Dynamic Profile Management Using Network Traffic Parameters

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Abstract: ***Due to the presence of various applications complexities in WSN increase. Thus, dynamic profiling provides exact behavior of application runtime behavior, which is adaptable with changing environment and reduces runtime overheads. Thus, designers required to design the appropriate method. The designer have to select the method which based on different application behavior, it could reduce network traffic overheads, power and codes of every method with minimum energy consumption. Our result fulfill all this. A Vehicular Ad Hoc Network (DPM) is a technology that uses moving cars as nodes in a network to create a mobile network. DPM turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 meters of each other to connect and, in turn, create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile Internet is created. It is estimated that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purposes.***

Keywords: Dynamic profile management, Profile management control protocol, embedded software, wireless sensor networks (WSN)

1. Introduction

Dynamic Profile Management (DPM) play an important role in future car-to-car communication systems and related applications like self-organizing traffic information systems (SOTIS), which are based on broadcast transmission schemes. Profile Management control for DPMs has not been studied thoroughly so far - but this feature is extremely necessary for DPM applications and network performance. Due to the high mobility and the resulting highly dynamic network topology, Profile Management control needs to be performed in a decentralized and self-organized way, locally in each DPM node. PMCP is a hop-by-hop upstream profile management control protocol for DPM. It tries to reduce packet loss and gives weighted fairness. It consist of three components intelligent profile management detection (ICD), implicit profile management notification (ICN), and priority based rate adjustment (PRA).ICD detects Profile Management based on packet inter-arrival time and packet service time. In ICN, Profile Management information is piggybacked in the header of data packets and PMCP also designs a novel priority-base rate adjustment algorithm (PRA) employed in each sensor node in order to guarantee both flexible fairness and throughput, where each sensor node is given a priority index. The use of PMCP achieves desired throughput for diverse data according to the priority specified by the base station, High link utilization, moderate queue length to reduce packet loss, relatively low packet drop rate. Therefore PMCP is energy efficient and provides lower delay. . It is also feasible in terms of memory requirements considering the configurations of today's multi-purpose motes.

2. Literature Review and Problem Identification

Profile Management occurs when too many sources are sending too much of data for network to handle. Profile Management in a wireless sensor network can cause missing packets, low energy efficiency and long delay. A sensor node may have multiple sensors like light, temperature etc. with different transmission characteristics has different characteristics and requirements in terms of transmission rate, bandwidth, delay, and packet loss. Different types of data generated in heterogeneous wireless sensor networks have different priorities. In multi path wireless sensor networks, the data flow is forwarded in multiple paths to the sink node. It is very important to achieve weighted fairness for many WSN applications. In this paper they proposes a priority based Profile Management control for heterogeneous each application traffic in multi path wireless sensor network. [1]

Heterogeneous applications could be assimilated within the same wireless sensor network with the aid of modern motes that have multiple sensor boards on a single radio board. Different types of data generated from such types of motes might have different transmission characteristics in terms of priority, transmission rate, required bandwidth, tolerable packet loss, delay demands etc. Considering a sensor network consisting of such multi-purpose nodes, this paper proposes Prioritized Heterogeneous Traffic-oriented Profile Management Control Protocol (PHTCCP) which ensures efficient rate control for prioritized heterogeneous traffic. This protocol uses intra-queue and inter-queue priorities for ensuring feasible transmission rates of heterogeneous data. It also guarantees efficient link utilization by using dynamic transmission rate adjustment. Detailed analysis and simulation results are presented along with the description of our protocol to demonstrate its effectiveness in handling prioritized heterogeneous traffic in wireless sensor networks. [2]

This paper proposes a distributed and scalable algorithm that eliminates Profile Management within a sensor network, and that ensures the fair delivery of packets to a central node, or base station. Fairness is achieved when equal numbers of packets are received from each node. Here they consider the scenario where we have many- to-one multihop routing. This algorithm exists in the transport layer of the traditional network stack model, and is designed to work with any MAC protocol in the data-link layer with minor modifications. This solution is scalable; each sensor mote requires state proportional to the number of its neighbors. Finally, they demonstrate the effectiveness of this solution with both simulations and actual implementation in UC Berkeley's sensor motes. But this solution is not applicable for many to many routing in sensor network .in many to many routing sensor network this solution will have more Profile Management. [3]

