How do I know that I have preserved software?

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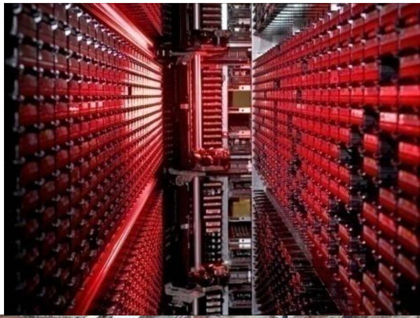
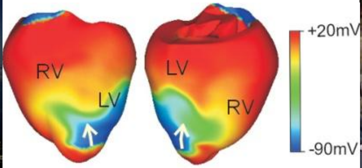
- Provide large-scale scientific facilities for UK Science
  - particularly in physics and astronomy
- E-Science Centre – at RAL and DL
  - Provides advanced IT development and services to the STFC Science Programme
  - Strong interest in Digital Curation of our science data
  - Keep the results alive and available
  - R&D Programme: CASPAR, SCAPE, APARSEN
- STFC Interest
  - Keeping science data usable for long periods
  - Specialised scientific analysis software
  - Needs to be kept along with the data
  - s/w preservation projects





Work on software preservation

- JISC projects (2007-09):
  - Report on the Significant Properties of Software
  - Tools & Guidelines for the preservation of software as a research output
- Software very large topic
  - Diversity in:
    - *application of software*
    - *software architecture*
    - *scale of software*
    - *provenance*
    - *user interaction*
- Project scoped to
  - Scientific and mathematical software
  - Limited commercial consideration
  - Limit consideration of user interaction

Developed a framework for software preservation properties.

Software Preservation...

.... is worth doing

- There are good reasons for us to try to preserve software

.... is complex

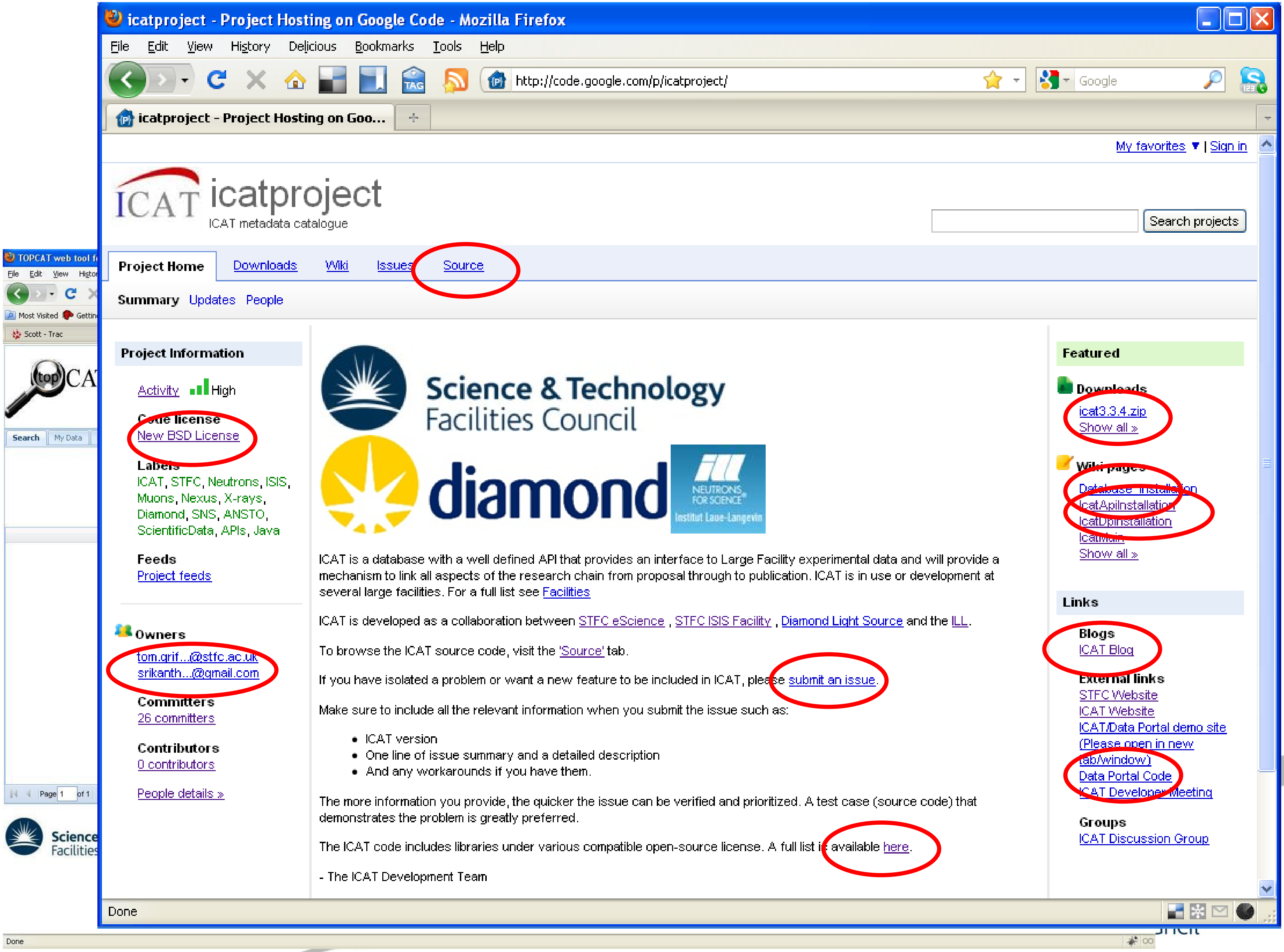
- Software not easy to define.
- Software has lots of different components and dependencies
- Software operates in a complex environment

