LATINCOM 2012

Thursday, November 8, 2012

9:25AM - 10:45AM

TS1 - Peer-to-peer and wireless sensor networks

Chair: Rommel Torres

Live Scalable Video Streaming on Peer-to-Peer Overlays with Network Coding

Michele Sanna, and Ebroul Izquierdo, *Senior Member, IEEE, School of Electronic Engineering and Computer Sceince.*
Queen Mary, *University of London, Mile End Road, E1 4NS, London, UK.*

Abstract: Scalable video coding is a paradigm that allows partial decoding of the video stream at reduced resolution, framerate or quality, adapting to display requirements and reception conditions of heterogeneous receivers. Transmission of scalable data with prioritization enhances the transmission performance, reducing the sensitivity to network congestions and exploiting the multirate characteristic of scalable coding. Network coding is a novel transmission technique that allows intermediate network nodes to perform coding operations on the information in transit, as opposed to traditional routing. This yields to maximization of the transmission rate and encoding of the information with spatial diversity. We employ an overlay network that uses network coding and delivers scalable video with prioritization. We test the performance of the scalable streaming against a nonscalable system, when the upload bandwidth of the nodes is not known.

TCNet: Trellis Coded Network - implementation of QoS - aware routing protocols in WSNs

Diogo F. Lima Filho, José Roberto Amazonas, *Escola Politécnica of the University of São Paulo, Brazil.*

Abstract: Wireless Sensor Networks (WSNs) are important infrastructures of the Internet of Things (IoT) architecture. Their huge potential to connect the real or physical world with the virtual world established new challenges of integration between “Infrastructure Networks” and “Wireless Domain” by means of protocols architectures compatible with the IP structure widely used in the Internet. WSNs are networks that may have a huge quantity of nodes where collaborative characteristics are exploited using ad hoc defined links. In addition, it is important to take into account that WSN nodes have few resources in terms of energy, processing power and memory. In this case, it is advantageous to employ self configurable architectures in which the competition to access channels and error control could be network distributed. Considering WSNs as an important structure for the IoT architecture, the interest in using sensor networks in the same universe as IP networks suggests the use of transit network configurations. This work proposes to implement the new concept of a “Trellis Coded Network”-(TCNet). This model uses Mealy machine-(MM) or low complexity Finite State Machine (FSM) network nodes (“XOR” gates and shift registers), eliminating the use of any routing tables by means of Trellis

decoding. The sequence of states of the FSM thus corresponds to a network route to be traveled by a transmission frame. The route can
be chosen based on criteria of Quality of Service (QoS)-aware routing protocols.

Minimizing Energy Consumption for Cooperative Network and Diversity Coded Sensor Networks

Gabriel E. Arrobo and Richard D. Gitlin, *Department of Electrical Engineering, University of South Florida, Tampa, FL 33620.*

Abstract: In this paper, we present an approach to minimize the energy consumption of multihop wireless packet networks, while achieving the required level of reliability. We consider networks that use Cooperative Network Coding (CNC), which is a synergistic combination of Cooperative Communications and Network Coding. Our approach is to optimize and balance the use of forward error control, error detection, and retransmissions at the packet level for these networks. Additionally, we introduce Cooperative Diversity Coding (CDC), which is a novel means to code the information packets, with the aim of minimizing the
energy consumed for coding operations. The performance of CDC is similar to CNC in terms of the probability of successful reception at the destination and expected number of correctly received information packets at the destination. However, CDC requires less energy at the source node because of its implementation simplicity. Achieving minimal energy consumption, with the required level of reliability is critical for the optimum functioning of many wireless sensor and body area networks. For representative applications, the optimized CDC or CNC network achieves $\geq 25\%$ energy savings compared to the baseline CNC scheme.

