





Google Cloud





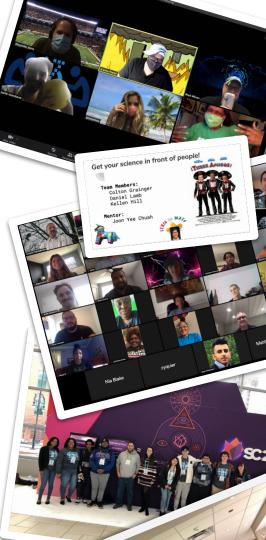
TACC TEXAS ADVANCED COMPUTING CENTER

XSEDE

HPC in the City CloudyCluster Training



sighpc



Agenda

- Introductions
- Hackathon Objective
- Deliverables and Resources
- General Information
- Google Cloud Overview







Presenter: Je'aime Powell

Organizers



Alex Nolte - University of Tartu alexander.nolte@ut.ee



Boyd Wilson - Omnibond boyd@omnibond.com



Amy Cannon - Omnibond amycannon@omnibond.com



Linda Hayden - ECSU

haydenl@mindspring.com



Je'aime Powell - TACC jpowell@tacc.utexas.edu



The Objective of HPC in the City

The hackathon aims to harness the resources, skills, and knowledge found in the HPC community in an effort to provide applied exposure towards the conference host city's local students from 2-4 year post-secondary educational institutions. In short, the hackathon will provide HPC skills and training while targeting problems that directly affect the participants.

• Develop an understanding of an Atlanta based issue through application of data analysis/presentation or management.

What you should expect to gain:

- Increased familiarity with data science in the cloud
- Experience collaborative software engineering
- Develop professional communication skills



Team Deliverables and Resources

Deliverables:

- Source code Including Comments
- PDF of presentation
 - Team members with pictures
 - Use of HPC technology in the project
 - \circ Regional (Atlanta) implications of the project ullet

• Github Link

• README.md project description

Resources:

- Mentors/Specialists
- Slack (Ad-Hoc Communication)
- Google Cloud (Provided Credits)
- Cloudy Cluster
- Most Commonly Used:
 - Python
 - Jupyter Notebooks
 - Node.Js (JavaScript)
 - HTML
- Datasets



General Information (the 3 T's)

• Teams

- 4-5 Students
- 1 Primary Mentor
- 1 Specialist/Staff

• Time (*Draft*)

- November 5th 9th
 - 11/5@~6pm ET Event Start
 - Team formation
 - 11/[6-9] @ 11 ET & 6pm ET- Checkins
 - 11/9@6pm ET-Final Presentations

• Topic Examples

- Data Analysis of COVID 19
- Economic disparities and their effects on college participation
- Genomics, Molecular Dynamics, or Weather Modeling in the Cloud.
- Social Justice
- Presidential Election
- Public Data Management
- Graduation Rates
- Broadband Access
- Insurance vs. Public Health Resilience



Presenter: Boyd Wilson

CloudyCluster and HPC/HTC Overview





Google Cloud Platform



High * Computing (H*C)

 High Performance Computing(HPC) [Generic] most generally refers to the practice of aggregating computing power in a way that delivers much higher performance than one could get out of a typical desktop computer or workstation in order to solve large problems in science, engineering, or business.

 Message Passing Interface (MPI) Nodes need to interact throughout the job (dependant on data from other nodes)

European Grid Infrastructure defines HTC as "a

High Throughput Computing(HTC)

computing paradigm that focuses on the efficient execution of a large number of loosely-coupled tasks",^[2] HTC systems are independent, sequential jobs that can be individually scheduled on many different computing resources across multiple administrative boundaries.

• High Performance Computing(HPC)

HPC systems tend to focus on tightly coupled parallel jobs, and as such they must execute within a particular site with low-latency interconnects. Conversely,

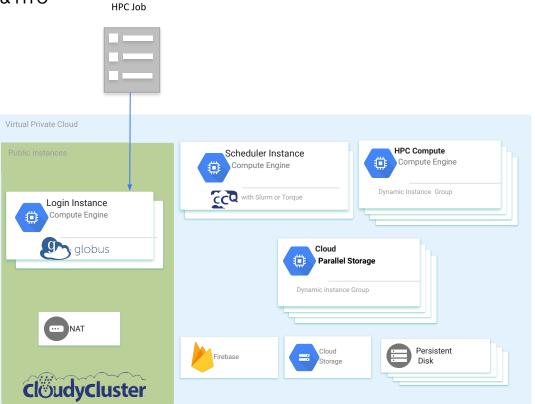
Pleasingly Parallel

No dependencies between nodes, data can be processed in any order.