In this paper they propose an efficient scheme to control multipath Profile Management so that the sink can get priority based throughput for heterogeneous data. They have used packet service ratio for detecting Profile Management as well as performed hop-by-hop multipath Profile Management control based on that metric. Finally, simulation results have demonstrated the effectiveness of their proposed approach**.** In this paper, they have presented an efficient multipath Profile Management control mechanism for heterogeneous data originated from a single sensor node. But using this method they have some disadvantages for multiple node. Hence to avoid the problems fairness must be improve , analysis of the impact of other parameters on the proposed scheme's performance and implementing this scheme on a real sensor test-bed.[4]

A Dynamic Profile Management (DPMs) are technology that uses moving cars as nodes in a network to create a mobile network. DPM turns every participating car into a wireless router, allowing cars of each other to connect and create a network with a wide range. DPMs are developed for enhancing the driving safety and comfort of automotive users. The DPMs can provide wide variety of services such as Intelligent Transportation System (ITS) e.g. safety applications. Many of safety applications built in DPMs are required real-time communication with high reliability. One of the main challenges is to avoid degradation of communication channels in dense traffic network. Many of studies suggested that appropriate Profile Management control algorithms are essential to provide efficient operation of a network. However, most of Profile Management control algorithms are not really applicable to event-driven safety messages. This paper propose Profile Management control algorithm as solution to prevent Profile Management in DPMs environment. And also study the performance of proposed Profile Management control algorithm for event-driven safety messages in difference congested scenarios. The effectiveness of the proposed Profile Management control algorithm is evaluated through the simulations using Veins simulator. This paper shows the Profile Management problem in favor of event-driven safety messages in DPMs environment. This work is not efficient for transmit power control to maximize energy consumption and connectivity for point-to-point communications and also not applicable for unipriority packet is caused by the traffic of the same high priority.[5]

2.1 Problem Identification

Based on the above discussion it is clear that a Profile Management occurring during the data transfer in a particular network causing a packet loss and long delay. Hence we are trying to improvise this on using priority based technique and control the Profile Management based on priority.

2.2 Objective

The main objective of this synopsis is priority based Profile Management control for DPM.

- Design a model using master and slave sensor nodes.
- Transmission of data packet from node to node based on priority.
- Comparing the result in terms of data transfer with earlier work.

3. Research Methodology

3.1 System Models

This project addresses upstream Profile Management control for a WSN that supports single-path routing. In Fig.3-1, sensor nodes generate continuous data and form many-to-one convergent traffic in the upstream direction. They are assumed to implement RF2.4GHZ-like DPM protocol. Each sensor node could have two types of traffic: source and transit. The former is locally generated at each sensor node, while the latter is from other nodes. Therefore each sensor node can be a source node and/or intermediate node. When a sensor node has offspring nodes and transit, it is a source node as well as an intermediate node. On the other hand, it is only a source node if it has no offspring nodes, and therefore only has source traffic. The offspring node of a particular node is defined as the node whose traffic is routed through this particular parent node. If an offspring node directly connects to its parent node, this offspring node is called child node and its parent node is called parent node.

