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An Efficient Peer-to-Peer Distributed Scheduling for Content Based File Sharing in Manet

K. Swathi
Research Scholar, Dept of computer science,
Sri Ramakrishna College of Arts & Science for Women
Coimbatore- 641044, Tamil Nadu, India.

Dr. G.Satyavathy
Assistant Professor, Dept of computer science,
Sri Ramakrishna College of Arts & Science for Women
Coimbatore- 641044, Tamil Nadu, India.

***Abstract*- File sharing applications in Mobile Ad hoc Networks plays a vital role in modern years. The effectiveness of file querying suffers from the distinct properties of such networks including node mobility and restricted communication range and resource. A spontaneous method to lighten this problem is to create file duplication in the network. No research has focused on the universal best reproduction creation with least querying delay. In this research work P2P content-based file sharing system, namely Improved SPOON (ISPOON) is implemented for disconnected MANETs. The method uses an interest extraction algorithm to obtain a node's attention from its files for content-based file searching. For efficient file searching, Social network based P2P cOntent-based file sharing in mObile ad hoc Network (SPOON)groups common-interest nodes that often meets with each other as communities and consider storage as resource for replica, but ignore the fact that the file holders frequently meet other nodes and also plays an important role in determining file accessibility. A node that meets frequently with others nodes affords higher availability to its files. This becomes even more apparent in lightly distributed MANETs, where nodes meet disruptively the protocol can attain minimum querying delay at a lower cost than existing replication protocols.**

Key Words*- *P2P network, File replication, Query delay.

I. INTRODUCTION

A. Mobile Ad Hoc Networks

A Mobile Ad hoc Network (MANET) is a continuously self-configuring, infrastructureless network of mobile devices linked without wires. In these networks, the nodes perform as routers. They play a significant role in the discovery and maintenance of the routes from the source node to the destination node or from one node to another node. If link failure occurs, the network has to stay ready by finding new routes. The main technique used is the multi-hopping which improves the overall network capability and performance. By using multi-hopping, one node can distribute data on behalf of another one to reach the destination. A MANET represents a system of wireless mobile nodes that can self-organize freely and dynamically into random and non-permanent network topology. On one hand, they can be quickly organize anywhere at any time as they reduce the difficulty of infrastructure setup. On the other hand, other trouble arises such as routing errors or higher overhead, caused by the mobility of nodes. In order to avoid some bugs or difficulties, it is necessary to examine the protocols officially before the protocols are deployed or applied. The traffic types in adhoc networks are quite different from those of an infrastructure wireless network. It includes: Peer-to-peer, Remote-to-remote and Dynamic tragic.

II. RELATED WORK

Qureshi et al [3], presents an adaptive protocol to implement a Mobile Social Network based on P2P content driven communication when end-to-end connectivity is not possible. The proposed protocol reflects on the information about user's interests. The content based data storing and forwarding, and host mobility in a disconnected and delay tolerant MANETs. The authors define a three layer stack in the protocol. The top layer supports the user interface which works as an application layer. Then the middle layer provides support for content driven data dissemination in the form of documents and messages. And the third layer is responsible for data forwarding to distant nodes in a multi-hop manner. In order to unicasting messages from point to a specific point in the network, the protocol considers using Ad hoc on-demand Distance Vector (AODV).

Li et F al [4], proposed a distinctive publish or subscribe scheme that exploits the enduring social network properties, which are practical in many DTN (Disruption Tolerant Network), to facilitate content-based services in DTNs. It distributively constructs community based on the neighboring relationships from nodes which come across the histories. Nodes within a community, communicates directly when the actions and interests matches as they have strong intra-community relationships. Inter-mediators are organized to bridge the communities, and they adopt a nearby weighted publish or subscribe scheme which merge the structural importance with subscription interests, to make a decision what actions they should gather, store and broadcast.

Costa P et al [1], proposed Social Cast routing structure for publish-subscribe that utilize prediction based on metrics of social interaction to recognize the best information carriers. It demonstrates the action, and evaluates its performance using a mobility representation based on a social network and authorized with real human mobility traces. The estimation shows that the prediction and the distribution of node mobility for maintaining a very high and steady result with low overhead and latency. Although the variation in density and number of replicas per message or speed.

