Relational Database Collaboration

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APS & SNS

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Argonne National Laboratory
“Top Down” meets “Bottom Up”

- Background

  - SNS has always been very ambitious with RDB’s
    - Physics parameters, accelerator devices, MPS inputs/modes
    - XAL (JAVA Framework)
    - JERI

  - APS has undertaken “as-built” documentation using RDBs
    - Descriptive rather than prescriptive

  - Do the two approaches indicate a set of tables that are useful in almost any EPICS environment?
    - rdbCore
RDB Approaches

SNS RDB

JERI

xml

XAL

MPS, … template substitution values

VDCT, vi, scripts,…

.db files

IOCBoot/ IOCcore

SNS Applications

APS RDB

IRMIS/ PV crawler

(read only)

IRMIS
First Step – identify common needs

- SNS RDB
- JERI
- xml
- XAL
- MPS, … template substitution values
- VDCT, vi, scripts...
- .db files
- IOCBoot/IOCcore
- rdbCore
- IRMIS/ PV crawler
- APS RDB

XAL Applications
Current Efforts

Plans are still developing ... but as of today ... 
- First tables of rdbCore
  - *PV database (every field of every record)*
  - *Installed device database*
    - Control Flow/Housing/Power
  - *Cable database*

- First Tools
  - ‘*Controls Framework*’ extension of XAL access rdbCore
  - *st.cmd crawler to populate PV database*
  - *PV Viewer*
  - “*vcct*” – *Visual Connection Configuration Tool*
    - View relationships between installed devices
  - Cable Editor/Viewer
Primary Tables

• Process Variable Table (of rdbCore)
  - Contains an entry for each Process Variable (record.field) name loaded into an IOC
  - Custom record definitions (and even modified record definitions) are recognized
  - 100% self-populated by “st.cmd crawler” that interprets dbLoadRecords & dbLoadDatabase lines
    - Need a plan to accommodate other CA servers
  - “extensions” to rdbCore can be added to reference client use of all PVs
    - Crawl through MEDM, ALH, Archiver config files
  - “Generic SQL” which can generate Oracle or MySQL tables
Primary Tables

• Installed Devices Table (of rdbCore)
  - Contains an entry for every replaceable component installed in the control system.
  - Each device is fully described by the following hierarchies:
    - Control parent – What is it connected to?
    - Housing parent – What is it housed in?
    - Power parent – What is it powered by?
  - 40-70% self-populated by EPICS business rules (INP/OUT fields, configDevice(), dbior, etc)

• Cable Table (of rdbCore)
  - Contains an entry for every cable installed in the control system
  - Uses ports on “installed devices” as source and destination
Primary Tables

• PV Table, Installed Device Table, Cable Table provide numerous relationships for advanced queries

  - What PVs will be affected by a particular device failure?
  - What PVs will be affected if this cable is disconnected?
  - What set of devices could cause a particular set of PVs to all be INVALID?

• And with “extended” tables …

  - What applications (MEDM displays, scripts, XAL apps, etc) will be affected if this device is powered off?
  - What applications (MEDM displays, scripts, XAL apps, etc) will be affected if this breaker trips?
Primary Tools

- Controls Framework
  - Extended from XAL (JAVA)
  - Predefined access methods to rdbCore
    - *Place to implement “business logic”*
  - Plan to make the st.cmd crawler a Controls Framework service
  - Work is underway on a persistent object API for the rdbCore tables.
    - *a standardized object view of the items in the relational database using Object Relational Mapping (ORMs)*

- Non-Java RDB access applications can also be written for routine queries and prototyping (PHP, Perl, Python, etc.)
Primary Tools – PV Viewer
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<table>
<thead>
<tr>
<th>PV Used by</th>
<th>Type</th>
<th>With Field Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL_LURF.HPM2.CHRSTH3.INFO</td>
<td>circuit</td>
<td>COL_LURF.HPM2.CHRSTH3.INFO</td>
</tr>
<tr>
<td>COL_LURF.HPM2.CHRSTH5.INFO</td>
<td>sub</td>
<td>COL_LURF.HPM2.CHRSTH5.INFO</td>
</tr>
</tbody>
</table>

Indicates other record.field(s) which reference this PV
Primary Tools - VCCT – Control/Housing/Power