OSI REFERENCE MODEL IN THE CONDITION OF POSTAL MARKET

OSI РЕФЕРЕНТЕН МОДЕЛ НА СЪСТОЯНИЕТО НА ПАЗАРА НА ПОЩЕНСКИ УСЛУГИ

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Тази статия е посветена на прилагането на референтен модел OSI към специфичните условия на пощенската система. Пощенският сектор принадлежи на мрежовата индустрия, но също така и в сектора на комуникациите и е възможно да се търси сходство с други системи като транспорт и телекомуникации. Въз основа на това, хартията показва, че чрез използване на достатъчно дизагрегацията, пощенската система може да се анализира чрез мрежовите слоеве. Тази нова "мрежовите слоеве подход" ще бъдат представени от проектирана пощенския модел, основан на три слоя. Първият се състои от приложения / услуги, предоставяни от пощенската инфраструктура, вторият слой, състоящ се от активната част на мрежата слой (технология на транспортиране) и третият слой е пасивна инфраструктура (превозни средства, транспортни маршрути ...) на пощенска мрежа. В статията ще се включат важни аспекти на слой модел, като прави възможността да се определят правилата за регулиране, технически и технологични изисквания и интерфейси за комуникация с други пощенски системи.

This paper is devoted to application of OSI reference model to the specific conditions of postal system. The postal sector belongs to the network industry, but also to the communications industry and it is possible to look similarity with other systems such as transport and telecommunications. On this basis, the paper shows that by use of sufficient disaggregation, the postal system can be analysed by network layers. This new "network layers approach" will be represented by designed postal model based on three layers. The first consists of applications/services provided by postal infrastructure, the second layer consisting of the active part network layer (technology of transportation) and the third layer is passive infrastructure (vehicles, transport routes…) of postal network. The paper will be include important aspects of layer model such as makes the possibility to define rules for regulating, technical and technological requirements and interfaces to communicate with other postal systems.

1. INTRODUCTION

The assurance of the basic functions for the postal systems of which networks and their technical and technological equipment must enable interoperability with other postal systems belongs to the complicated problems that are difficult to solve. It is necessary to consider the access safety to elements of postal infrastructure or services provided within the frame of the universal services. The question that arises is the determination of access points in the network of an universal service provider and the establishment of conditions for access and connection to other postal operators. This fact leads to the idea to examine the postal system not only from a procedural point of view, but also to look at it as an open communication system, what is typical for other departments of communication sector (transport, electronic communication).

The aim of this article is to present the formation of layer model for postal system, with the determination of the basic rules and tasks for mutual communication of individual layers for the purpose of interoperability assurance and regulation. The model for communication of open systems OSI (Open System Interconnection) seems to be an appropriate formula for this type of model, which was defined in 1978 by International Organization for Standardization (ISO) to avoid problems associated

2. ANALYSIS OF THE POSTAL SYSTEM

The postal services and their properties are defined in normative and regulative way. They are defined by the European postal standards of which content is reflected into national legislation, but they are defined also by the Acts of the Universal Postal Union, which determine the conditions associated with the ensurance of territorial coverage with normative attributes of accessibility (local, time and price), regularity and reliability including the determination of another qualitative indicators for the universal postal services. Normative and regulatory aspect in defining and assessing of the postal services is often completed by an analysis of the entire postal chain consisting of four basic activities / processes that form the postal service (collection, sorting, transport, delivery).

This kind of postal services is apparent also in the evaluation European Commission reports or in the professional reports and discussions of many authors [2,4]. It is a view of the postal service to the analysis of processes and sub-processes taking place in the networks, which is particularly relevant in recent times in terms of addressing interoperability and control access to the public network. The network character of postal services is not different from other network systems. The overlapping of common features is apparent mainly in transport and communicational systems, whether we speak about construction and organization of networks or in the character and requirements for coverage of territory, mainly in the connection with regulated services of general public interest [5]. Although we are accustomed to portrayal of postal services through the processes and sub-processes, it is possible to see the postal system at a certain level of abstraction also in layers as in the case of telecommunication services and transport systems. Agreement is significant especially in terms of the service provided through the model of layers, in which the

