

IRMIS: Workshop Summary

*IRMIS/Relational Database Workshop
Argonne National Laboratory
D. Dohan, June 16, 2006*

Argonne National Laboratory



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Office of Science Laboratory
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IRMIS/RDB Workshop

- **Workshop on relational databases in EPICS control systems in general, with focus/emphasis on IRMIS.**
- **General awareness/acceptance/demand for RDB technology in EPICS control systems has increased dramatically in the recent past.**
- **~ 40-50 attendees, huge increase since the kickoff meeting, 2005.**
- **IRMIS now installed/being used/modified in a number of laboratories, including:**
 - SNS
 - SLAC
 - APS
 - BESSY
 - TRIUMF
 - CLS

IRMIS - Introduction

- **Integrated Relational Model of Installed Systems**
 - 'connection-based' approach to modeling the accelerator and its control system
 - *integrated 'system' coverage of software, hardware and cabling*
- **Collaborative approach**
 - Goal is to provide re-useable relational database and application frameworks .
 - Inter-laboratory approach strengthens the underlying database and application structures.
 - The 'EPICS' model is used throughout – sophisticated high level tools are developed, but the user always maintains the ability to look 'under the hood'
 - Site-neutral (and RDBMS agnostic).
 - Minimalist approach, locally extensible.

PV Schema

- **PV crawler populates RDB (off-line) from ioc st.cmd information (emulate ioc load process)**
 - ✓ **insists on a certain discipline in ioc s/w organization**
- **full (cross-IOC, soft IOC) coverage. Allows viewing system-wide control system logic, fully macro expanded.**
- **time stamp - the crawler provides a snapshot of the entire set of operational EPICS databases and their database definitions each time an IOC reboots.**
- **channel access clients (more on this later)**
- **no type-specific code or schema structures**
 - ✓ **the crawler 'discovers' new record types from the installed EPICS database - no code/schema changes**
- **invites sending IRMIS query sets to VDCT < nonIOC centric > to analyze inter-IOC logic.**

Philosophy

- Integrate IRMISBase data with SNS data
- Use the XAL framework whose look and feel most SNS users are familiar with
- Simple RDB interaction through POJOs and database views to adapt IRMIS to SNS
- Tailor functions to SNS users
- But make UI configurable for anyone

Map Links

The screenshot shows the PV Browser interface with a search for 'CF*'. The left pane displays a tree view of records, with 'CF_CU:CF_AlarmActiveRed:Sts' selected. The main pane shows a list of 5385 records, with 'CF_CU:CF_AlarmActiveRed:Sts' highlighted. The right pane shows the details for the selected record, including its type, I/O, boot date, and a table of field values.

Field ID	Field Value	Probe
VAL		0.0
SCAN	1 second	6
CALC	A B C D E	A B C D E
INPA	CF_CU:CF_AlarmTemp1Red:Sts	CF_CU:CF_AlarmTemp1Red:Sts NPP NMS
INPB	CF_CU:CF_AlarmTemp2Red:Sts	CF_CU:CF_AlarmTemp2Red:Sts NPP NMS
INPC	CF_CU:HW_XX4022_LLRed:Sts	CF_CU:HW_XX4022_LLRed:Sts NPP NMS
INPD	CF_CU:HW_XX4022_LLRed:Sts	CF_CU:HW_XX4022_LLRed:Sts NPP NMS
INPE	CF_CU:HW_XXLSH8910Red:Sts	CF_CU:HW_XXLSH8910Red:Sts NPP NMS
HIHI	1	1.0
HHSV	MAJOR	2



OAK RIDGE NATIONAL LABORATORY
 U. S. DEPARTMENT OF ENERGY
 EPICS Collaboration Meeting, June 12, 2006



Probe multiple PV's

PV Browser - Untitled.pvs*

File Edit View Window Help

pv

System Subsystem Device Type Record Type

PV: HEBT_Mag:PS_DCH30:I
 Type: ai
 IOC: ring-ps-ioc1
 Boot Date: 05/15/2006 00:00:00
 DB File: jade/epics/locTop/R3.14.7/magnets/R2-6-9/ringMag/db/psc-ring-ps-ioc1.db

Field ID	Field Value	Probe
VAL		1.5182402...
DESC	Measured Current Readback	Measured ...
SCAN	.1 second	9
DTYP	PSC	9
FLNK	HEBT_Mag:PS_DCH30:CDF.VA	HEBT_Mag...
INP	#C4 S3 @ADCB	#C4 S3 @A...
PREC	3	3
EGUF	2.000000e+01	20.0
EGUL	-2.000000e+01	-20.0
HOPR	2.000000e+01	20.0
LOPR	-2.000000e+01	-20.0
ADEL	1.000000e-01	0.1
MDEL	2.000000e-02	0.02
HIHI	1.600000e+01	16.0
HIGH	1.200000e+01	12.0
LOW	-1.200000e+01	-12.0
LOLO	-1.600000e+01	-16.0
SMOO	8.000000e-01	0.8
HYST	4.000000e-02	0.04
ASLO	1.000000e+00	1.0
AOFF	0.000000e+00	0.0
EGU	Amps	Amps
LINR	LINEAR	2
HHSV	MAJOR	2
HSV	MINOR	1
LSV	MINOR	1
LLSV	MAJOR	2

PV: HEBT_Mag:PS_DCH30:V
 Type: ai
 IOC: ring-ps-ioc1
 Boot Date: 05/15/2006 00:00:00
 DB File: jade/epics/locTop/R3.14.7/magnets/R2-6-9/ringMag/db/psc-ring-ps-ioc1.db

Field ID	Field Value	Probe
VAL		0.0081170436280492...
DESC	Voltage Readba...	Voltage Readback
SCAN	.1 second	9
DTYP	PSC	9
INP	#C4 S3 @ADCC	#C4 S3 @ADCC
PREC	3	3
EGUF	3.500000e+01	35.0
EGUL	-3.500000e+01	-35.0
HOPR	3.500000e+01	35.0
LOPR	-3.500000e+01	-35.0
ADEL	3.500000e-01	0.35
MDEL	3.500000e-02	0.035
HIHI	2.800000e+01	28.0
HIGH	2.100000e+01	21.0
LOW	-2.100000e+01	-21.0
LOLO	-2.800000e+01	-28.0
SMOO	8.000000e-01	0.8
HYST	7.000000e-02	0.07
EGU	Volts	Volts
LINR	LINEAR	2
HHSV	MAJOR	2
HSV	MINOR	1
LSV	MINOR	1
LLSV	MAJOR	2

HEBT_Mag:PS_DCH30:FPL_IDmp_swmask_status
 HEBT_Mag:PS_DCH28:FPL_IDmp_swmask
 HEBT_Mag:PS_DCH28:FPL_IDmp_swmask_set
 HEBT_Mag:PS_DCH30:I
 HEBT_Mag:PS_DCH30:V
 HEBT_Mag:PS_DCH30:O
 HEBT_Mag:PS_DCH30:OT

LSV MINOR
 LLSV MAJOR

33920 Records, 2 Selected

Export to .db file

The screenshot shows the PV Browser application window with a 'Save' dialog box open. The dialog box is titled 'Save' and shows the file name 'Untitled.db' and the file type 'Supported Files'. The 'Save In' location is 'My Documents'. The background window shows a list of records and a table of data.

