

# Application Platform Modernization with Enterprise Linux

Sponsored by: Red Hat

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## IDC OPINION

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Applications form the central nervous system in modern enterprises; they are the foundation on which businesses maintain their existing revenue streams while examining ways to create new revenue streams. Organizations must constantly evolve their application strategy to be successful at expanding their competitive differentiation in the digital economy. Their applications portfolio must be constantly infused with new-generation applications that run in the cloud, are delivered as microservices, leverage open source technologies, and are increasingly (infrastructure) platform independent.

All applications are driven by data, however, and their ability to scale and adapt to changing business requirements is dependent on the database management system (DBMS) that drives the applications. For applications to be scalable and highly available, they need an underlying DBMS that can process transactions quickly and reliably and, for large analytic tasks, that can ingest huge and diverse data sets with low latency and leverage in-memory technologies for both transactional processing and real-time analytics. That DBMS must also support the next generation of applications that will require the ability to embed analytic queries in transaction processing, moving from online transaction processing (OLTP) to analytic transaction processing (ATP). Furthermore, these applications and their databases need to meet security and compliance requirements such as PCI DSS, GDPR, and HIPAA.

A versatile operating system (OS) environment such as Linux is an ideal platform for consolidating current- and new-generation applications and their respective data management stacks.

The availability of Microsoft SQL Server on Linux enhances the value proposition of both platforms:

- For existing applications, SQL Server on Linux offers reduced total cost of ownership (TCO). Firms with investments in SQL Server can now chart a path for platform consolidation while preserving interoperability.
- For new application development, SQL Server on Linux provides more opportunities. Developers can now choose to go with SQL Server for the database layer without giving up on Linux as their deployment platform.

And whether on current or new application platforms, SQL Server on Linux has been shown to perform well out of the box in terms of its speed and performance.

## SITUATION OVERVIEW

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### Application Modernization Is an Essential Business Function

A modern application portfolio is essential for organizations to compete in the digital economy efficiently. Application strategies must be constantly adjusted and tweaked so that the portfolio collectively enables companies to meet its business objectives. Application development and support teams, working in conjunction with their IT operations peers, employ a variety of techniques to maintain the currency of their applications:

- Repackaging is the process of moving custom-developed applications to run natively in the new environment (e.g., a public cloud). The most common form of repackaging involves modifying the application so that the entire application or pieces of it can run inside portable, lightweight containers.
- Replatforming involves tweaking or updating the application so that the entire application or pieces of it can run natively in the new environment (e.g., public, private, or hybrid cloud).
- Refactoring is the process of restructuring existing code – changing the factoring – without changing its external behavior. Refactoring improves nonfunctional attributes of the software (e.g., the operating system or data management layer).

These techniques are often used to meet key objectives involving redesign or change to the underlying components so the application becomes more highly scalable and distributed and thus highly available. These objectives and hence the techniques are not mutually exclusive. Example use cases include:

- Deploying data management systems (e.g., relational databases) that can ingest a huge amount of diverse data sets with low latency, leverage in-memory technologies for both transactional processing and real-time analytics, and generate near-real-time predictions based on transactions using machine learning as they are processed
- Achieving platform consolidation so that all or part of the application uses a common infrastructure layer such as the operating system environment with or on a modern virtualization stack
- Deploying secure computing and data-layer processes (e.g., developer sandbox environments) so that the applications and their data management systems can meet security and compliance requirements such as PCI DSS, GDPR, and HIPAA
- Leveraging microservices that enable the development of applications as a set of independently deployable small and modular services in which each service or function runs a unique process or command and communicates through well-defined, lightweight mechanisms such as APIs

### *The Role of Operating Systems in Application Modernization*

A versatile operating system environment is an ideal platform for consolidating current- and new-generation applications and their respective data management stacks. Such operating systems are designed to host or be hosted on a modern virtualization stack and offer the flexibility of choosing either on-premises or cloud deployments.

Over the past decade, Linux has become a preferred OS at most enterprises given its propensity for open operating system environments. As a modern OS, Linux – specifically commercial Linux – enables IT organizations to offer:

- Deployment flexibility and seamless experience on bare metal or in virtualized environments and in the public cloud, on-premises, and in hybrid cloud configurations
- Development agility with tools and frameworks used in modern application development and natively supported on the OS
- Stability and reliability by benefiting from a faster release cadence of features and functions, thanks to a vibrant open source community
- Enterprise service-level agreements, with enterprise-grade single-vendor support
- Choice through a robust ecosystem of vendors that provide a diverse array of software solutions.