A Study Based on the Lee Propagation Model for a Wireless Sensor Network on a Non-Uniform Vegetation Environment

Giselle M. Galvan-Tejada, *Communications Section, Department of Electrical Engineering, Center for Research and Advanced Studies of IPN Av IPN 2508 Col. San Pedro Zacatenco, C.P. 07360 Mexico City, MEXICO.*
Emmanuel Q. Duarte-Reynoso, *Communications Section, Department of Electrical Engineering, Center for Research and Advanced Studies of IPN Av IPN 2508 Col. San Pedro Zacatenco, C.P. 07360 Mexico City, MEXICO.*

Abstract: A propagation study for a wireless sensor network on a non-uniform vegetation environment is presented in this paper. The scenario analyzed is the Center for Research and
Advanced Studies of the IPN, Mexico, where it is being deployed a wireless sensor network applied to monitor the electrical energy consumption of different departments and laboratories. This fifty years old research center is characterized to have a variety of trees due to their age, size and species, which could affect the connectivity between nodes. Distinct vegetation propagation models are analyzed and their incorporation to the Lee model is considered. Simulation results are contrasted with field measurements.

11:15AM-12:15PM

TS2 - Wireless communications I

Chair: Luciana Andreia Fondazzi Martimiano

A distributed envelope-based admission control for multihop IEEE 802.11 ad hoc networks

María del Pilar Salamanca and Néstor Peña, *GEST - Electronics and Telecommunication Systems Group, Universidad de Los Andes, Bogotá, Colombia.*
Nelson L. S. da Fonseca, *Institute of Computing, Universidade Estadual de Campinas, Campinas, Brazil.*

Abstract: Transmitting real-time traffic in ad hoc networks is such a complex process that even the packets of a traffic flow interfere among themselves. A large variety of mechanisms to provide Quality of Service guarantees to real time traffic have been proposed in the literature; admission control is one of them. This paper proposes a distributed, stateless, and routing protocol decoupled admission control scheme for ad hoc networks that guarantees average delay to more than one traffic class. During the admission process, probing packets are sent from the incoming node to the receiving node of the flow. Based on the traffic and service envelopes of the probing packets, the receiving node decides whether the new flow is accepted or rejected. The admission control scheme was tested in static networks, where it effectively controls the packet delay. In mobile networks, the algorithm was evaluated varying the amount of mobile nodes, which move with a pedestrian pattern. The operation limits of the admission control were determined, to guarantee maximum delay and to control the packet losses of each traffic class.

A CART Based Mechanism for Collision Detection in IEEE 802.11

Muhammad Naveed Aman and Biplab Sikdar, *Department of ECSE, RPI, Troy, NY 12180 USA.*

Abstract: The ability to detect and distinguish packet errors due to collisions from those caused by channel errors can significantly impact the performance of medium access control (MAC) protocols such as IEEE 802.11. In particular, such mechanisms affect the backoff mechanism as well as rate adaptation algorithms. This paper presents a real-time algorithm based on classification and regression trees (CART) for distinguishing packet corruption and losses due to channel errors from those caused by collisions with other simultaneous transmissions. Using a set of four metrics, we propose a classifier tree that reduces the classification errors by considering the impact of channel variations and collisions on bit errors from multiple, disparate perspectives. Extensive simulation results are used to verify the superior performance of the proposed technique over existing mechanisms.

TCP-UEM: Detecting Link Failure by Keeping End-to-end Semantics

Renato Fernando Silva Gonçalves, *Departamento de Informática – DIN, Universidade Estadual de Maringá-UEM.*
Luciana Andréia Fondazzi Martimiano, Valéria Delisandra Feltrim, *Departamento de Informática – DIN, Universidade Estadual de Maringá-UEM, Maringá, Brazil.*

Abstract: The evolution of computer networks has happened, in most cases, on the wired networks. However, the appearance of the wireless network, called “revolution wireless”, brought some challenges. The use of the technologies belonging to the wired networks on wireless networks is not appropriate. Some challenges are in the transport layer, in which are TCP and UDP. These protocols evolved to answer problems mainly found in wired networks. The use of the TCP and its mechanism to avoid congestion on wireless networks introduce important problems, such as, misinterpretation of route failures as congestion, misinterpretation of link errors as congestion, inefficiency when dealing with contention both internal and external to the node, inefficiency caused by spurious retransmission, poor conservation of energy of the node, among others. Many solutions have been investigated and most of them

change the original TCP to solve one or more problems, but not all. Others solutions try to solve the problems designing a new protocol. In this paper we present a new TCP variant, called TCP-UEM, which aims at detecting link failures while maintaining the end-to-end semantic of the original TCP in order to avoid the congestion mechanism to be erroneously executed. Some of the simulations carried out to evaluate TCP-UEM are described as well as the statistical analysis of the results.

