CaSnooper and Other CA Diagnostics

Kenneth Evans, Jr.

Presented at the EPICS Collaboration Meeting
April 27 - 29, 2005
Stanford Linear Accelerator, Menlo Park, CA

Argonne National Laboratory

Topics Covered

- **Network and Channel Access Basics**
- **CaSnooper**
- **CASW**
- **ParseCASW**
- **RunCaSnooper**

Introduction to Networks

- **Channel Access uses two Network Protocols, UDP and TCP**

- **UDP (User Datagram Protocol)**
  - One way, unreliable
  - Send out packets, no guarantee they reach their destination

- **TCP (Transmission Control Protocol)**
  - Two way, reliable, persistent
  - Socket at each end
  - Acknowledgements, timeouts, retransmissions, etc. guarantee reliability

**Pioneering
Science and
Technology**

**Office of Science
U.S. Department
of Energy**

Introduction to Channel Access

- **Search request**
  - Sequence of UDP packets (up to 100 total or about 8 min.)
  - Sent by clients when they want to find PVs

- **Exist test**
  - Done by *each* server for *each* search request packet

- **Beacon**
  - Sequence of UDP packets sent by servers
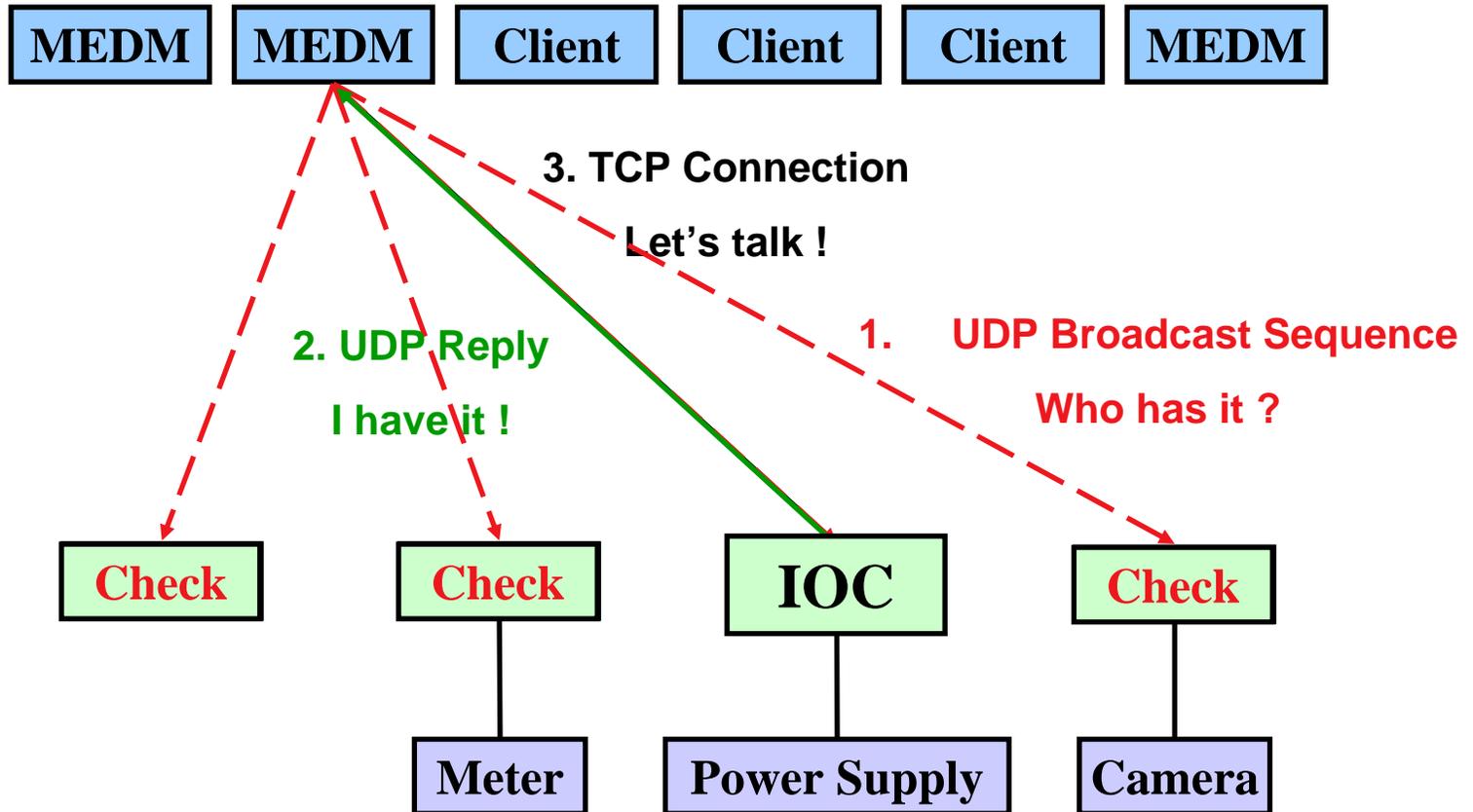 - Starts fast at startup, evolves to heartbeat

