

Towards a Web of Distributed Registries: JBEI Registry of Biological Parts

Timothy Ham

29 April 2009

Advances in Synthetic Biology



Sandia
National
Laboratories



UCDAVIS
UNIVERSITY OF CALIFORNIA

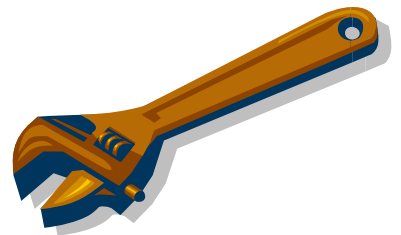


Lawrence Livermore
National Laboratory

CARNEGIE
INSTITUTION FOR
SCIENCE

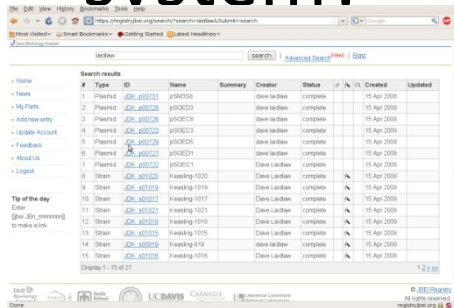
Synthetic Biology Software: Current Status

- MS Excel
- MS Word
- VectorNTI / APE / DNA Star
- How to share your data?
 - With your group?
 - With your community?
 - With the world?

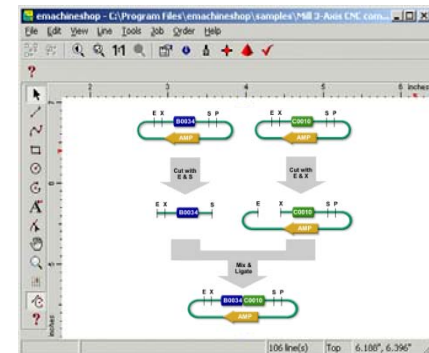
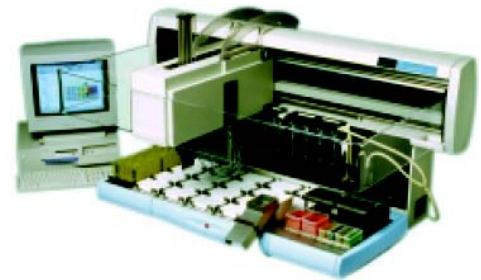
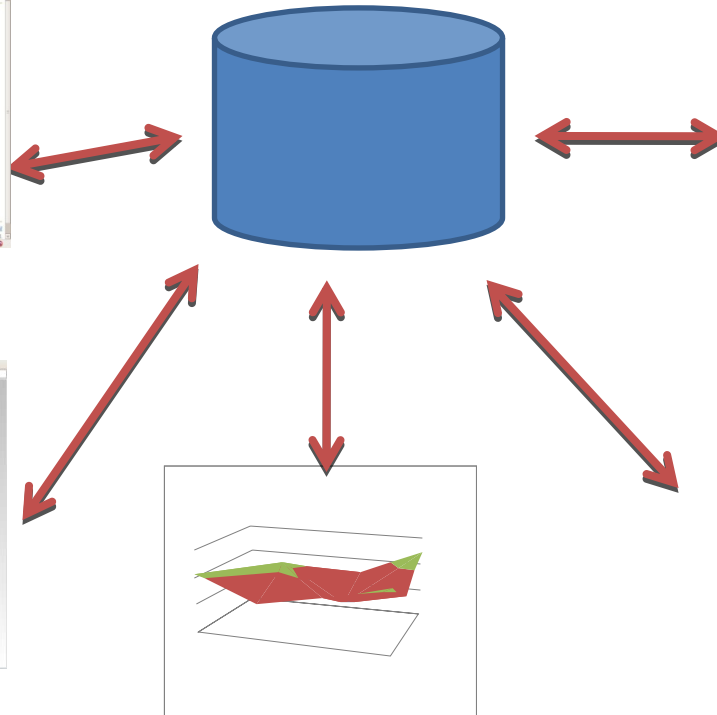


