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

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

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

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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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LORAWAN SCALABILITY ANALYSIS – CO SPREADING FACTOR INTERFERENCE

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

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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

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

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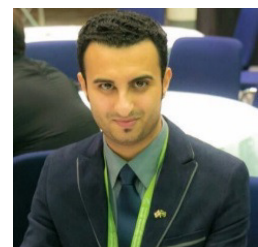
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ZIGBEE TECHNOLOGY AND ITS APPLICATION IN WIRELESS HOME AUTOMATION SYSTEMS: A SURVEY

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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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