



## THE FUNDAMENTAL QUESTIONS AND PROBLEMS OF CORPORATE NETWORK WITH DATA CENTRE FROM THE PERSPECTIVE OF INFORMATION FLOWS AND INFORMATION LOGISTICS

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**Abstract:** Information logistics in information networks and large corporate information networks is one of the key areas when designing information flows and information security of these networks. In implementing the new corporate networks and new components such as data centre or corporate networks reconstruction in implementing data centre is necessary to answer questions related to information flows with regard to knowledge of information logistics. From the perspective information flows and logistics information, this article provides a fundamental view into the problems and raises fundamental questions on the issue of implementation of the data centre to the corporate network.

**Key words:** information logistics, information flows, corporate network, data centre

### 1 INTRODUCTION

The issue of the proposal from the perspective of ensuring the smooth functioning of the information logistics of a proper information structure, network infrastructure and logistics data transfer within individual information flows of the information structure, network infrastructure and information systems are essential for the effective and safe functioning of any corporate networks. Equally crucial is the issue in the deployment of data centre services. The corporate network means information structure composed of network components, servers, firewalls, data fields, user stations including their software equipment.

Currently little emphasis is put on the application of the principles of information logistics and logistics in general in creating complex information networks in addressing the design of information structures. While suggesting proper topology, or a good estimate loading the individual components in the information network is already selected in the first step, just as

the implementation of new network infrastructure solutions, either when changing, or when deploying a new element, such as corporate data centre. Data centre means a space used for the location of computer systems and related components for communication systems and data transfer and storage. Data centre is usually constructed redundantly, not only from an IT perspective, but also from the perspective of backup electricity and such like [1].

## **2 THE BASIC RULES AND QUESTIONS IN TERMS OF INFORMATION LOGISTICS**

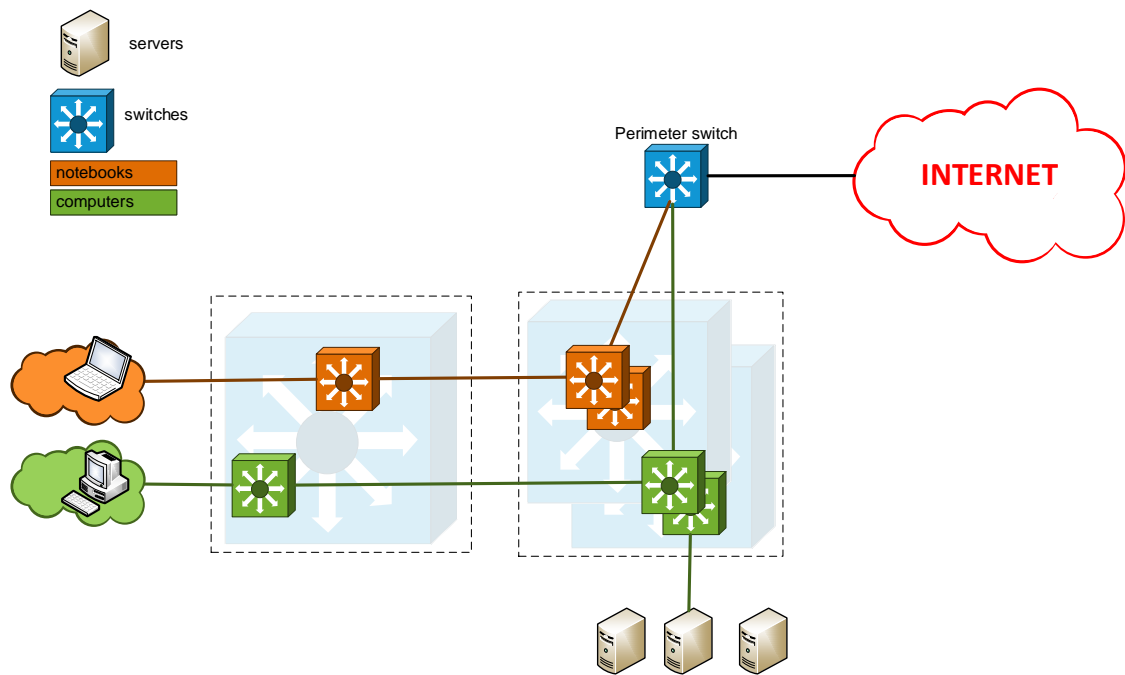
It should be understood that all data transfers and all direction in the design implementation of the corporate data centre to the network must follow certain rules. It is possible to apply knowledge from information logistics for parameter settings and directing the particular information flows in corporate network [2].

