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SCHEDULING SCHEME FOR FULL DUPLEX WIRELESS POWERED COMMUNICATION NETWORKS

T.G.DHAARANI , M.AKILA , A.C.DHARANI , S.JEEVITHA , V.SRUTHI

Abstract— Radio frequency (RF) energy harvesting is key in attaining perpetual lifetime for time-critical wireless powered communication networks (WPCNs) due to full control on energy transfer, far field region, small and low-cost circuitry. In this paper, we propose a novel minimum length scheduling problem to determine the optimal power control, time allocation and schedule subject to data, energy causality and maximum transmit power constraints in a full-duplex WPCN. We first formulate the problem as a mixed integer non-linear programming problem and conjecture that the problem is NP- hard. As a solution strategy, we demonstrate that the power control and time allocation, and the scheduling problems can be solved separately in the optimal solution. For the power control and time allocation problem, we derive the optimal solution by evaluating Karush-Kuhn-Tucker conditions. For the scheduling, we introduce a penalty function allowing reformulation of the problem as a sum penalty minimization problem. Upon derivation of the optimality conditions based on the characteristics of the penalty function, we propose two polynomial-time heuristic algorithms and a reduced-complexity exact algorithm employing smart pruning techniques. Via extensive simulations, we illustrate that the proposed heuristic schemes outperform the schemes for predetermined transmission order of users and achieve close-to-optimal solutions.

Key Words: RF, WPCN, FPA

I.INTRODUCTION

Time critical wireless sensor networks have been widely used in emergency alert systems and cyber-physical systems due to many advantages, including easy installation and maintenance, low complexity and cost, and flexibility. Several studies have been conducted on minimizing the schedule length given the traffic demand and limited battery lifetime of the users in these networks. However, recent developments in energy harvesting technologies have the potential to provide perpetual energy, eliminating the need to replace batteries. Considering the advantages of having full control on energy transfer, high range and small form factor, radio frequency (RF) energy harvesting is the most suitable technology. The recent advances in the design of highly efficient RF energy harvesting hardware is expected to even further extend its usage.

RF energy harvesting networks have been previously studied in the context of simultaneous wireless information and power transfer (SWIPT) and wireless powered communication networks (WPCNs). In SWIPT, the access point transmits energy and data simultaneously to multiple receivers in the downlink. The trade-off between wireless information transmission capacity and wireless energy transmission efficiency of a single user has been analyzed for point-to-point transmissions considering additive white gaussian noise (AWGN) channels [9], flat-fading channels, co-located or separated energy harvester and information decoder setup , and a non-linear energy harvesting model .

SWIPT based multi-user systems mostly optimize the performance by incorporating maxi- mization of the weighted energy transfer, throughput maximization and total transmit power minimization as objective function constrained by minimum signal to noise ratio, data buffer limit and harvested power, respectively. The energy efficiency of these systems is studied by

T.G.Dhaarani.,M.E., Assistnat professor, Department of Electronics and Communication Engineering, Nandha Engineering College, Erode, Tamil Nadu, India.
M.Akila , Department of Electronics and Communication Engineering, Nandha Engineering College, Erode, Tamil Nadu, India.
A.C.Dharani , Department of Electronics and Communication Engineering, Nandha Engineering College, Erode, Tamil Nadu, India.
S .Jeevitha , Department of Electronics and Communication Engineering, Nandha Engineering College, Erode, Tamil Nadu, India.
V.Sruthi , Department of Electronics and Communication Engineering, Nandha Engineering College, Erode, Tamil Nadu, India.

considering the power budget, artificial noise, relay based setup and co-variance channel state information feedback. These studies assume the simultaneous transmission of energy and information without considering any scheduling. The scheduling of SWIPT based networks has been considered in a limited context in. The time is divided into multiple slots. In each time slot, a single user is selected for information reception while energy is transferred to the remaining users. The scheduling algorithms are proposed for the selection of this single user in each time slot.

II. LITERATURE SURVEY

L. Zhu, F. R. Yu, Communication-Based Train Control (CBTC) system is an automated train control system using bidirectional train-ground communications to ensure the safe operation of rail vehicles. Handoff design has significant impacts on the train control performance in CBTC systems based on multi-input and multi-output (MIMO)-enabled WLANs. Most of previous works use traditional design criteria, such as network capacity and communication latency, in handoff designs. However, these designs do not necessarily benefit the train control performance. In this paper, we take an integrated design approach to jointly optimize handoff decisions and physical layer parameters to improve the train control performance in CBTC systems

C.-S. Li, Y.-C. Tseng, Seamless handover in IEEE 802.11 for quality of service (QoS) demanding applications is one of the critical issues because of handover latency. In this paper, we proposed the neighbor graph cache (NGC) mechanism to reduce scanning latency while a mobile station tries to make a link-layer handover. The handoff latency can be greatly reduced through NGC algorithm.

