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PERFORMANCE EVALUATION OF MODBUS TCP IN NORMAL OPERATION AND UNDER A DISTRIBUTED DENIAL OF SERVICE ATTACK

Eric Gamess[1], Brody Smith[1], and Guillermo Francia III[2]

[1]MCIS Department, Jacksonville State University, Jacksonville, AL, USA
[2]Center for Cybersecurity, University of West Florida, Pensacola, FL, USA

ABSTRACT

Modbus is the de facto standard communication protocol for the industrial world. It was initially designed to be used in serial communications (Modbus RTU/ASCII). However, not long ago, it was adapted to TCP due to the increasing popularity of the TCP/IP stack. Since it was originally designed for controlled serial lines, Modbus does not have any security features. In this paper, we wrote several benchmarks to evaluate the performance of networking devices that run Modbus TCP. Parameters reported by our benchmarks include: (1) response time for Modbus requests, (2) maximum number of requests successfully handled by Modbus devices in a specific amount of time, and (3) monitoring of Modbus devices when suffering a Distributed Denial of Service attack. Due to the growing adoption of IoT technologies, we also selected two widely known and inexpensive development boards (ESP8266 and Raspberry Pi 3 B+/OpenPLC) to realize a performance evaluation of Modbus TCP.

KEYWORDS

Modbus, Internet of Things, Programmable Logic Controllers, Security, DDoS, Network Evaluation, Benchmark.

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AUTHORS

Eric Gamess received a M.S. in Industrial Computation from the National Institute of Applied Sciences of Toulouse (INSA de Toulouse), France, in 1989, and a Ph.D. in Computer Science from the Central University of Venezuela, Venezuela, in 2010. He is currently working as a professor at Jacksonville State University, Jacksonville, AL, USA. Previously, he worked as a professor at the University of Puerto Rico, Puerto Rico, the Central University of Venezuela, Venezuela, and "Universidad del Valle", Colombia. His research interests include Security, Vehicular Adhoc Networks, Networking, and the Internet of Things. He is one of the co-founders of the Venezuelan Society of Computing and has been in the organizing and program committees of several national and international conferences.

Brody Smith received a Bachelor in Computer Science from Jacksonville State University, Jacksonville, AL, USA, in 2019. He is currently working as a Cybersecurity specialist at Fort Gordon in Augusta, Georgia, USA. His research interests include Cybersecurity and Computer Networks.

Guillermo A. Francia, III received his Ph.D. in Computer Science from New Mexico Tech. Before joining JSU in 1994, he was the chairman of the Computer Science department at Kansas Wesleyan University. In 1996, Dr. Francia received one of the five national awards for Innovators in Higher Education from Microsoft Corporation. His research interests include information security and assurance, embedded and industrial control systems security, vehicular network security, machine learning, unmanned aerial vehicle security, and risk management. He is a two-time recipient of a Fulbright award (UK, 2017 and Malta, 2007) related to cybersecurity projects and is the 2018 winner of the National Cyber Watch Center Innovations in Cybersecurity Education award. He has successfully managed research projects worth over $2.5M that were funded by the National Science Foundation, Department of Defense, Department of Energy, and Department of Homeland Security. He held Distinguished Professor and Director of the Center for Information Security and Assurance positions at Jacksonville State University prior to joining the University of West Florida (UWF) in 2018. In April 2019, he received an appointment as Commissioner of the Computing Accreditation Commission of ABET. Currently, Dr. Francia is serving as Faculty Scholar and Professor at the Center for Cybersecurity.

PERFORMANCE EVALUATION OF OSPF AND RIP ON IPV4 & IPV6 TECHNOLOGY USING G.711 CODEC

Mabubur Syed and Isaac Yerima Ambore

Department of Computer Information Science, Minnesota State University, Mankato.
Minnesota, USA

ABSTRACT

Migration from IPv4 to IPv6 is still visibly slow, mainly because of the inherent cost involved in the implementation, hardware and software acquisition. However, there are many values IPv6 can bring to the IP enabled environment as compared to IPv4, particularly for Voice Over Internet Protocol (VoIP) solutions. Many companies are drifting away from circuit based switching such as PSTN to packet based switching (VoIP) for collaboration. There are several factors determining the effective utilization and quality of VoIP solutions. These include the choice of codec, echo control, packet loss, delay, delay variation (jitter), and the network topology. The network is basically the environment in which VoIP is deployed. State of art network design for VoIP technologies requires impeccable Interior Gateway routing protocols that will reduce the convergence time of the network, in the event of a link failure. Choice of CODEC is also a main factor. Since most research work in this area did not consider a particular CODEC as a factor in determining performance, this paper will compare the behaviour of RIP and OSPF in IPv4 and IPv6 using G.711 CODEC with riverbed modeller17.5.

