Implementation and Testing of Peer to Peer Web Caching Technique for Mobile Ad-Hoc Network

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ABSTRACT
In Mobile Ad- Hoc Networks, web caching is the challenging job due to its moving nature of nodes. So we analyze one technique for web caching in Mobile Ad Hoc Networks. MANET stands for Mobile Ad Hoc Network which is an evolving concept. In the development various researches the different aspects of MANET are focused such as routing and caching of data. Among them, the lack of efforts done on web caching in MANET considered as one challenging job. In MANET the nodes are always moving in such cases the web caching is one of the difficult task. The implementing peer to peer web caching concept is purely focused on web applications in MANET. The proposed technique gives the better approach to the caching of web data in mobile ad-hoc networks. A proposed technique is build over the traditional technique Better Approach to Mobile Ad-Hoc Networks i.e. B.A.T.M.A.N. Besides, the result is compared with the Better Approach To Mobile Ad-hoc Network protocol and proves that the performance of caching web application in MANET is efficiently faster and takes less time as compared to fetching the given data from the original source. It also reduces the internet bandwidth, preserves the energy consumption and extends the lifetime of a network significantly.

Keywords
B.A.T.M.A.N.; Mobile Ad-Hoc Networks (MANET); Peer to Peer; Web Caching.

1. INTRODUCTION
The Mobile Ad-Hoc Networks are the collection of mobile nodes. These networks are self-configuring and infrastructure-less network of mobile devices which are connected without the help of wires. MANET consists of a set of wireless mobile devices or nodes .They communicates with each other without centralized control and no specific infrastructure. Each device in MANET is free to move for any direction independently. MANETs has Wireless Ad-Hoc Network that usually has a routable networking environment. In MANET, the applications are based on the "peer to peer "approach rather than "client-server". These networks are fully distributed, and can work at any place without the help of any fixed infrastructure as access points or base stations. In peer to peer approach mobile devices are communicate with each other by using wireless based concept of multihop communication. This network plays an important role where the internet facilities are not provided. The communication can be carried out using hopping of data between the nodes in Manet.

In critical environments where networking facility and subscription services are not available, such as emergency or any rescue operations, natural disaster relief efforts, and military networks. The Mobile Ad Hoc Networks (MANETs) plays an important role in establishing efficient and dynamic communication carried out through wireless links of MANET which have limited bandwidth. MANETs are dealing with very rarely available resources. Therefore, following limitations exists in reality with MANET

1.1 Bandwidth usage is Limited
The wirelesses links always have the less bandwidth as compared with the wired link. The Wi-Fi network has evolved several standards. As the standards report progressed that the speeds of the network increased up to 700 Mbps. While the current devices can deliver maximum speed limit 600 Mbps, the bandwidth decreased due to the reasons such as network overhead, interference, noise, attenuation, etc. Therefore, the bandwidth is often drops up to 200 Mbps.

1.2 Risk in wireless links
Sometimes the wireless links are much dangerous as they are exposed in open media. Although, the mobile terminals are stationary, and obstacles which are around the mobile terminals will affect the mobile signal and causes connection loss. Due to the movement of mobile terminals, packets which are delivered through the wireless link of devices are exposed to the signal degradation and causes interference to the mobile communication.

1.3 Insufficient network coverage in mobile devices.
The battery power is one of the considerable factors for its Wi-Fi range. Normally Wi-Fi requires high energy power in performing some operations. But mobile devices have less power resources. Therefore, in general mobile devices have allowed only less power consumption for WiFi usage. After that, signal strength decreased when the mobile devices move further apart.

1.4 Gateway blockage in MANETs while using web data
In some cases, the gateways exist in MANETs, if the node and gateway ratio is 1:5. The nodes that are farther away than one hop tend to get non negligible long latencies for web data retrievals.

