EMC APPSYNC SOLUTION FOR MANAGING PROTECTION OF MICROSOFT SQL SERVER
SLA-DRIVEN, SELF-SERVICE CAPABILITIES FOR MAXIMIZING AND SIMPLIFYING DATA PROTECTION AND RECOVERABILITY

ABSTRACT

With Microsoft SQL Server playing a critical role in today's around-the-clock business operations, IT organizations are under intense pressure to ensure database availability and prevent data loss. In response, organizations are using replication as a first line of defense for data protection. This white paper presents the technical capabilities that EMC AppSync provides in simplifying management of SQL Server protection and empowering database administrators with a simple, SLA-driven, self-service data protection solution.

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EXECUTIVE SUMMARY

The rising costs of downtime and demand for around-the-clock access to critical Microsoft SQL Server databases have intensified the need for advanced data protection that extends well beyond daily backup solutions. EMC AppSync provides a simple, SLA-driven, self-service copy management solution for Microsoft applications, including SQL Server and Microsoft Exchange, in physical, as well as virtual environments. This white paper provides an overview of the technical capabilities offered by AppSync, featuring a tiered set of pre-defined protection service plans that use array-based copy technologies such as EMC VNX Advanced Snapshots and EMC RecoverPoint for local and remote data protection. The paper presents several common SQL Server use cases for AppSync, including operational recovery, repurposing of database replicas, and database backup acceleration.

In addition, the paper details AppSync features designed specifically for SQL Server, which enhance data protection and recoverability, while affording SQL Server database administrators (DBAs) extensive flexibility to create and manage SQL Server replicas for a variety of purposes.

With the information provided in this paper, SQL Server DBAs, application owners, and storage administrators will understand how AppSync protects SQL Server databases with greater efficiency, economy, and flexibility than traditional replica management products, making it an ideal solution for their critical database environments.
INTRODUCTION
Enterprises rely on Microsoft SQL Server for many of their most critical applications. Due to the high business costs associated with data loss and downtime, IT organizations face growing pressure to improve protection of SQL Server databases with minimal disruption to production operations. As SQL Server environments are increasingly virtualized to support private cloud infrastructures and IT-as-a-Service (ITaaS), the requirement for around-the-clock accessibility has intensified demand for advanced data protection.

Traditionally, organizations have relied solely on once-a-day backup routines using tape- or disk-based solutions. While backup is an essential part of any data protection strategy, the potential impact of data loss is so great today that additional measures are needed. According to analyst firm IDC, organizations of all sizes now use replication as a first line of defense for data protection. Even given this transformation, database administrators (DBAs) have not had a way to directly manage SQL Server protection or monitor whether recovery point objectives (RPOs) and recovery time objectives (RTOs) are being met.

To address evolving data protection requirements, EMC® offers AppSync™, a simple, SLA-driven, self-service data protection management solution designed for Microsoft applications such as SQL Server 2008 and SQL Server 2012, as well as VMware data stores, running on EMC VNX® unified storage (Figure 1). AppSync allows SQL Server DBAs to directly manage snapshots and replicas to meet their SLAs without requiring engagement of the storage team. It also empowers DBAs to restore copies of their SQL Server databases as needed.

With its simple, flexible design, AppSync supports a number of use cases for SQL Server, including operational recovery, backup acceleration, and repurposing of database copies for testing, upgrades, and data mining. It is an efficient way for SQL Server DBAs to strengthen protection and maximize the value of their SQL Server investments.

1 Continuous Replication for Business-Critical Applications, white paper, IDC, January 2012.
APP SYNC TECHNICAL OVERVIEW

AppSync orchestrates the creation and management of database replicas using underlying copy technologies within EMC VNX storage, such as VNX Advanced Snapshots, as well as EMC RecoverPoint® continuous local and remote data protection solutions.

Snapshots are created by regularly synchronizing a production database volume with a second copy that is stored separately from the production environment. Snapshots can be taken automatically throughout the day to create multiple application restore points, or captured manually to create copies for non-recovery purposes such as data analysis and reporting. RecoverPoint continuous data protection (CDP) provides more granular recovery by using DVR-like features to continuously capture data and play it back to a point in time measured in milliseconds.

