

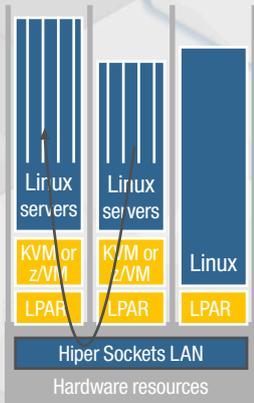
IBM LinuxONE™

Fact Sheet

Demand faster performance and more agility. Choose to do more with less. Maximize data center effectiveness with IBM LinuxONE and **outthink x86**



IBM LinuxONE supports thousands of Linux servers and massive workloads, all in one box



Works with multiple hypervisors:

LPAR (logical partitions) – Designed for complete workload isolation.¹

z/VM® – Offers recursion and live guest relocation.

KVM for LinuxONE – Widely used open source solution.

Hardware resources:

HiperSockets™ – Hyperfast, in-memory TCP/IP connectivity.

LinuxONE scales at your speed

Scale in any direction without disruption. Provision for peak demand and have any unused resources automatically reallocated.

More capacity:

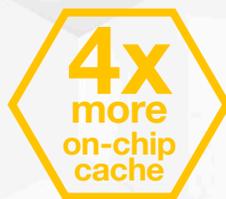
Add cores, memory, I/O adapters, devices and network cards on the fly.

Lower workloads:

Clone more Linux guests through shareable resources.

Cache-intensive and I/O-intensive ready

Compared to x86 servers:



Over 4x more on-chip cache per core.



Includes L4 cache not found elsewhere.²



Up to 24 separate cores to process I/O and drive a dedicated I/O subsystem.²

Ideal for data processing, transaction processing and large-scale analytics.

¹ IBM LinuxONE is a commercial platform with EAL5 security classification. This certification means that although different workloads are running on the same hardware, they are protected when running in separate partitions; one logical partition (LPAR) cannot reach across boundaries into the next LPAR and compromise its security.

² Evaluated LinuxONE servers are Emperor and Rockhopper; L4 cache and separate cores to process I/O are not mentioned in any x86 server specification.



IBM LinuxONE Rockhopper™

Run with a lighter footprint and improve data center performance.

Quick specs:

- 20 cores
- 4 TB memory
- 32 PCI slots

Both IBM LinuxONE systems support standard distributions of Red Hat, SUSE and Canonical (Ubuntu).



IBM LinuxONE Emperor™

Grow with virtually limitless scale to handle the most demanding workloads.

Quick specs:

- 141 cores
- 10 TB memory
- 160 PCI slots

Massive scale:

Single-node MongoDB has +1 TB footprint, processes +2 TB documents and maintains fetch times <5 ms, all without the cost and complexity of sharding.¹

Docker density:

Create and launch more than 1 million Docker containers.¹

Consolidation of x86 servers:

Can support up to 8,000 VMs per server in large-scale environments.²

¹ Based on results from internal lab measurements. The actual performance that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration and the workload processed. Therefore, results may vary depending on the workload and other factors.

² Based on IBM internal measurements and projections.

Designed for speed and flexibility

Only IBM LinuxONE has capacity on demand – more cores when you need them.

IBM LinuxONE Emperor chip performance

Micro-technology	22 nm SOI	<ul style="list-style-type: none">• Single Instruction/Multiple Data (SIMD)• Out-of-order processing• Dense packaging: electrons can travel about 11.8 inches in a nanosecond• On-chip coprocessors
Core count, speed and housing	8 cores per chip, 5.0 GHz, 6 chips per drawer (multiple drawer models)	
Threads	2 per core	

Supports hardware transactional memory (HTM), I/O offload from main cores, I/O prioritization and simplified DR.

IBM LinuxONE Emperor outshines x86 in multiple tests¹

Docker	2000+ Docker containers on average, 2x better than a compared x86-based system. ²
IBM WebSphere® Application Server Liberty	1.5x better throughput running DayTrader 3, on SMT and SIMD technology. ³
MariaDB	Scaling efficiency of 84% to 32 hardware threads (16 cores).
MongoDB	2.4x higher throughput running the Yahoo Cloud Service Benchmark (YCSB). ⁴
Spark	50% greater performance using Spark 1.4.0. ⁵

¹ These claims are based on results from internal IBM lab measurements on standalone dedicated systems in a controlled environment. Results may vary depending on the workload and other factors.