1.5 Inability of mobile device stands for network traffic
As soon as the network traffic gets heavier, the traffic which processed by any node is also increased. This is due to heavy congestion in the traffic. This leads to decreased in performance of the device. While the battery power consumption is more.
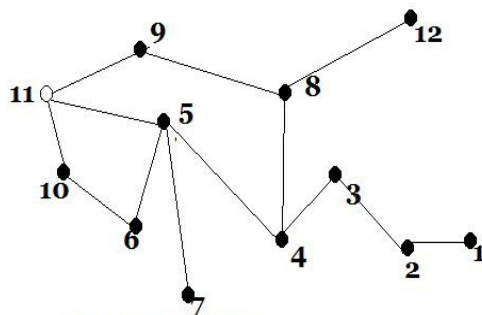
Fig. 1 Example of MANET

Basically, users can carry mobile devices from one place to another. In MANET, mobile nodes moves freely and disconnection occur frequently, and this causes loss of web caching applications. In a MANET a common technique used to improve the web caching performance of data communication is caching. The internet uses cache placement and replacement in proxy servers and cooperative caching concept to reduce the network traffic in Manet. The performance of data communication can be improved by caching in MANET. But in MANET, if the nodes cooperate and cache some recently used applications the requested data objects, the data accessibility can be enhanced. The existing cooperative caching schemes for MANET works only on the data caching .Therefore, our focus is on MANET web caching technique.

Basically there are two major categories of caching the data in MANET, i.e. Data Caching and Route Caching. Apart from that, peer to peer technique is purely based on web caching in MANETs. It is designed in a manner to work in constrained environment as mentioned above. To adjust the climate in MANET the inherent challenges such as mobility of nodes as well as the energy consumption of batteries. The adjustment of the nodes can be carried out manually. As a result it increases the web surfing performance in MANET.

2. RELATED WORK

P. Nagaraju, S. Praneetha, [1] have worked on cooperative caching including object replacements for the mobile ad-hoc networks. In this, MANET which is often formed using network protocols. They are different in the caching positions due to the nature of topological problems as well as limited availability resources. The three caching scheme are presented. The first scheme is Cache Data in which the forwarding node checks the objects and caches them on the basis of passing parameter techniques. The problem arises with this is that storing large number of popular objects in large number of intermediate node. In the second scheme Cache Path, The objects saving is not done by the intermediate node instead that they records path to the closest node of the objects. The two approaches, Cache Data or Cache Path are concentrated on passing by objects through the intermediate nodes. The result shows the improvement in system performance.

Isuru U. Jayasooriya , Thanuje A. Nallaperuma, Umesha K. Herath, Sachini R. Ranasinghe; Mohan Liyanage; Rajitha L Tennekoon and Lakmal Rupasinghe[2] proposed a protocol which purely based on web application in Mobile Ad-Hoc Networks. The iCache is a protocol implementation is for both Android and Linux platforms. Authors use Wi-Fi as one technology which underlying for the MANET creation.

This protocol i.e. iCache is a novel protocol which uses nodes in the MANET correspondingly to cache web data like pages, images etc. The iCache implemented on peer -to-peer accessing of data. The iCache protocol response time is very low as compared to fetching the web data from the original source. The performance time of this protocol is increased with the requested object size and along with the density of the nodes. It also preserves Internet bandwidth.

Weigang Wu, Jiannong Cao and Xiaopeng Fan [3], gives an algorithm which concentrates on overhearing property of wireless communication for improving the performance of caching a given network. The wireless links in MANET, a packet can be discovered by a node which is in the range of transmitter. In this paper the author gives algorithm for the overhearing property of information which includes request data and reply data for optimizing cache discovery and cache replacement. When, the wireless network is considered, the nodes in network can communicate with each other by receiving and sending messages through wireless links.

Komal M. Sharma and Archana Raut[5], stated as in MANETs the nodes are moving randomly .Therefore, to increase the performance of data items in the network caching by one caching scheme called Dynamic Group Caching which allows the grouping of mobile node which is considered to be host at one hop distance. The groups formed are managed by Group Master and Head of the Group. As a result gives a solution to the caching problems in MANET, so the performance of the MANETs is improved.