Protection of SQL Server in both physical and virtual environments, including VMware and Microsoft Hyper-V environments, is managed by AppSync. In addition to block data for SQL Server, AppSync also supports NFS data stores in a VMware environment to protect virtual machines (VMs) residing on the data stores, using VNX SnapSure™ and RepV2 replication technologies.

Because AppSync is application-aware, it is ideal for protecting SQL Server in dynamic virtualized environments. For example, it maintains synchronization with SQL Server within VMs even if they are moved from one physical host to another across the infrastructure. Unlike other solutions that would require IT to manually enable protection each time the VM is moved to a new location, AppSync follows it and sustains ongoing protection automatically.

DBAs can easily manage and control local or remote replication strategies, as well as monitor SLAs through a unified administrative AppSync console. AppSync automatically discovers all SQL Server databases in the infrastructure. Then, with just a few clicks, users can easily assign protection levels for each database. The AppSync console is organized into sections for management, reporting, and administration (Figure 1).

![Figure 2 – AppSync Console](image)

The AppSync dashboard provides a convenient, at-a-glance view of all protected databases and applications, including the status of replication services and alerts. The console also allows users to easily navigate through a series of tabs to specific environments, subscribe to or create service plans that match SLAs for individual databases, restore databases, or monitor compliance with SLAs. Access to specific operations within the console is based on roles so users only see what they need to see.

**Tiered Data Protection Service Plans**

To make it fast and easy for DBAs to protect SQL Server, AppSync comes with a pre-defined set of tiered service plans to meet the most common data protection objectives. Each service plan is associated with a specific copy technology, such as VNX Advanced Snapshots or RecoverPoint, which provides synchronous or asynchronous replication to enable local or remote protection based on the SLA requirements for each SQL Server database (Figure 3). Service plans also contain a range of attributes, including replica scheduling, frequency, mounting and unmounting policies, and expiration policy.
AppSync service plans provide three levels of protection:

- **Bronze** – creates local database copies using VNX Advanced Snapshots or EMC RecoverPoint continuous data protection (CDP)
- **Silver** – creates remote database copies using EMC RecoverPoint continuous remote replication (CRR)
- **Gold** – creates both local and remote copies simultaneously with RecoverPoint concurrent local and remote replication (CLR)

Choice of plan is based on the RPO required by each SQL Server database, with the Gold plan providing near-zero RPO. In addition to these pre-defined plans, DBAs can customize their own plans by mixing and matching attributes and copy technologies to precisely match their unique SLA requirements.

Once the DBA subscribes each database to a service plan, AppSync automatically manages protection according to the specified plan. AppSync also provides an application protection monitoring and reporting service that generates alerts if SLAs are not being met or if a replication job fails so that DBAs can take corrective action.

By using pre-defined service plans, DBAs can streamline the entire data protection process and avoid creating more SQL Server replicas than are needed. This not only saves time for the DBA, but also reduces the amount of storage space and cost needed to support database replicas.
APPSYNC USE CASES

With its ability to manage copies of SQL Server databases throughout the lifecycle of creation, mounting, unmounting, restoring, and expiring, AppSync supports a broad range of use cases and user roles (Figure 4).

<table>
<thead>
<tr>
<th>Role</th>
<th>Role Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Administrator</td>
<td>Manages the protection and recovery of data</td>
</tr>
<tr>
<td>Resource Administrator</td>
<td>Manages hosts, storage systems, VMware vCenter Servers, and RecoverPoint Sites</td>
</tr>
<tr>
<td>Security Administrator</td>
<td>Manages users that can log into AppSync</td>
</tr>
<tr>
<td>Service Plan Administrator</td>
<td>Customizes and runs service plans used for data protection</td>
</tr>
</tbody>
</table>

Figure 4 – AppSync User Roles

Operational Recovery

Local snapshots created on VNX storage, as well as continuous copies created locally or remotely by RecoverPoint, can be used to quickly recover SQL Server data and VM files. For example, if the production environment suffers a failure, data is corrupted, or a file inadvertently deleted, DBAs and application owners can use AppSync to restore data from the snapshot or copy in minutes.

