Tri-Delta Resources

Redbooks
ibm.com/redbooks

IBM Storage as a Service Offering Guide

Vasfi Gucer

Hartmut Lonzer

Cloud

Storage

IBM

Redpaper

Introduction to IBM Block Storage as a Service for IBM Storage FlashSystem and for IBM Storage DS8900F

IBM® announced *IBM Enterprise Block Storage as a Service* (STaaS) as a member of the IBM Storage family.

A traditional purchase of storage capacity means that clients can require a lengthy process of configuring a system to meet their current demands, estimate their future demands, leave room to maintain performance, and allow for unplanned requirements. All of which can mean making risky estimates and costly contingencies.

Buyer behavior is shifting from technology-focused to service-level agreement (SLA)-driven cloud-like simplicity. IT staff are often downsized and moved into generalist roles instead of specializing in specific areas. Enterprise workloads need flexibility where applications are to be deployed. Advancements in infrastructures, such as 5G, allow growth outside the traditional data center. The IBM STaaS offering is an operating expense solution and does not require initial capital.

Important aspects of the consumption-based solutions are described in the following list:

- Flexible scale-up and scale-down model
- Cloud-like functions in most solutions
- All the deployment and managed support, optimization, and disposal services included
- Well-defined upgrade path
- Clear pricing terms
- Switch from capital expenditures (CapEx) funding to operating expenses (OpEx) funding
- Ease of billing and payment terms

The following list describes important services that are usually included with a consumption-based solution:

- Deploying the solution
- On-going managed support, keeping the solution optimized
- Deployment and implementation services
- Services that determine when to refresh the assets
- Disposal services

With the IBM STaaS offering, the customer makes the following decisions:

- Which tier level they need
- The amount of storage capacity they need
- How long they want to use this offering
- Connection type
- Encryption option

IBM offers three performance levels of storage for IBM FlashSystem® Block Storage and Enterprise Block Storage: the *Extreme tier (Tier 1)*, the *Premium tier (Tier 2)*, and the *Balanced tier (Tier 3)*. IBM or an IBM Business Partner performs the following tasks:

- Sizes and configure the solution with room for growth (IBM or Business Partner)
- Installs the solution on the customer side (IBM)
- Maintains, monitors, and proactively supports the installation (IBM)

Business Partners can also provide their own add-on services. You can manage changes in the performance tiers or capacity.

By running this service, users can flexibly use the storage capacity as their business requires it. IBM monitors the storage usage by using Storage Insights Pro, and can add additional capacity if needed.

A solution that is based on IBM FlashSystem Block Storage or IBM Enterprise Block Storage technology

IBM STaaS brings the quality and performance of IBM FlashSystem and IBM DS8000® into your data center, without capital expenses (CapEx). IBM Storage as-a-Service is powered by IBM FlashSystem and IBM Storage DS8900F (IBM DS8900F) technology. IBM FlashSystem 9500 uses proprietary IBM flash technology for high-performance flash density, and latency as low as 50 µs (microseconds). It includes hardware-accelerated compression technology that is designed to provide consistent data compression with negligible impact on system performance. For mission-critical environments, IBM DS8900F high-performance storage solutions deliver next level performance, data resilience, and enterprise availability to help you build faster, more efficient operations and make smarter business decisions. IBM DS8900F is designed to manage the full spectrum of storage workloads that exist in today's dynamic business environments. The DS8900F offers high performance and high system availability, with industry-leading data protection and disaster recovery features. For more information, see "IBM FlashSystem storage solutions" on page 24

At the time of writing, the offering includes only block storage space. File Storage space is not currently supported.

STaaS drivers and customer expectations

Figure 1 shows STaaS drivers (on the left side) and customer expectations (on the right side).

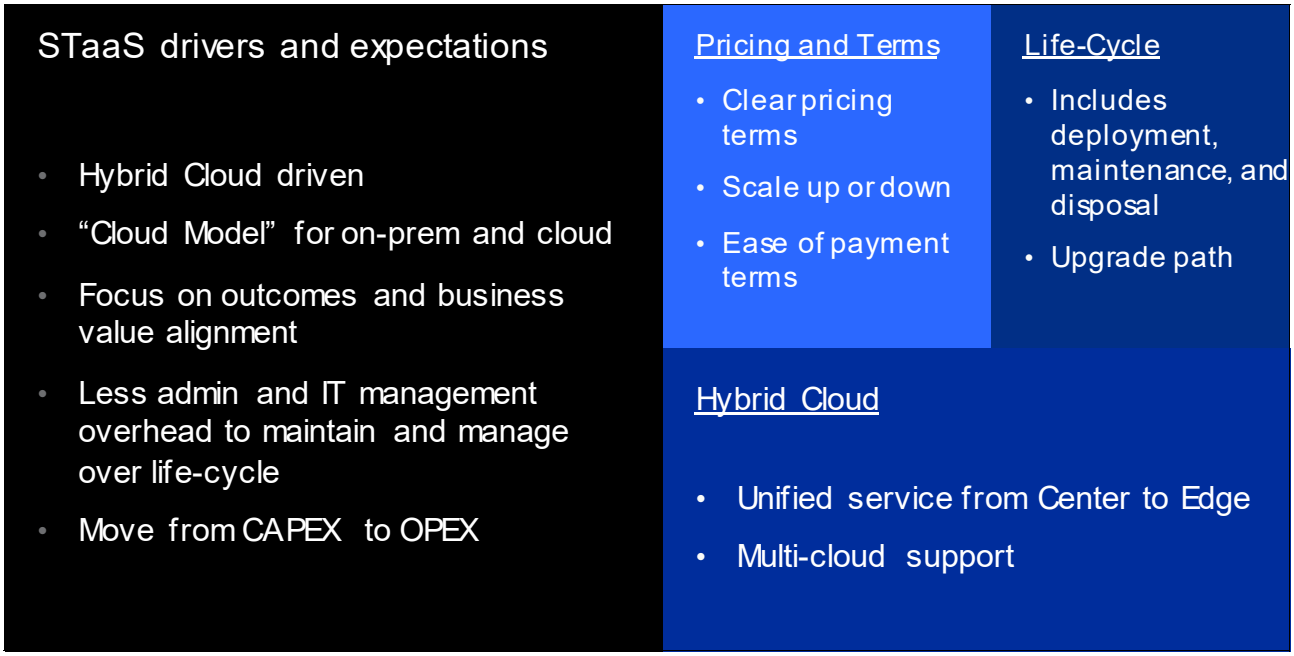

Figure 1 STaaS drivers and expectations

Hybrid-cloud customers who use cloud services to acquire infrastructure are especially interested in this type of service. For STaaS, these customers are more focused on outcomes instead of getting involved with lower-level operational and maintenance details for their storage infrastructures. Customers also look for their vendor to deal with refreshing the technology. They want a full-service delivery and pay-for-usage model.

Notes:

- If a charge-back agreement exists between storage and application owners, this solution is a good fit. For example, the customer is using services from a cloud services provider (CSP) or managed IT services (MSP) provider.
- This solution is also suitable for customers whose first priority is simplicity and flexibility for the application owners because the customers can now use storage in a manner similar to cloud environments. This solution is similar to having a storage cloud in your on-premises data center and includes the advantages of on-premises security.

As shown on the right side of Figure 1, customers have several expectations from the STaaS service such as:

- Clear pricing
- Full lifecycle management by the vendor
- Hybrid-cloud features, such as availability of the services from center to edge
- Multi-cloud support

Three performance tier levels

IBM STaaS provides options based on your needs when you order the solution. IBM offers 3 different Tiers, which are separated into I/O Performance levels.

FlashSystem Performance levels

Table 1 shows the FlashSystem Performance levels.

Table 1 FlashSystem Performance levels

Performance Level	IOPS per TB	Usage
Balanced	800	General purpose DevOps, High-performance file shares
Premium	2250	General-purpose DB, SQL, relational analytics, and VDI
Extreme	4500	Mission critical, machine learning, and AI

DS8900F Performance levels

Table 2 shows the DS8900F Performance levels.

Table 2 DS8900F Performance levels

Performance Level	IOPS per TB	Usage
Balanced	1200	Standard or regular workload
Premium	2300	Sequential write intensive workloads. Intensive IBM FlashCopy® or Safeguarded Copy.
Extreme	5500	High performance on small capacities

Configuration of a STaaS Solution

Configuration of a STaaS Solution is done in the IBM Storage Modeller. Figure 2 on page 5 shows an example. For more information, see IBM Storage Modeller.