KEYWORDS

IPv4, IPv6, Network topology, VoIP, CODEC

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AUTHORS

Mahbubur Syed is currently a professor and chair of Computer Information Science Department at Minnesota State University, Mankato USA. He also taught at the North Dakota State University in USA, Monash University in Australia, Bangladesh University of Engineering and in Bangladesh, and also worked at Ganz Electric Works in Hungary. He has more than 100 papers published in journals and conference proceedings. He has been serving in different roles such as co-editor-in chief, associate editor, editorial review committee, member of editorial board in several international journals. He has been involved in international professional activities including organizing conferences and serving as conference and program committee chair.

Isaac Yerima Ambore worked as Graduate research assistant in Computer Information Science department at Minnesota State University Mankato. He received his Bachelor's degree in Computer Science from Ahmadu Bello University Zaria, Nigeria and is currently pursuing his masters in Information Technology in MSU with Dr Syed as his advisor. He is a CISCO certified Network Professional (CCNP) and also a CISCO certified Design Professional (CCDP). His current research interests include VoIP Performance and information security risk.

A MAC PROTOCOL WITH DYNAMIC ALLOCATION OF TIME SLOTS BASED ON TRAFFIC PRIORITY IN WIRELESS BODY AREA NETWORKS

Sabin Bhandari and Sangman Moh

Department of Computer Engineering, Chosun University, Gwangju, South Korea

ABSTRACT

In a wireless body area network (WBAN), wireless biomedical sensors are placed around, on, or inside the human body. Given specific requirements, WBANs can significantly improve healthcare, diagnostic monitoring, and other medical services. However, the existing standards such as IEEE 802.11 and IEEE 802.15.4 have some limitations to meet all the requirements of WBANs. Many medium access control (MAC) protocols have been studied so far, most of which are derived from the IEEE 802.15.4 superframe structure with some improvements and adjustments. However, the MAC protocols do not provide the required quality of service (QoS) for various types of traffic in a WBAN. In this paper, a traffic-aware MAC (TA-MAC) protocol for WBANs is proposed, in which time slots are dynamically allocated on the basis of traffic priority, providing the required QoS. According to the performance evaluation results, the proposed TA-MAC is better than IEEE 802.15.4 MAC and the conventional priority-based MAC in terms of transmission time, system throughput, energy efficiency, and collision ratio.

KEYWORDS

Wireless body area network; Medium access control, Energy efficiency; Quality of service; Traffic priority; IEEE 802.15.4

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AUTHORS

Sabin Bhandari received his B.E. degree in electronics and communication engineering from Tribhuvan University, Nepal in 2010. He worked as a lecturer and project assistant in Kantipur Engineering College, Nepal from 2011 to 2014. He completed his M.E. degree in computer engineering from Chosun University, Gwangju, South Korea in 2016. His current research interests include wireless body area networks, wireless sensor networks, and cognitive radio.

Sangman Moh received his Ph.D. degree in computer engineering from Korea Advanced Institute of Science and Technology (KAIST), Korea in 2002. Since late 2002, he has been a professor at the Dept. of Computer Engineering at Chosun University, Korea. From 2006 to 2007, he was on leave at Cleveland State University, USA. His research interests include mobile computing and networking, ad hoc and sensor networks, cognitive radio networks, and parallel and distributed computing systems. He has published more than 200 papers in international and domestic journals and conference proceedings, and has held more than 40 overseas and domestic patents. He serves on the program committees of international conferences and workshops in his areas of interest as a chair or member. Dr. Moh is a member of the IEEE, the ACM, the IEICE, the KIISE, the IEIE, the KIPS, the KICS, the KMMS, the IEMEK, the KISM, and the KPEA.

LORAWAN SCALABILITY ANALYSIS – CO SPREADING FACTOR INTERFERENCE

Aiju Thomas and N V Eldhose

School of Technology and Applied Science, M G University,
Edappally Kochi, Kerala, India

ABSTRACT

Low Power Wide Area Networks (LPWAN) is on the verge of commercialization. The success of LPWAN technologies lies in the robustness of the modulation scheme. LoRa is a significant protocol in the segment which uses Chirp Spread Spectrum (CSS) as the modulation scheme. CSS is proven to be robust, ultra-low power consuming and resilient to noise and Doppler effects. Though noise resilience is profound, we investigate issues that may arise as the network scale. Co-Spreading Factor (Co-SF) interference is identified as a major issue that limits the performance of the network. Co-SF interference eventuates when multiple nodes trying to uplink simultaneously at the same Spreading Factor (SF) and almost at the near transmitted power level. Co-SF interference leads to packet error and escalation in the packet on air time which results in performance deterioration. Findings are justified through simulation and experimentation. Possible reasons leading to interference are constringed. Recommendations to reduce the effect of Co-SF interference are suggested and validated through experimentation.

