

ACTIFIO ENTERPRISE DATA AS A SERVICE

How It Works

Actifio Enterprise Data as a Service technology transforms data protection, data access, and cloud mobility with speed, savings, and simplicity



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Introduction to Enterprise Data as a Service

Actifio Enterprise Data as a Service (EDaaS) disrupts the traditional rules of data management, driving dramatic changes in the ways that data is captured, managed and used. As infrastructure has become more commoditized, applications have become more strategic. Actifio data virtualization decouples applications from infrastructure, improving business resiliency, agility, and cloud mobility. Actifio is a single platform that enables multiple use cases including data protection, test data management for application development and enabling the enterprise hybrid cloud. The technology eliminates redundant data copies, consolidates overlapping storage services, and performs the basic functions of copy, store, move, and optimize for all applications. Using a common data management platform means less software to support, fewer licenses to buy, fewer integration headaches and the elimination of costly operational complexity.

Actifio maximizes operational efficiencies because it captures, stores, and moves data once. And it includes comprehensive data services such as global deduplication and compression to eliminate excess data copies. The result is less data moving across networks, less data to store, greater efficiency in long-term retention, and substantial reductions in TCO (Total Costs of Ownership).

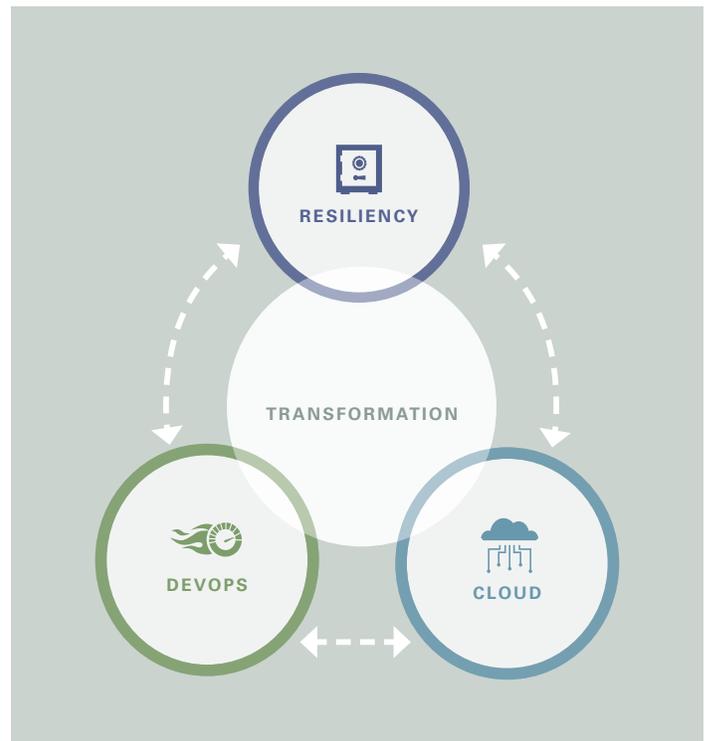
Applications are where business and technology meet. And applications are dependent on the underlying data that is the lifeblood of business. Actifio's platform provides a comprehensive means to manage that data. It's a solution that separates data from infrastructure and enables SLAs (Service Level Agreements) to be individually tailored to each application. It becomes economically feasible to have data time slices for each application. Users can mount, clone, live clone or restore data, from any point in time.

IT makes data instantly available, anytime.

Finally, the Actifio solution is radically simple to deploy and manage. It's infrastructure agnostic and easily integrated with existing systems for lower operational costs, improved RPO/RTO (Recovery Point Objective/Recovery Time Objective) and simplification of management challenges caused by redundant data copies.

Actifio's advanced technology changes data management. It's an innovative approach that enables IT professionals to control the data explosion and drive down IT costs at the same time. For businesses that run on Oracle, Microsoft, VMware, and many others, Actifio makes it easier to protect, access, and move data through EDaaS. Utilizing Actifio's Virtual Data Pipeline™ (VDP) technology, customers experience a revolutionary data management

FIGURE 1: Data Management Transformation— Resiliency, Agility, Cloud

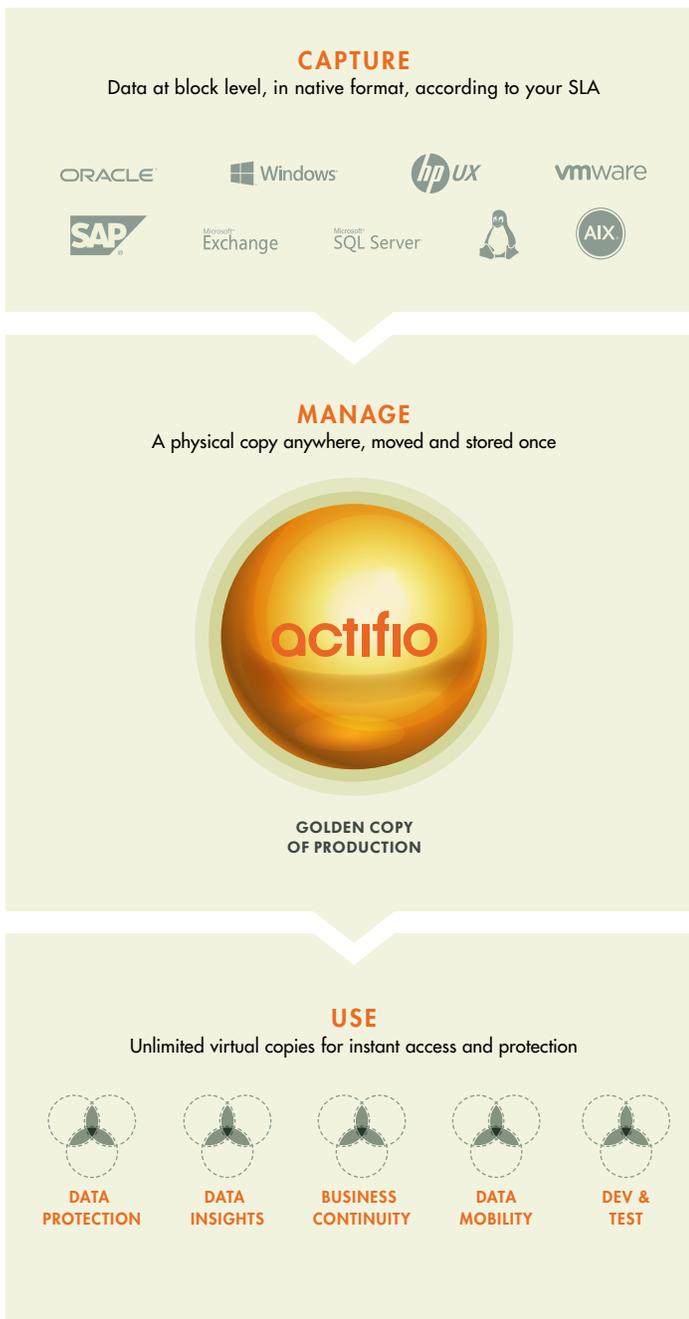


solution. They protect and access their data with increased speed and reduced complexity. With greater resiliency, business agility, and cloud mobility. Actifio VDP provides customers the ultimate data management control to satisfy current and future business needs.

