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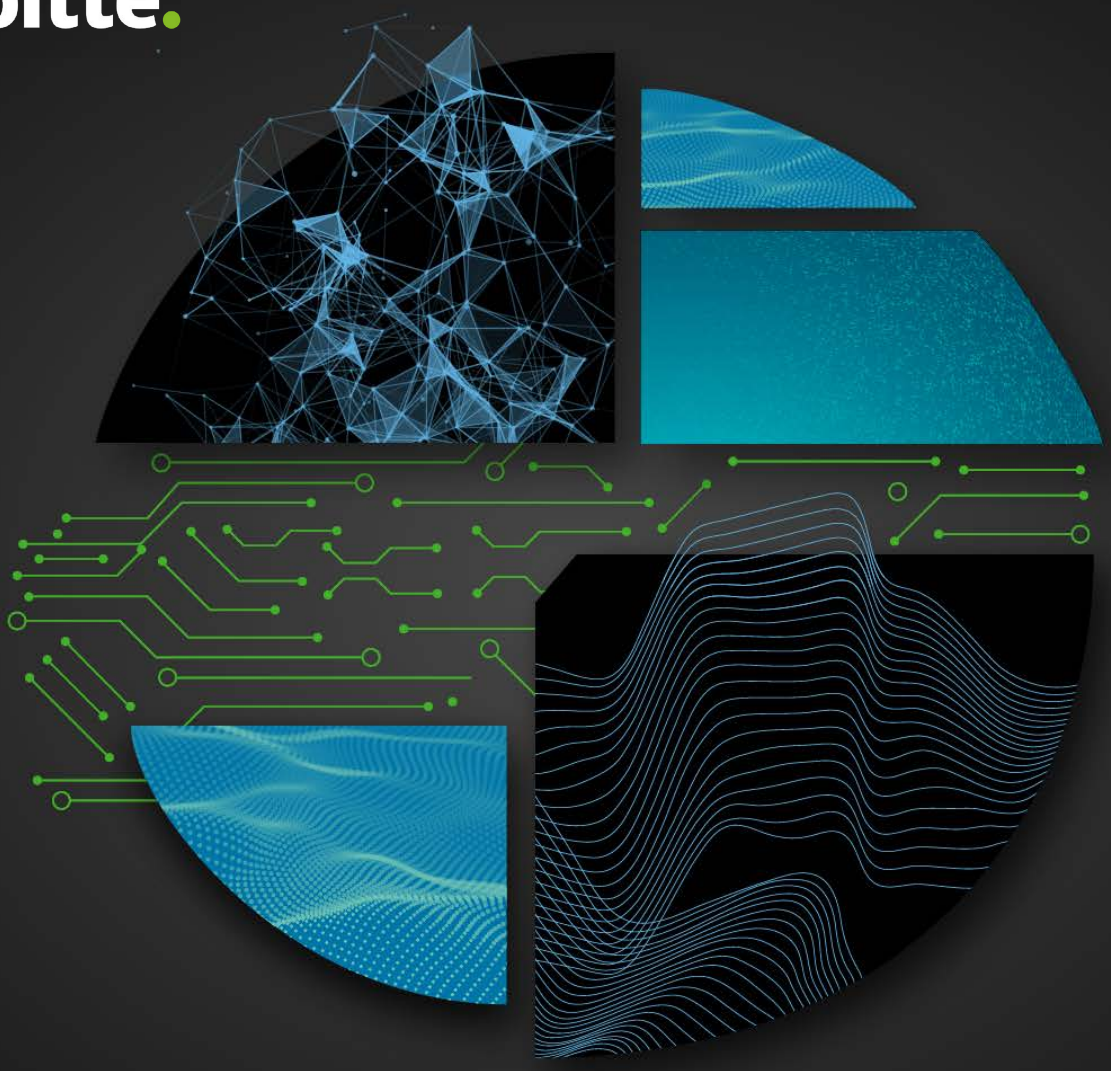


Driving Agility Through OCVS on OCI Using Intel® Technology

Meet the new tool that empowers fast, reliable cloud migration at scale

Introduction

Business leaders today have repeatedly heard that the cloud offers many organizational benefits over on-premise hosting, but the cost, disruption, risk, and inconvenience of switching have prevented many organizations from fully leveraging cloud infrastructure.

