

How are records given CPU time?

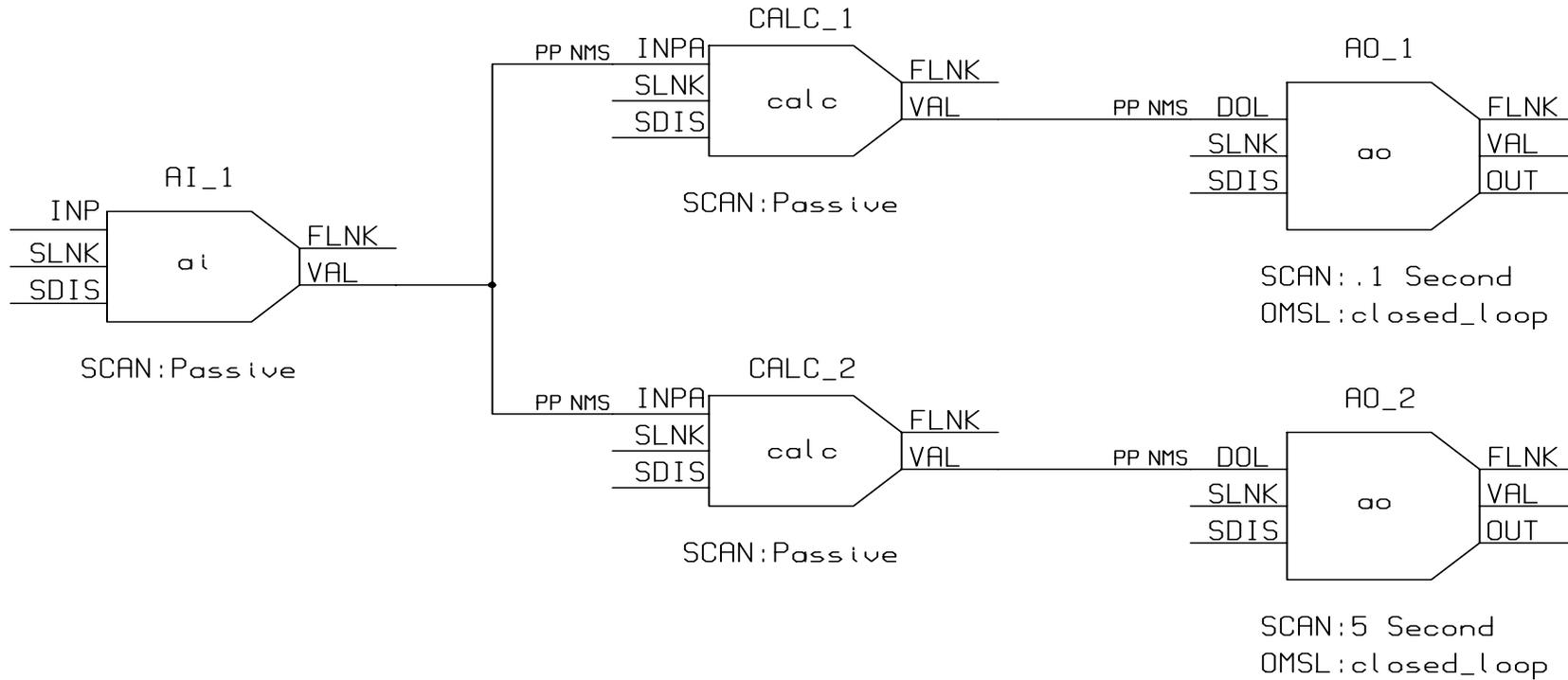


Several IOC tasks are used:

- ◆ **callback (3 priorities) — I/O Interrupt**
- ◆ **scanEvent — Soft Event**
- ◆ **scanPeriod — Periodic**
 - ❖ A separate task is used for each scan period
 - ❖ Faster scan rates are given a higher task priority (if supported by the IOC's Operating System)
- ◆ **Channel Access tasks use lower priority than record processing**
 - ❖ If a CPU spends all its time doing I/O and record processing, you may be unable to control or monitor the IOC via the network



What could go wrong here?





