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*Original Contribution*

# ANALYSIS OF TRAFFIC WHEN SYSTEMATIZING INFORMATION FLOWS IN LAN LOGISTICS

**Stefan Kazakov**

*KONSTANTIN PRESLAVSKY UNIVERSITY OF SHUMEN, 115 UNIVERSITETSKA, SHUMEN 9700, E-MAIL: KAZAKOV@SHU.BG*

***Abstract:*** *The paper presents research of the traffic when systematizing information flows in logistics. Ethernet is one of the most popular networks, especially if equal access networks are to be built and maintained. Ethernet is widely used to control machines, production lines and even entire production plants. However, working in real-time mode sometimes creates conflicts in certain actuators which are time-sensitive to the commands sent to them. Therefore, it is necessary to investigate the average delay time and time dispersion of the LAN Ethernet, to be able to meet the requirements for real-time operation in logistics*

***Keywords***: *Traffic, Data, Logistics, Network, LAN, Communication, Information, Flow.*

In accordance with the principles of the systems approach, each logistics system must first be examined in its relationships with the external environment, and only then within its structure. This principle of sequential movement through the stages of system creation must also be observed when designing logistics information systems. The analysis of the data and the forecasting of different aspects, related to the logistics, technologies, based on artificial intelligence, are used in other points in the supply chain management [5].

From the positions of the system approach to logistics processes, three levels are distinguished (Fig. 1).

The structural model should contain two main elements, namely the production facilities and the means of organizing the material flow. Combining these elements, researchers and system organizers divide the entire structure of the enterprise into buffer and technological parts. The remaining functions, such as transportation, storage, insurance, promotion, financing, can be performed by

the members in the marketing channel or by other organizations [6].

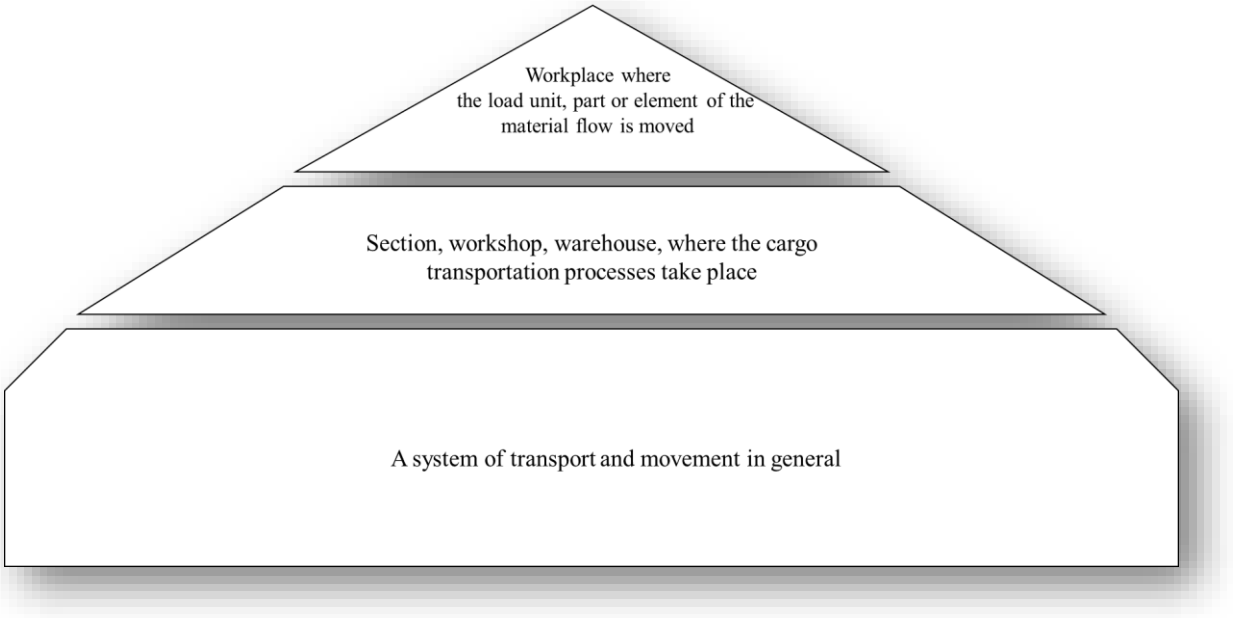


Fig. 1. Levels of logistics processes from the positions of the system approach

This covers all types of activity - from the receipt of raw materials to the delivery of the finished product to the buyer. The main criterion distinguishing the buffer zone from the technological zone is focused on the question: is the object of labor in a stationary state or is it set in motion? Obtaining an answer to this question further determines the data that must be collected, processed and transmitted to ensure optimal material flow management. The groups of transmitted data defined in this way must include the following nine information elements, which are considered to create a basis for information control of the entire structure of material and technical supply:

- type of supply item;
- quantity or volume of the subject of supply;
- origin of this item;
- its location (location);
- time of arrival at the deployment point;
- departure time from the deployment point;
- transportation system;
- time for transportation;
- booking.

