LAN SIMULATOR PROGRAM BY LOCAL SEGMENT – LANSS

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This paper presented work or possibilities the simulation program written by TU-Varna for LAN segment simulations. Program (simulator LANSS) and sours cod C++ is original application by authors. Work area and system resource is Intel or AMD based computer platform. Operation system - Microsoft Windows 98/2000/XP/. Program used in lab in TU Varna

Keywords: Local Area Network - LAN, LAN – simulation, LAN – communication, hub, switch, VLAN

1. INTRODUCTION

Paper present authors work by written program simulator LANSS by network area in local segment. Program is part of teach the process by local segment and hardware device configured whit his. Simulator demonstrated option and characteristic deferent possibilities of hardware com HUB, SWITCH and VLAN. Hi connection and configuration on port by input / output. By simulator with integrated area whit windows menu operators have instrument for construct topology and devices in segment et later visualize result of work configuration. Possibilities are check, ping and tracing in segment. Whit interactive form operator made change every situation.

1.1. Theoretical information

A. Network adapter

The network adapter (still known as network card, (Network Interface Card – NIC) is part of computer hardware, which ensures possibilities for communication of the computer with network.

Network card usually has socket for twisted pair, BNC or AUI, where the network cable is plugged and LED for indication of network activity. The network adapters support speed of 10, 100 and 1000 Mbit/s. The term MAC address is known at computer networks. It is unique identification number, attached to every kind of network devices. Most of Layer 2 network protocols use one of the three network dimension, organized by IEEE. These are MAC-48, EUI-48 and EUI-64, which are global unique by design. Not all of communication protocols use MAC address and not all of protocols, which use them need global unique identifications.

ARP/RARP protocols are used to create correspondence between Layer-2 MAC address and address from Layer-3protocol (e.g. IP). At networks with broadcasting of the information (for example Ethernet) the MAC address allows every terminal to be identified with unique address. This is the way to address definitely device. This ad-

dressing set the base of the Layer- 2 networks. They build the higher layers of the OSI Model, which build complex possibilities of a computer network

B. Hub

Hub or concentrator is device, which connect some devices, which work with cable twisted pair or optical fibers at one entire segment. The process is realized on physical level of The OSI model. The concentrator repeats signal coming from one of its port and send it to all of the other ports. If signal is received simultaneously at more than one port occurs collision. Collision affects every device connected with the hub or with other words – all of the devices are part of same collision area. If some segments are connected through hubs the collision area is expanded, which is not desirable. The hubs support only half duplex

C. Switch

At the most simple networks, knots are connected between themselves only through hubs. With expansion of the network occur some potentional problems:

- Expanding – at network with hubs, the collisions limit total speed of data. This makes serious troubles with adding of new knots. The present applications demand high speed and often are needed complete re-design of the network, to be able to supports new knots.

- Delay – That's the time, which one packet is needed to reach its destination. Because every knot must wait its possibility to transmit data, to prevent collisions, delay reaches high amounts at adding of new knots.

Collisions – Ethernet uses process called CSMA/CD (Carrier Sense Multiple Access with Collision Detection), for signalizing at the network. With its help, a knot will not transmit packet, except if the network is not free of traffic. If two knots transmit packet simultaneously occurs collision and packets are lost. Two knots wait random time and re-transmit packets. Everywhere, where possibility for collusion of two or more packets has is consider for one collision area. Networks with huge numbers of knots, at same segments, often have many collision and therefore huge collision area.

Decision of these problems gives up the network switch. Switch's principle of work is: when a packet arrives in the switch, it writes source's MAC address and number of port on which the packet is arrived at switch's address table. After that it transmit selectively the packet, only to port corresponding to t he MAC address of the destination and with corresponding record at MAC table. If there is no suitable record at the table the packet is transmitted to all of the ports, like a hub.

With expansion of the networks, most of the companies use virtual local networks (VLAN) to structure their networks logical. Commonly VLAN is collection of knots, grouped together in logical area. Normally all of the received packets from a router are at same area. With using of VLAN we can divide this area to smaller (virtual) areas. For communication between two areas traffic has to pass through a router.

Some of the reasons for using VLAN are:

— Security – separation of the systems, which have important data, from the rest of the network, reduce the chances people to get access to the information.

