The Met Office forecasts a bright outlook for Linux on zEnterprise

Saving software licensing and hardware lifecycle costs by consolidating applications and systems

Overview

The need

The Met Office uses post-processing systems to tailor its weather forecasts for specific clients' needs. Running these systems on a distributed Linux infrastructure was becoming complex and expensive.

The solution

Following a comprehensive evaluation and benchmarking process, the Met Office decided to migrate suitable candidates from its distributed Linux landscape onto a pair of IBM® zEnterprise® 196 servers.

The benefit

Consolidating from 204 x86 processor cores to 17 IFLs cuts Oracle licensing costs by a factor of 12. Fewer physical servers means a more manageable Linux landscape and lower hardware lifecycle costs.

The Met Office is the UK's national weather service, providing weather forecasts for the public, for government, and for businesses in a wide variety of sectors. It employs 1,800 people at 60 locations around the world, and creates more than 3,000 tailored forecasts and briefings each day, as well as conducting weather- and climate-related research.

Martyn Catlow, Met Office portfolio lead for centralised IT infrastructure, comments: "We forecast for the public and a wide range of commercial sectors, and have a strong history of forecasting for the marine and aviation sectors. We also produce weather products for defence and a wide range of retail and infrastructure customers, such as national road and utility services."

Big weather, big data

The Met Office's forecasts are based on more than 10 million daily weather observations, which are fed into its advanced atmospheric model and processed by a high-performance supercomputer built on IBM Power Systems™ technology. For research projects on topics such as climate patterns, the volumes of data involved are on an even larger scale.

Martyn Catlow explains: "Research is a huge consumer of our IT capabilities. The data produced by our global climate research to date amounts to around 17 petabytes and is archived in a specially designed, multi-storage-tier data warehouse."

Moreover, processing the weather data with the supercomputer is only the first step in a more complex process. Once the results are ready, they need to be passed to post-processing and distribution systems to package them up into a wide range of tailored products and services for each of the Met Office's clients. This downstream workload is mainly handled by an array of database-driven applications, most of which run on Linux.

Solution components

Hardware

- IBM® zEnterprise® 196

Software

- IBM z/VM®
- Oracle 11g
- Red Hat Enterprise Linux

Making the right infrastructure decisions

Until recently, the infrastructure that supported these Linux systems was a mixture of mainframes from the IBM System z family, and a distributed landscape of commodity x86 processor-based servers.

As I/O and processing requirements increased, this heterogeneous infrastructure was becoming large, complex and difficult to manage – and as both the mainframes and parts of its distributed server estate were due for an upgrade, the Met Office decided to re-evaluate the design of its architecture.

Martyn Catlow recalls: "We went through an extremely rigorous process of putting the mainframe technology up against commodity technology in terms of total lifecycle management and business benefit. It took us about a year to develop a total cost model relating to our environment. We looked at the many different aspects of running both technologies, in terms of hardware, infrastructure support, environmental and software-licensing costs. Once we got past the hardware and infrastructure costs, the focus then turned to the software licensing issues, and a test case was modelled specifically on the Oracle database product."

Making the case for Oracle on Linux on zEnterprise

Because Oracle software licensing is currently calculated on a per-core basis, running Oracle databases in virtualised Linux partitions on IBM zEnterprise Integrated Facility for Linux (IFL) specialty engines can often lead to significant cost savings.

Richard Cains, technical lead with Met Office's mainframe team, explains: "We already had a few Oracle databases running under Linux on the mainframe, as part of a pilot program we had undertaken a couple of years ago. It proved so successful that it actually set a technical foundation for consolidating more Oracle on System z. I think that was part of our mind-set when it came down to conducting the overall technology refresh. It then came down to the cost-benefits of Linux on the mainframe platform."

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— Martyn Catlow, portfolio lead for centralised IT infrastructure, the Met Office

Calculating the costs

From the hardware perspective, some of the Met Office stakeholders were initially concerned about the level of investment that would be required to expand the existing mainframe environment and use it as a replacement for the distributed servers. However, when the IT Infrastructure team actually analysed the full-lifecycle costs, it became clear to them that consolidating on a new IBM zEnterprise 196 platform would actually be more cost-effective than the commodity alternative.

Martyn Catlow comments: "Commodity x86-based systems do cost far less to acquire per unit of capability, which drives a lot of people when making technology comparisons. But the longer-term costs, including support, infrastructure, environmental issues and mirroring for resilience, quickly add up.

"The amount of money you spend on distributed systems can be staggering. You're not only looking at licensing costs, but also the lifecycle and resilience aspects. By consolidating distributed commodity servers, however, you can save a great deal of money; and believe me, when we looked at all of these parameters, it just made sense to move the workload to the mainframe."

Proven performance

To confirm that the hardware capability assumptions made in the cost model were accurate, the Met Office worked with IBM to conduct a series of rigorous benchmarking tests to evaluate the performance of different types of workloads on both zEnterprise and commodity x86 servers.

Thanks to the superior throughput capabilities of the zEnterprise architecture, the benchmark proved that the mainframe would perform considerably better than commodity servers particularly for I/O-intensive workloads including the majority of the organization's Oracle databases.

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— Martyn Catlow, portfolio lead for centralised IT infrastructure, the Met Office

"We went to great lengths to ensure the workload testing was fair for both platforms – mainframe and x86," says Martyn Catlow. "In production, the majority of our Oracle workloads have proved to be typically I/O-oriented, with one or two notable exceptions that drive CPU very high.

"During the migration process, we also took the opportunity to review and refine applications with anomalous response times, resulting in one instance in a reduction of data ingestion time from many minutes to a few seconds. I would say that the indications were that 80 percent or more of our distributed production workloads could migrate effectively to the mainframe, including Web services."

Harnessing the benefits of zEnterprise

The positive results of these benchmarking exercises convinced the Met Office to go ahead with the consolidation exercise. Working with IBM, it upgraded its existing mainframes to a pair of IBM zEnterprise 196 servers – one for production workload, and the other for development, testing, and quality assurance.

Each z196 has 17 IFL engines, which can support hundreds of virtualised Linux instances, and the whole architecture offers the traditional mainframe virtues of massive scalability, very high reliability and availability, and centralised management.

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From a financial perspective, by reducing the total number of cores used to run the organization's 120 Oracle instances, the new zEnterprise solution has made a very significant difference to the total cost of ownership, approximating to 75 percent reduction in licensing costs. Before consolidating the distributed Oracle instances to Linux on IBM zEnterprise, a total of 204 x86 processor cores were allocated to Oracle. Now the same workloads run on just 17 IFLs; and as a result, according to Richard Cains, the Met Office has "reduced costs by a similar ratio" of approximately 12:1.

In addition to cost savings, consolidating the organization's Oracle environment in a single place simplifies management. By enhancing efficiency in this way, the Met Office's IT team can focus on delivering more effective services to the organization, equipping employees with the tools to work more productively.

For more information

To learn more about IBM zEnterprise solutions, contact your IBM sales representative or IBM Business Partner, or visit us at **ibm.com**/zEnterprise

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