The fundamental issue in the design of data centre integration into corporate networks is the issue of the number of users, or more precisely the number of participants in the corporate network, including so-called guest participants. When designing the initial concept more significant issues come naturally and the author of the proposal must address:

- How many information systems does the corporate network have?
- How many information systems are needed to be added?
- What technologies are used for the operation of information systems?
- What is the licensing security of the information systems?
- What new technologies are needed to be implemented?
- Who are the different information systems accessible for?
- Where is the division point of the internal corporate network from external network?
- What services should corporate network provide for their participants?
- What technologies and what parameters are used in the corporate network infrastructure?
- What is the data security in the corporate network?
- How is the protection of corporate network secured?
- What information flows in the network exist, what is their intensity and density?

Answers to these questions are not easy even for active administrators working in the addressed corporation. In the implementing of complex units and their deployment to a new, or existing information structure is convenient to divide the whole into several parts, which of course must be coordinated [3]. In general, it is possible to follow the procedure: analysis of current situation - the initial design of the new solution (high level design) - implementation - the definitive solution design (low level design) – testing, while implementing the data centre to the corporate network.

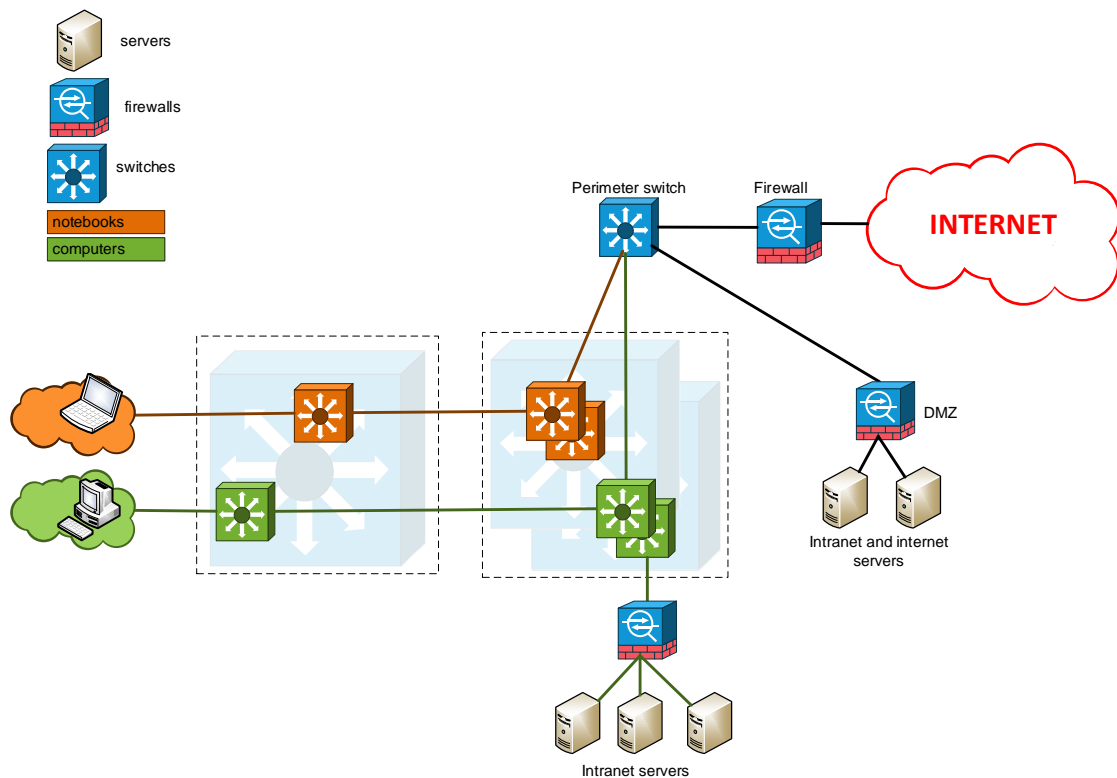
It is necessary to define the current state of information security network prior to the deployment of data centre, as it often gets little attention in this area in Slovakia. State of information security is often low, or none (Figure 1), meaning that it is either insecure network or network with low level of security. Deployment of data centre to such infrastructure is dangerous in terms of data protection.



