

# HPCx Service Report

## July 2007

### 1 Introduction

This report covers the period from 0800 on 1 July 2007 to 0800 on 1 August 2007, a service month of 744 hours.

Overall utilisation of the main service fell back to around 65%. Utilisation of the development service continues to be exceptionally high, at nearly 97%. For the sixth month running, there were no SEV1 incidents;

### 2 Usage

#### 2.1 Availability

##### *Incidents*

During this month, there were six incidents, none of which were at SEV1. The following table indicates the severity levels of the incidents, where SEV1 is defined as a *Failure* (in contractual terms). The definitions used for severity levels can be found in Appendix A.

<i>Severity</i>	<i>Number</i>
1	0
2	1
3	5
4	0

The MTBF figures for this month were as follows:

<i>SEV1</i>	<i>Incidents</i>	<i>MTBF</i>
IBM	0.0	$\infty$
Site	0.0	$\infty$
External	0.0	$\infty$
<i>Overall</i>	0.0	$\infty$

## *Serviceability*

Scheduled downtime for this month was 9.45 hours.

<i>Attribution</i>	<i>UDT</i>	<i>Serviceability</i>
IBM	0:00	100.0
Site	0:00	100.0
External	0:00	100.0
<i>Overall</i>	0:00	100.0

## 2.2 CPU Usage by Consortium

### Main Service

<i>Consortium</i>	<i>CPU Hours (Parallel)</i>	<i>CPU Hours (Other)</i>	<i>AUs charged</i>	<i>%age of charged AUs</i>
e01	127192	64	582872	10.8%
e03	0	0	0	0.0%
e05	172179	1853	815882	15.1%
e06	2016	0	9707	0.2%
e08	23520	0	113236	2.1%
e11	10540	0	50744	0.9%
e17	0	0	0	0.0%
e18	2040	0	9822	0.2%
e24	124838	1	601030	11.2%
e25	396	0	1907	0.0%
e31	10866	3	52327	1.0%
e33	55500	68	267530	5.0%
e35	81263	28	391371	7.3%
e37	39266	0	189042	3.5%
e38	981	0	4723	0.1%
e39	12079	0	58153	1.1%
e41	135	0	650	0.0%
e42	162828	6	783952	14.6%
e46	808	0	3889	0.1%
e49	752	6	3649	0.1%
e50	14266	0	68683	1.3%
e51	33	0	159	0.0%
e53	1010	10	4910	0.1%
e59	189	0	907	0.0%
e61	39743	29	191478	3.6%
<i>EPSRC Total</i>	882445	2068	4206658	78.1%

n01	48801	0	234948	4.4%
n02	123621	21	595269	11.1%
n03	47228	49	227612	4.2%
n04	2834	83	14045	0.3%
<i>NERC Total</i>	222484	153	1071875	19.9%

p01	1568	31	7699	0.1%
<i>PPARC Total</i>	1568	31	7699	0.1%

c01	1888	4	9112	0.2%
<i>CCLRC Total</i>	1888	4	9112	0.2%

b08	12907	0	62141	1.2%
<i>BBSRC Total</i>	12907	0	62141	1.2%

x01	1733	0	8342	0.2%
<i>External Total</i>	1733	0	8342	0.2%

z001	2445	13	11834	0.2%
z004	1901	28	9288	0.2%
z006	0	0	0	0.0%
<i>HPCx Total</i>	4347	41	21124	0.4%

### *Development Service*

<i>Consortium</i>	<i>CPU Hours (Parallel)</i>	<i>CPU Hours (Other)</i>	<i>AUs charged</i>	<i>%age of charged AUs</i>
n01	3	0	16	0.0%
n02	132002	190	636431	96.7%
n03	117	0	561	0.1%
n04	4453	0	21436	3.3%
<i>NERC Total</i>	136574	191	658444	100.0%

## 2.3 CPU Usage by Job Type

The figures for *Raw AUs* given here show the number of AUs actually supplied by the system to users' jobs.

### *Main service*

<i>Number of processors</i>	<i>Raw AUs</i>	<i>%age</i>	<i>Number of jobs</i>
≤32	488028	9.0%	3632
33–64	522156	9.6%	959
65–128	1461639	26.9%	989
129–256	2257011	41.6%	869
257–512	619150	11.4%	128
513–1024	79587	1.5%	68
>1024	105	0.0%	1

Overall utilisation of the main service was 64.84%. Capability usage was 12.9% of the total.

### *Development Service*

<i>Number of processors</i>	<i>Raw AUs</i>	<i>%age</i>	<i>Number of jobs</i>
≤32	642413	97.7%	7303
33–64	14496	2.2%	88
65–128	618	0.1%	1
129–256	0	0.0%	0

Overall utilisation of the development service was 96.88%.