Record Type

- Any
- aai
- aao
- ab1794IE4XOE2
- ab1794IE8
- ab1794IT8

Record List

- scl-ps-loc1.db
- Probe
- LS304198544198
- Input in Amp
- Mag_PS_QD02:cSplineToB
- 1.0

HSV	MINOR	1
LSV	MINOR	1
LLSV	MAJOR	2
PINI	YES	1

5822 Records, 2 Selected

ROCS: Sources of Data

- **Data are stored in RDB**
 - SNS Oracle database
- **Ways to add data to SNS RDB:**
 - IRMIS Crawler
 - JERI (online editable reports system)
 - Single task crawler type programs
 - Online editable reports (ROCS)
 - XAL Framework
 - Spreadsheets loaded by SSLoader.java
 - Manual loads and updates

Example 1: IOC Configuration Details

- **Purpose:**

- Provide IOC configuration information in fast to access and easy to analyze form

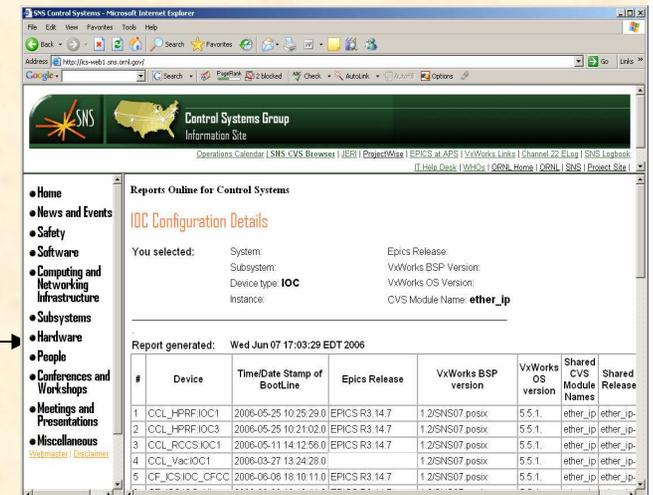
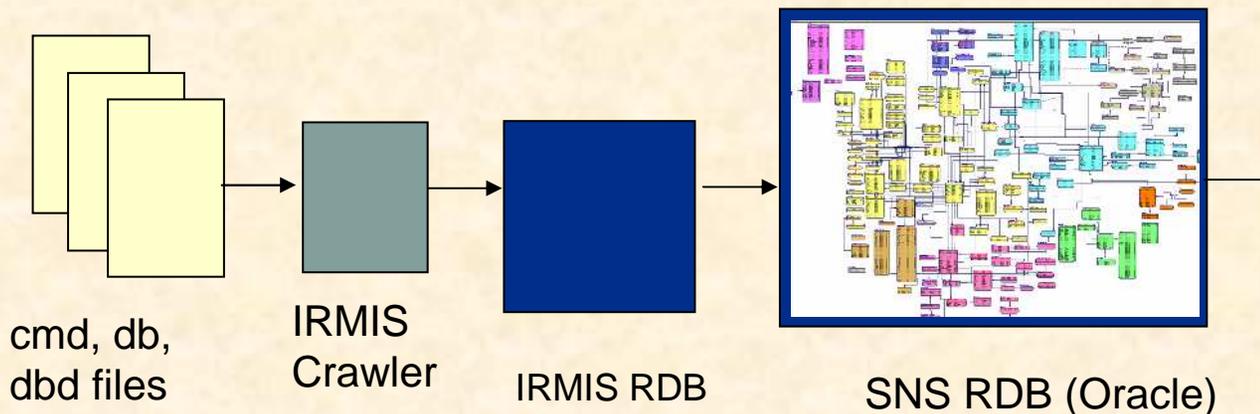
- **Data source:**

- Startup.cmd, bootline, st, iocInfo files, db and dbd files

- **Saving data to Oracle:**

- IRMIS crawler

<http://ics-web1.sns.ornl.gov:1982/reports2>



ROCS: IOC Configuration Details report at Control Systems website

Example 2: IOC Alarm Logs

- **Purpose:**

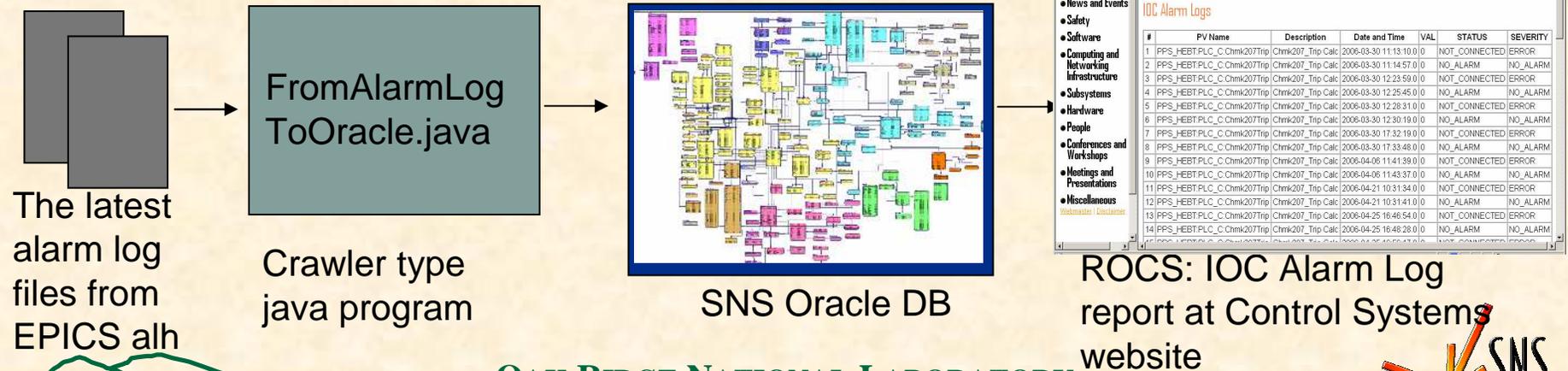
- provide alarm info in such a form that is easy to access and convenient to analyze

