

BRISKit update

Biomedical Research Infrastructure Software Service kit

A vision for cloud-based open source research applications

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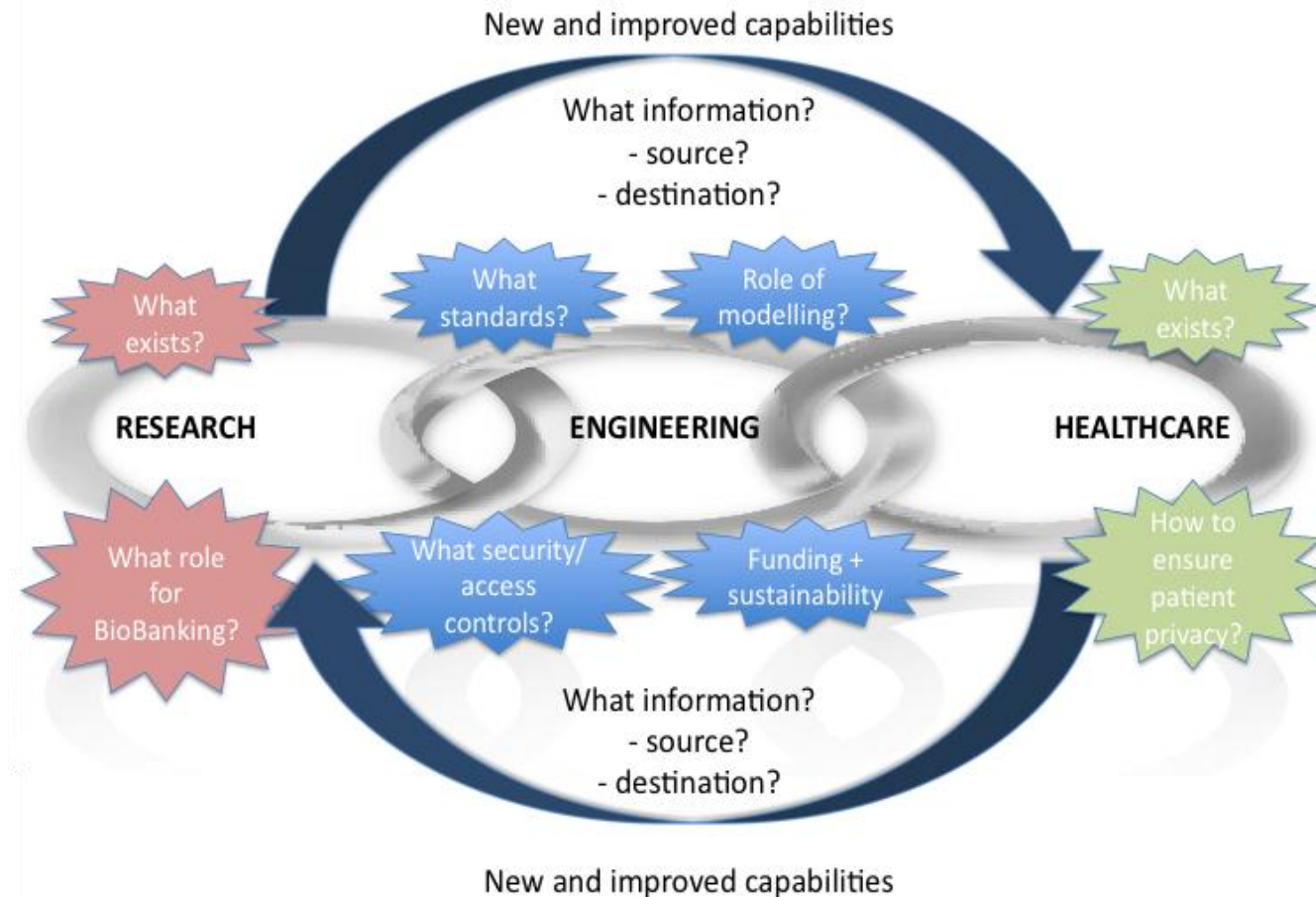
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BRISKit context:

need for data scientists / knowledge engineers!

