DESIGN AND IMPLEMENTATION OF A LIGHT WEIGHT, SCALABLE AND ASSISTIVE APPLICATION PROGRAMMING INTERFACE FOR INTERNET OF THINGS

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June 2018

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Thesis submitted in partial fulfillment of the requirements for the degree Master of Science in Computer Science and Engineering

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June 2018

DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Masters Thesis under my supervision.

Name of the supervisor: Dr. Indika Perera

Signature of the supervisor: ……. Date: …….

Abstract

Cloud computing and Internet of Things (IoT) brings various physical devices which generate and exchange data with the services promoting the integration between the physical world and the computer world into a single common page. Together they have been providing various applications, use cases and services over the past few years, that has made a significant benefit on both industrial applications as well as day to day needs of humans.

On the other side of the coin, programming of the IoT based applications has become very challenging due to the vast knowledge base required in various technical domains, from low-power networking to the embedded operating systems, from low level calculations to the distributed algorithms and so on. It is certain that a well designed, reliable and scalable, easy configurable and high performance Application Programming Interfaces (APIs) are much needed in this paradigm to offer sophisticated services for an IoT cloud. APIs are generally exposed to its consumers as service endpoints to get pre-defined jobs done, and are offering convenient ways for developers to design and implement applications as well as vendors (OEMs) to design and manufacture their devices.

In this research I have mainly focused and discussed about the true challenges, issues and the concerns that we may face when designing and implementing high performance APIs for IoT cloud. I have also elaborated the technical and theoretical limitations come along with the performance issues in such APIs. Most importantly I have tried to design a platform for small start-ups who start developing their IoT based products with a limited knowledge, time, funds and resources so that they can build their products without worrying about the production level challenges in terms of scaling and performance once the business is grown up.

This research will provide a solution for most of the challenges when it comes to IoT cloud in terms of self configurations and elasticity with auto scaling whilst keeping better performance. Considering the massive variety of devices and the resource constraints we have in IoT, an architecture has been proposed for devices to be self-configured to the maximum extent with the API. The proposed solution will have a well designed RESTful API which comes in plug-and-play mode with developer convenience, supporting horizontal scaling as and when needed. In a nut-shell this gives a framework which takes care of all the architectural level challenges and best practices in IoT cloud where the engineering team focuses more on the business and the product.

ACKNOWLEDGEMENTS

I am grateful to Dr. Indika Perera, my supervisor for accepting my research under his supervision and for the guidance, continuous support and the direction given throughout to make this research a success.

My sincere appreciation goes to my family for the support and the motivation given for making this thesis a success.

I would also like to thank my colleagues at work place, Sysco Labs for spending their valuable time with me to discuss about my research and opening gates to discover new areas.

Finally, I wish to thank all the academic and nonacademic staff of Department of Computer Science and Engineering, University of Moratuwa and my colleagues of MSC'16 batch for the support and encouragement provided throughout past 2 years.

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LIST OF ABBREVIATIONS

Abbreviation	Description
OEM	Original Equipment Manufacturer
WWW	World Wide Web
IoT	Internet of Things
RFID	Radio Frequency Identification
ITU	International Telecommunication Union
API	Application Programming Interfaces
M2M	Machine to Machine
REST	Representational State Transfer
SDK	Software Development Kit
SLA	Service Level Agreement
HTTP	Hypertext Transfer Protocol
MQTT	MQ Telemetry Transport
CoAP	Constrained Application Protocol
IOT-OAS	IoT Open Architecture System
ROM	Read Only Memory
XML	Extensible Markup Language
YAML	Yet Another Markup Language
JSON	JavaScript Object Notation
URI	Uniform Resource Identifier
IP	Internet Protocol
IDE	Integrated Development Environment
LAN	Local Area Network
URL	Universal Resource Locator
XMPP	Extensible Messaging and Presence Protocol