The evolution of monitoring system: the INFN-CNAF case study

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CNAF

CNAF is the national center of INFN (Italian Institute for Nuclear Physics) "for the Research and Development in INFN Information and Communication Technologies".

Mission

- Italian Tier 1 for WLCG infrastructure;
- Computing facility for 4 LHC experiments and many other astro-particle and neutrino-physics experiments;
- Mange INFN ICT and Information System infrastructure and services.
**CNAF resources in numbers**
- Core ~22000
- Disk storage ~23PB
- Tape storage ~39PB
- Racks > 180
- kHS06 ~250

**CNAF staff**
- 50 persons
- 7 functional units
New monitoring infrastructure

What we needed
- Cloud oriented monitoring system;
- Horizontal scalable and highly available monitoring system;
- Monitoring managed via CM tools like Puppet;
- Reusability of Nagios scripts;
- Interaction with API;
- Modern UI and dashboard composer system;
- Separation of contexts among CNAF functional units;
- Central monitoring infrastructure (Bebop group).

Bebop group task
- Scouting new monitoring technologies;
- Monitoring infrastructure design;
- Manage monitoring infrastructure;
- Facilitating migration from legacy systems;
- Support to CNAF functional units.
Architecture
What is Sensu

- Monitoring framework;
- Schedule check execution on clients (using pattern "Publish/Subscribe");
- Manage event actions for checks and metrics (such as send an email alert);
- Use RabbitMQ as message broker for communication between client and server;
- Use Redis as persistence layer to save checks and clients status.

Why Sensu

- Satisfy our requirements;
- We can reuse custom Nagios probe;
- Provide a rich RESTful API interface;
- Supported by large community;
- Provide modern dashboard;
- Suitable for dynamic infrastructures;
- Can scale at CNAF numbers;
- Opensource with commercial support.
InfluxDB

- Time series database;
- Optimized for handling time series data;
- No external dependencies;
- Query language SQL like;
- Permit to downsample the data.

CNAF numbers

- About 1900 nodes monitored;
- 5 db nodes, 1 for each functional unit;
- Installed version 1.0.0.

Performance and Optimizations

- Created 4 retention policy for data: 1 week, 1 month, 6 months, 1 year (or infinite);
- Created continuous queries for data aggregation: 15 minutes, 30 minutes, 1 hour;
- Data is written into 1 week retention policy by default. Every 15 minutes/30 minutes/1 hour we downsample raw data with Continuous Query into 1 month/6 month/1 year (or infinite) retention policy respectively, to change the high frequency data into lower frequency data.
Grafana

**CPU Count**: 32

**Current Load**: 23

**Free RAM**: 20%

**Total RAM**: 135.1 GB

**I/O usage**: 11%

**Puppet Run**: 53 s

**CPU Load**

- 1 Min: 15, 32, 24, 25
- 5 Min: 17, 31, 24, 25
- 15 Min: 18, 31, 24, 22

**Uptime**: 34.3 week

**Running Processes**

- Minimum: 20
- Maximum: 60
- Average: 40
- Current: 20
Future works

- Monitoring data center networks;
- InfluxDB optimizations and upgrade to version 1.2;
- Complete decommission of Nagios and Lemon;
- Integration with ELK stack.
Production for almost all functional units;
About 1900 servers monitored;
Monitoring infrastructure managed and completely integrated with Puppet;
Separated environment for each functional unit but unique infrastructure.
Thanks
References

- https://sensuapp.org
- https://influxdata.com
- https://grafana.com/
- https://uchiwa.io/