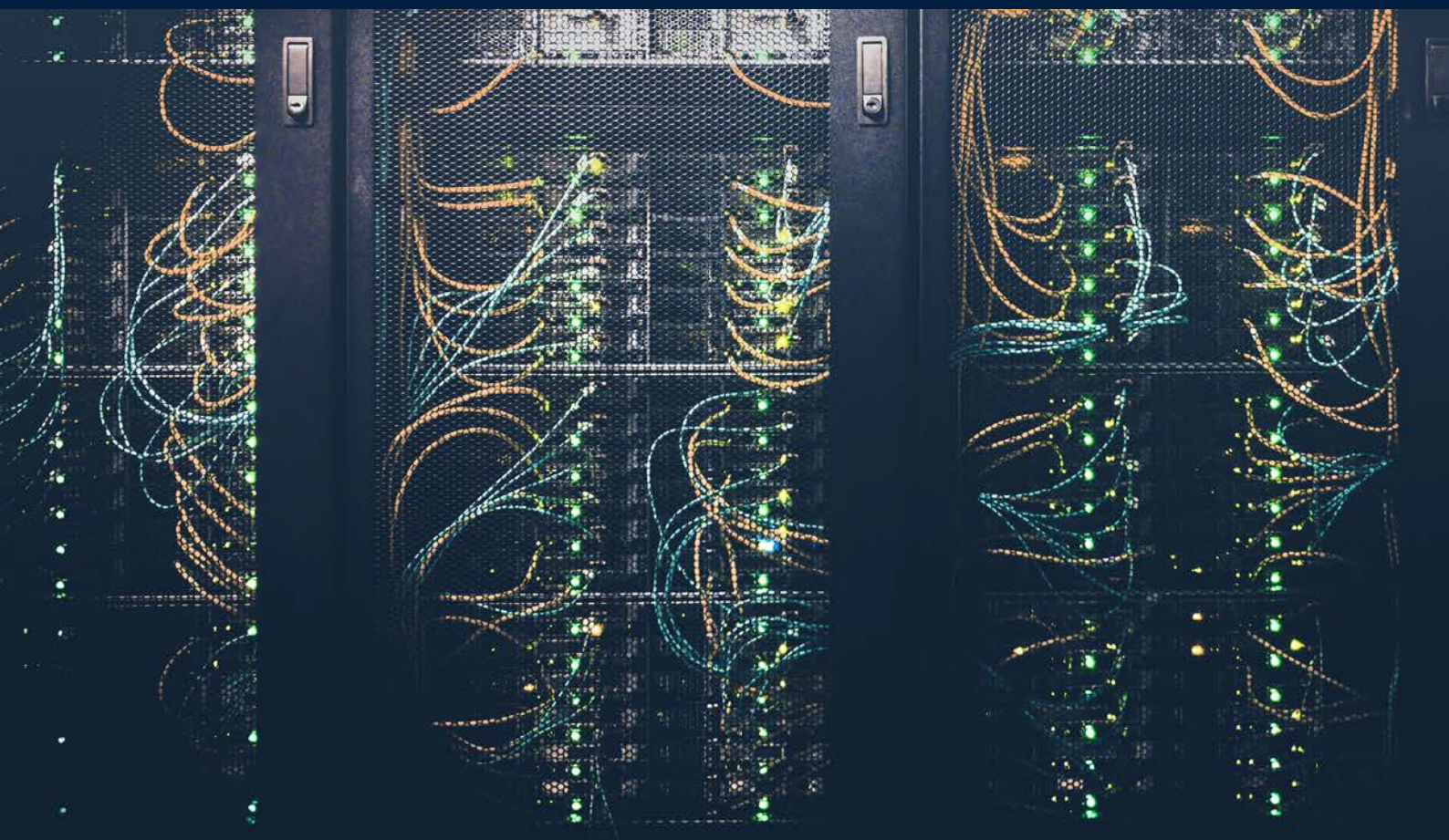
RAIDIX

White paper

5 Technologies to Reduce Hardware Storage Costs



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5 Technologies to Reduce Hardware Storage Costs

Data storage systems, as the majority of other IT infrastructure components, are comprehensive and expensive software-hardware solutions. Acquisition and maintenance of the storage demand significant capital expenditures and operational costs, starting from regular hardware updates and up to business processes administration.