## 2.4 Slowdown and Job Wait Times

### *Slowdowns*

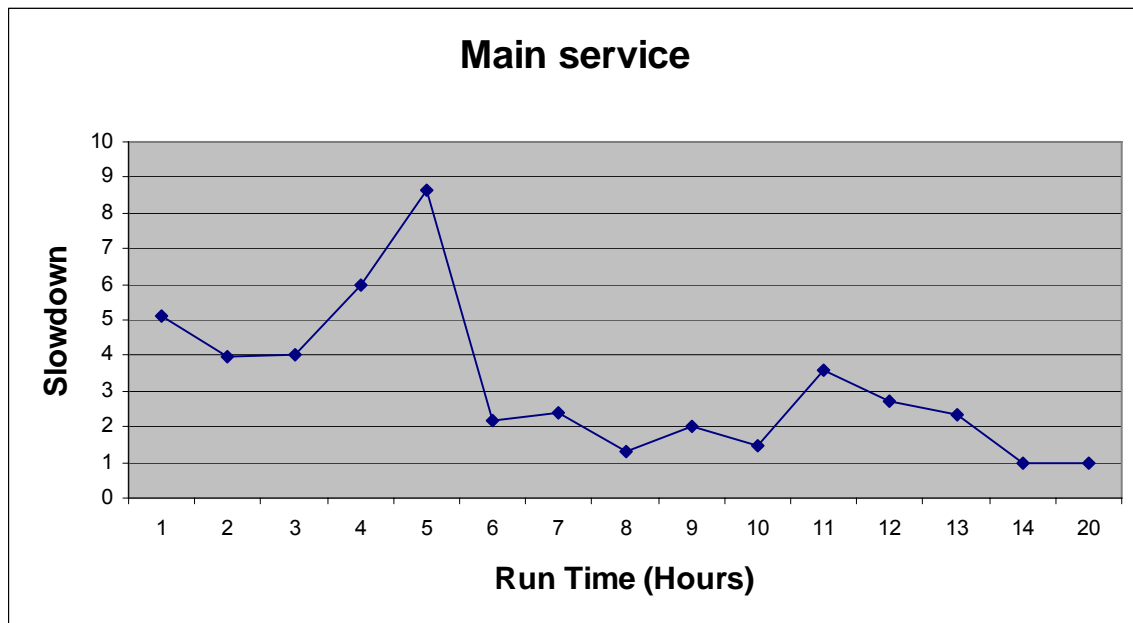
Slowdown is a widely used measure of the relative wait times of different classes of jobs. It is defined as:

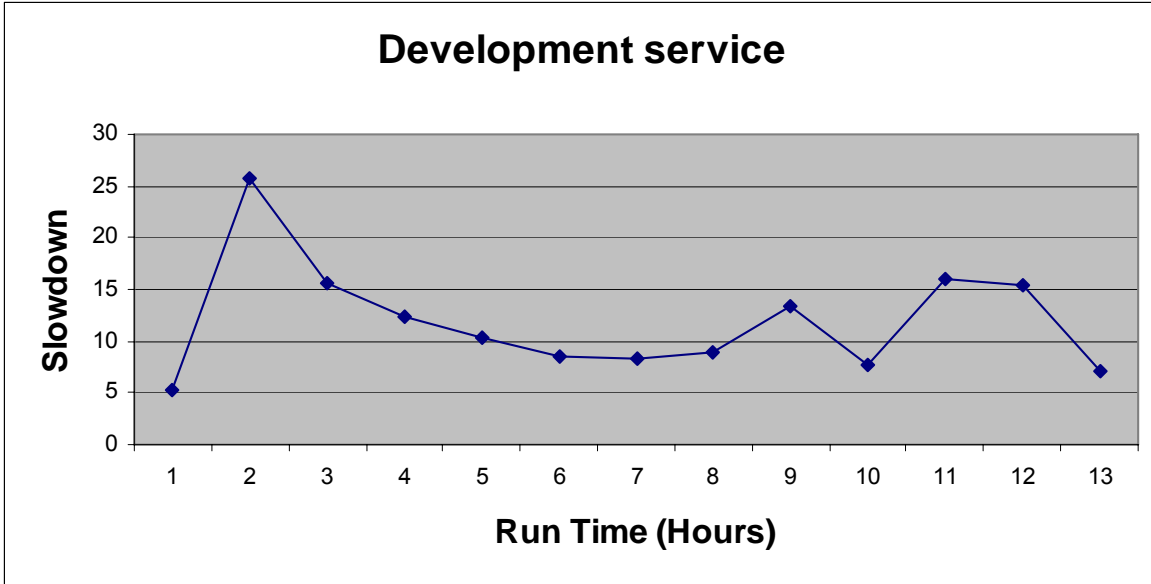
$$\text{Slowdown} = (\text{job run time} + \text{job wait time}) / (\text{job run time})$$

Slowdowns of less than around 10 are usually regarded as reasonable.

