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U.S. DEPARTMENT OF ENERGY
Office of Science

ALS-U EPICS Environment: Why and How

Jeong Han Lee, Dr.rer.nat.

ALS-U Project, Engineering Division
Berkeley Lab, USA

https://als.lbl.gov/als-u/
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Why Environment is Needed

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Complexity

- Each Site or Person follows various ways to develop, maintain, and configure modules and applications.
- Each Site uses a different HW and SW architecture
- Site-wide subsystems to be monitored by EPICS IOCs have their own requirements

Consistency

- Maintaining consistency for users, developers and LBNL operations is the key to develop, operate, and maintain the control system from its initial conception through its retirement within the Advanced Light Source's life cycle.
- Each facility needs its own environment to maintain its EPICS architecture. (ESS, e3 / ITER, CODAC / PSI, require... / APS, sumo / ...)
- **ALS-U EPICS Environment** was designed to support the ALS-U project.

Why : Global Perspective

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- Quality management of EPICS IOCs
  - Keep the same directory structure, the same naming conventions, and the consistent `st.cmd` structure
  - Incorporate lessons learned into the environment, and share them with engineers consistently.
- Common source code management problems:
  - varying quality of modules (open source): code, documentation, & styles
  - version changes of base, modules, etc.
  - customized patch files, while keeping in sync with the EPICS community
  - platform variability
  - inconsistent version management overall in EPICS community
- Have to consider different EPICS users over the ALS-U life time
  - advanced users: can manage their own IOC details
  - device integration focused (time limited) users: want to avoid low-level development, compiling code etc.
  - less experienced users: benefit from pre-selected and prepared modules
  - core development users

Why : Local Perspective

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Users

- avoid building IOCs from scratch
- consistent building results among users, systems, and Linux OS variant
- Users shielded from internal dependencies between EPICS base and modules
- Focus on higher-level tasks: IOC functionality, user-specific features, data analysis, and UI
- transfer time-consuming building and compiling issues for various EPICS software to an Architect (currently, only one)
- maintain consistent versions across modules with the ALS-U-specific version rules independent of external sources
- avoid incompatible version combinations
- Easier migration to future EPICS base releases with reduced risk of problems

ALS-U EPICS Environment Anatomy and Requirem

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Building

source codes
configure
customize
patch files
compile
install

- versioning
- bi-sync with community's work
- track down changes
- userspace libraries
- vendor libraries
- system libraries
- how to get source codes (git, tar, ...)
- only Linux OS targets
- global configuration
- site speicifc makefile
- useful makefile rules

Static

directory structure

- multiple NFS shared paths
- decouple production from unused old directories
- transparency from IOCs
- global / local / emergency environment
- easy to duplicate (clone or untar)
- define the dependency among base, modules, and others

Running

find
load
check
monitor

- consistent IOC Running
- leverage various methods to monitor IOC status and its corresponding health

- Work in Progress

ALS-U EPICS Environment (AUEE) Status

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Base Support List

- Base **7.0.7**

Modules Support List

- Almost all EPICS modules (retools, recsync, sequencer, ether_ip, iocStats, MCoreUtils, caPutLog, autosave, calc, sscan, asym, lua, modbus, busy, scaler, mca, measComp, StreamDevice, snmp, opcua, motor, motorMotorSim, pcas, pvxs, pmac, and pscdrv)
- Area Detector (ADCore, ADSimDetector, ADGenICam, ADVimba)
- ALS-U Site Specific Modules (dev-mks-mv2, dev-mks937b-unidrv, dev-gamma-pctrl, dev-evg-support, dev-bpm-support, and dev-feed-support)

Where the AUEE is

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You can build or clone it by yourself

- `git clone https://github.com/jeonghanlee/EPICS-env`
- `git clone ssh://git@git-local.als.lbl.gov:8022/alsu/epics/alsu-epics-environment.git~/epics`

Supported Linux Variants

- Rocky 8.10 Linux (Official Support)
- Debian 12 Linux (Official Support)
- Other Linux Distribution (Non-official Support)

Training Resources

- `https://jeonglee.pages.als.lbl.gov/epics-trainings/`

Questions? & Comments ?

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`Hmm, control, control. You must learn control!`

Yoda, Jedi Master (*The Empire Strikes Back*)

`I'll not leave you now. I've got to save you.`

Luke Skywalker, Jedi Master (*Return of the Jedi*)

Summary & Outlook

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Summary

- The ALS-U Controls System has its own EPICS environment.
- We aimed to cover various scenarios typically encountered in order to resolve issues consistently.
- Enjoy the ALS-U EPICS environment!
- Join alsu-epics@lbl.gov for the ALS-U EPICS Environment User Group!

Outlook

- We will release `1.1.2` this year to embrace the latest bug fixes from `pvxs`
- We will add open-source `opcua` support officially late this year. In this case, the version will be `1.2.X`

감사합니다!

Thank you!

Dankeschön!

Tack så mycket!

☺