

VELOSTRATA

Understanding Velostrata Technology: How it Works

WHITEPAPER

Executive Overview

This whitepaper will provide a deeper understanding of Velostrata's unique technology and architecture and will explore how these capabilities improve current migration practices and enable true cloud workload mobility. This paper is intended for a more technical audience whose responsibilities include data center infrastructure, hybrid, and public cloud initiatives.

More information about Velostrata is available on our website at velostrata.com.

Barriers to Public Cloud Adoption

Public cloud infrastructure as a service (IaaS) promises agility, scalability, and a compelling “pay as you go” cost model. However, moving existing enterprise workloads to public cloud has always been challenging. Complexity abounds as companies struggle to adapt and migrate applications to run in a cloud environment. IT managers must understand application dependencies, change drivers and networking configurations, and learn new management interfaces.

Data gravity has further complicated cloud adoption and migration of production workloads—especially stateful applications with a lot of data. Traditional migration practices involve many man hours, an assortment of tools, and substantial risk, not to mention the actual time required to move data from point A to point B. Moving lots of data to the cloud can also be expensive; high performance block storage can be costly and you typically pay for it 24/7.

Further, in the majority of cases, a trip to the cloud is a one-way ticket. Changing cloud providers requires that a company go through an even more complicated migration, so concerns about vendor lock in are very real.

These barriers have prevented organizations from truly leveraging public cloud as an extension of their data center, where workloads can be moved dynamically to meet the needs of the business. Velostrata helps organizations overcome these barriers—resulting in an agile IT organization that can be more responsive, effective, and cost-efficient.

Overcoming Barriers to Adoption



Risk

According to a report from Morgan Stanley, more than 90% of CIOs have reported that cloud migrations have stalled or failed. Velostrata lets you test—and re-test—non-disruptively before you migrate, so you know what you're getting into and you can easily move back if needed.



Complexity

Adapting workloads to the cloud has required changing images, drivers, and storage. The process of replication, synchronization, and cutover has been complicated. Velostrata moves the actual application workloads (not a copy) and adapts them on the fly. This eliminates the need to copy and sync the data that changed after replication. Your applications run natively in the cloud in minutes and data is pushed to the cloud in the background.



Lock-In

Moving to the cloud has been a one-way trip. Organizations want the flexibility to choose different providers as business needs change, and to revert back to on-premises. With Velostrata, reverting back on premises or moving to another cloud provider can be done in a matter of minutes.



Cost

Storage, especially high performance block storage, is usually the number one expense in the cloud. With Velostrata, you can reduce cloud storage costs by moving compute first and keeping storage on premises.



Time

Moving large amounts of storage takes a long time. For instance, moving 10 Terabytes of data over 20Mbps dedicated link takes 50 days to complete! Velostrata moves your application workloads in minutes, while storage migrates over time. Your apps continue to run in the cloud with good performance, leveraging Velostrata's advanced WAN optimization techniques.

Cloud Workload Mobility

Velostrata software enables an organization's journey to the cloud. Velostrata uniquely decouples compute from storage so you can move enterprise workloads to the cloud in minutes, while controlling and automating where storage resides. This unique architecture fundamentally changes how organizations can think about the cloud.

Compute Migration

Organizations may want to move compute to the cloud, but keep authoritative storage on premises for security, operational, or cost reasons. Velostrata's unique technologies enable applications to run in the cloud without performance degradation, despite the WAN latency.

Test Before You Migrate

One of the many challenges of cloud migration includes determining if an application will actually work in the cloud and how effectively. Velostrata makes it possible to move any workload in minutes and test application functionality and efficiency. You can then compare the cloud instance to on-premises, other clouds, or different cloud configurations. With Velostrata, you can take a snapshot of a live application with all its data and test it in the cloud non-disruptively, no storage replication needed. Optionally, test data can be kept only in the cloud, avoiding the need to set up extra storage on-prem or risk corrupting on-prem data.

Full Migration

For organizations that want to migrate both compute and storage to the cloud, Velostrata's streaming-based migration substantially reduces the time and complexity associated with traditional replication-based methods. Velostrata adapts the OS images on the fly, natively, for the target cloud and is up and running in minutes. Storage is efficiently moved while the applications are running, so there is no complicated re-sync and cutover. Because a copy of storage remains on premises until you disconnect it, you have a safety net to return a workload on premises.

How it Works

Velostrata Overview

Velostrata is cloud workload mobility software that lets you move enterprise workloads to and from the cloud in minutes, while controlling and automating where storage resides. Our patent-pending technology decouples compute (VMs) from storage (VMDKs) and provides intelligent streaming, optimization, multi-tier caching, and data pre-fetching capabilities to ensure optimal performance despite the WAN latency between on-premises storage and compute in the cloud. No manual changes to the applications, images, networks, or storage are required and IT organizations can leverage the same management tools and processes they use today. With

Velostrata, streaming production workloads to the cloud is as simple as a click of a button in our vCenter plug-in. Velostrata also provides a PowerShell module and APIs for simple integration with third-party management solutions, as well as extensive monitoring capabilities.

