

NetworkTree

A centralized architecture to
manage IOC networks

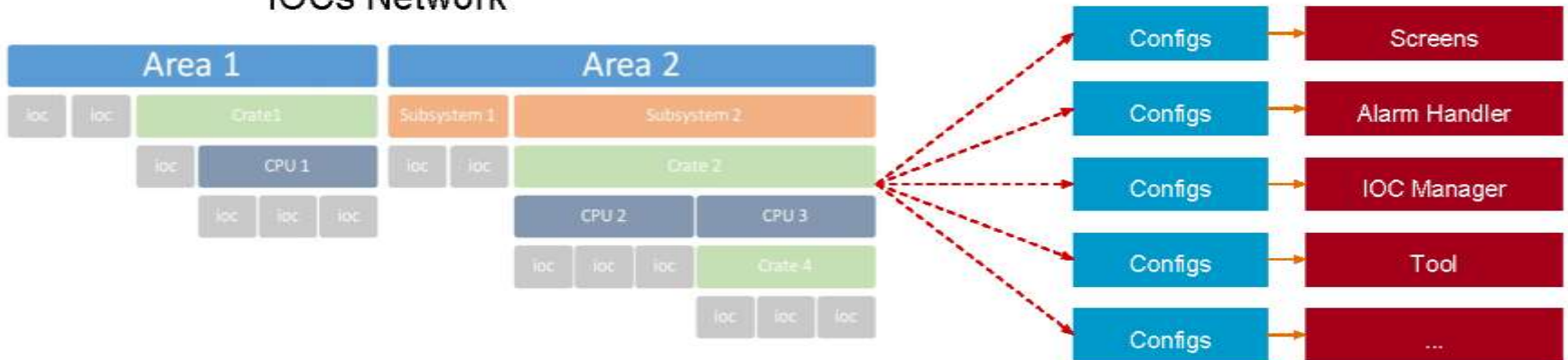
João Rodrigues
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Motivation

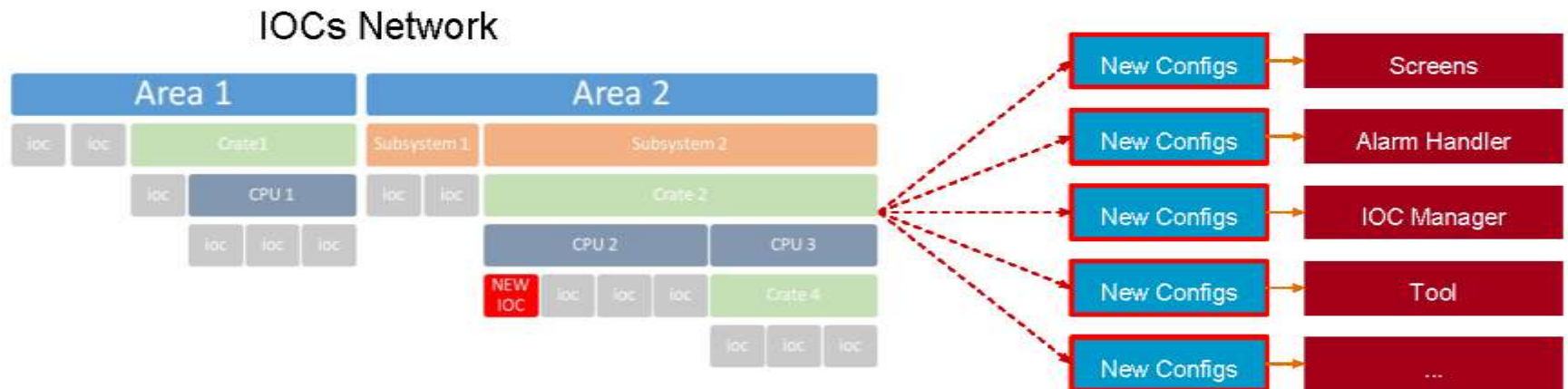
- Managing IOCs networks can become quite challenging for big facilities.
- IOCs are or can be organized in a logic tree structures (areas, subsystems, crates, cpus, etc.).
- There are a number of components on the control system that depend on this logical tree structure

