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ENERGY EFFICIENT SLEEP SCHEDULING WITH DISJOINT BACKBONE NODES AND DUTY CYCLE WITH OPTIMIZATION

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ABSTRACT

Wireless Sensor Networks (WSNs) growing day by day for flexible and fast communication which uses by many applications. Energy is the important parameter in WSN for long life communication. In this paper we present "Energy Efficient sleep scheduling with disjoint backbone nodes and duty cycle with optimization.". Backbone scheduling is designed for WSNs has redundant sensor nodes which form multiple disjoint backbones which work alternatively to increase the life of network by saving the energy. In VBS, traffic is only passing through the disjoint backbone, so that time other backbone is in sleep mode i.e. switch off their radios to save energy. The utilization of multiple backbones makes sure that the proper energy consumption of all sensor nodes is done, which fully utilizes the energy and increase the life of sensors than the existing techniques. In this paper we find the disjoint set of backbones such that all nodes in backbone are one hop away from set & maximum no. of sensor nodes are one hop away from that set which definitely improve the Quality of Service(QoS). Because of this one hop distance between sensor nodes and backbone we control the traffic through the proper utilization of sensor nodes and backbone node.

KEYWORDS: Wireless sensor networks (WSNs), backbone scheduling, sleep scheduling, disjoint backbone nodes.

INTRODUCTION

Wireless sensor networks (WSN) consists of a large number of low-cost micro-sensor nodes, which can form a special AdHoc Networks through wireless communication.WSN has been widely used in transportation, environmental protection, military, industry, and other fields. Compared with the Adhoc networks, there a real are number of distribution-intensive nodes in WSN, which has limited power and energy resources and no central organization. Since the energy consumption is the main problem in the WSN, the nodes in WSN should be low-power-consumption. Sensor nodes are expected to work on batteries for several months to a few years. Thus the Energy efficiency is very important parameter in WSNs. The network could be incrementally extended by simply adding more devices – no rework or complex configuration. With the devices presented the system would be capable of monitoring for anomalies for several years on a single set of batteries. Among the functional components of a sensor node, the radio consumes a major portion of the energy .Various techniques are proposed to minimize its energy consumption.

In this paper, we focus on to find the disjoint backbone nodes for duty cycle sleep scheduling with optimization. Backbone Scheduling (BS), which dynamically turns off the radio of the sensor nodes to save energy and Backbone Scheduling lets a fraction of the sensor nodes in a WSN turn on their radio to forward messages, which forms a backbone the rest of the sensor nodes turn off their radio to save energy[1]. This technique gives the very good communication quality with redundancy. Thus, it is possible to construct communication backbones to save energy. Specifically, use Connected Dominating Set (CDS) algorithms to construct such backbones[1]. However, a single backbone does not prolong the network lifetime. An intuitive idea is to construct multiple disjointed CDSs and let them work alternatively [1].

Virtual Backbone Scheduling (VBS), a novel algorithm that enables fine-grained sleep scheduling.VBS schedules multiple overlapped backbones so that the network energy consumption is evenly distributed among all sensor nodes. In this way, the energy of all of the sensor nodes in the network is fully utilized, which in turn prolongs the network lifetime [1].

In our system we find the disjoint set of backbones such that all nodes in backbone are one hop away from set & maximum no. of sensor nodes are one hop away from that set which definitely improve the Quality of Service(QoS). Because of this one hop distance between sensor nodes and backbone we control the

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traffic through the proper utilization of sensor nodes and backbone node.

