ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 3, Issue 2, pp: (849-854), Month: April - June 2015, Available at: www.researchpublish.com

Design and Implementation of an Algorithm for Finding Frequent Sequential Traversal Pattern from Web Logs Based On WEI

[1]Mrs. Karuna Nidhi Pandagre, [2]Ms. Apoorva Joshi, [3]Ms.Megha Jain

[1,2,3] Assistant Professor, Department of Computer Science, Career College, Bhopal, India

Abstract: **A wireless ad-hoc network is a decentralized type of wireless network. It does not rely on a preexisting infrastructure, such as routers or access points. For communication, nodes of the ad-hoc network use a routing protocol, which just tells about the best possible route too be taken. But just having an optimal route is not enough, the nodes need to co-operate for the successful communication. So ,Co-operative communication is important because it harness the broadcast nature of wireless channel and enhance Throughput capacity and also reduce Retransmission latency . But the nodes have some limiting constraints like limited battery life and limited storage area. These constraints raise some doubt, to co-operate or not to co-operate with the neighboring nodes. When they co-operate completely, then the nodes expend energy relaying traffic for others, unfortunately decreasing their lifetime. And if they do not co-operate then the share of service each user should get drops. Many c-operative algorithms have been developed which use schemes like credit based also called incentive based schemes, and remuneration schemes to stimulate co-operation between the nodes. An acceptance algorithm called GTFT (Generous Tit For Tat) has been developed already. This distributed and scalable acceptance algorithm is used by the nodes to decide whether to accept or reject a relay request. This acceptance and rejection is based on a ratio called the Normalized Acceptance rate (NAR).It is the ratio of number of relay request made by the node that has been accepted to the number of relay request made by the node. This algorithm is a Tit for Tat method taking some generosity into account. But it does not consider an important notion of priority of the message. So, we can extend the GTFT algorithm so that it can handle the priority of messages.**

Keywords: **Wireless adhoc-network, Communication, Nodes, Algorithm, Message.**

1. INTRODUCTION

1.1 Background:

We can categorize a wireless network into two kinds. One is fixed wireless network and the other is ad hoc network. A fixed wireless network uses point co-ordinate function (PCF) and an ad hoc wireless network uses distributed co ordinate function (DCF). In a fixed wireless use communicate using the base station. A wireless ad-hoc network is a decentralized type of wireless network. It does not rely on a preexisting infrastructure, such as routers or access points. Each node participates in routing by forwarding data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity.

There are many types of ad hoc network. Wireless Mesh network (WMN) has communications network made up of radio nodes organized in a mesh topology. It has a more planned configuration. Next, mobile ad-hoc network (MANET**) .**It has a self-configuring infrastructure less network of mobile devices connected by wireless links. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Another is the wireless sensor network (WSN). It consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to a main location. And another type is the Vehicular Ad hoc network (VANET). A variation of Ad-hoc network called VANET is discussed , which support communication among smart vehicles and roadside equipment .A node stores and carries messages and forwards the message to another node whenever two nodes come into communication range

For communication, nodes use a routing protocol. This routing protocol just tells about the best possible route too be taken. But just having an optimal route is not enough, the nodes need to co-operate for the successful communication. In Wireless Ad hoc Network, nodes communicate with far off destinations using intermediate nodes as relays. All Networking services are provided and are available if the relays are willing to do so. So ,Co-operative communication is important because it harness the broadcast nature of wireless channel and enhance Throughput capacity and also reduce Retransmission latency .But the nodes have some limiting constraints like limited battery life, limited storage area and energy constraints. These constraints raise some doubt, to co-operate or not to co-operate with the neighboring nodes. When they co-operate completely, then the nodes expend energy relaying traffic for others, unfortunately decreasing their lifetime. And if they do not co-operate then the share of service each user should get drops. So, there is a trade -off between individual user's lifetime and the received service. Taking this into view some strategies should be designed to enforce co-operation among nodes. The problem of co-operation can be seen in various kinds of networks. These networks include Mesh networks, Sensor Networks and Vehicular networks.

