Abstract

For decades, mission-critical applications and relational databases from SAP, Microsoft and Oracle have provided the backbone for the world’s transactional and reporting data.

Today, IT is wrestling with the next-generation applications and databases that have arrived on the scene, including SAP S4/HANA, SAP HANA, Microsoft SQL Server 2019 and Oracle 19/20c.

This 15-minute guide introduces the Dell Technologies approach for partnering with organizations looking to optimize IT for next-generation business applications and databases.

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Run business applications and databases in the digital business

In the digital economy, data is a precious asset, filled with obvious — and not so obvious — value to the business. When emerging technologies, like Internet of Things (IoT), present vast new data sources, the advantage goes to the organizations that can most quickly capitalize on them.

But turning raw data into data gold depends entirely on several game-changing technologies, like artificial intelligence (AI), machine learning (ML), deep learning (DL) and data analytics.

Collectively, these advances are disrupting traditional business processes and changing radically the amount, type and quality of data available to business applications.

Besides fueling the development of new apps, this profusion of new data sources requires a rearchitecting of traditional business applications and databases. This in turn places new demands on underlying IT infrastructure.

New platforms from SAP, Microsoft and Oracle

For decades, relational databases have provided the backbone for operational data (online transaction processing) and traditional data warehouses to support reporting and some analytics.

Today, organizations are looking for ways to unlock the other insights contained in this data, which is often located across multiple platforms and environments.

In response, SAP®, Microsoft® and Oracle® offer rearchitected applications and database platforms expanding their capabilities to include in-memory processing and working with AI, structured, unstructured, machine and IoT data.

Disruption and change are happening, with end-of-life (EOL) deadlines for legacy applications and databases driving new programs for upgrades and migrations to next-generation architectures and operating profiles.

- For SAP, IT needs to lower TCO running classic SAP enterprise resource planning (ERP) landscapes while investing and moving to SAP HANA® platform and SAP S/4HANA® founded on a next-generation, in-memory database.
- With Microsoft, IT needs to address EOL for SQL Server® 2008 while embracing the opportunity provided with SQL Server 2019, boasting big data clusters and poly-based capabilities for working with virtual data.
- With Oracle 19c/20c, IT will need to begin planning migrations from Oracle 12c to embrace new capabilities for security, cloud and big data.

Here begins the journey to the intelligent enterprise.
“Rethinking” IT models and services

For IT management, whether you are on the application or infrastructure IT side, real disruption is happening. This change is leading IT to pause and rethink current models and services.

The image below provides a logical view that this 15-minute guide will refer to as we position the evolving capabilities and newly architected applications and database platforms from SAP, Microsoft and Oracle (outlined in blue box) together with considerations when setting an IT foundation (outlined in orange box) working with Dell Technologies.

Today, with organizations looking for ways to unlock the insights hidden in their data across different platforms and environments, relational database management solutions vendors have responded by expanding capabilities. This includes in-memory processing and near-real-time analytics working with structured, unstructured, machine and IoT data.

These next-generation business applications — S4/HANA for example — are built on new relational database designs and capabilities.

Today, SAP HANA, Microsoft SQL Server 2019, and Oracle databases and platform capabilities include:

- **Database architectures:** Providing in-memory processing capabilities to power business warehouses and analytics in real time. For example, support for both row and columnar tables, enabling the processing of transaction and reporting data together, breaking traditional barriers leading to separation and isolation of legacy online transaction processing (OLTP) and online analytical processing (OLAP) applications.

- **Data integration services:** For accessing and working with data across data silos while keeping the data in place. These services consist of integration frameworks, adapters and tools for accessing, loading, streaming and synchronization of various data types and source data.

- **Application services:** For building and running web-based applications and choice user devices, database platform services include support for open standards such as SQL, HTML5, JDBC, JSON and OData.

But it is more than just bringing operational data together with machine, unstructured, IoT and big data. IT needs to be responsive to the business’s need to act, based on learnings from data mining and analytics, by enabling agile development and deployment of data-driven application add-ons and extensions to core applications and processes.

SAP, Microsoft and Oracle have been enhancing platform services to enable data scientists and developers to work directly with the data located within the database, eliminating the time and complexities associated with moving the data first. For example:

- **Database processing services:** Expanded to enable advanced analytics on data types including structured, unstructured, text, special and series data supporting next-generation applications.

