Accepted Manuscript

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PII: S0167-739X(17)30212-1
DOI: http://dx.doi.org/10.1016/j.future.2017.02.014
Reference: FUTURE 3332

To appear in: *Future Generation Computer Systems*

Received date : 26 May 2016
Revised date : 8 November 2016
Accepted date : 8 February 2017

Please cite this article as: A.M. Rahmani, et al., Exploiting smart e-Health gateways at the edge of healthcare Internet-of-Things: A fog computing approach, *Future Generation Computer Systems* (2017), http://dx.doi.org/10.1016/j.future.2017.02.014.

Exploiting Smart E-Health Gateways at the Edge of Healthcare Internet-of-Things: A Fog Computing Approach

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Abstract

Current developments in ICTs such as in Internet-of-Things (IoT) and Cyber-Physical Systems (CPS) allow us to develop healthcare solutions with more intelligent and prediction capabilities both for daily life (home/office) and in-hospitals. In most of IoT-based healthcare systems, especially at smart homes or hospitals, a bridging point (i.e., gateway) is needed between sensor infrastructure network and the Internet. The gateway at the edge of the network often just performs basic functions such as translating between the protocols used in the Internet and sensor networks. These gateways have beneficial knowledge and constructive control over both the sensor network and the data to be transmitted through the Internet. In this paper, we exploit the strategic position of such gateways at the edge of the network to offer several higher-level services such as local storage, real-time local data processing, embedded data mining, etc., presenting thus a Smart e-Health Gateway. We then propose to exploit the concept of Fog Computing in Healthcare IoT systems by forming a Geo-distributed intermediary layer of intelligence between sensor nodes and Cloud. By taking responsibility for handling some burdens of the sensor network and a remote healthcare center, our Fog-assisted system architecture can cope with many challenges in ubiquitous healthcare systems such as mobility, energy efficiency, scalability, and reliability issues. A successful implementation of Smart e-Health Gateways can enable massive deployment of ubiquitous health monitoring systems especially in clinical environments. We also present a prototype of a Smart