The Development of a Native Cross-Platform iRODS GUI Client

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June 11, 2015

Introduction

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- Ilari Korhonen, working as a Systems Designer at the IT Services department, University of Jyväskylä, Finland
- Doing research IT infrastructure development at JYU
- JYU is a mid-sized university with about 15,000 students in 7 faculties and has a strong focus on research as well as education

iRODS at JYU

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- My mission: a campus-wide iRODS data grid infrastructure for research data storage applicable to all fields of science
- Vast amount of requirements from different fields of science as well as legislation
- Physics, chemistry, biology, etc. produce large amounts of data in many different formats – both open and proprietary
- Social sciences, biology, psychology, etc. deal with sensitive data subject to legislation
- In almost all of the use cases proper metadata management is crucial

Research Data at JYU

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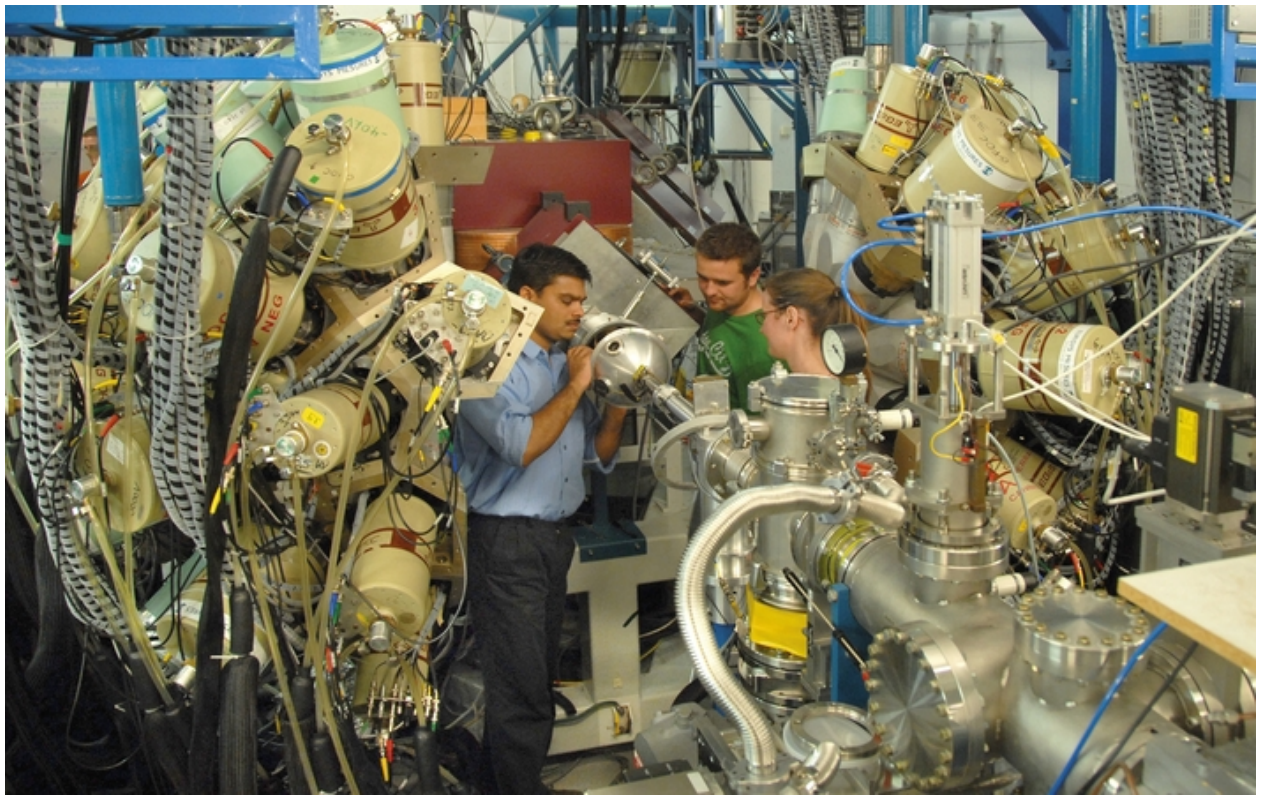

Research Data at JYU

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Requirements for iRODS Deployment

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- Secure data and metadata transfer
- Integration with external authentication (LDAP/Kerberos)
- Metadata extraction and management of some of the most crucial data formats in use
- Audit Trails for management of sensitive data
- High Availability and Scalability (no less than our EMC NAS)
- Ease of use – even for users with less techical skillsets

iRODS Clients

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- iRODS has many different (kinds of) client applications
- The reference implementation being the iRODS icommands command line tools package
- The iDrop project at DICE has implemented a Java client and a web interface built on their Jargon Java iRODS library
- DICE has also lately implemented a WebDAV interface on top of Jargon to replace Davis – which is no longer supported.
- Also other projects have existed but are no longer being supported or even compatible with the current iRODS version

Project Kanki - Why?