### *Slowdowns by runtime*

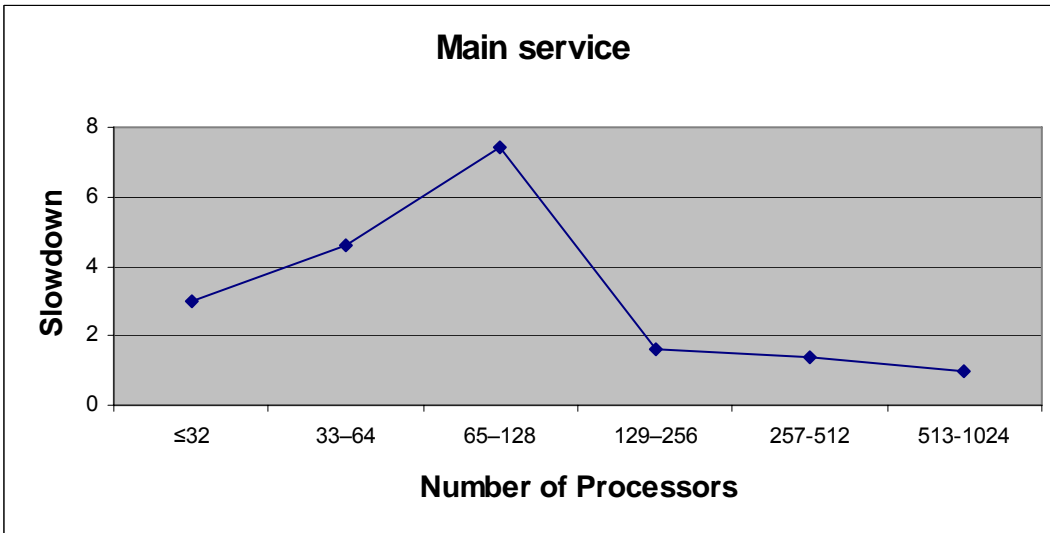
The following graphs show the slowdowns recorded for jobs of differing run times, ignoring those which ran for less than 5 minutes.

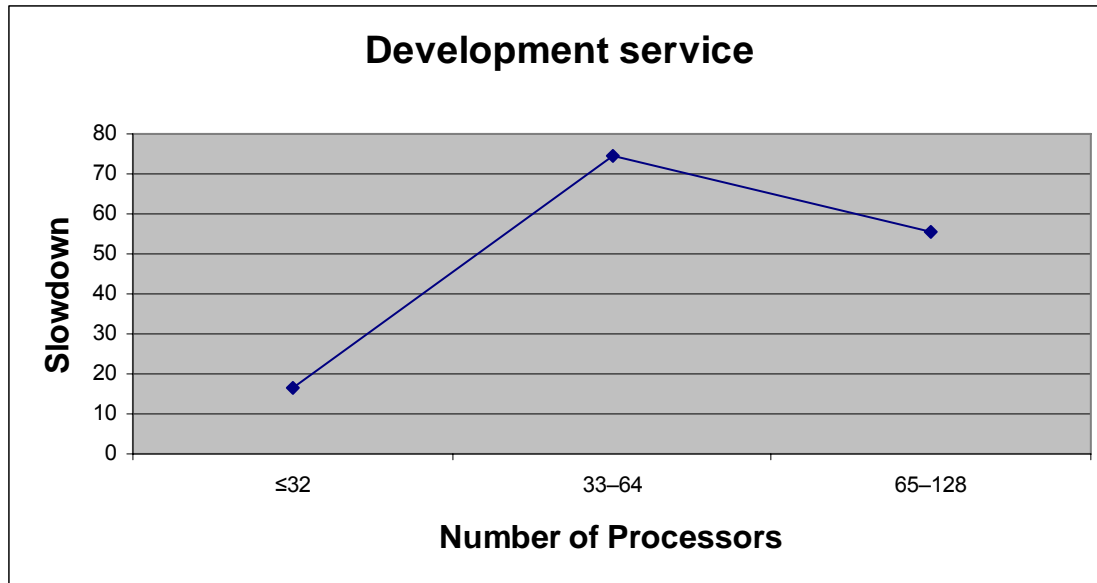




*Slowdowns by number of processors*

In the graphs below, we plot the slowdown figures against the number of processors used. Only jobs which ran for more than 1 hour are included.





