

EXPLORING THE BENEFITS & CHALLENGES OF MIGRATING LINUX WORKLOADS TO AZURE

Microsoft Azure

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Businesses are increasingly turning to cloud solutions to optimize operations, drive innovation and stay ahead of the curve. Microsoft Azure enables businesses to run Linux workloads in Azure to maximize ROI and performance, enhance security and accelerate innovation. This eBook looks at migrating Linux environments to Azure, discussing the benefits while navigating the challenges that come with such a transformational journey. Let's explore the opportunities and considerations involved in utilizing the power of Azure for Linux workloads.

LINUX IN AZURE

Linux in Azure offers the best of both worlds; you get all the customization features of Linux as well as the features and benefits of Azure. This combination provides unparalleled convenience and efficiency for organizations seeking to streamline their operations and drive rapid advancement. With Azure, there's no need to endure lengthy lead times for Linux environment preparation, as migration can be executed with minimal friction. Furthermore, administrators can save valuable time by leveraging intuitive Linux open-source environment and application management tools, reducing the burden of administrative tasks. Azure provides comprehensive built-in support for Red Hat, SUSE and Ubuntu ensuring seamless integration and compatibility.



More than 60% of customer cores in Azure run Linux workloads. Linux is a first class operating system in Azure, with many of Microsoft's most popular cloud services, like the Azure OpenAl service, Azure Kubernetes Service, App Service, Cosmos DB, Postgres and more, all running on it.

Additionally, Azure landing zones using Bicep and Terraform enable the swift creation of fully governed environments, simplifying the deployment process. For scalable applications, Azure offers Azure Virtual Machines Scale Sets for Linux VMs (virtual machines), allowing organizations to effortlessly manage a group of load balanced VMs that dynamically adjust to demand. With support for common Linux distributions, Azure empowers users to create their own Linux VMs, deploy containers in Kubernetes or choose from a vast array of preconfigured images in the Azure Marketplace. Whether running community-supported Linux distributions or Azure Linux as the container host operating system (OS) for Azure Kubernetes Services (AKS) clusters, Azure provides the flexibility and versatility needed for success.

BENEFITS OF MIGRATING LINUX WORKLOADS TO AZURE

Azure stands out for its exceptional capabilities in empowering high-performance compute within a Linux framework, making it an ideal choice for handling data-intensive workloads with purpose-built infrastructure running on AMD EPYC[™] powered VMs. Furthermore, Azure's Platform as a Service (PaaS) model simplifies the deployment and management of Linux workloads, allowing organizations to focus more on business logic without the burden of extensive infrastructure management. Containerization with Azure Kubernetes Services (AKS) further enhances scalability and flexibility by supporting Dockerized containers and images, facilitating seamless application deployment.

Additionally, Azure's ease of migration streamlines the transition process for Linux workloads, offering seamless integration with common Linux distributions and popular open-source databases like PostgreSQL and MySQL. Azure ensures a seamless Linux experience across all workloads, thereby enhancing compatibility and ease of migration for Linux users. Migration to Azure facilitates the segmentation and modernization of workloads, allowing organizations to break down monolithic servers into smaller, specialized components. This modernization effort not only enhances scalability and manageability but also lays the foundation for further advancements such as containerization and adoption of serverless solutions. Moving Linux workloads to Azure can unlock numerous advantages for businesses and developers alike, with a wealth of benefits.



of surveyed IT professionals said they're saving money, seeing more productivity & experiencing better security with cloud migration*

* uk.insight.com/content/dam/insight/EMEA/blog/2017/05/Trend%20Report



Scalability & Resiliency

One of the primary benefits lies in scalability. Workloads that natively run Linux are most often mission critical functions that require the ability to scale both up and out; Azure's AMD-based infrastructure allows for easy scaling of resources up or down based on demand. For example, Azure's AMD-based infrastructure scales from as few as 2 CPU cores up to hundreds of thousands with high-performance compute VMs and services. This scalability ensures that businesses can efficiently handle varying workloads without the need for hefty investments in on-premises hardware. Additionally, Azure's high-performance capabilities for Linux workloads enable seamless scaling and bursting out of different workloads as needed, ensuring optimal performance even during peak periods of activity.

Azure has over 300 physical datacenters arranged into more than 60 regions – more regions than any other cloud provider – and linked by one of the largest interconnected networks on the planet. With this connectivity, Azure provides unprecedented scalability, low latency, data residency and high availability around the world.

