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Title: Analyzing Frameworks for HPC Systems Regression Testing

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Systems testing is an important part in the lifecycle of a high-performance computing system that occurs during DSTs as well as when an unexpected problem occurs. System administrators need a way to quickly test the system when something goes wrong, as well as a way to perform regression testing. In regression testing, they track the health of the system in a more in-depth manner with the goal of detecting problems with a system before they become problems for the users. Frameworks that are available for testing on HPC systems were generally created for application testing, acceptance testing, or node health testing, leaving uncertainty as to whether they could be used in a systems regression testing context. In our project, we set out to either find a framework that can perform HPC system regression testing, particularly on management nodes, or determine if a new framework needs to be created.

During our project, we first explored existing frameworks designed specifically for HPC systems regression testing. When we found that there were no such frameworks, we tested three LANL-based non-regression HPC frameworks: Pavilion, Interstate, and Node Health Check (NHC). We implemented these frameworks to evaluate their potential to be used for system regression testing based on a list of desired characteristics. Through this, we found that none of the frameworks we tested had all of the desired characteristics of a systems regression testing framework.

However, although neither Pavilion nor NHC were designed for the purpose of systems regression testing, they both have the potential to be used for this purpose. Both frameworks have Splunk integration for tracking the health of the system over time and can be easily extended with custom test scripts. This gives each of them enough of the characteristics necessary to function as a systems regression testing framework. Going forward, either Pavilion or NHC could be effectively integrated into the systems regression workflow. On the other hand, while either Pavilion or NHC could be used on its own, there are characteristics where one is stronger and the other weaker. Pavilion does not come with any test templates or pre-written tests that could be used for systems testing, but it can be run from a CM and target other nodes on the system. NHC comes with a variety of tests that can be used for systems testing, but it has to be directly run on each node to perform the check. Therefore, a second potential route forward is to use Pavilion and NHC together by having Pavilion run NHC. Pavilion will run scripts in various languages and has the best result parsing of the frameworks tested, while NHC has many useful built-in tests. By using them together, each framework can complement the other. Furthermore, using pre-existing frameworks that are open source, as opposed to creating a new framework, has additional benefits, including ongoing development and support. We conclude that it is unnecessary to create a framework that is specific to systems regression testing, because existing tools can be used in combination to achieve the desired result.