## What is object storage?

[Object storage](https://www.ibm.com/cloud/learn/object-storage) is a system that divides data into separate, self-contained units that are re-stored in a flat environment, with all objects at the same level. There are no folders or sub-directories like those used with file storage. Additionally, object storage does not store all data together in a single file. Objects also contain metadata, which is information about the file that helps with processing and usability. Users can set the value for fixed-key metadata with object storage, or they can create both the key and value for custom metadata associated with an object.

## Pros and cons of object storage

### Pros

* Handles large amounts of unstructured data:
* Affordable consumption model:
* Unlimited scalability:
* Uses metadata:
* Advanced search capabilities: Object storage enables users to search for metadata, object contents and other properties.

### Cons

* Cannot lock files: All users with access to the cloud, network or hardware device can access the objects stored there.
* Slower performance than other storage types: The file format requires more processing time than file storage and block storage.
* Cannot modify a single portion of a file: Once an object is created, you cannot change the object; you can only recreate a new object.

## Use cases for object storage

* IoT data management:
* Email: Organizations that are required to store large volumes of emails for historical and compliance purposes
* Backup/recovery: Organizations often turn to object storage for their backup and recovery storage
* Video surveillance

## What is file storage?

[File storage](https://www.ibm.com/cloud/learn/file-storage) is when all the data is saved together in a single file with a file extension type that’s determined by the application used to create the file or file type, such as .jpg, .docx or .txt. For example, when you save a document on a corporate network or your computer’s hard drive, you are using file storage. Files may also be stored on a network-attached storage (NAS) device. These devices are specific to file storage, making it a faster option than general network servers. Other examples of file storage devices include cloud-based file storage systems, network drives, computer hard drives and flash drives.

## Pros and cons of file storage

### Pros

* Easy to access on a small scale:
* Familiar to most users:
* Users can manage their own files:
* Allows access rights/file sharing/file locking to be set at user level:

### Cons

* Challenging to manage and retrieve large numbers of files:
* Hard to work with unstructured data:
* Becomes expensive at large scales:

## Use cases for file storage

* Collaboration of documents: While it’s easy to collaborate on a single document with cloud storage or [Local Area Network (LAN)](https://www.ibm.com/cloud/learn/networking-a-complete-guide) file storage, users must create a versioning system or use versioning software to prevent overwriting each other’s changes.
* Backup and recovery: Cloud backup and external backup devices typically use file storage for creating copies of the latest versions of files.
* Archiving: Because of the ability to set permissions at a file level for sensitive data and the simplicity of management, many organizations use file storage for archiving documents for compliance or historical reasons.

## What is block storage?

[Block storage](https://www.ibm.com/cloud/learn/block-storage) is when the data is split into fixed blocks of data and then stored separately with unique identifiers. The blocks can be stored in different environments, such as one block in Windows and the rest in Linux. When a user retrieves a block, the storage system reassembles the blocks into a single unit. Block storage is the default storage for both hard disk drive and frequently updated data. You can store blocks on Storage Area Networks (SANs) or in cloud storage environments.

## Pros and cons of block storage.

### Pros

* Fast: When all blocks are stored locally or close together, block storage has a high performance with low latency for data retrieval, making it a common choice for business-critical data.
* Reliable: Because blocks are stored in self-contained units, block storage has a low fail rate.
* Easy to modify: Changing a block does not require creating a new block; instead, a new version is created.

### Cons

* Lack of metadata: Block storage does not contain metadata, making it less usable for unstructured data storage.
* Not searchable: Large volumes of block data quickly become unmanageable because of limited search capabilities.
* High cost: Purchasing additional block storage is expensive and often cost-prohibitive at a high scale.

## Use cases for block storage

* Databases: Because block storage has a high performance and is easily updatable, many organizations use it for transactional databases.
* Email servers: High performance and reliability make block storage a common solution for storing emails.
* Virtual machine file system (VMFS) volumes:

## What are the key differences between object storage, block storage and file storage?

When determining which type of storage to use for different types of data, consider the following:

* **Cost**: Because the costs involved with block and file storage are higher, many organizations choose object storage for high volumes of data.
* **Management ease:** The metadata and searchability make object storage a top choice for high volumes of data. File storage, with its hierarchical organization system, is more appropriate for lower volumes of data.
* **Volume:** Organizations with high volumes of data often choose object or block storage.
* **Retrievability:** Data is relatively retrievable from all three types of storage, though file and object storage are typically easier to access.
* **Handling of metadata:** Although file storage contains very basic metadata, information with extensive metadata is typically best served by object storage.
* **Data protection:** While the data is stored, its essential the data is protected from breaches and cybersecurity threats.
* **Storage use cases:** Each type of storage is most effective for different use cases and workflows. By understanding their specific needs, organizations can select the type that fits the majority of their storage use cases.