Sophisticated Technology Doing Three Simple Things: Capture, Manage, Use

Actifio Captures data (Figure 2) from production applications – Oracle, Exchange, SAP, etc. It captures data at the block level and in native application format so it can be recovered instantly. It's all governed by administrator defined Service Level Agreements (SLAs) refined or modified in just a few clicks

FIGURE 2: Next Generation Data Management—
Capture, Manage, Use



Once initially captured, data moves through the virtual data pipeline (VDP) to create a Golden Master Copy that will manage data use and access. The Golden Master is a single physical copy compatible with any storage infrastructure. Data moves once to the Golden Master. Based on its SLA, the master is then updated on an incremental forever basis from source production applications, making it extremely efficient in using bandwidth and storage capacity.

Once established, the Golden Master can supply a virtual copy of any application data from any point in time and for any authorized use. It means eliminating the entire disparate and proprietary vendor infrastructure previously devoted to tasks like backup, DR, long-term retention, replication or deduplication.

That's it—EDaaS. Actifio captures application data directly from the application and manages it in the most efficient way possible on any chosen infrastructure. Data, governed by user-defined SLAs, is immediately available whenever and wherever needed to support the enterprise with true application-centric data services.

Traditional Data Management Approaches Have Failed

Traditional data management approaches have compartmentalized business requirements and independently spawned separate stacks of uncoordinated infrastructure and duplicate data. First there was backup. Then separate and dedicated application infrastructures each created multiple data services with exclusive backup, mirroring, replication, thin provisioning, and snapshot functions. As data grew, efficiency services were added for deduplication and compression. Application development, test, analytics and compliance each created their individual column of infrastructure and services. The cloud then emerged as another avenue to support data protection and DevOps initiatives resulting in yet another complexity. The management challenge escalated as all of these services produced more redundant data copies in different places. The copies absorbed valuable storage and became a tremendous strain on management resources. Now, only a radically different approach can resolve the data copy explosion. Traditional tools and mindsets cannot manage the swelling burden.

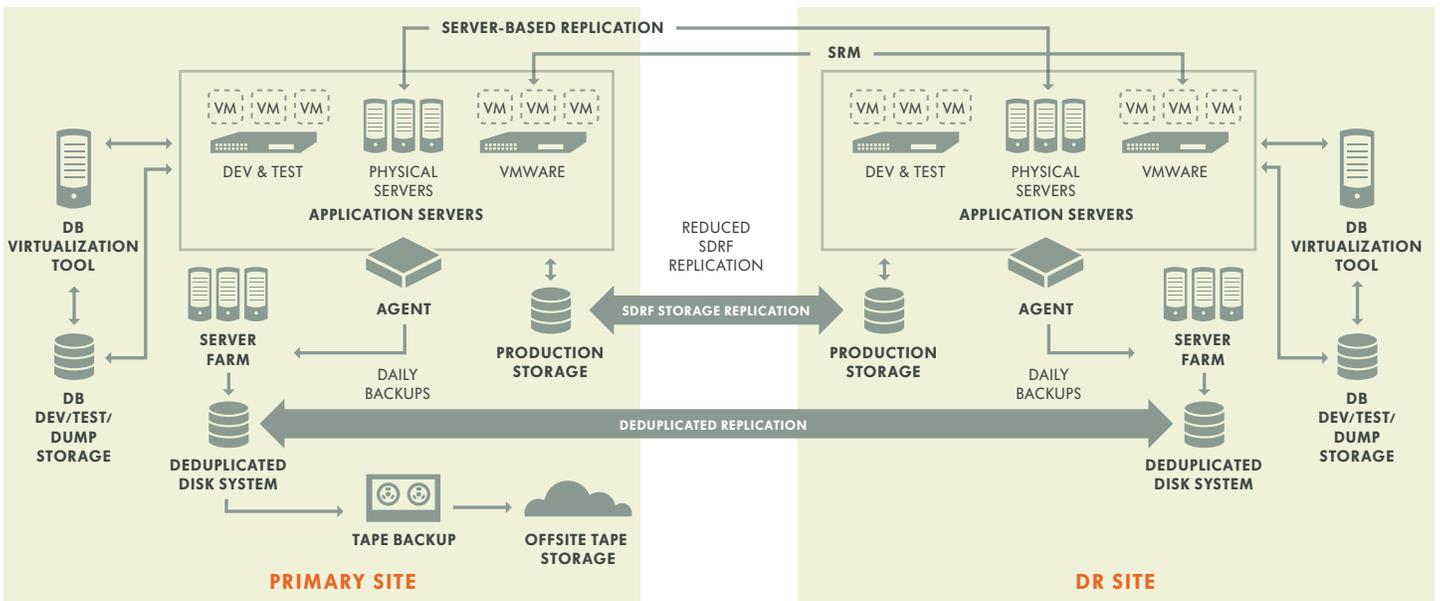
Production Data Copies Drive Data Growth

Storage capacity consumed by multiple unnecessary data copies costs businesses as much as \$44 billion annually, according to IDC. They estimate that copy data accounts for more than 60% of enterprise disk storage capacity. What began as rational practices intended to protect the business with separate copies of production data has generated a complex, brutally inflexible obstacle. Backup, disaster recovery, test & development, and data analytics each compound copy data growth. Across the vast majority of IT

If you're dealing with a storage explosion inside your enterprise, data copies created by data storage services are likely to blame

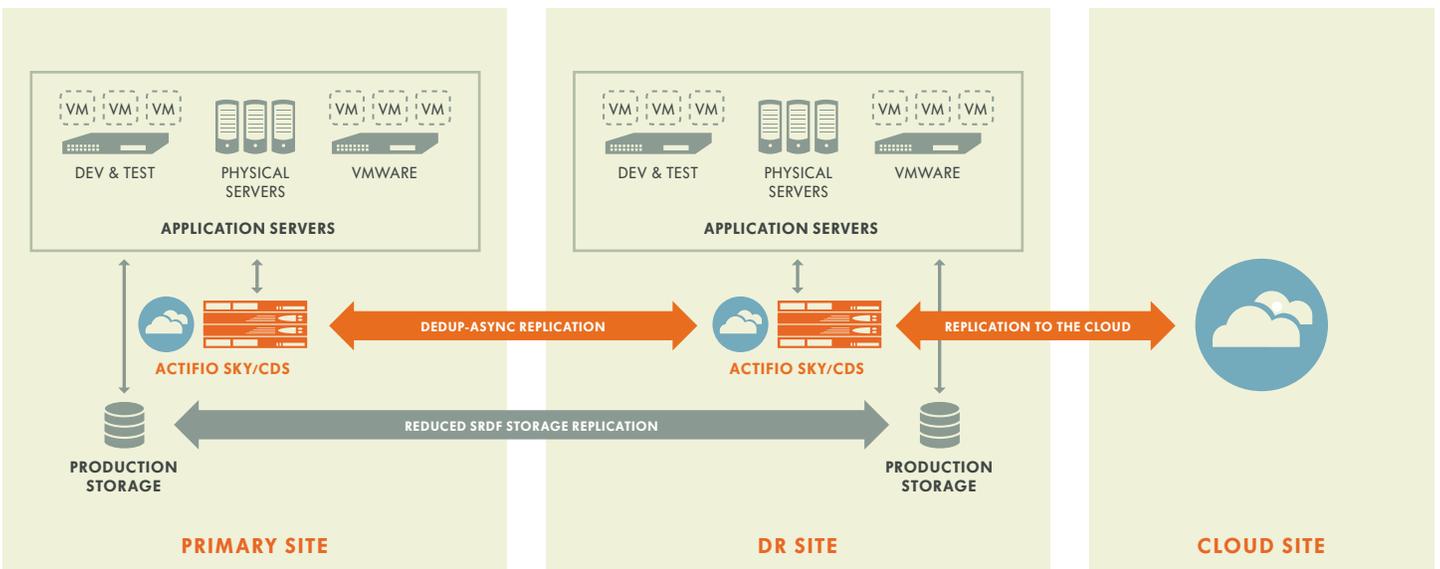
FIGURE 3: Actifio Impact—Radical Simplification

