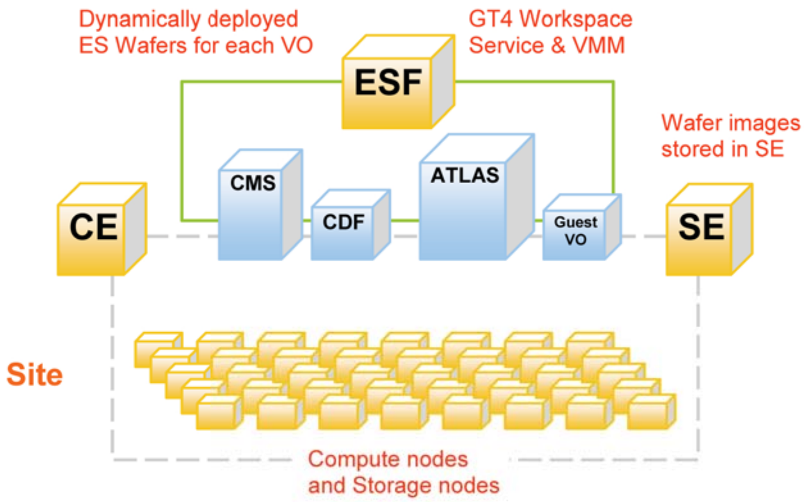
ESF

Edge Services Framework for Computational Grids

A collaborative Open Science Grid Consortium Activity

For on-demand deployment of services needed by applications running on computational grids, the Edge Services Framework (ESF) uses Workspace Service introduced in Globus Toolkit 4.0. In first phase of ESF, operating system (OS) and kernel images are securely deployed as virtual machines on Open Science Grid (OSG) Sites to provide grid-enabled database and web services for ATLAS and CMS high-energy physics experiments.

Secured grid facilities are architected with their compute and storage clusters behind firewalls separating the public and private networks. Public services allow authorized clients to submit jobs (by using the Compute Element (CE) service) or store and access data (by using the Storage Element (SE) service). First successful use of world-wide computational grids by large Virtual Organizations (VO) of the High-Energy Physics (HEP) community identified the need to go beyond many core middleware services in use.



In a preferred scenario for secure on-demand deployment of additional services required by HEP applications, the resources are partitioned into specific, VO-dedicated servers alongside shared, open grid services used by many VOs in opportunistic manner. OSG refers to such dynamically deployed VO-specific services executing on the edge of the public and private network as Edge Services. Initial Edge Services deployment include DASH grid-enabled database service for ATLAS, Condor-C batch slot harvesting, as well as FroNTier database cache using Squid technology for CMS. Future examples may include ATLAS and CMS specific data transfer agents, among others.

Experience has shown that two issues are of critical importance when designing an infrastructure in support of Edge Services. The first concerns Edge Service configuration. It is impractical to assume that each VO using a facility will employ the same Edge Service configuration, or that different configurations will coexist easily. Even within a VO, it should be possible to run different versions of the same Edge Service simultaneously. The second issue concerns resource usage: since Edge Services may become a bottleneck to a Site, it is essential that an ESF be able to effectively arbitrate resource usage (e.g., memory, CPU, and networking) among different VOs.

To address these two issues, we are developing an Edge Services Framework (ESF) that leverages the concept of virtual machines. By providing virtualization on the level

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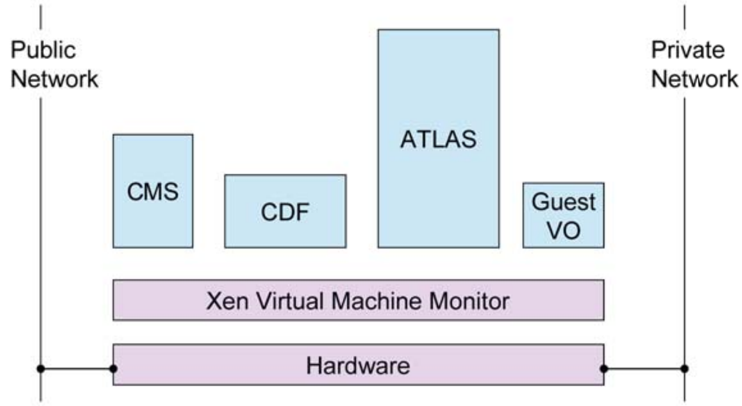
of instruction set architecture, virtual machines allow configuration of independent software stacks for each VM executing on a resource. Modern implementations of this abstraction are extremely efficient and have outstanding fine-grained enforcement capabilities. To securely deploy virtual machines, we use the Workspace Service from Globus Toolkit, which allows a VO administrator to dynamically launch appropriately-configured OS and kernel images in VMs. ESF is also developing a library of such images, reflecting the needs of presently participating communities ATLAS, CMS, and CDF.



ESF Core Technologies and Development

ESF Core Architecture 1.0 http://www.opensciencegrid.org/esf	The Open Science Grid Consortium http://www.opensciencegrid.org
ESF Core Images http://www.opensciencegrid.org/esf	Scientific Linux http://www.scientificlinux.org

ESF Technologies and Initial Services

Globus Toolkit 4.0 http://www.globus.org	Xen virtual machine monitor http://www.cl.cam.ac.uk/Research/SRG/netos/xen
Virtual Workspaces http://workspace.globus.org	ATLAS grid-enabled mysql-gsi service http://www.piocon.com/ANL_SBIR.php

ESF Collaborators and Early Adopters

EGEE project http://public.eu-egee.org	ATLAS experiment http://atlas.ch
LHC Computing Grid (**LCG**) http://lcg.web.cern.ch	CMS experiment http://cms.cern.ch
PIOCON Technologies, Inc http://www.piocon.com	CDF experiment http://www-cdf.fnal.gov

ESF Presentations at Conferences and Workshops

Supercomputing 2005, November 12-18, 2005
Washington State Convention and Trade Center, Seattle, Washington, USA
Argonne National Laboratory booth, Thursday, November 14, 10:30 am
Joint OSG and EGEE Operations Workshop, September 27-29, 2005
Culham Conference Centre, Abingdon, UK
http://agenda.cern.ch/askArchive.php?base=agenda&categ=a054670&id=a054670s34t8/transparencies
OSG Consortium Meeting, July 20-21, 2005
University of Wisconsin Milwaukee, Milwaukee, WI, USA
http://osg-docdb.opensciencegrid.org/0001/000193/001/ESF-July21-2005.pdf

http://www.opensciencegrid.org/esf