# Irish Centre for High-End Computing

The Irish Centre for High-End Computing (ICHEC) wanted to stay at the forefront of Ireland's computational expertise by delivering top-quality technology services and support to universities and enterprises. To achieve this, ICHEC needed a new supercomputer, running a stable, reliable and high-performance operating system. ICHEC deployed the Fionn supercomputer with SUSE® Linux Enterprise Server, and is now able to meet varied and demanding requirements from academic and business users alike.

## Overview

The Irish Centre for High-End Computing (ICHEC) provides supercomputing facilities to research and academic communities and extends both the computational science expertise and IT skills-base of Ireland. ICHEC serves, and shares expertise with, the commercial sector, particularly small and medium enterprises (SMEs). The organization also aligns itself with and participates actively in EU-wide high-performance computing (HPC) consortia, helping the broader academic community.

## Challenge

ICHEC caters for an extremely broad range of computing requirements from universities, research institutions, enterprises and SMEs. It also faces tight budgetary constraints, so price-performance is a key criterion in the selection of supercomputing resources.

> **"The powerful combination of SGI hardware and SUSE Linux Enterprise Server translates into unmatched availability, reliability and performance."**
>
> **NIALL WILSON**
> *Infrastructure Manager*
> ICHEC

ICHEC's existing HPC solutions—including the Stokes supercomputer—were approaching obsolescence and could no longer support increasing demand.

Lack of consolidation was another issue, as Niall Wilson, Infrastructure Manager at ICHEC said: "Our main supercomputer, Stokes, was a distributed-memory machine, and we also ran other systems using different architectures. Managing multiple machines was relatively inefficient, and made it hard for research teams to run projects requiring more than one architecture."

## Solution

ICHEC engaged several vendors in a competitive dialog to find the best solution. "We wanted a supercomputer that could consolidate the four different architectures that we manage, with a strong preference for keeping the same open-source scheduling environment for workload assignment," said Niall Wilson.

Based on the solution's superior price-performance, ICHEC deployed Fionn, a supercomputer built on SGI ICE X hardware running SUSE Linux Enterprise Server. On implementing Fionn, ICHEC was funded by Intel to work on its new many-core technology as one of only a small number of official Intel Parallel Computing Centres.

**ICHEC**
Irish Centre for High-End Computing

**Irish Centre for High-End Computing at a Glance:**
*The Irish Centre for High-End Computing (ICHEC) provides powerful supercomputing facilities and expertise to Irish universities and businesses.*

■ **Industry and Location**
Government, Ireland

■ **Product and Services**
SUSE Linux Enterprise Server

■ **Results**
+ *Boosted stability, performance and computational power*
+ *Enabled users to perform more complex and demanding research and development activities*
+ *Contributed to optimal price-performance through small OS footprint*

> "The stability of SUSE Linux Enterprise Server is impressive: Fionn has been running for months on end, with no deterioration in performance, which helps keep management costs down."

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Ranked first for power-efficiency among x86 supercomputers on **top500.org/lists/2014/06**, Fionn is a heterogeneous machine featuring four architectural components: Thin, Hybrid, Fat and Service. The Thin component (a 320-node SGI ICE X system) alone quadruples the computing resources available to scientists in Ireland, and offers the latest Intel Ivy Bridge processors. The Hybrid component includes both Xeon Phi and NVIDIA Tesla accelerators, while Fat provides a large shared-memory facility. Finally, Service provides job scheduling and data backup services using the Lustre filesystem.

Fionn will run non-stop for the next four years, providing an estimated 295,000,000 CPU hours. For provisioning and management, ICHEC uses SGI ProPack and Management Center, a suite of tools and libraries that drive the highest application performance on Linux, optimized for SUSE Linux Enterprise Server.

"SUSE Linux Enterprise Server is the ideal operating system for Fionn: it has a real lightness of touch, and doesn't get in the way of the computational workload," said Niall Wilson. "It features great tools for set up and configuration, like YaST®, but gives us the flexibility to use other tools, which simplifies maintenance. In our view, SUSE's distribution of Linux is very well suited to high-performance computing."

In addition to serving the academic community both in Ireland and across the EU, Fionn is employed by SMEs for Computational Fluid Dynamics (CFD) projects, which simulate the interaction of liquids and gases with surfaces.

## Results

Combining SUSE Linux Enterprise Server with SGI hardware, Fionn has dramatically increased the stability, performance and computational capacity of ICHEC's supercomputing resources. Uniting four separate architectures, Fionn also enables significant operational cost savings.

"The stability of SUSE Linux Enterprise Server is impressive: Fionn has been running for months on end, with no deterioration in performance, which helps keep management costs down," said Niall Wilson. "This stability also ensures that we can continue to support Met Éireann in running the national weather forecasts."

ICHEC's users can now perform significantly more demanding computations, enabling increased resolution in weather and climate forecasting, and larger and longer-running simulations in areas such as medical device development, nanotechnology, genomics, and drug design. Fionn also makes it easier for research teams to use heterogeneous approaches—for example, running a large in-memory database on the shared-memory component alongside intensive computation on the distributed-memory component.

"Thanks in part to SUSE Linux Enterprise Server, ICHEC has been able to help Irish oil exploration company Tullow Oil to develop next generation scalable models for discovering new drilling sites," said Niall Wilson. "Having an advanced collaborative platform like Fionn to co-develop new analysis algorithms and test scalability enables ICHEC to help industry to develop competitive new applications. These kinds of benefits drive real value from our investment in SUSE Linux Enterprise Server."

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