Argonne NATIONAL LABORATORY

Using APS iocappsTools

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Outline

- What are the iocappsTools
- APS Accelerator IOC standards
  - asdstd Support Module
  - IRMIS and AOIs
- Tools covered in this lecture
  - iocHelp
  - iocConsole
  - capr and pvExist
  - iocBoot, iocBootChange
  - iocBsp, iocModules, iocFindSupport
  - pvUsage
  - iocNetwork
  - iocErrorLog
  - aoiExist and aoiMedm

The iocappsTools

- EPICS Extension
- Provides scripts for querying, configuring and interacting with IOCs
- Most were designed for the APS Accelerator IOCs
  - IOCs must use the asdStd module to provide data for the scripts to use
  - Scripts rely on the /usr/local/iocapps file-system layout, IRMIS database etc.
    - The file-system path can often be changed by setting an environment variable
  - In most cases operations can cover multiple IOCs

iocHelp

- Alias for iocappsHelp
- Prints a summary list of the other scripts and what they do

```
tux% iocHelp

iocapps tools:

aoiExist          Print AOI names containing a specified string or AOI names of
                  an EPICS record containing a specified string
aoiMedm           Execute and/or list top medm displays for a specified AOI or
                  for the AOI of a specified EPICS record
capr              A channel access version of "dbpr"
caclients         Displays information about local CA clients
ctllog            Information on the e-mail list-server used as
                  the Controls Group "Knowledge Base"
iocappsHelp       List all iocapps tools
iocBoot           Print bootparams and bootlog messages
iocBootChange     Change vxWorks bootstrap parameters
iocBsp            Find the appropriate vxWorks board support package for a CPU
iocCodeChange     List active ioc's boot files changed since specified date
iocConsole        Connect to ioc by executing ssh or screen
iocErrorLog       Print iocErrorLog file messages (output piped to more)
iocFindSupport    Find EPICS support (record type, device support, etc) by
                  searching directories/files for a user supplied string
iocHelp           Alias for iocappsHelp
```

iocConsole

- Most used tool, opens a terminal session to the console of named IOC
- Uses GNU Screen to allow multiple users to connect at once
- Consults a series of configuration files to determine how to connect to the IOC
  - Environment variables IOC_INFO and IOC_SCREEN can override where it looks
  - Also accepts detailed connection information on the command line
- Can connect to IOC console port over telnet or ssh
  - APS IT group's terminal concentrators typically use ssh
  - Moxa devices use telnet to a specific port number
- Connects to IRMIS database to fetch pre- and post-boot instructions for display at connection time

- GNU Screen has many features, press Ctrl-A then '?' for help
- To exit an iocConsole session, press Ctrl-A then 'D' (disconnect)
  - If you use Ctrl-A then 'K' GNU Screen will stop running and all console history will be lost

capr — Channel Access Print Record

- CA version of the IOC ‘dbpr’ command
  - An updated version of this command ‘capr.pl’ was added to Base-3.14.12
- Takes 2 arguments, a PV name and an optional interest level (integer)
- Has its own list of record types and fields (capr.dbd file)
  - Use your own IOC’s .dbd file by adding the option ‘-d /path/to/file.dbd’
  - To see the complete list of known record types, use the command ‘capr -r’
- Example:

```
medusa% capr S:SRcurrentCC
Using /net/helios/epics/extensions/bin/linux-x86_64/../../dbd/capr.dbd

S:SRcurrentCC is record type calc
A:    102.52000000  ASG:                B:    0.00000000    C:    0.00000000
CALC: abs(a)        D:    0.00000000    DESC: SR Current    DISA: 0
DISP: 0             DISV: 1             E:    0.00000000    F:    0.00000000
G:    0.00000000    H:    0.00000000    I:    0.00000000    J:    0.00000000
K:    0.00000000    L:    0.00000000    NAME: S:SRcurrentCC SEVR: NO_ALARM
STAT: NO_ALARM      TPRO: 0             VAL:  102.51500000
```

pvExist

- Searches for APS accelerator PV names matching one or more strings
  - Actually runs grep on the /usr/local/iocapps/iocinfo/pvdata files
  - Set the IOC_INFO environment variable to override location of pvdata directory
- Takes a list of strings to look for
  - Also accepts regular expressions (enclose in quotes)
- Example:

```
medusa% pvExist SRcurrent currentCC
iocsrscope:S:SRcurrentAI
 iocsrscope:S:SRcurrentCC
 siocblops:S:SRcurrentCP
iocs35bpm:S36DCCT:currentCC
 iocs35bpm:S:DCCTa:currentCC
 iocs35bpm:S35DCCT:currentCC
 iocsrscope:S:SRcurrentCC
```