- **Data source:**

- The latest alarm log files from EPICS alh

- **Saving data to Oracle:**

- FromAlarmLogToOracle.java

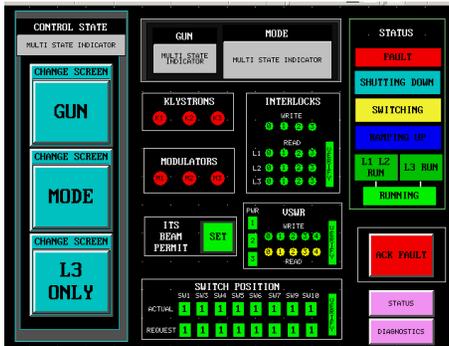


How to define an AOI...

...Let's start with LINAC RF Switching Control System example

How do we store all this information in an AOI database?

The PLC had Touch Screens with built-in logic for User Interface Control



ACIS

The PLC communicated with other "AOIs"

First there was a PLC for controlling the RF Switches



LINAC Interlock L1, L2 and L3 PLCs



LLRF Trigger & Interlock System



MEDM displays monitored RF switch positions

LINE Waveguide Switches

Waveguide Floor 6 Text

Switching System Position Charts

Selected Mode	Static Description	Mode Name	Description	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10
RF0001	RF Line	RF0001	RF0001-0001	Pos. 1	Pos. 2	Pos. 1							
RF0002	RF Line	RF0002	RF0002-0001	Pos. 1	Pos. 2	Pos. 1							
RF0003	RF Line	RF0003	RF0003-0001	Pos. 1	Pos. 2	Pos. 1							
RF0004	RF Line	RF0004	RF0004-0001	Pos. 1	Pos. 2	Pos. 1							
RF0005	RF Line	RF0005	RF0005-0001	Pos. 1	Pos. 2	Pos. 1							
RF0006	RF Line	RF0006	RF0006-0001	Pos. 1	Pos. 2	Pos. 1							
RF0007	RF Line	RF0007	RF0007-0001	Pos. 1	Pos. 2	Pos. 1							
RF0008	RF Line	RF0008	RF0008-0001	Pos. 1	Pos. 2	Pos. 1							
RF0009	RF Line	RF0009	RF0009-0001	Pos. 1	Pos. 2	Pos. 1							
RF0010	RF Line	RF0010	RF0010-0001	Pos. 1	Pos. 2	Pos. 1							

DO NOT TEND SWITCHES TO POSITION 2 NOW (Mode 3 - Test Run) (UNLESS LIP is in RW or DR mode!)

Waveguide Switch Interfaces

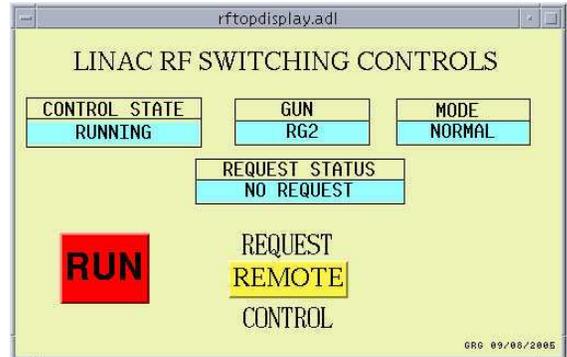
Release the current position

Switch A Switch B Switch A Switch B Switch A Switch B Switch A Switch B

RF0001 RF0002 RF0003 RF0004 RF0005 RF0006 RF0007 RF0008 RF0009 RF0010

SW1 SW2 SW3 SW4 SW5 SW6 SW7 SW8 SW9 SW10

Then along came request for remote control from the Main Control Room - MEDM displays with built-in logic



Example AOI Marked Up st.cmd File

```
# Absorber Databases
```

```
#dbLoadRecords ("vpApp/absDb/H2O-xx-FlowPres.db", "SECTOR=05, NODE=18")
```

```
#dbLoadRecords ("vpApp/absDb/H2O-xx-FlowPres.db", "SECTOR=06, NODE=20")
```

```
#<aoi aoi_name="aoi_sr_absorber_water_s5">
```

```
dbLoadRecords ("vpApp/absDb/DL250stat.db", "name=S05:H20:PLC,addr=L1 N20 P1 S1")
```

```
dbLoadRecords ("vpApp/absDb/PlcVersionInfo.db", "name=S5VP:H20:PLC,addr=L1 N20 P1 S1")
```

```
dbLoadRecords ("vpApp/absDb/H2O-xx-FlowPresOdd.db", "SECTOR=05,addr=L1 N20 P1 S1")
```

```
dbLoadRecords ("vpApp/absDb/H2O-xx-FlowPresEven.db", "SECTOR=06,addr=L1 N20 P1 S1")
```

```
dbLoadRecords ("vpApp/absDb/H2O-SECTOR-PW-SH-Temp.db", "SECTOR=06")
```

```
#</aoi>
```

```
dbLoadRecords ("vpApp/facilitiesDb/Ambient-SECTOR-Temp.db", "SECTOR=05, NODE=18")
```

```
dbLoadRecords ("vpApp/facilitiesDb/Ambient-SECTOR-Temp.db", "SECTOR=06, NODE=20")
```

AOI Viewer

AOI Basics Search Results Page - Microsoft Internet Explorer

Address: http://maia.aps.anl.gov/~QUOCK/aoi/aoibasics_search_results.php?aoiName=aoi_sr_absorber_water

IRMIS² Integrated Relational Model of Installed Systems

AOI Search Criteria Include Relatives

AOI Name: aoi_sr_absorber Technical System: All Machine: All PLC: All IOC: All Cognizant: All Criticality: All Keyword: PV:

