EESSI meeting

August 5th 2021

https://github.com/EESSI/meetings/wiki

Agenda

1. Quick introduction by new people
2. EESSI-related meetings in last month [Kenneth, Alan]
3. Progress update per EESSI layer [Kenneth]
4. 2021.06 version of pilot repository [Kenneth]
5. AWS/Azure sponsorship update [Kenneth, Alan, Henk-Jan]
6. AWS/Arm hackthon [Christian]
7. Q&A

Quick introduction by new people

New people on the call: feel free to introduce yourself!

- Who are you, where do you work, on what?
- Why are you interested in the EESSI project?
- Are you planning to actively contribute,
  and if so, to which aspect(s) of the project?

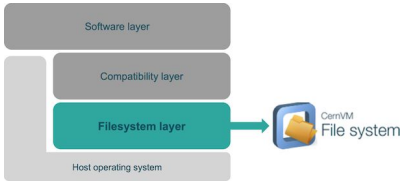
EESSI-related meetings

- July 13th: Monthly CernVM-FS coordination meeting (Bob?)
  - “interesting news” regarding corruption issue on in-place updates (CVM-2001)

- July 15th: kickoff meeting regarding Azure sponsorship for EESSI incl. RUG + SURF (Alan, Bob)
  - Subscription will be handled through SURF Research Cloud
  - Contacts are Ivar Janmaat and Martin Brandt
  - Will get access to a sub-subscription once Martin is back from vacation
  - Monthly coordination meeting every 3rd Friday at 3pm CEST (starting Sept’21)

[Kenneth, Alan]

Progress update: filesystem layer

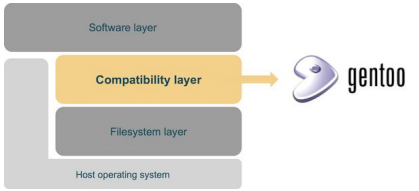


- Support for “direct I/O files” was implemented by CernVM-FS developers
  - See https://github.com/cvmfs/cvmfs/pull/2746 (not in latest CernVM-FS release yet)
  - Files can be marked to ***not*** be included in client kernel cache
  - Allows for in-place updates of stuff like glibc in compat layer with trouble client-side
  - Only when clients opt-in to accessing specific files via direct I/O?
  - `cvmfs_server publish -d` to mark files in transaction with direct I/O bit

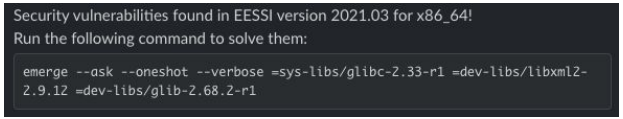
- No changes/updates to EESSI filesystem layer in last couple of weeks (summer vacation)

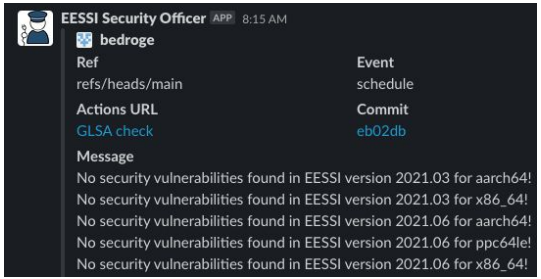
[Kenneth]

Progress update: compatibility layer



- Security officer bot is regularly checking whether security updates are needed
  - Semi-daily check, reports via private channel in Slack
  - Mentions command to run to update packages
  - Still requires significant amount of credits in GitHub Actions…
  - Security updates installed in 2021.03 compat layer on July 13th (glibc, glib, libxml2)

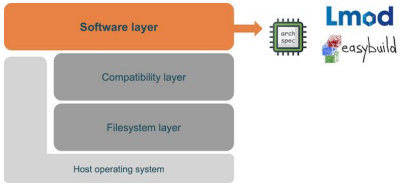




- Should ReFrame tests for compat layer be run daily via a cron in GitHub Actions?
  - Currently only run when changes are merged in `compatibility-layer` GitHub repo…
  - cfr. https://github.com/EESSI/compatibility-layer/pull/120

[Kenneth]