- **Database function libraries:** Expanded to enable ML, predictive analysis, and include APIs for R Systems® and Python®.

- **Cloud-native applications:** Expanded to include support for Docker® containers and Kubernetes® for orchestration and portability.

Application and database modernization

When you look at application and database modernization, there are several aspects that come into play.

One of those is desktop and applications delivery. These need to be more mobile, run on more devices, and accommodate business applications, HD multimedia and graphic-intensive applications.

From an SAP, Microsoft and Oracle perspective, they have enabled — and continue to enable — building, deploying and running web-based applications, including support for user access on the device of choice from any location.

Next, you have applications and business processes becoming intelligent and self-learning.
Planning an IT foundation
CIOs and IT management must prepare an IT foundation that provides the data and infrastructure services needed to support deploying, running and operating next-generation applications within a distributed data center architecture — one that spans from edge to core to hybrid cloud.

Edge to core to hybrid cloud
While SAP HANA, Microsoft SQL Server and Oracle databases are foundational for data-driven intelligent enterprise applications, not all data is stored in them. While we are accustomed to running, storing and protecting business data in a centralized environment, CIOs and IT management must prepare an IT foundation that provides the data and infrastructure services to support deploying, running and operating next-generation applications in a distributed data center architecture that spans from edge to core to hybrid cloud.

- At the core, you will have S/4HANA, Oracle ERP, or Microsoft Dynamics as your systems of record. If the core goes down, business could be severely disrupted or worse.
- But not all IoT data is processed at the core in these applications. IoT edge computing increasingly includes applications functionality that are using data generated at the edge (e.g., offshore oil rigs, manufacturing plants) and include use cases that support locally made decisions with subsets of aggregated data still transmitted to the core.
- All this will lead to change infrastructure as modern systems could be running from many different locations, so IT will increasingly move toward a hybrid cloud strategy for these applications and use cases.

Data services
IT needs to provide a comprehensive framework and strategy to orchestrate data management across a distributed, complex IT landscape. For instance, running applications and databases in a cloud-operating model requires a future-proof infrastructure foundation designed to optimize legacy ERP and business warehouses operating profiles and newly architected applications such as S/4HANA and SAP Leonardo.

- **Protection and availability:** When it comes to traditional business applications, compliant protection and availability are historical requirements. In an environment where business processes typically interact with other systems or applications to complete a transaction (e.g., purchase, credit check, inventory, order), data must be protected continuously at every step to ensure mission-critical applications are protected and maintain high availability.
- **Virtual data access:** With the emergence of SQL Server 2019, SAP HANA and Oracle comes the ability to work with virtual data to fuel new application use cases. Data virtualization aggregates data from different sources and develops a single, logical and virtual view of the information so it can be accessed by front-end solutions such as applications, dashboards and portals without having to know the data's exact storage location.
- **Streaming and pipelining:** Streaming data pipelines will need to handle millions of events at scale so you can collect, analyze and store large amounts of information. Network bandwidth and compliant data movement, placement, access and protection are critical for bringing operational data together with IoT and big data.
- **Containers and big data clusters:** Containers and big data clusters (such as SQL Server 2019 big data clusters) provide enhanced flexibility and scale to the way you interact with big data. You can query external data sources, store big data in Apache Hadoop distributed file system (HDFS) managed by SQL Server, or query data from multiple external data sources through the cluster. You can then use the data for AI, ML and other analysis tasks.
Infrastructure services
Enterprise IT is continually under pressure to rapidly deliver the IT services and applications a business requires. The right infrastructure should eliminate complexity, facilitate use cases, and run mission-critical applications including containerized databases. Other considerations include:

- **Flexible consumption with lifecycle assurance:** Regularly stabilize and optimize the infrastructure with firmware/software upgrades. This is key to providing ongoing lifecycle assurance so that SAP, Microsoft and Oracle systems and other mission-critical systems are running on compliant and healthy infrastructure. Routinely monitor infrastructure health — including compute, storage, network and virtual technologies — as a unified pool rather than a collection of discrete components.

- **Unified applications and IT operations:** Providing a complete view of the health and performance of SAP, Microsoft and Oracle systems and components is imperative for proactive remediation based in actionable explanations of underlying problems with recommended corrective actions.