KEYWORDS

LPWAN, Scalability, LoRa, LoRaWAN, co-spreading factor, Co-SF

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AUTHORS

Aiju Thomas received his Bachelor of Engineering and Masters of Technology in Electronics and Communication Engineering with specialization in microwave engineering. He is pursuing his research in the optimization of IoT protocols at M G University, Kottayam, Kerala, India. With 10 years of industrial experience and 19 years as faculty in Electronics and Communication Engineering at The Polytechnic Institute under State Government of Kerala, his field of interest includes industrial and embedded designing.

Dr. N V Eldhose received his Bachelor and Masters Degree in Science, Masters of Technology in Electronics and a Ph.D. degree in Physics. As a research guide for M G University, Kerala his field of interest includeubiquitous computing, wireless sensor networks, embedded systems, andmachine-to-machine communication. He is currently a faculty member in Electronics at the School of Technology and Applied Science, Kochi, India.

COMPARATIVE AND QOS PERFORMANCE ANALYSIS OF TERRESTRIAL-AERIAL PLATFORMS-SATELLITES SYSTEMS FOR TEMPORARY EVENTS

Faris. A. Almalki

Department of Computer Engineering, College of Computers and Information Technology
Taif University, Kingdome of Saudi Arabia

ABSTRACT

Wireless communications, nowadays, becomes a vital element of people's daily life. Providing global connectivity in future communication systems via the heterogeneous network opens up many research topics to investigate potentialities, enabling technologies, and challenges from the perspective of the integrated wireless systems. This paper aims to drive a comprehensive and comparative study on terrestrial-aerial platforms- satellite wireless communications systems, includes their characteristics and unravelling challenges. The comparison focuses on issues that reportedly can evaluate any wireless systems for temporary events. These issues are altitude and coverage, Radio Frequency (RF) propagation, interference, handover, power supply constraints, deployment and maintenance challenges, reliability on special events or disaster relief, cost-effectiveness and environmental impact. Last, Quality of service (QoS) performance is analysed for the four wireless communication systems from the temporary events perspective using the OPNET Modeller simulation tool. Results infer that space-based wireless systems outperform terrestrial ones.

KEYWORDS

Terrestial; Aerial Platforms; Satellites; QoS Performance; Temporary Events

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AUTHORS

Dr Faris A. Almalki is an assistant professor in wireless communications and satellites in Computer Engineering Department at Taif University. He is a Post-Doctoral Researcher in the Department of Electronics and Computer Engineering at Brunel University London. He holds a BSc in Computer Engineering from Taif University, an MSc in Broadband and Mobile Communication Networks from Kent University and a PhD. in Wireless Communication Networks from Brunel University London. He is a Member of the IEEE Communication Society. His research interests include Low- and High-Altitude Platforms and their application in Ad hoc wireless networks.

ZIGBEE TECHNOLOGY AND ITS APPLICATION IN WIRELESS HOME AUTOMATION SYSTEMS: A SURVEY

Thoraya Obaid, HaleemahRashed, Ali Abou-Elnour, Muhammad Rehan,
Mussab Muhammad Saleh, and Mohammed Tarique

Department of Electrical Engineering, Ajman University of Science and Technology
P.O. Box 2202, Fujairah, United Arab Emirates (UAE)

ABSTRACT

Wireless home automation systems have drawn considerable attentions of the researchers for more than a decade. The major technologies used to implement these systems include Z-Wave, Insteon, Wavenis, Bluetooth, WiFi, and ZigBee. Among these technologies the ZigBee based systems have become very popular because of its low cost and low power consumption. In this paper ZigBee based wireless home automation systems have been addressed. There are two main parts of this paper. In the first part a brief introduction of the ZigBee technology has been presented and in the second part a survey work on the ZigBee based wireless home automation system has been presented. The performances of the ZigBee based systems have also been compared with those of other competing technologies based systems. In addition some future opportunities and challenges of the ZigBee based systems have been listed in this paper.

KEYWORDS

Home automation, ZigBee, Z-Wave, Insteon, Waveins,PAN, voice control, energy management, assistive homes, industrial automation

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