1.2 Motivation:

Different kinds of nodes exist in the system like selfish, overloaded, misbehaving, or broken. A selfish node is not ready to spend his energy to provide service, but expects other nodes to provide service to it. An overloaded node does not have enough battery or network resources to relay traffic for others. Malicious nodes purposely drop packets and are unwilling to provide service. And a broken node may have a software fault in it. Various scheme and algorithms have been proposed to enhance co-operation in the network which have various kinds of nodes.

Many successful routing mechanisms have been developed. But just routing will not solve all the problems related to communication. Routing just provides the rules and the route that the nodes should follow. But in order to follow the routing scheme there should be some motivation schemes like incentive scheme, remuneration schemes when they co – operate and punishment schemes when they do not. So if co-operation is included in the routing then it will result in efficient communication.

2. REVIEW OF PREVIOUS WORK

2.1 Related Work:

To enforce co-operation it is of utmost importance that there should be means to identify malicious, selfish and other nodes, so that it is known with whom to co-operate and not co-operate .As discussed previously there are many kinds of nodes in a network. So, the problem is solved by introducing mechanisms like watchdog and path rater [1].The watchdog method is used to find nodes that misbehave. It was implemented by maintaining a buffer which will store recently sent packets .These are compared with the overheard packets, and if a match is found then they are discarded. The path rater algorithm is run by each node. It obtains information about the misbehaving nodes (nodes that do not forward the packet) from the watch, then combines this information with the link reliability information and finds the most reliable route.

Once the misbehaving nodes are identified, the routes which pass through these nodes are rejected and other routes are considered for routing. There should be some stimulation mechanism which will encourage the nodes to co-operate and relay the traffic. So two approaches have been identified .One is the reputation based approach, and another is the credit based approach. One such credit based approach is applied by using models like Packet purse model and Packet trade model [2)].Here a currency is introduced called nuggets. The nodes that use the service has to pay for it in nuggets and the nodes that provide the service are remunerated. Hence nodes are motivated to increase their number of nuggets by relaying traffic i.e. by providing service to others. The nodes also no longer send useless messages because in that way they will lose their nuggets.

Another remuneration algorithm developed was Nuglet [3], a micro payment system. It does this through the use of a nuglet counter, which is incremented whenever nodes forward packets for others. Conversely, the nuglet counter is decremented when a node, sends out a packet. If required number of nuglets is not available then nodes cannot send out packets. Hence, nodes increase their counter values by forwarding packets. Also, the algorithm includes a battery counter, which is decremented whenever a node sends or receives a data packet. It represents the battery power that is left in the node as well the number of packets that a node can send out before its battery life runs out. Based on these counter values it decides whether to or not to relay packets.

Apart from credit based or incentive based mechanisms there are also reputation based mechanisms. The first one is CORE [5] and the other one is CONFIDENT [4]. These techniques are based on monitoring system and reputation system. In this technique each node receives reports from other nodes. The difference between CORE and CONFIDANT is that CORE only allows positive reports to pass through, but CONFIDANT allows negative reports. This means that CORE prevents false reports thus preventing a DOS attack which CONFIDANT cannot do. When a node does not cooperate, a negative rating is given and its reputation decreased. And when, a positive report is received from this node and its reputation increases.

In paper (6) an acceptance algorithm called GTFT (Generous Tit For Tat) has been developed to decide whether a node will accept or reject a relay request. It is based on game theory and concepts like Nash Equilibrium is used. Nash Equilibrium says "No player can benefit from unilaterally changing its strategy". This implies there should be co-operation between the nodes to decide a strategy of co-operation. The GTFT strategy calculates the NAR (Normalized Acceptance Rate).If a node has relayed more traffic than what it should or the amount of traffic relayed by the node is greater than the amount of traffic relayed for the node by others, then it would reject the request also being generous on some occasion by agreeing to relay even if it does not get the reciprocal amount of help.

In paper (7) , an incentive scheme is proposed to encourage the nodes to forward messages in a VANET (Vehicular Ad-hoc network).A variation of Ad-hoc network called VANET is discussed , which support communication among smart vehicles and roadside equipment .A node stores and carries messages and forwards the message to another node whenever two nodes come into communication range. So, here also co-operation between the nodes is necessary .Some multicast protocols are discussed in paper (3).In paper (2) about VANET ,coalitional game theory is used to solve forwarding co-operation problem in VANET.

