

云中核心 /
稳敏合一新基建
/ 共应时变

IBM现代化架构实现绿色计算与降本增效

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IBM全球竞争力中心大中华区资讯精算顾问

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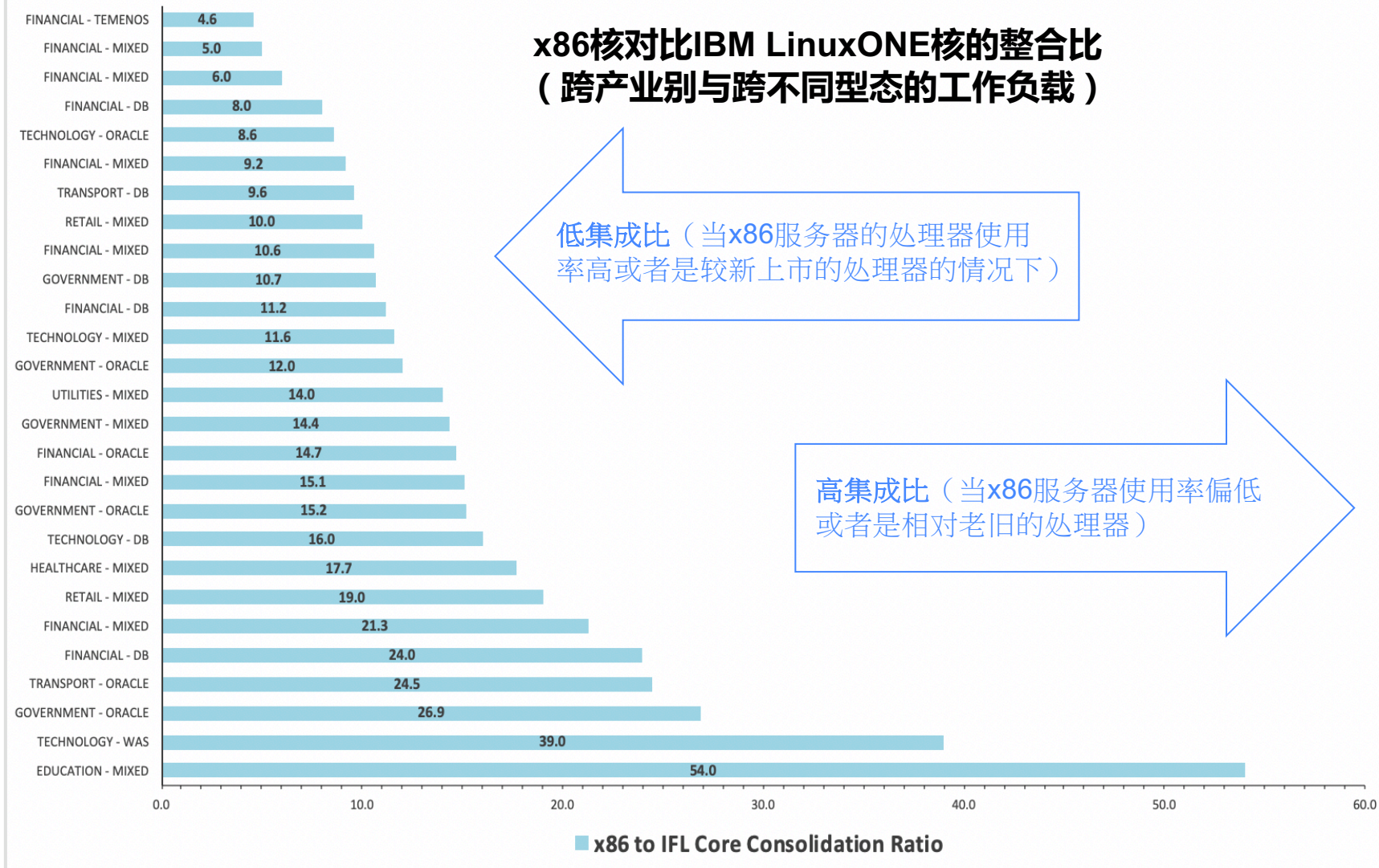
从CPO大数据来观察整合比



