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**PDC Center for High Performance Computing**

# Business Unit Newsflash

## Welcome to the first issue of the PDC Business Newsflash!

In future we will be issuing these Business Unit Newsflashes in the [PDC newsletters](#) or via the [PDC business email list](#) in accordance with the frequency of [PDC business events](#). Here you will find short articles about industrial collaborations with PDC and about business events relevant for high performance computing (HPC), along with overviews of important developments and trends in relation to HPC for small and medium-sized enterprises (SMEs) and large industries all around the world.

## PRACEdays15

### PRACE Scientific and Industrial Conference 2015

The Aviva Stadium in Dublin, Ireland, was the venue for the PRACE Scientific and Industrial Conference 2015 ([PRACEdays15](#)) which was jointly hosted by the Irish Centre for High-End Computing (ICHEC) and PRACE.

For two days at the end of May, the conference focused on [how to innovate through the scientific use of high performance computing \(HPC\)](#) both in

industry and academia. With guest speakers from the Japanese Research Organization for Information Science and Technology (RIST) and the Irish Industrial Development Authority (IDA Ireland), one of the main topics that was addressed was the question of how governments can best support the development of competitive HPC centres. The role of such centres in working with industries, and how [joint academic-industrial research](#) can help



# HPC for Industry R&D

Tom Wilkie, Editor-In-Chief of *Scientific Computing World*, leads the discussion on how industry and academia can innovate together using HPC. The panel consists of Sylvie Joussaume from the French National Centre for Scientific Research (CNRS), Anders Rhod Gregersen from Vestas Wind Systems, Mateo Valero from the Barcelona Supercomputing Center (BSC) and Augusto Burgueno Arjona of the EC Directorate General for Communications Networks, Content & Technology (DG Connect).



generate innovations to spur future growth, was discussed on the basis of the current investments in this area.

Leo Clancy of the Industrial Development Agency Ireland (IDA Ireland) explained how the Irish government invests not only in HPC but also in helping Irish industry grow through the use of HPC. He presented some inspiring examples of where Irish industry was given support for innovation through the use of HPC. When it comes to medicine/health and the biomedical area, this is being achieved via large-scale simulations and data analysis. The finance sector has received support for developing intrusion- and fraud-detection algorithms that run on large collected data streams. Other areas that are being supported include biosphere research and food production research via climate modelling, and real-time sensor monitoring and data analysis. Together with IBM, the Irish government has invested in an artificial intelligence (AI) and machine learning centre, known as IBM Research - Ireland, which is based in Dublin.

*Tax benefits are also given for all research-related investments in industry with a 25% tax rebate for R & D within companies. To promote the adoption of HPC by small and medium-sized enterprises (SMEs), a 5,000 euro voucher is available that gives SMEs access to the resources of governmental HPC infrastructure and research labs.*

Augusto Burgueño Arjona, the Head of the eInfrastructure Unit at the European Commission (EC) discussed how HPC can be a strategic tool for transforming scientific challenges in industry and society into innovation and business opportunities. The European HPC strategy in the Horizon 2020 programme combines these challenges with the goal of developing the next generation of supercomputers with exascale infrastructures open to both industry and academia together with leading software applications that can be run on these exascale systems.

## Beskow and Tegner

### Our New Supercomputers to Facilitate Leading Swedish Research

We have had a busy year at PDC seeking tenders for two new members of our research infrastructure then installing and tuning them. **These new systems are now available for collaborative research and development (R&D) with our industry partners and other research organisations in the Stockholm region.** Beskow is a state of the art supercomputer from Cray with the latest **Intel x86 processor technology**, and is specifically suited for running all kinds of large simulations. The system has been tested and run in production for some time now. With 1,676 server nodes and a total memory of 104.7 terabytes, Beskow is the largest system of its kind in Sweden. With such capacity at hand, all sorts of numerical simulations can now be run faster and with more accurate and granular models. **Computational fluid dynamics (CFD) and finite element modelling (FEM) codes, plasma physics, climate modelling, neuroscience and materials science** are but a few of the research areas where Beskow is being used. For example, at the Beskow inauguration ceremony in February this year, representatives from the global automotive company Scania gave a presentation about why Scania has been working with PDC since 2010 and how the company plans to make use of Beskow for their advanced simulation needs.

