

IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Redline," in *IEEE Std 802.11-2012 (Revision of IEEE Std 802.11-2007) - Redline*, vol., no., pp.1-5229, March 29 2012

Abstract: This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 to 10 published in 2008 to 2011.

keywords: {Emergency services;IEEE standards;Information exchange;Local area networks;Media Access Protocol;Metropolitan area networks;Physical layer;Throughput;2.4 GHz;3650 MHz;4.9 GHz;5 GHz;5.9 GHz;AES;CCMP;CSMA/CA;Counter mode with Cipher-block chaining Message authentication code Protocol;DFS;E911;IEEE 802.11;LAN;MAC;MIH;MIMO;MIMO-OFDM;PHY;QoS;QoS mapping;RF;SSP;SSPN;TKIP;TPC;WLAN;advanced encryption standard;carrier sense multiple access/collision avoidance;channel switching;confidentiality;direct link;dynamic frequency selection;emergency alert system;emergency services;forwarding;generic advertisement service;high throughput;interface;internationalroaming;interworking;interworking with external networks;local area network;measurement;media-independent handover;medium access control;medium access controller;mesh;multi-hop;multiple input multiple output;network advertisement;network discovery;network management;network selection;off-channel direct link;path-selection;physical layer;power saving;quality of service;radio;radio frequency;radio management;radio resource;subscriber service provider;temporal key integrity protocol;transmit power control;tunneled direct link setup;wireless LAN;wireless access in vehicular environments;wireless local area network;wireless network management;zero-knowledge proof},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6587723&isnumber=6587722>

IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications," in *IEEE Std 802.11-2012 (Revision of IEEE Std 802.11-2007)*, vol., no., pp.1-2793, March 29 2012

doi: 10.1109/IEEESTD.2012.6178212

Abstract: This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 to 10 published in 2008 to 2011.

keywords: {IEEE standards;access protocols;metropolitan area networks;wireless LAN;IEEE Std 802.11-2012;IEEE standard;MAC;PHY specification;WLAN;information technology;IEEE Std 802.11-2007;local area network;medium access control;metropolitan area network;physical layer;telecommunications-and-information exchange;wireless LAN;Authentication;Channel switching;Collision avoidance;Encryption;IEEE standards;Telecommunication network management;Wireless communication;2.4 GHz;3650 MHz;4.9 GHz;5 GHz;5.9 GHz;AES;CCMP;CSMA/CA;Counter mode with Cipher-block chaining Message authentication code Protocol;DFS;E911;IEEE 802.11;LAN;MAC;MIH;MIMO;MIMO-OFDM;PHY;QoS;QoS mapping;RF;SSP;SSPN;TKIP;TPC;WLAN;advanced encryption standard;carrier sense multiple access/collision avoidance;channel switching;confidentiality;direct link;dynamic frequency selection;emergency alert system;emergency services;forwarding;generic advertisement service;high throughput;interface;internationalroaming;interworking;interworking with external networks;local area network;measurement;media-independent handover;medium access control;medium access controller;mesh;multi-hop;multiple input multiple output;network advertisement;network discovery;network management;network selection;off-channel direct link;path-selection;physical layer;power saving;quality of service;radio;radio frequency;radio management;radio resource;subscriber service provider;temporal key integrity protocol;transmit power control;tunneled direct link setup;wireless LAN;wireless access in vehicular environments;wireless local area network;wireless network management;zero-knowledge proof},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6178212&isnumber=6178210>

D. Wang, Y. Wang, S. Meng and X. Zhang, "Game Based Wireless Fronthaul C-RAN Baseband Function Splitting and Placement," *2016 12th International Conference on Mobile Ad-Hoc and Sensor Networks (MSN)*, Hefei, 2016, pp. 400-404.

doi: 10.1109/MSN.2016.073

Abstract: Cloud radio access network (C-RAN) architecture has been a key technology and trend of the evolving fifth generation (5G) cellular networks, because it can achieve efficient cooperative communications and reduce deployment and operational costs. In C-RAN systems, although the fiber fronthaul has been a great candidate, we should continue to research the wireless fronthaul for the cost saving and flexible network deployment. With the data volume growth exponentially, however, there are lots of baseband samples need to be transmitted through fronthaul between remote radio heads (RRHs) and the Base Band Unit (BBU) pool. It has been a key obstacle in the adoption of the C-RAN architecture. There is another problem in CRAN with wireless fronthaul, imperfect channel state information (iCSI) result in the gap of RRH and BBU pool. In this paper, we propose game based C-RAN baseband functions splitting and placement to address the problems. In order to increase applicability and commodity of the models furthest, we focus on two typical C-RAN structures, P2P model and RRH cluster model. Based on the model of P2P structure, we propose Cournot douploy model with incomplete information to split the baseband functions between RRH/RRH cluster and BBU pool. In the RRH cluster structure model, we propose the Nash bargaining solution to split the baseband functions inside RRH cluster. Through the calculated equilibriums using the proposed game models, we can get the perfect tradeoff between fronthaul cost and CRAN cooperative performance in different deployment scenarios. Simulation results show that effective and efficient splitting and placement schemes can be achieved by using the proposed the Cournot douploy model and the Nash bargaining solution.