Daly et al [2], proposed the use of social network analysis techniques in order to forward data in a disconnected delay-tolerant MANET. Social networks exhibit the small world phenomenon which comes from the observation that individuals are often linked by a short chain of acquaintances. Simulations using actual trace data to display that SimBet Routing results in delivery performance close to Epidemic Routing but with extensively reduced overhead. Additionally, it shows that SimBet Routing outperforms PROPHET Routing, mainly when the sending and receiving nodes have low connectivity.

Chen et al [5], states file replication protocols in MANETs with have two shortcomings. First, it lacks a rule to assign restricted resource to dissimilar files in sort of minimizing the average querying delay. Second, consider storage as resource for replicas, but ignore the truth that the file holder's occurrence of meeting other nodes also plays a significant role in determining file accessibility. A node having a high meeting frequency with other nodes provides higher accessibility to its files. In this paper, a new idea of resource for file replication is established, which considers both node storage and meeting frequency. The theoretical study influences the resource distribution on the average querying delay and derives a resource allocation rule to reduce the average querying delay.

Chen et al [6], proposed SPOON is novel Social network based P2P content file sharing in mobile ad-hoc Networks. It mainly rely on that it leverages social network properties of both node interest and movement model. SPOON consists of three parts: the first part is interest extraction algorithm which derives a node's interests from its files; the second part is community construction algorithm which enables users to efficiently retrieve files using intra- and inter-community communication; the third part is node role assignment algorithm which designates the community coordinator and ambassador. A stable node which tightly connects others in its community is designated as the community coordinator. And the community coordinator will guide intra-community searching. For each foreign community, a node that repeatedly travels to it is selected as the community ambassador. And the ambassador will direct inter-community searching.

III. METHODOLOGY

Peer-to-Peer consist a set of self-organized and interconnected nodes, forming a topology that enables the sharing of computer resources (content, network bandwidth, storage capacity, processing power) through direct exchange. Peer-to-Peer file sharing method defines a "High overhead and low scalability" between different nodes from source to destination during communication. The proposed model is based on multiple hops between source and destination. The shortest path is calculated by using Inter and Intra community file searching retrieval algorithm. The source node broadcast a route with multiple hop at a specific time. This results in minimization of energy consumption.

A. *Chord Protocol*

The Chord protocol is one of the solutions for connecting the peers of a P2P network. It improves the scalability of reliable hashing by avoiding the requirement that every node has information about every other node. A Chord node needs a little amount of "routing" information about other nodes. It has been developed for distributed lookup protocol. Its primary function is to map a specified key to a node. It provides fast distributed computation of a hash function mapping keys to nodes related to them. Chord uses consistent hashing to offer keys to the nodes. Whenever a new node enters the organization the keys are evenly distributed to all the nodes thereby maintaining a well distributed load. Since a chord node stores information about some of the other nodes located close to it. All this information is stored in a distributed manner, so each node receives the hash value from other nodes. The number of nodes is make contact with to find a successor in an N-node network is O(log N). Chord revises the routing information when a node appear or disappear in the network and it requires O(log2 N) messages.

The cost Lchord for chord protocol is,

$$d = 2\alpha\sqrt{N/\pi} \text{ ------------- } (1)$$

$$\mathrm{Lchord} = d * \log(N) \text{ ------------- } (2)$$

where d is the distance between nodes, α is the constant, L is the nearest number of nodes in the network, N is the total number of nodes in the network.

B. *Route Selection Based On Route Fragility*

Route Fragility Coefficient (RFC) merges the individual link contraction or expansion performance to present a combined picture of the mute dynamics. This metric can be used as a origin for route selection so that route discovery increases the throughput while reducing overhead. The destination processes a Route Request (RREQ) packet and sends a route reply packet in the reverse path. Thus the destination chooses a route for the source.