2:45PM - 4:25PM

TS3 - Multimedia, radio, and traffic measurements

Chair: Nelson Fonseca

Performance Analysis on Return Channel for Interactive Digital TV ISDB-Tb System
Ana C. Paredes, Nancy M. Tonguino, Gonzalo F. Olmedo and Freddy R. Acosta.

Abstract: This article describes the analysis of return channel for digital terrestrial television (DTT), through the development of interactive application called ShoppingCar buying and selling. Using the middleware Ginga-NCL, Lua and MySQL, to get evidence of the return path for the interactive application and determines the capacity of server performance.

Experimental Characterization of a SFN Digital Broadcast Channel
M. V. Guerra, *NI Educational Unit, CEFET – RJ, Nova Iguaçu, Brazil.*
C. V. Rodriguez Ron, L. da Silva Mello, *Center for Telecommunication Studies, PUC-Rio, Rio de Janeiro, Brazil.*

Abstract: In this paper, a Single Frequency Network (SFN) broadcast propagation channel is characterized using measurements performed at a suburban region with two synchronized transmitters a mobile receiver unit. The path loss gain and improvement associated to the SFN scheme is obtained, as well as the multipath channel parameters, including the mean and r.m.s. delay spread.

Depth-Wise Multi-Protocol Stateless Switching of Multicast Traffic
Gonzalo M. Fernández, *Dept. of Electronics & Telecommunications Engineering, Universidad Católica San Pablo, Arequipa, Peru.*
David Larrabeiti, *Dept. of Telematics Engineering, Universidad Carlos III de Madrid, Madrid, Spain.*

Abstract: In order to reduce the state due to multicast forwarding in packet switched networks a number of proposals have been studied in the literature. One recently studied approach is MPSS (Multi-Protocol Stateless Switching), in which the path (unicast) or the tree (multicast) is encoded as a Bloom filter carried by a packet header. This sort of source-routed forwarding method makes it possible to eliminate the forwarding state in network nodes. Our proposal looks into improving MPSS and at the same time solving the forwarding anomalies observed in multicast Bloom filter-based approaches. We propose to encode the multicast tree into a stack of variable-length Bloom filters representing the set of output interfaces at a given tree depth, instead of a single filter for the whole tree. We prove that our approach is more efficient than MPSS on multicast, especially in large networks, and that it reduces and binds the scope of forwarding anomalies derived from false positives: packet storms, forwarding loops and flow

duplication. Furthermore, packet processing is simpler and the average header overhead is reduced.

On the reduction of the available bandwidth estimation error through clustering with K-means

Cesar D. Guerrero, *Universidad Autonoma de Bucaramanga –UNAB, Avenida 42 No. 48 – 11, Bucaramanga – Colombia.*
Dixon Salcedo Morillo, *Universidad de la Costa – CUC, St. 58 # 55 – 66, Barranquilla – Colombia.*

Abstract: There are different tools to estimate the end to end available bandwidth (AB). These tools use techniques which send pairs of packets to the network and observe changes in dispersion or propagation delays to infer the value of the AB. Given the fractal nature of Internet traffic, these observations are prompt to errors affecting the accuracy of the estimation. This article presents the application of a clustering technique to reduce the estimation error due to wrong observations of the available bandwidth in the network. The clustering technique used is K-means which is applied to a tool called Traceband that is originally based on a Hidden Markov Model to perform the estimation. It is shown that using K-means in Traceband can improve its accuracy in 67.45% when the cross traffic is about 70% of the end-to-end capacity.

A traffic testbed to help in a site survey procedure for the deployment of a WiFiPhone network

Benítez Emily, Blanco Natalya, Gimón Grace, González Ricardo, Moreau Sergio, Mundo Antonio, *Computer Department, Simon Bolivar University, Caracas,Venezuela.*
Huerta Mónica, *Electronic and Circuit Department, Simon Bolivar University, Caracas,Venezuela.*

Abstract: Today, smartphones are being equipped with an important set of different sensors that could be used to detect: sound, motion and location. This feature, in addition to the use of wireless communication networks are offering the possibility to build wireless sensor networks using smartphones as sensor nodes, in order to collect and transmit data from its surrounding environment. Unfortunately, by the nature of RF, wireless networks are disturbed by many factors, which could affect the devices communication and their ability to deliver collected data, such as signal attenuation and radio interferences. Because of these facts implementing a network of smartphones that use WiFi communication implies that devices should be situated, in a way that they can communicate with each other. To deal with this situation, there is a set of commonly used tools for the site survey process, among them are spectrum analyzers and packet sniffers to measure the RF signal range and to evaluate the potential for interferences. In this work, we implemented an traffic testbed that can help significantly during a site survey process, identifying if the communication between Android smartphones can be effectively reached, even though they have being placed distant from each other.