Architecture

Self-Service Elastic HPC & HTC





The Job (HPC not Italian)

 HPC jobs are shell scripts with specific commented directives to tell schedulers what to do.

```
#!/bin/bash
 Indicates that CCQ should launch the instances in
preemptible mode
#CC -gcpup
#Uncomment this section for use with Torque/Maui
##PBS -l nodes=4:ppn=2
#Uncomment this section for use with Slurm
#SBATCH -N 4
#SBATCH --ntasks-per-node=2
#Need to change the location of the shared FS to the
name you specified in the CloudyCluster creation
wizard when launching the clus
Ter
export SHARED FS NAME=/mnt/orangefs
#Uncomment this section for use with openMPI
module add openmpi/3.0.0
#Uncomment this section for use with mpich
#module add mpich/3.2
cd $SHARED FS NAME/samplejobs/mpi
```

```
mpirun -np 8 $SHARED_FS_NAME/samplejobs/mpi/mpi_prime
```



CCQ Job Execution

CloudyCluster			Close
rvar.vr.v 1 admin ddmin 633 Apr 5 11:46 mpi prime8-2. vvar.vr.v 1 addmin ddmin 715 Apr 5 11:42 mpi prime pre vvar.vr.v 1 admin ddmin 715 Apr 5 11:52 mpi prime pre vvar.vr.v 1 admin ddmin 715 Apr 5 11:56 mpi prime pre vvar.vr.v 1 admin ddmin 715 Apr 5 11:56 mpi prime pre saminferor3-461 advvi.0gin (dv)5 cognub mpi prime pre daminferor3-461 advvi.0gin (dv)5 cognub mpi prime pre daminferor3-461 advvi.0gin (dv)5 cognub mpi prime pre lasse enter your username: damin pre prime pre samovni: he job has successfully been submitted to the schedule The job id is: 235905 you can use this id to look up t	emptible.sh semt16-16 semt4-16		
successfully generated a new ccg certificate file that admin@ccv3-4cla-wd-login GCP]\$ ccgstat d Name	will expire Scheduler		
35905 mpi_prime2-8.sh	scheduler	CreatingCG	
adminêcev3-4cla-wd-login GCP)\$ ceqs Username admin			Phone Keys
Password			
MFA Token (if enabled)			
Private Key Choses File No file chosen Connect			
VM instances 🔹 C 🕨 🔳 🖑	1	+ MANAGE ACCESS	SHOW INFO PANEL SI LEARN

Ŧ	cov3 ② Filter VM instance	8					×	0	Colur	rns
-	Name A	Zone	Creation time	Recommendation	In use by	Internal IP	External IP	Con	nect	
1	🔮 cov3	us-central1- a	Apr 4, 2020, 5:05:28 PM			10.128.0.35 (nic0)	34.71.66.169 ピ	SSI	• •	
	🔮 cov3-4c1a-nat	us-central1- a	Apr 4, 2020, 5:16:38 PM			10.1.0.2 (nic0)	34.68.112.252	SSI	• •	
	Cov3-4c1a sched- scheduler	us-central1- a	Apr 4, 2020, 5:24:55 PM			10.1.1.2 (nic0)	None	SSI	• •	
	🔮 ccv3-4c1a wd-login	us-central1- a	Apr 4, 2020, 5:17:53 PM			10.1.0.3 (nic0)	130.211.211.117	SS	• •	
	🔮 ccv3-4c1aorangefs-fsas-0	us-central1- a	Apr 4, 2020, 5:21:28 PM			10.1.2.2 (nic0)	None	SS	• •	
	🔮 cov3-4c1aorangefs-fsas-1	us-central1- a	Apr 4, 2020, 5:21:29 PM			10.1.2.4 (nic0)	None	SS	• •	
	🔮 cov3-4c1aorangefs-fsas-2	us-central1- a	Apr 4, 2020, 5:21:29 PM			10.1.2.5 (nic0)	None	SSI	• •	
	🔮 ccv3-4c1aorangefs-fsas-3	us-central1- a	Apr 4, 2020, 5:21:29 PM			10.1.2.3 (nic0)	None	SSI	• •	

