

HSF India Project Proposal

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Project: Enabling Advanced Network and Infrastructure Alarms

Duration: July 2023 to November 2023 (15 weeks)

Project Description:

In the distributed scientific infrastructures that we use today, research and education networks play a pivotal role, enabling the operation and exchange of data and services across data centers over the world. With the usage of tools like pSDash and perfSONAR, the IRIS HEP/OSG-LHC team working on network measurement and analytics has assembled a large unique dataset which comprises network-specific metrics, statistics and other measurements.

pSDash is a web-based dashboard which provides semi-real time monitoring and visualization of various network problems. The interface allows users to examine numerous network aspects including toolkit locations, problem descriptions and other details regarding current alarms. It queries the data from a central database, where the alarms reside, to present the acquired information in an easily understandable format. It thus enables the network administrators to identify performance bottlenecks and troubleshoot accordingly.

perfSONAR (Performance focused Service Oriented Network Monitoring Architecture) is yet another similar tool which is an open source toolkit for assessing and monitoring the performance of network paths, diagnosing network problems and also providing elaborate evaluation and measurements of network characteristics. It includes a set of tools to facilitate the process of collection, analysis and sharing of network performance data. It facilitates the network administrators to measure important performance metrics like latency and packet loss.

As an integral part of this network infrastructure, the team has developed a functionality involving alarms and alerts, defined by simple functions in order to identify certain problems associated with the considerably large data that is being utilized by the

existing infrastructure. A new alarm can be created by registering it using REST API, adding the corresponding alarm-generating code to the program and creation of a cron (a time-based job scheduler) that executes our program after a fixed interval of time as specified.

Project Goals:

During the course of the project, we aim to expand and augment the existing alarms with new ones based on the data acquired by the infrastructure. While the creation of some of these alarms may have a greater priority over other ones, we also intend to address specific problems that we might encounter as we explore the particular type of data obtained using tools like Elasticsearch, Kibana and Jupyter Notebooks in the infrastructure and further use this knowledge to generate more complex alarms which seek to resolve these problems. We aspire to improve and maximize the diagnostic range and capability of the alarms to effectively identify the various problems one might face before they are actually encountered by scientists performing experiments that involve these networks or impact the network measurement infrastructure's ability to gather data. Ultimately, we aim to create an improved alerting and alarming system related to both the research and education networks used by HEP, WLCG and OSG communities.

Proposed Timeline:

Week 1-4:

- Study the existing infrastructure and the underlying working of the existing alarming and alerting system
- Explore the various types of data that we are dealing with using monitoring tools like ElasticSearch, Kibana, etc.
- Create an outline of some of the issues we are faced with while dealing with the data in the current infrastructure.

Week 5-7:

- Add the script for the new alarms that we seek to add to the existing infrastructure.
- Test the API using Postman API after the addition of these scripts locally.
- Specify the intervals at which we intend these alarms to be functional.

Week 8:

- Buffer for resolving any bugs that we might have encountered in the previous weeks.
- Work on the deployment of the alarms that we have added to the existing infrastructure.

Week 9-11:

- Work on the creation of additional more complex alarms to address the problems we face.
- Modify the code accordingly after the addition of the necessary scripts.
- Ensure existence of inter-communication between the alarms.

Week 12-13:

- Work on the deployment of these alarms to the infrastructure.
- Resolve any bug that might have occurred during the process.

Week 14-15:

- Evaluate the performance of our alarms on a real-time basis and make any changes to the system as and when necessary.
- Discuss the possibility of further extension of any of our alarms that we have generated during the course of the project or modifications to their functionality and make the changes wherever feasible.
- Document and summarize the project results.

References:

- <https://ps-dash.uc.ssl-hep.org/>
- <https://aaas.atlas-ml.org/>
- <https://www.perfsonar.net/>
- <https://github.com/sand-ci/ps-dash>
- <https://github.com/sand-ci/AlarmsAndAlerts>