ARCHER SP Service Quarterly Report

Quarter 4 2016

Document Information and Version History

Version:	1.0
Status	Final
Author(s):	Alan Simpson, Anne Whiting, Andy Turner, Mike Brown, Stephen Booth, Jo Beech-Brandt
Reviewer(s)	Alan Simpson

Version	Date	Comments, Changes, Status	Authors, contributors, reviewers
0.1	04/01/17	Initial Draft	Anne Whiting
0.2	10/01/17	Added graphs	Jo Beech-Brandt
0.3	12/01/17	Reviewed and updated	Andy Turner
0.4	12/01/17	Updated after review	Anne Whiting
0.5	12/01/17	Reviewed and updated	Alan Simpson
0.6	12/01/17	Updated after review	Anne Whiting
1.0	13/01/17	Version for EPSRC	Alan Simpson

1. The Service

1.1 Service Highlights

This is the report for the ARCHER SP Service for the Reporting Periods:

October 2016, November 2016 and December 2016

- Utilisation on the system during 16Q4 was 94% as compared to 95% in 16Q3. The continued high utilisation of the service supports the need for ongoing investment in HPC.

- Cray KNL System was made available to users in October:

  - The Cray 12-node XC40 KNL system was made available to users on 20 October 2016. SAFE functionality was modified to allow users to request access to the KNL system. This is a novel development system designed to allow experimentation and technology evaluation.
  - The system remains freely available to all users with no kAU usage limit to encourage use and experimentation.
  - During the implementation and configuration of the system, much useful experience was gained of CLE 6, which will support the eventual upgrade of ARCHER to CLE 6.
  - There are 188 user accounts on the KNL as of 4 January 2017. 3589 jobs were submitted to the KNL in 16Q4 using 3540 kAUs. The KNL utilisation was 47% for the quarter.

- We have worked with the CSE team to enable the upload of data from Cray ALPS and RUR to the SAFE to provide richer data on the use of ARCHER. This will help understand user requirements for the service and plan for future services. The data now available in SAFE includes: memory usage, energy use, application use, process-placement information.

- To prevent unauthorised access to user data due to the worldwide Linux security vulnerability ("Dirty COW"), user access to ARCHER was removed between 24 and 26 October 2016. More details are in Section 2.3.3.

- The first 2 steps of the 3-stage process to upgrade to CLE 5.2 UP04 have been successfully completed. Testing is underway on the TDS to ensure a smooth transition for the user community.

- SAFE functionality has just been introduced to allow users to register publications against projects, making it easier for them to record publications in ResearchFish. This functionality will also provide a useful input to the benefits realisation data collected.

- The Stage 1 document review element of the external ISO 9001:2015 audit has been passed.

1.2 Forward Look

- The final stage of the CLE upgrade to 5.2 UP04 will take place on 25 January 2017.

- Further work will continue to prepare ARCHER to upgrade to CLE 6, delivering the new functionality that this brings and ensuring the continued full support of the system's operating system by Cray.

- As part of improving security for users as well as investigating possible future service requirements, we are currently testing the use of two-factor authentication for ARCHER access

using the Google authenticator. It is hoped that this functionality can be made available as an option for users early in 2017.

- The next ARCHER Champions Workshop will take place in Leeds on 10 February, co-located with HPC-SIG following the decision for the meetings to be bi-annual and distributed around the UK.

- Work will continues to prepare for the full ISO 9001:2015 certification audit which is taking place 20 – 21 February 2017.

- The Annual User Survey will be released to users at the beginning of January. The results from the survey will be circulated and published along with the Q2 2017 report.

- We will repeat the scheduler analysis that we undertook throughout summer 2016 to ensure that the scheduler configuration remains well suited to the ARCHER workload.

2. Contractual Performance Report

This is the contractual performance report for the ARCHER SP Service.

2.1 Service Points and Service Credits

The Service Levels and Service Points for the SP service are defined as below in Schedule 2.2.

- **2.6.2 - Phone Response (PR):** 90% of incoming telephone calls answered personally within 2 minutes for any Service Period. *Service Threshold: 85.0%; Operating Service Level: 90.0%.*
- **2.6.3 - Query Closure (QC):** 97% of all administrative queries, problem reports and non in-depth queries shall be successfully resolved within 2 working days. *Service Threshold: 94.0%; Operating Service Level: 97.0%.*
- **2.6.4 - New User Registration (UR):** Process New User Registrations within 1 working day.