To remain competitive in the market, organizations can no longer put off the transition to cloud or maximizing it's value. As of 2020, more than 86% of enterprises relied on a hybrid cloud environment to meet their infrastructure needs. Among organizations that do leverage cloud infrastructure, only 42% say they're realizing all the benefits they expected.

Fortunately, the days of manual migration are gone. Rather than moving hundreds of applications hosted on thousands of virtual machines (VM), refactoring, regression testing, workforce retraining, minimizing downtime of critical systems, and so on, commercial and government organizations can finally easily, securely, and quickly migrate large, complex on-premises environments to the cloud.

Deloitte worked with technology leaders Oracle, Intel, and VMware, to create a cost-effective solution that effectively moves an on-premise VMware environment onto the cloud with zero manual work, refactoring, or application downtime. The solution is called Oracle Cloud VMware Solution (OCVS) on Oracle Cloud Infrastructure (OCI), or simply OCVS on OCI.

How OCVS on OCI works

OCVS on OCI uses Intel® Xeon® Scalable processor technology and provides a dedicated VMware Cloud Foundation Infrastructure in OCI, allowing organizations to deploy new or migrate their existing Virtual Machines. OCI provides best-of-breed Intel® Xeon® technology, enabling the performance and reliability organizations need for their most demanding enterprise workloads.

OCVS on OCI is a solution designed for:

- Existing users who can no longer expand their data center or want to exit their data center to focus on core business demands and seamlessly migrate their VMware environment.
- Enterprises that want cloud capacity flexibility while leveraging their same VMware skills to operate their hosted applications.
- Organizations that want to retain consistent patching and maintenance schedules, as OCVS is the only cloud offering that provides customers complete control of their VMware deployment.
- Companies that prefer migration of Virtual Machines from older Intel hardware generations to current generations because OCVS is based on Intel® Xeon® shapes, and this compatibility helps eliminate risk.
- Government entities seeking a GovCloud-certified option with experienced migration guidance to help ensure smooth, quick migration.

The Intel® Xeon® offered shapes provide reduced risk, consistent scale with performance, and lower latency than other OCVS shapes. The newest OCVS X9 shape, powered by the Intel® Xeon® Platinum 8358 Processor, includes 100Gbps network bandwidth and the ability to connect to OCI's block storage. The 3rd gen Xeon® Scalable processors, leveraged by this shape, have built-in accelerators to deliver an average 42% performance increase compared to the prior generation. Performance is gained by the following:

- Compute: Next-generation core with significant IPC improvements and new ISA instructions.
- IO: 64 lanes PCIe Gen4 and three high-speed UPI links
- Intra/Inter Node Scaling: Consistent low latencies to cache, memory, and inter-socket communications.
- The Xeon® 8358 processor has built-in accelerators and security features, such as Intel® Software Guard Extensions (Intel® SGX) and Intel® Advanced Vector Extensions 512 (Intel® AVX-512).
- Intel® AVX-512 Vector Extensions accelerate performance for compute-intensive workloads, such as AI, imaging, and networking. Intel® Deep Learning Boost (Intel® DL Boost) includes Intel® AVX-512 VNNI (Vector Neural Network Instructions), an extension to the Intel® AVX-512 instruction set. It can combine three instructions into one for processing, which further unleashes the computing potential of next-generation Intel® Xeon® Scalable processors.
- Intel® SGX helps protect data through unique application isolation technology.

