ЕЛЕКТРОННІ ІНФОРМАЦІЙНІ РЕСУРСИ: СТВОРЕННЯ, ВИКОРИСТАННЯ, ДОСТУП

ЗБІРНИК МАТЕРІАЛІВ

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ЗМІСТ

Mobile app testing involves checking how it works on different devices, screen resolutions, and operating systems, as well as taking into account the specifics of each platform.

Usability testing of online stores allows you to determine the reasons for the low level of sales, at what stage users have difficulties interacting with the online store, and also to offer solutions for solving the identified problems.

Usability testing is a key element of software development, as it helps to identify problems and improve the product based on user needs. Using a variety of methods, from interface testing to global assessments, allows you to provide a more detailed and comprehensive understanding of your product's usability. Conducting usability testing helps development teams identify and resolve issues, improving the usability and satisfaction of the product. As a result, this can lead to increased sales, customer loyalty, and market success for your product.

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MODELS AND CRITERIA FOR THE EFFICIENCY OF NODES IN DISTRIBUTED SYSTEMS

Abstract: the work shows the relevance of distributed systems, where the basic definitions and concepts in this area are presented. Examples explain the structures that can include distributed systems and the nodes that make up such structures. Models and evaluation of node efficiency criteria in distributed systems are described, and examples of such models are given. The most important criteria for node efficiency in distributed systems are explained. Some fundamental aspects of assessing the efficiency of nodes in distributed systems using the performance bottlenecks metric are described.

Keywords: distributed system, efficiency models, efficiency criteria.

Relevance of using distributed systems

The use of distributed systems remains relevant and important for several reasons. Let us note the most significant of them.

Distributed systems allow you to scale calculations and data storage to large volumes. This is especially important in the context of the growing volume of data and the increasing load on modern information systems.

Distributed systems are designed to provide high fault tolerance and reliability. They can recover from failures and ensure uninterrupted operation automatically.

Distributed systems enable efficient use of resources by distributing workload and tasks across different nodes.

Cloud platforms, based on distributed systems, have become widely used to provide computing and storage resources on demand.

Distributed systems play an important role in processing data collected from many devices under the Internet of Things concept.

Processing and analyzing large volumes of data requires distributed systems that can efficiently process data across multiple nodes.

Distributed systems enable collaboration and data exchange between users and devices in real-time.

Distributed systems create web services and applications with low latency, which is important for interactive applications and streaming media.

Thus, distributed systems remain relevant and important in the modern world, as they solve several significant problems related to scalability, reliability, global connectivity, and resource efficiency.

Definitions and concepts

Distributed systems (or distributed computing) are computer systems in which computing resources and data are distributed across multiple nodes or computers that communicate through a network. These systems are designed to improve performance, scalability, fault tolerance, and availability of computing resources.

In distributed systems, each node can perform its own calculations and data processing, as well as exchange information with other nodes in the system. Such systems can be heterogeneous and include servers, workstations, mobile devices, and other equipment.

Distributed systems may include the following structures (Fig. 1).

Clusters and network of servers. Groups of servers work together to process large amounts of data or provide fault tolerance.

Cloud structures. Cloud platforms provide distributed computing resources and services over the Internet.