Leo Sicard, Matyas Markovics and Giannakis Manthios [6], proposed a Better Approach to MANET protocol for the web caching. This protocol provides the better solution for the mobile ad hoc networks. The Better Approach To Mobile Ad-Hoc Networks algorithm works on the best paths between nodes in network. The each node in the network maintains only the information about the next hop among all the nodes. In a B.A.T.M.A.N. algorithm, all the participating nodes in the network broadcast originator messages (OGMs) to its neighbors. An OGM consist of an originator address, a sending node address and a unique sequence number. On receiving the OGMs, the neighbor nodes changes the sending address to their own address and re-broadcast the message, and so on .In this way the communication can be carried out. So, the network is flooded with originator messages. As a result, it provides the data accessibility to every node in a network.

Anuj K. Gupta, Harsh Sadawarti and Anil K. Verma [7], concentrated on performance analysis of different routing protocols in MANET. The mobile ad hoc network consists to number of mobile nodes which used to send packets of data through a wireless medium. There must be need of a good routing protocol which establishes the connection between mobile nodes. So, they show the property of dynamic changing topology. In previously existing routing protocols, the mobility of a node is one of the important characteristics while determining the performance of the mobile ad hoc network. Thus, it is very much important to know about mobility models and their effect among the all routing protocols. For that purpose the different mobility models are implemented. Among them, the major focus is on Random Mobility Models and second one is on the Group Mobility Models. All these mobility models show the proper way to routing technique for different routing

protocol. The result gives better approach to MANET routing protocols.

Preetha Theresa Joy and K. Poulose Jacob [8], proposed Cooperative caching is one approach used in mobile ad-hoc networks for improving the efficiency of information access and reducing the latency as well as bandwidth usage. They provide a general comparison for cache replacement policies which are used in mobile ad hoc networks. They classified the replacement policies for MANETs on basis of two groups i.e. coordinated and uncoordinated. .In uncoordinated replacement, the data item is evicted by determined independently to each node based on the local access information. Besides that, in coordinated replacement policy the mobile nodes forms cooperative cache works over the replacement decision. All these show the proper way to the MANET routing protocol.

Gang Ding and Bharat Bhargava [9], proposed peer-to-peer file sharing concept in Mobile Ad-Hoc Networks. They give five routing approaches with different complexity for "peer to peer" approach of file sharing over mobile ad hoc networks. MANET is only characterized as stuctureless mobile wireless network, where two mobile node can communicate with each other by using the intermediate node between the network. There is no specific server and every node should work independently. The result shows, quickly accessing of the requested file and reduces the internet bandwidth.

K.Shanmuga vadivu and Dr M.Madheswaran [10], proposed a group data caching scheme which is called as Neighbor Group Data Caching (NGDC) which improves data access efficiency in MANETs. In NGDC scheme for how and where to place the group member data objects when an message host receives a data object from the destination. The availability of data and accessing efficiency can be improved by using cooperative caching. That discovers data sources having less communication cost by the process of neighbor group nodes. The result shows reduction in the average latency and improves the cache hit ratio

3. IMPLEMENTED WORK
Mobile Ad-hoc Network (MANET) consists of mobile nodes which can selforganizing and dynamically into arbitrary temporary network topologies. Mobile nodes in ad-hoc networks can dynamically establish routes among themselves by means of a routing protocol. There are many immerging techniques in Manet such as routing and caching but no proper technique for web caching. The basic idea behind this technique is to improve the web caching performance of mobile ad-hoc network.

The technique is more developed solution for the Optimized Link State Routing Protocol which gives the optimized routing path for the mobile devices in MANET. The proposed approach over comes all the issues regarding to the Optimized Link State Routing Protocol (OLSR).

