ARCHER2 Quarterly Report

January 2025 - March 2025

EPCC

The University of Edinburgh

epcc

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ARCHER2 Quarterly Report

This section of the report covers the period January 2025 – March 2025 for the ARCHER2 service.

ARCHER2 Executive Summary

- EPCC continue to collaborate with HPE to investigate upgrade options that could maintain good cybersecurity while minimising disruption to users. A major part of the CSE team's work this quarter has been to test candidate Operating System images developed by HPE. Various images were deployed onto the ARCHER2 TDS and tested as candidates for an alternative user-facing environment which would result in a potentially streamlined upgrade process, reducing outage time for users.
- Further development of the EPCC Reframe suite has been carried out, specifically targeting the scientific development environment and application performance. This has been used extensively for the testing noted above.
- Significant planning has been undertaken for the upcoming ARCHER2 Celebration of Science of event, with an exciting and diverse programme developed and a range of supporting activities on offer.
- A total of 22 days of training have been delivered as part of the ARCHER2 CSE training programme. This included a first run of the "GPU programming using directives" course, a course that introduced attendees to the use of directives to leverage GPU compute performance.
- A series of three webinars was delivered by winners of the ARCHER2 Image and Video Competition 2024, aimed at disseminating the high-quality science on the service.
- A newly developed course on "Green Software Use on HPC" was delivered online in April, with a further face-to-face run planned for May. The course introduces environmental sustainability principles in the context of high performance computing systems.
- The ARCHER2 eCSE programme awarded 806 PMs across 11 calls, and the GPU eCSE programme awarded 231.8 PMs across 2 calls. While there are no further funds to run future ARCHER2 or GPU eCSE calls there is significant demand from the community for this sort of software development funding.
- The CSE team has launched a suite of tools to help ARCHER2 users estimate the greenhouse gas emissions associated with their use of ARCHER2. The tools allow users to put this into context alongside other emissions sources from research activities, e.g. transport, laboratory work.
- Through Women in HPC, EPCC is involved in the Connecting Communities event at the ISC gala event, in partnership with ISC25, (Tuesday, 10th June 2025). The evening will showcase a dynamic mix of invited and lightning talks, highlighting the many ways our community collaborates and grows together.

ARCHER2 Forward Look

- The CSE team will continue to test various candidate operating system images from HPE, utilising our ReFrame application-level compliance and verification suite. The aim is to ensure any solution is suitable for the ARCHER2 system and user community.
- Although effort will be mainly focused on software upgrade testing, once this is complete the CSE team plans to test the instance of PowerSched installed on the TDS by HPE. This tool, developed by HPE and HLRS, Stuttgart, dynamically adjusts CPU frequencies during computations to reduce energy use.
- Following feedback from the ARCHER2 User Advisory Group, EPCC is planning on running another Capability Days near the end of May. The aim is to give users the opportunity to test at scale and prepare their applications to better utilise the full capacity of ARCHER2 and future systems.
- The ARCHER2 Celebration of Science will take place during this quarter, with the user community invited to meet in Edinburgh and showcase science achieved on ARCHER2. Planning and running this will be a key focus of this quarter.
- Alongside AMD, we are organising a three-day hackathon to enable users to port and optimise their code using the latest AMD hardware and development suite.
- We are preparing for our annual ISO external certification audit which takes place in June. Our external auditor spends two weeks ensuring that we are complying with the requirement of ISO 9001 (quality and service delivery), ISO 27001 (information security) and ISO 22301 (business continuity and disaster recover). EPCC wants to make sure that we are applying best practice and identifying opportunities for continual improvement to ensure we deliver the best service to our users.
- Women In HPC has another full programme of activities for the ISC'25 conference in Hamburg, in June.
- The Outreach team has a drop-in booth at the Edinburgh Science Festival, at Dynamic Earth (14th – 16th April 2025). The theme, spaceship earth, allows the team to highlight the role supercomputers play in delivering for the greater good and in delivering more for less.

ARCHER2 Centralised CSE Team

In addition to continued contributions to science support and training, the CSE team has undertaken various community-engagement and service-improvement initiatives in the period, as described below.