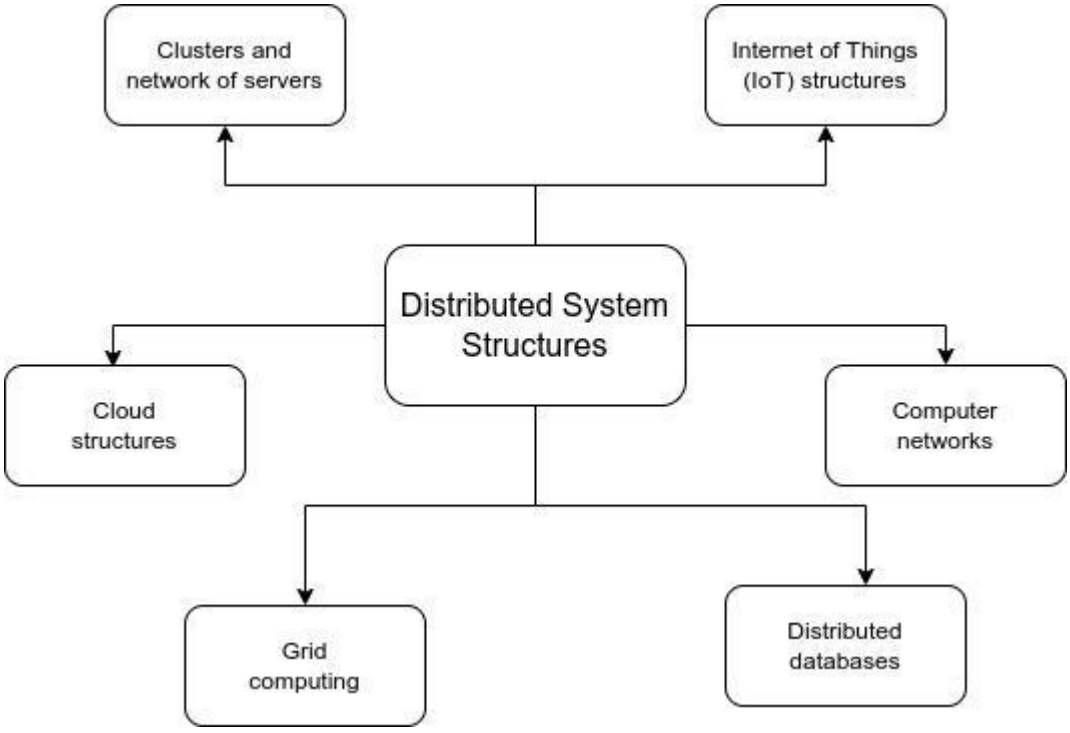

Figure 1 - Structures that may include distributed systems

Grid computing. We are using distributed resources from various sources to solve computing problems.

Distributed databases. Databases distributed across multiple servers to provide fault tolerance and increased performance.

Computer networks. Local area networks (LAN), wide area networks (Internet), and other networks that allow computers to exchange data and resources.

Internet of Things (IoT) structures. Systems that include many devices that collect and exchange data (for example, sensors in smart homes).

Distributed systems can present complex research and engineering design, management, and security challenges as they must consider network connectivity, data consistency, resource management, and many other aspects.

