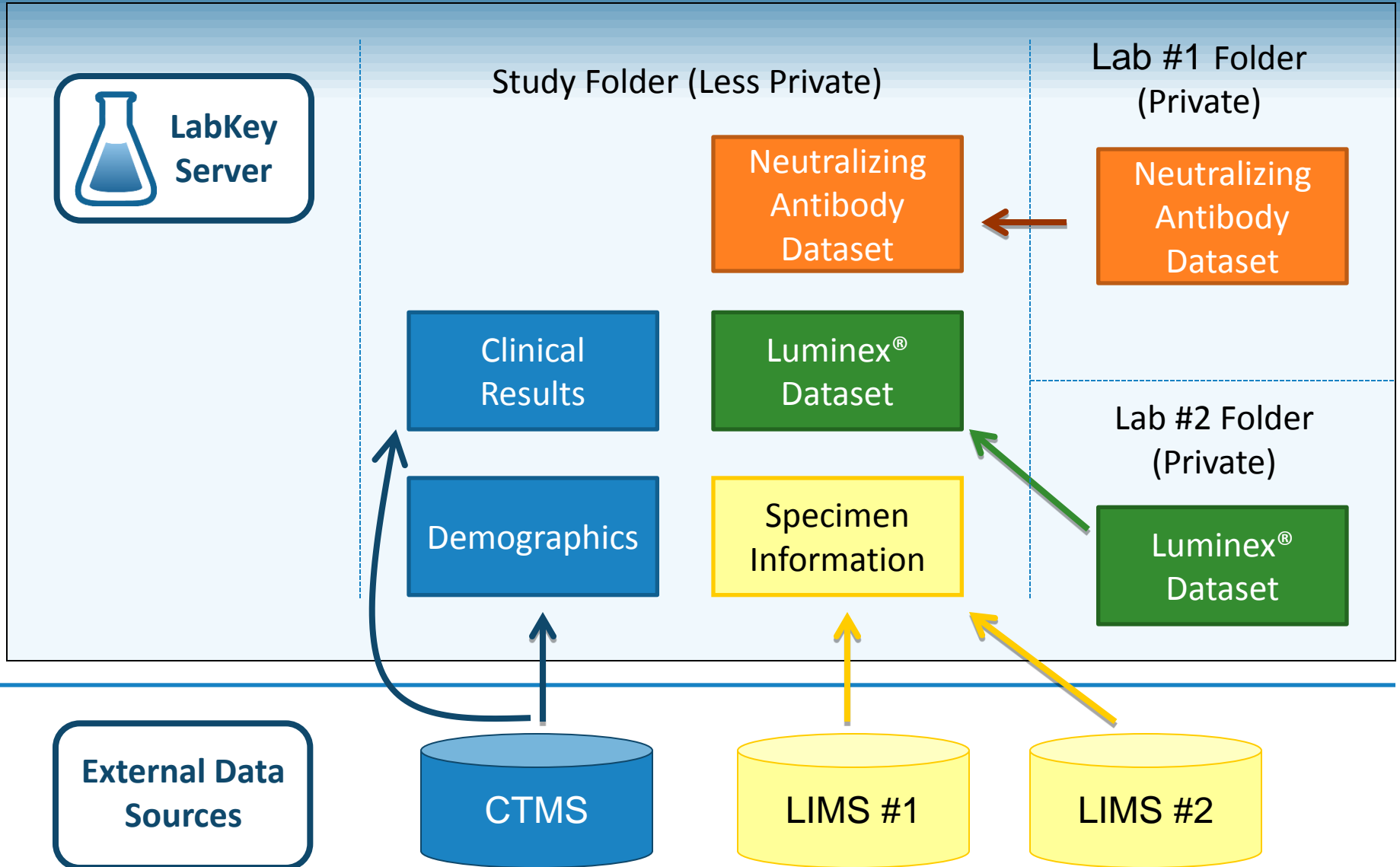
## Lab #1 Folder (Private)