Responding to the market needs, storage vendors create and implement various technologies to cut the costs at their most. Some of them minimize operational costs due to maintenance simplification, others suggest easy scaling, or provide tools for data compression.

One way or another, there is a strong interest in diversity of methods solving cost-efficiency issues.

Modern Challenges

More Data Is Generated

It's an evident notion that forms the industry's environment. Data comes with the growing intensity of data exchange, with new forms and ways of data processing, with increasing file size and archive depth. And this environment needs an appropriate infrastructure.

New Types of Apps and Services

We see how business employs Online Analytical Processing (OLAP), artificial intelligence technologies, smart analytics for video surveillance and much more. All of these were at the concept level just a few years ago, but now we have them in our reality as applied solutions. Obviously, such technologies are not suitable for everyone, but they have already changed our technological space, where all modern businesses are trying to operate. Now these technologies are going to be the key competitive drivers in IT-related enterprises.

Changing Competitive Environment

Emerging new tasks and applications speed up the overall modernization pace. Companies have to adapt to the new types of workloads that require additional funds for IT infrastructure.

Keeping competitive positions without regular modernization is going to be more difficult than ever before. Especially for those businesses that use technologies as a major part of the product value chain: entertainment, medicine, education, engineering, security, finance, etc. Moreover, small businesses will have to compete with large enterprises that can afford top notch hardware updates and expensive infrastructure solutions.

Rapid Pace of Obsolescence

Just a few years ago you thoughtfully selected server appliances and software, made data growth forecasts, and planned future expansion of your infrastructure. Today most of these purchases are inevitably obsolete.

Purchased hardware gives up its positions to more productive appliances, and they will be used only as a secondary equipment afterwards. Such hardware is still in order and is included in enterprise inventory, but it is not working well with the new types of workloads.

All these trends are rapidly making storage selection more and more complicated. Finding balance between storage price and its ability to work with the new workloads is really crucial.

So we are going to reveal five technologies that can help you reduce storage hardware costs and save money for additional functionality.

1. Benefits of Software-Defined Storage

All storage solutions can be divided into two groups according to their design approach: software-defined storage and classic storage. Both of them consist of a software layer and hardware appliance.

Functionality in **software-defined storage** (SDS) is provided by the software layer, while hardware can be chosen from the list of compatible components. This approach significantly depends on a system-builder company providing an end-to-end storage solution for a specific project or existing market needs.

Classic storage is all-in-one solution with the hardware platform precisely developed for the software layer, and vice versa. Tight hardware-software incorporation gives vendor advantages in the high-end functionality and operational characteristics. Vendor provides to the market the whole range of storage solutions, specifically tuned for the most popular customer needs.

Within the range of software-defined storages and classic storages, there are solutions in any price category. But let's inspect two ways how software-defined storage can reduce hardware costs in your server infrastructure.

Don't Pay for Additional Options

Purchasing classic storage, you pay for an end-to-end solution. It means you spend money for all hardware and software components inside, including the steps adding product value, such as production, testing and service costs.

Purchasing software-defined storage, you are free to choose options you really need. Having all functionality at the software layer, SDS helps you to assemble solution with precisely adjusted set of the hardware components. No "default" adapters, interfaces and drives — take only what solves your specific task.

Decrease Loss During Hardware Modernization

Hardware modernization is inevitable. Moreover, in these circumstances you have to upgrade your storage components more often. It's pushing you to use new protocols, drive types, and to buy controllers with better performance and JBODs with higher density.

