

EPICS BEAST Alarm System

Happily Purrs at ANKA Synchrotron Light Source

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Abstract

The control system of the ANKA synchrotron radiation source at KIT (Karlsruhe Institute of Technology) is adopting new, and converting old, devices into an EPICS control system. New GUI panels are developed in Control System Studio (CSS). EPICS alarming capabilities in connection with the BEAST alarm server tool-kit from the CSS bundle are used as an alarming solution. To accommodate ANKA future requirements as well as ANKA legacy solutions, we have decided to extend the basic functionality of BEAST with additional features in order to manage the alarming for different machine operation states. Since the database of alarm sources is been populated from scratch, we have been able to take a fresh approach in management and creation of alarm sources to build-up alarm trees. The new alarm system is being continuously used, tested and refined, and has been in the production environment since the end of 2013.

Alarm Operation policy

In business alarming quality comes before quantity! An alarm panel full of alarm messages, in which no-one has explanation or knows the cause, especially while the machine seems to be operating without problems, contribute little to the operation. Such an alarm system is not functional. This means that simply adding all (primary) alarm sources or PVs into the alarming system does not provide a functional alarm system.

There are two main rules for a functional alarm system:

- System should provide only alarms to which operator must react. If alarm information is nice-to-know, but does not require reaction from operator, then this piece of information is not an alarm. Even if technically it is defined as such.
- Alarm system must not provide to operator more alarms that operator can handle. There are several strategies to prevent this: do not include too many alarms in the first place, integrate/group alarms together or provide ways to easily disable alarms which carry no relevance.

Bottom line is that if an operator is bombarded with alarms, he will just stop paying attention to the alarm system and we don't want that.

ANKA Alarm System implementation

This additional functionality was provided with the ANKA Alarm Conditioning Server. The alarm conditioning server hosts alarm dedicated records, which are triggered by processing events from other alarm sources or by monitoring vital signals of the control system, which are not necessary integrated into EPICS.

The actual alarm processing is done by the configurable alarm processing units. Each of these alarm processing units provides one alarm dedicated PV into the BEAST alarm hierarchy tree and can be configured to listen to various parameters or PVs. The alarm processing units are loaded and configured from XML configuration files at the alarm conditioning server start-up. Additional scripts takes care that BEAST alarm configuration is updated.

