



Phoebus Alarm System

Micro Services for Logging and Management.

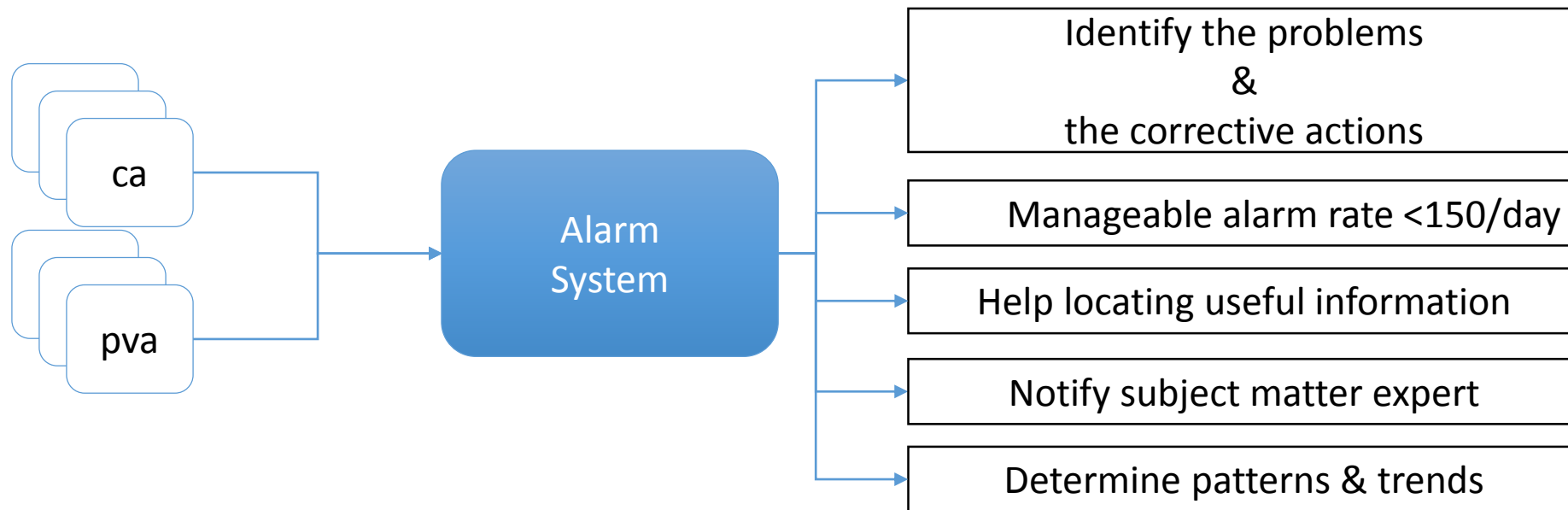
Alarm Philosophy

B. Hollifield, E. Habibi,

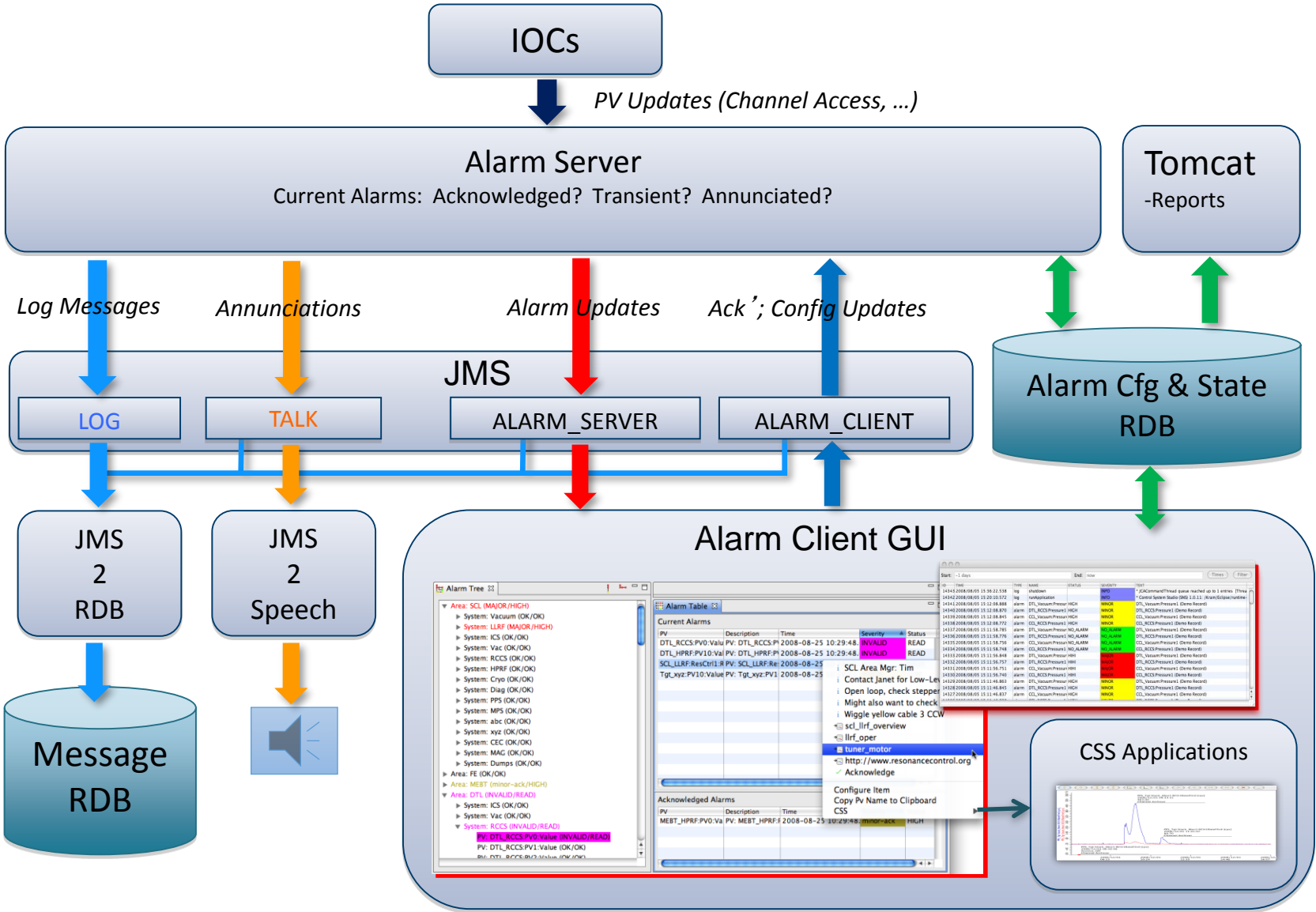
"Alarm Management:

