Program Book

TSSA 2017

11th International Conference on Telecommunication Systems, Services, and Applications

http://tssa-conference.org/

October 26-27, 2017
Lombok, Indonesia

11th International Conference on Telecommunication Systems, Services, and Applications (TSSA) 2017

Conference Record Number 41771

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Message from the General Chair

It gives me a great pleasure to welcome you to the 11th International Conference on Telecommunication Systems, Services, and Applications (TSSA) 2017. TSSA is one of the conferences which is organized by the Telecommunications Engineering Research Group, School of Electrical Engineering and Informatics, Institut Teknologi Bandung (STEI-ITB). This year, TSSA will be co-organized by STEI-ITB in collaboration with Faculty of Engineering, University of Mataram (UNRAM). This conference will be held in Lombok, the beautiful place in Indonesia that attracting many people to come.

TSSA has been an important conference in Indonesia on the area of telecommunications and networking. This conference provides a forum for universities, industries, government, and public sectors to expose and exchange their innovative ideas and methods.

Since 2004, this conference has brought together a tremendous and rich diversity of authors and speakers from several countries around the world to share ideas and new perspectives on a wide range of telecommunication research and technologies. It is our honour to have invited Dr. Ir. Ismail, MT as a keynote speaker, who is the General Director of SDPPI, Ministry of Communication and Informatics of Indonesia. His dedication is highly appreciated.

None of this would have happened without the earnest efforts of the organizers behind the scenes. We had an excellent team that has worked very hard to organize TSSA 2017. I'd like to thank the

steering committee: the Dean of STEI, ITB and the Dean of Faculty of Engineering University of Mataram (UNRAM); International advisory committe; the TPC and their team and Program Committee members both from ITB and UNRAM who have done an outstanding job in carrying out the paper review tasks.

In particular, I'd like to express my appreciation to PT. Telkomsel, PT. Telkom, PT XL Axiata, and PT. F5 Networks who have become our patrons and sponsors. Special thanks also go to all authors and reviewers who contributed for submission and reviewing processes. Finally, I wish all participants a successful and fruitful conference. I hope you enjoy your stay in Lombok of Indonesia.

Dr. Ir. Nana Rachmana, M.Eng
General Chair.

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Technical Program

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11th TSSA 2017
Conference Program – at Glance

Thursday, October 26, 2017			
08.00 - 09.00	**REGISTRATION**		
09.00 - 09.10	**Welcome Remarks & Opening Ceremony**		
	Dr. Ir. Nana Rachmana Syambas, M.Eng *General Chair of TSSA 2017*		
09.10 - 09.20	**Welcome Remarks**		
	Akmaluddin, S.T, M.Sc, Ph.D *Dean of Faculty of Engineering,* *University of Mataram (UNRAM)*		
09.20 - 10.05	**Keynote Speech**		
	Topic: **National Roadmap of Internet of Things (IoT) Development in Indonesia**		
	Dr. Ir. Ismail, M.T *General Director of SDPPI,* *The Ministry of Communication and Informatics,* *Indonesia*		
10.05 - 10.10	**Honors and Awards**		
10.10 - 10.15	**Photo Session**		
10.15- 10.45	Coffee Break		
	PARALLEL SESSION		**MEETING**
	Room 1	*Room 2*	*Room 3*
Track	**Communication System and Signal Processing**	**IT and Network Security**	**Focus Group Discussion**
Session Chair	Cahyo Mustiko	Obrina Candra Brilyant	Dr. Ir. Ian Joseph M.E, M.T, M.H
10.45 - 11.00	Paper ID 2015	Paper ID 2018	*Honourable Guests and Industrial Member*
11.00 - 11.15	Paper ID 2019	Paper ID 2045	
11.15 - 11.30	Paper ID 2025	Paper ID 2038	
11.30 - 11.45	Paper ID 2052	Paper ID 2035	
11.45 - 12.00	Paper ID 2054	Paper ID 2046	
12.00 - 12.15	Paper ID 2034	Paper ID 2055	
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	PARALLEL SESSION		
	Room 1	*Room 2*	*Room 3*

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13.45 - 14.00	Paper ID 2030	Paper ID 2020	Paper ID 2027
14.00 - 14.15	Paper ID 2036	Paper ID 2012	Paper ID 2033
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	PARALLEL SESSION		
	Room 1	*Room 2*	*Room 3*
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END OF CONFERENCE			

Friday, October 27, 2017	
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Keynote Speaker

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National Roadmap of Internet of Things (IoT) Development in Indonesia

Dr. Ir. Ismail, MT

Biography— Dr. Ir. Ismail, M.T., alumnus of De Britto Yogyakarta Senior High School & Bandung Institute of Technology, is a knowledgeable and competent type of figures in telecommunications-related area in Indonesia. Pioneered the career as a civil servant at the General of Post and Telecommunication Directorate, Dr. Ismail had become the 2nd echelon officer in Center for Financial Transaction Reporting and Analysis (Indonesia: PPATK). In 2012, the minister on duty, Tifatul Sembiring, called Ismail back by appointing him as a Director of Telecommunications. At the end of 2013, Dr. Ismail is rotated to be a Director of Specialized Telecommunications and Universal Service Obligations.

By the end of 2015, the nomenclature of the Specialized Telecommunications Directorate transformed into Directorate of Broadband Development. Dr. Ismail be trusted as a Director of Broadband Development.

The new responsibilities as a General Director of SDPPI are now being carried out after a rigorous selection of several leading candidates. The General Directorate of SDPPI has authority in the regulation, management & control of resources, facilities of post and informatics which related to the delivered service by internal (government) and the public.

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Communication System and Signal Processing

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Paper ID 2015

Non-Parametric Phase Tracking in Demodulation and Decoding of QAM Signals Affected by Phase Noise

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***Abstract*—Digital optical and radio transmission systems based on high order modulations can be severely impaired by phase noise affecting the local oscillators used for up-conversion and down-conversion. Pilot symbols can be of help in mitigating the impact of phase noise. This paper proposes a pilot-aided demodulation scheme where phase noise tracking is performed by a trellis-based algorithm. The benefits in terms of achievable information rate and bit error rate compared to adversary schemes are demonstrated by computer simulations for strong phase noise with coded 4096-QAM.**

***Index Terms*—Coherent Communication; Phase Noise; Information Rate; Trellis; Demodulation.**

Paper ID 2019

Performance Comparison of Communication Module against Detection Location for Blind Cane

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***Abstract*— A Blind Cane is a tool resembles an ordinary wooden stick that can help blind people to recognize the environment atmosphere around them. However, this Blind Cane only help the blind, passively. Many research has been developed and enhanced for the Blind Cane. One of the research conducted is to create a smart cane that can detect the location while the blind doing travel. This research is comparing the performance comparison of module communication that will be implemented on Blind Cane in Telkom University. There are three module communications that will be compared in order to have the best performance and the most economics cost implementation. It is module NRF24L01, module XBee Pro S2C, and module USRBLE101. Based on the testing scenario, the best performance module communication is gained by XBee Pro S2C Module. While the minimum cost for implementation system is using module communication NRF24L01.**

Keywords—Blind Cane; Module Communication; NRF24L01; XBee Pro S2C; USR BLE101.

Paper ID 2025

Comparison Between Three Methods of Pilot-Aided Demodulation

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***Abstract*—Coherent optical and radio systems suffer from phase noise introduced by radio frequency oscillators or lasers used for up-conversion and down-conversion. In strong phase noise conditions, cycle slips of the recovered carrier appear, leading to error floor. Pilot symbols are known to be an effective countermeasure against cycle slips. In this paper we compare the performance of three pilot-aided demodulation schemes. The results show that the trellis based method outperforms the competitors.**

***Index Terms*—Pilot symbols; Phase noise; Coherent Demodulation.**

Paper ID 2052

Persistent Scattering Interfrometry SAR based Velocity and Acceleration Analysis of Land Deformation: Case Study on Kelok Sembilan Bridge

Pakhrur Razi[1], Josaphat Tetuko Sri Sumatyo[1], Daniele Perissin[2] and Achmad Munir[3]
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Abstract—Analyzing characteristic of land deformation in the study area is helpful for mapping and preventing the impact of the landslide. Persistent Scatterer Interferometric (PSI) Synthetic Aperture Radar (SAR) technique has been applied on 13 ascending Advanced Land Observation Satellite Phased Array L-band Synthetic Aperture Radar (ALOS PALSAR) scenes from July 2007 until November 2010 for analyzing characteristic of the landslide. The PSI is employed to identify and measure landslide deformation on the earth surface. In addition, good accuracy dues to overcoming temporal and geometrical decorrelation than conventional Interferometric SAR technique. The result showed some landslide deformed area on Kelok Sembilan bridge has been identified. Time series of landslide deformation history was used for calculating its velocity and acceleration over time. It is useful for estimating velocity and acceleration of the landslide.

Keywords—Persistent scatterer interferometry; land deformation; velocity; acceleration; synthetic aperture radar.

Paper ID 2054

Formal Modeling for Consistency Checking of Signal Transition Graph

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***Abstract*— The behavior of asynchronous hardware system is crucial and practically assured using the formal verification techniques. A signal transition graph is one of the effective alternatives to represent the behavioral design of a huge asynchronous system. The design could be verified beforehand to assure several essential properties including its consistency property. In this paper, the formal modeling scheme of a signal transition graph is proposed along with the consistency property in term of the linear temporal formula. The target signal transition graph is written in Promela code and verified using SPIN model checker. The result shows that the method can verify consistency property automatically.**

Keywords—Formal verification, Asynchronous circuit, Model checking, Signal Transition Graph, SPIN, Promela.

