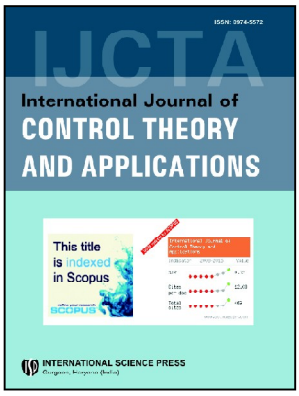

International Journal of Control Theory and Applications

ISSN : 0974-5572

© International Science Press

Volume 10 • Number 10 • 2017

A Sleep Scheduling Approach for maximum coverage of nodes for Wireless Sensor Networks

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Abstract: Wireless sensor network (WSN) are distributed in different sensor nodes to analysis the environmental and physical conditions like sound, pressure, and temperature etc. Improvement of the lifetime of the network is an essential concept in wireless sensor network. Sensor nodes are usually deployed in unpleasant environment in a large numbers. In this paper a sleep scheduling technique is discuss, a sleep scheduling approach, called Collaborative Location Based Sleep Scheduling (CLSS). This approach grouped nodes into groups and build routing paths based on localized metrics which makes Collaborative Location Based Sleep Scheduling energy efficient. The major purpose of tree-based routing is to tackle route instability by introducing neighborhood heuristics technique which involves a combination of present sensor node's routing metrics and the metrics of its neighbors to spot aspect of routes and different alternatives at the time of primary route failure. As a result, the sensors with multiple routing decisions are chosen for forwarding the packets. This protocol is well suited for low power networks. The proposed model is based upon the energy aware tree based routing protocol.

Keywords: Collaborating Location Based Sleep Scheduling, Mobile Wireless Sensor Network, Sensor Media Access Control, Sleep Scheduling, Wireless Sensor Network.

1. INTRODUCTION

Wireless sensor network is an ad hoc network without any infrastructure support in which a large number of sensors nodes are distributed in an area. A Wireless sensor network provides a bridge between the real worlds and virtual worlds. A number of these sensors nodes can be networked in many applications, such as wireless have effects on military and civil applications such target field imaging, intrusion detection, weather monitoring etc. WSNs contains number of sensor nodes and these sensors have ability to communicate with each other or precisely to an external base station(BS). Sensor nodes are usually deployed in unpleasant environment in a large numbers, With the help of these interfaces nodes can communicate with each other and form a network. Sensor nodes perform routing function to transfer data from one node to another nodes. The routing protocols have several shorts comings when applies to WSNs which due to energy constrained. In this flooding is a technique in which a given node broadcasts data and control packets . In WSN the main way is the communication that makes the environment setup and modification easy, cheap and more flexible. The Basic objectives of the

WSN include reliability, accuracy, flexibility, cost and ease of deployment. The characteristics of WSN like self organization, rapid deployment and fault tolerance that make them use for military and civilian applications.

In sleep scheduling each nodes follows a periodic active and inactive schedule organized with its neighboring nodes. During Inactive mode, the radios are completely turned off and during active mode they are turned on node and then the transfer of message are take place. Sensor network nodes switch between active and inactive mode to save energy thus to extending the network lifetime. The distributed sleep scheduling for nodes in WSNs has good scalability low cost, and easy implementation. The changing nature of sleep scheduling determining when each sensor should be involved in collecting data and each of them should be put on the standby mode, so as to expand the long term safety of the system. Since the sensors are heavily energy constrained and activated a sensor whenever possible may not be a good strategy[1].

