

# An Approach to Development of a Model of Interaction Between Convergent Telecommunication Network and Environment

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**Abstract** - Approaches to the formal description of interaction between the convergent telecommunication network and environment are offered.

**Keywords** - Convergent telecommunication network, Interaction medium, Generation medium.

## I. INTRODUCTION

The definition of the convergent telecommunication network (CTN), some formal representations and the approach for its analysis and synthesis are given in the production work [1]. It's established that it's impossible to carry CTN directly to any of known classes of networks which fit for realising service of users only in the determined clearly limited area. Therefore existing models of networks' functioning in crude form are unsuitable for CTN's analysis and designing problems solving.

## II. MAIN PART

Formally CTN's architecture is described in the form of the external medium and the network medium. Each of these mediums is represented in turn in the form of two mediums: external – generation and distribution mediums, network – interaction and processing mediums. Extraction of generation and interaction mediums allows to describe the network as a whole, as the unified system co-operating with the environment at the system level [1]. According to [2] let's present interaction medium as some homogeneous information medium consisting of switching nodes. For the description and analysis of interaction medium's features let's take advantage of the apparatus of hierarchical connectivity matrixes (CM). Let's set nodes' configuration in the matrix form with usage of square CM of the given level's nodes by dimension  $N_i \times N_i$ , where  $N_i$  – number of nodes of corresponding  $i$  level, and rectangular CM of the adjacent levels' nodes by dimension  $N_i \times N_{i-1}$ , where  $N_{i-1}$  – number of lower level's nodes. Here are CM for one and adjacent levels accordingly

$$\|M_{ii}\| = \begin{matrix} m_{ii}^{11} & \dots & m_{ii}^{1N_i} \\ \dots & \dots & \dots \\ m_{ii}^{N_i 1} & \dots & m_{ii}^{N_i N_i} \end{matrix}, \quad \|M_{i,i+1}\| = \begin{matrix} m_{i,i+1}^{11} & \dots & m_{ii}^{N_i 1} \\ \dots & \dots & \dots \\ m_{i,i+1}^{1N_{i+1}} & \dots & m_{i,i+1}^{N_i N_{i+1}} \end{matrix},$$

where the element of CM's level's node is:

$$m_{ii}^{ki} = \begin{cases} 0, & \text{if there is no connection between } k \text{ and } i \text{ nodes;} \\ 1, & \text{otherwise.} \end{cases}$$

Instead of 1 in the CM there can be denotations of numerical value of some parameters characterising appropriate links. Interlevel CM can be primary, displaying physical connections between nodes, and secondary.

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Solution of the problem of CTN's designing and optimisation from system positions should be received taking into account close interaction between the network and users. Users of CTN are informational processes. Informational stream entering into the network mirrors and allows to describe users' effect on the network. Consideration of transmission of various kinds of informational users' messages (UM) arriving from an external informational metastructure in CTN's transport system in the form of streams of switched informational units (SU) allows to pass to the formal description of the generation medium, reduced to the description of entering calls' (events) streams' effect on the network. The model of the calls' stream and ways of its representation are studied for a long time. The impossibility of usage in crude form of existing mathematical apparatus for definition of CTN's probability-time characteristics is defined in [3], also it's defined that for the description of arriving and circulating in CTN streams it's expedient to use superposition of the most adequate to the formulated representations about CTN streams' models, taking into account self-similarity of the traffic formed by these streams.

## III. CONCLUSION

On CM defined by offered in the article way, using some additional resources and concepts, e.g. concepts of rank and section, it's possible to organise search of two abonents' optimal connection path and to carry optimisation of the network's structure. According to [1,3] it's necessary to develop model of interaction between the CTN and environment based on the mathematical apparatus of UM and SU modelling taking into account self-similar character of CTN's traffic. Thus informational UM and SU besides allocation in time should be characterised by length of separate messages.

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