Paper ID 2034

Performance and Implementation of a FPGA-based Cross Polar Interference Canceller

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***Abstract*—Radio transmission on V and H polarizations is a well-known technique to double channel capacity in pointto-point microwave radio systems. Due to non-ideal separation between the two polarizations, co-channel interference arises and must be dealt with at the receive side. Here we report the results of a FPGA-based coded modulation system that employs interference cancellation. The results show that the performance of the implemented system is close to the computed one and meets ETSI specifications with large margin.**

***Index Terms*—XPIC; FPGA; Cross-Polarization Transmission; Co-Channel Interference.**

IT and Network Security

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Paper ID 2018

Implementation of RSA 2048-bit and AES 128-bit for Secure E-Learning Web-based Application

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***Abstract*—e-learning systems today focuses on wide accessibility which is relatively contradictive to security. But as the cyber landscape has changed, so is the cyber security threat that follows. Security is needed to prevent from cyber threat such as data theft, modification, and fabrication, especially in a web-based environment. In this research, RSA 2048-bit algorithm, AES 256-bit and SHA 256 will be implemented in PHP and Javascript programming. Secure Electronic Learning System (SELS) application is designed to accommodate security services, such as confidentiality, integrity, authentication, and non-repudiation. Encryption to provide confidentiality services in file exchange process. Digital signature used to provide integrity, authentication, and non-repudiation in the access control and file exchange processes. Moreover, application can give information about file modification with notification to users. We demonstrated the implementation of cryptography in SELS can prevent data theft, illegal access, data modification or fabrication and is proven on the test.**

Keywords—AES encryption;RSA digital signature; secure e-learning.

Paper ID 2045

Generation of Pseudorandom Numbers from Audio Input in Smartphone Android

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***Abstract*— The nowadays the needs of Random Number Generators (RNG) on the Internet of Things (IoT) devices have been increased such as Android smart phone. On Android devices, there are sources of randomness namely, dev/random Linux PRNG (LPNRG). But there are lacking in a way to get the new data source and extract the randomness of data. In addition, the use of LPRNG we can use another alternative, by using the microphone on Android devices. Microphone on Android devices can be used to obtain the audio input. The process of audio input will produce random noise so that it can be used as a source of randomness.**

The process of the audio input will need some addition process before being used as a source of data. The process of the utilization of audio input as a source of random data will produce a big size of data, so it should be used with maximum. In this research there will be the utilization of maximum data from the audio input. The results of the random data sources from the audio input will be used as the seed of the algorithm Mersenne Twister. To measure randomness from random numbers that have been produced writer use statistical testing suite tool from National Institute of Standards and Technology (NIST).

Keywords— Android; audio input; Mersenne Twister algorithm; the National Institute of Standards and Technology (NIST) statistical testing suite

Paper ID 2038

Secure VANET Protocol Using Hierarchical Pseudonyms with Blind Signature

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***Abstract*— The main objective of deploying Vehicular Ad-hoc Network (VANET) is to reduce the accidents level by providing traffic information to the driver to drive safely. Since VANET supports emergency real-time applications and deals with human life critical information, the security of VANET becomes one of the most critical issues. Numbers of secure VANET protocols have been proposed to solve this issue, but privacy has received less attention. In this paper, we proposed a secure VANET protocol which guarantees privacy and authentication via hierarchical pseudonyms with blind signature. Furthermore, we analyzed our protocol using Scyther Tool for protocol verification. The result shows that our protocol achieved the security claims.**

Keywords—VANET; cryptographic protocol; blind signature; pseudonym; scyther tool.

Paper ID 2035

ISMS Planning Based On ISO/IEC 27001:2013 Using Analytical Hierarchy Process at Gap Analysis Phase (Case Study : XYZ Institute)

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***Abstract*— According to the information security assessment result of Indeks KAMI, XYZ Institute needs to be certified based on ISO/IEC 27001:2013. If XYZ Institute didn't certified, the possible consequences started from written warning until temporary suspension of Indonesian domain name usage**

This research suggested the use of AHP on handling difference of information security control to give reflections on giving acts from the results of gap analysis based on priority use at AHP that supports the certification of ISO/IEC 27001:2013. Based on ISO/IEC 27001:2013 planning of ISMS has 5 stages to do. The 5 stages are defining the range, perform the difference analysis using AHP, accomplish risk assessment, determine the control and target, and determine the policy and procedure of information security management system (ISMS).

The result of this research is degree of information security gap handling that will be useful for XYZ institute to support the processes of ISO/IEC 27001:2013 certification.

Keywords-ISO/IEC 27001:2013, AHP, gap analysis

Paper ID 2046

Statistical Test on Lightweight Block Cipher Based PRNG

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***Abstract*—In this paper, a comparison of three Pseudo Random Number Generator (PRNG) based on SIMON-64, SPECK-64 and SIMECK-64 using PGV-5 scheme is presented. We use NIST randomness test suites sts-2.1.1 which consists of 15 statistical tests.We generate 1.000 sequences that consist of 1.000.000 bits. A sequence passes NIST statistical tests if p-value _ 0.01. According to the test result, SIMON-64 and SIMECK-64's PRNG pass all of 15 tests but SPECK-64's PRNG does not pass Random Excursions test.**

Keywords—SIMON, SPECK, SIMECK, NIST Statistical Test.

Paper ID 2055

Architectural Design of Token based Authentication of MQTT Protocol in Constrained IoT Devices

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***Abstract*— An effective and secure authentication mechanism is one of the important part in implementation of communication protocol in a Internet of Things (IoT) based system. As one of the popular messaging protocol in IoT world, Message Queue Telemetry Transport (MQTT) offers a basic authentication using username and password. However, this authentication method might possibly have a problem in term of security and scalability. In this paper, we propose the design and implementation of token based authentication of MQTT protocol in constrained devices. The proposed design consists of four components: publisher, subscriber, MQTT broker and token authentication server. Publisher/subscriber first sends its username password to authentication server to get the token. Notice that, the token generating process is only performed at following conditions: 1) when token has not been generated yet and 2) when token has been expired. Once publisher get a valid token, it will store that token in its local storage and use it for further authentication. From usability and performance testing result, the proposed system can perform the authentication of valid and expired token in relatively acceptable time.**

Communication Network

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Paper ID 2024

Effect of Overhead Flooding on NDN Forwarding Strategies Based on Broadcast Approach

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***Abstract*—At this time forwarding strategy became the center of attention of researchers in area named data networking (NDN). This is because the forwarding strategy is responsible for managing every packet of interest received by the NDN router, then the characteristics of forwarding strategies will have a significant impact on NDN performance. Therefore, this study aims to perform analysis using a large approach in forwarding strategy that is broadcast approach. It is expected that the results of this study can be utilized by researchers in the field of NDN to determine the direction of research. Parameter of study in this research is delay in observation time interval. A forwarding strategy using a broadcast approach is simulated in order to understand the NDN delay characteristics within the observation interval. The simulation of the research was conducted on the NDNSim simulator with several scenarios. From the simulation results obtained that cumulatively delay broadcast forwarding strategy in multi producer scenario there is no difference between fulldelay and lastdelay. However, in the single producer scenario there is a difference between fulldelay and lastdelay this can be influenced by the large number of consumers who send interest to the producer and also based on the flooding method of the interest package in order to find the nearest NDN router containing the expected content as soon as possible, So that it can overload the network performance and effects overhead.**

Keywords: Named Data Networking, Forwarding Strategy, Broadcast Strategy.

Paper ID 2030

Effect of the Content Store Size to Performance of Named Data Networking: Case Study on Palapa Ring Topology

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***Abstract* — in the digital era of information technology today, information technology services are needed by all parties ranging from lay people, educational organizations, government organizations, and companies. The current digital growth has resulted in data information services being used as a distribution network that is essentially more common than communication networks and solving distribution problems of complex point-to-point communication protocols and error-prone. One of them is Named Data Networking (NDN), which is a future network technology that is present in helping the effectiveness of network usage in contemporary Internet architecture such as Internet Protocol (IP). With the development of telecommunication technology in Indonesia, through the Ministry of Communication and Information has issued a project Palapa Ring backbone network which is one of the concerns of the Government of the Republic of Indonesia to build the availability of fiber-optic network as the backbone of the national telecommunication network that connects all regions in Indonesia. In this paper will discuss how the effect of changing the size of the content store in the NDN networks using the topology Palapa ring by measuring some parameters such as the value of the dropped package or the value of a delay package.**

Keywords—Named Data Networking, IP, Palapa Ring, Content Store

Paper ID 2036

Traveling Salesman Problem Using Multi-Element Genetic Algorithm

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***Abstract*—Travelling Salesman Problem (TSP) has been a favorite problem to solve. The idea is to search an optimal route between location. TSP always uses a distance as a cost, although there are other costed elements except for the distance. We found out that obstacle was another cost besides distance in TSP. It increases the elements to be evaluated. We need an approach to solve multi-elements TSP. Multi-Element Genetic Algorithm (ME-GA) was used to solve the NP-hard problem. It was proved that ME-GA provided a solution for a multi-element problem. In the crossover process, we use Partial Map Crossover (PMX), showing that PMX is overwhelmed Oder Crossover (OX) and Cycle Crossover (CX) methods. We formulate a multi-elements fitness function by three elements: distance, fixed obstacle, and non-fixed obstacles. The elements have a proportion of the fitness function; we give 70% for the distance, 20% for the fixed obstacle and 10% for the non-fixed obstacles. The results show that the distance of the location increased but we can minimize the number of obstacles. Compared to if only distance to evaluation, we find the shortest distance between the location, but we cannot decrease the number of obstacles.**