keywords: {5G mobile communication;cloud computing;cooperative communication;game theory;mobile computing;peer-to-peer computing;radio access networks;telecommunication computing;wireless channels;5G cellular networks;BBU pool;C-RAN baseband functions placement;C-RAN baseband functions splitting;Cournot douploy model;Nash bargaining solution;P2P model;RRH cluster model;base band unit pool;cloud radio access network architecture;cooperative communications;fiber fronthaul;flexible network deployment;game based wireless fronthaul C-RAN;iCSI;imperfect channel state information;remote radio heads;Ad hoc networks;Baseband;Bayes methods;Cost function;Delays;Games;Wireless communication;C-RAN;baseband function splitting;game model;wireless fronthaul},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7950267&isnumber=7950194>

K. F. Trillingsgaard and P. Popovski, "Communication strategies for two models of discrete energy harvesting," *2014 IEEE International Conference on Communications (ICC)*, Sydney, NSW, 2014, pp. 2081-2086.

doi: 10.1109/ICC.2014.6883630

Abstract: Energy harvesting is becoming a viable option for powering small wireless devices. Energy for data transmission is supplied by

the nature, such that when a transmission is about to take place in an arbitrary instant, the amount of available energy is a random quantity. The arrived energy is stored in a battery and transmissions are interrupted if the battery runs out of energy. We address communication in slot-based energy harvesting systems, where the transmitter communicates with ON-OFF signaling: in each slot it can either choose to transmit (ON) or stay silent (OFF). Two different models of harvesting and communication are addressed. In the first model an energy quantum can arrive, with a certain probability, in each slot. The second model is based on a frame of size  $F$ : energy arrives periodically over  $F$  slots, in batches containing a random number of energy quanta. We devise achievable strategies and compare the slot- with the frame-based model in the case of an errorless transmission channel. Additionally, for the slot-based model and channel with errors, we provide a new proof of the capacity achieved by the save-and-transmit scheme.

keywords: {channel capacity;data communication;energy harvesting;radio transmitters;radiofrequency power transmission;secondary cells;telecommunication signalling;ON-OFF signaling;battery system;channel capacity;data transmission;discrete energy harvesting;energy quantum;energy storage device;errorless transmission channel;probability;save-and-transmit scheme;slot-based energy harvesting system;slot-based model;transmitter;wireless device;Batteries;Energy harvesting;Energy states;Numerical models;Transmitters;Upper bound;Wireless communication},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6883630&isnumber=6883277>

C. Prieto del Amo and M. J. Fernández-Getino García, "Iterative Joint Estimation Procedure for Channel and Frequency Offset in Multi-Antenna OFDM Systems With an Insufficient Cyclic Prefix," in *IEEE Transactions on Vehicular Technology*, vol. 62, no. 8, pp. 3653-3662, Oct. 2013.

doi: 10.1109/TVT.2013.2260571

Abstract: This paper addresses a strategy to improve the joint channel and frequency offset (FO) estimation in multi-antenna systems, widely known as multiple-input-multiple-output orthogonal frequency-division multiplexing (MIMO-OFDM), in the presence of intersymbol interference (ISI) and intercarrier interference (ICI) occasioned by an insufficient cyclic prefix (CP). The enhancement is attained by the use of an iterative joint estimation procedure (IJEP) that successively cancels the interferences located in the preamble of the OFDM frame, which is used for the joint estimation and initially contains the interferences due to a CP shorter than the channel length. The IJEP requires at certain steps a proper iterative interference cancellation algorithm, which makes use of an initial FO compensation and channel estimation obtained due to the use of a symmetric sequence in the preamble. After the iterative cancellation of interferences, the procedure performs an additional joint channel and FO estimation whose mean square error converges to the Cramér-Rao bound (CRB). Later on, this subsequent joint estimation permits the removal of the interferences in the data part of the frame, which are also due to an insufficient CP, in the same iterative fashion but saving iterations compared with the use of other estimation strategies. The appraisal of the procedure has been performed by assessing the convergence of the simulated estimators to the CRB as a function of the number of iterations. Additionally, simulations for the evaluation of the bit error rate (BER) have been carried out to probe how the utilization of the proposed IJEP clearly improves the performance of the system. It is concluded that, with a reduced number of iterations in the preamble, the IJEP converges to the theoretical bounds, thus reducing the disturbances caused by a hard wireless channel or a deliberately insufficient CP. Therefore, this eases the interference cancellation in the data part, leading to an improvement in the BER that approximates to the ideal case of a sufficient CP and, consequently, an improvement in the computational cost of the whole procedure that has been analyzed.

