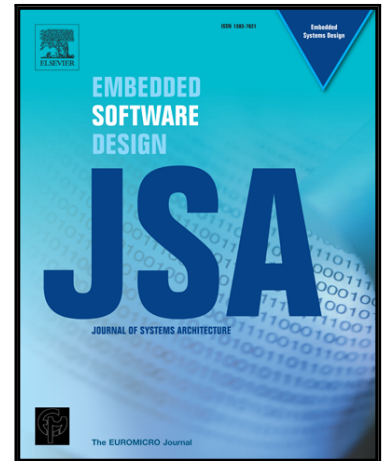


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# Smart-Toy-Edge-Computing-oriented Data Exchange Based on Blockchain

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## ABSTRACT

Smart toy is a specific IoT (Internet of Things) device, and its market demand is growing dramatically. Combined with edge computing technology, smart toy can generate valuable data. Smart toy data exchange is a new powerful area. However, there is no efficient, secure and reliable data exchange mechanism among isolated smart toy data platforms and other IoT systems. In this paper, we propose a Smart-Toy-Edge-Computing-oriented Data Exchange Prototype using Hyperledger Fabric v1.0. We target to solve the issue of automatically maintaining a tamper-resistant, reliable and distributed ledger by writing smart contract in the environment where the participants are distrustful of each other. This prototype can simplify the process, save resources and ensure a fair solution of dispute. This method also facilitates the implementation of P2P data exchange among the isolated smart toy and other IoT systems.

## 1. Introduction

We live in an era of big data; the current global Internet users have reached 3.4 billion according to the Internet trends 2017 report [1]. There are all kinds of data around us, which also make our lives full of possibilities.

With the rise of technology such as Internet of Things (IoT), a variety of devices, sensors, smart toys and electronic products have been deployed and used in the edge of Internet, called Edge Computing.

The final ideal of IoT is the connection of all things, but the current situation has not reached this goal. The architecture of IoT is basically closed, as Internet of Things is composed of many Intranet of Things. Although the devices in the same Intranet of Things can be interconnected, the devices of different Intranet of Things are difficult to achieve interoperability.

As shown in Fig.1, Some sensors and toys can produce IoT data, and all IoT data just are just transported to one IoT Big Data platform-one Intranet of Things. After that, this IoT Big Data platform just transfers some data or results to one centralized cloud-based Big Data platform. Therefore, each IoT system is longitudinally connected, without any transversal data exchange. This situation is far from reaching the interconnect target of the IoT system.

Some IoT systems try to expose API for accessing, but if each IoT system provides a heterogeneous API, the complexity of system interconnection is very high. However, it is difficult to implement a standard API interface, as different IoT systems have diverse data formats. Also, the centralized data exchange accounting system cannot resolve the problem of IoT system data exchange, as one centralized data exchange accounting system is actually based on the traditional database system.

Smart toy is a new type of toy that is different from traditional toys, as it combines some IT technology with traditional toys. It has become popular in recent years. Applying IT technology, such as voice recognition, human-computer interaction, etc., will greatly raise the price and gross margin of products in smart toys. The average annual growth rate of smart toy market in the next five years will be 75%, which is far faster than 6% in the traditional toy market.[2]

The smart toy device is also a kind of IoT device. Different toys support different functions. Children can use these toys to travel, chat, call, browse websites and search information. At the same time, these devices generate raw data like browsing records, location history, behavior preferences and other data.

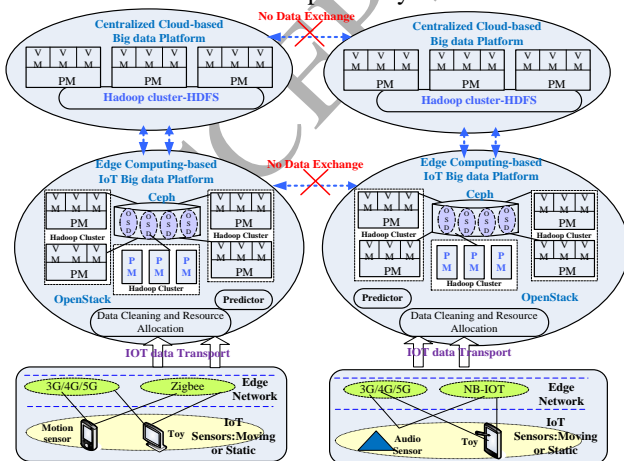


Fig.1 Isolated IoT Systems

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