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How to Effectively Monitor and Measure Your Data Center

Why data temperature should drive business storage decisions; virtual tape best practices and tools you can leverage to maximize performance

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Monitor and Measure Your Data Center



Running an efficient data center requires constant monitoring and measurement. This means understanding everything from storage best practices and tools for maximizing performance—to knowing your data's temperature in order to make accurate business decisions.

Data storage costs, for example, differ based on speed, availability and enterprise data services. Data temperature often determines the percentage of budget that gets devoted to storing different types of data. Once you create process maps based on the data's temperature, you can better manage both the data and the IT around the data.

Virtual tape performance is also dependent on several factors: total system configuration, Tape Volume Cache capacity, number of channels, read/write ratio and data characteristics, and more.

This TechChannel e-book features insight from IBM's Eric Herzog on hot, warm and cold data—and why data temperature should drive business storage decisions. Lastly, Kyndryl's John Shuman and Patrick Stanard explain which virtual tape best practices and tools you can leverage to maximize performance.

Keelia Estrada Moeller, Senior Editor

Driving Business Storage Decisions With Data Temperature

IBM's Eric Herzog on hot, warm and cold data and why data temperature should drive business storage decisions

BY JENNIFER GOFORTH GREGORY

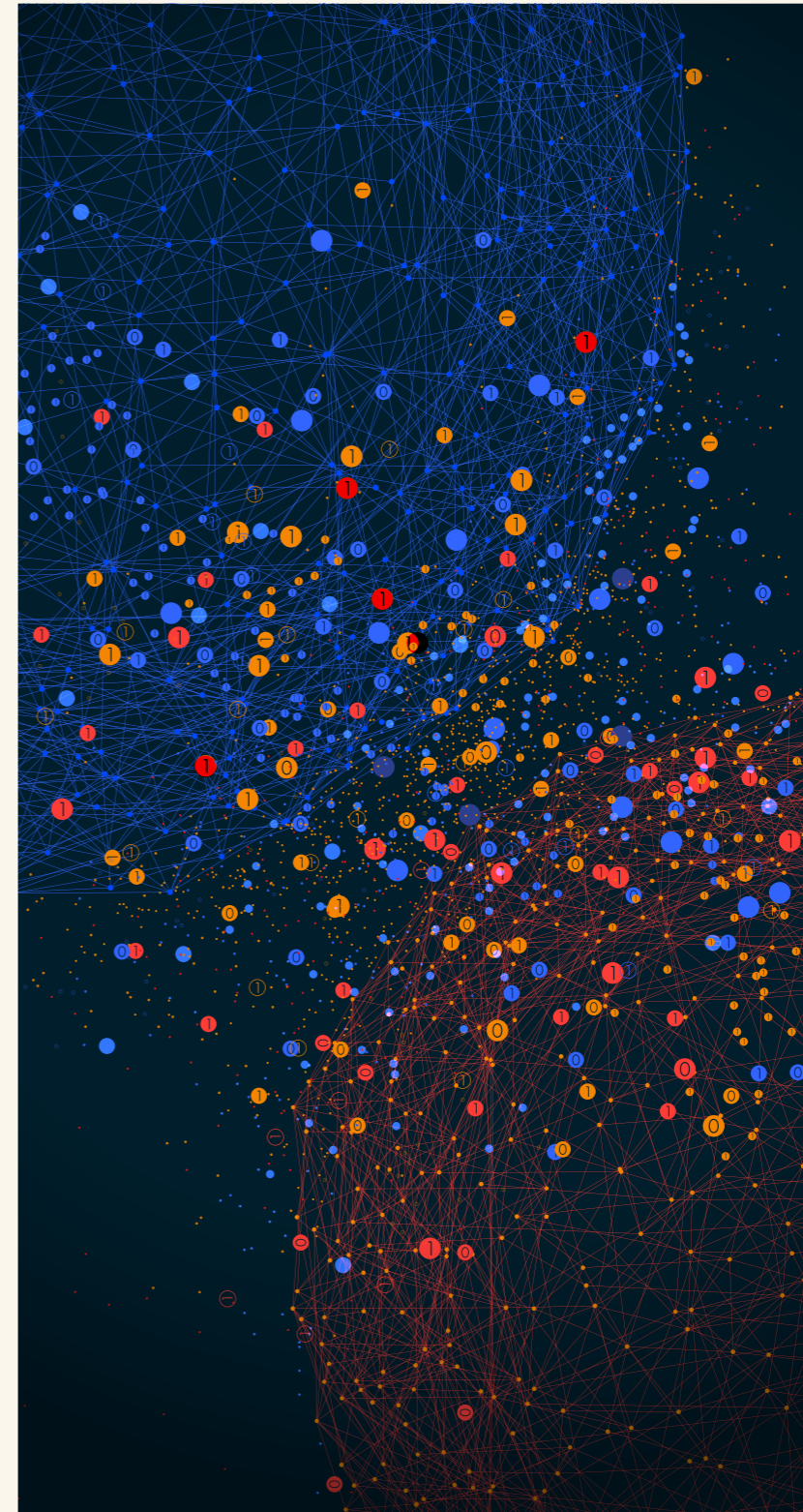
Your company's most valuable asset, by far, is its data. Your patents, customer records, designs, logistics, supply chain and more are all examples of company data. But the types of data are not equal in their value (or temperature). Some data is critical to the daily operation of the company, while other data may never be needed again after collection. Because of the resources required to protect and manage data, organizations must know the temperature of their data to make accurate business decisions.

