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# **PROPOSED LOAD BALANCING ALGORITHM TO REDUCE RESPONSE TIME AND PROCESSING TIME ON CLOUD COMPUTING**

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## **ABSTRACT**

Cloud computing is a new technology that brings new challenges to all organizations around the world. Improving response time for user requests on cloud computing is a critical issue to combat bottlenecks. As for cloud computing, bandwidth to from cloud service providers is a bottleneck. With the rapid development of the scale and number of applications, this access is often threatened by overload. Therefore, this paper our proposed Throttled Modified Algorithm(TMA) for improving the response time of VMs on cloud computing to improve performance for end-user. We have simulated the proposed algorithm with the CloudAnalyts simulation tool and this algorithm has improved response times and processing time of the cloud data center.

## **KEYWORDS**

Load balancing; response time; cloud computing; processing time.

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# NETWORK ANOMALY DETECTION BASED ON LATE FUSION OF SEVERAL MACHINE LEARNING ALGORITHMS

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## ABSTRACT

Today's Internet and enterprise networks are so popular as they can easily provide multimedia and ecommerce services to millions of users over the Internet in our daily lives. Since then, security has been a challenging problem in the Internet's world. That issue is called Cyberwar, in which attackers can aim or raise Distributed Denial of Service (DDoS) to others to take down the operation of enterprises Intranet. Therefore, the need of applying an Intrusion Detection System (IDS) is very important to enterprise networks. In this paper, we propose a smarter solution to detect network anomalies in Cyberwar using Stacking techniques in which we apply three popular machine learning models: k-nearest neighbor algorithm (KNN), Adaptive Boosting (AdaBoost), and Random Decision Forests (RandomForest). Our proposed scheme uses the Logistic Regression method to automatically search for better parameters to the Stacking model. We do the performance evaluation of our proposed scheme on the latest data set NSLKDD 2019 dataset. We also compare the achieved results with individual machine learning models to show that our proposed model achieves much higher accuracy than previous works.

## KEYWORDS

Network Security, Intrusion Detection System, Anomaly Detection, Machine Learning.

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# **LOAD BALANCING ALGORITHM FOR EFFICIENT VM ALLOCATION IN HETEROGENEOUS CLOUD**

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## **ABSTRACT**

Cloud computing is a growing service computing trend that offers users a range of on-demand variety of services from applications, processing capability, and storage based on the concept of the “Pay-As-PerUse” model. Organizations from every sector are now realizing the benefits offered by cloud computing technology and moving towards the cloud. Cloud computing offers numerous advantages over conventional computing. However, it still faces a few challenges such as resource utilization in a cloud data centre and quality of service to the end-users due to improper workload balance among available resources. Heterogeneous cloud resources also impact cloud systems overall performance. We proposed an enhanced load balancing algorithm in this research paper for efficient VM allocation in a heterogeneous cloud. Our proposed algorithm allocates independent user tasks or requests to available virtual machines in cloud datacentre efficiently to manage proper load balancing. This algorithm is aimed at minimizing user request response time and the time required for data centre processing. The results obtained showed a significant reduction in user request response time and data centre processing time as compared to “Throttled” and “Round Robin (RR)” algorithms.

## **KEYWORDS**

Load Balancing, Heterogeneous Cloud Environment, Response Time, Datacentre Processing Time, Independent Task.

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# AN EXACT ANALYTICAL MODEL FOR AN IOT NETWORK WITH MMPP ARRIVALS

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## ABSTRACT

Analytical modeling of the Internet of Things (IoT) networks is challenging. This is due to the presence of a large number of devices in these networks and the complexity of the priorities between different types of traffic. Taking these aspects into account, the objective of this paper is to analyze the performance of an IoT network where the IoT devices work independently of one another. To this end, we developed a novel multi-dimensional Continuous-Time Markov Chain (CTMC) model with threshold-based preemption. In this model, each IoT device is modeled as a Markov Modulated Poisson Process (MMPP) that can transmit regular and alarm packets. Alarm packets have higher priority over regular packets. To measure access to the channel between alarm and regular packets, we introduced a threshold parameter where the threshold is the number of packets in the alarm queue that indicates when preemption starts. The performance measures include blocking probability, the average delay of regular packets and alarm packets, discard rate, and success probability of regular packets. Comprehensive numerical analysis was conducted. Our results indicate that impact of the threshold on performance measures is higher on the boundary values of the threshold. The model was proven to be efficient in analyzing the performance of IoT networks on a wide range of parameter values. These results may be used in the future to develop and assess a protocol that utilizes a scheduling algorithm with a dynamic preemption threshold to optimize the performance of the IoT network.