4:55PM - 6:15PM

TS4 - Future Internet and wireless mesh networks

Chair: Marinho Barcellos

Applying Advanced Network Resource Provisioning in Future Internet Systems

S. Jardim, *Informatics Institute, Federal University of Goiás, Goiânia-GO, Brazil.*
A. Neto, *Teleinformatics Engineering, Federal University of Ceará, Fortaleza-CE, Brazil, Institute of Telecommunications, University of Aveiro, Aveiro, Portugal.*
J. Castillo, *Teleinformatics Engineering, Federal University of Ceará, Fortaleza-CE, Brazil, Computer Engineering, University of Coruña, Coruña, Spain.*
E. Cerqueira, *Computer Engineering, Federal University of Para (UFPA), Belém-PA, Brazil.*
H. Barros, *Federal University of Rio Grande do Norte (UFRN), Natal-RN, Brazil.*

Abstract: Attempts by the research community to meet the expectations arising from the future internet systems, and specifically to provide Quality of Service (QoS) for multimedia multi-user sessions, have resulted in mechanisms such as Multi-User Aggregated Resource Allocation (MARA) which coordinate the control of class-based bandwidth and multicast resources in a scalable manner and without instant signaling events. The results of MARA have been promising, mainly because it drastically reduces signaling and processing overhead, and has emerged as a feasible mechanism that can be implemented in the Future Internet, despite its limitations in multi-ingress scenarios. In view of these benefits, this paper proposes the Multi-User Aggregated Resource Allocation – Multi Ingress (MARA-MI). Its main extension can be found in a decision point that is able to correlate multicast aggregated paths and assist the adaptation of the over-reservation patterns at all the ingress nodes to avoid the possibility of a QoS violation occurrence, and to overcome the main limitations of MARA so that it can serve as a promising tool in the Future Internet. The performance benefits of MARA-MI are analyzed through simulations, and compared to those of Legacy MARA, in terms of bandwidth use and latency behavior improvements, as well as an ability to maintain a good level of quality over time in multi-user sessions.

Trade-off Between Bandwidth and Energy Consumption Minimization in Virtual Network Mapping

Esteban Rodriguez and Gustavo Alkmim, *Institute of Computing, State University of Campinas.*
Daniel M. Batista, *Department of Computer Science, University of Sao Paulo.*
Nelson L.S. da Fonseca, *Institute of Computing, State University of Campinas.*

Abstract: Network virtualization is a promising technology for the Internet of the Future. Nevertheless, an open issue in virtualization is to satisfy the control of resources in a way that energy savings are achieved. This paper introduces a model for the mapping of virtual networks onto network substrates which aims to reduce the energy consumption as well as to
reduce the bandwidth consumption. This model is based on an integer linear programming formulation and several parameters, corresponding to characteristic of real networks, are considered. The trade-off between energy and bandwidth consumption is analyzed based on results derived via simulation.

Experiences and Challenges in Deploying OpenFlow over a Real Wireless Mesh Network

Joaquin Chung, Grace González, Iván Armuelles, *University of Panama, Panama, Panama.*
Tomás Robles, Ramón Alcarria, Augusto Morales, *Technical University of Madrid (UPM), Madrid, Spain.*

Abstract: Wireless Mesh Networks propose a decentralized architecture for establishing multi-hop wireless communications. The decentralized architecture brings benefits such as ease of deployment and support, scalability and reliability. However, wireless mesh networks lack high

level services such as handoff and mobility management or access control. OpenFlow is an interface for remotely controlling the flow table of switches, routers and access points. The OpenFlow protocol separates the control plane and the data plane of network devices, proposing a centralized architecture for controlling the forwarding of data packets. Furthermore, it offers a framework for developing high level services over the network. Combining this solution with the characteristics of wireless mesh networks allows better performance, by the use of high level services. However, it introduces challenges regarding the opposition between the centralized control of OpenFlow and the distributed architecture of wireless mesh networks. In this paper we expose our experiences deploying an OpenFlow controller over a wireless mesh network based on the 802.11s standard. First, we describe the scenarios used in our testbed. Then, we discuss the considerations for each scenario. Finally we propose some applications using OpenFlow over a Wireless Mesh Network.