- Output is not particularly friendly
  - Each line starts '*iocname*:' followed by the PV name
  - Searches are run sequentially, note 1-space indent

iocBoot

- Displays latest boot parameters and boot history for a set of IOCs
  - Uses the bootparams and bootlog files from /usr/local/iocapps/iocinfo
  - Set the IOC_INFO environment variable to override iocinfo location
- Not just for VxWorks IOCs, handles RTEMS and Soft IOCs too
  - Boot parameters displayed are appropriate to the IOC type
  - Option '-s' limits output to startup script boot parameter only
- In some cases it queries IRMIS for the list of active IOCs
  - Option '-p' changes query to IOCs marked as production systems
- Four modes of operation, depending on command-line arguments
  - List of IOC names — display boot parameters and bootlog for named IOCs only
  - Option '-n' — display boot parameters and bootlog for all active IOCs listed in IRMIS that last booted from an application top *outside* the official /usr/local/iocapps area
  - Date (mm/dd/yy) — display bootlog messages for IOCs booted since midnight on given date
  - Date with '-' suffix — display names of all IOCs that have not booted since the given date

iocBoot Example #1

- VxWorks IOC

```
medusa% iocBoot iocrftime
iocrftime boot parameters:
   boot device             : ei0
   processor number        : 0
   host name               : ajax
   file name               : /usr/local/vxWorks/5.5.2/mv167-asd8
   inet on ethernet (e)    : 164.54.3.148:fffffc00
   host inet (h)           : 164.54.2.167
   user (u)                : vw5
   ftp password (pw) (blank = use rsh)   : **********
   flags (f)               : 0x1000
   target name (tn)        : iocrftime
   startup script (s)      : /usr/local/iocapps/R3.14.12.3/ioc/rfsys/3/iocBoot/iocrft…
iocrftime boot log:
   05/12/14 22:29:27.690843354   npd      Updated to R3.14.12.3
   09/01/14 10:16:24.000000000   mls      Change boot parameter "helios" to "ajax"
   09/01/14 10:16:24.000000000   mls      Change boot parameter "/usr/local/vxWorks/…
   09/01/14 14:10:22.000000000   mls      iocBootChange -- no changes, just reboot
   09/01/14 14:14:06.834891643   ***      ******
   09/02/14 11:01:48.029709386   npd      updated to ajax
   09/02/14 12:12:27.262891675   npd      Reboot reason:
   09/02/14 12:14:32.525558331   npd      Updated nfsCommands file
   09/19/14 07:01:38.793871842   npd      end of shutdown reboot
   01/19/15 09:05:15.627523518   npd      End of shutdown reboot.
```

iocBoot Example #2

- Soft IOC on linux-x86_64

```
medusa% iocBoot siocops
siocops boot parameters:
   host name (hn)          : ctlapps3-vm.aps4.anl.gov
   process id (pid)        : 11825
   file name (fn)          : /net/helios/iocapps/R3.14.12.3/ioc/ops/2/bin/linux-x86_6…
   target name (tn)        : siocops
   startup script (s)      : /net/helios/iocapps/R3.14.12.3/ioc/ops/2/iocBoot/siocops…
   launch script (ls)      : /net/helios/iocapps/R3.14.12.3/ioc/ops/2/iocBoot/siocops…
   launch script pid (lpid) : 11814
   console connection (cc): screen:ctlapps3-vm.aps4.anl.gov:sioc:11812.siocops
   target_arch (ta)        : linux-x86_64
   bootparams version (v) : 2.0
siocops boot log:
   01/05/15 15:48:39.926772234   sioc
   01/05/15 15:51:24.403814883   sioc
   01/05/15 15:53:15.965120503   sioc
   01/05/15 15:55:19.553946520   sioc
   01/06/15 15:56:47.762322552   sioc
   01/07/15 12:27:00.374647720   sioc
   01/07/15 12:31:30.271889758   sioc
   01/07/15 13:02:43.494659443   sioc
   01/07/15 13:12:36.695168279   jbs         boot from system area
   02/10/15 11:46:26.170368302   ***         ******
```