TRADITIONAL DATA ARCHITECTURE



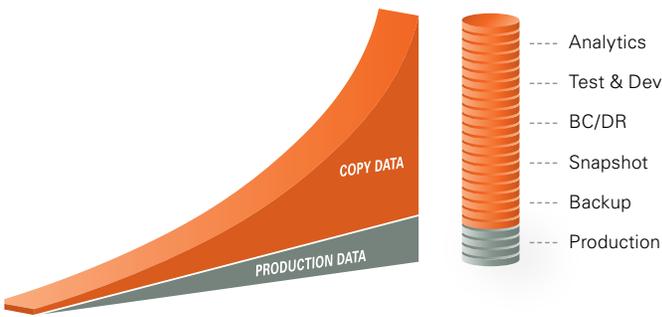
The diagram above presents a traditional data architecture full of physical devices from multiple suppliers all linking specialized data protection applications and redundant systems. It's complicated, messy, slow and expensive. Protection and failover are difficult to test, which makes reliability uncertain.

END-STATE TECHNICAL ARCHITECTURE



In the diagram above, Actifio has transformed that same architecture to the essential components of server, storage, primary and remote site with Actifio's Copy Data Storage (CDS) appliance added at each end. That's it. Many tools are consolidated into a single, radically simple solution.

FIGURE 4: The Copy Data Growth Challenge



- **Copy data** a \$44B problem
- Consumes **60%** of primary disk capacity
- Drives **65%** of storage software spending, **85%** of hardware

shops, separate and redundant tools are independently used to perform the same basic four operations: copy, store, move and optimize data. With a range of 13 to 120 duplicate copies businesses spend five times more for additional infrastructure and copy data management than is spent on production data. Figure 3 shows that even with data optimization services saving some storage space, they still manage an excessive number of data copies

Actifio's objective is to eliminate this copy data sprawl using copy data virtualization to improve performance, availability and protection.

Data Virtualization—The New Foundation

Virtualization of servers, networks, storage, and services has become core to information technology's continuing transition and advancement. Actifio now adds virtualization of data with Actifio's Virtual Data Pipeline (VDP) technology. Businesses have already seen the dramatic value virtualization brings to their data centers. Server virtualization provided the ability to reduce overall physical infrastructure, develop a more standard server configuration and save energy. It meant that workloads could move smoothly, and it increased operational efficiency. Storage virtualization has improved utilization while reducing storage sprawl. Common storage services are no longer chained to particular storage vendors. Server, storage, and network virtualization have helped IT organizations save millions in IT expense while significantly enhancing IT efficiency and flexibility.

Now, data virtualization continues the progression. It creates potentially unlimited virtual copies for multiple purposes from a single gold copy. It eliminates the need for multiple physical data copies. It enables streamlined business operations to manage backup and recovery, test and development, business continuity, disaster recovery, and analytics and delivers a path to the cloud. The Actifio platform is the first technology to provide users with virtualized data that dramatically reduces storage capacity and growth rates. It consolidates multiple point technologies, reduces operational complexity, and

allows IT to exceed all data SLAs. Above all, the platform does so without any impact on the performance of production systems.

Actifio Technology—Radically Simple Enterprise Data as a Service

Actifio technology is application-centric. It separates data from infrastructure and tightly ties data management to applications. Data is stored efficiently leveraging technologies such as deduplication, compression and object storage to keep only the data needed for an efficient, agile business. Because every enterprise wants data access when they need it, Actifio delivers in a way that drives efficient business operations to support organizational objectives. Actifio has liberated IT organizations and service providers of all sizes from data service sprawl and associated copy data management challenges. It's that simple: CAPTURE, MANAGE, USE.

Enterprise Data as a Service and the Actifio Virtual Data Pipeline

At the heart of the Actifio EDaaS platform is Actifio's Virtual Data Pipeline™ (VDP). Actifio VDP virtualizes data with guaranteed data protection and immediate access for backup and restore, test and development, analytics, disaster recovery and business continuity - all through a single storage platform. From the golden copy of production data, Actifio provides an any-point-in-time copy of primary data. It's a simple mount, clone, live clone or restore operation. Radically Simple.

Actifio's Virtual Data Pipeline runs as a fully integrated physical or virtual appliance. It is the industry's fastest, most efficient, and scalable method of data capture. It virtualizes data and consolidates copy services to make a single golden data copy available for multiple business solutions. Copies are application-consistent in native format, utilizing Changed Block Tracking (CBT) technology and based on customer defined SLAs. Applications directly access virtualized data either locally or in the cloud through the Actifio appliance without any data movement. The result is faster access, lower expense, and greater business impact.