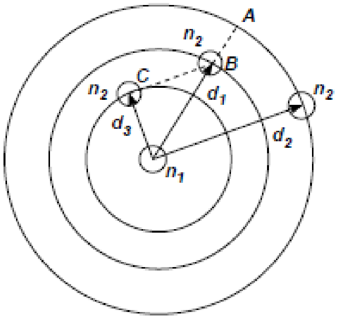


Fig.1. Node Moving Speed and Position

Figure.1 indicates two nodes n1 and n2, with d1 and d2 being distances corresponding to the positions of node n2 at received powers of P1 and P2. To estimate the relative speed of the nodes, there is no need the exact position of the two nodes. Assuming a free space path loss model,

$$P_i = \frac{K}{d_i^2} \Rightarrow \frac{d_i}{\sqrt{K}} = \frac{1}{\sqrt{P_i}} \text{ ----------- (3)}$$

where P is the receiving power, d is the distance and K denotes a constant that depends on the antenna gains of the two nodes and the wavelength of the transmission.

$$\frac{d_2 - d_1}{\sqrt{K}} = \frac{1}{\sqrt{P_2}} - \frac{1}{\sqrt{P_1}} \text{ ------------ (4)}$$

$$\frac{v}{\sqrt{K}} = \frac{1}{(t_2 - t_1)}\left(\frac{1}{\sqrt{P_2}} - \frac{1}{\sqrt{P_1}}\right) \text{------------ (5)}$$

The second equation allows computing the relative speed v, normalized by the constant K and t denotes the time.

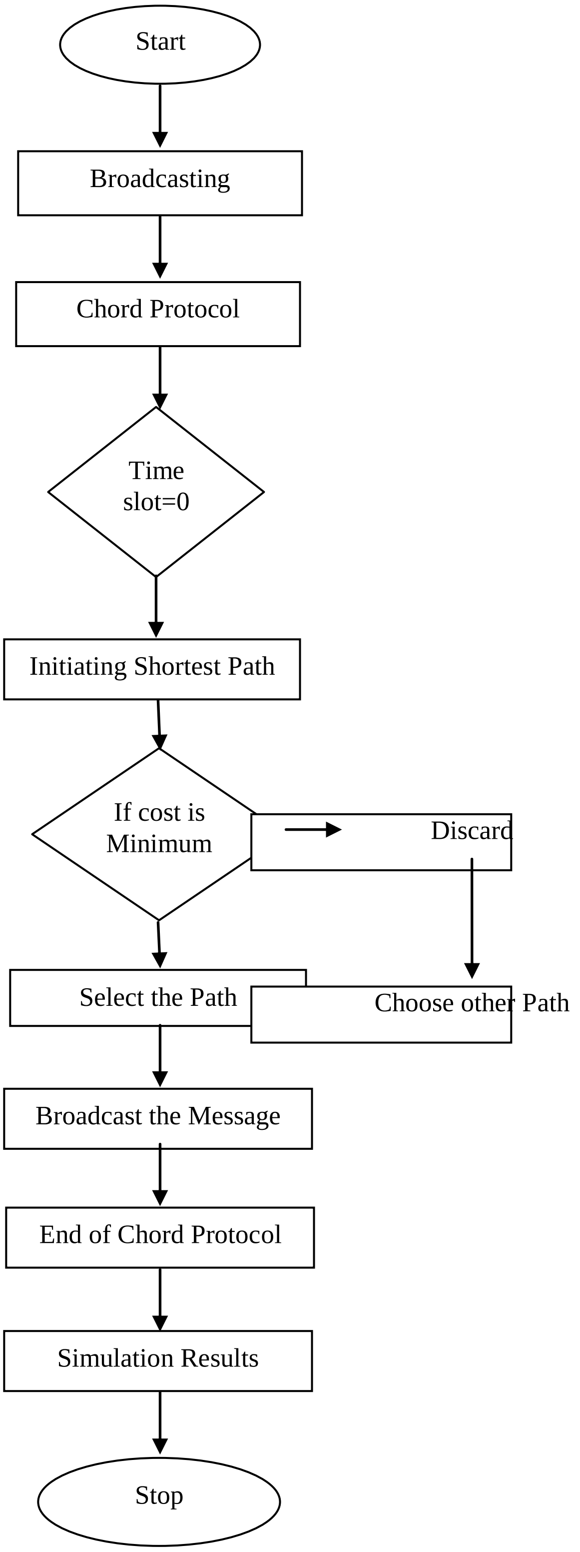


Fig.2. Flow Diagram of Proposed work

In the above flow diagram, the message is broadcasted from source node using chord protocol. The starting time slot is set as 0. Initiating a shortest path based on the cost of node. If the cost of the path is minimum, the path is chosen. If the cost of the path is maximum, then discard the path and choose another path.