- ◆ **Prevent a record from being processed simultaneously from two scan tasks**
- ◆ **A lock-set is a group of records interconnected by database links:**
 - ❖ Output links
 - ❖ Forward links
 - ❖ Input links which are PP or MS
 - ❖ Any link transporting an Array
- ◆ **Lock-sets are determined automatically by the IOC at start-up, or whenever a database link is added, deleted or modified**

You can split a lock set with

- ◆ **Channel Access links, using CA flag**
- ◆ **Database links which are both NPP and NMS**





- ◆ **Every record has the fields**

 - SEVR Alarm Severity

 - NONE, MINOR, MAJOR, INVALID*

 - STAT Alarm Status (reason)

 - READ, WRITE, UDF, HIGH, LOW, STATE, COS, CALC, DISABLE, etc.*

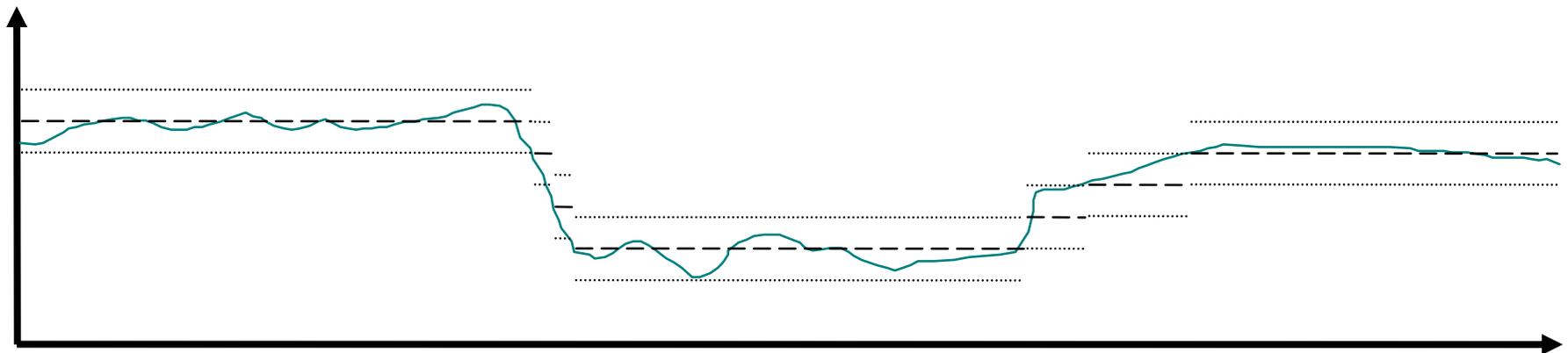
- ◆ **Most numeric records check VAL against HIHI, HIGH, LOW and LOLO fields after the value has been determined**
- ◆ **The HYST field prevents alarm chattering**
- ◆ **A separate severity can be set for each numeric limit (HHSV, HSV, LSV, LLSV)**
- ◆ **Discrete (binary) records can raise alarms on entering a particular state, or on a change of state (COS)**