For more information:

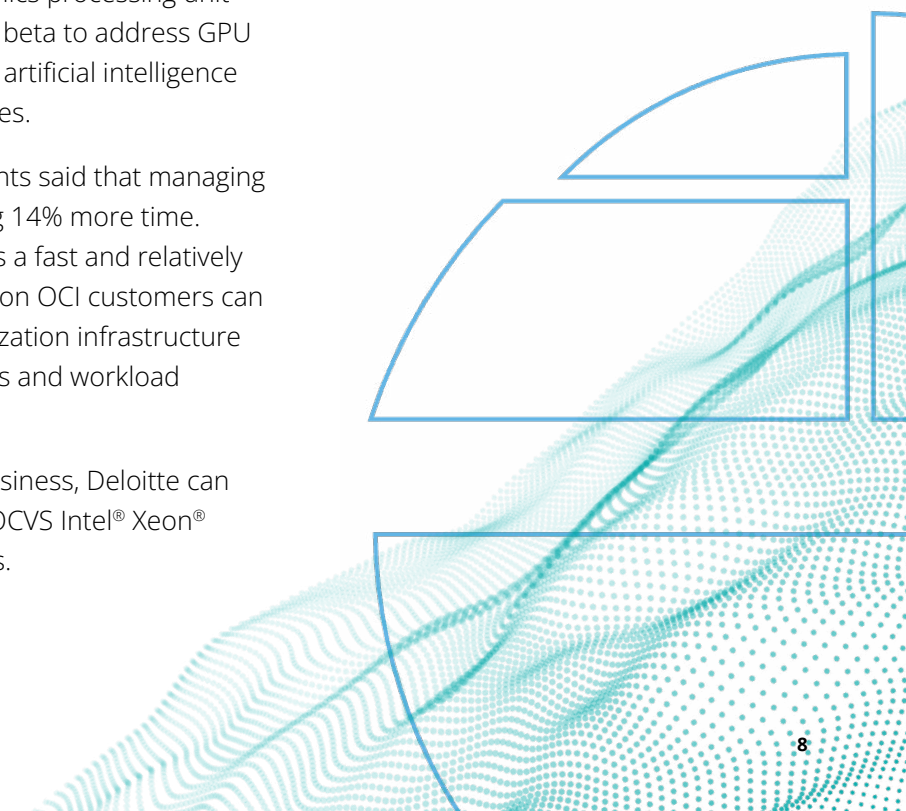
https://octo.vmware.com/introducing-the-multi-cloud-analytics-solution-by-intel-and-vmware/

https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/docs/vmw-vcf-solutions-reference-architecture-final.pdf

Additionally, the Oracle Cloud VMware Solution graphics processing unit (GPU) shape built on the Intel® Xeon® processor is in beta to address GPU needs for certain virtual desktop infrastructure (VDI), artificial intelligence (AI)/machine learning (ML), and Render Farm use cases.

According to a 2022 IDC study, 64% of the respondents said that managing Multiple Silicon Platforms slows their progress, taking 14% more time. Alternatively, OCVS powered by Intel® Xeon® provides a fast and relatively low-risk path for cloud migrations. Risk-averse OCVS on OCI customers can utilize Oracle's OCVS as a landing spot for the virtualization infrastructure to add the agility of the cloud while retaining the tools and workload management that were previously on-premises.

To further reduce over-purchasing and risk to the business, Deloitte can help modernize on-premises VMware workloads to OCVS Intel® Xeon® shapes through design, sizing, and migration services.



OCVS migrates workloads to cloud in **three easy steps:**

1 **ON-PREM**

It starts with the Enterprises on-prem VMs. The question is how do we move this farm to Oracle Cloud with minimal downtime and disruption?

2 **MIGRATION**

Using the same toolset Enterprises are used to, VMware vMotions your Software-Defined Data Center to Oracle Cloud Infrastructure in just a few hours.

