

White Paper

The Benefits of SAP's and SUSE's Long-Lasting Romance

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IDC OPINION

The technology platforms and applications that enable organizations to pivot their business models toward digital transformation (DX) can be referred to as the "digital core," which includes such workloads as machine learning (ML), advanced analytics, blockchain, and Internet of Things (IoT). These workloads require advanced hardware/software platforms that can execute operations on vast volumes of data to deliver sophisticated real-time insights to all parts of the business.

One key operation is the integration of structured operational or transactional data with unstructured data from such ubiquitous sources as social media or IoT devices. Analytics, including machine learning, performed on such data allows an organization to derive important real-time insights as well as predictive capabilities or automated response mechanisms.

While SAP has been building a comprehensive in-memory platform with hundreds of applications to drive its customers' DX, the open source community has provided many of the innovations that enable the management, integration, availability, and security of these environments, most notably the two largest Linux distributions. Among them, SUSE has played a historically critical role in advancing new open source capabilities that are the modern foundation of today's SAP landscapes, whether on-premise or in the cloud.

SUSE and SAP have collaborated closely for many years across their respective portfolios. SUSE is also used for SAP's internal operations and initial offerings of customer-facing services such as the HANA Enterprise Cloud and SAP Cloud Platform. A key area of collaboration between the vendors has been the development and ongoing innovation of the SUSE Linux Enterprise Server (SLES) for SAP applications. While the operating system (OS) layer is a key focus of the partnership, SUSE and SAP collaborate across different pieces of the software stack to support SAP's open source strategy for the digital core. From a portfolio standpoint, SUSE offers open source products spanning software-defined infrastructure and application delivery that can be stacked up as needed based on the needs of the SAP installation.

The collaboration between SAP and SUSE also extends to supporting their joint customers. Support can be a top concern for enterprises deploying mission-critical workloads like SAP applications on open source technologies. SUSE offers varying levels from typical support services to more high-touch consulting and advisory. SAP has positioned itself at the heart of enterprises' long journeys to DX. SUSE, for its part, is working with SAP to provide open source infrastructure solutions and associated support for organizations' SAP deployments as part of this journey.

SITUATION OVERVIEW

The Current State of DX

Digital transformation is about transforming decision making with technology by using new sources of innovation and creativity to enhance customer experiences and improve financial performance. Businesses that execute DX strategies delight customers with superior products, services, and quality in real time. They achieve this by creating an agile business organization with advanced change management maturity that can maintain a leading position in the industries and markets they serve. IDC predicts that by 2020, at least 55% of organizations will be digitally determined, transforming markets and reimagining the future through new business models and digitally enabled products and services.

There are two parts to DX, a people part and a business part, which has a significant technology component. The technology aspects of DX can at a high level be summarized as:

- Leveraging technology to achieve speed, scale, and agility
- Data that drives processes (versus processes that provide data)
- Process innovation at the intersection of code and data

Organizations are making massive investments in technologies and services that enable digital transformation. In April 2019, IDC forecast global DX spending to reach \$1.18 trillion, an increase of 17.9% over 2018. Hardware and services account for more than 75% of all DX spending, spread across enterprise hardware, personal devices, and IaaS. DX-related software spending will total \$253 billion in 2019. The fastest-growing technology categories will be IaaS (35.9% CAGR), application development and deployment software (26.7% CAGR), and business services (26.5% CAGR).

DX Requires Platforms for Real-Time Data Flows

The technology platforms and applications that enable organizations to pivot their business models toward DX are sometimes referred to as the "digital core." The digital core includes such modern workloads as machine learning, advanced analytics, blockchain, and Internet of Things. These workloads require advanced hardware/software platforms that can execute operations on complex flows of vast volumes of data from numerous sources to deliver sophisticated real-time insights to all parts of the business.

Machine learning, for example, has two distinct stages: the artificial intelligence (AI) training phase and the inferencing phase. In AI training, data scientists leverage either classical machine learning algorithms or deep learning techniques to train an AI model. In AI inferencing, that model is then deployed to make decisions about incoming data, often in real time. AI is increasingly being embedded in business and analytical applications and requires infrastructure and an operating environment that can manage multiple data streams that are being run through an AI model.