A key element of CSE work, in February and March, has been testing of node-image software, provided by HPE as part of the Software Upgrade investigation. Various images were deployed onto the ARCHER2 TDS and tested by the CSE team, as candidates for an alternative user-facing environment which would result from a potential streamlined upgrade process.

Andrew Turner was featured on the Code for Thought podcast in early March, discussing the topic of "What's the carbon footprint of my app?" The Podcast was released on 18th March and is accessible at https://codeforthought.buzzsprout.com/1326658/episodes/16791082-en-bytesized-rse-what-s-the-carbon-footprint-of-my-app.

Andrew is also part of the UKRI Digital Research Infrastructure-sponsored Living Benchmarks project, to develop a representative set of scientific-computing benchmarks for the UK computational research ecosystem, looking towards future service procurements.

Other items of note for CSE include:

- Kevin Stratford participated in the UKCOMES Consortium meeting at UCL on 14th February, in his role as Consortium Contact.
- Andrew Turner participated in various topical meetings:
    - Green RSE SIG meeting, 16th January (online)
    - UKRI Large Scale Compute Town Hall Meeting, 29th January (Oxford)
    - HPC RSE SIG meeting, on 10th March (online)
- Andrew Turner also presented an "Introduction to HPC", at the CCP9 Graduate School, 24th February at STFC Daresbury Laboratory and presented "HPC emissions: Raising awareness in the user community", at the HPC-SIG meeting on 5th March, at the University of Strathclyde, Glasgow.
- Juan Rodriguez-Herrera gave an online presentation aimed at PhD students (and PhD supervisors) at the University of La Laguna (Spain), titled "Avances y desafíos en la investigación computacional desde EPCC" (Advances and challenges in computational research from EPCC), featuring ARCHER2 service and science outputs.

Weronika Filinger is also contributing to the organisation and of the next International HPC Summer School which, this year, will take place in Lisbon, Portugal, during 6th—12th July. EPCC is supporting the attendance of four students and two staff members.

Also, based on Weronika's long-standing commitment to the HPC Summer School programme, Weronika is co-author (with Scott Callaghan, Ilya Zhukov, Hermann Lederer and John Urbanic) on a paper which will be presented at PEARC'25 "Fifteen Years of International HPC Summer School". The paper is expected to be published in early Summer.

Finally, the Linaro Forge debugger/ profiler licence has been extended through until the current end date of the ARCHER2 service and, following the formal end of the Cirrus service, the GPU support has been migrated to the ARCHER2 GPU Development service.

Continual Service Improvement (CSI) Projects

The period has involved further development of the EPCC Reframe suite, specifically targeting the scientific development environment and application performance. This has been prioritised to enable better testing and support for HPE as they mature a candidate Operating System image for the Software Upgrade project.

During this period, HPE confirmed they had completed the setup on the ARCHER2 TDS of a test instance of PowerSched. This tool was developed by HPE and HLRS, Stuttgart, to dynamically adjust CPU frequencies during computations to reduce energy use. CSE is ready to test the PowerSched instance, though the work has been put on hold to allow the Software Upgrade project to make full use of the TDS.

Work on the Likwid performance monitoring tool has been wrapped up, resolving some minor anomalies identified during final testing. A webinar is planned to showcase this to users, though several projects are already making use of the tool.

Working with colleagues from SP, several EPCC staff have helped roll out a new version of the Open On Demand platform on Cirrus, following a more conventional deployment path. The CSE team is testing the mechanism for integrating custom plugins and portal interfaces into Open On Demand, looking towards the user experience on future HPC services.

ARCHER2 Performance Report

This is the performance report for the ARCHER2 CSE Service for the Reporting Periods from January 2025 – March 2025.

The metrics were specified by EPSRC in Schedule 2.2 of ARCHER2 CSE Service Contract.