III.EXISTING WORK

- Existing system Minimum Length Scheduling Problem(MLSP) scheme for full duplex wireless communication in which this communication is not efficient
- The security analysis shows that the proposed scheme is insecure. In addition, we test the formal security verification of the proposed scheme using the widely-accepted TDCA tool to show the proposed scheme is also secure against the replay and man-in-the middle attacks
- In order to maintain the accuracy of the query result, nodes reply with k data items with the highest score along multiple routes.
- The query-issuing node tries to detect attacks from the information attached to the reply messages.
- After detecting attacks, the query-issuing node tries to identify the malicious nodes through message exchanges with other nodes.

DISADVANTAGE

- Discovered routes by these algorithms may neither be energy-efficient nor be reliable.
- Shortest path algorithm is not implemented
- System security is low
- No improved Energy Efficiency
- Discovered routes by these algorithms may neither be energy-efficient nor be reliable.

IV. PROPOSED SYSTEM

- **Fast pruning** is a symmetric block cipher that can be used as a drop-in replacement for DES or IDEA. It takes a variable-length key, from 32 bits to 448 bits, making it ideal for both domestic and exportable use.
- **Fast pruning** was designed in 1993 by Bruce Schneier as a fast, free alternative to existing **encryption algorithms**.
- Because **Fast pruning** is a symmetric **algorithm**, the same procedure is used for decryption as well as **encryption**.
- The only difference is that the input to the **encryption** is plaintext; for decryption, the input is ciphertext.
- The P-array and S-array values used by **Fast pruning** are pre-computed based on the user's key.

ADVANTAGES

- Algorithms that consider the reliability of links to find more reliable routes.
- Algorithms that aim at finding energy-efficient routes
- Algorithms that try to prolong the network lifetime by finding routes consisting of nodes with a higher level of battery energy

- Algorithms that has more security options .

V. WORKING

The trust is always present implicitly in the protocols based on cooperation, in particular, between the entities involved in routing operations in WSN Networks. WSN Networks continues to grow, they become vulnerable to attacks and hence the need for an effective security mechanisms. Identification of suitable cryptography for wireless sensor networks is an important challenge due to limitation of an energy, computation capability and storage resources of the sensor nodes. Novel energy-aware routing algorithms to be proposed for Adhoc networks, called reliable minimum Trust Secure Energy Optimized Aggregation Protocol . FPA addresses important requirements of WSN:energy-efficiency, reliability, Data Aggregation and attacker's detection. FPA is an energy-efficient routing algorithm which finds routes minimizing the total energy required for end-to- end packet traversal and enhanced malicious nodes detection. We proposed cryptography based security mechanism to apply Elliptic Curve Cryptography technique in WSN. Improving encryption and decryption aspects of the algorithm, which is already exist and creates the way for an excellent security.

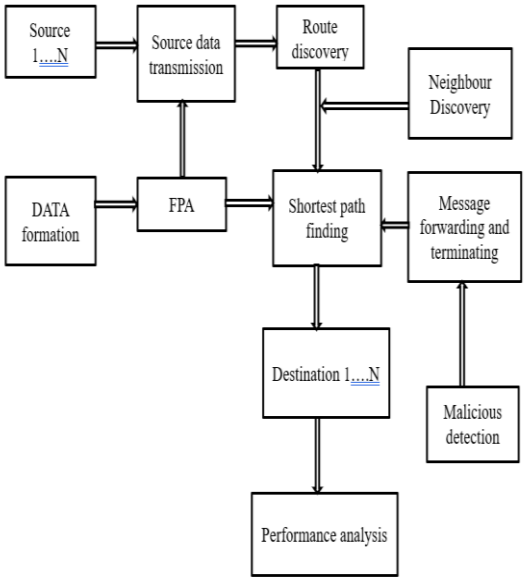
VI. MODULES

- WSN Network Deployment
- Data Communication
- Trust Computation
- FPA implementatio
- ENCRYPTION, DECRYPTION
- Performance Analysis Result