One key type of operation, therefore, is the integration of – typically structured – operational or transactional data with the unstructured data that flows from such ubiquitous sources as social media and IoT devices. Analytical algorithms performed on these data streams can allow an organization to not only derive important real-time insights about customers, competitors, markets, supply chains, and so forth, but they can also enable predictive capabilities or automated response mechanisms.

The digital core requires a dynamic, scalable hybrid cloud platform. Increasingly, applications for DX are delivered as SaaS, but they also need to seamlessly connect to their on-premise or IaaS counterparts in order to enable analytics that leverage core operational and transactional data. What's more, to perform these analytics on large amounts of data in real time, they run on in-memory platforms that include the database as well as deeply integrated solutions such as ERP or business warehouse.

SAP's Platform for DX

One of the prominent software vendors of such an integrated in-memory database platform is SAP. SAP offers more than a hundred products across a number of product categories such as enterprise resource management (ERM) applications, data management software, customer relationship management (CRM) applications, and analytics and artificial intelligence. Most of them are available as SaaS in the cloud, while about one-third are intended for on-premise deployment. Every conceivable business process of the enterprise is covered by an SAP application, and worldwide, tens of thousands of small, midsize, and large enterprises use these applications to advance their business on the road to DX.

At the heart of SAP's applications is five platforms: SAP Business One, Business Warehouse on HANA (BWoH), Business Warehouse for HANA (BW/4HANA), and Suite for HANA (S/4HANA). These platforms have been developed around SAP's in-memory database SAP HANA, which SAP has stated will become the exclusive database for all SAP applications by 2025. This allows SAP to simplify and optimize the database and application integration and evolve a streamlined and highly performant landscape for business applications and analytics that are interwoven with the database.

Many of SAP's customers, however, have been running (and continue to run) their SAP applications on non-SAP databases, such as the SQL Server (Windows) and Db2 (AIX and z/OS), which is why "SAP HANA migration" has been a major IT topic for several years now. Organizations that run SAP applications on non-SAP HANA databases have roughly four possible future scenarios:

1. If they decide to migrate to SAP HANA in the short term, they will need to disentangle their SAP landscape from the legacy database, re-establish the data flows, move to different SAP-certified hardware for the database, and – in the process – switch operating systems for the database to Linux.
2. If they decide to wait until SAP's formal end-of-support date in 2025 for non-HANA databases, they will be delaying the implications of scenario 1, but they may also miss out on years' worth of innovation and integration that SAP is creating at breakneck speed, potentially stunting them somewhat with less sophisticated analytics capabilities than their competitors.
3. If they decide to remain on the non-HANA database and continue running the business with SAP applications, they will experience high support expenses after 2025, either from SAP or from third-party consultants.
4. If they decide to switch to business and analytics applications from an entirely different vendor, they will be faced with disentanglement of their landscape and reintegration on the alternative software.

IDC research has found that scenario 1 is the most prevalent, but the other three scenarios have adherents too. We will, from here on, primarily discuss what the first scenario entails, and specifically the role of the operating system. It is well known that SAP HANA requires SAP-certified hardware, storage, virtualization, and OS solutions. Hardware is available either as SAP HANA appliances or as a customized SAP-certified combination of these components called Tailored Datacenter Integration (TDI). There are 14 server vendors that offer SAP-certified servers, 18 vendors (some overlapping with

the server vendors) that offer SAP-certified storage solutions, and 10 vendors that offer TDI. There are also converged and hyperconverged solutions that SAP has approved. All servers are Intel based, except for the IBM Power SAP HANA solutions that run on POWER processors. This is, in other words, a highly competitive market in which vendors are clamoring to differentiate themselves with performance and support.