2 AOIs Found		AOI General Information	
AOI Relation	AOI Name	AOI Name	aoi_sr_absorber_water
Child	aoi_sr_absorber_water_s5	Cognizant 1	Putnam
Parent	aoi_sr_absorber_water	Customer	Putnam
		Criticality	2
		Technical System	WATER
		Machine	SR
		Description	The storage ring absorber water flow AOI provides local control of defining the operation setpoints for absorber water flow rates via PLCs, interface to the APS Machine Protection System (MPS) through information provided from the PLCs to the MPS latch card
		Functional Criteria	The storage ring absorber water flow AOI provides alarm setpoints for water flow rate and monitoring of these flows. This AOI also interfaces to the APS Machine Protection System (MPS).
		Keyword	storage ring, absorber, water, water flow
		Status	under development
AOI UPCs			
UPC Type	UPC Name		
PLC	plc_absorber_s5_water		
IOC	ioc5vp		
AOI PVs			
Record Name	IOC	st.cmd Load Line	
H2O:05:C1:F:AIM	iocs5vp	dbLoadRecords ("vpApp/absDb/H2O-xx-FlowPresOdd.db", "SECTOR=05,addr=L1 N20 P1 S1")	
H2O:05:C1:F:OpenM	iocs5vp	dbLoadRecords ("vpApp/absDb/H2O-xx-FlowPresOdd.db", "SECTOR=05,addr=L1 N20 P1 S1")	
AOI MEDM Top Displays			
URI			
/usr/local/iocapps/adlsys/sr/absApp/H2O-SECTOR-FlowPlcPanel1.adl			
/usr/local/iocapps/adlsys/sr/absApp/absorberMasterPanel.adl			
AOI Documents			
URI			
http://www.aps.anl.gov/asd/controls/controlsweb/ctstutorialshomeparent.html			
AOI Revision History			
Revision Date	Comment		
2006-01-09 09:30:02	Upgrading sectors 35 and 36 during the April/May 2006 shutdown.		

Local intranet

PV Clients:

SLAC Workshop 2005 summary (excerpt)

- **Work breakdown – CA client crawlers**
 - adl,alh – Janet Anderson, APS
 - SDDS – APS
 - EDL – J. Sinclair
 - SNC – R. Chestnut
 - CA archiver – SLAC
 - Channel Watcher – M. Zelazny
 - BURT s/r – T. Birke
 - CDEV – T. Birke
 - XAL – J.Patton
 - CA Security – APS

What was done and why

- Modified `pv_crawler.pl` in a modular manner.
 - Didn't write a secondary crawler.
 - Needed to traverse boot tree to see current snapshot.
 - Needed to look into `seq.o` files and do macro substitution
- Requirements for DB viewing
 - For a given `pv`, which sequences use it and on which `ioc`'s.
 - For a given `ioc`, which `pv` are used in sequences.
 - For a given `sequence.o` file, what `pv`'s are used.



Source files delivered

- `src/crawlers/pv/pv_crawler.pl`
 - Added SEQ logic to main loop
- `src/crawlers/pv/PVCrawlerParser.pm`
 - Two new subroutines
- `src/crawlers/pv/SEQCrawlerDBLayer.pm`
 - New module.
- `src/crawlers/pv/README_SEQ`
- `src/crawlers/pv/README_SEQ_USE_CASES`

IRMIS @ SLAC Summary

- **PV part of the schema only so far**
- **Running:**
 - PV Crawler since late 2005
 - SEQ crawler
 - ALH crawler
- **Use PV Viewer and batch reporting**
- **Plans for client config data and UI**

IRMIS Uses so far

- **PV Viewer for ad hoc database queries**
- **PV Crawler reports EPICS database and template errors (-:**
- **Data source for EPICS PV names for SLAC legacy control system**
 - formerly dbLoadTemplate and dbReport on hardcoded lists of template files

View Child Equipments

Welcome to Diamond Relational DatabasePRODUCTION..... K. Vijayan - Microsoft Internet Explorer provided by DLS

File Edit View Favorites Tools Help

Address http://serv0001.cs.diamond.ac.uk/php/login/cs_framepage.php

View Child Equipment

DLS Eqp Group: All | DLS Equipment ID: DC5%13% | Retrieve

Eq Name/Description: | DLS Eqp Type ID: CRATE

DLS Eqp SubType ID: All | Manufacturer Serial Number: | Manufacturer Model Number: |

Manufacturer Name: | Subcontract Name: | Comments: |

EPICS ID: | Curr Location: |

Curr Room: | Curr User: |

Equipment Status: | Current Group: |

Sub Group ID: | Download

[Records 1 to 10 of 49] [Page 1 of 5]

Sl No.	S	DLS Equipment ID	R	Child Equipments	Equipment Name/Description	Manufacturer Name	Model Number	Man...
1	5	DCS00001306	RDCS00001479 VMECARD IPCARRIER 8002DCS00000070 IPMODULE QUADENC 8513DCS00000071 IPMODULE QUADENC 8513DCS00001493 VMECARD DIO 8001DCS00001494 TRANSCARD DIO 8305DCS00000449 TRANSCARD STRTHRU 8304DCS00001509 VMECARD IOC MVME24XX	Elma 4U	ELMA	EUK1091380000	
2	5	DCS00001307	RDCS00005430 TRANSCARD AI 8201DCS00001492 VMECARD IPCARRIER 8002DCS00001523 VMECARD IPCARRIER 8002DCS00003310 VMECARD IPCARRIER 8002DCS00000334 TRANSCARD PSC PSC-TMDCS00000335 TRANSCARD PSC PSC-TMDCS00000336 TRANSCARD PSC PSC-TMDCS00003660 VMECARD IOC MVME5500DCS00001635 VMECARD IPCARRIER 8002DCS0000175 IPMODULE ADC16BIT 8401	Elma 4U	ELMA	EUK1091380000	

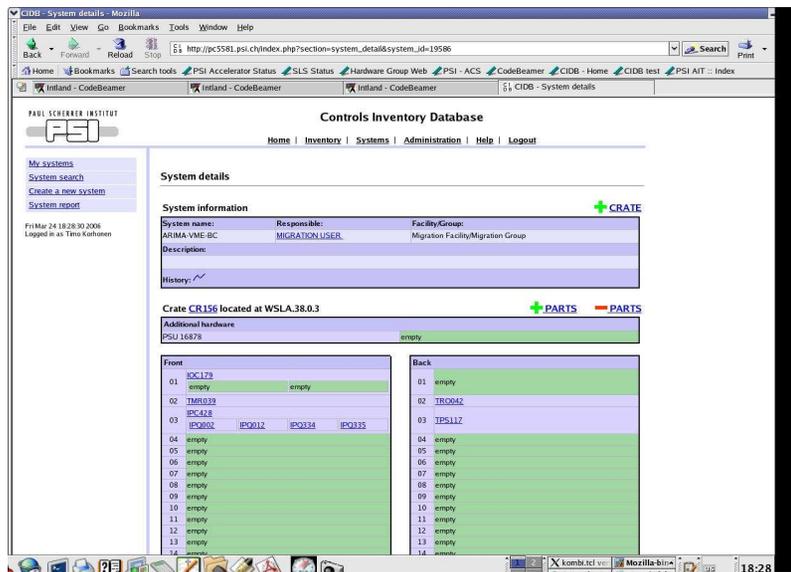
The wildcard character '%' may be used in search options

start | Inbox - Microsof... | 5 Internet Ex... | Oracle SQL*Plus | Microsoft Power... | Local intranet | 14:59