basis consists of the physical layer, network layer, and layer of services. The physical layer represents a means of transport or vehicle of transport and it is responsible for the physical realisation of transmission in the case of telecommunication. The network layer expresses mainly the creation of interconnection for transport requirements or for the transfer of message in telecommunication.
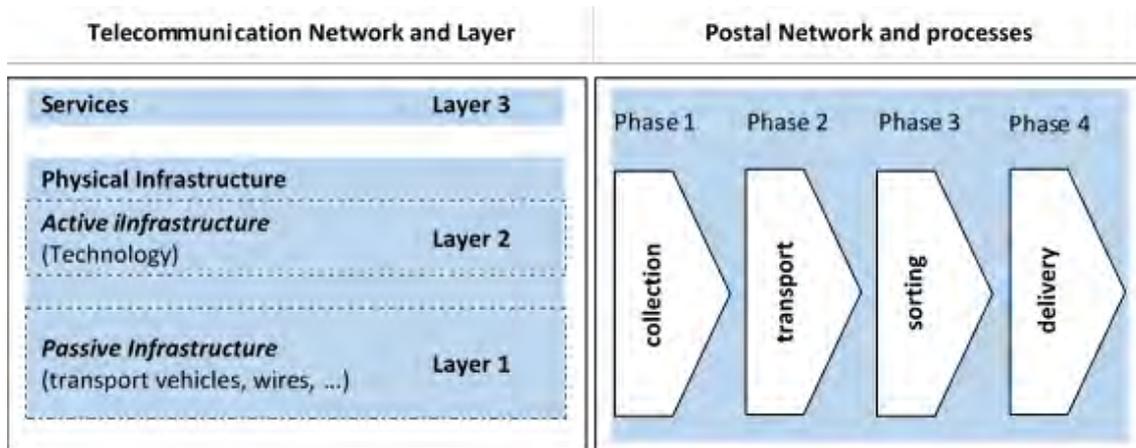

Figure 1: Approaches for network analysis: Telecommunications Infrastructure vs. Postal Infrastructure

3. THE PROPOSAL OF LAYER MODEL OF POSTAL SYSTEM

We will describe the selection of package and its distribution between postal systems and the way of its connection on the basis of the model principles OSI. We will describe not only the immediate shipment of package between the systems, but also the abilities of the system to collaborate and to solve tasks of relocation with other systems, through which the package is going during its transfer until the delivery to the addressee. It is possible to characterize the interconnected postal systems on the basis of grouping that consists of one or more access points, related hardware, terminals / hubs / depots, human features and vehicles used for the carriage of postal substrate, etc.

Communicating devices in the postal system will be represented by the means of the layer architecture. This layer architecture is characterized by the hierarchical organisation of the functions (entities) that are needful for linking system. The highest layer allows the contact with the user interface (e.g. with network subscribers) and the lowest layer allows the contact with the physical transmission medium.

Different functions are allocated to the individual layers of model that enable the realisation of "the system interconnection". The architecture of the open system is made up from number of subsystems - layers that are stored on each other. Every layer contains interface between the nearest higher and the nearest lower layer. The highest layer has the interface towards the user environment and the lowest layer towards the transmission medium [3].

3.1 Elements of the layer model

A *layer* can be understood as a part of the network´s function. When we monitor the activities that take place in the postal network, it is clear that those functions depend on each other - one function provides its services to another while using the services of other layers. Those categories can be called the layers of network. It is important to note, that only the same layers (equal) of the postal system will communicate between the sender and the addressee during the relocation process and transport of the package.

Function / functionality will constitute a certain functioning, security operation or determination of specific activities in the transfer process. It can also determine the relationship between two layers. It limits the layer competence, role and its importance in ensuring of goal achievement- the transfer of the package from the sender to the recipient.

Identification of the sender, recipient, transmitted postal substrate and endpoints in network are related to the use of a suitable *protocol*. Protocol can be understood in two ways. It may be characterized as a register, report and record of the process or a result of the activity or operation, for example a book of records about the acceptance and dispatch of packages. On the other hand, it may be a sum of the procedures and rules determining the operation of the installation or method of communication between endpoints in the postal system.

Each layer (N) has specific functions that form a part of the management communication and defined way of communication with a neighboring lower (N-1) and higher layer (N +1). This is the way, how the *interface* is formed. The interface is defined as a border between two layers. The interface in layer postal model is formed by a physical point (mailbox, post office box), but it is formed also as a set of norms, regulations and protocols defining characteristics of a connection that may be virtual/ electronic.

The determination of the security and qualitative characteristics is a very important part of architecture for the layer model. *Security* can be understood as a minimalisation of the "vulnerability" whether of the postal substrate that enters the technological system or instruments and procedures that ensure the distribution of the postal substrate. It means that, if the substrate is secured for example by the cover, barrier or by another element of protection against loss or damage, but on the other side the access to the postal system does not include any physical security restrictions, the protection may be pointless [3]. The safety measures do not have to be set just at the technical and technological level, they can also be measures in the form of insurance, because it is not possible to achieve perfect technical and physical security. The goal of safety measures should be to reduce the risk of violation on acceptable level.

The *quality* of the postal service is defined as a degree of achievement of the customer´s expectation with the provided service and as a disproportion between expectations and perceptions. The quality is determined by the normative requirements and its level is dependent not only on the perception of impact the output process, but mainly on the quality of the whole process.