As stated previously, the SAP HANA and S/4HANA run on Linux, and there are only two Linux distributions that have been certified by SAP: SUSE (SLES [for SAP] 11 SP1 through SLES [for SAP] 15) and Red Hat (RHEL 6.10 for SAP HANA through RHEL 7.6 for SAP Solutions). Customers that are going through scenario 1 (described previously), therefore, need to select a preferred Linux distribution, which they can do based on various considerations:

- They may already have a Linux vendor in the datacenter or cloud and might consider to remain with that vendor – one caveat here is that IDC generally warns against sticking with a vendor without thoroughly investigating the merits of alternatives; furthermore, two Linux environments – one for SAP and another for other environments – are not necessarily incompatible with each other.
- They may not have a significant Linux presence in the datacenter or cloud yet, in which case, a comprehensive evaluation of the differentiators between the two Linux vendors is paramount. Features to evaluate against might include:
 - **Performance optimization:** Optimizations between the OS and the SAP HANA appliance or between SAP and the OS can increase performance.
 - **High availability (HA)/disaster recovery (DR):** An OS that provides HA and/or DR or participates strongly in HA and DR helps with the resilience and data protection of the landscape.
 - **Security:** Security is top of mind among IT buyers, and the OS plays an important role in securing the environment.
 - **Management:** The complexity of an SAP landscape can be significant, and the OS can contribute to managing the environment itself, as well as how it is integrated with the rest of the datacenter or cloud.
 - **Hybrid cloud and/or multicloud:** To achieve a seamless hybrid cloud or multicloud environment, the OS is critical, as are the open source solutions for hybrid cloud that the OS interacts with.

It should be noted that SAP is increasingly urging its customers to deploy SAP HANA, S/4HANA, and the many SAP applications in the cloud, whether IaaS, SaaS, or platform as a service (PaaS). This means that organizations that are on the scenario 1 journey have an additional complexity to consider for their SAP deployment, namely the ideal mix of on-premise, IaaS, PaaS, and/or SaaS. One important aspect of this evaluation is the need for seamless continuity between the various deployments. This is an area where the OS plays a critical role.

SUSE FOR SAP

SUSE Is a Longtime Open Source Partner for SAP

As mentioned previously, SUSE and SAP have collaborated for many years to codevelop technologies, solutions, and best practices across their portfolios. One interesting aspect of the companies' relationship is that SUSE is SAP's in-house implementation platform. SUSE is used for SAP's both internal operations and initial offerings of customer-facing products and services like the HANA Enterprise Cloud and SAP Data Hub.

SAP also chose to build the first SAP HANA solution on SUSE Linux, an example of the joint product development and innovation efforts between the companies. SUSE offers a version of the SUSE Linux Enterprise Server (SLES), SLES for SAP Applications, which is a comprehensive platform for all SAP software solutions. According to SUSE, the number of SAP customers across all solutions on their platform is approximately 30,000. Further, SLES for SAP Applications is currently running in approximately 90% of SAP HANA installations according to SUSE.

The companies' alliance extends beyond that of a traditional technology partnership. SUSE and SAP can be seen as "co-innovation" partners that are jointly developing and delivering solutions across their respective portfolios. SUSE has been a sponsor of the SAP Linux Lab since it was established in 1999. True to its open source heritage, technological developments of the SAP Linux Lab are offered upstream to the open source community. In 2017, SUSE became a sponsor of the SAP Co-Innovation Lab (COIL) network, which consists of 18 labs worldwide that provide solution architecture guidance and ongoing coaching, as well as preconfigured system landscape templates for on-premise, off-premise, and hybrid environments. As a sponsor, SUSE provides the COIL computing centers with SLES for SAP Applications, and the library of preconfigured system landscape templates are also based on SLES.