从大数据来观察这些真实客户案例得知，平均而言，整合比在大多数的个案符合预期的水平，甚至于有为数不少的案例中，我们观察到更高的整合比。

在整合比其中一个很重要的数据来自于客户生产环境中的真实处理器使用效率，这个部份和分布式服务器x86的科技含量有很直接的关系。

*本数据呈现来自于29件真实客户的分析报告。Intel核对比IBM LinuxONE核的整合比分布从4.6 : 1 to 54 : 1。



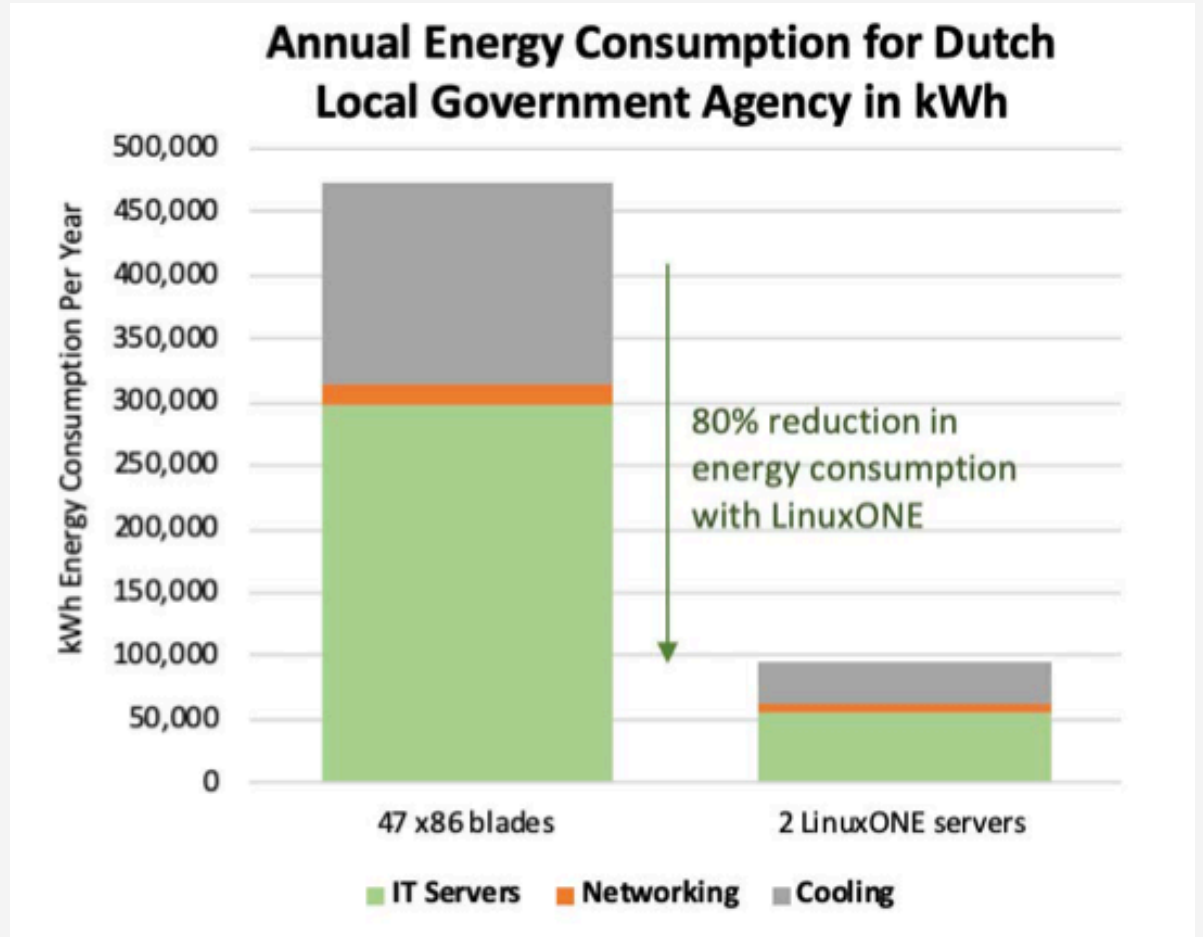
荷兰某官方机构选择IBM LinuxONE取代现有x86，以合规新的温室气体排放标准