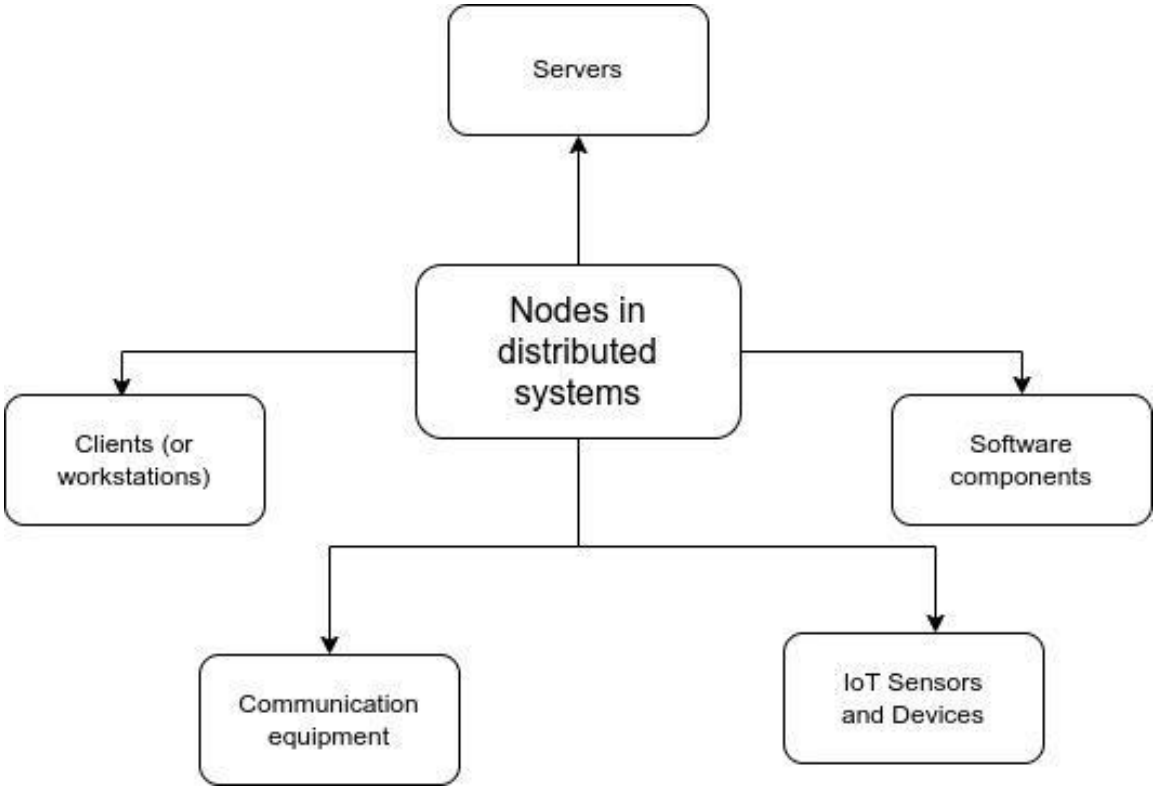

Figure 2 - Main components of distributed systems

In distributed systems, "nodes" (or "system nodes") are individual computers, servers, devices, or software components that form part of a given system and perform specific functions within that system. Nodes in distributed systems can have different roles and perform different tasks depending on the specific architecture and goals of the system. Let us give some examples of nodes in distributed systems (Fig. 2).

Servers, which are powerful computers, are the basis of nodes in distributed systems. They provide computing resources and services to clients or other nodes on the network. Servers can perform tasks such as data storage, query processing, web servers, databases, etc.

Clients (or workstations) are nodes that access servers or other resources on the system to perform specific tasks. They can be computers, mobile devices, or even other servers. Workstations typically perform user tasks such as processing data, creating documents, and interacting with users.

Communication equipment consists of nodes, which mainly include routers and switches. They mainly provide network connectivity between other nodes in the system.

IoT sensors and devices can also be nodes that collect data from the physical environment (e.g., temperature, humidity, motion) and transmit it to a distributed system for further processing.

In individual tasks, software components that perform autonomous tasks of monitoring, data processing, and interaction can be represented as nodes. This can be separate software (for example, services) that are part of the host's central operating system or separate virtual machines on which information is processed.

Nodes in distributed systems communicate with each other through the network, transmitting data, requests, and resources to perform tasks required by users. Governance, data consistency, security, and system resiliency are all important aspects in the design and operation of distributed systems, and they often depend on the roles and functions performed by different nodes.

Models and evaluation of node efficiency criteria in distributed systems

In distributed systems, the efficiency of nodes can be assessed using various models and metrics. Node performance criteria in distributed systems are a set of parameters and metrics used to measure and evaluate performance, reliability, security, and other characteristics. These criteria help determine how well the components perform their functions and how the system meets the requirements.

Evaluating the performance of nodes must consider the specific goals and requirements of the system. This helps determine how well the nodes are performing as expected and ensures the optimal functioning of the distributed system. Let's consider some key criteria and their assessment of the efficiency of nodes (Fig. 3).