Dynamic Labeling in Wireless Mesh Networks
Diego Américo Guedes , Eder dos Santos Silva, Kleber Vieira Cardoso, *Institute of Informatics (INF), Federal University of Goiás, Goiania, Brazil.*
Artur Ziviani, *National Laboratory for Scientific Computing (LNCC), Petrópolis, Brazil.*

Abstract: The relative importance of a node in wireless mesh networks (WMNs) is typically related to its topological position and data forwarding capacity. In dynamic scenarios, however, these particular characteristics may change over time. In the analysis of complex networks, the concept of network centrality reflects the relative importance of a node within a network. We first show the current centrality metrics are unable to dynamically classify nodes in the scenarios we target. We then propose the Dynamic Labeling of Nodes (DyLaN), a new metric that aims at identifying and monitoring the most important nodes in time-varying WMN scenarios. We evaluate DyLaN using realworld traces showing that it can improve the quality of managing such dynamic WMNs.

Friday, November 9, 2012

9:25AM - 10:45AM

TS5 - Power line and optical networking

Chair: Germán Arévalo

Real time synchronization for OFDM/PLC system implemented with a DSP
Daniel Torres-Alvarado, Gerardo Abel Laguna-Sanchez, Alfonso Prieto-Guerrero, *Department of Electrical Engineering, Universidad Autónoma Metropolitana. Mexico, D. F.*

Abstract: PLC is a technology for data transmission over the power line and, it is a very attractive area of research since PLC is potentially suitable for sending data at high rates over the existing power system infrastructure. Synchronization is a fundamental process in any OFDM communication system and its implementation must be efficient and fast. This work presents a real time implementation featuring a synchronization method for an OFDM Power Line Communication (PLC) system using a TMS320C6416 DSP. The synchronization method presented in this paper combines techniques based on correlation, linear regression and phase rotation. We propose a specific design for the preamble sequence used in synchronization and

channel estimation and present some implementation details that could be useful to implement the referred synchronization algorithm in a real PLC modem.

A TEO-Based Algorithm to detect events over OTDR Measurements in FTTH PON Networks

Lima, Gerson F. M; Lamounier, Edgard; Cardoso, Alexandre; Peretta, Igor, *Federal University of Uberlandia, MG- Brazil.*
Barcelos,Sergio; Muramoto, Willian; Rigon,Elso; *FiberWork Optical Communications, Campinas-Brazil.*

Abstract: The FTTH business needs new network maintenance technologies that can, economically and effectively, cope with the massive FTTH fiber plants that are yet to come. Based on the Teager Energy Operator (TEO), we have developed a method for testing and evaluating FTTH networks from the Central Office, which allows the identification of event failures in the optical branches after the PON splitter.

Quadrature Chaotic Symbolic Ofdm Communication Over Radio Channels

Luiz Bernardo, *Escola de Engenharia Universidade Presbiteriana Mackenzie- São Paulo – Brasil.*
P.B.Lopes, *Escola de Engenharia Universidade Presbiteriana Mackenzie- São Paulo –Brasil.*

Abstract: This article introduces a novel modulation technique, namely quadrature chaotic symbolic OFDM (QCSO), that conjugates OFDM (orthogonal frequency division multiplex) and symbolic dynamics chaotic signal communication. The main innovation of QCSO is the use of two orthogonal chaotic signal streams multiplexed through orthogonal carriers to double the transmitted bit rate. A study on the performance of quadrature chaotic symbolic OFDM signals over both AWGN and Rayleigh fading channels is presented. Both FFT- OFDM and Wavelet OFDM are considered and compared against each other. The performance of this new modulation scheme is found to be comparable to traditional modulation techniques. Also, it was also found that Chaotic Wavelet OFDM outperforms Chaotic FFT systems in
both AWGN and multipath environment.

