



## TECHNOLOGY OF WORKING WITH CLUSTER TESTS IN RUSSIAN LESSONS

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### Abstract

The lecture discusses the problem of evaluating cluster performance, provides an overview of existing tests and talks about using tests to assess performance.

**Keywords:** queue, life cycle stage, cluster system, testing problem, test program, heapsort, communication environment, context switching, process creation, adaptability.

### Introduction

At the moment, it can be stated that the creation and use of multiprocessor (parallel) computing systems is the most important component of the development of computer technology. In turn, cluster computing systems make up a significant part of parallel computing systems and play an important role in connection with some of their inherent unique features: relatively low cost, comparative ease of deployment, the ability to gradually increase capacity while using "old" equipment, etc. In this regard, all major research centers and leading industrial enterprises either have or have plans to install parallel cluster-type computing systems.

### Testing Methods

In the previous section, we tried to prove that testing is absolutely necessary and its results are explicitly or indirectly used at all stages of the life cycle of a computing cluster system. Below are some of the requirements that must be met in order for tests to be used for their stated purposes.

**Completeness.** The test should evaluate only those parameters for which it was created. The returned results should be consistent, concise and easy to understand.

### Ease of Use

**Scalability.** The test should be available for a large number of hardware with different computing power.





**Portability.** The test should be available for a large number of different hardware architectures. The main feature of portability is the programming language, and, accordingly, the presence of a compiler for this platform.

**Representativeness.** Regardless of the platform, the test should load the system in the same way as the applications used by users. The results of tests with similar structure should be comparable.

**Availability.** The test must be available, including its source code. However, if the test is distributed with its source code, then the version and any changes made must be indicated when presenting the results.

**Reproducibility.** If necessary, it should be possible to repeat the test with similar results. For this, when publishing the results, it is necessary to provide comprehensive information about the software and hardware.

All test programs that meet the specified requirements (and there are many of them at the moment) can be classified as follows. Toy benchmarks are small, several hundred lines of source code. As a rule, such tests represent the solution of some well-known mathematical problem - quick sort or heapsort, shuffle, etc.

Microtests (microbenchmarks) - specialized, focused on determining one of the main quantitative characteristics of hardware - among the tested characteristics may be:

CPU performance;

Performance and bandwidth of local RAM;

The speed of basic operations;

Performance and bandwidth of the communication environment.

The effectiveness of practical training largely depends on the system of written and oral exercises. This system should provide for a phased learning, a certain sequence in the work on theoretical material, the ability to identify and correct the knowledge, skills and abilities of the student. This group includes tests that measure the performance of operations that require synchronization and tests for the operating system (context switching, system calls, and process creation). Microtests are often bundled into test suites.

These include: a) exercises aimed at teaching the student to distinguish between the studied facets, to detect them among other phenomena, to operate with ideas about the volume of study and use as a basis for the formation of concepts; b) exercises in operating concepts, generalizing accumulated knowledge, c) exercises that form the student's ability to freely and creatively use the entire fund of knowledge, independently acquire new knowledge and solve various practical problems.

Practical classes are usually held after a lecture, and students come to them with a certain baggage acquired at the lecture and in the course of studying the





recommended literature. This is enough for the student to start training exercises for processing the main provisions of the lecture. Grammatical analysis is a habitual way of working in practice. The benefits of this form of repetition and reinforcement of material, improvement of skills and abilities are quite obvious. Students get used to the parsing program, memorize the list of signs of the phenomenon and the order of their sequence, systematically referring to them. Ultimately, a stable stereotype of the analysis of grammatical facts is developed, which is so necessary for every language specialist. Speaking about grammatical analysis, it should be noted that it is necessary to conduct this type of exercise in all courses, in every practical lesson, regardless of the nature of the material being studied. Any phenomenon being studied is learned the better, the more often it appears to the student in new connections and relationships. In practical lessons in the Russian language, the studied forms and structures, as well as other phenomena of the language, are analyzed, compared with each other so that the student quickly learns to recognize and reproduce them. This important work should be supplemented by exercises in constructing, reconstructing the facts being studied.

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