CSE Query Metrics

- **ARCHER2_CSE_Level1 (MTR)**: The Median Time to Resolution, as measured by Working Days (WDs), of all CSE queries falling within Level 1 resolved by the Contractor in the Reporting Period. *MTR applicable to OY5: Service Threshold: >4 WD; Operating Service Level: >1 WD, ≤2 WD.*
- **ARCHER2_CSE_Level2 (MTR)**: The Median Time to Resolution, as measured by Working Days (WD), of all CSE queries falling within Level 2 resolved by the Contractor in the Reporting Period. *MTR applicable to OY5: Service Threshold: >25 Working Days (WD); Operating Service Level: >10 WD, ≤15 WD.*
- **ARCHER2_CSE_Level3 (MTR)**: The Median Time to Resolution, as measured by Working Days (WD), of all CSE queries falling within Level 3 resolved by the Contractor in the Reporting Period. *MTR applicable to OY5: Service Threshold: >55 Working Days (WD); Operating Service Level: >25 WD, ≤35 WD.*
- **ARCHER2_CSE_TA (%):** The percentage of the total number of Technical Assessments (TAs) assigned to the Contractor in the Reporting Period completed prior to the commencement of the applicable TA Target Completion Date after the assignment of such Technical Assessment to the Contractor*. TA Target Completion Date in OY5: 6 WD; Service Threshold: <90.00%; Operating Service Level: 95.00-97.49%.*
- **Initial Response to Queries (%):** The percentage of the total number of CSE queries assigned to the Contractor in the Reporting Period responded to within 3 Working Hours. *Service Threshold: <96.00%; Operating Service Level: 98.00 – 98.99%.*
- **Query User Satisfaction (%):** The percentage of the total number of query satisfaction surveys completed in each Reporting Period, rating the quality of the resolution of Queries by the Contractor as "Good", "Very Good" or "Excellent". *Operating Service Level: 82.00 – 87.99%.*
- **Training User Satisfaction (%):** The percentage of all training satisfaction surveys completed in each Service Period, rating the Contractor as "Good", "Very Good" or "Excellent". *Operating Service Level: 88.00%-92.99%.*

Metric	Jan 2025		Feb 2025		Mar 2025		Q1 2025	
	Perf	Points	Perf	Points	Perf	Points	Perf	Points
ARCHER2_CSE_Level1 (MTR)	0.1WD	-2	0.1WD	-2	0.1WD	-2	0.1WD	-6
ARCHER2_CSE_Level2 (MTR)	0.3WD	-2	0.5WD	-2	0.3WD	-2	0.3WD	-6
ARCHER2_CSE_Level3 (MTR)	-	-	18WD	-0.5	12WD	-2	13WD	-2.5
ARCHER2_CSE_TA (%)	100%	-1	100%	-1	100%	-1	100%	-3
Initial Response to Queries (%)	100%	-1	100%	-1	100%	-1	100%	-3
Query User Satisfaction (%)	100%	-2	100%	-2	100%	-2	100%	-6
Training Satisfaction (%)	91.67%	0	100%	-1	100%	-1	98.41%	-2
Total		-8		-9.5		-11		-28.5

85 query feedback responses were received on query resolution in the Reporting Period. 100% of responses had a score of “Good”, “Very Good” or “Excellent”.

ARCHER2 CSE Queries

This section provides details on ARCHER2 CSE queries during the Reporting Periods from January 2025 – March 2025.

CSE Query Statistics

The metrics were specified by EPSRC in Schedule 2.2 of ARCHER2 CSE Service Contract.

- **Assigned:** The number of CSE queries assigned to the Contractor within each query resolution category in the Reporting Period.
- **Resolved:** The number of CSE queries resolved by the Contractor within each query resolution category in the Reporting Period.
- **Backlog:** The number of CSE queries assigned to the Contractor that remained unsolved within each query resolution category in the Reporting Period
- **Correspondence:** The average number of pieces of correspondence generated for CSE queries in each query resolution category.
- **First Response:** The average time taken for the Contractor to first respond to the Originator of the CSE query.

Jan 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	90	90	0	2	0.2h
ARCHER2_CSE_Level2	60	46	33	11	0.3h
ARCHER2_CSE_Level3	0	0	1	-	-
ARCHER2_CSE_TA	8	6	2	9	0.5h
Feb 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	103	103	0	2	0.2h
ARCHER2_CSE_Level2	37	52	18	12	0.2h
ARCHER2_CSE_Level3	5	1	5	31	0.2h
ARCHER2_CSE_TA	15	15	2	7	0.4h
Mar 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	38	38	0	2	0.3h
ARCHER2_CSE_Level2	53	53	18	13	0.3h
ARCHER2_CSE_Level3	0	4	1	27	0.2h
ARCHER2_CSE_TA	5	7	0	8	0.2h
Q1 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	231	231	0	2	0.2h
ARCHER2_CSE_Level2	150	151	18	12	0.3h
ARCHER2_CSE_Level3	5	5	1	28	0.2h
ARCHER2_CSE_TA	28	28	0	8	0.4h