Synthetic Biology Software: Goals

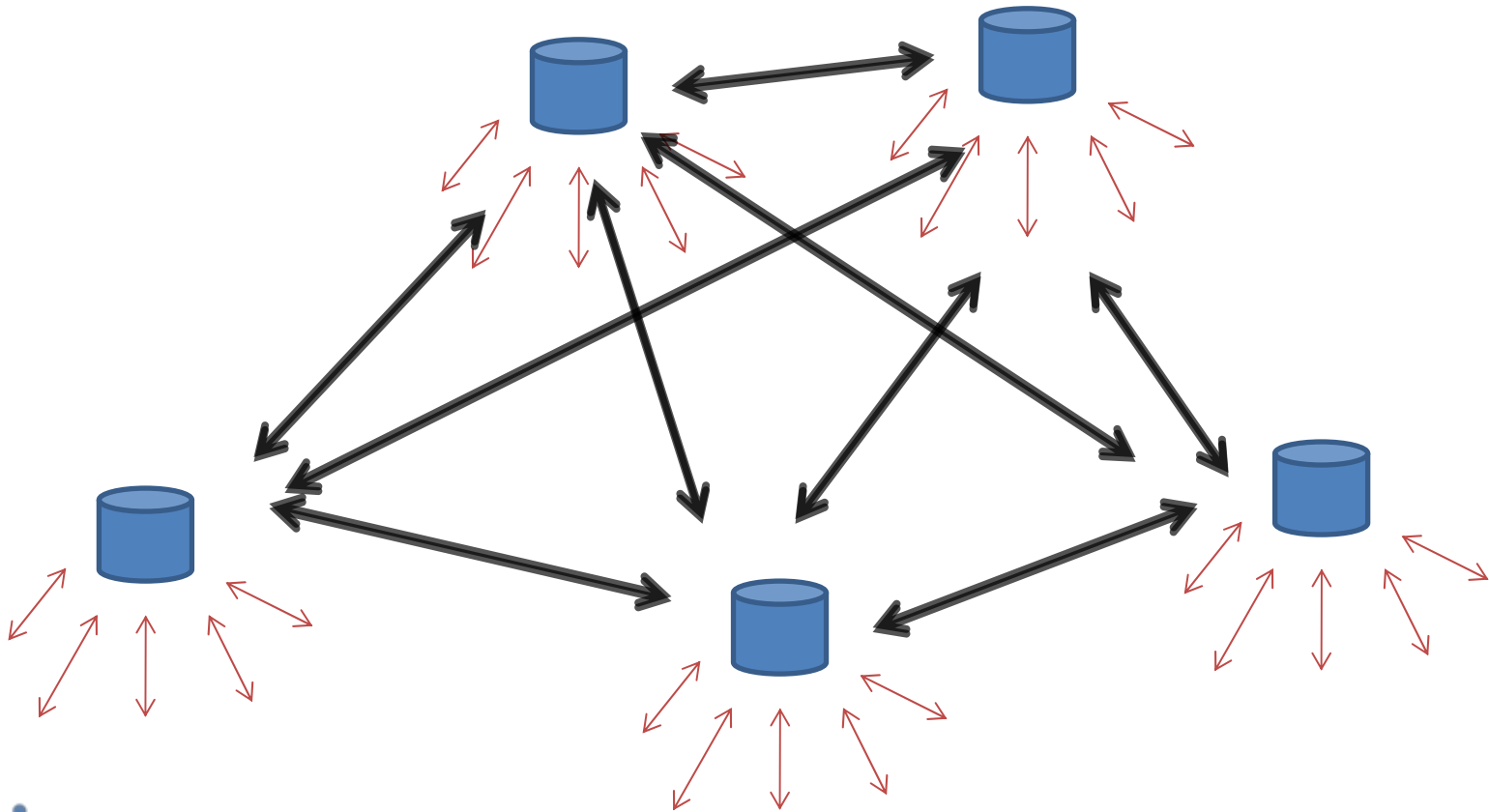
- Blank Canvas. What would be an ideal system?



#	Type	ID	Name	Summary	Creator	Status	Created	Updated
1	Plasmid	J01_00001	pJ01001	down to date	complete	15 Apr 2009		
2	Plasmid	J01_00002	pJ01002	down to date	complete	15 Apr 2009		
3	Plasmid	J01_00003	pJ01003	down to date	complete	15 Apr 2009		
4	Plasmid	J01_00004	pJ01004	down to date	complete	15 Apr 2009		
5	Plasmid	J01_00005	pJ01005	down to date	complete	15 Apr 2009		
6	Plasmid	J01_00006	pJ01006	down to date	complete	15 Apr 2009		
7	Plasmid	J01_00007	pJ01007	down to date	complete	15 Apr 2009		
8	Strain	J01_00008	Strain 1000	Down to date	complete	15 Apr 2009		
9	Strain	J01_00009	Strain 1010	Down to date	complete	15 Apr 2009		
10	Strain	J01_00010	Strain 1011	Down to date	complete	15 Apr 2009		
11	Strain	J01_00011	Strain 1012	Down to date	complete	15 Apr 2009		
12	Strain	J01_00012	Strain 1013	Down to date	complete	15 Apr 2009		
13	Strain	J01_00013	Strain 1014	Down to date	complete	15 Apr 2009		
14	Strain	J01_00014	Strain 1015	Down to date	complete	15 Apr 2009		
15	Strain	J01_00015	Strain 1016	Down to date	complete	15 Apr 2009		



