TECH BRIEF

Advancing IBM SAN Volume Controller (SVC) Capabilities with VirtualWisdom4®

Introduction

When most IT professionals hear the term "Virtualization", they think of server virtualization technologies such as VMware, Citrix (Xen), or Hyper-V (Microsoft). Yet, many IT organizations deploy storage virtualizers (such as IBM SVC) to improve storage resource utilization and performance, and to simplify data migrations in highly virtualized organizations. However, this additional layer of abstraction often introduces increased complexity and I/O congestion—and severely limits visibility—which often impacts performance and jeopardizes the success of storage virtualization strategies. VirtualWisdom4 delivers value to hardware-based storage virtualized environments by enabling true real-time visibility, comprehensive application workload analysis, and end-to-end performance management. This helps accelerate adoption of storage virtualization, and more importantly, it helps guarantee success.

What is SVC Storage Virtualization?

Hardware-based storage virtualization helps achieve location independence by abstracting the physical location of data. The virtualization system presents to the user a logical space for data storage, and handles the process of mapping it to the actual physical location. The SVC device also uses the metadata to redirect I/O requests. It receives an incoming I/O request containing information about the location of the data (in terms of the logical disk), and translates this request into a new I/O request to the physical disk location. SVC is comprised of 2 to 8 nodes that are installed in pairs, and each pair is called an I/O group. Each SVC has 4 to 6 ports. The SVC does not modify Fibre Channel headers (although SVCs do have some proprietary headers when they communicate with other SVCs, which VirtualWisdom4 understands).

Why Should I Use SVC Storage Virtualization?

- Ease of Migration: One of the major benefits of abstracting the host or server from the actual storage is having the ability to migrate data while maintaining concurrent and consistent I/O access. Also, most implementations allow for heterogeneous management of multi-vendor storage devices. This allows data to be transferred between different arrays across multiple vendors without incurring significant downtime.
- **Higher Utilization:** The physical storage is allocated into storage pools. Storage utilization can be increased by leveraging a shared pool of storage capacity. In traditional environments, entire disks are mapped to hosts. This is often a larger allocation than is required, resulting in wasted space. In virtualized storage environments, the logical disk (LUN) is only assigned the capacity that is required by the host.
- **Better Performance:** Many hardware-based storage virtualization devices also leverage SSD caching to improve the performance of frequently accessed I/O requests. However, storage virtualizer caching will improve performance of reads more than writes.
- **Commoditization of Disk:** By adding a software layer that abstracts the underlying hardware, it lessens the importance of and reliance on the storage array. The ease of data migration between different storage arrays from different vendors also further commoditizes the storage disk and reduces vendor lock-in.
- **Simplified Management:** With storage virtualization, multiple independent storage devices (even if scattered across a network) appear as a single monolithic storage device and can be managed centrally.

SVC Storage Virtualization Challenges:

- **Decreased I/O Visibility and Control:** The additional layer of abstraction introduced by storage virtualizers makes problem identification and root-cause analysis significantly more complex. Some I/O requests are handled from the storage virtualizer cache and some are routed to back-end storage arrays. This lack of visibility limits the ability of storage administration teams to measure, monitor, and guarantee Service Level Objectives (SLO). Thus, when performance problems occur, the storage virtualization device is often assumed to be the culprit. This creates uncertainty, which often delays and/or undermines the success of storage virtualization implementations.
- **I/O Congestion:** SVC storage virtualization can introduce an extra set of hops in the data path that may increase the risk of I/O congestion and latency. For example, in a non-virtualized environment, one write command results in a total of nineteen frames transmitted and received (17 Rx and 2 Tx). However, in an SVC storage virtualized environment, the same write operation results in a total of fifty-seven frames transmitted and received (21 Rx and 36 Tx). The 3X increase in I/O frames can also contribute to the creation of flow control back-pressure that is extremely disruptive andvery difficult to trouble-shoot in storage virtualized environments.
- **Performance Degradation**: Caching can help improve performance for the I/O requests that hit the storage virtualizer cache. However storage I/O requests that miss the cache also directly influence the overall latency of an application, beacuse the I/O has to flow through the storage virtualization layer. Due to the nature of storage virtualization, the mapping of logical to physicalrequires some processing power and lookup tables. Therefore every implementation adds some amount of latency.

VirtualWisdom4 and SVC Joint Value Propositions (SVC)

VirtualWisdom4 Benefits for SVC:

Virtual Instruments customers are successfully leveraging VirtualWisdom4 to instrument, measure, monitor, and optimize IBM SVC-enabled SANs.

