OSG Run II Core Services Assessment

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December 2010

1. Introduction

The Run II experiments at the Fermilab Tevatron have been in operation for about eight years. During most of this time, the scale of computing required to analyze the large datasets produced by CDF and DØ has required the use of a distributed computing model. Both experiments met this challenge early in their operational phase prior to the existence of the OSG. The solutions were developed independently, and consequently, were not based on a common architecture and were not interoperable with each other. Since the inception of the OSG, however, both experiments have adopted the grid infrastructure provided by the OSG as the implementation for the respective distributed computing models. In so doing, the experiments now share a common infrastructure and common operational support teams, and gained interoperability across resources at Fermilab and the OSG at large. This consolidation has significantly reduced the effort required to perform large-scale computing at the experiments. As the Run II experiments now rely on this infrastructure, the OSG has been and will continue to be critical to the success of the computing models at both the CDF and DØ experiments.

The relationship between the Run II experiments and the OSG differs somewhat from that of the LHC experiments and the OSG. Whereas the LHC experiments have mounted large efforts in close collaboration with the OSG to develop technologies and grid computing capabilities, CDF and DØ have primarily adopted and adapted production-ready solutions that have emerged from that collaboration. In this way, the Run II experiments leveraged the effort of the LHC experiments and the OSG Consortium to solve grid computing problems. Despite this difference, however, many of the core services required by the experiments, the roles played by the OSG organization, and the strategic importance of the OSG to the Run II experiment are the same as those for U.S. ATLAS and U.S. CMS. The following assessment of OSG core services, as will be noted, therefore shares much in common to that from ATLAS and CMS.

1.1. Strategic Importance of the OSG Consortium

The computing systems for CDF and DØ consist of a grid of approximately 30 distributed computing centers. The bulk of computing resources are located at Fermilab, where access to data is most efficient. The grid approach helps to distribute the computing that does not require direct data access, such as Monte Carlo simulations and sophisticated analysis and statistical techniques, preferentially to sites that do not have direct data access. Distributing the computing also addresses complexities in the funding structure of a worldwide collaboration of universities and labs. Unlike a company or a single institutional computing center with top-down management and coordination covering all required services, the Run II experiments are a group of researchers that rely on a loosely affiliated set of computing centers.

The OSG provides the infrastructure and organization binding these sites together. In many cases, the sites hold significant computing responsibilities to one of the LHC experiments, and therefore have a high level of local expertise and direct involvement with the OSG for that purpose. The OSG Consortium addresses the need for a homogenous approach across all these sites on important issues, including not only issues such as the middleware and interfaces to site services, but also those regarding approaches and procedures concerning computer security, incident response, user registration, etc. This convergence of technology, support and organization within the OSG Consortium enables a significant leveraging of institutional resources for the Run II experiments that stems from reductions in the marginal cost of support.

Run II computing is benefiting from advances OSG has made in job management allowing transparent use of heterogeneous clusters as a uniform distributed facility, OSG maintaining and evolving a secure high-availability production infrastructure, and OSG provisioning remotely accessible storage caches.

Occasionally, the experiments need additional computing power for a limited time, for example a re-processing of a large dataset. The ability to use OSG resources for such a case is extremely important. DØ has successfully performed such a re-processing of data using OSG resources, and CDF is currently considering such a plan.

OSG thus has become a major strategic component for the Run II scientific programs by addressing critical needs for Run II computing.

1.2. OSG Services and Software

Run II computing relies quite extensively on services and software provided by OSG, and on processes and support systems that have been produced or evolved by OSG. The components and procedures developed in the process have become the basis for support and operation covering the interoperation between OSG, EGI, and other grid sites relevant to Run II computing. GlideinWMS has been particularly important to the Run II experiments in achieving these goals.

The Run II experiments are currently planning to extend data-taking for another three years beyond 2011. Large-scale computing operations is expected to continue for at least five years beyond that point, or nine years from the present, or a minimum of six years should the extension not occur. It is therefore vital to the Run II program that the present level of service continue uninterrupted for the foreseeable future, and that all of the services and support structures upon which the Run II program relies today have a clear transition or continuation strategy.

2. OSG Support Services

The Run II assessment of OSG support services, as for many other areas, closely parallels that from ATLAS and CMS ("Assessment of Core Services Provided to U.S. ATLAS and U.S. CMS by OSG"). The reader is referred to that document for details in those areas. Run II has the following additional comments.

Since not all OSG users have the depth of local expertise found at some large grid facilities, it is sometimes extremely difficult to deploy a new grid site in a timely manner. While it is understood that establishing definitions of production readiness are by design the responsibility of VOs, additional tools or practical guidance for basic operational testing procedures could enhance the deployment experience in these cases.

Run II also amplifies the comments on storage services and emphasizes that Run II is highly dependent upon OSG storage services. Utilization of these services has been and will continue to be critical to the efficient transfer of data to and from OSG sites for Monte Carlo processing.

3. Operations Tools

Essential tools have been developed for the daily operation of OSG. The reader is again referred to the ATLAS and CMS assessment document for the Run II position

on accounting (net of comments referring directly to WLCG), configuration management, and OSG's responsibility in supporting these tools. In addition, Run II notes that although a number of important monitoring tools are available, the existing set does not entirely meet the needs for Run II operations. CDF and DØ would benefit from a time display of running and idle jobs at all sites by VO. Having the data of the display available in machine readable format would also be beneficial.and are still being developed that are required for the daily operation of OSG, as well as the overall management and reporting including accounting, configuration management, and operations support. U.S. ATLAS and U.S. CMS require that maintenance and development remains part of OSG's responsibilities.

4. Security and Policy

Run II fully endorses the comments on Security and Policy contained within the ATLAS and CMS assessment document.

5. Application Support

The Run II computing projects require that OSG personnel will continue to be involved in the process of developing and applying experiment-specific services for LHC data analysis on top of the OSG middleware stack, such as glideinWMS and high performance systems for data storage and data access. While some of these systems may have been developed within the context of a single experiment, they have become an integral part of others, such as those at Run II.

Run II entirely endorses the comments on virtualization contained in the ATLAS and CMS assessment document.