Algorithm to update RREQ packets with expansion or contraction information

Input: A RREQ packet from node s
Last two received power measurements P1, P2, for node s
if No Power Samples then
CUM ← CUM + 1; return
end if
if P2 < P1 then
Compute relative speed estimate v
CEM ← CEM + v
end if
if P2 > P1 then
Compute relative speed estimate v
CCM ← CCM + v
end if

The RREQ packet is enhanced with three fields, a Cumulative Contraction Metric field (CCM), a Cumulative Expansion Metric field (CEM), and a Cumulative Uncertainty Metric field (CUM). CUM is used to indicate the number of links and there are one or no received power measurements and computing CCM (or CEM) is not possible. When a RREQ is received from a source, the MAC layer passes the previously received power information for this source and the received power for the RREQ packet. The routing layer obtains two power samples (P1, P2) for the previous hop. If there are no power samples, then the CUM adds the packet. If P2 less than P1, the CEM estimates the relative speed (v). If P2 is greater CCM estimates the speed. The advantage of proposed methodology is

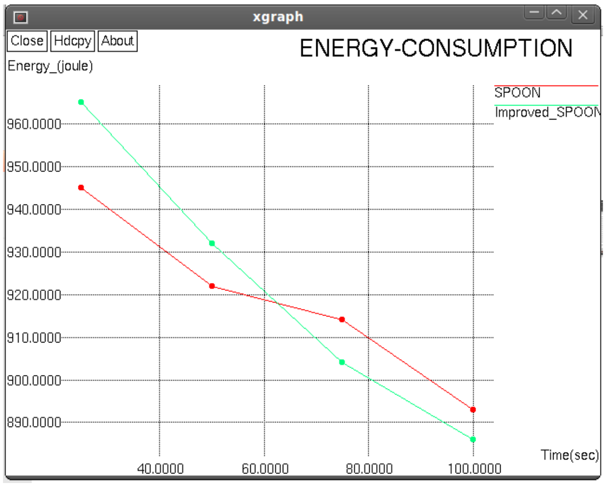
- Energy consumption is minimized.
- Throughput and packet delivery ratio is increased.
- Collision is reduced.
- Packet loss is reduced.

IV RESULTS AND DISCUSSION

A. *Energy Consumption*

Amount of energy consumed in a process or system. Energy consumption has been reduced while comparing to the existing system. The Unit is Joule.

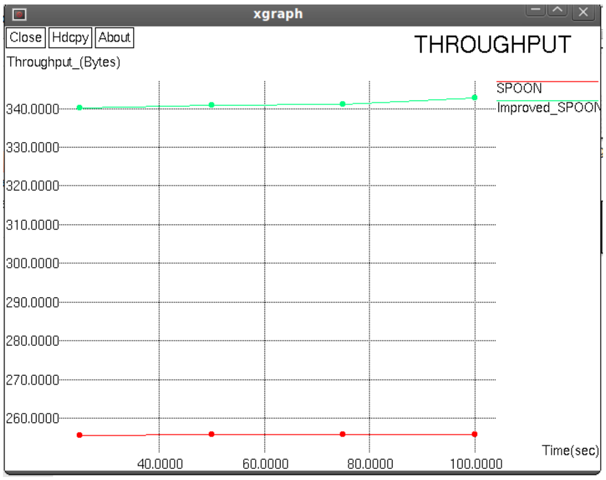
$$\text{Energy Consumption} = \frac{\text{Average energy consumed}}{\text{Total energy consumed}}$$



B. *Throughput*

Throughput has been increased and it is calculated using number of packets received by time in seconds. The Unit is Kbytes.

