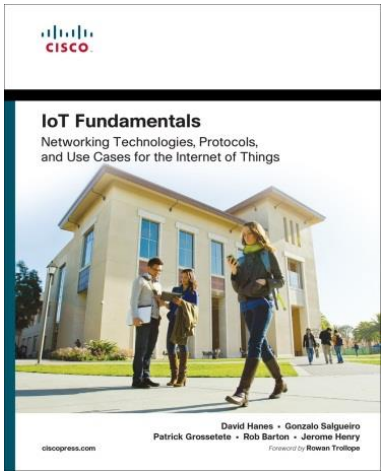
Book Review

IOT Fundamentals

Vinita Sharma
Associate Professor
New Delhi Institute of Management



The book "IOT Fundamentals" has been written by five leading CISCO IOT experts. The book introduces key concepts needed to successfully design IOT solution. It covers the principles and components of next generation wireless network and brings best practices for designing and implementing next generation wireless network.

The book is divided into 3 parts consisting of total 15 chapters. The first part is an introduction to IOT which is divided into two chapters. This part helps the reader to understand the newly emerged term IOT with the overview of lots of IOT examples.

Chapter 1 provides overview of beginning of IOT concept along with the current view of IOT as the next evolutionary phase of the Internet. Convergence between IT & OT is also one important topic, touched in this chapter. Examples of IOT covered in this chapter start from smart building to smart creatures.

The 2nd chapter talks about the network architecture, IOT Reference model, different types of networks of IOT and various designs of network topologies. Basically this chapter covers data management aspects of IOT. The chapter also illustrates various features of 2 stacks- 'the core IT functional stack' and 'the IOT data management and computer stack'.

Part 2 of the book "Engineering IOT network" contains 6 chapters. After getting an interesting introduction of IOT and its smart applications in the previous chapters, the reader gets deep knowledge of IOT networks, engineering, smart objects applications, data analytics and security.

The 3rd chapter introduces the smart objects that are the building blocks of IOT and can be called as "Things" in IOT. These things of IOT may be wearables, or can be mounted on walls, bridges, windows, cars, electric equipments etc. the chapter also illustrates about sensors and their networks, actuator and smart objects in a very user friendly manner. This chapter also highlights recent manufacturing trends ex-MEMS, toward making sensors & actuators ever smaller and more embeddable in everyday objects. The

last topic is communication protocols for wireless sensor networks. The topic is so well written due to which the reader starts having an urge of going through the next chapter of the book to explore new things.

After deployment of smart objects, they need to connect with one another within a network. This is what the chapter 4 is all about. This chapter also explains about different elements which are essential to understand to build a network for IOT. 802.15.4, 802.15g, 802.15e, NB-IOT, LTE variations are explained in the chapter thoroughly.

Chapter 5 covers the network layer of the protocol stack. This chapter also details how IP was optimized with enhancements like 6 Lo WPAN, 6TiSCH and RPL, to adopt to the low-power and lossy network (LLNs) where IOT usually operates.

The chapter 6 covers the transport layer of the protocol stack. The chapter guides the readers through different common application protocols, from MQTT, CoAP and SCADA to generic and web based protocols. This chapter also provides architecture recommendation to optimize your IOT network application and communication efficiency.

Chapter 7, "Data and Analytics for IOT" provides an overview of the field of data analytics from an IOT perspective and includes machine learning, big data analytics tools and technology edge streaming analytics and network analytics. The chapter explains the tools used to make intelligence of large amount of data and to analyse in real time Network flows and streams.

Chapter 8 is all about securing IOT networks. The chapter explains security practices of IT and OT and details how security is applied to an IOT environment. The chapter also explains challenges in OT security, IT and OT securities practices, formal risk analysis structures – OCTAVE and FAIR and phased application of security in an operational environment. This is the end of the second part of the book.

The last part of the book "IOT in Industry: contains 7 interesting chapters. IOT is transforming few major industries. This part of the book educates the readers how IOT can be used and what IOT architecture is recommended to increase safety, operational efficiency and user experience.

Chapter 9 gives an overview of connected manufacturing and architecture of the converged factory. The chapter also introduces the readers to industrial automation control protocols, which includes PROFINET, ETHERNET/IP, Modbus/TCP. Connected factory security, edge, computing and connected factory are the other important sections of this chapter.

Oil and gas are among the most critical resources used in the modern society. Chapter 10 introduces to this industry and its challenges during digitization of this industry. IOT architectures for oil and gas sector is explained thoroughly in a well interesting way. Security is also an important part of this industry which is explained in this chapter.

Main focus of chapter 11 is on the digitization journey of electric power companies and how IOT is being used to build smart grid networks. The chapter covers the introduction to the power utility industry and explains GridBlocks reference model which is a foundational architecture for the smart grid. The chapter also gives an overview of Field Are Network (FAN) Grid Block. The chapter ends with the concepts of SCADA security and NERC CTP for security of smart grid and explains the future benefits of smart grid.

Smart and connected cities include street lighting, smart parking, traffic optimization, waste collection and management and smart environment. Chapter 12 discusses the various IOT solutions for smart and connected cities. The chapter explains the IOT strategies for smarter cities, their architecture, security architecture, smart lighting pollution and traffic detection, smart parking, smart traffic control etc.

Chapter 13 talks about roadways, rail, mass transmit and fleet management. The chapter explains how IOT is used to allow for communication between vehicles and the infrastructure through protocols like DSRC and WAVE and how IOT increases the efficiency and safety of the transportation infrastructure. Smart cars, buses and their smart panels provide an intelligent view of the journey.

Chapter 14 shows various use cases of IOT in mining. The chapter also suggests an architectural IOT strategy for deploying smart objects in an ever –changing and often extreme environment. While this chapter covers a wide variety of topics in IOT and mining, it is far from exhaustive and is merely an introduction to the subject, based on a snapshot in time.

The last chapter is based on public safety which describes the emergency response IOT architecture and details how public safety operations leverage IOT to better exchange information and big data to respond more quickly and efficiently to emergencies.

The book has been designed and written in a user friendly manner, describing all concepts in detail and supporting them with good and live examples. The network diagrams and pictures which are made to explain the concepts are very useful and self-explanatory. Each chapter has a concluding summary and references to help readers gain a complete understanding of the concept and its application.

The book is suitable for engineering students. The management students can also have clear understanding of IOT fundamentals from 3-4 chapters in the beginning itself. Overall the book will give benefits to the students of all kinds of stream who are interested to know and understand the future applications of IOT.