Study of characteristics of signal traffic in a communication network based on the IMS system process

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Annotation

The rapid development of multiservice communication networks using the architectural concept of NGN (Next Generation Network) requires the creation of an adequate mathematical model of the quality of the functioning of signaling systems based on the IMS (IP Multimedia Subsystem) multimedia communication subsystem, which are switching nodes of NGN / IMS networks when establishing a connection and providing multimedia communication. Here, multimedia communication refers to the organization of telephone connections, video conferencing, the transmission of multimedia information, as well as Triple Play services, including voice services, Internet access and watching television programs. The following article is devoted to the study of characteristics of signal traffic in a communication network based on the IMS system.

Keywords: NGN/IMS networks, signaling traffic, SIP protocol, self-similar traffic, average packet service time, multimedia services.

The NGN/IMS multiservice network, built on the IMS architecture, consists of various modules and is a distributed structure for managing communication sessions using signaling systems and protocols - SIP (Session Initiation Protocol) and Diameter, a home subscriber server HSS (Home Subscriber Server), transport gateways (MGW) and the core of the control system CSCF (Call/Session Control Function), signaling gateways (SGW) that serve service and useful traffic transmitted in the process of providing multimedia communication services. The SIP and Diameter protocols are the main protocols for establishing multimedia communication in NGN/IMS networks, providing a procedure for exchanging signaling traffic to establish a multimedia sessionThe concept (architecture) of IMS

is a development of the so-called. architecture of the next generation network (NGN), which provides the expansion of communication network capabilities in the implementation of various services based on the separation of the infrastructure layer from the service layer.

Due to its focus on multimedia services, the IMS concept does not consider telephony as a core service. In fact, telephony in the IMS architecture is emulated, and voice connections are provided in a technological way that is fundamentally different from "classical" telephony.

The IMS network architecture is a geographically distributed "cloud" that uses a "flat" (non-hierarchical) data network to interconnect the main functional elements of the IMS infrastructure

For IMS, a multi-layer architecture has been developed with separation of the traffic transport transport and the IMS signaling network for session management. Thus, during the development of IMS, the main ideology of Softswitch was actually transferred to mobile networks.

The IMS stands out

1) user level or data transfer level (User Plane),

2) control level (Control Plane) and

3) application level (Application Plane).

In these planes, 3GPP does not specify network nodes, but functions. This means that the IMS architecture, like the Softswitch architecture, is also a set of functions connected by standard interfaces. At the same time, in the case of IMS, the functions also turn out to be described in the standards. Developers are free to combine multiple functions in a single physical object or, conversely, implement one function in a distributed manner.

Each IMS network contains one or more user servers. HSS databases. The HSS server is a centralized a repository of information about subscribers and services and is evolutionary development of HLR (Home Location Register) from the architecture of GSM networks. Network may contain more than one HSS if the

number of subscribers too large to be supported by a single HSS. Such a network, along with multiple HSS, will need to include the SLF function (Subscriber Location Function), which is a simple database, which stores the correspondence of HSS information to user addresses.

A node that sent a request with a user address to the SLF receives from it information about the HSS that contains information about this user. SIP server function Call Session Control Function (CSCF) is the central part of the IMS system, is, in fact, SIP server and handles SIP signaling in IMS.

There are three types of CSCFs: Proxy-CSCF (P-CSCF), Interrogating-CSCF (I-CSCF) and Serving-CSCF (S-CSCF).

The first of these, the P-CSCF, is the first point of interaction (at the signaling layer) of the IMS user terminal and IMS networks. From a SIP point of view, it is an incoming/outgoing proxy server through which all requests originating from the IMS- terminal or directed to it. However, the P-CSCF may himself and as a UA user agent, which is necessary to terminate sessions in non-standard situations and to create independent SIP transactions, related to the registration process.

I-CSCF is another SIP proxy located on the border of the Operator's administrative domain. When a SIP server determines the next hop for a SIP message, it obtains the I-CSCF address of the corresponding domain from the DNS service. In addition to performing functions, SIP proxy I-CSCF communicates with HSS and SLF via Diameter protocol, receives from them information about the location of the user and the S-CSCF serving him. If no S-CSCF has yet been assigned, the I-CSCF makes its assignment.