Progress update: software layer



- Some progress on getting software layer in 2021.06 in place, but got stuck on Java…
  - Java is installed as a binary package
  - Picks up libc.so from host OS, should be from compat layer!
  - glibc version in compat layer is now recent enough for that to cause trouble...
  - See https://github.com/EESSI/software-layer/issues/123
  - Requires use of `patchelf` to fix RPATH in Java installation, like ComputeCanada does
  - Or use Java from compat layer instead? (probably not a good idea)
- Init script doesn't correctly fall back to `x86_64/generic` when it should (issue #124)
- Improved ReFrame tests for GROMACS (PR #115) and TensorFlow/Horovod (PR #122)

[Kenneth]

EESSI pilot repository

https://eessi.github.io/docs/pilot

NOT FOR PRODUCTION USE!

2021.06 version of pilot software stack

Current status:

- Compatibility layer in place for `x86_64` + `aarch64` + `ppc64le`

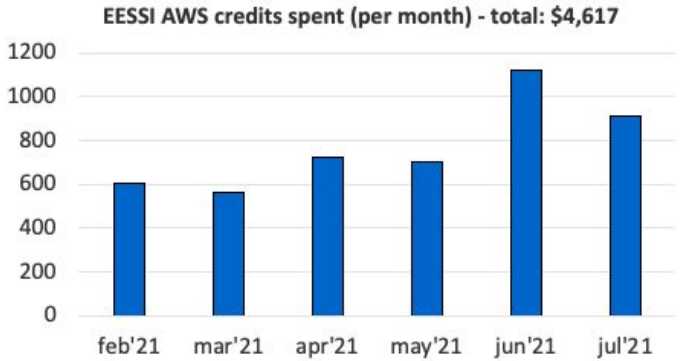
To do:

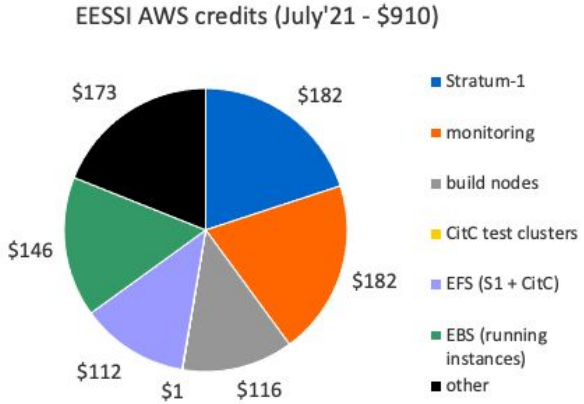
- Install software (**work-in-progress**)
  - Target CPUs:
    - `{aarch64,x86_64,ppc64le}/generic`
    - `intel/{haswell,skylake_avx512}`, `amd/zen2`, `aarch64/graviton2`, `ppc64le/power9le`
  - Bioconductor (R), GROMACS, OpenFOAM, TensorFlow, Spark, IPython, Horovod, QuantumESPRESSO, …
- Provide init scripts
- GPU installations: on hold (cfr. discussion with NVIDIA on CUDA, meeting to be planned)

[Bob, Kenneth]

Usage of sponsored AWS credits

- Sponsored credits ($25,000) are being put to good use!
- **Ask in #aws-resources Slack channel to get access!**
- In July ‘21: ~$910 worth of credits spent
- on Stratum-1, monitoring node, build nodes, ...
- ~$4,617 worth of credits spent in total





[Kenneth]

Azure sponsorship

- Access to provides Azure credits needs to be set up with SURF
  - Will be looked into after summer vacation breaks...
- Monthly follow-up meetings planned with Azure + SURF
  - every 3rd Friday at 3pm CEST (starting Sept'21)

