

# Reality of less trust than expected to trustless financial system

Yuta Takanashi<sup>1,2</sup>, Shin'ichiro Matsuo<sup>1</sup>, Pindar Wong<sup>3</sup>, and Eric Burger<sup>1</sup>

<sup>1</sup> Georgetown University

<sup>2</sup> Financial Services Agency

<sup>3</sup> VeriFi Ltd.

**Abstract.** After the original publication of the Bitcoin paper [1], cryptocurrency exchange was born to connect the cryptocurrency world to fiat currency world. Although most persons believe that the cryptocurrency exchange plays the simple role of exchange, several security incidents raise a big question on the reality of the cryptocurrency exchange. That is, what kinds of operations are conducted, what are the informational assets to be protected, and what kinds of security postures are required.

In this paper, we report the results of investigation of 16 registered and 16 quasi-registered cryptocurrency exchanges by Japanese regulators, then analyze the reality of functionalities, implementation and operations of real cryptocurrency exchanges. Then, we conduct analysis from the information security management system (ISMS) standard point of views, to clarify the required actions to secure the implementation and operation of cryptocurrency exchanges. They include analysis on blockchain protocol, cryptographic key management, system security, and operation. We show the current activities in IETF and ISO to have a common document on security of cryptocurrency exchange.

**Keyword:** Cryptocurrency exchange, Information security management, Standards

## **1 Introduction**

### **1.1 Background**

### **1.2 Contributions**

## **2 Investigation and audit to 32 cryptocurrency exchanges**

### **2.1 Security incidents and their history**

### **2.2 Perspectives of investigations**

### **2.3 Results of investigation and audit**

## **3 Analysis of the reality of “Cryptocurrency Exchanges”**

### **3.1 How do cryptocurrency exchanges introduce themselves and general persons recognize it**

### **3.2 Functionalities which real cryptocurrency exchanges have**

### **3.3 Shortage of security consideration**

## **4 Reconsidering governance and security management**

### **4.1 Threat modeling and security requirements**

### **4.2 Analysis based on governance and security management standard**

## **5 Directions and action items to secure cryptocurrency exchanges**

### **5.1 Required technologies**

### **5.2 Required operations**

### **5.3 Standardization**

## **6 Conclusion**

## **References**

1. Satoshi Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System,” <https://bitcoin.org/bitcoin.pdf>.
2. M. Sato, M. Shimaoka, and H. Nakajima, “General Security Considerations for Crypto Assets Custodians,” <https://tools.ietf.org/html/draft-vcgtf-crypto-assets-security-considerations-02>
3. S. Matsuo and A. L. Castro (ed.), “ISO TR 23576: Blockchain and distributed ledger technologies – Security of digital asset custodians,” under development, <https://www.iso.org/standard/76072.html>