Advantages of the use of VCSEL over RSOA for uplink transmission on WDM-PON networks

G. Arévalo and D. Cárdenas, *Member, IEEE.*

Abstract: The present paper compares and discusses the advantages, disadvantages and performance of the principal tendencies presented in the last researches made around the topic of the WDM-PON networks, focusing in those aiming to achieve high data rate transmission in the uplink channels. By means of simulation models, it is demonstrated that VCSELs have some remarkable advantages over RSOAs particularly in high data rate per channel WDM-PON transmissions.

11:15AM - 12:15PM

TS6 - Performance evaluation and smart grids

Chair: Balasubramaniam Natarajan

An Approach for QoS Routing based on Packet Loss Probability

Emilio C. G. Wille and Marcos M. Tenório, *Federal University of Technology - Paraná (UTFPR), Curitiba (PR) – Brazil.*

Abstract: Interior Gateway Protocols (IGP) such as Open Shortest Path First (OSPF) associate a weight with each network link and compute shortest routes based on these weights. Current approaches for solve Weight Setting Problems (WSP) disregard factors like packet losses. To fulfill these requirements, this paper presents the weight setting problem with packet loss constraints (WSP-P) in order to minimize network congestion and packet losses. The proposed approach has been tested by dimensioning two different network topologies by means of metaheuristic algorithms (SA and HS). As a result, we have been able to confirm performance improvements, in comparison with well–known proposals present in literature, when applying the proposed approach.

Distributed Optimization for Shipboard Smartgrid

Sayak Bose, *Student Member IEEE*; Balasubramaniam Natarajan, *Senior Member IEEE*; Caterina Scoglio, *Senior Member IEEE*; Noel. N. Schulz, *Senior Member IEEE*; *Department of Electrical and Computer Engineering, Kansas State University, Manhattan, KS 66502.*

Abstract: Shipboard smartgrid (SSG) requires optimized power delivery under faults. This is essentially achieved by reconfiguring the switch states (ON/OFF) in a manner that ensures maximal power to be delivered to loads after the occurrence of one or more faults. This paper seeks to investigate (1) the quality of the SSG reconfiguration solution without complete knowledge of the overall system state, and (2) Communication costs that may affect the quality of the reconfiguration. To this end, a dual decomposition based distributed optimization method for shipboard smartgrid system is proposed. The shipboard system is decomposed into multiple separable subsystems with agents. The agents locally maximize the power delivery to loads for a subsystem. Specifically, each agent solves a concave dual function of the original objective subject to convex constraints. Neighboring agent subsystems
interact through convex coupling constraints and fuse the local optimizations into a globally optimal state. The reconfiguration results of the proposed implementation compared to the conventional centralized methods of reconfiguration demonstrate its effectiveness. We further investigate the convergence of the proposed approach under varying network delays and quantization noise. A theoretical lower bound on convergence due to the impact of communication network is presented.

Stochastic State Estimation for Smart Grids in the Presence of Intermittent Measurements

Siddharth Deshmukh, Balasubramaniam Natarajan and Anil Pahwa; *Department of Electrical and Computer Engineering; Kansas State University, Manhattan, Kansas 66506-5204.*

Abstract: Future smart grids are envisioned to have significant distributed generation penetration. In this paper, we develop a dynamic nonlinear model for the power distribution networks, incorporating power flow equations along with load and distributed generation forecasts. As traditional state estimation approaches based on Weighted Least Squares (WLS) are inadequate in dynamic system models, we consider an extended Kalman filter (EKF) for state estimation. Unlike prior efforts, we analyze impact of communication network on state estimation process by considering intermittent measurements. The intermittent measurements denoted by packet drops are modeled as a Bernoulli random process. A stochastic analysis for

boundedness of state estimation error is presented. The analysis establishes system conditions for which stochastic stability of state estimates can be assured. An upper bound on critical packet drop rate is derived. We also relate the bound on critical packet drop rate with randomness in load fluctuations. Finally, we verify our analysis by simulating a single phase radial distribution network model as an example.