Seven Effective Methods for Optimum Performance", ISA, 2007

A good alarm system is one which helps users take correct actions



BEAST



CS-Studio

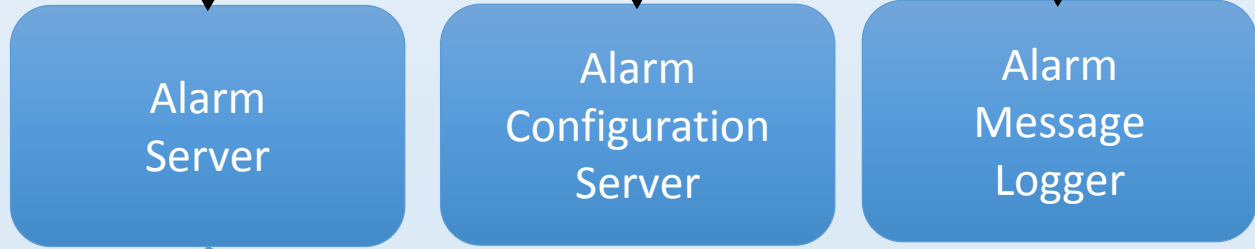
The screenshot shows the CS-Studio interface with several windows. On the left, a table lists alarm events with columns for ID, TIME, TYPE, NAME, and STATUS. The main window displays a tree view of system components like 'System: Vacuum' and 'System: Beam Monitor'. A right-hand pane shows 'Current Alarms (3)' with details for each, including description and severity.

kibana

The screenshot shows the Kibana dashboard with a bar chart representing alarm data over time. The chart has a blue header and a grid background. Below the chart, there are several panels showing detailed views of specific alarm events, including their configuration and current status.

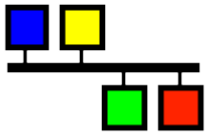
Alarm Clients

kafka



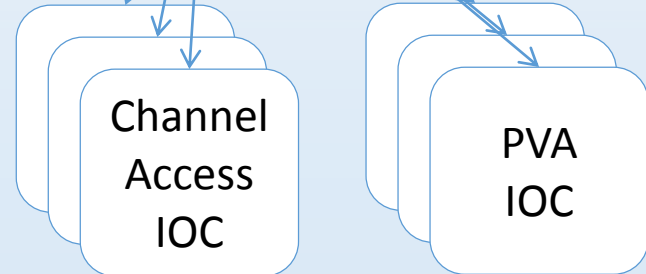
Alarm micro services

EPICS



git

elasticsearch



Control Systems

...

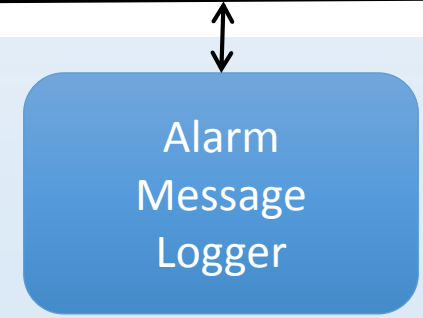
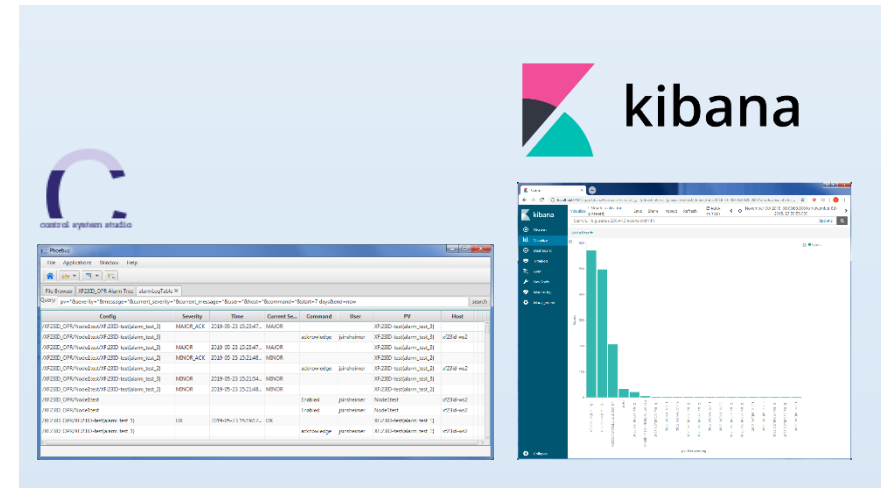
Alarm Logger Service

Alarm Message Logger

Motivation

To create an archive of all alarm state changes and associated actions

- Discover alarm patterns and trends
- Generate Statistical reports on alarms
- Debug the alarm system