3 **ON THE CLOUD**

Enterprises complete the migration and move applications to the cloud with no downtime, no refactoring and no retraining of your workforce. Once you're on the cloud, you can take advantage of the new generation of tools and features OCVS has to offer like autonomous database, cloud service, Oracle Application cloud, and generative AI.

LIVE MIGRATION FROM ON-PREMISES TO ORACLE CLOUD INFRASTRUCTURE - OCVS

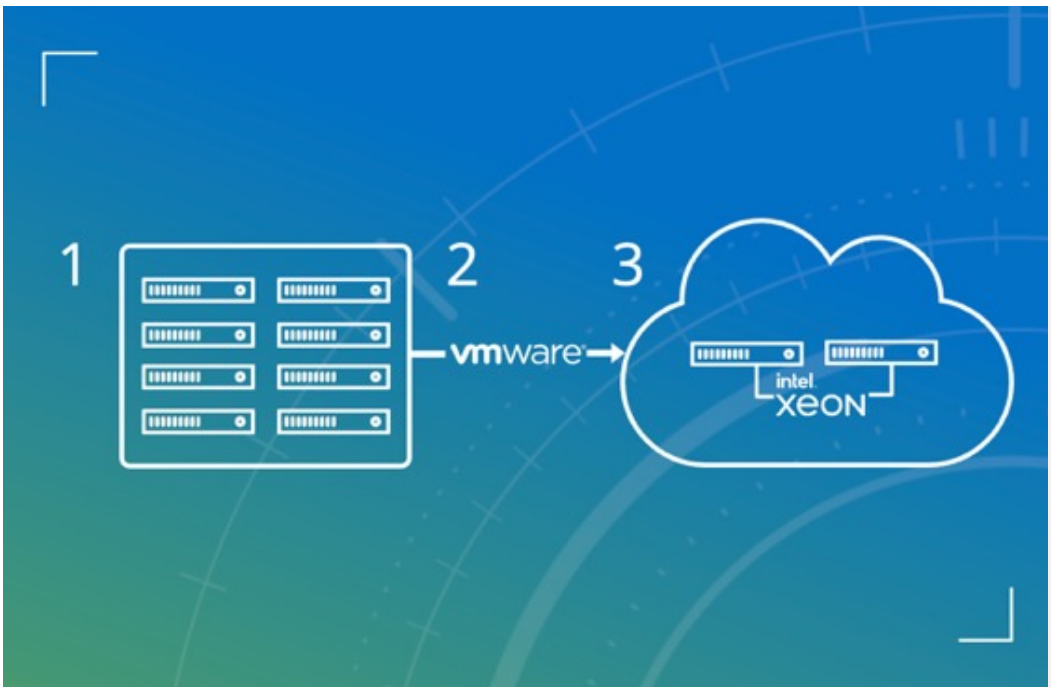


Figure 1 shows how enterprises modernize their VMware estate from on-premises to OCI by leveraging OCVS. Using OCVS reduces complexities as enterprise customers embark on their Digital Transformation journey by adding cloud agility.

What sets OCVS apart?

OCVS offers customers significant advantages over other public VMware Cloud providers:

1. The customer has complete control over their hypervisor, including root passwords. The customer is responsible for maintaining and patching VMware to the application layer. Some applications require root access to the hypervisor, prohibiting customers from using public cloud offerings; OCVS provides this ability natively.
2. Oracle is the only public cloud provider offering a layer two network throughout "ALL" OCI resources and services, including OCVS. OCI is also the only VMware cloud provider allowing the enterprise to use the same IP address scheme for their VMware Cloud (OCVS) and native OCI resources. The end-to-end layer of two networks for all of an organization's resources and services allows the organization to have a single IP address schema and reduce network complexities, further empowering the agility of the cloud from on-prem resources to all OCI resources.
3. OCVS shapes are in every OCI region globally. A customer can find solutions in all OCI regions and get a consistent solution globally. No one region is different than another in terms of shape offerings.

