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USING PARALLEL SERVICE TECHNIQUES TO CONTROL SYSTEM LOAD

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Abstract:

Objective. At the moment, remote service systems are being used more frequently to implement work and study activities. This calls for the accomplishment of activities including enhancing the fundamentals of remote systems using information and communication technologies, which are the system's constituents, picking the appropriate categories of services, and picking acceptable system-related hardware. Choosing appropriate service delivery techniques for distance education systems is a topic that is discussed in this article. Additionally, it was discovered that forming the system component using techniques appropriate for the service task could improve the service's quality and cut down on the amount of time needed to provide it.

Methods. This article uses threading, process and asynchronous programming methods of service provision. Also, the advantages of responding to requests by these methods were analyzed.

Results. As a result of the research, the dependence of the above service methods on the types of requests and the importance of their role in reducing the service time are stated.

Conclusion. In conclusion, it can be said that the use of service methods in service systems is not only important in the correct organization of services, but also in reducing the time of service requests. This is important for system users to be satisfied with the quality of service.

Keywords: remote service system, service methods, threading, processes, asynchronous programming, client-server system.

Introduction. These days, remote service solutions are always evolving. This is an opportunity to provide users with services that are more practical. In all spheres of business, including education, remote services are becoming more prevalent. This method has been progressively enhanced, particularly since the COVID-19 pandemic, and it has now developed into a distinct field of instruction. The number of its users is currently growing daily [10]. Typically, remote education uses information and communication technologies (ICTs) in all educational processes and enables users to engage in online training in the field of their choice regardless of location [10]–[11]. The demand for information and communication technologies is consequently increased significantly. To put it another way, choosing the right hardware for any remote service systems, setting up Internet connections, and choosing the right ways to handle user requests all play a crucial role in this. This is not achievable in remote systems since in the typical harvesting operations, all training sessions are planned in accordance with the training audiences. Because users participate in the educational process through a single system in convenient circumstances for themselves when the educational process is structured through remote platforms. This means that as a result of the increase in the number of users of the remote

system, the load on the dedicated service device for the system increases. Therefore, in the organization of such systems, it is appropriate to pre-estimate the probability of an increase in users, to determine the compatibility of the devices selected for the system with the number of users and the number of requests, and to choose service methods depending on the types of service.

Materials and methods. Currently, the system goes through the following processes as it responds to user requests: First, as remote systems take the form of web applications, the user logs in and creates a preliminary connection with the system by entering the system address in the browser. The next request to enter the system via permission is then sent. He identifies what function he is in and begins servicing the system in the sequence that relates to that position by providing the user's login and password to the system server as part of the authorization section of the request. The user makes multiple requests to the system in the following phases. In this situation, the user's requests might be for changing various settings, gaining access to other subject departments, using certain subject materials, taking part in various debates, uploading or downloading files, or performing control activities. The system creates an appropriate answer to the request based on the type of requests given to it. As part of the answer-formation process, the database is searched for the relevant data, which is then presented to the system's required areas. The address of the user who submitted the request will receive the data that was collected. The data sent must be in the format designed for the network, and it is compressed using a number of different sending philosophies and sending speeds. This implies that it is necessary to make the user's device usable once the response has reached it.

Additionally, the service device encounters the issue of an increase in response time to requests due to an increase in requests during the deployment of these activities. When serving requests, this results in the loss of some of them. Since incoming requests happen at random times and are only fulfilled when the service device is free, the theory of mass service states that requests are fulfilled when they are. The reason being that each user uses the equipment or software they require at a time that suits them. Aggregated procedures, waiting or conditional loss, and transparent loss can all be used to handle the flow of requests that users generate. Each request's service time is unique and assigned at random [1]. The number of requests in the system at the time the user sends a request, the number of requests in the queue, and whether or not service devices are busy are all represented by this value. The time it takes to respond to each request therefore relies on when it enters the system.