Keywords— TSP; Genetic Algorithm; ME-GA; Multi Element; PMX

Paper ID 2051

Desinge and Implementation of Government Cloud Computing Requirements: TOGAF

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***Abstract*—Digital technologies, such as cloud computing, have transformed business activities, particularly in the public domain. In the corporate sector, where cloud computing technology has long been implemented, some organisations have succeeded, while others have been less successful. Saudi Arabia has enthusiastically supported the move to cloud computing technology; however, from a business perspective, its implementation of government cloud technology is still relatively nascent and has faced numerous challenges. The existing literature suggests that the government cloud migration depends not only on project drivers, but also on considerable barriers, which often delay successful implementation. Furthermore, many current barriers and drivers clearly involve the roles of cloud vendors, meaning that cloud vendors must be fully engaged in order to develop comprehensive solutions. Addressing this phenomenon from the lens of enterprise architecture (EA) may support the development of appropriate deployment requirements for optimal government cloud implementation. Thus, this paper is a research in progress that analyses the major barriers and drivers in public organisations, taking into consideration the perspectives of cloud consumers and vendors. This paper also introduces a mapping conceptual model throughout The Open Group Architecture Framework (TOGAF) that supports a novel framework for tackling these barriers and their influences and enhancing drivers via a set of requirements.**

Keywords— cloud computing, enterprise architecture, TOGAF, successful implementation.

Paper ID 2062

Throughput Performance of Transmission Control Protocols on Multipath Fading Environment in Mobile Ad-hoc Network

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***Abstract*— Transmission control protocol (TCP) ensures the destination received the data. With the congestion control mechanism, TCP play important roles in throughput network performance. Unfortunately, this mechanism has the inaccurately assume about network condition and cause throughput degradation. TCP assumes that packet losses are due to congestion, unfortunately, wireless networks suffer from several types of losses that are not related to congestion, especially in wireless ad-hoc network with the multipath fading environment. In this paper, we evaluate and investigated the congestion control mechanism in TCP Tahoe and TCP Reno at Rayleigh environment, and Two-Ray ground as a comparison propagation model. The result shows the highest degradation of TCP performance is in severe fading, which is Rayleigh fading. For analysis, we used a throughput model to find TCP performance based on SNR (Signal to Noise Ratio) in a Rayleigh fading environment.**

Keywords—TCP, Congestion Control, Rayleigh, Two-Rayground, Rician, Throughput, SNR

Paper ID 2064

Content Storage Effecton the Named Data Network Traffic Load

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***Abstract*— Named Data Network (NDN) is a network architecture with a content-centric paradigm, in which the consumer has a certain interest in a content. Requests for data are performed based on the content, not to specific server or producer so that the respond to the requested content can be performed by the NDN router, not only by the server or producer. NDN causes data traffic more efficient because the request will be served by the node that closest to the consumer who has the content in its Content Storage. In this research the performance of NDN is tested based on changes in the size of Content Storage as one of the structures in NDN, and also the changes of frequency of interest. This research use Ebilene network topology and the simulation is performed to know the performance of the network. The performance will be analyzed from average delay, number of interest message retransmission, cache hit ratio and packet drop. Simulation results show that the size of Content Storage greatly affects the efficiency in data transmission in the NDN network. The smaller the size of Content Storage relatively compared to the number of consumer demand, the greater the network load. Data circulation becomes larger, delay and packet drop increases, the number of packet packet retransmission increases and the cache hit ratio deteriorates. The provision of Content Storage of the optimum size makes the data transmission on the NDN network efficient.**

Keywords—content storage; named data network; eficiency; data circulation

Paper ID 2065

Routing in NDN Network: a Survey and Future Prespectives

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***Abstract*—Evolving of the internet infrastructure have been worried brought to collapse, due misconduct of implementation since the beginning. NDN bring second wind implementation of data communication for internet. Routing as one of the important factor are explored and classified. This article critically discusses classification of NDN routing plane research by surveying the current literature and presenting its research objective. Major challenges and opportunities are also highlighted, serving as guidelines for the state of the art of NDN routing future research.**

Keywords—ndn; routing

Paper ID 2070

NMS for Universal Service over Named Data Networking Study on Indonesia Higher Education Network

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***Abstract*—It seems that developing Indonesian higher education would trigger further the development of such as capacity in information communication technology. As part of academic institution therefore information communication technology development of Indonesia higher education should follow the universal service model. Universal service model requires improvement service to advance the availability of information communication technology services to all consummers including those in low income, rural, insular, and high cost areas at rates that are reasonably comparable to those charged in urban areas. NMS is the most trusted tool to monitor the availability of services instead of any other related systems that still intervented by human. However NMS for universal service model needs more improvement than basic NMS that might be already fit and proper on common services. In this work had been conducted investigation the challenges to implement universal model in Indonesia as a case study. The result of study then used as a base to develop a solution model for enhancement network management that estimated would be fit and proper to be used in Indonesia. Inherent as Indonesian higher education network is used as topology in simulation. Using market pull-technology push methodology then from technology point of view, in this work also had been proposed the integration between Named Data Networking and the proposed enhancement network management for universal service model.**

Index Terms—Named Data Networking, Universal Service, Network Management System, Indonesia Higher Education

Internet of Things

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Paper ID 2009

Topic Based IoT Data Storage Framework for Heterogeneous Sensor Data

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***Abstract*—Massive volume and heterogeneous data are the challenges in IoT data storage. A properly designed IoT middleware is required to handle the issues. This paper presents a framework consists of Internet Gateway Device (IGD) function, a Web service, NoSQL database, and IoT Application. The framework efficiently handles the structured and unstructured of sensors data. To verify the framework, we evaluated it using functional and non-functional testing. From the functional testing, this framework can deliver and store data with heterogeneous data and volume. From the non-functional testing, this framework can receive 443 data per second from an IGD, can deliver 173 data per second to IoT Apps, and response times are acceptable which is under 1 seconds.**

Keywords— MongoDB, GridFS, Internet of Things

Paper ID 2020

Low Cost Wireless Parking Sensor Design and Prototype

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***Abstract*— Finding a parking space in a large parking area becomes a problem for a driver these days. In this paper, we present a design and prototype of a low cost wireless module, which contains of a parking sensor to detects a vehicle and a LED to display available parking space. For this module, we are using an PING ultrasonic sensor and a Node MCU as a microcontroller. The module then connected wirelessly to the main server via a router. Prototype of the module costs less than US$15, lower than average retail price. A better approach for the vehicle detection scenario is also presented as a result.**

Keywords— ultrasonic; vehicle detection; low cost; prototype

Paper ID 2012

Statistical Comparison of Grain Algorithm for IoT Device Security

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***Abstract*— Internet of Things (IoT) is an interconnection among devices or "things" that exchange data between them. A man-in-the-middle can be performed when two IoT devices are communicating, therefore secure data transmission between IoT devices has emerged as a challenging task. There are numbers of existing cryptography algorithms that offers protection. However, their utilization in IoT is questionable since the hardware is not suitable for inexpensive yet efficient encryption process. This paper proposed implementation of Grain as the winner for eSTREAM project and compare all version of Grain, i.e Grain v0, Grain v1 and Grain 128 in Arduino Mega 2560 as it used as a single board computer for IoT. The result shows that there is no significant difference in encryption-decryption processing time. While, in generating keystream, Grain 128 will take more time when implemented in Arduino Mega 2560.**

Keywords—internet of things; cryptography; grain algorithm; Arduino Mega 2560

Paper ID 2011

Lightweight Monitoring System for IOT Devices

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***Abstract*—The Internet of Things (IoT) brings millions of devices, in the form of sensor, actuator, or embedded electronic devices interconnected through the Internet. Monitoring abundant of IoT devices is a big challenge, especially in a constrained condition of sensor nodes (e.g. limited CPU, memory, and battery). Therefore, a good monitoring system with an efficient monitoring protocol is often needed to compensate the limited resources of sensor nodes. SNMP is a protocol that widely used for a monitoring system. However, SNMP was developed without taking into account of devices with limited resources. This paper presents a proposed prototype of a light weight monitoring system based on agent-manager model. The testing result shows that the developed prototype system generates smaller packet sizes than the SNMP-based monitoring system on the same function and shows a low CPU and memory usage in monitoring thousands of devices.**

Keywords— Monitoring; SNMP; Internet of Things

Paper ID 2022

Web-Based Macroscopic Road Traffic Simulator

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***Abstract*—Simulator works as an evaluation tool to implement the traffic system planning. However, available traffic simulator prompts the user to install the application to use it. This makes the simulation became exclusively accessible and needs more resource to run. It may hinder the planning process especially when it is done collaboratively. Most available traffic simulators also have not included the real-time traffic data into the simulation by default. It is possible to use those data, but it needs more effort and code-intensive which is not suitable for non-technical users. The real-time traffic data represent the real-world traffic distribution. It can be applied to simulator to simulate the vehicles movement in more realistic way in terms of vehicle distribution. A web-based macroscopic road traffic simulator is proposed by using web technology. It may act as a cloud road traffic simulator services to create an easy to- access while integrating real-time traffic data. The proposed simulator is discussed in terms of map data preparation, traffic network creation, traffic data integration to simulator, and vehicle generation. Results of current development shows feasibility of implementing the simulator using the web technology. There are constraints faced on developing the simulator which provide more future works to create a web-based macroscopic traffic simulator.**