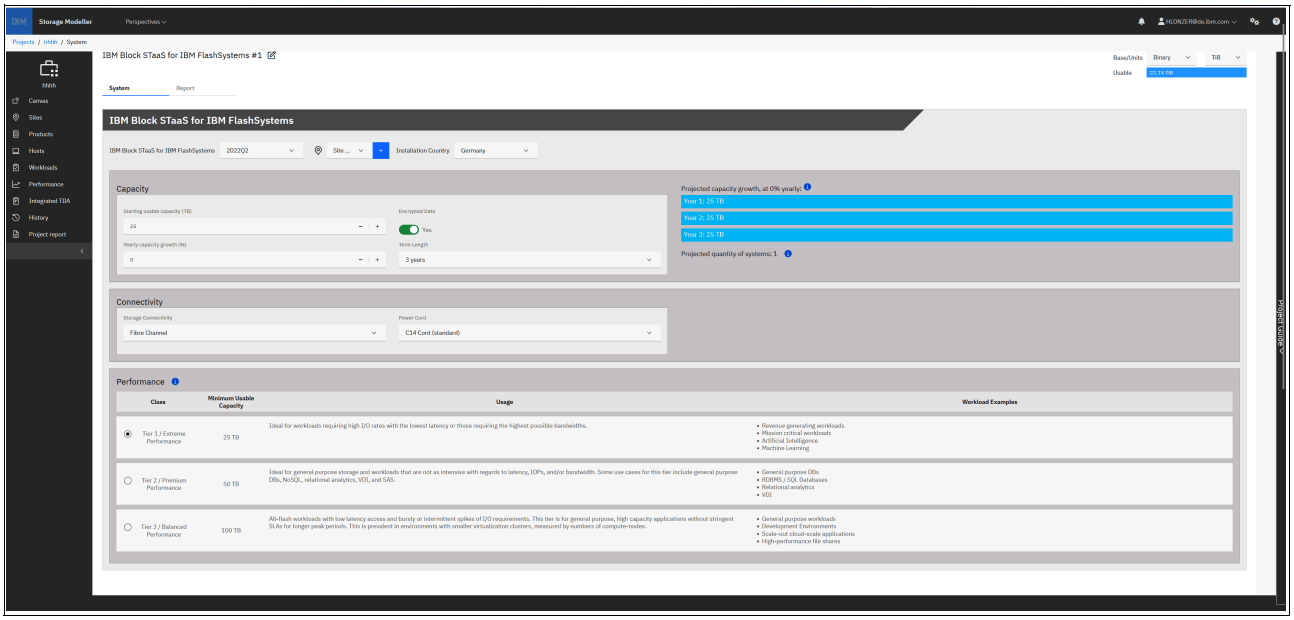

Figure 2 IBM Storage Modeller example

Life cycle of the solution

Figure 3 shows the lifecycle details of the IBM STaaS solution.

IBM Storage as a Service

Cloud-like

IBM lifecycle management	All Tiers
IBM Install	Yes
Predictive support	Storage Insights Pro Included
Software Subscription and Support	Yes
Remote system software updates	Yes
IBM Technical Account Manager	Yes
Sev1/2 Initial response time	30min
Hardware service	24x7x4 IBM performed
IBM monitoring of capacity growth and IBM Install more if need	Yes
Periodic Technology Refresh (90 day overlap for migration)	Yes
IBM recycle of old equipment	Yes

OPEX service (base billed annually; variable billed quarterly)

Includes IBM lifecycle management

Concierge support

Lower price than public cloud storage

Security and control of on-prem or colocation deployment

Hybrid cloud enabled

4

Figure 3 IBM Storage as a Service solution

IBM installs one or more systems at the customer site, provides predictive support with Storage Insights Pro, and provides software support and updates. A Technical Account

Manager is assigned to the account. IBM monitors capacity monthly. If the customer reaches 75% usage of storage space, IBM offers to add more capacity. Customers can also contact IBM to get more capacity if, for example, they are planning to provision a new application and need more storage space. IBM also periodically refreshes the hardware as needed (at the discretion of IBM) to maintain the service level objectives.

Note: At the time of writing, the offering includes block storage space only. File Storage space is not currently supported.

Pricing

Customers commit to various levels of fixed-base capacity for a time-frame, typically 3–5 years, and pay-for-use for any variable usage beyond the base. Base is prepaid billing with in-arrears billing for any variable usage. More favorable pricing options exist for longer times and larger base-capacity commitments. At the end of the term, IBM offers a renewal process, at the then-current market price. Also, customers can opt for a quarter-to-quarter extension (for up to one year) at the initial contract rates.

Note: For most up-to-date options, see the straightforward pricing model at Pricing Model.

Figure 4 shows the pricing model.

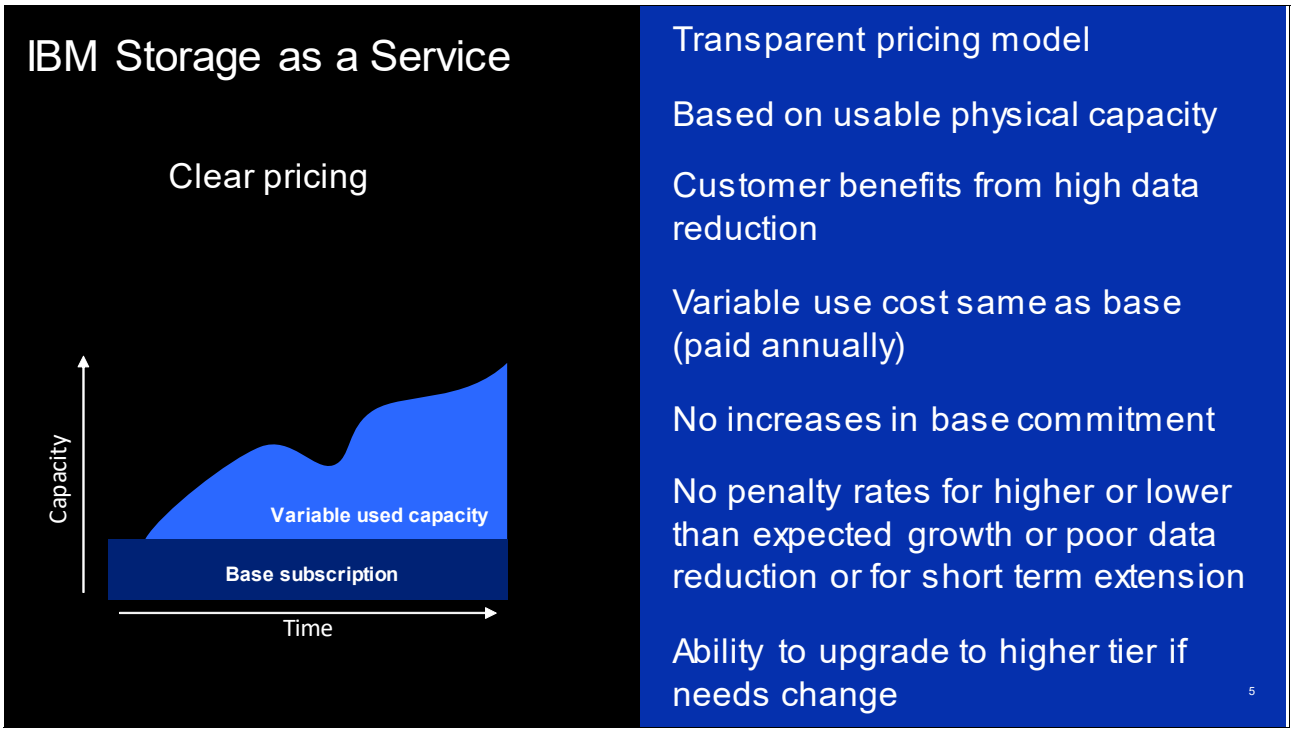

Figure 4 Clear pricing model

Contact your IBM representative or Business Partner for exact pricing for this solution.

Pricing depends on the following items:

- The tier level that you choose (Extreme-Tier 1, Premium-Tier 2, or Balanced-Tier 3)
- Your base capacity commitment
- Your commitment duration (1 - 5 years)
- Connectivity and encryption options

Also, prices can vary in different countries.

You can also check the Pricing Model for details.

Metering

IBM measures the capacity usage by using Storage Insights Pro. This product is included in the offering, but requires hardware where it can be installed and can access the internet. Storage Insights Pro is discussed in more detail in “Storage Insights”.

The amount of used capacity must be continuously monitored, and information must be stored, so that the average usage rate can be determined at the end of a month. IBM Storage Insights Pro is included in this offering, so the storage that you are paying for is not used to store information about storage-consumption for reporting and quarterly billing.

Storage Insights

Storage Insights is available in two editions:

- IBM Storage Insights: free-of-charge offering for IBM block storage devices

  The offering includes the tools that are needed to interact with IBM Support and provides analytics and recommendations to help improve the experience of using the storage systems.

- IBM Storage Insights Pro: a subscription-based Software-as-a-Service (SaaS) offering

  In addition to the functions provided by Storage Insights, IBM Storage Insights Pro provides resource-management functions, such as performance management, alerting, and reporting functions. Therefore, with STaaS and the included IBM Storage Insights Pro, you do not need to pay for additional storage-management software.

For more information about the IBM Storage Insights offering, see IBM Storage Insights.

Storage Insights consists of two types of components:

1. *Server instance*, which runs in the IBM Cloud®
2. One or more *data collectors* on-premises in the data center

Server instance

Each STaaS customer offering includes an instance of IBM Storage Insights Pro that runs within the IBM Cloud. This instance is set up at the start of the subscription term, and is available to you for the duration of the term.

Data collector

The data collector is a small piece of software that runs in your data center. It connects to the storage systems and reports on the metadata such as basic configuration, usage, and performance, to your cloud instance of Storage Insights.

The data collector can run on multiple operating systems, either on a physical server or in a virtual machine (VM). Each data collector needs to be downloaded from the corresponding Storage Insights cloud-instance, which ensures that a single data collector can report to only its corresponding Storage Insights instance. You can have multiple data collectors for redundancy or when you have more than one data center. However, all data collectors need to be downloaded from your instance.