80%

把客户现有的Linux应用从47部x86刀锋式服务器移转至IBM LinuxONE 11颗IFL处理器上，节省了80%的能耗^{附注1}

946

五年内减少二氧化碳排放量达946吨^{附注1}



¹Energy savings are based on a carbon footprint assessment conducted by the IBM IT Economics team for a government agency in the Netherlands using four blade centers with a total of 47 blades at 8.5 KW (4.5 KW for blades and 4 KW for the chassis based on vendor published KW rates) for an estimated annual server energy consumption of 297,840 kWh versus two LinuxONE Rockhopper I servers with 6 IFLs each at 3.1 KW each, consuming an estimated total of 54,312 kWh annually. Network energy consumption of 2 KW for the blades (two for each blade center for a total of eight) and 1 KW for the LinuxONE servers (two switches for each server), based on vendor published KW rates for networking switches, results in an estimated 17,520 kWh for the blade centers and 8,760 kWh for the LinuxONE servers. Cooling energy consumption is estimated by using an efficiency factor based on the server's architecture and is proportional to the networking and servers' power consumption. In this assessment both blade centers and LinuxONE servers use a data center power utilization effectiveness rate of 1.5 as the factor to calculate cooling consumption, resulting in an estimated 157,680 kWh for the blade centers and 31,536 kWh for the LinuxONE servers. The assessment uses a kWh to CO2 factor of 505.2 grams of CO2 for 1 kWh based on Netherlands CO2 emissions intensity from electricity generation from the European Environment Agency, <https://www.eea.europa.eu>. Findings from IBM IT Economics assessments will vary according to each client environment.

IBM z/LinuxONE 致力不断提升能源效率的科技创新

右图所示，数据来源来自IBM 信息精算顾问团队协助客户完成的一个以五年为期的信息投资总体成本评估案。

对比IBM zEnterprise®EC12 (zEC12) 与IBM z13®主机，新的IBM z13®主机透过科技的创新，可以降低能耗达8%。新发布的IBM z15 对比IBM z13， 能耗更是高达51%的节省。

更值得一提的是，新的IBM z15导入智能电源供应 (iPDU) 选项，让选择幅射散热冷却系统Radiator-cooled systems的客户多了一个更加省电的装置选择。

(Source: IBM IT Economic Consulting & research <https://www.ibm.com/downloads/cas/K9XD9V1Q>)