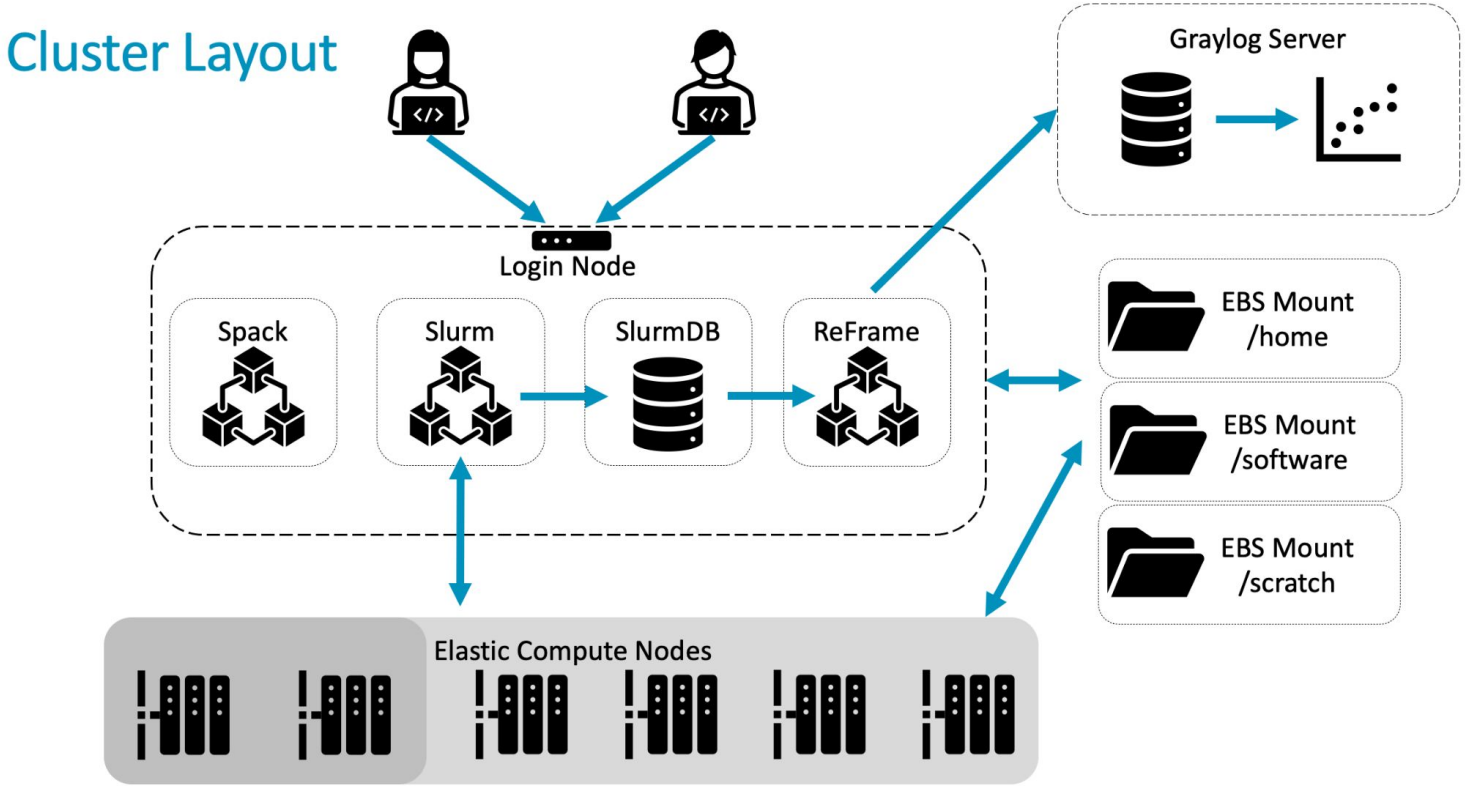
[Alan, Kenneth

AWS / Arm hackathon

- Collaboration between ARM HPC Usergroup (AHUG) and AWS
- Supported by the open-source groups from: $THE_OTHER_TOOL (Spack) and ReFrame
- Hackathon started on Monday morning and went until Friday Afternoon
    - 17h time-zone difference (Australia to US westcoast)
    - > 30 teams, > 50 mentors (Spack, ReFrame, AWS, ARM, NVIDIA)
    - Three toolchains (gcc, nvhpc, arm)
- Self-paced workshop: https://cloud-hpc-hackathon.workshop.aws