.... can be done in lots of different ways

- Preservation, emulation, migration, cultivation, hibernation ...
- Each strategy has different consequences and cost/benefits

How do we know:

- What to preserve ?
- Whether we have done it right ?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Activity High

Code license
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Labels
ICAT, STFC, Neutrons, ISIS, Muons, Nexus, X-rays, Diamond, SNS, ANSTO, ScientificData, APIs, Java

Feeds
Project feeds

Owners
tom.grif...@stfc.ac.uk
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Committers
26 committers

Contributors
0 contributors

People details »

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diamond

NEUTRONS FOR SCIENCE Institut Laue-Langevin

ICAT is a database with a well defined API that provides an interface to Large Facility experimental data and will provide a mechanism to link all aspects of the research chain from proposal through to publication. ICAT is in use or development at several large facilities. For a full list see Facilities

ICAT is developed as a collaboration between STFC eScience , STFC ISIS Facility , Diamond Light Source and the ILL.

To browse the ICAT source code, visit the 'Source' tab.

If you have isolated a problem or want a new feature to be included in ICAT, please submit an issue.

Make sure to include all the relevant information when you submit the issue such as:

- ICAT version
- One line of issue summary and a detailed description
- And any workarounds if you have them.

The more information you provide, the quicker the issue can be verified and prioritized. A test case (source code) that demonstrates the problem is greatly preferred.

The ICAT code includes libraries under various compatible open-source license. A full list is available here.

- The ICAT Development Team

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ICAT/Data Portal demo site (Please open in new tab/window)
Data Portal Code
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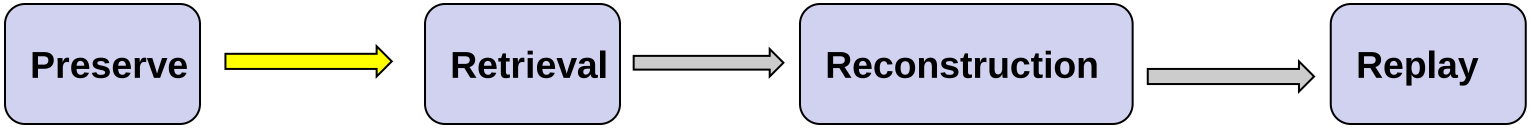
Software Preservation Steps



- What do we do when we preserve software?
  - Identify a number of related digital artefacts to preserve
- What do we do when we want to use it again ?
  - Find the right software artefacts to use
  - Reconstruct them into a executable system.
  - Replay the execution of the system

How do I judge now that what I have preserved is “enough” ?

What we need to support retrieval?