“The key is understanding the temperature of your data, which includes the value, how it fits from a corporate perspective, and any legal/compliance issues. Once you understand where your data is and what it does, you can then optimize your availability, cost, performance and cyberresilience around the storage that supports your data,” says Eric Herzog, VP of Business Development and Evangelism and VP of Global Storage Channels, IBM Storage Division.

Herzog says many organizations overlook seemingly small pieces of data that can be much more important than expected, such as a SKU number on a pair of pink socks. If the SKU is incorrect, distribution may send the socks to a store in California instead of the New York City location that needs them, leaving the NYC store totally out of their customers' favorite pink socks. The SKU seems to be a small detail, but it's extremely valuable because it is the identification used to move the product through the supply chain and, eventually, results in revenue. And the results can be far-reaching. If these socks are not available when a customer wants to buy them, the company not only loses the initial sale of the socks—but also, potentially, a loyal customer.

Data Temperature Drives Many Business Decisions

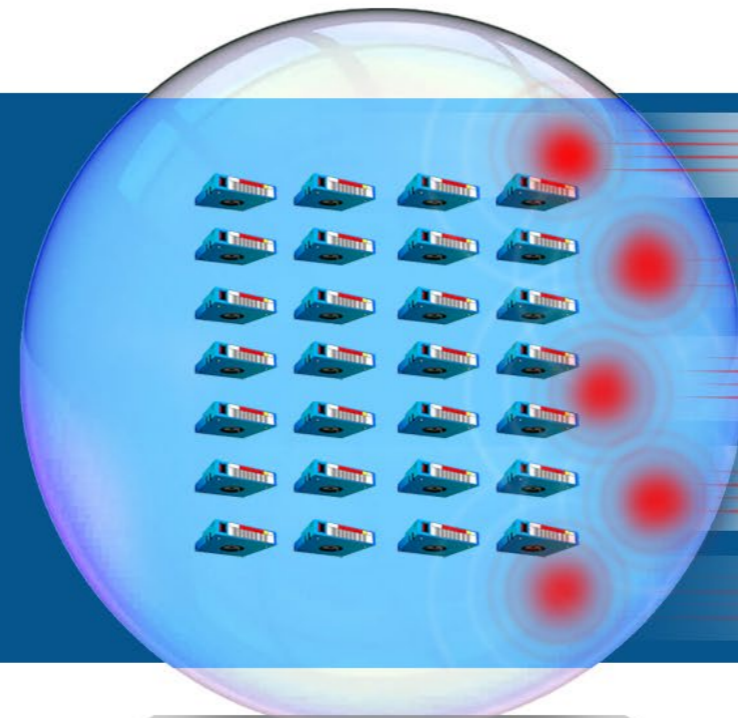
When determining data temperature, Herzog says organizations must consider two things: frequency of access and value to the company. A customer database in a retail business is accessed every 30 seconds or less and a customer database at a B2B company may only be accessed four or five times a day, but both databases are critical to their company's operation. If you only look at amount of access, it's easy to overlook potentially hot data, which leads to negative business consequences in terms of protection.