IOCs Network



Motivation

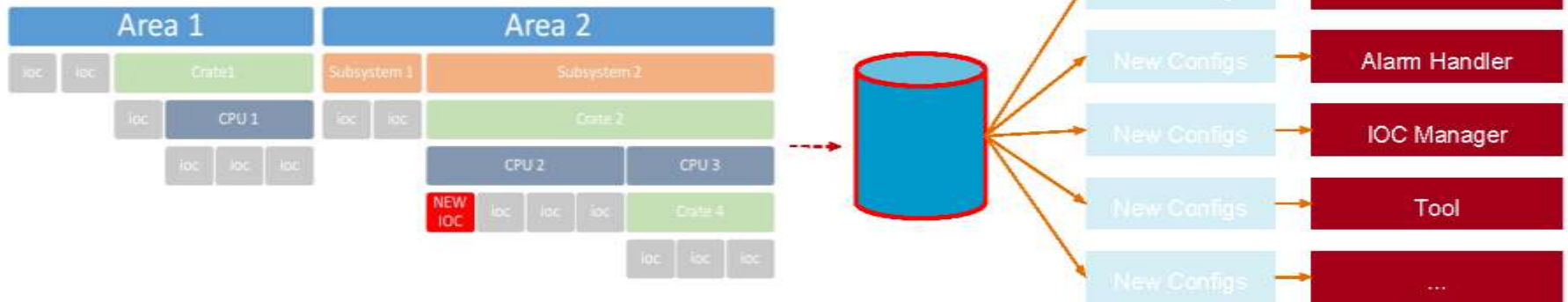
- As IOCs are deployed or decommissioned, all of these components need to be reconfigured, redesigned and updated.
- This is usually a lot of work and might easily lead to incoherences.
- What is the source of truth?



