

Significant Event System Tutorial: DAQ Operations

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SES Tutorial Outline

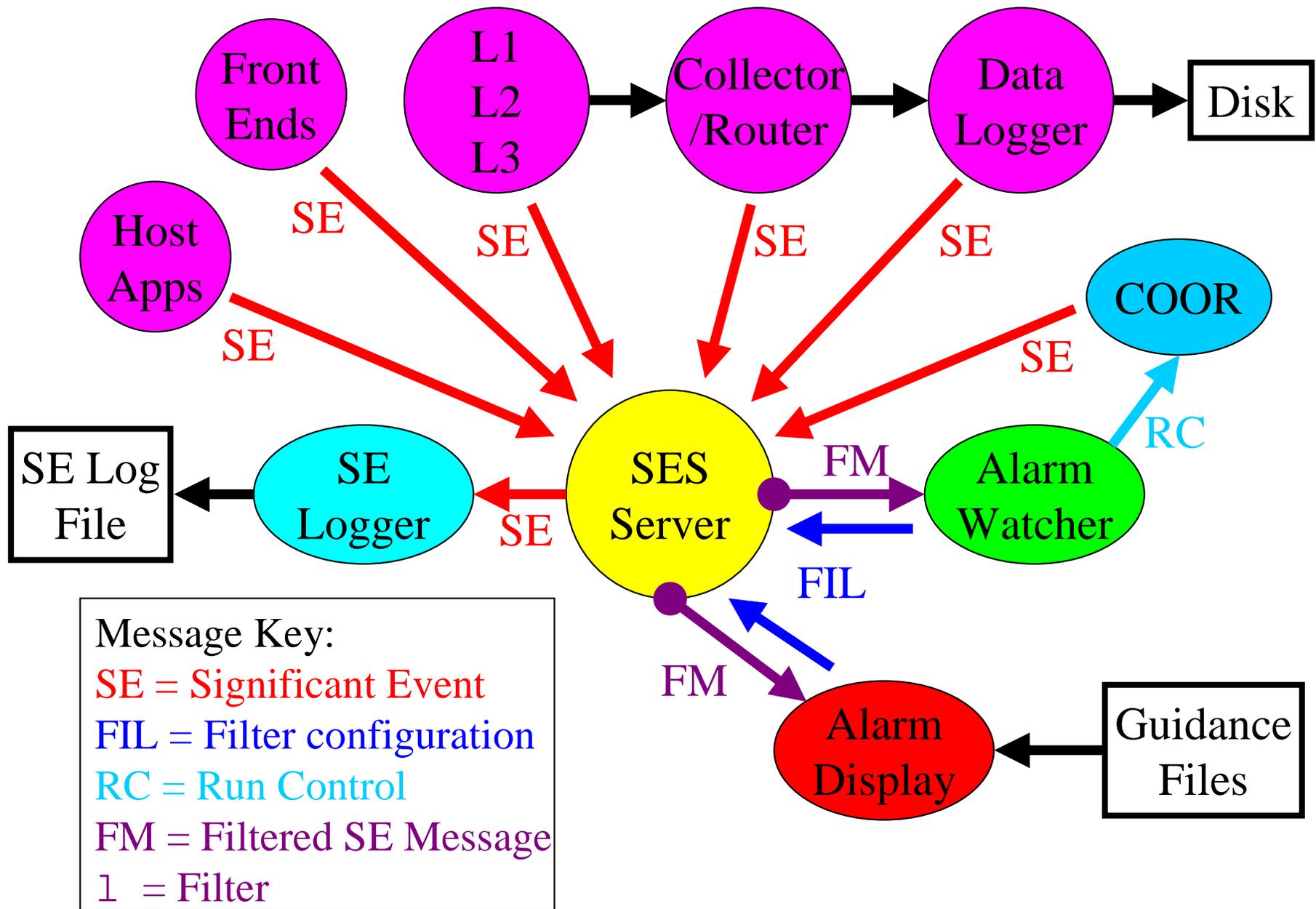
- u Goals – the role of the SES
- u Overview - SES system architecture
- u Shift operations – alarm display
- u Core applications – server, alarm watcher, logger
- u Operation – starting, stopping, and status



Goals

- u Monitor the health of the DZero online system
- u During detector operations produce, distribute, and display events which are significant to the experiment
 - Alarm conditions
 - DAQ state transitions from COOR
 - Information from any application
- u Archive SE messages for later review
 - Look for trends when diagnosing equipment issues
 - In run I the detectors state was checked for all top event candidates to insure the events were not artifacts of a detector problem



