Construction of Cloud information Technologies for Optimization of Technological Process of Restoration and Strengthening of Surfaces of Parts

In the given work the problem of optimization of the technological process of restoration and strengthening of surfaces of parts is considered in the conditions of flexible change of parameters of carrying out of technological operations. To do this, we need to develop an appropriate information technology in the form of a recommendation system that allows you to choose an optimized chain of technological processes, which in turn allows you to implement the technological process of recovery and strengthening of parts surfaces in accordance with the given criteria. Proceeding from the widespread distribution of the Internet, and its application in modern production, this technology is offered in the form of cloud service. The subject of the study in the article is the cloud information technology optimizing the technological process of recovery and strengthening of parts surfaces. The purpose of the work, respectively, is to build a cloud information technology optimizing the technological process of recovery and strengthening the surfaces of parts with specified characteristics based on a combination of several technological processes. For this purpose, the following set of tasks was solved in this work: an overview of known expert systems of optimization of the technological process and their reduction to an abstract view was carried out; for this purpose, information movement was introduced in the expert system of optimization of technological processes, which was based on the analysis of the process of electric arc spraying; formalized subsets of abstract expert systems for optimizing the technological process; formalized recommendation systems for optimization of the technological process chain, as an add-on of the expert system over the expert systems of individual technological processes. The results of work are the information technology of optimization of the technological process of restoration and strengthening of parts surfaces as a cloud service. Conclusions: in the whole, the information technology of solving the problem of constructing an optimized chain of technological processes of restoration and strengthening of surfaces of shafts, with the choice of a more optimal process among alternatives, in the form of cloud service is proposed.

information technologies, expert systems, restoration, strengthening, detail, technological process

Одержано (Received) 08.02.2019 *Прорецензовано (Reviewed) 10.04.2019*
Прийнято до друку (Approved) 04.06.2019

УДК 004.7:658.5.011 DOI: https://doi.org/10.32515/2664-262X.2019.1(32).194-201

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To substantiate the principle of building local computer networks

The article considers the basic principles of the construction of local computer networks. Described is a peer-to-peer local computer network based on Fast Ethernet technology, its purpose, basic parameters and operating principles, as well as the necessary hardware and software.

local computer network, topology, switch, workstation, network traffic

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К обоснованию принципа построения современных локальных компьютерных сетей

В статье рассмотрены основные принципы построения локальных компьютерных сетей. Описана одноранговая локальная компьютерная сеть на основе технології Fast Ethernet, ее назначение, основные параметры и принципы работы, а также необходимое аппаратное и програмное обеспечение.

локальная компьютерная сеть, топологія, комутатор, рабочая станция, сетевой трафик

Statement of the problem. It is generally known that the Local Computer Network (LCN) is a collection of computers connected by communication lines that provides network users with the potential for sharing resources of all computers. On the other hand, more simply, a computer network is a set of computers and different devices that provide information exchange between computers on the network without the use of any intermediate media. It is also possible to attribute that, the main purpose of computer networks is the sharing of resources and the implementation of interactive communication both within the same firm, and beyond its borders [1].

Setting objectives. In previously written works devoted to computer technology, the focus was on reliability issues [2-4]. However, now attention should also be paid to principle of building local computer networks.

The purpose of writing an article is the need to develop a local computer network, to identify and substantiate the hardware and software system of the system and subsystems of workplaces, to bring the order of their adjustment. Provide protection for the program part and databases of the network, connecting to the Internet. The software and hardware of the network must meet the needs.

Presenting main material. The main purpose of computer networks is the sharing of resources and the implementation of interactive communication. Since the inception of local networks, they have constantly improved, expanded their capabilities in accordance with the standards with which they operate. This has led to the emergence of different types of networks that differ in certain ways. Let's look at some of them.