There are three type of modes in the sleep scheduling such as receive mode, idle mode, sleep mode. In receive mode the data are transferring from one node to another node, In idle mode there is no transformation of data from one node to another node but still node are consuming energy so there is loss of energy consumption, And in sleep mode there is no loss of energy consumption and no data are transferring from one node to another node. Sleep scheduling balance the power consumption of sensors and reduce the transmission message. A sensible sleep scheduling algorithm ought to each option for choose the minimum variety of active nodes and satisfy user outlined constraints. The non-sleeping nodes should be chosen so they're connected to the sink and that they give some minimum coverage of the network field. User outlined constraints might vary betting on the application kind. For example, the user might want the network to be connected and supply some minimum coverage for as long as potential or the user might want the network to be connected and supply full coverage of the network field whereas making certain some minimum delay in gathering information. Besides, the sleep scheduling rule should be straightforward, distributed a and localized. It should be applicable to several styles of networks with minor modifications. As a result of the distributed nature of sensor networks, it should be a distributed approach and it ought only use native data since every node features a restricted transmission vary. It's conjointly fascinating to not to need any location information since it's terribly pricey for a detector network. Though sleep planning isn't a replacement approach to extending network period, there's nearby no work satisfying of these need at the same time. sleep scheduling algorithms that think about only coverage or only connectivity are conferred and so algorithms that think about coverage beside connectivity . sleep scheduling algorithms that try and maintain an exact range of active sensors at each spherical while not considering coverage is bestowed. detector nodes, i.e., an space that all the points within the area are within the sensing vary of a minimum of one active sensor node. The coverage drawback addresses on finding the minimum set of sensors which might cover a similar space because the deployed sensors, thus avoiding redundant information transmissions with in the network. The sensing region of a node is usually assumed to be a disk with radius up to the sensing vary of the detector node. two varieties of sensor nodes with totally different prices and sensing ranges and a grid primarily based network structure are assumed. One node kind incorporates a larger sensing vary than the opposite that is on the opposite hand cheaper. They notice the minimum price placement of sensor nodes whereas quaranteeing that everyone grid points are lined adequately with a applied mathematics approach. In addition, the matter of determining the grid points to find the sensor nodes such that the grid positions of targets will be unambiguously known from the set of sensors that notice the targets is analyzed within the paper. Similarly, during a applied mathematics approach is employed to work out the minimum variety of sensors which may cowl an explicit space. Once an explicit variety of nodes are deployed to a field in keeping with a regular distribution, the minimum set of device nodes to cover the identical space because the original network is found. In additional, locating many disjoint sets of detector nodes which may cowl the area is mentioned. This way, every set will be scheduled to be operational throughout a unique time slice for providing a balanced operation which is able to increase the use of resources. Associated with this approach, during a heuristic that finds reciprocally exclusive sets of device nodes wherever every set entirely covers the network field is planned. The algorithmic rule ensures that only one set is active at a time. Using only a subset of nodes at when saves energy whereas maintaining the

coverage. A network is connected if all detector nodes will reach the sink, that additionally means that every node will reach one another, possibly by multiple hops. Sleep scheduling algorithms that only contemplate connectivity regardless of coverage. During a Geographic Adaptive Fidelity (GAF) algorithm is introduced which needs location information of the nodes. The algorithmic rule divides the network area into virtual grids. Nodes figure the grid that they belong to from their location information. Grids are organized so that any node during a grid will reach all the nodes within the adjacent grids. This puts a certain on the grid size and this bound is freelance from the node density. Nodes switch between sleeping, discovery and active states, with the necessity that one node in every grid stays awake so as to confirm property. Within the discovery state, nodes exchange discovery messages to seek out different nodes among identical grid.