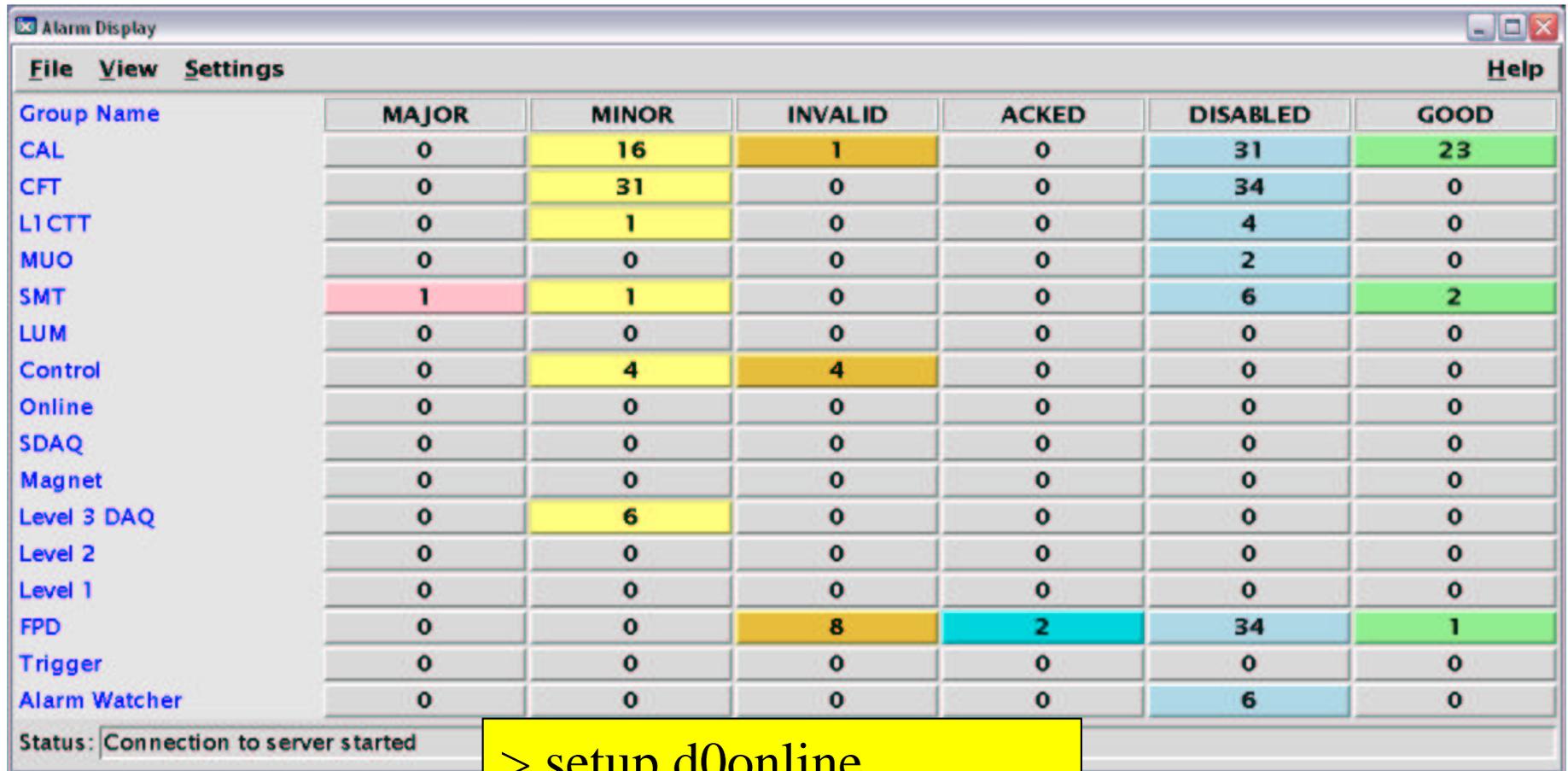


Functionality

- u **Sender Clients**
 - Identify bad states
 - Send alarms
- u **Server**
 - Maintains the current state
 - Supplies the state to clients on request
- u **Logger**
 - Writes SE messages to files
- u **Alarm watcher**
 - Detects alarms that should pause runs
 - Sends run pause commands to COOR
- u **Alarm display**
 - Shows the current state to the user



Alarm Display



The screenshot shows a window titled "Alarm Display" with a menu bar (File, View, Settings, Help) and a table of alarm counts. The table has columns for MAJOR, MINOR, INVALID, ACKED, DISABLED, and GOOD. The rows list various groups and their corresponding counts. A status bar at the bottom indicates "Connection to server started".

Group Name	MAJOR	MINOR	INVALID	ACKED	DISABLED	GOOD
CAL	0	16	1	0	31	23
CFT	0	31	0	0	34	0
L1CTT	0	1	0	0	4	0
MUO	0	0	0	0	2	0
SMT	1	1	0	0	6	2
LUM	0	0	0	0	0	0
Control	0	4	4	0	0	0
Online	0	0	0	0	0	0
SDAQ	0	0	0	0	0	0
Magnet	0	0	0	0	0	0
Level 3 DAQ	0	6	0	0	0	0
Level 2	0	0	0	0	0	0
Level 1	0	0	0	0	0	0
FPD	0	0	8	2	34	1
Trigger	0	0	0	0	0	0
Alarm Watcher	0	0	0	0	6	0

Status: Connection to server started

> setup d0online
> start_daq alarm_display



Alarm Display

File View Settings Help

Group Name	MAJOR	MINOR	INVALID	ACKED	DISABLED	GOOD
CAL	0	16	0	0	0	3
CFT	0	31	0	0	0	0
L1CTT	0	1	0	0	0	0
MUO	0	0	0	0	0	0
SMT	1	1	0	0	0	2
LUM	0	0	0	0	0	0
Control	0	4	0	0	0	0
Online	0	0	0	0	0	0
SDAQ	0	0	0	0	0	0
Magnet	0	0	0	0	0	0
Level 3 DAQ	0	6	0	0	0	0
Level 2	0	0	0	0	0	0
Level 1	0	0	0	0	0	0
FPD	0	0	8	2	34	1
Trigger	0	0	0	0	0	0
Alarm Watcher	0	0	0	0	6	0

Status: Connection to server started

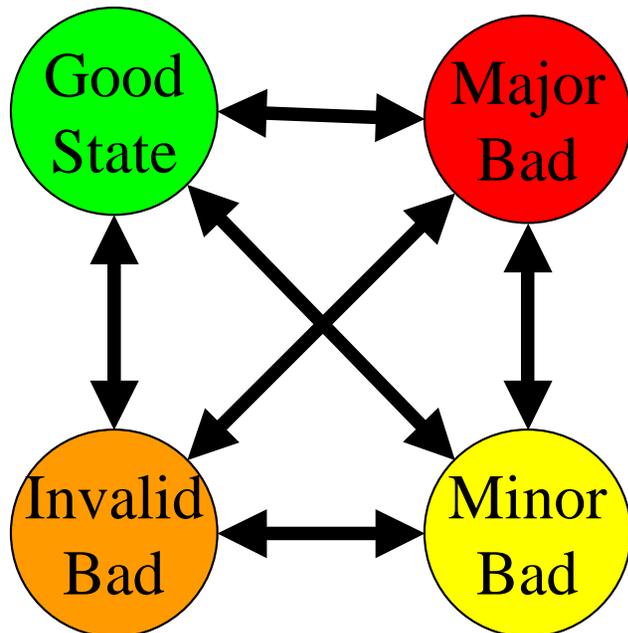
Four alarm severity levels:

- Major – fix the problem
- Minor – monitor the situation
- Invalid – read or write error
- Good – problem repaired

- Each button is labeled with a value that reflects the number of alarms of a severity that pass the filter for that row
- Each row has a different filter
- Alarms that pass multiple filters appear in multiple rows



Group Name	MAJOR	MINOR	INVALID	ACKED	DISABLED	GOOD
CAL	0	16	1	0	31	23
CFT	0	31	0	0	34	0
L1CTT	0	1	0	0	4	0
MUO	0	0	0	0	2	0
SMT	1	1	0	0	6	2
LUM	0	0	0	0	0	0
Control	0	4	4	0	0	0
Online	0	0	0	0	0	0
SDAQ	0	0	0	0	0	0



- Alarm severity transitions
- A device starts in the good state (not listed on the display)
 - An bad alarm is in one of the three severity levels
 - Transitions from the bad severities to good can occur at any point
 - As can transitions between severities



Default configuration file, /online/config/ses/ad.config

```
addRow('CAL', "contains(det, 'CAL')")
addRow('CFT', "contains(det, 'CFT')")
addRow('L1CTT', "contains(det, 'CTT')")
addRow('MUO', "contains(det, 'MUO')")
addRow('SMT', "contains(det, 'SMT')")
addRow('LUM', "contains(det, 'LUM')")
addRow('Control', "contains(det, 'CTL')")
addRow('Online', "contains(det, 'ONL') and not contains(devtype, 'SDAQ')")
addRow('SDAQ', "contains(devtype, 'SDAQ')")
addRow('Magnet', "contains(devtype, 'MAG')")
addRow('Level 3 DAQ', "contains(name, 'L3DAQ')")
addRow('Level 2', "contains(det, 'L2')")
addRow('Level 1', "contains(det, 'L1') and not contains(devtype, 'SDAQ')")
addRow('FPD', "contains(det, 'FPD')")
addRow('Trigger', "contains(det, 'TRG')")
addRow('Alarm Watcher', "contains(mtype, 'alarm') and (priority > 100)")
```

An alarm display configuration file contains the filter for each row.