**Example system**

The example logistics system discussed below (Fig. 2) is built on three levels according to the 802.3 standard. When building such systems for real-time workstations, it is advisable to adopt a strictly deterministic strategy for exchanging information between system elements, due to the very rapidly changing environment.

The network simulation was done with Cisco's Packet Tracer software product. Basically, Packet Tracer allows to create a network with a large number of simulated real facilities. Routers, switches, end-client systems and links can be used to simulate the physical information flow in the network. It is also possible to simulate equipment options to access real networks and logistics processes.

The control cycle of these systems depends on the following factors:

- First level decision time;
- Second level decision time;
- Third level decision time;
- Time for coding and transmission along the communication line of the messages;
- Time to decode and receive the messages.

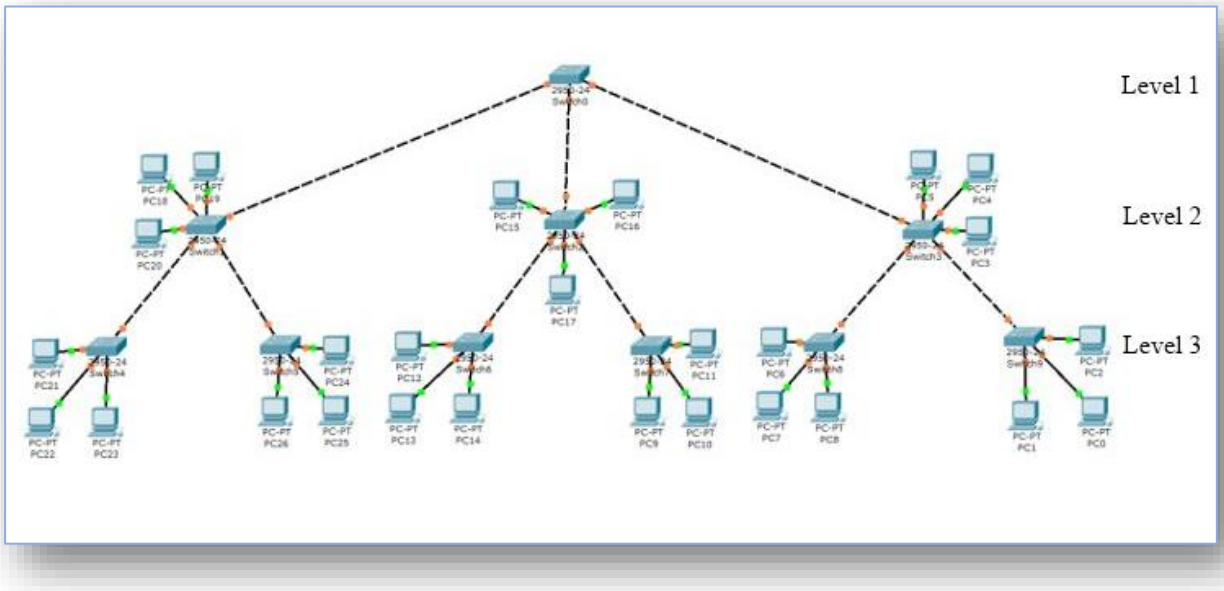


Fig. 2. An example of three-level 802.3 system

Broadcast networks are characterized by a common communication channel that is shared by all machines connected to the network. Every frame

sent goes through the common channel and reaches all the machines on the network. An address field in the frame indicates who this frame is intended for. When a machine receives a frame, it checks whether it is intended for it. If so, the frame is accepted and processed, otherwise it is discarded. In public broadcasting networks, a major problem is determining who gets to use the channel when there is competition for it. The protocols used to solve this problem refer to a sublayer of the channel layer called the medium access control sublayer. Urban and regional networks usually use point-to-point connections, public multipoint channels are mostly used in local area networks.

When analyzing these factors, expressions should be obtained for the average control cycle time, its variance and the probability of successful transmission of information between individual levels and endpoints. Results of the traffic study are shown in fig.3 and in table 1 shows numerical results of average delay time for different number of computer pairs.