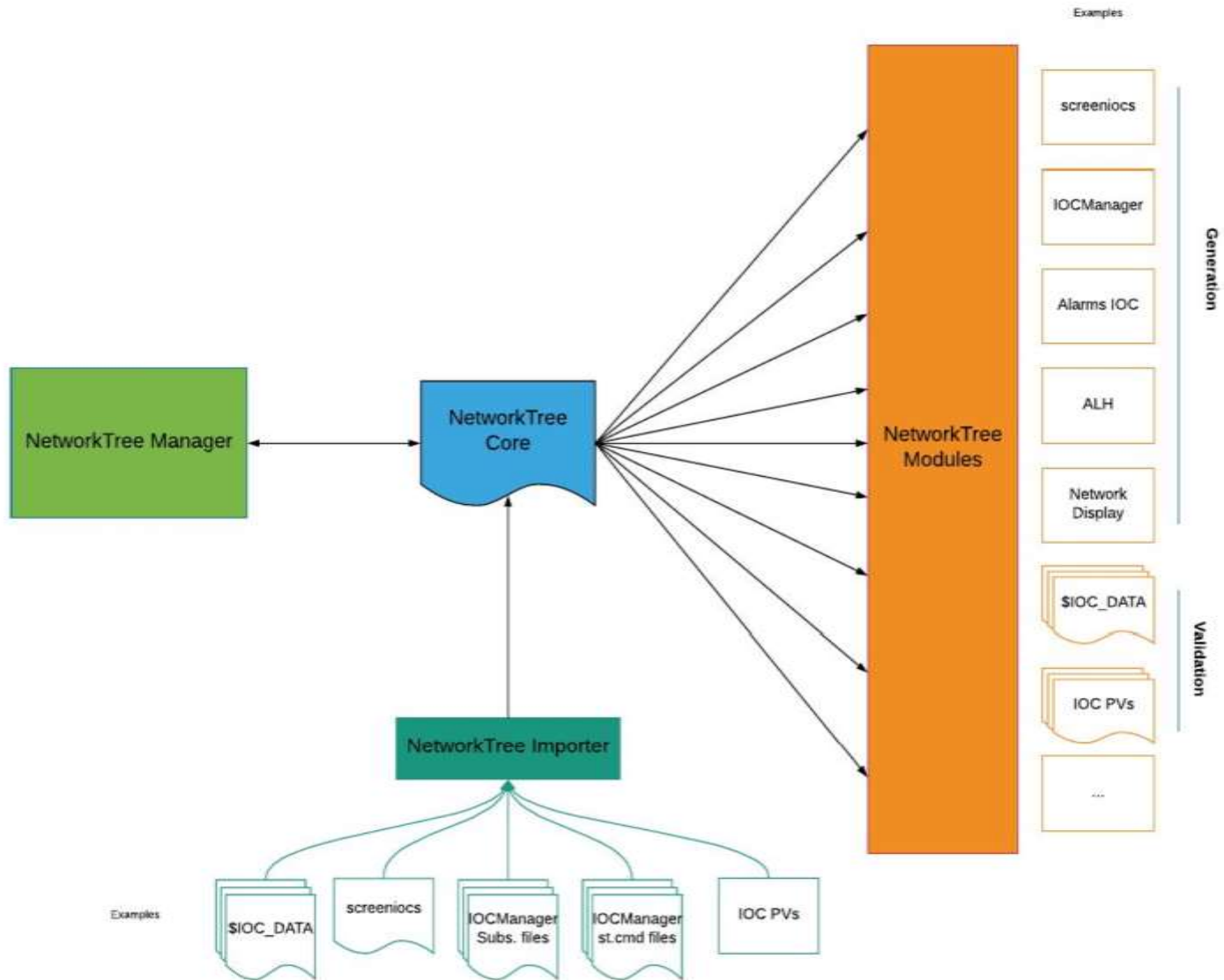
Objectives

- Keep and maintain the logical structure of the IOC network at a single point that becomes the source of truth for all other elements.
- Prevent incoherencies and ambiguities between the different elements of the system.

IOCs Network



Architecture



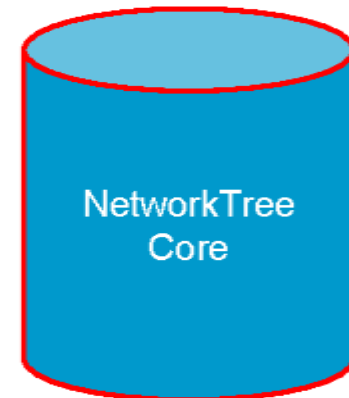
NetworkTree Core

- The NetworkTree Core has the description of the **logic structure** of the IOCs network.
- It includes **all the information** that all the NetworkTree modules need to generate their configuration files.

- It's **flexible** to accommodate different **network architectures**.
- It doesn't have necessarily to be a tree. Some relations are not linear.
- It's **flexible** to accommodate different **type of devices** that not being IOCs are part of the IOCs network (some examples are terminal servers, power switches,...).

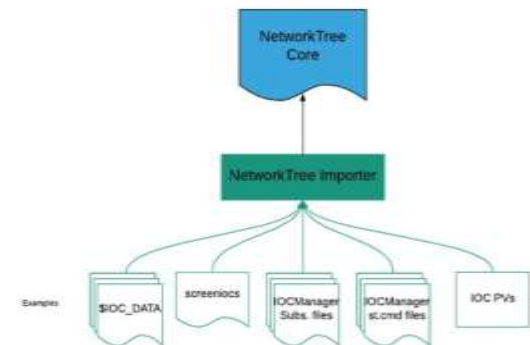
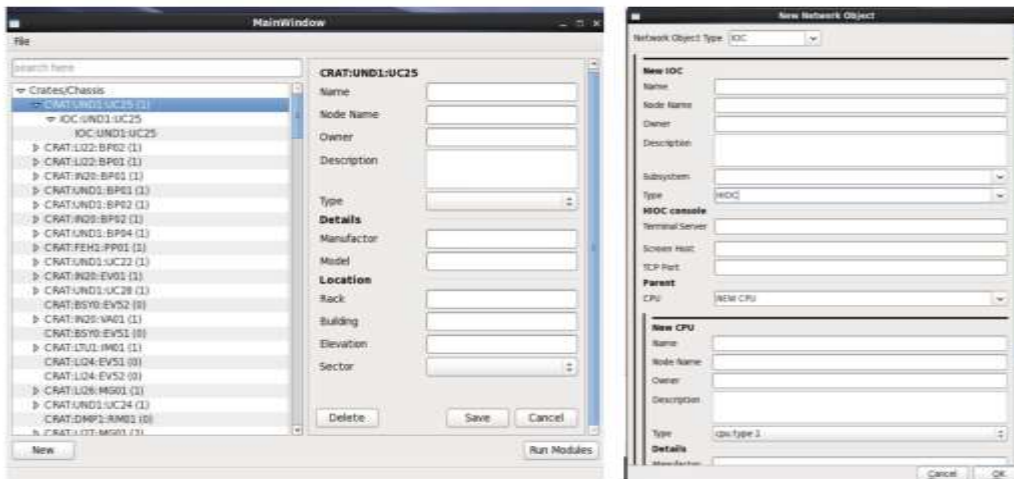
- Now it is implemented in a JSON file.
- We might evaluate the possibility of using a different way of storing this information (YAML, Relational DBs, ...).