SUSE Solutions for the SAP Intelligent Enterprise

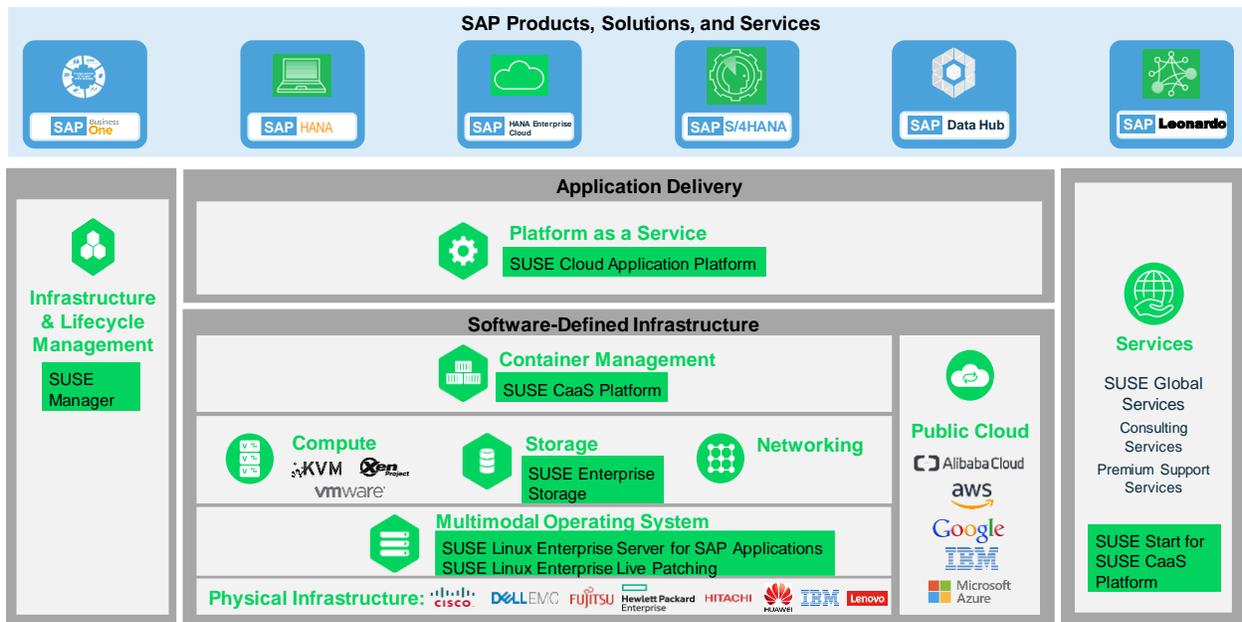
SUSE's core customer base remains traditional IT departments, but the supplier has been working for several years to expand its portfolio beyond its company heritage of commercial Linux. Like mentioned previously, SAP has been a co-innovation partner with SUSE for many years, and the companies have been working closely to ensure tight integration as SUSE has expanded its portfolio.

As shown in Figure 1, SUSE's portfolio of solutions for SAP environments now includes application delivery solutions including the SUSE CaaS Platform and SUSE Cloud Application Platform Cloud Foundry-certified platform as a service. The company's core software-defined infrastructure solutions portfolio spans operating systems, storage, virtualization, and containers. SUSE Manager is the vendor's infrastructure management solution based on open source technologies including Uyuni/Spacewalk, SALT, and Monasca.

SUSE partners with many infrastructure suppliers and public cloud services providers, some of which are listed in Figure 1, to certify leading hardware platforms and address hybrid and public cloud deployments. Through its partnerships and portfolio offerings across the software stack, SUSE essentially offers building blocks that can be assembled based on the requirements of organizations' workload or application needs. This holds true when it comes to SAP customers – SUSE's portfolio pieces can be stacked up based on the infrastructure requirements of their particular SAP installation.

FIGURE 1

SUSE Solutions for the SAP Intelligent Enterprise



Source: SUSE, 2019

Key Features of SUSE's Solutions for the SAP Intelligent Enterprise

High Availability/Disaster Recovery

Organizations globally rely on SAP products such as SAP HANA and S/4HANA for critical operations and data. Organizations have common concerns regarding availability and data recovery and need assurance regarding business continuity for critical workloads. Some key features SUSE has built in conjunction with SAP to address these concerns are:

- **SLE High Availability (HA) Extension (SLES):** HA clustering system is used to automate application and data recovery. Business continuity is supported by continuous monitoring and transferring of workloads/applications from failures to known working systems.
- **SAP HANA HA Resource Agents (SLES):** They supplement SAP HANA System Replication capabilities to automate failover for both scale-up and scale-out configurations on-premise and in the cloud.
- **Non-Volatile Dual In-line Memory Module (NVDIMM) support (SLES):** NVDIMM can reduce recovery time to load data from storage after a reboot. Most, if not all, of the x86 server suppliers SUSE partners with have near-term plans if they have not already implemented NVDIMM.
- **Full System Rollback (SLES):** It has a single-click snapshot and rollback feature.
- **Highly redundant storage (SUSE Enterprise Storage):** Infrastructure is designed to maximize application availability with no single points of failure.