Index Terms*—traffic simulator, macroscopic, web technology, traffic network, traffic data

Paper ID 2029

Clustering Based on the Node Health Status in Wireless Sensor Networks

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***Abstract*— One of the applications of wireless sensor network is the forest fire monitoring which has different characteristics from others. In this application, the connectivity of nodes should not be destroyed just because of nodes lose their energy or burnt in the fire. Since the wide area of monitoring, the clustering method is considered as the efficient routing to increase its scalability as well as reduce energy consumed of nodes. Many clustering methods which are mostly based on Leach protocol are proposed without considering the node's failure. Here, we proposed the node health status as a parameter to select a Cluster Head and compared its performance with Leach, MTE and the direct algorithm. Results show that the number of packets received and the alive nodes of the proposed method are higher than others. Identically, it has the lowest average end to end delay which is suitable for forest fire application.**

Keywords—; clustering; node health status; forest fire; Leach

Paper ID 2041

Alert, Monitoring and Tracking Electronic Device Prototype

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***Abstract*— ALMONTD (ALert, MONitoring, and Tracking Device) is a system that allowed users to monitor the voltage, current, location of electronic devices, track the last position, and receive an alert message as the devices move away from its intended position. This system is equipped with MAX471 voltage sensors, Ublox neo-7m GPS shield, and SIM 900 GSM/GPRS communication module which is able to transmit data remotely wirelessly. ALMONTD also uses a web page as visualization media for its user interface including digital map. These sensors provide voltage and electrical current information. The GPS detect the current location. Voltage, electrical current, and current location then are transmitted to a web server by Arduino Pro Mini via GSM/GPRS communication module and alert message will be sent if ALMONTD are moved to certain distance.**

Keywords: ALMONT (Alert, MONitoring, Tracking); GPS; GPRS/GSM; Arduino Pro Mini; Digital Map

Paper ID 2049

An Investigation of External Factors for Acceptance of e-Health Nurses in Rural Region of Indonesia

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***Abstract*—The Indonesian government policy has required the hospitals in Indonesia to implement a health information system. There are still found many barriers in its implementation in the hospitals such as lack of facilities and human resources which lead to the problem complexity. As a result, the e-health system implementation has not been being optimum. The aim of this paper is to identify the problem related to the technology adoption particularly the adoption which uses Technology Acceptance Model (TAM) theory. By reviewing the previous studies and literatures, we detected the need to relate the external variables of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which are rooted in TAM. The study we conducted shows that TAM model application as the e-Health measurement framework in Indonesia needs to be extended particularly its factors which significantly influence PEOU and PEU since it will directly affect on the acceptance of eHealth Nurses in Rural Region of Indonesia. The factors are personal factors and organizational factors. Furthermore, a model is formulated for future empirical testing.**

Keywords— TAM, e-Health Adoption Model, Nurse, Personal Factors, Organizational Factors

5G and Multimedia Communication

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Paper ID 2075

A New Heuristic Method for Ring Topology Optimization: A Proposal

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Nowadays, the ring topology has become a standard in network topology design, at least at the core network. The problem in designing ring topology is how to design the connections of each node to each other with the overall cost of the ring is minimum. This problem is known as the Traveling Salesman Problem (TSP). There are two variables which need consideration in TSP, finding the nodes configuration that has minimum cost, and how long it takes to get this minimum configuration. Brute Force has the capability to find the minimum nodes configuration cost, but with every node added to the overall configuration, the time to solve it is increasing exponentially. While not giving the minimum cost, The Ant Colony Optimization (ACO) algorithm has the advantage of minimal time needed to find the sub-minimum nodes configuration. This paper proposed a new heuristic algorithm to find the sub-minimum nodes configuration. The proposed algorithm has a shorter time, in order of less than 1 second for up to 50 nodes, compared to the Ant Colony Algorithm. Although, the cost of the nodes configuration didn't always lower than the Ant Colony Algorithm.

Keyword: TSP, ring topology, ACO, Heuristic, network design

Paper ID 2027

Prototyping Takes 5G from Concept to Reality

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***Abstract*—The continuously increasing demand for wireless data has pushed researchers to search for new technologies in order to significantly expand wireless data capacity and network capability. Researchers are not only addressing capacity in their innovations, they also aim to improve coverage and reliability at the cell edges, improve energy efficiency for providing service, and decrease latency—all of which will improve the overall responsiveness of the network. Researchers worldwide are racing to set the standards for 5G. In order to stand out in this competition, the ability to quickly test out an algorithm and simulation in real-world signal is crucial. The NI platform based prototyping approach enables researchers to map the algorithm to a system and working hardware in a short time. This paper presents the NI solution on 5G prototyping platform, in particular, discusses the software and hardware architectures of Massive MIMO and mmWave systems in detail.**

Keywords—5G, Massive MIMO, mmWave

Paper ID 2033

Comparison of the Haryadi Index with Existing Method in Competition, Equality, Fairness, and Correlation Level Calculation Case Study: Telecommunication Industry

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***Abstract*— This research is focused in a formula called Haryadi Index, which implemented in the assessment of telco industry. This formula will be contested with the other existing formula to gauge competition level, equality level, fairness level, and correlation level. The Herfindahl-Hirschman Index will be compared against Haryadi Index for competition level, Gini Index will be compared for equality level, Jain Index for fairness level, and Pearson Correlation for the correlation level calculation.**

The research produces the following : (1) Haryadi Index can provide better number for an industry with a different level of competition, whereas the Herfindahl-Hirschman Index do worse; (2) Haryadi Index has more precise equality level coefficient than the Gini Index; (3) Haryadi Index can give more appropriate indexes for a variety levels of fairness, while Jain Index gives a relatively bigger indexes for a variety levels of fairness; (4) Haryadi Index gives a new alternative for correlation counting which refer to the linear equation, while more research will be needed to find the better situation to use the Haryadi Index or the Pearson Correlation appropriately.

Keywords*— Statistics, Haryadi Index, Herfindahl-Hirschman Index, Gini Index, Jain Index, Pearson Correlation.

Paper ID 2032

The Fairness of Resource Allocation and Its Impact on the 5G Ultra-Dense Cellular Network Performance

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***Abstract*— This paper proposes novel insight about the dependencies of network performance and the level of fairness of network resource allocation. The presence of dozens of ENB in the macro cell of the 5G ultra-dense cellular networks will cause a high performance loss if the ENBs have a high variation in traffic intensity value. In this article, a method of arranging all ENBs in a macro cell to have traffic intensity of approximately the same value by adjusting the throughput allocation of each ENB backhaul to be a proportional value of its traffic. This article also promotes the Harmony-in-gradation resource allocation method for 5G ultra dense network. This method is believed to play an important role in realising a constant good performance of 5G mobile network.**

Keywords—5G mobile communication, communication system traffic, fairness, harmony-in-gradation resource allocation method, performance loss, resource allocation, throughput.

Paper ID 2056

HEVC Video Compression Performance Evaluation On LTE Network

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***Abstract*— Today's communication and entertainment World videos play a very important role in. Many services are being developed based on the concept of video like video streaming, video calling etc. The increase in demand for such services made the service providers evince interest in investigating, monitoring and maintaining the quality that they provide for such services. In order to improve the quality for delivering video services, video quality evaluation is necessary. For this purpose many tools to evaluate the quality of a video have been designed. In this research we use several parameter to evaluate video transmission on the LTE network, which is run on open source network simulator called Network Simulator 3. We have evaluated a set of videos using this simulator to examine the performance of HEVC video compression on LTE network and calculate to know how this parameter impact the video quality if the video sent via LTE network by determine its PSNR.**

Keywords: Evaluation, Peak Signal to Noise Ratio,Burst Error, Video quality, LTE.

Paper ID 2061

Cell Capacity Prediction with Traffic Load Effect for Soft Frequency Reuse (SFR) Technique in LTE – A Network

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Abstract – The next generation OFDMA-based cellular network that targeted high spectrum efficiency requires the frequency reuse system as one of the solutions, such as a deployment needs a good planning as well. In this paper, an analysis of soft frequency reuse (SFR) performance under various traffic loads is another important task, in case planning a good cellular network based on cell capacity is something considered. We predict it in LTE – A Network which offers higher data rate than LTE Network. The result shows that SFR can mitigate the inter-cell interference by providing higher troughput for cell-edge users. Also, in order to achieve better performance of traffic load effect, cell radius is varied. The result indicates that troughput maximum is obtained when cell radius is 700 m.