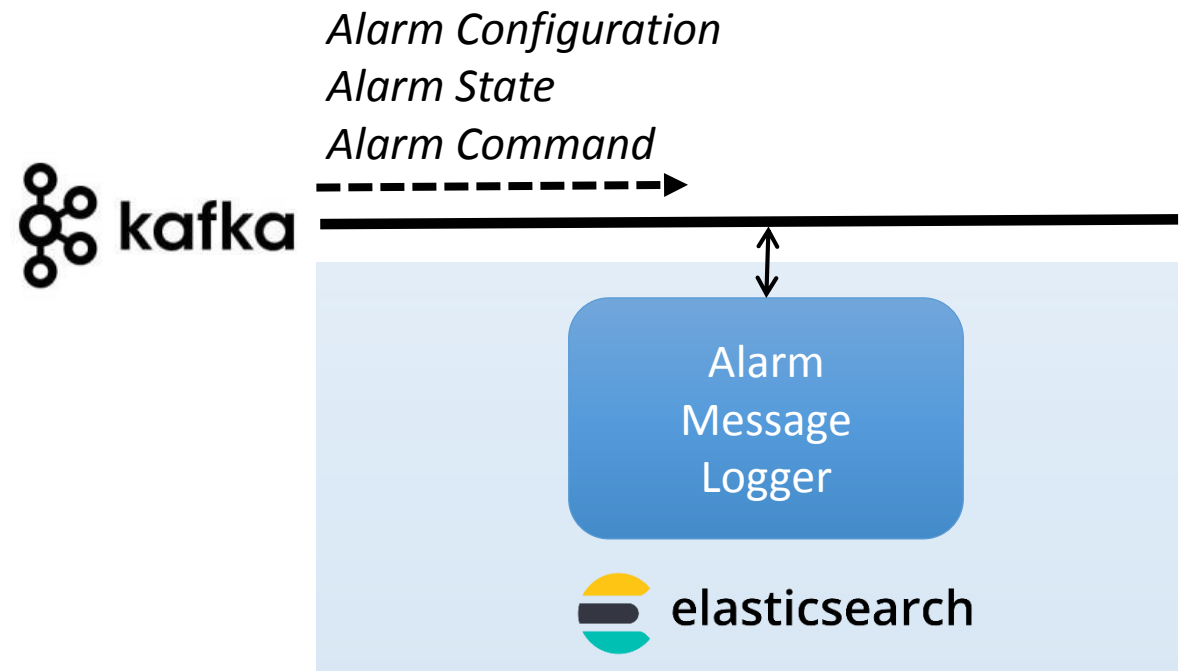


Alarm Message Logger

The alarm message logger subscribes to all

- Configuration changes
adding/removing or enabling/disabling
- State changes
e.g. alarm state changes from **OK** to **MAJOR**
- Commands
e.g. user actions to Acknowledge an alarm

All the above changes and commands are logged into a dedicated elastic index



Architecture



elasticsearch

- Elasticsearch is a distributed, RESTful search and analytics engine.



kibana

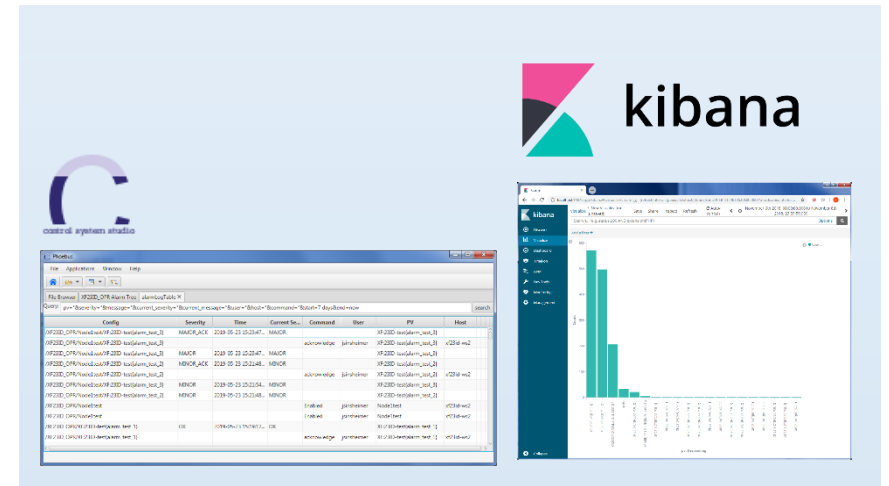
- An analytics and visualization platform called Kibana

Build and Run

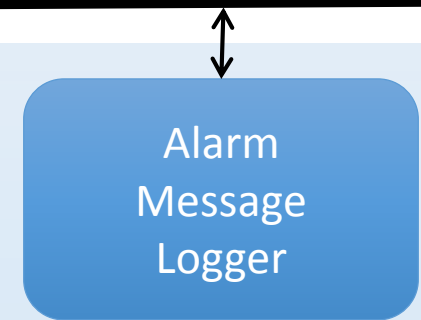
git <https://github.com/shroffk/phoebus.git>

cd services/alarm-config-logger

mvn exec:java



kafka



elasticsearch

kibana client

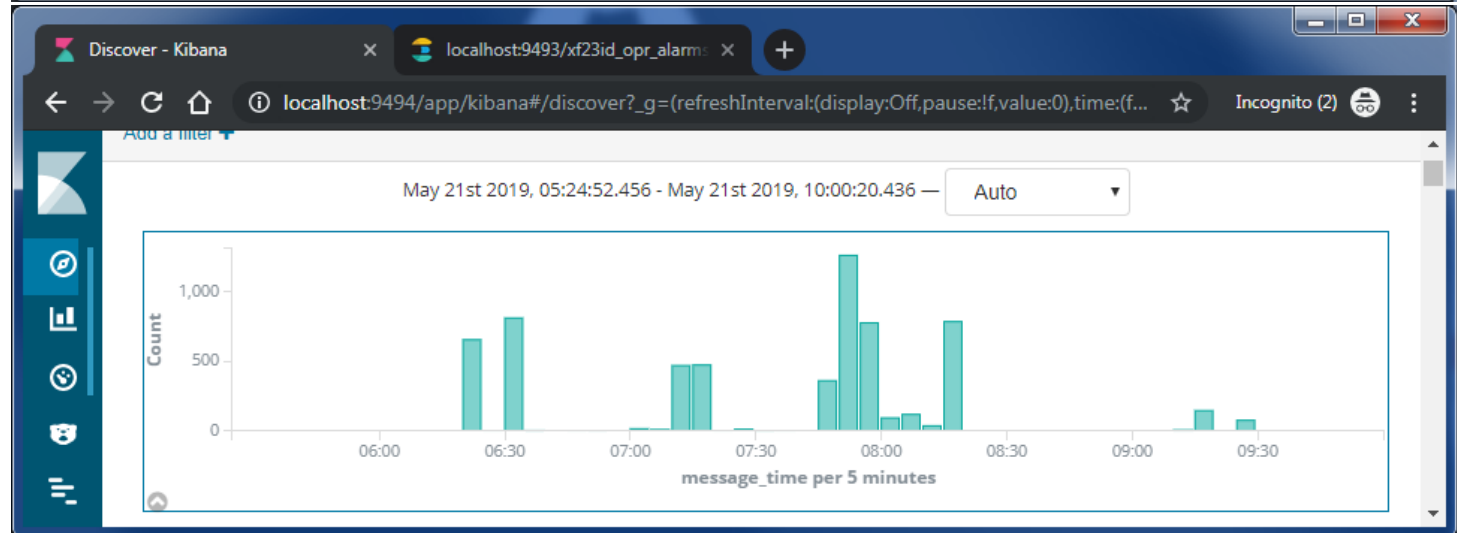
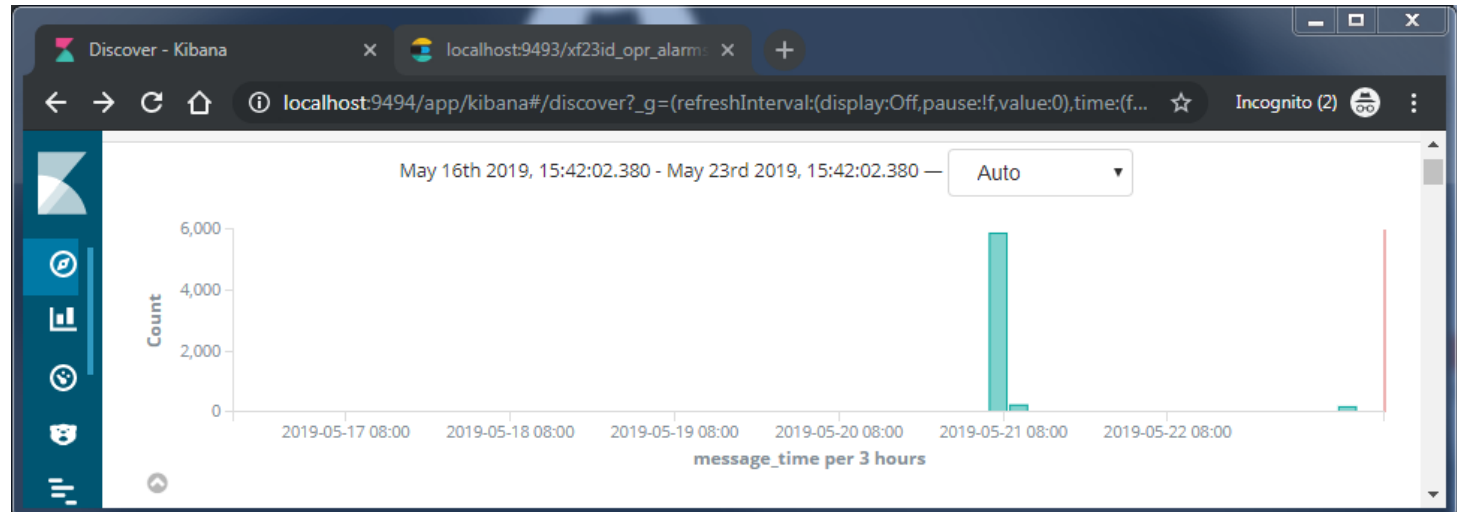
A Timeseries view of phoebus alarm server messages.

