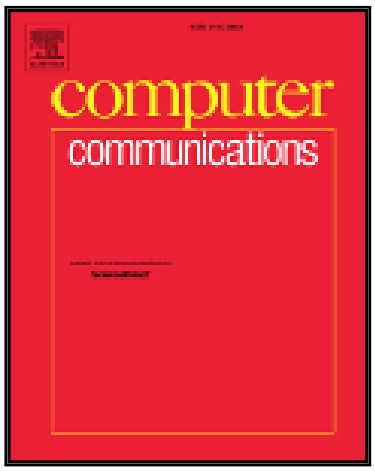


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# Do we all really know what a Fog Node is? Current trends towards an open definition

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**Abstract:**

Fog computing has emerged as a promising technology that can bring cloud applications closer to the physical IoT devices at the network edge. While it is widely known what cloud computing is, how data centers can build the cloud infrastructure and how applications can make use of this infrastructure, there is no common picture on what fog computing and particularly a fog node, as its main building block, really is. One of the first attempts to define a fog node was made by Cisco, qualifying a fog computing system as a "mini-cloud" located at the edge of the network and implemented through a variety of edge devices, interconnected by a variety, mostly wireless, communication technologies. Thus, a fog node would be the infrastructure implementing the said mini-cloud. Other proposals have their own definition of what a fog node is, usually in relation to a specific edge device, a specific use case or an application. In this paper, we first survey the state of the art in technologies for fog computing nodes, paying special attention to the contributions that analyze the role edge devices play in the fog node definition. We summarize and compare the concepts, lessons learned from their implementation, and end up showing how a conceptual framework is emerging towards a unifying fog node definition. We focus on core functionalities of a fog node as well as in the accompanying opportunities and challenges towards their practical realization in the near future.

**Keywords:** fog computing, fog node, IoT, edge devices, edge computing

## 1. Introduction

Cloud computing has become an essential information technology power horse, commonly used by a myriad of applications, and valued by users to seamlessly run business, entertainment and social network applications at remote data center premises. The IT outsourcing feature of the cloud is not only bringing value added services, but also lowering expectations on the ability of edge devices to process the applications locally. The recent proliferation of Internet of Things (IoT)-related services, including eHealth [1], smart cities [2], smart transportation systems [3] and industrial scenarios [4], to name a few, are however challenging the performance of cloud computing, mostly for the reasons of unpredictable and often high communication latency, privacy gaps and related traffic loads of networks connecting cloud computing to end-users. To address some of these limitations of cloud computing, the research community has recently proposed the concept of *Fog Computing* [5], aiming at bringing cloud service features closer to what is referred to as "Things," including sensors, embedded systems, mobile phones, cars, etc.

Fog computing was initially proposed in the area of IoT to help execute applications and services. The work by Al-Fuqaha [6], et al, surveyed IoT concepts with fog