Dynamic TCP pacing for Delay Intolerant Cloud Communications

Vincent O. Nyangaresi, Silvance O. Abeka, Solomon Ogara
Jaramogi Oginga Odinga University of Science & Technology, Bondo – Kenya.

Abstract

In the recent years, many organizations have turned to cloud technology to support their information technology services. The cloud servers are therefore increasingly holding huge and sensitive information belonging to diverse groups of individuals and companies. Additionally, some organizations employ the cloud to provide them with online backup services. One of the most outstanding requirements for cloud customers is availability – the customers must be able to access their information and other resources stored in the cloud any time and from anywhere on the globe. This means that there should be efficient network design such that any delays are averted. The connection between the customer and the cloud can therefore be regarded as delay intolerant. Network congestions often lead to delays and packet losses. Transmission control protocol employs four congestion control algorithms– slow start, congestion avoidance, fast retransmit and fast recovery, all of which fail to meet the requirements of delay intolerance. Transmission control protocol pacing has been suggested as a possible solution to delays and packet dropping in computer networks. However, the current pacing is static in nature, meaning that constant pauses are introduced between packet transmissions to prevent bursty transmissions which can lead to delays at the receiver buffers. This paper therefore presents a dynamic pacing where the delay period is hinged on the prevailing network conditions. This dynamic pacing algorithm was designed and implemented in Spyder using Python programming language. It employed probe signals to gather network intelligence such as the applicable round trip times of the network. Thereafter, this network intelligence was employed to tailor the paces to these network conditions. The results obtained showed that this algorithm introduced longer paces when more packets are transmitted and shorter paces when few packets are transmitted. In so doing, this new algorithm gives enough time for large packets to be delivered and smaller paces when few packets are sent. The analysis was done in terms of bandwidth utilization efficiency, round trip times and congestion window size adjustments. The congestion window – time graphs and throughput – time graphs showed that the developed dynamic pacing algorithm adjusted quickly to network congestions hence ensuring that the network is efficiently utilized by averting delays.

Keywords: Cloud computing, congestion, network delays, algorithm, TCP Pacing.