SURVEY OF CHANNEL ALLOCATION TECHNIQUES IN MOBILE CELLULAR NETWORKS

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Abstract

Channel allocation in a network in which a particular spectrum will be partitioned into a number of multiple disjoint channels which further slated for obtaining efficiency by minimizing the interference occurred due to the usage of adjacent channels. Channel allocation and its strategies generally will come under three categories (fixed channel allocation, dynamic channel allocation, and hybrid channel allocation) which is included in this survey. Channel allocation strategy is which avoids a collision, congestion, and packet delivery ratio. By selecting the good channel allocation algorithm the efficiency of the network is improved. Thus the analysis of multiple channel allocation leads to the better way to form a good network. Channel allocation is sufficient in any mobile or wireless networks because of the rapid increase of nodes/subscribers in that category of the network. One of the main aims of the channel allocation system is to reduce the call blocking by providing proper split up of channels.

Index Terms: channel allocation, wireless networks, call blocking

I. INTRODUCTION

In the present situation, the mobile users are increasing in the worst manner but where the frequency spectrum is limited. Due to this limitation, channel allocation methods are utilized by all network users. According to the usage ratio, the DCA place a vital role in channel assignment. The common types of channel allocation are shown in Fig 1. A successful channel allocation method is which attaining maximum calls with the restricted amount of spectrum. If there is a limited amount of spectrum has to be used for more number of cells then it has to utilize the reusability methods.

Channel allocation is categorized into 1) FCA, 2) DCA, 3) hybrid channel allocation, 4) Flexible channel allocation, and 5) Handoff channel allocation. Fixed channel allocation in which a set of a channel is assigned to the cells/nodes according to its maximum usage and distance. Dynamic channel allocation in which the channels are temporarily assigned to other cells with its distance. Also, the DCA can be further divided into Distributed Dynamic Channel Allocation (DDCA) and Centralized Dynamic Channel Allocation (CDCA). Hybrid channel allocation in which the combination of FCA and DCA. Flexible channel allocation is which will act same as DCA but it also provides the flexibility for the nodes which needs the higher loads. Handoff channel allocation is utilized this allocation scheme during the handoffs.
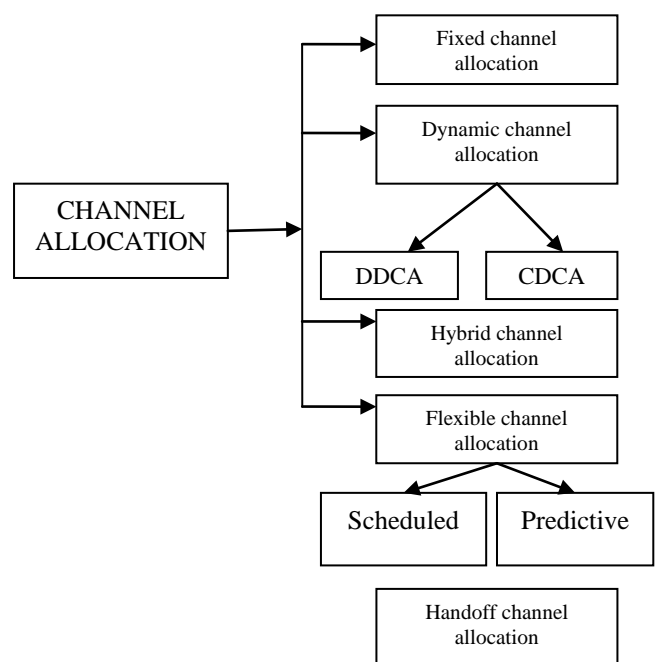
. Fig.1. Types of channel allocation

II. TYPES OF CHANNEL ALLOCATION
A. Fixed channel allocation

The fixed channel allocation in which the available channels in the network will be divided into slots which will be utilized by all over the area. The FCA has a drawback of traffic fluctuations and less management of high quality. These two drawbacks of FCA is overcome by the channel borrowing scheme. Channel borrowing in which the process of getting the free channels from the neighboring cells. The FCA will be utilizing the five common streams such as the following

- Simple borrowing
- Barrow from the richest
- Basic algorithm
- A basic algorithm with reassignment
- Barrow first available

Channel borrowing

The channel borrowing is done by using 2 actors and cells such as acceptor and donor. Channel borrowing is the scheme which will be automated when the allotted/nominal channel gets over with the cell. The neighboring nodes which are at a particular distance are called as a donor.