Containerization is a key technology related to scaling an application to manage usage spikes or self-heal due to error states. Modern containerization technologies often are developed to run primarily on Linux. These technologies can leverage the full scope of cloud computing to allow applications to expand almost infinitely out to meet any expected or unexpected performance requirements. In addition, the ability to natively scale an application to meet performance demands also allows the application to be fault tolerant. Since the cloud is designed to be site and region resilient, these workloads can instantly take advantage of a global footprint that would be difficult to replicate with an on-premises data center.

Cost Savings

By moving to the cloud, you can shift from a capital expenditure (CapEx) model, where you invest in hardware and infrastructure, to an operational expenditure (OpEx) model, where you pay for what you use. Businesses can achieve substantial cost savings, particularly for fluctuating workloads, by choosing AMD EPYC[™] based VMs, which delivers remarkable price-performance for Linux workloads. Azure's pay-as-you-go (PAYG) model allows for cost optimization by automating processes such as turning virtual machines on or off based on usage patterns, further enhancing flexibility and potential savings. With Azure Hybrid Benefit for Linux, customers can bring their Red Hat and SUSE Linux subscriptions directly to Azure resulting in savings up to 76% (in combination with 3-year RIs). The ability to convert from PAYG to a bring-your-own-subscription (BYOS) model seamlessly post deployment is only available on Azure.



* The Total Economic Impact[™] Red Hat Enterprise Linux On Microsoft Azure, a commissioned study conducted by Forrester Consulting, 2024. Results are for a composite organization based on interviewed customers.



Additional points for consideration:

- Azure offers Reserved Virtual Machine Instances, allowing you to commit to one or three years of usage for a specific virtual machine size and region.
- Azure savings plan for compute provides savings up to 65% off pay-as-you-go pricing when you commit to spend a fixed hourly amount on compute services for one or three years. This can lead to substantial cost savings compared to pay-as-you-go rates.
- For workloads that can tolerate interruptions, Azure Spot Virtual Machines offer a significant discount compared to regular on-demand VMs.
- Azure provides tools and dashboards to help you monitor and optimize your spending. You can set budgets, create alerts and gain insights into your resource usage. This financial flexibility aligns with changing business demands and encourages innovation without budget constraints.

Forrester Consulting conducted a Total Economic Impact (TEI) study to examine the potential return on investment (ROI) enterprises may realize by deploying Linux in Microsoft Azure. Here are the results:*

50% Reduction in outage frequency

- **85%** Reduction in outage downtime
- **80%** Reduction in datacenter spend

60% Reduction in legacy solution costs

From an application standpoint, mission critical applications can be expensive to host in an on-premises data center due to the requirements related to data center specific scale/ resiliency and geographical isolation of data. These features are native in the cloud and allow any workload to be configured to leverage them at the proper size for the application. Gone are the days of overbuilding every application environment for the one use case where performance is required to instantly double. Linux workloads especially are most often built on services that run natively in the cloud and have a native "right-sizing" action built into cloud computing.

* The Total Economic Impact[™] Red Hat Enterprise Linux On Microsoft Azure, a commissioned study conducted by Forrester Consulting, 2024. Results are for a composite organization based on interviewed customers.



Flexibility

Azure provides businesses with a range of compute, storage, networking, database and AI services, so you can choose the one that best fits your needs. This flexibility extends to the deployment of new instances, switching operating systems or creating test environments swiftly and efficiently. By migrating Linux workloads to Azure, organizations can shift from a rigid infrastructure setup to a dynamic and adaptable environment tailored to their requirements. Furthermore, Azure's flexibility extends to its global presence, enabling customers to deploy resources in regions that best suit their requirements, ensuring low latency and compliance with data residency regulations. Azure's hybrid capabilities mean organizations can seamlessly connect their on-premises infrastructure to the cloud, allowing for a gradual, less disruptive migration path.



Reliability & Security

Azure's security portfolio is a formidable arsenal for safeguarding Linux workloads, offering a multi-layered defense that spans identity and access management, threat protection, compliance, and more. Microsoft Azure has over 100 compliance certifications, more than any other cloud provider. Plus, Azure is the only leading public cloud that offers a cloud native application protection platform, CNAPP, which means end-to-end protection across your Linux application and infrastructure stack.