CloudyCluster 608464 mpi_prime8-2.sh

scheduler CreatingCG

Close

Id	Name	Scheduler	Status
235905	mpi_prime2-8.sh	scheduler	Completed
843873	mpi_prime_preemt4-16	scheduler	Provisioning
608464	mpi_prime8-2.sh	scheduler	CreatingCG
	<pre>!ccv3-4cla-wd-login GCP}\$ ccgstat Name</pre>	Scheduler	Ctatus
	lccv3-4cla-wd-login GCP}\$ ccqstat Name	Scheduler	Status
Id 235905	Name mpi_prime2-8.sh	scheduler	Completed
Id 235905	Name	scheduler	

[admin@ccv3-4cla-wd-login GCP]\$

Jsername								Pho	ne Kevs
idmin									
assword									
AFA Token (if	enabled)								
/M instances	CREATE INSTANCE	٠	С	•	신	1	+1 MANAGE ACCESS	SHOW INFO PANEL	S LEARN

Name ^	Creation time	Machine type	In use by	Internal IP	External IP	Conne	et	
🖸 🔮 cev3	Apr 4, 2020, 5:05:28 PM	2 vCPUs, 8 GB		10.128.0.35 (nic0)	34.71.66.169 🖻	SSH		1
🖸 🔮 ccv3-4c1a-nat	Apr 4, 2020, 5:16:38 PM	4 vCPUs, 15 GB		10.1.0.2 (nic0)	34.71.26.62	SSH	*	1
🛾 🔮 ccv3-4c1a-sched-scheduler	Apr 4, 2020, 5:24:55 PM	4 vCPUs, 15 GB		10.1.1.2 (nic0)	None	SSH	*	1
🛛 🔮 ccv3-4c1a-wd-login	Apr 4, 2020, 5:17:53 PM	4 vCPUs, 15 GB		10.1.0.3 (nic0)	34.68.112.252	SSH	•	1
🛛 🥝 ccv3-4c1accauto-235905-cgas-0	Apr 5, 2020, 8:02:24 AM	8 vCPUs, 7.2 GB		10.1.2.19 (nic0)	None	SSH		:
🛛 🥝 ccv3-4c1accauto-235905-cgas-1	Apr 5, 2020, 8:02:24 AM	8 vCPUs, 7.2 GB		10.1.2.18 (nic0)	None	SSH	*	1
🛛 🔮 ccv3-4c1accauto-608464-cgas-0	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.72 (nic0)	None	SSH	•	
🛾 🔮 ccv3-4c1accauto-608464-cgas-1	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.70 (nic0)	None	SSH	*	
🛛 🥝 ccv3-4c1accauto-608464-cgas-2	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.67 (nic0)	None	SSH	*	
🛛 🔮 ccv3-4c1accauto-608464-cgas-3	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.68 (nic0)	None	SSH	*	
🛛 🔮 ccv3-4c1accauto-608464-cgas-4	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.66 (nic0)	None	SSH	•	
🛛 🔮 ccv3-4c1accauto-608464-cgas-5	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.73 (nic0)	None	SSH		
🛛 🔮 ccv3-4c1accauto-608464-cgas-6	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.71 (nic0)	None	SSH	•	
🛛 🔮 ccv3-4c1accauto-608464-cgas-7	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.69 (nic0)	None	SSH	*	
🛛 🔮 ccv3-4c1accauto-843873-cgas-0	Apr 5, 2020, 8:03:19 AM	16 vCPUs, 14.4 GB		10.1.2.36 (nic0)	None	SSH	•	
🛛 🥝 ccv3-4c1accauto-843873-cgas-1	Apr 5, 2020, 8:03:19 AM	16 vCPUs, 14.4 GB		10.1.2.34 (nic0)	None	SSH		
🗌 🔮 ccv3-4c1accauto-843873-cgas-2	Apr 5, 2020, 8:03:19 AM	16 vCPUs, 14.4 GB		10.1.2.37 (nic0)	None	SSH	*	
🗆 🥝 ccv3-4c1accauto-843873-cgas-3	Apr 5, 2020, 8:03:19 AM	16 vCPUs, 14.4 GB		10.1.2.35 (nic0)	None	SSH	•	
🛛 🥝 ccv3-4c1aorangefs-fsas-0	Apr 4, 2020, 5:21:28 PM	4 vCPUs, 15 GB		10.1.2.2 (nic0)	None	SSH	•	
🛛 🥝 ccv3-4c1aorangefs-fsas-1	Apr 4, 2020, 5:21:29 PM	4 vCPUs, 15 GB		10.1.2.4 (nic0)	None	SSH		
🗌 🥝 ccv3-4c1aorangefs-fsas-2	Apr 4, 2020, 5:21:29 PM	4 vCPUs, 15 GB		10.1.2.5 (nic0)	None	SSH	•	
🛛 🔮 ccv3-4c1aorangefs-fsas-3	Apr 4, 2020, 5:21:29 PM	4 vCPUs, 15 GB		10.1.2.3 (nic0)	None	SSH		