iocBoot Example #3

- Find production IOCs booting from developer trees

```
medusa% iocBoot -s -p -n
iocbol          : /home/helios/JBS/iocapps/R3.14.12.3/ioc/xdiag/1/iocBoot/iocbol/st.cmd
iocbramp        : /home/helios1/XUSF/iocapps/R3.14.11/ioc/bramp/2/iocBoot/iocbramp/st.…
iocs35idbl      : /home/helios/JBS/iocapps/R3.14.12.3/ioc/xdiag/1/iocBoot/iocs35misc/s…
ioctest40       : /home/helios/JBS/iocapps/R3.14.12.3/ioc/srtemp/1/iocBoot/ioctest40/s…
siocbarometer   : /home/helios/MLS/iocapps/R3.14.12.3/ioc/frontend/2/iocBoot/siocbarom…
siocid06        : /home/helios/MLS/iocapps/R3.14.12.3/ioc/ids/1/iocBoot/siocid06/st.cmd
siocmetasys     : /home/helios/MLS/iocapps/R3.14.11/ioc/metasys/1/iocBoot/siocmetasys/…
siocvidfg1      : /home/helios/SHOAF/iocapps/R3.14.11/ioc/imaging/3/iocBoot/siocvidfg1…
siocvidfg2      : /home/helios/SHOAF/iocapps/R3.14.12.3/ioc/lfgviddev/1/iocBoot/siocvi…
siocvidfg3      : /home/helios/SHOAF/iocapps/R3.14.12.3/ioc/lfgviddev/1/iocBoot/siocvi…
```

- Options reminders
  - -s — display only the startup script
  - -p — list production IOCs only
  - -n — not booting from official area (/usr/local/iocapps/…)

iocBoot Example #4

- Find IOCs that rebooted since a particular date

```
medusa% iocBoot 3/24/15
iocbbpm2 boot log:
   03/24/15 10:32:12.024433851   ***      ******
iocpar02 boot log:
   03/24/15 22:15:55.572020261
iocpartune boot log:
   03/24/15 22:15:49.081964614
iocs10abpm boot log:
   03/24/15 16:01:29.027907690   afp        lost event time
iocs10bbpm boot log:
   03/24/15 16:01:38.967907690   afp        lost event time
iocs11abpm boot log:
   03/24/15 16:03:34.063907690   afp        lost event time
iocs11bbpm boot log:
   03/24/15 16:04:02.762907690   afp        lost event time
iocs12abpm boot log:
   03/24/15 16:10:48.030079752   afp        lost event time
iocs12bbpm boot log:
   03/24/15 16:11:05.109079752   afp        lost event time
iocs13abpm boot log:
   03/24/15 16:12:47.566079752   afp        lost event time
iocs13bbpm boot log:
   03/24/15 16:12:56.565079752   afp        lost event time
```

iocBootChange

- Script to modify VxWorks boot parameters for a set of IOCs
- For each IOC it
  1. Connects to the console of the IOC using iocConsole
  2. Sends ^X^Y^Z to reset the VME CPU
  3. Stops the boot countdown
  4. Sends a ‘c’ command and modifies the parameters as requested
  5. Sends ‘@’ command to boot the IOC
  6. Disconnects from iocConsole
  7. Repeat for next IOC in the list
- Has options to change
  - VxWorks image release version: -f asd7
  - VxWorks image full path name: -v /usr/local/vxWorks/5.5.2/mv167-asd8
  - EPICS Base version in startup script: -s R3.14.12.5
  - Branch version in startup script: -b 3
  - Top directory in startup script: -t /usr/local/iocapps/R3.14.11/ioc/srrtfb/1

iocBootChange continued

- This script is written in tcl and uses expect
  - Originated with Eric Norum
- This script is an expert level tool
  - Can be temperamental
  - Can be dangerous
    - Has various safeguards built in (reboot confirmations etc.)
  - Works differently on Solaris and Linux
  - See Marty Smith if you need to use it

