ANALYSIS AND CALCULATION OF MULTISERVICE ACCESS POINT PERFORMANCE

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Abstract

This work deals with the problem of transition from PSTN networks to the next generation network. It is shown that this issue, due to its complexity, can be solved in practice with the modernization of the existing public telephone networks. Because customers use different types of services, such as: telephony, data and video transmission, appears a need to divide them into categories, depending on the services that they use. In this situation, it is useful is to calculate the number of packets individually for each group and the average value of them. Also it's important to calculate bandwidth requirements, that will allow us to find the optimal use of multi-service access node. In the paper it comes with analyzing of traffic for different user groups and the final calculation of the required capacity of the hub (multi-service access point).

Modern development of computer networks characterized by its convergence. Previously isolated LANs were combined with global networks. Becoming significant the task of building a universal networks that can provide equally effective services of various types.

Promising architecture of next generation networks (NGN) involves the creation of multi-service network in the disposition functionality of services in the boundary nodes of the network , the creation of a special sub-system management services as a separate network subsystem, as well as expanding the range of interfaces for service providers equipment.

Multiservice networks can be created as a new class of networks ensuring interoperability with existing networks. The essence of the next generation network is to switch to a simple and effective cost network designed specifically to provide all kinds of services. From a technology standpoint movement from conventional network to the NGN is the existence of a separate transition from a circuit switching network and a packet switched network to multiservice networks capable with operating in both the first and second switching modes. As a result, the network can be adapted to all types of services. These networks will be much easier to manage, and at the same time monitoring of quality of services largely will mostly go to the customers for better meet their needs.

Considering two main options for the transition to next-generation networks - the transition from the transport network and from the access network, were analyzed the basic NGN models and the principles of the existing access networks and scenarios of transition to next generation networks, concluded the feasibility of using the second method.

In the construction of the NGN network, all users were conditionally divided into three groups: traditional users (telephony), subscribers that use voice services and data services and subscribers that use telephone, internet and video (triple play) (fig. 1).

Calculation of access knot performance for new user groups should be carried out with the "old" groups that use only telephony from the full range of services. This group takes almost 70% of all users . In addition, it is necessary to take into account the part of the users, that use the services of data transmission in addition to telephone services. The value of this part of users is about 17%. The number of such subscribers, as a percentage, significantly less than number of "traditional" users, but bigger than number of "advanced" users who use video conferencing services, VoD, etc. This group is the smallest one – about 13%, but it brings largest share of revenue.

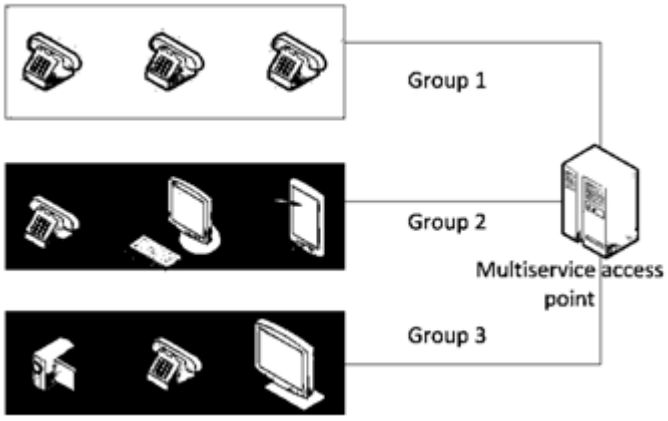

Fig 1. Three main groups of users

Were analyzed and calculated the number of packets in a given environment for each group using:

$$N_1 = n_1 \cdot t_1 \cdot f_1 \cdot \pi_1 \cdot N .$$

For second group

$$N_2 = N_{2t} + N_{2d}, \; N_{2t} = n_1 \cdot t_2 \cdot f_2 \cdot \pi_2 \cdot N,$$

$$N_{2d} = \pi_2 \cdot N \cdot V_2 / h,$$

where N_{2t} – elephone packets, N_{2d} – data packets.

Same formulas were used for packet calculation for the third group with only difference of packet calculations for TV:

$$N_{3v} = K_{tv} \cdot n_3 \cdot t_{3v} \cdot 60.$$

The total number of packets that should handle multi-service access node will be:

$$\sum N = N_1 + N_2 + N_3.$$

This index allows to estimate the requirements for performance of the router, aggregating traffic of multiservice access network NGN.

These values were the started point of multi-service access node performance calculations that must be able to handle quality of service using traffic shaping. Based on the results was made a conclusion which type and model of router we have to use for this particular situation. The key point was analyze of performance requirements for the aggregation node to meet the requirements of new users groups that use the services of «triple-play». Calculated bandwidth requirements are determined by the guarantees of quality of service provided by the operator to the user. Using the formula of Pollaczek–Khinchine was calculated average call in system

$$\bar{t}_{a\partial} = \frac{\tau(1 + C_b^2)}{2(1 - \lambda\tau)}.$$

Also were made calculations of intensity of service and the number of packets for busy hour that let us calculate required capacity.

The results obtained in this study allow us to judge that the demand for multimedia services even by a small group of subscribers bandwidth requirements vary radically. Therefore, while designing the NGN is necessary to first - conduct a thorough analysis of the customer's needs, and secondly, to provide a substantial margin of bandwidth in the event of changes in the composition of the subscriber access network.

The QoS parameters used in the work described in Recommendation ITU Y.1541. For calculations of bandwidth was used M/G/1 [6] model and taken into account codec G.711, that provides the best voice quality, ease of implementation and conversion efficiency.

So in general NGN is effective maintenance traffic with different attributes. The basis of NGN is a packet-switched network and the support of QoS. To date, the introduction of NGN undermined by a number of objective and subjective obstacles. Current scenario is the creation of NGN is upgrade of the existing telephone networks and unite them to the network that can convert and handle all kinds of traffic – "Triple-Play Services" system. But to do that we have to rely on serious calculations of multiservice access point performance, structure of old networks, clients base and needs.

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