

Chapter 10

Examining Software-Defined Networking for Cloud-Based IoT Systems

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ABSTRACT

The Internet of Things (IoT) represents the current and future state of the internet. The large number of things (objects) connected to the internet produces a huge amount of data that needs a lot of effort and processing operations to transfer it to useful information. Maximizing the utilization of this paradigm requires fine-grained QoS support for differentiated application requirements, context-aware semantic information retrieval, and quick and easy deployment of resources, among many other objectives. These objectives can only be achieved if components of the IoT can be dynamically managed end-to-end across heterogeneous objects, transmission technologies, and networking architectures. In this chapter, Software Defined Systems (SDS) is described as a new paradigm to hide all complexity in traditional system architecture by abstracting all the controls and management operations from the underlying devices (things in the IoT) and setting them inside a middleware layer, a software layer, using a software-based control plane.

1. INTRODUCTION

After a couple of years, world is going to witness a technology transformation because Internet will interface billions of “things” which will be communicating with each other (Perera et al., 2014a). Devices associated to this IoT will be highly

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assorted in nature and will provide functions such as processing, sensing, storing capabilities. All the communicating objects will collaborate with themselves in a machine-to-machine pattern and with the users as well, upheld by their undeniably smartphones and other mobile devices, prompting a more unavoidable and deeply engaging Internet. This will encourage an extensive variety of utilizations in fields such as industrial automation and home, optimization of public services, real-time healthcare monitoring, energy management, etc.

The stretch of the IoT has constraint of complex necessities to both frameworks organization and internetworking plans in present and future frameworks.. To make it honest to goodness, networks have to welcome heterogeneity in devices as well as in networking behavior and underlying protocols. The IoT components are sorted out in 4 layers, as shown in Figure 1. The principal layer is the sensing layer, consist all RFIDs, Wireless Sensor Networks (WSN) and sensors. Data delivered through this layer is gathered with the help of aggregation layer (Layer 2). Distinctive sorts of aggregators are conceivable relying upon the sensing devices of the first layer. Aggregators either handle the information specifically or transfer that information to the other processing nodes of Layer 3. After information is handled, it can be transferred to the Cloud by means of an Internet connection (Layer 4), where it will be available to get used by countless.

In this way, unmistakably the IoT gives an amazing networking atmosphere in form of applications and devices both. In any case, IoT has most difficult issue of heterogeneity, which is required to exist with an exceptional extension. For instance, the sensing layer is relied upon to use diverse technologies like ZigBee and Bluetooth Low Energy (BLE) (Perera et al., 2014b). Diverse transmission technologies might be utilized, such as 3G/4G and WiFi, to guarantee the connectivity of diligent level at Layers 2 and 3. To bolster these transmission technologies, network operators use segments from various sellers, confounding their management and diminishing their interoperability. Besides, operators and service providers are progressively actualizing system and server virtualization arrangements for the end goal to amplify the use of their assets, which presents huge administration issues. Rapid and proficient deployment of services improvement of information delivery and boosting up the use of the Big Data generated by the IoT are the challenges at Layer 4 to maintain a fine-grained end-to-end Quality. The initial move in direction of this colossal enterprise is the description of general schemes to segregate data and control planes in routing and switching elements. This has gone well with the improvement of intermediate network elements, which now end up with mere packet forwarders, and the meaning of a all-purpose control protocol that is utilized to set them with the essential forwarding rules to achieve with the goal of the network. In addition, this scheme likewise proposes a conceptually centralized *brain* which has the knowledge of topology and condition of the network to take decisions about packet forwarding,

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