“By correctly identifying the temperature of your data, you can make sure valuable data is always preserved from threats—from earthquakes to ransomware. Next, you can map your IT process properly based on the heat of the data to most efficiently use manpower resources and processes. Because protection and processes are expensive, especially for Fortune 2000 companies, knowing the temperature helps you properly profile the data for CAPEX, OPEX and IT process management,” says Herzog.

Data storage costs differ based on speed, availability and enterprise data services, and the temperature often determines the percentage of budget that gets devoted to storing different types of data. Data that is hot and very active should be prioritized on the fastest and most highly available storage. All data, however, doesn't need this level of performance. When you understand your data's temperature, you can make the

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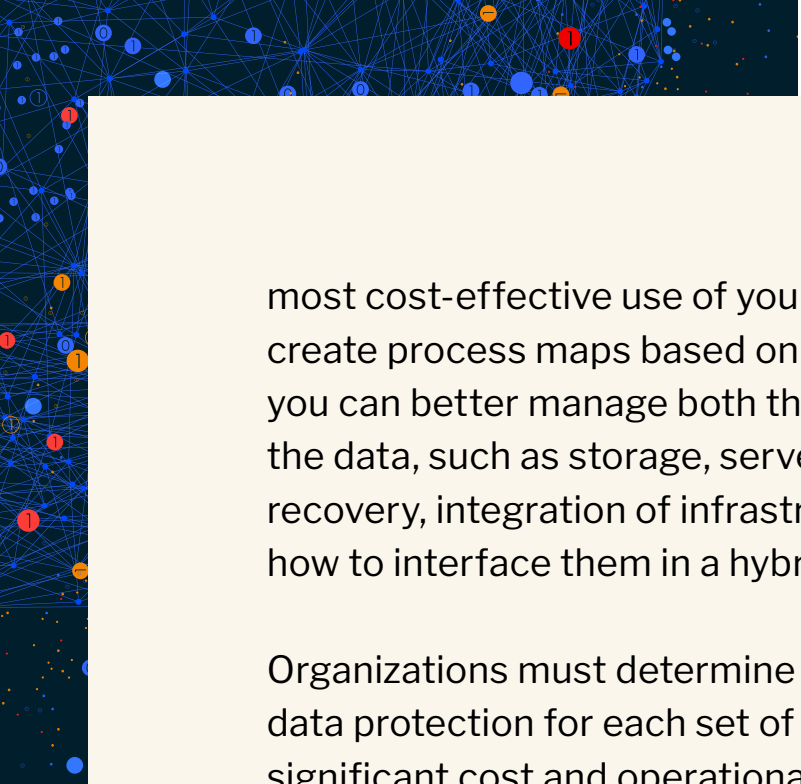
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most cost-effective use of your physical assets. Once you create process maps based on the data's temperature, you can better manage both the data and the IT around the data, such as storage, servers, networking, disaster recovery, integration of infrastructure with security and how to interface them in a hybrid cloud configuration.

Organizations must determine the appropriate level of data protection for each set of data, which can have significant cost and operational consequences. When considering data protection, Herzog says organizations must determine how often each data set needs to be backed up and what tier backup each data set falls into. Performing automated backups that meet your business needs starts by understanding the characters of each data set.

Using Technology to Manage Storage Based on Temperature

In addition to backing up data, data protection means protecting data from cyberattacks, such as malware, ransomware and data breaches. Herzog says that once you know the temperature of your data, you can decide if it's a fit for IBM Safeguarded Copy, which allows you to rapidly recover data after an attack. Because you need additional storage for this technology, he says most organizations

don't need to do Safeguarded Copy on the entire data set, but instead only make frequent copies of hot and critical data.