The Beskow system was named in honour of the famous Swedish illustrator and author, **Elsa Beskow**, and the latest girl to join the PDC team, Tegner, is named after **Alice Tegnér**, a



Beskow, PDC's Cray XC40

composer who worked with Elsa Beskow to produce books of songs for children. Perhaps their most famous collaboration is “Mors lilla Olle” which was based on a real incident that happened in Sweden in 1850 when a young toddler was picking lingonberries with his siblings and met a female brown bear with two cubs. The little boy was so young that he was not afraid of the bears and fed the cubs with lingonberries until they became tired, when the cubs and the toddler lay down to rest next to the mother bear... until the boy's mother was fetched and scared the bears away. The central panel on Beskow shows one of Elsa Beskow's most beloved illustrations from this book. You may notice that the image shows blueberries, rather than lingonberries, as it was changed in the song (probably to make the Swedish rhyme).

**Tegner** is a slightly smaller system than Beskow as it has a somewhat different purpose. The server nodes within Tegner are not all the same, which gives this system a flexible, dynamic and adaptive personality suited to solving specific issues related to pre- and post-processing. The pre- and post-processing is needed to prepare the data that is used in the large simulations that are run on Beskow (for example, preparing a grid of points to represent the surface of an aeroplane wing), and to analyse the data that results from the calculations performed on Beskow (for example, creating an image with different colours to indicate the different levels of air resistance around the wing as a plane flies after Beskow has calculated the air resistance values for all the points in that grid). **Graphics processing unit (GPU) compute capabilities are also built in to Tegner, so the latest NVIDIA K80 general-purpose computing GPU (or GPGPU as they are commonly known) is available to all our users.**

Some of Tegner's 512 GB "thin" nodes



With the ability to develop and run massively parallel codes on these systems, PDC is now offering this new technology to interested users, including the capability to run codes for CFD (such as [OpenFOAM](#) or the [ANSYS Fluent](#) and Mechanical software), machine learning/artificial intelligence, molecular dynamics (for example, [GROMACS](#)), media/animation (including [Autodesk 3ds Max](#)), electronic design automation or EDA, and computational finance. Our application experts can work together with you to evaluate which technology is best for your R & D needs.

## Tegner

### 2TB Fat nodes

- 5 nodes
- 4 x 12 core E7-8857v2 (Ivy Bridge) (total 48 cores per node)
- 2 TB RAM per node
- 2 x nVIDIA K420 KEPLER GPUs

### 1TB Fat nodes

- 5 nodes
- 4 x 12 core E7-8857v2 (Ivy Bridge) (total 48 cores per node)
- 1 TB RAM per node
- 2 x nVIDIA K420 KEPLER GPUs

### Thin nodes

- 46 nodes
- 2 x 12 core E5-2690v3 (Haswell) (total 24 cores per node)
- 512 GB RAM per node
- nVIDIA K420 KEPLER GPUs

### Thin nodes with high performance GPU accelerators

- 9 nodes
- 2 x 12 core E5-2690v3 (Haswell) (total 24 cores per node)
- 512 GB RAM per node
- nVIDIA K80 GPU Accelerator

**Number of compute nodes: 65**

## Why and How to Engage with PDC

In a fast-paced, global marketplace, quicker and more cost-effective research and development is vital for maintaining a competitive advantage and achieving a higher return on investment. Large-scale simulations and data analysis are now becoming common to all areas of industry research and business activity. To help our industry partners further unlock the potential of intense computing and data analytics, PDC now offers a new compute infrastructure, along with software tools and know-how, to help engineers and researchers **produce faster and more accurate results in ways that are also cheaper than traditional research methods**. We can offer help with scaling your program codes and mathematical models to make use of the latest technologies that are available today. If you do not have the most up-to-date computing facilities at hand, we also offer assistance and advice on how to gain access to, and make effective use of, today's latest advancements in hardware and software.