- **IT service delivery:** When looking at the changing landscape of traditional application and databases, such as SQL Server 2019, SAP HANA and Oracle, working together with AI, ML, big data and containers, the underlining infrastructure services — together with data services — must complement the use cases and deployment services and service level agreements for database administrators (DBAs), developers, application admins, data analyst and scientist roles.

The transformation journey
While IT transformation is a journey with different routes for different organizations, we have seen common objectives as IT embarks on a path to deploy and run next-generation applications and databases.

Regardless of the industry (manufacturing, retail, science, finance, etc.), Dell Technologies has a distinguished history of partnering with organizations to remove complexity and optimize IT for these critical business workloads.

Consolidate and simplify IT
Delivering power and simplicity begins with removing IT complexity from traditional applications and database landscapes by:

- Employing a consolidation strategy to simplify and lower cost for legacy applications running on “siloed IT,” freeing investments for migrating to next-gen applications and databases from SAP, Microsoft and Oracle.
- Balancing the reduction of cost and resources required to maintain traditional ERP, SCM, CRM and business warehouses while investing in new projects for SAP, Microsoft and Oracle applications and databases.
- Deploying a future-proof infrastructure architecture foundation that redefines agility, performance, protection and availability for mixed workloads with varying operating profiles (OLTP, OLAP, analytics and big data).

Additionally, IT needs to prepare for app development and delivery from the data center to end-points. This will require IT platforms delivering mobility with dynamic scale and capable of powering high-performance GPU-intensive use cases.
Dell platforms provide a broad portfolio of cloud-enabled virtual infrastructure foundations for providing end-to-end optimization for workloads, such as SAP, Microsoft and Oracle, across hybrid IT.

**Performance**
All-flash, easy to scale, low latency, high bandwidth

**Application | database protection**
SAP admin / DBA control of backup, recovery, replication

**System copies | database refresh**
DBAs, DevOps, admins quickly make copies, no matter the size

**DR and continuous availability**
Proven zero RTO for critical applications and databases

**Enabling IaaS | DBaaS**
 Begins with cloud-enabled virtual infrastructure

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**Run with greater agility**
Building off the consolidation strategy comes providing a consistent infrastructure and operational experience across your cloud ecosystem. The experience needs to support traditional “heavy” mission-critical systems and emerging mobile, cloud-native applications.

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**Workload Needs Drive Cloud Strategies**

<table>
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<tr>
<th>Existing Workloads</th>
<th>Cloud Native Workloads</th>
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<tbody>
<tr>
<td>Modernize</td>
<td>Utilize Hybrid Infrastructure</td>
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<tr>
<td>Refactor</td>
<td>Develop for Cloud</td>
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<tr>
<td>Replace</td>
<td>Replace</td>
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</table>

Cloud strategies must match the needs of each workload

- For existing applications, customers are wrestling with managing costs and maintaining a reliable, secure environment that will keep an existing portfolio of applications extended through its logical lifespan, including how they can add new capabilities and features to enhance and extend the value of existing applications.
- At the same time, they are prioritizing a new set of applications focused on differentiating the business. These built-in-the-cloud applications will set apart every business from their competition.
Getting there: The steps to on-premises / hybrid cloud

First, as many organizations running applications today have mixed environments (OS / hypervisors / applications / databases), moving to a cloud infrastructure foundation takes a phased approach. A starting point is to leverage your preferred Dell EMC cloud-enabled infrastructure foundation that supports later phases as you move to a unified strategy.

As a second phase, you can build on your Dell EMC infrastructure foundation taking the first step leveraging Dell Technologies Cloud for hybrid model by:

- Carving out and isolating targeted infrastructure resources to be managed as part of VMware® Cloud Foundation™ (VCF)
- Rationalizing and moving select parts of your SAP, Oracle or Microsoft environment to run a hybrid model
- Looking to leverage hybrid cloud linkages, including VMware Cloud on Amazon Web Services® (AWS®), VMware on Oracle Cloud or Dell EMC Data Protection Suite (DPS) offerings for on-premises and public clouds.

The third phase looks at running all workloads with VMware, Dell Technologies Cloud platforms, which deliver the simplest and fastest hybrid cloud deployment path due to VCF shipping on VxRail. Organizations benefit greatly from integrations and continued innovations that can be quickly onboarded given the synchronized Dell Technologies product releases and roadmaps.