VirtualWisdom4:

- Helps customers use SVC more aggressively by improving performance reporting for tiering, enabling more aggressive use of lower cost tiers.
- Shows the results and adherence to performance and uptime SLAs.
- Proves SVC innocence and shows when the SVC is responsible for actually improving application response times.
- Offers operational (OpEx) savings through improved operations and faster troubleshooting
- Aids capital expenditure (CapEx) savings by helping to extend health, utilization, performance and life of existing infrastructure investments.
- Supports increased use of server virtualization.
- Audits system-wide performance of SVC/array configurations to help ensure DR and HA readiness.
- Assists in the reduction in unplanned downtime.

SVC Benefits for VirtualWisdom:

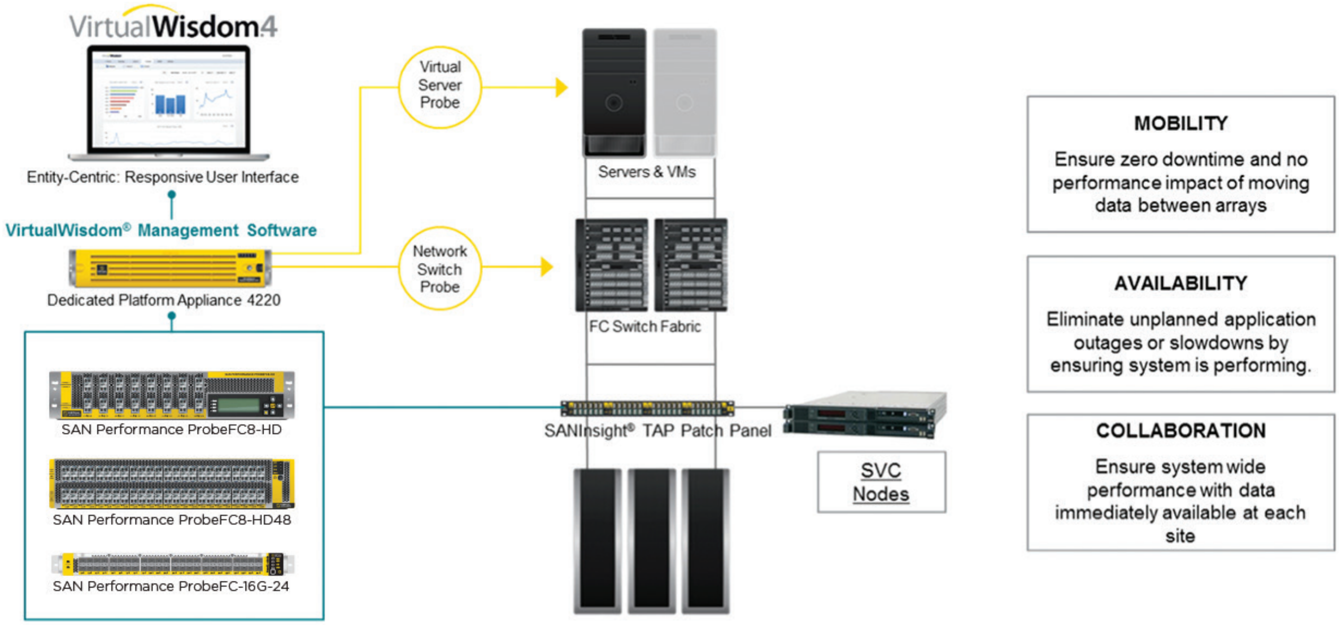
- SVC acts as an I/O concentration point for VirtualWisdom4.
  - This concentrated data access point allows the VirtualWisdom SAN Performance Probes to provide full I/O visibility while monitoring fewer ports.
- SVC enables zero downtime migration to maximize utilization of storage assets.
  - If the SVC storage virtualization solution is already in place, VirtualWisdom4 can leverage SVC's data mobility functionality to avoid any downtime when deploying the performance probes.

Reference Architecture

The VirtualWisdom4 Infrastructure Performance Analytics (IPA) platform is used to measure, real-time, system-wide health, utilization, and performance. Inserting traffic access points (TAP's) in front of the front-end SVC ports allows VirtualWisdom4 to monitor the I/O to and from the SVC device.

Conclusion

SVC has a number of key benefits that can improve storage efficiency, performance, and flexibility of the storage infrastructure. However, the additional layer of abstraction can add complexity, latency, and opaqueness to the infrastructure that makes it difficult to manage the performance and availability of the infrastructure. VirtualWisdom4 fully supports storage virtualized environments by providing detailed visibility into the performance, utilization, and health of the infrastructure. SVC storage virtualization technology also makes VirtualWisdom4 more operationally and economically efficient by reducing the number of monitored storage ports, and leveraging SVC data mobility features to eliminate planned downtime. The combined VirtualWisdom4 and SVC solution helps customers improve the performance, availability, and cost efficiency of their end-to-end infrastructure.



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