Running ATLAS@HOME on ATLAS Tier-1 Cluster

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TRIUMF ATLAS Tier-1

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Why?

- Site is not fully utilized
  - Average CPU efficiency in 2017 was only about 82.7%
  - CPU utilization rate lower
    - According to the statistics of Wenjing Wu (IHEP) the CPU utilization rate was only about 69% from Mar 12 to Mar 19 though the CPU efficiency was 80% in the same period
  - CPU usage of one chassis (168 cores) last year

  - Reasons: staging in/out data, sequential step of MCORE job, maintenance, no payloads, draining jobs, switching nodes between single core and multi-core productions etc
- Motivated by the BOINC talk on ATLAS site Jamboree in March

Install and configure BOINC Client

- Create account on LHC@HOME
  - Configure computing preference
    - Can use update to 2/3 of the cores on each node
  - Select ATLAS project
- Follow RunningATLASAtHomeOnLinux wiki page to install and configure BOINC client
  - https://twiki.cern.ch/twiki/bin/view/AtlasComputing/RunningATLASAtHomeOnLinux
  - BOINC client runs as daemon
- Started the initial test on one chassis in March and then expanded to 421 nodes (~4800 cores) in April
  - Configured CGroup for BOINC jobs in May

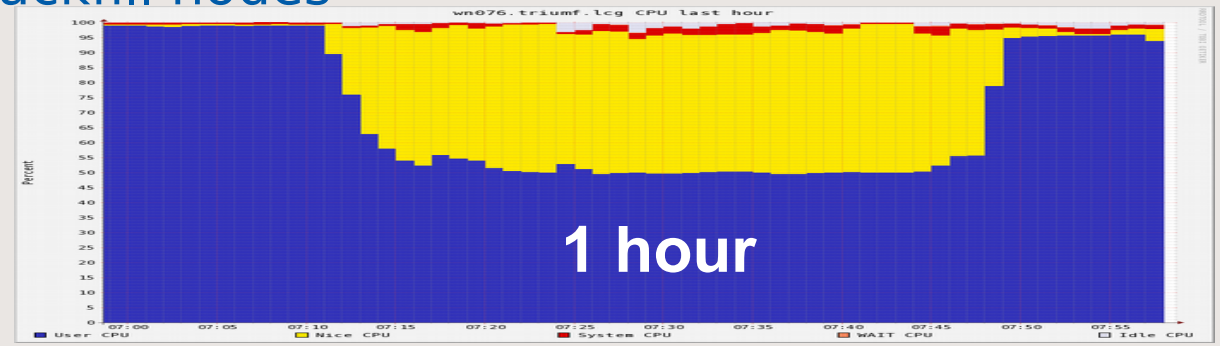
Tuning

- At the beginning we saw big impact on CPU efficiency of production jobs
  - We aggressively configured BOINC to use up to 100% CPU
  - Changed to allow BOINC to use up to 4 cores, no improvement

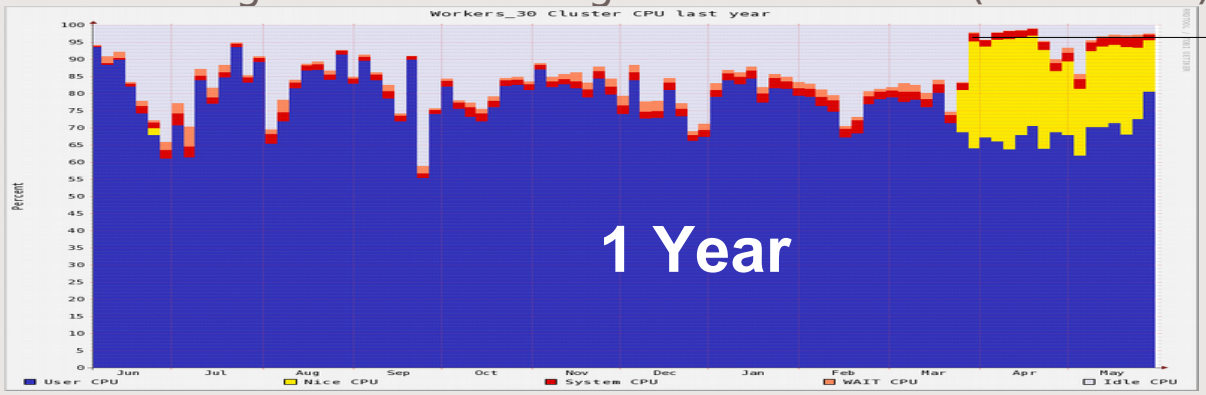
- Create CGroup for BOINC jobs with the lowest CPU share
  - Other ATLAS jobs under CGroup control which assigns CPU slice based on CPU shares
  - The default Linux priority ('NICED') mechanism doesn't work as expected in this case
  - Use cgred daemon to move the processes of BOINC user to this CGroup
    - All BOINC jobs would run in the background with very low shares
  - BOINC jobs can use up to 2/3 cores
- CPU efficiency of production jobs increased after configuring CGroup for BOINC jobs

What is Gained with BOINC Jobs(I)

- Backfill nodes



- Increase the CPU utilization of the cluster
  - Monitoring of the CPU usage of one chassis (168 cores)



total CPU usage

  - The CPU utilization of the whole cluster increased to ~92%

What is Gained with BOINC Jobs(II)

- Provided a lot of resources to ATLAS@HOME project
  - As yesterday

LHC@home Project Computing Community Jobs Site TRIUMF-LCG2 Log out

Rank	Name	Recent average credit	Total credit	Country	Participant since
1	Agile Boincers	2,512,127	1,161,982,330	Switzerland	20 Sep 2012, 13:19:40 UTC
2	TRIUMF-LCG2	627,055	52,100,772	Canada	15 Mar 2018, 21:05:31 UTC
3	BEIJING-LCG2	304,713	127,236,878	China	23 Jun 2014, 2:32:15 UTC
4	USTL-FIL (Lille Fr)	284,705	112,943,702	France	11 Dec 2009, 16:07:36 UTC
5	CharityEngine1	261,883	27,395,247	International	19 Aug 2017, 12:07:53 UTC

TRIUMF contributions

Impact of BOINC jobs

- The CPU efficiency of ATLAS productions dropped a little bit
  - ~13% dropped before configuring CGroup for BOINC jobs
  - Still ~7% dropped after tuning and moving BOINC jobs to Cgroup
  - We will replacing all old WNs (most of them have 12 cores) with new 48-core WNs, the impact on CPU efficiency may be different
- Potentially compete with normal production jobs on memory
  - Majority of our WNs have 4GB RAM per core
- Disk space and network bandwidth usages are trivial
- Accounting? How can we have the additional delivered HEPSPEC accounted ?Count the credits to LHC@HOME as the contribution to ATLAS production?

Thank You

- Thanks to Wenjing Wu (IHEP) for providing the statistics on CPU usage
- For more details on the benefit of running BOINC jobs please see Rod Walker's presentation about BOINC in March ATLAS site Jamboree
- Questions?