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

Faheem Masoodi[1] Shadab Alam[2] and Shams Tabrez Siddiqui[2]

[1]Department of Computer Science, University of Kashmir, J&k, India [2]Department of Computer Science, Jazan University, KSA

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

Michael Xevgenis[1], Dimitrios G. Kogias[2], Ioannis Christidis[1], Charalampos Patrikakis[2] and Helen C. Leligou[1]

[1]Dept. of Industrial Design and Production Engineering, University of West Attica, 122 43 Attica, Greece
[2]Dept. of Electrical and Electronics Engineering, University of West Attica, 122 43 Attica, Greece

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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AUTHORS

Michael Xevgenis is a Ph.D. Candidate at the Department of Industrial Design and Production Engineering of the University of West Attica. The subject of his Ph.D. research is Secure Resource Management in Next Generation Networks, where Blockchain technology is one of the main fields of this study. In addition, he is a Research Associate at the Computer Network and Services Research Team (CONSERT) of the University of West Attica. His research concerns are on the Networking and Cloud Computing sector. In the last few years he has participated in two EU projects: the TRILLION and the STORM of H2020. Finally, he holds the Master in Data and Networking Communications of Kingston University in collaboration with TEI of Piraeus.

Dimitrios G. Kogias was born in Athens in 1978. He received his diploma in Physics from the National and Kapodistrian University of Athens in 2001. In December 2004 he received his M.Sc. in Electronics and Radioelectrology and in May 2010 his Ph.D. degree from the National and Kapodistrian University of Athens on Algorithms for dissemination of information in Unstructured Networking Environments. He works as an Adjunct Lecturer in the Department of Electrical & Electronics Engineering of the University of West Attica (UniWA).

Ioannis Christidis has graduated from the University of West Attica while also participated in ASSET Learning Community & Ecosystem. He is currently a postgraduate student at the University of West Attica and the subject of his research is Blockchain as real-time monitoring system. His research interests focus on blockchain and distributed ledger technologies, data freshness, and gamification.

Charalampos Z. Patrikakis is a Full Professor at the Dept. of Electrical & Electronics Engineering of the University of West Attica. He has participated in more than 32 National, European and International programs, in 16 of which he has been involved as technical coordinator or principal researcher. He has more than 100 publications in chapters of books, international journals, and conferences, and has 2 contributions in national legislation. He is a member of the editorial committee of more than 50 international journals and conferences and has acted as editor in the publication of special issues of international journals, conference proceedings volumes, and coedited three books. He is a senior member of IEEE, Assistant Editor In Chief (Special Issues) of IEEE IT Pro Magazine, member of the Technical Chamber of Greece, the European Association for Theoretical Computer Science, ACM, and counselor of the IEEE student department of University of West Attica.

Helen C. Leligou received the Dipl.Ing. and Ph.D. degrees, both in electrical and computer engineering, from the National Technical University of Athens (NTUA), Athens, Greece, in 1995 and 2002, respectively. Her research interests lie in the area of protocol design for communication systems, access control mechanisms in optical access/metro/core networks, with emphasis on their implementation in hardware using state-of-the-art primarily FPGA but also ASIC technologies. She has also been active in security, routing, and application layer protocols for wireless sensor networks and their implementation in embedded systems. Currently, her research interests lie in blockchain technologies and in the application of novel sensor applications for affect detection in learning environments. She is currently an assistant professor at the University of West Attica while from 2007-2017 she is acting as Assistant Professor at the Technological Educational Institute of Central Greece teaching “Digital Design” and “Computer Networks”. Her research results have been published in more than 100 scientific journals and conferences. She has participated in several EU-funded ACTS, IST and ICT and H2020 research projects in the above areas.

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

Kishore Golla[1] and S. PallamSetty[2]

[1]Research Scholar, Dept. of CSE, Andhra University, Visakhapatnam, Andhra Pradesh, India
[2]Dept. of CSE, Andhra University, Visakhapatnam, Andhra Pradesh, India

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 ClonQlearnintegrated 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

Paulus Kautwima, Titus Haiduwa, Kundai Sai, Valerianus Hashiyana and Nalina Suresh

Department of Computing, Mathematical and Statistical Sciences, University of Namibia, Windhoek, Namibia

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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AUTHORS

Paulus Kautwima is currently a Lecturer in the School of Computing, Department of Computer Science, University of Namibia. His area of research is Networking and Security, Online Child Protection, eLearning, IOT, Cloud Computing and Security, AI, Robotics, egovernment, and educational technologies.
Tel:+264814131922, pkautwima@unam.com; pkautwima@gmail.com

Kundai Sai is currently a Ph.D. candidate at University of KwaZulu-Natal, SA. He holds a BSC Degree in Physics and Computer Science from Great Zimbabwe University, a Master of Science Degree in Information Systems Management from Midlands State University.
Tel: +264814515699, ksai@unam.na