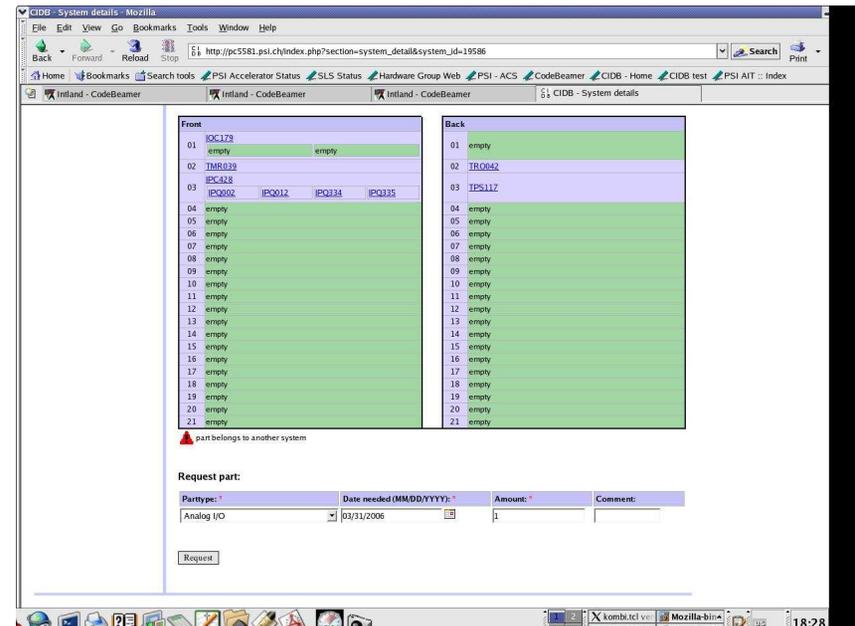
CIDB is...

- **A database-based application that**
 - Enables us to track the control system hardware (stock, installations)
 - Embeds the working practices related to controls hardware distribution and maintenance (transparency)
 - Tries to make our (controls group HW&SW, system developers, other related groups) lives easier
 - It is limited to the hardware handling, but is able to provide configuration information (installation hierarchy)
- **Note: I am not a database expert; I will not show any table diagrams or other details in this talk. However, details can be obtained from the developers if wanted.**

System view



System contents (VME crate)
-nonhierarchical installations
are also supported



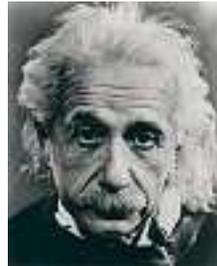
Request part:
-select part type from a list
-add count & date needed

Status & future

- **Core functions**
 - In use since February
 - CIDB has already much improved our view of the status, and enabled to share and distribute the work better
- **Integrate hardware testing**
 - Work in progress
- **Include purchasing information**
 - Important for ordering, repairs, budgeting, etc.
 - In progress, planned by end of June
- **New applications/modules**
 - (diagnostics) component calibration management
- **Connection to / integration with IRMIS?**
 - The functionality is largely complementary

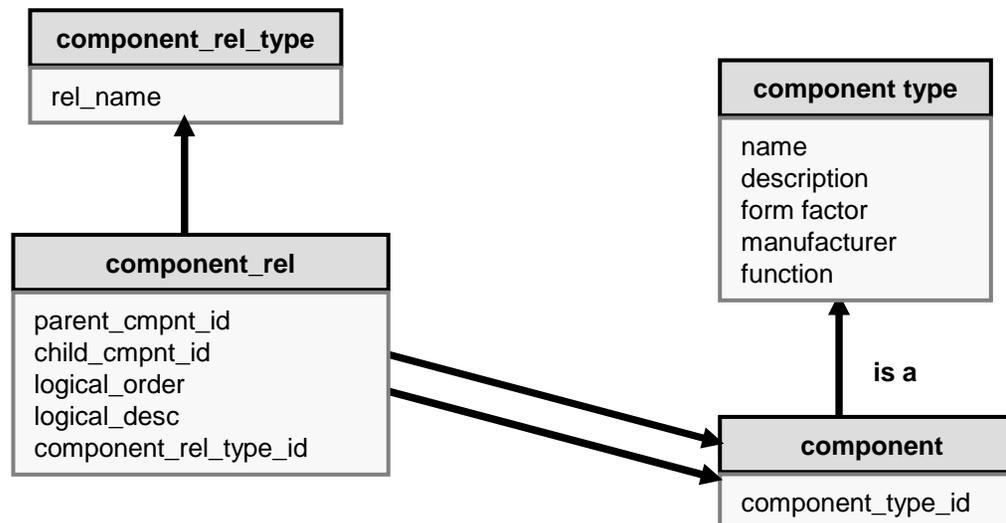
Components: IRMIS approach

- **Minimize the abstraction/modeling in the definition of ‘components’**
- **Thus, instead of assigning a ‘behavior’ to a magnet (“sextupole corrector in the LEBT”), in IRMIS a magnet is simply a component that converts a DC electric current into a magnetic field. *(It is characterized by the number of ports it has, rather than what it does to the beam.)***
- **The goal is to have component definitions that are universal in nature.**
- **"Make everything as simple as possible, but not simpler."**