It is noteworthy that most infrastructure-focused independent software vendors (ISVs) have made Linux their preferred deployment platform.

### ***Platform Consolidation and Choice for Data Management***

Platform consolidation and data management architecture go hand in hand. A modern operating system environment enables the repackaging, replatforming, and refactoring of the data management and analytics layers in line with other application components. Running databases in containers, for example, enables integration with development methodologies such as DevOps and continuous integration/continuous delivery (CI/CD), thereby giving developers more control over the provisioning and orchestration of infrastructure resources. Furthermore, the use of a microservice delivery model results in a smaller and nimbler database footprint and allows for a higher density of database instances compared with running the same environment in a virtual machine.

## **MICROSOFT SQL SERVER ON RED HAT ENTERPRISE LINUX EXPERIENCE**

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Since 1993, Red Hat has steadfastly executed on its mission to accelerate enterprise adoption of commercially supported open source platforms. Its portfolio of products, offerings, and solutions enables customers to preserve many of their existing investments without making serious financial investments to self-maintain open source platforms. A key reason for the industry success of open source software is vendors such as Red Hat. And key reasons for the success of Red Hat are its commitment to and support of the open source community – both financially and by code contributions. In addition, Red Hat is one of the largest employers of developers supporting open source initiatives worldwide, including in communities that are upstream from its core products. Red Hat has successfully commercialized products such as Red Hat Enterprise Linux (RHEL), Red Hat OpenShift, and Red Hat Ansible Automation Platform.

### **Red Hat Enterprise Linux**

Red Hat's product stack begins with the company's flagship operating system product, Red Hat Enterprise Linux. IDC research has found that Red Hat Enterprise Linux customers often use RHEL for enterprisewide business-critical deployments because of:

- Enterprise-grade features such as stability, reliability, security, and performance for current-generation workloads

- A solid yet flexible foundation for a new generation of workloads and solutions with the ability to deploy them in the core, at the edge, and in the cloud (Consistency is a key value proposition for RHEL – consistency across deployment choices.)
- Access to one of the industry's most extensive communities of partners, customers, and experts on infrastructure software
- Predictability in terms of licensing costs and a clear upgrade path, which alleviates both burdens from businesses' C-suites and IT staffs

Over time, these types of features and benefits have helped RHEL continue to win new workloads and customers, which has allowed it to grow its status as the largest commercial Linux OS product<sup>1</sup>, with roughly an 80% market share of the segment in 2022. Our research shows broad enterprise buyer support for RHEL thanks to its enhanced security features and functionality, commercial support by Red Hat (including a 10-year support life cycle), and deep, long-standing partnerships across the hardware, software, and services spaces. These are all aspects of RHEL that customers can expect to enjoy whether deploying RHEL in their datacenters, in the public cloud, or at the edge. In contrast, other nonpaid, self-supported Linux distributions have no guarantees of these types of benefits and often require notable investment from internal IT teams and/or external third parties to secure and maintain their operating system environments.

All RHEL new licenses and subscriptions also come with Red Hat Insights. Red Hat Insights allows operations teams to analyze their IT footprints through a single dashboard and provides recommendations that help track performance and costs in addition to identifying potential security risks and vulnerabilities in customers' OS environments, which proves itself as an additional advantage. This pairs well with RHEL System Roles for SQL Server, which are a collection of Ansible roles that allow users to automate and manage their infrastructure deployments running SQL Server from a single system.

## The Choice of Microsoft SQL Server for RHEL

A commercial Linux distribution such as Red Hat Enterprise Linux, which is also Microsoft's reference Linux platform for SQL Server, enables IT to better support database consolidation, application modernization, and modern application development and packaging techniques such as support for DevOps, microservices, and containerized deployments. This is because RHEL offers:

- A consistent experience, whether running on bare metal or in virtualized environments or deployed in the public cloud, on-premises, or in hybrid cloud configurations
- Native support for tools and frameworks that are required for modern application development
- The best of both worlds – a faster release cadence of features and functions, thanks to a vibrant open source community and enterprise-grade single-vendor support
- A robust ecosystem of vendors that provide a diverse array of software solutions

Most enterprises use relational DBMSs (RDBMSs) to manage their databases of record as well as their key ongoing analytic data management workloads. A great many of those enterprises are committed to the use of Microsoft's RDBMS, Microsoft SQL Server, for transaction processing as well as analytics and business intelligence. Microsoft SQL Server can manage data in a memory-optimized row or column format and employs the columnwise vector processing capability that combines

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<sup>1</sup> For more details, see *Worldwide Server Operating System Environments Market Shares, 2022: Steady Growth Persists* (IDC #US51038623, July 2023).

processor cache exploitation with single instruction, multiple data (SIMD) processing. It can be deployed as a single instance or in a cluster.