Filtered:

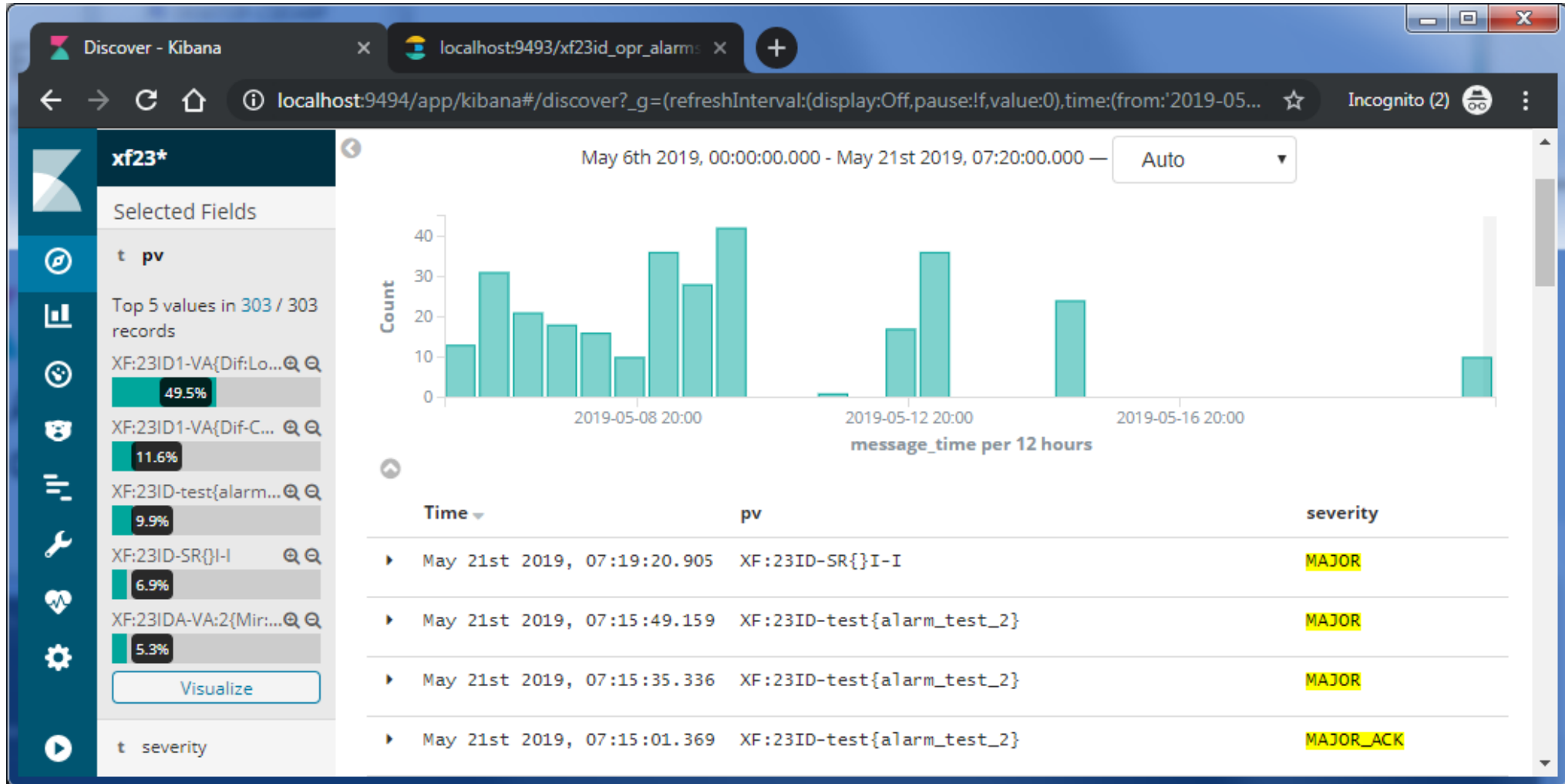
pvname

node/system

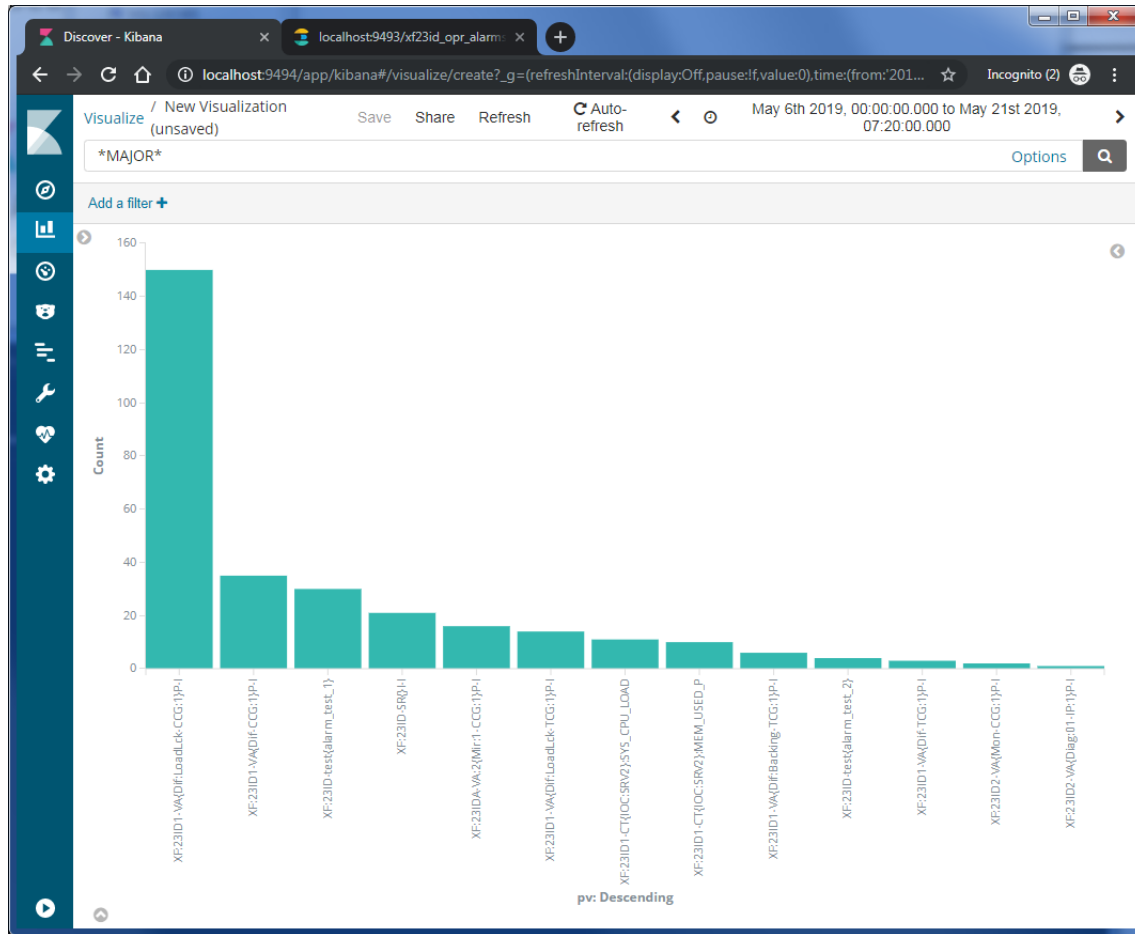
alarm severity



kibana client



kibana client



The screenshot shows a Kibana visualization titled "New Visualization (unsaved)" with a search filter of "*MAJOR*". The visualization is a table showing the count of events for various log types. The table is sorted by "pv: Descending" and has a page size of 10.

Log Type	Count
XF:23ID1-VA{Dif:LoadLck-CCG:1}P-I	150
XF:23ID1-VA{Dif-CCG:1}P-I	35
XF:23ID-test{alarm_test_1}	30
XF:23ID-SRQ{I-I}	21
XF:23IDA-VA:2{Mir:1-CCG:1}P-I	16
XF:23ID1-VA{Dif:LoadLck-TCG:1}P-I	14
XF:23ID1-CT{IOC:SRV2}SYS_CPU_LOAD	11
XF:23ID1-CT{IOC:SRV2}MEM_USED_P	10
XF:23ID1-VA{Dif:Backing-TCG:1}P-I	6
XF:23ID-test{alarm_test_2}	4

CS-Studio/Phoebus client

XF23ID_OPR

Computer Systems

- PV: XF:23ID1-CT{IOG:IOC1}:MEM USED P
- PV: XF:23ID1-CT{IOG:IOC1}:MEM USED P
- PV: XF:23ID1-CT{IOG:IOC1}:MEM USED P
- PV: XF:23ID1-CT{IOG:IOC1}:MEM USED P
- PV: XF:23ID1-CT{IOG:IOC1}:MEM USED P
- PV: XF:23ID1-CT{IOG:IOC1}:MEM USED P
- PV: XF:23ID1-CT{IOG:IOC1}:MEM USED P

Alarm History

Copy PV to Clipboard

Data Browser

PV Table

PV Tree

Probe

Alarm Tree alarmLogTable X