**Fig. 1** An example of unsecured network with unsecured information flows

### 3 BASIC STEPS OF THE FLOW OF INFORMATION SOLUTIONS FOR CORPORATE INFORMATION NETWORK

Analysis of the current state has to provide a realistic and updated picture of the state of information structure, information systems, security and the current network architecture as well as information systems. This analysis should be based on problem areas that need to be addressed along with deploying data centre. The analysis may be based on statements that insufficient initial network element is server infrastructure or data repositories that are out of date or of that of the weak element as for example the low security, secured with one firewall at the entry to the network, and the like [4]. It must be remembered that the connection of data centre or connection of a new information system is not often done without a complete restructuring of the information network. In our example (Figure 1), network security is completely absent and it is therefore necessary to supplement the firewall and divide the network into individual zones. Proposal for minimum security information flow provides a diagram in Figure 2.



**Fig. 2** The corporate network with a higher level security of information flows

After analysis, it is appropriate to draw up a document that proposes solutions aimed at implementation of the data centre in the corporation. It is initial proposal for a new solution called high level design, which task is not to specify deployment in detail, but to give an overall view of the new solution. High level design addresses the objective solution questions, the current state of information infrastructure of the corporation, solves the proposal to eliminate the deficiencies and proposals for implementation of the new solutions for the deployment of data centre [5].

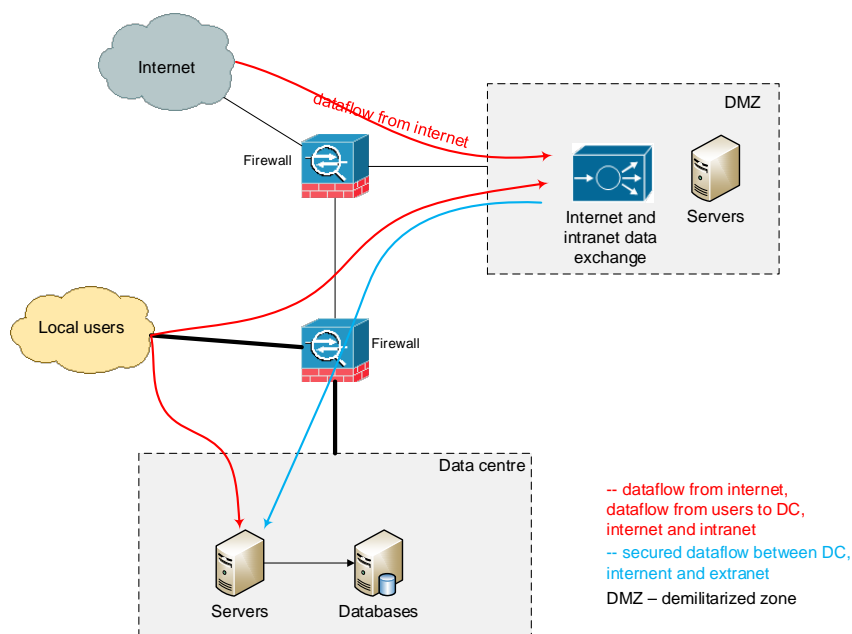
Implementation process itself is a process which is carried out continuously in repeated process of analysis - synthesis – solution, in a cyclical unit, until it reaches a solution that is consistent with the high level design and in accordance with the requirements of the corporation for the data centre [6].

The document is created progressively from the implementation process that determines various proposals in depth. This concerns low level design, such as design solution, which describes already implemented and deployed solutions in detail. Low level designing should include the objectives and scope of the original design description, requirements, description of the proposed solution, information security solution, addressing, topology, configuration of individual elements and detailed descriptions of all partial solutions that were needed when deploying data centre in the corporation. Proper development of low level design and proper deployment of data centre into information structure of a corporation is essential in order to build a data centre that provides the highest availability, expandability and security.

#### 4 APPLICATION OF INFORMATION LOGISTICS PRINCIPLES FOR BUILDING OF CORPORATE NETWORK

In terms of logistics information, the proposal of data centre itself should consist of aggregation / service and access layers for different information flows. Aggregation layer consolidates the flow of information access layer of data centre and provides connectivity for service facilities.