Once the acceptor gets the channel from the donor during the period of lack of channels, the acceptor will reassign those sane channels once the work is completed. Here the neighborhood cells are acting as the donors there will be the situation where the acceptor needs the channel but the donor cannot provide the channels because of its own existing call.

Simple borrowing

In a simple borrowing scheme the particular set of channels will be allotted to the cells, once the availability is over then the cell will be borrowing the channels from the donor.

Barrow from the richest

The barrow from the richest is abbreviated as SBR. Acceptor will be having the channels when there is more than one cell then the channel will be borrowed from other cells

Basic algorithm

It is an enhanced version of barrow from the richest. The basic algorithm uses the channel blocking system. The channel blocking system in which it will be done once the channel borrowing is done.

A basic algorithm with reassignment

Here the transfer of call action will be utilized. In which once the channel assignment is done and the borrower once again having the channel availability then the channel will be transferred.

Barrow first available

It will not be utilizing the optimized scheme like other methods. Here the channel borrowing will be done once the channel is available. At the initial stage itself, the channel will be borrowed and kept at a cell.

B. Dynamic channel allocation

Since the usage of spectrum is limited to the DCA method utilized much in order to attain the efficiency. In dynamic channel allocation, the distance is considered as one of the main constraints to utilize the channel borrowing. In this, the channels are temporarily allotted for the acceptor cells. The cells are allotted to the acceptors for the particular duration of time and once the duration is over then the cells will be returned to its pool of available spectrums. The channel allocation will maintain the 3 basic steps which are

1. Calculation of the distance
2. Assignment of channels
3. Reassignment of channels

The distance calculation is which used to avoid the collision between the channels with the possibility of different users using the same spectrum. Assigning the spectrums used to provide the channels borrowing system and the reassignment are which used to do make the spectrums to be available for the other users after the completed particular duration.

According to the network usage, the DCA is categorized into common two terms such as

CDCA
DDCA

Centralized Dynamic Channel Allocation

In CDCA the channel allocation strategy is centralized where the single base system will be allotting the channels to the other cells dynamically. But which it includes the drawback of single point failure. When the single base station of the channel spectrum fails the whole network will be of the bottleneck.

Distributed Dynamic Channel Allocation

In DDCA the single point of failure will be avoided by the distribution of the channel spectrum in a dynamic manner. In DDCA the

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channel interference and the bottleneck problems will be avoided. By the usage of DDCA by Dipti varpe et al [,] showed that the call blocking is reduced compared with other CA methods. In order to attain the good call fluency with limited call blocking without the violation of channel interference constraint.

As shown in Fig 2 the DDCA aims to reduce/avoids the interference by the minimizing the call blocking by that utilizing the bandwidth. If the spectrum is slated into two groups than the network has to utilize the spectrum as shown in the above Fig 2.every nodes in a good network will be having its own cluster head and the base station. The cell/nodes from the same network which exceeds the minimum reuse distance which is allotted in order to reduce the interference will not be allowed to use the spectrum s in the same group. It is indicated by the red mark in Fig 2.

In DDCA the method is classified 3 equal sets of a group. Any cell can barrow the channels from the other group but the other cell from the same cluster. This is because of the purpose to avoid the co-channel interference.

Storage information table is which used to monitor each cell with respective channel allocations in order allocate the proper channel to the nodes.
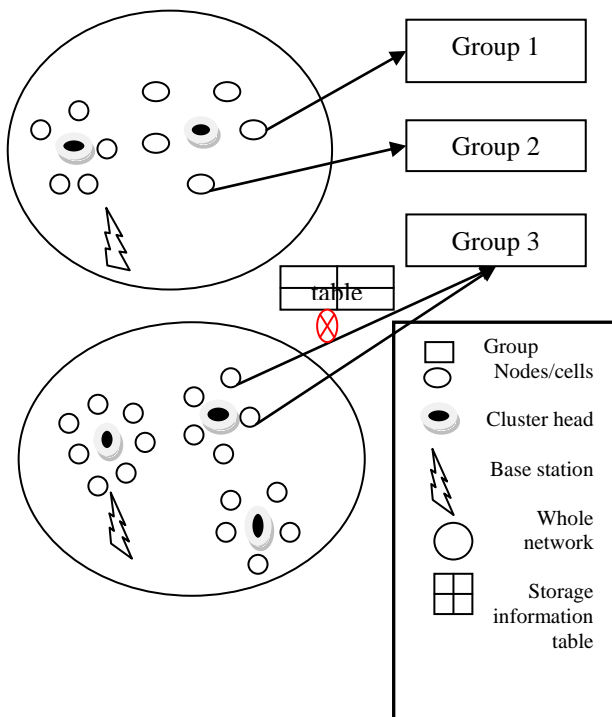