- The Core also includes a set of scripts to manage and run the Manager, importer and different modules.



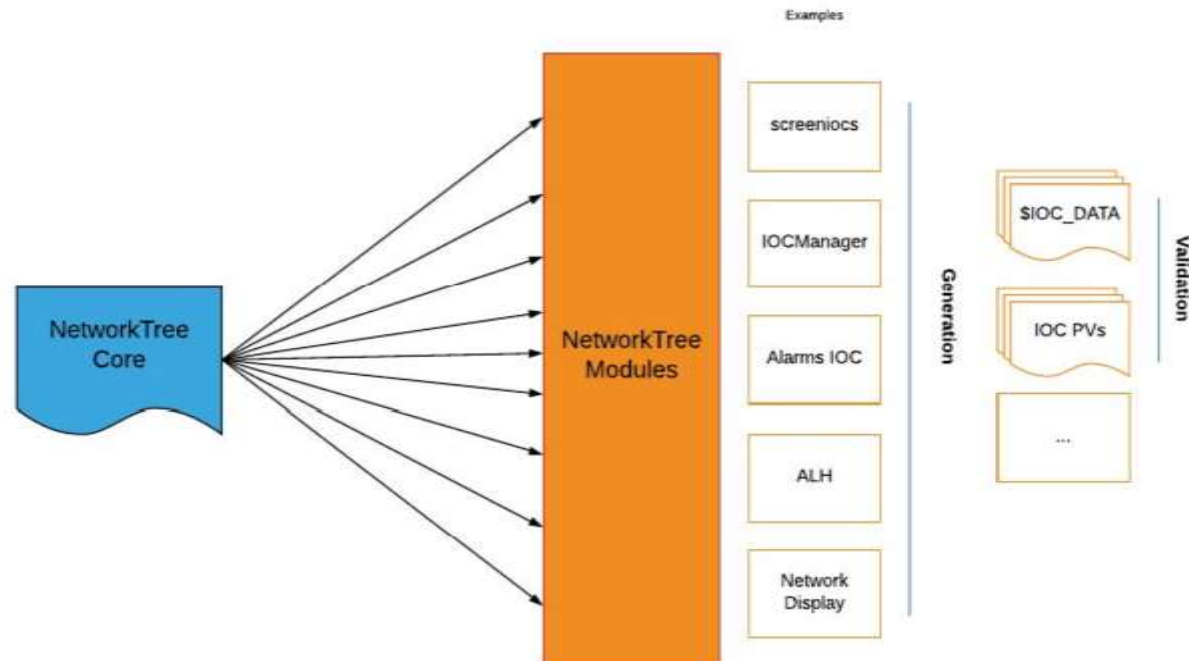
NetworkTree Importer and Manager

- Tools to feed the NetworkTree Core
- **NetworkTree Importer**
 - Import IOCs Network structure from existing sources. Check for coherence.
- **NetworkTree Manager**
 - GUI Tool to explore, add, remove or update elements to the tree.
- The NetworkTree core can always be edited by hand, but these tools make it easier for the user and do some validations to avoid human errors.



NetworkTree Modules

- NetworkTree Modules are responsible for **propagating changes** in the NetworkTree Core to all the others control system components that depend on it.
- **Automate** config files generation (something that can be very time consuming).
- Guarantees **coherence** across the whole system.
- Each module does **version control** keeping a relation between generated config files and NetworkTree Core versions.
- NetworkTree Modules can also be used for validation instead of generation.