The improved peer to peer web caching is proposed to overcome the limitations and issues of the existing traditional approaches. The basic idea is to improve the web caching performance in Manet by using peer to peer concept.
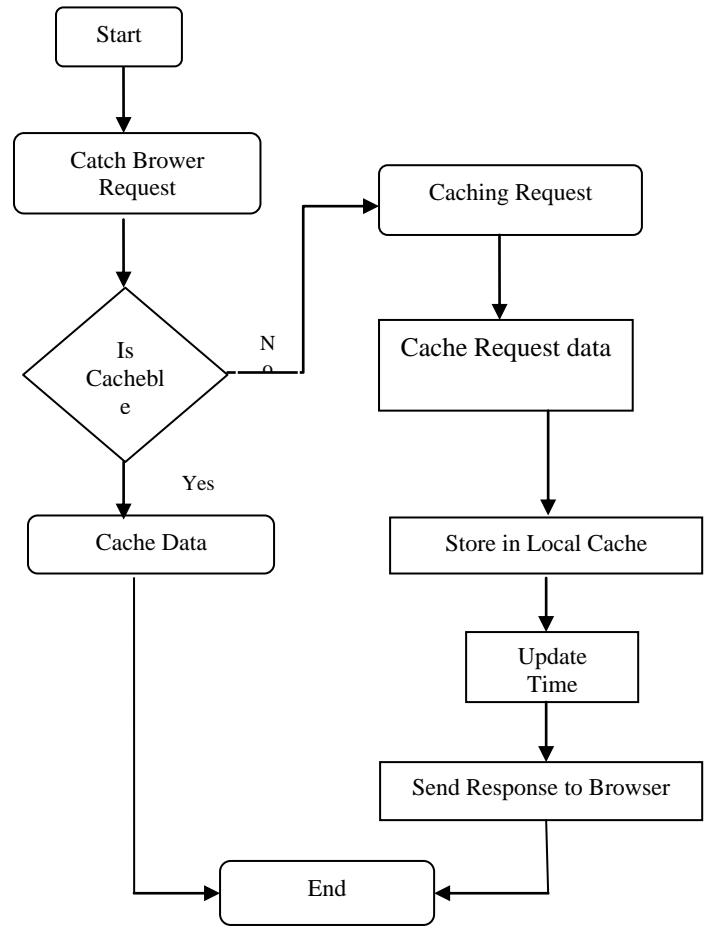

Fig.2. Resolution of Web Caching

In this technique we considered the Manet environment where each node having its internet access with them. By using that concept the web caching can be carried out. The Catch Browser consist of the data requests from user's application, and resolves the requests using the cache resolution scheme by applying filtering rules. If the requested data is available in its local cache then it sends the acknowledgement of the particular node where the requested data recently access. In this way, the caching is carried out and updating of time is also managed. If the requested data is not found in the local cache or the cache of any peer, then the requested data can be accessed with the help of internet and the data can be maintained into its local cache. The data is consists of any web application such as images, information regarding to any query etc. The accessing time of the requested data is maintained. In this way, the caching is carried out.

If the new node is entered into the network, the information of that node can be carried out dynamically. All the activities about the node in that network is maintained by server side. This technique is purely based on the web caching data in MANET .So, it helpful to reduce internet bandwidth as well as the time delay.

The major areas to be considered in the performance of MANET are as follows:

3.1 Minimize the usage of resources
While caching the web application, the usage of resource is higher. The result shows the reduction in performance of the

web caching. By using the minimum resources such internet bandwidth the performance can be increased.

3.2 Improve data availability for web applications

The proposed peer to peer web caching technique where caching of web application is carried out by peer to peer approach, improves the data availability for each node in the network. This leads to significant increase in data availability which improves the performance of the network.

3.3 Minimize the response time

The peer to peer approach in the proposed methodology reduces the response time as compared to the traditional approach in Manet. It minimizes the response time for fetching of the data. This leads to prevent the loss of data in the network which decreases the internet bandwidth of the network, effectively. So, the it minimizes the response as compared to fetching of data from the original source.

3.4 Increases overall performance of a network

The proposed peer to peer web caching technique in manet where all the web application is carried out on the peer to peer concept, improves the performance of the a network. Also, the data availability for the given node increases. This leads to significant decrease in energy consumption of nodes, thus increases the overall performance of a network. This peer to peer web caching technique based on the peer to peer communication of nodes in the networks. It reduces the energy consumption of each node in the network. So, the performance of caching of web data is increased, thus the overall performance of a network is also increased.