keywords: {MIMO communication;OFDM modulation;antenna arrays;channel estimation;error statistics;frequency estimation;intercarrier interference;interference suppression;intersymbol interference;iterative methods;mean square error methods;wireless channels;BER evaluation;Cramer-Rao bound;FO compensation;ICI;ISI;OFDM frame preamble;bit error rate evaluation;channel length;insufficient CP;insufficient cyclic prefix;intercarrier interference;intersymbol interference;iterative interference cancellation algorithm;iterative joint estimation procedure;joint channel-FO estimation;joint channel-frequency offset estimation;mean square error;multiantenna MIMO-OFDM systems;multiple-input-multiple-output orthogonal frequency-division multiplexing system;successive interference cancellation;symmetric sequence;wireless channel;Channel estimation;Interference cancellation;Joints;Maximum likelihood estimation;OFDM;Vectors;Channel estimation;frequency offset (FO) estimation;insufficient cyclic prefix (CP);interference cancellation;multiple-input-multiple-output orthogonal frequency-division multiplexing (MIMO-OFDM)},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6587822&isnumber=6631523>

E. Elahi, A. Qayyum and S. Naz, "The effect of payload length on QoS in IEEE 802.11s Wireless Mesh Networks," *2012 18th IEEE International Conference on Networks (ICON)*, Singapore, 2012, pp. 70-73.

doi: 10.1109/ICON.2012.6506536

Abstract: In recent years Wireless Mesh Networks (WMN) have gained lot of attention from service providers and industry due to low cost and instant deployment at both access and distribution level. The IEEE 802.11s standard addresses the need for such networks. In multi-hop networks, throughput decreases exponentially with the increase in number of hops. Thus providing QoS in multi-hop networks becomes a delicate process. The use of larger payloads can significantly enhance throughput and channel utilization. However, using larger payloads has some coupled tradeoffs. The selection of optimal payload length varies with the type of the data in the frame and flow requirements. This paper describes these tradeoffs and presents the effect of payload length on various QoS measures like throughput, jitter, packet loss ratio and end-to-end delay for different type of traffic classes and access categories.

keywords: {quality of service;telecommunication standards;telecommunication traffic;wireless mesh networks;IEEE 802.11s standard;IEEE 802.11s wireless mesh network;QoS measures;WMN;access category;access level;channel utilization;distribution level;end-to-end delay;flow requirement;frame requirement;jitter;multihop network;network throughput;optimal payload length;packet loss ratio;service provider;traffic class;Delays;IEEE 802.11 Standards;Loss measurement;Payloads;Quality of service;Real-time systems;Throughput;Frame Aggregation;IEEE 802.11s;Payload Length;QoS;Wireless Mesh Networks},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6506536&isnumber=6506523>

M. Hata, M. Kawasima, Y. Hamasuna, S. Usami and I. Takumi, "On IP based access protocol for high-speed wireless LAN," *Proceedings ITCC 2003. International Conference on Information Technology: Coding and Computing*, 2003, pp. 356-361.

doi: 10.1109/ITCC.2003.1197555

Abstract: Next-generation wireless LAN and mobile communications might be constructed upon IP based radio networks. A deep and fast fading of high-frequency high-speed radio transmission with a longer path will be inevitable and give rise to severe erroneous channels. It causes frame synchronization loss and address misreading of the IP packet. New schemes are requested for the protocol and physical layer of such IEEE 802.11s to improve degradation in reception probability or throughput of the packet. The proposed new

schemes are three fold. First is the introduction of an error correcting code (ECC) into the physical layer of the packet header and to the payload frame. A new ECC and new scheme for the robust packet synchronization are proposed. The second proposal is the adoption of GPS data to discriminate mobiles accessible to the access point (AP). The distance is the prime parameter to estimate RF signal quality. Third is enhancement of busy or idle messages by introducing the marked packet upon the handshaking and termination modes to cover the hidden terminal problem. Furthermore, a single-carrier transceiver is discussed as one candidate for future applications, basing on the controlled access distance and fading. The transceiver is promising from the respects of simple circuit configuration and constant envelope modulation with low power consumption. The developed torus knot code (TKC) is robust and high-speed for the decoding, and considered as the outer code for the 8-PSK TCM with inner code of a rate 2/3 convolution code.