Repurposing

Snapshots and copies of the SQL Server database are also useful for a number of other purposes beyond data protection. DBAs and application owners can use AppSync to easily create copies for tasks such as applying SQL Server updates, managing quality assurance, developing and testing new SQL Server applications, running reports, or mining data for business intelligence—all without impacting production operations. IT and business users can use the copies as long as necessary and refresh the data periodically through AppSync to keep the repurposed environments current. When desired, AppSync can restore updates and applications back into the production environment, or expire copies that are no longer needed.

Backup Acceleration

In addition, AppSync can help accelerate SQL Server backups and avoid disruption to production operations. Instead of backing up directly from the production database, organizations can create a database replica through AppSync, mount it on another server, and run the backup from that server. This approach reduces load on the production server by offloading backup processes to a non-production server. The backup created from the database replica can then be married with differential and log backups performed by SQL Server scripts or other solutions to enable a complete recovery if necessary.
APPLICATION-AWARE FEATURES FOR SQL SERVER

While AppSync offers a wide range of capabilities designed for numerous Microsoft enterprise applications and virtualized environments, it also includes several features specifically for SQL Server.

Application Consistency

AppSync uses the SQL Server virtual device interface to create application-consistent copies of the database that ensure recoverability. Through the virtual device interface, AppSync freezes the SQL Server database while taking a snapshot with VNX Advanced Snapshots or creating a bookmark in a RecoverPoint continuous copy. All I/O activity is held while the copy is made to avoid any transaction loss. The database is then thawed and regular I/O activity resumed.

These application-consistent copies can be mounted on another server and paired with transaction logs. This ensures that the application-consistent copies can always be recovered—an important advantage over crash-consistent copies. Although crash-consistent copies contain the database, they do not include data in memory at the time the copy is made. In addition, with crash consistency, transaction logs cannot be applied so the SQL Server environment is at risk for data loss.

Copy, Mount, and Restore Options for SQL Server

AppSync offers a range of copy, mount, and restore options for SQL Server databases.

Copy Options

AppSync enables DBAs to create three types of copies, which are tied to the three service plans defined earlier—local copy (Bronze plan), remote copy (Silver plan), or local and remote copies (Gold plan). When the copy is used as a backup of the database, AppSync supports "full" backup copies, which allow transaction logs to be restored to fully protect the database. Since full backup copies can interfere with third-party backup schedules, AppSync offers the alternative of "copy" backups, which protect the database and the active portion of the transaction log without affecting backup schedules. AppSync uses the SQL Server virtual device interface to create both full and copy backups.

Mount and Recovery Options

When mounting copies of SQL Server to another host, AppSync provides several options, such as selecting which host for mounting, type of access granted to the copy, whether metadata is also copied, and recovery options. Recovery options include:

- Recovery – When the SQL Server restore command is issued, this option brings the database copy back online and ready to use in production.
- No Recovery – This option puts the database copy in a "restoring" state to allow the DBA to restore transaction logs if desired. When in "No Recovery" mode, the database is unusable.
- Standby – This option restores the database in read-only mode, allowing the DBA to apply transaction logs or evaluate if the database is a valid, usable copy.

AppSync also allows DBAs to rename the database copy to prevent it from overwriting the production database.

SQL Server AlwaysOn Support

AlwaysOn Failover Cluster Instances

SQL Server can be configured with a Microsoft high-availability feature called AlwaysOn Failover Cluster Instances, which allows a single instance of SQL Server to run on multiple servers serving as nodes. If one node in the cluster goes down, SQL Server will automatically fail over operations to another available node. AppSync can protect SQL Server within AlwaysOn Failover Cluster Instances across synchronous or asynchronous distances using one of the AppSync service plans. In this way, AppSync ensures that a clean copy of SQL Server is always available in case the database becomes corrupted. If a SQL Server failover occurs in the cluster, AppSync will automatically find it on the new node and continue the protection service plan.