- **Beacon anomaly**
  - Any beacon that is not at the heartbeat interval

  - Clients use to determine connection status, reissue searches

Pioneering Science and Technology

Office of Science
U.S. Department
of Energy

Search and Connect Procedure

Nonexistent PVs are a problem

- **The search request sequence ends early for found PVs**
  - Typically on the first or second packet
- **Goes the full 100 packets (~ 8 min) for nonexistent PVs**
- **Each server has to do an exist test for each packet**
- **Badness:**
  - Uses up network bandwidth
  - Uses up resources in servers
  - Contributes to network storms

    Slow network -> Beacon anomalies -> Reissued search requests -> Slow network

- **Note: As of 3.14.5, Channel Access is more conservative about reissuing search requests**

CaSnooper

- **CaSnooper is a server whose ExistTest routine keeps track of search requests rather than seeing if it has the PV**

- **It can print the names of all PVs being searched for and related statistics using several report formats**

- **It can also check if these PVs are connected (C) or not (NC)**

- **It has internal PVs if started with the –n option**
    - ExistTest rates that can be monitored
    - Others that allow it to be controlled from an MEDM screen
        - *Specify report parameters, make reports, exit*

- **Ways to run CaSnooper:**
    - Run at the command line to get one report
    - Run with PVs and monitor, say with StripTool
    - Run with PVs and control with MEDM for continuous operation

Sample CaSnooper Output

Two lines from RunCaSnooper →

Print top 10 (-p10) →

Check top 10 (-c10) →

individual name, prefix

statistics

machine:port, (can be used to identify source)

