

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)

IRMIS (logged in as saunders)

File Edit View Login Window Help

idtcomponenttype

Component Types

Component Type

- GPiB_Link
- HET_BPM
- HLI100
- HP3458A
- HP3488A
- HP4396A
- HP53131A
- HP53181A
- HP54540A
- HP54542A
- HP54615B
- HP54616B
- HP6235A
- HP6622
- HP6643
- HP8447D Opt. 001
- HP8508A
- HP8643A
- HP8648D
- HP8711A
- HP89410A
- HP89441A
- HPE1328A
- HPE1340-C
- HPE1366A

Edit... Add...

General Info

Component Type: HP54615B
 Description: Oscilloscope: 2 Channel @ 1GS/s; 500MHz BW
 Manufacturer: Agilent (HP)
 Form Factor: Freestanding
 Spare Quantity: 0
 Stock Quantity: 0
 Function(s): Instrument
 Cognitive Person: Ned Arnold (nda)

Logical Interfaces

required

relationship	interface
control	GPiB_Slave
housing	Freestanding
power	120VAC

presented

relationship	interface
control	Port

Physical Interfaces

Ports

- 1X:BNC-F:RF Connectors
- 1Y:BNC-F:RF Connectors
- Ext Trigger:BNC-F:RF Connectors
- RS-232:DB9-M:D-Connectors
- Parallel Port:DB25-F:D-Connectors

Edit IRMIS Component Type Wizard

Steps

- Welcome
- General Info 1
- General Info 2
- Logical Interfaces
- Physical Interfaces
- ...

Physical Interfaces

HP54615B

Physical Ports:

Order	Name	Type	Group	Num Pins
0	1X	BNC-F	RF Conn...	1
1	1Y	BNC-F	RF Conn...	1
2	Ext Trig...	BNC-F	RF Conn...	1
3	RS-232	DB9-M	D-Conn...	9
4	Parallel ...	DB25-F	D-Conn...	25

Add Remove Done

< Back Next > Finish Cancel

Component Viewer/Editor (ANL)

IRMIS (logged in as saunders)

File Edit View Login Window Help

idcomponent

Component Locator

Housing

- Room SR_Mezzanine_SXX
- Room SR_Mezzanine_S01
- Room SR_Mezzanine_S02
- Room SR_Mezzanine_S03
 - Rack 03-01
 - Rack 03-02
 - Rack 03-03
 - Rack 03-04
 - Rack 03-BM-AR-RR01
 - Rack 03-BM-AR-RR02
 - Rack 03-BM-AR-RR03
 - Rack 03-BM-AR-RR04
 - Rack 03-ID-AR-RR01
 - Rack 03-ID-AR-RR02
 - Rack 03-ID-AR-RR03
 - Rack 03-ID-AR-RR04
 - Rack 03-ID-AR-RR05
 - Rack 03-ID-AR-RR06
 - Rack 03-SRTUNE
 - HP4396A
 - 2/+5/-5V Power Supply
 - 2/+5/-5V Power Supply
 - z_Ancillary Devices
 - Tune Measurement Electronics
 - Patch Panel (Tune Meas\T)
 - 120VAC Power Strip/Outlet
 - 120VAC Power Strip/Outlet
 - 120VAC Power Strip/Outlet B

Control


- iocrf5mon
- iocrfest1
- iocrfest2
- iocs35idbl1
- iocs40misc
- iocsrtune
 - VME Chassis-Mupac 0
 - CTM100 (CTC100) 0
 - 1014 0
 - HP1396A 1
 - VMIVME-4100 0
 - XVME-220 0
 - HPE1366A 0
 - HPE1366A 1
 - HPE1368A 0
 - VME-ADC750 0
 - VME-ADC750 1
 - JLM100 0
 - PPS100 0
 - FRX200 0
 - TIM100 C
 - VME Power Supply - Mupac
 - z_Ancillary Devices
- iocbdg1
- iocbdg2
- iocbol
- iochramp

Power

- AC Panel MCC-X1-1
- AC Panel MCC X2 1
- AC Panel DP-X1-1
- AC Panel EDP-X1-1
- AC Circuit (120V) -
- AC Circuit (120V) -
 - AC Panel -
 - AC Circuit (120V) -
 - AC Circuit (120V) -
 - 120VAC Power Strip/Outlet -
 - 120VAC Power Strip/Outlet
 - VME Power Supply - Mupac -
 - VME Chassis-Mupac -
 - VMIVME 167-xxx DBL -
 - CTM100 (CTC100) -
 - 1014 -
 - VMIVME-4100 -
 - XVME-220 -
 - HPE1366A -
 - HPE1366A -
 - HPE1368A -
 - VME-ADC750 -
 - VME-ADC750 -
 - ULM100 -
 - PPS100 -
 - FRX200 -
 - TIM100 -

Slot: Card: 4 Outlet:

Component to Configure



Component Info

Component Type	HP4396A
Slot/Card/Outlet	./1/
Description	RF Network/Spectrum/Impedance Analyzer
Serial Number	0.0
Manufacturer	Agilent (HP)
Form Factor	Rack Mount

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	<u>component_type_id</u>
	component_type_name description form_factor_id mfg_id

component_rel_type	
PK	<u>component_rel_type_id</u>
	rel_name

+ lots more

component	
PK	<u>component_id</u>
	component_type_id component_name version

component_rel	
PK	<u>component_rel_id</u>
	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?