iocBsp

- For an application built against a particular release of EPICS Base, which VxWorks OS image file should I boot my VME CPU with?

```
medusa% iocBsp R3.14.12.3
R3.14.12.3 mv162 /usr/local/vxWorks/5.5.2/mv162-asd8
R3.14.12.3 mv167 /usr/local/vxWorks/5.5.2/mv167-asd8
R3.14.12.3 mv172 /usr/local/vxWorks/5.5.2/mv172-asd8
R3.14.12.3 mv2100 /usr/local/vxWorks/5.5.2/mv2100-asd8
R3.14.12.3 mv2700 /usr/local/vxWorks/5.5.2/mv2700-asd8
R3.14.12.3 mv2700 /usr/local/vxWorks/6.8/mv2700-dev8
R3.14.12.3 mv2700 /usr/local/vxWorks/6.8/mv2700-dev8-debug
R3.14.12.3 mv3100 /usr/local/vxWorks/6.8/mv3100-dev8
R3.14.12.3 mv3100 /usr/local/vxWorks/6.8/mv3100-dev8-debug
R3.14.12.3 mv5100 /usr/local/vxWorks/5.5.2/mv5100-asd8
R3.14.12.3 mv5100 /usr/local/vxWorks/6.8/mv5100-dev8
R3.14.12.3 mv5100 /usr/local/vxWorks/6.8/mv5100-dev8-debug
R3.14.12.3 mv6100 /usr/local/vxWorks/5.5.2/mv6100-asd8
R3.14.12.3 mv6100 /usr/local/vxWorks/6.8/mv6100-dev8
R3.14.12.3 mv6100 /usr/local/vxWorks/6.8/mv6100-dev8-debug
```

- Lists the latest release for each CPU (give option -a to list all releases)
- Also accepts the CPU type as a second argument for less output

iocModules

- What are the latest versions of a set of IOC support modules available in the production area for this release of EPICS Base?

```
medusa% iocModules R3.14.12.3 ipac asyn directNetAsyn
IOCAPPS=/usr/local/iocapps/R3.14.12.3
IPAC=$(IOCAPPS)/modules/bus/ipac/2-12-asd1
ASYN=$(IOCAPPS)/modules/soft/asyn/4-21-asd2
DIRECTNETASYN=$(IOCAPPS)/modules/plc/directNetAsyn/1-3-asd11
```

- Lists the latest release for each module (give option -a to list all releases)
- The output can usually be pasted directly into a configure/RELEASE file
  - Output probably should include EPICS Base, but currently doesn't
- For Base R3.13.10, use iocSupport instead of iocModules

iocFindSupport

- I know there's a driver installed for this module, how do I find it?

```
medusa% iocFindSupport tvme200 R3.14.12.3
/usr/local/iocapps/R3.14.12.3/modules/bus/ipac/2-11-asd4/drvIpac/drvTvme200.c
/usr/local/iocapps/R3.14.12.3/modules/bus/ipac/2-12-asd1/drvIpac/drvTvme200.c
```

- Searches for the first argument string in the filenames of the iocapps area
- The second argument may be
  - Omitted (searches all EPICS releases)
  - A single release version
  - An absolute pathname to one or more directory trees to be searched
- If you get no answers the first time, adding a '-t' option tells it to search the contents of all text files examined, not just their names
  - The '-t' option greatly increases the search time, so don't use it unless you need it

pvUsage

- What other records or CA clients connect to these PVs?

```
medusa% pvUsage ID01ds:DeviceEnbl%
ID01ds:DeviceEnbl%
  PV link usage
    iocid01       ID01ds:DeviceEnable.FLNK          ID01ds:DeviceEnblRdbk.PROC PP NMS
    iocid01       ID01ds:MotorDriveStatus.INPF      ID01ds:DeviceEnblRdbk.VAL CP NMS
    iocid01b      ID01ds:DeviceEnable.FLNK          ID01ds:DeviceEnblRdbk.PROC
    iocid01b      ID01ds:MotorDriveStatus.INPF      ID01ds:DeviceEnblRdbk.VAL CP NMS
  CA client usage
    MEDM
      ID01ds:DeviceEnblRdbk.VAL
          /net/helios/iocapps/adlsys/sr/id/GlobalIDEnable.adl
      ID01ds:DeviceEnblRdbk.VAL
          /net/helios/iocapps/adlsys/sr/id/ID4SStatus.adl   'ID=01ds, M=4, D=1'
          /net/helios/iocapps/adlsys/sr/id/ID4SStatus.adl ''
          /net/helios/iocapps/adlsys/sr/id/4_Motor_Encoders.adl
      ID01ds:DeviceEnblStat.VAL
          /net/helios/iocapps/adlsys/sr/id/ID4SStatus.adl   'ID=01ds, M=4, D=1'
          /net/helios/iocapps/adlsys/sr/id/ID4SStatus.adl ''
          /net/helios/iocapps/adlsys/sr/id/4_Motor_Encoders.adl
```