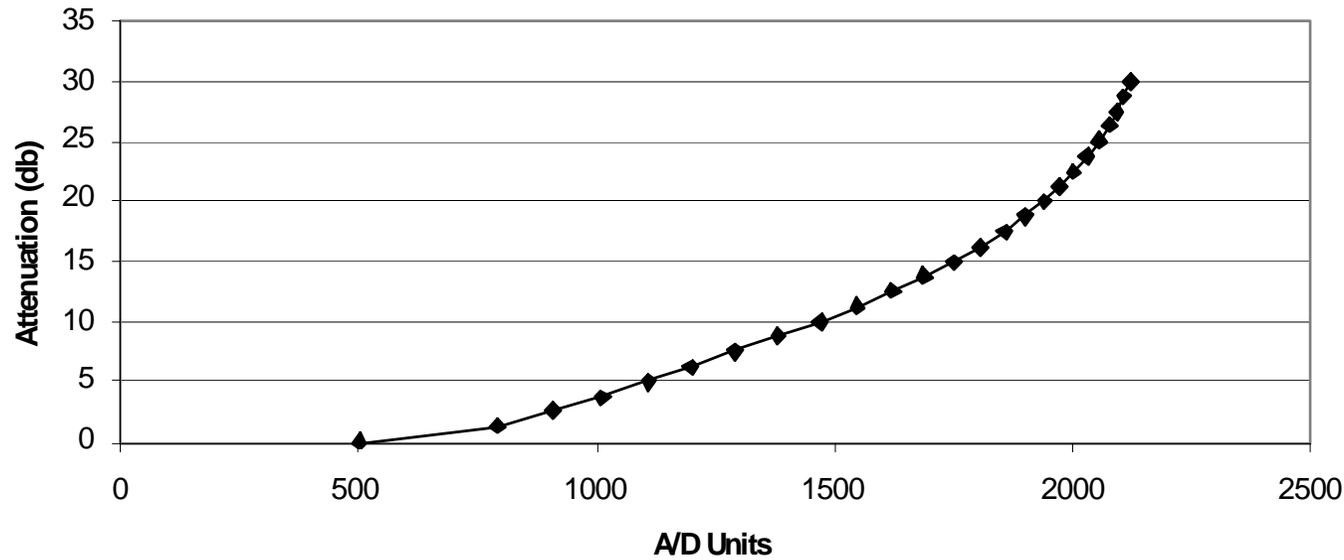
Change notification: Monitor deadbands

Channel Access notifies clients which are monitoring a numeric record when

- ❖ VAL changes by more than the value in field:
 - MDEL Value monitors
 - ADEL Archive monitors
- ❖ Record's Alarm Status changes
 - HYST Alarm hysteresis
- ❖ Analogue Input record provides smoothing filter to reduce input noise (SMOO)



Breakpoint Tables



- ◆ Analogue Input and Output records can do non-linear conversions from/to the raw hardware value
- ◆ Breakpoint tables interpolate values from a given table
- ◆ To use, set the record's LINR field to the name of the breakpoint table you want to use
- ◆ Example breakpoint table (in some loaded .dbd file):

```
breaktable(attenuator1_1) {  
    504,0  
    795,1.25  
    909,2.5  
    1012,3.75  
    ...  
}
```



- ◆ **Input and output record types often allow simulation of hardware interfaces**
 - SIML Simulation mode link
 - SIMM Simulation mode value
 - SIOL Simulation input link
 - SIMS Simulation alarm severity
- ◆ **Before using its device support, a record reads SIMM through the SIML link**
- ◆ **If SIMM=YES, device support is ignored; record I/O uses the SIOL link instead**
- ◆ **An alarm severity can be set whenever simulating, given by SIMS field**





- ◆ **A networked control system must have the ability to enforce security rules**
 - ❖ Who can do what from where, and when?
- ◆ **In EPICS, security is enforced by the CA server (typically the IOC).**
- ◆ **A record is placed in the Access Security Group named in its ASG field**
 - ❖ DEFAULT is used if no group name is given
- ◆ **Rules for each group determine whether a CA client can read or write to records in the group, based on**
 - ❖ Client user ID
 - ❖ Client IP address
 - ❖ Access Security Level of the field addressed
 - ❖ Values read from the database





Access Security Configuration File

- ◆ **Security rules are loaded from an Access Security Configuration File, for example:**

```
UAG(users) {user1, user2}
HAG(hosts) {host1, host2}
ASG(DEFAULT) {
    RULE(1, READ)
    RULE(1, WRITE) {
        UAG(users)
        HAG(hosts)
    }
}
```

- ◆ **If no security file is loaded, Security will be turned off and nothing refused**
- ◆ **For more details and the rule syntax, see Chapter 8 of the IOC Application Developers Guide**

