Grid Canada

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Overview

- Canadian computing infrastructure
- Grid Canada organization
- GridX1 computational grid project
- Grid R&D Projects
- Summary
Computational resources in Canada

- Distributed set of mid-range facilities across Canada
  - Funded by the Canada Foundation for Innovation (CFI)
  - Dec 2006 CFI announced $120M-CDN for new hardware
  - Parallel, vector and serial computing; storage; visualization
  - ATLAS Tier 2 facilities funded in this award

- In 2006, CFI funded the ATLAS Tier 1 computer centre in TRIUMF
  - $10M-CDN (2006-2010) for storage, computing and operations
  - Linked to the LCG
  - Currently procuring hardware though all aspects of the T1 are operational

- Grid Efforts have been ad-hoc
  - Grid Canada has endeavoured to raise the awareness of the Grid
  - Grid Research Centre in Calgary (HPC-focus)
  - GridX1 Project (HEP/serial computing focus)
In Jan 2006 CAnet 4 consisted of five 10Gbps lambdas with interconnects with regional networks across the country and with international peer networks at the major access points.

In 2006, CANARIE deployed a new Reconfigurable Optical Add-Drop Multiplexer (ROADM) DWDM network in Eastern Canada.

It can support up to 72 x 10Gbps lambdas and will support 40Gbps lambdas in the future.

ATLAS
10 G T0-T1 TRIUMF-CERN
1 G T1-T2 lightpaths
1G TRIUMF-BNL link

Lightpaths for CDF/D0 to FNAL
GridX1

Grid Canada

• Formed by CANARIE, National Research Council (NRC) and C3.ca
  – Informal organization with the goal of promoting “cyber-infrastructure”
  – Hosts the Canadian Grid Certificate Authority

• Grid Research Centre (Calgary)
  – Link with Hewlett-Packard
  – HPC-focus

• GridX1 Project
  – Victoria/NRC/TRIUMF/SFU/Alberta/Toronto/McGill
  – HEP focus (ATLAS, BaBar), NEPTUNE (Video pattern recognition)
  – Grid R&D
    • Grid Services using GT4 (registry and metascheduler services)
    • BaBar Monte Carlo production on a GT4 Grid
    • Xen on a grid
GridX1 is a computational Grid linking HEP and shared facilities across Canada:
- Alberta (2), NRC Ottawa, WestGrid (UBC), Victoria (2), McGill (2), Toronto
- Built out of standard open-source software and designed to utilize idle CPU cycles.

GridX1 uses Globus Toolkit V2 with a “CondorG” resource broker:
- Sites advertise using class-ads.

ATLAS has adopted our model for its “CondorG executor”:
- Managed in TRIUMF/Victoria
- Class-ads are generated for LCG-sties

In the next year there will be many new shared clusters in Canada:
- GridX1 is an easy way to exploit idle CPUs
GridX1 Resource Brokering

- We use Condor-G for resource brokering
  - Flexible and Scalable
- Adopted by ATLAS (CondorG executor) to submit jobs to Atlas-LCG sites
  - Currently operated in UVic and TRIUMF for ATLAS MC Production (A.Agarwal/R.Walker)

GridX1 and CondorG grid presented at CHEP 2006, GlobusWorld

GridX1 journal paper in Future Generation Computer Systems
GridX1 Monitoring

http://monitor.gridx1.ca/
GridX1 Monitoring

A web-based dynamic resource monitor for jobs on Canadian sites but also LCG sites seen by the condorG executor.
In 2004-2005 GridX1 used by the ATLAS experiment via the LCG-TRIUMF interface:
- The interface resubmits LCG jobs to GridX1
- GridX1 sites could run LCG jobs with running LCG software

Over 20,000 ATLAS jobs successfully completed
Success rate of jobs was similar to LCG (50%)

Currently the ATLAS-HEP sites are registered LCG sites:
- UBC/Westgrid advertises directly to the CondorG executor
- Victoria advertises to the executor and is also an LCG site

We may revisit building an interface to the LCG:
- Non-HEP sites are reluctant to become LCG-sites
- LCG software is complicated and requires modest operational support
GridX1 is used to manage most of Canadian BaBar MC production.

Plan is to migrate all MC production to GridX1 in 2007.

Canada/UK/Italy produce BaBar MC via the grid.
GridX1

Grid R&D: next generation computational grid

- GridX1 based on GT2 service-specific protocols
  - Difficult to extend (services use ad-hoc and evolving protocols)
  - Compatibility issues between client and service versions
  - Firewall problems
  - Security vulnerabilities (job service runs as a privileged user)

- Next generation GridX1 is based on WSRF and its implementation in GT4
  - We leverage the maturity of Web Services
  - Easy to extend/modular architecture
  - Reduced firewall problems (use of non-privileged ports)
  - Better security (services run as a non-privileged user)
Grid R&D: Gavia Project

- Development of a registry and metascheduler in a service-oriented architecture (SOA)

- We developed the GaviaMS (metascheduler)
  - It is a WS-GRAM service that uses Condor for matchmaking
  - Condor provides WS-GRAM resubmission to GT4 clusters
  - Provides 2-hop file staging

- We developed a WS-MDS Registry
  - Service-oriented advertisement and discovery of grid resources

- Deployed a small testbed

- Applied for Globus Incubation project
Grid X1

Grid R&D: *BaBar MC production on a GT4 Grid*

We will generate BaBar Monte Carlo events using the GT4 grid.

The clusters can accept jobs from GT2, GT4 (and in some cases, LCG).
Due to the heterogeneous nature of the resources available to GridX1 application deployment can be time consuming.
- HEP applications in particular can be highly OS flavor dependant and have many special requirements.
- Installation requires time from both local sys admins and application specialists.

Xen is a high performance virtual machine manager that has been shown to offer no performance penalty to HEP applications

Plan is to run Xen images with a preinstalled application on Grid resources

We have investigated the deployment of Xen images using our own AutoXen scripts
- Now studying Globus project “Virtual Workspaces” (http://workspace.globus.org/)
- Will soon test with an HEP application
CHEP 2007

Abstracts due April 1 2007
WLCG Meeting Sat/Sun Sep 1-2
ISSeG Site Security

Book hotels early as it’s a long weekend
Summary

• Canada has significant computing resources
  – Wide-range of mid-sized facilities with funding for next 5 years
  – World-class research network (CANARIE)
  – However the use of the Grid is still not fully accepted

• Smaller projects such as GridX1 focus on specific application areas
  – Serial computing as required by particle physics
  – Working with other projects such as Neptune-Canada

• R&D projects
  – GT4 computational grid
  – Xen virtual machines