Identical to the alarm watcher filter.

Detector groups can generate a customized alarm display by creating a detector specific configuration file.



Alarm Display

Group Name	MAJOR	MINOR				
CAL	0	16	1	0	31	23
CFT	0	31	0	0	34	0
L1CTT	0	1	0	0	4	0
MUO	0	0	0	0	2	0
SMT	1	1				
LUM	0	0				
Control	0	4				

Left click a button to see the names of all alarms in that category.

SMT:Major Alarms

SMT:Major Alarms

SMT_BDISK_B1-2-4/OCC_P

SHOW
ACK
ACK ALL
DISABLE
DISABLE ALL
CLOSE

CFT:Minor Alarms

CFT:Minor Alarms

CFTA_AFE_4B2/VLPUD6
CFTA_AFE_4B4/VLPUD1
CFTA_AFE_4B4/VLPUD4
CFTA_AFE_4B4/VLPUD6
CFTA_AFE_4B4/VLPUD7
CFTA_AFE_4B4/VLPUD8
CFTA_AFE_8A2/VLPUD1
CFTA_AFE_8A2/VLPUD2
CFTA_AFE_8A2/VLPUD5
CFTA_AFE_8A2/VLPUD6
CFTA_AFE_8A2/VLPUD8
CFTA_AFE_8B6/VLPUD2
CFTA_AFE_8B6/VLPUD3
CFTA_AFE_8B6/VLPUD4
CFTA_AFE_8B6/VLPUD6

SHOW
ACK
ACK ALL
DISABLE
DISABLE ALL
CLOSE



Alarm Display

Group Name	MAJOR	MINOR	INVALID	ACKED	DISABLED	GOOD
CAL	0	16	1			
CFT	0	31	0			
L1CTT	0	1	0			
MUC			0			
SMT			0			
LUM			0			
Con			4			
Onli			0			
SDA			0	0	0	0
Mag			0	0	0	0
Leve			0	0	0	0
Leve			0	0	0	0
Leve			0	0	0	0
FPD						1
Trig						0
Alar						0
Stat						0

CFT:Minor Alarms

CFT:Minor Alarms

- SHOW
- ACK
- ACK ALL
- DISABLE
- DISABLE ALL
- CLOSE

CFTA_AFE_4B2/VLPUD6
 CFTA_AFE_4B4/VLPUD1
 CFTA_AFE_4B4/VLPUD4
 CFTA_AFE_4B4/VLPUD6
 CFTA_AFE_4B4/VLPUD7
 CFTA_AFE_4B4/VLPUD8
 CFTA_AFE_8A2/VLPUD1
 CFTA_AFE_8A2/VLPUD2
 CFTA_AFE_8A2/VLPUD5
 CFTA_AFE_8A2/VLPUD6
 CFTA_AFE_8A2/VLPUD8
 CFTA_AFE_8B6/VLPUD2
 CFTA_AFE_8B6/VLPUD3

Left click a name then click the show button or double click a name to see the single alarm display.

Alarms can be disabled or acknowledged from here.

- Alarm names identify the source of the alarm and must be unique.
- Alarms must follow the official DZero naming convention:
 <detector>_<device type>_<location>/<attribute>



Alarms in the good, acked, and disabled columns behave differently than alarms in bad columns.

Group Name	MAJOR	MINOR	INVALID	ACKED	DISABLED	GOOD
CAI	0	16	1	0	31	23
				0	34	0
				0	4	0
				0	2	0
				0	6	2
				0	0	0
				0	0	0
				0	0	0
				0	0	0
				0	0	0
Level 3 DAQ	0	6	0	0	0	0
Level						0
Level						0
FPD						1
Trigg						0
Alarm						0
Statu						

- Acked indicates that a bad alarm has been seen by the shifter.
- A state transition causes the alarm to appear in the major, minor, invalid, or good column.

- There is a persistence mechanism for disabled alarms.
- The last alarm message sent will be stored in the disabled column independent of the alarms severity.
- Disabled alarms will not pause runs!!!

- An alarm transition from bad to good is stored for five minutes.
- Multiple alarms can be listed under one name.



Single Alarm Display

***** CTL_PROC_11/MEM *****

Alarm cause: High alarm
Alarm value: 86.465053
HiHi limit: 90.000000
High limit: 60.000000
Low limit : 0.000000
LoLo limit: 0.000000

Message contents:

version: v4
utility: ef(6)
timestamp: Thu Jan 29 10:23:42 2004
message type: alarm
name: CTL_PROC_11/MEM
priority: 0
host: d0olct11
db entry: 0
parent: none
children: none
transition: bad
severity: minor
alarm type: analog
parameters: ai 4 86.465053 90.000000 60.000000 0.000000 0.000000

CLOSE ACK DISABLE CONTROL GUIDANCE COMMAND

The name identifies the device in alarm.

Explains the cause of the alarm.

Shows the contents of the alarm message.



CTL_PROC_11/MEM:Control:Minor Alarms

```

***** CTL_PROC_11/MEM *****
Alarm cause:      High alarm
Alarm value:     86.465053
HiHi limit:    90.000000
High limit:    60.000000
Low limit :    0.000000
LoLo limit:    0.000000

Message contents:
  version:      v4
  utility:     ef(6)
  timestamp:   Thu Jan 29 10:23:42 2004

  parent:      none
  children:    none
  transition:  bad
  severity:    minor
  alarm type:  analog
  parameters:  ai 4 86.465053 90.000000 60.000000 0.000000 0.000000
  
```

Issue a command stored in the hardware database.

Display information on resolving the alarm condition.