SQL Server AlwaysOn Availability Groups

The Availability Groups can be part of clustered and non-clustered SQL Server instances installed on AlwaysOn Failover clusters. An availability group is a set of SQL Server databases that all fail over together. Each availability group supports a set of primary databases and up to four secondary databases, each with a replica on different nodes in the failover cluster.
AppSync service plans can be applied to both primary and secondary SQL Server database replicas. That way, if a problem occurs with a primary database, the DBA can restore from an AppSync copy instead of failing over to a secondary database replica. If AppSync were configured to create a full backup of the primary database, and the database were to fail over so that a secondary database is now running on this node, AppSync can automatically switch from full to copy and continue to protect the secondary database.
SIMPLE, EFFICIENT DATA PROTECTION

AppSync is a highly efficient management solution for ensuring and simplifying protection of SQL Server databases around the clock. It is comprised of just three components—AppSync server, host plug-in software, and the administrative console—and is easily deployed without outside technical assistance. Administrators can download and install AppSync software within a few minutes.

The AppSync server resides on a physical or virtual Windows host and uses a lightweight plug-in to manage protection on the database host. This approach is much less resource-intensive than traditional replica management solutions, minimizing any performance impact on the hosts.

EMC replication technologies used with AppSync also are resource efficient. For example, VNX Advanced Snapshots use redirect on write (ROW) technology that greatly simplifies and accelerates snapshot creation and speeds data recovery if necessary. In addition, the combination of AppSync and RecoverPoint enables continuous data protection while requiring 90 percent less bandwidth than other methods of remote replication. This minimizes stress on the network and avoids performance degradation.

By using these technologies, tests conducted in EMC laboratories showed AppSync could protect up to 22 terabytes of data in less than seven minutes and restore one terabyte of data in less than three minutes. Traditional backup solutions would require days or weeks to protect this amount of data.

Self Service for DBAs

AppSync makes it easy for DBAs to manage protection of SQL Server databases independent of the storage team. First, the AppSync administrative console is launched from within the familiar EMC Unisphere® unified management interface (Figure 5). AppSync then automatically discovers all instances of SQL Server in the infrastructure.

![Figure 5 – AppSync Dashboard](image-url)
DBAs then can use LDAP to import their existing user and security credentials, and immediately begin selecting the SQL Server instances they want to protect. AppSync automatically installs the lightweight plug-in on the database host and, with a few clicks, DBAs can subscribe their databases to service plans, monitor replication status, and mount database copies on other servers, among other tasks. Through the AppSync dashboard, they also can set up email alerts for when SLAs are not being met or if replication jobs fail.

**Flexible Application Support**

The AppSync console can run on any supported web browser from any system that has connectivity to the AppSync server. Additionally, AppSync offers a REST interface that allows application programmers to access AppSync’s capabilities without using its console.
CONCLUSION

Traditional backup solutions are no longer the primary solution for protecting Microsoft SQL Server databases and other applications. Given the dynamic nature of virtualized environments and the continuous availability demands of cloud computing and ITaaS, advanced data protection has become a critical component of a complete business continuity strategy. EMC AppSync provides organizations with an easy, economical replica or copy management solution to ensure data protection throughout the day without disrupting production operations or other backup schedules.

With its simple management console, AppSync allows SQL Server DBAs to take charge of their databases directly, instead of relying on storage administrators or other IT staff for assistance. This not only saves time, but also allows much greater flexibility to manage protection, as well as quickly create database replicas for a variety of other purposes. Most importantly, since SQL Server DBAs and application owners are closest to the data, empowering them with AppSync is the best way to ensure front-line protection of critical information assets.

In addition, AppSync makes it easy to choose the best-cost protection strategy to match the individual SLAs required for each database. With its pre-defined protection service plans, AppSync allows DBAs to simply choose a plan that delivers the necessary RPO and RTO based on database criticality, or tailor a plan to suit their precise needs. AppSync further helps DBAs balance their RPO and RTO requirements with cost by supporting a tiered set of replication technologies, including VNX Advanced Snapshots for local protection and EMC RecoverPoint for continuous protection across synchronous and asynchronous distances.

Finally, through an intuitive at-a-glance dashboard interface, AppSync allows DBAs to continually monitor the status of the protected environment and efficiently manage alerts to ensure SLAs are being met.

Easy to use, SLA-driven, and self-service, AppSync is the ideal way to manage and achieve around-the-clock protection of SQL Server databases, as well as other Microsoft applications and VMware environments running on EMC VNX storage infrastructures.
References
For additional information on AppSync and to sign up for a 90-day free trial, visit:
http://www.emc.com/AppSync