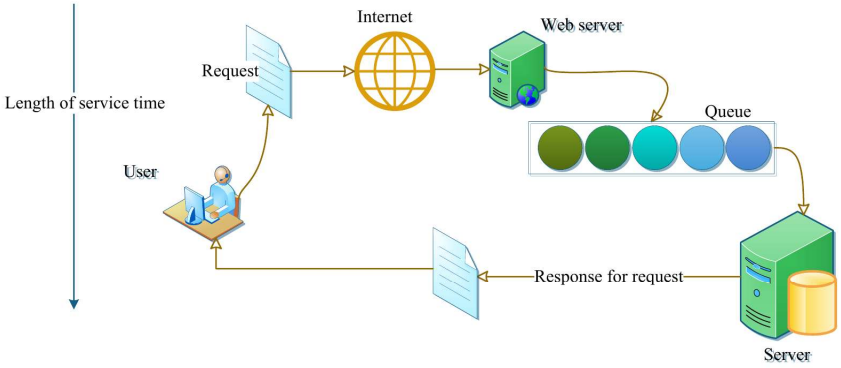


Figure 1. Service procedure for user requests

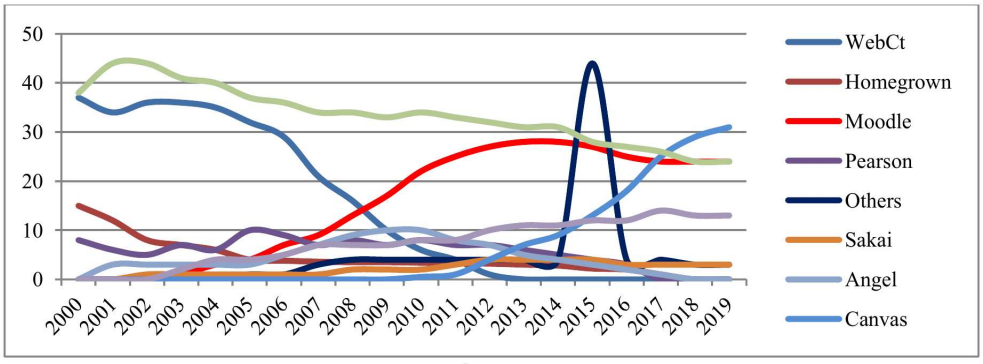
The service method, the speed at which the device responds to requests, and the speed of the Internet connection are some of the other elements that influence the service time. The usage of parallel service methods for requests is becoming common, and service methods are one of the key influencing variables in this context. Because remote systems are maintained one client at a time, the service provider and the typical turnaround time for requests directly affect how quickly a problem is resolved. In remote systems, several users can send requests and use the system simultaneously. According to [2] and [3], this condition results in an increase in service time and the system is unable to serve the customers as soon as they anticipate due to the rise in users or requests in the system. When this occurs, web servers employ load-management strategies that enable the parallel processing of many requests. Several approaches of controlling the load entering the system are now in use, and they are described below.

- Threading;
- Processes;
- Asynchronous programming.

While providing quick responses to user requests is essential, providing excellent service to multiple users simultaneously is also necessary in remote systems support. The foundation of a convenient service for system users is thus the construction of this component of the system based on the type of service that is appropriate for them, depending on the types of services in the system [4]. As a result, even when the system is under a heavy demand, user requests can be processed quickly and effectively [5, 8, 12].

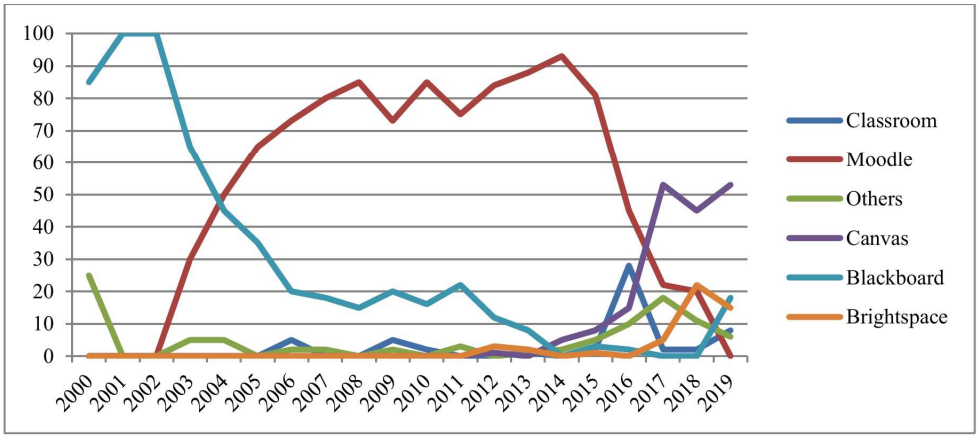
The system's service device is also the most crucial element in how quickly requests are fulfilled, and whether or not it is enough for the load on the system has a direct impact on how quickly requests are fulfilled. This therefore causes a variety of delays, including the inability to fulfill requests. This in turn has an impact on where various mistakes originate, whether information is lost throughout the updating process, and, of course, how quickly and well services are given in response to user requests. Users have noticed that server overloading and failure are the two most prevalent issues with the system server. These issues are some of the ones that are currently being watched the most.