BREAKING IT DOWN, OCVS OFFERS YOU:

Cloud without compromise
so you can migrate your VMware clusters to the cloud without application changes.

Root access control
so you maintain full administrative permissions of your VMware environments.

Flexible storage & compute offerings
so you can efficiently address your changing application needs with precise provisioning.

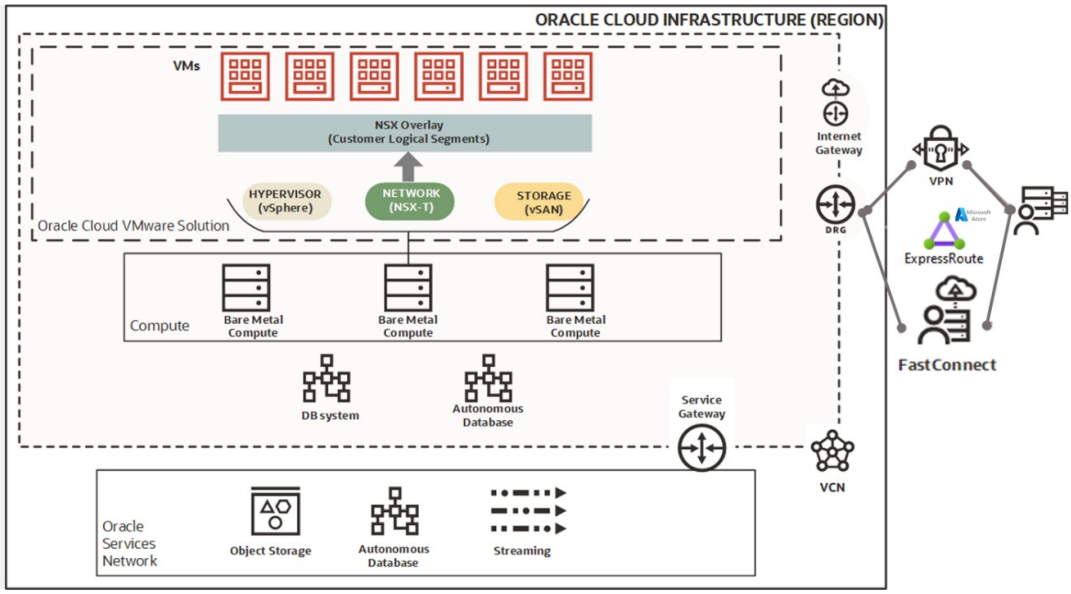
Oracle continues aligning the OCVS offering to meet market demands, such as adding new shapes to for enhanced performance, security, and flexibility—the new X9 Standard BM.Standard3 permits enterprises to choose the number of cores (16, 32, 48, or 64) OCPUs enabled on the shape.

Compared to X7 Standard BM.Standard2, the X9 BM.Standard3—based on the 3rd Gen Intel® Xeon® Scalable processor—has improved performance from increased instructions per clock cycle, faster memory transfers, higher frequency, increased memory, and 100Gbps networking. Rather than being locked into set storage requirements, OCVS on Intel® supports multiple secure and scalable external storage options to provide best-in-class cloud economics. Leveraging OCI block storage allows for dynamic scaling with auto-tune performance to meet application requirements at a lower cost than attached storage.

OCVS also provides the customer with root access to their hypervisors to schedule maintenance, perform patches, and install third-party applications that are not available on other public VMware clouds.

OCVS SOLUTION ARCHITECTURE

Figure 2 shows the OCVS Solution Architecture in OCI. This architecture allows OCVS to use other OCI services **seamlessly**. Customers can connect to OCVS from their premises via the dedicated FastConnect or VPN.