LCLS Example: Network Screen

- Screens to browse, overview the status and and have access to the configuration of all IOCs in LCLS

LCLS Example: PyDM Network Screens

- Screens to browse, overview the status and and have access to the configuration of all IOCs in LCLS

LCLS Global Network and IOCs - Area IN20

Legacy EDM Display Home Screen... About

Global IN20 U21 U22 U23 U24 U25 U26 U27 U28 U29 U30 BSY0 LTU1 UND1 DMP1 FEE1 NEH1 FEH1

Alignment Mirror
BCS
BPMs
CAMAC
Event/Timing
IOC Manager
Klystron Support
LLRF
Laser
MPS
Magnets
Motion Control
PPS
Profile Monitor
Temperature
Toroids
Vacuum
Water

IOCs

SIOC.IN20.FC01.. BIOC.IN20.RD05.. SIOC.SYS0.RF02..
EIOC.IN20.RC01.. BIOC.IN20.RD06.. IOC.IN20.RF04..
EIOC.IN20.RC02.. BIOC.IN20.RD07.. IOC.IN20.RF05..
EIOC.IN20.RC03.. BIOC.IN20.RD08.. IOC.IN20.RF06..
EIOC.IN20.RC04.. BIOC.IN20.RD09..
EIOC.IN20.RC05.. BIOC.IN20.RD10..
EIOC.IN20.RC06.. BIOC.IN20.RD11..
EIOC.IN20.RC07.. BIOC.IN20.RD12..
EIOC.IN20.RC08.. BIOC.IN20.RD13..
EIOC.IN20.RC09.. BIOC.IN20.RD14..
EIOC.IN20.RC10.. BIOC.IN20.RD15..
EIOC.IN20.RC11.. BIOC.IN20.RD16..
EIOC.IN20.RC12.. BIOC.IN20.RD17..
EIOC.IN20.RD01.. IOC.IN20.RF01..
EIOC.IN20.RD02.. SIOC.IN20.RF01..
EIOC.IN20.RD03.. SIOC.SYS0.RF01..
EIOC.IN20.RD04.. IOC.IN20.RF02..

ACSWs

ACSW.IN20.NW12..

PRODUCTION 06/07/2018 19:03:53

LCLS Example: AHL

- Generate AHL configuration files to automatically create group alarms per IOC, Subsystems and Sectors.

```
networkTree_ntwk_alhConfig
networkTree_ntwk_bsy0_alhConfig
networkTree_ntwk_bsy0_subareas_alhConfig
networkTree_ntwk_bsy0_subsys_alhConfig
networkTree_ntwk_dmp1_alhConfig
networkTree_ntwk_dmp1_subsys_alhConfig
networkTree_ntwk_global_alhConfig
networkTree_ntwk_global_subsys_alhConfig
networkTree_ntwk_in20_alhConfig
networkTree_ntwk_in20_subareas_alhConfig
networkTree_ntwk_in20_subsys_alhConfig
networkTree_ntwk_li21_alhConfig
networkTree_ntwk_li21_subareas_alhConfig
networkTree_ntwk_li21_subsys_alhConfig
networkTree_ntwk_li22_alhConfig
networkTree_ntwk_li22_subsys_alhConfig
networkTree_ntwk_li23_alhConfig
networkTree_ntwk_li23_subsys_alhConfig
networkTree_ntwk_li24_alhConfig
networkTree_ntwk_li24_subsys_alhConfig
networkTree_ntwk_li25_alhConfig
networkTree_ntwk_li25_subsys_alhConfig
networkTree_ntwk_li26_alhConfig
networkTree_ntwk_li26_subsys_alhConfig
networkTree_ntwk_li27_alhConfig
networkTree_ntwk_li27_subsys_alhConfig
networkTree_ntwk_li28_alhConfig
networkTree_ntwk_li28_subsys_alhConfig
networkTree_ntwk_li29_alhConfig
networkTree_ntwk_li29_subsys_alhConfig
networkTree_ntwk_li30_alhConfig
networkTree_ntwk_li30_subsys_alhConfig
networkTree_ntwk_ltul_alhConfig
networkTree_ntwk_ltul_subsys_alhConfig
networkTree_ntwk_und1_alhConfig
networkTree_ntwk_und1_subsys_alhConfig
```

```
GROUP NULL NTKW_new:BSY0SUBS:ALL
$ALIAS BSY0 subsystems
$GUIDANCE
  BSY0 Network Subsystems
  Group Name: NTKW_new:BSY0SUBS:ALL
  Summary PV: NTKW_new:BSY0SUBS:ALL:STATSUMY
$END
$COMMAND networkTreeDisplay -a BSY0

GROUP NTKW_new:BSY0SUBS:ALL NTKW_new:BSY0SUBS:BED
$ALIAS BEAMLINE DATA
$GUIDANCE
  BSY0 BeamLine Data summary.
  Group Name: NTKW_new:BSY0SUBS:BED
  Summary PV: NTKW_new:BSY0SUBS:BED:STATSUMY
$END

GROUP NTKW_new:BSY0SUBS:BED IOC:SYS0:BD01:GROUP
$GUIDANCE
  IOC:SYS0:BD01 Button summary
  Group Name: IOC:SYS0:BD01:GROUP
  Summary PV: IOC:SYS0:BD01:GROUP:STATSUMY
$END

GROUP IOC:SYS0:BD01:GROUP ACSW:IOC:SYS0:BD01:GROUP
$ALIAS ACSWs
$GUIDANCE
  ACSWs summary
  Group Name: ACSW:IOC:SYS0:BD01:GROUP
  Summary PV: ACSW:IOC:SYS0:BD01:GROUP:STATSUMY
$END

GROUP ACSW:IOC:SYS0:BD01:GROUP ACSW:NCC0:NM04:NM99
$GUIDANCE
```

```
GROUP NULL IOC:BSYA:NM01
$ALIAS IOC
$GUIDANCE
  IOC status
  Group Name: IOC:BSYA:NM01
  Summary PV: IOC:BSYA:NM01:STATSUMY
$END

GROUP IOC:BSYA:NM01 SIOC:BSY0:V001
CHANNEL SIOC:BSY0:V001 SIOC:BSY0:V001:HEARTBEATSUM -----
CHANNEL SIOC:BSY0:V001 SIOC:BSY0:V001:TOOSUM -----

GROUP IOC:BSYA:NM01 IOC:BSY0:PM02
CHANNEL IOC:BSY0:PM02 IOC:BSY0:PM02:HEARTBEATSUM -----
CHANNEL IOC:BSY0:PM02 IOC:BSY0:PM02:TOOSUM -----

GROUP IOC:BSYA:NM01 SIOC:ESAO:PP01
CHANNEL SIOC:ESAO:PP01 SIOC:ESAO:PP01:HEARTBEATSUM -----
CHANNEL SIOC:ESAO:PP01 SIOC:ESAO:PP01:TOOSUM -----

GROUP IOC:BSYA:NM01 SIOC:BSY0:TM01
CHANNEL SIOC:BSY0:TM01 SIOC:BSY0:TM01:HEARTBEATSUM -----
CHANNEL SIOC:BSY0:TM01 SIOC:BSY0:TM01:TOOSUM -----

GROUP IOC:BSYA:NM01 SIOC:BSY0:NM01
CHANNEL SIOC:BSY0:NM01 SIOC:BSY0:NM01:HEARTBEATSUM -----
CHANNEL SIOC:BSY0:NM01 SIOC:BSY0:NM01:TOOSUM -----
```