Prepare for next-gen intelligence

The third and final part of the IT transformation journey is enabling your business to take insightful action through data management and real-time intelligence.

IT needs a platform to power the data scientists with self-service workspaces, model development, deployment, productization and data management services, from edge to core to cloud.

This includes transforming how you design, build and run AI-based applications. Delivery cycles once measured in quarters or months need to be reduced to weeks or days.

Through data management and real-time intelligence, AI models can be aligned between data scientists and business teams to make sure they are using the same data, security, governance, development, infrastructure and DevOps models to close the “last mile” gap, where projects developed on traditional infrastructure often stall.
**Dell Technologies solutions strategy**

Dell Technologies is collaborating with its leading partners (SAP, Microsoft and Oracle) to ensure that businesses are equipped to make the intelligent enterprise a reality.

As a result, Dell has developed compelling solutions grounded in partner-certified infrastructure platforms to meet performance and availability key performance indicators, together with validated use cases and reference architectures designed to accelerate deployment.

With a history of successful partnerships that include investment in Customer Solution Centers, joint engineering and validation projects, Dell Technologies is in a strategic position to help businesses optimize IT operations, transition traditional applications and databases, and make the intelligent enterprise a reality for customers.

**Solutions portfolio**

<table>
<thead>
<tr>
<th>Mission-critical systems</th>
<th>Business applications, databases</th>
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<tbody>
<tr>
<td><strong>SAP</strong></td>
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<tr>
<td>- SAP landscape consolidation</td>
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<tr>
<td>- SAP HANA–certified infrastructure</td>
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<tr>
<td>- SAP LaMa integration with ESI</td>
<td></td>
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<tr>
<td><strong>Oracle</strong></td>
<td></td>
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<tr>
<td>- Consolidate mixed SQL Server / Oracle workloads</td>
<td></td>
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<tr>
<td>- Integrated data copy management</td>
<td></td>
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<tr>
<td>- Oracle database migrations</td>
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<tr>
<td><strong>Microsoft</strong></td>
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<tr>
<td>- Consolidate mixed SQL Server / Oracle workloads</td>
<td></td>
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<tr>
<td>- Run SQL Server on Linux®</td>
<td></td>
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<tr>
<td>- SQL Server migrations and upgrades</td>
<td></td>
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<tr>
<td>- SQL Server containers</td>
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Dell Technologies Services
Dell Technologies is ready to partner with you on your transformation journey for the digital future. From edge to core to cloud, our industry experts offer strategic guidance and proven practical capabilities to help you accelerate time to value across your transformation objectives.

For example, Dell Technologies consulting services can help you determine how to execute your IT, workforce or application transformation. We use prescriptive approaches and proven methodologies, combined with Dell Technologies’ portfolio and partner ecosystem, to ensure you achieve real business outcomes.

Application transformation services
Our Application Transformation Services encompass:

- **Application Portfolio Optimization Services**: By identifying the right platform for your applications, we determine the most cost-effective platform to reduce risk, cut complexity and drive out cost.
  - Identify optimal cloud consumption models
  - Retire legacy applications
  - Accelerate and reduce risk during application migration

- **Cloud Native Apps and DevOps Services**: Refactor existing apps for cloud, automate manual processes and improve the way development and IT operations teams work together.
  - Refactor legacy apps for cloud
  - Simplify infrastructure configuration management with Infrastructure as Code
  - Assess readiness to deliver DevOps

- **Big Data and IoT Analytics Services**: Gain actionable insight from your data, at speed and scale, using a modern infrastructure, proven solutions, and advanced techniques like artificial intelligence.
  - Develop a strategy and identify high-impact use cases
  - Design and implement optimized infrastructure and industry-leading analytics solutions
  - Expand data science and data engineering capabilities

Taking the next step
So, where are you on your own journey for SAP, Microsoft and Oracle? Whatever compelling events, projects or use cases you have in mind, Dell Technologies is here to help. From retirements to migrations to upgrades, Dell Technologies is ready to support your organization in delivering power and simplicity by getting complexity out of your way, providing an end-to-end experience across hybrid IT infrastructure, and enabling insightful action through data management and real-time intelligence.

Additional solutions and information:
- SAP
- Microsoft SQL
- Oracle

Technical documents:
- Visit the Infohub

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