Definitions:

Operating Service Level: *The minimum level of performance for a Service Level which is required by the Authority if the Contractor is to avoid the need to account to the Authority for Service Credits.*

Service Threshold: *This term is not defined in the contract. Our interpretation is that it refers to the minimum allowed service level. Below this threshold, the Contractor is in breach of contract.*

Non In-Depth: *This term is not defined in the contract. Our interpretation is that it refers to Basic queries which are handled by the SP Service. This includes all Admin queries (e.g. requests for Disk Quota, Adjustments to Allocations, Creation of Projects) and Technical Queries (Batch script questions, high level technical 'How do I?' requests). Queries requiring detailed technical and/or scientific analysis (debugging, software package installations, code porting) are referred to the CSE Team as In-Depth queries.*

Change Request*: This term is not defined in the contract. There are times when SP receives requests that may require changes to be deployed on ARCHER. These requests may come from the users, the CSE team or Cray. Examples may include the deployment of new OS patches, the deployment Cray bug fixes, or the addition of new systems software. Such changes are subject to Change Control and may have to wait for a Maintenance Session. The nature of such requests means that they cannot be completed in 2 working days.*

2.1.1 Service Points

In the previous Service Quarter the Service Points can be summarised as follows:

Period	**Oct 16**		**Nov 16**		**Dec 16**		**16Q4**
Metric	**Service Level**	**Service Points**	**Service Level**	**Service Points**	**Service Level**	**Service Points**	**Service Points**
2.6.2 – PR	100%	-5	100%	-5	100%	-5	-15
2.6.3 – QC	99.0%	-2	99.9%	-2	99.8%	-2	-6
2.6.4 – UR	1 WD	0	1 WD	0	1 WD	0	0
Total		**-7**		**-7**		**-7**	**-20**

The details of the above can be found in Section 2.2 of this report.

2.1.2 Service Failures

There were no SEV1 Service Failures during this Quarter. The SEV3 "Dirty COW" incident is discussed in Section 2.3.3.

Details of planned maintenance sessions can be found in Section 2.3.2.

2.1.3 Service Credits

As the Total Service Points are negative (-21), no Service Credits apply in 16Q4.

2.2 Detailed Service Level Breakdown

2.2.1 Phone Response (PR)

	Oct 16	Nov 16	Dec 16	16Q4
Phone Calls Received	22 (6)	25 (5)	33 (5)	**80 (16)**
Answered 2 Minutes	22	25	33	**80**
Service Level	**100.0%**	**100.0%**	**100.0%**	**100.0%**

The volume of telephone calls remained low in 16Q4. Of the total of 80 calls received above, only 16 were actual ARCHER user calls that either resulted in queries or answered user questions directly.

2.2.2 Query Closure (QC)

	Oct 16	Nov 16	Dec 16	16Q4
Self-Service Admin	689	646	358	**1693**
Admin	162	189	146	**497**
Technical	24	27	32	**83**
Total Queries	875	862	536	**2273**
Total Closed in 2 Days	862	860	532	**2254**
Service Level	**99.5%**	**99.8%**	**99.3%**	**99.2%**

The above table shows the queries closed by SP during the period.

In addition to the Admin and Technical queries, the following Change Requests were resolved in 16Q4:

	Oct 16	Nov 16	Dec 16	16Q4
Change Requests	2	4	1	**7**

2.2.3 User Registration (UR)

	Oct 16	Nov 16	Dec 16	16Q4
No of Requests	93	69	56	**218**
Closed in One Working Day	90	69	56	**215**
Average Closure Time (Hrs)	1.2	0.6	0.4	**0.8**
Average Closure Time (Working Days)	0.1	0.1	0.1	**0.1**
Service Level	**1 WD**	**1 WD**	**1 WD**	**1 WD**

Note: In October, there were 3 user registrations requests (out of the total of 93) that took between 1 WD and 2 WD to process due to the "Dirty COW" outage. However, the average time taken for user registrations during this month was still less than 2 hours.

To avoid double counting, these requests are not included in the above metrics for "Admin and Technical" Query Closure.

2.3 Additional Metrics

2.3.1 Target Response Times

The following metrics are also defined in Schedule 2.2, but have no Service Points associated.

Target Response Times	
1	During core time, an initial response to the user acknowledging receipt of the query
2	A Tracking Identifier within 5 minutes of receiving the query
3	During Core Time, 90% of incoming telephone calls should be answered personally (not by computer) within 2 minutes
4	During UK office hours, all non telephone communications shall be acknowledged within 1 Hour

1 – Initial Response

This is sent automatically when the user raises a query to the address helpdesk@archer.ac.uk. Users may choose not to receive such emails by mailing support@archer.ac.uk.

2 – Tracking Identifier

This is sent automatically when the user raises a query to the address helpdesk@archer.ac.uk. Users may choose not to receive such emails by mailing support@archer.ac.uk. The tracking identifier is set in the SAFE regardless which option the user selects.

3 – Incoming Calls

These are covered in the previous section of the report. Service Points apply.

4 - Query Acknowledgement

Acknowledgment of the query is defined as when the Helpdesk assigns the new incoming query to the relevant Service Provider. This should happen within 1 working hour of the query arriving at the Helpdesk. The Helpdesk processed the following number of incoming queries during the Service Quarter:

	Oct 16	Nov 16	Dec 16	16Q4
CRAY	4	13	23	**40**
ARCHER_CSE	116	126	27	**269**
ARCHER_SP	1317	1186	746	**3249**

Total Queries Assigned	1437	1325	796	**3558**
Total Assigned in 1 Hour	1437	1325	796	**3558**
Service Level	**100%**	**100%**	**100%**	**100%**

The Service Desk assigns queries to all groups supporting the service i.e. SP, CSE and Cray. The above table includes queries handled by the other groups supporting the service as well as internally generated queries used to manage the operation of the service.

