

Exploiting LoRa, Edge and Fog Computing for Traffic Monitoring in Smart Cities

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ABSTRACT

Smart cities are already a reality, with hyperconnected urban areas and increasing ubiquity of Internet of Things (IoT) devices. These connected devices generate and transmit a vast amount of data about the city's environment, traffic and any other aspects that define the interaction between the cities and their citizens. The appearance and rising penetration of new computing paradigms and low-power wireless area network technologies are turning traditional cloud architectures that gather data from Wi-Fi, Bluetooth or GSM/LTE connected devices into more distributed platforms with computation at different network layers. At the same time, Low Power Wide Area Network (LPWAN) technology has opened a whole new world of opportunities in the IoT. More concretely, LPWAN solutions that operate on unlicensed radio bands have enabled low power and long distance communication to industry, researchers, public organizations and individuals equally. Together with these, the increasing penetration of the edge and fog computing paradigms is allowing for smarter IoT solutions that do not necessarily rely on cloud servers. In this chapter, we present a hybrid edge-fog-cloud computing architecture for monitoring environment parameters and traffic flow in a city with a very small footprint in terms of installed infrastructure. In particular, we put an emphasis on traffic monitoring and propose a lightweight image processing algorithm that estimates traffic density.

Keywords: LoRa; LPWAN; Fog Computing; Edge Computing; Smart Cities; Traffic Management; Image Processing; Edge-AI;