ARCHER2 Quarterly Report

April 2025 – June 2025

EPCC

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Author(s):	Lorna Smith, Juan Rodriguez Herrera, Chris Johnson, Xu Guo, Anne Whiting, George Beckett
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ARCHER 2 Quarterly Report

This section of the report covers the period April 2025 – June 2025 for the ARCHER2 service.

ARCHER2 Executive Summary

- The team organised the second Celebration of Science event in Edinburgh on the 14th-15th May 2025. The event provided ARCHER2 users with the opportunity to showcase their science achievements on the service and to share experiences and ideas with other users. The event was very well attended, with around 110 registered attendees, and feedback from the event has been very positive.
- The main service-improvement activity during the period has been work on the Software Upgrade Project which is developing and testing a new node operating system to replace the aging Cray OS, without the need for an extended outage. CSE has been testing a candidate image, and has given early access to a selection of users from the HEC and NERC Consortia. The expectation is that a final candidate image will be confirmed in early July.
- CSE were heavily involved in an AMD Hack-a-thon session for better exploitation of GPU-based architectures for HPC simulation and modelling. This allowed teams to look at better exploitation of AMD GPUs, like those on the ARCHER2 GPU Development System, for their research.
- WHPC had a full and popular programme of EDI activities at ISC'25 including organising and chairing the Chapter and Affiliate Updates at the WHPC Tech Talks at the ISC25 Opening Gala and leading an ISC25 Birds of a Feather session, titled: "Shaping the Future of WHPC".
- Juan Rodriguez Herrera was also re-elected Director at Large of the CUG Board of Directors for another two years. This ensures ARCHER2 is well represented on CUG and able to benefit from community best practice.
- CSE were well-represented at the Durham HPC days. In particular, we ran an eCSE session with Chris Johnson introducing several talks for previous/ current eCSE funded teams.
- The outreach team had a drop-in booth at the Edinburgh Science Festival, at Dynamic Earth, across 4 days, with a theme of Spaceship Earth. The event was well attended with around 2000 visitors in total.
- The team had a booth at the Big Bang Fair in Birmingham, from the 19th June to the 21st June 2025. This is the UK's biggest celebration of STEM (science, technology, engineering and mathematics) for young people and we aimed to demonstrate the relevance and benefits of high performance computing across society to attendees.
- The ARCHER2 team has recently successfully completed our annual two-week external certification ISO audits. There were 19 audit sessions across three standards, ISO 9001 quality service delivery, ISO 27001 information security and ISO 22301 business continuity and disaster recovery. All three were passed with flying colours.
- There are no eCSE calls open at present but projects from the later ARCHER2 eCSE calls and from the GPU eCSE calls are on-going. At present, the focus of the eCSE team is on the collection of final reports and any highlights from completed projects. Many eCSE projects were highlighted at the ARCHER2 Celebration of Science in May and a very successful session on the eCSE programme was given at the Durham HPC Days in June.

ARCHER2 Forward Look

- The CSE team will continue to focus on the Software Upgrade Project during this period. Working with the early access users to test the new candidate image and working with local HPE team to resolve any problems and functional issues. The expectation is that a final candidate image will be confirmed in early July, which will be thoroughly tested and a report produced for the ARCHER2 Management Board.
- The CSE team has now begun testing PowerSched, based on an installation on the TDS set up by local HPE staff. The focus will be on testing functionality and compatibility with the ARCHER2 software stack.
- The team will continue to deliver a full programme of training, including courses on Green Software Engineering, C++ for computational scientists, and advanced MPI running during July.
- The International HPC Summer School will run during this period, with the team involved in finalising preparations for this event in Lisbon, Portugal. The team will deliver lectures and is also running the mentoring programme.
- During the summer the Outreach team will focus their efforts on supporting a range of work experience students. In addition to running two separate week-long work experience opportunities for students in the final years of school, the centre will host three mentor scheme students, working in the centre for a month. In addition, there will be students from the In^{2}STEM programme and from STEM learning, both programs aimed at encouraging students who might not normally consider careers in STEM.

ARCHER2 Centralised CSE Team

This quarter has been a busy one for the CSE team, with several significant conferences (both UK and international) and significant progress on the ARCHER2 Software Upgrade project with HPE (discussed below).

One of the highlights of the quarter was the ISC'25 conference in Hamburg. EPCC runs a booth at the conference, showcasing the ARCHER2 service and science outputs. As in previous years, CSE members also contributed to the technical programme, including James Richings presenting on EPCC's quantum-computing activities, and Eleanor Broadway organising EDI-related activities (see later in the report).