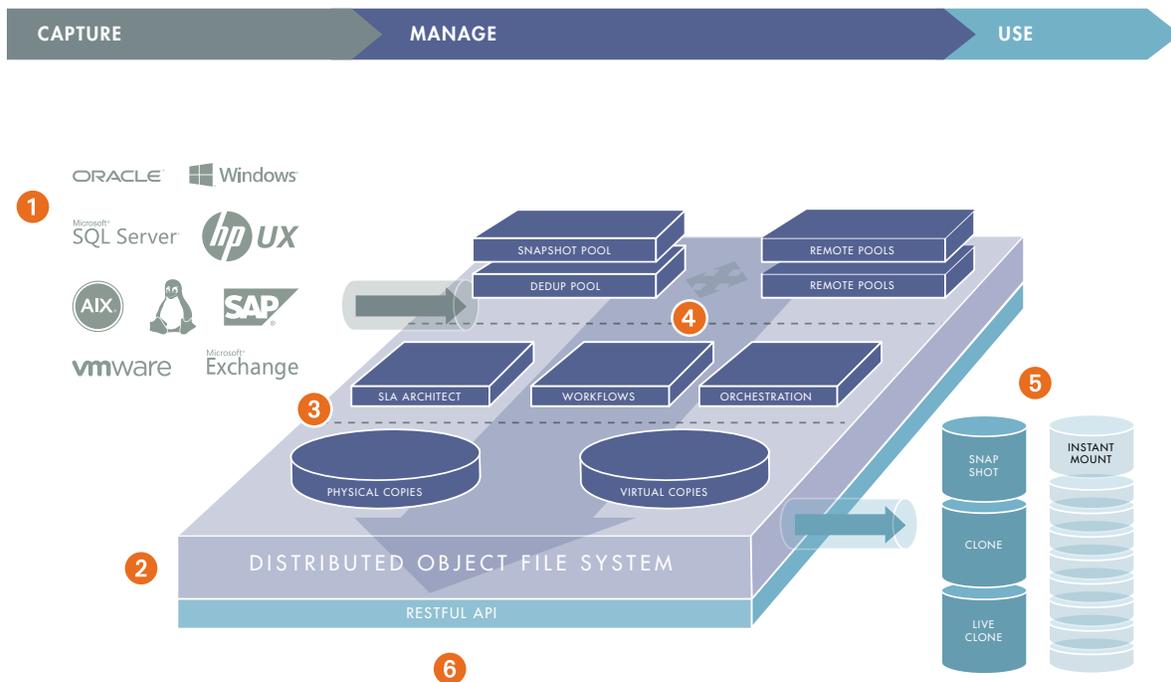
VDP Core Components (Figure 5):

- 1 **Discovery and Capture**—Identification of hosts, applications, volumes and file systems
- 2 **Distributed Object File System**—Captured data consolidated and secured
- 3 **Virtualized Storage Repository**—Data virtualized to any storage device
- 4 **Service Level Agreements**—Per-application SLAs apply primary data services
- 5 **Virtualized Data Availability Services**—Mount, clone, live clone, restore operations enabled
- 6 **RESTful API Extensions**—Open standards provide access to custom portals

Discovery and Capture

To ease management, Actifio automates discovery of virtual or physical hosts, applications, operating systems, volumes and file systems. (Figure 4, Section 1) Depending on the environment auto-discovery and data capture can occur

FIGURE 5: Actifio Virtual Data Pipeline—VDP



in multiple ways using industry and vendor standards, including VMware vStorage API's™, VADP, Oracle RMAN™ and Microsoft VSS.

Distributed Object File System

Actifio's Distributed Object File System incorporates all captured data for orchestrated delivery of data services. (Figure 4, Section 2) It consolidates previously separate service stacks to facilitate simple, consistent and efficient data management that reduces business risk.

Actifio's software is delivered either as a physical appliance, CDS, or a virtual appliance, Sky. CDS is an enterprise-class turnkey system including Actifio's software and a fault-tolerant appliance that is deployed as a gateway and supports virtually any third-party storage. CDS integrates seamlessly into any data center to capture data through the IP network or Fibre Channel SAN.

Sky is delivered as a virtual machine image that runs locally in VMware or Hyper-V environments using existing customer storage. Sky can also run in a variety of public clouds including Amazon AWS, Microsoft Azure and Oracle Cloud. Sky is fully compatible with CDS enabling customers to mix and match solutions to best meet their business requirements.

Both CDS and Sky support heterogeneous data center environments. Setup is straightforward and includes the industry's only application-centric SLA-based management. Particularly well suited for VMware deployments, Actifio directly integrates through vSphere and vCenter APIs. Actifio also integrates directly with Oracle RMAN and SAP BRTools to create a powerful platform for data management, test and development, and data protection.

Storage Agnostic

Actifio supports a wide variety of third party storage systems enabling customers to leverage existing investments. The removal of data copies significantly improves storage utilization, and the total storage footprint is reduced. (Figure 4, Section 3) A range of data services that include SLA controls, workflows, and orchestration, support the virtualized storage repository. SLAs can be finely tuned to dictate the type and tier of storage used without constraints set by individual storage vendors. Many customers use the power of this system to re-purpose or decommission existing storage. Some have substituted lower cost storage devices to satisfy tailored application SLA refinements. The result is maximized storage efficiency at much lower cost.

Service Level Agreements

Data is captured and stored in the distributed object file system subject to SLAs set by system administrators according to individual application requirements. (Figure 4, Section 4) The SLA engine applies client-selected data services based on service catalog requirements. SLAs are assigned to each application for control of variables such as capture frequency and retention periods. For example, a Tier 1 database application may have a snapshot taken every 4 hours with transaction logs captured every 15 minutes to create an appropriately granular RPO. Additionally, workflows can be introduced to allow virtual data sets to be mounted or cloned on an update schedule that provides test and development teams with current data access.

Virtualizing the Data Availability Services

Once the data is in the Actifio data repository, using this data is simple and straightforward. Applications have direct access to use point-in-time data copies without the need for traditional “restore” operations. Actifio acts as an intelligent, fully integrated storage solution that instantly creates virtual point-in-time application data copies. Users can choose a Snapshot, Clone or LiveClone (Figure 4 section 5) and efficiently access the data via a Fibre Channel or iSCSI interface, just as they would from a traditional storage system.

RESTful API Extensions

VDP provides programmatic extensions through open standards and a RESTful API. Administrators can apply these to proprietary portals, to help accelerate their enterprise time-to-value. ISV's or MSP's can use it to create custom services, including backup, DR, Dev/Test, etc.

Integrating Actifio and Applications

VMware™ vStorage APIs

Actifio uses VMware snapshots and a feature of VMware's vStorage APIs for Data Protection (VADP) called Changed Block Tracking™ (CBT). VMware-specific environments are discovered by querying VMware vCenter for a list of ESX servers and the VM's running on those servers. Combined with CBT, Actifio VDP transports only blocks that have changed since the last data refresh. Changes are captured from the production environment non-disruptively, with speed and efficiency.

DEPLOYMENT FACTS

Actifio's platform is typically deployed “out-of-band” or outside the primary data path. This ensures that volumes presented by Actifio will never impact the production environment. Actifio also offers an in-band option for selected environments. Each method has its advantages, and they are not mutually exclusive for continued flexibility in deployment and ongoing operations.

Actifio fully integrates with VMware vSphere™ and the vSphere Web Client. A plug-in is available to manage virtualized data from VMware's management platform, communicating directly with the VMware vCenter management server. It initiates data collection by taking a VMware snapshot of the Virtual Machine. These VMware VM snapshots provide Actifio with an application consistent view of the blocks on the virtual disk(s) inside a VM.

Actifio Sky is also available as a VMware virtual machine. It can also integrate directly with vSAN, eliminating the need for external copy data storage. Coupled with Actifio's Resiliency Director it provides the opportunity to run disaster recovery tests as often as necessary with no production impacts.

Actifio provides the flexibility for you to choose the storage for your virtualized data allowing you to repurpose storage and lower costs.

