EPICS Channel Access Overview

2006

kasemirk@ornl.gov
Channel Access: The EPICS Network Protocol

• Read and write Process Variables over the network.

• To many, CA is EPICS.
  – Especially to users of systems that have no IOC database.
  – "Integrate into EPICS" can mean: Talk CA on the network.
History

• CA was **not** defined via a protocol specification.

• Jeff Hill (LANL) provides CA server and client libraries in C/C++.
  – Odd, but resulted in very stable implementation, avoiding conflicts caused by differing interpretations of the protocol by different persons.

• Cosylab recently has reverse-engineered the protocol specification, and implemented a pure Java version.
  – Which is great for the future of CA.
  – … but for now suffers from interpretation issues, possibly crashing CA servers on IOCs.
What is a Process Variable?

• Good question!
  – Need to revisit.

• "A named piece of data with attributes".

• Consider this record:

```plaintext
record(calc, "t1:calcExample")
{
    field(Desc, "Sawtooth Ramp")
    field(SCAN, "1 second")
    field(CALC, "(A<10)?(A+1):0")
    field(INPA, "t1:calcExample.VAL")
}
```

  – Fine print:
  Your soft IOC will have a "t1:calcExample" with a slightly more complicated "CALC=(A<B)?(A+C):D", because it uses variables B and C instead of fixed values 10 and 0. Plus it defaults to B=9, not 10 as used in this example.
What is a PV, given that record?

- "t1:calcExample"
  - PV for the current value of the record.
  - Number 0…10, changes each second.

- "t1:calcExample.DESC"
  - PV for the DESC (description) field of the record.
  - String "Sawtooth Ramp", static.

- "t1:calcExample.VAL"
  - Same as "t1:calcExample".

- Pretty much every field of a record can be a PV:
  - "{record name}.{field name}"
  - ".VAL" is implied when the field is left off.
'caget', 'caput' Experiments

- 'caget' command-line tool comes with EPICS base:
  
  ```
  > caget tl:calcExample
  tl:calcExample 6
  > caget tl:calcExample.VAL
  tl:calcExample.VAL 9
  > caget tl:calcExample.DESC
  tl:calcExample.DESC Sawtooth Ramp
  ```

- 'caput' allows writing:
  
  ```
  > caput tl:calcExample.DESC "Howdy"
  Old : tl:calcExample.DESC Sawtooth Ramp
  New : tl:calcExample.DESC Howdy
  ```
'camonitor'

• 'camonitor' monitors value changes:

  > camonitor t1:calcExample
  t1:calcExample 2006–10–06 13:26:03.332756 6
  t1:calcExample 2006–10–06 13:26:04.332809 7
  t1:calcExample 2006–10–06 13:26:05.332866 8
  t1:calcExample 2006–10–06 13:26:06.332928 9
  t1:calcExample 2006–10–06 13:26:07.332981 10
  t1:calcExample 2006–10–06 13:26:08.333034 0
  t1:calcExample 2006–10–06 13:26:09.333097 1
  t1:calcExample 2006–10–06 13:26:10.333143 2
  ... plus one more each second...
  ... press Ctrl-C to stop ...

  > camonitor t1:calcExample.DESC
  ... and then nothing ...

• Idea called publish and subscribe.
probe

- Graphical tool similar to caget/put.
  - Run probe &
  - Enter PV name
  - Press 'start' to subscribe,
  - ... 'stop' to unsubscribe.
  - Press 'adjust' to write/put.
StripTool

- Plots value over time.
  - Run StripTool &
  - Enter PV name
  - Maybe adjust the min/max value range or color.

- Based on (configurable) sampling, defaulting to once per second.
  - Note occasional hickup when data also changes at 1Hz, but isn’t synchronized with the sampling.
  - Fix: Configure StripTool to sample every 0.5 secs.
Intermediate Summary

- CA is the EPICS network protocol.
- CA can get/monitor/put PVs
  - read, listen, write
- PV can be
  - "{record name}"  
  - "{record name}.{field name}"  
- Useful Tools:
  - caget, caput, camonitor, (and cainfo)
  - probe, StripTool

... to be continued...
Acknowledgements

• Material and ideas have been copied from
  – Bob Dalesio (LANL)
  – Ned Arnold (APS)
  – Ken Evans (APS)