CSE were also significant contributors to the ARCHER2 Celebration of Science, including several poster submissions, showcasing CSE and related work on ARCHER2:

- Sebastien Lemaire's work to "Create impactful scientific visualisations from your laptop*! (*also requires access to HPC)"
- Nathan Mannall's eCSE project work on "gprMax + MPI: Large-scale open-source computational electrodynamics".

Juan Rodriguez Herrera attended the Cray User Group meeting, held during 4th—8th May in New York, USA. He chaired several technical sessions and participated in a panel on Python Management, as part of the Programming Environments, Applications, and Documentation (PEAD) Special Interest Group. We are pleased to report that Juan was also re-elected Director at Large of the CUG Board of Directors for another two years.

Related to CUG, the CSE paper on "Scalability and Performance of OFI and UCX on ARCHER2" (co-authored by Jaffery Irudayasamy, Juan Rodriguez Herrera, Michael Bareford and Evgenij Belikov, originally presented at CUG 2024 was published in the ACM, New York, NY, USA (https://doi.org/10.1145/3725789.3725796).

Closer to home, CSE were well-represented at the Durham HPC days. In particular, we ran an eCSE session where Chris Johnson introduced several talks for previous/ current eCSE funded teams. Furthermore, CSE member Sebastien Lemaire presented on "x3d2: a modern High-Fidelity CFD Solver for CPU and GPU based supercomputers".

Some other CSE activities of note during the period were:

- James Richings attended the "Computing for Sustainable Innovation: 3rd Exascale and Scalable AI Workshop" at the STFC Hartree Centre during 16th—17th June.
- Eleanor Broadway is serving on the Supercomputing 2025 Technical Programme Committee for the "Performance Measurement, Modeling and Tools" track, and as a member of the SC24 Reproducibility Challenge Committee shepherding submissions by Student Cluster Competition teams to publish an IEEE Transaction.
- Juan Rodriguez Herrera gave a talk on ARCHER2 as part of the Summer Seminars organised by the Society of Spanish Researchers in the UK (https://sruk.org.uk/ceru-events/scotland-summer-seminars/). The audience was mainly PhD students and post-docs of the University of Edinburgh.
- Weronika Filinger was co-author on a paper entitled "Fifteen Years of International HPC Summer School. In Practice and Experience in Advanced Research Computing (PEARC '25)", July 20–24, 2025, Columbus, OH, USA. ACM, New York, NY, USA, https://doi.org/https://doi.org/10.1145/3708035.3736011. Weronika will present it at the PEARC'25 meeting, in Columbus, USA, later in July.

Continual Service Improvement (CSI) Projects

ARCHER2 Software Upgrade Project

The main service-improvement activity during the period has been work on the Software Upgrade Project which is developing and testing a new node operating system to replace the aging Cray OS, without the need for an extended outage.

HPE is developing a replacement 'image' based on the main SuSE Linux distribution, augmented with critical elements that are needed for it to function properly in the ARCHER2 ecosystem.

CSE has been testing a candidate image, working with the local HPE team to resolve some teething problems and address some functional issues. The work has progressed sufficiently to warrant giving early access to a 140-node test reservation to a selection of key users from the HEC and NERC Consortia.

The expectation is that a final candidate image will be confirmed in early July, which will be thoroughly tested before featuring in a recommendation report for the ARCHER2 management to consider.

PowerSched

After a period of inactivity due to the conflicting demands of the Software Upgrade project, the CSE team has now begun testing PowerSched, based on an installation on the TDS set up by local HPE staff. The focus of testing, at the time of writing, is functionality and compatibility with ARCHER2 software stack. Once this phase is complete, we hope to deploy onto a test reservation on the main system, allowing performance (versus energy efficiency) benchmarking to be undertaken.

ARCHER2 Performance Report

This is the performance report for the ARCHER2 CSE Service for the Reporting Periods from April 2025 – June 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	April 2025		May 2025		June 2025		Q2 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)	0.5WD	-2	0.3WD	-2	0.2WD	-2	0.3WD	-6
ARCHER2_CSE_Level3 (MTR)	15WD	-2	16WD	-0.5	18WD	-0.5	16WD	-3
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 (%)	96.4%	-0.25	100%	-1	100%	-1	97.8%	-2.25
Total		-10.25		-9.5		-9.5		-29.25

55 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 April 2025 – June 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.