Connecting the data centre to an existing infrastructure must implement redundant link to the existing core / distribution (C / D) layer. If necessary, components should be added in the existing C / D switches to connect the data centre. Aggregation switches are intended for the integration of information flows to existing C / D network switches, and to connect information flows from access layer devices of the data centre. Service layer consists simply from service modules that are installed in the switches. Aggregation layer provides services such as high-performance packet forwarding, the access layer as aggregation blocks, L3 services (OSPF, VRF) and L2 services (VLAN, STP, link aggregation (Port channel), CDP for the network infrastructure. From the perspective of information flow the OSPF and VRF belong to the main supporting services. OSPF (Open Shortest Path First) is a routing protocol that allows transmits information dynamically on the available routes in IP networks. If the line is disconnected this protocol is able to use backup line, if available, and thus maintain continuity of information flow. VRF (Virtual Routing and Forwarding) is a concept that allows virtualizing the network device at a level routing table. Virtualization is just a catalytic converter for the modernization [3], [13]. Such virtualization can be achieved by the distribution of a device at a level L3. The aim of this virtualization is to separate multiple L3 segments logically without the need for multiple physical devices and separate the individual information flows. It is necessary to physically separate them in terms of logistics. The access layer is intended for terminal equipment and the management of their information flows. Information flows that provide applications and data centre services should be connected to the access layer in a data centre, which links them from and for the websites (Figure. 3). Access switches should allow the connection to information flows from servers and terminal equipment, and shall be connected to the aggregation / service layer



**Fig. 3** The basic scheme of the corporate network with the implemented data centre

In order to achieve high availability of aggregational / service layer is suitable to use redundant switches, wherein each of the pair switches is provided with redundant supervisors and redundant power supplies. Virtual Switching System (VSS) technology allows connection with switches of aggregational / service layer into a single logical device that controls the transfer of information flows. In order to achieve availability in the access layer is appropriate to use switches with redundant power supplies where each access switch is then redundantly connected to a pair of aggregation switches, ensuring redundancy technology, after which the individual information flows flow [7], [8]. An important part in the implementation of data centre is the data centre management that serves the data centre administration, management and the control.

The main problem in implementing of data centre is to combine the technology, information systems, and network infrastructure with respect to users, network zoning and other aspects. In fact, information logistics and logistics in general could help in the design of corporate network functioning and its information flows with the implemented data centre, in particular, by addressing the following questions:

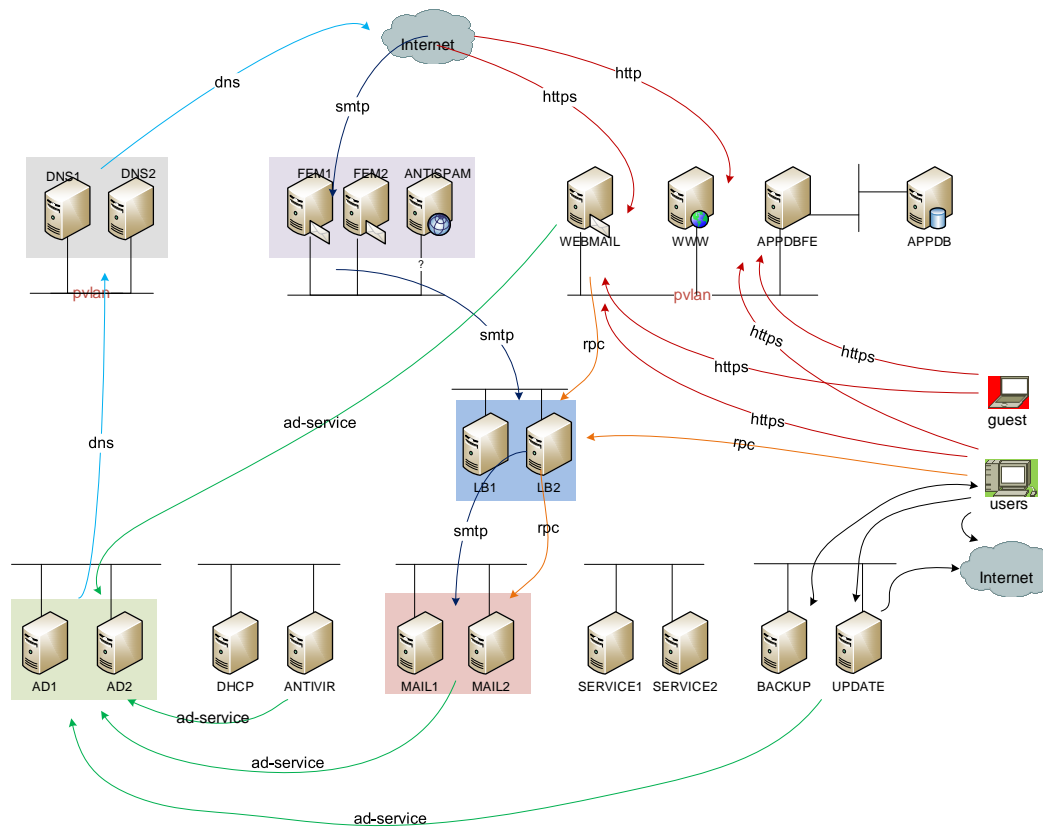
- What information flows exist among the different parts of the data centre?
- What information flows are directed from the data centre to participants in corporate networks?
- What information flows are directed from participants of the corporate network to the data centre?
- What is the appropriate level of security of information flows between data centre and participants in corporate networks?
- Are there information flows, which are necessary to be excluded from the security of communication of the data centre?
- How to implement information flows, which cannot be directed to the data centre?
- How to deal with a major network topology so that the availability of information flows should not come at the expense of their safety?