message=*¤t_severity=*¤t_message=*&user=*&host=*&command=*&start=7 days&end=now search

Config	Severity	Time	Current Se...	Command	User	PV	Host
/XF23ID_OPR/Node1test/XF:23ID-test{alarm_test_3}	MAJOR_ACK	2019-05-23 15:23:47...	MAJOR			XF:23ID-test{alarm_test_3}	
/XF23ID_OPR/Node1test/XF:23ID-test{alarm_test_3}				acknowledge	jsinsheimer	XF:23ID-test{alarm_test_3}	xf23id-ws2
/XF23ID_OPR/Node1test/XF:23ID-test{alarm_test_3}	MAJOR	2019-05-23 15:23:47...	MAJOR			XF:23ID-test{alarm_test_3}	
/XF23ID_OPR/Node1test/XF:23ID-test{alarm_test_2}	MINOR_ACK	2019-05-23 15:21:48...	MINOR			XF:23ID-test{alarm_test_2}	
/XF23ID_OPR/Node1test/XF:23ID-test{alarm_test_2}				acknowledge	jsinsheimer	XF:23ID-test{alarm_test_2}	xf23id-ws2
/XF23ID_OPR/Node1test/XF:23ID-test{alarm_test_3}	MINOR	2019-05-23 15:21:54...	MINOR			XF:23ID-test{alarm_test_3}	
/XF23ID_OPR/Node1test/XF:23ID-test{alarm_test_2}	MINOR	2019-05-23 15:21:48...	MINOR			XF:23ID-test{alarm_test_2}	
/XF23ID_OPR/Node1test				Enabled	jsinsheimer	Node1test	xf23id-ws2
/XF23ID_OPR/Node1test				Enabled	jsinsheimer	Node1test	xf23id-ws2
/XF23ID_OPR/XF:23ID-test{alarm_test_1}	OK	2019-05-23 15:19:12...	OK			XF:23ID-test{alarm_test_1}	
/XF23ID_OPR/XF:23ID-test{alarm_test_1}				acknowledge	jsinsheimer	XF:23ID-test{alarm_test_1}	xf23id-ws2

