

## **IV. Современные информационные технологии и их применение**

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### **Применение информационных систем для хранения данных**

Статья рассказывает о развивающихся надежных технологиях хранения данных и информационных ресурсов, доступа к ним через сеть, а также о не менее важном аспекте – резервном копировании.

#### **Use of Information Systems for Data Storage**

Enterprises and business organizations strive to optimize existing business processes in order to improve control efficiency and minimize expenses. The most important assets are information availability and its relevance; these are the key factors of success in the competitive environment. This situation stimulates a large-scale development of data storage technologies.

The ultramodern data storage system ensures the reliable storage of information resources and access to them. The system includes disc arrays, access infrastructure and data storage control software systems.

##### **Network Data Storage**

The access infrastructure of data storage devices is responsible for the information being available for applications and final users. That is why this component of data storage systems shows the most dynamic development. Instead of the conventional direct connection of disc arrays to servers (i.e. DAS - Direct Attached Storage), a number of new and now widely used technologies appeared, which are based on the use of network as an infrastructure to access the data.

The SAN (Storage Area Network) technology uses a dedicated network based on the Fibre Channel protocol and exchanges data on the level of units.

The NAS (Network Attached Storage) devices are, in fact, specialized file servers. The NAS technology uses existing IP networks as transport and operates at the file level. The best option is to use SAN and NAS simultaneously, and the data access method will be defined depending on certain requirements [4].

The main advantages of the network storage are:

- high scaling. While the data volumes grow, the solution of scaling becomes of great importance as it allows to cut the cost of data storage;

- high performance. The application of the Fibre Channel protocol for the SAN technology (and the Gigabit Ethernet protocol for the NAS one) ensures high data exchange speed.

- high availability and reliability. The network architecture enables storage system component backup and elimination of a single point of failure;

- effective implementation of data migration procedures (backup, data replication, etc.); reduced loads on the main network (SAN) and on the computing complexes (SAN, NAS);

- long distance of information transmission and possibility to create distributed storage systems;

- possibility to control memory distribution and data storage device consolidation;

- possibility to access data from the heterogeneous environments [1].

Nowadays the main topology in the construction of SAN is FC\_SF – a switch fabric allowing the extension of addressability up to 16 million devices, the increase of data accessibility area dimensions, and the readiness of the whole storage network for operation.

With the continuing growth of the data volumes the use of SAN technology becomes the most economically feasible solution. Nowadays the cost of introducing a storage area network differs slightly from the cost of direct attached storages. Further high SAN scaling will allow to reduce the cost of information storage.

### **Data Replication**

Data replication ensures the implementation of a large number of tasks. The most relevant of them are the following:

- data backup – storing of a relevant information copy at the alternative storage devices;

- data separation – the possibility for several servers at once to change the distributed data set;
- data consolidation – copying data from the remote hosts to the central host;
- “follow-the-sun” technology – managing local data copies to ensure information support of the organization.

Data replication can be effected via the integrated software complex facilities; however, in this case the centralized replication process will be impossible. Moreover, data replication at the application level leads to additional loads on the server computing capacities. Special program replicators or data replication hardware facilities are used to eliminate these disadvantages.

Irrespective of the replication method one of two modes – synchronous or asynchronous – can be used. The synchronous replication mode ensures absolute data relevance but requires high performance of the communication infrastructure, for example, SAN [2].

### **Data Backup**

One of the effective means to prevent information losses that occur as a result of failures is mirroring. But the mirrored data cannot eliminate user errors – the initial cause of losses. Data backup copying allows to prevent losses both in case of software or hardware failures and in case of operators' errors.

When constructing backup copying and data recovery systems two tasks are solved:

- backup copying "gap" reduction (zero downtime);
- reduction of backup data copying traffic and computing resource cost.

The application downtime can be minimized with special methods such as snapshots. Snapshot is a shot of state and record of data location. Using this information, the data can be restored in case of loss or damage. Snapshot creation requires the application to stop but the downtime amounts to seconds.

With the application of the SAN architecture the processes of backup copying and data recovery can be arranged without local area network resources (LAN-free backup) and server resources (server-free backup). Moreover, the centralized data backup scheme reduces the number of devices (tape storage, etc.) participating in the process.

In the LAN-free backup the data are transported from the disc arrays inside the SAN to tape storages connected directly to the storage network.

In the server-free backup the data are transported from storage devices to tape storages not involving servers directly – the data exchange occurs between the storage devices inside the SAN at the data unit level but, if necessary, file-by-file data recovery is possible. The main advantage of server-free backup is a release of server computing resources [3].

In conclusion, massive amounts of digital information are with us today, and even more are being collected, at an ever-increasing rate. But this – and the technology described – is not the final goal: what matters is how we make good use of information and the technology around it to make better-informed decisions that improve our businesses and our lives.

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