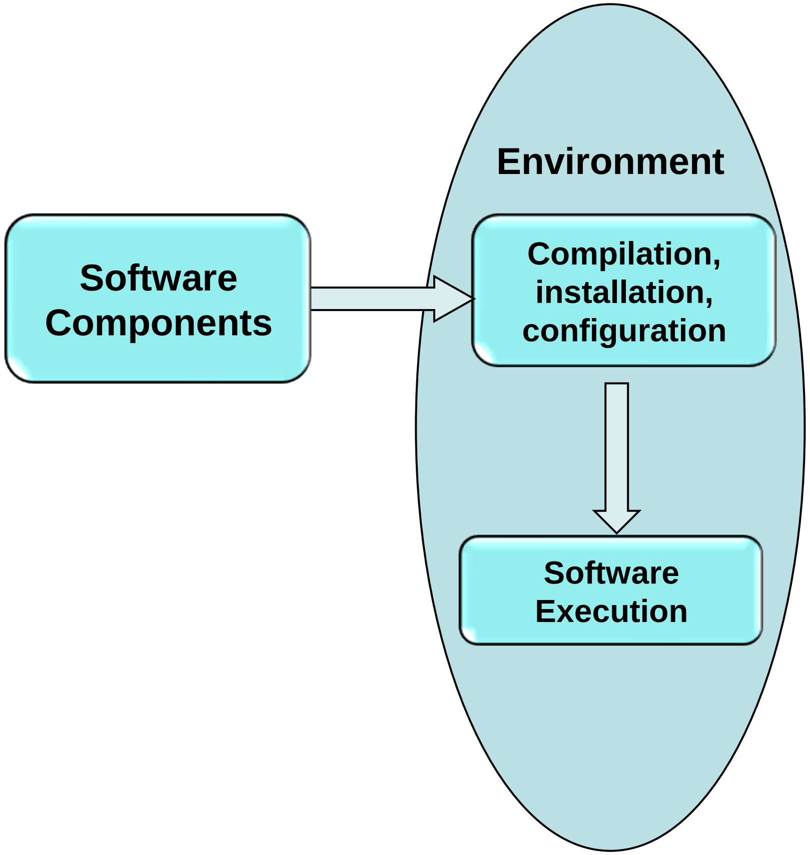
Software Components

- Gross functionality:
  - Description of what the product does
  - Major input and outputs
  - Categorisation under a controlled vocabulary (e.g. GAMS)

Data

- Ownership and legal control, licensing
- Provenance
- General software architecture principles