2.3.2 Maintenance

A change in the maintenance arrangements was agreed with the Authority during this quarter. There is now a single day each month (fourth Wednesday of each month) that is marked as a full maintenance session for a maximum of 8 hours taken. There is an additional "at-risk" session that is scheduled for the second Wednesday of each month. This reduces the number of sessions taken, which then reduces user impact since the jobs running on the service have to be drained down once and not twice. It also eases the planning for training courses running on ARCHER.

Such Maintenance Periods are defined as "Permitted Maintenance " and recorded in the Maintenance Schedule. A 6-month forward plan of maintenance has been agreed with the Authority.

Where possible, SP will perform maintenance on an 'At-risk' basis, thus maximising the Availability of the Service. The following planned maintenance took place in the Service Quarter.

Date	Start	End	Duration	Type	Notes	Reason
26/10/16	0800	1229	4 hrs 29 mins	Full Outage	EPSRC Approved 0800 – 2000	Patching for security vulnerability
16/11/16	0800	1835	10 hrs 35 mins	Full Outage	EPSRC Approved 0800 – 2000	Upgrade to CLE 5.2 UP04
23/11/16	0900	1534	6 hrs 34 mins	Full Outage	EPSRC Approved 0900 – 1700	Upgrade to CLE 5.2 UP04

2.3.3 "Dirty COW" Issue

To prevent unauthorised access to user data due to the recent worldwide Linux security vulnerability (https://en.wikipedia.org/wiki/Dirty_COW, http://www.bbc.co.uk/news/technology-37728010), user access to ARCHER was removed between 24 and 26 October 2016. Once a vendor fix was received to prevent the vulnerability, this was tested, applied and access to the service restored as quickly as possible.

2.3.3 Quality Tokens

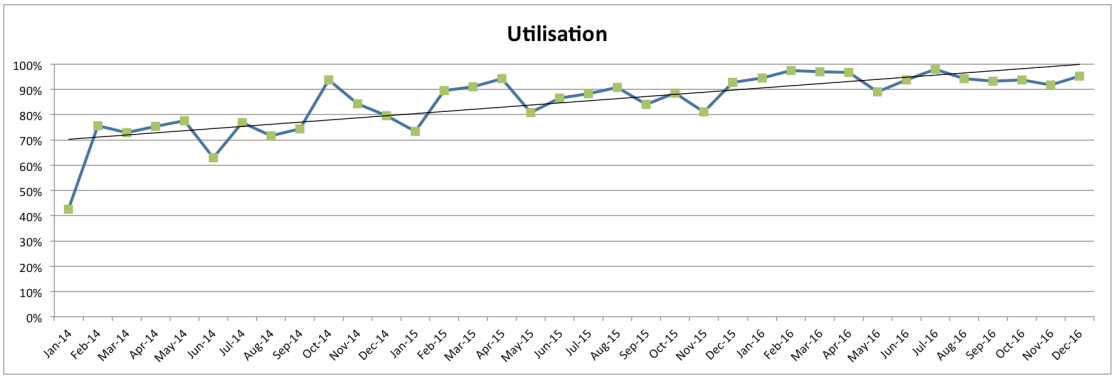
No quality tokens have been received this quarter.

3. Service Statistics

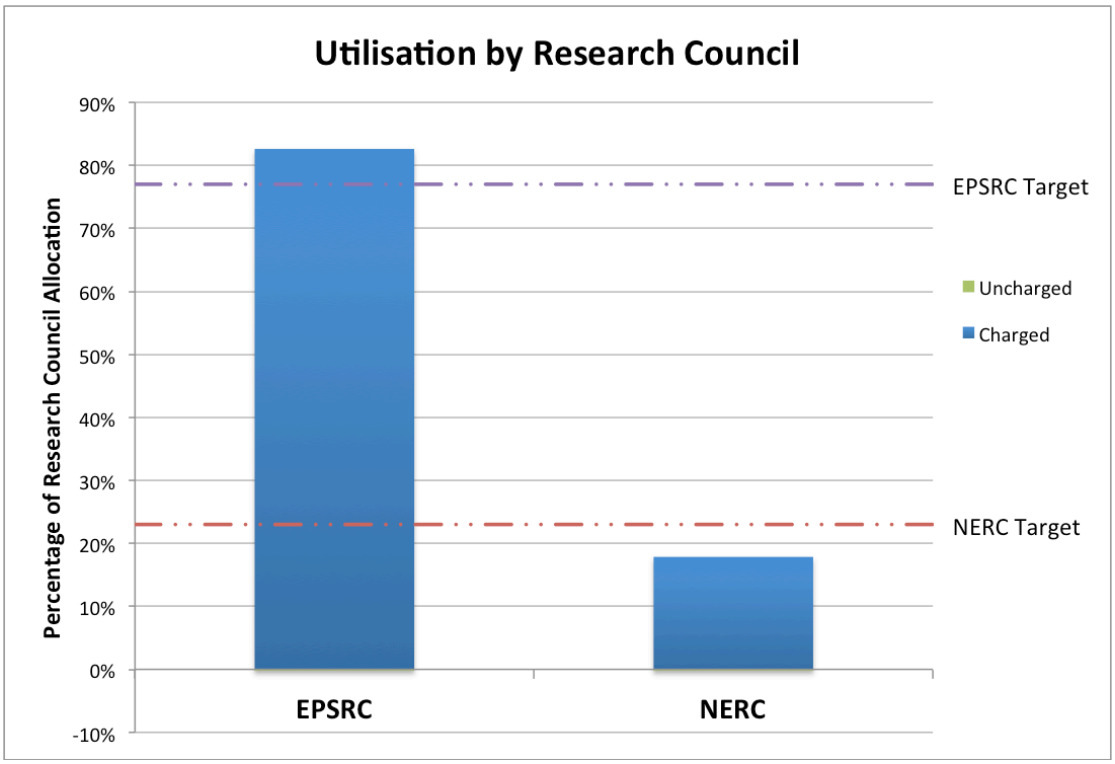
This section contains statistics on the ARCHER service as requested by EPSRC, SAC and SMB.