Keywords – Soft Frequency Reuse, Traffic Load, Capacity, Cell Radius, LTE-A Network

Paper ID 2063

RRC Success Rate Accessibility Prediction on SAE/LTE Network Using Markov Chain Model

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***Abstract*— Accessibility KPIs in SAE/LTE network are used to measure the success rate of users in accessing the network. The accessibility KPI is expressed in terms of probabilities that state how likely the user will be able to access the service for certain service times and conditions. Accessibility KPIs cover three areas to provide service ie. RRC success rate (RRC_SR), ERAB success rate and S1 setup success rate. In this study, future long-term performance of the RRC_SR, in term of KPI degradation will be predicted from existing historical data based on discrete time Markov Chain. Predicted KPI of RRC_SR in the long-run will be required in the failure management process for root cause analysis and to trigger preventive action. This is becoming increasingly important in line with the introduction of Self-Organizing Netwrok (SON) on SAE/LTE networks.**

Keywords—caccessibility; SAE/LTE; KPI; RRC_SR, S1 setup, ERAB setup

Paper ID 2031

Analysis of Harmony in Gradation Index on 5G Cellular Network: Quantitative Analysis

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***Abstract*—This paper provides analysis and simulations result of Harmony in Gradation index which refers to previous research about the concept. Simulations prove that the network performance depends on level of fairness of resource allocation in the network. The simulations were successfully conducted and followed by analysis of the simulations' results.**

Keywords— 5G mobile communication, communication system traffic, harmony-in-gradation resource allocation method, harmony-in-gradation index, performance loss, resource allocation, throughput.

Wireless Communication

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Paper ID 2008

Artificial Dielectric Material and Its Implementation for TE_{10} Mode Waveguide Filter

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***Abstract*—In this paper, a study on artificial dielectric material and its implementation as a waveguide filter are proposed numerically and experimentally. The use of artificial dielectric material for waveguide filter implementation is intended to produce lower frequency response of filter without enlarging the dimension of waveguide. The filter is designed using a rectangular waveguide which has the width of 72.4 mm and the height of 34 mm with the TE_{10} cut-off frequency of 2.08GHz. Two identical resonators are inserted into the waveguide and separated in a specific distance. Each resonator is composed of three parts where the left and right parts are made of FR4 epoxy substrate with the same percentage of dimension. Meanwhile, the middle part is made of dielectric material with modified permittivity value using artificial dielectric material of Split Ring Resonator (SRR). The parametric studies are carried out through simulation by changing the distance between resonators and the thickness of resonators. From the measurement, it shows that the frequency response of filter were shifted lower at 1.7GHz with the values of S_{11} and S_{21} are -15dB and -3dB, respectively.**

Keywords—Artificial dielectric material; rectangular waveguide; Split Ring Resonator (SRR); waveguide filter.

Paper ID 2007

Satellite Deployment Strategy for an Archipelagic State: The Case of Indonesia

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***Abstract* — A satellite is a vital infrastructure for national security, national telecommunications infrastructure, broadcasting services, and earth observation purposes. Indonesia has used satellites since 1976 for domestic communications purposes. As a maritime and an archipelagic country, satellite communications is very useful with Indonesia's condition. Therefore, it is important to develop new policies and regulations to increase the number of national satellite filings and orbital slots. Indonesia's current government has a Nawacita program that should be supported by the national telecommunications infrastructure, especially in using satellites. The Indonesian satellite market shows a supply and demand gap condition, where most of the satellite usage is provided by foreign satellites. There are 36 foreign satellites used in Indonesia, which is served by 16 countries. Currently, Indonesia uses a foreign satellite capacity equal to 5 to 6 foreign satellites. Based on interviews conducted on several key respondents, new policies and regulations are needed to support national orbital slots and set up new entities to manage national satellite filings. Indonesia will significantly increase its satellite use in line with the deployment of *3T (Terluar, Terdepan, dan Tertinggal)* areas, and in support of economic activities such as e-commerce and digital economic aspects. If the cost of leasing foreign satellite usage can be decreased, Indonesia can save more in expenditures. These savings can be used to deploy national satellites. Based on the results of interviews conducted, the problems with Indonesian satellite operators include: a lag of investment, an inward looking orientation, and too many national satellite operators with minimum real satellites in operation. According to the respondents, Indonesian satellite deployment can be done by a special board that is called *Badan Layanan Umum (BLU)*. Having direct government to government (G to G) cooperation between Indonesia and other countries in the satellite and orbital slot usage agreement is a strategy to increase the satellite capacity. Once Indonesia and other countries reach a consensus in using satellite filings, it can be managed by BLU. BLU will then make a satellite design until the satellite launching. Satellite operators will be selected by BLU through a tender, and the winner**

of the tender will deliver the satellite capacity to all users in terms of business to business.

Keywords — national policies and regulations, satellite system, lag of investment, Badan Layanan Umum.

Paper ID 2074

Design and Simulation of FDD-TDD Carrier Aggregation on LTE-Advanced Network

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Abstract*—LTE-Advanced technology (LTE-A) focuses on increasing the bandwidth of the access network by using a variety of techniques, one of them is carrier aggregation (CA). Carrier aggregation (CA) is a technique used to create virtual bandwidth by combining 2-5 component carrier (CC) at the same or different frequency with total aggregated bandwidth 100 MHz. This paper aims to perform LTE-A network planning using FDD-TDD CA technique Rel 13 case studies in central Jakarta with area coverage probability reach 95% and RSRP ≥ 110 dBm. Network performance analysis is based on the measurement of BLER, peak RLC throughput channel, effective channel throughput, and path loss, obtained from monte carlo simulation results in a combination of FDD-TDD Rel-13 spectrum with total aggregated bandwidth reach 30 MHz using 2 component carrier. This research is also aimed to obtaining the best FDD-TDD spectrum combinations of E-UTRA CA band Rel-13 in order to be a reference on the next generation in cellular technology system. Based on the experimental and analysis result on the six scenarios of FDD-TDD CA Rel 13, the RSRP which obtained from CA 1-41, 1-42, 8-41 and 8-42 scenarios with a frequency 2100 and 900 MHz FDD as primary cell (Pcell), are in the range of -90 dBm or >-100 dBm and it's good for dense urban areas such as Central Jakarta. While RSRP in scenario CA 3-41 and 3-42 with frequency 1800 MHz FDD as primary cell (Pcell) <-100 dBm, and classified as bad for dense urban area. The simulation results also show that the combination of FDD-TDD CA has a quality of load-balancing, where the effectiveness of RLC throughput channel for each service on dense urban area reaches 99% in the downlink for all scenarios. The best FDD-TDD CA Release 13 is obtained from the FDD-TDD scenario of CA 8-41 and 8-42 because it has the smallest path loss value, with 900 MHz FDD as Pcell. The BLER on Uplink is 0 for all scenarios, it shows that the connection on uplink is 100% successfull. While BLER on downlink is at 2% for all scenarios or still good category on every carrier combination because BLER value < 10%.

Keywords—Carrier Aggregation, LTE-Advanced, RSRP, BLER, peak RLC channel throughput, path loss, FDD-TDD CA Rel 13.

Paper ID 2014

LTE Networks BTS Location Optimation with Double Step Grey Wolf Optimizer

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Abstract— Base station is the main network element in cellular networks deployment. The vast area of placement, position variation and number of users and environmental factors spawned a vastly searching solution space. Those are makes base station location determination an NP-hard problem. Network planning optimization frequently use meta-heuristic algorithm to find the optimum solution. Grey Wolf Optimizer (GWO), one of meta-heuristic algorithm has advantages in number of parameters used and simplicity of the process. GWO allocates exploration phase and exploitation phase in the same portion makes diversity issue in the finding solution process. The research proposes modified GWO to prolong exploration phase that enabler the algorithm to expand the search through wider search space. Double step GWO change the way of coefficient vector |A| decrease along the iteration. This new algorithm differentiates changing behavior of vector coefficient between exploration phase and exploitation phase. Simulation conducted covered variation of areas, user number and user density. The work evaluated the number and locations of BTS deployed, coverage area and number of users that can be and compare it to grey wolf optimizer

Keywords— Base station location, LTE Network, and Grey wolf optimizer, capacity constraints, coverage constraints

Paper ID 2050

Transformation of Time Petri net into Promela

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***Abstract*— This paper proposes a method of transformation of time Petri net into Promela in order to verify their behavioral properties of the timed systems. The concurrent systems, with time attributes on transactions, are typically written in time Petri net. For quantitative and qualitative analysis of their properties, these time Petri net would be transformed into Promela beforehand. We also propose the linear temporal formula to specify the correctness properties. The proposed transforming method copes with the representation of both Petri net structure and its dynamic behavior. The token flows in time Petri net are modelled into Promela code, hence the implicit dynamic behavior would be practically described in the model. The resulting Promela code is simulated and verified by SPIN tool and reveals that not only the time related behaviors would be evaluated, but also the qualitative properties, such as safety and liveness.**

Keywords*— *Formal Model, Time Petri net, Promela

Paper ID 2059

Fading Distribution Rain Scattering Model for Wireless Communication Channel Millimeter wave

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Abstract - This paper presents an initial result rain rate measuring of research for channel modeling of wireless channel in Indonesia considering the impact of rainfall due to attenuation, fading and wave polarization propagations millimeter wave. The rain change wave propagation direction, its mean scattering, which is damaging channel communication. Model developed in time series (time domain) by assuming channel as a random variable. The rain data is based on retrieval result from direct measurements. The rain distribution made statistical value of rain, i.e. mean, variance, autocorrelation, and cross correlation. Distribution rain rate used model rain attenuation in 5G for power link budget.

