How the UKCloud OpenStack platform outperforms hyperscalers
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The evolution of UKCloud

UKCloud has long been known for our Enterprise Compute Cloud, powered by VMware, which has enabled hundreds of UK public sector workloads to move to the cloud. In response to increasing demand from customers creating genuine cloud native (12-Factor) applications, we have developed and launched our Cloud Native Infrastructure, powered by OpenStack – the leading open-source alternative to the proprietary global public cloud platforms.

Based on our innovative, next generation infrastructure

Our OpenStack platform is deployed on our innovative, next generation infrastructure. Rather than a SAN-based converged infrastructure, our next generation infrastructure is built on commodity hardware and leverages software defined datacentre (SDDC) technology including software defined networking (Cisco ACI and OpenStack Neutron) and software defined storage (Red Hat Ceph).

This new infrastructure is designed to deliver much greater levels of scalability via multiple fault domains to improve availability and resilience. As bottlenecks such as the storage array and network functions are replaced with highly distributed resources, the new infrastructure is designed to deliver much greater levels of performance compared with our previous infrastructure.

Our approach to benchmarking

To validate the performance of our platform, UKCloud engaged the services of Stack Evolution, an independent specialist in OpenStack design and consultancy. The goal was to compare the performance of our Cloud Native Infrastructure (powered by OpenStack) against the two leading proprietary public cloud platforms, Amazon Web Services and Microsoft Azure.

The benchmarking was based on the PerfKit Benchmarker tool which was originally developed by Google and made available to the open source community. PerfKit is designed to provide a repeatable, consistent and open way of measuring cloud performance.

PerfKit was configured to specifically compare the UKCloud region 5 OpenStack platform with AWS EU-West 1 region and the Azure North Europe region. The benchmarks ran over a period of weeks Q4 2016 and average values are reported below.

UKCloud OpenStack outperforms both hyperscalers

The data in the benchmark data section shows that the UKCloud OpenStack platform consistently outperforms both hyperscalers across a variety of benchmarks including:

- UKCloud performs **18% faster** than AWS and more than **two-and-a-half times faster** than Azure on UnixBench system performance
- UKCloud performs almost **30 times faster** than Azure and almost **15 times faster** than AWS for internal network throughput on Iperf network throughput
- UKCloud performs more than **three times faster** than Azure and almost **20% faster** than AWS on SysBench OLTP storage throughput
- UKCloud performs more than **three-and-a-half times faster** than Azure and almost **20% faster** than AWS on HPL processor performance
UKCloud performs more than **twice as fast** as both AWS and Azure on NoSQL (MongoDB) workload performance

- UKCloud performs almost twice as fast as AWS and more than **five times faster** than Azure on Cluster boot time system performance

**Why does performance matter?**

These results are important for several reasons:

1. **Cost control** – the superior performance of our platform means that you can do more with less. To match our performance using the hyperscalers, you would need bigger instances, more instances or both – significantly increasing the cost of those platforms. A platform that appears 20% cheaper but has half the performance may mean you end up paying 60% more for the same performance.

2. **Developer productivity** – our OpenStack platform has been designed specifically for agile software development projects where there is a real demand for environments to be provisioned rapidly and destroyed when no longer needed. Superior performance means that pipeline automation happens quickly and reliably so your developers aren’t blocked waiting for the infrastructure to be ready.

3. **User experience** – as digital systems are increasingly used directly by millions of potential users (for example, citizens), it’s important that your platform can deliver the CPU, storage and network performance when your users need it.

**Benchmark results**

UKCloud commissioned a suite of tests to assess the performance of various components of the platform, as well as some end-to-end system tests. The following pages provide more detail regarding each of the benchmark results.
UnixBench system performance

The purpose of UnixBench is to provide a basic indicator of the performance of a Unix-like system; hence, multiple tests are used to test various aspects of the system’s performance including processor, memory and storage components. UKCloud performs more than two-and-a-half times faster than Azure and 18% faster than AWS.

Network performance (Iperf)

Iperf is a commonly used network testing tool that can create TCP and UDP data streams and measure the throughput of a network that is carrying them. For internal network throughput, UKCloud performs almost 30 times faster than Azure and almost 15 times faster than AWS. For external network throughput, UKCloud performs almost five times faster than AWS and more than twice as fast as Azure.
Storage performance (SysBench)

SysBench is a multi-threaded benchmark tool for evaluating system performance related to MySQL OLTP databases. This predominantly tests storage performance. UKCloud performs more than three times faster than Azure and almost 20% faster than AWS.

Processor performance (HPCC HPL)

HPCC is the High Performance Computing Challenge benchmark suite used to test the processing performance of target systems. HPL (also known as LINPACK) is a specific test of the floating point performance of the system. UKCloud performs three-and-a-half times faster than Azure and almost 20% faster than AWS.
**NoSQL performance (YCSB MongoDB)**

The Yahoo! Cloud Serving Benchmark (YCSB) is an open-source specification that is often used to compare relative performance of NoSQL database management systems (in this case MongoDB). WorkloadA is update heavy. WorkloadB is read centric. Both benchmarks show that UKCloud performs more than **twice as fast** as both AWS and Azure.

**Cluster boot performance**

This is a system test measuring the boot time of instances on the cloud platform. UKCloud performs more than **five times faster** than Azure and almost **twice as fast as AWS**.
Summary

Although actual performance may vary based upon numerous real world factors such as internet latency, application-tuning and a low risk of multi-tenant contention. We are confident that these benchmark results truly reflect the performance increase that UKCloud’s Cloud Native Infrastructure delivers over the nearest equivalent region and flavours of both AWS and Azure.

We continuously investigate ways to improve the performance of our Cloud Native Infrastructure through using the latest versions of OpenStack, software-defined storage and networking, coupled with adaptive storage and network tuning as the platform is consumed. All of this helps to bring assurances that the performance increase delivered today remains true in the future.