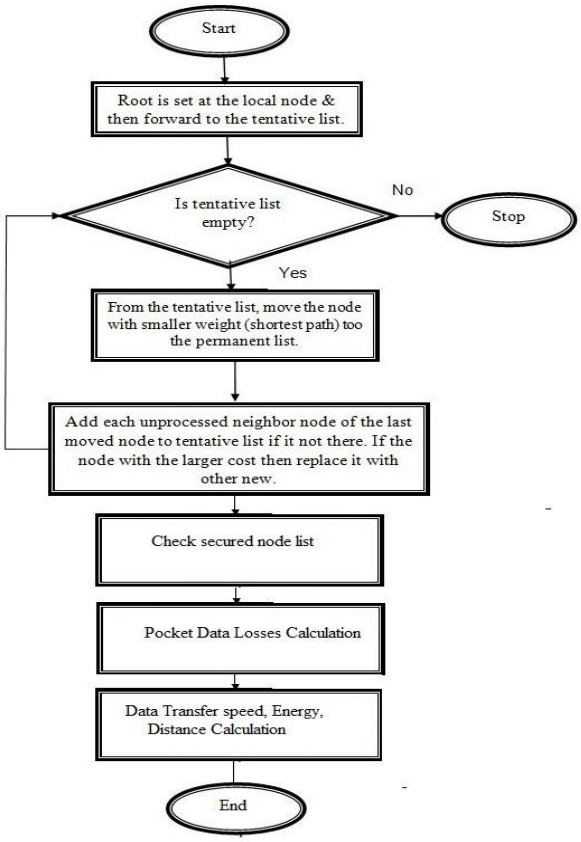
VII. NETWORK SIMULATOR

A network simulator is a software program that imitates the working of a computer network. In simulators, the computer network is typically modelled with devices, traffic etc and the performance is analysed. Typically, users can then customize the simulator to fulfill their specific analysis needs. Simulators typically come with support for the most popular protocols in use today, such as WLAN, Wi-Max, UDP, and TCP.

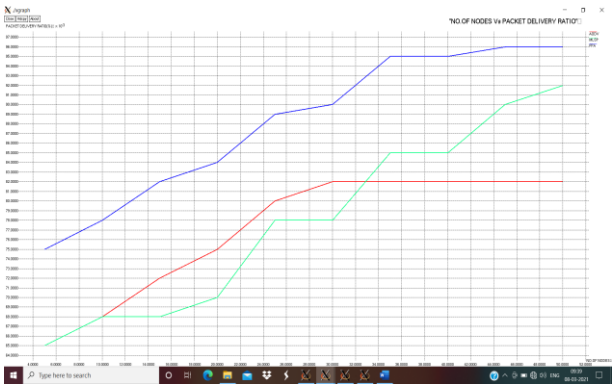
VIII. BLOCK DIAGRAM

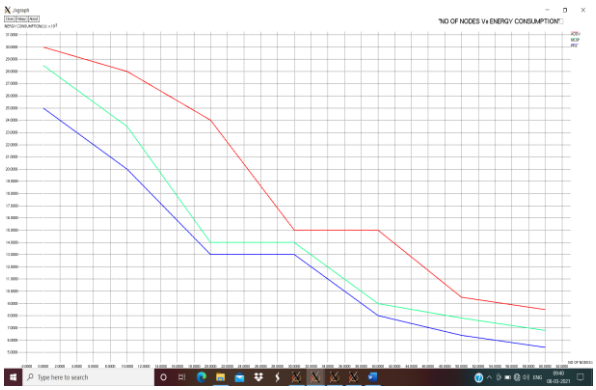


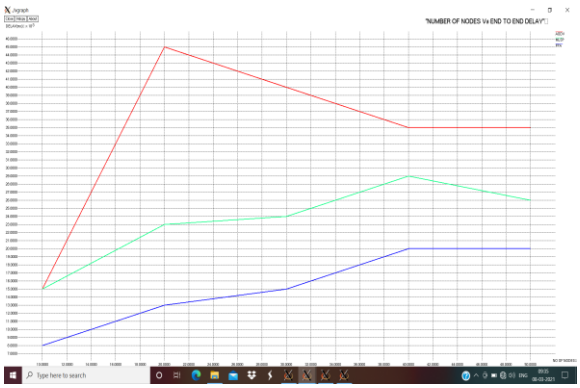
IX. FLOW DIAGRAM

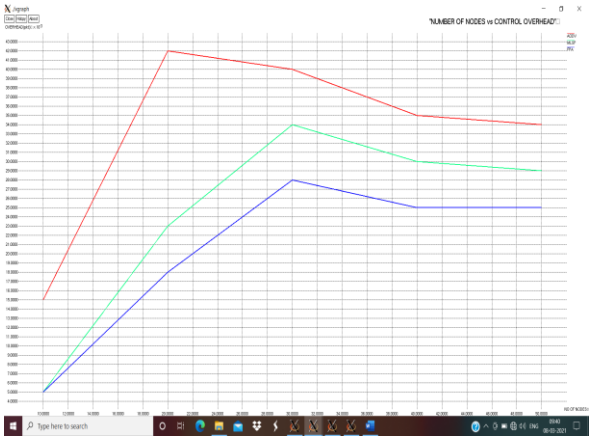


X. SIMULATION OUTPUT









XI. CONCLUSION

In this paper, we have considered a WPCN where multiple users can harvest energy from and communicate data to a hybrid access point that can supply RF energy in full duplex manner. We have investigated the minimum length scheduling problem to determine the optimal power control, time allocation and transmission schedule subject to data, energy causality and maximum transmit power constraints. We have formulated the problem as a MINLP problem, which is generally difficult to solve for a global optimum, and conjectured that the problem is NP-hard. We have provided a solution strategy in which the power control and time allocation, and the scheduling problems are decomposed. For the power control and time allocation problem, we have proposed optimal closed-form solution. For the scheduling, we have introduced the penalty function through which we have analyzed the characteristics of the optimal solution. We have proposed two polynomial time heuristic algorithms and an exact fast enumeration algorithm based on the optimality conditions. Through simulations, we have illustrated that the heuristic algorithms perform very close-to-optimal outperforming the conventional schemes significantly.

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