Incentive scheme in self organized vehicular network is proposed in (8).This scheme is also based on behavioral strategy where a node is rewarded depending on its level of involvement in the routing process. Schemes based on reputation were here discarded due to the high mobility of nodes in VANETs, which makes infeasible to maintain historical information about peers behavior. And in rewarding incentive schemes there is the possibility for selfish or malicious users in the vehicles to exaggerate their contribution in order to get more rewards. Also this model produces a network overload. So, these two problems need to be dealt. In the scheme, they have assigned different possible incentives to vehicles according to their contribution in packet forwarding, in an effort to achieve fairness and provide stimulation for participation. A weighted rewarding component. is used to decide the specific incentive in each case so they help to keep the packet forwarding attractive to the potential intermediate vehicles. contribution Ci to packet forwarding of a node i during the forwarding process may be modeled as a linear convex combination balancing numbers of forwarding fi and the period the packet is stored ti: as $Ci = \alpha ti + (1 - \alpha) fi$ the reward associated to each intermediate node Ri after the packet reaches the destination according to the following formula: $Ri = R \cdot Ci$ and C where $C = \Sigma Ci$.

The concept of co-operation till here was discussed at the network layer, as to how the nodes are encouraged to co-operate with their peers. Co-operation can also be applied at the MAC layer of IEEE 802.11.Here the nodes are encouraged to co-operate because that results in better throughput, better data rate and better transmission time. A protocol called 2rcMAC (9) is discussed which increases the performance of the communication. It is an improvement over CoopMAC protocol proposed by Liu, in which data rate is compared between the direct path and the relay path. The path which gives better throughput is taken to do the transmissions. But here there is no backup path in case the transmission fails. But 2rcMAC improves this drawback. It uses two best relays as co –operating nodes to achieve superior throughput and delay performance, if compared with the existing MAC protocols. The secondary relay path is invoked as backup path for better transmission reliability and higher throughput for the relay path. The two best relays are chosen such that the total transmission time through the first relay plus the backup relay path is less than direct transmission time i.e. $(R_{sr1}R_{r1d} / R_{sr1} + R_{r1d}) > \alpha R_{sd}$ where α is a discreet value greater than unity.

Another network called wireless sensor networks (WSN) is discussed in which energy efficiency is crucial to achieving satisfactory network lifetime. The most commonly used and may be the only efficient method to reduce the energy consumption significantly is to turn off the radios most of the time, except when it has to participate in data communication. In cooperative wireless communication node cooperation has been exploited to reduce end-to-end delay, improve transmission reliability, etc. In this paper, they have exploited the possibility of cooperative power saving in wireless ad-hoc networks. The trade-off between energy consumption and delay is studied. It is shown that cooperation together with asymmetric power allocation can achieve the optimal delay-power trade-off.

2.2 Noteworthy Contribution:

A distributed and scalable acceptance algorithm GTFT (6) is proposed. This algorithm is used by the nodes to decide whether to accept or reject a relay request. This acceptance and rejection is based on a ratio called the Normalized Acceptance rate (NAR).It is the ratio of number of relay request made by the node that has been accepted to the number of relay request made by the node. This ratio gives some idea of the share of service received by the node. The algorithm uses game theoretic model. In this, N nodes distributed among K classes (energy classes) are considered. The energy constraint for each of the classes is given. Four parameters are calculated to decide whether to reject or accept a relay request.

A = No. of relay request made by the node that have been accepted.

B = No. of relay request made by the node.

C = No. of relay request made to the node that have been accepted by the node.

D = No. of relay request made to the node.

Γ = rational Pareto optimal acceptance probability

Compute:

$\Phi = A/B$

$\Psi = C/D$

The algorithm followed by the node when it receives a relay request is as follows:

If $(\Psi > \Gamma)$ or $(\Phi < \Psi - \varepsilon)$, reject

Else accept

This implies the amount of traffic relayed by node is greater than what it should do OR the amount of traffic relayed by node is greater than the amount of traffic relayed for node, and also being generous sometimes by relaying traffic for others even if they have not received a reciprocal amount of help. The algorithm should achieve an optimal operating point such that there is optimal tradeoff between the individual user's life and the received service.