keywords: {Global Positioning System;access protocols;convolutional codes;decoding;error correction codes;fading channels;mobile computing;mobile radio;phase shift keying;radio access networks;synchronisation;telecommunication traffic;trellis coded modulation;wireless LAN;8-PSK TCM;ECC;GPS data;IEEE 802.11s;IP based access protocol;IP packet;address misreading;decoding;error correcting code;fading;frame synchronization loss;hidden terminal problem;high-speed wireless LAN;mobile communications;next-generation wireless LAN;radio networks;rate 2/3 convolution code;reception probability;robust packet synchronization;throughput;torus knot code;Access protocols;Error correction codes;Fading;Mobile communication;Next generation networking;Physical layer;Radio network;Robustness;Transceivers;Wireless LAN},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1197555&isnumber=26947>

Y. Yang, D. Zhang and F. Ding, "Distributed compressive video sensing with adaptive measurements based on temporal correlativity," *2017 9th International Conference on Wireless Communications and Signal Processing (WCSP)*, Nanjing, 2017, pp. 1-5.

doi: 10.1109/WCSP.2017.8171062

Abstract: For most of those existing Distributed Compressive Video Sensing system, the same measurement rate is utilized for all non-key frames, which ignores the temporal correlativity of frames and leads to an inferior reconstruction quality. To address this issue, an adaptive measurements algorithm is proposed according to the temporal correlativity between non-key frames. The measurement rate of each non-key frame is allocated according to the ratio of the information of each non-key frame to that of the pictures group. Then, the measurement rate of each block is calculated according to the mode of blocks, which is discriminated by the inter-frame residual variance. The experiment results show that the proposed algorithm can provide better reconstruction quality compared to the fixed measurement rate algorithm. The energy saving caused by the reduction of measurement times is far more than the additional energy consumption caused by the dynamic measurement rate algorithm. In addition, there is no feedback channel in the proposed algorithm, which makes the proposed algorithm suitable for video system of emergency service.

keywords: {data compression;image reconstruction;video coding;adaptive measurements algorithm;distributed compressive video sensing system;emergency service;energy consumption;inter-frame residual variance;measurement rate algorithm;temporal correlativity;video system;adaptive measurements;distributed compressive video sensing;residual variance;temporal correlativity},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8171062&isnumber=8170872>

N. Nesaragi, B. P. Kumar, C. M. Ananda and J. Suganthi, "Design of fiber channel based high speed serial transmitter for video protocol on FPGA," *2015 Twelfth International Conference on Wireless and Optical Communications Networks (WOCN)*, Bangalore, 2015, pp. 1-6.

doi: 10.1109/WOCN.2015.8064515

Abstract: Fiber channel (FC) based implementations have become a ubiquitous choice for most of the high-performance video multimedia storage networks and display units. FC is being considered a kind of communication architecture in the field of avionics for a variety of next generation aircrafts. However the challenge faced by designers is how to realize the complicated FC protocols implementation in a feasible way. The paper addresses this problem by describing the development of high speed transmitter section right from conceptual design to hardware implementation. A customized protocol is proposed which is used by the transmitter for video transmission over fiber channel with a point to point link to drive display units. The protocol is video-centric supporting real time transmission in which four different objects i.e. progressive video, interlaced video, audio and data are considered. The transmitter plays the role of Serialiser using Gigabit Transceiver Port (GTP) and converts the parallel data available from the video source into serial via optical transceiver. It adopts SP605 FPGA through Small-Form Factor Pluggable (SFP) transceiver for the implementation. The proposed protocol supports any video resolution; however experiments carried out with an example of a 1024×768 RGB video frame validates the data transfer rate of 144M bytes/sec which is further added with protocol overheads and blanking fields to achieve a standard link rate of 2.125Gbps.

keywords: {field programmable gate arrays;optical transceivers;protocols;1024×768 RGB video frame;FC protocols implementation;GTP;Gigabit Transceiver Port;SFP;SP605 FPGA;Small-Form Factor Pluggable transceiver;audio data;blanking fields;communication architecture;conceptual design;customized protocol;display units;fiber channel based implementations;hardware implementation;high speed serial transmitter;high speed transmitter section;high-performance video multimedia storage networks;interlaced video;next generation aircrafts;optical transceiver;parallel data;point link;progressive video;protocol overheads;video protocol;video resolution;video source;video transmission;video-centric supporting real time transmission;Blanking;Containers;Optical transmitters;Payloads;Protocols;Streaming media;Synchronization;Fiber Channel;GTP;Objects;SFP},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8064515&isnumber=8064483>

M. M. Alam, D. Ben Arbia and E. Ben Hamida, "Joint throughput and channel aware (TCA) dynamic scheduling algorithm for emerging wearable applications," *2016 IEEE Wireless Communications and Networking Conference*, Doha, 2016, pp. 1-6.