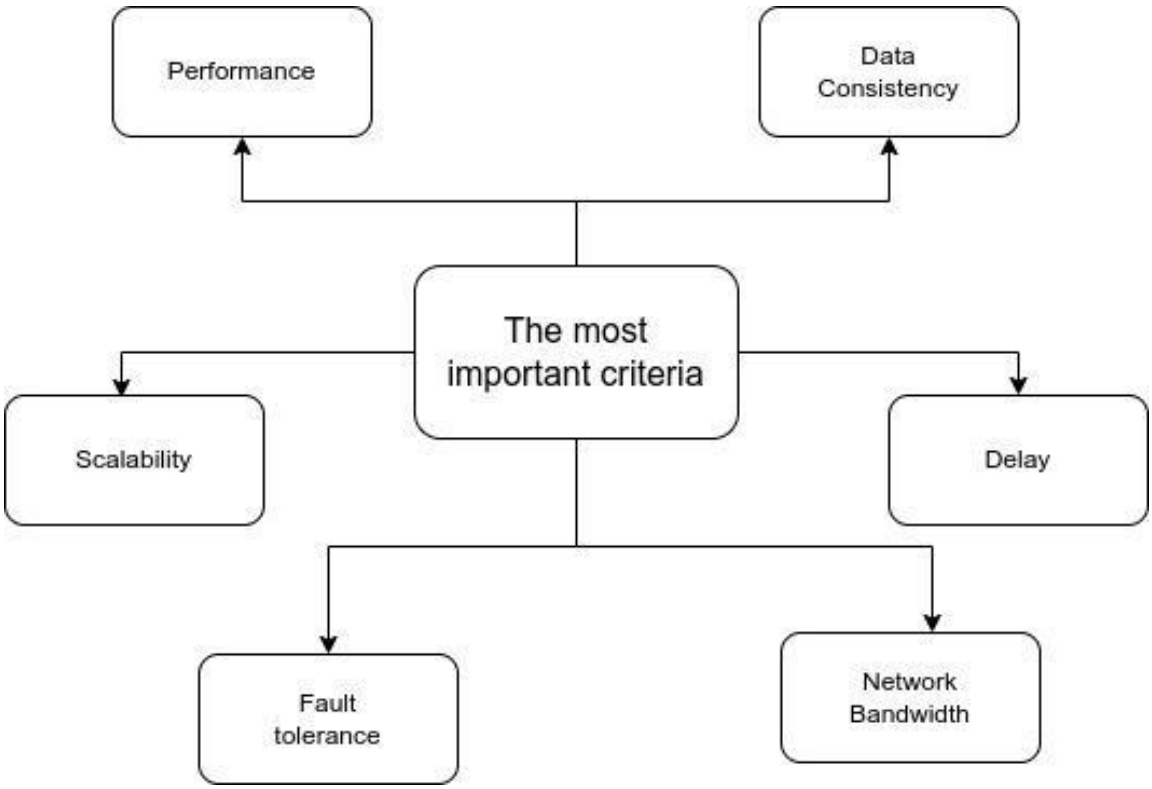

Figure 3 - The most important criteria for the efficiency of nodes in distributed systems

The efficiency of a node in a distributed system is measured by its ability to process data and perform calculations, which determines its productivity. High performance means that the node can process large volumes of work quickly.

Measuring the performance of nodes is done using benchmarks, which measure how many operations or tasks a node can perform in a given time. Monitor the load on the central processing unit (CPU), memory, and other resources on nodes to identify bottlenecks and bottlenecks.

Performance models evaluate a node's ability to perform computation and data processing per unit of time. Metrics include processing speed, number of operations completed, and throughput. For example, there are such well-known performance models. Task execution speed:

$$Per = 1/t,$$

where *Per* is productivity (number of tasks per unit of time),

t is the time it takes to complete one task.

Nodes in a distributed system must be able to scale as the load increases. This means the system must be able to add new nodes to increase performance and balance workloads quickly.

Measuring the system's ability to add new nodes and maintain an even load distribution among them is an important criterion. It is widely used in analyzing performance and latency changes as the number of nodes increases.

The scaling model evaluates the system's ability to support, increase, or decrease the number of nodes in a distributed system. Metrics include definitions of levels of parallelization, performance, and latency as the volume of computing or information resources changes. For example, we can give this scaling model. Increased performance when adding nodes:

$$S = T(N)/T(1),$$

where S is the scalability factor,

$T(N)$ - performance with N nodes,

$T(1)$ - performance with 1 node.

The efficiency of nodes is also related to their ability to continue operating in the event of failures or failures. Fault-tolerant nodes ensure system reliability and availability.

Fault tolerance is an important criterion when monitoring and analyzing a system's resilience and ability to recover from failures. A pressing issue in distributed system reliability is failure testing to determine how nodes respond to various failures.

The reliability model evaluates the ability of the node and the system as a whole to remain operational in the face of failures and failures. Metrics include mean time between failures (MTBF), mean time to recovery (MTTR), and availability of computing or information resources. For example, we can give this model of fault tolerance as follows:

$$A = MTBF/(MTBF + MTTR),$$

where A is availability,

$MTBF$ - average time between failures,

$MTTR$ - average recovery time.

