

Linux Workload Performance on IBM z14

IBM z14 provides up to 170 IFLs with more capacity and the next generation of multi-threading capabilities (SMT), 1.5x more on-chip cache per core, 32 TB memory (3x more), massively increased I/O throughput and many more enhancements. Thereby, z14 systems provide extraordinary consolidation, scale-out as well as scale-up capabilities combined with its legendary reliability, availability, and security features. This makes it the ideal platform for enterprise Linux workloads.

Consolidate or scale-out more workload on the same number of cores

Due to large caches, improved SMT, and higher core capacity more workload can be ran per core. In an experiment we ran in an LPAR with 32 IFLs and 1 TB memory z/VM 6.4 with a large number of MongoDB guests with a constant transaction rate on z14 and on z13. On z13 we could run 160 guests before the transaction rate started to decrease. On z14 we could run 200 guests before the transaction rate started to decrease, which is 25% more guests or total throughput with the same amount of cores.

Scale-up workload with improved performance using more cores or memory

3X the memory and 20% more cores compared to z13 enables to scale-up workloads to large extents with excellent performance characteristics. In an experiment we scaled up in native LPAR a single MongoDB database to 17 TB. We assigned 12 IFLs to the LPAR. On z13 we assigned 10 TB memory to the LPAR and on z14 we assigned 20 TB memory to the LPAR. Running the Yahoo Cloud Serving Benchmark (YCSB) against MongoDB, we measure 2.4x more throughput and 2.4x lower response time on z14 compared to z13 because on z13 the database did not fit in memory and on z14 it did and benefitted from reduced I/O and fast in-memory processing.

In another experiment we used a LPAR with 32 IFLs under z/VM and four guests with MongoDB databases of 256 GB. On z13 we configured 1 TB memory for the LPAR, used z/VM 6.3, and assigned to each guest 250 GB memory and 8 vCPU. On z14 we configured 2 TB memory for the LPAR, used z/VM 6.4, and assigned to each guest 500 GB memory and 8 vCPUs. Running the Yahoo Cloud Serving Benchmark (YCSB) against the MongoDB instances, we measured on z14 4.8x more throughput compared to z13 because on z13 the database did not fit in memory and on z14 it did and benefitted from reduced I/O and fast in-memory processing.

Improve the performance of I/O intensive workloads with FICON Express16S+

The new FICON Express16S+ cards provide significant lower I/O latency and a higher I/O bandwidth compared to FICON Express16S cards. In an experiment we ran in an LPAR with 8 IFLs and 64 GB memory PostgreSQL with a 300 GB database. On z13 the database was located on a DS8700 LUN attached via FICON Express16S cards using the FCP protocol. On z14 the database was also located on a DS8700 LUN, but attached via FICON Express16S+ cards using the FCP protocol. Running the pgBench benchmark against the PostgreSQL, we measured up to 45% more throughput on z14 with FICON Express16S+ cards compared to z13 with FICON Express16 cards.

Experience improved performance per core running Linux workloads on z14 compared to the x86 platform

The Linux ecosystem on z Systems is growing constantly, especially in the domain of Open Source products. In experiments we have verified the excellent performance of web- and data serving Linux workloads on z14:

- MongoDB (benchmarked with YCSB) showed up to 2.6x more throughput per core on z14 versus the compared x86 Broadwell platform.
- PostgreSQL (benchmarked with pgBench) showed up to 2x more throughput per core on z14 versus the compared x86 Broadwell platform.
- Node.js (benchmarked with Acmeair, MongoDB used as database) showed up to 2.5x more throughput per core on z14 versus the compared x86 Broadwell platform.
- Apache TomEE (benchmarked with DayTrader, MariaDB used as database) showed up to 2.3x more throughput per core on z14 versus the compared x86 Broadwell platform.
- WebSphere Application Server (benchmarked with DayTrader, DB2 LUW used as database) showed up to 1.9x more throughput per core on z14 versus the compared x86 Broadwell platform.