2:45PM – 4:25PM

TS7 - Wireless communications II

Chair: Fernando Ramirez-Mireles

Analysis of Spectral Efficiency for Licensed Bands WIMAX

Marcia Maria Savoine, *Pontificia Universidade de Campinas, Caixa Postal 317, CEP: 13.012-970, Campinas - SP – Brazil.*
Norma Reggiani, *Pontificia Universidade de Campinas, Caixa Postal 317, CEP: 13.012-970, Campinas-SP – Brazil.*
Omar Carvalho Branquinho, *Pontificia Universidade de Campinas, Caixa Postal 317, CEP: 13.012-970, Campinas-SP – Brazil.*

Abstract: This paper introduces a spectral analysis techniques made from TDD and FDD which are present on the IEEE 802.16 and used by WiMAX in the uplink-downlink bidirectional channels. The simulation model considered in the arrival queue services, the FIFO concept and the simulations were performed considering five applications (Streaming, Download, Web, Email and Small-Transaction) for downlink and uplink. The number of channels on the Base Station varied from 4 to 60, with a throughput of 600 kbps, where the considered efficiency parameter was the minimum number of channels required for each channel pattern. The simulations were performed in three different scenarios for different traffic profiles for downlink and uplink, and the analyzes of the performance, taken as a measure of the efficiency arrival rate and waiting time before the user's typical applications used in-band technology licensed WiMAX, which follows this pattern. The made analysis allowed identifying, given these traffic conditions, which technique is better recommended. It was further observed that in the data traffic asymmetric, the TDD technique was more efficient, and it
was noticed an idleness spectrum in the FDD technique.

CRUAM-MAC: A Novel Cognitive Radio MAC protocol for Dynamic Spectrum Access

J. Hernandez-Guillen, E. Rodriguez-Colina, R. Marcelín-Jiménez, M. Pascoe Chalke, *Department of Electrical Engineering, Autonomous Metropolitan University (UAM), Campus Iztapalapa, Mexico City, Mexico.*

Abstract: Current proposals for Cognitive Radio Networks (CRN) are created mainly to solve dynamic spectrum access where several cognitive devices are searching for free frequency bands, i.e. ‘white spaces’. This is in order to communicate without or with minimum interference to primary users (PU). Cognitive Radio devices must coordinate the communication with peers when they have to change their communication to another frequency band when licensed user communications are established in the same frequency band. Then this coordination comprises sensing, decision making, sharing and mobility as main

functionalities. We propose a medium access control (MAC) protocol for CRN which have been tested with a developed discrete event simulator to characterize cognitive radio devices communicating in presence of primary users. We found that our proposed MAC operates with minimum interference to PU transmissions; it also reduces the channel access time and the packet loss when compared with an overlay CSMA/CA implementation for CRN. These advantages are in spite of the increase in the number of Pus communicating. We show a complete solution for dynamic spectrum access which incorporates a control mechanism to coordinate the communication establishment between CR devices. This solution has also the advantage that does not require a control common channel (CCC).

Spectrum Sensing of TETRA Systems through Time-Frequency Analysis

Wilson D. Wellisch, Anatel, *University of Brasília (UnB), Brazil.*
André N. Barreto, *Microwave and Wireless Systems Laboratory, University of Brasília (UnB), Brazil.*

Abstract: In a cognitive radio system where the primary user is a TDMA based system, spectrum sensing must be able to identify the occupation of both a frequency band and a time slot. Whereas this can be done by scanning each narrowband frequency channel in turns, we can also perform a wideband sampling of the transmitted signal, and identify simultaneously the occupied frequency bands and time slots by means of a time-frequency analysis. In this paper we propose the use of this approach, using a spectrogram, in order to sense the spectrum and determine the occupied channels of a TETRA system.

Optimization of Radio Network Design Problems for WLANs using Propagation Simulations

Carlos Andrés Viteri-Mera, Alexander Obando-Sarchi and Andrés Alberto Rodríguez-Rosas,
Departamento de Electrónica, Universidad de Nariño, Pasto, Colombia.

Abstract: This document presents the formulation of Radio Network Design Problems (RNDPs) and their solutions using three metaheuristic algorithms. A mathematical model is presented: optimization variables, constraints handling, and objective functions for performance maximization and transmit power minimization. Our optimization framework is based on a light computational weight statistical propagation simulator, designed to work for 802.11n indoor WLANs. Solutions to formulated RNDPs are presented using Simulated Annealing, Firefly Algorithm, and Modified Particle Swarm metaheuristics. We provide a comparison between different objective functions and solution algorithms.