In distributed systems, the efficiency of nodes depends on the bandwidth of the network through which they communicate. High bandwidth allows you to transfer data between nodes quickly.

Measuring network throughput using data transfer tests can help identify many problems in the operation of distributed systems. Therefore, monitoring network traffic allows you to identify bottlenecks and data losses effectively.

The throughput model estimates the amount of data that a node or system can transmit through a network per unit of time. Metrics include data transfer speed and network throughput. For example, we can give this throughput model as follows:

$$R = D/T,$$

where R is data transmission capacity,

D is the amount of data transferred during time T.

Network latency can have a significant impact on node efficiency, especially in applications that require fast response times. Low latency is desirable in reactive systems. Measuring the latency of data exchange between nodes is important for applications with strict time constraints and various real-time systems.

The latency model estimates the time required to transfer data between nodes and may include delays in processing and transmitting data. Metrics include average latency and maximum latency. For example, we can give this delay model as follows:

$$AL = L/R,$$

where AL is the average delay time,

AL is the total delay time,

N is the total number of observed delays.

The effectiveness of nodes depends on their ability to maintain consistency and compromise in the use of data in a distributed system to eliminate conflicts and information loss.

Evaluation of data consistency mechanisms is used to determine the effectiveness of transactions.

The data consistency model evaluates the ability of nodes and the system to maintain data consistency across distributed operations. Metrics include the level of transaction isolation and the degree of transaction consistency.

For example, we can give the following consistency model. The degree of transaction isolation can be assessed by ACID (Atomicity, Consistency, Isolation, Durability) standards.

Thus, the effectiveness of nodes usually depends on the specific requirements and goals of the distributed system. Assessing and managing node performance is an important part of the design and management of distributed systems.

Conclusions

The use of distributed systems remains relevant and important for several reasons. The main ones include scaling of calculations, high fault tolerance and reliability, efficient use of resources, efficient processing and analysis of large volumes of data, and the ability to work in real-time. Distributed systems can support complex research and engineering tasks in the design and control of various technological processes.

In distributed systems, the efficiency of nodes can be assessed using various models and metrics. Node performance criteria in distributed systems are a set of parameters and metrics used to measure and evaluate performance, reliability, security, and other characteristics. These criteria help determine how well the components perform their functions and how the system meets the requirements.

Evaluating the performance of nodes must consider the specific goals and requirements of the system. This helps determine how well the nodes are performing as expected and ensures the optimal functioning of the distributed system. The efficiency of a node in a distributed system is measured by its ability to process data and perform calculations, which determines its productivity. High performance means that the node can process large volumes of work quickly.

Nodes in a distributed system must be able to scale as the load increases. This means the system must be able to add new nodes to increase performance and balance workloads quickly.

Measuring the system's ability to add new nodes and maintain an even load distribution among them is an important criterion. It is widely used in analyzing performance and latency changes as the number of nodes increases.

Assessing the efficiency of nodes in distributed systems using performance bottlenecks is one of the important and standard methods for studying distributed systems. To understand and manage performance bottlenecks in distributed systems, there are several key aspects to consider, including estimates, temporal locality, and locality.

АНТОНЮК Р.І.,
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УПРАВЛІННЯ РОЗВИТКОМ ОРГАНІЗАЦІЙНОЇ КУЛЬТУРИ ОРГАНІВ ПУБЛІЧНОЇ ВЛАДИ В СУЧАСНИХ УМОВАХ ДЕРЖАВОТВОРЕННЯ

Ключові слова: публічне управління, організаційна культура, органи публічної влади.

Управління розвитком організаційної культури органів публічної влади сприяє модернізації чинної системи публічного управління; воно є необхідною умовою для формування інноваційної економіки і виступає основою динамічного економічного зростання та соціального розвитку суспільства, фактором добробуту громадян та безпеки країни.

Організаційна культура публічного управління є запорукою для постійного оновлення технологій, прискореного освоєння інновацій, швидкої адаптації до запитів і вимог світу, що швидко змінюється. Вона відкриває можливість здобуття якісних послуг публічного управління і продовжує залишатися однією з найбільш важливих життєвих цінностей громадян, вирішальним фактором соціальної справедливості та політичної стабільності.

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