Application API Integration In Physical Environments

Several enterprise class applications and platforms provide advanced interfaces for better manageability of copy data services. Examples include Microsoft Windows VSS, Oracle RMAN and Backint SAP APIs (details on the Actifio website in the application specific white papers and support matrix). Actifio VDP is integrated directly with these API's to capture an application-consistent data snapshot, and only importing changed blocks. The result is extremely efficient and accurate data capture that ensures application consistency when mounting, cloning or recovering application data

Actifio Connectors

Actifio provides connectors for physical and virtual servers where necessary to obtain application consistency at the precise moment a snapshot is taken. The Actifio connector installs on a server non-disruptively and is a lightweight, low I/O profile service that provides tight integration and reports changed blocks back to VDP.

Actifio Connectors are also used to include file systems mounted on servers that have DAS, SAN or NAS devices as storage. Both file and block copy data services on those servers can now take advantage of Actifio's data virtualization. Actifio connectors are centrally managed and simply deployed to facilitate host communication to VDP.

For applications and operating systems that are homegrown or do not have built-in interfaces for quiescing, Actifio's internal snapshot technology quickly captures crash consistent views of the applications data. Also, pre- and post-snapshot scripts can be run to ensure data consistency.

VDP Data Services

Discovery and Capture

Once the Virtual Data Pipeline discovers an application or server it creates an initial snapshot. VDP then mounts a staging disk to the host, and a data copy is created as the foundation data set. Advanced Copy On Write (COW) snapshot technology is used for server environments such as Microsoft Windows™, Unix, Linux, and IBM i Servers™ (see www.actifio.com/support_matrix for details). The next step links the assigned SLA to the data and governs incremental changes. The staging disk is then remounted to the Actifio appliance and a snap copy taken to capture any data updates. Based on the defined SLA, a point-in-time copy of the data set is now available for use. When a virtual data copy is requested, VDP snapshots are built into full synthetic snapshots. These can immediately Mount, Clone, LiveClone or Restore any snapshot from any point in time from the virtualized data pool.

Globally Deduplicating and Compressing Changed Data

For long-term retention and/or replication, all changed blocks captured by VDP are globally deduplicated, ensuring that the same 4K blocks are never unnecessarily stored or moved again. Compression then further enhances storage efficiency. Together, global deduplication and compression provide several significant benefits, including:

- Globally deduplicated and compressed data is economically stored on disk for backup or long-term data retention
- A deduplicated data pool creates a wholly independent copy of the data for protection against physical problems with production storage

- Deduplication and compression optimize the data set for transport between sites, eliminating the cost of WAN optimization

SLAs Drive New Rules of Data Management

Once an enterprise deploys Actifio, it immediately begins gaining operational efficiency. Actifio discovers applications and file systems running in the environment. Then, custom tailored service level agreements (SLAs) are applied to each application and data set. Actifio binds the data management services such as snapshots, replication, workflows, lifecycle management, and deduplication directly to the application. This hard linkage enforces service levels for groups or individual VMs. It assures desired data lifecycle policies for each application. Assigned policies – including data access restrictions – will stay with each application, even if the underlying infrastructure changes or the application moves to a cloud service.

Creating these SLAs is simple and intuitive. They define the frequency of capture, lifecycle policies, retention periods, data mobility type, access policies and more. Workflows use the point-in-time data sets created by SLAs to add additional levels of automation. Any authorized system connected to the Actifio platform can access virtual data copies.

Common use cases include:

- Mount a volume for testing or application development
- Recover data or a complete VM following a system failure
- Retrieve an accidentally deleted file
- Use a virtual production data copy for analytics
- Move a volume to object storage for long-term retention

Actifio SLA controls add considerable data assurance and safety. Protection can be applied individually to any application or data set according to the data value. That enhances benefits from data sharing and use across the enterprise. It places SLAs at the core of simple but sophisticated next generation data management.

Data Access

There are four different methods to access data on the Actifio platform: Mount, Clone, Live Clone and Restore.

Mount

“Mount” is the most frequently used Actifio data access method. It directly accesses virtual data copies. After storing the first full production copy, VDP tracks and stores changes over time. With all data in place, VDP services IO directly. There is no need to copy the data anywhere for use, and no waiting required. Virtual copies can be mounted immediately on any authorized physical or virtual system using efficient block-level iSCSI and Fibre Channel protocol. By eliminating data movement from the process, even very large data sets can be accessed without delay.

Clone

The clone function is used to create an independent copy of a data set for any number of reasons. The most common uses are application development and testing, data audit for compliance, data warehousing, e-discovery, and

user acceptance testing. Application consistent data sets can be copied to virtual or physical servers from any point in time and saved to a separate storage location anywhere in the environment.

LiveClone

LiveClone functions like Clone, but with updates. LiveClone creates an independent copy to be mounted and then maintained as the primary data is refreshed. Teams such as test and development then have automated access to the freshest data set without excessive data management.

Restore

The Restore function effectively reverts production data to look exactly as it did at the time of a selected data collection point. Restore is the only operation that moves 100% of the data before it can be used. A typical Restore use case would be the recovery of an entire server or application back to a valid state after a massive data corruption or storage array failure. It is important to remember, that this takes the most time from a “recovery” perspective.

Alternate Data Recovery Methods

File-Level Recovery

While all datasets can be accessed very quickly at the VM level or at the volume level, Actifio provides a file level recovery feature for Windows systems. File-level recovery allows the administrator to browse a data set directly from the Actifio GUI and retrieve individual files or directories from any NTFS volumes managed by the Actifio platform.

Object Level Recovery

Actifio also provides object level recovery for Microsoft SharePoint™ and Exchange™ systems. Individual objects, including emails, documents, mailboxes, contacts, etc., can be retrieved or restored back to production from within the application content database. Actifio also helps manage consistency groups allowing customers to recover mixed data sets.

Automated vSphere Disaster Recovery

When deployed in a VMware vSphere environment, Actifio can automate both scheduled and on-demand execution of recovery plans for recovery testing as well as actual failover. Plans can be structured to recover whole vApps or individual VMs in Application Groups.

Application Development and Test—Speed, Quality, Cost, and Control

Faster application development is consistently near the top of every enterprise wish list. That’s because the cost of application development and related support are eating up a third or more of typical IT budgets. These expensive apps are central to business success and competitive advantage - but an immense IT expense. The ultimate objective is to develop apps faster, less expensively, with more frequent updates, and still gain that competitive edge.

Because applications are integral to business transactions, there’s a heavy burden on application developers to provide modern, integrated, worry free applications in very short time frames. They need to iterate quickly with new features, functions, and competitive benefits. It’s about high-quality output and faster time-to-market. They need simple and direct access to all of the technical

resources. And they need fast, efficient access to production data.

More than anything, applications are about data. Actifio EDaaS provides capabilities for users to rethink the functional relationships of data to storage, compute, network and systems administration. Actifio introduces self-service and near-instant availability to access scrubbed database environments. Cost savings occur in multiple dimensions, including reduced staff costs, capital costs, delay costs, complexity costs, and, most important in the eyes of many business leaders, the costs of time.