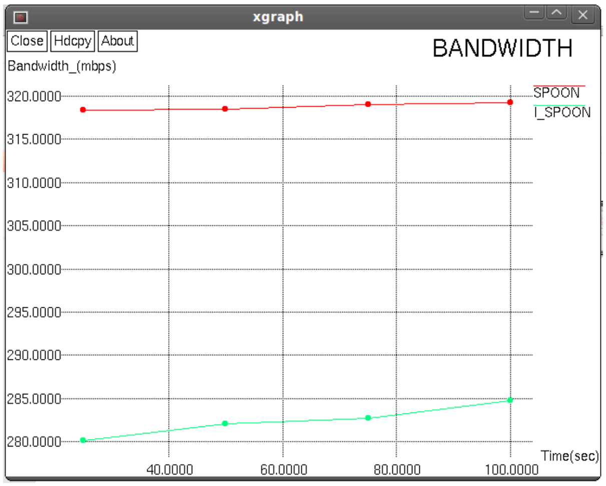
$$\text{Throughput} = \frac{\text{Number of packets received}}{\text{Time (Sec)}}$$

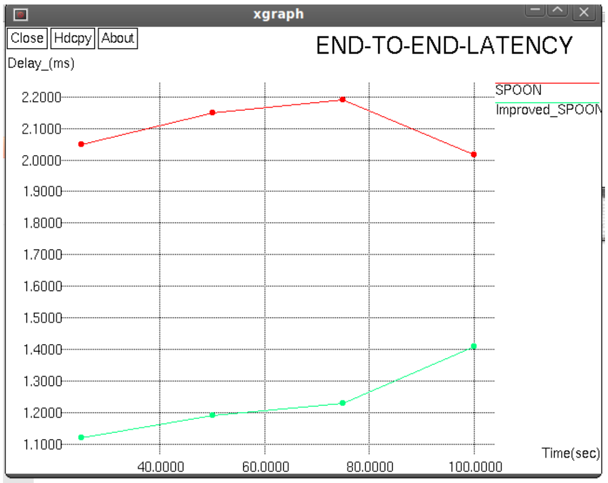


C. *Bandwidth*

Bandwidth has been reduced and it is calculated using total data transfer rate by time in seconds. The Unit is Bytes.

$$\text{Bandwidth} = \frac{\text{Data transfer rate in bytes}}{\text{Time (Sec)}}$$

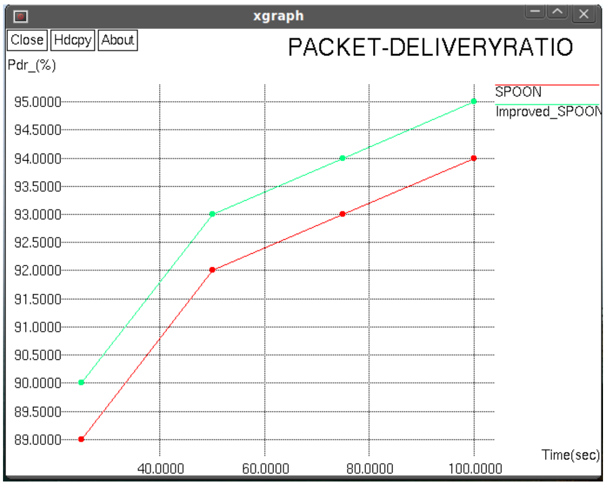




D. Packet Delivery Ratio

Packet Delivery Ratio (PDR) is calculated by dividing the number of packets received by the destination through the number of packets originated by the source. The unit is Percentage.

$$\text{PDR} = \frac{\text{Number of packets sent}}{\text{Number of packets received}} * 100$$



E. End–To-End Latency

Latency denotes the time delay. It is calculated by dividing total packets delivered in time by the inter arrival of first and second packet. The unit is msec.

$$\text{Delay} = \frac{\text{Inter arrival of first packet and second packet}}{\text{Total data packet delivery time}}$$

V. CONCLUSION

The proposed work introduces new ISPOON (Improved SPOON) scheme with file searching and retrieval algorithm to overcome the problem. Route Fragility Coefficient is used to minimize the cost. The chord protocol improves the routing and scalability. ISPOON also incorporates additional strategies for file prefetching, querying-completion, and loop-prevention. In future, Route Fragility Coefficient can be used to adopt more disconnected network. The chord protocol can be used for large unstructured peer-to-peer networks.

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