Users that deploy databases on RHEL, whether on premises or in the public cloud, typically have many databases of different types. They generally have a need to query that data altogether. Converging the data in one database through ETL is slow and cumbersome and fraught with the risk of human error. So many are turning to data virtualization capabilities. Microsoft SQL Server has a data virtualization feature, called PolyBase, built in. With PolyBase, Microsoft SQL Server users can issue queries that join data from a variety of sources with data in the database in a transparent manner. This allows the use of Microsoft SQL Server as an access point for querying data across a broad spectrum of databases.

IDC has identified machine learning as a key capability at many levels of the technology stack, driving artificial intelligence functions at the operational, data management, and application levels. Such functions, including predictive analytics, can optimize execution at all those levels and can deliver immediate actionable data intelligence. Microsoft SQL Server offers a feature called SQL Server Machine Learning Services that provides this capability, driven by the relational data in the database. It works with Microsoft Python and R packages as well as open source packages, frameworks, and libraries including PyTorch and TensorFlow.

That the latest version of Microsoft SQL Server can also support ATP establishes its long-term strategic position for such enterprises. SQL Server users on RHEL also have access to a variety of other tools and features that help future-proof, manage, and secure their investments such as SQL Assessment API that integrates with Red Hat Insights to improve user visibility into their database environments as well as SELinux compatibility for SQL Server 2022 for users to be able to run deployments as confined applications.

But as these enterprises plan their future cloud migrations, one obstacle has stood in the way: Microsoft SQL Server ran only on Windows, but, for many of these enterprises, Linux is the key strategic OS for cloud migration and deployment. Fortunately, this constraint no longer exists.

## RHEL Is Microsoft's Reference Linux Platform for SQL Server

When it comes to platform consolidation, existing Microsoft and Red Hat customers get more choice without making any compromises:

- **Enterprise-grade functionality:** Microsoft has been developing and adding innovative and enterprise-grade features to SQL Server, its flagship database product, for over 20 years. These capabilities are now available on RHEL, which gives SQL Server feature/function parity on Linux and Windows, allowing common deployments across each platform.
- **Workload-optimized performance:** SQL Server on RHEL provides faster performance for tough workloads relative to other open source or commercial relational databases supported on Linux. Red Hat claims that SQL Server performs as well on RHEL as it does on any other server platform.
- **Consistency:** Firms benefit from a streamlined and consistent SQL Server database experience across RHEL instances running on premises or in the Microsoft Cloud, on bare metal servers, and as virtual machines and the database instances themselves running inside containers in the cloud (Azure). Further, RHEL and Ansible Automation Platform customers have access to the Ansible Collection for SQL Server, a package that was co-developed by Red Hat and Microsoft. Ansible Collection for SQL Server improves consistency by giving

users a common way to install and deploy SQL servers and/or clustered availability groups on physical or virtual hardware whether on premises or in the cloud.

- **Agility:** SQL Server is fully compatible with containerized deployments, that is, SQL Server itself can be containerized and support other applications running in containers. When applications are replatformed onto Linux, developers can choose to deploy the entire stack to run in containers, which are natively and fully supported on RHEL.
- **Security:** Both RHEL and SQL Server offer robust security capabilities. For example, RHEL has been certified by the U.S. military as a secure platform. Similarly, SQL Server has had the fewest security vulnerabilities of any database platform over the past seven years (source: NIST National Vulnerability Database). The combination results in a formidable stack: the SQL Server on RHEL stack with built-in end-to-end security. It includes technologies such as transparent data encryption (TDE), encrypted client connections, row-level security (RLS), dynamic data masking (DDM), and always encrypted (AE). For user and data access, SQL Server also provides audit capabilities and integration with Active Directory directly or via Red Hat IDM. Moreover, Microsoft is introducing SQL Server support for SELinux confined mode, a Linux feature pioneered by Red Hat that can be used to provide additional security over and above traditional Unix-style permissions that are found in most Linux distributions.
- **Service and support:** Given that RHEL is Microsoft's reference Linux platform for SQL Server, existing Microsoft and Red Hat customers ought to know that all development and testing of "SQL Server on Linux" first happened on RHEL. Both vendors are committed to collocated support for SQL Server on RHEL customers. Moreover, these customers benefit from product support from product security teams from Red Hat and Microsoft.

