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Author: Prof. Marco Schmidt
Bochum University of Applied Sciences, Germany, marco.schmidt@hs-bochum.de

Dr. Florian Zeiger
Siemens AG, Germany, florian.zeiger@siemens.com
Mr. Hans-Peter Huth
Siemens AG, Germany, hans-peter.huth@siemens.com
Mr. Christof Kaufmann
Bochum University of Applied Sciences, Germany, christof.kaufmann@hs-bochum.de

PERFORMANCE EVALUATION OF INTERNET OVER GEOSTATIONARY SATELLITE FOR INDUSTRIAL APPLICATIONS

Abstract

In contrast to consumer IoT, Industrial IoT applications depend on highly-available Internet communication with defined performance , mainly due to digitalization in production and assembly lines. For many industrial applications such as e.g. cloud-based plant operations or analytics, high data transmission rates are desired as well. Especially with regard to actual trends in cloud services and Internet of Things (IoT), it can be expected that communication demands will increase even further. Unfortunately, it is quite often not possible in rural or remote areas to support an industrial plant (e. g. offshore plants) with sufficient fixed line or cellular communication capabilities.

Falling prices and new technologies propose to use satellite-based Internet to overcome this situation. There are a number of ongoing projects which try to provide global connectivity to the Internet via small satellite constellations. This concept sounds very promising, but is not fully operational at the moment. However, Internet over geostationary satellites is already available for a couple of years and nowadays at affordable cost with reasonable performance. Internet Protocol (IP) based communication over geostationary satellites provide high bandwidth and permanent availability. However, protocols (e.g.,Transmission Control Protocol TCP) heavily depend on link characteristics, such as the signal propagation delay (around 270 milliseconds per hop for geostationary satellites). This work addresses the question, how strong the limitations of geostationary satellite communication services affect their applicabikity to industrial application scenarios from an end-to-end perspective.

The paper analyzes in detail the measured performance of a satellite based internet connection. Guided by defined industrial use cases corresponding traffic profiles are generated and measured in a test setup with a geostationary satellite link and a terrestrial measurement end points (measurement computer). The measurement computer records a number of Key Performance Indicators (KPI) (e. g. bandwidth, packet loss, jitter, round trip time, connectivity) and additional environmental parameters, such as weather conditions, time, date and RF signal characteristics. Based on the analysis of the KPI, we will explain in detail how industrial applications can be connected to terrestrial internet over satellite without major performance issues. The paper concludes with a recommendation for the initially defined use cases.