For the list of operating systems and other prerequisites for the data collector, see Downloading and installing the plug-in package for vRO.

Data collector and IBM Storage Insights security

Note: It is important to understand that the data collector needs to be able to communicate with the storage device and the cloud instance. This is a secure communication.

The following list provides some frequently asked questions about the data collector:

- Can we use a proxy server?
- What information is sent to IBM?
- Is the information encrypted?
- Can IBM access our devices or data?

For resources on security-related questions about the connection and information that is gathered for access to Storage Insights, see IBM Storage Insights Security.

Setting up and adding storage

After you sign up for the STaaS offering, a Technical Account Manager will be assigned to your account. This person helps, remotely, to create a Storage Insights Pro instance for the customer. When the instance is ready, the Technical Account Manager assists with the installation of the data collector software. The creation of the instance and the data collector installation are part of the initial configuration and are not repeated.

When the Storage Insights Pro instance and data collector software are set up, the next step is to add a storage device to IBM Storage Insights Pro. The Technical Account Manager assists in downloading this task each time a new storage system is installed.

Metering the used capacity

One purpose of deploying and using Storage Insights Pro is to collect the usage-statistics of the storage systems that are used by the STaaS offering. This is done by using a *probe job*. This probe runs automatically each day.

In “Metrics” on page 16, the definition of usage within STaaS is described in more details.

The metric in Storage Insights that corresponds to the usage is called Used Capacity. This value is derived from the data that is stored on the redundant array of independent disks (RAID) arrays. This means that Used Capacity can be used for systems that use FlashCore Modules, which use compression, and for systems that use other non-self-compressing media.

However, the units in Storage Insights are based on GiB, whereas the corresponding unit used in STaaS is TB. Therefore, to see the same value, the information must be converted from GiB to TB. The *Used Capacity (in %)* metric might be more helpful sometimes because you do not need to do this conversion to get an idea how much storage is used.

Figure 5 shows how to navigate to the lists of block storage systems.

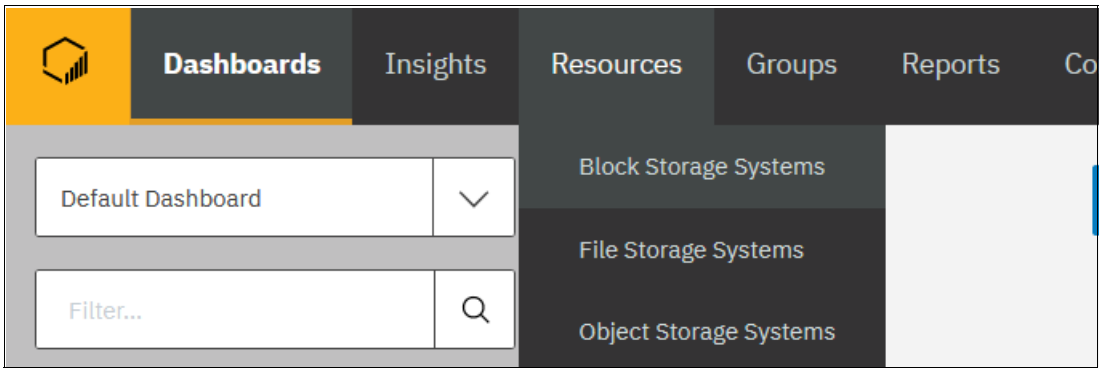

Figure 5 Navigate to the list of block storage systems

Depending on the storage system that you choose, a list is displayed of storage systems (Block, File, or Object) that were added to your Storage Insights instance.

Figure 6 shows the following three capacity-related metrics for the FlashSystem 5200:

- Capacity (GiB)
- Used Capacity (%)
- Available Capacity (GiB)

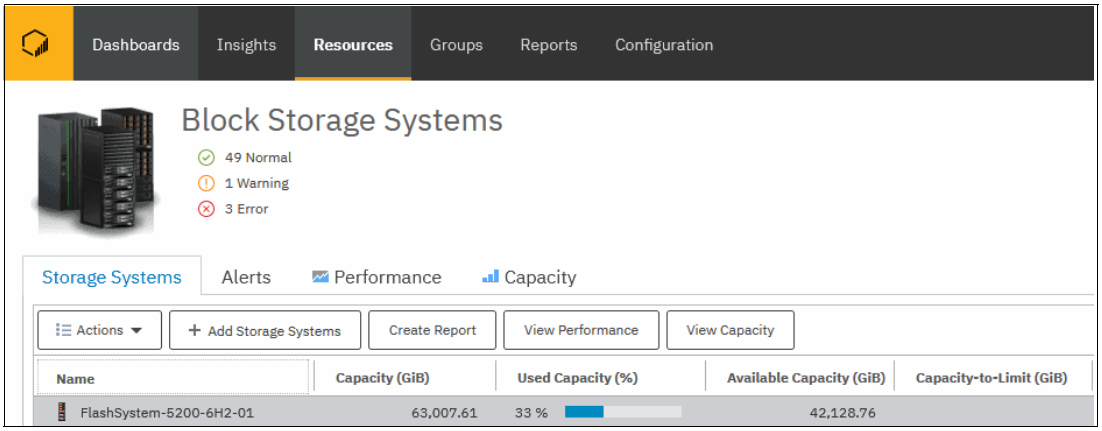

Figure 6 List of block storage systems

Note: Several more capacity details exist in Storage Insights, but the three that are listed are the most relevant for the STaaS offering.

To see a history of those metrics for all systems, click the **Capacity** tab.

To see a history of capacity usage for only one system, highlight the line in the table and click **View Capacity** to display a chart. See Figure 7.

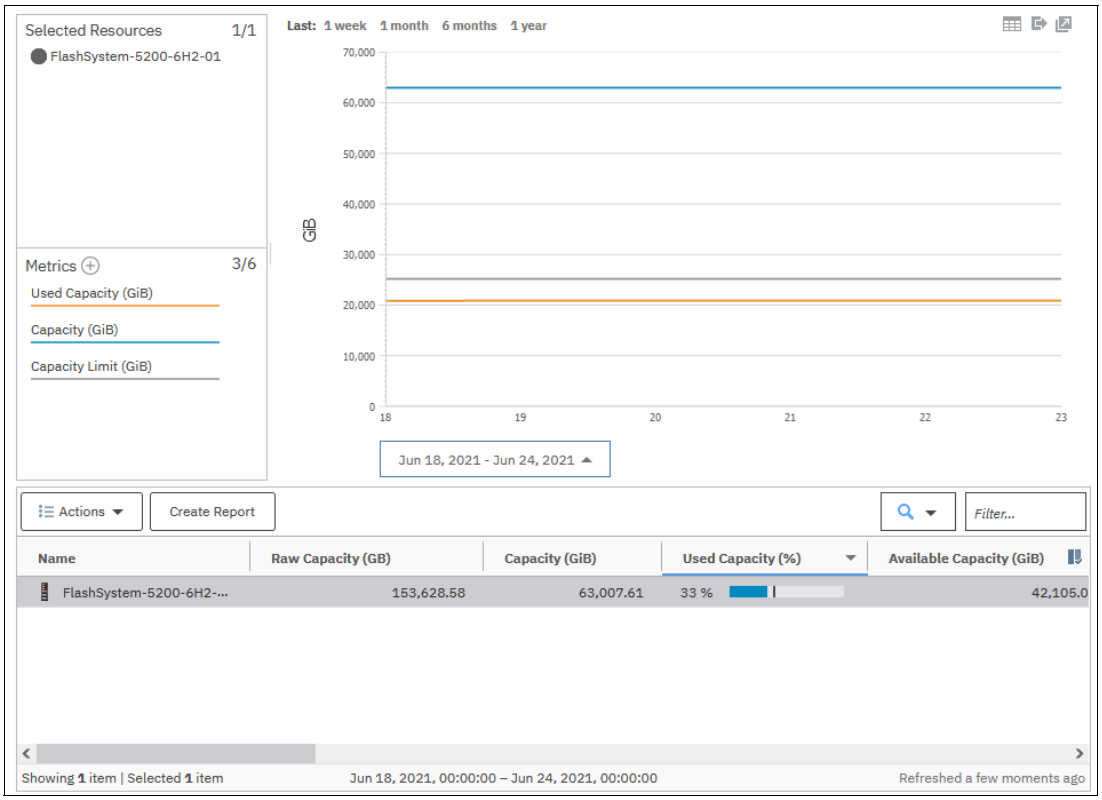

Figure 7 Capacity chart

Consider the following points:

- When you click **Metrics,** you can configure up to six metrics to be shown in the chart. The chart has a second Y axis (not shown), so you can select metrics from two different units.
- Click the ellipsis (**...**) in the upper right for the following functions:
  - Switch to a table view.
  - Export information.
  - Open the same chart in a new window, for example to get the URL for bookmarking.

Tips: If you open the chart in a new window, you can bookmark the URL and quickly return to the same chart. Bookmarking is especially useful when you use relative timestamps.

If you use too many resources and metrics, the charts can become confusing.

Special tip for monitoring the base and variable capacity

A function is available to help you monitor the base and variable capacity (see “Base versus variable use” on page 17). This function is one of the advantages of having unrestricted access to the Storage Insights Pro edition as part of STaaS.