Analysis using remote systems. Additionally, a lot of remote learning organizations exist today in the sphere of education, and the indications of their use have altered as a result of their growth and the aforementioned issues. [9] (Fig. 2).



a)

Application of distance learning platforms in North American education



b) Application of distance learning platforms in European education

Figure 2. The indicator of the use of distance education platforms by years

As was already established, the systems' responsiveness and level of user assistance are seen as the primary causes in this situation. These systems are being employed extensively throughout all educational institutions and help to advance the distant learning process. Because it offers its services for free, many organizations increasingly heavily rely on the Moodle system in particular. For example, TST University has developed its own style of distance learning and uses the Moodle platform to build learning processes. There are more and more signs that it is being used. If we simply consider the time of the 2021–2022 academic year, we can observe that the following was the indicator of its use (Fig. 3).

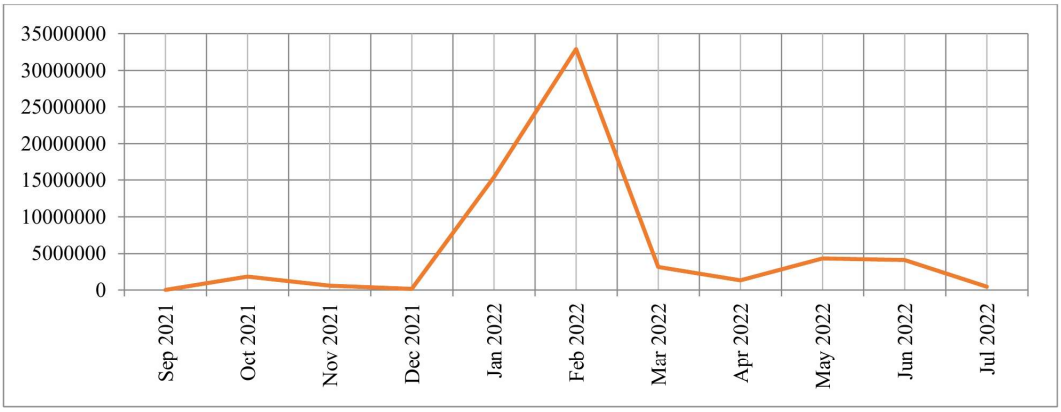


Figure 3. Indicator of the number of requests in the 2021-2022 academic year

Additionally, it should be emphasized that the peak period for these requests was during the students' exam times, when they were most frequently noticed. This in turn affected the lengthening of the response time to requests and the accomplishment of the desired results from controls. The rate of requests lost during this time was as follows (Fig. 4).

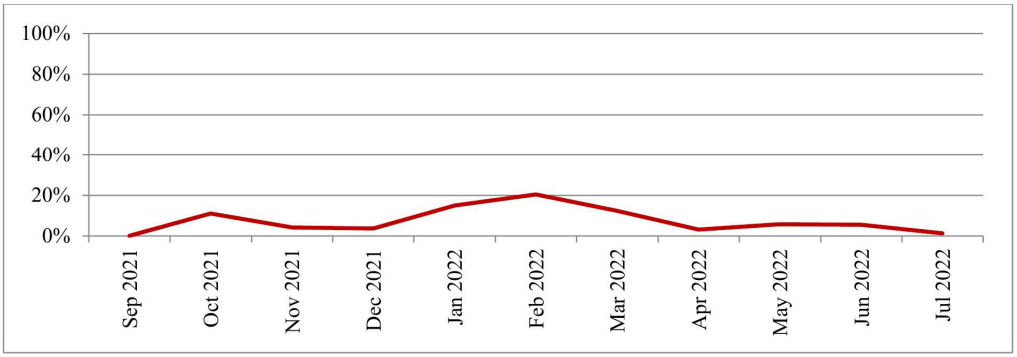


Figure 4. Query loss rate

Service provision methods. The approaches for service parallelization discussed above are frequently employed to solve this service time issue. The following operating principles underlie these approaches, which are chosen depending on the services they provide:

Working with high-load systems often involves threading. This technique will also make it feasible to put the web server in parallel operating mode, which will increase the workload on the server. Typically, web servers process incoming requests one at a time, responding to the previous request before serving the subsequent one [5]. In addition, threading allows the web server to generate a distinct thread for each request as soon as it detects one coming to the system and attach that request to that thread when it really arrives at the system. This request will be handled by a thread, which will also produce the response and transmit it to the user. As a result, the web server will be able to handle more requests while providing faster service to fewer consumers [4], [5] (Fig. 5).

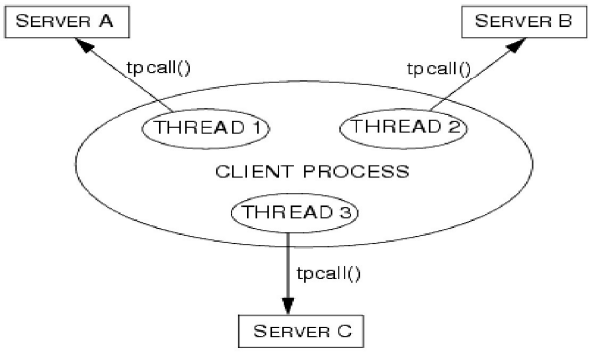


Figure 5. Serving requests in a threading manner

Similar to threading, processes allow you to reply to requests simultaneously. But process, in contrast to threading, has a broader definition. In other words, the process is a way to achieve parallelism in the handling of requests, where each request may be handled by one or more threads. A process is also seen as one that has the ability to operate independently within the system and provide responses to requests by allocating the incoming requests to its thread(s) [4]. This plays a significant role in speeding up request responses.

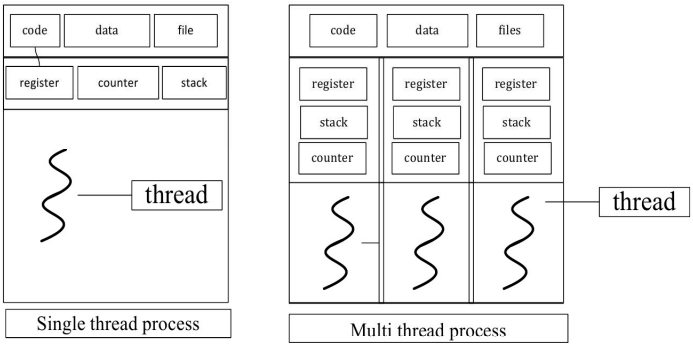


Figure 6. Service requests in the process method

Another popular method for handling requests is asynchronous programming. Asynchronous programming is typically used to increase service delivery and boost system performance [1], [6]. The asynchronous programming technologies listed below are used to do this:

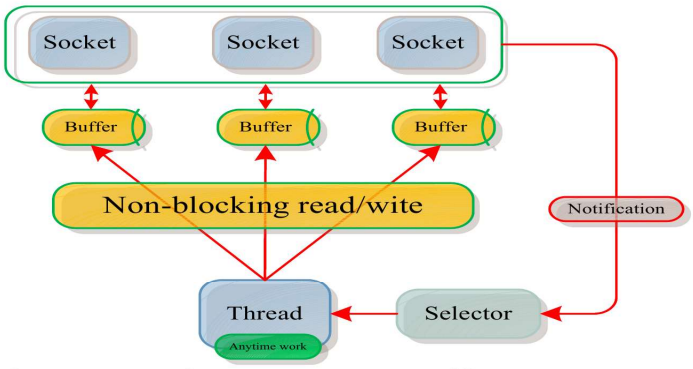


Figure 7. Operation of a non-blocking I/O asynchronous system

- Web servers may handle many requests without preventing the completion of other tasks by using input-output operations (non-blocking input and output) [7]. Additionally, it enables the system to accept additional requests before concluding one request's response.
- A system is continually run using an event-driven architectural paradigm based on various circumstances. The request arrival rate, request response approximation, and time-based versions of this model all make extensive use of it [6], [8]. This in turn helps to handle requests as they enter the system, preventing a number of pauses brought on by requests.
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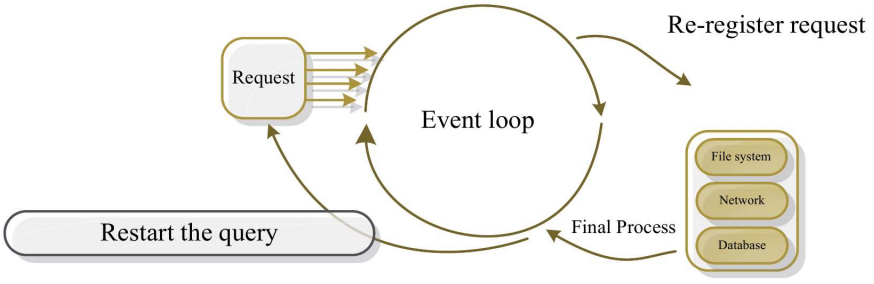

Figure 8. Process of event-driven architecture system

Results. Appropriateness of service delivery techniques for various service kinds Every one of these service delivery techniques is typically applied in every system. In this instance, service methods are chosen in accordance with the task carried out by a system component. The efficiency of the service delivery techniques is crucial in this situation. A distance learning platform is an illustration of a multi-functional remote service system. These systems offer customers a wide range of services, including the ability to participate in video conferences, work with files, ensure data synchronization between the user and server sides, and perform inspections. The methods used by service organizations to handle various requests are not the ideal, though. As a result, a different service technique is chosen for each kind of service.

As a result, it is feasible to speed up the process of serving requests while also handling more of them. As a result, it becomes possible to handle additional requests without switching out system components.

Conclusion. In remote systems service, while requiring fast service to user requests, it also requires quality service to many users at the same time. This is related to several factors, including the service method, the speed of the device's response to requests, and the speed of the Internet connection. Therefore, the formation of this part of the system based on the type of service that is suitable for them, depending on the types of services in the system, is the basis of convenient service for system users, which in turn leads to a reduction in the speed of responding to requests. This serves as the foundation for quickly responding to user queries even when the system is under a heavy load. Knowing which types of services are appropriate for which types of services is crucial for this. Additionally, choosing the right devices for the system and organizing its operating principles correctly will result in high-quality service for a long period.

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DEVELOPMENT OF EFFICIENT CHAIN TRANSMISSION CONSTRUCTION BASED ON ANALYSIS OF CONSTRUCTIVE CHARACTERISTICS OF CHAIN DRIVES OF TECHNOLOGICAL MACHINES

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Abstract. In the article, the constructions of roller chain transmissions with a new composition, which work smoothly, have high durability, and have a longer service life, are developed for the drives of technological machines for the production of oil from plants. It is proposed to use the proposed extension structures in the handling of the seed distribution drum in the hopper.

Keywords. Chain, drive, sprocket, transmission, leader, driven, tension, roller, roller, inner ring, outer ring, ring, component, belt, pulley, impact forces, noise, flat.

Introduction. In Uzbekistan, since ancient times, vegetable oil has been extracted from the seeds of sesame, flax, indow, safflower, cottonseed, and poliza crops in oil mills. Comprehensive measures are being implemented in our republic to modernize and re-equip plant oil plants, to increase the profitability of production and processing of oil products, and at the same time, the competitiveness of manufactured products. In the direction of the conducted research, the task of improving the operation of oil-producing technological machines and the development of effective resource-efficient transmission structures was set.

Analysis of supply drum management. The seed chamber is served by a feeder of a special construction with mechanisms that increase or decrease the seed depending on the density of the seed bed during the linting period to distribute the seeds evenly. Figure 1 shows the overview and kinematic scheme of the seed distribution device in the bunker.

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