Integrated monitoring of the ATLAS online computing farm

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Why

The online farm of the ATLAS experiment at the LHC consists of nearly 4,000 PCs with various characteristics and the status and health of every host must be constantly monitored to ensure the correct and reliable operation of the whole online system.

The monitoring is the first line of defense: it should not only promptly provide alerts in case of failure but, whenever possible, warn of impending issues.

How

Two different monitoring systems have been combined to get a complete picture of the system:

- Icinga 2 for active checks and alerting
  - it replaced Icinga (end 2015) which in turn replaced Nagios v3 (2014/2015)
  - it improved scalability and has native support for load balancing
  - it currently handles – 4,000 hosts and – 85,000 checks performed with different time intervals ranging between 5 minutes and 24 hours according to the need
  - two servers are configured with the built-in High Availability Cluster feature

- Ganglia for performance data useful for debugging
  - historical data are stored
  - high scalability and good data visualization
  - Ganglia Monitoring Agent (gmond)
    - runs on each node and gathers data every 20 seconds
    - same parameters useful for alerting too
    - helps reducing the active Icinga 2 checks

In addition Ganglia and Icinga 2 have been integrated with other data sources, such as SNMP for system information and IPMI for hardware health.

Monitoring system

Data Flow:

SNMP data polled by Icinga 2 (blue lines)
Gmond data pushed to Ganglia, Icinga 2 can poll Ganglia (blue lines)

BMC
- Icinga 2 polls critical data from BMC, stores copy to Ganglia (orange lines)
- script polls the host’s BMC, pushes complete data to Ganglia (red lines)
  (no info if host is down)

The arrows indicate the data flow

Ganglia and Icinga 2 are the core of the monitoring system: the information from both is used to provide alerts and an historical evolution of the monitored parameters. The data is saved as RRD and in a MySQL database to be used by various web interfaces.

The web interfaces show at a glance the status of the farm, from the health status to the resources currently used by data taking.

Conclusions

The new monitoring system based on Icinga 2 and Ganglia provides the required information and alert notifications.

Our experience shows that a comprehensive and robust monitoring system allows to prevent a lot of hardware and software issues in advance, before they become critical for the ATLAS data taking and the security of the whole system.

Farm overview

A custom web page shows an overview of the status of the whole farm.

A “cross-consistency check” custom web page provides information from Icinga, ConfDB and the ATLAS Run status: it displays a quick overview of the resources not in use by ATLAS because of some ongoing hardware or software intervention.