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Research on Anomaly Detection Algorithm Based on Generalization Latency of Telecommunication Network

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Abstract

With the rapid development of Mobile Internet and the 4th Generation mobile communication technology, data service has exceeded voice service, which has also become the important means for mobile operators to promote shares in the communication market.Therefore, the service quality of data service business will directly influence mobile user perception and satisfaction to network. With complicated process networking procedure is long in the data service process and the fundamental reasons of problems arerelatively more di□cult to position. During voice communication in mobile networks, there are relatively unitary important factorswhich can a□ect user perception such as call drop, network congestion and signal interference, etc. However, users perceptiontowards data services is somewhat di□erent, which shows strong association with the usage scenarios of the various applications ofusers. For example, in the data browsing service, if terminal connection fails, the background will start the function of automaticrepeated connections, during which, latency is increased, so as to influence user perception of data service latently. Besides, in thevideo service, initialization delay, stalling during the play and times of stalling are also the factors which could a□ect video quality.The above analysis shows the latency in the various data service processes and the usual network latency indicators, such as TCPthree-way handshake and DNS, etc. gathered and mapped into a total latency, which is the latency perception from the perspectiveof user experience. In the current work, it is defined as generalization latency, which is also known as the total latency coveringlatency for users to establish connection on the signaling control plane and latency of user plane. However, users perception towards data services is somewhat di□erent, which shows strong association with the usage scenarios of the various applications ofusers. For example, in the data browsing service, if terminal connection fails, the background will start the function of automaticrepeated connections, during which, latency is increased, so as to influence user perception of data service latently. Besides, in thevideo service, initialization delay, stalling during the play and times of stalling are also the factors which could a□ect video quality.The above analysis shows the latency in the various data service processes and the usual network latency indicators, such as TCPthree-way handshake and DNS, etc. gathered and mapped into a total latency, which is the latency perception from the perspectiveof user experience. In the current work, it is defined as generalization latency, which is also known as the total latency coveringlatency for users to establish connection on the signaling control plane and latency of user plane.

The first innovation of this paper is to establish a mapping model, where, generalization latency, which is from the perspective of user using perception, is related to performance indicators of telecommunication network, under different data service characteristic scenarios, so as to forecast the inflection point of network performance anomaly. The second innovation is to introduce the abnormally detection model for generalization latency, so as to detect the performance stability of the application layer of the application service plane.

Keywords:
anomaly detection; wireless network; generalization latency; user perception; temporal characteristics

I. INTRODUCTION

In recent years, with the sustainable development of the high-speed LTE wireless connection, network data traffic has increased substantially. Besides, the different consumption of the data services, such as web browser, video communication, stream media and the application of traditional mobile phones are more diversified. Compared with the traditional broadband, surfing the Internet with mobile phones is featured by long process and complicated networks. Users will experience air interface, transmission access network, core network and the phase from core network export to application server. In the existing research system of the user perception about data services, the various signaling indicators of telecommunication network are researched to build a model, then indicators exerting greater influence on the user perception are judged, and each indicator is endowedwith weights coefficient for the quantified scoring of the user perception. Nevertheless, this method has two limitations. First of all, the most immediate response of user perception towards the data service in Internet surfing is latency. In this research system[1], the perceptual model is not mapped to the real user latency feeling, and the result of the response is not objective and direct; with this method, a evaluation model for user perception towards network is provided, starting from user perception. However, it is unable to pinpoint the problems encountered by users who have poor perception; for example, whether the problem occurs in the air interface, transmission access, core network or the export from the core network to the application service platform server is unable to be pinpointed.

In this paper, the concept generalization latency of telecommunication network, taking user experience as the starting point, is proposed. Generalization latency refers to the total latency in each data services process when users access to the network. For example, latency felt by users intuitively when clicking on a web page, which is also the total latency covering users' latency in establishing connections on the Internet signaling plane and user plane latency of the Internet application service. Innovations of this paper are reflected by the emphatic analysis on latency combination of generalization latency in the various data services phase, such as air interface, transmission access network, core network and the phase from core network export to application server. Model research is made based on a great amount of sample data. This paperwill build a mapping model between generalization latencytaking user perception as the starting pointand network performance indicators, and then