Azure offers high availability and reliability features such as data redundancy, failover mechanisms and automatic backups, enhancing system uptime and resilience. Azure also invests heavily in security measures to protect infrastructure and data, offering robust tools and services such as firewalls, encryption and identity management to safeguard environments against threats and vulnerabilities. In addition to security, Azure's disaster recovery capabilities offer peace of mind by providing various backup and recovery options, ensuring swift recovery from data loss or unforeseen disasters. This resilience is vital for maintaining business continuity and safeguarding critical data and applications.

With Microsoft Defender for Cloud, you get end to end protection that will unify security posture management and workload protection across AWS and Google Cloud as well. All of this is native to Azure, you just have to enable the capability. Furthermore, Azure is the first public cloud to enable a cloud native SIEM - a security information event management solution in its portal. Microsoft Sentinel provides intelligent security information and event management for Linux workloads, enabling real-time threat detection and response.

Microsoft is the cloud leader in confidential computing, collaborating with AMD, Red Hat, and others. Azure Confidential computing protects sensitive data without application changes. While other vendors offer confidential computing, Azure provides the most comprehensive AMD CPU features. The AMD-Microsoft collaboration delivers unique capabilities for AMD-based VMs.

Additionally, by offloading infrastructure management to a cloud provider, you can focus more on core business objectives and development projects. By entrusting Azure with infrastructure responsibilities, businesses can streamline operations, increase agility, and allocate resources more strategically. Lastly, with Azure's global reach, businesses can deploy Linux environments closer to users for better performance and lower latency, ensuring a seamless experience regardless of geographic location. Linux workloads on Azure help organizations improve operations, boost resilience and innovate more, preparing them for long-term growth and success. By migrating to Azure, you're not just moving your Linux workloads; you're unlocking a realm of possibilities for high-performance computing. With tools like Azure Databricks and the photon engine, you can take advantage of massive, distributed compute architecture effortlessly. You can leave behind the challenges of cluster tuning and maintenance and use a platform that allows you to focus on your business logic and innovation.

> - Adam McGinnis 3Cloud Senior Architect, Al Solutions

Additional Benefits of Linux Applications in Azure

Besides the cost savings, scalability and resiliency, there are numerous benefits to having Linux applications in the cloud.

Agile Mindset

Modern business moves fast; users, partners and employees expect their applications to move just as quickly. Having to build and configure new environments in a private data center can challenge the ability for the application team to release more functionality faster and more reliably. The agile business requires an agile application, having that natively in the cloud alleviates internal cost and complexity.

Global Footprint

Increased applications are being used by a global audience. Having an instant ability to deploy an application to a pre-configured geographic region in the cloud is a critical component to staying out in front of the growth of any application. Linux applications are no different in that the closer the users are to the application and data, the better experience they will have.

Automation

Linux management, administration and configuration can be complex. The cloud allows for a best practice, hardened method for deploying popular Linux applications and services. By normalizing the environment, teams can automate their routine tasks for deployment, testing and QA, and spend more time on what matters – improving the application. Linux applications especially are prone to complex configurations and build processes. The cloud allows these to be standardized.



HOW CAN MIGRATING LINUX WORKLOADS HELP WITH AI READINESS?

Azure's extensive suite of additional services beyond infrastructure, including databases, analytics, machine learning and Internet of Things (IoT) solutions, opens avenues for building complex and feature-rich applications. This comprehensive ecosystem enables businesses to innovate and plays a pivotal role in enhancing organizations' AI readiness by providing a conducive environment for AI development and deployment. While Azure migration may not directly correlate with AI readiness, the process of modernizing and optimizing Linux workloads in Azure lays a solid foundation for future AI initiatives.

Linux in Azure offers seamless access to GPU resources specifically tailored for AI workloads, eliminating the need for extensive hardware investments, and enabling data science teams to conduct experiments and test experiences without the constraints of on-premises infrastructure. Azure's Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) solutions are intricately designed to support AI workloads, including GPU-accelerated resources, thereby facilitating efficient and scalable AI development.

