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SECURITY & PRIVACY THREATS, ATTACKS AND COUNTERMEASURES IN INTERNET OF THINGS

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ABSTRACT

The idea to connect everything to anything and at any point of time is what vaguely defines the concept of the Internet of Things (IoT). The IoT is not only about providing connectivity but also facilitating interaction among these connected things. Though the term IoT was introduced in 1999 but has drawn significant attention during the past few years, the pace at which new devices are being integrated into the system will profoundly impact the world in a good way but also poses some severe queries about security and privacy. IoT in its current form is susceptible to a multitudinous set of attacks. One of the most significant concerns of IoT is to provide security assurance for the data exchange because data is vulnerable to some attacks by the attackers at each layer of IoT. The IoT has a layered structure where each layer provides a service. The security needs vary from layer to layer as each layer serves a different purpose. This paper aims to analyze the various security and privacy threats related to IoT. Some attacks have been discussed along with some existing and proposed countermeasures.

KEYWORDS

Internet of Things, privacy, attacks, security, threats, protocols.

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EVALUATION OF A BLOCKCHAIN-ENABLED RESOURCE MANAGEMENT MECHANISM FOR NGNS

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ABSTRACT

A new era in ICT has begun with the evolution of Next Generation Networks (NGNs) and the development of human-centric applications. Ultra-low latency, high throughput, and high availability are a few of the main characteristics of modern networks. Network Providers (NPs) are responsible for the development and maintenance of network infrastructures ready to support the most demanding applications that should be available not only in urban areas but in every corner of the earth. The NP's must collaborate to offer high- quality services and keep their overall cost low. The collaboration among competitive entities can in principle be regulated by a trusted 3rd party or by a distributed approach/technology which can guarantee integrity, security, and trust. This paper examines the use of blockchain technology for resource management and negotiation among NPs and presents the results of experiments conducted in a dedicated real testbed. The implementation of the resource management mechanism is described in a Smart Contract (SC) and the testbeds use the Raft and the IBFT consensus mechanisms respectively. The goal of this paper is two-fold: to assess its performance in terms of transaction throughput and latency so that we can assess the granularity at which this solution can operate (e.g. support resource re-allocation among NPs on micro-service level or not) and define implementation-specific parameters like the consensus mechanism that is the most suitable for this use case based on performance metrics.

KEYWORDS

Blockchain, NGNs, Resource management, Consensus, Performance

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AN EFFICIENT SECURE CRYPTOGRAPHY SCHEME FOR NEW ML-BASED RPL ROUTING PROTOCOL IN MOBILE IOT ENVIRONMENT

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ABSTRACT

Internet of Things (IoT) offers reliable and seamless communication for the heterogeneous dynamic low-power and lossy network (LLNs). To perform effective routing in IoT communication, LLN Routing Protocol (RPL) is developed for the tiny nodes to establish connection by using deflaut objective functions: OF0, MRHOF, for which resources are constraints like battery power, computation capacity, memory communication link impacts on varying traffic scenarios in terms of QoS metrics like packet delivery ratio, delay, secure communication channel. At present, conventional Internet of Things (IoT) are having secure communication channels issue for transmission of data between nodes. To withstand those issues, it is necessary to balance resource constraints of nodes in the network. In this paper, we developed a security algorithm for IoT networks with RPL routing. Initially, the constructed network in corporates optimization-based deep learning (reinforcement learning) for route establishment in IoT. Upon the establishment of the route, the ClonQlearn based security algorithm is implemented for improving security which is based onaECC scheme for encryption and decryption of data. The proposed security technique incorporates reinforcement learning-based ClonQlearn integrated with ECC (ClonQlearn+ECC) for random key generation. The proposed ClonQlearn+ECCexhibits secure data transmission with improved network performance when compared with the earlier works in simulation. The performance of network expressed that the proposed ClonQlearn+ECC increased the PDR of approximately 8% - 10%, throughput of 7% - 13%, end-to-end delay of 5% - 10% and power consumption variation of 3% - 7%.

KEYWORDS

ECC, security, Optimal path, Routing, Reinforcement learning

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SYSTEM END-USER ACTIONS AS A THREAT TO INFORMATION SYSTEM SECURITY

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ABSTRACT

As universities migrate online due to the advent of Covid-19, there is a need for enhanced security in information systems in the institution of higher learning. Many opted to invest in technological approaches to mitigate cybersecurity threats; however, the most common types of cybersecurity breaches happen due to the human factor, well known as end-user error or actions. Thus, this study aimed to identify and explore possible end-user errors in academia and the resulting vulnerabilities and threats that could affect the integrity of the university's information system. The study further presented state-of-the-art human-oriented security threats countermeasures to compliment universities' cybersecurity plans. Countermeasures include well-tailored ICT policies, incident response procedures, and education to protect themselves from security events (disruption, distortion, and exploitation). Adopted is a mixed-method research approach with a qualitative research design to guide the study. An open-ended questionnaire and semi-structured interviews were used as data collection tools. Findings showed that system end-user errors remain the biggest security threat to information systems security in institutions of higher learning. Indeed errors make information systems vulnerable to certain cybersecurity attacks and, when exploited, put legitimate users, institutional network, and its computers at risk of contracting viruses, worms, Trojan, and expose it to spam, phishing, e-mail fraud, and other modern security attacks such as DDoS, session hijacking, replay attack and many more. Understanding that technology has failed to fully protect systems, specific recommendations are provided for the institution of higher education to consider improving employee actions and minimizing security incidents in their eLearning platforms, post Covid-19.