3.1 Utilisation

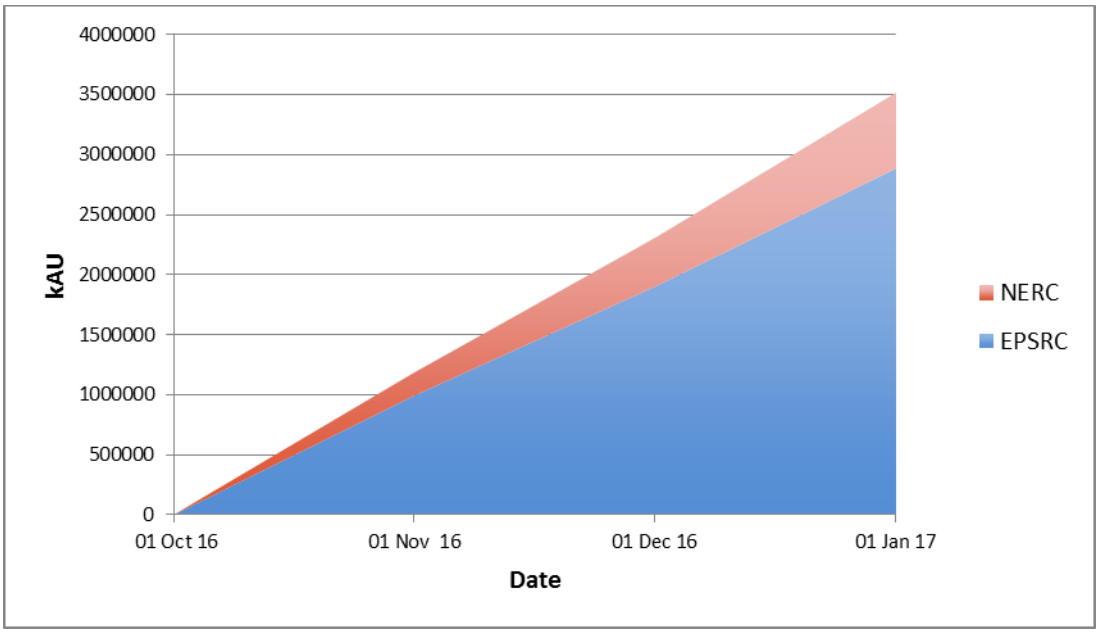
Utilisation over the quarter was 94%. The plot below shows a steady increase in utilisation over the lifetime of the service to Dec 2015 and since then the service has effectively been operating at maximum capacity as shown by the steady utilisation value:



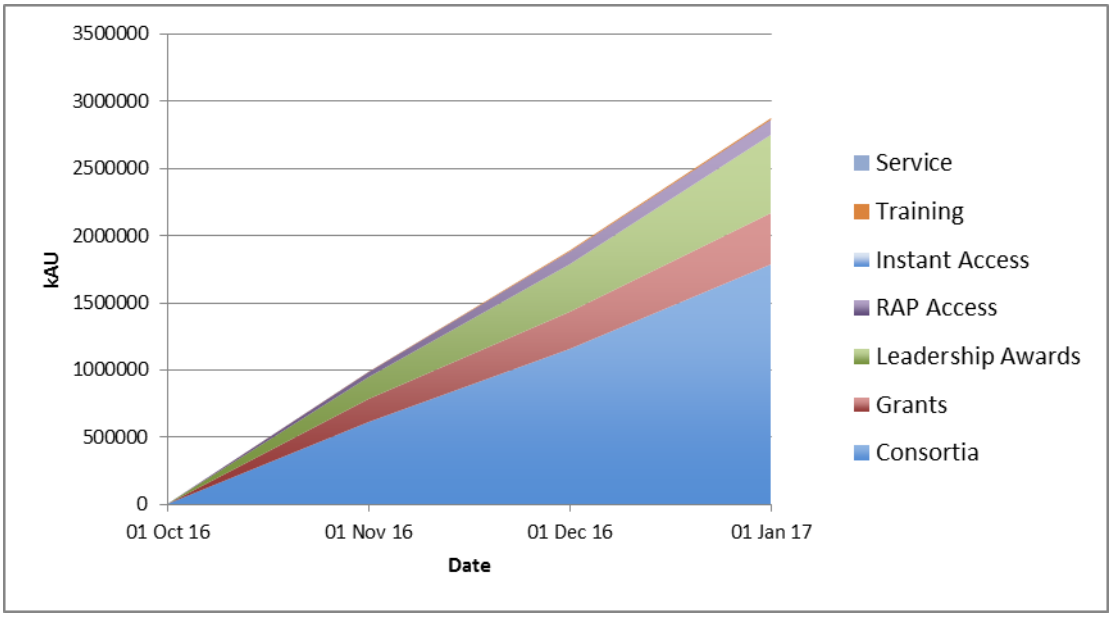
The utilisation by the Research Councils, relative to their respective allocations, is presented below. This bar chart shows the usage of ARCHER by the two Research Councils presented as a percentage of the total Research Council allocation on ARCHER. It can be seen that the EPSRC utilisation exceeded their 77% target this quarter and was 81%, whereas NERC utilisation was 17% with their target being 23%.



The cumulative allocation utilisation for the quarter by the Research Councils is shown below:

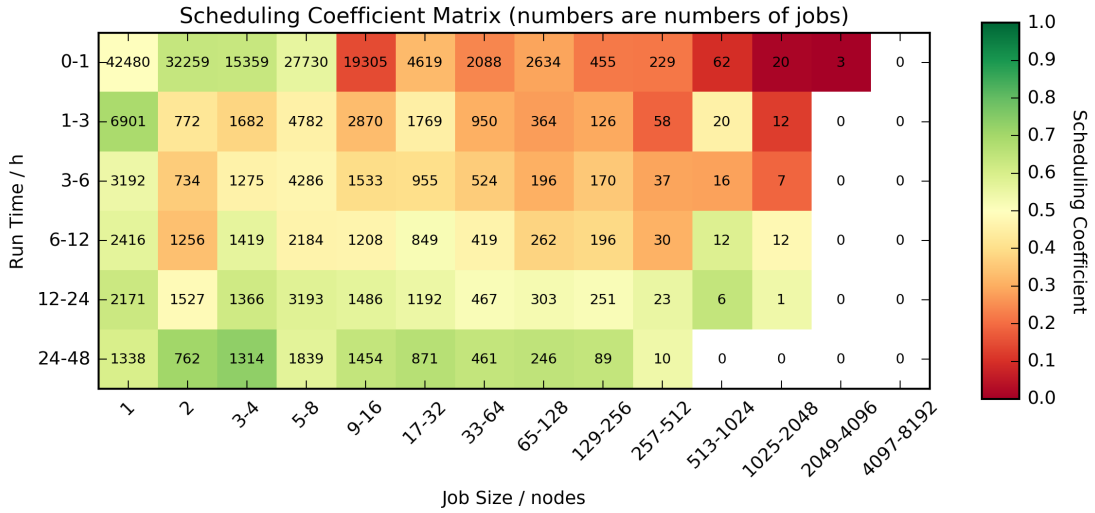


The cumulative allocation utilisation for the quarter by EPSRC broken down by different project types (see below) shows that the majority of usage comes from the scientific Consortia (as expected) with significant usage from research grants, ARCHER Leadership projects and ARCHER RAP projects. The times used by Instant Access projects, training projects and general service usage are very small.



3.2 Scheduling Coefficient Matrix

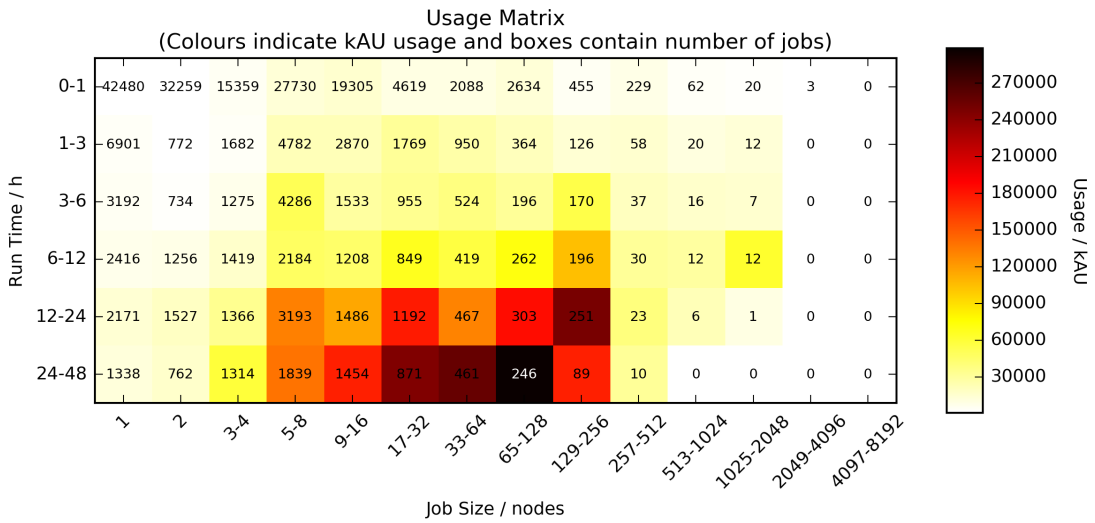
The colour in the matrix indicates the value of the Scheduling Coefficient. This is defined as the ratio of runtime to runtime plus wait time. Hence, a value of 1 (green) indicates that a job ran with no time waiting in the queue, a value of 0.5 (pale yellow) indicates a job queued for the same amount of time that it ran, and anything below 0.5 (orange to red) indicates that a job queued for longer than it ran.