Titus Haiduwa is currently a Lecturer in the Department of Information Technology, School of Computing, University of Namibia. He currently holds a Diploma and a Bachelors' Degree in Information Technology from Namibia University of Science & Technology, as well as a Master Degree in Engineering with specialization in Software Engineering from Wuhan University.
Tel: +264812001246, thaiduwa@unam.na

Nalina Suresh is currently a Senior Lecturer in the School of Computing, Department of Information technology University of Namibia. Her area of research is Networking and Security, Computational Theory and modelling, Automation, IOT, Cloud Computing and Security, AI, Robotics, ML, DSP, educational technologies.
Tel: +264812229533, nsuresh@unam.com; nalina.kss@gmail.com

Valerianus Hashiyana is currently a Senior Lecturer at School of Computing and Head of Department: Computer Science, University of Namibia. His area of research are Cybersecurity, Networking, IOT, e-health, Next generation computing.
Tel: +264812830277, vhashiyana@unam.na; vhashiyana@gmail.com

USE OF MARKOV CHAIN FOR EARLY DETECTING DDOS ATTACKS

Chin-Ling Chen[1] and Jian-Ming Chen[2]

[1]Department of Information Management, National Pingtung University, Pingtung, Taiwan 900
[2]Genesis Technology, Inc., HsinChu, Taiwan 300

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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AUTHORS

Chin-Ling Chen received the BS degree from National Taiwan University in 1988, the Master degree in Management Information System from the University of Wisconsin, Milwaukee, in 1992, and the Ph.D. degree in Information Management from National Taiwan University of Science and Technology, 1999. Since the spring of 1999, he has joined the faculty of the Department of Information Management at National Pingtung University, Taiwan. His research interests include Internet QoS, network technology, and network security. He is a member of IEICE.

Jian-Ming Chen received his master's degree in Information Management from National Pingtung University, 2019. Currently, he is a software engineer of Genesis Technology, Inc, Hsinchu, Taiwan.

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

Iyas Alodat

Department of Computer and Information System, Jerash University, Jerash, Jordan

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

Wosah Peace Nmachi and Thomas Win

School of Computing & Engineering University of Gloucestershire, Park Campus, Cheltenham GL50 2RH United Kingdom

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 explorationin 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

Oladotun Aluko[1] and Anton Kolonin[2]

[1]Novosibirsk State University, Novosibirsk, Russia
[2]Aigents Group, Novosibirsk, Russia

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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AUTHORS

Oladotun Aluko received his BSc (2017) in Computer Science and Engineering from Obafemi Awolowo University, Nigeria. He is currently working on his MSc in Big Data Analytics and Artificial Intelligence at Novosibirsk State University, Novosibirsk, Russia. His research interests are in Distributed Computing, Blockchain Technology, Machine Learning and Cloud Databases.

Anton Kolonin received his PhD in 1998 after he independently developed a software-algorithmic complex for processing geophysical data, introduced into production in many CIS countries. He has also participated as a leader or lead architect in many projects to develop algorithms and software, including those related to the use of AI, including the recognition of static text, moving objects, music, extracting information from texts and identifying events on financial markets – in Russian and foreign companies. Since 2017, he has also been a software architect for AI and blockchain in the Singularity NET project, leading projects on unsupervised language learning and reputation systems.

SECURE BLOCKCHAIN DECENTRALIZED VOTING FOR VERIFIED USERS

Piotr Pospiech, Aleksander Marianski and Michal Kedziora

Department of Computer Science and Management, Wroclaw University of Science and Technology, Wroclaw, Poland

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

Tuan Nguyen Kim[1], Duy Ho Ngoc[2] and Nikolay A. Moldovyan[3]

[1]Faculty of Information Technology - Duy Tan University, Da Nang 550000, Vietnam
[2]Department of Information Technology, Ha Noi, Vietnam
[3]St. Petersburg Institute for Informatics and Automation of Russian Academy of Sciences, St. Petersburg, Russia

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

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

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AUTHORS

Tuan Nguyen Kim was born in 1969, received B.E, and M.E from Hue University of Sciences in 1994, and Hanoi University of Technology in 1998. He has been a lecturer at Hue University since 1996. From 2011 to the present (2021) he is a lecturer at School of Computer Science, Duy Tan University, Da Nang, Vietnam. His main research interests include Computer Network Technology and Information Security.

Duy Ho Ngoc was born in 1982. He received his Ph.D. in Cybersecurity in 2007 from LETI University, St. Petersburg, Russia Federation. He has authored more than 45 scientific articles in cybersecurity.

Nikolay A. Moldovyan is an honored inventor of Russian Federation (2002), a laboratory head at St. Petersburg Institute for Informatics and Automation of Russian Academy of Sciences, and a Professor with the St. Petersburg State Electrotechnical University. His research interests include computer security and cryptography. He has authored or co-authored more than 60 inventions and 220 scientific articles, books, and reports. He received his Ph. D. from the Academy of Sciences of Moldova (1981).