Synthetic Biology Software Goals



MIT Registry

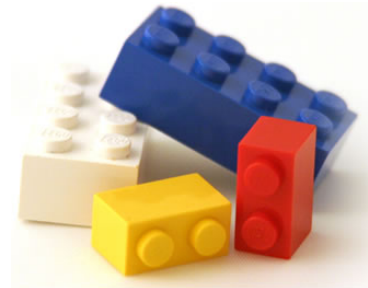
- Centralized
 - One Registry to Rule Them All
 - All parts are **public**
- Wiki based
 - Easy to add pictures and descriptions
 - Hard to automatically organize information
- Rapid Growth
 - iGEM contributions

MIT Registry

- Too **Brick-Centric**
 - No concept of plasmids or strains, outside of brick context
 - Brick as both a basis of unit as well as “kind” of a part
- Software is not available

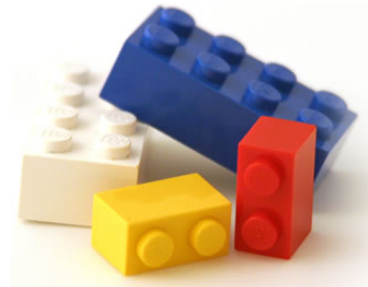
JBEIR: Goals

- “Backward” compatible
 - Support for **strains**, **plasmids**, as well as **parts**
- Distributed
 - Software is Open Source (BSD-style license)
 - Allows individual labs to run their own registry
- Encourages **sharing** of data
 - Core Data Model will be published with Clotho (UC Berkeley BioCAD) group.



JBEIR: Status

- 3500+ parts
- 200+ new parts since last year
- Advanced searches
 - Google-like full text search
 - Field based search
 - BLAST search




JBEIR: Screenshot Tour

File Edit View History Bookmarks Tools Help

https://registry.jbei.org/user_entries/

Google

Most Visited Smart Bookmarks Getting Started Latest Headlines

Joint BioEnergy Institute

As of **Friday 24th April 2009**
there are 3663 Parts available

Welcome, **Timothy Ham**

| [Advanced Search](#) ^(new) | [Blast](#)






- Home
- News
- My Parts
- Add new entry
- Update Account
- Feedback
- About Us
- Logout

My Parts

#	Type	ID	Name	Summary	Creator	Status				Created	Updated
1.	Strain	JBx_000024	teststrain1			in progress				25 Sep 2008	18 Apr 2009
2.	Part	JBx_000017				planned				30 Jul 2008	08 Apr 2009
3.	Plasmid	JBx_000023	testplasmid1		tsham@lbl.gov					25 Sep 2008	25 Sep 2008
4.	Part	JBx_000018								14 Aug 2008	04 Dec 2008
5.	Part	JBx_000001								31 May 2008	01 Oct 2008

Display 1 - 5 of 5 1

Tip of the day
Enter
[[jbei:JBn_nnnnnnnn]]
to make a link.



© [JBEI Registry](#)
All rights reserved.
[Feedback](#) | Phone +1 510 486 5380

Done registry.jbei.org

JBEIR: Screenshot Tour

File Edit View History Bookmarks Tools Help

https://registry.jbei.org/search/?search=laidlaw&Submit=search

Most Visited Smart Bookmarks Getting Started Latest Headlines

Joint BioEnergy Institute

laidlaw search | [Advanced Search \(new\)](#) | [Blast](#)

Search results

#	Type	ID	Name	Summary	Creator	Status				Created	Updated
1.	Plasmid	JDK_p00731	pSM3S8		dave laidlaw	complete				15 Apr 2008	
2.	Plasmid	JDK_p00728	pSOED3		dave laidlaw	complete				15 Apr 2008	
3.	Plasmid	JDK_p00726	pSOEC6		dave laidlaw	complete				15 Apr 2008	
4.	Plasmid	JDK_p00723	pSOEC3		dave laidlaw	complete				15 Apr 2008	
5.	Plasmid	JDK_p00729	pSOED5		dave laidlaw	complete				15 Apr 2008	
6.	Plasmid	JDK_p00727	pSOED1		dave laidlaw	complete				15 Apr 2008	
7.	Plasmid	JDK_p00722	pSOEC1		Dave Laidlaw	complete				15 Apr 2008	
8.	Strain	JDK_s01020	Keasling-1020		Dave Laidlaw	complete				15 Apr 2008	
9.	Strain	JDK_s01019	Keasling-1019		Dave Laidlaw	complete				15 Apr 2008	
10.	Strain	JDK_s01017	Keasling-1017		Dave Laidlaw	complete				15 Apr 2008	
11.	Strain	JDK_s01021	Keasling-1021		Dave Laidlaw	complete				15 Apr 2008	
12.	Strain	JDK_s01018	Keasling-1018		Dave Laidlaw	complete				15 Apr 2008	
13.	Strain	JDK_s01015	Keasling-1015		Dave Laidlaw	complete				15 Apr 2008	
14.	Strain	JDK_s00819	Keasling-819		dave laidlaw	complete				15 Apr 2008	
15.	Strain	JDK_s01016	Keasling-1016		Dave Laidlaw	complete				15 Apr 2008	

Display 1 - 15 of 27

1 2 » » »

- Home
- News
- My Parts
- Add new entry
- Update Account
- Feedback
- About Us
- Logout

Tip of the day
Enter
[[jbei:JBn_nnnnnnnn]]
to make a link.