The I4Health goal of applying knowledge engineering to close the 'ICT gap' between research and healthcare (Beck, T. et al 2012)



BRICCS - *the story so far*

Biomedical Research Informatics Centre for Cardiovascular Science

- End-to-end informatics support for the Leicester Cardiovascular Biomedical Research Unit
- Largely via the use of open source tools
 - Electronic data capture
 - Sample / specimen management
 - Research data management
 - Research project / registration management

BRICCS

Biomedical Research Informatics Centre for Cardiovascular Science

- Collects data only for consented participants.
- Patient identities validated against UHL 'S' number.
- Bridges UHL and university domains.
- Provides sophisticated cohort selection criteria for future research projects (e.g. 'people with existing diagnosis of A, with a family history of B, who have taken C for more than six months, have undergone procedure D and have blood sample E in our lab').

BRISKit components = web services

CiviCRM

Enables end-to-end contact management for volunteers and research participants, tracking approaches, contact, responses, recruitment, exclusions.

CiviCRM was designed for the 'civic sector' and has an object model that reflects community building and non-profit relationships.

CiviCRM 3.1 Demo Site

Home > CiviCRM

最近項目: dan rol

新個人

名字:

姓氏:

電子郵件:

儲存

我的聯絡人總覽

即將舉辦的活動

test
May 31st, 2010

demo

- CiviCRM
- My account
- Log out

首頁

設置您的控制面板

更新控制台資訊

Activities

Type	Subject	Added By	With	Assi To
Meeting		demo@example.com		
Recibido correo	contestar a javier	demo@example.com	berberecho, javier	

Event Income Report (Summary)

Event Summary

Month Beginning	Membership Type	Member Count	Total Payments Made	Contribution Count	Average
February 2009	General	3	\$ 0.00	0	\$ 0.00
February 2009	Student	1	\$ 0.00	0	\$ 0.00
	SubTotal	4	\$ 0.00	0	\$ 0.00
Subtotal		4	\$ 0.00	0	\$ 0.00
January 2010	General	2	\$ 0.00	0	\$ 0.00
January 2010	Student	2	\$ 0.00	0	\$ 0.00
	SubTotal	4	\$ 0.00	0	\$ 0.00
February 2010	General	9	\$ 0.00	0	\$ 0.00
February 2010	Student	11	\$ 0.00	0	\$ 0.00
February 2010	Lifetime	2	\$ 0.00	0	\$ 0.00
	SubTotal	22	\$ 0.00	0	\$ 0.00
May 2010	Mem Org	1	\$ 0.00	0	\$ 0.00
May 2010	Mem Org 2	1	\$ 0.00	0	\$ 0.00
	SubTotal	2	\$ 0.00	0	\$ 0.00
Subtotal		28	\$ 0.00	0	\$ 0.00
Grand Total		32	\$ 0.00	0	\$ 0.00

OBiBa Onyx

Records participant consent, questionnaire data and primary specimen IDs.

Web-based, secure data entry by research staff. E.g. used for all patient recruits in LCBRU - mobile computing on wards and outpatient clinic in TMF.

Await significant new release...

Participant

Participant ID **BP100112928**
First Name **VICTORIA**
Last Name **SEIDU**

Interview

Start Date **26-05-2010 14:54**
End Date **27-05-2010 10:27**
Status **Completed**