RELATED WORK

Yaxiong Zhao, Jie Wu, Fellow, IEEE, Feng Li, Member, IEEE, and Sanglu Lu, Member, IEEEet. al [1],Suggest a novel sleep-scheduling technique called Virtual Backbone Scheduling (VBS). VBS is designed for WSNs has redundant sensor nodes. VBS forms multiple overlapped backbones which work alternatively to prolong the network lifetime. In VBS, traffic is only forwarded by backbone sensor nodes, and the rest of the sensor nodes turn off their radios to save energy. The rotation of multiple backbones makes sure that the energy consumption of all sensor nodes is balanced, which fully utilizes the energy and achieves a longer network lifetime compared to the existing techniques.
Advantage:
1.To improve the efficiency of system.
2.To improve the Quality of the system.
Disadvantage:
1.It does not consider packet loss during sleep time.
Qing Xiong; Weijia Jia; Chanle Wu et. al [2], Suggest to analyze the interference model of IEEE 802.16 TDMA mesh networks and propose a bidirectional concurrent transmission model. We propose a packet scheduling problem to formulate centralized scheduling in WiMAX mesh networks with bidirectional concurrent transmission, and make simulations to verify the effect of it with various scheduling algorithms. Experiment results reveal that comparing to unidirectional transmission, bidirectional transmission can effectively minimize the number of timeslots required to transmission packets.
Advantage:
1.increasing the efficiency of transmission.
2.TDMA offers the ability to carry data rates of 64 kbps to 120 Mbps .
Disadvantage:
3.One of the disadvantages of TDMA is that each user has a predefined time slot.
Byung-Gook Kim; Shaolei Ren; van der Schaar, M.; Jang-Won Lee et. al [3], Suggest residential load scheduling problem with bidirectional energy trading. Compared with the previous work, in which customers are assumed to be obedient and agree to maximize the social welfare of the smart grid system, in this paper, they consider a non-collaborative approach, where consumers are self-interested. We model the energy scheduling problem as a non-cooperative game, where each customer determines its load scheduling and energy trading to maximize its own profit. In order to resolve the unfairness between heavy and light customers, we propose a novel tiered billing scheme that can control the electricity rates for customers according to their different energy consumption levels.
Advantage:
1.To maximize the customers profit.
Disadvantage:
1.This approach is very complex.
Zhao, Z.J.; Hoong Chuin Lau; Ge, S.S. et. al [4], Suggest Fast heuristic methods are proposed with the relaxation of the machine capacity. For the integrated resource allocation and scheduling problem, a linear programming relaxation approach is applied to solve the global resource allocation and a fast heuristic method is applied to solve each scheduling sub problem. The proposed solution is compared experimentally with that from the integer programming solver by CPLEX.
Advantage:
1.To improve the performance.
2.Increase the life time of sensor node
Disadvantage:
1.It is difficult to identify the behavior of every node in transit environment
Meshgi, H.; Dongmeiet. al [5], Suggest Zhao study transmission scheduling in a bidirectional communication link, where two end nodes are communicating with each other through a relay node. Each of the two end nodes injects data into a separate buffer at the relay node, which can either forward the data from one end node to the other at a given time (referred to as one-way relay), or simultaneously forwarding the data to both the end nodes by using network coding (referred to as two-way relay).
Advantage:
1.Increase the life time of sensor node
2.Very well done energy efficient scheduling in MAC layer.
Disadvantage:
Scheduling use in only single layer .
Guang Yang; Yan-Fang Yue; Jin-ye Wang et. al [6], Suggest A heuristic algorithm is used to adjust the initial solution afterwards so that the final solution is obtained. The result of simulation experiment indicates that the algorithm has low computational complexity and satisfactory optimization effect. Based on the idea of the algorithm, a job-shop scheduling system in ASP (application service provider) is finished to solve scheduling problem in machine shop of cooperating production on net.
Advantage:
1.Decrease the complexity of communication.
2. Opportunistic scheduling improve the Quality of service(QOS).

