EPICS 'makeBaseApp', IOC Binaries

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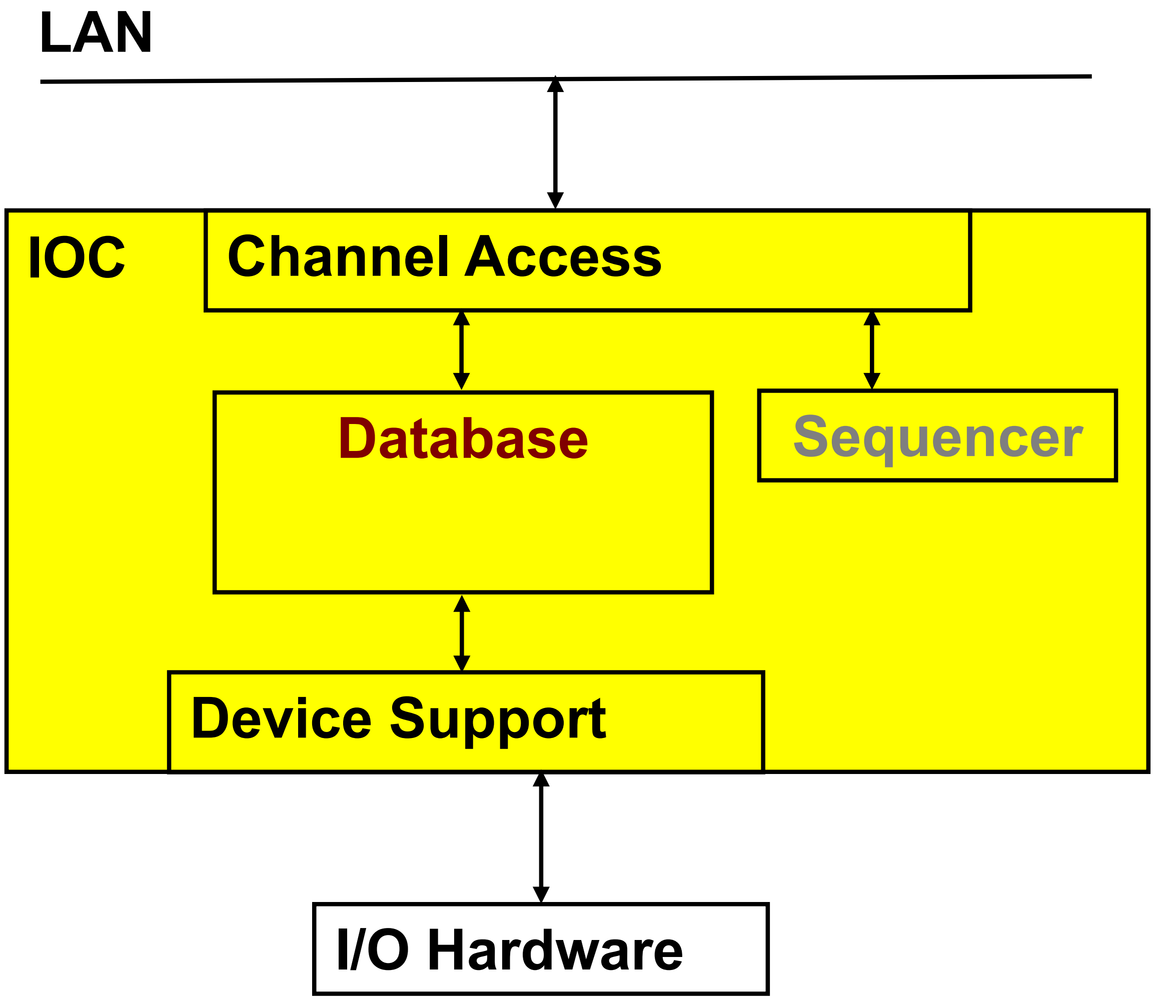
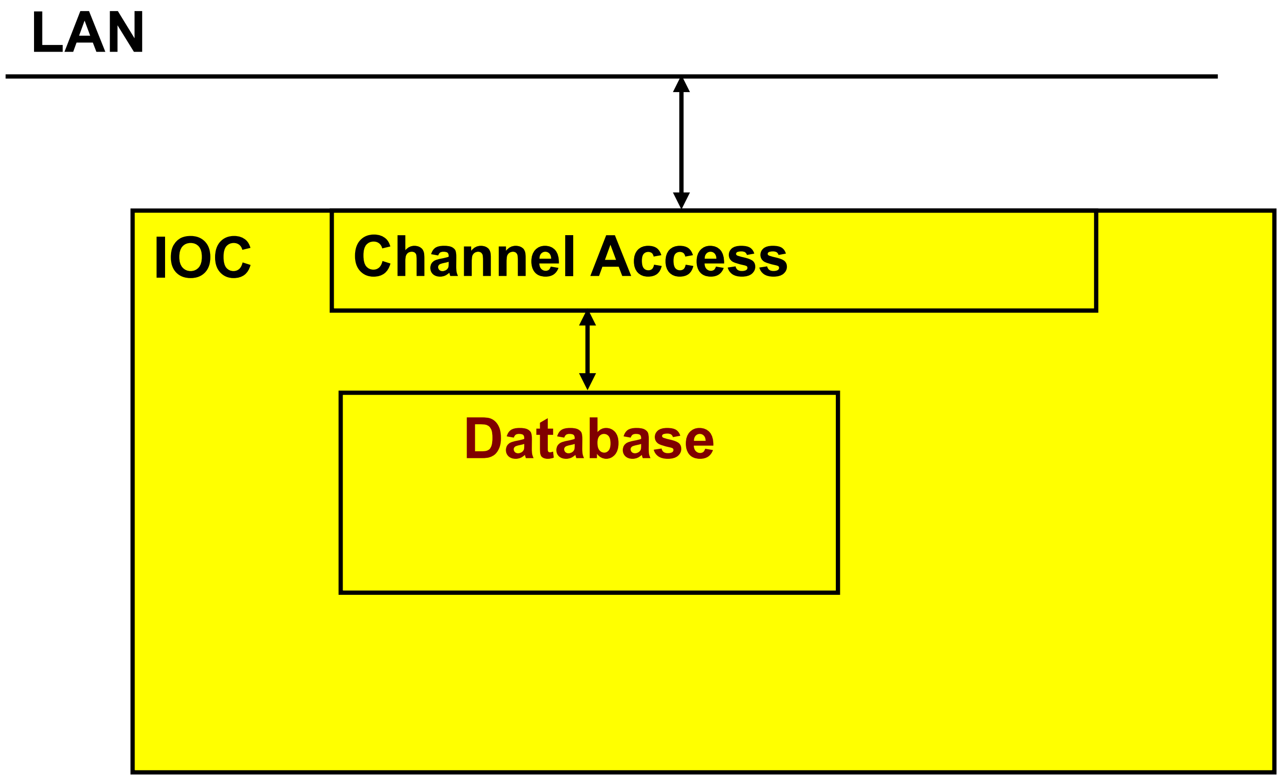
EPICS IOC