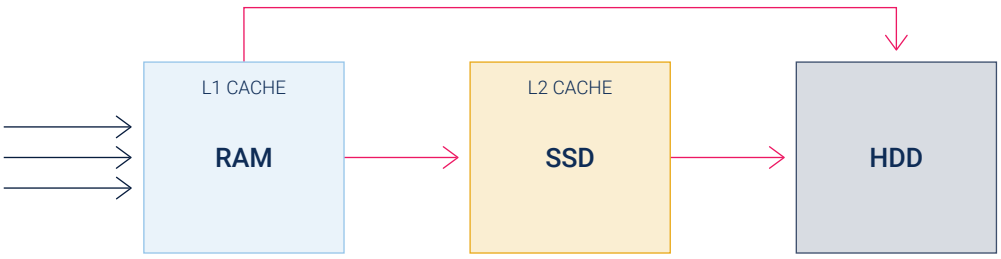
In terms of classic storage, this paradigm is very painful for your budget — imagine that each time you have to pay for a new storage system. Software-defined storage gives you here a chance to update storage selectively, avoiding high capital expenditure. For instance, you can simply insert new high volume drives into the storage, software update will not be required.

2. Reducing Wearing-Out of Flash Drives With Parallel SSD Cache

SSD caching is a data processing technology that uses solid state drives as a buffer space for frequently used data. Flash drives have limited durability resources defined by a number of rewrite cycles (P/E cycles).

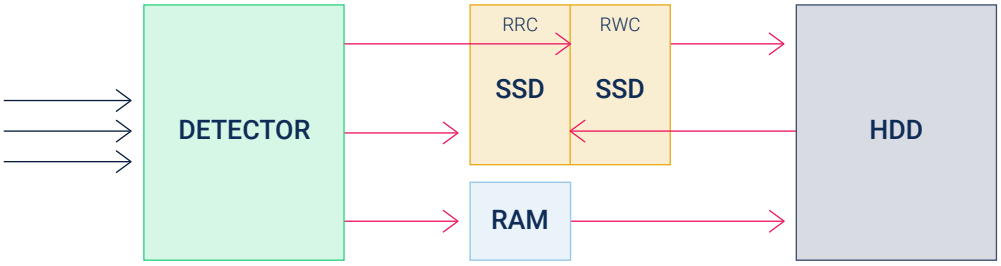
The major part of hybrid storage uses second level cache (L2 cache) and its traditional scheme is the following: all requests come to RAM first and then move to the SSD buffer (Figure 1). In this operating mode, flash drives receive intensive workload that shortens their lifetime.

Figure 1.Traditional second-level SSD cache



The alternative way is to implement SSD caching with parallel architecture. In this option storage uses a specific tool (Detector) to allocate request that moves to SSD only selected data blocks.

Figure 2. Parallel SSD caching in RAIDIX storage



SSD cache in RAIDIX storage has unique parallel architecture with log-structured writing. Implemented detector and proprietary cache algorithms successfully reduce total write hits to the dedicated SSD array. Conventional 2L cache with LRU algorithms shows 10.8 write hits, while RAIDIX shows only 1.8.

It means that RAIDIX cache demands 6 times less flash memory write cycles than cache in traditional hybrid storage. Therefore, this approach makes the lifetime of your flash drives in the caching services **up to 6 times longer.**