## Key Use Case: Platform Modernization and Consolidation

SQL Server on RHEL is a great choice for existing Red Hat customers that want to consolidate their data management stack on a common enterprisewide platform without giving up flexibility or feature/function parity.

Non-Red Hat customers will also find SQL Server on RHEL attractive as they consider a path to migrate away from legacy platforms. Both groups will benefit from a reduced total cost of ownership by moving to a consolidated, simplified, and modern data management stack on a single commercial Linux OS.

By focusing on the following key business benefits of SQL Server on RHEL, both groups will be able to convince business stakeholders that may resist any movement toward standardization or optimization that fails to align with their vision for "what is best or already working for them":

- Availability, performance, and security capabilities in line with business requirements
- Quick issue resolution backed by engineering and support teams from both vendors collaborating via an integrated ticketing system
- An extensive knowledge base that provides guidelines on migrating database instances without impacting business operations

## FUTURE OUTLOOK

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Linux continues to show growth in the enterprise – for both on premises and off premises and in cloud and traditional IT deployments. Linux, specifically commercial Linux, will continue to gain strategic

importance among firms as they embark on a multipronged business transformation strategy to remain competitive in the digital economy:

- Existing application modernization initiatives that require replatforming, refactoring, or repackaging to run natively on Linux
- New application development efforts to increase customer engagement and retention, such as the Internet of Things

IDC research shows that for the foreseeable future, Linux will remain a preferred platform for application modernization and data management delivery, regardless of the application type and the way the application is delivered (i.e., bare metal, virtualized, or containerized) and deployed (public cloud, private cloud, or traditional IT).

Successful vendors will be those that support enterprise digitalization strategies and have a reputation for supporting commercial and open source platforms, all the way from the operating system to the application layer. Such vendors not only understand the nuances of application and database development and delivery but also can provide a one-stop shop for IT administrators and developers alike.

Microsoft and Red Hat partnering to support SQL Server and RHEL will surely open the floodgates for more application modernization and platform consolidation. IT buyers that are hesitant to touch their legacy production systems for fear of impacting business operations will now find a guided path toward a more modern, standardized, and well-managed application, data management, and operating environment stack that serves as the basis for innovation.

## CHALLENGES/OPPORTUNITIES FOR RED HAT

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IDC considers the availability of Microsoft SQL Server – a leading relational database platform – on Linux to be a noteworthy development that provides more choice to IT buyers:

- Red Hat has built a formidable portfolio of open source products and platforms. This portfolio is further strengthened by a robust ecosystem of ISVs and solution partners that build open source and commercial software with diverse data management stacks. Furthermore, Red Hat has extensive experience in supporting other OSs such as Microsoft Windows Server. Red Hat also provides robust support and services for its own products as well as joint support and services for its partners' products.
- For Microsoft, its investments in building its cloud-based Azure data services have paid off. Microsoft has gained solid traction in the enterprise as a tier 1 public cloud service provider. With platforms such as SQL Server, Microsoft also provides customers with a robust data platform that not only caters to enterprisewide relational and structured data management requirements but also supports unstructured, nonrelational, and big data and analytics requirements. The latter is gaining importance as firms aggressively chart out a plan for competing in the digital economy. A consolidated platform play is therefore a logical choice for such firms.

Together with Microsoft, Red Hat can capitalize on its unique position in the enterprise for consolidating SQL workloads.

However, Red Hat will face some headwinds as it seeks to expand the SQL Server on RHEL install base:

- **Perception:** This is not the first time that platforms have been ported from one OS to another. Many of the firms that made the switch early on had to contend with unfortunate side effects that included lack of feature parity between the old and new stacks, mixed experience from the various application and data management components, and lack of single-vendor/joint-vendor support. Fortunately, Red Hat is no stranger to replatforming and can utilize its reputation to its advantage.
- **Stickiness of SQL Server on Windows:** Given the fact that SQL Server has been run exclusively on Windows since its inception, the IT buyer base it is pursuing will have plenty of reservations in replatforming the database portion of it, not so much because of the RDBMS itself but because the applications it serves may be Windows native and difficult to migrate. These reservations will include the migration of SQL Server from Windows to Linux and supporting Linux, an environment with which many current Windows administrators have little to no experience.