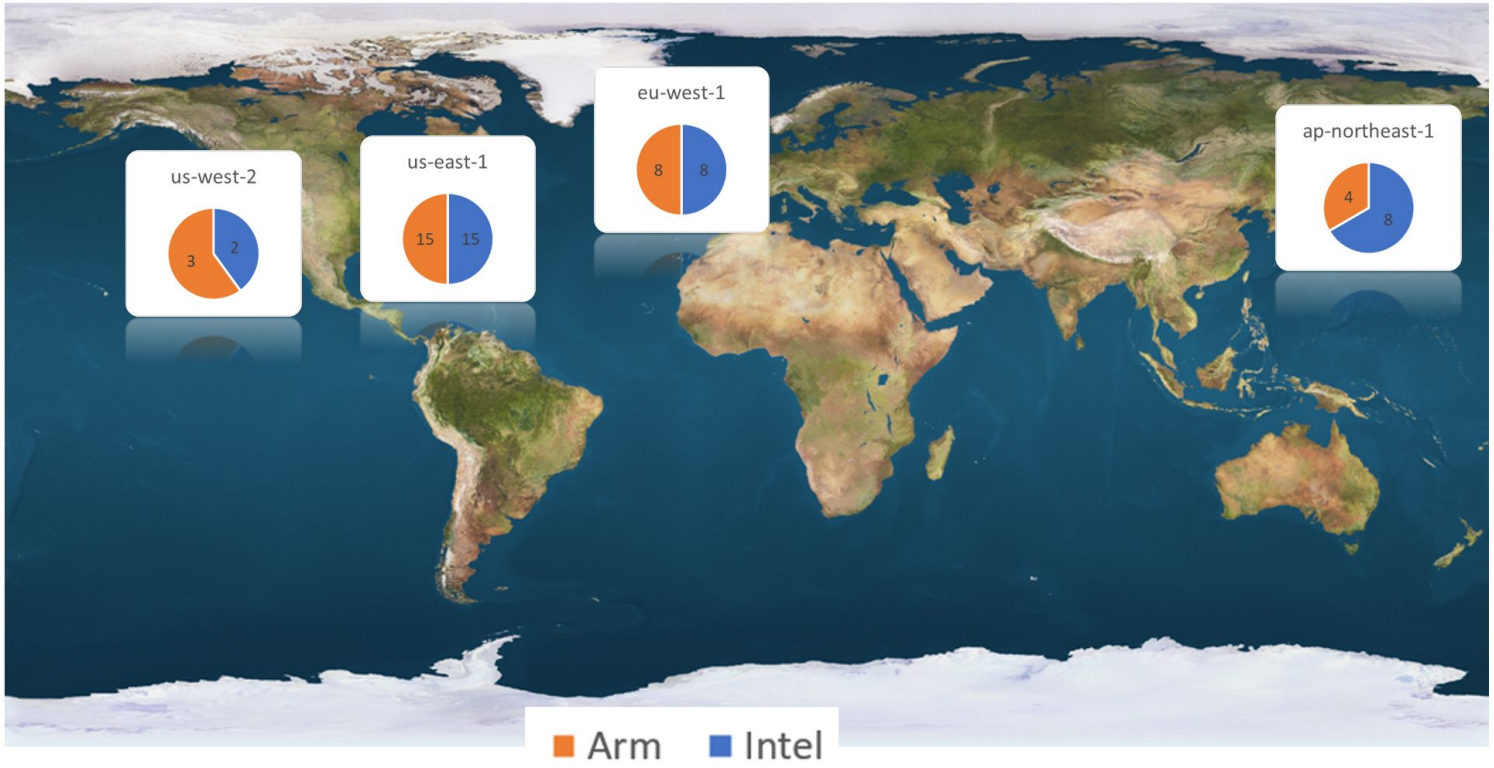
[Christian]

AWS / Arm hackathon - Cluster Layout



[Christian]