Log

Stages

#	Name	Status	Start	End	Log
1	Acute Verbal Consent for samples collection	Skipped (Participant not an acute admission)	14:55	14:55	<input type="button" value="View"/>
2	Participant Consent	Completed	14:56	15:02	<input type="button" value="View"/>
3	Paper Consent	Completed	15:02	15:03	<input type="button" value="View"/>
4	Recruitment Context	Completed	15:06	15:06	<input type="button" value="View"/>
5	Risk Factor	Completed	15:07	15:16	<input type="button" value="View"/>
6	Samples Preliminary	Completed	15:16	15:18	<input type="button" value="View"/>
7	Blood Samples Collection	Completed	15:19	15:30	<input type="button" value="View"/>
8	Urine Sample Collection	Completed	16:07	16:07	<input type="button" value="View"/>
9	End of Patient Contact	Completed	15:31	15:32	<input type="button" value="View"/>
10	Medical History	Completed	15:32	15:59	<input type="button" value="View"/>
11	Data Submission	Completed	15:59	16:06	<input type="button" value="View"/>
12	Conclusion	Completed	10:26	10:27	<input type="button" value="View"/>

Nick Holden - 2010-06-08 - 16:02:30

OBiBa / 1.7.0-669446

caTissue

Holds data on primary, derived and aliquot specimen, including linear and 2d barcodes.

Storage inventory, order tracking - currently over 30,000 LCBRU samples stored and recorded.

i2b2

Data from multiple data sources combined into multiple ontologies for flexible and sophisticated searching, cohort discovery and research.

The screenshot displays the i2b2 Workbench interface. The 'Export Data' window is active, showing options for exporting patient mappings. The 'Export Tables' tab is selected, with 'Return patient mappings within obs. set' chosen. The 'Save To Directory' is set to 'C:\Documents and Settings\nholden\Desktop'. A progress bar indicates the export is complete.

The 'Analysis View' window shows a tree of queries. The selected query is 'Type2 30-79 NoAF Y@05:43:13 [03-02-2012] [demo]'. The 'Age patient breakdown' analysis is highlighted, and a bar chart is displayed.

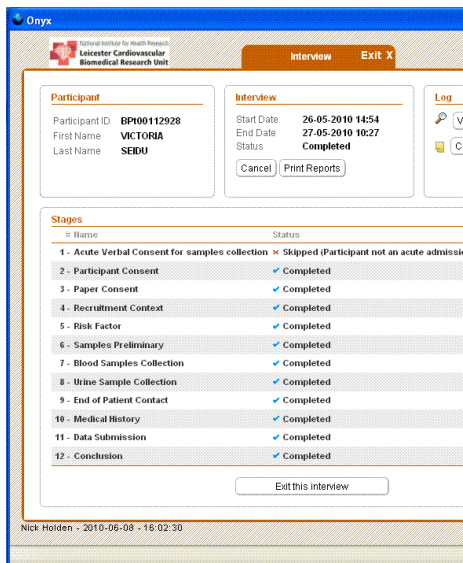
The bar chart, titled 'Age patient breakdown', shows the number of patients in different age groups. The x-axis represents age ranges from 0 to 9 to 100 to 109. The y-axis represents the number of patients, ranging from 0 to 60. The bars are red, and the highest number of patients is in the 60 to 69 age group.

Age Group	Number of Patients
0 to 9	0
10 to 19	0
20 to 29	0
30 to 39	0
40 to 49	10
50 to 59	40
60 to 69	60
70 to 79	40
80 to 89	0
90 to 99	0
100 to 109	0

The semantic bridge

OBIa Onyx

Records participant consent, questionnaire data and primary specimen IDs

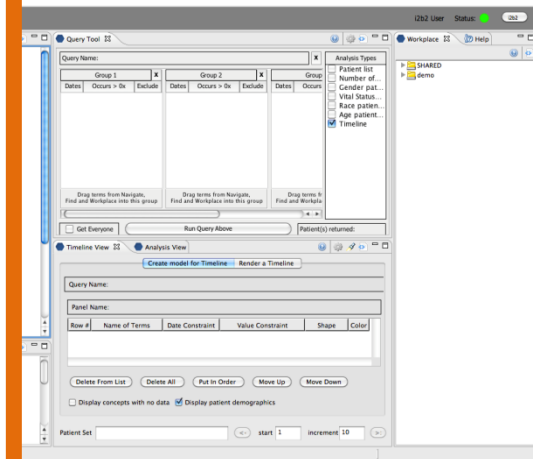


Bio-ontology!