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Zhao, Z.J.; Thin-Yin Leong; Shuzhi Sam Ge; Hoong Chuin Lau et. al [7],propoesd study a special bidirectional flow shop problem with multi-machine capacity and sequencing constraints on critical operations. A formulation is proposed in continuous time domain and compared with a mixed integer programming (MIP) formulation in discrete time domain. Of particular interest to us is the formulation of the machine utilization function -both in continuous time and in discrete time domain. Fast heuristics are proposed with the relaxation of the machine capacity.
Advantage:
1.Minimize the delay of packet transmission.
Disadvantage:
1.This is the NP-hard problem.
Bo Zhou; Liu, Yuan; Tao, Meixia et. al [8],proposed the relay buffering in delay-tolerant networks. The relay node is aided by two buffers and one for each user, so that it can adaptively decide when to buffer the received packets or to forward them according to the instantaneous channel and queue conditions. They formulate the joint optimization of subcarrier assignment, transmission mode selection (direct or relay mode), and relay strategy selection (buffering or forwarding), for maximizing the long-term average throughput. An efficient dual-based algorithm is proposed to characterize the optimal policy. Simulation results show that relay buffering can significantly enhance the long-term throughput in OFDM bidirectional transmission systems.
Advantage:
1.Minimize the delay of packet transmission.
2. Improve the utilization of the system.
Disadvantage:
1.It is difficult to identify the behavior of every node in transit environment
Li Ya; Zhang Jingyaoet. al [9], Suggest A bidirectional evolutional algorithm for the resource-constrained project scheduling problem After providing a new representation of the solution for the resource-constrained project scheduling problem (RCPSP), a bidirectional evolutional algorithm is given. This algorithm will firstly find the solutions with potential good properties and then use these selected solutions to guide the searching process. All the searching operations are applied in the two direction problems that are the original problem and the reverse problem
Advantage:
1.Maximize the efficiency of network.
Disadvantage:
1.It is difficult to balance the traffic of communication.
Byung-Gook Kim; Shaolei Ren; van der Schaar, M.; Jang-Won Lee et. al [10], Suggest :consider a power system with an aggregator and multiple customers with EVs and propose a novel electricity load scheduling which, unlike previous works, jointly considers the load scheduling for appliances and the energy trading using EVs. Specifically, we allow customers to determine how much energy to purchase from or to sell to the aggregator while taking into consideration the load demands of their residential appliances and the associated electricity bill. Under the assumption of the collaborative system where the customers agree to maximize the social welfare of the power system, we develop an optimal distributed load scheduling algorithm that maximizes the social welfare.
Advantage:
1.It propose power transitions scheduling to improve the energy of wsn.
Disadvantage:
1.This is very costly approach.
Baumann, P.; Trautmann, N.et. al [11], Suggest a scheduling heuristic for Microsoft Project which generates a series of initial schedules by regret-based biased random sampling and improves these schedules by backward-forward passes. In order to consider all types of temporal or calendar constraints that can be modeled in Microsoft Project, both parts of the heuristic employ the built-in schedule-generation scheme of Microsoft Project. Computational results for two real-world construction projects indicate that the presented heuristic improves the resource-allocation capabilities of Microsoft Project considerably.
Adavantage:
1. improves these schedules by backward-forward passes.
2.Employ the built-in schedule-generation scheme.
Byung-Gook Kim; Shaolei Ren; van der Schaar, M.; Jang-Won Leeet. al [12], Suggest: consider a power system with an aggregator and multiple customers with EVs and propose novel electricity load scheduling algorithms which, unlike previous works, jointly consider the load scheduling for appliances and the energy trading using EVs. Specifically, we allow customers to determine how much energy to purchase from or to sell to the aggregator while taking into consideration the load demands of their residential appliances and the associated electricity bill. We propose two different approaches: a collaborative and a non-collaborative approach. In the collaborative approach, we develop an optimal distributed load scheduling algorithm that maximizes the social welfare of the power system.
Advantage:
1.provide the guaranteed minimum performances in uncertain environments.

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Disadvantage:
1.Power gating is difficult.
Wang, J.Q.; Zhang, S.F.; Chen, J.; Wang, S.; Zhang, Y.F. et. al [13], Suggest at resources-constrained multiple projects scheduling problem (RCMPSP), a three-dimensional representation is presented through extending the two-dimensional representation of resources-constrained scheduling problem by adding resource dimension to the two-dimensional Gantt chart. It can clearly display the resources consumption of every activity and provide valuable reference for concerning bottleneck resources and solving the resources conflict. In addition, a hybrid algorithm which combined the merits of bidirectional scheduling and parallel schedule generation scheme (PSGS) is proposed to optimize the RCMPSP.
Advantage:
1.Approach is effective and explicit for resource constrained.
Disadvantage:
1.It is difficult to identify the transitions state of wsn

PROPOSED WORK

Problem Definition

In this paper we find the disjoint set of backbones such that all nodes in backbone are one hop away from set & maximum no. of sensor nodes are one hop away from that set which definitely improve the Quality of Service(QoS). Because of this one hop distance between sensor nodes and backbone we control the traffic through the proper utilization of sensor nodes and backbone node. Since the VBS problem is NP-hard, we propose a Disjoint backbone scheduling with approximation algorithms based on the Schedule Transition Graph (STG) and Virtual Scheduling Graph (VSG). Theoretical analyses and simulation studies verify that disjoint VBS is superior than the existing techniques.

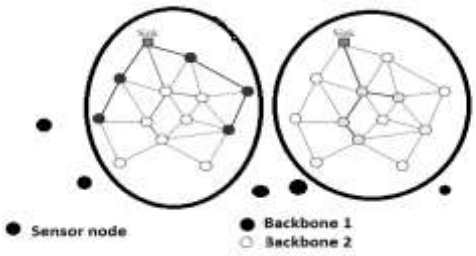

Figure 1: Disjoint backbones with one hop distance between backbone nodes and sensors.