Alarm Data Management

- The server can be configured to create a new index every day, week, month, or year

```
# The units of the indices date span: Days (D), Weeks(W), Months(M), Years(Y).  
date_span_units=M
```

```
# The value of the indices date span.  
# An integer value to be combined with the units. For example, if months were selected and the value set  
to 2, each index would span 2 months.  
date_span_value=1
```

- Searches can be performed across multiple indexes

```
http://localhost:9493/xf23id\_opr\_alarms\_config\_\*/\_search
```

- Elastic Curator

An Index Lifecycle Management tool which manages the cleanup and deletion of cold indices

Alarm Configuration Service

Alarm Configuration Service

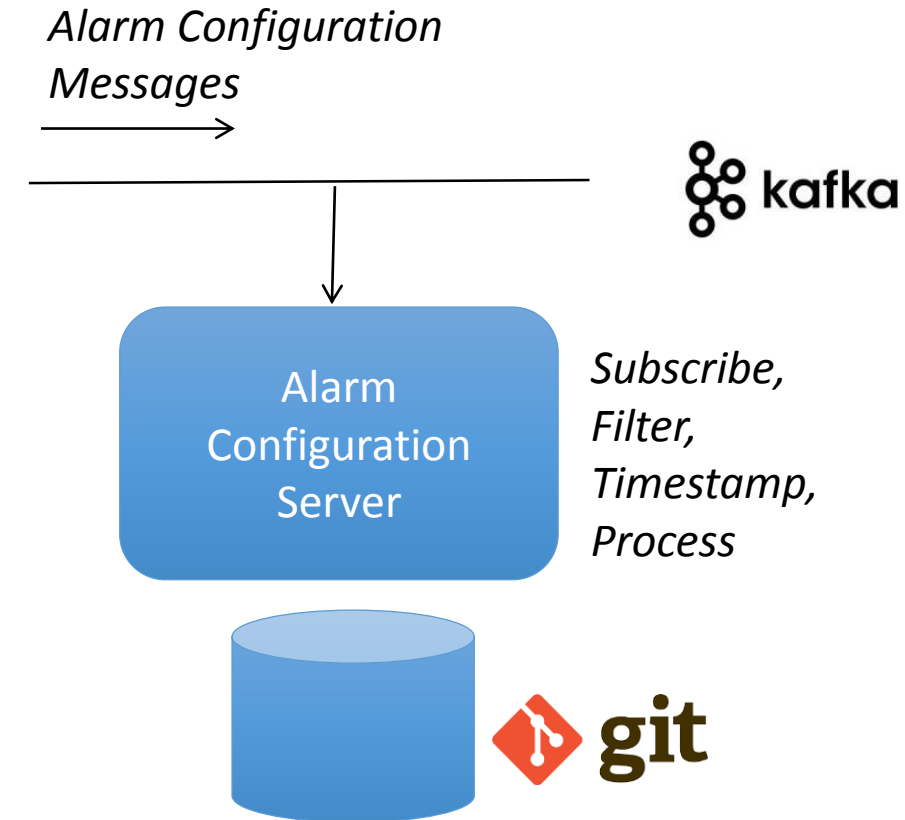
Log all the configuration changes made to the alarm server configuration

