Storage Area Network

IV, II Sem

UNIT-1

Information is increasingly important in our daily lives. We have become information-dependent in the 21st century, living in an on-command, on-demand world, which means, we need information when and where it is required. We access the Internet every day to perform searches, participate in social networking, send and receive e-mails, share pictures and videos, and use scores of other applications.

When created, information resides locally on devices, such as cell phones, smartphones, tablets, cameras, and laptops. To be shared, this information needs to be uploaded to central data repositories (data centers) via networks.

Data centers now view information storage as one of their core elements,along with applications, databases, operating systems, and networks. Storage technology continues to evolve with technical advancements offering increas-ingly higher levels of availability, security, scalability, performance, integrity, capacity, and manageability.

1.1Information Storage

Data

Data is a collection of raw facts from which conclusions may be drawn. Handwritten letters, a printed book, a family photograph, a movie on video , printed and duly signed copies of mortgage papers, a bank's ledgers, and an account holder's passbooks are all examples of data.

Factors that have contributed to the growth of digital data;

- ➔ Increase in data Processing capabilities
- ➔ Lower cost of digital storage:
- ➔ Affordable and faster communication technology:
- ➔ Proliferation of applications and smart devices

Types of data

Data can be classified as structured or unstructured (see Figure 1-3) based on how it is stored and managed. Structured data is organized in rows and columns in a rigidly defined format so that applications can retrieve and process it efficiently. Structured data is typically stored using a database management system (DBMS).

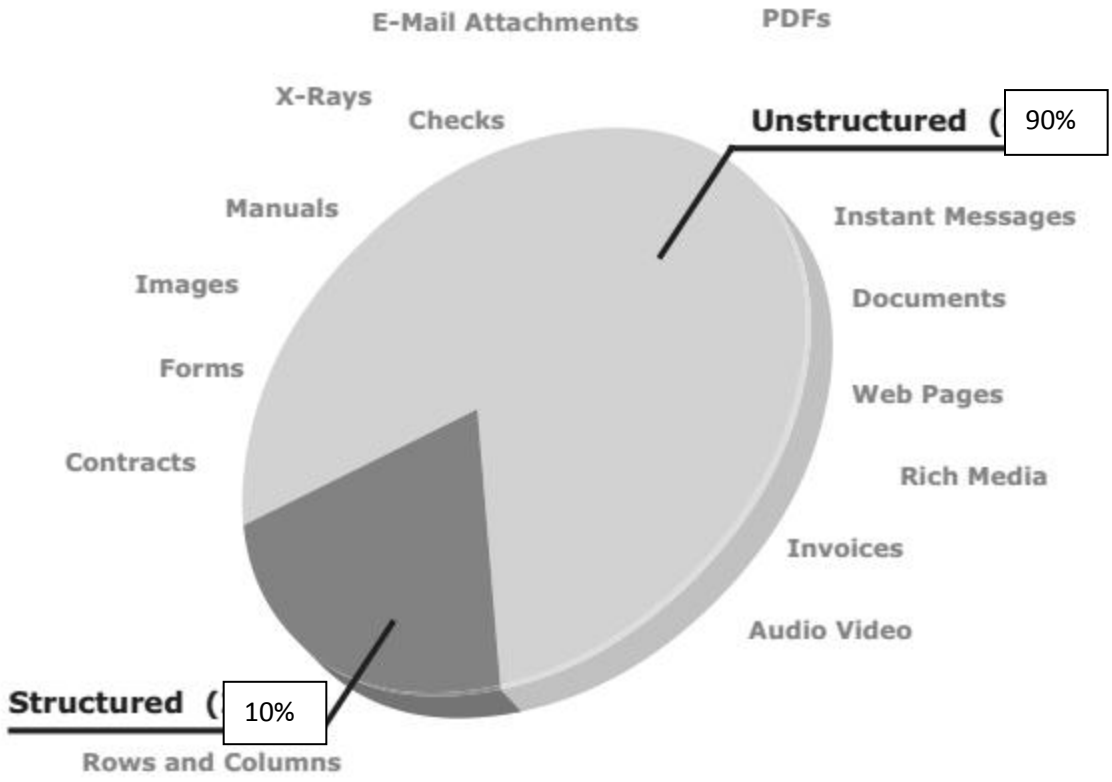


Figure 1-3: Types of data

Information

Data, whether structured or unstructured, does not fulfill any purpose for individuals or businesses unless it is presented in a meaningful form. Businesses need to analyze data for it to be of value. Information is the intelligence and knowledge derived from data.

Evolution of Storage architecture

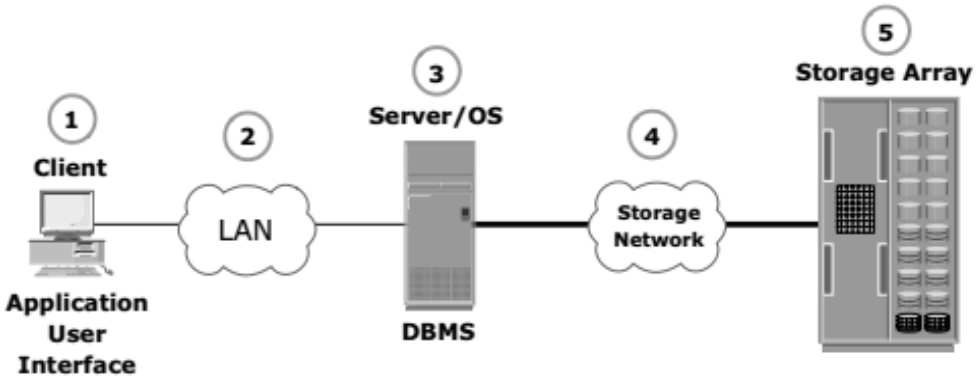
The proliferation of departmental servers in an enterprise resulted in unprotected, unmanaged, fragmented islands of information and increased operating cost. Originally, there were very limited policies and processes for managing these servers and the data created. To overcome these challenges, storage technology evolved from non-intelligent internal storage to intelligent networked storage .