CSE Query Categories

A total of 415 queries were resolved by the ARCHER2 CSE service in the Reporting Period. Resolved CSE queries in the Reporting Period fell into the following categories:

Service level	Category	Number resolved	% Queries
ARCHER2_CSE_Level1	Courses	231	55.7%
ARCHER2_CSE_Level2	3rd party software	37	8.9%
	Batch system and queues	30	7.2%
	Software installation	19	4.6%
	Compilers and system software	16	3.9%
	Software errors	12	2.9%
	Login, passwords and ssh	7	1.7%
	Storage and compute resources	7	1.7%
	Porting, performance and scaling	6	1.4%
	Access to services	3	0.7%
	Courses	3	0.7%
	Hardware issue	3	0.7%
	eCSE applications/calls	3	0.7%
	User behaviour: Queries relating to user behaviour	2	0.5%
	3rd party software	2	0.5%
	Data transfer	1	0.2%
	Other: Queries which do not fit within other categories	1	0.2%
	Website and documentation	1	0.2%
ARCHER2_CSE_Level3	Access to services	1	0.2%
	Hardware issue	1	0.2%
	Software installation	1	0.2%
ARCHER2_CSE_TA	Access to HPC	12	2.9%
	Pump-priming	9	2.2%
	Grant	4	1.0%
	Director's Time	3	0.7%
Total		415	100.0%

ARCHER2 Training

As part of ARCHER2, the service has been developing and delivering a training programme for the ARCHER2 community. During the first quarter of 2025, the CSE service has provided a total of 22 days of training, scheduled as follows:

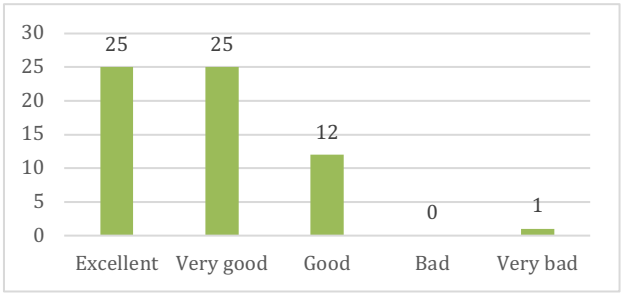
Dates	Course	Location	Days	Attend
28-30 Jan	Using ARCHER2 efficiently	Online	3	21
30-31 Jan	Data Carpentry	Cardiff	2	19
17-18 Feb	Reproducible comp. env. using containers	Cambridge	2	21
18, 20, 25, 27 Feb	Advanced OpenMP	Online	2	7
4-5 Mar	Modern C++ for Computational Scientists	Culham	2	36
5 Mar	The Science behind the Image Competition #1	Online	0.5	8
13-14 Mar	GPU programming using directives	Edinburgh	2	13
17-21 Mar	Software Carpentry	Online	2.5	10
19 Mar	The Science behind the Image Competition #2	Online	0.5	20
24-25 Mar	Introduction to Modern Fortran	London	2	13
24-25, 31 Mar	GPU programming with HIP	Online	3	7
26 Mar	The Science behind the Image Competition #3	Online	0.5	18

The HPE Centre of Excellence delivered a three-day course entitled “Using ARCHER2 efficiently”, which attracted 21 attendees. The course covered advanced concepts on ARCHER2, covering both the main system as well as the AMD GPU development platform.

We hosted the first run of the “GPU programming using directives” course. The course introduces how to use directives such as OpenMP offload to leverage the GPU compute performance. The feedback response rated the course as excellent.

Several winners of the ARCHER2 Image and Video Competition 2024 delivered a series of three webinars that covered the science behind the winning submissions. The competition is an annual event for all users of ARCHER2 to share their images or videos on “ARCHER2 Enabling Research.” A selection of images is featured on the ARCHER2 monthly wall calendar.

On the feedback for online courses, attendees rate the course on a scale of 1-5 (“Very Bad”, “Bad”, “Good”, “Very Good”, and “Excellent”).



