IRMIS: a practical Ansatz for an Accelerator *Operations* DB?

S. Herb, 24.09.07

What is IRMIS ?

'*Integrated Relational Model of Installed Systems*'

(ANL, SLAC, …) http://www.aps.anl.gov/epics/irmis/index.php

Currently Includes three Pieces

PV (PROCESS VARIABLE) DB : EPICS control system specific

('crawler' builds DB of current PVs by queries to IOCs)

Control System Components DB: **NOT** EPICS specific **

(+ possibility of extending to other accelerator components)

Cabling DB: **NOT** EPICS Specific

(but too Utopian for present consideration)

IRMIS Overview: “Purpose”

Maintain up-to-date documentation of the components **now installed** in the accelerator, and of the **relationships** between them

Present this information in various **views** appropriate to the questions which arise during accelerator operation and maintenance

Examples (from IRMIS Overview writeup)

- Where does the other end of this cable go?
- What components do all of these non-functioning devices have in common?
- Which module type in this system has the worst reliability history?
- How many devices of a particular model number are installed?
- Where are all the devices of a particular model number installed?
- What application software will be affected if this device is removed?
- What equipment will be affected when this breaker is locked-out?

Component Relationships

- Power hierarchy

(where does each device get its power?)

- Housing hierarchy

(what does each device physically plug into?)

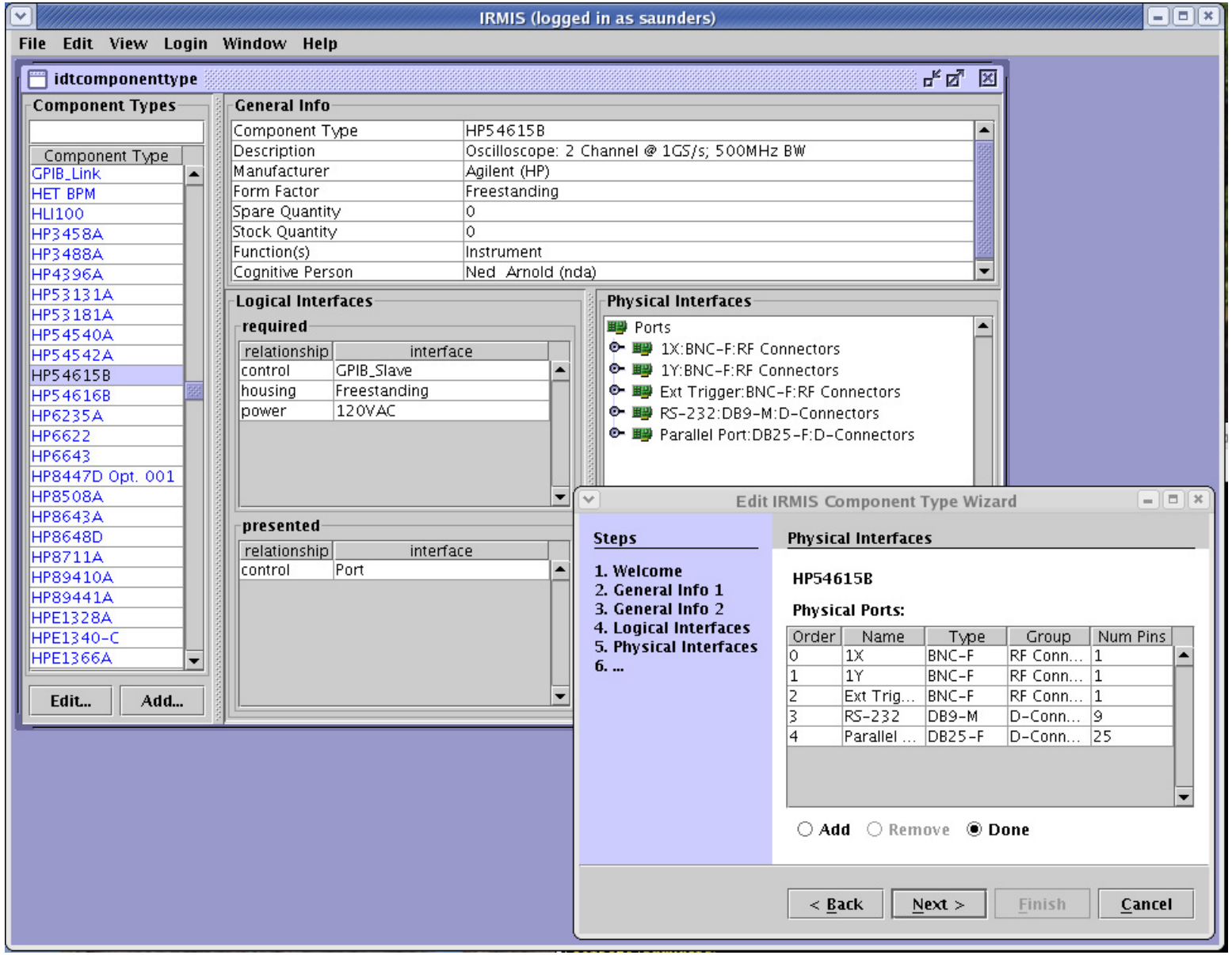
- Control hierarchy

(where does this device sit in the chain of information flow?)