— Productivity/Speed – Carefully observe to the network usage allow network administrator to create VLANs, to reduce number of router's hops and to increase speed of the users.
— Data stream – Because VLAN doesn't transmit broadcast traffic to other VLAN, this automatic decrease number of broadcast packet.
— Department – Large companies can create VLANs for their different department

Although, that we can have more than one VLAN on a switch they aren't able to transfer traffic between themselves. If they were able to do this VLAN is superfluous, because its main function is to isolate part of the network. The communication between VLANs require router.

VLANs are able to spread out themselves over more then one switch. For communication between some VLANs on different switches is used a process called trucking. It allows information from some VLANs to be transferred over one link between the switches

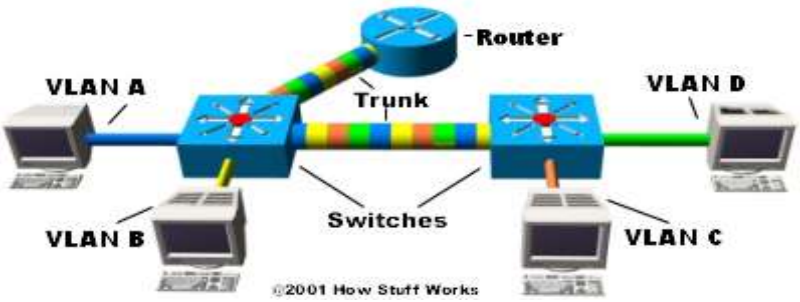


Fig. 1 Principal structural schem

On picture above every switch has two VLANs. On the first switch, VLAN A and VLAN B are transmitted over one port (trunk) to the router and by other to second switch. VLAN C and VLAN D are trunked from second switch to the first and from it to the router. Trunks can carry information from every of the four VLANs. By this way it seems that router has four physical links with the switches of four VLANs.For communication between separate VLANs the traffic has to pass through the router. For example if VLAN A wants to connect with computer from VLAN B, the traffic pass from the switch to the router and then backwards.

2. WORK WITH LAN SEGMENT SIMULATOR (LANSS)

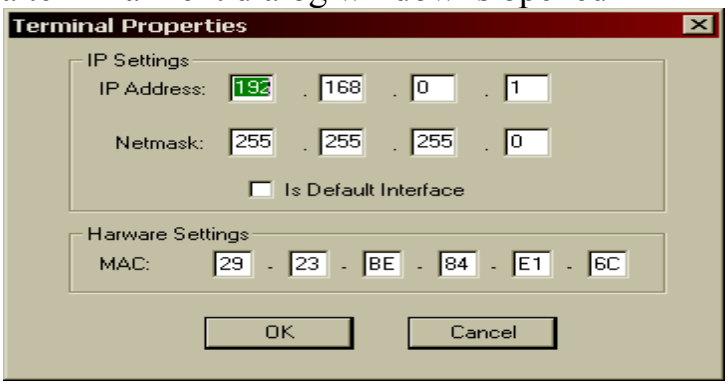
With the start of the program the blank window is opened in readiness to work.

To start the work you have to push the right button of the mouse inside the window and pop-up menu is opened.

From it you can choose one from the possibilities:

- Insert switch – adding a switch
- Insert Hub – adding a hub
- Insert Terminal – adding a terminal

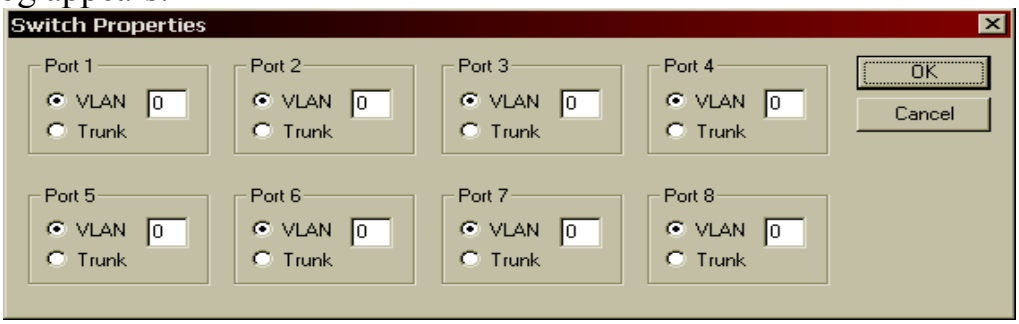
When you add a terminal next dialog window is opened



In this dialog we can enter IP address, subnet mask and MAC address. The checkbox 'Is Default Interface' shows if this interface will accept to other sub networks.