Keyword; scattering, power link budget, 5G

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Antenna and Broadcasting

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Paper ID 2004

Ultra-Wide Band Crescent Antenna with Enhanced Maximum Gain

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***Abstract*—In this study, an ultra wide band microstrip antenna fed by coplanar wavequide with enhanced maximum gain is designed. Size of the designed antenna is 30x38mm and the dielectric material (Rogers RO3006) with relative dielectric constant ε_r=6,15 is used. At the designing stages, the effects of the modifications on the gain is examined too. The gain of the modified antenna is increased with minimum 1dB and maximum 3 dB at whole bandwith.**

Keywords—ultra wide band; microstrip antenna; gain enhancement

Paper ID 2040

Modified Half Bowtie Antenna for Direction Finding

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***Abstract*—a half bowtie antenna was designed to facilitate the application of direction finding in FM Radio Frequency (88-108 MHz) and UHF television reception (500-600 MHz). A slot augmenting was applied at the middle of the antenna to make a better performance on return loss of both bandwidths. Antenna size minimizing was applied to make it easier to manufacture and lower on the budget. Antenna characteristics were analyzed by simulation. Then, four antennas were manufactured and measured. The measured results showed that the proposed antenna had an impedance bandwidth from 88-108 MHz and 500-600 MHz with return loss smaller than -10. The antenna achieves a compact size which is 17.6% smaller than its theory size. Furthermore, signal receiving from the transmitting artificial antenna experiment demonstrates that the antenna can be well suitable for determining the Direction of Arrival (DoA).**

Keywords: Microstrip patch Half Bowtie Antenna; FM Radio Frequency; UHF Television Reception Frequency; Direction Finding

Paper ID 2042

Design and Realization of Microstrip Antenna for GPS Antenna using Proximity Coupled Techniques

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Abstarct **- The development of wireless technology has driven many innovations in the realization of the antenna. Microstrip antenna is an antenna that is very popular. One use is contained in the navigation system that is the GPS system. This study designed a rectangular-shaped microstrip antenna array that is supplied by a proximity method coupled with the use of FR-4 Epoxy. This antenna is designed and realized in the GPS frequency 1575.42 MHz. The result are gain = 3.4 dB, return loss = -13.91, VSWR = 1.5, and bandwidth of 41 MHz. This antenna produces a directional radiation pattern with circular polarisation.**

Keywords- Microstrip Antenna, GPS, Proximity Coupled, Gain, Radiation Pattern.

Paper ID 2066

An SDR-Based Multistation FM Broadcasting Monitoring System

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Abstract— In a country like Indonesia which still upholds eastern culture and religion norm, the content of FM broadcasting stations considered important for mentality development of the society. A committee to monitor broadcasting content has been established. Its responsibility, among others, is to manage complains on negative broadcasting content. Currently, the commissioners must visit the FM broadcasting studios to compile evidences, which is can be very costly since the location of the studios can be far (>200 km away) from the committee headquarter. We propose a system to remotely monitor the content of FM broadcasting stations. By using this system, commissioners do not have to visit the stations, instead they monitor them remotely from the headquarter. We just have to put the system in the area we want to monitor (an area can be a city wide with several FM stations) and send the broadcasting content via internet. Thus, the proposed system offers cheaper solution which solves economical constraint. In our previous monitoring system, we use one digital FM tuner that can be used to monitor (including recording the content) one station at a time. In order to monitor more than one station at the same time (recording some stations), we propose an SDR (Software Defined Radio)-based monitoring system. Combined with OpenWebRX, we can monitor some FM broadcasting stations at the same time. The system accessible via web browser which can be used by users to monitor up to 4 stations.

Keywords: FM radio, multi station, OpenWebRX, SDR

Paper ID 2060

Spiral-shaped Printed Planar Inverted-F Antenna for Body Wearable Application

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***Abstract*—In this paper, a spiral-shaped printed planar inverted-F antenna (PIFA) is presented for body wearable application. A combination technique of planar inverted-F and geometry modification is implemented to reduce the physical dimension of proposed antenna. The antenna which is intended to operate around the frequency of 920MHz is deployed on an FR4 epoxy dielectric substrate with the thickness of 0.8mm. Prior hardware realization, the antenna parameters such as reflection coefficient, voltage standing wave ratio (VSWR), gain, and radiation pattern are numerically investigated to obtain the optimum performance design. Meanwhile from hardware characterization, the measurement result shows that the realized antenna which has the diameter of 18mm has the resonant frequency of 911MHz with -10dB measured bandwidth of 20MHz and gain of -29.82dBi. This achievement could be beneficial for body wearable application such as implantable antenna.**

Keywords—body wearable application; implantable antenna; printed planar inverted-F antenna (PIFA); spiral-shaped.

Paper ID 2058

Wideband Monofilar Helical Antenna for Wireless Communication in Remote Area

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***Abstract*—This paper presents the wideband monofilar helical antenna which is aimed to increase low level signal commonly occurs in the remote area such as highlands, ridge, and borderlands. The use of helical antenna type is due to its ability in producing circularly polarized wave useful to support wireless communication frequently surrounded by some obstructions. The proposed antenna is expected to operate at wideband frequency range including cellular communication and connectable to the GSM modem associated with a laptop or PC device. The antenna is designed by using thin copper wire with spiral turn number of 8 and fed through a 50Ω female N-connector type. Based on the optimum design, the proposed monofilar helical antenna is then realized for experimental characterization. The measurement result shows that the realized antenna has working frequency from 1200 MHz to 2250 MHz and has the gain up to 14.5 dBi.**

Keywords—Helical monofilar antenna; remote area; wideband; wireless communications.

Informatics and Application

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Paper ID 2005

Java and Sunda Dialect Recognition from Indonesian Speech using GMM and I-vector

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***Abstract*—Recognition of dialect is a field of research in the field of language recognition. The purpose of this study is to compare the best modelling features and techniques for recognizing Javanese and Sundanese dialects in Indonesian speech using MFCC and combination of MFCC and pitch feature candidates and comparing GMM and I-Vector modelling techniques. This research uses machine learning approach for training process and model testing. As a result, the use of the combination of MFCC and pitch feature and the I-Vector modelling technique has the advantage to recognize Java and Sunda dialect.**

Keywords—Indonesian languange, Bahasa, dialect, machine learning, Java dialect, Sunda dialect

Paper ID 2010

Blockchain Based E-Voting Recording System Design

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***Abstract* — Increasingly digital technology in the present helped many people lives. Unlike the electoral system, there are many conventional uses of paper in its implementation. The aspect of security and transparency is a threat from still widespread election with the conventional system (offline). General elections still use a centralized system, there is one organization that manages it. Some of the problems that can occur in traditional electoral systems is with an organization that has full control over the database and system, it is possible to tamper with the database of considerable opportunities.**

Blockchain technology is one of solutions, because it embraces a decentralized system and the entire database are owned by many users. Blockchain itself has been used in the Bitcoin system known as the decentralized Bank system. By adopting blockchain in the distribution of databases on e-voting systems can reduce one of the cheating sources of database manipulation. This research discusses the recording of voting result using blockchain algorithm from every place of election. Unlike Bitcoin with its Proof of Work, this thesis proposed a method based on a predetermined turn on the system for each node in the built of blockchain.

Keywords — e-voting; blockchain; database; security

Paper ID 2026

Disaster Mitigation Management Using Geofencing in Indonesia

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***Abstract*—Disaster mitigation is defined as activities to reduce the loss of life and assets. The information technology (IT) grows rapidly and brings benefits and values to human such as automating processes, gaining efficiency and effectivity, helping human in solving problems, and taking decision. In this research, we propose the used of IT such as mobile technology, geofencing technique, and also communication technology such as the concept of smartphone ad hoc networks (SPANs), and Optimized Link State Routing (OLSR) Protocol to ensure the information about disaster mitigation in the disaster-prone area spread widely. This finding aims to enhance local community and tourists awareness, spread the whole information about disaster mitigation, and help the government to evaluate, direct, and monitor the disaster mitigation, and accommodate less delayed communication while the disaster occurs.**

Keywords---Disaster mitigation; smartphone; mobile technology; geofencing; SPANs, OLSR.

Paper ID 2037

Comparison of A* and Dynamic Pathfinding Algorithm with Dynamic Pathfinding Algorithm for NPC on Car Racing Game

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***Abstract* — The game of a racing car is one of the simulation games that require Non-Playable Character (NPC) as the opponent's choice of play when a player wants to play on his own. In a race car game, the NPC needs pathfinding to be able to walk on the track and avoid obstacles to reach the finish line. Pathfinding method used by NPC in this game is Al Dynamic Pathfinding Algorithm to avoid the static and dynamic obstacles in track. The experimental results show that NPCs using combined Dynamic Pathfinding Algorithm and Algorithm A * get the results from NPCs that use only DPA Algorithm A * while the obstacle position and trajectory shape have a big effect on DPA.**

Keywords—Algorithm A*; Dynamic Pathfinding Algorithm; Pathfinding; Artificial Intelligence; Race Car Game

Paper ID 2043

VP-Lab: A Virtual Way to Stay Connected with Programming Laboratory

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***Abstract*—The VP-lab is built to accommodate the need of virtual laboratory of programming language. The system compiles the program, stored and transferred the data, and marked the exam in an online manner. This kind of approach gives benefits to the parties involved in how utilizing the internet technology to give access to the laboratory that is not limited by space and time. Moreover, the students can optimize their time to do the experiment on Javascript, HTML, and PHP language. This system is developed by the help of Javascript language and node.js as the server.**

Keywords—virtual laboratory; simulation; programming; javascript.