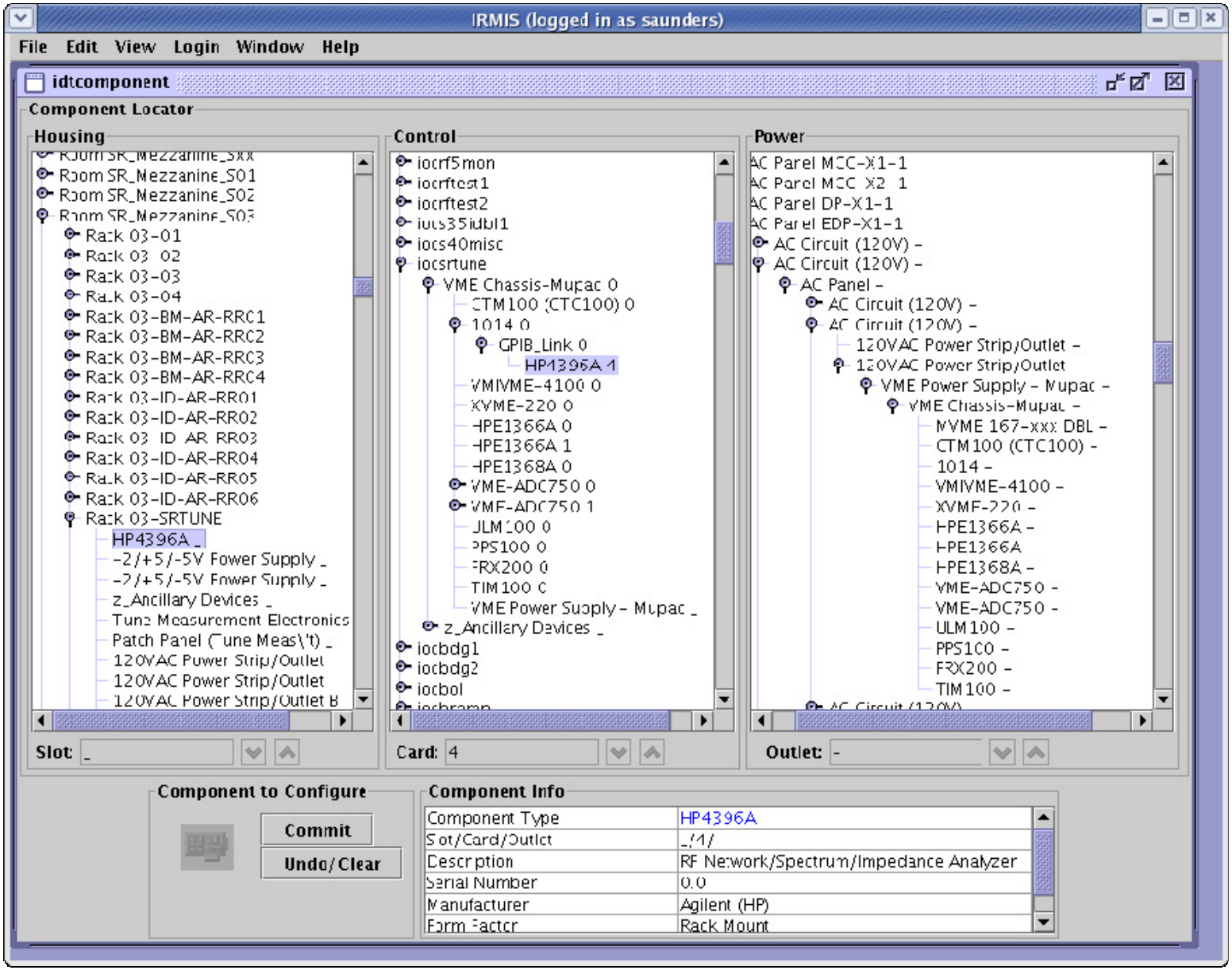
NOTE:

- Tree Diagrams are extremely useful for presenting relationships
- But single hierarchies are only partial descriptions of a system !

Component Type Viewer/Editor (ANL)



Component Viewer/Editor (ANL)



A few comments

- These applications **look as if** they should be usable by both experts and non-experts
- The applications can be used for data entry, as well as viewing.
- The system also includes the possibility of including **URL references** for each component type. The tree views thus can also serve as a sort of ‘search’ platform for accessing additional documentation on a control system component.
- D. Dohan, ANL, says that IRMIS is now an important Control Room app for the ALS, and that an effort to include power supplies in the system is underway (04.2007)

Implementation (I)

- MySQL Database (or Oracle)
- Java Applications with Hibernate DB access layer

Most of the DB related logic is implemented in the applications (in particular via Hibernate), to avoid dependence on DB specific features

Implementation (II)

- All component instances live in a single table
- All relationship instances live in a single table

=> More flexible than a traditional DB in which each component type has its own table with a fixed set of relationships (ie columns)

component_type	
PK	component_type_id
	component_type_name description form_factor_id mfg_id

component_rel_type	
PK	component_rel_type_id
	rel_name

+ lots more

component	
PK	component_id
	component_type_id component_name version

component_rel	
PK	component_rel_id
	parent_component_id child_component_id component_rel_type_id version

An Aside: Serial Numbers

Q. Is it possible to build such a database for components which do not have individual serial numbers?

A. Yes, but some useful functionality is lost, for example

- Failure records per device
- Tracking devices through repairs
- Possibility of calibration data attached to specific devices

A large, complex facility **should** use serial numbers for most components. To accommodate historical circumstances, the database must be capable of simultaneously supporting components with and without serial numbers.

D. Dohan, ANL, says that an attempt to introduce 'global' serial numbers based on bar codes failed, and that they now permit serial number implementation to depend on component type:

(Component Type, Serial Number)

Conclusions

IMHO:

Accelerator operation at DESY is too dependent on knowledge confined to small expert groups.

DESY needs more formal procedures for ‘change management’ at operating accelerators, e.g. documentation of actions performed during tunnel accesses.

The DB approach being pioneered at ANL looks to me like a possible path forward. Implementing such a system would require a major effort. What are the alternatives?