You can set up a *Capacity Limit* for a storage system in the properties page of the storage device as shown in Figure 8. For demonstration purposes, the value is set to 30%. Usually you set this value to the percentage of the base capacity in relationship to the total system capacity. Although you must specify the value as a percentage, Storage Insights also shows you the capacity value in GiB.

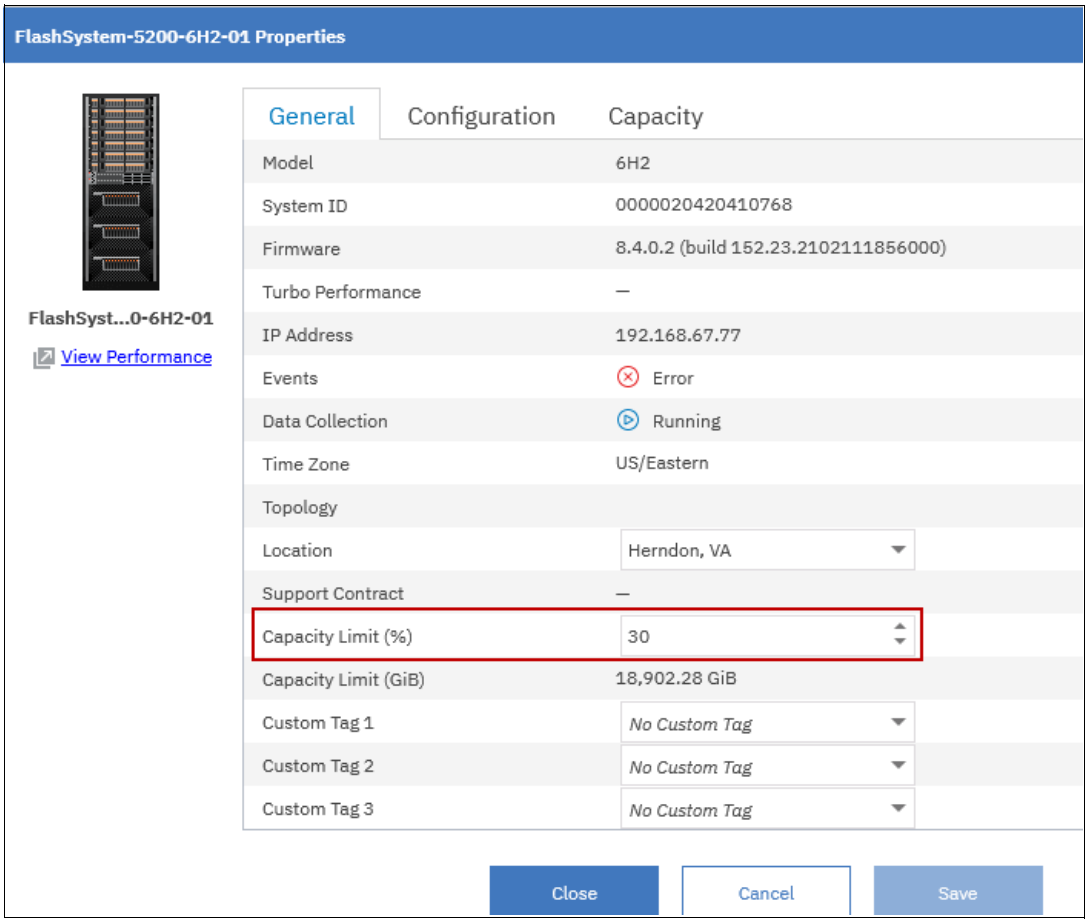

Figure 8 Capacity Limit setting in the storage system properties

After you define a capacity limit, it is reflected in the following ways:

- The Used Capacity (%) metric reflects the limit with a vertical bar. See Figure 9 on page 13. Compare this with Figure 6 on page 10 where the limit is not set.
- When the limit is exceeded, the metric Capacity-to-limit (GiB) contains a red and negative number of how much the limit is exceeded. See Figure 9 on page 13.

  However, while the limit is not exceeded, the Capacity-to-limit (GiB) shows a positive number that corresponds to the difference between the limit and the currently used capacity. This metric can also be included in a chart and exported as a list of values, if you want to use it in your own reporting.

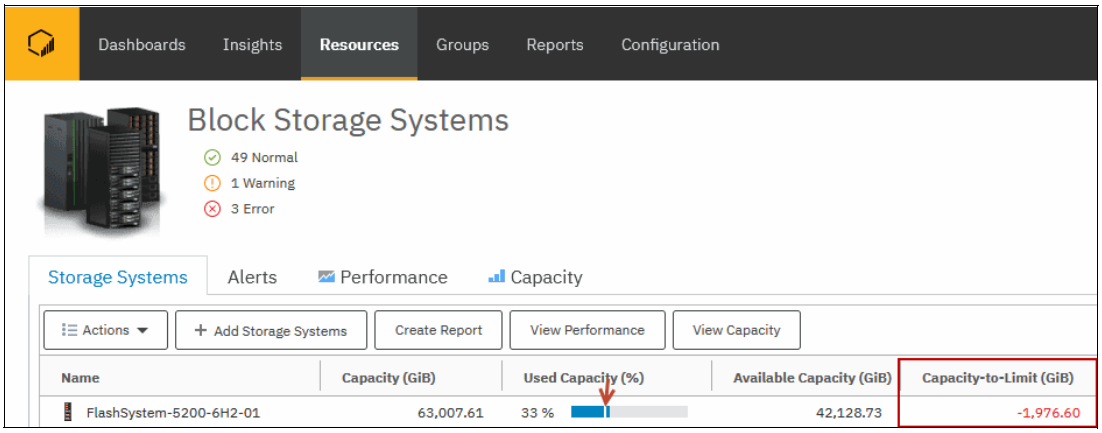

Figure 9 Capacity limit information

When you look at the capacity chart with a capacity limit that is set, you can also show the limit in the diagram. See Figure 10.

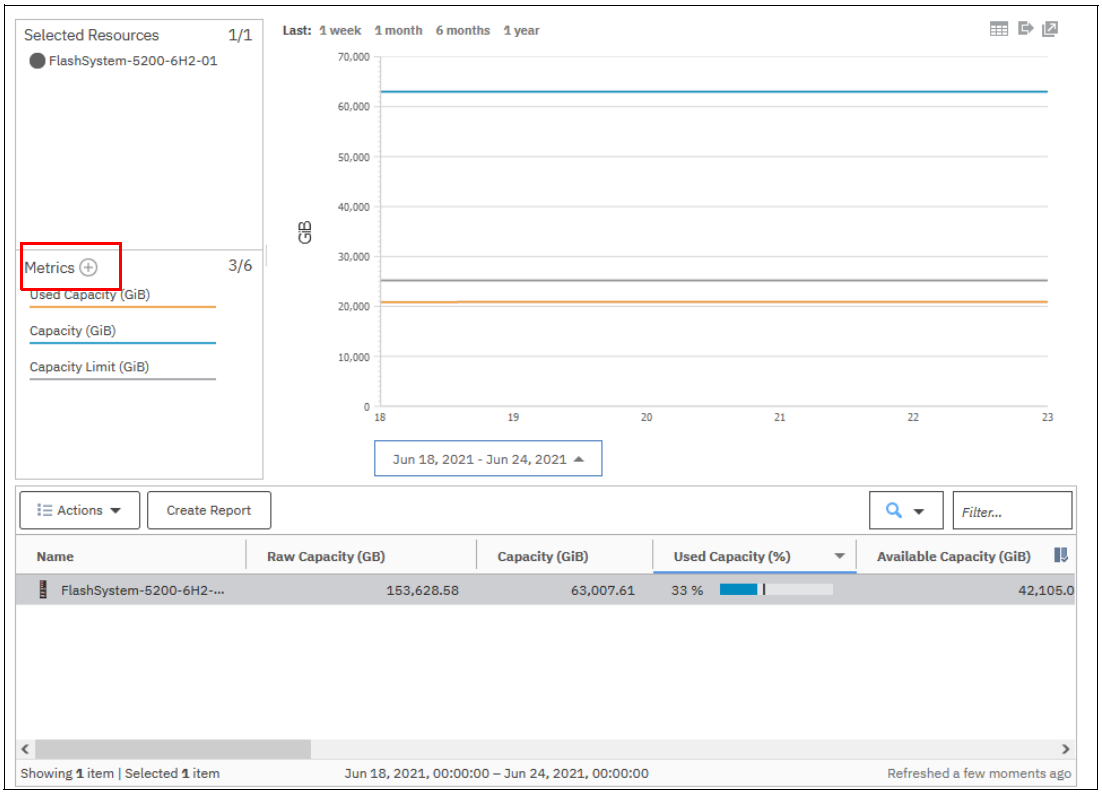

Figure 10 Capacity diagram with a capacity limit configured

To add the metric to the diagram, click the plus sign next to **Metrics** on the left (Figure 10).

Important: If additional capacity is added to your environment, you must adjust the capacity limit value because the user provides the information as a percentage and not an absolute value.

Hybrid cloud use cases

IBM STaaS also supports the hybrid cloud use cases. See Figure 11.