doi: 10.1109/WCNC.2016.7564978

Abstract: This paper addresses a reliability concern of the emerging wearable applications under dynamic and realistic conditions. We propose a new joint throughput and channel aware (TCA) dynamic scheduling algorithm for IEEE 802.15.6 standard to enhance the system performance while exploiting m-periodic scheduled access mechanism. First, various mobility patterns are generated with special emphasis on space and time varying links and their performance which are most vulnerable under dynamic environment. A deterministic pathloss values (as an estimate of the channel) are obtained from a set of training sequence which is generated using motion capture system and bio-mechanical modeling. Consequently, signal to noise (SNR), bit error rate (BER) and packet error rate (PER) are calculated. The TCA algorithm during the first phase uses this estimated PER to select the potential nodes for a time slot. Whereas in the second phase, based on the nodes priority and the data packets availability among the potential candidates, finally a slot is assigned to one node. This process is repeated by the coordinating node until the end of the super frame. This scheme has a significant gain over a

reference scheme (i.e., without above adaptation). On average, 20-to-55 percent extra packets are received, along with 1-to-5 joules of energy savings though at the cost of higher delay ranging from 20-to-200 ms while operating at low power levels (i.e., 0 dBm, -5 dBm, -10 dBm).

keywords: {body area networks;mobile radio;telecommunication network reliability;telecommunication scheduling;IEEE 802.15.6 standard;biomechanical model;channel aware dynamic scheduling algorithm;mobility patterns;motion capture;throughput dynamic scheduling algorithm;time varying links and;training sequence;wearable applications;Body area networks;Dynamic scheduling;Heuristic algorithms;IEEE 802.15 Standard;Throughput;Wireless communication;IEEE 802.15.6;Medium Access Control;Performance Analysis;Throughput and Channel-Aware (TCA) Dynamic Scheduling Algorithm;Wireless Body Area Networks},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7564978&isnumber=7564633>

F. Rosas and C. Oberli, "Impact of the Channel State Information on the Energy-Efficiency of MIMO Communications," in *IEEE Transactions on Wireless Communications*, vol. 14, no. 8, pp. 4156-4169, Aug. 2015.

doi: 10.1109/TWC.2015.2417530

Abstract: Although multiple-input multiple-output (MIMO) techniques provide attractive tools for reducing the energy consumption of wireless communications, many of them require transmitter-side channel state information (TCSI). While the effect of the TCSI on the MIMO channel capacity is well known, its impact on the achievable energy-efficiency is still not well determined. In this paper, we address this issue by studying the energy consumption of the singular value decomposition (SVD), beamforming, zero forcing and generalized Alamouti MIMO schemes. Although TCSI provides important savings in long-range communications, our results suggest that it is not critical when transmitting over short link distances. Results also show that large antenna arrays using schemes with a large diversity gain are energy-optimal for transmitting data over long transmission distances, while small arrays using schemes with a large multiplexing gain are more energy-efficient for performing short-range communications.

keywords: {MIMO communication;antenna arrays;array signal processing;channel capacity;diversity reception;energy conservation;radio links;radio transmitters;singular value decomposition;telecommunication power management;wireless channels;MIMO channel capacity;SVD;TCSI;antenna array;beamforming;data transmission;diversity gain;energy efficiency;generalized Alamouti MIMO communication scheme;multiple input multiple output technique;singular value decomposition;transmitter-side channel state information;wireless communication energy consumption reduction;Antenna arrays;Energy consumption;MIMO;Modulation;Payloads;Signal to noise ratio;Transceivers;Antennas and Propagation;Low Power Algorithms and Protocols;MIMO systems;Multimedia;Networks and Systems;Smart antennas;Transmission Technology},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7072539&isnumber=7182829>

H. Wirtz, T. Zimmermann, M. Ceriotti and K. Wehrle, "CA-Fi: Ubiquitous mobile wireless networking without 802.11 overhead and restrictions," *Proceeding of IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks 2014*, Sydney, NSW, 2014, pp. 1-9.

doi: 10.1109/WoWMoM.2014.6918950

Abstract: The proliferation, flexibility, and mobility of wireless communication devices provides a readily available basis for ubiquitous mobile communication. However, the network-centric design of 802.11 does not support the spontaneity, continuity, and ubiquitous scope of mobile communication for two reasons: i) The time and maintenance overhead of 802.11 networks prevents spontaneous device interaction, and ii) 802.11 restricts the communication scope to devices in a common network. We thus enable ubiquitous wireless communication, independent from 802.11 network structures in CA-Fi, a continuous, low-overhead communication channel concurrent to 802.11 associations. CA-Fi augments 802.11 with an association-less broadcast mechanism of up to 30 kB/s, preserving up to 70 % of simultaneous 802.11 throughput and enabling unrestricted and instant networking in the wireless medium. Directly addressing applications in 802.11 frames using Bloom filters enables message aggregation for space efficiency and saves communication overhead by unifying peer and application discovery. CA-Fi inherently supports duty cycling and saves up to 44 % of the energy consumption of the 802.11 ad-hoc mode.