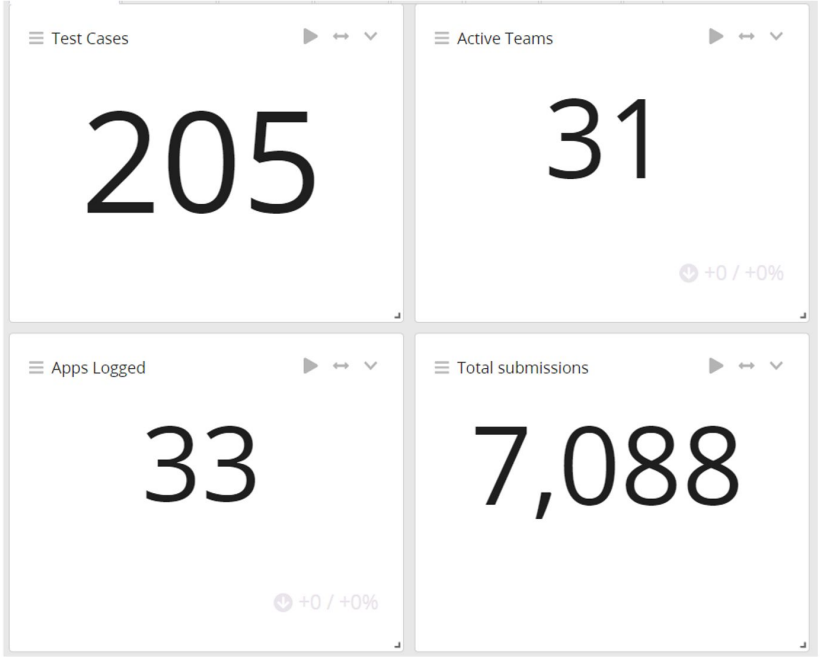
AWS / Arm hackathon - Cluster Distribution



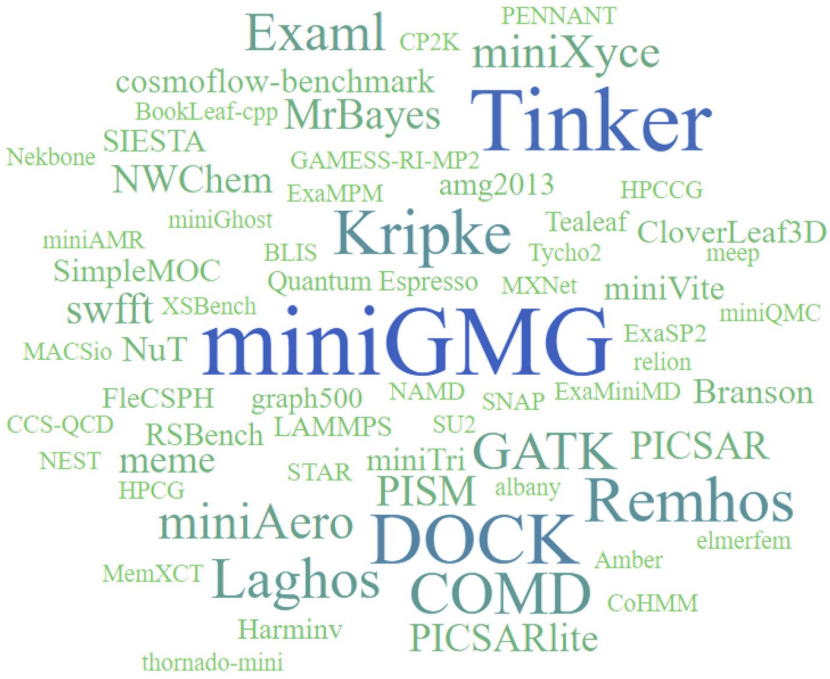
[Christian]

AWS / Arm hackathon - Stats Overview

Graylog Overview



App Impact



[Christian]

AWS / Arm hackathon - Pizza!

Virtual Pizza Eating: #pizzawednesday

Pizza Recovery Fund

How to swap calories for Amazon vouchers.