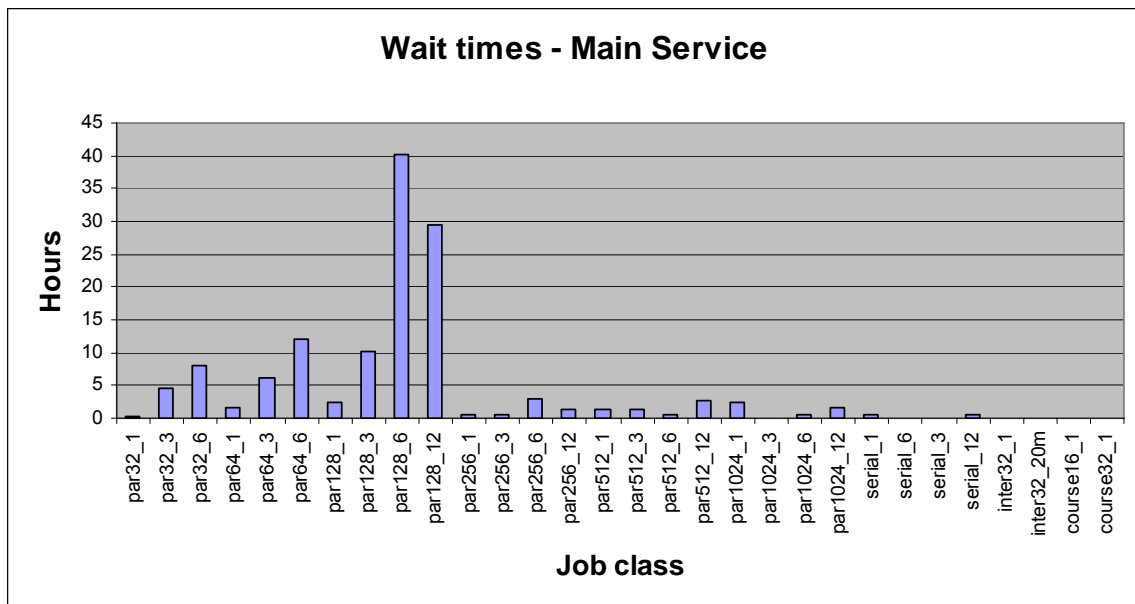
On both services, slowdowns are currently generally satisfactory. On the development service, the very heavy utilisation has resulted in larger slowdowns on jobs using more than 32 processors (6 jobs out of 577).

#### *Job wait times – main service*

The following table and graph shows the average wait time (in hours) for each class of job on the main service. Once again, the relatively long wait times for long 128-processor jobs are attributable to the high utilisation of the capacity region.

<i>Job Class</i>	<i>Category</i>	<i>Maximum Number of CPUs</i>	<i>Maximum Job length</i>	<i>Average wait time</i>	<i>Number of Jobs</i>
par32_1	parallel	32	1	0.2	2690
par32_3	parallel	32	3	4.6	42
par32_6	parallel	32	6	8.0	900
par64_1	parallel	64	1	1.7	541
par64_3	parallel	64	3	6.0	21
par64_6	parallel	64	6	12.2	397
par128_1	parallel	128	1	2.5	535
par128_3	parallel	128	3	10.1	102
par128_6	parallel	128	6	40.2	105
par128_12	parallel	128	12	29.5	247
par256_1	parallel	256	1	0.4	294
par256_3	parallel	256	3	0.6	188
par256_6	parallel	256	6	3.0	53
par256_12	parallel	256	12	1.5	334
par512_1	parallel	512	1	1.4	51

par512_3	parallel	512	3	1.3	22
par512_6	parallel	512	6	0.6	21
par512_12	parallel	512	12	2.7	34
par1024_1	parallel	1024	1	2.4	48
par1024_3	parallel	1024	3	0.0	0
par1024_6	parallel	1024	6	0.4	18
par1024_12	parallel	1024	12	1.5	2
serial_1	serial	1	1	0.6	3611
serial_6	serial	1	6	0.0	199
serial_3	serial	1	3	0.0	27
serial_12	serial	1	12	0.5	106
inter32_1	interactive	32	1	0.0	0
inter32_20m	interactive	32	1	0.0	2718
course16_1	interactive	16	1	0.0	0
course32_1	parallel	32	1	0.0	0