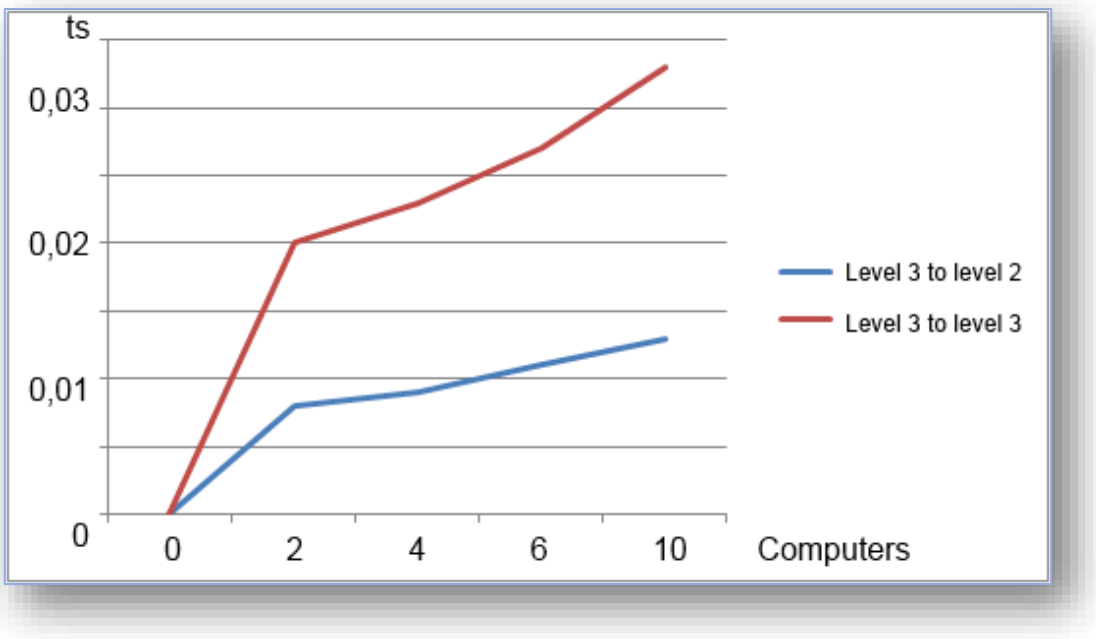


Fig. 3. Plot of average delay times at different numbers of computers in different segments of the network

Table 1. Numerical results of average delay time for different number of computer pairs

| Level 3 to level 2 | | | Level 3 to level 2 | |
|---|---|---|---|---|
| **1** | 0,008 | | **1** | 0,02 |
| **2** | 0,009 | | **2** | 0,023 |
| **3** | 0,011 | | **3** | 0,027 |
| **5** | 0,013 | | **5** | 0,033 |

The following conclusions and recommendations can be made from the research:

- As the number of communicating computers between network segments increases, the average delay time increases.

- When managing objects sensitive to data delay, it is imperative to introduce a data transmission priority scheme.

**Conclusion**

The role of logistics management information provision is constantly growing. The implementation of modern information logistics systems is gaining more and more mass scale. Dispositive information systems are created at the warehouse or workshop management level and serve to ensure the normal operation of logistics systems. Executive information systems are created at the level of administrative or operational management.

The widespread entry of logistics into the economy is largely due to the computerization of material flow management. The ability of microprocessor technology to solve complex issues of information processing allows analysis and mutual exchange of large volumes of information between the various participants in the logistics process.

When building logistics information systems, it is necessary to observe certain principles, which ensures their effective functioning, taking into account the development of computing technology, the requirements of their users and the specific conditions of their operation.

As the number of computers communicating between network segments increases, the average delay time increases to 0.033s. at 5 pairs of computers.

For real-time systems, it is recommended to build a computer network for management with up to 10 computers. When managing objects sensitive to data delay, it is imperative to introduce a data transmission priority scheme.

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## References:

[1] Data analysis, Yordan Shterev, 2010

[2] Computer networks and communications – Tsonev, Stanev, SHU 2007

[3] 2. Computer systems and networks - Stanev, SHU 2002

[4] 3. Peer-to-Peer Local Area Networks - Thomas Madron, Technics 1995

[5] 4. Botev, B. Genov G., Botev R. Technical Logistics, Shumen, 2015, University Press Episkop Konstantin Preslavski

[6] 5. Stoyanov Sv. Integration of artificial intelligence in the supply Chain management – Journal scientific and applied research, 2021, Volume 20, <http://jsar.ftn.shu.bg/doc/2021/vol.20.pdf>, International journal, 53 – 58 (11 pgs BSS), Association Scientific and Applied Research (Bulgaria, BG), Konstantin Preslavsky University – Faculty of Technical Sciences, Shumen (Bulgaria, BG), ISSN 1314-6289.

[7] 6. Stoyanov Sv. - notes to marketing channels and the concept of a supply Chain, International scientific refereed indexed online journal with impact factor "SocioBrains", 2021, Issue 81, 1 – 6 (11 pgs BSS), Smart Ideas – Wise Decisions Ltd., Bulgaria, Sofia, ISSN 2367-5721