² Apache Solr search queries driven by Apache Jmeter System Stack, Emperor native LPAR on 36 cores with 755 GB memory. x86-based alternative system (Lenovo System x3650 M5 w/ E5-2699 v3 processors): Native Linux on 36 CPU cores with 755 GB memory, Heavy Docker Container: Apache Solr v4.10.0, WebSphere Liberty v8.5.5.2, IBM Java 1.8.0 SR1, Lightweight Docker Container: BusyBox, System SW: Docker 1.10.0-dev w/ aufs storage backend, RHEL 7.1. Note: Each active container is driven by a client thread in Apache Jmeter, which keeps sending the same Solr query repeatedly to the container to search documents that contain given key words in a pre-loaded & pre-indexed 46 GB Wikipedia snapshot. The docker runtime was modified to increase a thread count limit, to avoid connection time-out, and to separate a dockerinit binary from a docker binary. A modified Linux 4.3.0 kernel to support more than 1024 network bridge ports was installed on RHEL 7.1.

IBM LinuxONE serves beyond comparison

“LinuxONE systems provide the highest levels of availability (near 100% uptime with no single point of failure), performance, throughput and security.”¹

- Spare cores for failover
- RAIM you won't find on x86
- Built-in-top to bottom security
- Up to 0% unplanned downtime due to hardware failures
- Near-continuous availability with GDPS® Virtual Appliance

IBM LinuxONE is the bottom line

Consolidating on LinuxONE raises efficiency, reduces core requirements and lowers cost per workload.

For web applications, the LinuxONE Rockhopper private cloud deployment is estimated to be 45% lower in cost than the compared x86 private cloud.³

The cost of running Linux applications on x86 servers can be upwards of 65% more expensive than LinuxONE servers.^{2,1}

ROI studies confirmed that larger systems tended to deliver lower management costs than those associated with distributed servers.⁴

[Learn more about LinuxONE Solutions](#)

¹ Robert Frances Group, 10 Reasons LinuxONE is the Best Choice for Linux Workloads, 2015; The information and materials presented herein represent to the best of our knowledge true and accurate information as of date of publication. It nevertheless is being provided on an “as is” basis. IBM Corp. sponsored this research report.

² This holds true for entities in developing countries that have as few as 30 Linux workloads or 20 Linux servers, as well as large enterprises with an IT infrastructure that spans across multiple data centers.

³ Performance comparison based on IBM Internal tests comparing IBM LinuxONE Rockhopper cloud with one comparably configured private x86 cloud and one comparably configured public cloud running general purpose virtual machines designed to replicate typical IBM customer workload usage in the marketplace. System configurations are based on equivalence ratios derived from IBM internal studies and are as follows: Public Cloud configuration: total of 24 general purpose instances; x86 cloud configuration: total of two x86 systems each with 24 Intel E5-2690 v3 cores, 192GB memory, and 2x400GB SSDs; LinuxONE Rockhopper cloud configuration: total of 8 cores, 384GB memory, and Storwize v7000 with 4x400GB SSDs. Price comparison estimates based on a 3YR Total Cost of Ownership (TCO) using publicly available U.S. street prices (current as of December 10, 2015). Public Cloud TCO estimate includes costs (US East Region) of infrastructure (instances, data out, storage, support, free tier/reserved tier discounts), middleware and labor. LinuxONE Rockhopper and x86 TCO estimates include costs of infrastructure (system, memory, storage, virtualization, OS, cloud management), middleware and labor. Results may vary based on actual workloads, system configurations, customer applications, queries and other variables in a production environment and may produce different results. Users of this document should verify the applicable data for their specific environment.

⁴ IDC White Paper, sponsored by IBM, Driving Digital Transformation through Infrastructure Built for Open Source: How IBM LinuxONE Addresses Agile Infrastructure Needs of Next Generation Applications, September 2015.