2. LITERATURE REVIEW

Lubing Dong *et al.* [1] Authors have researched to extend the lifetime of a wireless sensor network and improve the energy performance of its nodes, it is important to use node collaborative sleep algorithm to reduce the number of unnecessary nodes in the network. This paper proposes a particle swarm optimization sleep scheduling mechanism for benefit in wireless sensor networks based on sleep scheduling algorithm. Ying-Hong Wang *et al.* [2] Authors have worked upon Wireless Sensor Networks(WSNs) how to extend the lifetime is an important issue. Our research uses Sleeping Scheduling scheme which divides the network into many coordinated layers and move sensors in different odd and even layers to sleep. Mohammad Hammoudeh *et al.* [3] Authors have proposed the research in wireless sensor networks is the development of routing protocols that provide application different service guarantees. This paper presents a new cluster-based Route Optimization and Load-balancing protocol, called ROL, uses different Quality of Service (QoS) metrics to suitable application requirements. To this end, an optimization tool for equalizing the communication resources for the pressure and importance of user applications has been advanced and Nutrient-flow-based Distributed Clustering (NDC), an algorithm for load balancing is proposed. Zhu, Chunshenget. *et al.* [4] has proposed the Collaborative location-based sleep scheduling for wireless sensor networks combined with mobile cloud computing. In this paper, motivated by these two observations, two odd collaborative location-based sleep scheduling (CLSS) strategy are planned for WSNs integrated with MCC. Based on the locations of mobile users, CLSS dynamically resolve the awake or asleep status of each sensor node to reduce energy utilization of the combined WSN. Particularly, CLSS1 centre on maximizing the energy utilization saving of the combined WSN while CLSS2 also examines the scalability and robustness of the combined WSN. C. Zhu *et. al.* [5]has conducted the survey on communication and data management puzzles in mobile sensor networks. All this cause the mobile wireless sensor networks (MWSNs) which can greatly build up the development and application of WSNs. In this paper, converging on researching the communication issues and data management issues in MWSNs, the authors have discussed different research mechanisms regarding communication and data management in MWSNs and offer any further open research areas in MWSNs. Yuichiro Takabe *et. al.* [9] building and energy management systems and home energy management systems are effective energy-saving strategies based on the visualization, control and management IT equipment. HEMS, an expensive node is required to visualize the result of analyzing energy consumption. In this HEMS, which is based on achievement of a cloud and a sensor network. In this method the cloud cost can be reduced because a supersaturated cloud is reasonable and also avoiding incidents for stable cloud operation. J. Broberg.et.al.[10] has worked on adaptive mobile cloud computing. In spite of advances in the efficiencies of mobile devices, a gap will move ahead to exist, and may even widen, with the requirements of well to do multimedia applications. Mobile cloud computing can support bridge this hole, maintaining mobile applications the effectiveness of cloud servers and storage together with the gain of mobile devices and mobile connectivity, possibly permissive a new generation of truly everywhere multimedia applications on mobile devices: Cloud Mobile Media (CMM) applications. H. T. Dinh *et al.* [11] has conducted the survey on mobile cloud computing: Architecture, applications, and approaches. Together with an stormy growth of the mobile applications and rising of cloud computing concept, mobile cloud computing (MCC) has been received to be a potential technology

for mobile services. This paper gives a inquiry of MCC, which helps general readers have an audit of the MCC including the definition, constructing, and applications. Giancarlo Fortino *et al.* [21] Spatially distributed sensor nodes can be used to analysis systems and humans constrains in a large range of applications domains. In this Paper, a system layout based on cloud computing for the management and analyzing of body sensor data segments.

3. DESIGN AND IMPLEMENTATION

Neighbor Formation

The neighbor formation is the process of initial stage connectivity between the wireless sensor nodes. The neighbor formation process is based upon the coordinate information sharing and distance based calculation. The nodes within the one hop distance and transmission radius are marked as the immediate neighbor for the nodes. The Pythagorean formula has been used for the purpose of distance calculation in the three dimensional environment. The formula is as following:

$$D_i = (x_i - x_j)^2 + (y_i - y_j)^2 + (z_i - z_j)^2$$

The neighbor formation is the fundamental process for the wireless sensor network connectivity. The neighbor formation process is the initial stage sensor node connectivity process initiated using the hello sharing and then followed by sharing the node location coordinates. The following algorithm describes the neighbor formation process in more detail:

Algorithm 1: Neighbor Formation

Assumptions:

1. The process of neighbor formation launch after initializing of sensor network and the sensor node form neighbor nodes that are present in direct transmission range.
2. All the sensor nodes are deployed randomly in clustered network. All the nodes broadcast data to their neighboring nodes without any acknowledgement.

Algorithm Logic

1. Start up nodes N.
2. All nodes will transmit their data in network to the Sink, neighboring nodes or the nodes that are in direct range.
   Transmission Radius: R (=250 meters), denotes the direct range
3. Node i out of Node N transmit neighbor formation message to all the other nodes that are present in the network.

$$Di(i,j) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2 + (z_i - z_j)^2} \quad (1)$$

$$\int_0^N transmit(x,y) \rightarrow i, \quad if\ Di < R \quad (2)$$

4. Node i will receive the j coordinate of all range and the nodes in the range of neighbors.
5. Node I will build up coordinate array.
6. Node I will compute the distance between every other nodes.
   Compute Distance(i,j) using (1)
7. Enable the process of Neighbor Formation for all the nodes with in the distance according to transmission range.

$$\text{Ni(j)} = \int_0^N \Sigma_{n=j}^{di<R}\ fn(x_j, y_j, d_{ij}) \quad (3)$$

   Where, Ni(j) denotes Neighbor Table array for node i.
   x_j denote x coordinate and y_j denote y coordinate.
8. Neighbor formation will be established and information of all neighbors will be updated in the corresponding neighbor table.