CloudyCluster 608464 mpi_prime8-2.sh scheduler Provisioning [admin@ccv3-4cla-wd-login GCP]\$ ccqstat Scheduler Status Name 235905 mpi_prime2-8.sh scheduler Completed scheduler Completed scheduler Provisioning 843873 mpi_prime_preemt4-16 608464 mpi_prime8-2.sh [admin@ccv3-4cla-wd-login GCP]\$ ccqstat Name Scheduler Status 235905 mpi_prime2-8.sh scheduler Completed 843873 mpi_prime_preemt4-16 608464 mpi_prime8-2.sh scheduler Completed scheduler Completed

[admin@ccv3-4c1a-wd-login GCP]\$

Username admin	Phone Keys
Password	
MFA Token (if enabled)	
Private Key	
Choose File No file chosen	
Connect	

/M instances CREA		Cefresh		1	MANAGE ACCESS	SHOW INF) PANEL	.	EAR
T COV3 O Filter VM instances					×	0	Column	s *	
Name ~	Creation time	Machine type	In use by	Internal IP	External IP	Cor	nect		
Ocv3	Apr 4, 2020, 5:05:28 PM	2 vCPUs, 8 GB		10.128.0.35 (nic0)	34.71.66.169 🖻	\$\$	н -	:	
🗆 🔮 ccv3-4c1a-nat	Apr 4, 2020, 5:16:38 PM	4 vCPUs, 15 GB		10.1.0.2 (nic0)	34.71.26.62	\$\$	н -	:	
🗌 🔮 ccv3-4c1a-sched-scheduler	Apr 4, 2020, 5:24:55 PM	4 vCPUs, 15 GB		10.1.1.2 (nic0)	None	55	н -	:	
🗌 🤮 ccv3-4c1a wd-login	Apr 4, 2020, 5:17:53 PM	4 vCPUs, 15 GB		10.1.0.3 (nic0)	34.68.112.252	\$5	н -	:	
ccv3-4c1accauto-608464-ogas-6	Apr 5, 2020, 8:04:48 AM	2 vCPUs, 1.8 GB		10.1.2.71 (nic0)	None	SS	н •	:	
🗌 🔮 ccv3-4c1acrangefs-fsas-0	Apr 4, 2020, 5:21:28 PM	4 vCPUs, 15 GB		10.1.2.2 (nic0)	None	55	н -	:	
ccv3-4c1aorangefs-fsas-1	Apr 4, 2020, 5:21.29 PM	4 vCPUs, 15 08		10.1.2.4 (nic0)	None	\$\$	н -	:	
ccv3-4c1aorangefs-fsas-2	Apr 4, 2020, 5:21:29 PM	4 vCPUs, 15 GB		10.1.2.5 (nic0)	None	\$\$	н -	:	
ccv3-4c1aorangefs-fsas-3	Apr 4, 2020, 5:21 29 PM	4 vCPUs, 15 GB		10.1.2.3 (nic0)	None	55	н -	:	

Related Actions

Close

Live stuff!



General Information (the 3 T's)

• Teams

- 4-5 Students
- 1 Primary Mentor
- 1 Specialist/Staff

• Time (*Draft*)

- November 5th 9th
 - 11/5@~6pm ET Event Start
 - Team formation
 - 11/[6-9] @ 11 ET & 6pm ET- Checkins
 - 11/9@6pm ET-Final Presentations

• Topic Examples

- Data Analysis of COVID 19
- Economic disparities and their effects on college participation
- Genomics, Molecular Dynamics, or Weather Modeling in the Cloud.
- Social Justice
- Presidential Election
- Public Data Management
- Graduation Rates
- Broadband Access
- Insurance vs. Public Health Resilience



Questions and Concerns

Contact Information:

Boyd Wilson (*HPC in the City Organizing Committee Member*)

Email: boyd@omnibond.com

Twitter: @boydwilson

HPC in the City Event Site: http://hackhpc.org/hpc/