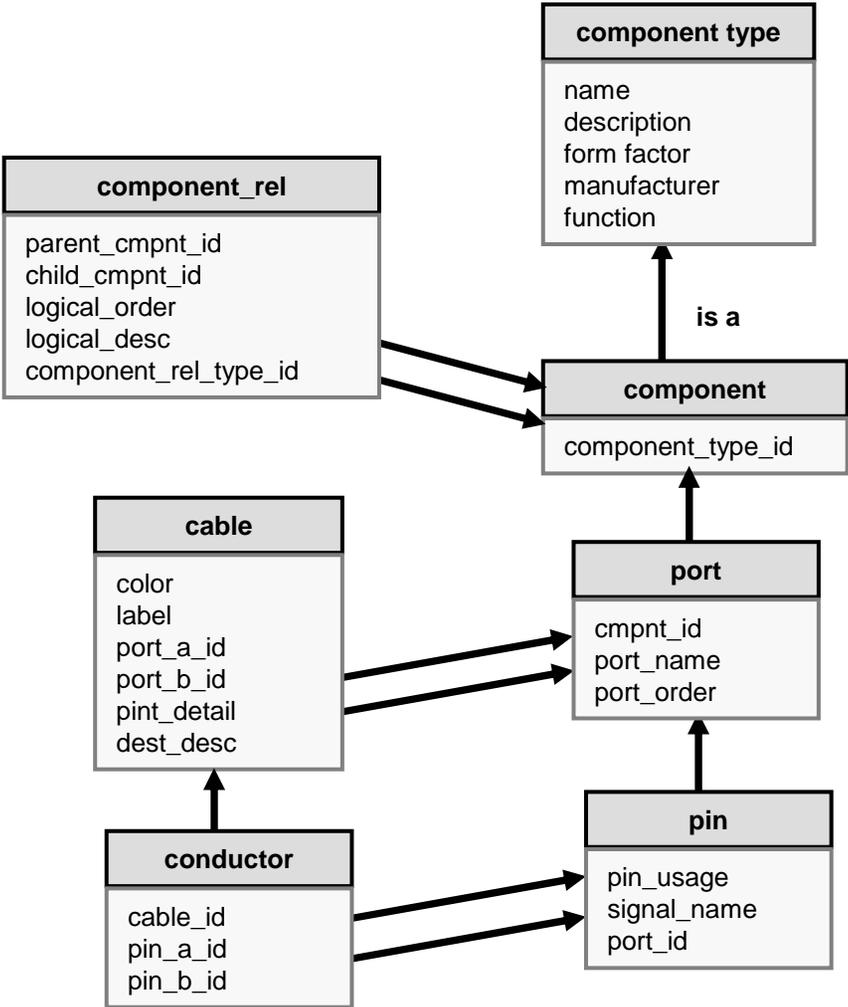


Component Connections

- The IRMIS schema relates components by how they are interconnected:
 - physically (housing hierarchy)
 - logically (control hierarchy)
 - power grid (power hierarchy)
- Each relationship type is hierarchical in nature (each child has a unique parent in each hierarchy). The hierarchies are modeled as node/edge graphs (DAGs).



Ports and Cables



IRMIS Out of the Box

■ Database Access

- DDL (SQL scripts for creating IRMIS schema)
 - *MySQL*
 - *Oracle*
- Java database access layer (POJO – DAO – Hibernate)
- Perl database access layer (minor extension of Perl-DBI)
- PHP database access layer (simple OO layer on top of PHP-mysql)
- Perl Crawlers
 - *PV (and SEQ)*
 - *ADL*
 - *ALH*
 - *IOCSR*
 - *SDDS*
 - *Network (switch connectivity)*

IRMIS Out of the Box

- Applications
 - IDT – IRMIS DeskTop
 - *Java/Swing application containing*
 - idt::ioc, idt::pv, idt::component, idt::component-type, idt::cable, idt::admin
 - *Java WebStart support provided*
 - Demo PHP PV Viewer
 - Demo CFW Java application

idt:pv

PV Search

Systems

- Front-end
- Insertion Device
- Timing
- LINAC**
- RF

all

IOCs

- ioclibpm3
- ioclibpm4
- ioclibpm5
- ioclic1
- ioclic2**
- ioclic3

all

DB Files

- l4InterlocksStatic.db
- dgCommon.db
- leakDetect.db
- liTriggerSwitch.vdb
- xxVvcStatic.db

all

Record Types

- ab1771IFE
- ab1771IX
- ab1771N
- ab1791
- abDcm

all

Other Search Params

PV: *DG*

Field:

Value:

* allowed

Search History Mode

PV Search Results (1478)

Record Name	Type
L3:DG1B:trigBurstPerSet...	fanout
L3:DG1B:trigBurstRateAI	ai
L3:DG1B:trigBurstRateS...	ao
L3:DG1B:trigInputAmpAI	ai
L3:DG1B:trigInputAmpSe...	ao
L3:DG1B:trigInputPolBI	bi
L3:DG1B:trigInputPolSet...	bo
L3:DG1B:trigInputZBI	bi
L3:DG1B:trigInputZSetBO	bo
L3:DG1B:trigModeMI	mbbi
L3:DG1B:trigModeSetMO	mbbo
L3:DG1B:trigRateAI	ai
L3:DG1B:trigRateSetAO	ao
L3:DG1B:trigThrottleCC	calc
L3:DG2:aDelayAI	ai
L3:DG2:aDelayRefMI	mbbi
L3:DG2:aDelayRefSetFO	fanout
L3:DG2:aDelayRefSetMO	mbbo
L3:DG2:aDelaySI	stringin
L3:DG2:aDelaySetAO	ao
L3:DG2:aOutputAmpAI	ai
L3:DG2:aOutputAmpSetAO	ao
L3:DG2:aOutputAmpSetFO	fanout
L3:DG2:aOutputModeMI	mbbi
L3:DG2:aOutputModeSet...	mbbo
L3:DG2:aOutputOffsetAI	ai
L3:DG2:aOutputOffsetSet...	ao
L3:DG2:aOutputPolBI	bi

Columns... Save As...