keywords: {data structures;mobile radio;mobility management (mobile radio);radio equipment;wireless channels;802.11 ad-hoc mode;802.11 network structures;CA-Fi;Wireless communication device mobility;application discovery;association-less broadcast mechanism;bloom filters;communication scope restriction;concurrent association-less Wi-Fi;device interaction;duty cycling;energy consumption;low-overhead communication channel;maintenance overhead;message aggregation;mobile communication;network-centric design;space efficiency;time overhead;ubiquitous mobile wireless networking;wireless communication device flexibility;wireless communication device proliferation;Ad hoc networks;Context;IEEE 802.11 Standards;Mobile communication;Mobile computing;Throughput;Wireless communication},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6918950&isnumber=6918912>

S. Biswas and A. Chandra, "DF versus AF: Energy consumption comparison for IEEE 802.15.4 networks," *2014 Sixth International Conference on Communication Systems and Networks (COMSNETS)*, Bangalore, 2014, pp. 1-7.

doi: 10.1109/COMSNETS.2014.6734904

Abstract: IEEE 802.15.4 refers to a standard meant for short range wireless sensor networks (WSNs). Recently, the standard has gained huge popularity due to its simplicity, scalability, and low power consumption. In this paper, we investigate the energy efficiency of relay assisted dual hop communication between two 802.15.4 compliant wireless nodes. Novel energy consumption models for both amplify-and-forward (AF) and decode-and-forward (DF) selective relaying protocols have been formulated and energy efficiency of these two protocols have been assessed by comparing the respective energy requirement per successful bit transmission. Small scale fading introduces outage during transmission over 802.15.4 links. The results show that although under moderate to high channel outage probability, DF relaying offers better energy efficiency than AF relays, when the outage is low, their performances become identical. Next, variation of energy consumption with data payload size is elaborated for both DF and AF relays. It was found that, under moderate outage, there exists an optimum value for the payload size where energy saving is maximum. For similar channel conditions, the optimum payload size is more for DF relays. When the outage value is very high energy consumption increases exponentially with payload size. The trend reverses when the outage is low.

keywords: {Zigbee;amplify and forward communication;decode and forward communication;energy consumption;probability;protocols;relay networks (telecommunication);wireless sensor networks;AF selective relaying protocols;DF selective relaying protocols;IEEE 802.15.4 networks;WSN;amplify-and-forward selective relaying protocols;decode-and-forward selective relaying protocols;energy consumption comparison;energy efficiency;optimum payload size;outage probability;short range wireless sensor networks;Energy consumption;Fading;IEEE 802.15 Standards;Relays;Wireless sensor networks;Amplify-and-forward

(AF);Decode-and-forward (DF);Energy consumption;Frame outage;IEEE 802.15.4;Instantaneous power scaling (IPS);Payload Length;Wireless relay},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6734904&isnumber=6734849>

C. Tachtatzis, F. Di Franco, D. C. Tracey, N. F. Timmons and J. Morrison, "An energy analysis of IEEE 802.15.6 scheduled access modes," *2010 IEEE Globecom Workshops*, Miami, FL, 2010, pp. 1270-1275.

doi: 10.1109/GLOCOMW.2010.5700142

Abstract: Body Area Networks (BANs) are an emerging area of wireless personal communications. The IEEE 802.15.6 working group aims to develop a communications standard optimised for low power devices operating on, in or around the human body. IEEE 802.15.6 specifically targets low power medical application areas. The IEEE 802.15.6 draft defines two main channel access modes; contention based and contention free. This paper examines the energy lifetime performance of contention free access and in particular of periodic scheduled allocations. This paper presents an overview of the IEEE 802.15.6 and an analytical model for estimating the device lifetime. The analysis determines the maximum device lifetime for a range of scheduled allocations. It also shows that the higher the data rate of frame transfers the longer the device lifetime. Finally, the energy savings provided by block transfers are quantified and compared to immediately acknowledged alternatives.

keywords: {biomedical communication;body area networks;personal area networks;IEEE 802.15.6 scheduled access modes;body area network;channel access modes;communications standard;device lifetime estimation;energy analysis;energy lifetime performance;human body;low power devices;low power medical application areas;periodic scheduled allocation;wireless personal communication;Downlink;Payloads;Physical layer;Resource management;Silicon;Silicon compounds;Transceivers},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5700142&isnumber=5700081>