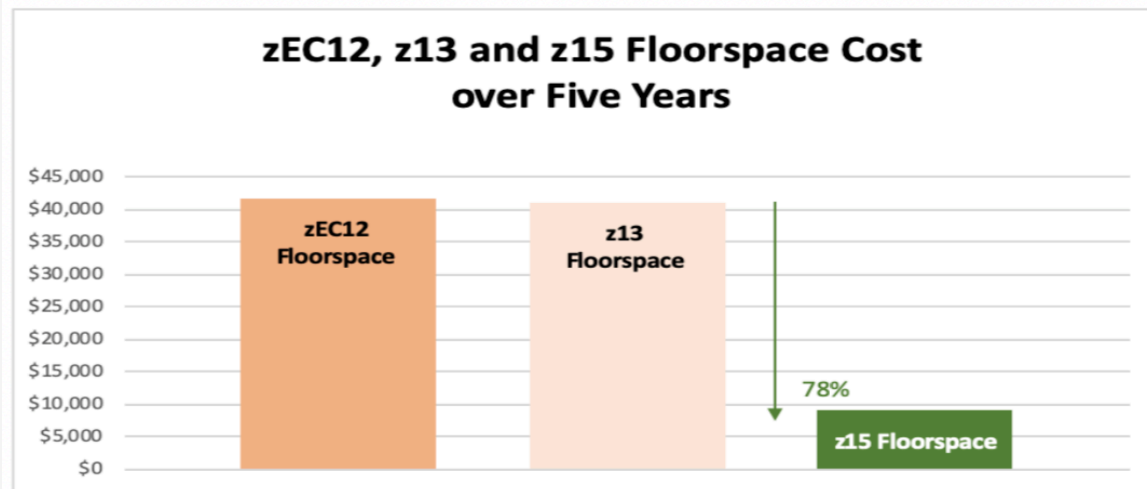
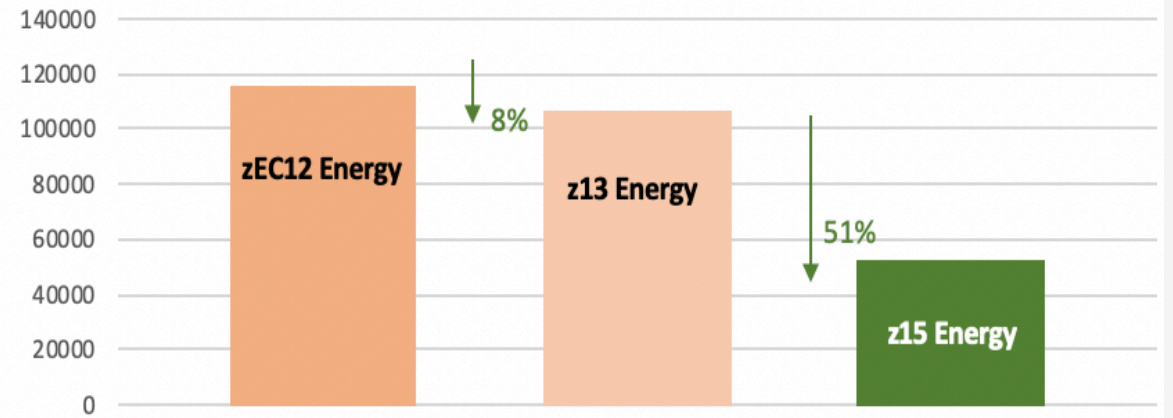


Figure 3: Total floorspace costs over five years for zEC12, z13 and z15

zEC12, z13 and z15 Energy Consumption in Five Year Cost Model



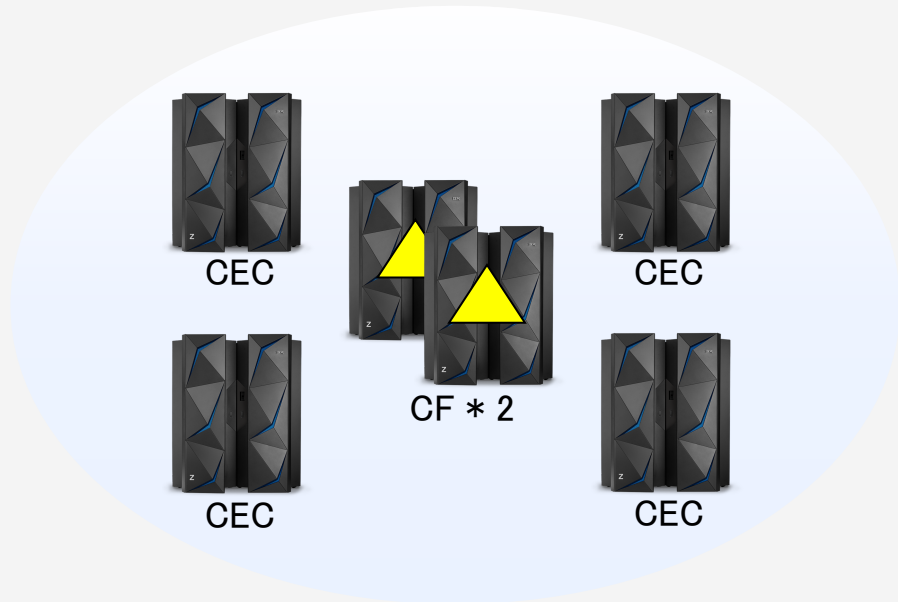
客户个案评估背景为长期的IBM 主机客户，得利于IBM 主机不断地科技创新，因为IBM 主机硬/软件的持续精进，IBM主机客户得以直接享受硬/软件创新所带来的好处之外，间接地，客户在能耗的表现也同样地大幅降低。这种来自于IBM 主机世代交时时，科技创新所带来的火花，实实在在地帮IBM主机客户带来更多的优惠。