Localization Group Formation

Wireless sensor network Localization is the case of creating the inter-connections between the sensor nodes. The sensor node localization case connects the nodes with other nodes within the transmission range of each node. The nodes maintain the neighbor table for the shortlisted nodes. The neighboring nodes are further connected and grouped in the groups in order to facilitate the flexible and easy management of the nodes in near connections. The localization process further enables the routing process.

Algorithm 2: Localization Group Formation

1. Once the neighbor information exchange is complete then selection of anchor node will be done randomly.
2. Each anchor node will compute the distance of each node from itself.
3. The node with minimum hop-count and average distance will be connected with the anchor node.
4. In the final step, the anchor node will release and relay its role to other node with highest degree of connections on the distance of one –hop.

Sleep Scheduling

After the completion of the localization process the final step comes to sleep/awake scheduling the nodes in network, which are implemented small groups within in the WSN. The nodes are capable analyzing the traffic coming from the slave nodes or from base station. The algorithm first analyzes the ingress data then applies protocols of sleep/awake scheduling. It analyzes each group whether transmission is going on. IF transmission is going on then it waits to complete the transmission for sending the group into sleep mode. It applies on every node of the group. Following method is implemented to change the mode awake to sleep and vice versa for each group.

Algorithm 3: Aggregation Process

1. The algorithm analyzes the every node of each group in the network.
2. The system checks the data transmission between base station and nodes or between anchor node and slave nodes.
3. It tracks the nodes for their group.
4. It checks if the communication is going on then it waits to complete it. After that it sends that particular group into sleep mode.
5. Another group is on sleep mode if one group is awake.
6. If there is no transmission then the mode will be changed for each group in a particular time slot.

4. RESULT ANALYSIS

The major desire of tree-based routing is to tackle route instability by introducing neighborhood heuristics technique that involves a mixture of gift sensor node's routing metrics and therefore the metrics of its neighbors to spot of kind routes and different alternatives at the time of primary route failure. As a result, the sensors with multiple routing choices are chosen for forwarding the packets. This protocol is well suited for low power networks. The proposed model is based upon the energy aware tree based routing protocol. The tree based routing protocol is being used for the motile wireless sensor nodes. The proposed model has been built for the wide variety of the wireless sensor network application where mobility is required.

The proposed model has been well tested under various conditions in the sensor network simulation. The proposed energy based sleep scheduling protocol on sensor network has been well tested for the performance parameters of latency . The nodes in the recommended model simulation have performed well in terms of all of the above parameters. The latency has been recorded lesser than the ordinary sleep scheduling sensor networks with mobility or stationary positioning under the similar situations.