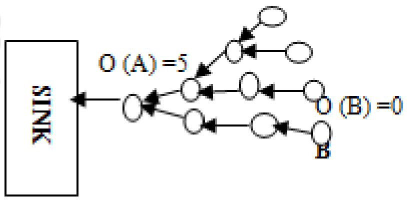


Figure 1: Network model-logical topology established by routing protocol

3.2 Node Model

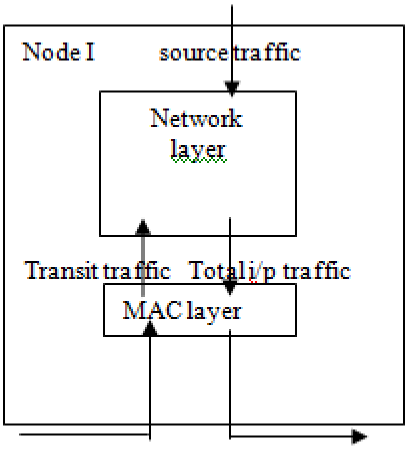


Figure 2: General node model

Above figure.2 presents the queuing model at a particular sensor node *i* with single-path routing. The transit traffic of node i (irtr) is received from its child nodes such as node *i* 1 through its DPM layer. The source traffic is locally generated with the rate of *rsirc* . Both the transit traffic and the source traffic converge at the network layer before being forwarded to node *i* + 1, which is the parent node of node *i* . Packets could be queued at the DPM layer if total input traffic rate (*r iin* = *rsirc* + rtir) exceeds packet forwarding rate at the DPM layer (*irf*). The packet forwarding rate *Irf* depends on the DPM protocol itself. With the assumption of RF2.4GHZ-like protocol, the number of active sensor nodes as well as their traffic density influences *irf* . In Fig. above, *irout* is the packet rate at the node *i* towards node *i* + 1. If *irin* is smaller than *irf* , *rout* will equal *irin* . Otherwise if *irin* > *irf* , then *irout* will be close to *irf* .

Therefore, min(i, i) *irout* = *rin r f* .This property can be utilized to indirectly reduce *irout* through reducing *irin* . In fact, the output traffic at node *i* is part of transit traffic at the node *i* + 1. Therefore reduction of *irout* implies a decrease of *irtr+* . If packet input rate *irin* exceeds packet forwarding rate *irf* , then there will be backlogged packets inside node *i* and node-level Profile Management takes place. At this time, we need to reduce *irin* and/or increase *irf* . While *irf* can be increased through adjusting DPM protocols, it is much easier to lower *irin* through throttling either *is r* , *irtr* or both of them. The source rate *rsirc* can be reduced locally by changing sampling (or reporting) frequency. The transit traffic *Irtr* can be indirectly reduced through rate adjustment at the node *i*+ 1 . On the other hand, if there is collision on the link around the node *i*, then node *i* and its neighboring nodes should reduce channel access in order to prevent further link-level Profile Management. Although this task may be performed through DPM, yet it is easier to reduce *irin* . This project designs a novel Profile Management control approach through flexible and distributed rate adjustment in each senor node as shown in fig above. It introduces a scheduler between network layer and DPM layer, which maintains two queues: one for source traffic and another for transit traffic. The scheduling rate is denoted as *rsivc*. A Weighted Queuing (WQ) algorithm can be used to guarantee fairness between source and transit traffic, as well as among all sensor nodes. The priority index of source traffic and transit traffic, which will be defined in next section, is used as the weight, respectively, for source traffic queue and transit traffic queue. By adjusting the scheduling rate *rsivc* , PMCP realizes an efficient Profile Management control while maintaining the DPM protocol parameters unchanged and therefore works well with any RF2.4GHZ like DPM protocol.

3.3 Generating the PMCP

PMCP is designed with such motivations:

1) In WSNs, sensor nodes might have different priority due to their function or location. Therefore Profile Management control protocols need guarantee weighted fairness so that the sink can get different, but in a weighted fair way, throughput from sensor nodes.
2) Profile Management control protocols need to improve energy-efficient and support traditional QoS in terms of packet delivery latency, throughput and packet loss ratio.