[Source: https://docs.oracle.com/en-us/iaas/Content/VMware/Concepts/ocvsoverview.htm]

Additional Oracle OCI features include:

- OCVS will run from 16 to 64 cores per node based on the infrastructure demands.
- Independent scaling of the compute and storage, as needed.
- Availability in all 46 OCI regions globally.
- 12 of the 46 OCI regions at the core are enabled with Azure interconnects. The Azure interconnect is a low-latency, high-throughput, private connection between Oracle Cloud Infrastructure (OCI) and Microsoft Azure services. When implemented in one of the 12 regions, your OCI services can communicate with Microsoft Azure services without traveling over the public internet, providing a lower latency and better response for users and applications.
- OCI is the only public VMware cloud provider allowing the enterprise to use the same IP address schema for their VMware Cloud, on-premises environment, and native OCI resources. This feature enables OCVS to use other OCI services seamlessly.
- OCI includes 10 TB network egress at no extra cost to help reduce the enterprise's net cloud expenses. In contrast, other cloud providers charge for such egress data.

OCVS Technical Specification

Oracle designed the new OCVS X9 shape, powered by the Intel® Xeon® Platinum 8358 Processor, to offer an efficient CPU-to-memory ratio to balance the resources used and reduce unused properties. In addition to efficient resource utilization and adding additional bandwidth—now 100Gbps—to the network interface card (NIC), this helps ensure that network throughput would not throttle a physical host failure and vMotion recovery.

To choose the right OCVS shape, consider:

1. For existing on-premises VMware, will you use vMotion or cold migrate the virtual machines?
    - Seamlessly vMotion (live migration) up to OCVS Intel® Xeon® shapes when the on-premises VMware environment utilizes Intel® sockets
    - Cold migration is required for on-premises from one CPU manufacturer to another and updating VMtools. Cold migration does require downtime
2. Consider consumption of resources and failover for sizing?
    - vCPU to CPU oversubscription or one-to-one
    - Host Virtual Machine blast ratio over the shape's provided network, for example:

        With 50 VMs on an X7 Standard BM.Standard2 with 25Gbps networking, vMotion roughly vMotions 16vms at a time

        The same 50 Virtual Machines on an X9 Standard BM.Standard3 with 100Gbps provides 4x the bandwidth, so migrating up to 64vms at one time is possible

With VMware, enterprises can vMotion from an older Intel® Xeon® socket to a newer socket family. VMware EVC (enhanced vMotion compatibility) allows you to migrate virtual machines between different generations of CPUs. With EVC, you can mix older and newer server generations in the same cluster and migrate virtual machines with vMotion between these hosts. While VMware 6.7 and 7.0 support seven generations of Intel® Xeon® sockets to be live migrated backward, VMware 8.0 limits live migrations back to Intel®.

Please check VMware for the latest compatibility details.

Enterprises can run several VMware-attached services on OCVS, including but not limited to:

- **vRealize:** Single pane of glass with tools for monitoring performance, optimizing resources, and automating tasks
- **Horizon:** Desktop and application virtualization platform
- **Tanzu:** A modular, cloud-native platform that accelerates development, delivery, and operations across multiple clouds
- **Cloud Director Service:** A multi-cloud service-delivery platform that enables cloud providers to deliver virtual infrastructure resources in a multitenant cloud environment
- **Site Recovery Manager (SRM):** SRM is a disaster recovery (DR) software solution that helps enterprises protect their virtual machines and applications from disaster

Learn more about migrating applications.

The foundation of Oracle Cloud VMware Solution (OCVS) lies in the VMware SDDC (Software-Defined Data Center) architecture. OCVS offers a fully supported and customizable cloud environment tailored for VMware deployments and migrations. The comprehensive solution, featuring VMware components, encompasses the entire software-defined data center (SDDC) stack. OCVS is designed to address scenarios such as migrating data centers and applications, hybrid extension for seamless integration, on-demand capacity provisioning, data center evacuation, and disaster recovery.