In addition, Azure Databricks, built on Linux and Spark, seamlessly integrates with large language models (LLMs) for general artificial intelligence, offering features like embedding within tables and fine-tuning models. This integrated ecosystem enhances efficiency and empowers users to leverage AI capabilities within the Azure ecosystem, positioning Azure and Databricks as preferred choices for organizations seeking to embark on AI initiatives. By modernizing and optimizing Linux workloads in Azure, organizations pave the way for a more flexible, scalable and AI-ready infrastructure, setting the stage for future advancements and innovation in AI.

CHALLENGES OF LINUX MIGRATION

Migrating Linux workloads to Azure offers compelling benefits such as enhanced performance, cost savings and opportunities for modernization. However, to realize these advantages, organizations must adopt a strategic approach, proactively addressing compatibility issues and migration complexities to facilitate a smooth and successful transition.

In the world of migrations, it's not the obvious technical hurdles that trip us up; it's the forgotten details, the overlooked workloads, and the unsupported versions. Success lies in mastering the unexpected challenges – the 'other stuff' that tends to be ignored until it causes chaos.

- Marquis Wynne 3Cloud Consulting Director, Infrastructure

Organizations must navigate several challenges to ensure a successful transition. Compatibility issues are a primary concern, as ensuring that Linux distributions align with Azure services is crucial. Some older or less common distributions may lack support from Azure, necessitating alternative migration strategies to bridge the gap.

Preparation and qualification form the backbone of any migration endeavor. Considerable time and effort are invested in activities like workload qualification and dependency mapping. Identifying dependencies and scheduling downtime for migration are vital steps that demand meticulous attention to detail, as overlooking these aspects can lead to disruptions and project setbacks.

The complexity of migration often stems from managing dependencies and unforeseen technical hurdles. While the technical process itself might seem straightforward, navigating compatibility issues and addressing dependencies require careful planning and coordination to mitigate risks effectively. Also, organizations may have to contend with technical debt and legacy systems associated with older Linux distributions, necessitating specialized tools or alternative migration approaches to ensure a seamless transition to Azure.

At 3Cloud we've provided expert guidance on thousands of cloud migrations and modernizations. Businesses can start their journey with our Cloud Roadmap where 3Cloud will collaborate with you to develop both short- and long-term strategies for your Azure initiatives and develop a clear action plan to reach the cloud. A Cloud Roadmap analyzes your current Azure IT systems and services to create a deliberate growth plan that's aligned with your business goals.

Download 🕁

Cloud Roadmap Solution Datasheet

LINUX MIGRATION BEST PRACTICES & LESSONS LEARNED

Through 3Cloud's years of experience and lessons learned helping clients across a multitude of industries with their cloud journey, we've discovered best practices that should be adhered to in order to effectively streamline the process of Linux workload migration. As stated, prequalification of workloads stands as a foundational step, ensuring compatibility between Linux versions and Azure's environment. Conducting test migrations before the actual transition is invaluable, allowing teams to identify and address any compatibility issues or challenges proactively, thereby minimizing disruptions during the migration phase.

Attention to detail in disk layout and mapping is crucial, particularly in complex setups where discrepancies between on-premises and Azure infrastructure configurations can lead to complications. Leveraging Azure Marketplace images for Linux distributions not only ensures full support from Microsoft but also simplifies troubleshooting and issue resolution. Also, tapping into Azure's partnerships and built-in support for Red Hat, Canonical and SUSE, among others, is a big advantage. For example, migrating Red Hat Enterprise Linux workloads provides access to specialized expertise and support from Red Hat professionals embedded within Azure.

Furthermore, considering industry-specific needs is key. Industries like healthcare and manufacturing, with their specialized or highly transactional workloads, can benefit from Azure's support for Linux by gaining stability, security and compatibility, facilitating smoother operations and potentially enhancing readiness for AI integration. By incorporating these best practices and lessons learned, organizations can navigate the complexities of migrating Linux workloads to Azure with greater confidence and efficiency.

Conclusion

In conclusion, migrating Linux workloads to Azure offers many benefits, from enhanced scalability and flexibility to improved security and cost-efficiency. By taking advantage of the customization features of Linux and Azure's robust infrastructure and comprehensive set of services, organizations can optimize their operations and drive innovation with ease. However, successful migration requires careful planning and following of best practices, including thorough assessment of workloads, strategic deployment of resources and ongoing monitoring and optimization. With the right approach, businesses can maximize the potential of their Linux environments on Azure. 3Cloud has the experience and expertise to ensure that your Linux migration is a success. Get started with 3Cloud's Cloud Roadmap for a holistic approach to prepare for your cloud journey.