## KEYWORDS

Continuous-Time Markov Chain, IoT, MMPP.

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# PEER TO PEER APPROACH BASED REPLICA AND LOCALITY AWARENESS TO MANAGE AND DISSEMINATE DATA IN VEHICULAR AD HOC NETWORKS

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## ABSTRACT

Distributed Hash Table (DHT) based structured peer-to-peer (P2P) systems provide an efficient method of disseminating information in a VANET environment owing to its high performance and properties (e.g., self-organization, decentralization, scalability, etc.). The topology of ad hoc vehicle networks (VANET) varies dynamically; its disconnections are frequent due to the high movement of vehicles. In such a topology, information availability is an ultimate problem for vehicles, in general, connect and disconnect frequently from the network. Data replication is an appropriate and adequate solution to this problem. In this contribution, to increase the accessibility of data, which also increases the success rate of the lookup, a method based on replication in the Vanet network is proposed named LAaR-Vanet. Also, this replication strategy is combined with a locality-awareness method to promote the same purpose and to avoid the problems of long paths. The performance of the proposed solution is assessed by a series of in-depth simulations in urban areas. The obtained results indicate the efficiency of the proposed approach, in terms of the following metrics: lookup success rate, the delay, and the number of the logical hop.

## KEYWORDS

Vehicular Ad-hoc Network (VANET), Structured P2P Systems, Distributed Hash Table (DHT), Locality Awareness, Replication.

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# **FLOODING ATTACK DETECTION AND MITIGATION IN SDN WITH MODIFIED ADAPTIVE THRESHOLD ALGORITHM**

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## **ABSTRACT**

Flooding attack is a network attack that sends a large amount of traffic to the victim networks or services to cause denial-of-service. In Software-Defined Networking (SDN) environment, this attack might not only breach the hosts and services but also the SDN controller. Besides, it will also cause a disconnection of links between the controller and the switches. Thus, an effective detection and mitigation technique of flooding attacks is required. Statistical analysis techniques are widely used for the detection and mitigation of flooding attacks. However, the effectiveness of these techniques strongly depends on the defined threshold. Defining the static threshold is a tedious job and most of the time produces a high false positive alarm. In this paper, we proposed the dynamic threshold which is calculated using modified adaptive threshold algorithm (MATA). The original ATA is based on the Exponential Weighted Moving Average (EWMA) formula which produces the high number of false alarms. To reduce the false alarms, the alarm signal will only be generated after a minimum number of consecutive violations of the threshold. This, however, has increased the false negative rate when the network is under attack. In order to reduce this false negative rate, MATA adapted the baseline traffic info of the network infrastructure. The comparative analysis of MATA and ATA are performed through the measurement of false negative rate, and accuracy of detection rate. Our experimental results show that MATA is able to reduce false negative rates up to 17.74% and increase the detection accuracy of 16.11% over the various types of flooding attacks at the transport layer.

## **KEYWORDS**

Adaptive Threshold, Flooding attack, Software-Defined Networking

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## WiFi TRANSMIT POWER AND ITS EFFECT ON CO-CHANNEL INTERFERENCE

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### ABSTRACT

The mass adoption of WiFi (IEEE 802.11) technology has increased numbers of devices simultaneously attempting to use high-bandwidth applications such as video streaming in a finite portion of the frequency spectrum. These increasing numbers can be seen in the deployment of highly-dense wireless environments in which performance can be affected due to the intensification of challenges such as co-channel interference (CCI). There are mechanisms in place to try to avoid sources of interference from non-WiFi devices. Still, CCI caused by legitimate WiFi traffic can be equally or even more disruptive, and also though some tools and protocols try to address CCI, these are no longer sufficient for this type of environment. Therefore, this paper investigates the effect of transmit power and direction have on CCI in a high-density environment consisting of multiple access points (APs) and multiple clients. We suggest improvements on publicly-existing documented power control algorithms and techniques by proposing a cooperative approach consisting of the incorporation of feedback from the receiver to the transmitter to allow it to reduce power level where possible, which will minimize the range of CCI for near clients without compromising coverage for the most distant ones.

### KEYWORDS

Wi-Fi, co-channel interference, transmit power.