Build and Run

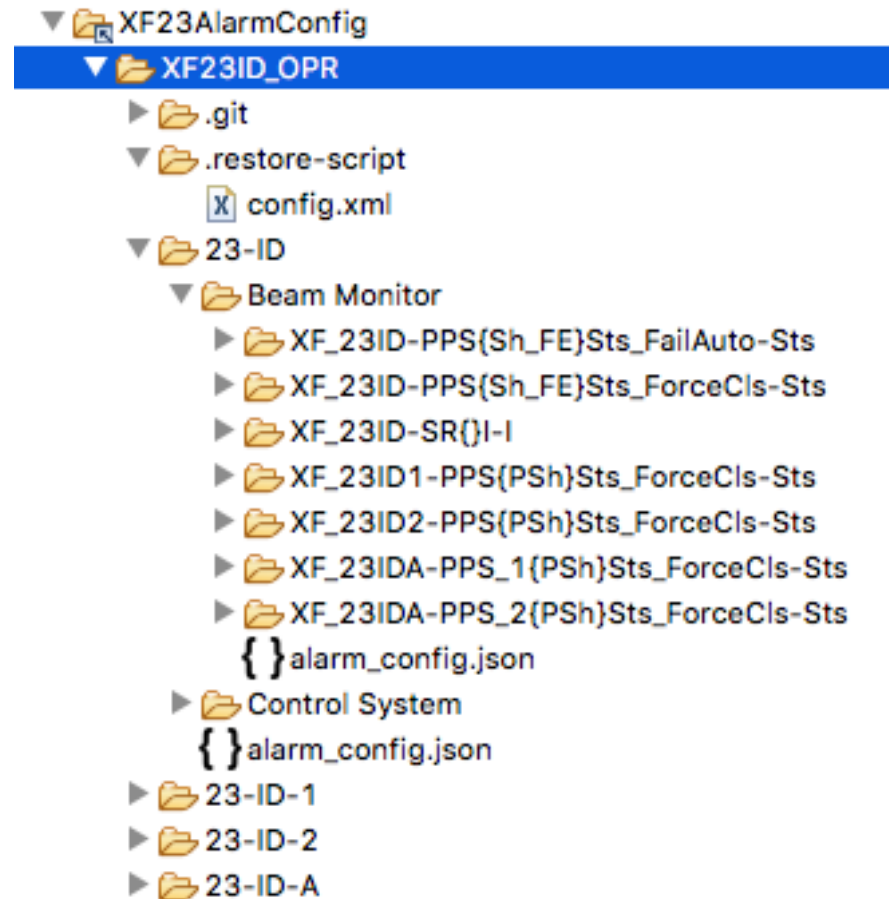
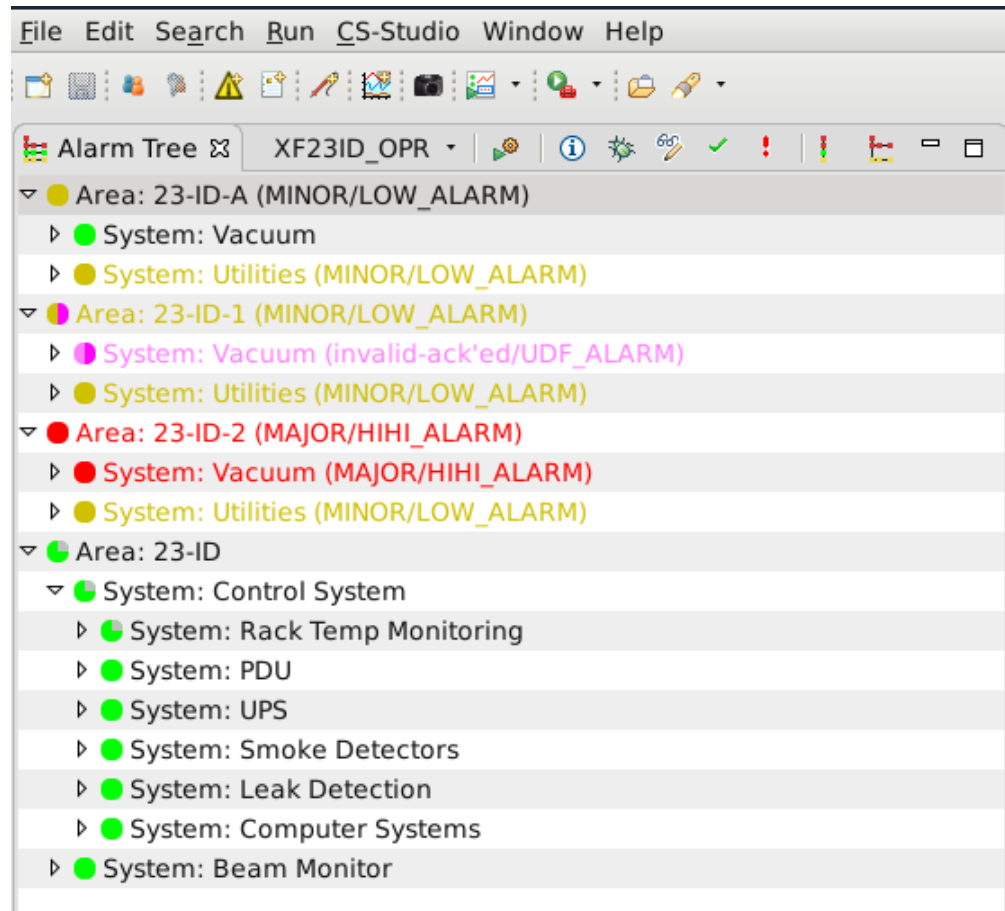
```
git https://github.com/shroffk/phoebus.git
```

```
cd services/alarm-config-logger
```

```
mvn exec:java
```



Alarm Configuration Tree



Configuration History

Id	Message	Author	Authored Date
8367a50	Alarm config update /XF23ID_OPR/23-ID/Beam Monitor	Kunal Shroff	5 days ago
167c5cc	Alarm config update /XF23ID_OPR/23-ID/Beam Monitor	Kunal Shroff	5 days ago
ad473db	Alarm config update /XF23ID_OPR/23-ID-A/Vacuum	Kunal Shroff	5 days ago
116f791	Alarm config update /XF23ID_OPR/23-ID-A/Utilities	Kunal Shroff	5 days ago
398112e	Alarm config update /XF23ID_OPR/23-ID-A	Kunal Shroff	5 days ago
aeb1775	Alarm config update /XF23ID_OPR/23-ID-2/Vacuum	Kunal Shroff	5 days ago
ce96729	Alarm config update /XF23ID_OPR/23-ID-2/Utilities	Kunal Shroff	5 days ago
db94929	Alarm config update /XF23ID_OPR/23-ID-2	Kunal Shroff	5 days ago
e00bd93	Alarm config update /XF23ID_OPR/23-ID-1/Vacuum	Kunal Shroff	5 days ago
705ed07	Alarm config update /XF23ID_OPR/23-ID-1/Utilities	Kunal Shroff	5 days ago
b8e97da	Alarm config update /XF23ID_OPR/23-ID-1	Kunal Shroff	5 days ago
03a090f	Alarm config update /XF23ID_OPR/23-ID/Control System/UPS	Kunal Shroff	5 days ago
6936805	Alarm config update /XF23ID_OPR/23-ID/Control System/Smoke Detectors	Kunal Shroff	5 days ago
aaeb060	Alarm config update /XF23ID_OPR/23-ID/Control System/Rack Temp Monitoring	Kunal Shroff	5 days ago
176daa1	Alarm config update /XF23ID_OPR/23-ID/Control System/PDU	Kunal Shroff	5 days ago
e497446	Alarm config update /XF23ID_OPR/23-ID/Control System/Leak Detection	Kunal Shroff	5 days ago
554f35	Alarm config update /XF23ID_OPR/23-ID/Control System/Computer Systems	Kunal Shroff	5 days ago

