DEFESA DE TESE DE DOUTORADO
Programa de Pós-Graduação em Ciência da Computação

A LIGHTWEIGHT BLOCKCHAIN DATA MODEL FOR THE INTERNET OF THINGS

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RESUMO:

The number of connected devices increased significantly in the last years. These devices are not limited to traditional computers, but nowadays it is also common to find hardware-constrained devices, e.g., TVs, IP cameras, smart watches, able to handle information and interact through a computer network. Due to the growing on the use of these devices in the Internet of Things (IoT), they become an attractive target for malicious users. The number of attacks performed in IoT devices increased in the last years, hence it is paramount to improve security on the hardware constrained devices. Therefore, a new technology that guarantees data integrity, resilience and a decentralized architecture has been investigated in order to bring solutions in the IoT environment. This technology is called blockchain. Despite the benefits a blockchain brings, it still presents some drawbacks, such as, high storage demand, processing power and high latency, which could restrain its adoption in IoT environments. Based on that, the current thesis proposes a lightweight blockchain able to run in common constrained hardware used in IoT. The proposed solution is called SpeedyChain. To achieve the lightweight solution, a new data model is proposed, and this change makes the blockchain able to add one or more transactions at the same time and still decouple the payload from the blockchain. In order to show the viability of the proposed solution, it was applied to three experiments: Smart Home, Smart City, and Industrial IoT. The achieved results are promising, keeping the time to handle transactions in milliseconds. Furthermore, SpeedyChain data model is able to ensure data integrity as well as non-repudiation security properties, with a minimum processing overhead. This thesis also discusses main attacks on blockchains and how the proposed solution avoids these attacks.

Keywords: Blockchain, data model, appendable block, security, IoT.