The temperature of data often changes, as do instances of data with different temperatures being stored together. Herzog says that technology such as the AI-based tool Easy Tier automatically determines the temperature of the data and then moves it seamlessly to appropriate storage based on the temperature. For example, certain financial data may only be hot at the end and beginning of a quarter. When the data cools down, the system moves it to a lower-performing tier and then moves it back to a higher-performing tier when its temperature increases. This process optimizes the underlying storage infrastructure to optimize your budget and cost space.

Creating a Process for Regularly Checking Data Temperature

Because the importance of data changes and evolves over time, organizations must regularly review data temperature. For example, the data for many physical assets of a large company (chairs, desks, whiteboards, etc.) is going to be the same for many years. However, some items will be added, such as new technology. Other items will be removed—such as fax machines, which were

previously a staple of most offices and are now almost non-existent.

While it's easy to focus on the specific data items as they evolve, organizations must also keep their eye on their data strategy and how it relates to data temperature as their business needs evolve. Storage is critical for cybersecurity strategy, both in terms of saving and money and keeping critical data safe.

“Data storage is going to remain a chief part of organizations for the long-term future. By building the right data and cyberresilience into your storage strategy, you can ensure that your company is both protected and positioned to increase revenue,” says Herzog.

The Rise of Edge Infrastructure Storage

BY EVELYN HOOVER

Storing edge data is one of the reasons IBM announced **IBM Spectrum Fusion** back in April 2021, which seamlessly spans edge, core and cloud. Designed to simplify data accessibility and availability, Spectrum Fusion is the first container-native solution designed on Red Hat OpenShift. The new offering fuses IBM's general parallel file system technology and its data protection software.

“IBM sees that containers are where the world is going,” says Eric Herzog, vice president, Business Development and Evangelism and Vice President of Global Storage Channels, IBM Storage Division.

It's common for workloads and applications to create multiple copies of the same data set—one for the edge users, one for the core users and one for the cloud users. Spectrum Fusion offers a streamlined solution with a single copy of data.

“By having a single copy, we give customers much better CapEx and OpEx, because they only have one copy,” Herzog says. “If you’ve got 20 PB and you make four copies of it, you have to buy 80 PB. You have to manage 80 PB and all of the aspects of OpEx, like power, cooling, rack space.”

Spectrum Fusion wasn’t the only announcement Big Blue made in April this year. Updates to the **IBM Elastic Storage System** (ESS) family were also unveiled. The revamped ESS 5000 supports 10% more density with a total capacity of 15.2 PB. The new ESS 3200 offers double the read performance of its predecessor, the ESS 3000. The all-flash systems are a strong play for AI, analytics and big data.

The ESS updates are important for a few reasons, Herzog says. First, the new ESS family automatically joins the existing file system in the global native space, saving time and manpower. Second, the performance and capacity scales linearly, which helps clients save on CapEx.

Herzog views these latest storage announcements as testament to IBM’s leadership in the container-native storage, which he says will be important to clients interested in AI, big data and analytics.

[Learn more about IBM storage advancements in the full article](#)

Virtual Tape Performance Best Practices and Tools

Running an efficient data center requires constant monitoring and measurement. Learn virtual tape best practices and tools you can leverage to maximize performance

BY JOHN SHUMAN AND PATRICK STANARD

Thomas Monson once said, “When performance is measured, performance improves. When performance is measured and reported, the rate of improvement accelerates.” Tape performance is one of the myriads of topics that is reported on for data centers. Reporting always leads to better performance as changes and tuning can occur.