新一代的z15提供19寸标准宽度的机柜设计，更符合现代化绿色机房要求。

依左图表说明，相较于zEC12， z13的机柜设计，z15节省了最高达78%的机房楼板面积要求。

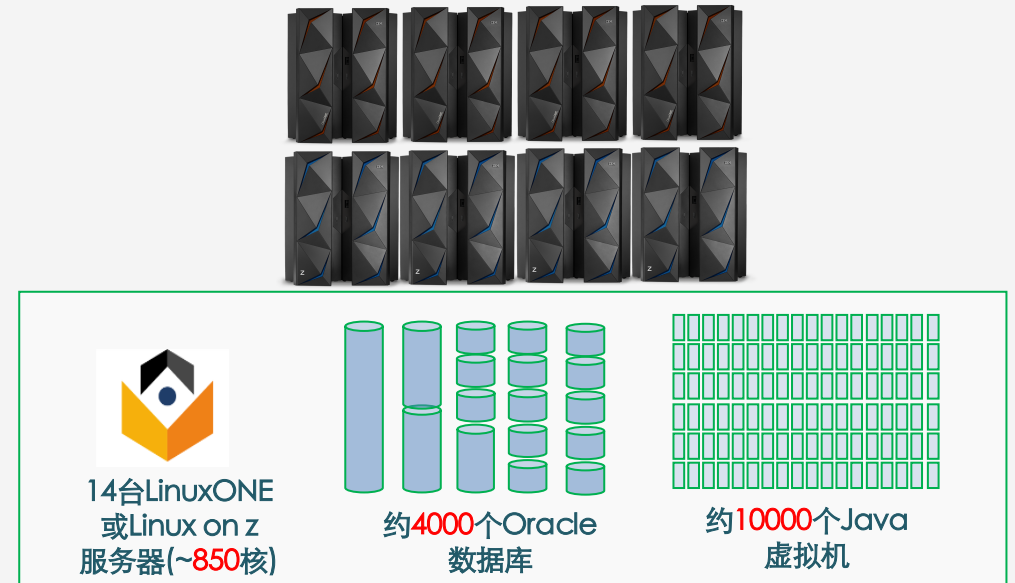
因为这些坚持不懈的创新使得今天我们可以做到

6还是6



国内z/OS客户最常用的生产集群架构共由6台IBM主机构成, 自2002/2003年以来, 虽然客户**交易规模增长高达数十倍**, 但是客户**从来无需增加服务器数量**, 无需增加机房占地空间和配电用电需求, 始终保持精简架构简化运维, 并有足够可扩展处理能力应对未来业务进一步增长, 实现真正绿色计算!

以一顶百



某国际大型人力资源外包公司, 利用约14台LinuxONE及主机 (约850核) 运行ORACLE/WAS/Portal/Cognos/DB2 Connect/QMF/Tomcat等软件产品和应用, 支持约**4000个ORACLE数据库/10000个Java虚机/4000+容器**, 帮助客户大幅**节省硬件和环境成本同时大幅简化运维**(如采用x86需采购超过**1400台服务器及大量配套设备**)

IBM z/LinuxONE + TCO Study 达成降本增效 绿色计算

Range of core consolidation ratios for specific client environments

For most of these accounts, analysis found core consolidation ratios to be the same or higher than the ratio guidelines

Core ratio results varied depending on the client's workload activity, x86 server technology and x86 utilization rates

Analysis in 20 client assessments observed core consolidation ratios ranging from 10:1 to 32.5:1 x86 cores to one IFL with an average of 17 times fewer cores¹

Industry/GEO/Workload Type	Ratio
Mixed - Retail, US	10.00
Mixed - Financial, GGG	10.60
DB - Government, EUR	10.70
DB - Financial, EUR	11.20
Mixed - Technology, AP	13.60
Commercial DB - Government, EUR	22.00
Mixed - Utilities, EUR	14.00
Mixed - Government, EUR	14.40
Commercial DB - Financial, AP	14.70
Mixed - Financial, AP	15.10
Commercial DB - Government, EUR	15.30
DB - Technology, US	16.60
Mixed - Healthcare, GGG	17.70
Mixed - Retail, GGG	18.00
Mixed - Financial, GGG	21.10
DB - Transport, JP	22.00
DB - Financial, AP	24.00
Commercial DB - Transport, GGG	24.50
Commercial DB - Government, NA	26.90
Mixed - Financial, GGG	32.50