April 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	59	59	0	2	0.2h
ARCHER2_CSE_Level2	39	37	18	15	0.3h
ARCHER2_CSE_Level3	1	1	3	48	0.1h
ARCHER2_CSE_TA	10	9	1	7	0.3h
May 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	21	21	0	2	0.3h
ARCHER2_CSE_Level2	39	36	21	11	0.2h
ARCHER2_CSE_Level3	1	2	2	76	0.1h
ARCHER2_CSE_TA	7	6	2	8	0.2h
June 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	26	26	0	2	0.3h
ARCHER2_CSE_Level2	65	61	25	12	0.3h
ARCHER2_CSE_Level3	0	1	1	98	-
ARCHER2_CSE_TA	7	6	3	9	0.3h
Q2 2025					
Service level	**Assigned**	**Resolved**	**Backlog**	**Correspondence**	**First Response**
ARCHER2_CSE_Level1	106	106	0	2	0.3h
ARCHER2_CSE_Level2	143	134	25	13	0.3h
ARCHER2_CSE_Level3	2	4	1	74	0.1h
ARCHER2_CSE_TA	24	21	3	8	0.2h

CSE Query Categories

A total of 265 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	106	40.0%
ARCHER2_CSE_Level2	3rd party software	35	13.2%
	Batch system and queues	21	7.9%
	Compilers and system software	15	5.7%
	Software installation	13	4.9%
	Software errors	9	3.4%
	Storage and compute resources	9	3.4%
	Courses	8	3.0%
	Login, passwords and ssh	7	2.6%
	Access to services	6	2.3%
	Porting, performance and scaling	4	1.5%
	Other: Queries which do not fit within other categories	3	1.1%
	Data transfer	2	0.8%
	Hardware issue	1	0.4%
	User behaviour: Queries relating to user behaviour	1	0.4%
ARCHER2_CSE_Level3	3rd party software	1	0.4%
	Compilers and system software	1	0.4%
	Software installation	1	0.4%
	Storage and compute resources	1	0.4%
ARCHER2_CSE_TA	Pump-priming	12	4.5%
	Grant	6	2.3%
	Director's Time	2	0.8%
	Access to HPC	1	0.4%
Total		265	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 10 days of training, scheduled as follows:

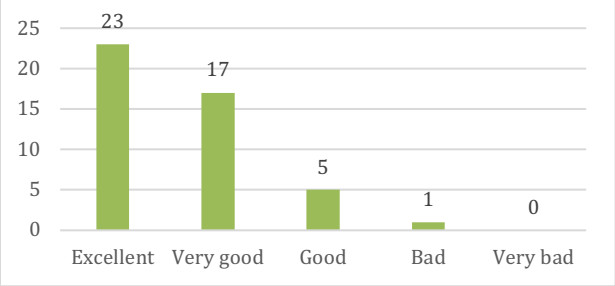
Dates	Course	Location	Days	Attend
1 Apr	Green software use on HPC	Online	1	21
9 Apr	From 0 to ARCHER2 in 65k lines of Rust	Online	0.5	26
22, 24, 28, 30 Apr	GPU programming using directives	Online	2	17
23 Apr	High Performance Algorithms for the Computation of the Hardy Function - Dissemination & Development	Online	0.5	8
23-24 Apr	Modern C++ for Computational Scientists	Durham	2	20
13 May	Green software use on HPC	Edinburgh	1	16
27-29 May	AMD MI300 Series Hackathon	Edinburgh	3	44

EPCC hosted and helped organise the AMD MI300 Series Hackathon on 27-29 May. During three intense days, 14 teams from the UK and overseas ported and optimised a large range of HPC and AI applications. AMD provided access to the latest AMD hardware and ROCm software stack.

This allowed computational science teams to better exploit AMD GPUs, like those on the ARCHER2 GPU Development System for their research. CSE members (Michael Bareford, James Richings, and Sebastien Lemaire) participated in some of the science teams, in part to grow CSE's exposure to key use cases for GPU-enabled HPC simulations.

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 4.3, i.e., better than "Very Good". Users provided 46 responses, a response rate of 39%.



ARCHER2 Community Engagement, Outreach, Collaboration and Impact

Community and Outreach Activities

We organised the second Celebration of Science event in Edinburgh on the 14th-15th May 2025. The event provided ARCHER2 users with the opportunity to showcase their science achievements on the service and to share experiences and ideas with other users. The two-day programme included talks by ARCHER2 researchers and other invited presenters involved in the ARCHER2 service, a poster session, and a panel session. The event was very well attended, with around 110 registered attendees and feedback from the event has been very positive.