Virtual Tape Performance Factors

Virtual tape performance, for instance, depends on several factors, such as total system configuration,

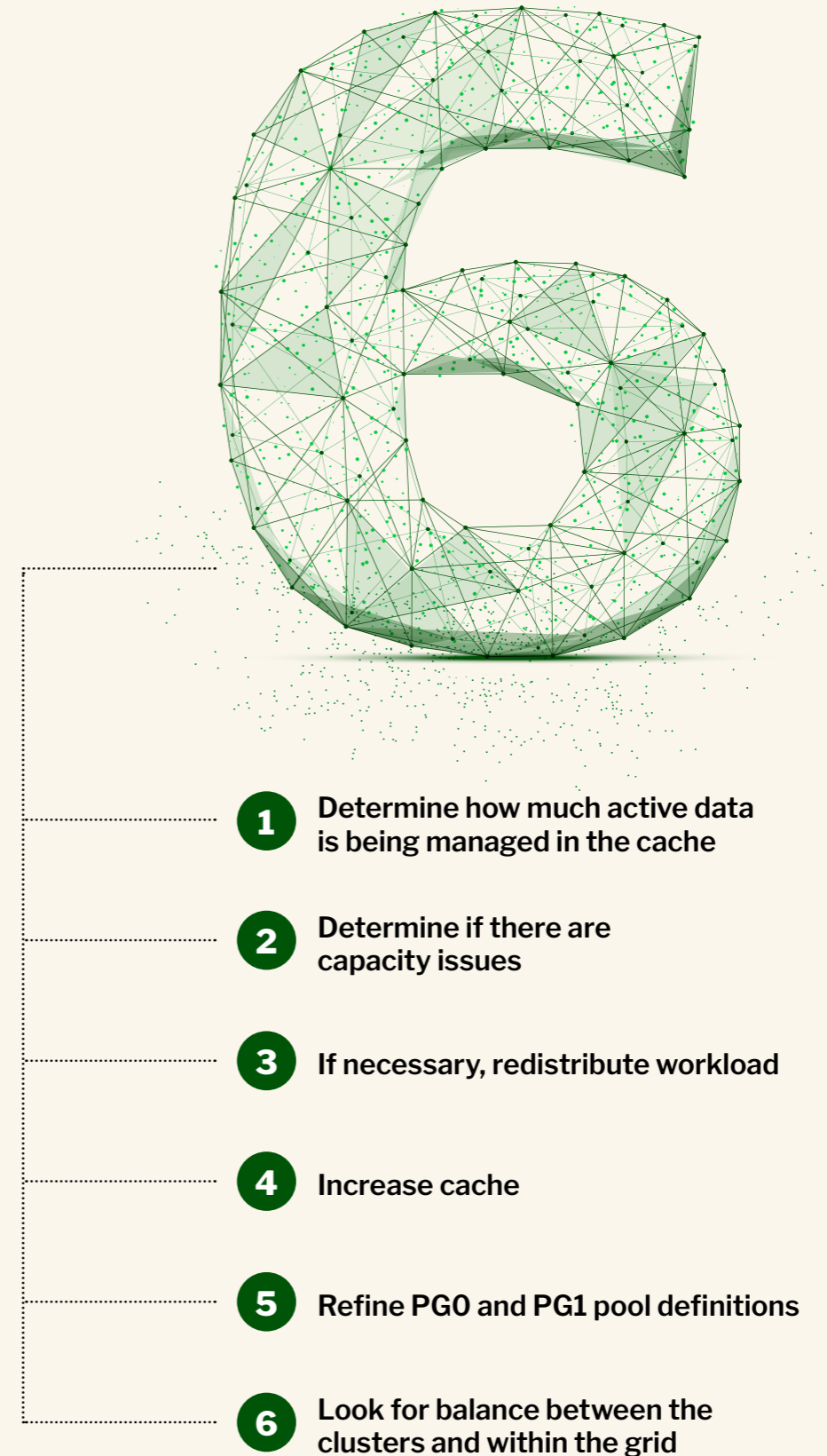
Tape Volume Cache capacity, the number of channels, the read/write ratio and data characteristics, such as block size and the mount patterns.

In general, tape performance and capacity planning tools rely on Bulk Volume Information Retrieval (BVIR) data about local volumes. This includes volume status, cache content, physical to logical volume mapping, physical media pools, physical volume status and copy audit.