K. C. Ting, F. C. Kuo, B. J. Hwang, H. C. Wang and C. C. Tseng, "A Power-Saving and Robust Point Coordination Function for the Transmission of VoIP over 802.11," *International Symposium on Parallel and Distributed Processing with Applications*, Taipei, 2010, pp. 283-289.

doi: 10.1109/ISPA.2010.89

Abstract: Group-polling based schemes for the enhancement of the Point Coordination Function (PCF) in the 802.11 have been supposed to be the most efficient scheme for the transmission of VoIP frame. However, most of the group-polling schemes are not energy-efficient at all due to the fact that all the stations in this list must listen to the channel during all the transmissions belonging to this polling list. Furthermore, if some stations loss this group-polling frame, it will result in many empty group slots leading to unstable system states. In this article, we propose a Power-Saving and Robust Point Coordination function (PSR-PCF) for the transmission of VoIP over 802.11. Any stations can set its wakeup timer and fall asleep according to the schedule information of the received group polling frame. In order to make this system more robust, we propose a chained-scheme, that is, the MAC address of next active station is piggybacked in the frame header of the uplink data frame to the AP with no additional overheads. Analysis shows that the energy consumption can be reduced by over 93.2% compared with that of ICF [20]. The number of active VoIP stations sustained can be up to about 260 without any data loss under the 802.11a with 54Mbps data rate. Whereas, in the same parameters of 802.11a, the PCF with the Round-Robin (RR) scheduler will have more than 10% data losses if the number of active VoIP stations is larger than 60.

keywords: {Internet telephony;access protocols;power aware computing;wireless LAN;802.11;MAC address;VoIP transmission;chained scheme;group polling based scheme;point coordination function;power saving function;robust point coordination function;Equations;IEEE 802.11 Standards;Mathematical model;Protocols;Robustness;Signal to noise ratio;Time factors;802.11a;Low-power;PCF;WLAN;group poll},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5634345&isnumber=5634322>

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC)and Physical Layer (PHY) Specifications Amendment 5: Enhancements for Higher Throughput," in *IEEE Std 802.11n-2009 (Amendment to IEEE Std 802.11-2007 as amended by IEEE Std 802.11k-2008, IEEE Std 802.11r-2008, IEEE Std 802.11y-2008, and IEEE Std 802.11w-2009)*, vol., no., pp.1-565, Oct. 29 2009

doi: 10.1109/IEEESTD.2009.5307322

Abstract: This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the IEEE 802.11 medium access control (MAC) sublayer so that modes of operation can be enabled that are capable of much higher throughputs, with a maximum throughput of at least 100 Mb/s, as measured at the MAC data service access point (SAP).

keywords: {IEEE standards;telecommunication standards;wireless LAN;IEEE 802.11 medium access control sublayer;IEEE 802.11 physical layer;IEEE standard amendment;MAC data service access point;bit rate 100 Mbit/s;information exchange;information technology;local area networks;maximum throughput;medium access control;metropolitan area networks;wireless LAN;802.11-2007. 802.11w-2009;MAC;MIMO;MIMO-OFDM;PHY;WLAN;high throughput;medium access control;multiple input;multiple output;physical layer;radio;wireless local area network},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5307322&isnumber=5307317>

P. Kannan, "PRATM - Derived PRASAN Error Concealment Model for Efficient Transmission of MPEG Video Streams Over ATM Networks," *2006 International Conference on Wireless Communications, Networking and Mobile Computing*, Wuhan, 2006, pp. 1-4.

doi: 10.1109/WiCOM.2006.314

Abstract: Efficient recovery of video sequences from compressed video, transmitted over data networks is one of the biggest challenges to researchers in the field. This paper addresses this problem in context of asynchronous transfer mode networks (ATM) and proposes a model for error free recovery of damaged/lost data. In ATM networks channel errors or congestion cause data to be dropped, which results in the loss of entire macro blocks of MPEG video being transmitted. The proposed model PRATM employs the bit mapping procedure defined in PRASAN error concealment model and applies the mapping algorithm to the intra frames of GOPs for providing enhanced compression by generating correlation polynomials. The major contribution of this paper is the inclusion of additional header block, containing the correlation information derived from the principle of bit level mapping for the payload data of high priority ATM packets carrying the video information. The high priority data, taken two (termed inverse pair) at a time are subjected to bit level mapping and the obtained correlation polynomial information is provided as the header in both the considered data. This is a measure taken to cope with extreme congestion condition when even a high priority packet could be lost in the channel

keywords: {asynchronous transfer mode;data compression;image sequences;polynomials;video coding;video streaming;ATM networks;MPEG video streams;PRATM;asynchronous transfer mode networks;compressed video;correlation polynomials;derived