DOE Bioenergy Research Sandia National UCDAVIS CARNEGIE INSTITUTE FOR LAWRENCE LIVERMORE NATIONAL LABORATORY

© JBEI Registry
All rights reserved.
registry.jbei.org

JBEIR: Screenshot Tour

The screenshot shows a web browser window with the URL <https://registry.jbei.org/search/?search=holtz&Submit=search>. The page header includes the JBEI logo, the date "As of Friday 24th April 2009", and a welcome message "Welcome, Timothy Ham" with a note that "there are 3663 Parts available". A search bar with the text "search" and links for "Advanced Search (new)" and "Blast" are present.

The main content area displays "Search results" for the query "holtz". A table lists 13 results, with the first result being "JDK_s01217" by William Holtz. The second result, "JDK_s02392", is expanded to show detailed information.

#	Type	ID	Name	Summary	Creator	Status	Created	Updated
1.	Strain	JDK_s01217	Keasling-1217		William Holtz	complete	15 Apr 2008	
2.	Strain	JDK_s02391	General Information					
3.	Strain	JDK_s02395	ID	JDK_s02392	Markers			
4.	Strain	JDK_s02050	Name	Keasling-2392	Host			
5.	Strain	JDK_s02049	Alias		Genotype/Phenotype			
6.	Strain	JDK_s02052			supE44, DlacU169 (f80 lacZ DM15)			
7.	Strain	JDK_s02051			hsdR17, rec A1, end A1, gyr A46,			
8.	Strain	JDK_s02053	Creator	Addgene	thi-1 rel A1 (permits			
9.	Strain	JDK_s02392	Status	Complete	a-complementation)			
10.	Strain	JDK_s02389	Owner	filemakerimport	Plasmids			
11.	Strain	JDK_s02393	Links		pH3U3-mcs			
12.	Strain	JDK_s02390	Summary		Created			
13.	Strain	JDK_s02055	References	A bacterial one-hybrid system for determining the DNA-binding specificity of transcription factors. Meng X et al. (Nat Biotechnol. 2005 Aug. 23(8):988-94.	Modified			
			Notes	Data from Filemaker: Record ID: 2577 Location: 2392	Keywords			
					one hybrid			

Display 1 - 13 of 13


The footer includes logos for DOE Bioenergy Research, Sandia National Laboratories, and the University of California, along with the URL https://registry.jbei.org/entry/view/JDK_s02392/.

JBEIR: Screenshot Tour

File Edit View History Bookmarks Tools Help

https://registry.jbei.org/query/

Most Visited Smart Bookmarks Getting Started Latest Headlines

Joint BioEnergy Institute

As of **Friday 24th April 2009**
there are 3663 Parts available

Welcome, **Timothy Ham**

| [Advanced Search](#) ^(new) | [Blast](#)

- Home
- News
- My Parts
- Add new entry
- Update Account
- Feedback
- About Us
- Logout

Filters






Host (Strains only) contains dh10b

Strain Plasmid (Strains only) is empty

#	Type	ID	Name	Summary	Creator	Status				Created	Updated
1.	Strain	JDK_s00572	Keasling-572			complete				15 Apr 2008	
2.	Strain	JDK_s01088	Keasling-1088			complete				15 Apr 2008	
3.	Strain	JDK_s01101	Keasling-1101			complete				15 Apr 2008	
4.	Strain	JBx_000098	Keasling-1717		Michelle Chang					22 Dec 2008	