4. DESIGN AND IMPLEMENTATION

The implemented work for the proposed technique has been carried out in two phases; in the first phase the updating of node can be carried. The presented nodes records can be maintained at the server side. As soon as the new node is inserted into the network, the record of that node is maintained at the server side.

In this paper, the analysis is carried out on two platforms. The manet environment is created by considering mobile phones and laptop. In this, testing is carried out on some Android phones and Window based Laptop. To show platform independency, we implemented it on Java and Android platform.
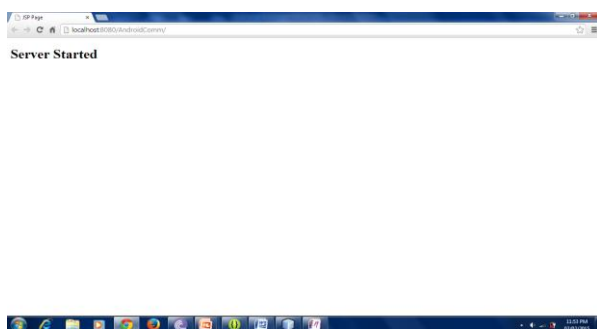

Fig.3. Server Scenario

In Fig.3, the server scenario is shown. Whenever, the server is started the records of all presented node in the network is maintained. The node which are active and the node which are not in active phase are maintained in the server side.

Fig.4. Client Scenario

In the proposed work, the peer to peer approach gives more accurate solution to the web caching of data in manet.Fig.4 shows the client side view of the application. Here, we consider one android based mobile phone as a client. When the first name and last name is inserted in the given form, it will automatically connect to the server. The whole details of the node are maintained into the server side.
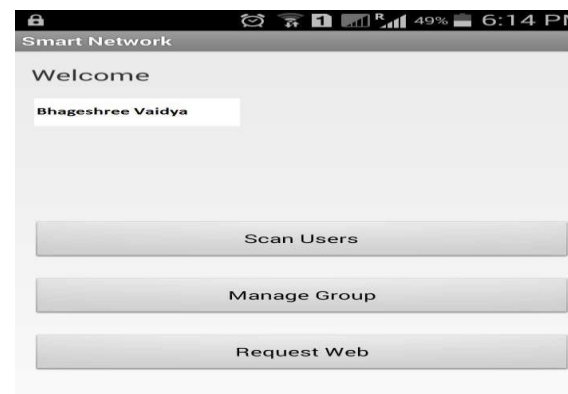

Fig.5.Client Response

Fig.5 shows the client side response after the maintaining all the necessary record of the nodes presented in the network. After the registration of the node at server the new window is opened at the client side. The window consist of three buttons, the first is scan users which scans all the active nodes in the network. Second is Manage Group, which maintains the details of the group. And the last is Request Web which gives details of the requested web data.

Fig.6.Request for Web

The above figure shows the web request response for the client side. In above figure, user inserts the required web address for the any application. The request will be send to all the nodes present in the network. The node which recently accessed that web page will give response the

requesting node. In this way, peer to peer communication can be carried out. If the requested page is not present to any of the node in the network then the respective node directly access it from internet, stored into its local cache and update the time. As a result, the page will be stored for next use. In this way, the communication can be carried out by using peer to peer approach. This will preserve the internet bandwidth and increases the data availability for each node. This approach also required less energy consumption. This gives result to the web caching in MANET. In the MANET, the nodes are always moving so it is difficult to access the web application in the network. This technique will preserve the internet bandwidth and improves the web caching performance. The fig. 7, shows the window screen of the mobile device after getting response from the mobile node.

The proposed technique is based on caching of web data in Manet which achieves significant increase in performance of the network. By considering the peer to peer approach data availability is also increased as compared to the previous approach. As the reducing the energy consumption and increases the overall performance of the network.

5. CONCLUSION

Proposed peer to peer web technique gives more proper solution to web caching in mobile ad-hoc networks. The result and analysis shows the proper way to web caching mechanism over the previous technique. Ultimately the performance of the network is improved. The life time of the network is also increased.