FAQS ABOUT AZURE & LINUX VMS

What Linux distributions does Azure support?

Azure supports all the major Linux distributions including Red Hat Enterprise Linux, SUSE Linux Enterprise, openSUSE, Ubuntu, CoreOS, Debian, and Oracle Linux. * In September 2019, Red Hat announced its intent to sunset CentOS and replace it with CentOS Stream. CentOS 7 and 8 are the final releases of CentOS Linux with EOL dates as: CentOS 8 - December 31, 2021 & CentOS 7 – June 30, 2024. Please consider your use and plan accordingly. See the updated list <u>here</u>.

Which on-premises Linux virtual machines can I migrate to Azure?

A range of guest operating systems, including the Azure-endorsed Linux distributions and supported Windows Server versions. Migrate virtual machines from VMware and Microsoft Hyper-V environments with Azure Site Recovery. VMs migrated from these on-premises virtualization platforms run as native Azure IaaS VMs and are not dependent on the on-premises hypervisor.

How many different VM types are available in Azure and what type of Linuxbased workloads can they run?

Azure offers a broad range of virtual machines — there is a VM for every workload. AMD alone has over 35 different VM types available in most Azure regions covering Linux general purpose, high-performance computing, storage-optimized, visualization and AI workloads. Read the <u>documentation for Linux VMs</u> to learn more.

How can I find out which VM best fits my workload?

The Azure VM <u>technical documentation</u> pages, Azure VM <u>series</u> pages, and Azure VM <u>pricing</u> <u>calculator</u> can help you determine your VM needs.

What support can I get for my Linux VM deployments on Azure?

You get co-located technical support from Azure, Red Hat, and SUSE with just one ticket. Explore Azure support options and choose the plan that best fits your needs.

How can I save money with Linux VMs running on Azure?

There are no upfront costs, and you only pay for what you use. Use Azure Reserved VM Instances and save up to 72 percent. Additionally, through Azure Hybrid Benefit for Linux, you can use your pre-existing on-premises Red Hat or SUSE software subscriptions in Azure. Alternatively, pre-pay for your SUSE and Red Hat software usage in Azure, and save money over pay-as-you-go prices.

How do I create Linux VMs in Azure?

Create Linux virtual machines in Azure through the Azure portal, Azure PowerShell or Azure CLI:

- The Azure portal provides a browser-based user interface to create VMs and associated resources.
- Use the Azure PowerShell module to create and manage Azure resources from the PowerShell command line or in scripts.
- Use the Azure CLI to create and manage Azure resources from the command line or in scripts.

What are the SLAs for Linux VMs on Azure?

Microsoft offers a range of OS-independent SLAs for Azure VMs.

What disk storage options are there for provisioning new Azure VMs?

Most Azure VMs come with temporary non-persistent local storage. Additionally, Azure offers HDD and SSD storage for data.

What are Azure Virtual Machine Scale Sets?

Virtual Machine Scale Sets help you create and manage a group of load-balanced and autoscaling VMs. Deploy virtual machine scale sets using Azure Resource Manager templates, which support Windows and Linux platform images and custom images and extensions.

Can I use my existing on-premises Linux software subscriptions on Azure?

Take advantage of Azure Hybrid Benefit to use your existing on-premises Red Hat Enterprise Linux and SUSE Linux Enterprise Server subscriptions when you convert your Red Hat Enterprise Linux and SUSE Linux Enterprise Server pay-as-you-go Azure VMs to bring-your-ownsubscription billing. Typically, VMs deployed from pay-as-you-go images on Azure will incur both an infrastructure fee and a software fee. With Azure Hybrid Benefit, pay-as-you-go VMs can be converted to a bring-your-own-subscription billing model without a redeployment, so you can avoid any risk of downtime.

3Cloud's partnership enabled Virtus Partners to transition quickly to where we wanted to be today, and to transform our operations to where we are headed in the future.

- Virtus Partners



3Cloud is the premier pure-play Azure partner in the ecosystem with unparalleled expertise in all things Azure. We specialize in delivering top-tier Azure infrastructure, cutting-edge artificial intelligence (AI), robust data & analytics and ground-breaking app development. Leveraging our extensive experience, advanced tools and customized accelerators – we ensure the quickest time to value for your Azure-based projects.