Human Body Influence on Terminal in Wireless Communication

Marcos Patricio dos Santos, *University of Brasilia, Brasilia, Distrito Federal, Brasil.*
Adoniram J. Braga, *University of Brasilia, Brasilia, Distrito Federal, Brasil.*

Abstract: This paper presents a statistical characterization of communication channel under influence of human body on mobile terminal using the concept of super antenna and geometrybased stochastic models. The disturbances are inserted into the channel trough modified radiation patterns. We have concluded in this work that the human body changes the communication channel from a Nakagami to aWeibull distribution for the studied scenarios. Furthermore, its presence in antenna near field results in worse level cross rating proportional to the distance between the terminal and disturbers.

4:55PM - 6:15PM

TS8 - Signal processing and communication theory

Chair: Stephen Wilson

Performance of Equi-Correlated M-ary UWB-FSK considering Antenna and Multipath Effects

Fernando Ramirez-Mireles, *ITAM, Mexico City, D.F. C.P. 01000, Mexico.*

Abstract: We study ultra wideband (UWB) communications over dense multipath channels using M-ary frequency shift keying (FSK) data modulation with both coherent and noncoherent detection. We present an M-ary FSK signal design to balance energy and correlation variations due to the frequency selectivity of the multipath channels and the frequency response of the antenna system. We evaluate the bit error rate (BER) taking into account the frequency domain effects of the antenna and the channel. We calculate the signal-to-noise ratio (SNR) improvement for different values of M and channel conditions. Using the binary coherent receiver as a baseline, we provide numerical results showing that a coding gain larger than 6 dB is possible for large M using a coherent receiver with just two correlators.

Achievable Information Rates for Nonlinear Satellite Channels in Unidirectional and Bidirectional Relaying

Chenguang Xu, John Peng, Stephen G. Wilson, Toby Berger; *Department of Electrical and Computer Engineering, University of Virginia, Charlottesville, VA 22904.*

Abstract: With an eye toward coded transmission of high-level modulation on satellite links, we study the information-theoretic potential of nonlinear satellite channels, for both single-user per transponder operation and simultaneous two-way, on-frequency relaying to improve spectrum efficiency as much as 100%. We develop an analytic nonlinear model with finite memory for these two scenarios, and compute achievable rate regions, i.e. information rates that are arbitrarily reliable, as a function of link SNR's and input backoff of the nonlinear amplifier. This provides guidance on required SNR and desired amplifier operating point for advanced coded modulation schemes.

Evaluation of the Effects of Co-Channel Interference on the Bit Error Rate of Wireless Networks with Error
Correcting Codes in Fading Channels

Daniel Altamirano C., *Department of Electrical and Electronics Engineering – DEEE, Ecuadorian Armed Forces University – ESPE, Sangolquí, Ecuador.*
Celso de Almeida, *Department of Communications – DECOM, State University of Campinas – UNICAMP, Campinas, Brazil.*

Abstract: This paper presents a performance analysis of wireless networks using error correcting codes on channels with Rayleigh fading in the presence of co-channel interference. The performance is evaluated in terms of the average bit error rate (BER) using TCM (Trellis Coded Modulation) and TTCM (Turbo Trellis Coded Modulation) schemes for QAM modulations. The effects of co-channel interference are evaluated through Monte Carlo simulation in scenarios where the system is affected by a dominant interfering synchronous and

similar to the target user. For each coded-modulation schemes, the results show that there are BER floors, which vary according to the signal-interference (S/I).

Matrix Expansions for Computing the Discrete Hartley Transform for blocklength N≡0 (mod 4)

R. C. de Oliveira, *Coordination of Computer Engineering, Amazon State University, UEA Manaus, AM, Brazil.*
R. M. Campello de Souza and H. M. de Oliveira, *Department of Electronic and Systems, Federal University of Pernambuco, UFPE, Recife, PE, Brazil.*

Abstract: A new fast algorithm for computing the discrete Hartley transform (DHT) is presented, which is based on the expansion of the transform matrix. The algorithm presents a better performance, in terms of multiplicative complexity, than previously known fast Hartley transform algorithms and same performance, in terms of additive complexity, as the Split-Radix algorithm. A detailed description of the computation of DHTs with blocklengths 8 and 16 is shown. The algorithm is very attractive for blocklengths $N \geq 128$.