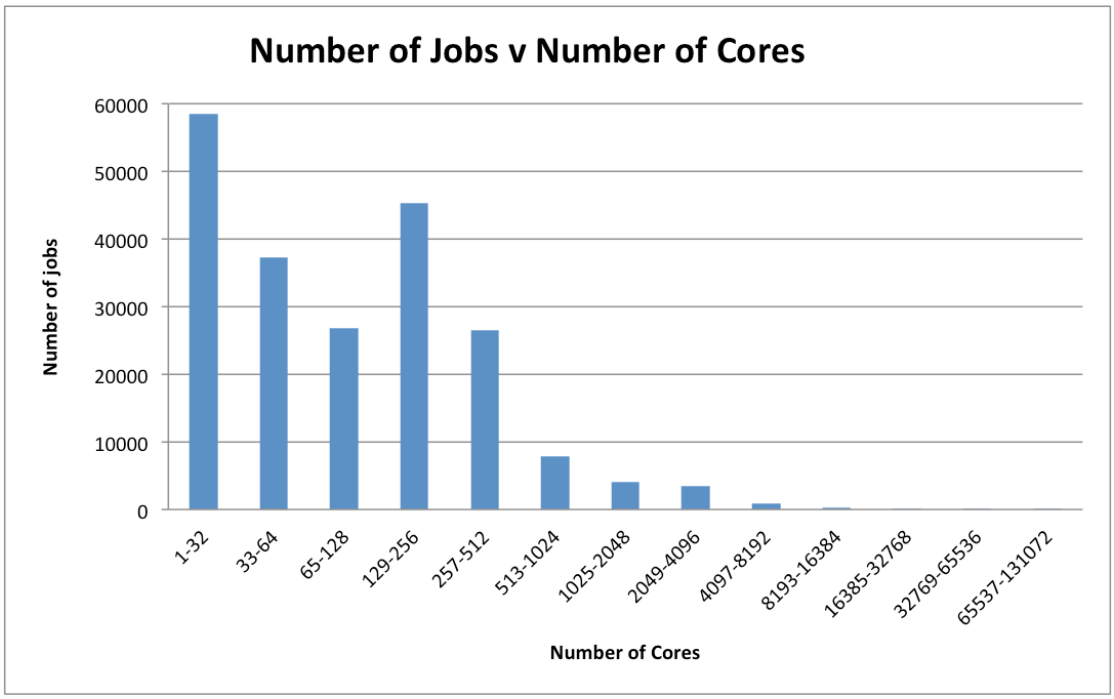
3.3 Additional Usage Graphs

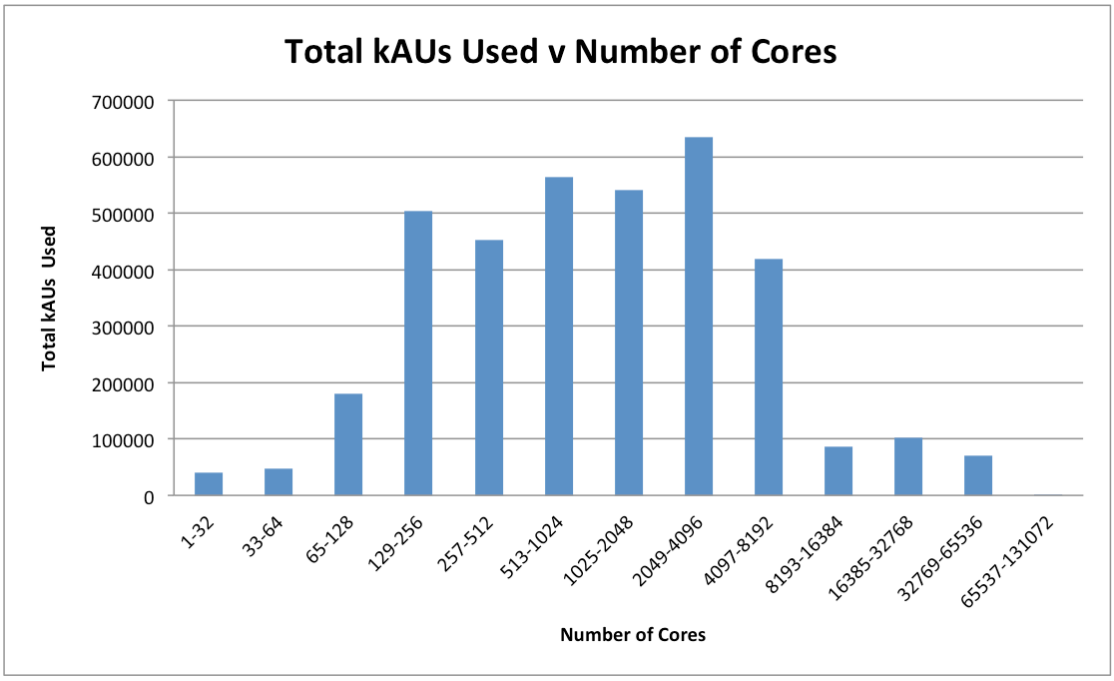
The following charts provide different views of the distribution of job sizes on ARCHER.