Display 1 - 4 of 4 1

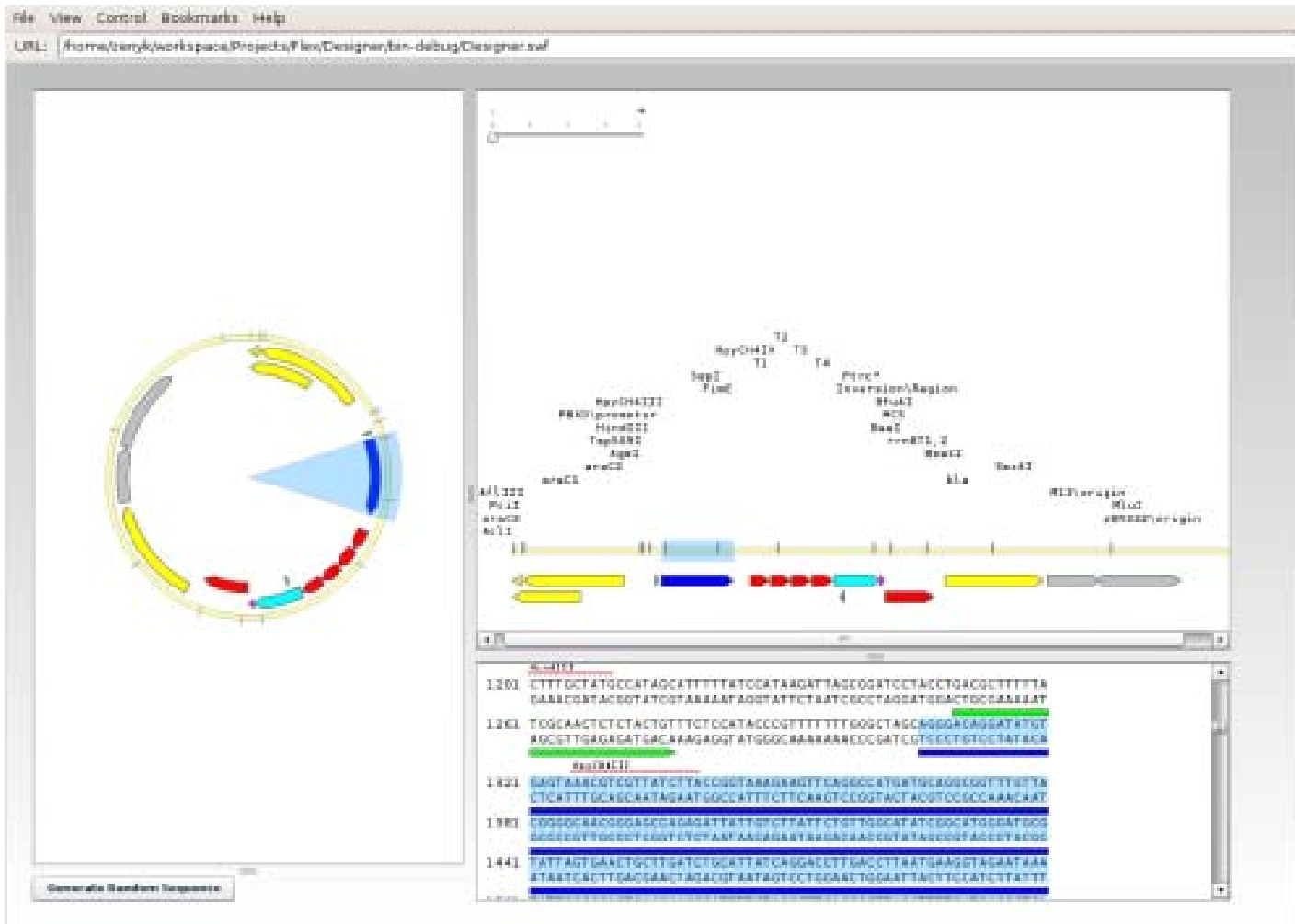
Tip of the day
Enter
[[jbei:JBn_nnnnnnnn]]
to make a link.



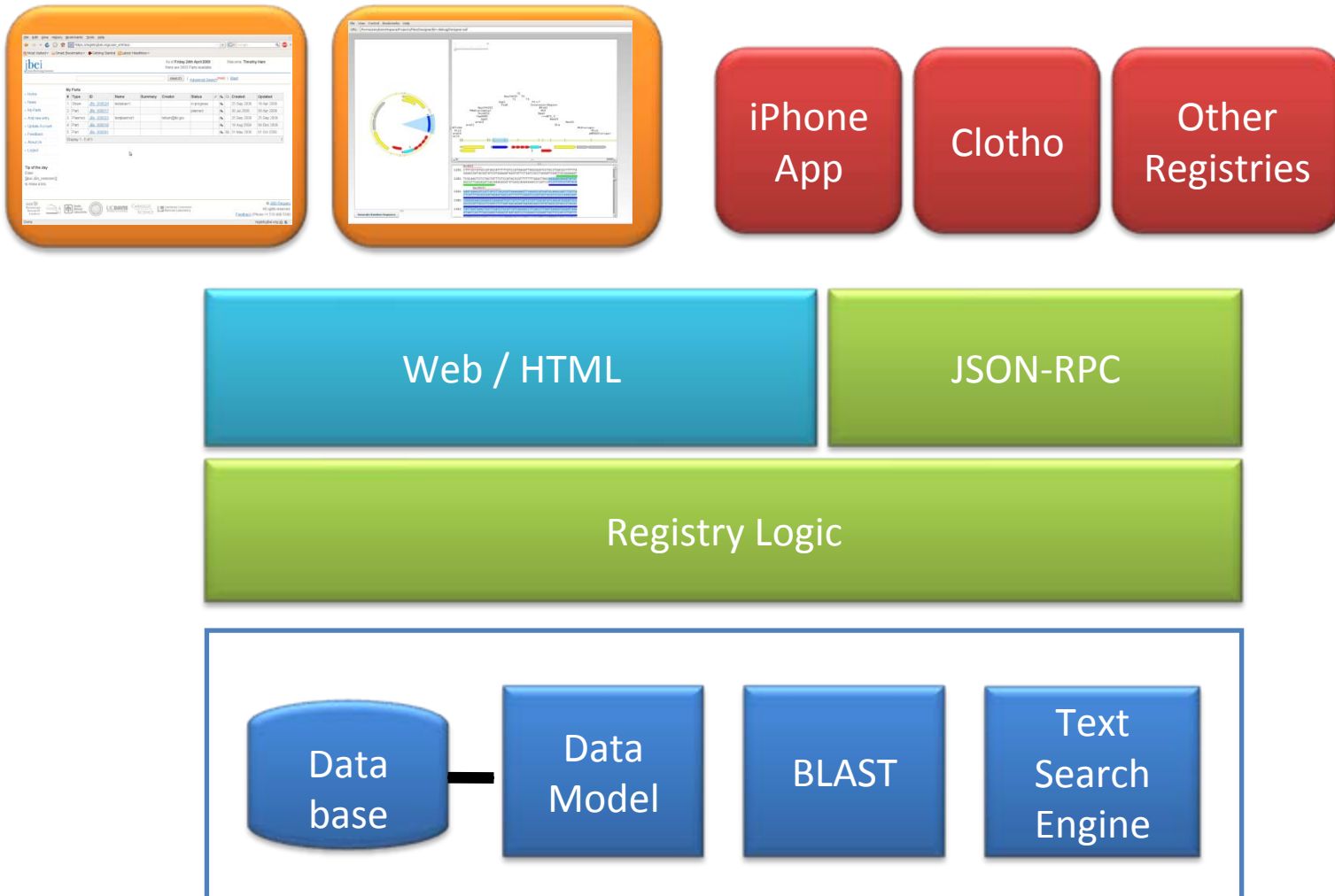
© JBEI Registry
All rights reserved.
[Feedback](#) | Phone +1 510 486 5380