The Ethernet network is simple, reliable, cheap and efficient, has high data transfer speeds and has become the most widespread one. In some developments, Ethernet adapters are integrated into the motherboard. The first versions are for coaxial cable. Today, this network is described in standards 802.3 and 82, which can also use twisted pair and fiber. There are several types of cable connections, they are labeled as follows: NNN Base-XX. The first figures characterize the transmission rate, Mbit / s, the XX characters - the maximum length of the segment in hundreds of meters or the medium of transmission, Base is a direct unmodulated transmission. Ethernet network usually consists of several bus segments, connected by means of hubs. The Ethernet network has become the basis for the creation of new high-speed networks, such as Fast Ethernet and Gigabit Ethernet. Fast Ethernet uses a pair of different categories of wires or fiber optic and hubs. Coaxial cables are not supported. The distance between the hubs should not exceed 100 m. You can attach an unlimited number of segments to the network. The maximum distance between the two stations in the network is 210 m. There can be no more than two repeaters between the workstations. The properties of the network depend on the type of cable used. Network speed 100 Mbps. Works with standard 802.3u. In July 1996, the engineering team began developing a standard at a rate of 1000 Mbit / s. The Gigabit Ethernet 802.3z standard was approved in 1998. Fiber optic cable and twisted pair can be used. The length of the segment for multimode cable is 500 m, for single mode - 2000 m. Depending on the application area, specifications for coaxial cables and twisted pair are separately defined. In this network, full-duplex repeaters are used, the minimum packet length is increased from 64 to 512 bytes, and the maximum is from 1500 to 9000 bytes.

Token Ring is a circular topology network (Fig. 1), developed by the Swedish engineer Olaf Sodbalom in the 1960s. Patented in 1981. Today, there are two variants of this network - with transmission rates of 4, 16 and 100 Mbps. . An option is also developed for 1000Mbps. The owner and developer of Token Ring is IBM. Compared to the Ethernet network, Token Ring ranks second in use. Token Ring is much more complicated than Ethernet, both technically and with algorithms and operating procedures. Token Ring adapters are three to five times more expensive than Ethernet adapters. At the same time, it has advantages, in

particular, it works more efficiently at high loads (in this case, Ethernet uses up to 30-40% of the nominal bandwidth, and Token Ring - 90%).

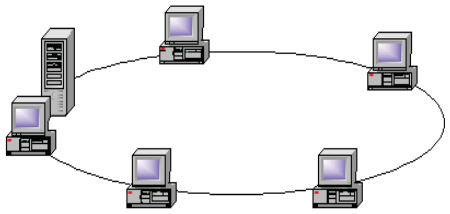

Figure 1 - Example of a typical Token Ring network ring topology
Original source: [1]

Token Ring has a marker access method implemented. Marker is a triple-ring circle ring. The station receiving this frame removes it from the network and transmits its information frame, which makes a full circle and returns to the station that transmitted it. This station removes the information frame from the network and passes the marker.

This network distinguishes between regular and irregular errors. Irregular error is an unstable error that temporarily disrupts the ring. If the station detects regular errors, the station repeats the data transfer, if, after 8 repetitions, the error does not disappear, the frame is temporarily removed from the network and is testing. If during the test errors are found then the frame is eliminated. The network goes into normal operation

ArcNet is a marker locale of a star (Figure 2a) or a bus (Figure 2b) of the topology developed by Datapoint in the early 70's of the 20th century. It uses the marker access method with the formation of a logical ring and the transmission of a special frame marker that gives permission to transmit. ArcNet's specification describes not only the access method, but also the electrical characteristics of the network. The speed of data transmission reaches 2.5 Mbps. The frame length is 508 bytes.

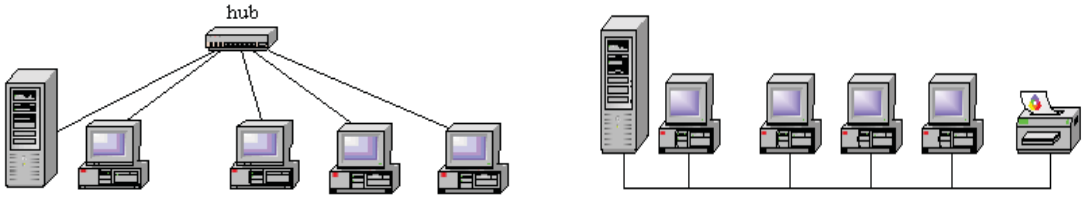

Figure 2 - An example marker local network ArcNet star (Figure 2a) or bus (Figure 2b) topology
Original source: [1]

ArcNet has two topologies: distributed star and bus. The most common topology is the star. Workstations in such a network are connected to hubs that can be active or passive. Active concentrators amplify the signal, have an external power supply.

You can connect up to eight stations at a distance of up to 600 m. Passive concentrator only ramps signals. You can connect only four stations at a distance of 30m.