Performance Best Practices

Here are some performance best practices you should follow:

- 1. Determine how much active data is being managed in the cache** and optional external physical tape libraries. This includes binary gigabytes (GiB) transferred and active logical mount times. If there are any significant or unexpected spikes, then move to the weekly and daily data.
- 2.** If the subsystem has back-end tape, then it's necessary to **determine if there are capacity issues** that result in poor performance. Report on key indicators like recall mount time, mount hit percentage, time-in-cache and physical mounts per day. If recall mount time is too high then maybe there are too many simultaneous requests, or the cache hit ratio is low (<80%).
- 3. If necessary, redistribute workload** to reduce mount requests
- 4. Increase cache** to allow the data to remain in residence longer



5. Refine PGO and PG1 pool definitions and make sure data is being sent to the correct pool; as data that's in PGO moves off cache to tape quickly, while data sent to the PG1 pool is more likely to be recalled and is designed to keep the data in cache longer. Make sure data is being sent to the correct pool.

6. Look for balance between the clusters and within the grid. One cluster may have more virtual devices active and flows between the clusters can be tuned.

The incoming copy queue represents the amount of data waiting to be copied to a cluster. Data written to a cluster in one location can be copied to other clusters



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One of the quickest ways to improve performance is to reduce the amount of data being copied through compression. Compression becomes a powerful tool for the reduction of the Recovery Point Objective time.

in a grid to achieve uninterrupted data access. Copies can be directed to specific clusters and the frequency of copy operations occurring. Each cluster maintains its own list of copies to acquire, then satisfies that list by requesting copies from other clusters in the grid according to queue priority.

Improving Performance With Compression

One of the quickest ways to improve performance is to reduce the amount of data being copied through compression.

Compression becomes a powerful tool for the reduction of the Recovery Point Objective time. As an example, consider an application that writes 300 GB of data. The host has a compression rate of about 3:1 and compresses the 300 Gb to 100 GB. ZSTD doubles the compression to 6:1 and now the data being sent over the network is only 50 GB, which could dramatically reduce RPO.

Tape Tools

Tape tools like IBM's VEHSTATS and IntelliMagic's Vision, turn this data into spreadsheets, charts, and graphics. VEHSTATS is designed to produce reports based on statistics generated as the result of BVIR requests. The IBM Techdocs public URL points to the location where the tools can be downloaded.

Other related documentation and tools can be found here. Start by reading the Updates.txt files for changes. A document that describes each field in detail, the Vehstats Decoder v2.4, is available as well as the BVIRHSTx collection and the VEHSTxx reporting tools.

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Best Practices for AIX in a SAN Environment

BY JOSE LUIS ORTEGA

The AIX OS supports different SAN topologies, switches and storage servers from multiple vendors. This represents challenges, due to the fact the interoperability among vendors is less than ideal. Therefore, one important aspect to get a reliable AIX is to follow the best practices for the SAN environment. There are a few major best practices for AIX in a SAN environment you should follow, related to storage systems, FC connectivity and multipathing recommendations.

One general rule of thumb is to avoid making changes if the performance is OK, because what could help in one situation may create an issue in other. Having said that, it's also important to check the storage vendor site and follow its recommendations. AIX can work with storage systems from different vendors.

Additionally, check the interoperability matrix from the storage vendor. Interoperability problems are notoriously

difficult to isolate and can take a long time to obtain a fix from the vendor.

Unique combinations of AIX configurations, SAN equipment, topologies and zoning each need unique recommendations. However, there are basic principles to consider which we can rely on. For example, there are different SAN topologies such as edge-core-edge, core-to-edge or full-mesh. These topologies fit better for certain demands.

Additionally, all SAN topologies should always be divided in two fabrics with failover configuration. This means, all storage servers and hosts should be connected to two different fabrics.

Another important consideration is the zoning configuration. Zoning is used to keep the servers isolated from each other and controls which servers can reach the LUNs in the storage server. SAN zoning is important to avoid boot problems and paths issues on AIX.

[Learn more about best practices in the full article](#)

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