- Classes
 - BrissKitQuestionnaire
 - RiskFactorAlcohol
 - RiskFactorCigars
 - RiskFactorCigs
 - RiskFactorDietExercise
 - RiskFactorFamilyHistory
 - RiskFactorOtherTobacco
 - RiskFactorSocioeconomic
 - RiskFactorTobacco
 - HPO
 - All
 - Phenotypic abnormality
 - Abnormality of the cardiovascular system
 - Abnormality of the hematopoietic system
 - ICD10
 - Diseases of the circulatory system
 - Diseases of the skin and subcutaneous tissue
 - Factors influencing health status and contact with health services
 - Persons encountering health services in other circumstances
 - LOINC
 - LOINCCLASSTYPES
 - Clinical Class
 - Functional status (e.g. Glasgow)
 - Gastrointestinal endoscopy
 - Medical Devices
 - SNOMED-CT
 - Clinical finding
 - Functional finding
 - Hepatorrhaphy
 - Observable entity
 - Organism
 - Social and personal history finding
 - Substance
 - Tobacco smoking behavior - finding
 - Tobacco use and exposure - finding

2

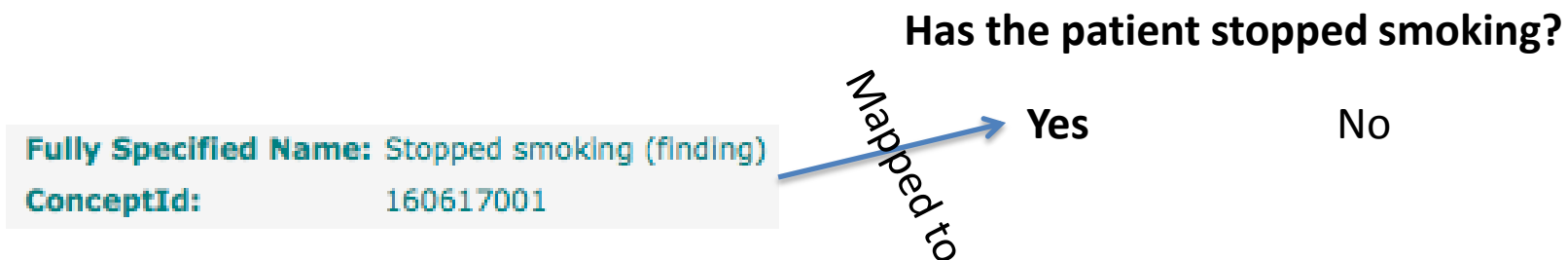
port selection and querying



Building Questionnaires with ontologies

- Researcher determines questions and ontologies to use
- While designing questionnaire with Onyx, researcher maps question answers to ontology codes

e.g.



BRISKit ontology tree builder

- Accepts questionnaire design from Onyx
- Allows use any of the 297 ontologies in BioPortal
- Builds an ontology-slim tree:
 - Some ontologies are unmanageable in their full form e.g. SNOMED-CT has 400,000 classes!
 - Only includes terms used in the questionnaire
- Also builds a tree following the questionnaire design
- Outputs in useful formats
 - For use in ontology browsers and of course i2b2!