Actifio separates application data from the physical architecture. It replaces multiple steps and weeks of waiting for storage, network, and OS resources that stretch out development times. It operates across virtual and physical platforms, on-premises and cloud, databases, hypervisors, and operating systems. Because the Actifio data virtualization platform already has copies of production data, it can non-disruptively repurpose them for development and test environments. Even with very large databases authorized data access is nearly instant. Masking sensitive data can be automated, avoiding intensive and time-consuming manual work previously needed to protect privacy and assure security. A fully integrated workflow guarantees that only the correct/masked data is accessible, and only to authorized users.

It's all part of Actifio's workflow that permits an authorized administrator to create a tailored data masking script, server, and schedule. An image is then mounted to the server and the masking script invoked. As a result, all accessible virtual copies are created from the masked version ensuring only safe copies are used in development and QA. As the database is updated, incremental refreshes can be scheduled.

Actifio further accelerates the development process through its RESTful API. This interface exposes Actifio functionality to third party applications and enables tight integration between VDP technology and third party configuration and provisioning solutions such as Ansible, Chef, Puppet and SaltStack. The

combined offering can deliver a complete orchestration solution enabling the instant creation of development compute, networking and storage in an automated and secure fashion.

All of the Actifio capabilities for secure and efficient test data management are available for remote or cloud development, including replication optimization, continuous updates, and automated data masking. Capabilities can be efficiently deployed in remote office locations, at a service provider, or in the public cloud. In some cases, service providers also take advantage of available APIs to integrate Actifio functionality into their own portals. It helps to promote easy service access and provide their clients with heightened data control.

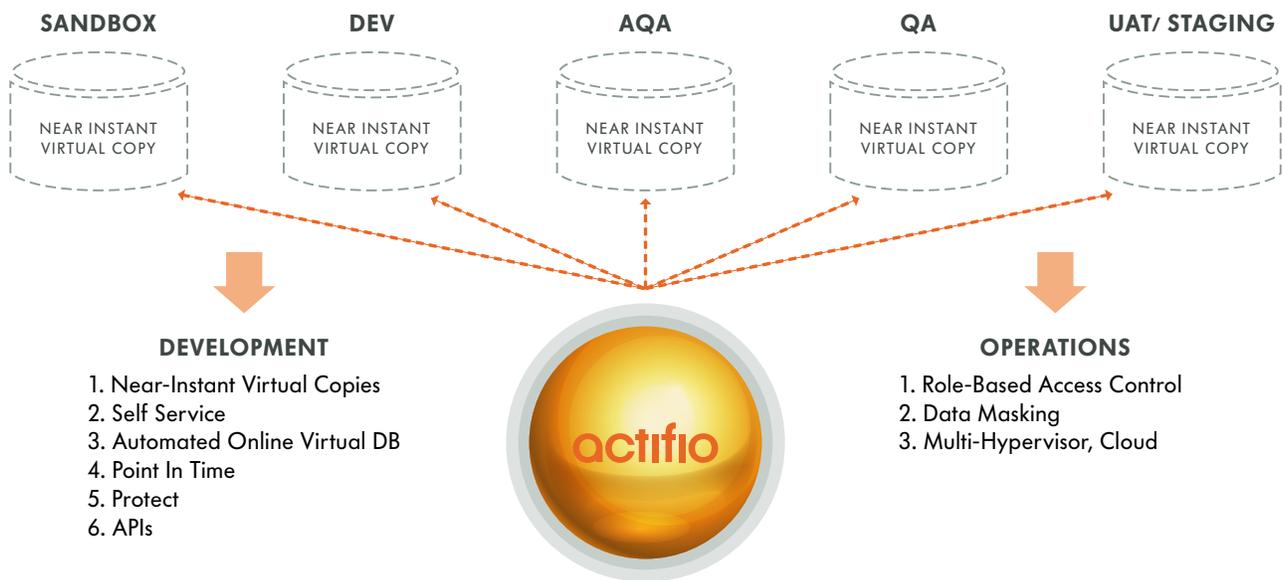
Automating Improvements for Test Data Management

Scalability, consistency, data control, and ease-of-use are all fundamental needs when incorporating automation technologies into an existing environment. Actifio workflows collapse multiple, disparate, time-consuming steps into single-click automated tasks creating the basis for self-service automation that reduces reliance on scripts and human factors. Flexible orchestration controls data provisioning to development, testing, QA, pre-production, analytics, and dozens of other use cases. The impact substantially improves quality and accelerates application release cycles.

Automated features include:

- Near Instant self-service access to virtual copies with minimal storage consumption
- Automated data masking
- Automated data refresh
- Point-in-time masked copies
- Role-Based Access Controls (RBAC) enable secure data access without DBA involvement
- Coordination of database and log files to roll logs prior to mount

FIGURE 6: Data Virtualization for Dev-Ops



- Bookmarks for roll back in test environments
- Database Integration environment with customization options
- Consistency groups that coordinate multiple volumes, applications and data
- Space efficient protection for Dev and QA test data sets
- Regulatory compliance functions for analytics or forensic analysis.
- Test-in-cloud enables masked cloud compute testing
- Automated workflows for dev/test/QA

Data virtualization is a natural progression in the course of server and network virtualization. It's a fresh approach that enables rapid development by reducing provisioning times by as much as 90%. Actifio allows IT administrators or application owners to set role-based data access controls (RBAC). This provides a fine-tuned capability to manage who gets access to which data sets on which test servers. It also includes an audit trail, all automated and updated automatically. Controls stay in force even if data moves to the cloud or underlying infrastructure changes. QA engineers can freeze an environment to reproduce and debug problems or for developer review. The same approach works when production support needs to reproduce and debug issues in an active customer-facing application. A near-instant copy can be created to find the root cause quickly and get it fixed while QA and production continue operating.

Application development is a complex and demanding process. Anything that makes it simpler is welcome and appreciated. Actifio means applications can attain maximum scalability, consistency, data control, automation and ease-of-use fundamentals. All of that helps DevOps improve quality while accelerating application release cycles.

Enhanced Data Safety and Control

Confidence in Enterprise data safety and control is essential. It starts with common sense management of potential vulnerabilities. Actifio customers gain an exceptional measure of trust by eliminating rogue copies and reducing data targets. EDaaS collapses the potential "surface of attack" for any malicious purpose into a single golden copy of protected production data.

In Enterprise cloud deployments, Actifio manages data movement across physical, virtual and hybrid environments, maintaining protection regardless of platform shifts. It supports governance and regulatory compliance for sensitive data and safeguards against potential data leaks and risks to reputation. Automated workflows transform and mask sensitive production data before it reaches development environments, creating a virtual data firewall between the two.

Data Virtualization provides centralized control for the entire EDaaS environment and life cycle. Employing a single tool to create and manage all copies establishes a platform for applying access control, data monitoring, and authentication. It inhibits unsecured shadow IT operations, and it constrains cost. All of the Actifio capabilities that manage secure and efficient data control are available for remote or cloud instances, including replication optimization, continuous updates, and automated data masking.