From the research work presented in this paper, it has been concluded that the proposed technique improves the accessing of web application in mobile ad-hoc networks. The result and analysis signifies that the performance implementation of proposed technique satisfactorily preventing the time for caching of web applications in the mobile ad-hoc networks. It also prevents the internet bandwidth as well as preserves the energy consumption.

6. FUTURE WORK

The research work implemented in this paper can be extended further by reducing the response time as compared to fetching the data from the original source as well as improving data availability for web application by using peer to peer approach. Similarly based on this approach, peer to peer web technique can further be developed to extend lifetime of Manet.

7. REFERENCES

[1] P. Nagaraju and S. Praneetha, Propagate Cooperative Caching on MANETS, International Journal of Computer Science and Information Technologies (IJCSIT), Vol. 5 (4) , 2014,pp 5371-5374.

[2] Isuru U. Jayasooriya, Thanuje A. Nallaperuma , Umesha K. Herath ,Sachini R. Ranasinghe, Mohan Liyanage,Rajitha L Tennekoon, Lakmal Rupasinghe, Decentralized Peer to Peer Web Caching for MANETs, 8th IEEE International Conference on Computer Science and Education, April 26-28,2013.

[3] Weigang Wu, Member, Jiannong Cao and Xiaopeng Fan, Design and Performance Evaluation of Overhearing-Aided Data Caching in Wireless Ad Hoc Networks, IEEE Transaction on Parallel And Distributed Systems, VOL 24, No.3, March 2013.

[4] S. Rajeswari and Dr. Y .Venkataramani, Traffic Performance Analysis OF MANET Routing Protocol, International Journal of Distributed and Parallel Systems (IJDPS) Vol.2, No.3, May 2011.

[5] Komal M. Sharma and Archana Raut, Improving Efficiency in Mobile Adhoc Networks using Dynamic Data Caching Scheme, National Conference on Innovative Paradigms in Engineering and Technology (NCIPET),2013.

[6] Leo Sicard, Matyas Markovics and Giannakis Manthios, An Ad-hoc Network of Android Phones Using B.A.T.M.A.N., IJATCSE, 2013.

[7] Anuj K. Gupta and Harsh Sadawarti, Performance Analysis of MANET Routing Protocols in Different Mobility Models, I.J.Information Technology and Computer Science, pages 72-82, May 2013.

[8] Preetha Theresa Joy and K. Poulose Jacob, Cache Replacement Policies for Cooperative Caching in Mobile Ad hoc Networks, IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 3, No 2, May 2012.

[9] Gang Ding and Bharat Bhargava, Peer-to-peer File-sharing over Mobile Ad hoc Networks, IJCA, 2011.

[10] V. Balaji and Dr. V. Khanaa , "A Novel Web-Based Teaching System for Autistic Children in Rural Area using MANET ", International Journal of Scientific & Engineering Research Volume 3, Issue 9, September-2012.

[11] P. Kuppusamy , B. Kalaavathi and S. Chandra ,Optimal Data Replacement Technique For Cooperative Caching In MANET ,ICTACT Journal on Communication Tecchnology, Volume 05, Issue 3,September 2014.

[12] Yeon-Seok Kim, Yoo-Seok Shim and Kyong-Ho Lee, "A cluster-based web service discovery in MANET environments", Mobile Information Systems 7, pages 299–315, October 2011.

[13] Alex Hinds, Michael Ngulube, Shaoying Zhu, and Hussain Al-Aqrabi, A Review of Routing Protocols for Mobile Ad-Hoc Networks (MANET),

International Journal of Information and Education Technology, Vol. 3, No. 1, February 2013.

[14] Wensheng Zhang, Liangzhong Yin, and Guohong Cao, Secure Cooperative Cache Based Data Access in Ad Hoc Networks, National Science Foundation, May 2011.

[15] Meenakshi Bansal, Rachna Rajput and Gaurav Gupta, Mobile Ad hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation Considerations, 5th IEEE Multi Topic conference (INMIC 2005), 2005.