Paper ID 2057

Development of Business Intelligence Roadmap to Support the National Food Security System

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Abstract— Managing an effective food logistic is important factor in national food security. An effective food logistic management depends on the availability of reliable information leading to an on-target public policy. Developing a national roadmap of the integration of food security logistics information for analytics and predictive purposes to support national food security system is the main objective of this research. This Roadmap is designed as framework to develop a food security business intelligence system that comprises of 4 development phases: (1) Developing of data acquisition layer, (2) Developing of data integration layer, (3) Predictive and analytic layer; and (4) User presentation layer. The output was in the form that offers the users an integrated and comprehensive view of the food security performance metrics, the Key Performance Indicators (KPI) of food security system that consist of three main sub-system: food availability, food access and food utilization indicators. This system supports the decision-making process by providing better understanding on the running business condition and business trend, and it may lead to fast and accurate decisions.

Keywords— business intelligence, food security, Key Performance Indicators (KPI)

Posters

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Paper ID 2001

LTE Uplink Cellular Capacity Analysis in A High Altitude Platforms (HAPS) Communication

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Abstract—High Altitude Platforms (HAPS) is a novel alternative communication system that provides the advantages of terrestrial system and satellite system. HAPS provides large coverage, able to serve users in line of sight (LOS) condition, and low propagation delay. One of the most potential HAPS applications is cellular communication which deploys LTE technology. Cellular system is widely used in wireless communication because of the high capacity. In this paper, single HAPS and multiple HAPS LTE cellular capacity analysis is proposed. Interference mechanism is calculated by considering fading channel characteristic and power control error. Channel model used is Rician fading channel with K factor gained from our earlier research. Simulation result showed that the performance of uplink LTE using SC-FDMA is improved significantly as the elevation angle increased. The result also showed for the same outage probability, single HAPS capacity is higher than multiple HAPS capacity. Therefore in multiple HAPS system, interference caused by user in overlapped region is not trivial.

Keywords: Capacity, LTE Uplink, outage probability***, Single HAPS, multiple HAPS.***

Paper ID 2002

Power Ratio Evaluation for Soft Frequency Reuse Technique in LTE-A Heterogeneous Networks

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***Abstract* – As the traffic demand grows and the RF environment changes, the mobile network relies on techniques such as SFR in Heterogeneous Network (HetNet) to overcome capacity and link budget limitation to maintain user experience. Inter-Cell Interference (ICI) strongly affecting Signal-to-Interference plus Noise Ratio (SINR) of active UEs, especially cell-edge users, which leads to a significant degradation in the total throughput.**

In this paper we evaluate the performance of SFR with HetNet system in order dealing with interferences. Simulation result shows that the power ratio control in SFR HetNet system doesn't have much effect on total achieved capacity for overall cell.

Keywords – LTE-Advanced, HetNet, SFR, power ratio.

Paper ID 2003

A Wideband C-shaped Patch Antenna for LibyaSat-1

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***Abstract*—this paper presents a wideband C-shaped patch antenna for LibyaSat-1. The two parallel slots of the upper E-shaped path are incorporated to generate a second resonant frequency and hence broaden bandwidth. The folded patch technique is used to reduce the coaxial probe length and inductance at the feed section. Our simulation results show that the antenna achieves a -10-dB impedance bandwidth of 1550 MHz (2.00 -3.55 GHz), and has a total gain of 6.45 dB at 2.215GHz.**

Keywords: mini-satellite. LibyaSat-1. remote sensing. space science. gain. bandwidth.

Paper ID 2016

Comparative Analysis of Scheduling Methods Developed in Case of LTE Network Planning

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***Abstract*— In this paper, we conducted a comparative analysis of the scheduling methods taking a case study in urban, sub urban, and rural environment. The rapid changing of data and information has encouraged the growth of LTE technology which has capable of meeting the needs of data transfer. With scheduling analysis we can determine the best schemes in each type of radio environment such as urban, suburban and rural which produce maximum throughput and the most efficient planning. From this research, proportional fair scheduling algorithms in general is the best algorithm with greatest throughput output for each area, which is urban (max 1154 kbps), suburban (max 2291kbps) and rural (max 3888 kbps). In urban areas proportional fair had better throughput up to 113% in low PDSCH level (<20 dB) compared to Round robin and Maximum C/I scenario.**

Keywords*— *Scheduling, Throughput, LTE, QoS, PRB.

Paper ID 2017

On the Design and Development of Flying BTS System using Balloon for Remote Area Communication

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***Abstract*—This paper aims at designing and developing an aerial 'flying platform' for communication in remote area in which common telecommunication infrastructures are unavailable or not economically viable to be deployed. The base transceiver station communication devices of the platform consists of Raspberry Pi, Wi-Fi dongle, 4W amplifier and single element patch antenna as radiator. All communication devices will be packed by a container to be placed in a balloon. The balloon is designed to lift the load so that it is at an altitude of about 70 meters for the experiment. At this stage of our research, the system testing was done by placing the communication devices at the 4th floor of Labtek 8 building and measuring the received signal at surrounding places. From the measurement results, the maximum range of the 'flying platform' coverage is about 300 meters with received signal level of -70 dBm.**

Keywords: Balloon, BTS, Raspberry Pi, HAPS, SPF, flying platform.

Paper ID 2039

Paper 39 – Beam Steering Implementation Using 8×8 Butler Matrix on X-Band Array Antenna

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Abstract— The beam steering system which consists of rectangular array antenna and 8×8 Butler Matrix are presented. This system can work properly at 9.4 GHz for proving the concept of AESA radar in the fighter aircraft. The antenna has eight linear arrays with 40 single patches and successfully implemented since the average value of return loss in each linear array is 32.18 dB. The Butler Matrix also can steer the beam. The beam steering process is done when the input port (from the first until the eighth port) of Butler Matrix is supplied alternately, hence it produces the main lobe position that leads to 50º, 250º, 80º, 300º, 40º, 310º, 60º, and 310º. Both antenna and Butler Matrix are implemented using FR-4 epoxy as the substrate. While in simulating the Butler Matrix, it used two different substrates there are FR-4 epoxy and Duroid (RT 5880) to compare the performance.

Keywords: beam steering, rectangular array antenna, Butler Matrix

Paper ID 2044

Design and development of an efficient and cost effective ECG simulator capable of generating normal and pathological ECG signals

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Abstract— Cardiovascular diseases are one of the major causes of death worldwide. According to the publication of World Health Organization (WHO), number of deaths in Pakistan due to cardiovascular diseases (CVDs) reached by 111,367 or 9.87% of total deaths. Pakistan stands at #63 in the world. This shows that the death rate is increasing day by day. For diagnostics and treatment of cardiovascular diseases (CVDs), proper diagnostic and well calibrated equipment is required. The initial test for diagnosing any heart disease is carried out by electrocardiography (ECG). For calibration of such equipments, test equipment is used. ECG simulator is the major equipment used for calibration and testing of ECG machines and Patient Monitors. Currently available ECG Simulators are very costly and microcontroller based, which consists of some specific number of signals that cannot be changed. The idea behind this thesis was to design and develop of a cost effective and customized Arduino based 4-lead ECG Simulator. It was customized in such a way that user can change the number and type of signal, according to the requirement. It will be beneficial for students for their research purpose as well as local manufacturing industry for production of device. Analog ECG signals were burned into arduino Due board. User interface was designed in such a way that user can easily select the required ECG signal and observe it on oscilloscope as well as on serial plotter (by using arduino UNO). This whole designing and working is carried out by using arduino software. The output signals are the combination of limb leads (Right Arm, Left Arm, Right Leg and Left Leg). These waveforms are then verified by using Fast Fourier Transform and cross correlation. The type of signal chosen from the user interface can be observed on Liquid Crystal Display (LCD) and its waveform can be seen on oscilloscope as well as biopac system.

Index Terms— Arduino due board, Biopac system, Cardiovascular diseases (CVDs), ECG simulator, Electrocardiography (ECG).

Paper ID 2047

Quantitative Study of Thresholding for Device-to-Device Communication in 5G Network

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***Abstract*—Device-to-device (D2D) communication was introduced as one of the technologies expected to tackle the increasing demand for high data rates and the growing usage of smartphones with its consequent traffic volumes. Interference is the main problem from which D2D suffers, for which several schedulers were developed. Most of the current scheduling techniques show a significant level of complexity. One way to reduce interference for D2D is to exclude some devices in a cell from D2D communication. In this paper we propose the use of a simple noise thresholding regardless of the scheduler. A device can take part in a D2D connection only if after their transmission, the value of interference in the cell remains below a specific threshold. This paper presents a comparison between the throughput of D2D devices for the case when devices are excluded based on the noise level in a cell compared to the case where no exclusion is made. In a previous work it was found that the probability distribution of device locations significantly impacted throughput. The results from two different probability distributions are presented in this paper. This study shows that when an exclusive approach is taken, the throughput per D2D device can be probabilistically guaranteed.**

Paper ID 2048

Scheduling Techniques in Release 8 LTE Network

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***Abstract*—This paper describes comparative analysis of the performance between three scheduling algorithm, Round Robin, Proportional Fair, and Maximum C / I based on Monte Carlo simulation method on the Release 8 LTE network using case studies of Bandung city. Simulations performed with radio planning software Atoll 3.2.1. From the test results, Proportional Fair scheduling algorithm outperformed the other two algorithms in downlink parameters, the cumulated throughput, fairness and the average BLER.**

Keywords: LTE, Scheduling Algorithm, C/I, OFDMA.