IBM IT Economics assessments involving analysis of 485 workloads for consolidation onto IFLs on IBM Z or LinuxONE were selected from diverse industries (25% financial, 25% healthcare, 10% retail, 10% technology, 5% transport, 5% utilities, and other geographies (5% North America, 30% Europe, 20% Asia Pacific, and 30% Greater China Great). The assessments included work performed for clients with business critical workloads serving production and non-production environments. The workloads targeted for consolidation from x86 and distributed servers were IBM and third party proprietary and open source databases, application server middleware and industry specific solutions serving on different types of x86 and distributed servers. Each client targeted for IT Economics team is provided the IBM z/LinuxONE environment for the consolidation. For each assessment, IT Economics consultants work with the clients to identify consolidation patterns and scenarios, analyzed for clients a cost of ownership, and provided a targeted IBM z/LinuxONE workload consolidation based on estimated core consolidation ratios for the client's workload. Consultant analysis identified potential financial savings and IT efficiency that enable the client to move their workloads to IFLs or LinuxONE. For additional information on IBM workload analysis contact IBM IT Economics team, IT.Economics@ibm.com.

LinuxONE workload core consolidation findings

What is hiding in your datacenter?

The impact of indirect costs in x86 and LinuxONE environments

Roger Rogers
IBM Executive IT Economics Consultant
IBM IT Economics Team

Indirect costs [paper](#)

Labor observations for LinuxONE

IT Infrastructure analysis
The IBM IT Economics team is a worldwide group of technical and financial consultants who work with clients to optimize their IT operations. The team focuses on identifying areas for efficiency, cost reduction and increased business value for their business objectives.

Client asks the team to find infrastructure and solution opportunities to reduce workload and maximize utilization of software. Areas of focus include hardware refresh and software purchase and maintenance costs, disaster recovery, security, disaster costs such as networking, operations, energy, and labor.

Labor observations
The following paper summarizes labor efforts observed for the team's client environments using IBM LinuxONE[®] and distributed servers. These observations are based on IBM IT Economics studies for clients either currently or considering LinuxONE as an alternative for their business critical workloads in distributed servers.

While each client's IT environment was different due to organizational structure, server types and workloads, one or more of the following practices were found to be most common across 22 of the distributed servers that actually required and 25 use of cores that are distributed servers than for LinuxONE servers.

Common practices in distributed server environments:

- Some applications or lines of business do not share work with other departments. Clients adhering to this practice indicated they require a higher number of servers than their shared resource strategy in which all users utilize common resources or needed.
- Most clients confirmed development and test are only run on the same distributed server with production, and deploy additional physical servers dedicated to development and test use only.

IBM IT Economics Consulting & Research

Labor observations [paper](#)

LinuxONE Assessment

Quantify benefits and return on investment of Linux workloads on LinuxONE[™]

Companies around the world are faced with the challenges of growing data center costs, server administration complexities, and security concerns. The ability to scale seamlessly for changing business demands with simplified workload and security administration is essential to business success.

Increasingly companies are consolidating their x86 workloads onto IBM LinuxONE servers to leverage the openness of Linux with the advantages of enterprise server resilience and security. The advantages of workload consolidation onto LinuxONE result in less overhead, increased responsiveness and lower IT costs.

IBM offers a no-charge IT value and cost LinuxONE assessment to quantify the benefits and return on investment of consolidating your x86 workloads onto LinuxONE. Use this assessment to evaluate your x86 Linux workload requirements and to quantify the savings of LinuxONE for your organization.

What information is examined in your IT value and cost LinuxONE assessment?

The assessment evaluates technical and operational differences between your existing x86 environment and a LinuxONE solution:

- Linux with open source software
- Platform attributes—resiliency, security, performance, scalability
- Encryption technologies
- Workload consolidation benefits
- Business values (KPIs)
- Actual client data and/or industry average assumptions
- Return on investment and payback period
- Total cost of ownership

Get started
Send a request to the IBM IT Economics team at IT.Economics@us.ibm.com or ask your IBM Client Representative or IBM Business Partner.