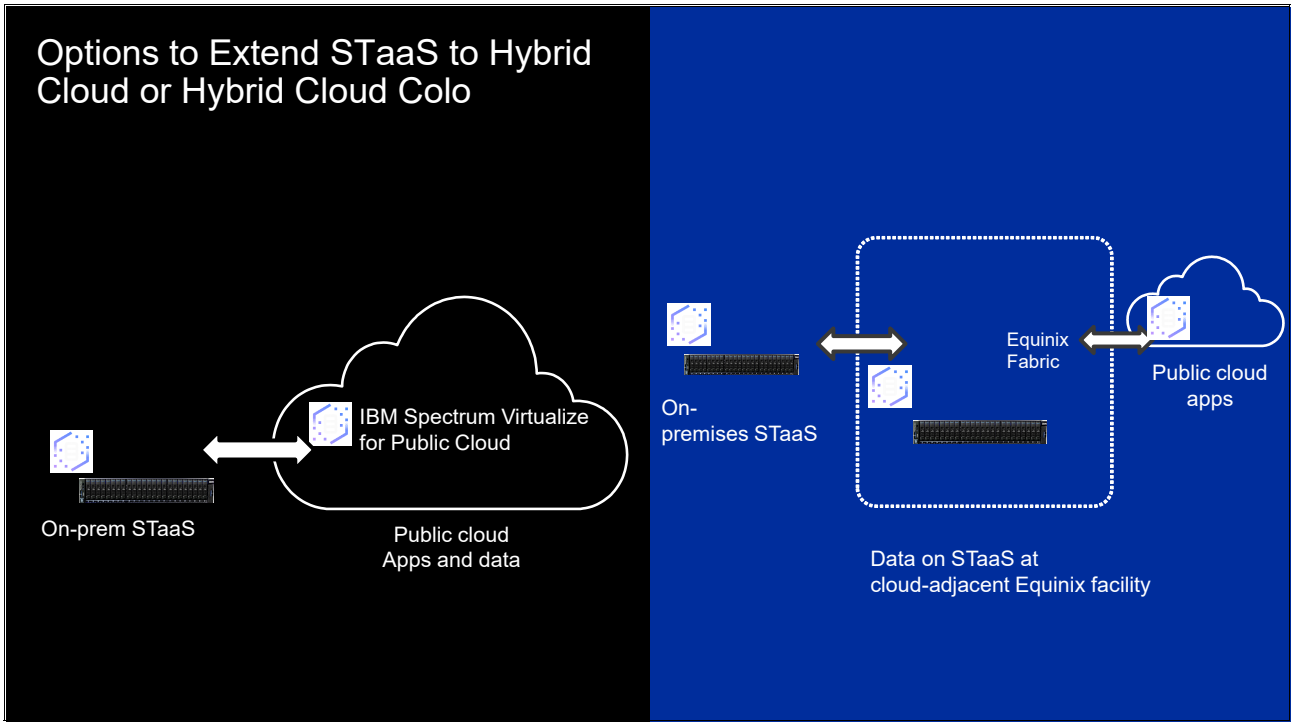

Figure 11 Hybrid cloud use cases

You can use IBM Storage Virtualize for Public Cloud with IBM STaaS. On the cloud, IBM Storage Virtualize for Public Cloud can bring that same consistency to Amazon Elastic Block Storage (EBS) and block storage from the IBM Cloud. One simple example is space efficiency. To make efficient use of your on-premises storage capacity, you can use IBM Storage Virtualize for Public Cloud features like deduplication, compression, and thin-provisioning. IBM Storage Virtualize for Public Cloud provides a consistent experience with the same software running natively on-premises as on a cloud provider as Infrastructure as a service (IaaS).

For more information on IBM Storage Virtualize for Public Cloud, see the following publications:

- Implementation Guide for IBM Spectrum Virtualize for Public Cloud 8.5: For AWS and Azure Public Clouds
- Implementing IBM Spectrum Virtualize for Public Cloud Version 8.3.1

IBM Storage Virtualize for Public Cloud is available on a monthly subscription or perpetual basis.

IBM also has an agreement with Equinix to provide an option for customers who want to use applications and resources of an Equinix data center or on public cloud but don't want all their data on the public cloud. Equinix has data centers next to public cloud providers with high-speed connections, such as IBM, AWS, and Azure. IBM STaaS can be deployed in an Equinix data center. The customer can elect to replicate only a subset of their data to the public cloud as needed for applications that are running in the public cloud. Customers can use the application resources of both Equinix and the public cloud, such as the replication of volumes between their on-premises environments and an IBM STaaS that is running in an Equinix data center that is collocated in a public cloud.

Storage pay-per-use market overview

You can view storage solutions such as IBM STaaS, from a few different angles to find out whether it or a similar solution is the right one for you.

Types of expenses

Budgets are shrinking for many organizations. At the same time, planning for future growth is becoming more difficult because of constantly changing requirements and innovations in IT. More importantly, the ever-increasing desire to store more data so that you can use the information for analytical purposes also makes it difficult to plan for the future.

IBM does not provide financial or accounting guidance, but it is helpful to have a basic understanding of types of expenses so that you can ask the right questions of your vendors.

Capital expenses

When you use funds for capital expenses, you purchase the system with a single outlay of funds, and the system that is shipped becomes an asset at your company. This means that you bought a new system and converted money into an asset. This is called a capital expense or CapEx.

Instead of a large, single payment, you can reduce the burden on your budget by leasing the asset and paying for the system with smaller payments. Although leasing is helpful in reducing the burden on your budget, many accountants consider this as a capital expense that is paid over a long time, which is a drawback. Because the hardware asset belongs to you, leasing in this form is still considered an expense for the asset. Therefore, it is paid out of the company’s capital budget and is not considered as an operating cost.

Operational expenses

When you acquire a service, such as a cloud service, it is typically accounted for as an OpEx with no ownership of an asset. The payments for use are typically paid over time and might vary with usage. The service is defined by service levels rather than by the type of asset that might be used to deliver the service. The provider usually has total control over what is deployed to support the services. The right to substitute what is deployed is at the sole discretion of the service provider.

An internal CapEx spending request is typically needed to get the approval for buying something new in many IT organizations, which can be a significant hurdle. However, paying for a services-oriented solution from an operating budget can be easier, so converting CapEx into OpEx can be helpful.

Pay-per-use models

The idea of paying for what you use is not new. In the world of utilities, such as power and water, paying for what you use is typical. However, when you look at the details, you realize that these utility models are not completely pay-per-use because there is usually an initial setup or base fee.

For utilities, you typically must pay a base fee plus a consumption fee. Discounts depend on how much you consume, and there are metrics on measuring the consumption.

Metrics

For storage environments, the most obvious metric is capacity, but even this simple metric requires a well-documented definition to compare the offerings. Some metrics might be based on decimal bytes and others on binary bytes. In today's environments, data reduction is a key factor when you compare different solutions.

The challenge with compression is that the terminology is not well defined for the capacity before and after data reduction. Therefore, IBM uses the term *stored capacity* for what is actually being stored on the volumes, as opposed to *effective capacity,* which is the amount of data that is written by the servers to the storage system.

The advantage of using stored capacity is that IBM makes no assumption of compression. Therefore, the price is not impacted. Any compression that you achieve with the data that you stored on the system is to your benefit because it reduces your cost.

Consider the following examples:

- If a server writes 100 TB that is compressed 1.5:1, then only 66.6 TB is stored. Therefore, only 66.6 TB of stored capacity are measured.
- If the data can be compressed 2:1, then only 50 TB of storage capacity is used, and you pay even less.

In both examples, the *effective capacity* is 100 TB.

Important: Other vendor offerings might appear less expensive because the price per TB is defined for the effective capacity. This means that compression benefits the vendor and not for the customer.

In addition, verify what happens when you have data that does not compress well. Data that does not compress well can increase vendor costs. Some vendors impose a penalty on data that is not compressed by at least 2:1.

A large difference in price can exist, depending on which of the capacity metrics, either decimal bytes or binary bytes, is used and the unit of measurement.

For consumption, the other metric is *time*. You might use 100 TB today, then add some volumes and use 110 TB tomorrow. The following day you might delete some volumes and use only 98 TB. The price is defined as monthly Terabytes (decimal not binary), and that is calculated by taking the daily usage value and calculating an average for the month.

To summarize, the IBM STaaS offering is measured based on the following metrics:

- Decimal terabytes

  A *decimal terabyte* (TB) is one trillion bytes, or 1000 gigabytes (GB). Sometimes this is confused with *Tebibyte* (TiB) which is 1024 *gibibytes* (GiB).

- Stored capacity

  Compression is to your benefit.

Time commitment

Some of the pay-per-use offerings require you to commit to a usage period. Typically, a longer commitment means a lower price. Other than the duration, determine what happens at the end of the time-frame and whether you can extend the duration even before the end of the term. Verify that you are not locked into a contract extension.

Base versus variable use

One of the core concepts of IBM STaaS is how the different types of capacity are defined. This is the same definition as for the *Storage Utility Offerings*, which are also available from IBM. For more information, see Storage Utility Offerings.

When you use a pay-per-use offering, you typically sign up for a baseline capacity, which is called *the base*. The amount of the base is related to the attributes of the offering, such as the discount you can get.

The base capacity is not a physical limit. It is a capacity value that you agree to be your minimum payment, and it is set at the start of the contract. You can look back at your past use to estimate the appropriate base capacity for your needs. If you are confident that your capacity needs are increasing, then you can set your base capacity accordingly. This cost of the base capacity is paid annually.