Velostrata Deployment

Velostrata is a software-only solution, prepackaged and deployed in vCenter as virtual appliances and installation requires just a few easy steps. A Velostrata OnPrem™ virtual appliance is deployed in your virtual data center, and Velostrata Edge™ virtual appliances (called a Cloud Extension, or CE) are then automatically deployed in a dual-node active/active configuration in the cloud for scale and high availability.

The Edge appliances are deployed within a customer-owned cloud account (such as VPC or VNET) and connected to the on-premises virtualized infrastructure via a new or existing VPN connection. Velostrata makes sure that all data is encrypted end-to-end, in flight and at rest. When using Velostrata in a hybrid model to run workloads in the cloud while keeping storage on-premises, each Edge virtual appliance supports up to 50 concurrent VMs. More appliances can be added as needed to scale out linearly. When using Velostrata for full migration, the breakdown is slightly different. A recommended configuration for a company that wants to migrate 1000 virtual machines would be to deploy five Edge appliances to migrate 250 virtual machines in a batch, and the migration would be completed in four batches.

Velostrata includes a vCenter plug-in that provides you with additional cloud operations within the standard vCenter interface, such as add new "Cloud Extension," "run-in-cloud," "run back on premises," as well as commands to start and stop VMs when they are in the cloud.

Once Velostrata is installed and the cloud infrastructure has been set up, streaming workloads to and from the cloud is as simple as right-clicking VMs, selecting "run in cloud" and selecting a few additional deployment options. Alternatively, IT managers can use the powershell CLI and invoke a runbook script to automate migration for large numbers of multi-tier applications. Velostrata currently supports vSphere in the data center and AWS or Azure as the cloud target; support for additional clouds and hypervisors will be coming in the future.

Velostrata's unique, patent-pending technology includes innovations in several key areas, including Streaming-Based Migration, Bi-Directional Optimization and Multi-Tier Caching, Resiliency, Management, and Security. Each one of these areas of innovation will be covered in the section below.

Streaming-Based Migration

Most solutions that migrate VMs to the cloud have many complex steps, including full replication of the images to the

cloud, converting these images to the format used by the cloud vendor (e.g., AMI for machine templates in AWS), and then instantiating an image and booting it in the cloud. For transactional workloads that generate many data changes and can't have significant downtime, tracking the data changes that occur during the migration and syncing them before the cutover to the cloud instance can be an additional challenge.

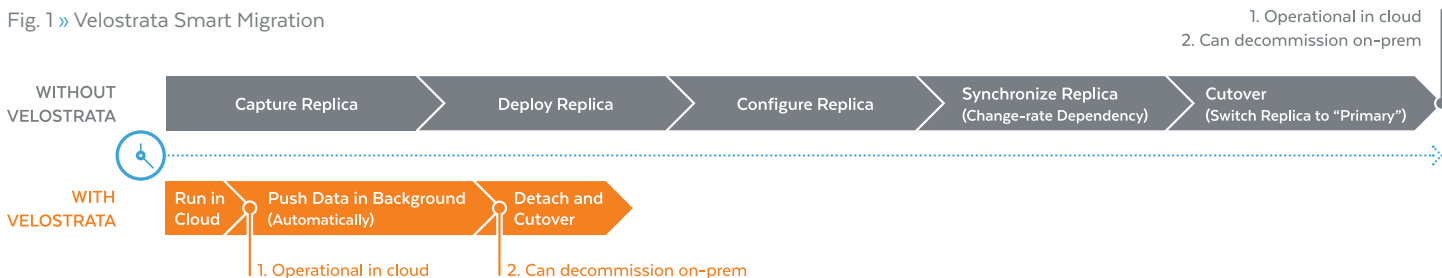
Velostrata differentiates from all other solutions by eliminating the need for replication. Instead, Velostrata performs a native boot of an on-premises operating system over the WAN in just a few minutes. While the OS boots, it is adapted on the fly by Velostrata to meet the requirements of the target cloud environment automatically and transparently, without any user intervention. Thus, unlike all other solutions, there is no need to replicate the boot image along with its entire virtual data disks as a prerequisite for booting the instance in the cloud.

LAN-like performance. In addition, the cache includes sophisticated pre-fetching algorithms that predict data most likely to be needed next, further improving response times.

Velostrata also leverages its multi-tier caching for write operations, with latency that is lower than typical cloud-native block-level storage. In addition, Velostrata allows the user to choose whether changes should be written back to the on-premises storage, in which case the changes propagate asynchronously, or persist only in the cloud. This "cloud-persist" mode is especially useful for testing workloads in the cloud or for development environments.