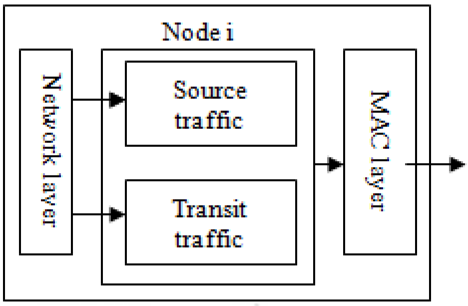


Figure 3: Node model in PMCP

PMCP tries to avoid/reduce packet loss while guaranteeing weighted fairness and supporting multipath routing with lower control overhead. PMCP consists of three components: intelligent Profile Management detection (ICD), implicit Profile Management notification (ICN), and priority-based rate adjustment (PRA). ICD detects Profile Management based on packet inter-arrival time and packet service time. The joint participation of inter-arrival and service times reflect the current Profile Management level and therefore provide helpful and rich Profile Management information. To the best of our knowledge, jointly use of packet inter-arrival and packet service times as in ICD to measure Profile Management in WSNs has not been done in the past. PMCP uses implicit Profile Management notification to avoid transmission of additional control messages and therefore help improve energy-efficiency. In ICN, Profile Management information is piggybacked in the header of data packets. Taking advantage of the broadcast nature of wireless channel, child nodes can capture such information when packets are forwarded by their parent nodes towards the sink. Finally, PMCP designs a novel priority-base rate adjustment algorithm (PRA) employed in each sensor node in order to guarantee both flexible fairness and throughput, where each sensor node is given a priority index. PRA is designed to guarantee that:

1) The node with higher priority index gets more bandwidth.
2) The nodes with the same priority index get equal bandwidth.
3) A node with sufficient traffic gets more bandwidth than one that generates less traffic.

4. Implementation

4.1 Hardware Methodology

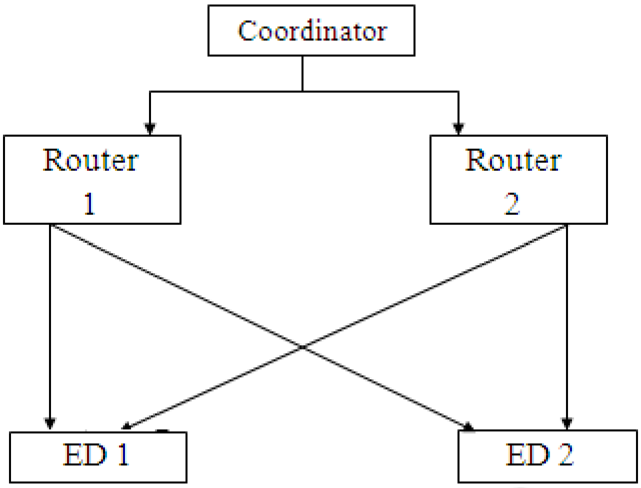


Figure 4: General block diagram of DPM

Figure.4 shows general block diagram of DPM. It is consists of four nodes one node is master which is connected to the personal computer and other three nodes are the slave nodes connected with wireless module which is RF2.4GHZ .and these three nodes also connected with temperature sensors .

Co-coordinator broadcast data to end devices (ED) with their specific addresses through routers. Then end device will send the acknowledgement to co-coordinator. Router 1 is sending msg 1 to end device1 and if co-coordinator wants to send msg 2 to same device then router 2 will send the msg2 to end device 1. End device will receive msg 2 after sending acknowledgement of msg 1 to co-coordinator.

Table 4.1: List of Components used

Blocks	*Key Component Name*	*Significance*
Microcontroller	PIC18F252	Control & Operator for other components.
DPM Node (WM)	RF2.4GHZ	For Communication.
Human Interfacings	LED's/Keypad	Communicating with Real World
PC		For result monitoring
Display	LCD	To View result parameters & simulation processes
Power Supply Regulators	7805	For Maintaining 5V Supply to circuits.

