For cloud service providers and enterprises, the unrelenting growth of unstructured data creates major storage issues. Data such as user-generated photos, videos, e-mail, documents, and web content already occupy the bulk of storage capacity—and continue to expand by more than 50 percent annually.1

Today, both “hot” and “cold” data are stored in the cloud. Hot data is accessed frequently and requires very high-performance, low-latency solutions. Cold data, on the other hand, is accessed infrequently and can tolerate longer latencies. The challenge with vast amounts of unstructured information is to maintain the correct balance between cost and performance while making sure the data is always available.

Using storage solutions based on Intel® processors and networking, cloud service providers and enterprises can address these issues by building storage tiers optimized for specific cost, reliability, security, and performance requirements—including a highly cost-effective tier designed to handle massive quantities of unstructured data. This strategy efficiently delivers the right data to the right place at the right time.

High-performance Intel processors make it possible to apply compute-intensive techniques designed to minimize storage capacity requirements, which can reduce both acquisition and operational costs. Additionally, storage solutions based on Intel processors and networking components provide access to a mature, well-supported ecosystem of storage applications.

Intelligent Storage: Using Compute Performance to Reduce Cost and Protect Data

Intel® Xeon® processor-based storage delivers powerful compute performance and storage-optimized capabilities with high I/O throughput. This provides the flexibility to apply compute-intensive approaches designed to reduce storage costs and increase data protection and security. Storage applications can take advantage of hardware features within Intel processors that are specifically designed to accelerate data storage and retrieval. As a result, efficiency-enhancing intelligent storage techniques such as erasure code, data compression, thin provisioning, and data deduplication can easily be applied on the fly as needed. When coupled with Intel networking solutions, data is reliably and efficiently transported to and from application servers to the storage.
Distributed Storage Architecture

A distributed storage architecture based on industry-standard servers allows great flexibility in implementing cost-effective storage for unstructured data. An example, shown in Figure 1, is an object store built using Intel processor-based servers optimized for different roles as application servers, storage nodes, or metadata servers. Each server is configured with the optimum compute, I/O, and memory capacity for its specific role. As storage needs grow, customers can increase capacity simply by adding servers where needed.

Protecting Data

Intel processors support powerful data-protection mechanisms:

- **RAID and triple replication.** Legacy methods of protecting data such as RAID and triple replication can benefit from the broad ecosystem and performance of Intel processors. The scalability of Intel processors enables solutions to meet many price and performance needs.

- **Erasure code.** High-performance Intel processors support erasure code, an alternative to triple replication designed to increase storage efficiency. Data can be distributed across a data center and even between data centers, supporting disaster recovery.

- **Encryption.** To help protect data at rest, Intel processors include instructions that accelerate industry-standard data encryption and decryption using Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI).

![Figure 1. Cloud object store based on distributed storage architecture.](image)

When a user needs access to specific data, a request is generated on an application server. A metadata server determines where the object is physically located, and the object is retrieved from the corresponding storage node.

Figure 2. Intel® processor-based storage delivers the right data to the right place at the right time. Users generate vast amounts of unstructured information, and they want that information to be instantly available whenever they need it. This creates a critical need for a cost-effective, reliable, secure cloud storage tier optimized for unstructured data. Cloud providers, solution providers, and Intel collaborate closely to deliver an effective, affordable solution that can scale to meet rapidly expanding needs.

**Customer**

**Line of Business Users**

“I need last year’s financial presentations right now, not later today.”

**Line of Business Managers**

“My employees need immediate access to all data all the time—but I have a limited budget.”

**IT Data Center Manager**

100 TB combined storage requests from business groups

“I’m flooded with requests for more online storage capacity from my business groups. How can I quickly obtain a cost-effective, safe, scalable solution?”

As users generate large amounts of unstructured data—including photos, documents, presentations, videos, e-mails—IT has been forced to move old data to tape to save disk space and manage costs. But retrieving this data can take hours, causing business inefficiency and frustration for users who need immediate access to information to do their jobs. The company needs to find a secure, reliable online storage solution—fast and on a tight budget.
Cloud Service Provider
Cloud service providers (CSPs) win business by demonstrating they can deliver a highly cost-effective and reliable service that protects confidential customer data. To stay competitive and grow, cloud service providers must be able to build storage that is highly scalable at low cost. And to offer even more attractive services over time, cloud providers want to base services on trusted brands and the broadest set of industry-standard solutions.

Sales Representative
“How can I win and keep this customer's business while increasing our bottom line in a fiercely competitive cloud services market?”

Data Center Manager
100 PB combined storage requests from customers
“How can I quickly and cost-effectively add capacity to grow my business?”

Right Data, Right Place, Right Time.

Storage Solution Provider
Must offer storage that best meets cloud service providers' needs, based on trusted brands and industry-standard technology, with a mature ecosystem and the performance required to run intelligent storage applications.

Sales Specialist
“What is the best solution I can provide to meet this CSP's needs?”

Intel
With Intel processor-based storage, cloud service providers and enterprises have access to the industry's most mature ecosystem of proven networking and storage hardware and software solutions, including a broad range of applications for increasing storage efficiency and data protection.

Intel Representative
“Intel helps storage solution providers deliver the most cost-effective cloud solutions while keeping data safe.”
Reducing Storage Costs

With intelligent storage based on high-performance Intel processors, cloud service providers and enterprises can run applications designed to cut costs by reducing required capacity—without introducing performance bottlenecks. Applications can take advantage of instructions in the processor or source code libraries developed by Intel to accelerate storage functions, including:

- **Data deduplication.** Identifies redundant copies of data and reclaimed space.
- **Thin provisioning.** Increases utilization by over-allocating the available capacity. This works because people tend not to use all their allotted storage space.
- **Data compression and decompression.** Can be conducted on the fly, thanks to the performance of Intel processors, helping squeeze information into less disk space.

Storage Built with Standard Servers

Storage based on standard, high-volume servers has the opportunity to increase performance and flexibility while reducing costs. Storage systems can be built combining Intel processor-based standard servers and storage software. This creates highly distributed and highly scalable solutions that are a great fit for the cloud.

Mature Ecosystem and Support

Intel provides extensive pre- and post-sales support to providers designing Intel-based solutions. This includes reference designs for industry-standard storage and software-defined networking systems. Intel supports open-source initiatives such as the Ceph* and OpenStack Swift* object stores. The Intel® Cloud Builders program brings together industry leaders in systems and software solutions to provide practical guidance on how to deploy, maintain, and optimize cloud infrastructure.

Summary

With storage solutions built on Intel processors, cloud service providers and enterprises can deploy highly cost-effective storage to manage the unrelenting growth of unstructured data. Solutions for both hot and cold data are required in an effective cloud, and storage products built with Intel processors and networking components are ideal for both types of data. High-performance processors also enable customers to increase storage efficiency using compute-intensive techniques such as erasure code, data compression, thin provisioning, and data deduplication. Intel provides extensive support for the industry’s most mature ecosystem of proven storage hardware and software solutions, helping customers deliver the right data to the right place at the right time.