ENERGY EFFICIENT AND RESOURCE ALLOCATION OF CLUSTERING IN AD HOC NETWORKS

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***Abstract*— We investigate how to achieve close-to-optimal utility performance in energy harvesting networks with only finite capacity energy storage devices. In these networks, nodes are capable of harvesting energy from the environment. The amount of energy that can be harvested is time-varying and evolves according to some probability law. We develop an online algorithm, called the Energy-limited Scheduling Algorithm (ESA), which jointly manages the energy and makes power allocation decisions for packet transmissions. In this phase, we have to detect unknown flow of data by generating unknown application which provides avoid network traffic and good security and performance using intra-cluster mechanism**

***Index Terms*—harvesting, Esa, intra cluster mechanism**

I. INTRODUCTION

A Wireless Sensor Network is a network of many sensor nodes, having wireless channel to communicate with each other. Without any centralized control and predefined communication link, it can transfer signals to the exterior world. All nodes are capable to act as source or sink node at the same time. These nodes have a limited processing power because of their tiny physical size, which limits the capacity of processor and size of battery. When collectively works together, they have an ability to collect information of the physical environment. They have transceiver to communicate with the virtual world and the physical world.

Routing topology to be used for the network depends on the transmission power available at its nodes. It also depends on the node's location, which may vary time to time. The main problem in ad-hoc networking is the efficient transmission of data packets to the mobile nodes. Hence, proper routing in ad-hoc networks is the challenge to the designers.

Advances in wireless communication made it possible to develop wireless sensor networks (WSN) consisting of small devices, which collect information by cooperating with each other. These small sensing devices are called nodes and consist of CPU (for data processing), memory (for data storage), battery (for energy) and transceiver (for receiving and sending signals or data from one node to another). The size of each sensor node varies with applications. For example, in some military or surveillance applications it might be microscopically small. Its cost depends on its parameters like memory size, processing speed and battery

Today, wireless sensor networks are widely used in the commercial and industrial areas such as for e.g. environmental monitoring, habitat monitoring, healthcare, process monitoring and surveillance. For example, in a military area, we can use wireless sensor networks to monitor an activity. If an event is triggered, these sensor nodes sense it and send the information to the base station (called sink) by communicating with other nodes.

The use of wireless sensor networks is increasing day by day and at the same time it faces the problem of energy constraints in terms of limited battery lifetime. As each node depends on energy for its activities, this has become a major issue in wireless sensor networks. The failure of one node can interrupt the entire system or application. Every sensing node can be in active (for receiving and transmission activities), idle and sleep modes. In active mode nodes consume energy when receiving or transmitting data. In idle mode, the nodes consume almost the same amount of energy as in active mode, while in sleep mode, the nodes shutdown the radio to save the energy.

The following steps can be taken to save energy caused by communication in wireless sensor networks.

- To schedule the state of the nodes (i.e. transmitting, receiving, idle or sleep).
- Changing the transmission range between the sensing nodes.
- Using efficient routing and data collecting methods.
- Avoiding the handling of unwanted data as in the case of overhearing.

In WSNs the only source of life for the nodes is the battery. Communicating with other nodes or sensing activities consumes a lot of energy in processing the data and transmitting the collected data to the sink. In many cases (e.g. surveillance applications), it is undesirable to replace the batteries that are depleted or drained of energy. Many researchers are therefore trying to find power-aware protocols for wireless sensor networks in order to overcome such energy efficiency problems as those stated above. All the protocols that are designed and implemented in WSNs should provide some real-time support as they are applied in areas where data is sensed, processed and transmitted based on an event that leads to an immediate action. A protocol is said to have real-time support if and only if it is fast and reliable in its reactions to the changes prevailing in the network. It should provide redundant data to the base station or sink using the data that is collected among all the sensing nodes in the network. The delay in transmission of data to the sink from the sensing nodes should be short, which leads to a fast response.

1.1 Purpose of the Project Contention Based or Contention free Protocols

MAC protocols are divided into two groups contention-based and contention-free. In the contention-based group, the protocol allows the multiple nodes to access the single channel. Each node has to sense the medium before sending the data. Collision can occur frequently, and retransmission is required. IN contention-free protocols, on the other hand, the channel is divided into time slots. Each node uses the time slot to send the data. It provides collision free communication because each node knows in advance about the time slots.

Synchronization: When sensors nodes in a network ensure that the receiving end can recognize the data that is transmitted at the other end in the exact order it is sent, this is known as synchronization between two nodes where the flow of data and receiving is done at the same rate**.** The node needs to have same notion of time in order to go to sleep and wake up at the same time.