- Accepts list of PV names; use ‘%’ for wildcards
- Sends query to the the IRMIS database and displays the results

iocNetwork

- Query IRMIS for network and serial connections to one or more IOCs

```
tux% iocNetwork ioc%time

iocinjtime
                        Rack Number                 Server:Port          Fiber Chas…
    Terminal Server:    B111_(ICR)/02                CTSINJA:12          A:12

                        Rack Number                 Switch:Blade:Port    MediaConve…
    Primary Ethernet:   B111_(ICR)/02                 swinj:  C:21              -:0
    Secondary Ethernet: B111_(ICR)/03                 swinj:  E:16              -:0

iocmtime
                        Rack Number                 Server:Port          Fiber Chas…
    Terminal Server:    MCR/03                        CTSMCR:5           A:5

                        Rack Number                    Switch:Blade:Port    MediaConve…
    Primary Ethernet:   MCR/03                  swacccoreb:  D:15              -:0
    Secondary Ethernet: MCR/03                  swacccorea:  G:6       MCMCR02-B2:1

iocrftime
                        Rack Number                 Server:Port          Fiber Chas…
    Terminal Server:                                       :0            :0
```

iocErrorLog

- Display error messages logged by one or more IOCs
  - Default is to print the 10 most recent messages found
  - Give option '-20' to print last 20, etc.
- Provide date (mm/dd/yy) before IOC names to only see messages since date

```
tux% iocErrorLog 2/3/15 iocsmps

IOCNAME: iocsmps
iocsmps.aps4.anl.gov:4089 Tue Feb  3 00:11:35 2015 sync Slave not in sync…
8853 != 791791895,315149268
iocsmps.aps4.anl.gov:4089 Tue Feb  3 02:12:15 2015 sync Slave not in sync…
268 != 791799135,62369199
iocsmps.aps4.anl.gov:4089 Tue Feb  3 16:00:43 2015 sync Slave not in sync…
9199 != 791848843,324712696
iocsmps.aps4.anl.gov:4089 Wed Feb  4 13:32:50 2015 sync Slave not in sync…
2696 != 791926370,617879807
```

- NB: The accelerator iocLogServers have not been running since 2015-02-05

aoiExist

- Find AOI names matching a string

```
tux% aoiExist asdstd
asdstd
  aoi_site_controls_asdstd
  aoi_site_controls_asdstd_ca-host-id
  aoi_site_controls_asdstd_console-chime
  aoi_site_controls_asdstd_general-time
  aoi_site_controls_asdstd_ioc-data-dump
  aoi_site_controls_asdstd_ioc-status
```

- Find AOI names associated with a PV

```
tux% aoiExist -p ID01ds:DeviceEnbl%
ID01ds:DeviceEnbl%
  ID01ds:DeviceEnblRdbk
    aoi_sr_id_4-motor_s1ds
```

aoiMedm

- List or open MEDM screens associated with an AOI
  - The aoi names used here must be complete, no wild-cards allowed

```
tux% aoiMedm -l aoi_par_ps_dipoles
aoi_par_ps_dipoles
      /usr/local/iocapps/adlsys/par/parTopApp/PAR_PS_strip.adl
      /usr/local/iocapps/adlsys/par/psApp/parPSStatus.adl
```

- Omit '-l' to have it start MEDM and open these screens
  - Currently only works from helios workstations, PV Gateway address needs updating
- Accepts a '-p' option like aoiExist to identify the aoi from a PV name
  - PV name must be complete, no wild-cards allowed