Configuration events

Repository: XF23ID_OPR

Id	Message	Author	Authored Date	Comm
0137b02	master (HEAD) Alarm config update /XF23ID_OPR/23-ID/Control System	Kunal Shroff	5 days ago	Kunal S
8971901	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum	Kunal Shroff	5 days ago	Kunal S
3578b08	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum	Kunal Shroff	5 days ago	Kunal S
57ed173	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum/XF_23ID1-VA{Dif_lKunal Shroff	Kunal Shroff	5 days ago	Kunal S
5a6bc90	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum/XF_23ID1-VA{Dif_lKunal Shroff	Kunal Shroff	5 days ago	Kunal S
2caa434	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum/XF_23ID1-VA{Dif_lKunal Shroff	Kunal Shroff	5 days ago	Kunal S
73d076a	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum/XF_23ID1-VA{Dif_lKunal Shroff	Kunal Shroff	5 days ago	Kunal S
301d6df	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum	Kunal Shroff	5 days ago	Kunal S
55cce99	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum	Kunal Shroff	5 days ago	Kunal S
7afc7d6	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum	Kunal Shroff	5 days ago	Kunal S
964ef0a	Alarm config update /XF23ID_OPR/23-ID/Control System/Vacuum	Kunal Shroff	5 days ago	Kunal S
e9ebeb4	Alarm config update /XF23ID_OPR/23-ID-1/Vacuum/XF_23ID1-VA{Dif_LoadLck-TCG_Kunal Shroff	Kunal Shroff	5 days ago	Kunal S
ead4b54	Alarm config update /XF23ID_OPR/23-ID-1/Vacuum/XF_23ID1-VA{Dif_LoadLck-CCG_Kunal Shroff	Kunal Shroff	5 days ago	Kunal S

```
index 0000000..4101b8c
--- /dev/null
+++ "b/23-ID/Control System/Vacuum/XF_23ID1-VA\173Dif_LoadLck-CCG_
@@ -0,0 +1,5 @@
+{
+  "user" : "Kunal Shroff",
+  "host" : "KunalShroff-PC",
+  "description" : "XF:23ID1-VA{Dif:LoadLck-CCG:1}P-2"
+}
```

```
{
  "user" : "Kunal Shroff",
  "host" : "KunalShroff-PC",
  "description" : "XF:23ID1-VA{Dif:LoadLck-CCG:1}P-2"
}
```

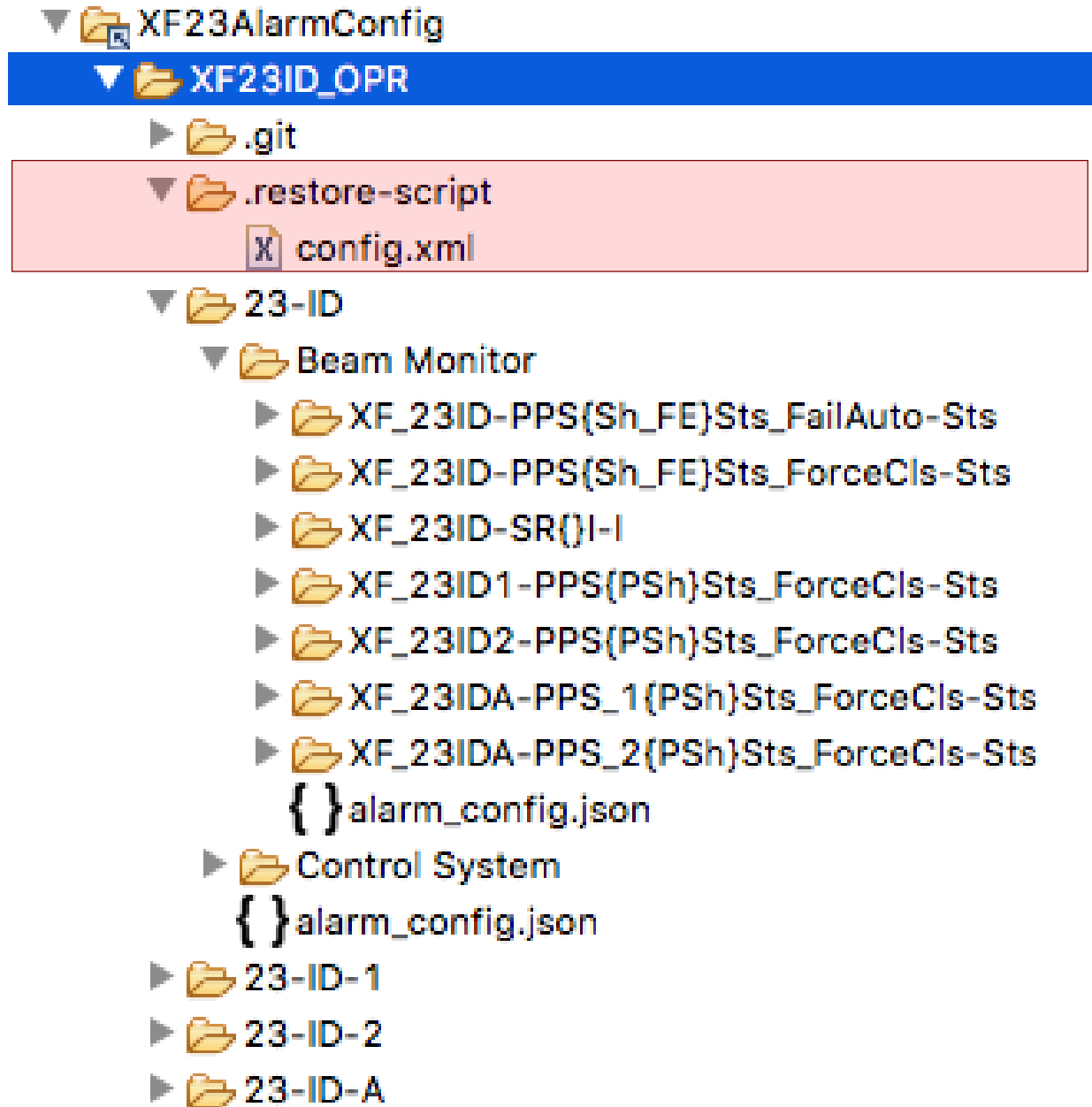
```
index 9acaef9..0000000
--- a/23-ID/Control System/Vacuum/alarm_config.json
+++ /dev/null
@@ -1,5 +0,0 @@
- {
-   "user" : "Kunal Shroff",
-   "host" : "KunalShroff-PC",
-   "description" : "XF:23ID1-VA{Dif:LoadLck-CCG:1}P-2"
- }
```

```
23-ID/Control System/Vacuum/alarm_config.json
23-ID/Control System/Vacuum/XF_23ID1-VA{Dif_LoadLck-CCG,
23-ID/Control System/Vacuum/XF_23ID1-VA{Dif_LoadLck-CCG,
```

Restore Scripts

Each alarm configuration change results in the creation or an update to the config.xml file.

The config.xml can be directly imported into the alarm server to restore it to the alarm configuration to that instant.



Questions