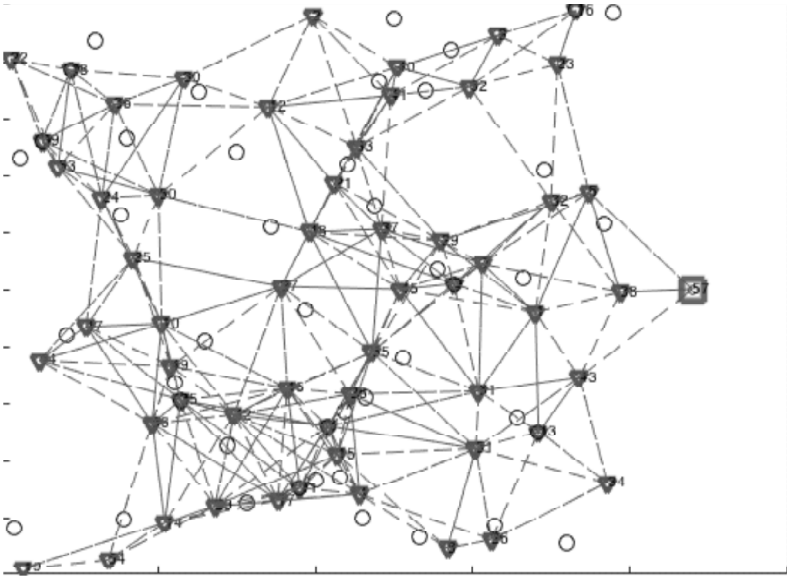

Figure 1: Sleep/Awake Model

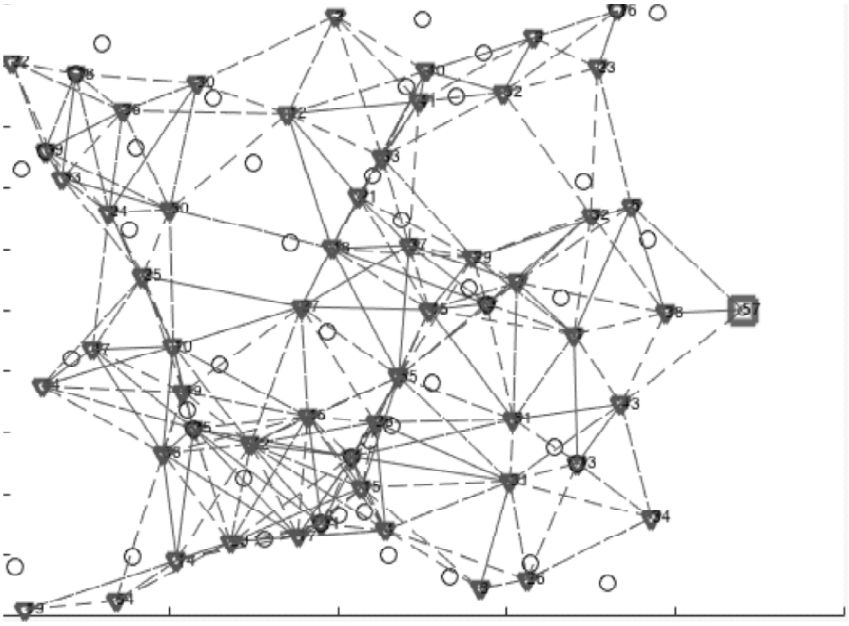

Figure 2: Data transmitting in one group

Table 1
Sleep Rate Comparison

No of Nodes	*Proposed*	*Existing*
100	33	30
150	37	34
200	36	37
250	42	42
300	40	48

Table 2
Comparison for coverage rate

No of Nodes	*Proposed*	*Existing*
100	95	80
150	96	85
200	97	86
250	98	90
300	99	98