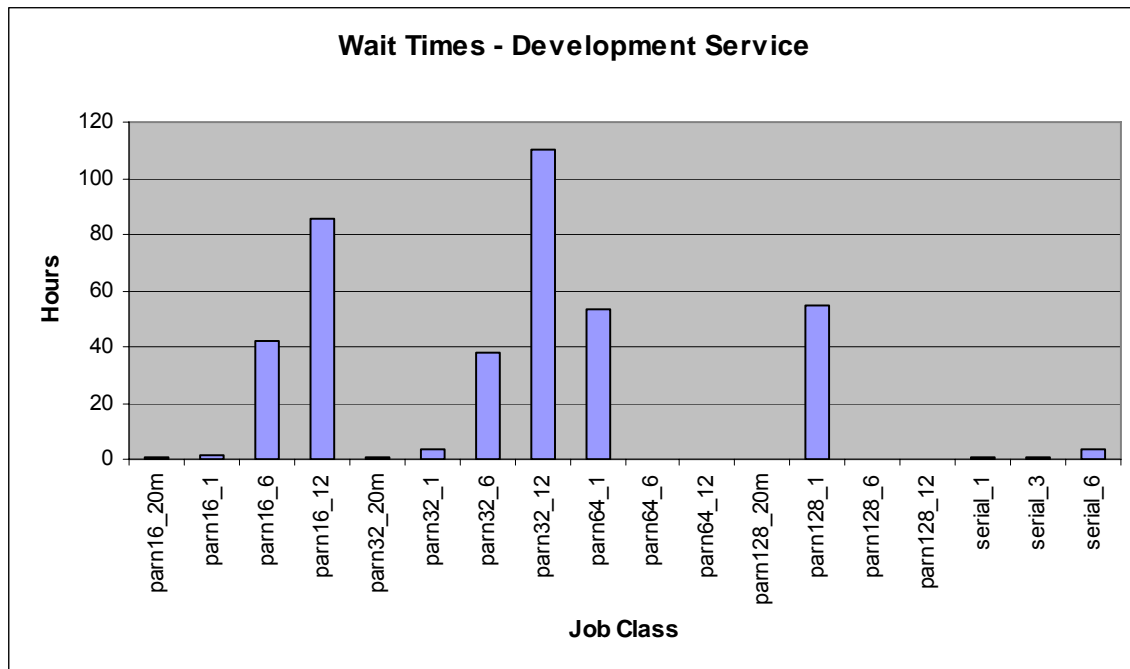


### Job wait times – development service

As we noted last month, wait times on the development service have lengthened to some degree, as a result of the exceptionally high utilisation of the service (96.88%).

Job Class	Category	Maximum Number of CPUs	Maximum Job length	Average wait time	Number of Jobs
parn16_20m	parallel	16	20 mins	0.4	1992
parn16_1	parallel	16	1 hour	1.2	3249
parn16_6	parallel	16	6 hours	42.3	209

parn16_12	parallel	16	12 hours	85.7	191
parn32_20m	parallel	32	20 mins	1.0	458
parn32_1	parallel	32	1 hour	3.6	1031
parn32_6	parallel	32	6 hours	37.6	16
parn32_12	parallel	32	12 hours	110.0	157
parn64_1	parallel	64	1 hour	53.5	88
parn64_6	parallel	64	6 hours	0.0	0
parn64_12	parallel	64	12 hours	0.0	0
parn128_20m	parallel	128	20 mins	0.0	0
parn128_1	parallel	128	1 hour	54.5	1
parn128_6	parallel	128	6 hours	0.0	0
parn128_12	parallel	128	12 hours	0.0	0
serial_1	serial	1	1 hour	0.4	6375
serial_3	serial	1	12 hours	0.4	28
serial_6	serial	1	12 hours	3.5	23



## 2.5 Disk Occupancy

### *Home Space*

Home space is the part of the disk space that is regularly backed up.

<i>Consortium</i>	<i>Disc Occupancy (Mb)</i>	<i>Disc Quota (Mb)</i>
b08	19,221	50,000
c01	163,169	300,000
e01	183,912	199,995
e05	68,167	113,000
e06	288,087	300,000
e08	96,000	100,000
e14	97,348	100,000
e17	48,574	50,000
e33	15,944	50,000
e35	98,145	100,000
e42	54,835	100,000
e46	7,002	50,000
e49	34,236	50,000
e55	1,664	50,000
e62	191	50,000
n02	168,776	298,000
n03	99,926	99,998
n04	278,905	299,999
p01	171,718	200,000
z001	498,818	499,999
z002	24,204	100,000
z004	99,571	100,000
z06	62,913	75,000
z07	38,136	50,000
z10	1,233	50,000

### *Workspace*

<i>Consortium</i>	<i>Disc Occupancy (Mb)</i>	<i>Disc Quota (Mb)</i>
e01	1,100,551	1,349,995
e05	85,540	100,000
e33	84,190	100,000
e42	294,559	400,000
e50	45,455	
e53	1,127	150,000

e61	24,335	100,000
n01	224,868	800,000
n02	2,904,873	4,075,964
n04	549,999	550,000
z001	478,745	499,999
z004	10,865	25,000
z07	5	20,000

*Development service space*

This is the disk space reserved for users of the development service.