The qualitative indicators are currently established normatively only for service category within the scope of universal service. They result from the recommendations of European Commission instructions and they are obligatory for the universal service providers being specified by the law of postal services and quality requirements of the universal service. The determination of the basic qualitative requirements is necessary from a view of ensuring the interconnection and interoperability of postal systems. [1]

3.2 Basic characteristics of the layers formation in the postal system

The layer number 1: The physical layer (the lowest layer of architecture) is identified as a physical communication (shipment) in available infrastructure (road, rail, air, water), that is provided through physical media (a means of transport). This layer specifies the characteristics of individual vehicles (postal rates), such as capacity, loading surface and it also defines the way of shipment. The devices that belong into this layer are different types of nodes (e.g. depots and hubs).

The layer number 2: The line (data link) layer provides a connection between two neighboring systems, respectively nodes. It identifies and organizes packages from the physical layer into logical units and it provides the connection of neighboring nodes and enables the setting of transmission data between two nodes. Its function is also to ensure the formation of transport units on the basis of codes such as: (ZIP code, label of direction ...), and it announces the errors of sorting and loading. Its task is to ensure the functions in transport of postal substrate between the network units and the detection of errors that occur in physical layer.

The layer number 3: The network layer takes care about the direction of packages within the network and network addressing. It provides the connection between the systems that are not neighboring ones. It means, that some systems have a function of an end source (post) and a goal of dispatched package (the delivery post office, PO Box...) and vice versa. Some open systems have functions of internode link (processing centres) that ensures the handover of distributed postal substrate to another systems. The basic function of this layer is a collection of network-oriented protocols for the goal of correct shipment (sorting feature, e.g Zip code) and crossing of different technological characteristics that are applied in individual networks. This layer provides a connecting path between endpoints (the sender and the addressee), including the use of internodes. It is responsible for the selection of the best path between the terminal equipments and transport between them, as well as the delivery.

The layer number 4: The transport layer manages the transport of postal item from end node source (open system), into targeted end node (open system) that is not realised in internodes. This layer reminds us an illusion as if each node in the network had direct connections with any other node. It ensures the creation of transport units from expedition of packages and their deconsolidation in delivery. Its purpose is to provide such quality distribution that is required by higher layers. This required quality is maintained throughout whole time of the transport connection. Higher layer is informed in the case of quality failure (service T & T). This includes for example the application of protocols related to the requirements for distribution with guarantee (recorded packages as registered mail, insurance ...) and the requirements for

distribution without guarantee (non-registered mail). The guarantee can be applied also to loss and damage of the package.

The layer number 5: The relational (session) layer organizes and synchronizes dialog between co-relational layers of both systems and it controls the exchange of data between them. It creates a connection between the sender and the addressee through the application of defined protocols- the selection of suitable cover for package and the presentation of personalized features, followed by submission of package- the enter into the postal system. The mailbox or partition are considered to be the interface. In the case of system´s failure to deliver the package, it may be returned to the sender on the basis of referred synchronized data- address (sender, recipient).

The layer number 6: The presentation layer transforms the package into the shape that is used by application. It determines the conditions for the requested service and it sets rules for the choice and distribution of packages. The protocols are based on legislative measurement. It deals with the formal aspect of package (cover, address information) and with the preservation of information content during the transport. Its task is to ensure the secrecy of correspondence.

The layer number 7: The application layer includes the postal service of which disclosure is required by the sender through the entry of the postal system.

4. CONCEPT OF POSTAL LAYER MODEL

We can divide layers on the basis of their characteristics and functional content into two basic groups: either in terms of their functions within the network, or from the perspective of user access.

- Division of layers in terms of their functions within the network:

    1. End-oriented layers- they are implemented only into the terminals- (application, presentation, session, transport layer).

    2. Network-oriented layers- they are dependent on the network technology that is used and they have to be at least partially implemented into the network (network, line/data link, physical layer).

- Division of layers in terms of their users:

    1. User-oriented layers (application, presentation, session layer) - they play important roles in interpretation of the data to user.

    2. Transport-oriented layers (transport, network, line/data link, physical layer) - they are related to the distribution of the package.

The transport layer can be described also as so called interlayer that forms an interface between user-oriented layers and network-oriented layers.

During application of the layer model into environment of the postal system, it is possible to think about the integration of chosen layers. This is possible just in the case of insufficiency of functional filler, or in the functional intersection of the

individual layers, in which the interface identification between layers or setting of communicating protocols will be not possible [6].

5. CONCLUSIONS

The idea and the purpose of this paper consist in problematic solving of postal system model through the decomposition into independent subsystems by the form of layer network model depiction. Postal service that is generally understood as a sequence of processes for collection and distribution of package can be presented through the security functions in identified layers of postal systems.

Another reason why to think about the postal system in the forms of layers is its wider range of services and their penetration into the field of electronic communication, that are becoming necessary part of delivery services, mainly in the form of supplementary services that increase the positive perception of the customer. Interesting part is the creation of hybrid products involving ICT into the process of selection and distribution, when the part of the chain is realized through the electronic means. This creates space for discussion, especially in the field of service regulation. Into which regime of regulation can we include these services? Which regulating organ should solve this regulation? Which regulating orders or means will be redundant and which will be absent?

6. ACKNOWLEDGEMENTS

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