PRASAN error concealment model;error free recovery;video information;video sequences;Asynchronous transfer mode;Context modeling;Loss measurement;Payloads;Polynomials;Propagation losses;Streaming media;Transform coding;Video compression;Video sequences},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4149491&isnumber=4149177>

P. Ding, J. Holliday and A. Celik, "DEMAC: an adaptive power control MAC protocol for ad-hoc networks," *2005 IEEE 16th International Symposium on Personal, Indoor and Mobile Radio Communications*, Berlin, 2005, pp. 1389-1395 Vol. 2.  
doi: 10.1109/PIMRC.2005.1651667

Abstract: Transmit power control (TPC) protocols have been proposed to address the limited power supplies in ad hoc networks. However, most of the previous work minimizes the transmit power without considering both the energy wasted in collisions and the energy used to overcome the interference from all the interfering nodes existing in the network. Our previous work shows the optimal transmit power for the maximum throughput and per frame minimum consumed energy exists and occurs when the power level is sufficient to avoid the interference, and causes the least contention between nodes. In this paper, we propose a novel per-frame-based TPC protocol, DEMAC, in ad hoc networks using IEEE 802.11 at low PHY rate. To avoid interference, improve throughput, and save energy, DEMAC adaptively looks for the optimal transmit power based on the network interference and data payload. DEMAC is validated via simulations and is shown to outperform several existing TPC protocols

keywords: {access protocols;ad hoc networks;interference suppression;power control;telecommunication congestion control;wireless LAN;DEMAC;IEEE 802.11;MAC protocol;PHY rate;ad-hoc network;adaptive power control;interference avoidance;Ad hoc networks;Adaptive control;Interference;Media Access Protocol;Payloads;Physical layer;Power control;Power supplies;Programmable control;Throughput;Ad-Hoc Networks;IEEE 802.11;Interference;Transmit Power Control},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1651667&isnumber=34627>

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 15.3: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for High Rate Wireless Personal Area Networks (WPAN)," in *IEEE Std 802.15.3-2003*, vol., no., pp.1-360, Sept. 29 2003

doi: 10.1109/IEEESTD.2003.94395

Abstract: The protocol and compatible interconnection of data and multimedia communication equipment via 2.4 GHz radio transmissions in a Wireless Personal Area Network (WPAN) using low power and multiple modulation formats to support scalable data rates is defined in this standard. The Medium Access Control (MAC) sublayer protocol supports both isochronous and asynchronous data types

keywords: {OFDM;Orthogonal Frequency Division Multiplexing;PAN;Personal Area Network;UWB;WPAN;Wireless;ad hoc network;low-rate;mobility;radio frequency;signals;ultra-wideband},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1245785&isnumber=27918>

I. F. Akyildiz, Inwhee Joe, H. Driver and Yung-Lung Ho, "An adaptive FEC scheme for data traffic in wireless ATM networks," in *IEEE/ACM Transactions on Networking*, vol. 9, no. 4, pp. 419-426, Aug 2001.

doi: 10.1109/90.944340

Abstract: A new adaptive forward-error-correction scheme (AFEC) is introduced at the link layer for TCP/IP data traffic in wireless ATM networks. The fading and interference in wireless links cause high and variable error rates, as well as bursty errors. The purpose of the AFEC scheme is to provide a dynamic error-control mechanism by using Reed-Solomon coding to protect the ATM cell payload, as well as the payload type indicator/cell loss priority fields in the ATM cell header. In order to enhance the error tolerance in cell framing and correct delivery, the AFEC scheme functions within a new concept called LANET framing and addressing protection mechanisms. The AFEC scheme has been validated using a simulation testbed of a low-speed wireless ATM network

keywords: {Reed-Solomon codes;adaptive codes;asynchronous transfer mode;data communication;digital simulation;error statistics;fading channels;forward error correction;packet radio networks;radiofrequency interference;time-varying channels;transport protocols;ATM cell header;ATM cell payload protection;BER;LANET addressing protection;LANET framing protection;Reed-Solomon coding;TCP/IP data traffic;adaptive FEC;adaptive coding;adaptive forward error correction;bursty errors;cell framing;cell loss priority fields;data traffic;dynamic error-control;error tolerance;fading;high error rates;interference;link layer;low-speed wireless ATM network;payload type indicator;simulation testbed;time-varying wireless channels;variable error rates;wireless links;Adaptive systems;Error analysis;Fading;Forward error correction;Interference;Payloads;Protection;Reed-Solomon codes;TCPIP;Telecommunication traffic},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=944340&isnumber=20434>