<i>Consortium</i>	<i>Disc Occupancy (Mb)</i>	<i>Disc Quota (Mb)</i>
n02	6,229,618.40	9,499,000

## 2.6 Tape Archive

<i>Consortium</i>	<i>Usage (Tapes)</i>	<i>Quota (Tapes)</i>	<i>Files</i>	<i>Data (Gb)</i>
c01	2	2	7,231	65
e01	70	70	429,774	6,339
e03	5	5	18,797	429
e14	10	10	391,623	595
e15	1	3	26	6
e24	10	10	7,785	803
e26	2	2	545	27
e42	10	10	29,481	447
n01	313	325	35,162	33,686
n02	579	585	691,688	64,804
n04	28	30	116,775	3,740
z001	7	10	11,045	67
z002	2	3	5,801	15
z06	1	3	833	68

Note that a tape is counted in the *Usage* column even if it is only partly occupied.

## 3 Support

### 3.1 Helpdesk

#### *Classifications*

<i>Service metric</i>	<i>Number</i>	<i>% of all</i>
Administrative	35	52.2%
Technical	22	32.8%
In-depth	7	10.4%
Technical assessment	3	4.5%
PMR	0	0.0%
<i>Total</i>	67	100.0%

The *PMR* service metric includes in-depth queries that result in Problem Management Reports for IBM. The *Technical Assessment* metric has been added since technical assessments are now being handled through the helpdesk, for compatibility with the HECToR procedure.

In place of the former *Service Area* information we shall supply a breakdown of queries by subject category.

<i>Category</i>	<i>Number</i>	<i>% of all</i>
3rd party software	13	19.1%
Batch system and queues	10	14.7%
Disks, tapes, resources	8	11.8%
Access to HPCx	8	11.8%
Other	6	10.3%
Login, passwords, ssh	6	8.8%
Compilers and system software	5	7.4%
User behaviour	4	5.9%
User programs	3	4.4%
Courses	2	2.9%
Static website	1	1.5%
SAFE	1	1.5%
<i>Total</i>	67	100.0%

*Performance*

<i>Metric</i>	<i>Achieved</i>	<i>Total</i>	<i>Fraction</i>	<i>Target</i>
Administrative queries - two days	33	35	94%	97%
All queries - three days	57	57	100%	97%
All queries - one day	43	57	75%	75%

*Query handlers*

<i>Handler</i>	<i>Technical</i>	<i>In-depth</i>	<i>Admin</i>	<i>PMR</i>	<i>Technical assessment</i>
Sysadm	5	2	14	0	
DL	4	1	2	1	3
EPCC	13	4	17	0	

## **3.2 Training**

There were no training courses this month.

## 4 Staffing

### 4.1 Science Support Staffing

#### *Daresbury Laboratory*

<i>Name</i>	<i>Days</i>
Ashworth	12.3
Blake	1.7
Bush	19.0
Johnstone	3.6
Jones	2.9
Plummer	8.0
Sunderland	20.0
Todorov	10.5
Total (Days)	78.0
FTEs	4.4

#### *EPCC*

<i>Name</i>	<i>Days</i>
Simpson	12.4
Booth	8.3
Henty	7.7
Smith	0.0
Bull	10.8
Fisher	2.5
Hein	18.3
Jackson	3.4
Reid	11.4
Stratford	6.7
Nazarova	1.8
Trew	4.3
Gray	12.8
D'Mellow	16.9
Hill	10.1
Johnson	0.8

Maynard	1.0
Weiland	11.1
Collard	3.7
Other Staff	44.0
<i>Total (Days)</i>	188.1
<i>FTEs</i>	10.6

*Overall Levels*

	<i>FTEs</i>
DL	4.4
EPCC	10.6
Total	15.0

**4.2 Systems Staffing**

<i>Name</i>	<i>Days</i>
Andrews	17.1
Brown	22.0
Fisher	11.0
Georgeson	18.9
Franks	13.5
Jones	0.7
BITD	21.0
<i>Total (days)</i>	104.2
<i>FTEs</i>	5.9

*Note:* BITD covers a range of bookings from a support department who provide approximately 1 FTE to support computer room operations, electrical and mechanical site services and networking and security. Roughly a dozen staff charge time to the project in amounts which vary from month to month. We believe that it adds no value to report these individual bookings although a full listing can be provided annually if required.