Control Packet: A packet which is sent before the transmission between two nodes is known as control packet. Control packet contains the number of data bits sent, the address of the destination node and certain flags which can avoid collisions during transmission.

II. OVERVIEW OF THE PROJECT

The main objectives of this algorithm consists in reducing the reconstruction of the topology and stabilizing it as a long time as possible. This clustering algorithm can be used by several routing algorithms for ad hoc networks. The optimal cluster head characteristics: connectivity, energy and mobility, lead to a stable topology in terms of reconfiguration frequency.

III. RELATED WORK

" On the Optimal Allocation of Virtual Resources in Cloud Computing Networks"

Cloud computing builds upon advances on virtualization and distributed computing to support cost-efficient usage of computing resources, emphasizing on resource scalability and on demand services. Moving away from traditional data-center oriented models; distributed clouds extend over a loosely coupled federated substrate, offering enhanced communication and computational services to target end-users with quality of service (QoS) requirements, as dictated by the future Internet vision. Toward facilitating the efficient realization of such networked computing environments, computing and networking resources need to be jointly treated and optimized. This requires delivery of user-driven sets of virtual resources, dynamically allocated to actual substrate resources within networked clouds, creating the need to revisit resource mapping algorithms and tailor them to a composite virtual resource mapping problem. In this paper, toward providing a unified resource allocation framework for networked clouds, we first formulate the optimal networked cloud mapping problem as a mixed integer programming (MIP) problem, indicating objectives related to cost efficiency of the resource mapping procedure, while abiding by user requests for QoS-aware virtual resources. We subsequently propose a method for the efficient mapping of resource requests onto a shared substrate interconnecting various islands of computing resources, and adopt a heuristic methodology to address the problem. The efficiency of the proposed approach is illustrated in a simulation/emulation environment that allows for a flexible, structured, and comparative performance evaluation. We conclude by outlining a proof-of concept realization of our proposed schema, mounted over the European future Internet test-bed FEDERICA, a resource virtualization Platform augmented with network and computing facilities.

"Optimal Multiserver Configuration for Profit Maximization in Cloud Computing"

As cloud computing becomes more and more popular, understanding the economics of cloud computing becomes critically important. To maximize the profit, a service provider should understand both service charges and business costs, and how they are determined by the characteristics of the applications and the configuration of a multiserver system. The problem of optimal multiserver configuration for profit maximization in a cloud computing environment is studied. Our pricing model takes such factors into considerations as the amount of a service, the workload of an application environment, the configuration of a multi server system, the service-level agreement, the satisfaction of a consumer, the quality of a service, the penalty of a low-quality service, the cost of renting, the cost of energy consumption, and a service provider's margin and profit. Our approach is to treat a multi server system as an M/M/m queuing model, such that our optimization problem can be formulated and solved analytically. Two server speed and power consumption models are considered, namely, the idle-speed model and the constant-speed model. The probability density function of the waiting time of a newly arrived service request is derived. The expected service charge to a service request is calculated. The expected net business gain in one unit of time is obtained. Numerical calculations of the optimal server size and the optimal server speed are demonstrated.

"Optimal Power Allocation and Load Distribution for Multiple Heterogeneous Multi core Server Processors across Clouds and Data Centers"

For multiple heterogeneous multi core server processors across clouds and data centers, the aggregated performance of the cloud of clouds can be optimized by load distribution and balancing. Energy efficiency is one of the most important issues for large-scale server systems in current and future data centers. The multi core processor technology provides new levels of performance and energy efficiency. The present paper aims to develop power and performance constrained load distribution methods for cloud computing in current and future large-scale data centers. In particular, we address the problem of optimal power allocation and load distribution for multiple heterogeneous multi core server processors across clouds and data centers. Our strategy is to formulate optimal power allocation and load distribution for multiple servers in a cloud of clouds as optimization problems, i.e., power constrained performance optimization and performance constrained power optimization. Our research problems in large-scale data centers are well defined multivariable optimization problems, which explore the power-performance tradeoff by fixing one factor and minimizing the other, from the perspective of optimal load distribution. It is clear that such power and performance optimization is important for a cloud computing provider to efficiently utilize all the available resources. We model a multi core server processor as a queueing system with multiple servers. Our optimization problems are solved for two different models of core speed, where one model assumes that a core runs at zero speed when it is idle, and the other model assumes that a core runs at a constant speed. Our results in this paper provide new theoretical insights into power management and performance optimization in data centers.