* Required

Event Logo

Team Name *

Mentors

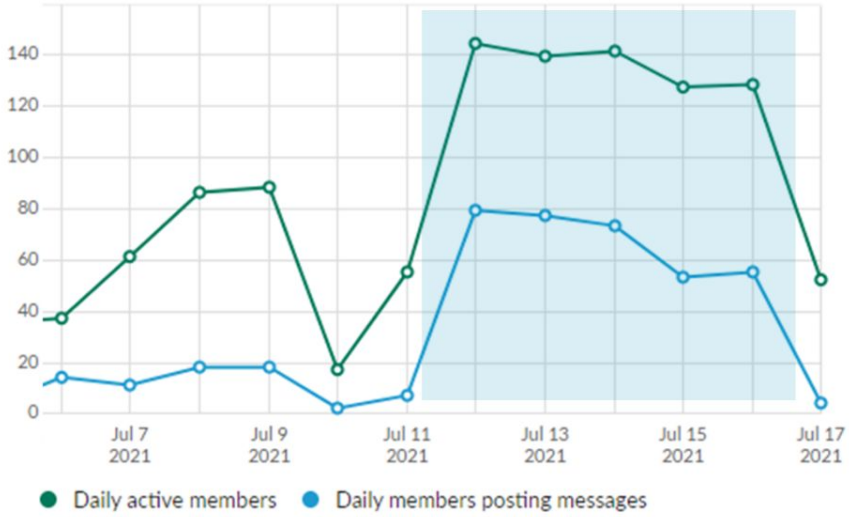
Does your social media post contain #ahughackathon hash tag? *

- Yes
- No I don't need the FREE VOUCHER

[Christian]

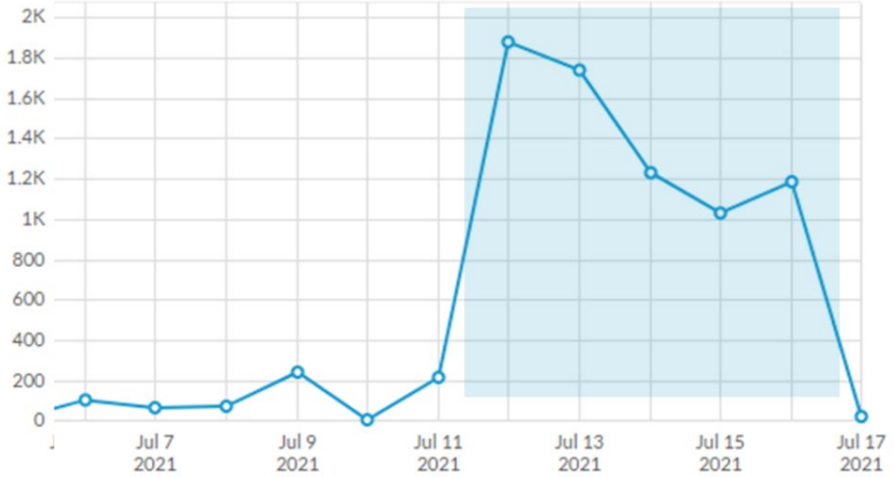
AWS / Arm hackathon - Slack stats

Active Users:



Total Members: 183

Messages Sent:

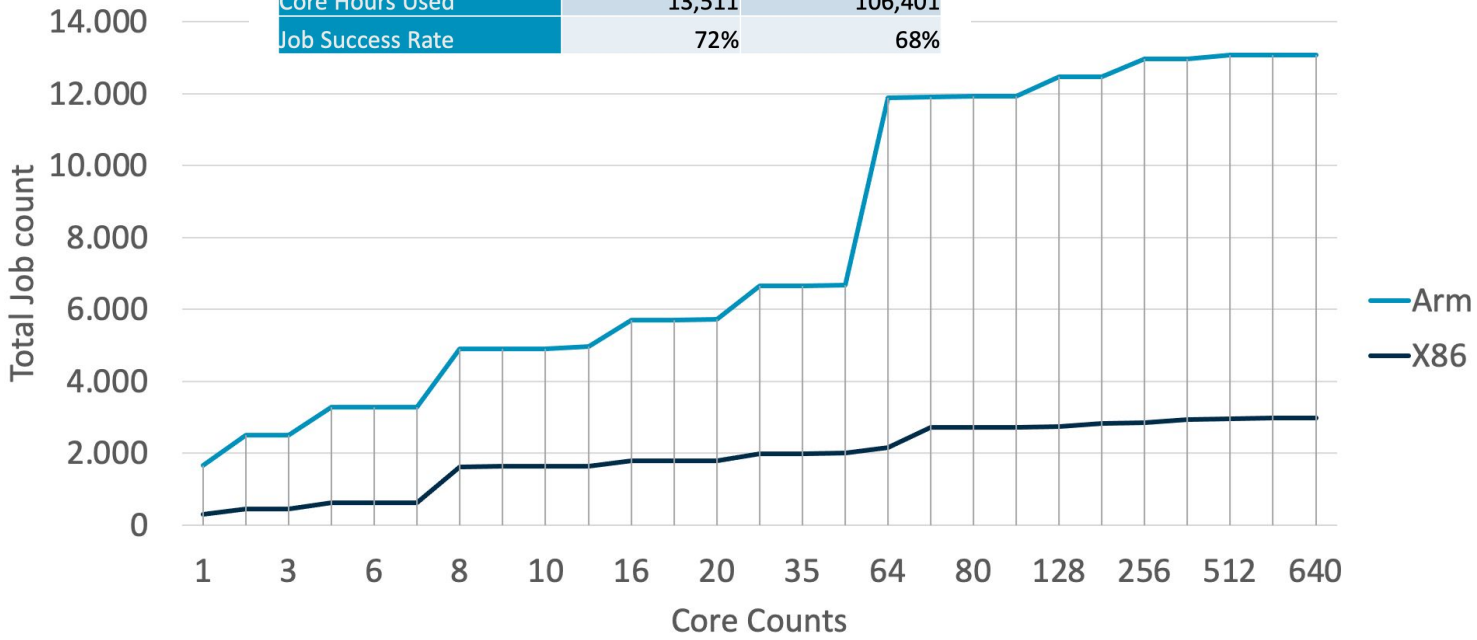


Total Messages: ~8k

[Christian]

AWS / Arm hackathon - SLURM Stats

	X86 Clusters	Arm Clusters
Number of Clusters	33	30
Total Jobs Submitted	3,322	13,099
Core Hours Used	13,511	106,401
Job Success Rate	72%	68%



[Christian]

AWS / Arm hackathon - App Porting per Compiler

	C5n (X86)		C6gn (Arm)		
	GCC	NVHPC	ACFL	GCC	NVHPC
CloverLeaf	X	X	X	X	X
CloverLeaf3D	X	X	X	X	X
CoMD	X	X	X	X	X
ExaML	X		X	X	
FlecSPH	X	X		X	X
GATK	X		X	X	
Kripke	X		X	X	X
MiniGMG	X		X	X	
MiniXyce	X		X	X	X
MrBayes	X		X	X	
NWChem	X		X	X	
PICSAR	X		X	X	X
PICSARlite	X		X	X	X
RSbench	X	X			
Remhos	X	X	X	X	X
SIESTA	X			X	

	C5n (X86)		C6gn (Arm)		
	GCC	NVHPC	ACFL	GCC	NVHPC
SWFFT	X		X	X	X
SimpleMOC			X	X	X
amg2013			X	X	X
branson			X	X	X
cosmoflow	X			X	
cosmoflow-benchmark	X				
dock	X	X	X	X	X
laghos			X	X	X
meme	X	X	X	X	X
miniAero			X	X	
miniTri			X	X	X
miniVite	X	X	X	X	X
nut			X	X	X
pism			X	X	
tinker			X	X	X

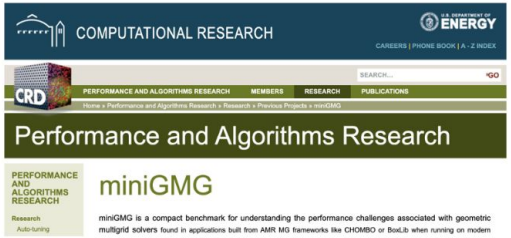
[Christian]

AWS / Arm hackathon - Example App

MiniGMG (Wolfpack)