In addition to business continuity, aspects of the SUSE's HA/DR capabilities mentioned previously also provide automated tools that eliminate otherwise manual HA/DR processes. These features can free IT staff from time-intensive administrative tasks to focus on more critical IT areas and strategic projects. SUSE states that the SAP HANA HA Resource Agents can reduce recovery time for failures from hours to minutes depending on the database size.

Live Patching

Another feature offered by SUSE to reduce downtime is its SLE Live Patching capability, which allows IT administrators to apply patches to the Linux kernel without rebooting the system and keep applications running while patching. While Live Patching is independent of the application running on the Linux kernel, SAP workloads with large memory requirements are expected to be a key use case because of the rebooting times required when applying patches. It is not an option for IT departments to allow important mission-critical applications to go offline for extended periods during updates. This feature can also free IT staff to focus on other more strategic IT initiatives.

The SUSE CaaS Platform offers a similar feature for nondisruptive rollout/rollback of new applications and updates. Much like Live Patching with SLES, organizations can make frequent changes to SAP installations on the SUSE CaaS Platform without downtime.

Performance

Working with SAP, SUSE has built several features to help IT administrators configure and optimize IT environments to meet the performance needs of their SAP installations, which like other data-centric workloads can be more stringent compared with other workload areas. Some of these key features are:

- **Configuration and tuning packages (SLES):** Packages to optimize the performance of SAP solution stacks on Linux and automate system setup
- **Workload memory protection (SLES):** Based on open source cgroup; ensures SAP transactional and analytics data to remain in memory for SAP applications that depend on this feature
- **Application scaling (SUSE CaaS Platform):** Accommodates changing application load both up and down

SUSE Is Seen as a Trusted Partner to IT Departments for Their SAP Deployments

Providing support for joint customers is a major focus of SUSE's ongoing collaboration with SAP. Support is often a key concern for organizations when they are considering adopting open source software, particularly for mission-critical workloads like SAP applications. SUSE, like other commercial open source suppliers, addresses this need by offering enterprise-grade services and support for its portfolio of open source software solutions. In the case of joint SUSE-SAP customers, they can access 24 x 7 support through either SAP's channel or directly with SUSE if they are having issues with their infrastructure.

SUSE also offers higher-touch services for organizations that need more help with any aspect of their SAP deployments such as planning, designing, deployment, and ongoing management. Examples include workshops and architecture sessions from SUSE Consulting and dedicated support engineers and customer success managers from SUSE Premium Support Services. These support options from

SUSE for SAP installations are backed by expertise and experience stemming from their long-standing collaboration and joint innovation.

Many SAP customers continue to run their applications on non-SAP databases such as SQL Server and are used to working with Microsoft Windows Server. A common problem is that many of these customers need to move or deploy SAP applications on Linux but have a lack of skill sets and require assistance to be productive working with key SAP products on Linux. SUSE offers tools and services tailored for the needs of these customers. For example, SAP S/4HANA Transition Support includes features such as Microsoft Remote Desktop Protocol (RDP) and Active Directory Integration, as well as instructions to execute common Windows administration commands with Linux.

Worldwide, small, midsize, and large enterprises rely on SAP applications to advance their business on the road to DX. This journey can often be a long and gradual process, and legacy workloads, applications, and data need to coexist with more modern, digitally enabled workloads. SUSE has positioned itself to be a partner to organizations deploying SAP products, solutions, and services as part of their digital agendas. As mentioned previously, the company's portfolio and partnerships essentially function as building blocks that allow firms to deploy the pieces needed by their SAP installation. This building block approach can help organizations take projects gradually and use a phased approach when it comes to DX.