Ontologies displayed in i2b2

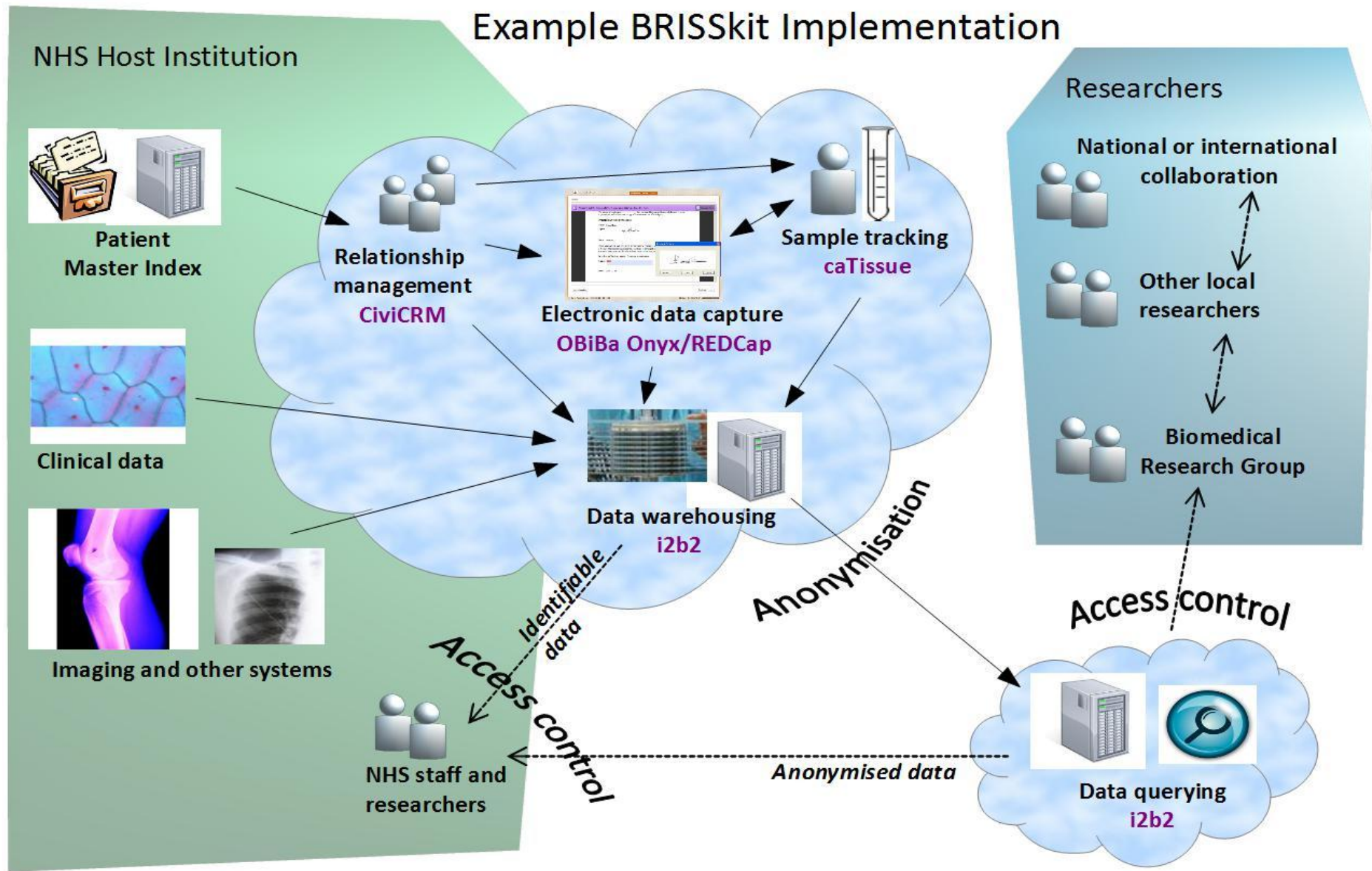
Questionnaire ontology

BioPortal ontologies

The screenshot displays the i2b2 Workbench for Briccs2 interface. The top bar shows the user is logged in as 'i2b2 User' with a green status indicator. The main window is divided into several panes:

- Left Pane (Ontology Tree):** A hierarchical tree of ontologies. The top section, labeled 'Questionnaire ontology', includes 'Onyx Ontology' and 'BrissKitOntology' (with sub-items like 'BrissKitQuestionnaire', 'RiskFactorAlcohol', etc.). The bottom section, labeled 'BioPortal ontologies', includes 'HPO', 'ICD10', 'LOINC', 'SNOMED-CT', and various clinical and behavioral findings.
- Top Middle Pane (Query Tool):** A window for creating queries. It features a 'Query Name' field, three groups (Group 1, Group 2, Group 3) for organizing terms, and an 'Analysis Types' list on the right. The 'TimeLine' analysis type is checked. Buttons for 'Get Everyone', 'Run Query Above', and 'Patient(s) returned:' are visible.
- Bottom Middle Pane (Timeline View):** A window for visualizing query results. It includes a 'Query Name' field, a 'Panel Name' field, and a table with columns: 'Row #', 'Name of Terms', 'Date Constraint', 'Value Constraint', 'Shape', and 'Color'. Below the table are buttons for 'Delete From List', 'Delete All', 'Put In Order', 'Move Up', and 'Move Down'. There are also checkboxes for 'Display concepts with no data' and 'Display patient demographics'. At the bottom, a 'Patient Set' field is followed by navigation controls: '<<< start: 1 increment: 10 >>>'.

all components ready for service July 2012



Transition to cloud computing

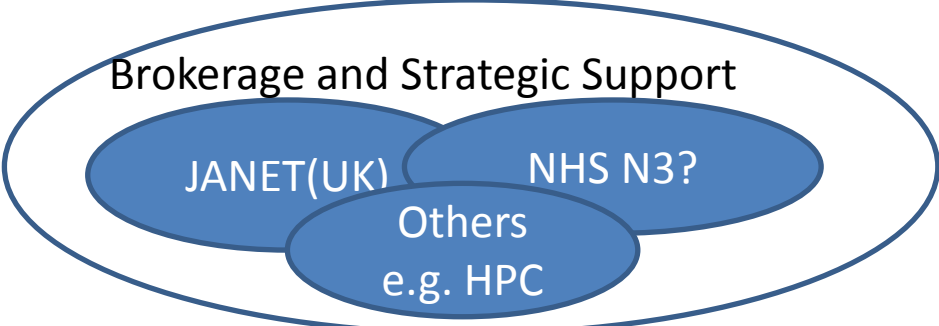
Virtualisation + Service Computing = Cloud computing

- Infrastructure-as-a-Service: accessing cloud-hosted virtual machines
- Platform-as-a-Service: accessing a cloud-hosted environment
- *Software-as-a-Service: accessing a cloud-hosted application, such as BRISKit*
- ***NHS-HE JANET connectivity***
 - Web services
 - Rapid flexibility
 - Scalability - location-transparent resource pooling
 - On-demand and self-service
 - Ubiquitous access with high levels of security and compartmentalisation
 - Measured service, with payments geared to usage

Universities and their users

<http://www.brisskit.le.ac.uk>

Advice and requirements response



<http://www.janetbrokerage.ac.uk>

SLAs Ts and Cs
Compliance monitoring

<http://umfcloudpilot.eduserv.org.uk>



Service delivery and support

Service delivery and support



BRISKit Project Phase 1 Status

Project Phase 1 Start Date: 1st July 2011

Project Phase 1 End Date: 30th June 2012

Development is done iteratively under 3 Release Cycles

✓ Release 1 - 31st July 2011 -31st Jan 2012

✓ Status - Completed

✓ Release 2 - 1st Feb 2012 - 31st March 2012

✓ Status - Completed

✓ Release 3 - 1st April 2012 - 30th June 2012

✓ Status – Ongoing

Milestones achieved:

- Implemented cloud infrastructure on Eduserv test platform
- 3 of 4 components operationally ready now, final one by end June 2012
- Onyx-i2b2 integration deployed in genetics
- civiCRM-caTissue-i2b2 integration – under user evaluation
- BRISKit sustainability plan, community building & partnering support groups

Who is BRISKit for?