## 5 Summary of Performance Metrics

<i>Metric</i>	<i>TSL</i>	<i>FSL</i>	<i>Monthly Measurement</i>
Technology serviceability	80%	99.2%	100.0%
Technology MTBF (hours)	200	300	∞
Number of AV FTEs	7.5	10	15.0
Number of training days per month	20/12	25/12	13/7
Non in-depth queries resolved within 3 days	85%	97%	100.0%
Number of A&M FTEs	3.75	5.75	5.9
A&M serviceability	80%	99.6%	100.0%

## Appendix A: Incident Severity Levels

**SEV 1** — anything that comprises a FAILURE as defined in the contract with EPSRC.

**SEV 2** — NON-FATAL incidents that typically cause immediate termination of a user application, but not the entire user service.

The service may be so degraded (or liable to collapse completely) that a controlled, but unplanned (and often very short-notice) shutdown is required or unplanned downtime subsequent to the next planned reload is necessary.

This category includes unrecovered disc errors where damage to filesystems may occur if the service was allowed to continue in operation; incidents when although the service can continue in operation in a degraded state until the next reload, downtime at less than 24 hours notice is required to fix or investigate the problem; and incidents whereby the throughput of user work is affected (typically by the unrecovered disabling of a portion of the system) even though no subsequent unplanned downtime results.

**SEV 3** — NON-FATAL incidents that typically cause immediate termination of a user application, but the service is able to continue in operation until the next planned reload or re-configuration.

**SEV 4** — NON-FATAL recoverable incidents that typically include the loss of a storage device, or a peripheral component, but the service is able to continue in operation largely unaffected, and typically the component may be replaced without any future loss of service.

## Appendix B: Projects

### B.1 Current Projects

#### EPSRC Projects

<i>Code</i>	<i>Class</i>	<i>Title</i>	<i>PI</i>
e01	1	UK Turbulence Consortium	Dr Gary Coleman
e05	1	Materials Chemistry using Terascaling Computing	Prof Richard Catlow
e06	1	UK Car-Parrinello Consortium	Prof Paul Madden
e08	2	Organic Solid State	Prof Sarah Price
e10	1	Reality Grid	Prof Peter Coveney
e11	1	Bond making and breaking at surfaces	Prof Sir David A King
e14	1	Blade and Cavity Noise	Prof Neil Sandham
e15	2	CSAR/HPCx Collaboration	Dr Mike Pettipher
e16	1	Cardiac virtual tissues	Prof Arun V Holden
e17	1	Integrative Biology	Dr David Gavaghan
e18	1	DARP: Highly swept leading edge separations	Prof Michael A Leschziner
e19	1	Edinburgh Soft Matter and Statistical Physics Group	Prof Michael E Cates
e20	1	UK Applied Aerodynamics Consortium	Dr Ken Badcock
e21	1	Intrinsic Parameter Fluctuations in Decananometer MOSFETs	Prof Asen M Asenov
e22	1	Preconditioners for finite element problems	Prof David J Silvester
e23	1	Exploitation of Switched Lightpaths for e-Science Applications	Prof Peter Clarke
e24	1	DEISA - Distributed European Infrastructure for Supercomputing Applications	Dr David Henty
e25	1	Turbulent vortex motion in stratified flows	Dr Gary Coleman
e26	1	Simulation of Radioprobing	Dr Charlie Laughton
e27	1	SPICE	Prof Peter V Coveney
e29	1	Free-surface-piercing circular cylinders	Dr Eldad Avital

e30	1	Metal/Oxide Interfaces at the Atomic Level	Dr Nora de Leeuw
e31	1	Lateral Straining of Wall-Bounded Turbulence	Dr Gary N Coleman
e32	1	Rapid Prototyping of Usable Grid Middleware	Prof Peter V Coveney
e33	1	Engineering Functional Coatings	Prof Roger Smith
e34	1	Dissolution of Bioactive Phosphate Glasses	Dr N de Leeuw
e35	1	Non-adiabatic processes	Dr T Todorov
e36	1	Jets in Cross-Flow	Dr Y Yao
e37	1	LESUK_3	Prof J J McGuirk
e38	1	Viscoelastic deformation in 3D non-linear media	Prof Greg A Houseman
e39	1	The Supergen 5 biological fuel cells consortium	Prof FA Armstrong
e40	1	Computational Quantum Many-Body Theory	Prof R Needs
e41	1	Flow in Weapon Bays	Dr George N Barakos
e42	1	Computational Combustion for Engineering Applications	Prof K Luo
e44	1	Extreme Wave Loading on Offshore Wave Energy Devices	Dr Deborah Greaves
e45	1	Metals under extreme conditions	Prof Mike Gillan
e46	1	Advanced materials with complex architectures	Dr Paul Mummery
e47	1	Parallel stochastic analysis for geo-engineering	Dr Michael A. Hicks
e48	1	Organised structure in turbulent flows	Prof Sergei Chernyshenko
e49	1	Integrated Programme of Research in Aeronautical Engineering	Prof Michael Leschziner
e50	1	Biological interface with materials	Prof John Harding
e51	1	Super-computing data mining	Dr Mike Pettipher
e52	1	Spacecraft force modelling	Dr M Ziebart
e53	1	Large-scale communication networks	Prof J M Pitts
e54	1	Free surface simulation of waves overtopping during storms	Dr D M Ingram