name

search rate in Hz

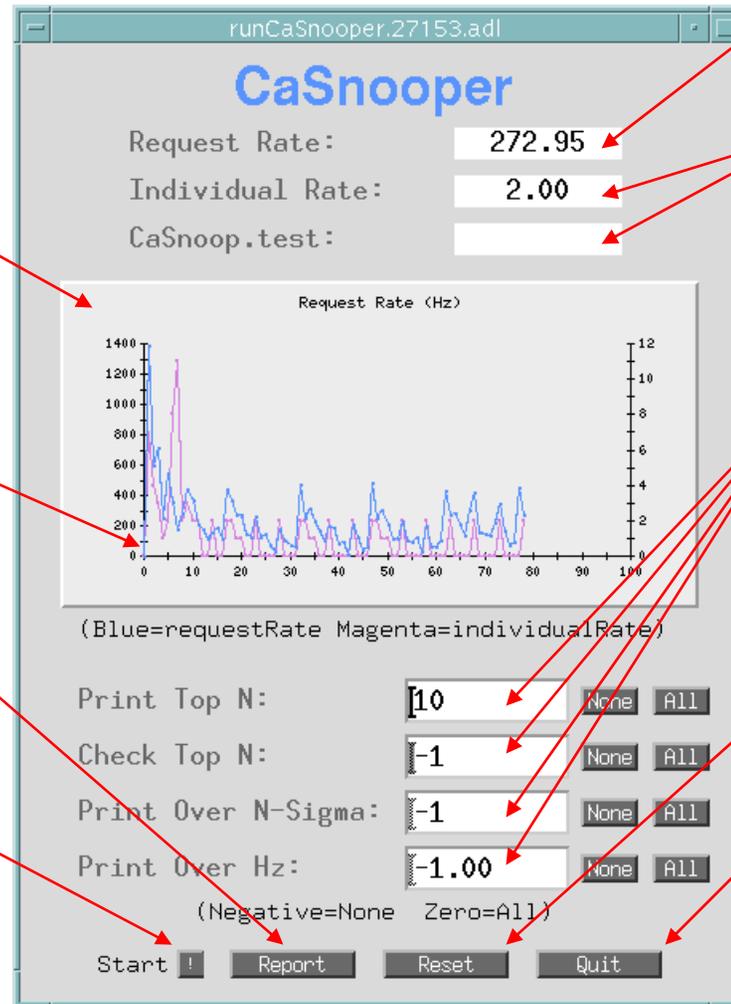Not connected, will be C for connected (hardly ever the case)

```
                              CaSnooper

Starting CcSnooper...
Type Ctrl-C to stop it
Starting CaSnooper 2.1.0.1 (8-27-2003) at Nov 04 13:50:08
EPICS 3.14.3
Individual Name is CaSnoop.test
PV name prefix is CaSnoop

Nov 04 13:50:42:
There were 17508 requests to check for PV existence for 2307 different PVs.
   Max(Hz):   11.17
   Mean(Hz):   0.22
   StDev(Hz): 0.61

PVs with top 10 requests:
    1 willow:52275              FEL:$(M8).VAL             11.17
    2 willow:52275              FEL:$(M8).RBV              8.94
    3 gateway433:33790          FE:09:ID:SR:HPOS:CC.VAL    4.15
    4 gateway433:33790          FE:09:ID:SR:VPOS:CC.VAL    4.15
    5 willow:52275              FEL:VUV4f2_able.VAL        3.35
    6 gateway435:33270          s17id:scan1.NPTS           3.06
    7 gateway435:33270          s17id:scan1.MPTS           3.06
    8 gateway435:33270          s17id:scan1.PASM           3.06
    9 gateway435:33270          s17id:scan1.P1EP           3.06
   10 gateway435:33270          s17id:scan1.P1AR           3.06

Nov 04 13:51:01:
There were 23868 requests to check for PV existence for 2329 different PVs.
   Max(Hz):   10.45
   Mean(Hz):   0.19
   StDev(Hz): 0.56

Connection status for top 10 PVs after 10.00 sec:
    1 willow:52275              FEL:$(M8).VAL          NC 10.45
    2 willow:52275              FEL:$(M8).RBV          NC 8.36
    3 gateway433:33790          FE:09:ID:SR:HPOS:CC.VAL  NC 4.01
    4 gateway433:33790          FE:09:ID:SR:VPOS:CC.VAL  NC 4.01
    5 willow:52275              FEL:VUV4f2_able.VAL    NC 3.13
    6 gateway435:33270          s17id:scan1.NPTS       NC 3.04
    7 gateway435:33270          s17id:scan1.P1PV       NC 3.04
    8 gateway435:33270          s17id:scan1.R1PV       NC 3.04
    9 gateway435:33270          s17id:scan1.CMND       NC 3.04
   10 gateway435:33270          s17id:scan1.P1EP       NC 3.04
```

Control CaSnooper via MEDM

Request rate

Individual rate for CaSnoop.test, which doesn't exist

Cartesian plot of requestRate and individualRate

CaSnooper was started here (with EPICS_CA_REPEATER_PORT = 5065)

Use these to set what will happen when you press Report. Case illustrated will print the top 10.

Execute selected reports in the CaSnooper stdout

Reset the counters in CaSnooper

Shell command to start CaSnooper, CASW, StripTool, etc.

Stop CaSnooper

CASW

- **CASW (Channel Access Server Watcher) monitors Beacon Anomalies**
- **Is a simple command-line utility**
- **Part of EPICS Base**
- **Prints a line with a timestamp when it sees a beacon anomaly**