When adding hub we are asked to enter the number of ports – 2 to 8.

When adding switch we should also enter the number of ports. Then a switch specific dialog appears:



In this dialog we can adjust different properties for each port. We can determine witch port(s) is used as trunk and set VLAN number to the others. In LANSS VLAN 0 shows a lack of VLAN number.

After adding the necessary devices they ca be moved across the working space. To do that click and hold the left mouse button, then drag to the desired location.

By pressing the right mouse button we open the context menu, specific for each device type. The possible choices are:

Properties – opens a dialog with device properties (only for Terminal and Switch)

- View ARP/MAC Table – opens a dialog containing device's ARP/MAC table records (only for Terminal and Switch)
- Clear ARP/MAC Table – deletes the content of device's ARP/MAC table
- Delete – deletes the device

The next step is to connect the ports with communication cables. To do this click the left mouse button on the first port and then move the mouse towards the second port. A wire should be "stretching" from the port. Click the second port to complete the link. You can cancel the link clicking the right mouse button before clicking on the second port.

To delete a link right click on one of the ports it connects.

After building and linking the desired network configuration we can check the connection between the different terminals. First select active terminal. To do that,

left click on the terminal. The active terminal is surrounded by a rectangle. Then click on the "Ping" icon in the toolbar (racket and a ball). The cursor changes to that picture. Now point the terminal we want to connect to and left click on it. We can see the communication in action. To be able to manipulate the working plot again we have to select the "Arrow" tool from the toolbox.

Passing packets are marked with a square or a circle. Packets that are requests for information are red, and packets that are answers are blue. A square represents ARP packet and a circle represents PING. The types of packets are as follows:

- Red square – ARP Request, request for MAC address of terminal x.x.x.x.
- Blue square – ARP Response, response of ARP Request, carrying the MAC address of the terminal
- Red circle– PING, request for echo packet

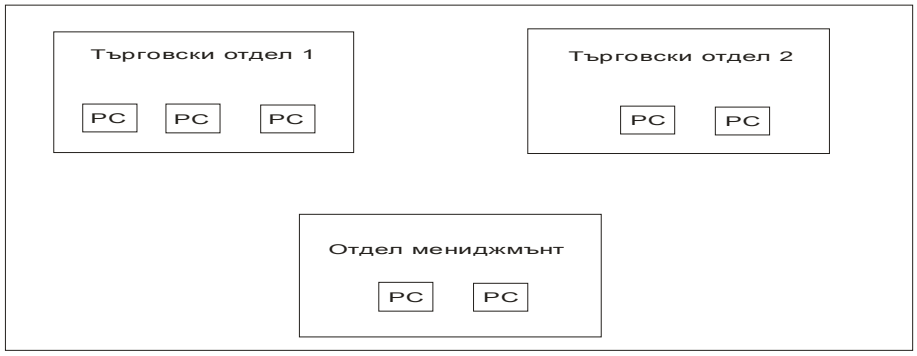
Blue circle – PONG, answer of echo packet

3. TASK FOR SIMULATION WITH (LANSS)

Then program included several variant simulations. Par example presented tree variant for configuration by simulation.

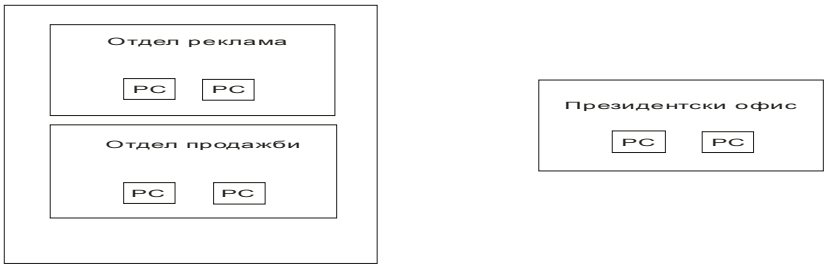
3.1. Create and simulate a local area network