- Acknowledge this alarm
- Unack for an alarm in the acked column

parent: none
 children: none
 transition: bad
 severity: minor
 alarm type: analog
 parameters: ai 4 86.465053 90.000000 60.000000 0.000000 0.000000

CLOSE ACK DISABLE CONTROL **GUIDANCE** COMMAND

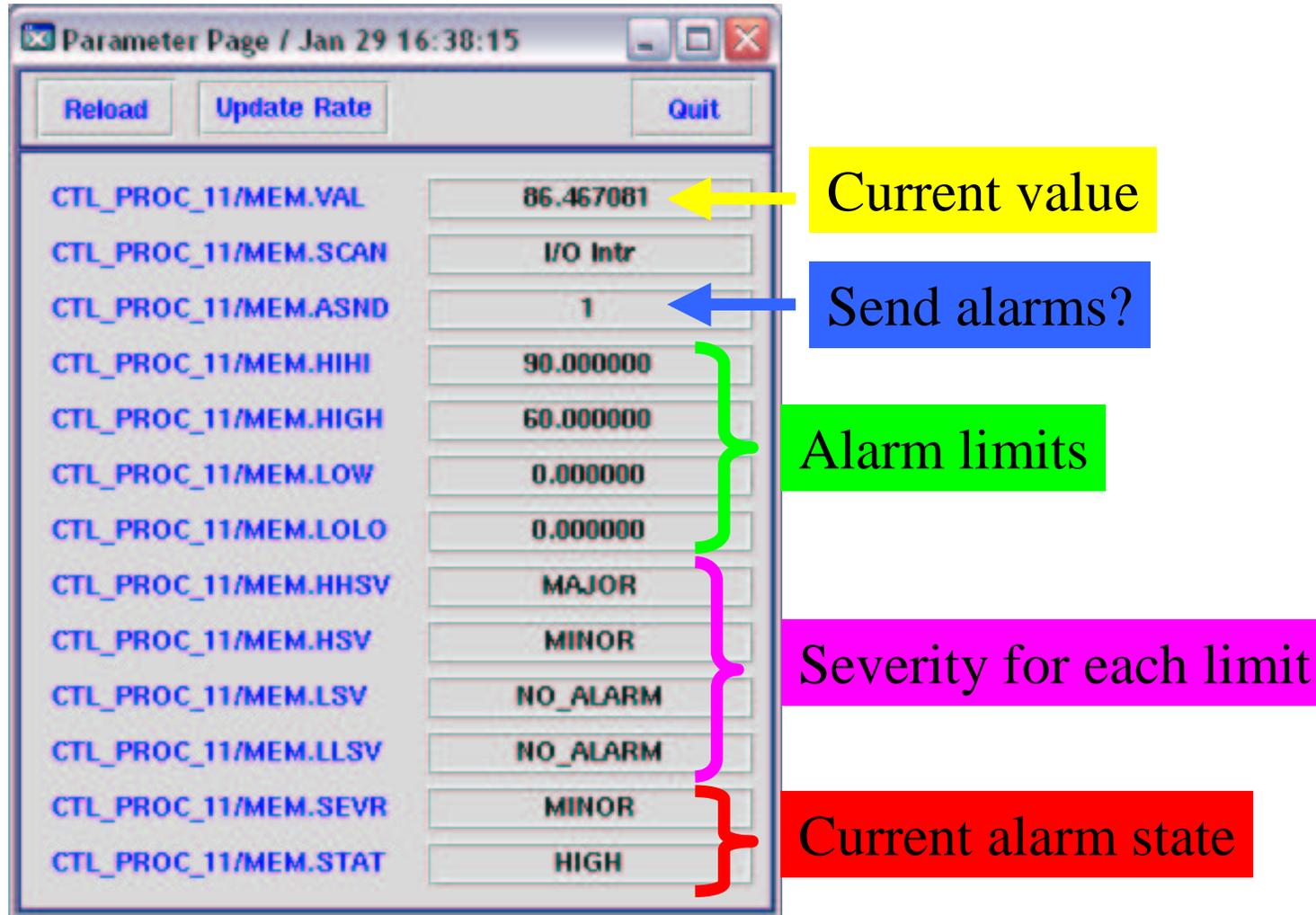
- Acknowledge this alarm
- Unack for an alarm in the acked column

Disable this alarm.

Look at the current values.



Current Control Values



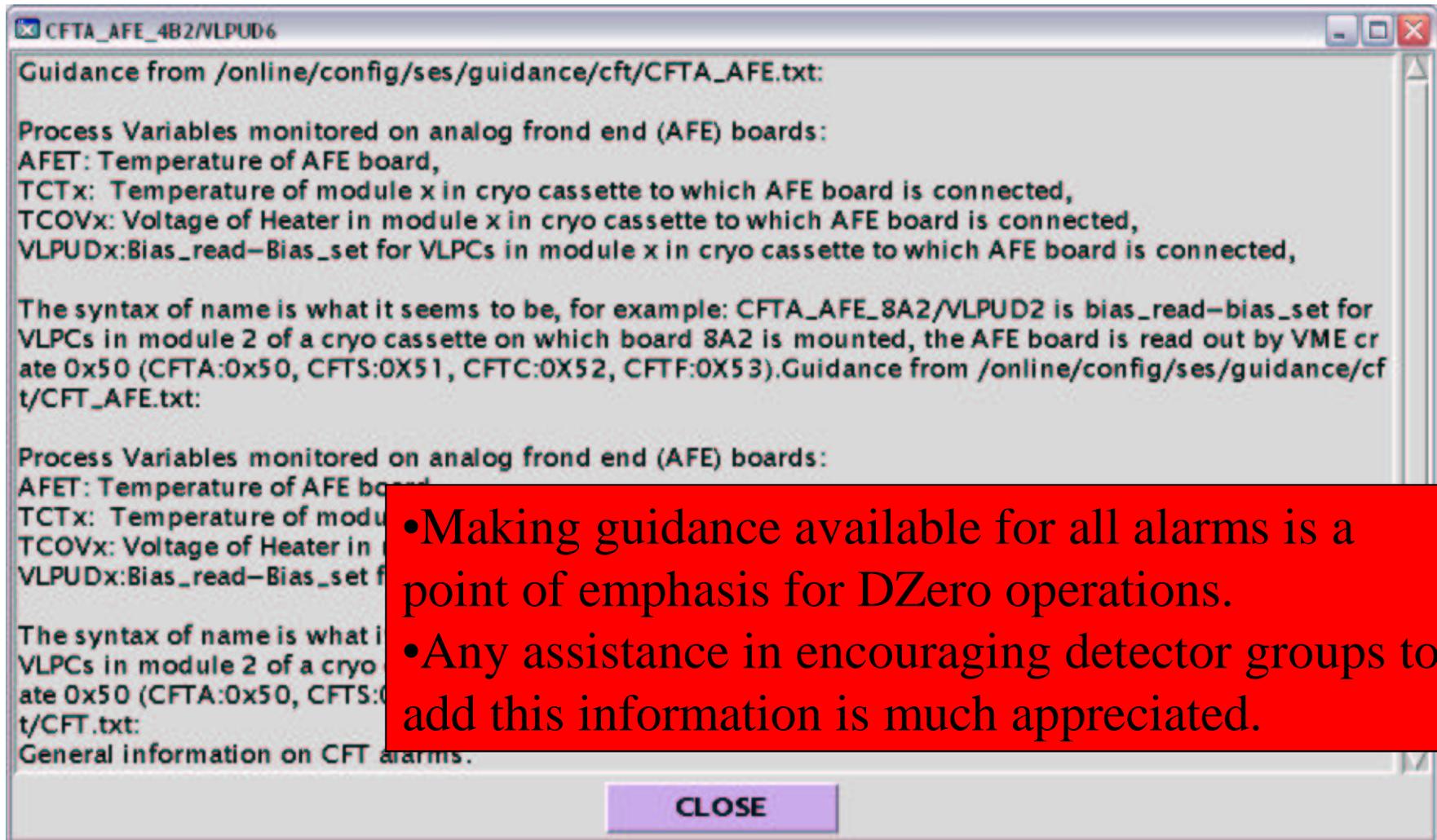
Parameter	Value
CTL_PROC_11/MEM.VAL	86.467081
CTL_PROC_11/MEM.SCAN	I/O Intr
CTL_PROC_11/MEM.ASND	1
CTL_PROC_11/MEM.HIHI	90.000000
CTL_PROC_11/MEM.HIGH	60.000000
CTL_PROC_11/MEM.LOW	0.000000
CTL_PROC_11/MEM.LOLO	0.000000
CTL_PROC_11/MEM.HHSV	MAJOR
CTL_PROC_11/MEM.HSV	MINOR
CTL_PROC_11/MEM.LSV	NO_ALARM
CTL_PROC_11/MEM.LLSV	NO_ALARM
CTL_PROC_11/MEM.SEVR	MINOR
CTL_PROC_11/MEM.STAT	HIGH