KEYWORDS

Information Systems, Security Threats, End-user errors, Human Factors, DDoS, Virus, Worms, Trojan.

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USE OF MARKOV CHAIN FOR EARLY DETECTING DDOS ATTACKS

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ABSTRACT

DDoS has a variety of types of mixed attacks. Botnet attackers can chain different types of DDoS attacks to confuse cybersecurity defenders. In this article, the attack type can be represented as the state of the model. Considering the attack type, we use this model to calculate the final attack probability. The final attack probability is then converted into one prediction vector, and the incoming attacks can be detected early before IDS issues an alert. The experiment results have shown that the prediction model that can make multi-vector DDoS detection and analysis easier.

KEYWORDS

DDoS, attack detection, Markov chain, TCP SYN flood, ICMP flood, HTTP flood, LAND, UDP flood.

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EFFECT MAN-IN THE MIDDLE ON THE NETWORK PERFORMANCE IN VARIOUS ATTACK STRATEGIES

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ABSTRACT

In this paper, we examined the effect on network performance of the various strategies an attacker could adopt to launch Man-In The Middle (MITM) attacks on the wireless network, such as fleet or random strategies. In particular, we're focusing on some of those goals for MITM attackers - message delay, message dropping. According to simulation data, these attacks have a significant effect on legitimate nodes in the network, causing vast amounts of infected packets, end-to-end delays, and significant packet loss.

KEYWORDS

Wireless Network, Mobile Network, security; Man-In-The-Middle Attack; smart cities; simulation; Intelligent Transportation System; Internet-of-Things.

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PHISHING MITIGATION TECHNIQUES: A LITERATURE SURVEY

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ABSTRACT

Email is a channel of communication which is considered to be a confidential medium of communication for exchange of information among individuals and organisations. The confidentiality consideration about e-mail is no longer the case as attackers send malicious emails to users to deceive them into disclosing their private personal information such as username, password, and bank card details, etc. In search of a solution to combat phishing cybercrime attacks, different approaches have been developed. However, the traditional exiting solutions have been limited in assisting email users to identify phishing emails from legitimate ones. This paper reveals the different email and website phishing solutions in phishing attack detection. It first provides a literature analysis of different existing phishing mitigation approaches. It then provides a discussion on the limitations of the techniques, before concluding with an exploration in to how phishing detection can be improved.

KEYWORDS

Cyber-security, Phishing Email Attack, Deep Learning, Stylometric Analysis, Cyber Human Behaviour

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PROOF-OF-REPUTATION: AN ALTERNATIVE CONSENSUS MECHANISM FOR BLOCKCHAIN SYSTEMS

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ABSTRACT

Blockchains combine other technologies, such as cryptography, networking, and incentive mechanisms, to enable the creation, validation, and recording of transactions between participating nodes. A consensus algorithm is used in a blockchain system to determine the shared state among distributed nodes. An important component underlying any blockchain-based system is its consensus mechanism, which principally determines the performance and security of the overall system. As the nature of peer-to-peer(P2P) networks is open and dynamic, the security risk within that environment is greatly increased mostly because nodes can join and leave the network at will. Thus, it is important to have a system that can check against malicious behaviour. In this work, we propose a reputation-based consensus mechanism for blockchain-based systems, Proof-of-Reputation (PoR) where the nodes with the highest reputation values eventually become part of a consensus group that determines the state of the blockchain.

KEYWORDS

Consensus Mechanism, Distributed Ledger Technology, Blockchain, Reputation System, Social Computing.

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SECURE BLOCKCHAIN DECENTRALIZED VOTING FOR VERIFIED USERS

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ABSTRACT

The paper focuses on introducing a decentralized e-voting scheme that uses blockchain to achieve security and anonymity. A blockchain network based on Ethereum was applied, to provide a decentralized and distributed database based on the Peer-to-Peer architecture. During the implementation, smart contracts were used. Thanks to this, it is possible to code the terms of the contract required to perform the transaction. The proof-of-concept implementation uses the blind signature protocol and encryption with the RSA algorithm. Presented in this paper scheme for blockchain decentralized voting is fully implemented and potential issues are analyzed and discussed.

KEYWORDS

Blockchain, e-voting, Ethereum

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CONSTRUCTING THE 2-ELEMENT AGDS PROTOCOL BASED ON THE DISCRETE LOGARITHM PROBLEM

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ABSTRACT

It is considered a group signature scheme in frame of which different sets of signers sign electronic documents with hidden signatures and the head of the signing group generates a group signature of fixed size. A new mechanism for imbedding the information about signers into a group signature is proposed. The method provides possibilities for reducing the signature size and to construct collective signature protocols for signing groups. New group signature and collective signature protocols based on the computational difficulty of discrete logarithm are proposed.

KEYWORDS

Group digital signature, Collective digital signature, difficult computational problems, Signing group.

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