KEY BENEFITS OF ACTIFIO DEVOPS

HIGHER SPEED



- **Develop and Test** apps faster
- **UAT and Release** apps faster
- **Support** apps faster
- **Self-Service** for Dev, QA, DBA

BETTER QUALY



- **Catch and Fix** bugs early
- **Minimize** last-minute surprises
- **Release** products on time

MORE CONTROL



- **Role-Based** access control
- **Data Masking**

LOWER COSTS



- **Minimize** storage costs
- **Minimize** burden on DBAs
- **Minimize** burden on IT

Actifio Data Control Functions

Data Virtualization: EDaaS produces a critical data control and management structure. In the event of a security breach, potential weaknesses can be more quickly identified and breaches more swiftly recovered because excess physical copies no longer exist. The smaller "surface of attack" provides less opportunity to compromise privileged information.

Masking for Development and Test: Data control requirements continue during application development and testing. Sensitive data that has no bearing on the development process can be automatically masked before DEV & QA teams get access. (Figure 6) That means data is available to authorized users for sanctioned purposes and fully restricted from any unauthorized use or purpose.

Immutable references: In the event of a suspected security breach, copies of a baseline or known-good and unalterable state are available for comparison and investigatory purposes. Unauthorized data tampering can be detected, verified and mapped using a combination of Actifio and real-time integrity monitoring tools.

Penetration and vulnerability testing: The Actifio Golden Copy of production data can serve data control objectives as a virtual clone of an entire production environment. It can be created and exposed to routine and aggressive penetration and vulnerability testing without the risk of disruption to production environments.

Data Loss Prevention (DLP): Actifio can be used to conduct data loss and compliance scanning of virtual database clones as well as physical and virtual machines. Compliance is more easily evaluated without any load on production servers.

Two-factor control: Authorized data access can be restricted, requiring both appropriate rights to the copy data appliance and access to a designated host. Permission can be set to an individual, divided by a two-person-rule or require passwords from multiple individuals.

Audit Logs and Access Controls: Actifio enables IT administrators or application owners to set role-based data access controls (RBAC). It integrates with external event receivers and provides a fine-tuned capability to manage who gets access to which data sets on which test servers. It includes an audit trail, updated automatically.

Complexity Reduction: Actifio builds confidence in critical data security through simplified procedural testing and non-disruptive demonstrations of

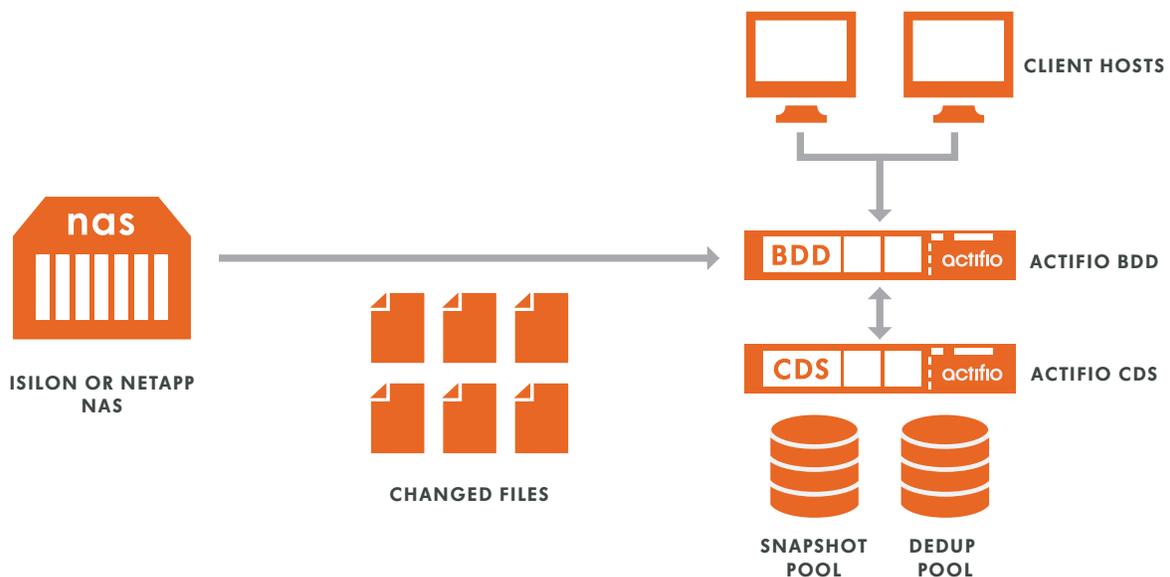
data control. Data virtualization eliminates redundant infrastructure, process, and expense. Meaningful key performance indicators (KPIs) are more accessible, enabling faster insight and appropriate intrusion response.

Actifio Incorporates Essential Technical Standards to Deliver Multiple Levels of Data Control:

- Accountability controls and audit log integration with external authentication (LDAP) to manage password policies, account lockout, centralized provisioning and de-provisioning
- Extensive Role Based Access Control (RBAC) for fine-grained, multi-tenant user rights access controls that define which users can perform what actions, on what data, and against what systems
- No direct end-user access to the internal hardened Linux operating system
- Hardening to Defense Information Systems Agency (DISA) Secure Technical Implementation Guide (STIG) compliance requirements*
- FIPS 140-2 certified cryptography with Perfect Forward Secrecy ciphers for replication traffic.
- Integrity monitoring and intrusion detection capabilities*
- Self-encrypting drives utilizing FIPS 140-2 hardware cryptography with centralized key management for the storage of Copy Data*
- Secure customer-controlled service access

* Optional

FIGURE 8: Big Data Director—Logical Diagram



Actifio Big Data Director (BDD)

Customers can extend Actifio's EDaaS platform to include their large-scale NAS servers using Actifio Big Data Director. BDD provides an efficient platform for capturing, archiving, moving, and recovering large file systems from NAS servers. Even PB scale unstructured datasets can be instantly mounted from BDD with a nearly immediate recovery of lost files. The platform also reduces expenses by eliminating any need for costly system redundancy.

Speed, Simplicity, Scalability, and Savings:

Actifio BDD addresses several longstanding NAS challenges by enabling backups to be mounted to the same server while employing a single tool for mobility and disaster recovery. It effectively protects large data sets without the need for full backups and provides near-instant data recovery. BDD reduces the cost of storage, replaces multiple backup/DR point tools and provides a low RTO for mission critical data to protect against downtime business losses. .