→Redundant Array of Independent Disks (RAID):
→Direct-attached storage (DAS):
→Storage area network (SAN):
→Network-attached storage (NAS):
→Internet Protocol SAN (IP-SAN):

Data Center Infrastructure

Core Elements of a Data center

Application: An application is a computer program that provides thelogic for computing operations. Applications, such as an order processing system, can be layered on a database, which in turn uses operating system services to perform read/write operations to storage devices.
Database: More commonly, a database management system (DBMS) provides a structured way to store data in logically organized tables that are interrelated. A DBMS optimizes the storage and retrieval of data.
Host or Compute: A computing platform that runs applications and databases.
Network: A data path that facilitates communication between clients and servers or between servers and storage.
Storage: A device that stores data persistently for subsequent use.



1. A customer places an order through the AUI of the order processing application software located on the client computer.
2. The client connects to the server over the LAN and accesses the DBMS located on the server to update the relevant information such as the customer name, address, payment method, products ordered, and quantity ordered.
3. The DBMS uses the server operating system to read and write this data to the database located on physical disks in the storage array.
4. The Storage Network provides the communication link between the server and the storage array and transports the read or write commands between them.
5. The storage array, after receiving the read or write commands from the server, performs the necessary operations to store the data on physical disks.

Figure 1-5: Example of an order processing system

Key Requirements for Data Center Elements

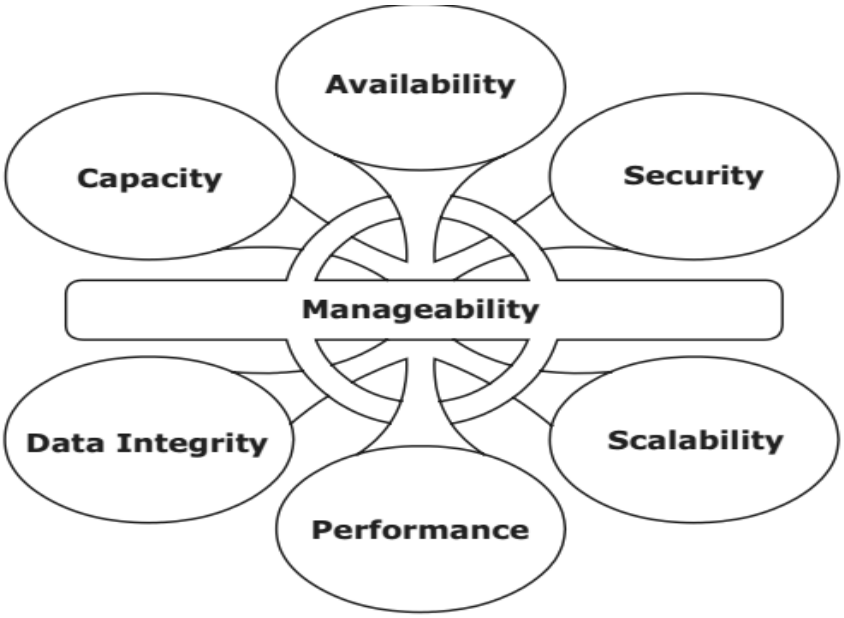


Figure 1-6: Key characteristics of data center elements

■Availability: All data center elements should be designed to ensure accessibility. The inability of users to access data can have a significant negative impact on a business.

■ Security: Polices, procedures, and proper integration of the data center core elements that will prevent unauthorized access to information must be established. In addition to the security measures for client access, specific mechanisms must enable servers to access only their allocated resources on storage arrays.

■ Scalability: Data center operations should be able to allocate additional processing capabilities or storage on demand, without interrupting business operations. Business growth often requires deploying more servers, new applications, and additional databases. The storage solution should be able to grow with the business.

■ Performance: All the core elements of the data center should be able to provide optimal performance and service all processing requests at high speed. The infrastructure should be able to support performance requirements.

■ Data integrity: Data integrity refers to mechanisms such as error correction codes or parity bits which ensure that data is written to disk exactly as it was received. Any variation in data during its retrieval implies corruption, which may affect the operations of the organization.

■ Capacity: Data center operations require adequate resources to store and process large amounts of data efficiently. When capacity requirements increase, the data center must be able to provide additional capacity with-out interrupting availability, or, at the very least, with minimal disruption. Capacity may be managed by reallocation of existing resources, rather than by adding new resources.

■ Manageability: A data center should perform all operations and activities in the most efficient manner. Manageability can be achieved through automation and the reduction of human (manual) intervention in common tasks.

Managing A Data Center

Managing a modern, complex data center involves many tasks. Key manage-ment activities include:

■ Monitoring is the continuous collection of information and the review of the entire data center infrastructure. The aspects of a data center that are monitored include security, performance, accessibility, and capacity.

■ Reporting is done periodically on resource performance, capacity, and utilization. Reporting tasks help to establish business justifications and chargeback of costs associated with data center operations.

■ Provisioning is the process of providing the hardware, software, and other resources needed to run a data center. Provisioning activities include capacity and resource planning. Capacity planning ensures that the user's and the application's future needs will be addressed in the most cost-effective and controlled manner. Resource planning is the process of evaluating and identifying required resources.