PV Info

Record Name	Type	IOC
L3:DG2:aDelayRefSetMO	mbbo	ioclic2

DB File(s)

/net/helios/iocapps/R3.13.10/ioc/linac/2/linacApp/timingDb/dg1234567.dat

PV Fields

Field	Value
NAME	
DESC	Set Chan A ref
ASG	
SCAN	Passive
PINI	NO
PHAS	0
EVNT	0
TSE	0
TSEL	0
DTYP	DG535 Delay Generator (GPIB)
DISV	1
DISA	0
SDIS	L3:DG2:scanDisableCC.VAL NPP NMS
DISP	

PV Links

Used By	Field	Type	With Field Value
L3:DG2:aDelayRefMI	SIOL	mbbi	L3:DG2:aDelayRefSetMO.VAL NPP NMS
LI:TM:initToBaseline3SQ	LNK5	seq	L3:DG2:aDelayRefSetMO.VAL PP NMS

PV Clients

App	Field	File	Extra Info
Save/Rest...	VAL	/home/helios/oagData/SCR/requestFiles/LPL.req	none
Save/Rest...	VAL	/home/helios/oagData/SCR/requestFiles/LINAC.req	none
Save/Rest...	VAL	/home/helios/oagData/SCR/requestFiles/L3.rf.req	none
MEDM	VAL	/net/helios/iocapps/adlsys/linac/xxDg535.adl	'dg=L3:DG2'/net/helios/iocapps/adlsys/linac

Component Locator

Housing

- Building 400_mech_mezz
- Building 400_Mezzanine
- Building 400_Tunnel
- Building 411_Gallery
 - Room LINAC_Gallery_Area#1
 - Room LINAC_Gallery_Area#2
 - Room LINAC_Gallery_Area#3
 - AC Panel ERP-J2
 - AC Panel ERP-J5
 - Rack L3:BC:RA:1
 - Rack L3:BC:RA:2
 - Rack L3:BC:RA:3
 - Rack L3:CO:RA:1
 - Rack L3:DU:RA:1
 - Rack L3:DU:RA:2
 - AC Panel L3:EL:SO1
 - Rack L3:HV:RA:1
 - Enclosure L3:IC1
 - Rack L3:IO:RA:1
 - Rack L3:IO:RA:2
 - 9" Video Monitor 1
 - 9" Video Monitor 2
 - DG535 15
 - DG535 19
 - DG535 22**
 - DG535 23
 - 120VAC Power Strip/Outlet R
 - FFC100 _
 - 24-Port Light Box _
 - 72-Port Light Box _
 - ELFC100 _
 - 120VAC Power Strip/Outlet virtual
 - 120VAC Power Strip/Outlet

Control

- MVME 5100-013x ioclibpm3
- MVME 5100-013x ioclibpm4
- MVME 5100-013x ioclibpm5
- MVME 167-xxx DBL ioclic1
- MVME 167-xxx DBL ioclic2
- VME Chassis - System 22 Type 1-A _
 - CTM100 (CTC100) _
 - 1014D 0,1
 - GPIB_Link 0
 - HP8648D 7
 - DG535 15
 - DG535 16
 - DG535 17
 - DG535 18
 - DG535 19
 - DG535 20
 - DG535 21
 - DG535 22**
 - DG535 23
 - GPIB_Link 1
 - 6008-SV 0
 - 6008-SV 1
 - VMOD-2 0,1
 - VMOD-2 2,3
 - HPE1368A 41
 - FOM112 _
 - TIM100 _
 - DDPG02 0
 - DDPG02 1
 - DDPG02 2
 - DDPG02 3
 - FOM102 _
 - CTS100 0

Power

- Utility
- Switch Gear SG-A1
- Switch Gear SG-J1
 - Circuit Breaker 1,3,5
 - Circuit Breaker CB-J10
 - Circuit Breaker CB-J12
 - Circuit Breaker CB-J13
 - AC Panel EDP-J1
 - AC Circuit (120V) 14,16,18
 - AC Circuit (120V) 2,4,6
 - AC Panel ERP-J5
 - AC Circuit (120V) 16,18,20
 - AC Circuit (120V) 19,21,23
 - AC Panel L3:EL:SO1
 - AC Circuit (120V) 3
 - AC Circuit (120V) 10
 - AC Circuit (120V) 1
 - AC Circuit (120V) 5
 - AC Circuit (120V) 7
 - AC Circuit (120V) 2
 - AC Circuit (120V) 8
 - AC Circuit (120V) 9
 - 120VAC Power Strip/
 - 120VAC Power Strip/
 - DG535 -
 - DG535 -
 - DG535 -**
 - DG535 -

Slot: 22

Card: 22

Outlet: -

Component to Configure

Save

Undo

Component Info

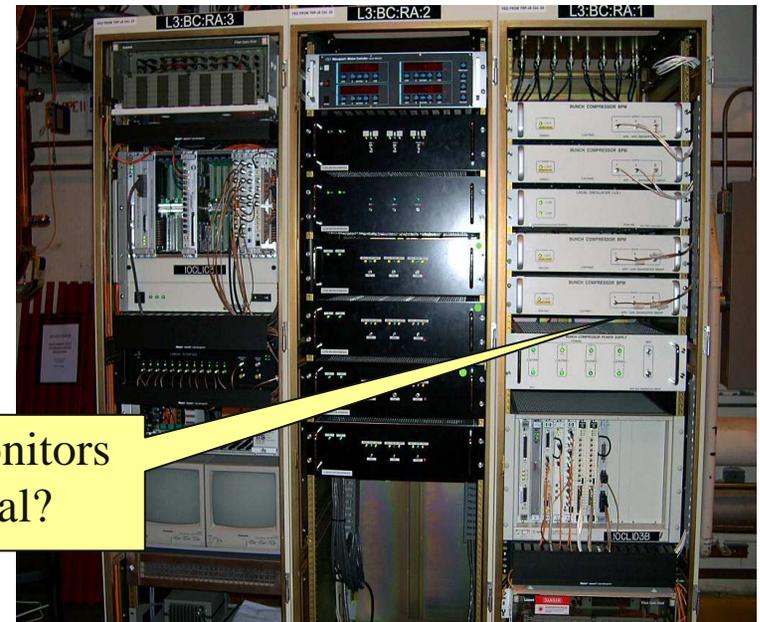
| | |
|------------------|--|
| Component Type | DG535 |
| Component Name | |
| Slot/Card/Outlet | 22/22/- |
| Description | Precision 4-channel Delay Generator (GPIB) |
| Serial Number | 000 |
| Group Ownership | controls |
| Verified | true |

One Relationship still escapes us ... PV-to-Signal



Which field signal does this Process Variable control?