Annotations:

- Current value (yellow box)
- Send alarms? (blue box)
- Alarm limits (green box)
- Severity for each limit (magenta box)
- Current alarm state (red box)



Guidance



```
CFTA_AFE_4B2/VLPUD6
Guidance from /online/config/ses/guidance/cft/CFTA_AFE.txt:

Process Variables monitored on analog frond end (AFE) boards:
AFET: Temperature of AFE board,
TCTx: Temperature of module x in cryo cassette to which AFE board is connected,
TCOVx: Voltage of Heater in module x in cryo cassette to which AFE board is connected,
VLPUDx: Bias_read-Bias_set for VLPCs in module x in cryo cassette to which AFE board is connected,

The syntax of name is what it seems to be, for example: CFTA_AFE_8A2/VLPUD2 is bias_read-bias_set for
VLPCs in module 2 of a cryo cassette on which board 8A2 is mounted, the AFE board is read out by VME cr
ate 0x50 (CFTA:0x50, CFTS:0X51, CFTC:0X52, CFTF:0X53).Guidance from /online/config/ses/guidance/cf
t/CFTA_AFE.txt:

Process Variables monitored on analog frond end (AFE) boards:
AFET: Temperature of AFE board,
TCTx: Temperature of modu
TCOVx: Voltage of Heater in
VLPUDx: Bias_read-Bias_set f

The syntax of name is what i
VLPCs in module 2 of a cryo
ate 0x50 (CFTA:0x50, CFTS:0
t/CFTA_AFE.txt:
General information on CFT alarms.
```

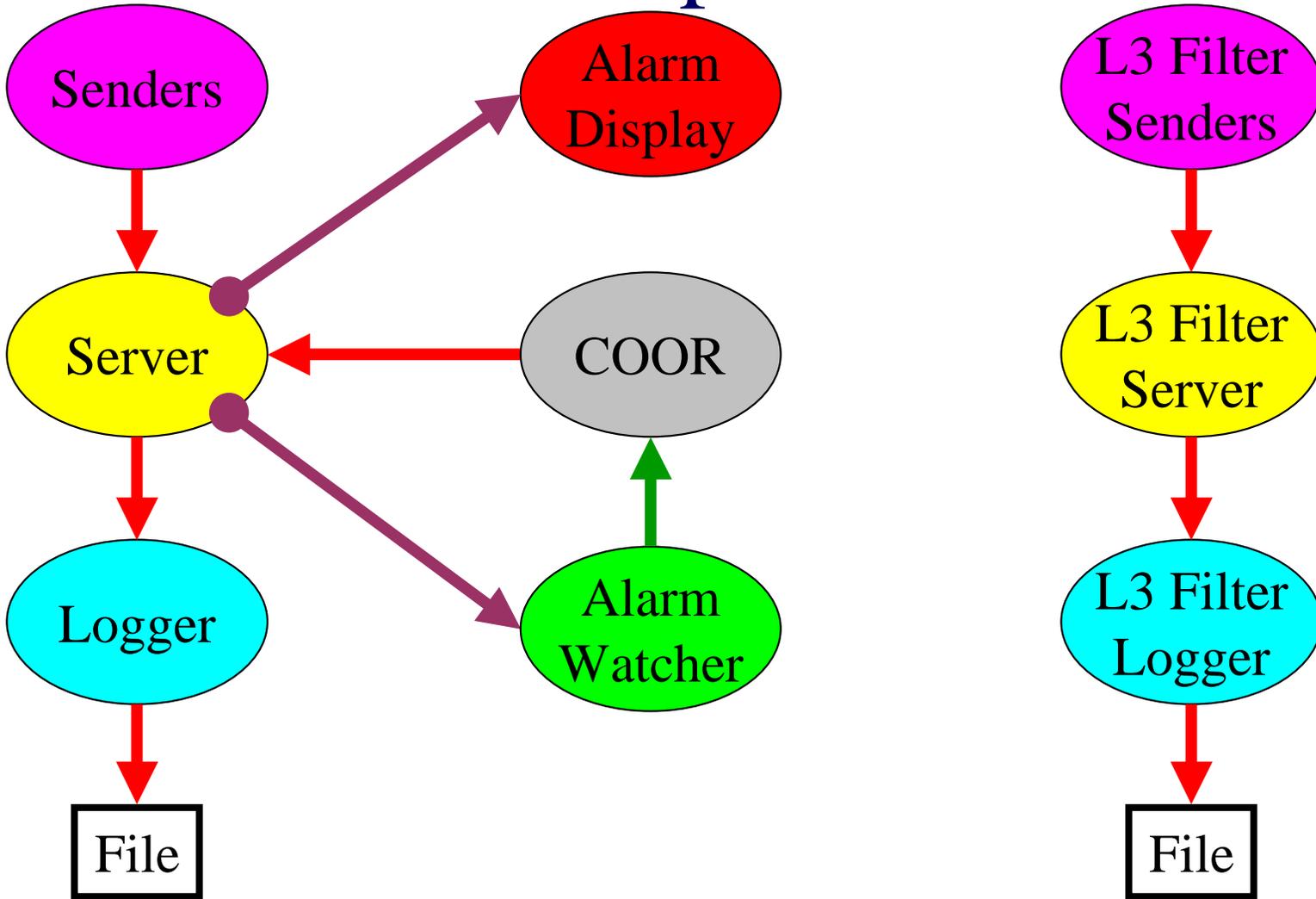
• Making guidance available for all alarms is a point of emphasis for DZero operations.

• Any assistance in encouraging detector groups to add this information is much appreciated.

CLOSE



Online Operations



Why are there two servers in the SES?

- Errors in level 3 filters are fixed without outside intervention.
- The SES framework was a simple way to get level 3 filter errors written to a file for later review.
- There is a special level 3 message that is simply passed through the server to attached clients.