FUTURE OUTLOOK

SAP is placing itself at the heart of its customers' DX with a growing portfolio of applications that enable real-time data-driven decision making in all parts of the business. IDC expects that SAP will be successful in moving a large portion of its customer base to SAP HANA. Furthermore, the company's efforts to encourage businesses to deploy SAP in the cloud is expected to pay off. For many SAP applications, cloud is actually the only option; for those applications that can be deployed in a cloud or on-premise, IDC expects that customers will become increasingly less reluctant to deploy in the cloud.

The infrastructure underneath the multiple SAP deployment options varies – from SAP HANA appliances offered by multiple vendors to custom TDI-built landscapes to IaaS from various cloud providers to the virtualized hardware leveraged by PaaS and SaaS providers. In between these many infrastructure varieties and the SAP HANA database and applications lies a critical open source operating layer that provides consistency, predictability, manageability, resilience, and security to SAP customers.

The fact that Linux is an open source OS ensures that future innovation on this layer will be widely shared and adopted. At the same time, the Linux distributions that are certified for SAP have an ongoing opportunity to codevelop as closely as possible with SAP and then contribute their innovations back to the community. IDC expects that SUSE will forge an even tighter relationship with SAP than it already has to continue developing a seamless, highly performant operating environment for SAP in the future.

CHALLENGES/OPPORTUNITIES

For the IT Buyer

- Over the longer term, move toward SAP HANA adoption or risk losing access to SAP's innovative technologies by 2025. Further:
 - Technical risks and financial costs should be weighed against advantages of these technologies.
- Deploy SAP technologies to leverage digital core in support of efficiencies and broader DX initiatives.

For SUSE

- Continue working with SAP to codevelop SUSE's operating environment for the SAP Intelligent Enterprise.
- Continue to contribute SAP-specific innovations upstream to open source community.
- Continue to collaborate beyond the OS layer to support SAP's open source strategy for the digital core.
- Support SAP customers leveraging hybrid and multicloud environments via partnerships, migration tools and services, and ongoing support.
- Help ease the transition to SAP HANA for organizations that run SAP applications on non-SAP HANA databases.
- Assist organizations used to working with Microsoft Windows Server to be productive working with key SAP products on Linux.

CONCLUSION

SAP is one of the prominent IT vendors helping organizations leverage digital core strategies in support of broader DX initiatives. The company's applications and platforms are developed around the SAP HANA in-memory database, which will become the exclusive database for all SAP applications in a few years. Because of this, organizations using non-SAP databases must choose between migrating to SAP HANA or risk missing out on SAP innovations and integrations. Most organizations in this position are choosing to migrate to SAP HANA and face the task of replacing existing systems with SAP-certified hardware as well as switching the operating systems for the database for Linux. Furthermore, SAP continues to encourage its customers to deploy SAP HANA in the cloud, which can add additional complexities for organizations to consider.

While the infrastructure used for SAP deployments varies, a common open source operating layer can provide an array of advantages such as better consistency, predictability, and security. Over time, the open source community, with SUSE playing a critical role, has innovated many of the capabilities that are at the foundation of modern SAP landscapes. SUSE's and SAP's codevelopment efforts have also resulted innovations that have helped SUSE tailor its solutions for SAP applications and platforms, particularly with regard to SLES for SAP Applications. SUSE will continue to collaborate closely with SAP to supply customers with a seamless operating environment for SAP deployments.

SUSE's portfolio expansion beyond the OS layer has created new opportunities for collaboration with SAP to support its open source strategy for the digital core. SUSE is now armed with a portfolio of solutions for SAP environments spanning application delivery solutions like PaaS and container management, as well as software-defined infrastructure solutions like OSs, storage, virtualization, and private cloud. IDC expects that SUSE's and SAP's collaboration, if anything, will become even stronger in the coming years as the companies work together to codevelop new technologies for the SAP Intelligent Enterprise.

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