The usage heatmap below provides an overview of the usage on ARCHER over the quarter for different job sizes/lengths. The colour in the heatmap indicates the number of kAU expended for each class, and the number in the box is the number of jobs of that class.



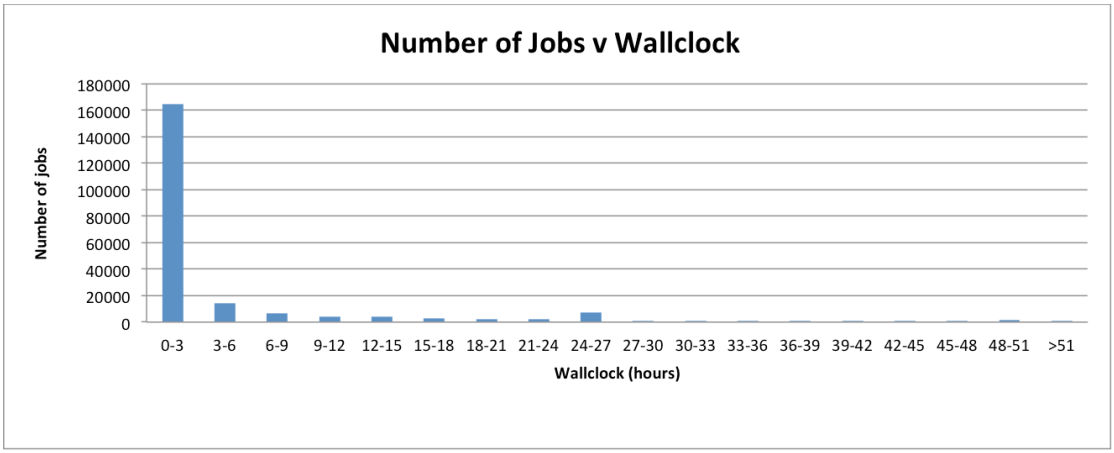
Analysis of Job Sizes

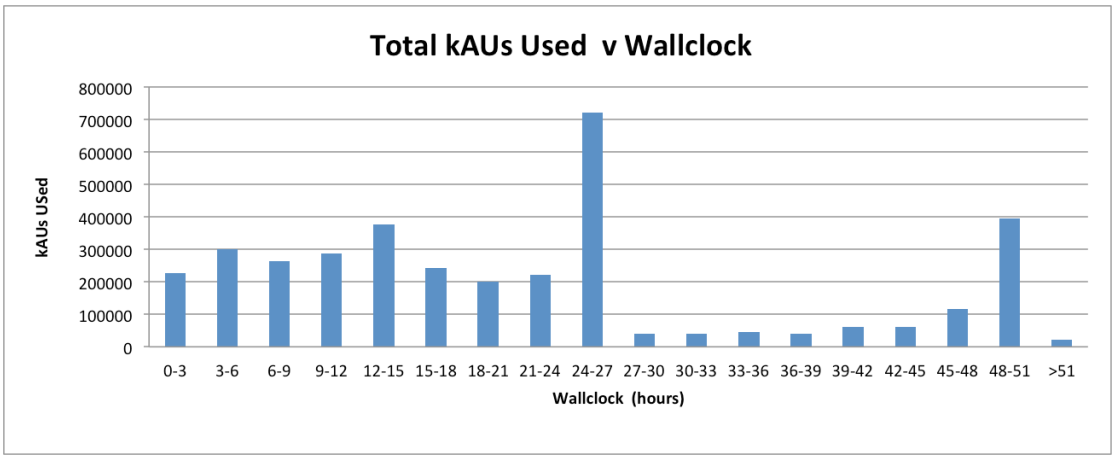




The first graph shows that, in terms of numbers, there are a significant number of jobs using no more than 256 cores. However, the second graph reveals that most of the kAUs were spent on jobs between 257 cores and 8192 cores. The number of kAUs used is closely related to money and shows better how the investment in the system is utilised.