STUDY 1:

Business suite migration from on-premises to OCVS OCI GovCloud

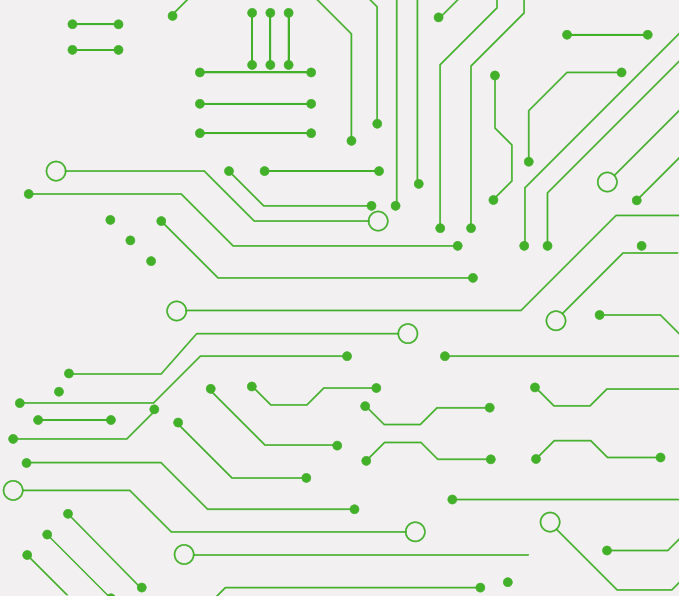
A leading provider of advanced IT solutions and services to government organizations and federal agencies selected OCVS on OCI for their ERP, peripheral financial services, Hyperion, and Data Warehousing solutions.

The customer migrated their E-Business Suite applications from on-premises VMware to OCVS. The on-premises Oracle databases were migrated to Oracle Exadata Cloud Services, an automated Oracle Database service that allows organizations to run databases with the highest performance, availability, security, and cost effectiveness. All supporting applications, including finance applications, Hyperion, and Oracle BI Applications, were also migrated to OCVS and provided a high-performance environment.

This use of the single silicon architecture demonstrates how easily organizations, including those adhering to government regulations, can migrate from on-premises VMware applications running on Intel® Xeon® processors to Intel® Xeon®-powered shapes in OCI for the OCVS systems.

STUDY 2:

San Jose Water moves OCVS and lifts app performance 50%



San Jose Water (SJW) provides water service to over 1 million people in the greater San Jose, California metropolitan area. Despite being one of the largest and most technically sophisticated urban water systems in the US, on-premises IT infrastructure stood in the way of necessary agility and scalability.

SJW's many VMware workloads included legacy customer care billing applications, WebLogic, and Crystal Reports, all running on an older Oracle Database and Windows version.

SJW migrated all these applications to OCVS on OCI over a weekend with minor modifications but no changes to the legacy applications. Using both OCI and Microsoft Azure, which handles user authentication (LDAP) when logging into OCI, San Jose Water lifted app performance 50%.

See the full story about SJW's move to Oracle Cloud VMware Solution.

> **San Jose Water selected Oracle Cloud VMware Solution because it could operate as an extension of the company's on-premises environment. It allowed the team to move legacy workloads faster, while enjoying the same ease of management, scalability, security, and full admin rights as on-premises.**
>
> *- Alexander Hawk, Director of Customer Information Systems, San Jose Water*

The Deloitte advantage

Success stories like those shared above demonstrate how easy and powerful cloud migration can be when leading technology pairs with Deloitte's industry knowledge and experience.

Deloitte's deep understanding of each customer's industry and existing applications equips us to help design effective migration infrastructure while also improving the overall usefulness of applications for end users. With visibility into our customer's full IT landscape, we've helped all kinds of customers realize rapid, low-cost, low-risk cloud migration.

Because OCVS on OCI is built by Oracle, run on VMware, powered by Intel, and managed by Deloitte, our clients have access to all the leading tools and resources in the industry. Given the criticality of the applications and sensitivity of the data that organizations migrate to cloud, business leaders shouldn't settle for anything less.

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