Another type of network considered is Vehicular Ad hoc Network (VANET) (7). Its main goal is to improve safety and comfort for passengers, but it can also be used for commercial applications. The main advantage of VANETs is that they do not need an expensive infrastructure. However, their major drawback is the comparatively complex networking management system and security protocols that are required. This difficulty is mainly due to some specific characteristics of VANETs that allow differentiating them from the rest of MANETs such as their hybrid architecture, high mobility, dynamic topology, scalability problems, and intermittent and unpredictable communications. Consequently, these features have to be taken into account when designing any management service or security protocol. Here basically two kinds of nodes are discussed an ordinary node that may be selfish because its storage capacity decreases when it forwards the relay request, and another with active mobility on the road (Ex. Taxi) which are taken as forwarders. But if they are overloaded with services then much of their communication resources will be consumed or finished and they start deviating from its behavior. So, an incentive scheme based on credits is proposed to stimulate the message forwarding. This approach is based on coalitional game theory. In this the system consists of a number of smart vehicles that have VANET communication devices installed on it. There is a central authority called virtual credit center (VCC) that issues authentication certificates to the nodes. Every node has an account in the VCC.As VANET has the nodes which have high mobility it is not possible for them to constant be connected to the VCC, so they temporarily store the information and exchange it with VCC when they are close to some infrastructure. If a node has co-operated in relaying the traffic then it is remunerated by VCC in the form of virtual currency. Similarly the source node is charged when it generates the packet and transmits them. When the source node wants to send a message it finds the digital signature, and sends the message together with the message digest digital signature, to the intermediate node. The intermediate node, on receiving the message verifies the signature using the senders public key , then keeps a brief record of their meeting in the form of triplet (ts, id,Rinf), where ts is the time they meet,id is the identifier of the source and Rinf if the Routing information i.e. Routing Protocol being used. Thereafter it transmits the message to the destination. Whenever the nodes meet they make the meeting records and send them as a receipt to the VCC.Whenever nodes meet the VCC they exchanges this information with it and increment or decrement the virtual currency. The destination on receiving the message calculates the number of copies and submits its receipt. The VCC on receiving the receipts match the contents and accordingly compute the payoff allocations.

3. PROBLEM IDENTIFICATION & METHODOLOGY

In the acceptance algorithm of (6) it is believed that users are only rational and selfish but it does not take into account the misbehaving nodes, so we can implement advanced watchdog mechanism to take into account all kinds of nodes and improve the GTFT algorithm.

In paper (7) the incentive scheme it is assumed there is no communication failure for control messages at the physical level of each link. It is observed that if on meeting, the nodes make their meeting records and suddenly the communication failure occurs, then the message does not reach the destination node but for the intermediate nodes the payoff is allocated on submitting the receipt. So algorithm can be designed to take into account the communication failure that may occur and also bring into the aspects of security.

A modification can be made to the existing co-operation protocol by including the Priority measure. In GTFT it is observed that relaying the messages is dependent on the past behavior of the node. In short GTFT follows behavioral strategy. In GTFT a node will get the service if it has provided service to others. But in this scenario priority factor is not considered. For example in the vehicular network there are messages relating to product promotion which are relayed by the intermediate node, but suddenly if a message relating to route change because of traffic jam is to be relayed, and the node's resources are getting over, then preference should be given to that message. And enhanced co-operation should be provided by the network nodes to relay the prioritized messages.

4. CONCLUSION

For communication, routing protocol is important. But for successful communication, the nodes need to co-operate. In Wireless Ad hoc Network, nodes communicate with far off destinations using intermediate nodes as relays. So, the relay nodes have a great importance in ad hoc network. Also, all networking services are provided and are available if the relays are willing to do so. Hence there should be some co –ordination and co-operation between the relays. Co-operative communication is important because it harness the broadcast nature of wireless channel and enhance Throughput capacity and also reduce Retransmission latency .But the limiting constraints like limited battery life, limited storage area ,limit the nodes to co-operate with the neighboring nodes.