4.2 Software Methodology

Development Tools for Microcontroller:-

- **MPLAB IDE**

The MPLAB IDE software brings an ease of software development previously unseen in the 8/16-bit microcontroller market. The MPLAB IDE is a Windows based application that contains:
1) An interface to debugging tools
2) Simulator
3) Programmer (sold separately)
4) Emulator (sold separately)
5) In-circuit debugger (sold separately)
6) A full-featured editor with color coded context
7) A multiple project manager
8) Customizable data windows with direct edit of contents
9) High-level source code debugging
10) Mouse over variable inspection
11) Extensive on-line help

5. Result

5.1 Hardware Testing

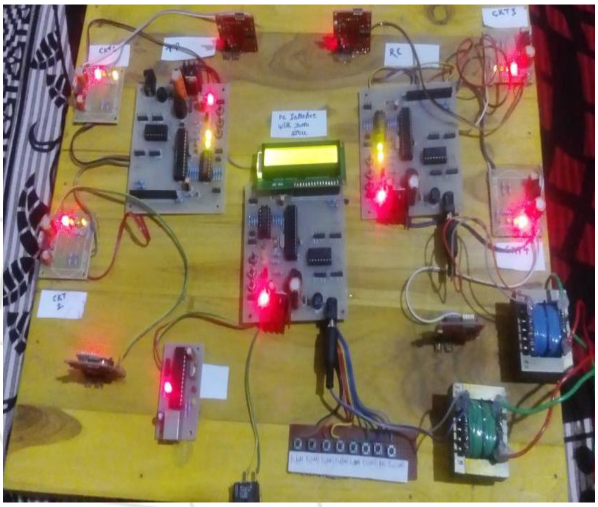


Figure 5: Complete circuit with master and slave nodes

Figure.5 shows the complete circuit with master and slave nodes. In which the master node is connected with the LCD on which the message will be display. On left hand side master having three switches , from which second switch is used to select the mode of operation either normal mode or priority mode and first switch is used to halt the simulation and then by pressing third switch results will be display. If the priority mode is selected then right hand side switches used to set the class priority, according to which priority of three slave nodes is set. Above figure shows the three slave nodes connected with RF2.4GHZ device for communication.

From Hardware Modeling

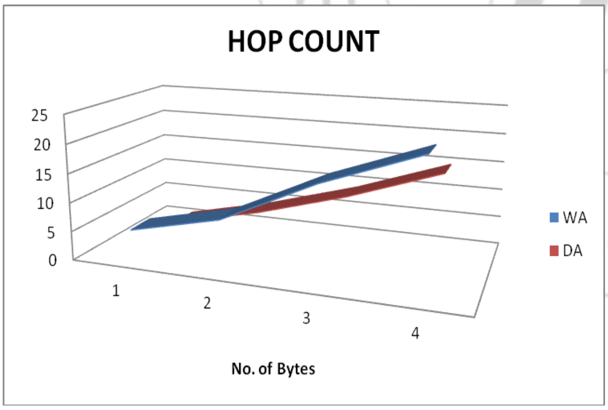
Table Run time results for normal mode and priority mode.

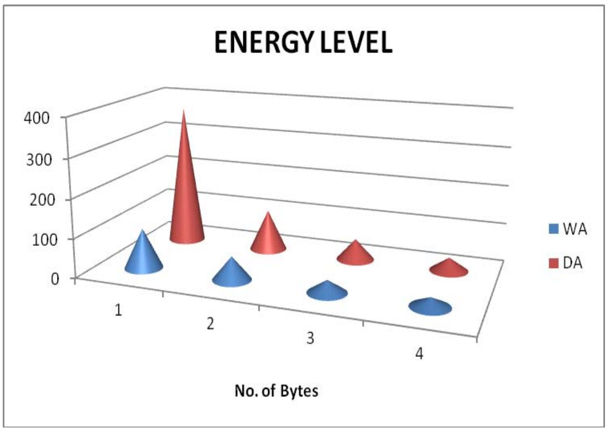
E1 (WA)			
parameter	ND11-	ND21-	ND11-
parameter/Mode	C1-C2-ND12	C1-C2-ND22	C1-C2-ND22
Time (ms)	27	32	33
Energy	122	96	93
Send	36	43	44
Received	33	49	41
Hop count	4	5	5
Packet Drop Events	15	17	17
Packet Drops Observed	2	4	4
Packet Recovered	13	13	13