CaSnooper Starting

ParseCASW

- **CASW produces a list of beacons that came at the wrong time**
  - Listed in the order they happen
    - *Intervals between anomalies are important*
    - *Not easy to see from the output*
  - Anomalies from different causes are mixed together
  - Cause of an anomaly sequence is not readily apparent
- **ParseCASW parses the CASW output**
  - Uses artificial intelligence to try to determine the event that caused the anomaly (e.g. an IOC coming up)
  - Prints the events instead of the anomalies
- **Can be used in two ways**
  - Parse output saved from CASW (or SDDS data loggers)
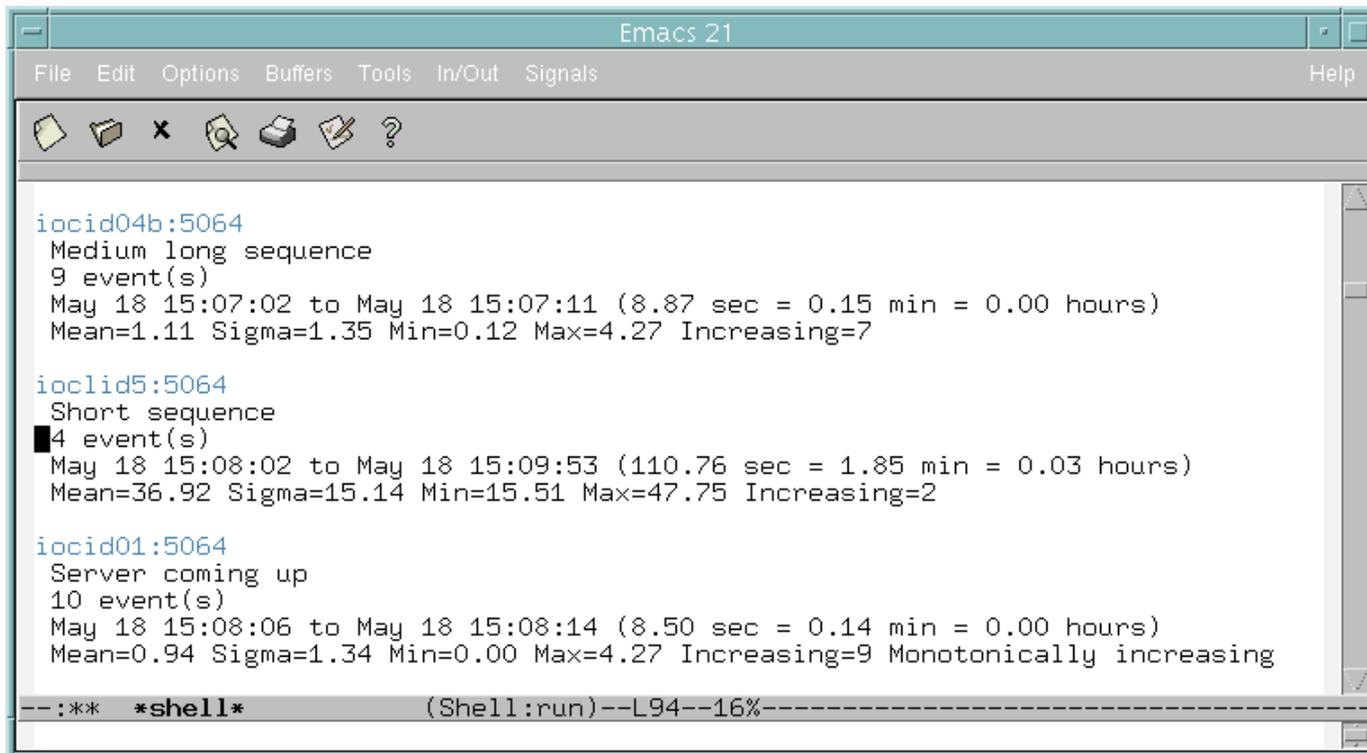 - Pipe CASW into ParseCASW in real time

ParseCASW Output

ParseCASW Verbose Output

- **With the –v option you get more details**
  - You can decide for yourself what kind of event it is

Pioneering Science and Technology

Office of Science U.S. Department of Energy

RunCaSnooper

- **RunCaSnooper is a shell script that provides an interface to CaSnooper and CASW with an associated MEDM and StripTool**
- **Is APS specific, but the script can be modified for your needs**
- **By default it brings up an MEDM and a StripTool and does not start CaSnooper**
  - If CaSnooper is running, the MEDM screen will not be white
  - If it is white, you can start CaSnooper from the MEDM screen
- **Uses EPICS_CA_REPEATER_PORT=9876 by default, not 5065**
- **You can also start CASW and StripTool from the MEDM screen**
- **Everything is generated on the fly and stored in /tmp**
  - Logs of the CaSnooper reports and CASW output
  - MEDM ADL file and StripTool configuration files
- **On startup it prints directions and allows you to continue**
  - Intended for occasional use by semi-experienced people

RunCaSnooper

More information

- **Jeffery O. Hill,** *EPICS R3.14 Channel Access Reference Manual*, **(EPICS Documentation, 2005 or latest).**

  http://www.aps.anl.gov/epics/modules/base/R3-14/index.php

- **W. Richard Stevens,** *UNIX Network Programming*, **(Prentice-Hall, Upper Saddle River, NJ, 1998) Vol. 1.**

- **K. Evans, Jr.,** *CaSnooper Reference Manual,* **(EPICS Documentation, 2005 or latest).**

  http://www.aps.anl.gov/epics/extensions/caSnooper/index.php

  - Has links to more extensive Channel Access presentations

Thank You

This has been an

APS Controls Presentation

**Pioneering
Science and
Technology**

**Office of Science
U.S. Department
of Energy**

Thank You

This has been an
APS Controls Presentation