Alarm Display

COOR

Alarm Watcher

L3 Filter Senders

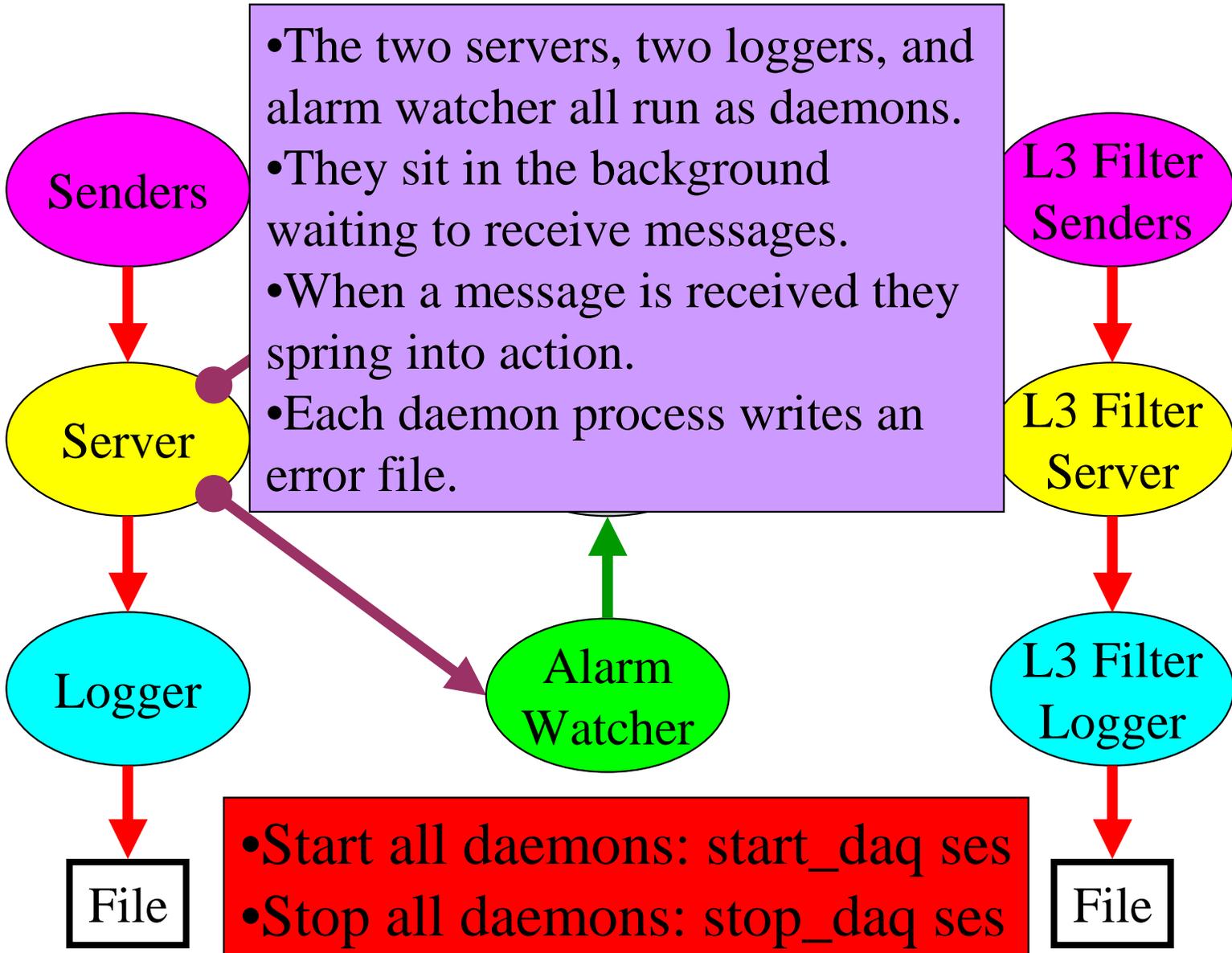
L3 Filter Server

L3 Filter Logger

File

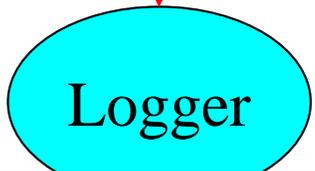
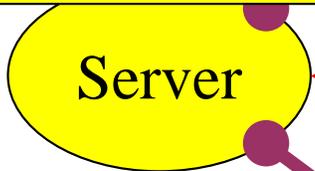
The alarm display and watcher serve no purpose connected to the level 3 filter server.





Each daemon can be stopped and started individually.

- Start server:
start_daq ses_server
- Stop server:
stop_daq ses_server



- Start logger:
start_daq ses_logger
- Stop logger:
stop_daq ses_logger



- Start alarm watcher:
start_daq alarm_watcher
- Stop alarm watcher:
stop_daq alarm_watcher