The Outreach team carried out two significant engagements during this quarter, with booths at the Edinburgh Science Festival and at the Big Bang Fair in Birmingham.

The Edinburgh Science Festival explored the challenges of living on a planet with finite resources, through the lenses of science fiction and space exploration, with the theme Spaceship Earth. The team had a free drop-in booth in the lobby of Dynamic Earth across 4 days in April, together with other colleagues from the University of Edinburgh. The theme ties in closely with EPCC's priorities: emerging technologies are of course core to EPCC's mission, and energy efficiency is now as important as compute performance in new hardware design. The team was therefore able to focus the hands-on activities to the theme, even managing to tie in the space exploration theme via one of our puzzles. We had around 2000 visitors in total.

The team also had a booth at the Big Bang Fair in Birmingham, from the 19th June to the 21st June 2025. While final attendee numbers are still to be confirmed, this is estimated at around 25,000 visitors and the stand was extremely busy. The aim of the Big Bang Fair it to inspire the next generation with hands-on activities, experiments and workshops. It is the UK's biggest celebration of STEM (science, technology, engineering and mathematics) for young people. We had a range of activities on the booth primarily aimed at demonstrating the relevance and benefits of high performance computing across society and looking to engage young people in careers in computational science.

Diversity and Inclusivity

In our role as steward of Women in HPC, the CSE team (primarily Eleanor Broadway) have run a number of EDI-related activities during the period:

- On 14th May 2025, Eleanor organised and lead a WHPC session at the ARCHER2 Celebration of Science 2025, titled: "Blooming Good Ideas" https://www.archer2.ac.uk/community/events/celebration-of-science-2025/#women-in-hpc-whpc-session-blooming-good-ideas.
- At the Durham HPC Days (during 4th—6th June 2025), she organised and led a WHPC workshop, titled "The EDI Equation: Getting the balance wrong". The first session presented a panel of invited speakers and the second session comprised of mini-group discussions and a session on mental health. See https://www.durham.ac.uk/research/institutes-and-centres/data-science/events-/durham---hpc-days/ https://www.epcc.ed.ac.uk/whats-happening/events/durham-hpc-days-2025-ai-and-simulations-we-all-need-hpc for more details.
- As always, WHPC had a significant programme at the ISC 2025 conference. On 10th June 2025, Eleanor organised and chaired the Chapter and Affiliate Updates at the WHPC Tech Talks at the ISC25 Opening Gala. Also, she led an ISC25 Birds of a Feather session, titled: "Shaping the Future of WHPC" - https://womeninhpc.org/women-in-hpc/whpc-chapters-and-affiliates-at-isc25.

Also, during the period, Weronika Filinger has been finalising preparations for the International HPC Summer School 2025, which will be held in Lisbon, Portugal, during 6th—12th July. There will be four EPCC students and two staff attending. James Richings is delivering the Programming Methodologies lecture, and Weronika Filinger is running the mentoring programme.

Quality Management, Information Security and Business Continuity

We have just completed our annual two-week external certification ISO audits. A qualified auditor from the certification body carried out a series of 19 audit sessions across three standards, ISO 9001 quality service delivery, ISO 27001 information security, and ISO 22301 business continuity and disaster recovery. At each audit, members of staff responsible for running the particular element being examined need to present evidence to support our compliance with the relevant parts of the particular standard and of improvements made since the previous audit. Every three years a full recertification audit is carried out across the whole of the standard in question, and on the years between, a more light-weight surveillance audit is carried out to ensure things haven't slipped. This year two out of the three standards had full re-certification audits (ISO 9001 quality service delivery and ISO 22301 business continuity); ISO 27001 information security had a surveillance audit. At the end of the two weeks, we are delighted to be able to report that we passed with flying colours. The auditor's report goes forward for checking by the certification body and then once they have confirmed all is well, we will be re-awarded the two certificates that are up for re-certification. The information security certificate is still valid until 2027.

Whilst it is a huge amount of work to prepare, collecting all the evidence of the achievements of the past year, from service desk statistics, through security vulnerability monitoring, business continuity testing and HR processes around staff joining and leaving, it is very worthwhile. It ensures that we continue to apply best practice delivering services, especially ARCHER2 for our users. It is also a great validation of the work of all the staff in a wide variety of roles who contribute to service delivery often behind the scenes and their work is also a key part of enabling our users' vital science.