e55	1	High-Reynolds-Number Near-Wall Flows	Prof Michael Leschziner
e56	1	Infectious disease threats	Dr Iain Barrass
e57	1	Triplex DNA Structures	Dr Hooshang Nikjoo
e58	1	Quantum Simulations for Chemical Biology	Dr Carmen Domene
e59	1	Turbulence in breaking gravity waves	Prof Ian Castro
e60	1	Device Electronics Based on nanoWires and NanoTubes	Dr Merlyne M de Souza
e61	1	Enhancement of droplet concentrations in clouds	Dr Alan A M Gadian
e62	1	Low Voltage Defibrillation	Dr Vadim Biktashev

### PPARC Projects

<i>Code</i>	<i>Class</i>	<i>Title</i>	<i>PI</i>
p01	1	Atomic Physics and Astrophysics	Prof Alan Hibbert

### NERC Projects

<i>Code</i>	<i>Class</i>	<i>Title</i>	<i>PI</i>
n01	1	Large-Scale Long-Term Ocean Circulation	Dr David Webb
n02	1	NCAS	Prof Alan J Thorpe
n03	1	Computational Mineral Physics Consortium	Dr John Brodholt
n04	1	Shelf Seas Consortium	Dr Roger Proctor

### BBSRC Projects

<i>Code</i>	<i>Class</i>	<i>Title</i>	<i>PI</i>
b02	1	Modelling enzyme catalysis	Dr Adrian J Mulholland
b08	1	IntBioSim	Prof M S Sansom

### CCLRC Projects

<i>Code</i>	<i>Class</i>	<i>Title</i>	<i>PI</i>
c01	1	Daresbury Laboratory Facilities Agreement Consortium	Dr Richard J Blake

## Externally-funded Projects

<i>Code</i>	<i>Title</i>	<i>PI</i>
x01	HPC-Europa	Dr Judy Hardy
x03	IBM	Mr Derrick J Byford

## HPCx Projects

<i>Code</i>	<i>Title</i>	<i>PI</i>
z001	HPCx Support	Dr Alan Simpson
z002	Systems and Operations	Mr Mike Brown
z003	Test Project	Dr Denis Nicole
z004	HPCx Training	Dr David Henty
z05	Outreach Projects	Dr Richard Blake
z06	Application Porting	Dr David Henty
z07	Package Installation	Dr Mike Ashworth
z10	Globus	Dr Stephen P Booth

## B.2 Former Projects

<i>Code</i>	<i>Class</i>	<i>Title</i>	<i>PI</i>
b01	2	Quantum Chemistry Studies of the Rusticyanin Protein Crystal	Prof Samar Hasnain
b03	1	Towards a virtual outer membrane	Prof Mark S Sansom
b04	1	Life sciences software development	Dr Jo L Dicks
b05	1	Virtual forced evolution of catalytic transition metal complexes	Dr Marcus Durrant
b06	2	Biomolecular computational chemistry	Prof Jonathan D Hirst
e02	1	Ab-initio simulation of covalently bonded materials	Dr Patrick Briddon
e03	1	Multi-photon, electron collisions and BEC HPC consortium	Prof Ken Taylor
e04	1	Chemreact Computing Consortium	Prof Jonathon Tennyson
e07	2	Turbulent Plasma Transport in Tokamaks	Dr Colin M Roach
e09	2	Molecular Properties and their Geometry	Dr Mark R Wilson

e12	1	Parallel programs for the simulation of complex fluids	Dr Richard J Blake
e13	1	TeraGyroid project	Mr Mark Westwood
e28	1	Towards the Dynome	Dr Jonathan W Essex
z09		HECToR Benchmarking	Dr Edward Smyth
x02		OHM Ltd	Dr Lucy MacGregor
n05	2	Non-linear Wave-particle Instabilities in Plasmas	Dr Mervyn Freeman