The cost of ArcNet network adapters depends on network topology. Star topology adapters are much cheaper than Ethernet adapters and three times cheaper than Token Ring adapters. ArcNet is not only the cheapest but has the most flexible and easiest-to-use technology. A disadvantage can be considered a biased mechanism for the interaction of nodes (initially requested transmission. If the receiver agrees, there is a transfer. Each transmission is individually confirmed). However, despite the emergence of the ArcNet Plus network at a transmission rate of 20 Mbps, an increase in the maximum frame size from 516 to 4224 bytes, it is gradually replacing the Ethernet network.

The FDDI (Fiber Distributed Data Interfase) standard is one of the promising solutions supported by major PC makers. In terms of topology, the FDDI network (Figure 3) is a double-fiber optic ring (the second ring is back-up). The speed of information transmission in it is 100 Mbps. Each ring has a length of up to 200 km . Separate nodes of the network can not be separated from each other at a distance of 2.5 km. The maximum number of network stations is 1000. The FDDI networks are considered as transitions between LM and city networks. The main medium of FDDI transmission is fiber optic cables. At the same time there are developments of this network for copper wire. Maximum transmission distance is 100m. You can use both shielded and not shielded twisted pair. The FDDI network uses a 4V5B encoding scheme that encodes 4-bit data combinations in 5-bit light pulse combinations. The marker in this network is transmitted as soon as the station frame is transferred, without waiting for the frame to be returned by the ring.

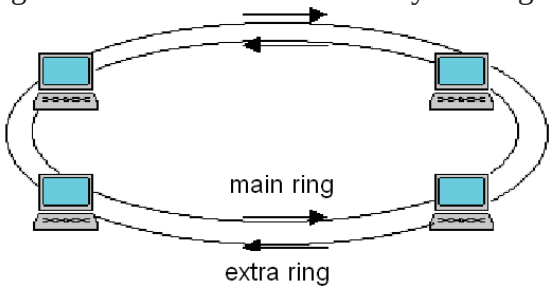

Figure 3 - Ring topology with double fiber optic ring

Original source: [1]

ATM (Asynchronous Transfer Mode) technology is used both in local and global networks. The basic idea is to transfer digital, voice and multimedia data over the same channels. Strictly speaking, there is no solid standard for ATM equipment. Initially, the speed of transmission was 155 Mbps (for desktop systems - 25 Mbps), then - 662 Mbps, and now work is underway to speed up to 2488 Mbps. At ATM speed, it successfully competes with Gigabit Ethernet. By the way, ATM appeared earlier than Gigabit Ethernet. As a medium for transmitting information in a local area network, ATM technology involves the use of an optical fiber cable and an unshielded twisted pair.

Structuring IP network. An IP address is the identifier (unique numeric number) of the network layer used to address computers or devices in networks that are built using TCP/IP.

The IP address consists of four 8-bit numbers, called octets. An example of an IP address can be the address 127.0.0.1 (Local IP address, it is impossible to change, and it is on each OS only one / Localhost).

The IP address consists of two parts [5]: the network number and the hostname. In the case of an isolated network, its address may be chosen by the administrator from addresses specially reserved for such networks (10.0.0.0 / 8, 172.16.0.0/12 or 192.168.0.0/16). If the network should work as an integral part of the Internet, then the network address is provided by the provider or regional Internet Registry (RIR).

The host number in the IP protocol is assigned regardless of the local host address. The router is defined by several networks at once. Therefore, each port of the router has its own IP address. The end node may also be included in multiple IP networks. In this case, the computer must have multiple IP addresses, according to the number of network connections. Thus, an IP address is not a separate computer or router, but one network connection.

Depending on the size of the network, the number of addresses may be larger or smaller. There are several classes of networks for different needs, which depend on the maximum number of addresses for hosts.

Class A: Includes networks from 1.0.0.0 to 127.0.0.0. The network number is in the first octet. This provides a 24-bit bit to indicate hosts. Allows use of approximately 16 million hosts on the network.

Class B: accommodates networks from 128.0.0.0 to 191.255.0.0; The network number is in the first two octets. Counts 16320 networks with 65024 hosts in each.

Class C: Network range from 192.0.0.0 to 223.255.255.0; network number - the first three octets. There are about 2 million networks with 254 hosts in each.

Class D, E, and F: addresses falling within the range from 224.0.0.0 to 254.0.0.0 are either experimental, or stored for future use and do not describe any network.