Problem formulation Mathematical Model

Let G(V,E) be the graph of 'V' no of nodes and 'E' edges. Let S={s1,s2,s3…….,sn} be the set of sensor nodes.B={BN1,BN2…….BNn} be the set of backbone nodes.Our problem is to find B={B1,B2…Bp} set of backbone .A each backbone Bi works for T1 rounds.A duty cycle sleep scheduling is represented as {<B,T>……<Bp,Tp>} with the following constraints.
1.Connectivity
2.Energy Constraints
3.Backbone node set should have maximum number of active sensor nodes at one Hop distance.
Step1: Every sensor node has data packet with value normal on reserved. Previous reserved packets have high priority over Rn normal packets.
Step2:Using packet priorities sensor nodes reserve time slots.
Step3:Sensor nodes form the set of disjoint nodes.
Step4:Sensor nodes form TDMA based scheduling.
Step5: Active sensor nodes sense the data that will be forwarded to backbone.
Step6:Let SA={SA1, SA2,…….SAn} be the set of active sensor nodes.
Step7: From given set of backbone nodes B,find the disjoint set B1,B2,……Bn such that all nodes in backbone are one hop away from set & maximum no. of sensor nodes are one hop away from that set.
Step8: Send data by sensor through backbone node.

Architecture diagram

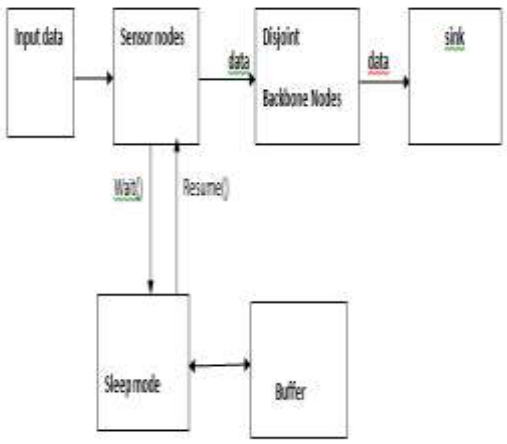

Figure 2: Architectural diagram of system.

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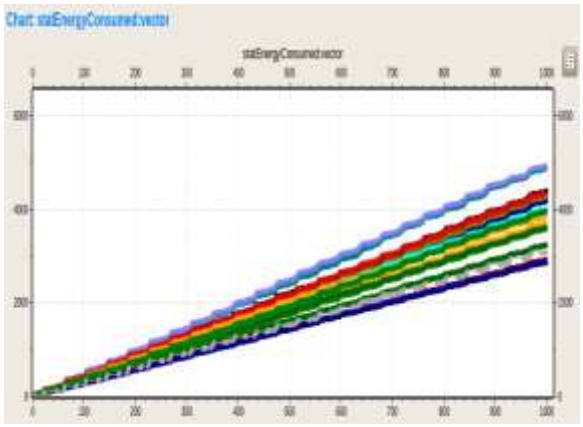
SIMULATION RESULTS

Framework of proposed system

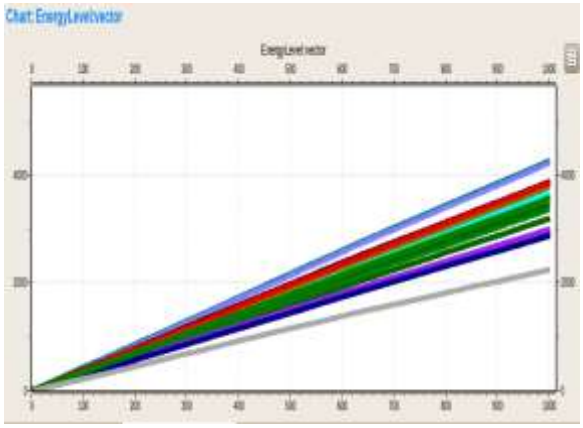
Comparison of energy consumption of Virtual Backbone Scheduling & Proposed system

a)VBS Energy Graph:



In Above figure contain the energy consumption of existing work i.e. VBS.

b)Proposed system Graph



In Above figure contain the energy consumption of Proposed work which is better than existing system.

So the proposed system is more efficient than the existing system i.e. VBS.

CONCLUSION

Energy is the important parameter for Wireless Communication Network. Battery is essential resource for energy to Sensor nodes through which communication is possible for long period so to save energy becomes very essential in WSN .In this paper, In our system we find the disjoint set of backbones such that all nodes in backbone are one hop away from set & maximum no. of sensor nodes are one hop away from that set which definitely improve the Life time of the network by proper utilization of energy.

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