Alarm Handler: NTKW@mcclogn

File Action View Setup

- NTKW_new (27,0,130,0,3296)
- BSY0 (10,0,0,0,430)
- DMP1 (0,0,8,0,84)
- GLOBAL (-----)
- IN20 (117,0,99,0,932)
- IN20 subareas (10,0,60,0,573)
- IN20 subsystems (7,0,31,0,359)
- ALIGNMENT MIRROR (-----)
- BCS (-----)
- BPMS (-----)
- EIOC:IN20:BP221:GROUP (-----)
- ACSWs (-----)
- ACSW:IN20:NM01:NM99 (-----)
- IOCs (-----)
- EIOC:IN20:BP221:NM99 (-----)
- EIOC:IN20:BP235:GROUP (-----)
- EIOC:IN20:BP371:GROUP (-----)
- EIOC:IN20:BP425:GROUP (-----)
- EIOC:IN20:BP511:GROUP (-----)
- EIOC:IN20:BP625:GROUP (-----)
- EIOC:IN20:BP681:GROUP (-----)
- EIOC:IN20:BP631:GROUP (-----)
- EIOC:IN20:BP651:GROUP (-----)
- EIOC:IN20:BP731:GROUP (-----)
- EIOC:IN20:BP771:GROUP (-----)
- EIOC:IN20:BP781:GROUP (-----)
- EIOC:IN20:BP821:GROUP (-----)
- EIOC:IN20:BP945:GROUP (-----)
- EIOC:IN20:BP981:GROUP (-----)
- IOC:IN20:BP01:GROUP (-----)
- IOC:IN20:BP02:GROUP (-----)
- SUNCH LENGTH (-----)
- CAMAC (-----)
- EVERYTHING (-----)

Thank you!

João Rodrigues
joaoprod@slac.stanford.edu