In addition to the base capacity, a system comes with more capacity installed. The amount of capacity depends on the size of the base. IBM deploys approximately 50% more than the base-capacity amount. As discussed earlier, IBM adds more capacity when the system is 75% used or if you request capacity for a pending need that is larger than the available free capacity. IBM also collects your growth expectations and optimizes the infrastructure that is deployed.

Total-capacity usage is metered. The difference between the total average-monthly usage and the base capacity is the variable capacity. The variable capacity is what you pay for when you use more than your defined base capacity. The price per TB is the same as the price for the base, so you do not have to worry about exceeding capacity and spend time monitoring use of capacity. Most other providers charge a higher rate for usage over the base capacity. Therefore, with those offerings you must spend time monitoring their use, and as your data grows, you can request to increase the base-capacity level to avoid the higher rate. However, if your usage goes down, you are paying for the higher base-level regardless of use. (You cannot lower the base after you raise it.)

Difference between base and variable capacity

The base capacity is what you sign up for at the start and pay for annually.

The variable capacity is what makes this a consumption model and is billed quarterly.

This offering consists of several different performance-tiers of storage. Therefore, if you use more than one tier, you have one base-capacity commitment per tier.

Advantages of IBM Storage as a Service

The idea of STaaS is similar to how cloud providers offer storage capacity. This section describes a couple of advantages that the IBM solution offers.

Simplicity

Most of the solutions on the market are similar at first glance. However, the solutions work in different ways.

- Compression

  You might think that compressing the data does not impact the price. In fact, as was previously described, you pay less if you store data that can be compressed well. The advertised price for the IBM offering is for the amount of data that is stored in the system and not what the servers sent before compression.

  Also, the compression happens in the FlashCore Modules. That means that compression does not impact performance because the tasks are performed by hardware and are distributed across all the FlashCore Modules. Compression tasks are not performed by software.

  When you look at other offerings, be sure that you fully understand how the price is impacted by compression. Determine whether you are paying for what is stored on the drives, as with IBM, instead of paying for the data or capacity that the servers are sending, which is often called *effective capacity*. Paying for effective capacity typically means that the vendor made an assumption of how well the data compresses, but this is a risk for the vendor if the assumption is not true. Therefore, there can be other conditions as to what happens when the data cannot be compressed. For example, a surcharge or penalty can be imposed (typically 2.5X the base-rate if the compression ratio of the data is not at least 2:1), which might be even higher than the assumed compression rate. This means that the vendor earns more money when the data is less compressed than the assumed rate. With IBM, there is no assumption, so you can only gain from compression and never pay more.

- Disruptions

  The availability is impacted in a case of disruption, and that can include planned and unplanned events. In the IBM solution, components are carefully selected, which allows IBM to target a 99.9999 (6 nines) availability objective. To compare with other offerings, an offering with 5 nines has a target availability 10 times lower, an offering with 4 nines has a target availability 100 times lower, and so on. The Technical Account Manager works with the administrator to help ensure that best practices and proactive actions are taken to maximize availability.

  The difference in these claims come from the fact that some offerings provide only a small amount of buffer to grow into. When you grow, frequent hardware changes can be required to add more capacity. Those changes might be disruptive, which can result in an unreliable system.

  You can also get a 100% availability guarantee, but this is only possible with a two-system installation (IBM HyperSwap®) implemented by IBM Lab Services.

- Speed

  After the initial setup, procurement and installation planning is not required. Even if you underestimated your capacity needs, you have the contract in place and IBM installs more capacity at your site, as needed. If you know that the buffer is too small for the next new application, then you work with the Technical Account Manager to have additional capacity shipped. However, you pay for only this extra storage when you start to use it. It can be more efficient to use the storage as needed instead of requiring possibly time-consuming in-house planning and budget meetings.

Pricing

This is another area that demonstrates the simplicity of this offering from IBM because there is only one price per TB/month for each tier. The price per TB/month is *not* increased because of the following conditions:

- Compression: Compression is to your benefit
- The base and variable capacity
- Fast growth: No penalties for faster growth
- Reduction of capacity: No penalties for reduction of capacity because the minimum payment is the base commitment

Although many offerings look simple at first glance, you must be aware of hidden costs or penalties.

Although IBM cannot give you financial or accounting guidance, it is important to point out that the IBM STaaS offering is designed as an OpEx-based solution. Not all pay-for-use offerings are set up for OpEx models, so consider this factor if it is important for you to use OpEx.

Another advantage of the STaaS offering is that the price does not change. For example, if you start with 100 TB, but soon you and IBM realize that you need more capacity and another storage unit is shipped and installed. You might think that the price needs to be adjusted. However, this is not the case because IBM agreed to a price at the start of the contract and the price does not change.

Flexibility

The prices are established at the start of a subscription term. The prices typically are better for longer-term commitments. Because the contract is set up so that it can be easily renewed or extended, you already know the price for future payments after the initial contract. For example, if you have a three-year contract, you already know what the price will be after three years. You might opt for a quarter-to-quarter extension (for up to one year) at the same price without having to go through the procurement processes.

You can also sign up for a new contract at the then-current rate, and in times where the average price of capacity is falling, this might be the better option. You can choose the type of contract that best fits your needs. If your total usage increases, you can also benefit from lower prices for higher base-capacity commitments.

The end of the contract

When the contract ends, you have the option to extend the IBM STaaS service quarter-by-quarter (up to one year) without committing to a new multi-year term. This is another point to consider when you compare offerings because extending the STaaS service provides you with a fair price for extended usage of the equipment with no penalty and gives you flexibility in deciding what to do. Other providers might charge a penalty if they do not get their systems back in time.

Also, if you continue and commit for another term, the devices are refreshed and you do not have to pay double for the storage space while you migrate from old to new, for up to 90 days.

Data security and high availability considerations

This section describes the points to consider when you set up data security and high availability.

Data security

Depending on what you need or want to protect against, the following solutions are possible:

- Secure erase

  The drives that are included in this solution are self-encryption drives. Self-encryption means that you must run the *cryptographic erase procedures* to be sure that no one can read the data when you return the device to IBM. For more information, see Returning equipment to IBM and IBM FlashCore Module Cryptographic Erase, REDP-5529.

- Encryption

  If you want to include more security and protect against media theft when the system is in your data center or a colocation data center, you can enable encryption when you set up the system. This encrypts the master encryption key (MEK) with a system encryption key, so the drive itself cannot be used unless the MEK is decrypted in the storage system.

  The license for setting up encryption is included in the solution if you select *encryption* during the configuration. You might need a supported key lifecycle management solution, or you can use the USB keys that are provided.

For many users, these free-of-charge functions can help to address the requirement that media cannot leave the site because the intent of such a requirement is to avoid data-loss. Encryption prevents data-loss at no additional cost or performance impact when you use self-encrypting drives that are provided with this offering.

Options for a high availability solution

You can implement multi-site high availability in the following ways:

- HyperSwap

  HyperSwap is a solution in which you configure two FlashSystem controllers or two DS8000 controllers into one cluster and then provision volumes that get mirrored between the two systems. When this is done by IBM LAB Services, IBM guarantees 100% availability.

- IBM SAN Volume Controller (SVC) Stretched Cluster

  There are a few advantages of using a storage virtualization layer on top of the storage controllers. IBM SVC is such a virtualization.

  In SVC, two nodes are grouped into an *I/O group* because most storage systems have two controllers. These two nodes are installed in the two locations, so this configuration is called a *stretched cluster*. A cluster is 1–4 I/O groups. In an SVC stretched cluster, volumes are mirrored, and you can add standby nodes, so that if a node at one site fails, you do not need to fail over to the second site.

  This form of high availability is not included in the IBM STaaS offering, but can be contracted with another IBM pay-per-use offering called *IBM Storage Utility*. The concept is essentially the same: you sign up for a base capacity and usage above that capacity is measured by using Storage Insights. IBM Storage Utility uses the same metric, stored capacity, as the IBM STaaS solution.

The primary differences between the two offerings are provided in the following list:

- IBM Storage Virtualize Storage Utility uses TiB instead of TB as the unit of measurement, like other IBM storage software products.
- The SVC nodes are not part of this offering, but can be leased or purchased.
- Because this is a storage virtualization software solution, there are no tiers, not a buffer capacity like the case with the back-end storage layer.

When SVC is added to the solution, you can use functions like Easy Tier® because the SVC can use capacity from multiple tiers of storage or FlashCopy.

Note: Regardless of high-availability requirements, when you need capacity at multiple sites, each site should have its own contract instead of summing up all capacity. With a single contract, the contract can assign all the storage to a single storage system.

Supporting the solution

The customer's responsibilities include operating the environment, creating new volumes, setting up snapshots, and setting up disaster recovery (DR). IBM monitors the storage consumption with Storage Insights and provides you with the recommendations of the analytics of this tool.

There are some additional aspects of this solution that make it convenient:

- Hardware maintenance
- Technical Account Manager
- Remote firmware upgrades
- Machine setup and removal

Regardless of the tier you choose and the hardware that is shipped and installed, you always get the same support from IBM. These support services are also available when you buy a system from IBM, but they are not always included with the initial sale and might be a separately charged service.

