

# Administration of Control Systems at the Advanced Photon Source Using Applications Organizing Index\*

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## What is an AOI?

Applications Organizing Index (AOI) is a relational database tool that has been implemented at the Advanced Photon Source (APS) to aid in the management of over 600 unique control system applications.

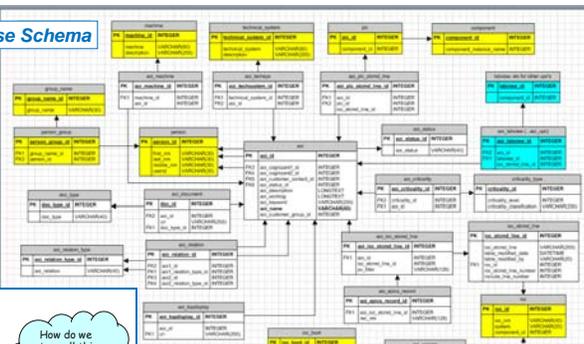
AOI provides control system developers an intuitive view of and navigation links to the components that make up a single control system, such as source code files, operator displays, process variables, work history notes, programmable components, validation procedures, drawings, and more.

The foundation for the Applications Organizing Index tool is the collaborative effort among several Experimental Physics and Industrial Control System (EPICS) sites to build the Integrated Relational Model of Installed Systems (IRMIS), a common relational database schema for documenting large and complex particle accelerator control systems.

Examples of AOIs at APS:

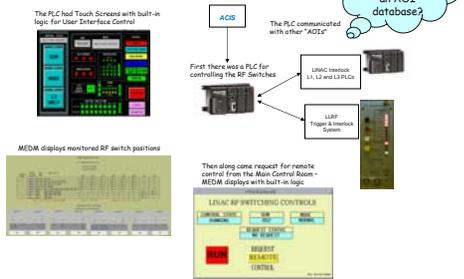
- LINAC RF Switching Control System
- BESOCM Trigger Select System
- Vacuum Valve Control
- Power Supplies

## AOI Database Schema



## How to define an AOI...

...LINAC RF Switching Control System example



## AOI Crawler Discovered Attributes

AOI Crawler parses IOC EPICS startup command files to retrieve information about:

- UPCs (IOCs, PLCs, LabView, ...) associated with each AOI
- Process Variables associated with each AOI
- EPICS startup command lines for later viewing directly through IRMIS sequence programs [Id < mpsTesterSingleLatchCard.o configuration data](#) [MpcConfig 0,0x3100,80.3](#)

Parsing requires unique AOI comment lines in the EPICS IOC startup command files:

```
# load one or more databases here.
#<aoi name="aoi_linac_llrf_control_l6">
dbLoadRecords "linacApp/llrfDb/llrf6.db"
#</aoi>
#<aoi name="aoi_linac_rf_modulator_l6">
dbLoadRecords "linacApp/modulatorDb/modulator6.db"
#</aoi>
#<aoi name="aoi_linac_rf_waveguide-switching-control">
dbLoadRecords "linacApp/opDb/waveGuideSwitch.db"
#</aoi>
#<aoi name="aoi_linac_controls_equipment-monitor">
dbLoadRecords "linacApp/opDb/opD6.vdb"
#</aoi>
```

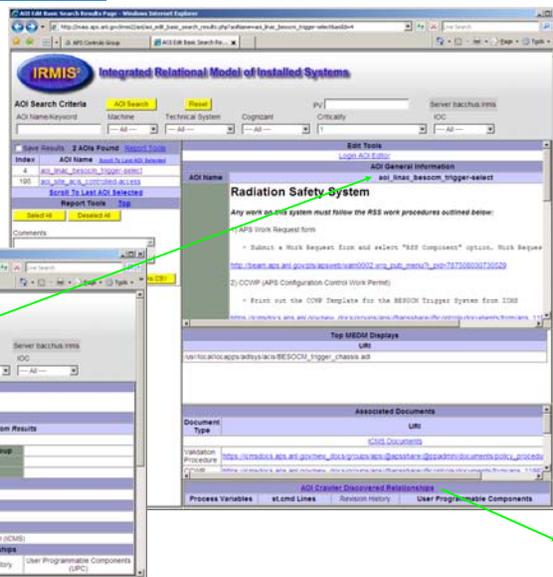
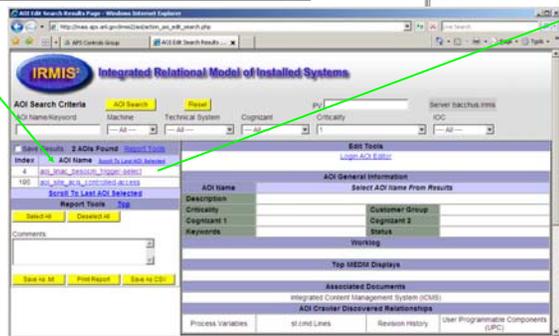
## Each AOI has the attributes:

- AOI Name
- Cognizant 1
- Cognizant 2
- Customer Group
- Criticality (Ranging from 1 to 5 with 1 being the most severe)
- Description
- Keywords
- Status (Active, Inactive, Decommissioned, Under Development, and Other)
- Worklog (time stamped user entry of work performed)
- EPICS Top Displays
- Associated Documents
- EPICS Process Variables
- IOC startup file command lines
- User Programmable Components (UPCs) such as PLCs and IOCs

## Examples of AOIs at APS:

```
aoi_linac_besocm_trigger-select
aoi_linac_bunch-compressor_motion
aoi_linac_bunch-compressor_scraper
aoi_linac_diagnostics_autotiming-sequencer
aoi_linac_diagnostics_beam-power-calculations
aoi_linac_diagnostics_flag
aoi_linac_diagnostics_bpm
aoi_linac_diagnostics_flag_alignment-laser
aoi_linac_diagnostics_flag_bunch-compressor
aoi_linac_ps_dipoles
aoi_linac_ps_dipoles_analyzing-magnets
aoi_linac_ps_dipoles_bending-magnets
aoi_linac_vacuum_control
aoi_linac_vacuum_control_klystron
aoi_linac_vacuum_control_lts
aoi_linac_vacuum_control_pc-gun
```

## IRMIS AOI Viewer



## APS AOI Statistics

AOIs defined in IRMIS relational database:

- Linac – 128
- PAR and Booster – 166
- Storage Ring – 265
- Miscellaneous – 121

AOIs associated with EPICS IOC startup command files, EPICS MEDM displays, and ICMS documents:

- AOIs having IOCs (247/680 → 36%)
- IOCs having AOIs (262/299 → 88%)
- AOIs having ICMS' documents (29/680 → 4%)
- AOIs having MEDM displays (410/680 → 60%)

\*AOI names are used as keywords in documents stored in the Oracle/Stellent Integrated Content Management System (ICMS)

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