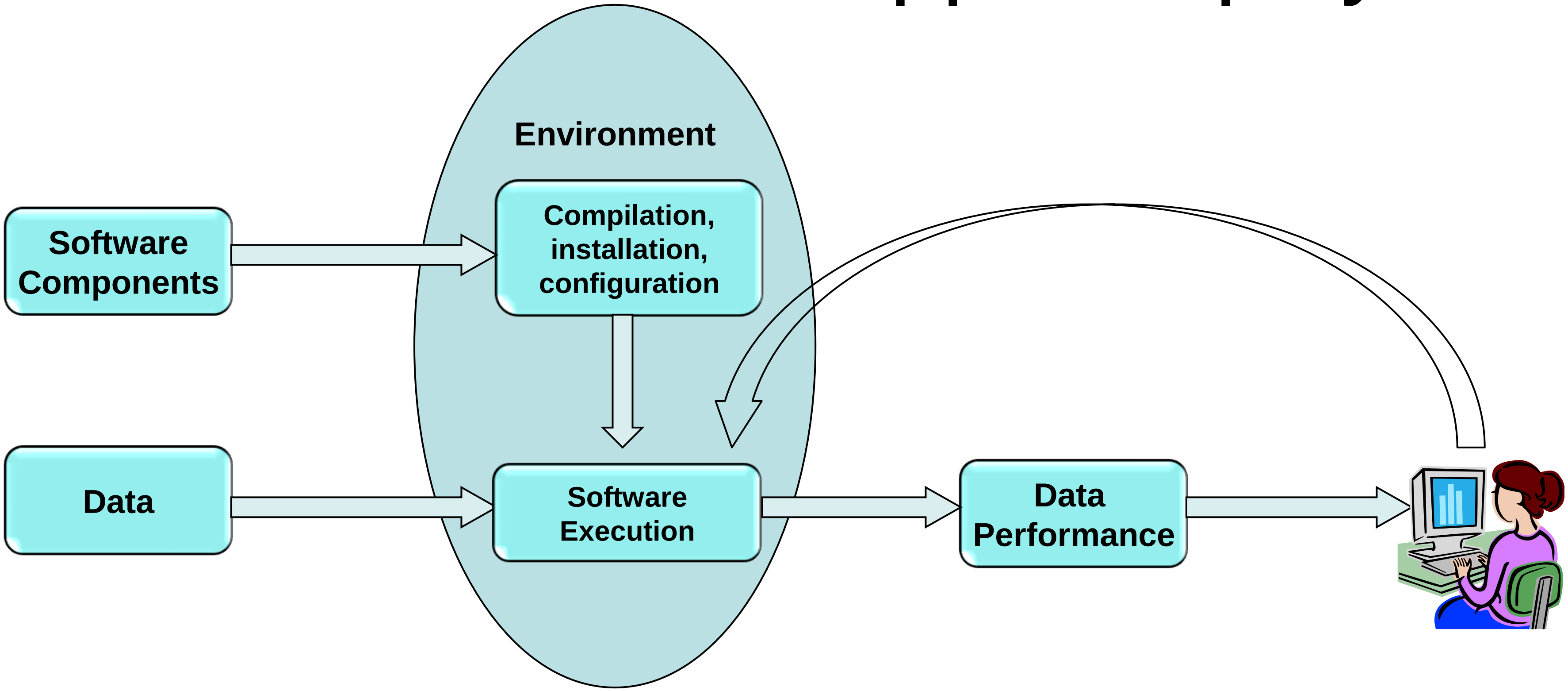
What we need to support reconstruction?



- Set of components and their dependencies
  - Including installation, configuration and build as necessary
- Programming language details
  - Compiler version if needed
- Specific operating system
- Specific hardware platform if needed
  - Including any dependencies on peripherals
- Specifics on required machine performance
  - RAM and disk space, processor speed, screen resolution
- Auxiliary libraries
- Auxiliary tools (with version)

May have versions and variants for different platforms

What we need to support replay?



- Detailed functional description
  - Input formats, output formats, API, error handling
- User Interaction model
- Programming languages
- Non-functional behaviour
  - Response speed, data size, security
- Usage documentation

How do I judge now that what I have preserved is "enough" ?

- Based on the NAA performance model for digital preservation
  - The test of the success of our preservation is the ***performance of the data for the user***
- The Replay information are the **Significant Properties**

  "those characteristics of digital objects that must be preserved over time in order to ensure the continued accessibility, usability, and meaning of the objects"
- Testing data performance to judge ***adequacy*** of the software performance.

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Adequacy of Software Preservation

A software package can be said to perform adequately relative to a particular "significant property", if in a particular performance it preserves those significant properties to an acceptable tolerance.

- Significant properties are evaluable features of the performance
- After the recall and reconstruction phase
- Supply **test cases** to evaluate the adequacy against properties
- Assesses the value of the replay
- ***Can be generalised to any digital object***

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Example Test Cases

- So tests on relevant significant properties need to be supplied
  - "the system should calculate the Fast Fourier Transform"
  - "the result must accurate to 8 decimal places"
  - "the pagination has to remain the same"
  - "the system should respond in 0.4- 0.8 seconds"
  - "The user must be able to enter a 6 digit number representing a parameter"
  - "the user must be able to enter a 6 digit number representing a parameter in a text box on the upper left of the screen"
  - "the output should distinguish roads and rivers"
  - "rivers should be in blue (0000ff), roads in red (ff0000)"
- Need to supply test suites to prove that the preservation should be adequate on replay.