Done registry.jbei.org

JBEIR: Screenshot Tour



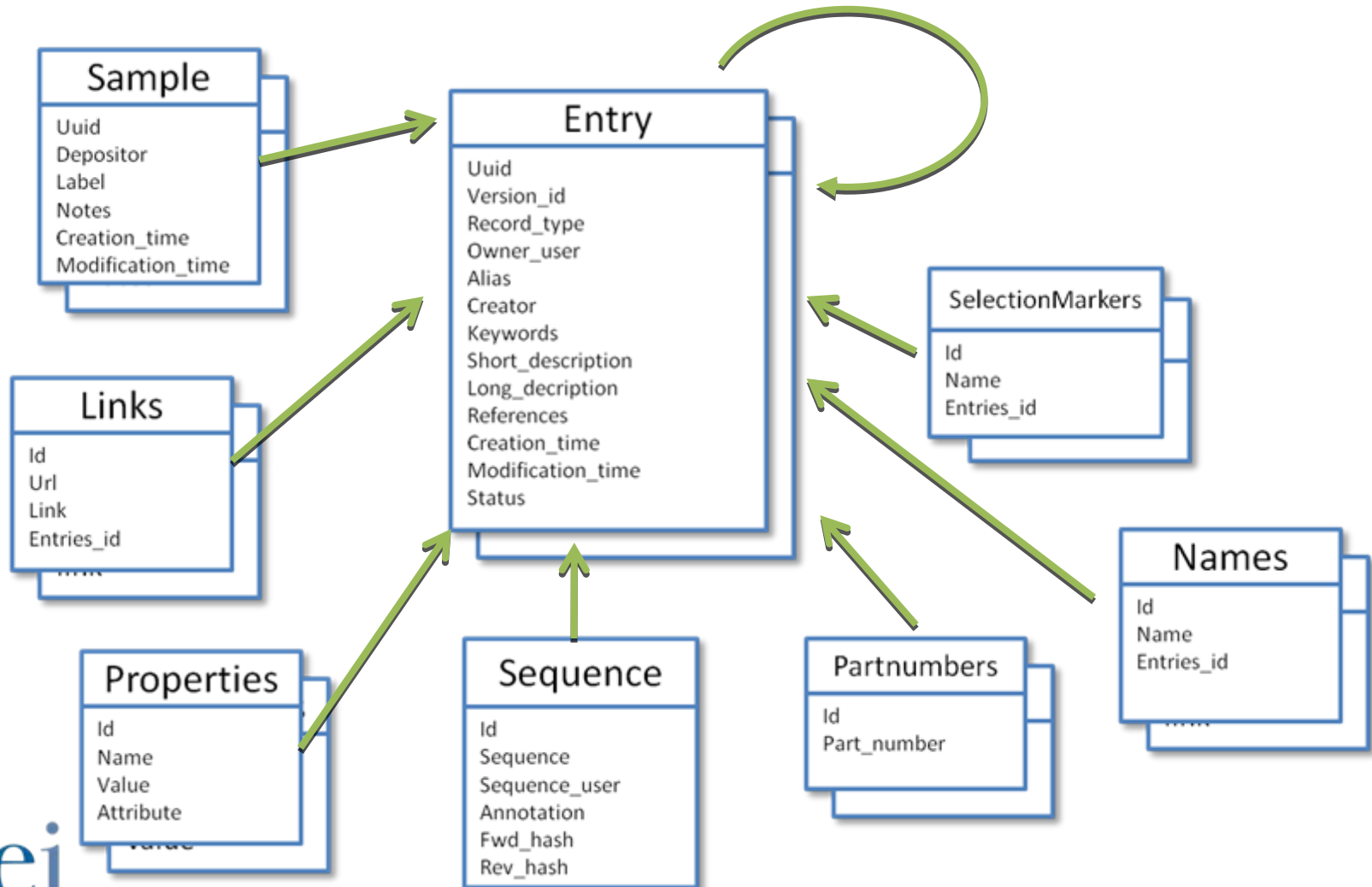
JBEIR: Architecture



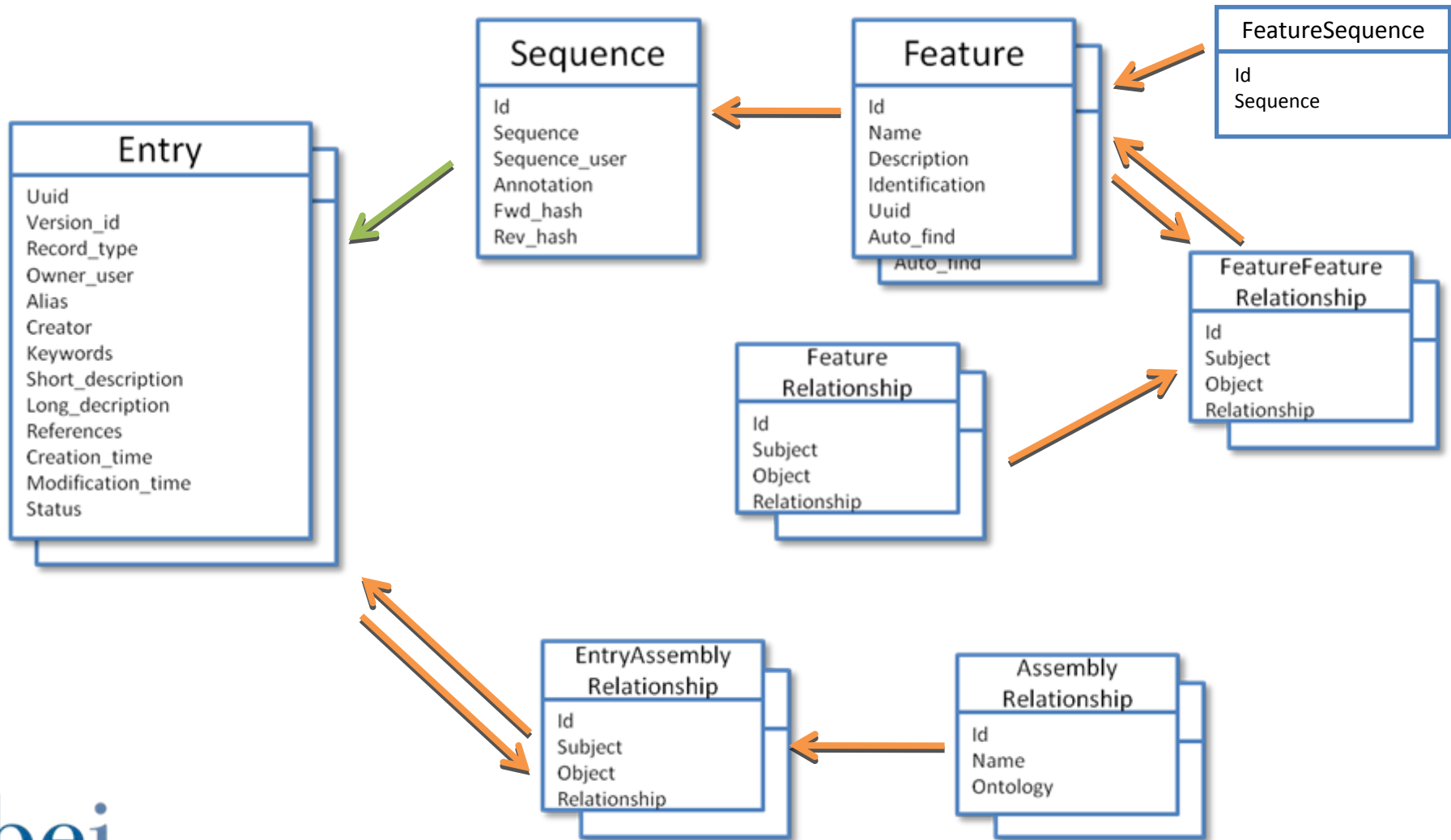
JBEIR: Architecture

- Capabilities
 - Modular brings flexibility
 - Web accessible, both by browser, and through Javascript, RPC, and REST.