The average feedback using this metric was 4.2, i.e., better than “Very Good”. Users provided 63 responses, a response rate of 43%.

One of the responses scored the overall satisfaction as “Very bad”. After carefully reviewing the complete feedback response, we concluded that it was a misunderstanding with the course level.

ARCHER2 and GPU Embedded CSE Programme (eCSE)

- The ARCHER2 eCSE programme awarded 806 PMs across 11 calls, exceeding the contractual requirement of 798 PMs. Of the 81 projects awarded, 66 projects have now finished, and 15 are on-going.
- The GPU eCSE programme awarded 231.8 PMs across 2 calls. Of the 12 projects awarded, 9 have started and 3 projects will start during the next quarter.
- Project reports from completed projects can be found here: https://www.archer2.ac.uk/ecse/reports/
- No further ARCHER2 or GPU eCSE calls will be opened in the near future.

ARCHER2 Community Engagement, Outreach, Collaboration and Impact

Blogs

Five blogs have been published this quarter. Highlights have included information for PIs on administering ARCHER2 projects through the SAFE, and information on the science carried out by our ARCHER2 calendar entries.

Community and Outreach Activities

The team has been planning for the upcoming ARCHER2 Celebration of Science of event in Edinburgh in May. The aim is to provide ARCHER2 users with the opportunity to showcase their achievements on ARCHER2. There are a series of invited talks highlighting science on ARCHER2 as well as a session on significant UK software applications and a panel discussion on this theme. There is a poster session with short lightning talks and canapés.

The team has a drop-in booth at the Edinburgh Science Festival, at Dynamic Earth (14th – 16th April 2025). The theme, spaceship earth, allows the team to highlight the role supercomputers play in delivering for the greater good and in delivering more for less. A new Wee Archie demo has been developed that allows attendees to design their own turbine blade and see if they can improve the power delivered by their turbine. There will also be a showcase of past, present and future hardware, looking at trends across HPC services, including changes in power consumption.

Diversity and Inclusivity

WHPC is finalising plans for its ISC'25 programme including:

- Poster session dedicated to women and individuals from underrepresented groups who are students or in the early stages of their HPC careers
- Connecting Communities event at the ISC gala event, in partnership with ISC25, (Tuesday, 10th June 2025). Taking place in the Exhibitor Hall from 6:45 PM to 8:30 PM, this marks the third edition of this extremely popular WHPC event.
- This year, under the overarching theme "Connecting the Dots," we are focusing on "Connecting Communities." Throughout the evening, we will showcase our dynamic mix of invited and lightning talks, highlighting the many ways our community collaborates and grows together.
- Diversity Day – a celebration of diversity and inclusivity running throughout the day on Wednesday 11th June.
- Furthermore, the Central European, MAR and JuWinHPC WHPC Chapters, are co-organising a Supercomputing Heroes Birds of a Feather.

In other activities, Eleanor Broadway gave a presentation entitled "The damage of outsourcing EDI: Introduction to WHPC and my thoughts on the future of diversity in tech" at the ExaBioSim workshop on the 14th of March (virtual) – https://excalibur.ac.uk/events/exabiosim-workshop/.

Quality Management, Information Security and Business Continuity

We are preparing for our annual ISO external audit, due this year in June. The external auditor from our certification body needs to ensure that we are complying with the requirements for the three ISO standards that we have gained: ISO 9001 (quality and service delivery), ISO 27001 (information security) and ISO 22301 (business continuity and disaster recover). We run an annual programme of internal audits to ensure that our management systems are working well for our users, customers and

organisation, and to identify areas that require improvement. The annual certification audit is the higher level check that we are meeting the requirements of the standard.

We are also due to run a practical business continuity test this year. We try to identify a scenario that is a risk to the services we run and we simulate this scenario to see how staff and any stakeholders respond to it. Staff do not know in advance when the test will take place or the identified scenario. In the past we have tested: a leak of sensitive data; an outbreak of staff sickness; and a fire in the office building. Staff keep diaries during the test and a review is carried out after to learn lessons and update processes. These exercises are always useful and, we hope, fun and informative. In the past they have helped us deal better with moving the service desk to a home working situation in a hurry and to prepare for remote working with a reduced staff population.