The Application of a Socio-Economic Indicator for Calculating the Bandwidth of a Backbone in a WAN

Basri H. Ahmedi, University Kadri Zeka, Kosovo*
https://orcid.org/0000-0002-6572-550X

ABSTRACT

In a regional network, the graph branches that describe it are not loaded equally with data traffic. A branch that is loaded with traffic will depend on the number of users in both nodes of the graph, the number of paths that pass through that branch which are defined by the algorithm for finding the shortest path, the position of the branch in the network, as well as the position of WAN in other neighbors' networks. The traffic on the branches that connect the nodes of a network is constantly changing. It is important to know the maximum load of a branch in order to adapt to the demand so that there are no communication barriers. The calculation of data traffic in these branches is possible to be calculated and to know the maximum traffic limit in the respective branches. The branches that are busiest with data traffic represent the backbone of the network. The calculation of the bandwidth of the branch is affected not only by the number of users but also by their structure. In this paper, bandwidth calculation on a main branch in a graph is done through a case study using SEI.

KEYWORDS

Bandwidth, Network Backbone, Socio-Economic Indicator, Traffic Matrix, Wide Area Network

1. INTRODUCTION

For computer networks where the number of users is small there is no need for planning and calculation because usually such networks meet the requirements for which they are built. It does not happen that the branches of such computer networks are 100% loaded. If the number of users of a regional computer network is large, planning should be done in accordance with the requirements for which the computer network is established. In this case, some calculations need to be made before such a network can be built. Since each network is specific, there is no one-size-fits-all model for planning (*Al-Wakeel, 2009*). This requires help from some scientific disciplines such as graph theory, neighbor matrix, algorithms for finding the shortest path, statistical data on population structure, data on the technical-technological level of computer network equipment, etc. In a computer network the branches which connect the graph nodes representing the network are not equally loaded with traffic. Some branches are loaded with more traffic and some with less data traffic and this is constantly changing. This paper identifies several graphical branches of a WAN that represent a backbone of the Network. This paper attempts to identify such branches in a regional network in the region. In order to have a forecast for the maximum data traffic capacities in these main branches, the bandwidth of these branches is calculated. These maximum limits should be known despite the fact that the capacity for data transfer in these branches rarely reaches the maximum level. The structure of the population

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such as: workers in the public sector, workers in enterprises, unemployed, students, pupils, others do not use the same and it is possible to measure This provides even more accurate possibilities for calculating the maximum limits of bandwidth of these key backbone graph using the Socio-Economic Indicator (SEI). The contribution of the paper is that for the most accurate bandwith calculation of a branch at a certain region in WAN, a parameter is used and it is SEI (Socio Economic Indicator) with data from the field where that WAN network is located.

2. CALCULATION AND PLANNING OF BANDWIDTH ON THE BACKBONE OF A WIDE AREA NETWORK A CASE STUDY

A graph describes the regional WAN network through nodes and branches. Graph nodes represent cities and branches the connections between them. Some branches in the graph are overloaded. This is because through these branches data is transferred not only of those nodes (cities) that connect them but here can also pass traffic which is dictated through the algorithm for finding the shortest route. The application of the methodology for planning WAN networks enables the calculation of Erlang and then the availability of these branches, which create the backbone of a regional network. In accordance with the calculations in these branches, which form the main pillar of the network, technology will be deployed, which justifies the demand with the same communication capacity and cost reasonableness. This eliminates communication expectations and increases the stability of the regional network. To calculate Erlang and Accessibility several actions will be included: the traffic matrix for each city, the number of households, the number of network users, the total traffic for each city, the communication matrix between all cities and the shortest route between the vertices of graphite. In this case, it is attempted to calculate through these parameters some of the branches that are busiest with traffic connecting several nodes (cities) of a region. These branches can be said to represent the backbones that connect several cities to a regional computer network.

3. THE MOST IMPORTANT STAGES TO GET TO CALCULATION OF BANDWIDTH IN BACKBONE OF A WAN

The most important stages to achieve the calculation of bandwidth in the branches of a graph are: creating the graph and measuring the distances between nodes, calculating the SEI, calculating the traffic for each city, calculating the intercity traffic (traffic matrix), implementation of the algorithm for finding the shortest path, calculation of Erlang in the branches that connect cities, calculation of bandwidth in the main branches (*Ahmedi, 2014)*.

3.1 Creating the Graph And Measuring The Distances Between Nodes

The first step in planning a WAN is to create a graph that will out line the network. It consists of nodes which represent cities and branches which represent the connections between these nodes respectively cities. This is done to proceed further with the next steps for each node and each branch of the graph. There are some parameters that are treated in the following such as: number of families and structure, distance between nodes, position of the branch in the graph, etc.

3.2 SEI Calculation

The use of computer networks is not at the same level by the demographic structure of a city. It is quantified by a composite socioeconomic indicator (SEI), as a linear sum of products of weights w_i, and several measures of labor status and education, a_i ($0 \le a_i \le 1$ (Table 1). The weights w_i are defined on the basis of statistical reports *(Ahmedi, 2014*), *(De Montis, 2007*):

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