IBM performs one monitoring function, which is *capacity monitoring*. This means, with the help of Storage Insights Pro, IBM makes sure that a buffer of 25% free space is maintained. Therefore, when you use more than 75% of the capacity, averaged over one month, your assigned IBM Technical Account Manager works with you to see whether more capacity is required. If you know that a new project will store its data onto the IBM STaaS systems, which would consume so much capacity that the free space is substantially reduced, you can call IBM ahead of time, and ask for more capacity.

Reacting to changes

This section describes the most common change-scenarios in IBM STaaS.

Faster than expected growth

It is not a problem if you grow faster than originally expected. IBM monitors the usage with a target of a minimum growth buffer of 30%. This means that IBM might contact you with a proposal to increase the installed capacity. This additional capacity can come in the form of new drives or a new storage system if, for example, the current one cannot grow anymore, or has reached its performance service level objectives (SLOs).

Changes to your contract or renegotiation are not required, and your committed capacity stays the same except in the case when capacity usage grows beyond 2.5 times the base capacity. In this case, IBM might require an increase to the base-capacity level and associated annual payment.

You do not have to commit to using more capacity and increasing your baseline, but you can work with IBM if you choose to do so. When you use more capacity and increase your baseline, your price per TB decreases.

Switch to a higher tier

If you run the solution and realize that you have chosen the wrong tier, and your workload demands something faster, you can work with IBM or your Business Partner to upgrade to a higher performing tier. Although the price changes, an upgrade to a higher tier and more capacity can be accommodated.

Negative capacity growth

Projects might be canceled, which results in less used capacity than originally anticipated. There are two possible consequences:

- The variable capacity is reduced.

  The quarterly charge is reduced, but there is no extra charge or penalty for using less storage.

- The used capacity drops below the base capacity.

  IBM commits to always make the base capacity available with the given tier characteristics and in return, you commit to pay for the base capacity for a certain time. In this case, you pay for the base, even if usage is below the base capacity.

Data does not compress well

Certain types of data do not compress well, either because the files are already compressed or encrypted, or the data structure does not lend itself well to compression (for example, binary data).

Because the IBM STaaS offering is based on physical capacity, there is no risk to you either in required capacity or higher cost because with the contracted capacity you know exactly what you can store. If the data compresses well, you can store more. If the data does not compress well, you do not pay more than what was negotiated at the contract time.

Planning

In this section, planning considerations for the solution are described.

Requirements and responsibilities

This section includes a description of some of the responsibilities of IBM and the IBM STaaS customer. This is not a complete summary.

IBM

The following responsibilities of IBM are fulfilled by the IBM Service Support Representative (IBM SSR) or an authorized Business Partner:

- Installation of the hardware
- Cabling
- Configuring
- System setup, which includes Call Home setup
- Software and services
- Predictive support with Storage Inside Pro (included in the offering)
- Hardware maintenance 24x7x4 with IBM STaaS dedicated Expert Premium Service. Sev 1 or Sev 2 Initial Response Time of 30 min
- Remote firmware updates
- IBM Technical Advisor
- IBM monitoring of capacity growth (monthly) and adding more capacity as the need grows beyond initial capacity
- Return, recycle, and technology refresh

IBM STaaS customer

The following responsibilities are fulfilled by the customer:

- Data security and backup
- Rack space for the hardware
- Compute power for the installation of Storage Insights Pro
- Internet access and several IP addresses for server and hardware
- Creating the needed data space (such as I/O groups and volumes)
- Confirming Call Home settings that are entered from the IBM SSR or Business Partner
- Configuring licensed functions
- Creating storage pools
- Migrating data from or to on-premises
- Power and cooling for on-premises installation
- Any damage on the provided property
- Clustering the solution is up to the customer

After the installation and initial configuration of the hardware is complete, IBM strongly suggests that you determine whether a more recent level of system software is available. If

so, update to that level of software. After you complete the software update, if necessary, you might also need to update the firmware on the drives in the system.

Note: IBM provides and installs storage with approximately 50% margin for growth. If more storage space is needed, new controllers might be added. This requires more space in the rack and enough Fibre Channel ports and IP addresses on the infrastructure side.

Physical planning

IBM has a large variety of products. See the IBM StaaS FlashSystem Hardware Planning Guide or IBM StaaS D8900 Hardware Planning Guide for planning or contact your IBM Technical Account Manager (TAM)

IBM FlashSystem storage solutions

The IBM FlashSystem family currently consists of models that are designed to address the full range of application workload and cost requirements.

IBM FlashSystem hardware

Every solution comes with the intelligence and capabilities that are needed to deploy and manage hybrid-cloud architectures that use IBM FlashSystem hardware:

- IBM FlashSystem 5200 offers an efficient end-to-end NVMe or hybrid flash 1U option with all the performance and functions of larger arrays.
- IBM FlashSystem 7300 provides the combination of performance features that make it a favorite of budget-constrained enterprises with mid-range workloads.
- IBM FlashSystem 9500 is engineered to handle the most demanding business and research environments. IBM FlashSystem 9500 is built, tested, delivered, and configured by IBM. It delivers ultra-high throughput and NVMe-optimized flash performance.

IBM FlashSystem features

The IBM FlashSystem storage system includes the following features:

- NVMe-accelerated flash arrays with control enclosures that are 100% end-to-end NVMe-enabled and Storage Class Memory (SCM)-capable
- Industry-leading performance and scalability with support for bare-metal, virtual, and containerized environments
- IBM Storage Virtualize-driven, with a full range of industry-leading data services
- Hybrid cloud ready, with support for private, hybrid, or public cloud deployments
- Enterprise-grade system availability and data-security features that include nondisruptive data migration plus *6 nines* availability and hardware-accelerated data-at-rest encryption
- Affordable, nondisruptive upgrade paths that deliver increased performance, scalability, and functionality

IBM DS8900F storage solutions

IBM Storage DS8900F is the next generation of enterprise data systems that are built with the most advanced processor technology. It is designed to provide the performance and data resilience you need to increase customer satisfaction and transform data into business opportunities.

Ultra-low application response times

Process huge volumes of transactions faster and unlocking greater value for mission-critical workloads with ultra-low storage latencies

High availability and disaster recovery

Better than seven 9's (99.999996%) of availability with HyperSwap technology, which provides no-data-loss capabilities within metropolitan distances. IBM Geographically Dispersed Parallel Sysplex® enables faster recovery times for IBM Z®, with superior RPO and RTO over long distances.

Cyber resilience with IBM Safeguarded Copy

Prevent your data from being modified or deleted due to user errors, malicious destruction, malware, or ransomware attacks with hundreds of immutable copies per volume, which can be used as a trusted source for selective or full recovery of a production environment.

Transparent cloud tiering

Enable your hybrid cloud as a new storage tier for backup, archive, and disaster recovery operations on IBM Z environments with no impact on I/O performance and without the need of additional servers or gateways. Transparent cloud tiering protects your data with AES-256 encryption and provides significant savings in mainframe CPU utilization when you migrate large data sets.

Reliable storage for mission-critical containers

IBM Storage DS8900F provides persistent storage for mission-critical containers with support for Container Storage Interface. IBM Storage DS8900F also supports IBM Cloud Pak® solutions to enhance and extend the functionality of Red Hat OpenShift. These solutions provide an open, faster and more secure way to move core business applications to the cloud and container-based deployments.

Fibre Channel endpoint security

Ensure all data that is flowing on IBM FICON® and Fibre Channel Protocol (FCP) links from IBM Z to DS8900F are encrypted and protected. IBM Fibre Channel Endpoint Security provides in-flight protection for all data, independent of the operating system, file system, or access method in use.

IBM Copy Services Manager

Simplify and automate the management of your replication solutions and provide disaster recovery and high availability under a single point of control. IBM Copy Services Manager supports FlashCopy, Safeguarded Copy and advanced disaster recovery functions with failover or failback operations across 2, 3 and 4 remote sites.

Automated data placement

Automate data placement to meet performance objectives at a reasonable cost. IBM Easy Tier intelligently identifies and moves less-frequently accessed data to high-capacity flash

drives. Similarly, frequently accessed data is migrated to high-performance flash drives to ensure the lowest response times for those applications that need it.

Flexible storage for IBM Z and IBM LinuxONE

Deploy IBM Storage DS8910F into IBM z15® model T02 or LinuxONE III model LT2 to enable a powerful end-to-end solution delivered in a single 19-inch industry standard rack.

AI-driven management and proactive support

IBM Storage Insights can help you better understand trends in storage capacity and performance and expedite resolution when support is needed. Using AI-based analytics, it helps identify potential issues before they become problems. When support is needed, Storage Insights helps speed resolution by simplifying tickets and automating log uploads.

IBM Storage DS8910F

The DS8910F provides a flexible solution to be integrated into IBM z15, IBM LinuxONE III LT2, or customer provided 19-inch industry standard racks.

The DS8910F includes the following features:

- 1,474 TB maximum physical capacity
- 80 µs minimum response time
- 18 µs minimum response time with zHyperLink
- 16 cores per system
- 512 GB of system cache
- 32 host ports

IBM Storage DS8950F

The DS8950F is for large organizations that want to consolidate all their mission-critical workloads for IBM Z, IBM LinuxONE, and IBM Power®.