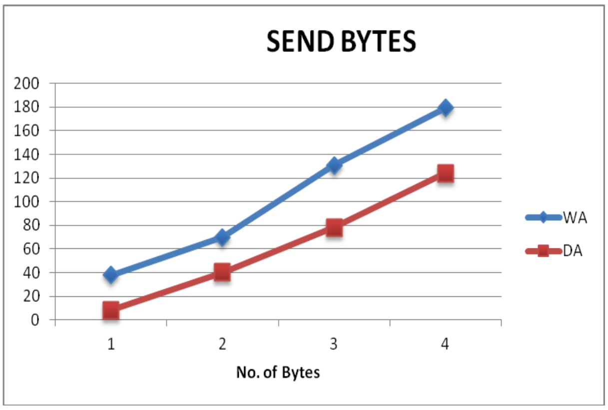
E1 (DA)			
parameter/Mode	ND11-C1C-C2-ND12	ND21-C1C-C2-ND22	ND11-C1C-C2-ND22
Time (ms)	8	9	9
Energy	412	344	344
Send	10	12	12
Received	8	8	8
Hop count	1	1	1
Packet Drops Events	5	5	5
Packet Drops Observed	0	1	1
Packet Recovered	5	4	4

E2 (WA)			
parameter/Mode	ND11-C1-C2-ND12	ND21-C1-C2-ND22	ND11-C1-C2-ND22
Time (ms)	46	55	57
Energy	71	56	54
Send	61	73	76
Received	57	69	71
Hop count	7	9	9
Packet Drops Events	25	28	29
Packet Drops Observed	5	8	8
Packet Recovered	20	20	21

E2 (DA)			
parameter/Mode	ND11-C1C-C2-ND12	ND21-C1C-C2-ND22	ND11-C1C-C2-ND22
Time (ms)	26	31	34
Energy	126	100	91
Send	34	41	45
Received	27	27	28
Hop count	4	5	5
Packet Drop Events	16	19	21
Packet Drops Observed	2	3	3
Packet Recovered	14	16	18







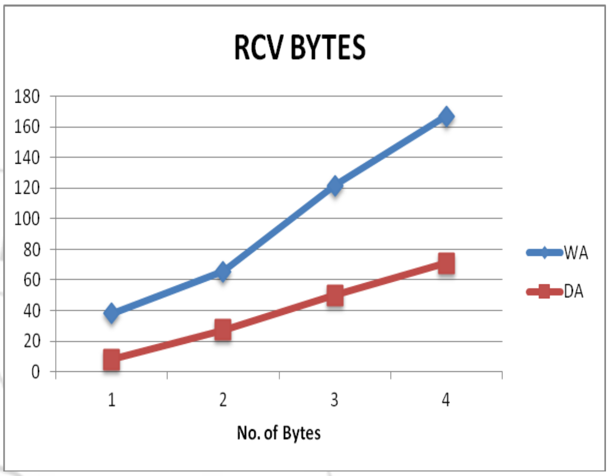


Figure 6: Graph for normalized throughput

Graph shows the normalized throughput of the purpose method is very less as compare to previous method.

6. Conclusion and Future Scope

6.1 Conclusion

PMCP is a hop-by-hop upstream Profile Management control protocol for DPM. It uses packet inter-arrival and service times to accurately measure Profile Management at each sensor node. Introduces node priority index and realizes weighted fairness.

PMCP achieves small buffer size therefore it can avoid/reduce packet loss and therefore improve energy-efficiency, and provide lower delay with the improvement in throughput capabilities for DPM. According to priority of base station it gives desired output. It uses High link. It having moderate queue length to reduce packet loss.

Therefore PMCP is energy efficient and provides lower delay. It is also feasible in terms of memory requirements considering the configurations of today's multi-purpose motes.

6.2 Future Scope

In future this work can be greatly useful on integrating end-to-end reliability mechanism and further improvement in fairness for PMCP.

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