Computational Shared Facility

increasing your productivity

The **Computational Shared Facility** (CSF) is the University of Manchester's flagship facility for Computationally-Intensive Research (CIR), also known as High Performance Computing (HPC).

The CSF started life in January 2011 with £90,000 of investment from the University. Funds contributed by research groups to the facility now total £1.3m, with approximately £300,000 being contributed in summer 2013. This represents outstanding buy-in to the service from our research colleagues!

It is managed by the Research Infrastructure team and used by academics, postdoctoral students and postgraduate students for computations which are too large to fit on desktop and laptop computers. Examples include:

- work that requires large amounts of memory
- using hundreds of CPU cores simultaneously
- running multiple jobs (which previously took days if not weeks)

There are now almost 5,000 CPU cores available to users and in addition, 27 NVIDIA GPGPUs – graphics processing units adapted for more general-purpose computational work. Almost 200 Terabytes of local, fast scratch storage is available; up to 0.5 Terabytes of RAM is available on a single node.

Who is using the CSF?

Traditionally, Computationally Intensive Research is associated with engineering, mathematics and the physical sciences. However, use of the CSF by researchers from the Faculties of Life Sciences and Medical and Human Sciences is fast catching up with heavy use of both the computational resources and storage by genome-related work and medical image-processing, for example.

Help and Support

The CSF was created to provide a professionally-managed service; a better alternative to the many small computational clusters across campus which were owned and run by individual research groups. With this in mind:

a. Support for users of the CSF particularly focuses on helping those new to using shared High Performance Computing or High Throughput Computing systems become productive; the Research Infrastructure team are happy to provide face-to-face help for small groups and individuals.

b. The Research Infrastructure team attempt to accommodate the very different needs of as many University research groups as possible, including quick responses to queries and requests for support, software installations, procurement and system configurations to assist with research deadlines. They work closely with central and faculty IT teams to provide a local service that can best respond to these varied and challenging research computing requirements.

Funding

The Facility is funded on a shared model, with compute nodes procured using financial contributions from research groups and the cost of infrastructure such as login nodes, fileservers and network equipment paid for by the University.

Contributions are also accepted at University school and faculty level, so that all members of those schools and faculties then have access to the facility. The School of Mechanical, Aerospace and Civil Engineering (MACE) and the School of Chemical Engineering and Analytical Science (CEAS) and the Faculty of Life Sciences have contributed in this way.

The Computationally Intensive Research ecosystem:

The CSF forms part of a campus 'ecosystem' for Computationally Intensive Research (CIR):

1. The Research Data Service (known as Isilon) is tightly integrated with the CSF, ideal for those whose work involves large quantities of data. All CSF home directories are located on Isilon and several research groups have additional Isilon-based shares mounted across the facility; a total of approximately 100 Terabytes and growing fast.

2. There is a dedicated 20 Gigabit network connection between the CSF and Isilon. This dedicated Research Data Network has been extended to the Michael Smith Building within the Faculty of Life Sciences, to enable the upload of DNA sequencing and other data from experimental instruments.

3. The CSF has a new, experimental, little brother designed specifically for computationally-intensive, interactive work. The iCSF (also known as INCLINE – the INteractive Computational LINux Environment) will be used for development and testing of research codes, and for interactive use of applications, initially for statistical analysis.

4. A virtual desktop service which allows users to use the same desktop session to access the CSF ecosystem from on campus, at home or anywhere in the world.

If you would like more details about the service, please visit the web site:
ri.itservices.manchester.ac.uk/csf

or contact the Research Infrastructure team via:
its-ri-team@manchester.ac.uk

How the CSF compares to an average £500 desktop PC bought in November 2013:

	Desktop PC	CSF
RAM (Random Access Memory)	8 Gigabytes	300 nodes; most have 64 Gigabytes of RAM; four have 256 Gigabytes RAM; one has 0.5 Terabytes of RAM
CPU (Central Processing Unit) cores	4	5,000
Storage space	2 Terabytes	almost 200 Terabytes (also fast network link to the RDS – expandable to 15 Petabytes)

In addition, whilst the average home broadband connection stands at a speed of 14.7 Megabits per second*, the Research Data Service connection runs at 20 Gigabits per second, or approximately 20,480 Megabits per second. The interconnect between some compute nodes runs at 40 Gb/s.

Source: Ofcom August 2013