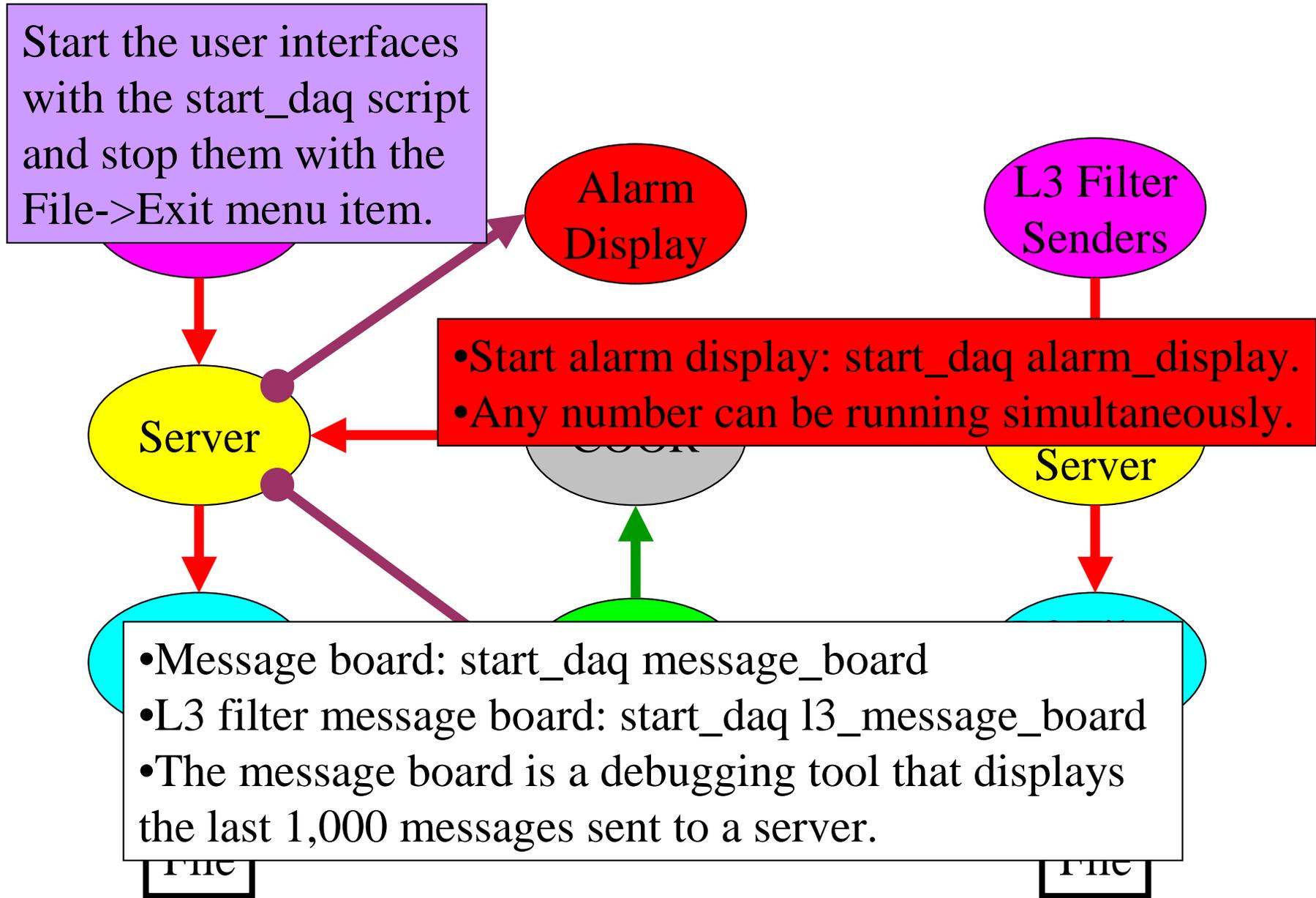


- Start L3 filter server:
start_daq ses_l3_server
- Stop L3 filter server:
stop_daq ses_l3_server



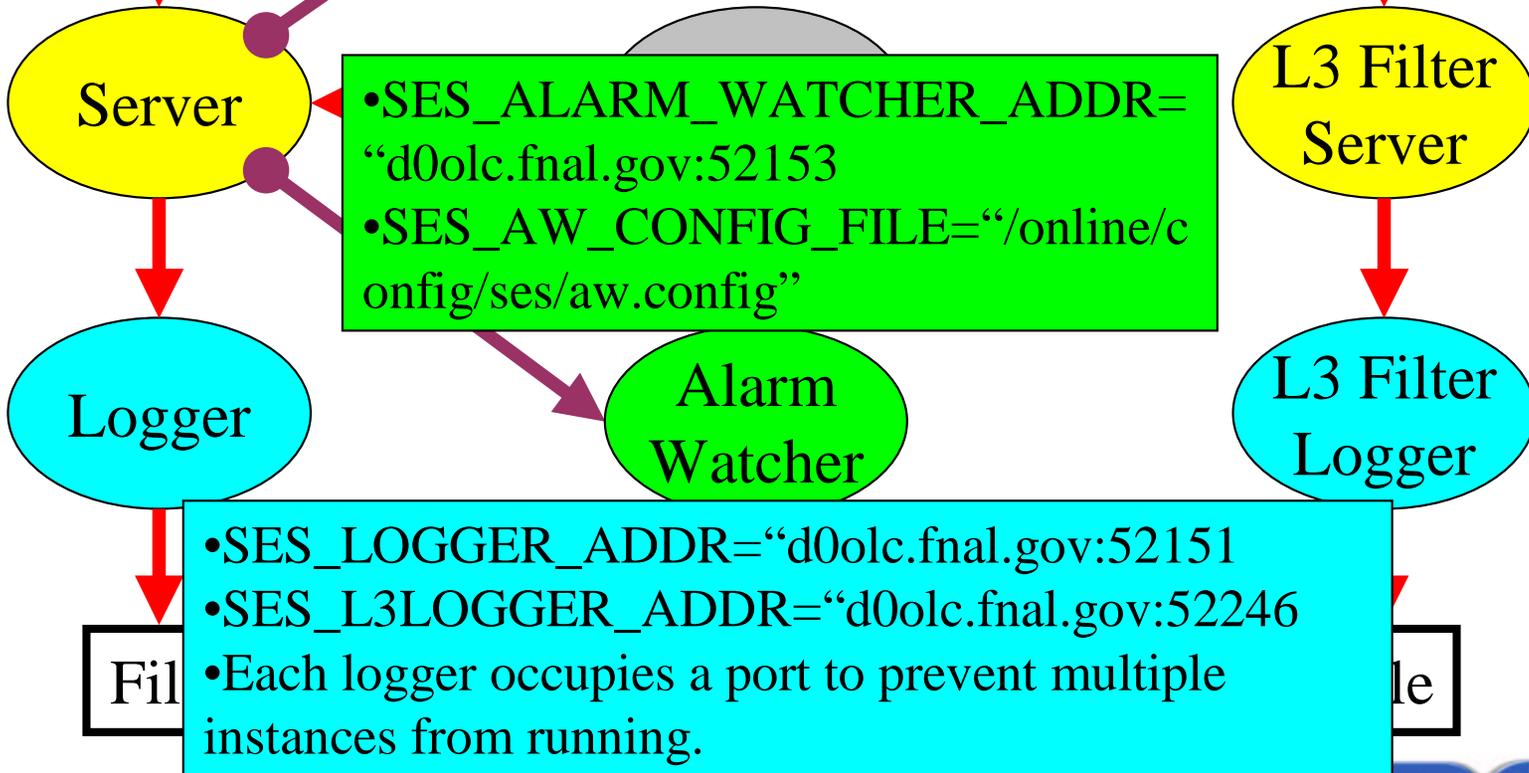
- Start L3 filter logger: start_daq ses_l3_logger
- Stop L3 filter logger: stop_daq ses_l3_logger





System configuration is handled in
/online/data/d0online/d0online_names.py.