Paper ID 2053

Heart Rate Monitoring using IoT wearable for Ambulatory Patient

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***Abstract*— This paper describes the development of a prototype that allows monitoring heart rate and inter beat intervals for some subjects.This Prototipe was realizationed using wearable Smartwatch Samsung gear S3, with library WebSocket, nodejs and JavaScript. The system architecture is described where the server nodejs act as signal processing and GUI code for the client. The signal processing algorithm is implemented in JavaScript. GUI applications are presented which can be used in monitoring tools. Some important parts of the code are describes the communication between wearable smartwatch Samsung gear S3, server and client. The developed prototype shows one possible realization of monitoring of biomedical.**

Keywords— wearable, Tizen, IoT, nodejs, heart rate

Paper ID 2068

Alert Application for Network Management System

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***Abstract*— Software industries, especially related to NMS are prospectus to be developed regarding today's business competition among service provider. Customer expect the offered SLA should be able to be proved by Quality of Experience as well as Quality of Service. A tough, cost-effective, marketable and independet architecture should be availabe to support such requirement. It had been chosen the methodology that fit with this work. The methodology is adopted from innovation and commercialization product development model. In this work, a system which be planned to care about quality, had been sucessfuly designed. Therefore it would be able to be expected that customers pay the service provider without any complain, especially about the precision of invoice. A validation had been conducted to prove that all requirements and market needs are able to be fullfiled. No human adjustment and automatic invoice generation, both of those features, are able to be supported by solution system regarding alert application addition. Alert application contains hybrid application between email and trouble ticket system that supported by alert.**

***Index Terms*—SLA, alert application, trouble ticket system.**

Paper ID 2069

Fast Heuristic Algorithm for Travelling Salesman Problem

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***Abstract*— The Optimization of a large-scale Traveling Salesman Problem (TSP) especially in telecommunication networks, which is a well-known NP-hard problem in combinatorial optimization, is a time-consuming problem. In this paper, the proposed heuristic algorithm is designed for fast computing. The result will be compared with two keys parameter, accuracy and computation time. Proposed algorithm has been compared with brute force and Ant colony optimization (ACO) which known as an algorithm that is used to determine the shortest path and best cost at minimum iterations possible for a random data set on the basis of Euclidean distance formula. Proposed algorithm takes only 0.0074 seconds to provide shortest path solution with 50 nodes combination. The proposed algorithm has 5% less accuracy from brute force and provide 6.69 % better solution from ACO for 33 nodes through 50 nodes.**

Keywords*— *travelling salesman problem; shortest path value; ring topology; brute force; ant colony; heuristic algorithm; the shortest route

Paper ID 2071

Recovery of Radar's Beat Signal Based on Compressive Sampling

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***Abstract*—Weather radar is a type of radar that used to detect rainfall, the direction of movement and speed, to know the level of rain and cloud composition. One of the problems that occurs in weather radar is the amount of raw data to be acquired in the digital signal processing process is too large, the size until Gigabyte. In order that, we using Compressive Sampling(CS) to reduce the radar's beat signal, as part of weather radar data. CS requires that the signal must be sparse on a certain basis. When using CS the radar's beat signal are compressed by projecting it onto a randomly generated orthogonal matrix and then recovered by l_1 norm optimization and Orhogonal Matching Pursuit (OMP) methode. From the simulation, all the methode of reconstruction can recover the beat signal radar. We also evaluate the relation of compression ratio and reconstruction accuracy. By PSNR measurement, we propose OMP algorithm for the better radar's beat signal reconstruction.**

Paper ID 2072

Secure HEVC Video by Encrypting Header of Wavefront Parallel Processing

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Abstract— This research proposed a method in securing HEVC video. The proposed method considered to be efficient (few bytes that being manipulated) , effective (changes in certain frame impacts whole group of picture), powerful (shown by visual and PSNR analysis), and has potential use in video-related technologies. the main idea of the proposed method is performing an encryption method to the first 3 bytes of WPP's header for video which has its feature. The encryption will be done for I, P, and B frames of the proposed method is snipped frame from video got wholly blurred with gray blocks in majority. the numerical result is shown by value of PSNR which indicates 14.3941 dB.

Keywords—, HEVC, secure, encryption, WPP, header.

Paper ID 2073

Evaluation of HEVC vs H.264/AVC Video Compression Transmission on LTE network

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***Abstract*— Streaming video delivery over mobile networks is becoming more popular today. Since video consumes very large bandwidth, compression is required before video can be sent via mobile network. The most popular and dominant video compression standard used today is the H.264 / AVC standard. Meanwhile, Long Term Evolution (LTE) is the Third Generation Partnership Project (3GPP) standard designed to meet high data rate requirements with increasing demand for growing content services of cellular networks as the successor of the 3G technology. This paper reports the results of a performance comparison evaluation of H.264 / AVC vs HEVC video streams over an LTE network, using network simulator NS3. The analysis of this performance comparison is performed as a function of packet loss, the availability of the resource block and the link capacity in the core network of the LTE network.**

Keywords: H.264/AVC, HEVC/H.265, video streaming, packet loss, LTE, NS3

Paper ID 2076

Service Level Measurement Based on Uptime Data Monitoring For Rural Internet Access Services in Indonesia

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***Abstract* – As an archipelago country, Indonesia still has many islands which do not have proper infrastructure. This situation creates a huge digital divide which made rural areas often are lagging behind from the cities in terms of economy and public health. To bridge this gap, a government organization initiated a program to provide internet access in rural areas, which then joined by many ISPs. Problem arose when initial method to calculate service level, which based on Ping sensor downtime, cannot be implemented. While the method can detect a failure, it cannot identify a failure which caused by power failure or by transmission (link) failure, so the service level will be significantly lower than it should be. Whereas, the service contract clearly says that the failure which caused by power cannot be charged to ISPs (tolerance factor).**

To accommodate the contract, a new method to calculate service level shall be made. This paper proposes a new method based on Uptime sensor downtime, which can be collected from Network Management System (NMS). The new method observes the duration of a device's uptime over time and gives different and unique visualization for each type of failure, transmission or power failure. This allow us to calculate service level objectively and effectively.

The method gives remarkably improvement in terms of service level percentage. As a comparison, in a simulation test a new method gave 97,5% service level while the old method which based on Ping downtime gave 56% of service level. The huge difference is attributed to many power failures which cannot be identified by the old method and eventually cannot be emitted from the service level calculation.

Key Words: rural areas, service level measurement, Ping, uptime, downtime, service level agreement

Paper ID 2077

Proposed Architecture of Ambient Assisted Living for Indoor Living Elderly

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***Abstract*—In this work we propose an architecture to provide secure living situation for elderly who lives alone in their home. It consists of activity monitoring, fall detection, and Islamic praying counter. All of the data collected by the system are sent to the cloud for family/next of kin information. An emergency status will be generated by sending SMS to family/next of kin.**

Keywords: ambient assisted living, elderly people, fall detection, activity monitoring

Paper ID 2078

Aspiration and Complaint System: From Literature Survey to Implementation

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***Abstract*—The culture in an organization influence the intention of employees to give useful information or report any misconduct performed by other employees in the organization. This limits the freedom of the employees expressing their opinions which can further affect the performance of the organization. It is required to have a whistleblower system where the employees can express their opitnions efficiently, effectively, and anonymously. In this paper, we study existing whistleblower systems that are already used in several organizations. We further identify which system is most suited to our organization in School of Electrical Engineering and Informatics (SEEI), Institut Teknologi Bandung (ITB). We develop the standard operating procedure (SOP) for accomodating aspiration and complaint from the SEEI civitas. Based on this SOP, we adopt the Globaleaks whistleblower system as the Aspiration and Complaint System (ACS) in SEEI ITB.**

Keywords: whistleblower system, Globaleaks, secure, anonymity

Paper ID 2079

Coordinated Beamforming for High-speed Trains in Multiple HAPs Networks

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***Abstract*—We consider the sum rate achievable throughput between different heuristic coordinated beamforming scenarios, which are the maximum ratio transmission (MRT), zero-forcing beamforming (ZF-BF) and the maximum signal-to-leakage-and-noise ratio maximizing beamforming (SNLR-MAX). We assume there is a fixed number of high-altitude-platforms (HAPs) providing simultaneously high-data rate internet access on a fixed number of high-speed trains (HST). We consider the scenarios where the trains are separated apart and crossing each other. Simulation results show that he SNLR-MAX beamforming outperforms the ZF-BF and MRT schemes.**

Keywords: resource allocation, heuristic beamforming, multiple-input multiple-output (MIMO) networks, cooperative networks, multi-cell

Paper ID 2080

Proposal for Outdoor Ambient Assisted Living for Elderly

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***Abstract*—In this work we propose an architecture for outdoor ambient assisted living for elderly. It provides save environment for elderly who are doing outdoor activities. The architecture consists of house perimeter crossing system as the mean to remind elderly who forget to bring their smartwatch and/or smartphone. It also contains activity control to monitor heartbeat. If there is anomaly, the system send notification via SMS to family/next of kin. The architecture also consists of guidance for elderly who forget to reach their home.**

Keywords: ambient assisted living, elderly, perimeter, hear beat, smartwatch, smartphone

Paper ID 2081

Wireless Ad-Hoc Architecture for on Train Network Infrastructure

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***Abstract*—In this work we propose wireless ad-hoc network architecture as on train network infrastructure. In each train carriage, there will be nodes who act as an access point (AP) as well as wireless router. Passenger access the network via AP, while the traffic between carriages are transported via multi-hop nature of the wireless ad-hoc network. We evaluate the infrastructure by deploying BATMAN routing for the wireless router.**

Keywords: wireless, ad-hoc, BATMAN, access point, router

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