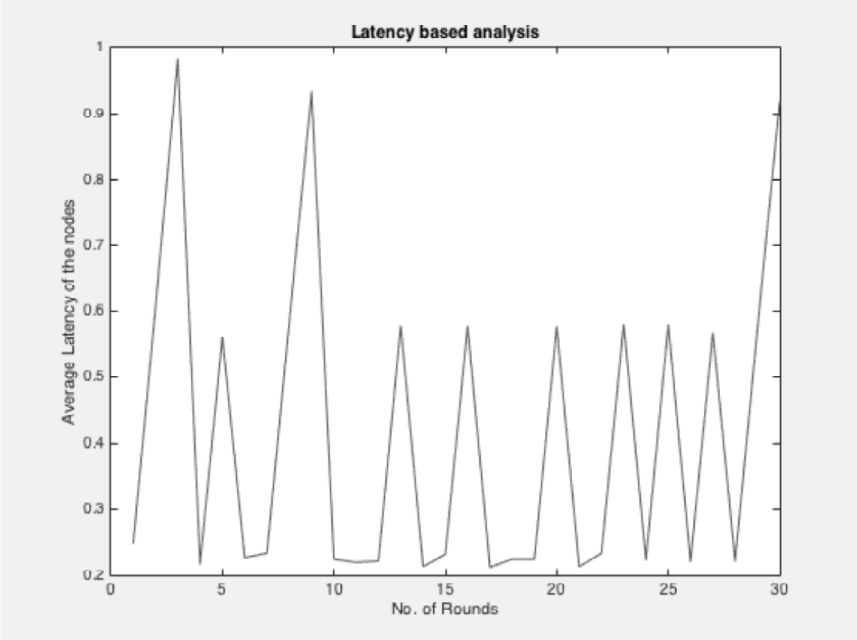

Figure 3: The graph shows latency based analysis

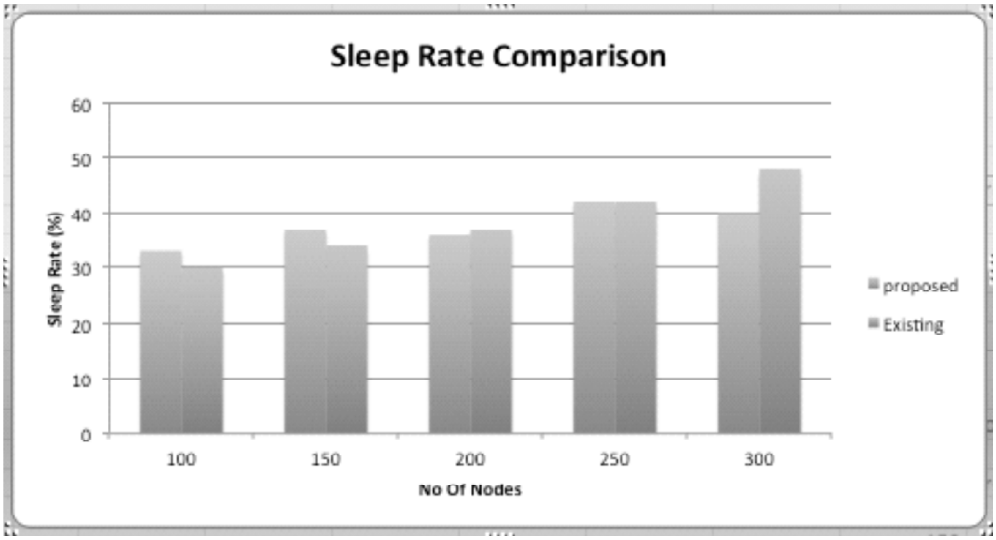

Figure 4: The Comparison graph of Sleep Rate

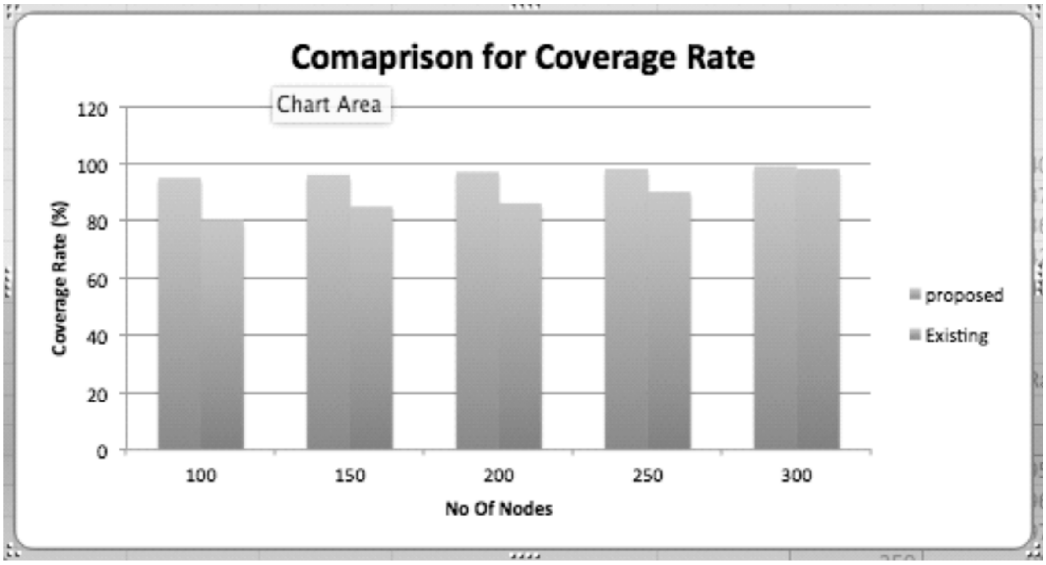

Figure 5: Comparison graph for coverage rate

5. CONCLUSION

This paper presented a sleep scheduling approach, called Collaborative Location Based Sleep Scheduling(CLSS). This approach grouped nodes into groups and build routing paths based on localized metrics which makes Collaborative Location Based Sleep Scheduling(CLSS) energy efficient. This work, distinguishes itself from current state of the art solutions in three aspects. First, it uses a combination of optimisable routing metrics to build energy efficient network at low cost. These parameters can be configured on second layer of network. Second, it defines a new network balancing method, with maximum coverage of network. Third, the work defines the low latency rate method and reduce data loss due to active all paths all the time.

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