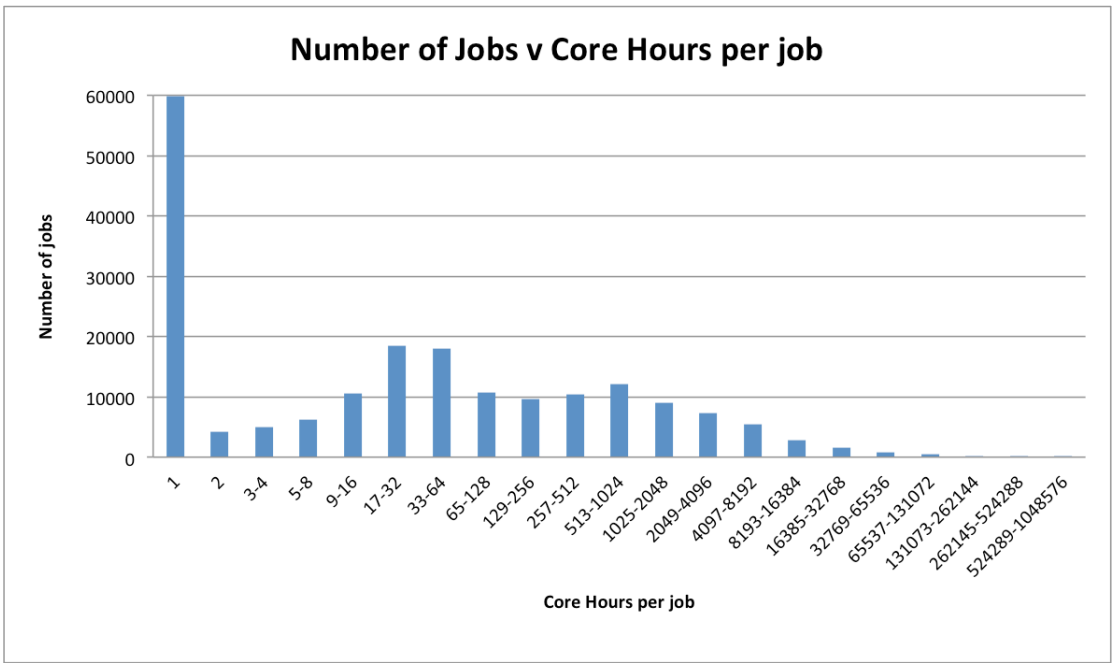
Analysis of Jobs Length

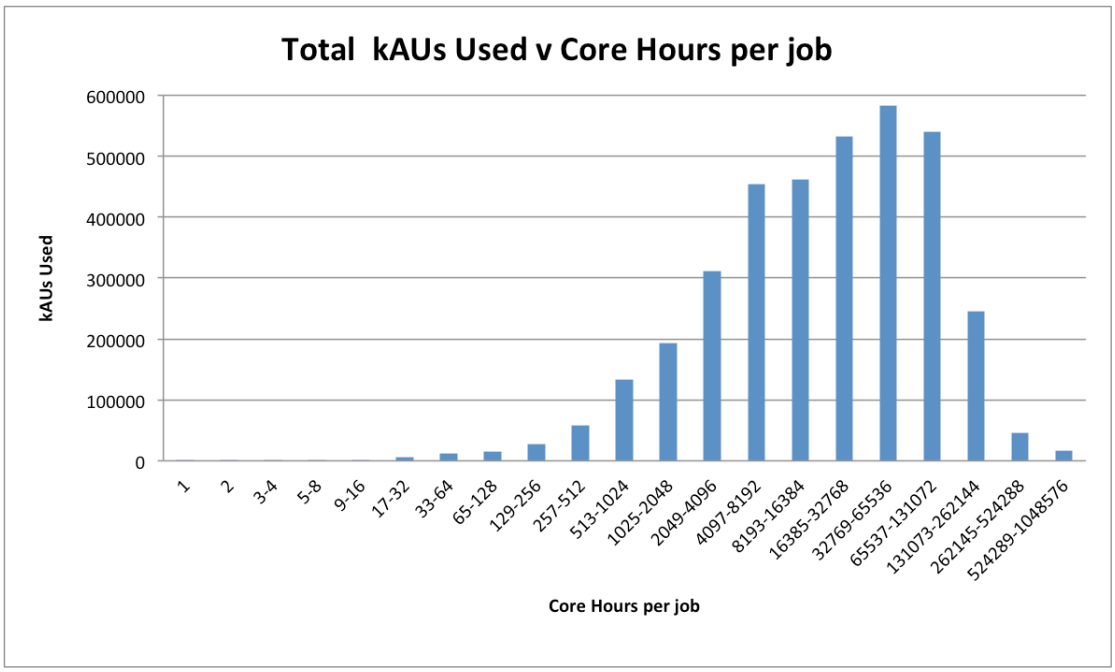




From the first graph, it would appear that the system is dominated by short jobs. However, the second graph shows that actual usage of the system is more spread and dominated by jobs of up to 27 hours with a second peak for jobs at 48-51 hours.

Core Hours per Job Analysis





Appendix – Infrastructure report

There is nothing to report regarding infrastructure work within this quarter.