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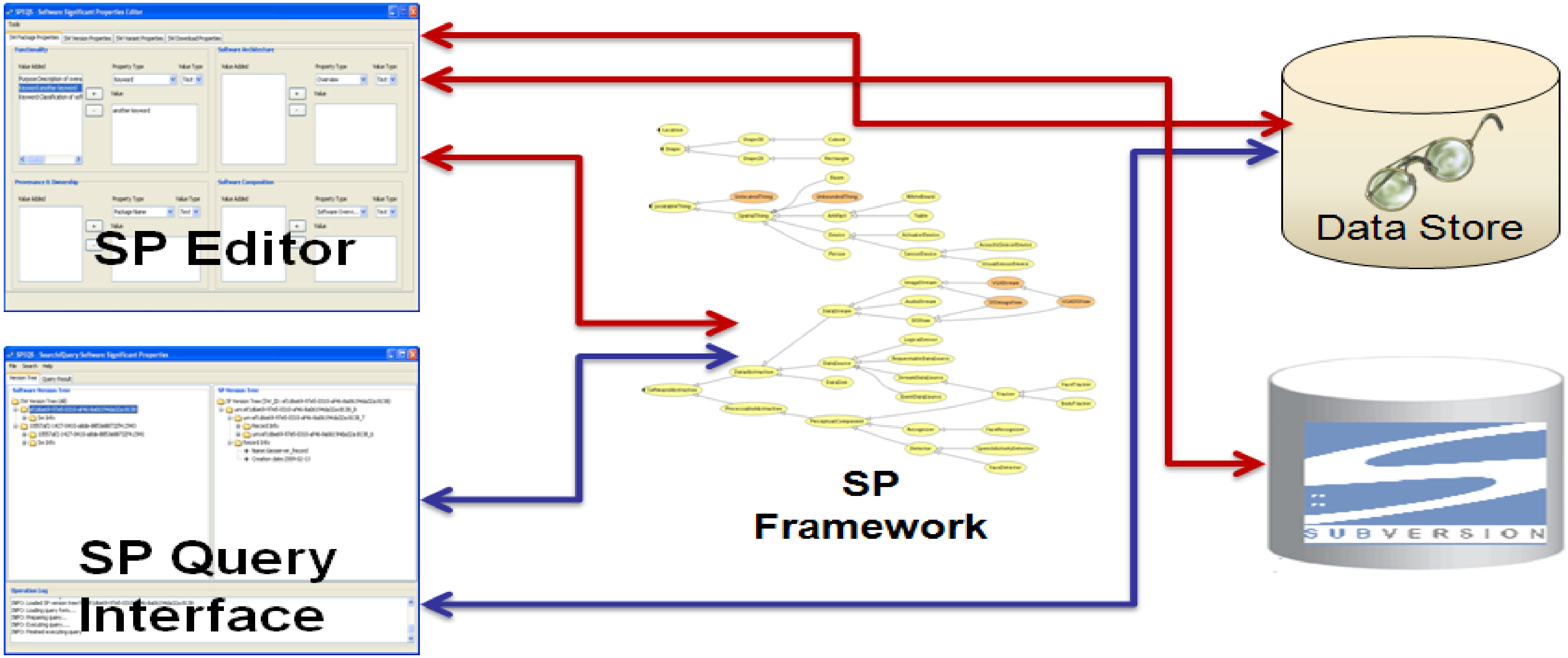
Significant Properties Editing and Querying for Software (SPEQS)



- Java-based Eclipse plug-in
- Enables capturing software preservation properties during its development
- Demonstrates the concept of preservation tools that could be integrated within existing **software development** systems

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Preserving Legacy?

- Software repositories
  - – Managed with preservation in mind
  - – Provides capacity to capture relevant metadata
  - – Encourage the right documentation
- PaNSoft
  - – Software repository for Photon and Neutron data analysis software

Summary

- A framework for software preservation
  - Conceptual model of software
  - What components to preserve?
  - Preservation properties of software
  - Performance and adequacy
  - Fits in a OAIS compatible preservation methodology

- Validated in some practical scenarios
  - More validation and tools
  - In a methodology – risks and benefits
  - Integrated with a software repository.

- Ideally considered within a software engineering process
  - Good version control
  - Good documentation
  - Testing and test cases key to assuring adequacy of preservation.

Good software engineering leads to good software preservation.

http://sigsoft.dcc.rl.ac.uk/twiki/bin/view

http://www.e-science.stfc.ac.uk/projects/software-preservation/preserving-software.html

Thank You

Questions?

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http://www.e-science.stfc.ac.uk

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