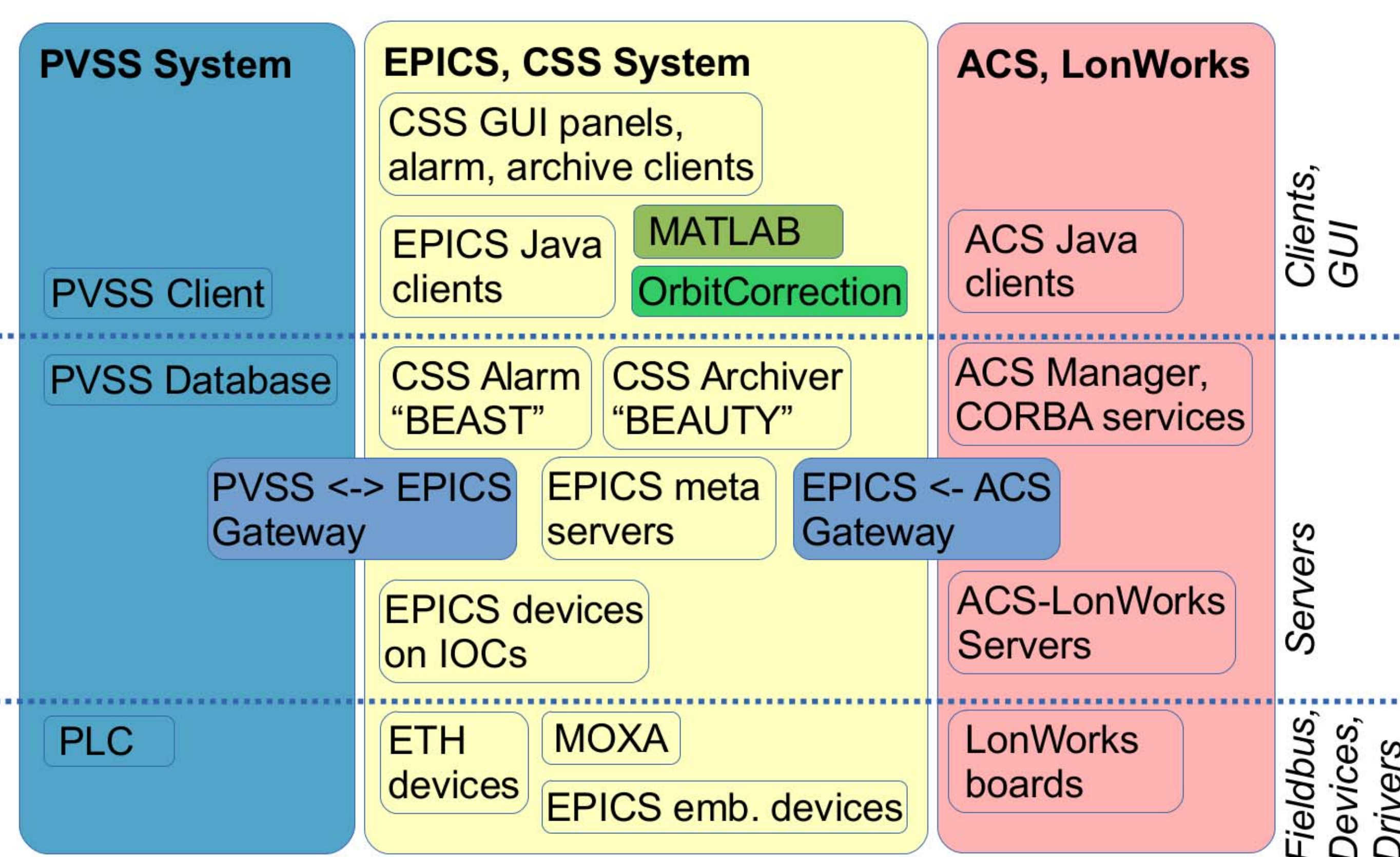


Figure 1: Patchwork of different components and technologies in ANKA control system.