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# DESIGNING AN ENERGY EFFICIENT CLUSTERING IN HETEROGENEOUS WIRELESS SENSOR NETWORK

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## ABSTRACT

Designing an energy-efficient scheme in a Heterogeneous Wireless Sensor Network (HWSN) is a critical issue that degrades the network performance. Recharging and providing security to the sensor devices is very difficult in an unattended environment once the energy is drained off. A Clustering scheme is an important and suitable approach to increase energy efficiency and transmitting secured data which in turn enhances the performance in the network. The proposed algorithm Energy Efficient Clustering (EEC) works for optimum energy utilization in sensor nodes. The algorithm is proposed by combining the rotation-based clustering and energy-saving mechanism for avoiding the node failure and prolonging the network lifetime. This shows MAC layer scheduling is based on optimum energy utilization depending on the residual energy. In the proposed work, a densely populated network is partitioned into clusters and all the cluster heads are formed at a time and selected on rotation based on considering the highest energy of the sensor nodes. Other cluster members are accommodated in a cluster based on Basic Cost Maximum flow (BCMF) to allow the cluster head for transmitting the secured data. Carrier Sense Multiple Access (CSMA), a contention window based protocol is used at the MAC layer for collision detection and to provide channel access prioritization to HWSN of different traffic classes with reduction in End to End delay, energy consumption, and improved throughput and Packet delivery ratio(PDR) and allowing the cluster head for transmission without depleting the energy. Simulation parameters of the proposed system such as Throughput, Energy, and Packet Delivery Ratio are obtained and compared with the existing system.

## KEYWORDS

HWSN, Clustering, EEC, CSMA, MAC, PDR.

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# **IPTV IMPROVEMENT APPROACH OVER LTEWLAN HETEROGENEOUS NETWORKS**

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## **ABSTRACT**

IPTV (Internet Protocol Television) includes several video components. The IMS (IP Multimedia Subsystem) cannot differentiate between them what causes their treatment similarly. These sub-components must have different priorities because they have distinct QoS constraints. In this paper, we suggest the implementation of IPTV in a heterogeneous network that improved QoS by providing the capability to prioritize the sub traffic according to the system administrator policy. A new IPv6 flow label field definition was proposed that is ready for standardization. OPNET Modeler software is used to design our approached architecture. The results show that IPTV users receive different amounts of video data based on the stream's priority.

## **KEYWORDS**

IPv6, Flow Label, Heterogeneous Networks, LTE, WLAN, QoS, Diffserv, IPTV, IMS & MIPv6

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# ENHANCED PARTICLE SWARM OPTIMIZATION FOR EFFECTIVE RELAY NODES DEPLOYMENT IN WIRELESS SENSOR NETWORKS

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## ABSTRACT

One of the critical design problems in Wireless Sensor Networks (WSNs) is the Relay Node Placement (RNP) problem. Inefficient deployment of RNs would have adverse effects on the overall performance and energy efficiency of WSNs. The RNP problem is a typical example of an NP-hard optimization problem which can be addressed using metaheuristics with multi-objective formulation. In this paper, we aimed to provide an efficient optimization approach considering the unconstrained deployment of energy-harvesting RNs into a pre-established stationary WSN. The optimization was carried out for three different objectives: energy consumption, network coverage, and deployment cost. This was approached using a novel optimization approach based on the integration of the Particle Swarm Optimization (PSO) algorithm and a greedy technique. In the optimization process, the greedy algorithm is an essential component to provide effective guidance during PSO convergence. It supports the PSO algorithm with the required information to efficiently alleviate the complexity of the PSO search space and locate RNs in the spots of critical significance. The evaluation of the proposed greedy-based PSO algorithm was carried out with different WSN scenarios of varying complexity levels. A comparison was established with two PSO variants: the classical PSO and a PSO hybridized with the pattern search optimizer. The experimental results demonstrated the significance of the greedy algorithm in enhancing the optimization process for all the considered PSO variants. The results also showed how the solution quality and time efficiency were considerably improved by the proposed optimization approach. Such improvements were achieved using a simple integration technique without adding to the complexity of the system and introducing additional optimization stages. This was more evident in the RNP scenarios of considerably large search spaces, even with highly complex and challenging setups.

## KEYWORDS

Wireless Sensor Networks, Relay Node Placement, Swarm Intelligence, Particle Swarm Optimization, Greedy Algorithm

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