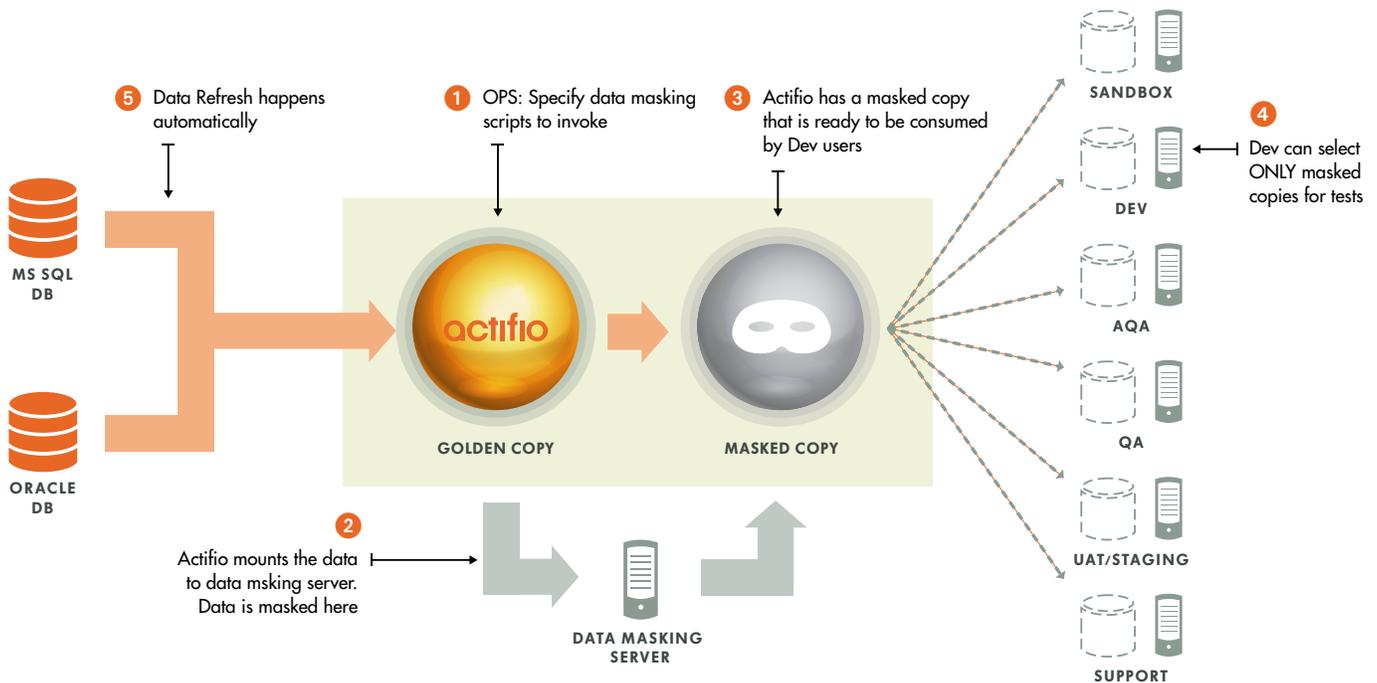
NAS Business Resiliency with Actifio Big Data Director:

- Enables protection for large NAS servers.
- Flexible Service Level Agreements (SLA) can be tailored to individual dataset requirements
- Change file tracking

- Incremental Forever data protection even on very large datasets
- Nearly instant recoveries of datasets locally or to a remote office
- Present synthetic full NAS images if needed
- Inline and global deduplication to maximize storage efficiency
- WAN-optimized replication protocol optimizes bandwidth usage, transferring only changed files remotely through BDD and significantly reducing WAN bandwidth requirements
- Access Control Lists are inherited from the source appliance and used when mounting or exporting datasets as CIFS or NFS shares
- BDD efficiency backs up and recovers very large NAS servers without the need for identical redundant systems
- BDD is a 2U rack-mountable hardware addition to the Actifio CDS on-premise appliance solution to protect and recover data locally or to remote offices with the click of a button. A single Actifio Big Data Director can protect up to 50 TB or 200 million files. Up to 8 BDD nodes can be clustered in combination with CDS to supports the following environments:
 - **Isilon** (OneFS 7.1.1.3 or later)
 - **NetApp**: ONTAP 8.x or later (7-Mode)

FIGURE 8: Big Data Director—Logical Diagram

FIGURE 9: Data Masking



FLEXIBLE DATA MOBILITY

DEDUP ASYNC™ REPLICATION

Dedup Async is an industry first, uniquely delivered by Actifio as the most efficient way to move data to a remote site. Dedup Async sends deduplicated and compressed data over the network at a fraction of the bandwidth required for traditional replication technologies. Customers have reported as much as 10X bandwidth savings. When Dedup Async data reaches the remote site, it rehydrates according to defined SLAs, providing the flexibility of instant access at the remote location. Dedup Async provides disaster recovery potential for a much larger set of applications where traditional storage replication technologies have been cost-prohibitive.

ASYNCRONOUS REPLICATION

Asynchronous replication, also used for mirroring to a remote site has no distance limitation and will send data over the WAN as fast as network bandwidth allows.

OBJECT STORAGE

For longer term retention, data can be moved to a local or remote Object Storage repository. Actifio supports a variety of in-premises object storage and cloud-based offerings including solutions from Amazon, Google and Microsoft. The technology allows instant volume mounts from object storage to accelerate data access.

VIRTUALIZING DATA MOVE OPERATIONS

Moving data in any IT environment is complex, time consuming and expensive. Now, as more enterprises move to cloud-based services, the need for simple, fast and frequent data movement is more critical than ever. With virtualized data, mobility potential is transformed in speed, simplicity, security, and scalability. It's done with less network usage and no WAN accelerators. Actifio provides options to support data movement outside data centers, remote offices or to and from cloud services. These include Dedup Async or Asynchronous replication.

For cloud enablement, DR or BC purposes, Actifio efficiently moves application data to create remote copies available for instant use or recovery. SLAs can define data move operations for each data set. While Actifio Async is similar to asynchronous replication offered by traditional storage vendors, it is completely storage vendor agnostic and utilizes an Ethernet connection between customer sites for efficient data movement. Dedup Async replication is a patented, extremely effective method of replicating point-in-time changes to a remote location using any standard WAN link without any WAN acceleration device. All methods described use secure, encrypted communication in data replication. Because data is sent from one Actifio system to another, replication is storage independent and no storage vendor licenses are needed.

Conclusion

Actifio's EDaaS is a transformational approach to business resiliency through a data management and protection platform that controls copy data sprawl. Actifio decouples applications from infrastructure to advance business resiliency, agility, and cloud mobility. It means speed, savings, and simplicity. It provides flexible "when and where" data access by consolidating multiple data services onto a single, simple management platform. It provides a central point of access and control for backup, disaster recovery, business continuity, test/development, replication, and archive. It provides data efficiency services such as compression and deduplication across all

applications and storage systems. Through a common set of heterogeneous data services the Actifio VDP platform eliminates expensive software licenses supporting multiple functions across disparate storage arrays and local and remote object stores. It dramatically reduces requirements for storage capacity, energy and floor space.

Actifio means business runs faster, with dramatic cost savings, and infrastructure reductions that radically simplify operations. Just as VMware redefined the approach to compute, Actifio is redefining how businesses capture, manage and use their data for greater resiliency, agility, and cloud mobility

ABOUT ACTIFIO

Actifio delivers Enterprise Data as a Service to thousands of global enterprise customers and service provider partners in more than 37 countries around the world. Our Virtual Data decouples data from infrastructure, enabling dramatic improvements in business resiliency, agility, and access to the cloud. Actifio replaces siloed data management applications with a radically simple, application-centric, SLA-driven approach that lets customers capture data from production applications, manage it more economically, and use it when and where they need to. Actifio is headquartered just outside Boston, Massachusetts, and can be reached via the web (actifio.com), Twitter ([@actifio](https://twitter.com/actifio)) or email at info@actifio.com.

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Radically Simple



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