- **Ideally: Just Database records**
  - Known & well tested building blocks
  - Remote access
  - Access security
  - 'bumpless' reboot
- **Sometimes: Need Sequencer code**
  - C(++) code, nobody else will understand it
- **Need Device Support**
  - Include existing device support? Easy enough
  - Have to write new device (driver) code? Running with scissors!



‘softIoc’



Binary with
Database engine
and
Channel Access.

Run as many
instances as
needed.

Need sequencer, device support?
→ Create your own IOC application binary!

Who needs custom IOC binary?

Accelerator: One per subsystem

- Vacuum: Support for AllenBradley PLC
- LLRF: Support for LLRF hardware

→ Different maintainers, different needs,
then many instances per subsystem

Beamlines: One (few) per beamline?

- CG-1D:
  One binary with support for Camera, Parker6K, ‘Stream’ device.
  Separate instance for Camera, Motors, ICP, Robofocus, Scan support.
- Choppers: One binary for all choppers?

→ Each beam line <u>must</u> have different binary
to allow independent updates.
Within a beam line, try to keep low number?

‘makeBaseApp.pl’

- Creates skeleton for custom IOC
  - Directory structure
  - Makefiles
  - Examples: *.db, *.st, driver/device/record *.c
  - IOC startup file
- Two extremes
  - makeBaseApp.pl –t example
    - Get most everything; you delete what’s not needed
  - makeBaseApp.pl –t ioc
    - Just dirs & Makefiles; you add what’s needed

EPICS Build Facility

Is outstanding

- make, perl
- Builds on Linux, Mac, Windows
- ..for Linux, FreeBSD, OS X, Windows, vxWorks, RTEMS, x86, x86_64, ppc, arm, …
- AppDevGuide
- Functioned for decades across many changes of OSs, compilers, …

Is aggravating

- "Why is it not an Eclipse, Visual C++, Kdeveloper … project? What about CMake, GNU automake, … ?"
- What's the name of that option again?
- What's causing this error now?

‘example’ Example

```
# Go somewhere

mkdir –p ~/epics-train/mine
cd ~/epics-train/mine


# Create IOC application of type ‘example’,
# using ‘demo’ in the generated names
makeBaseApp.pl -t example demo


# Create IOC startup settings of type ‘example’,
# call it ‘demo’
makeBaseApp.pl -t example -i demo
# When prompted, use the previously created ‘demo’
# application as the one that the IOC should load

# Compile everything
make

# Start IOC
cd iocBoot/iocdemo
chmod +x st.cmd
./st.cmd
```

Directory Layout: Key Files

```
# makeBaseApp.pl -t example demo
configure/RELEASE
configure/CONFIG_SITE
demoApp/Db/*.db
demoApp/Db/*.substitutions
demoApp/Db/Makefile
demoApp/src/Makefile

# makeBaseApp.pl -t example -i demo
iocBoot/iocdemo/Makefile
iocBoot/iocdemo/st.cmd
```

- To study the skeleton, check files before the first ‘make’ or after a ‘make distclean’

Directory Layout: Generated Files

```
**/O.Common
**/O.linux-x86_64
**/O.*
db/*
dbd/*
include/*
lib/*
bin/*
```

Beware of difference:

- **whateverApp/Db/***
  - Database 'Sources'. Edit these!
- **db/***
  - 'Installed' databases, may have macros replaced. Will be overwritten by next 'make'!

*.dbd: Database Descriptions

IOC record types, device support, … are extensible

- Implement new record type, new device support: Write C/C++ code for certain interfaces, compile.
- Somehow ‘register’ this with core IOC code: *.dbd file

Internals:
VxWorks RTOS, the original IOC target, had runtime loader and symbol table.
RTEMS, .. don’t necessarily offer this.
EPICS build facility generates IOC startup source code from *.dbd file.

HowTo: Add Support Modules (Device, …)

Example: 'Autosave'

1. Define path in `configure/RELEASE`:

```
AUTOSAVE=/home/controls/epics/R3.14.12.2/support/autosave
```

   Path to the support directory is usually pulled into a macro, since you often include more than one support module:

```
SUPPORT=/home/controls/epics/R3.14.12.2/support
AUTOSAVE=$(SUPPORT)/autosave
```

2. Add binary and DBD info to `xyzApp/Db/Makefile`:

```
YourProduct_DBD += asSupport.dbd
YourProduct_LIBS += autosave
```

3. Use the support module in the IOC startup file:

```
cd ${AUTOSAVE}
dbLoadRecords "db/save_restoreStatus.db", "P=demo"
set_requestfile_path("/home/controls/var")
create_monitor_set(...)
```

Details on how to use a support module depend on the specific one, including names of provided *.dbd, binary, *.db, IOC commands

HowTo: Add Database files

1. Create `xyzApp/Db/another.db`

   For simple database, can test via

   ```
   softIoc –d another.db
   ```

2. Add to `xyzApp/Db/Makefile`:

   ```
   DB += another.db
   ```

3. `make`

   Now it's under `db/another.db`

4. Add to `iocBoot/iocwhatever/st.cmd`

   ```
   dbLoadRecords "db/another.db", "macro=value″
   ```

5. (Re-)start the IOC

Summary

makeBaseApp.pl creates the IOC skeleton

Good practice:

- **Use `makeBaseApp.pl –t example…` for copy/paste.**
- **Create empty operational setup, and only paste-in what you need.**
- **Do it in small steps.**