From the perspective of logistics, the basic solution to all these issues is the application of the principle element - binding, determining the elements, groups of elements in corporate network and their linkage. The element of the corporate network can be an information system, server, disk in a data field, firewall, etc. Group of elements can be data field, a group of servers or IT systems in the data centre, a group of servers or IT systems outside the data centre, a group of servers in the DMZ (demilitarized zone - that zone that is open for the flow of information from corporations, but also for specific information flows also from outside the internal network corporation), a group of users with certain privileges, group administrators (from the perspective of an information network, this includes the domain administrators group, but in no case a group of local administrators), a group, so-called guest users with minimal privileges to access to information flows of their own corporation [9], [10]. From the perspective of information logistics, the information flows are then bonds arising from services provided to individual groups of elements or to the individual elements of the corporate network [11], [12]. A more detailed diagram of information flows in the corporate network with data centre captures Figure 4, definition of information flows in the corporate network. In this picture are captured information flows among servers and users with the specific protocol definition. Image defines the information flows among users, internet and information flows among these servers:

- DNS1,2 – Domain Name Server in redundantly connected master-slave
- FEM1,2 – Frontend mail server in redundant connection - e-mail transport communication service towards the Internet
- Antispam – Internet protection of e-mail communication
- Webmail – web access towards the corporate e-mail services
- WWW –web server
- APPDBFE – frontend application for applications that users use outside of the corporate network server
- APPDB –database for the application server
- AD1,2 – active directory in redundant connections - services for users of corporate networks
- DHCP – dynamic host configuration protocol – assignment of IP devices in the corporate network
- Antivir – centralized antivirus protection of servers and users
- MAIL1,2 – e-mail server in redundant connection
- SERVICE1,2 – application server for services available only for corporate network
- Backup – backup server
- Update – server for updates

Figure 4: Definition of information flows in the corporate network captures the following information flows:

- dns – domain protocol – communication for resolving the domain names
- smtp – simple mail transfer protocol – information flow containing the e-mail communication
- http – hyper text transfer protocol – information flow for transferring documents between servers and www client services
- https– hyper text transfer protocol secure – secure version of information flow for http
- rpc – remote procedure call – information flow, which can induce a subprogram but start the process in the address space on a network share
- ad-service – information flow associated with verifying identities towards active directory deployment and global policies and other active directory services



**Fig. 4** The definition of information flows with the description of services in the corporate network

## 5 CONCLUSIONS

Fundamental role of logistics in corporate information networks is to provide devices and knowledge for the application of the logical structure network that will provide the optimum design solution of individual element topology, groups of elements, and information flows for the smooth functioning of information flow, information systems and information network with regard of the elimination of sterile information flows and with sufficient physical and data security information flows. Even within this field is the space for application of the principles of information logistics in building corporate information networks and deploying solutions in data centres.



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