- SES_SERVER_ADDR="d0ol39.fnal.gov:52150
- SES_DISABLE_FILE="/online/config/ses/ses.disable
- The disable file keeps a record of disabled alarms for persistence.
- SES_L3_SERVER="d0ol39.fnal.gov:52245



New log files are opened when:

- The logger starts
- At midnight
- The server is restarted

- Date when the file was opened.
- YYYYMMDD-NNMMSSSTZ

arm

Jan 28 23:59 se_log.20040128-000000CST.gz

-rw-r--r-- 1 d0run d0_prod 2688616 Jan 29 10:22 se_log.20040129-000000CST.gz

-rw-r--r-- 1 d0run d0_prod 3796569 Jan 30 00:00 se_log.20040129-102321CST.gz

-rw-r--r-- 1 d0run d0_prod 97396837 Jan 31 00:00 se_log.20040130-000000CST

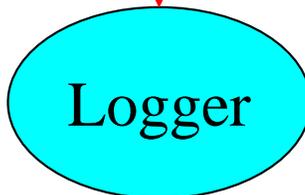
-rw-r--r-- 1 d0run d0_prod 201863729 Jan 31 23:59 se_log.20040131-000000CST

-rw-r--r-- 1 d0run d0_prod 87175211 Feb 1 23:59 se_log.20040131-235959CST

-rw-r--r-- 1 d0run d0_prod 79317890 Feb 2 23:59 se_log.20040202-000000CST

-rw-r--r-- 1 d0run d0_prod 47788150 Feb 3 14:42 se_log.20040203-000000CST

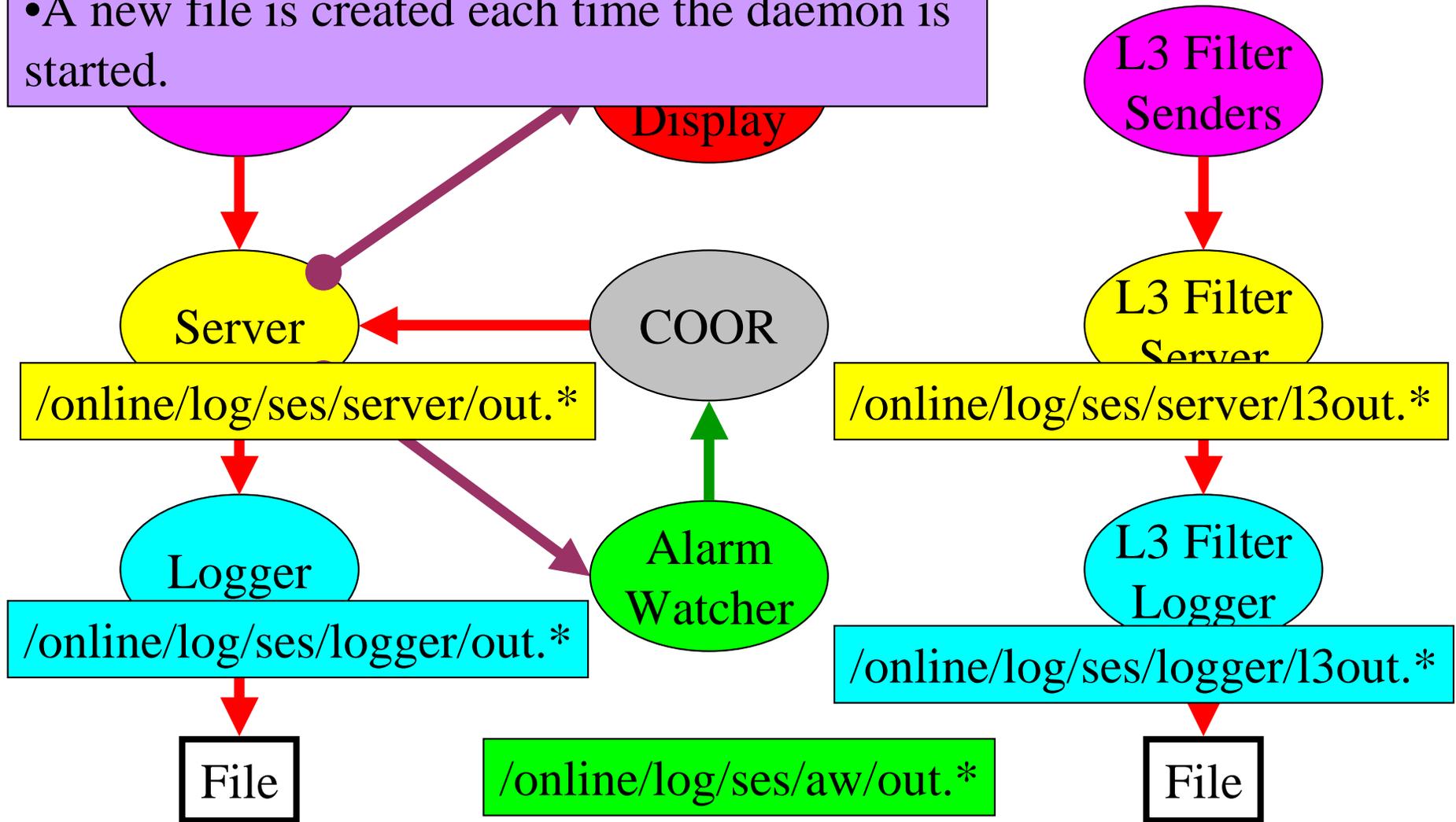
L3 Filter



- Log files written by the logger are located in /online/log/ses.
- Log files written by the l3 logger are located in /online/log/ses/l3
- A cron job zip log files more than a few days old.



- All the daemons write information about their internal state to files to aid in debugging
- A new file is created each time the daemon is started.



Manually Checking the Daemons

- u Log into the computer specified in `d0online_names.py`
- u View the process status with the `ps` command
 - On Linux (`d0ol39`) all the threads are shown (hundreds for the servers)
 - On OSF1 (`d0olc`) only the main thread is shown
- u When starting each daemon all the data is passed via command line arguments
 - `-r` = port on which a server listens for connection requests
 - `-c` = configuration file
 - `-h` = server host
 - `-p` = server port
 - `-l` = log directory
 - `--coor` = COOR host and port



```
<d0l39> ps auxwww | grep seserver
```

```
d0run 29841 0.0 3.6 849036 18720 ? S Jan29 0:00 python  
/online/products/SigEvtSys/onl04-05-00/NULL/py/seserver.py -r 52150 -c  
/online/config/ses/ses.disable
```

Server

```
d0run 31997 0.0 7.8 1036712 40084 ? S Jan23 0:00 python  
/online/products/SigEvtSys/onl04-05-00/NULL/py/seserver.py -r 52245
```

L3 Server

```
<d0lc> ps auxwww | grep selogger
```

```
d0run 612223 0.9 0.2 15.6M 6.6M ?? S Jan 23 05:08:08 python  
/online/products/SigEvtSys/onl04-05-00/NULL/py/selogger.py -p 52150 -h  
d0l39.fnal.gov -l /online/log/ses -r 52151
```

```
d0run 616384 0.2 0.2 16.3M 7.5M ?? S Jan 23 05:57:13 python  
/online/products/SigEvtSys/onl04-05-00/NULL/py/selogger.py -p 52245 -h  
d0l39.fnal.gov -l /online/log/ses/13 -r 52246
```

Logger

L3 Logger

```
<d0lc> ps auxwww | grep watcher
```

```
d0run 687585 0.0 0.1 14.2M 5.4M ?? S Jan 29 21:02.30 python  
/online/products/SigEvtSys/onl04-05-00/NULL/py/sealarmwatcher.py -p 52150 -h  
d0l39.fnal.gov -r 52153 -c /online/config/ses/aw.config --  
coor=d0lc.fnal.gov:52127 --online
```

Alarm Watcher

