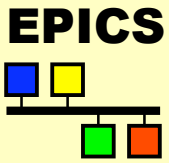
NSRL
EPICS
Seminar



Channel Access Configuration

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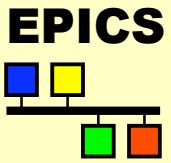
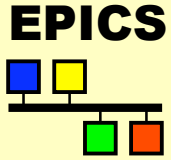
(Andrew Johnson, APS, USPAS1999)
(Bob Dalesio, LANL, USPAS2003)

Configuration method



- CA clients and servers can be configured by setting environment variables
  - On Unix:
    - csh, tcsh — `setenv VARNAME value`
    - sh, ksh — `VARNAME=value;export VARNAME`
    - `printenv` displays all variables from any shell
  - On vxWorks:
    - `putenv "VARNAME=value"`
    - `envShow` displays all variable values
  - On Windows
    - `set VARNAME=value`
    - `set` displays all variables from a Command Prompt
    - or Control Panel / System / can be used
- Environment variables are inherited when you start a new program, not afterwards
  - Unix, Windows: Set the variables, then start the client
  - vxWorks: Set variables in the startup script
- Default values for a site are set at build-time in (EPICS 3.14)
  `<epics>/base/configure/CONFIG_ENV` and
  `<epics>/base/configure/CONFIG_SITE_ENV`
  (The files are in `<epics>/base/config/` on EPICS 3.13)

CA name resolution



- Search requests for CA channel names are broadcast to all CA servers on the client's local TCP/IP subnet
- Only a server which recognizes the name will respond to the client
  - If identical record names exist in two IOCs, the first to reply "wins" the connection
- The client library then opens a connection with that server to access that channel
- Potential problems:
  - Not all LANs support broadcasting
    - Ethernet does, Token Ring doesn't
  - Some sites don't allow broadcasting
    - Bridges/hubs will not forward packets
  - Broadcasts are local to the machine's subnet
    - Sites can span more than a single subnet

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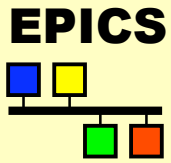
Configuring name resolution



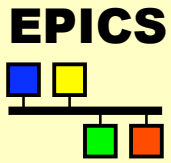
- How to disable all broadcasts?
  - **`EPICS_CA_AUTO_ADDR_LIST = NO`**
  - Default value = YES
  - IOCs are also clients, so generate broadcasts
- How to find channels without broadcast?
  - **`EPICS_CA_ADDR_LIST`**
  - List of IP addresses, separated by spaces

    ```
    setenv EPICS_CA_ADDR_LIST "164.54.8.145"
    ```
  - This list is used in addition to broadcasts if these are enabled
- How to search other subnets as well?
  - Use a broadcast address in **`EPICS_CA_ADDR_LIST`**

    ```
    setenv EPICS_CA_ADDR_LIST "131.111.69.255"
    ```
  - Some routers will not pass broadcast addresses
- Combination
  - Use a space separated addresses in **`EPICS_CA_ADDR_LIST`**

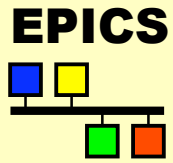
    ```
    setenv EPICS_CA_ADDR_LIST "131.111.69.255 131.11.70.10 131.11.70.11"
    ```

Connection health



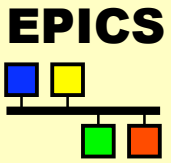
- CA servers send out an “I’m still here” beacon ever 15 seconds
  - Usually broadcast, configurable as before
- If a server is quiet for 30 seconds, any connected clients will
  - send it an “echo” packet (not broadcast)
  - allow 5 seconds for it to reply
  - mark all channels to this server disconnected
- Potential problems:
  - Slow or busy links might introduce random delays, some longer than 15 seconds
  - Busy sites may want to reduce broadcast rates
  - Clients take 35 seconds to recognize when a server has died

Configuring connection health



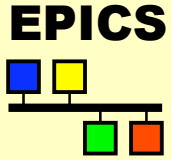
- How to change the server beacon period?
  - `putenv "EPICS_CA_BEACON_PERIOD=30.0"`
  - Default value is 15.0 seconds
- How to change the client timeout delay?
  - `setenv EPICS_CA_CONN_TMO 60.0`
  - Default value is 30.0 seconds
  - This value determines how long a client takes to notice that a server has died (+5 seconds)
- The connection timeout must be longer than the beacon period, preferably twice
  - Breaking the ‘preferred’ condition could increase network traffic
  - Breaking the ‘must be’ condition can also cause random client disconnections

Port numbers



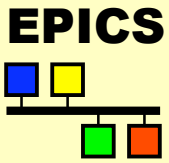
- Channel Access uses two IP port numbers for its communication (UDP and TCP)
  - **`EPICS_CA_SERVER_PORT`**
    - Default is 5064
  - **`EPICS_CA_REPEATER_PORT`**
    - Default is 5065
  - Both should be > 5000, check with sysadmins
- The settings for a server and all its clients must be the same
- Using different port numbers can allow independent projects to share a subnet without any danger of CA name clashes
  - Can also be used for application testing
  - No interaction is possible between projects

Where am I — What time is it?



- An IOC gets Universal Coordinated Time from its boot host (UTC=GMT)
  - This is converted to local time using the server's value for **`EPICS_TS_MIN_WEST`**
- CA Servers report timestamp values using their local timezone
- How to tell a client that the server is in a different timezone?
  - **`setenv EPICS_TS_MIN_WEST -480`**
    - Default value is set by site manager (APS=360)
  - Gives server's timezone in minutes relative to GMT; negative means east of Greenwich
- Daylight savings changes are hard-coded into the IOC software. Changes may occur on the wrong date in some locations…

References



- Documents
  - Channel Access Reference Manual
    - The First Chapter for “Configuration”
    - <URL:http://www.aps.anl.gov/epics/docs/ca.php>
  - EPICS Base Configuration Files
    - ${EPICS_BASE}/configure/CONFIG_ENV
    - ${EPICS_BASE}/configure/CONFIG_SITE_ENV
  - EPICS Base Header Files
    - ${EPICS_BASE}/include/cadef.h
    - ${EPICS_BASE}/include/caerr.h
    - ${EPICS_BASE}/include/db_access.h