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DIFFERENCES AND SCENARIOS OF USING INTERNET TRAFFIC BALANCING METHODS

Due to the ever-increasing amount of information transmitted through the worldwide Internet, it is far from always possible to process it using a single node. To solve this problem, we can create a set of nodes combined into a single information processing system - a cluster. However, with such a construction of information processing systems, a new problem arises – a correct distribution of

data between nodes is required in order to evenly distribute the load and optimize the performance of the whole system.

The most common balancing solutions are based on the principles of distributing the incoming data flow between nodes using routing, proxying, or marking network data packets. Some of these solutions are represented by freely distributed software products:

1. Keepalived: The server implements the vrrpd routing demon, which enables routing failover for a pair (or set) of routers (or LVS directors), and the keepalived demon, which sets up and does the health checking of virtual services in a Linux Virtual Server.

2. Haproxy: This is a free and open-source software that provides a high availability load balancer and reverse proxy for TCP and HTTP-based applications that spreads requests across multiple servers.

3. Nginx: This is a web server that can also be used as a reverse proxy, load balancer, mail proxy, and HTTP cache.

These solutions allow both at the low level of the TCP / IP protocol to route data between nodes and with the help of high-level distribution of packets by marking them. This can be done using various balancing algorithms, such as:

- Round Robin
- Weighted Round Robin
- Least Connection
- Weighted Least Connection
- Resource Based (Adaptive)
- Resource Based (SDN Adaptive)
- Fixed Weighting
- Weighted Response Time
- Source IP Hash
- URL Hash

The main advantage of low-level balancing with TCP/IP is a high level of performance with low hardware requirements. Reducing the network load on the balancer node due to the unidirectionality of the incoming data flow and the individual outgoing data flow for each node of the computing system. Immunity to the data type and its content due to the end-to-end transmission of requests to nodes. However, this method does not allow marking data and distributing it according to any internal rule. This type of balancing excludes the possibility of processing incoming information and, accordingly, performing encryption-decryption or controlling data transmission security.

Proxying, in contrast to routing, has several significant advantages, such as the ability to individually determine the data type at the input of the balancer, marking and distributing the load among various kinds of nodes according to a set of rules. However, with this approach, the data has a single exchange node, which

imposes significant requirements both on the organization of the network and on the hardware of the balancer's computing system.

The highest logical level of balancing allows you to partially process information packets at the input of the balancer and carry out their partial processing and verification before distribution between nodes. The main advantage of such a solution is the possibility of data type conversion and their corresponding distribution between different computing systems.

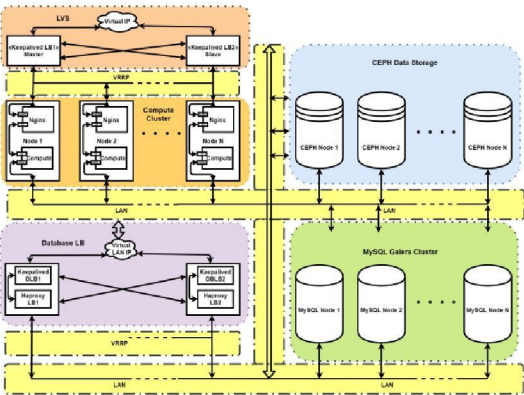


Figure 1 – Organization of a large computing cluster with a low and high level of balancing

All considered balancing systems are widely used in the modern world and are the leading solutions on the market. However, they cannot be interchanged and require an individual approach when designing a distributed computing system based on the type of data and methods for processing them.