JBEIR: Data Model



JBEIR: Ontology Model

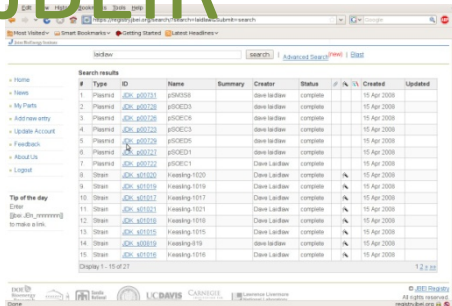


JBEIR: Data Model

- Advanced Capabilities
 - Strains can have multiple plasmids
 - Plasmid can be in multiple strains
 - Can determine all strains with a given plasmid
 - Determine construction lineage: derived parts, sibling parts (mutations), etc.
 - Determine Families/Categories:
 - Lac Promoter -> Promoter -> Transcriptional Regulator
- Draft “Core Data” RFC in progress

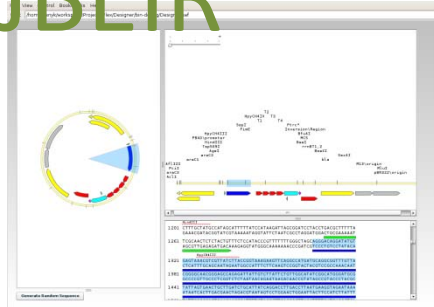
Synthetic Biology Software: Goals

JBEIR

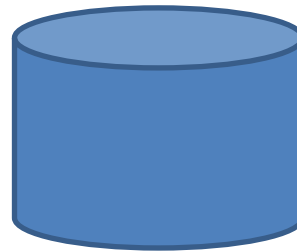


#	Type	ID	Name	Summary	Creator	Status	%	Created	Updated
1	Plasmid	JBEI_p00001	p00001	clone to base	complete	15 Apr 2009			
2	Plasmid	JBEI_p00002	p00002	clone to base	complete	15 Apr 2009			
3	Plasmid	JBEI_p00003	p00003	clone to base	complete	15 Apr 2009			
4	Plasmid	JBEI_p00004	p00004	clone to base	complete	15 Apr 2009			
5	Plasmid	JBEI_p00005	p00005	clone to base	complete	15 Apr 2009			
6	Plasmid	JBEI_p00006	p00006	clone to base	complete	15 Apr 2009			
7	Plasmid	JBEI_p00007	p00007	clone to base	complete	15 Apr 2009			
8	Strain	JBEI_s00001	Strain s00001	clone to base	complete	15 Apr 2009			
9	Strain	JBEI_s00002	Strain s00002	clone to base	complete	15 Apr 2009			
10	Strain	JBEI_s00003	Strain s00003	clone to base	complete	15 Apr 2009			
11	Strain	JBEI_s00004	Strain s00004	clone to base	complete	15 Apr 2009			
12	Strain	JBEI_s00005	Strain s00005	clone to base	complete	15 Apr 2009			
13	Strain	JBEI_s00006	Strain s00006	clone to base	complete	15 Apr 2009			
14	Strain	JBEI_s00007	Strain s00007	clone to base	complete	15 Apr 2009			
15	Strain	JBEI_s00008	Strain s00008	clone to base	complete	15 Apr 2009			

JBEIR



Core Data

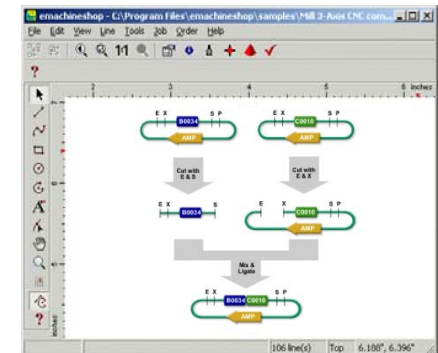
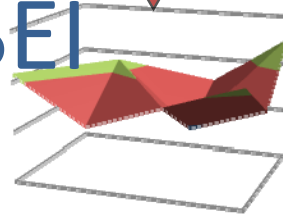


Clotho/JBEI



Clotho

JBEI



JBEIR: Current Work

- Getting ready for a **public release**. Coming this summer.
 - Set up your own instance of the registry.
 - Contact me for a **preview** release.
 - Public Registry to deposit your parts.
- Share data with other software
 - Clotho, Synthetic Biology Core Data Model
- Integration of graphical annotation tools
 - This Summer

Thank you

Thanks goes out to:

- Zinovii Dmitriv
- Blake Simmons
 - Paul Adams
- Wayne Townsend
 - Will Holtz
- Swap Chhabra
 - Jay Keasling
 - JBEI