"Optimal Route Queries with Arbitrary Order Constraints"

Given a set of spatial points DS, each of which is associated with categorical information, e.g., restaurant, pub, etc., the optimal route query finds the shortest path that starts from the query point (e.g., a home or hotel), and covers a user-specified set of categories (e.g., {pub, restaurant, museum}). The user may also specify partial order constraints between different categories, e.g., a restaurant must be visited before a pub. Previous work has focused on a special case where the query contains the total order of all categories to be visited (e.g., museum ! restaurant ! pub). For the general scenario without such a total order, the only known solution reduces the problem to multiple, total-order optimal route queries. As we show in this paper, this naı¨ve approach incurs a significant amount of repeated computations, and, thus, is not scalable to large data sets. Motivated by this, we propose novel solutions to the general optimal route query, based on two different methodologies, namely backward search and forward search. In addition, we discuss how the proposed methods can be adapted to answer a variant of the optimal route queries, in which the route only needs to cover a subset of the given categories. Extensive experiments, using both real and synthetic data sets, confirm that the proposed solutions are efficient and practical, and outperform existing methods by large margins.

IV. PROPOSED SYSTEM

We have to detect unknown flow data by generating unknown applications using intra-cluster mechanism and digital signature algorithm. Intra-cluster mechanism Provides good network performance, avoid the network traffic and improve security of message or data. Digital signature consists of identity of node, internet protocol address and verify each and every node profile history.

V. EXISTING SYSTEM

In Existing work, Energy-limited Scheduling Algorithm (ESA), which jointly manages the energy and makes power allocation decisions for packet transmissions. ESA only has to keep track of the amount of energy left at the network nodes and does not require any knowledge of the harvestable energy process. We Propose the Modified-ESA (MESA) algorithm to achieve the same close-to-utility performance, with the average network congestion and the required capacity of the energy storage devices being only ,which is close to the theoretical lower bound . In this paper achieves good performance and high power transmission

VI. ALGORITHM DETAILS

1.Election of the cluster head

Calculate the mobility of the node

The mobility is evaluated periodically in order to expect the future state of the network, it is defined as follows:
Where:
Si: the relative speed of the node vs the other nodes.
Di(*t*): the average distance between the node i and all its neighbors at time *t*.
n: the number of neighbors of node i.
dist(*i*,*j*)(*t*): the distance between node i and node j.
x and *y*: the coordinates of the node.

Compute the node degree

This is done as:
ei,*j* is a direct wireless link between node *i* and *j* at
time *t*.

Calculate the energy level of the node

This energy is also evaluated periodically in order to allow the adaptation to the future state of the network.

Calculate the quality of the node

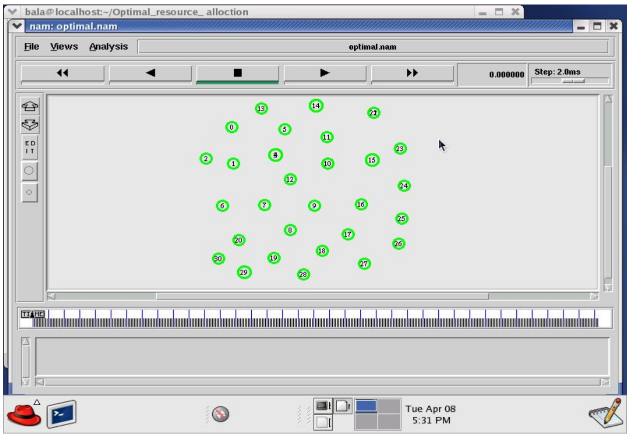
Compute the ratio for each parameter using three defined constants *Smax*, *Cmin* and *Emax*.
After this, calculate the quality for each node, i.e. its suitability for the cluster head role.

The constant quantities above are chosen depending on the state of the nodes and the network. *Smax* is the maximum speed possible for any node in the network. *Cmin* is the minimal connectivity (it is equal to 1, i.e. 1 neighbor).*Emax* is the maximum energy stored in the node battery. The node broadcasts its quality to their neighbors in order to compare the better among them. After this, the node that has the best quality is chosen as a cluster head.