An example of an IP class scheme is shown in Fig. 4

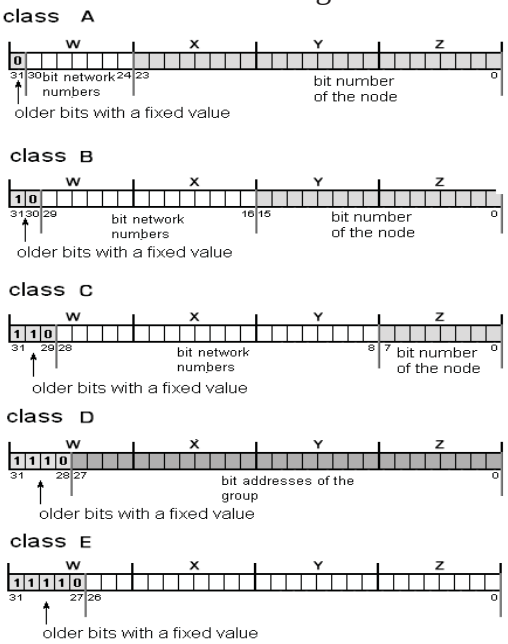

Figure 4 - Schematic of IP address classes

Original source: [5]

For the local network of the school's natural-mathematical cycle, the class of IP-addresses of the school was chosen. This class is most commonly used and used for such tasks. Accordingly, all IP-addressed personal computers were installed (Table 1).

Table 1 – IP addresses assigned to personal computers

Type	Category	Length, m	Endpoints		Subnet mask	IP address mode
			Beginning	End		
UTP	5	2	PC1	Patch panel	255.255.255.0	192.168.1.1
UTP	5	8	PC2	Patch panel	255.255.255.0	192.168.1.2
UTP	5	10	PC3	Patch panel	255.255.255.0	192.168.1.3
UTP	5	12	PC4	Patch panel	255.255.255.0	192.168.1.4
UTP	5	14	PC5	Patch panel	255.255.255.0	192.168.1.5
UTP	5	16	PC6	Patch panel	255.255.255.0	192.168.1.6
UTP	5	18	PC7	Patch panel	255.255.255.0	192.168.1.7
UTP	5	20	PC8	Patch panel	255.255.255.0	192.168.1.8
Tatal		100				

Original source: developed by the author

Calculation of the cabling system. There are two ways to calculate the required number of cable products to create LCNs.

First, we calculate the pre-requisite for copper UTP5e cable to create LCN. To do this, determine the cable that has the largest length (L_{max}) and the length of the smallest cable (L_{min}), the total number of cables in the pre-selection version is determined by the expression:

$$L_{tot.pr} = \left[\left(L_{\max} + L_{\min}\right)/2\right] \times N \times k, \quad (1)$$

where $L_{tot.pr}$. – total pretensional length of copper cable in meter;
L_{max} – the length of the longest cable LKM in (*m*) $L40 = 20m$;
L_{min} – the length of the smallest cable in (*m*) $L25 = 2m$;
N – total number of cables in LCN, 8pcs;
k – the factor of the stock is selected within the limits of 1,2 ... 1,6.

We substitute in the formula (1) the value and compute:

$$L_{tot.pr} = \left[\left(20m + 2m\right)/2\right] \times 8 \times 1.5 = 132m.$$

Thus, for the preliminary ordering of the amount of cable on the LCN, the calculated value $L_{tot.pr}$. is taken 132 meter.

Calculate the required number of cables, using its dilution according to the structure of the network in the premises. To do this, using the measured dimensions in the scheme, we measure the approximate length of each cable LCN in accordance with the scheme of network connections, we give the measured lengths of the cables.

We calculate the required cable length for LCN with the expression:

$$L_{tot.l.} = k \times L_{\Sigma}, \quad (2)$$

where $L_{tot.r.l.}$ = total required length in meter;
k – the factor of the stock is selected within the limits 1,2 ... 1,4;
L_{Σ} – the total length of the cable is 100 meter, shown in Table 1.

It is also necessary to add cable lengths to connect the switches with patch panels to the total length. Since the switch is used on the network for 16 ports and 12 is used, then the required number of segments is equal to 12 pieces at their length of 0.5 meters, which is 6m, which we add to the total number and get $L_{\Sigma} = 106$ meter.