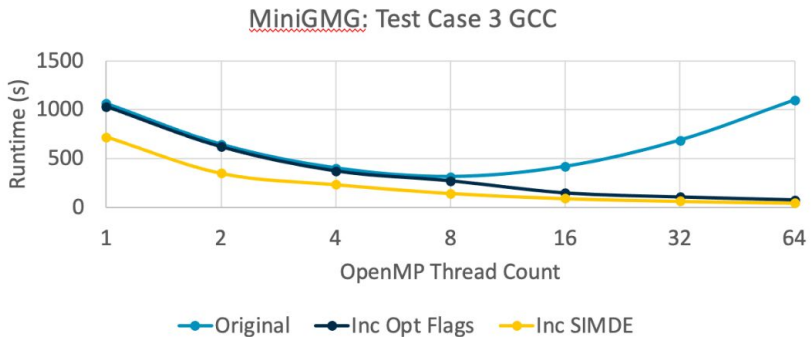
Geometric MultiGrid Mini-App

- Benchmarked:
  - 4 Test cases
  - C6gn: ACFL + GCC
  - C5n: GCC
- Identified huge OpenMP overhead
- Optimisations:
  - Compiler flags
    - '-O3' => '-Ofast'
  - Application flags
    - '-D__PREFETCH_NEXT_PLANE_FROM_DRAM'
    - '-D__FUSION_RESIDUAL_RESTRICTION'
  - Replaced Intel vector intrinsics with SIMDE
- Spack PR with changes
  - https://github.com/spack/spack/pull/24926



Functions

Self time	Total	MPI	Child	Overhead	Function
97.6%	97.6%			97.6%	[OpenMP overhead (no region active)]
1.0%	1.0%			1.0%	GOMP_parallel (OpenMP Overhead)
0.4%	0.4%				poll
0.4%	0.4%			0.4%	GOMP_parallel (OpenMP Overhead)
0.3%	0.3%			0.3%	gomp_thread_start
0.2%	0.2%				DoBufferCopy
0.1%	0.1%	0.1%			MPI_Finalize
<0.1%	<0.1%			<0.1%	gomp_team_barrier_wait_end
<0.1%	<0.1%				__pow_finite
<0.1%	0.2%		0.2%		exchange_boundary [OpenMP region 1]



[Christian]

AWS / Arm hackathon - Tentative Conclusion

- Event went well - hiding AWS setup from participants
  - ssh into ParallelCluster
  - Some confusion about the time to scale up a node
  - We had to redo the setup the night before - still worked
- End-To-End scope - smaller scope might be easier next time
  - Teams build app, created ReFrame testcase, tinkered with optimization
- Next time (Christian’s thoughts):
  - Focus on either building or testing
  - in-person/virtual hybrid?

[Christian]

AWS / Arm hackathon - More info

- Announcement blog post: https://aws.amazon.com/blogs/hpc/aws-arm-hpc-hackathon-2021
- Introductory video: https://www.youtube.com/watch?v=NrsZvFsdxug
- Application Scaling talk by Jeff Hammond: https://www.youtube.com/watch?v=Hfrc_Pqm0oY
- GitHub repo: https://github.com/arm-hpc-user-group/Cloud-HPC-Hackathon-2021
  - ReFrame tests in Applications subdirectory
- Self-paced workshop: https://cloud-hpc-hackathon.workshop.aws

[Christian]

Coming soon...

- Acceptance notification of submission of paper on EESSI
  - Special issue “New Trends in HPC: Software Systems and Applications” in “Software: Practice and Experience” journal
  - Original dates:
    - Notification: July 31, 2021 (but no news yet so far…)
    - Revision due: Aug 20, 2021
    - Notification of final acceptance: Sept 20, 2021
    - Final revised paper due: October 15, 2021
- Feedback on S4 project NeIC proposal
  - “Scientific Software Stacks as a Service (S4)”, ~100PMs over 2 years
  - Partners: UoIceland, UoEstonia, Sigma2 (NO), SNIC/Umeå (SE), CERN, CSCS, UGent, RUG
  - 11 project applications were sent, https://neic.no/news/2021/03/18/open-call-applications
  - Acceptance notification expected in Sept’21

[Kenneth, Thomas]