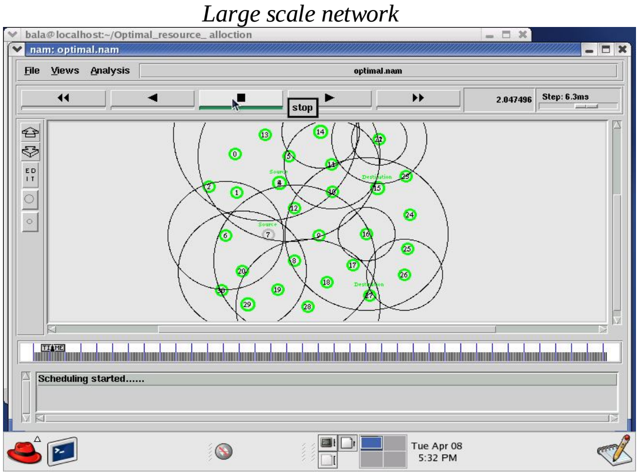
2.Formation of the cluster members'set

This stage is the final step of the algorithm. Here, we present the construction of the cluster members'set. Each cluster head defines its neighbors at two hops maximum. These nodes form the members of the cluster. Next, each cluster head stores all information about its members, and all nodes record the cluster head identifier. This exchange of information allows the routing protocol to function in the cluster and between the clusters. Due to the dynamic topology of ad hoc networks, the nodes tend to move in different directions and at different speeds, thus the configuration of clusters is necessary. Consequently, the system must be updated periodically. This update concerns the position of the nodes and their speed. The speed of a node is responsible for the change in its position. For this reason, the choice of the update time-slot is based on the speed of the node. If the mobility of the node is low, we suppose that its position does not change much and consequently we choose a longer time-slot, thus we avoid updates when it is not necessary. A periodical update with a higher frequency results in a great consumption of battery power and consequently, to more configuration changes.

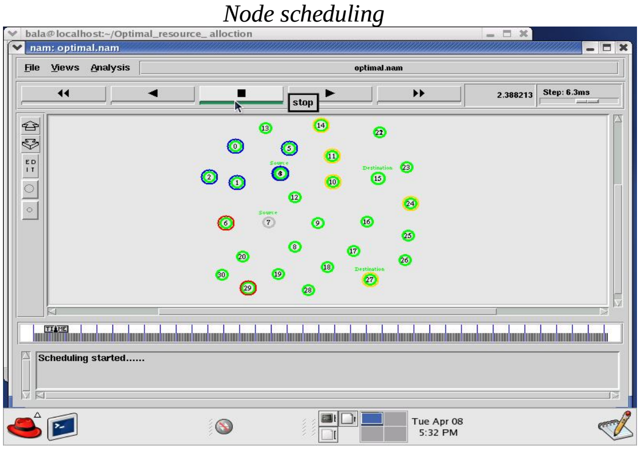
VII. EXPERIMENT RESULTS

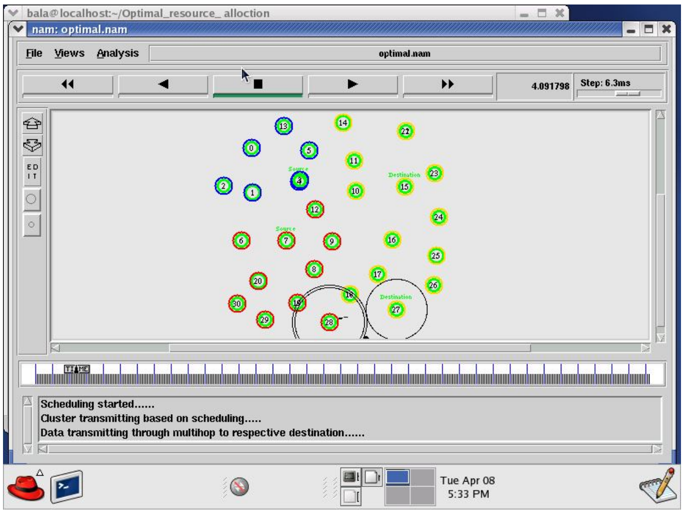


Large scale network



Node scheduling





Cluster transmitting data based on scheduling

CONCLUSION

In this paper, we have developed a clustering algorithm usable by large scale ad hoc networks with high mobility. This algorithm can be used by several MANET routing protocols. The main objective consists respectively in ensuring the stability of the clusters and in reducing the re-election of the cluster head. We have introduced some metrics to choose the cluster head in order to respect the capacities of the node and reflect the state of the network. These metrics merge together and provide a higher connectivity and economy of energy, as well as the best value of transmission range by using our SEMC algorithm that is developed. Simulations made via ns-2 (version 2.29) demonstrated the stability of our clustering algorithm under a large scale network with high mobility.

FUTURE WORK

We will study the impact of congestion on our clustering algorithm. Then we plan to evaluate the performances of our algorithm under more stressful scenarios such as network connections including bursts of data transmission.

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