At the end we substitute values in the expression (2) and we calculate:

$$L = 1.4 \times 106 = 148.4m.$$

In the specification, we put the received cable length $L = 149$ meter.

Calculate the cross section of the box. Determined in two ways - based on the total area of the cable section, which is calculated by the expression:

$$S = k \times Scros \times N, \quad (3)$$

where S – area of the cross-section of the box (mm^2);
S_{cros} – cross section of cable;
N – number of cables in the box;
k – stock factor, is selected within the limits of 1,4 ... 1,6.

$$Scros = \pi \times d^2 / 4. \quad (4)$$

The second method – the cross-sectional area of the box is determined using the tab in the box of a specified number of cables, shown in Fig. 5.

Taking into account the further modernization and scaling of LKM, the resulting area is increased by a coefficient equal to 1.6.

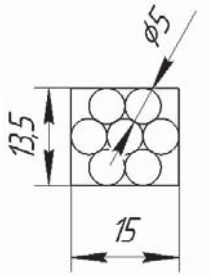

Figure 5 – Dimensions of cables in (mm)

Original source: developed by the author

We calculate the required section of the box by formula (4):

$$Scros = 3.14 \times 5^2 / 4 = 3.925\,\text{mm}^2$$

Calculate the cross section of the box by formula (3):

$$S = 1.6 \times 3.925 \times 7 = 43.96\,\text{mm}^2$$

We accept for installation in a study box a box measuring 16 × 16 mm.

Conclusions. The materials of the article give an example of the design of a local computer peer-to-peer network based on Fast Ethernet technology, with a data transfer rate of 100 Mbps with the Star topology, which includes 8 workstations, 1 FFT, 1 switch, 1 modem and 1 patch -panel. The connection of workstations to the switch via a patch panel was made using a copper cable with twisted pair of category 5. The purpose and main parameters of local computer networks were considered, an analytical review of the main technologies was carried out, the local computer network project was selected and substantiated. networks on the main network standards and the most optimal and modern. Each network computer was assigned an IP address. Since all computers are in the same room, IP addresses are not split into several subnets.

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До обґрунтування принципу побудови локальних комп’ютерних мереж

Метою написання статті є потреба розробити локальну комп’ютерну мережу , визначити і обґрунтувати склад апаратного і програмного забезпечення робочих місць, привести порядок їх налагодження.

В статті розглянуто основні принципи побудови локальних комп’ютерних мереж. Описана однорангова локальна комп’ютерна мережа на основі технології Fast Ethernet, її призначення, основні параметри та принцип роботи, а також необхідне апаратне та програмне забезпечення. Локальна комп’ютерна мережа – це сукупність комп’ютерів, з’єднаних лініями зв’язку, яка забезпечує користувачам мережі потенційну можливість спільного використання ресурсів всіх комп’ютерів. Простіше кажучи, комп’ютерна мережа - це сукупність комп’ютерів і різних пристроїв, що забезпечують інформаційний обмін між комп’ютерами в мережі без використання яких-небудь проміжних носіїв інформації. Основне призначення комп’ютерних мереж - спільне використання ресурсів і здійснення інтерактивного зв’язку як усередині одного приміщення, так і за його межами.

В матеріалах статті приведено приклад проектування локальної комп’ютерної однорангової мережі на основі технології Fast Ethernet, швидкість передачі даних якої 100 Мб/с з топологією «Зірка», в яку входить 8 робочих станцій, 1 БФП, 1 комутатор, 1 модем та 1 патч-панель. Підключення робочих станцій до комутатора, через патч-панель, виконано за допомогою мідного кабелю з витими парами категорії 5. Було розглянуто призначення та основні параметри локальних комп’ютерних мереж, проведено аналітичний огляд основних технологій, вибрано та обґрунтовано реалізацію проекту локальної комп’ютерної мережі мереж на основні стандартів мереж та обрано найбільш оптимальну та сучасну. Кожному комп’ютеру мережі було присвоєно IP-адресу. Так як всі комп’ютери знаходяться в одному приміщенні, IP-адреси не розбивалася на декілька підмереж.

локальна комп’ютерна мережа, топологія, комутатор, робоча станція, мережевий трафік

Одержано (Received) 18.09.2018 *Прорецензовано (Reviewed) 16.02.2019*
Прийнято до друку (Approved) 04.06.2019