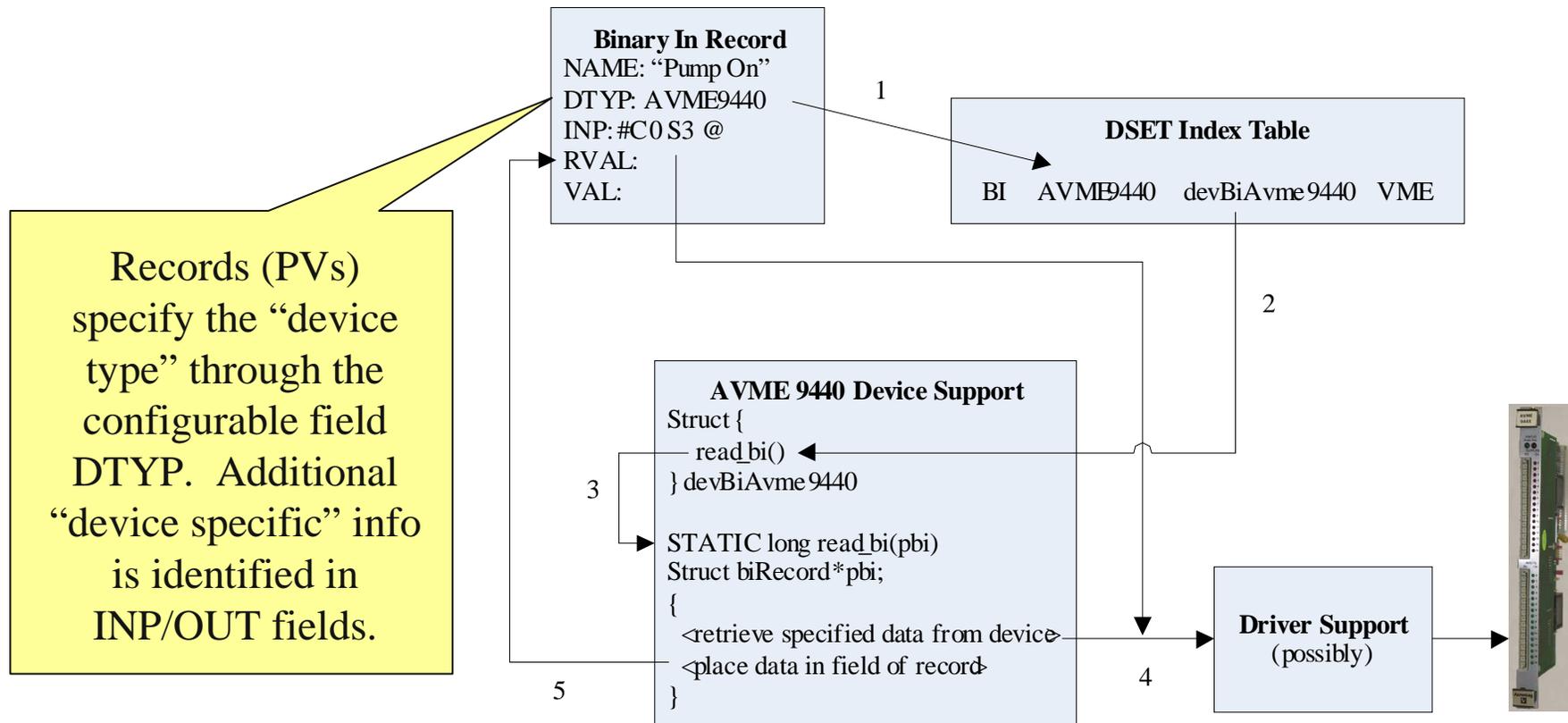
For ongoing operation and maintenance of a large accelerator facility, it is imperative to know the relationship between Process Variables and field signals. This relationship should be traceable in either direction.



Which PV(s) monitors this field signal?



Can this relationship be “discovered” in EPICS?



Although certain specifics about the field signal location can be heuristically determined, *there are no hard rules for mapping between INP/OUT and an actual device port. Due to the diverse styles of device support authorship, the PV-to-signal relationship cannot be traced with existing EPICS facilities.*

The Cloud

The screenshot displays three panels from a control system interface:

- PV Info:** Shows record details for 'L2:SC1:HZ:PS:measCurrentAI' with type 'ai' and IOC 'ioclic1'. The DB File(s) is '/net/helios/iocapps/R3.13.10/ioc/linac/2/linacApp/magnetsDb/Steering.db'. Below is a table of PV Fields.
- Control:** A tree view of the control system hierarchy, including MVME units, VME Chassis, and various detector and magnet components like 1771-DCM, 1771-IF, and 1771-IBD.
- Housing:** A tree view of the physical housing components, including AC Panels, Room LINAC_Gallery_Area#2, and various detector and magnet components like 1771-IBD, 1771-IFE, and 1771-WG.

| Field | Value |
|-------|-------------------|
| DTYP | AB-1771IFE |
| EGU | Amps |
| EGUF | 5 |
| EGUL | -5 |
| EOFF | 0 |
| ESLO | 0 |
| EVNT | 0 |
| FLNK | 0 |
| HHSV | NO_ALARM |
| HIGH | 0 |
| HIHI | 0 |
| HOPR | 5 |
| HSV | NO_ALARM |
| HYST | 0 |
| INIT | 0 |
| INP | #L0 A5 C6 S1 F0 @ |

Dispersing the Cloud

- The *missing link* to allow fully automatic discovery of the relationship between a Process Variable and a field signal occurs at the device support layer (unique code for each device type).
- If an additional lookup table (link_rule table) were available that identified the relationship between the INP/OUT specifiers and the device port (or parameter), the relationship could be “mined” by an intelligent “crawler” script. Such a table would look similar to the one below:

| DSET Routine Name | Expected INP/OUT Structure | Port Identifier Token | Device Port (Connector) | Device Signal Name |
|--------------------------|-----------------------------------|------------------------------|--------------------------------|---------------------------|
| devBiAvme9440 | #C_S_@< string> | S0 | P1 | INP00 |
| devBiAvme9440 | #C_S_@< string> | S1 | P1 | INP01 |
| devBiAvme9440 | #C_S_@< string> | S2 | P1 | INP02 |
| devBiAvme9440 | #C_S_@< string> | S3 | P1 | INP02 |
| devAiDg535 | #L_A_@ | @2 | A_Out | A_Out |
| devAiDg535 | #L_A_@ | @3 | B_Out | B_Out |
| devAiDg535 | #L_A_@ | @4 | C_Out | C_Out |
| devAiDg535 | #L_A_@ | @5 | D_Out | D_Out |

IRMIS - future

- signal tracing
 - concept of the component as a ‘signal transformer’
- fault diagnosis
 - trace failed PV to the suspect component/port
 - locate failed component control path item
- integration with VDCT
- ‘prescriptive’ applications - ioc configuration, etc.
- integration with CSS
- long wish list