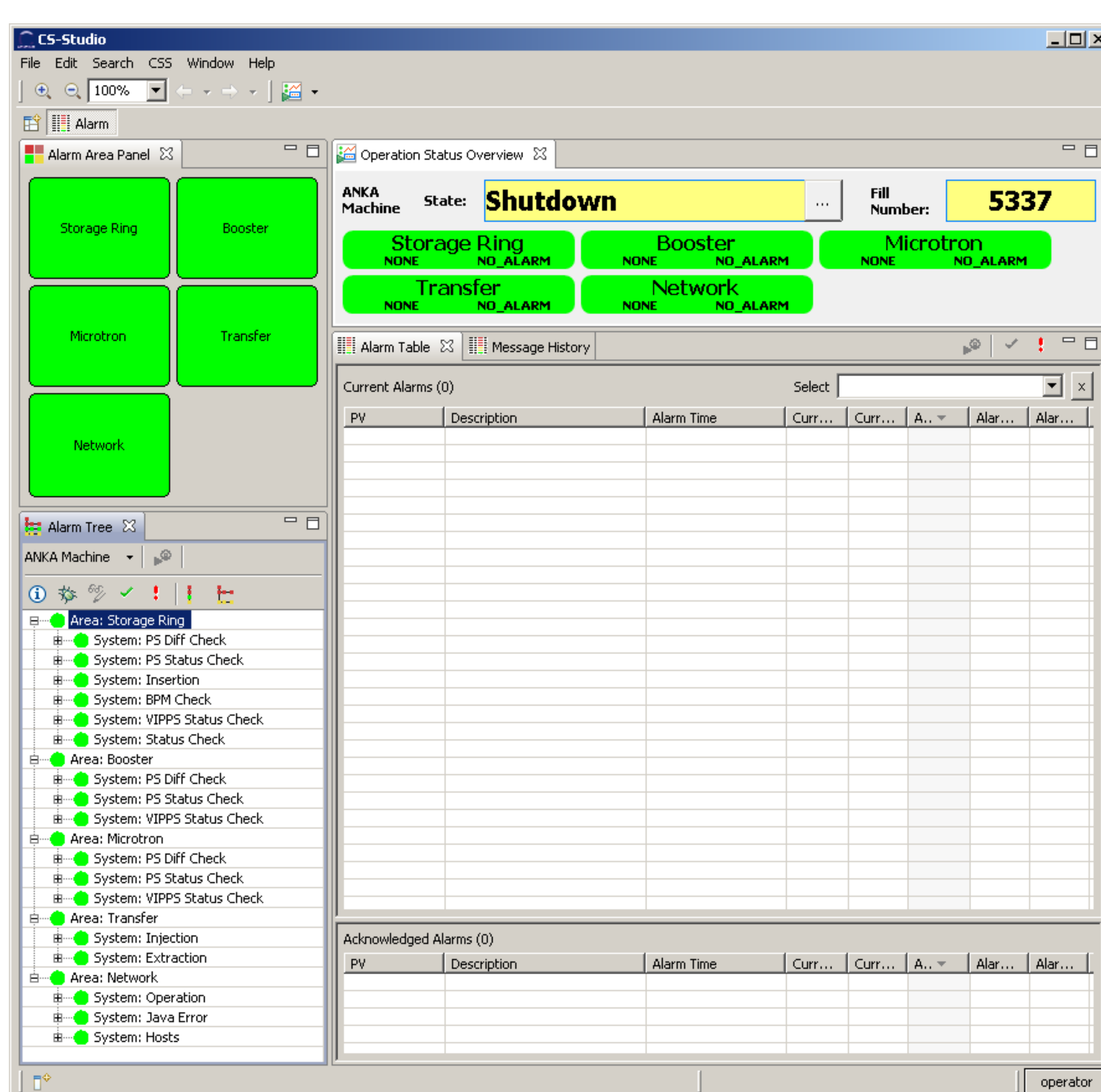


Figure 2: BEAST Alarm panel at ANKA as it is usually seen, without errors, even during shut-down period, when operation related signals are in undefined state.

Alarm Source Type	Applications
Host ping	Makes periodic network ping to all important servers or IP enabled devices in the control system.
System Process Watchdog	Runs on Windows or Linux computer, raises alarm when certain process appears in OS task list. Designed to intercept Java Errors on Windows servers.
Status Check	Monitors PVs with bitset value (such as mbbiDirect record value) and raises alarm if bits matches configured bit-masks for on or off states. Status PVs of all power supplies are checked this way.
State Watchdog	A PV value of this processor must be reset in regular intervals by some remote process. If this fails, then alarm is raised. Some crucial application are monitored this way, such as slow orbit correction and some archiving processes.
Summary Alarm	Listens to one or more PVs, sums their alarms, and forwards them further if machine operation state allows. It can also provide configurable alarm sums of a sub-tree in the BEAST alarm hierarchy tree.
Value Diff Check	Check value difference between set-point and read-back of a power supply. All power supplies are included. This alarm check has two implementations in use: one as part of conditioning server and one as independent dedicated EPICS server.

SUMMARY

ANKA has introduced in last year into operation functioning and relevant alarm system. Operators have learned to trust information in alarm panel and take alarms serious. This already proved very useful in day-to-day operation. ANKA alarm system was carefully built with alarm sources that were giving information relevant for operation. The set of alarm sources might not be as wide as would be possible but the ones that are included are of high quality.