The network should connect two sales departments in one subnet and management department in another subnet



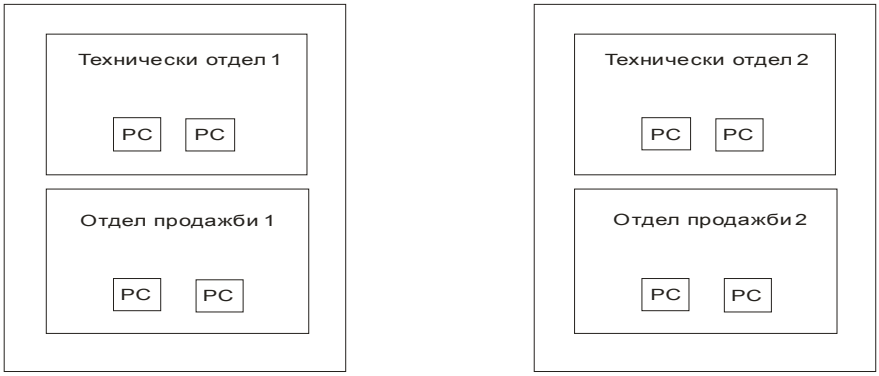
3.2. Create and simulate a local area network (V.2)

Connect two departments and the president's office in one joint network. The president's office is in another building, 70 meters apart



3.3. Create and simulate a local area network (V.3)

Connect the technical departments in a joint network and the sales departments in another joint network. The departments are in separate building, as shown in the picture bellow



3.4. An example solution of task № 2 (V.2): presented in Fig. 2.

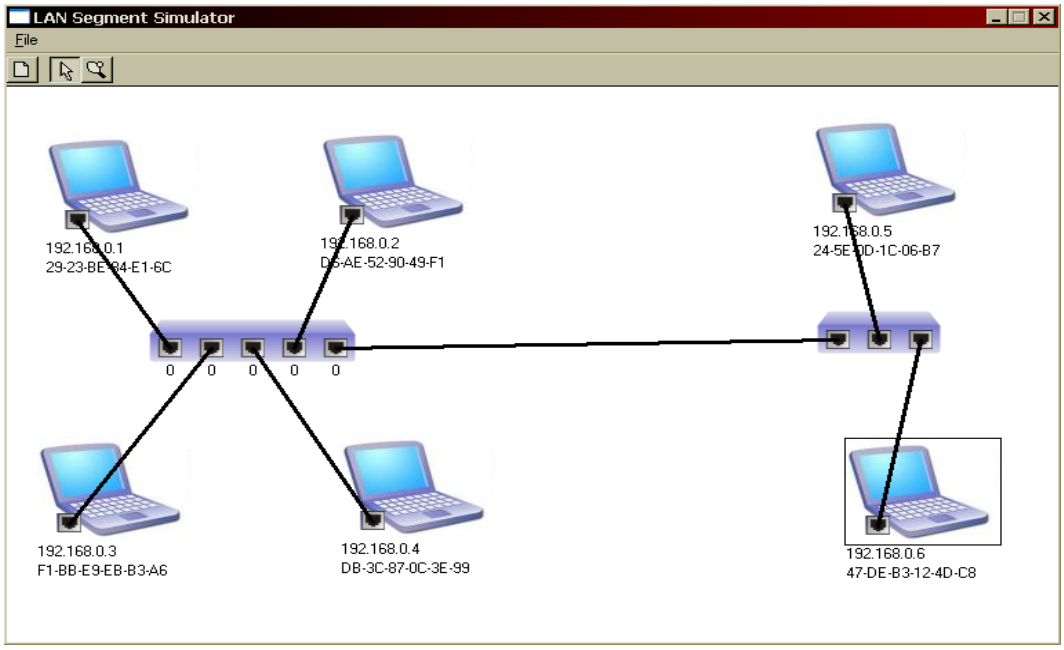


Fig.2 Result of simulations by tack 2 (V.2)

4. CONCLUSION

Presented program LANSS introduce in TU-Varna above two years. Simulator is appliance by teaching process in discipline telecommunication. This paper is sponsored by project BY-TH-105 /2005y.

5. REFERENCES

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