## Lab #2 Folder (Private)



# Private and shared spaces



## Clinical results

Assay results

Demographics

Calculated

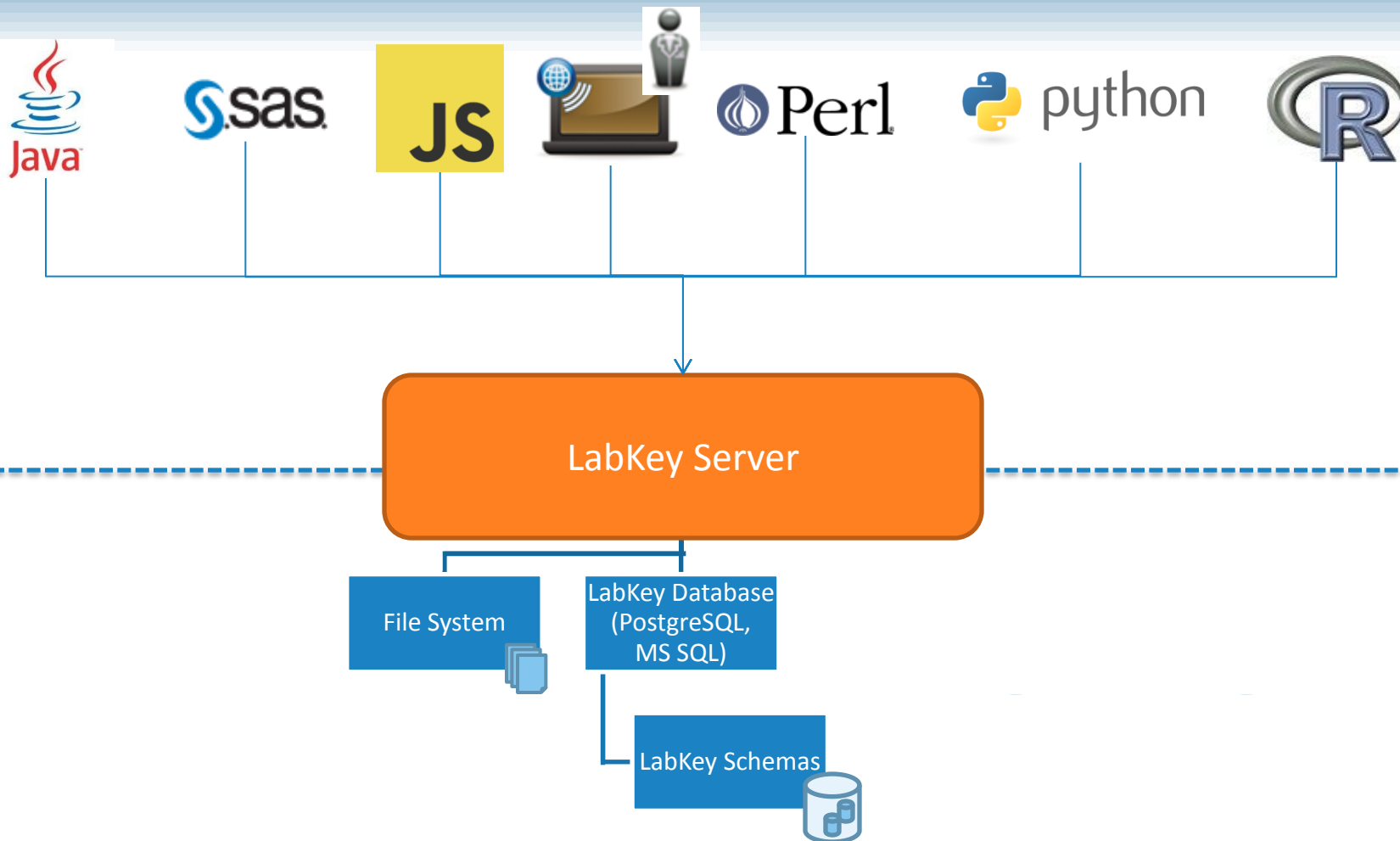
Participant ID	Date	Result	Analyte	Gender	Enroll Date	Weight	Days since enroll
A	11/13/2001	28.93	IFN-a	Male	11/1/2001	163	12
A	11/13/2001	10.30	IL-2	Male	11/1/2001	163	12
A	11/20/2001	27.74	IFN-a	Male	11/1/2001	161	19
A	11/20/2001	11.17	IL-2	Male	11/1/2001	161	19
B	6/13/2012	5.54	IL-2	Female	6/1/2012	148	12
B	6/20/2012	6.03	IL-2	Female	6/1/2012	149	19

# Visualization of cohort results





# Platform extension and customization



## Organizations & Networks

- Immune Tolerance Network (ITN)
- HIV Vaccine Trial Network (HVTN) and other HIV networks (MTN, HPTN, ...)
- Fred Hutchinson Cancer Research Center (FHCRC)
- Statistical Center for HIV/AIDS Research and Prevention (SCHARP)
- Center for HIV-AIDS Vaccine Immunology (CHAVI)
- Collaboration for AIDS Vaccine Discovery (CAVD)
- Human Immunology Project Consortium (HIPC)
- Wisconsin National Primate Research Center (WNPRC)
- Oregon National Primate Research Center (ONPRC)
- Juvenile Diabetes Research Foundation Network for Pancreatic Organ Donors (nPOD)
- University of Washington International Center for Excellence in Malaria Research (ICEMR)
- NWBioTrust
- TB Systems Biology (TBSB) collaboration
- LabKey Software team
- ...

## Labs

- Katze (UW)
- Kiem (FHCRC)
- Letvin (Harvard)
- MacCoss (UW)
- Mallick (USC)
- McElrath/DeRosa (FHCRC)
- McIntosh (FHCRC)
- Montefiori (Duke)
- O'Connor (Wisconsin)
- Tomaras (Duke)
- ...

Research reported in this talk was supported by the National Institutes of Health under award numbers UM1-AI-068618, U01-AI-068635, and many others.

- Documentation, tutorials, videos, forums, installers
  - <http://labkey.org>
- Overview paper
  - Nelson *et al.*, [LabKey Server: An open source platform for scientific data integration, analysis and collaboration](#). *BMC Bioinformatics* 2011
- 2013 User Conference
  - Seattle, September 18-20<sup>th</sup>
  - <http://labkey.com/conference>
  - Training, tips, user presentations



*NIH Disclaimer: The content of this talk is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health*

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# Questions?