Modular approaches and scalable tools with open source licenses make good investments

- *Individual researchers and associates*
 - enterprise-level tools without the IT overheads
- *Research themes and departments*
 - stand-alone instances of required tools to accelerate research
- *Research units and centres*
 - integrated toolkit with clinical data loading services, or 'jigsaw pieces' to complement existing provision

www.brisskit.le.ac.uk

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BRISSkit - Biomedical Research Infrastructure Software Service kit

Overview

BRISSkit will design a national shared service brokered by JANET to host, implement and deploy biomedical research database applications that support the management and integration of tissue samples with clinical data and electronic patient records. We are uniquely positioned to tackle this through our experience in developing the pioneering open source IT infrastructure for the Biomedical Research Informatics Centre for

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Building the BRISKit community

- **PILOT GROUPS:** new JISC funding for sustainability & uptake, July 2012 - Mar 2013
 - University Hospitals Leicester Trust (NHS-HE)
 - Cardiovascular BRU & new Respiratory BRU *
 - New Lifestyle BRU (Loughborough-Leicester)
 - Institute for Child Health (UCL) *
 - School of Cancer Studies (Birmingham) *
- **Many OTHER GROUPS** with firm interest nationally, e.g.
 - Kings Health Partners BRC, Institute of Cancer Research, Arthritis UK, Cancer Research UK
 - YHMAN Yorks & Humber community cloud (Bradford, Huddersfield, Hull, Leeds, Leeds Met, Sheffield, York) via JANET brokerage?
 - 50+ attendees to Jan 2012 workshop in Leicester (Institute for Cancer Research, Oxford, Birmingham, Sheffield, Loughborough, Manchester, UCL, Leeds & Northumbria)
 - **Community workshop in Leicester + Hack Day - early Sep 2012**

Sustainability phase outcomes

- Harden service
 - VM management & service management
 - Activate new users
 - Integrating distributed data sources
 - Thoroughly test demand through independent evaluation
 - Customisation process commoditised
 - Investable business plan
- Transitioning to longer term service & sustainability

Current and Potential Technical Partners

Krishagni



PERSISTENT

Total Cost of Ownership of Open Source Software

LSE report for the UK Cabinet Office Sept 2011

Benefits of Open Source approach

- Reliability, stability
- Freedom to alter or adapt the software - no 'tie in'
- Lower costs - no upgrade licenses
- Interoperability - lower barriers to integration
- Capabilities for data sharing enhanced

Phase	Cost Savings	BRISKit Application
Search	Cost of up-front evaluation study Cost of up-front proof of concept	
Acquisition	Initial Cost of Software Cost of Customisation	Tissue Management Electronic Data Capture Translational Data Management Central Participant Registration
Integration	Cost of Integration	Tissue Management Electronic Data Capture Translational Data Management Central Participant Registration
Use	Annual software costs Software scaling (user or transactions) Data Capture (re-use)	Tissue Management Electronic Data Capture Translational Data Management Central Participant Registration
Retire	Exit costs (hardware and software) Exit costs (changeover, re-training) Exit costs (data migration)	

BRISKit - Community Sustainability

- **Partnership (indirect service) Model**
 - **BRISKit partnership agreement**
 - **Partners deliver all direct client services - training, integration, first line support**
 - **Private clouds running BRISKit software encouraged**
 - **% Revenues sustain central software support, maintenance and training**
- **Direct Service Model**
 - **BRISKit direct service agreement with clients**
 - **Single central cloud service with preferred partners**
 - **All revenue sustains central support, maintenance and training**
- **Community Model**
 - **Client pay/donate to BRISKit Community membership fund**
 - **Direct access to central cloud service with preferred partners but no service levels**
 - **Funds sustain central support, maintenance and training**

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