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- Goal: To build a fully native, cross-platform iRODS client application with a rich graphical user interface
- *Kanki – e.g. a rods in Finnish, cold or frost in Japanese*
- We really needed something to integrate seamlessly with iRODS 4.x to fully leverage the new modular architecture
- The ability to be able to use the iRODS 4.x auth and network transport modules out-of-the-box is great!
- Also, we did seem to have some special requirements for metadata management – for which we can now build custom metadata editors

The Benefits of a Desktop Client App

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- Web applications still have a lot of limitations
- The numerous incompatiblities between different browsers – especially with the certain unmentionable one
- For example dealing with large iRODS data objects can be problematic because of memory issues

Why Go Native?

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- Many reasons, one above all else – performance
- Also, seamless intergration with iRODS 4.x features as well as the features of upcoming releases!
- E.g. Kerberos authentication and SSL transports work great

What About Portability?

- With native development portability issues are a reality
- This can be mitigated by using only std C++ and portable frameworks instead of OS interfaces
- A single codebase is ideal – which can be achieved
- The Qt framework has proven to be an exellent choice for cross-platform development

About Qt

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- Originally developed by Haavard Nord and Eirik Chambe-Eng the two of which founded TrollTech, Inc. in Norway
- Stands for Q Toolkit – apparently Q was considered to be a pretty letter in Haavard Nord's emacs font
- May 20, 1995 Qt 0.90 was uploaded to `sunsite.unc.edu`.
- Today Qt is actually Finnish owned and is the leading platform for cross-platfrom GUI development
- Many mobile and embedded platforms are supported as well

Some Points About Qt Development

- Qt heavily leverages threads so code should be thread-safe
- A thread safe calling convention called signal-slot interface
- To make the call interface easier, it is supported by extensive precompiler macros
- Qt 4 introduced a MVC (Model-View-Controller) architecture
- Abstract models can be extended to build custom models and associated with many different kinds of view objects (which Qt has many of)
- Also there is a UI compiler for building UI objects from XML

Project Kanki - So Far

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- An object-oriented interface for iRODS
- Has all of the basic iRODS features implemented in the GUI
- A metadata editor with schema management with namespace separation and attribute management
- Compiles against iRODS 4.0 on both Linux and OS X (will do it with iRODS 4.1 next week)
- Windows support possible when it will be added to iRODS 4.x
- Still work in progress but soon to be released as beta
- A source release has been discussed and is probably out by the end of summer.

Object-Oriented C++ Interface for iRODS

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```
Kanki::RodsGenQuery metaQuery(this->conn);
int status = 0;
if (this->objDatum->objType == DATA_OBJ_T) {
    metaQuery.addQueryAttribute(COL_META_DATA_ATTR_NAME);
    metaQuery.addQueryAttribute(COL_META_DATA_ATTR_VALUE);
    metaQuery.addQueryAttribute(COL_META_DATA_ATTR_UNITS);
}
else if (this->objDatum->objType == COLL_OBJ_T) {
    metaQuery.addQueryAttribute(COL_META_COLL_ATTR_NAME);
    metaQuery.addQueryAttribute(COL_META_COLL_ATTR_VALUE);
    metaQuery.addQueryAttribute(COL_META_COLL_ATTR_UNITS);
}
// add a query condition for object name
metaQuery.addQueryCondition(this->objDatum->objType == DATA_OBJ_T ? COL_DATA_NAME : COL_COLL_NAME,
                            Kanki::RodsGenQuery::isEqual, this->objDatum->objName);
// if we are querying a data object also specify collection path
if (this->objDatum->objType == DATA_OBJ_T)
    metaQuery.addQueryCondition(COL_COLL_NAME, Kanki::RodsGenQuery::isEqual, this->objDatum->collPath);
// execute genquery and get status code from iRODS API
if ((status = metaQuery.execute()) < 0) {
    // error reporting code
}
else {
    std::vector<std::string> names = metaQuery.getResultSet(0);
    std::vector<std::string> values = metaQuery.getResultSet(1);
    std::vector<std::string> units = metaQuery.getResultSet(2);
}
```

To Do – Features To Be Added

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- Full drag & drop integration to and from the desktop and inside the iRODS grid browser window
- A search interface with arbitrary criteria based on iRODS object attributes as well as AVU metadata
- Metadata validation against the configured schema
- Custom editors for metadata attributes
- A Rule Exec interface for submitting user rules to iRODS
- iRODS Access Control List Editor
- Synchronization of local directories to iRODS collections
- If you have suggestions?

Demo and Questions?

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Thank you for your interest!