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HPC FOR HUDDERSFIELD

Implementing a Condor Pool Using a Green-IT Policy

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KeyWord: Condor, HTC, Job Scheduling, Computer Clusters, cycle stealing, Flocking

Abstract

High Throughput Computing (HTC) systems are designed to utilise available resources on a network of idle machines in an institution or organization by cycle stealing. Condor is an excellent HTC tool that excels in cycle stealing tool that works effectively within a power saving environment

Background

- During the course of a day there are thousands of machines that are idle for long periods of time. These machines are wasting power as well as computing cycles that could be better utilised by researchers simulations/calculations.
- Condor is an excellent HTC tool that excels in cycle stealing job scheduling on idle machines.
- However only idle and powered machines can be used from the a networked pool.
- Most organisations deploy power saving mechanisms to try and reduce energy consumption of their systems, and power down idle resources, using rigid and inflexible power management policies.
- Condor supports some power management, but it is not used widely because it is not easily configurable.
- An example is from the University of Liverpool where they had calculated that their computer labs were only used 6% of the time [1].

Current Solution

- We modified Perl script developed by Liverpool University to show how many jobs of each operating system are queued, and how many machines are idle.
- This script is using Wake on LAN to wake machine up using the machines IP addresses and MAC addresses.
- Additional script turns on the PoVB to be able to run Linux jobs on a Windows machine

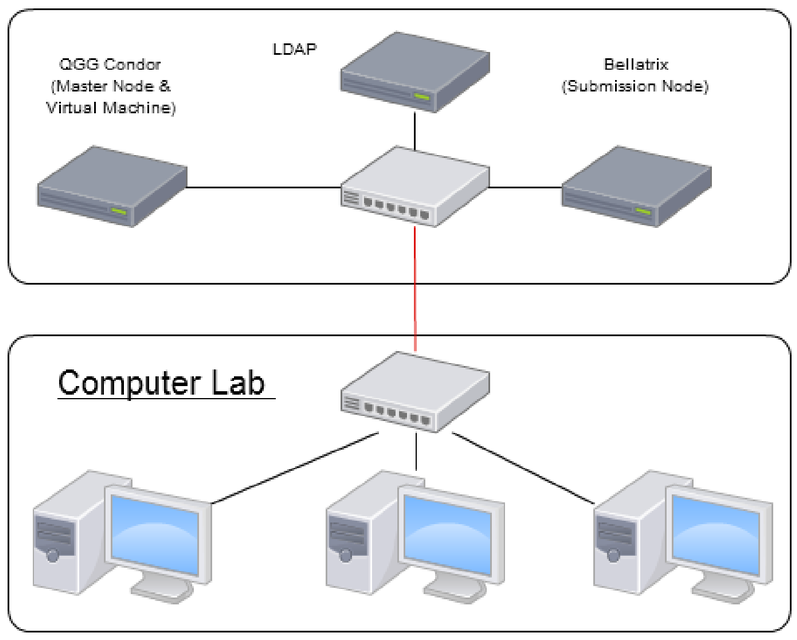
```
[H[2J--------------------------------------------------
Number of Busy Machines = 151
Number of idle jobs = 783
Number of idle machines = 11
Number of idle Win7 = 10
Number of idle WinXP = 0
Number of require machines = 772

Number of idle Windows jobs = 783
Number of idle Windows machines = 10
Number of Windows Machines required = 773

Number of idle Linux jobs = 0
Number of idle Linux Machines = 1
Number of Linux Machines Reqired = -1
----------------------------------------------------

#####################################################
#                                                   #
# Number of required machines = 772 #
# Machines have been woken                          #
#                                                   #
#####################################################
```

- Waking up machine will need to be done intelligently so that the same machine isn't woken up often, causing an excessive wear on machines
- In this context, we will wake up machine individually, rather than all laboratory computers; unlike Liverpool implementation causing annoyance to the students who resort to shutting down computers to stop prevent of a whole room powering up at the same time.[1]

Reference: an C. Smith. Towards a greener Condor pool: adapting condor for use with energy-efficient pcs. 2010. http://www.liv.ac.uk/csd/escience/condor/power save.pdf.

Current Configuration of Condor Pool

- The current condor pool has around 500 cores on Lab machines in engineering with the availability to expand to over 2000+ cores
- We plan to implement Linux virtual machines (Pool of Virtual Boxes, POVB) to run on lab machines when the labs are closed.
- Machines power off after 20 minutes from the user logging out.



Connecting to QGG Condor

- Users connect to the Bellatarix submission node using the campus key which authenticates the user using the LDAP
- The Master node is implemented as a virtual machine which aid testing of new versions
- The Submission node is a part of the internal submission node for the QGG. The submission node is separate from the Master node because the scheduler requires a larger amount of processing power than currently available on the virtual machine.

Conclusions

- Condor is an excellent HTC tool that provides extra computing resources for scientific calculations utilising existing idle resources, and providing a relatively inexpensive solution for research computing.
- With new intelligent management system, Condor can become more energy efficient.
- With PoVB it will allow Linux specific programs to run on an already existing Windows computing infrastructure

Further Work

- To deploy Condor across the Queensgate campus computing laboratories and in the library
- To increase the user base, running a variety of applications from different schools, and to make a more efficient use of the computing infrastructure owned by the University .