An IT Economics consultant will provide a two hour on-site workshop to learn about your IT strategy, capture objectives for the assessment, gather information about your IT environment, and share best practices.

Your consultant will develop a business case which is delivered in two to four weeks. Your assessment will provide:

- Detailed analysis based on your customized scenario
- Recommendations to reduce IT spend and to achieve technical and business requirements

IT value and cost assessment
No-charge, on-site IT assessments available
Visit: ibm.com/iteconomics

IBM IT Economics Consulting & Economics

No-charge LinuxONE assessment

Leveraging workload consolidation for lower IT costs

Why IT organizations use workload consolidation to resolve data center constraints and mitigate cost

Workload consolidation reduces cost
Whether large or small, companies are seeking solutions to simplify IT operations and reduce cost. For many, consolidating workloads onto denser, centralized computing platforms is an effective way to decrease IT expense.

A major savings driver is the decrease in software costs. Typically, Linux workloads running on centralized servers such as LinuxONE and Integrated Facility for Linux (IFLs) on IBM Z[®] require fewer per core licenses due to per core pricing.¹

Another savings driver is energy efficiency. Workloads on IFLs on IBM Z and LinuxONE consume less energy compared to distributed server environments², reducing data center carbon footprint and improving Power usage effectiveness (PUE).

Consolidating x86 workloads onto a fewer physical servers also lowers floor space costs.³ As distributed server environments grow to meet new business demands, floor space can become a significant expense, particularly when an IT organization has reached the physical limits of its data center and is considering a move to a larger facility.

Not only can workload consolidation lower software and data center costs, it can lower administrative overhead. Fewer physical servers can mean less hardware maintenance, less network management, and simpler software patching.

For most organizations, workload growth is inevitable. Centralized servers simplify the task of workload provisioning and deprovisioning by leveraging available capacity within the same physical server.

Most IBM Z and LinuxONE systems provide dormant capacity that can be activated on demand for rapid provisioning of new LPARs versus setting up a distributed server that requires procurement, installation, configuration, security administration, and workload deployment. Reliable disaster recovery for a distributed server environment can also become difficult as more servers with potentially different components, hundreds or thousands of parts, and new configurations are added over time. In contrast, a condensed server environment comprised of one or a few servers can facilitate replication for disaster recovery.

Which workloads consolidate well
Organizations opting for workload consolidation to relieve cost and IT complexity tend to look for the following types of workloads.

- Workloads with per core pricing**
Linux[®] workloads that have a software license price per unit of compute power (processor or socket) are strong candidates for consolidation on LinuxONE or IFLs on IBM Z from a financial perspective. This is due to differences in centralized versus distributed server architecture such as processor speeds, caching, HyperSockets[™] for in-memory communication across LPARs, high levels of sustained CPU utilization and workload management capabilities. In general, distributed servers require considerably more processor cores to run the same Linux workloads than LinuxONE or IFLs on IBM Z. IBM internal tests and data from client environments show core consolidation ratios ranging from 10 to 32.5 distributed cores to one IFL, yielding dramatically lower software costs.
- Workloads with variable resource requirements**
Linux workloads with activity fluctuations are very well suited for LinuxONE and IFLs. Centralized servers provide compute elasticity, or resource sharing, so that memory, CPU and I/O can be allocated to workloads with diverse timeline requirements over a 24-hour period.
- Workloads with I/O demands**
Most business workloads consistently use I/O to perform their tasks (for example databases, messaging, and stream processing workloads). These workloads tend to be I/O driven and can accelerate response times by leveraging LinuxONE and IFL FICON[®] or FCP protocols designed to enhance data transfer and to increase sustained CPU utilization through advanced workload management capabilities. FICON I/O capabilities such as multipathing[®] that automatically switches to an alternate path in event of an interruption, can alleviate administrative overhead for maintenance and network bottlenecks.

IBM IT Economics Consulting & Research

Lower IT costs with workload consolidation [paper](#)

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