

IOT Architecture

Research Paper Summary

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Explainable AI

Abstract

The Internet of Things is a technical advancement that will shape how computers and communications work in the future. It is not only a straightforward expansion of the Internet or the Network for Telecommunications.

It has characteristics of both the Internet and the Telecommunications Network in addition to having a unique feature of its own. By examining the three-layer framework for the Internet of Things that is currently recognised, we argue that it is insufficient to capture all of its characteristics and meaning. Establishment a new five-layer design for the Internet of Things after reanalyzing the technological foundation of the Internet and the Logical Layered Architecture of the Telecommunication Management Network. We hope that this architecture will help you better understand the essence of the Internet of Things.

3-Layered Architecture

Different from its definition unclear, the architecture of IoT is generally accepted. The well-known 3-layer architecture consists of the Perception Layer, the Network Layer and the Application layer

1. **The Perception Layer** - The Perception Layer is like the facial skin and the five sense organs of IoT, which is mainly identifying objects, gathering information. The Perception Layer includes 2-D bar code labels and readers, RFID tags and reader-writers, camera, GPS, sensors, terminals, and sensor network. Its main task is to identify the object, gathering information.
2. **The Network Layer** - The network layer is like the neural network and brain of IoT, its main function is transmitting and processing information. The network layer includes a convergence network of communication and Internet network, network management center, information center and intelligent processing center, etc. The network layer will transmit and process the information obtained from perception layer.
3. **The application layer** -The Application Layer is a combination of IoT's social division and industry demand, to realize the extensive intellectualization. The Application Layer is the deep convergence of IoT and industry technology, combined

with industry needs to realize the intellectualized industry, similar to person's social division of labor, eventually form human society

We can see various technologies development and application, but the Internet of Things still has not been large-scale applied into our work and life, and even many scholars think the Internet of Things is a it is lack of good management methods and business models. depends on the technology progress, more on various new applications and successful business models.

So we also look at two other models for better understanding -the Internet and communications network.

Internert and Telecommunications Architecture

TCP/IP Model Layer - Internet Architecture

The TCP/IP (Transmission Control Protocol Internet Protocol) model uses four layers that logically span the equivalent of the top six layers of the OSI (Open System Interconnect) reference model.

Internet Layer

This layer corresponds to the network layer in the OSI Reference Model. It is responsible for typical layer three jobs, such as logical device addressing, data packaging, manipulation and delivery, and last but not least, routing

Transport Layer

This primary job of this layer is to facilitate end-to-end communication over an internet-work. It is in charge of allowing logical connections to be made between devices to allow data to be sent either unreliably or reliably. The key TCP/IP protocols at this layer are the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). The TCP/IP transport layer corresponds to the layer of the same name in the OSI model (layer four) but includes certain elements that are arguably part of the OSI session layer.

Application Layer

This is the highest layer in the TCP/IP model. It is a rather broad layer, encompassing layers five through seven in the OSI model. Numerous protocols reside at the application layer. These include application protocols such as HTTP, FTP and SMTP for providing end-user services, as well as administrative protocols like SNMP, DHCP and DNS.

TMN Logical Layered Architecture - Telecommunications architecture

To deal with the complexity of telecommunications management, management functionality may be considered to be partitioned into logical layers. The Logical Layered Architecture (LLA) is a concept for the structuring of management functionality which organizes the functions into groupings called "logical layers" and describes the relationship between layers

Element management layer

The element management layer manages each network element on an individual or group basis and supports an abstraction of the functions provided by the network element layer.

The element management layer has the following three principal roles:

- a) Control and coordination of a subset of network elements on an individual NEF
- b) The element management layer may also control and coordinate a subset of network elements on collective basis.
- c) Maintaining statistical, log and other data about elements within its scope of control

Network management layer

The network management layer has the responsibility for the management of a network as supported by the element management layer. At this layer, functions addressing the management of a wide geographical area are located. The network management layer has the following five principal roles:

- a) The control and coordination of the network view of all network elements within its scope or domain.
- b) The provision, cessation or modification of network capabilities for the support of service to customers.
- c) The maintenance of network capabilities.
- d) Maintaining statistical, log and other data about the network and interact with the service manager layer on performance, usage, availability, etc.
- e) The network OSFs may manage the relationships (e.g. connectivity) between NEFs

Service management layer

Service management is concerned with, and responsible for, the contractual aspects of services that are being provided to customers or available to potential new customers. Some of the main functions of this layer are service order handling, complaint handling and invoicing. The service management layer has the following four principal roles:

- a) Customer facing and interfacing with other PTOs (Public Telecommunications Operators)
- b) Interaction with service providers
- c) Maintaining statistical data (e.g. QOS)
- d) Interaction between services.

Business management layer

The business management layer has responsibility for the total enterprise. The business management layer comprises proprietary functionality. The business management layer has the following four principal roles:

- a) Supporting the decision-making process for the optimal investment and use of new telecommunications resources
- b) Supporting the management of OAM related budget
- c) Supporting the supply and demand of OAM related manpower
- d) Maintaining aggregate data about the total enterprise.

A New Architecture OF IOT

After combining the features of Internet and Telecommunication architecture along with the features of the existing IOT, the new architecture has been divided IoT into 5 layers, which are the Business Layer, the Application Layer, the Processing Layer, the Transport Layer and the Perception Layer.

The Perception Layer

The main task of the Perception Layer is to perceive the physical properties of objects by various sensors, and convert these informations to digital signals which is more convenient for network transmission

The Transport Layer

The Transport Layer, or called the Network Layer, is responsible for transmitting data received from the Perception Layer to the processing center through various network, such as wireless or cable network, even the enterprise Local Area Network (LAN).

The Processing Layer

The Processing Layer mainly store, analyse and process the informations of objects received from the transport layer. We specially extract this new layer from others, because we think, due to the large quantities of things and the huge informations they carried, it is very important and difficulty to store and process these massdata. Main techniques include database, intelligent processing, cloud computing, ubiquitous computing, etc.

The Application Layer

The task of the Application Layer is based on the data processed in the Process Layer, and develops diverse applications of the Internet of Things, such as intelligent transportation, logistics management, identity authentication, location based service (LBS), and safety, etc. The function of this layer is providing all kinds of applications for each industry.

The Business Layer

The Business Layer is like a manager of the Internet of Things, including managing the applications, the relevant business model and other business. The Business Layer not only manages the release and charging of various applications, but also the research on business model and profit model.

Conclusions

I think the existing three-layer structure has certain significance to understand technical architecture of the Internet of Things at the initial stage of its development, but it cannot completely explain its structure and the connotation. Just because of this, many scholars have different opinions on the definition and scope of the Internet of Things.