There are many motivation schemes designed already like incentive scheme, remuneration schemes when nodes co – operate and punishment schemes when they do not. There are some drawbacks in some of the existing schemes like the GTFT algorithm does not take into account the misbehaving nodes. In other schemes, communication failures like breaking of the physical link, collision of messages etc. are not taken into consideration.

So, more efficient co –operative algorithms can be designed taking the above points into consideration and also an important parameter named Priority can be included. This enhancement can take into account all the prioritized messages that are in transit.

REFERENCES

[1] Sergio Marti, T.J.Giuli, Kevin Lai, Mary Baker. Mitigating Routing Misbehavior in Mobile Ad hoc Network. Proc. Int. Conf. Mobile Computing and Networking, Boston.MA, Aug 2000 pp 255 – 265.

[2] L.Buttyan and J.P. Hubaux. Enforcing Service Availability in Mobile Ad-HocWANs, Proc. of Workshop on Mobile Ad-hoc networking and Computing (MobiHOC), Boston, USA, August 2000.

[3] J.P Hubaux, Stimulating Cooperation in Self-Organizing Mobile Ad Hoc Network, Technical Report No. DSC/2001/046, August 2001.

[4] S. Buchegger and J. Le Boudec, Performance analysis of the CONFIDANT protocol: (Cooperation of nodes fairness in dynamic ad-hoc networks), in Proc. IEEE / ACM Workshop on Mobile Ad Hoc Networking and Computing. , Switzerland, June 2002 pp.226-336

[5] P. Michiardi and R. Molva, Core: a collaborative reputation mechanism to enforce node cooperation in mobile ad hoc networks. Communication and Multimedia Security Conference September 2002.

[6] Vikram Srinivasan, Carla Fabiana, Pawan Muggehalli.An Analytical approach to the study of Co-operation in Wireless Ad-hoc Network. IEEE Transactions on Wireless Communications Vol 4, No. 2 March 2005.

[7] Tingting Chen, Liehuang Zhu.Stimulating Co-operation in Vehicular Ad-hoc Network: A Coalitional Game Theoretic Approach. IEEE Transactions on Vehicular Technology Vol 60, No. 2 February 2011.

[8] P. Caballero-Gil, J. Molina-Gil, C. Hernandez-Goya and C. Caballero-Gil. Stimulating Cooperation in Self-organized Vehicular Network. Proceedings of the 15th Asia-Pacific Conference on Communications (APCC 2009)-082.

[9] Murad Khalid, Yufeng Wang,In ho Ra and Ravi Shankar. Two Relay Based Co-operative MAC Protocol for Wireless Ad-hoc Network. IEEE Transactions on Vehicular Technology Vol 60, No. 7 September 2011.

[10] Liping Wang and Viktoria Fodor.Cooperative Geographic Routing in Wireless Mesh Networks 2010.

[11] Guanfeng Liang; Vaidya.Cooperation helps power saving. Mobile Ad hoc and Sensor Systems, 2009. MASS '09. IEEE 6th International Conference on Oct. 2009.

[12] L. Wang, V. Fodor, and M. Skoglund, Using cooperative transmission in wireless multihop networks in Proc. of IEEE PIMRC 2009.

[13] Walid Saad, Zhu Han, Are Hjrungnes, Dusit Niyato, and Ekram Hossain. Coalition Formation Games for Distributed Cooperation among Roadside Units in Vehicular Networks. IEEE journal on selected areas in communications, vol. 29, no. 1, january 2011.

[14] K. Yang, S. Ou, H.-H. Chen, and J. He A multihop peercommunication protocol with fairness guarantee for IEEE 802.16-based vehicular networks," IEEE Trans. Veh. Technol vol. 56, no. 6, pp. 3358–3370, Nov. 2007.

[15] D. Ray, A Game-Theoretic Perspective on Coalition Formation. New York, USA: Oxford University Press, Jan. 2007

[16] W. Saad, Z. Han, M. Debbah, A. Hjørungnes, and T. Bas¸ar, "Coalition game theory for communication networks: A tutorial," IEEE Signal Processing Mag., Special issue on Game Theory in Signal Processing and Communications, vol. 26, no. 5, pp. 77–97, Sep. 2009.