Finally, Velostrata also provides strong bi-directional block level data de-duplication and compression algorithms to minimize the amount of data traversing the WAN and accelerate access to on-premises data. All written and migrated data is stored compressed, further improving storage cost savings.

Fig. 1 » Velostrata Smart Migration



Another major difference is that Velostrata is designed to be agentless. In contrast, all other migration solutions require customers to install an agent on each migrated server. Agent-based design leads to two undesirable outcomes—It interferes with workload apps and competes with them on resources, and it requires an Internet connection or firewall opening ports to/from the app.

Since the VM is not replicated, Velostrata streams only what is required for the workload to run and be available in the cloud. This approach is somewhat analogous to the way Netflix or other streaming video services work. Despite the length of the movie, you can start watching in minutes. Note, however, that in the case of VM disks, many parts will probably never be used, in which case they are never streamed unless you are doing full migration. For more information on Velostrata's streaming-based migration, visit velostrata.com/resources and download the whitepaper.

Bi-Directional Optimization and Multi-Tier Caching

Velostrata software includes a multi-tier, read-write cache in the cloud which combines in-memory (RAM) caching, SSD, and an object store.

For read purposes, the cache hosts the "working set" of data—this is the data that is frequently accessed by the application. Because the cloud VMs access this cache, they can achieve

The result is that for most enterprise applications, performance in cloud is on par with performance in the data center, despite the fact that storage and compute are now decoupled. In fact, in some cases performance actually improves with Velostrata's approach because larger compute instances may be instantiated in the cloud and IOPs are now a shared resource that can scale out linearly, on-demand.

Resiliency

All deployments of Velostrata include a Edge virtual appliance deployed in a dual-node, active/active configuration. Put simply, one Edge instance is deployed in one AWS Availability Zone (AZ) or Azure Fault domain (FD) while a second Edge instance is deployed in a separate another AZ/FD for redundancy and high availability. Velostrata acknowledges and ensures data resiliency by performing the write operations across these zones, so if one node fails, the system will continue to operate.

In addition, Velostrata stores the journal of write operations in an object store (S3 in AWS or Blob storage in Azure) to maintain a transient resilient data store while the data is written back to the virtual disks on-premises.

According to Amazon, the annual uptime SLA for EC2 (dual-AZ) is 99.95% and for S3 it is 99.99% (per year). S3 durability is 99.999999999% (11 9s). Velostrata keeps a maximum 30 seconds of write journal on the dual-AZ nodes before that

data is committed to the higher resiliency S3 object store. This 30 second RPO is relevant in the event that there are software issues (like a system crash) or an infrastructure issue (such as AZ failure).

Velostrata's architecture ensures that there is never data loss related to a single Edge failure or data consistency issues. Further, Velostrata's architecture ensures a 30-second RPO for sync to S3 (resilient to dual AZ crash, which is very rare) and a 30-minute RPO for sync on-premises (resilient to whole cloud outage, which is extremely rare).

Simple and Transparent Management

With Velostrata, no changes to the applications, images, networks, storage, or drivers are required and there is no need to learn new tools or processes. Storage can be managed and backed up just as it is today, regardless of whether workloads have been moved to the cloud. In other words, your on-premises backup solution will back up all changes to VMs in the cloud, just as if they were on premises. Velostrata also handles all image adaptation from vSphere to AWS/Azure (and back) automatically and transparently, including injection of missing drivers, configuring the storage, licensing, and more.

Velostrata extends the actions of an existing VM object without replication or cloning, thus providing administrators with management context, continuity, and coherency. With Velostrata, there is no change to the managed object, no ambiguity, and no loss of administrative history or operational context. Management and reporting is integrated into the vCenter console through Velostrata's vCenter plug-in. Velostrata is also designed with a PowerShell module and orchestrator for easy administration and automation of batch operations on bulk tasks, as well as a REST API for integration into third party management tools.



Fig. 2 » Velostrata vCenter Plug-In. Right-click VMs to “run in cloud” or “run on-premises.”

Streaming production workloads to and from the cloud with Velostrata involves right-clicking VMs and selecting “run in cloud” or “run on-premises.” Additional functionality includes selecting the instance type (larger instances or specific configurations may be selected to further improve performance), setting storage policy (cloud persist or write-back), creating security groups, networking, and execution options.

Safe and Secure

Security and data privacy is top of mind for most organizations today. Velostrata is configured to work within an existing or new VPN connection between the data center and the public cloud instance. Velostrata offers broad VPN support and will work with any VPN solution. Further, all data transferred by Velostrata is encrypted with AES-128, whether it's in the cache, in a store, or in flight between the cloud and your data center.

Summary & Conclusion

Velostrata's unique technology resolves all previous barriers to cloud adoption, de-risking the process so organizations can unlock cloud value more quickly. For more information on Velostrata or to start a free trial, visit velostrata.com.