3. Reducing Array Redundancy with RAID 7.3

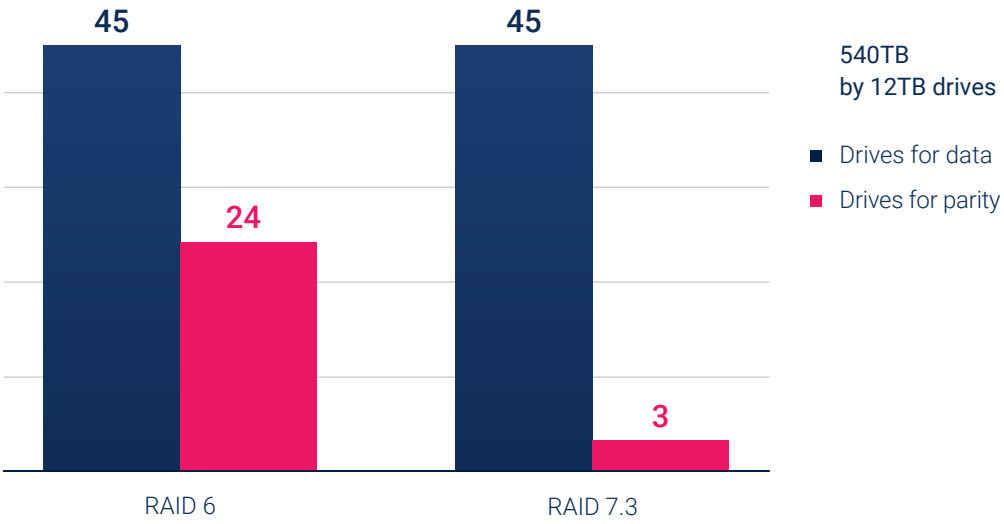
Storage administrators are constantly looking for balance in space optimization: how to get maximum performance and availability rate from RAID while using the minimum drives possible.

This equation makes RAID 6 so popular in the network storage installations. Spending two drives for checksums, RAID 6 has enough speed rate and high level of availability.

As an alternative option, we can use RAID with triple parity. For this purpose, RAIDIX has invented proprietary RAID 7.3 that demonstrates similar performance rate, but stays tolerant to failures of three drives at a time. High reliability allows you to achieve desired availability rate with less redundant drives than other RAID levels.

Figure 3.

Providing 99,9999% availability, RAID 7.3 has **up to 30%** less drives in array than RAID 6*



*Calculated for arrays with 12TB, working in full-loaded sequential mode, with 15% reconstruction priority.

4. Virtualization of Legacy Storage

Data storage systems become obsolete very quickly. Simultaneously with storage aging, the business has changes in the structure, staff, suppliers and values. Usually it causes disorder and fragmentation of the appliances and software within IT infrastructure that cannot effectively solve their tasks.

To prevent expensive total storage replacement, you can use the virtualization of legacy storage. This tool combines old storage systems in the one virtualized storage.

As an example, SAN Optimizer tool can connect RAIDIX with the storage legacy systems and work with them as with the local drives. It can create RAIDs and LUNs on already existing drive enclosures.

Advantages of this technology highly depend on each particular case, but the example in the table below can highlight the benefits from it.

Appliance	Traditional Approach	Using Virtualization of Legacy Storage
Primary storage system	Need to change	Use as drive enclosure
Secondary storage system	Need to change	Use as drive enclosure
Primary storage system (new)	Need to purchase	Need to purchase
Secondary storage system (new)	Need to purchase	Need to purchase
Drive enclosure (new)	Need to purchase	No needs

5. Heterogeneous System Architecture Support

There are situations where several clients work with the same data set located at one storage. Each of these clients need a different level of throughput. For example, five-person post-production workgroup is working with a project at one storage volume. Three of them have color correction tasks, two others — sound editing. In this case, we need to provide three high-speed lanes and two with average throughput rate.

The most of the data storage systems can give access via only one type of protocol. In our example, all five workstations demand high performance access, like Fibre Channel 32Gbit.

With heterogeneous architecture support you can connect sound specialists via more affordable interface like Ethernet 10Gbit. It reduces hardware costs because you need only three expensive Fibre Channel adapters instead of five.

Of course, this money savings doesn't look significant, but you need to remember that the FC 32Gbit adapter is several times cheaper than Ethernet 10Gbit. Evidently, with storage system growth this option looks more appealing.

Conclusion

Designing storage infrastructure, you always need to make decisions about these or that options. And every decision inevitably faces a cost-efficiency test: can it reduce purchase costs, or will it give benefits in the near future?

But the important thing is having a set of these options for the client no matter if he is a partner or an end customer. It brings value not only at the level of strategic vision of storage infrastructure, but also in everyday tasks, managing data volumes and commutations.

We have reviewed five technologies that reduce hardware costs for the storage infrastructure. Each of these methods is used in this or that way by our partners and customers, providing tangible value in real cases.