Red Hat must focus on the business benefits of SQL Server on Linux in warding off potential resistance from the technology, people skills, or budget side. For example:

- Database administrators don't necessarily have the time to adapt to a new platform. Operations' productivity is also hindered by a lack of cross-platform tooling. Moving the database layer to an OS they know (i.e., Linux) will make it easier for them to utilize SQL Server for their structured data needs.
- Developers can continue to use the tools with which they are familiar. SQL on RHEL supports existing SQL development tools such as Azure Data Studio, mssql-cli, and Visual Studio Code.
- The database tier can blend into the existing workflows, thus eliminating any need for additional resources or budgets to be expended on new hardware, software, and processes (e.g., DevOps) – for example, for managing SQL Server, Azure SQL, Azure SQL Data Warehouse, and Azure Data Studio run on Linux, macOS, and Windows.
- By taking a solutions approach, Red Hat can focus on a return-on-investment story. It can bring together its own products closer to SQL Server. For example, JBoss middleware together with SQL Server is a great opportunity for Red Hat to go after other open source and commercial competitive stacks.

Red Hat should also enable IT administrators to self-migrate their databases and, in the process, demonstrate the ease with which it can be done. For example, communicate documented and supported processes such as:

- Manually performing backups of the database on Windows and then restoring on RHEL
- Using the Database Migration Assistant
- Using SQL Server Management Studio and Azure Data Studio
- Using SSIS on Linux to load data from SQL Server and other RDBMSs to SQL Server on Linux
- Using cross-platform (hybrid) AlwaysOn Availability Groups (A non-clustered configuration primarily runs on Windows, while the secondary copy runs on RHEL. After a manual failover, the primary switches run on RHEL.)



- Deploying Microsoft SQL Server on Linux containers, which further enhances the range of flexibility for running the DBMS on RHEL

Further, Red Hat Ansible Automation Platform customers can use its built-in features to assist with their migrations. Ansible Automation Platform is designed to work with Microsoft PowerShell, so existing libraries of SQL Server automation tools can be run from Linux and Windows.

## ESSENTIAL GUIDANCE FOR IT BUYERS

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IT investments have a cumulative effect on firms. Over the course of many years, firms have made heavy investments in IT infrastructure, applications, processes, and policies. Much of their business runs on these technologies and keeping them functioning "as is" is crucial for their IT organizations. At the same time, these IT organizations are under increasing pressure to become more efficient and increasingly agile so their firms can compete in the digital economy. These new requirements often trigger IT organizations to migrate to new platforms, adopt new technologies, and embrace newer workflows and processes. In light of aging infrastructures, the increased demand of both applications and workloads, and processes and policies that fail to map to modern "best practices," something needs to give should the IT organization wish to not fall further and further behind.

While it would be ideal for every IT organization to "start fresh," the reality is that IT organizations are generally unable to scrap existing investments and assets because of their resistance to write off sunk costs combined with a general tendency to limit change and a reluctance to compel their stakeholders to change the processes that directly impact the business. Embracing change and planning for the future while minimizing disruption to current operations are challenging to say the least.

A consolidation strategy with the right OS (Linux) helps firms mitigate or address these challenges. The process works something like this:

- **Acknowledge:** Acquire greater insight into how the problems (i.e., dwindling efficiencies and increased costs) may grow worse should one choose to ignore them and/or not take any action.
- **Assess:** Acquire greater insight into how embracing change is easier and safer than it seems. For example, it is worth learning how it is possible to preserve existing investments as one standardizes and modernizes existing platforms. Recognize the benefits associated with IT optimization.
- **Plan and execute:** Select a trusted partner that can help "keep the lights on" while enabling the migration to a modern and industry-standard OS and data management stack. Create a plan for how to meet the needs of today while building out an IT infrastructure for the demands of tomorrow. Finally, execute.

## CONCLUSION

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Selecting the right platforms for enterprisewide consolidation is crucial for maximizing the chances of a successful outcome. Tried and trusted platforms such as RHEL and Microsoft SQL Server are great platforms on their own. Collectively, SQL Server on RHEL amplifies the value proposition because it brings together experienced product development expertise, investments in cloud platforms and services, and the support and services reputation of the respective vendors. The net beneficiary is the customer.

## About IDC

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