The DS8950F includes the following features:

- 5,898 TB maximum physical capacity
- 80 µs minimum response time
- 18 µs minimum response time with zHyperLink
- 40 cores per system
- 3.4 TB of system cache
- 128 host ports

Ordering information (for Business Partners)

Note: This section is for Business Partners. Clients do not order a specific model.

The IBM STaaS solution is based on the IBM FlashSystem® family and on the DS8900 family. Appropriate systems are chosen to fulfill the requested performance and ensure that capacity levels are met.

IBM FlashSystem family

The DS8900F family includes the following models as shown in Figure 12:

- Entry enterprise:
  - FlashSystem 5015
  - FlashSystem 5045
  - FlashSystem 5200
- Midrange enterprise: FlashSystem 7300
- High-end enterprise
  - FlashSystem 9500
  - FlashSystem 9500R

For more information about the FlashSystem Family, see Implementation Guide for IBM Storage FlashSystem and IBM SAN Volume Controller (for IBM Storage Virtualize 8.6), SG24-8542.

For more information about the DS8900F Family, see IBM Storage DS8900F Architecture and Implementation: Updated for Release 9.3.2, SG24-8456.

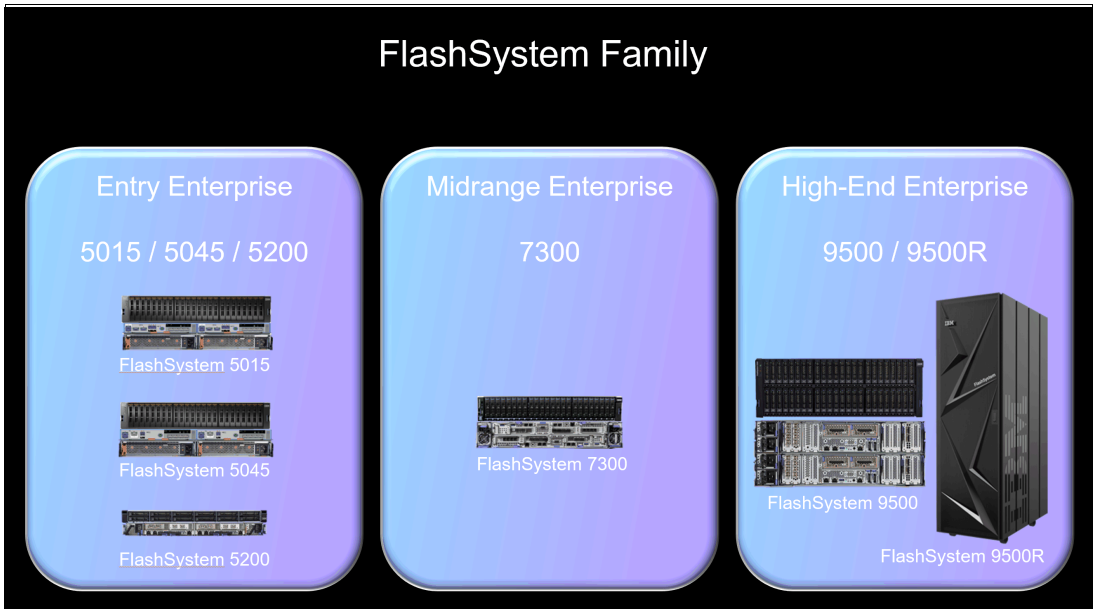

Figure 12 FlashSystem portfolio

IBM DS8900 family

At the time of writing, the DS8900F family includes the following models as shown in Figure 13:

- DS8910F
- DS8950F
- DS8980F

Figure 13 DS8900F family

STasS product structure

The STaaS product structure names for Base and Variable models are differentiated by machine type and model (MTM).

Base FlashSystem machine type and model

Machine type for the IBM STaaS Base for initial (12 month) and annual (12 month) MES orders is **9601** followed by the model number. Model structure is a combination of performance tier and duration. See Table 3.

Table 3 Model structure Base FlashSystem MTM 9601

Model Structure	3 years	4 years	5 years
Tier 3 Balanced	BT3	BT4	BT5
Tier 2 Premium	MT3	MT4	MT5
Tier 1 Extreme	HT3	HT4	HT5

For example, a Tier 1-performance solution with the duration of three years has the Machine and Model Type 9601-HT3.

Variable FlashSystem machine type and model

Machine type for the IBM STaaS Variable used for quarterly variable use orders, which is tied 1 to 1 to the Base FlashSystem MTM, is **9602** followed by the model number.

Model structure is a combination of performance tier and duration. See Table 4.

Table 4 Model structure Variable FlashSystem MTM 9602

Model Structure	3 years	4 years	5 years
Tier 3 Balanced	BV3	BV4	BV5
Tier 2 Premium	MV3	MV4	MV5
Tier 1 Extreme	HV3	HV4	HV5

Base DS9800F machine type and model

Machine type for the IBM STaaS Base for initial (12 month) and annual (12 month) MES orders is **9603** followed by the model number.

Model structure is a combination of performance tier and duration. See Table 5.

Table 5 Model structure Base DS8900F MTM 9603

Model Structure	3 years	4 years	5 years
Tier 3 Balanced	ET3	ET4	ET5
Tier 2 Premium	DT3	DT4	DT5
Tier 1 Extreme	DB3	DB4	DB5

Variable DS9800F machine type and model

Machine type for the IBM STaaS Variable for quarterly variable use orders, which is tied 1 to 1 to the Base DS8900F MTM, is **9604** followed by the model number.

Model structure is a combination of performance tier and duration. See Table 6.

Table 6 Model structure Variable DS8900F MTM 9604

Model Structure	3 years	4 years	5 years
Tier 3 Balanced	DE3	DE4	DE5
Tier 2 Premium	DS3	DS4	DS5
Tier 1 Extreme	DV3	DV4	DV5

Authors

Vasfi Gucer is a project leader with the IBM Systems WW Client Experience Center. He has more than 20 years of experience in the areas of systems management, networking hardware, and software. He writes extensively and teaches IBM classes worldwide about IBM products. His focus has been primarily on storage and cloud computing for the last eight years. Vasfi is also an IBM Certified Senior IT Specialist, Project Management Professional (PMP), IT Infrastructure Library (ITIL) V2 Manager, and ITIL V3 Expert.

Hartmut Lonzer is the IBM FlashSystem Territory Account Manager for Germany (D), Austria (A), and Switzerland (CH) (DACH). Before this position, he was original equipment manufacturer (OEM) Alliance Manager for Lenovo in IBM Germany. He works at the IBM Germany headquarters in Ehningen. His main focus is on the IBM FlashSystem family and the SAN Volume Controller. His experience with the SAN Volume Controller and IBM FlashSystem products goes back to the beginning of these products. Hartmut has been with IBM in various technical and sales roles for 45 years.

Thanks to the following people for their contributions to this project:

Jerry D Baldock
Jeffrey Barnett
Mary J Connell
Robert Moon
IBM US

Iliana Garcia Espinosa
IBM Mexico

The team also would like to thank **Markus Standau** from IBM Germany, who is one of the authors of the previous edition of this book.

Now you can become a published author, too!

Here's an opportunity to spotlight your skills, grow your career, and become a published author—all at the same time! Join an ITSO residency project and help write a book in your area of expertise, while honing your experience using leading-edge technologies. Your efforts will help to increase product acceptance and customer satisfaction, as you expand your network of technical contacts and relationships. Residencies run from two to six weeks in length, and you can participate either in person or as a remote resident working from your home base.

Find out more about the residency program, browse the residency index, and apply online at:

ibm.com/redbooks/residencies.html

Stay connected to IBM Redbooks

- Look for us on LinkedIn:

  http://www.linkedin.com/groups?home=&gid=2130806

- Explore new IBM Redbooks® publications, residencies, and workshops with the IBM Redbooks weekly newsletter:

  https://www.redbooks.ibm.com/Redbooks.nsf/subscribe?OpenForm

- Stay current on recent Redbooks publications with RSS Feeds:

  http://www.redbooks.ibm.com/rss.html

Notices

This information was developed for products and services offered in the US. This material might be available from IBM in other languages. However, you may be required to own a copy of the product or product version in that language in order to access it.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:
IBM Director of Licensing, IBM Corporation, North Castle Drive, MD-NC119, Armonk, NY 10504-1785, US

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you provide in any way it believes appropriate without incurring any obligation to you.

The performance data and client examples cited are presented for illustrative purposes only. Actual performance results may vary depending on specific configurations and operating conditions.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to actual people or business enterprises is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at http://www.ibm.com/legal/copytrade.shtml

The following terms are trademarks or registered trademarks of International Business Machines Corporation, and might also be trademarks or registered trademarks in other countries.

DS8000®
Easy Tier®
FICON®
FlashCopy®
HyperSwap®
IBM®
IBM Cloud®
IBM FlashSystem®
IBM Power®
IBM Z®
Parallel Sysplex®
Redbooks®
Redbooks (logo)  ®
z15®

The following terms are trademarks of other companies:

ITIL is a Registered Trade Mark of AXELOS Limited.

Red Hat, OpenShift, are trademarks or registered trademarks of Red Hat, Inc. or its subsidiaries in the United States and other countries.

Other company, product, or service names may be trademarks or service marks of others.

REDP-5644-01

ISBN 0738461318

Printed in U.S.A.