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Entitled

TRAFFIC CHARACTERIZATION OF AN INTERNET OF THINGS (IOT) NETWORK ARCHITECTURE

by

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Abstract:

Internet of things (IoT) is an evolving paradigm that is currently getting more attention and rapidly gaining importance. The basic idea of IoT is to connect everyone and everything to the Internet for information exchange. It is essential to develop a clear understanding of characteristics of IoT traffic sources as well as to find a traffic model that efficiently characterizes the statistical behavior of IoT traffic. Since many IoT devices generate relatively small sized data, we are particularly interested in an IoT network architecture where data from a number of different IoT devices are aggregated at an IoT gateway. We focus on characterizing the IoT aggregated traffic pattern for three common IoT applications with real-time and non-real-time quality of service (QoS) requirements. These applications include healthcare, smart cities, and video surveillance. Our study is based on generating a real IoT traffic trace in a lab by using various sensors and devices in the aforementioned applications. The generated traffic trace is transmitted wirelessly over the air using Wi-Fi technology to an IoT gateway. The input network traffic to this gateway is characterized. In the experiments, the amount of input traffic to the gateway is varied and different traffic patterns for each of the selected applications are examined. Statistical tests and parameters are used to determine the best matching packet inter-arrival time distribution for different traffic penetrations. Moreover, we also examine packet size distributions. Based on our empirical data, the experimental results indicate that IoT packet inter-arrival time follows a Pareto distribution. However, it can be better modeled as a Weibull distribution in some traffic patterns. Our experimental results also reveal that the packet size distribution of different penetrations of the studied IoT applications is not in a good match with the commonly used Geometric distribution. Furthermore, we investigate the impact of traffic characterization on the performance of the considered IoT network architecture for a certain availability of network resources using computer simulations.

Keywords: IoT, QoS, Wi-Fi, packet inter-arrival time distribution, packet size distribution, IoT gateway, traffic model.