Fig 2 DDCA method sample diagram

. C. Hybrid channel allocation

In hybrid channel allocation the available channel spectrum will be slated into two sets which one set is used with FCA and the other with DCA. In FCA the set of a channel will be allotted for each cell and the other set of channels will be kept in a centralized pool for the purpose of dynamic channel allocation. In recent years high channel reusability is needed because of the increasing number of mobile users and the limited amount of channel spectrum. Usually, the given frequency is not utilized with two other users when it is with the same distance .because which it will increase the interference. This is which also called radio interference or co-channel interference.

Hybrid channel allocation is said to be efficient because of the usage of DCA and FCA. The dynamic channel allocation is efficient but it has a complexity of distance usage thus to overcome this action and to enhance the performance of DCA the FCA is embedded with the DCA, where the distance allocation is proper with the FCA.
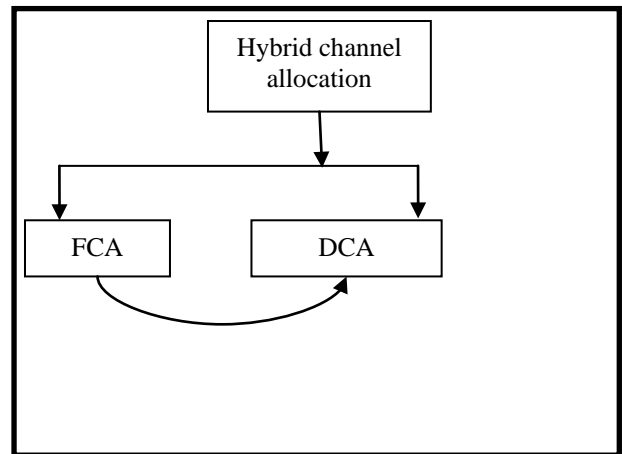

Fig 3 Hybrid channel allocation

Efficient Evolutionary Strategy

The channel allocation problem is often called as an NP-Hard problem. In this, the evolutionary strategy is utilized where the D-Ring is utilized.

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D. Flexible channel allocation

One of the major tasks is to make the channels to be available for the emergency situations Flexible channel is utilized for that places where its channel allocation is divided into two sets
- Scheduled
- predictive

Scheduled allocation

In Scheduled allocation, the estimation is done first which will be easy to use for the predictive and analyzed situations

Predictive allocation

In predictive allocation, each cell is monitored all the time for its Traffic intensity and blocking probability.

E.CDCA method

Mobile ad hoc network is highly dynamic in nature, whose nodes have the capability to form different types of topologies depending upon the environment. The nodes in MANET act as both routers and hosts in order to attain the QoS in the application. MANET should have routing protocols such as (proactive, reactive, hybrid) in which the routing will depend upon the minimal hop count without the consideration of the traffic. This selection method degrades the performance of the network. Since the nodes in MANET are not static at a particular location, the network topology also dynamic. Hence by considering the dynamic nature of the MANET the on-demand routing suits well for the network. In on-demand routing the efficient packet delivery or the delay is not attained due to congestion in nodes and channels, thus it degrades the MANET performance. One of the best ways to improvise the performance in a good manner is by the use of load balancing methods.

There are multiple loads balancing algorithms for uniform loads with coordinated channel access protocol by IEEE 802.15.3. In order to attain the load balancing efficiently in the network which has non-uniform loads, it

should have on-demand dynamic channel allocation algorithm which will increase the performance in the best manner. Thus the cooperative load balancing and dynamic channel allocation (CDCA) method by is utilized for non-uniform loads with on-demand dynamic channel allocation. In that loads are managed in a cooperative manner and channel utilization is done through dynamic channel allocation which suits best for the improvement of a network by reducing the jitter and provides the good packet delivery ratio by reducing the delay.

Dynamic channel allocation works through carrier sensing identified by Nasipuri A. and Das.S (2000) and does not increase the overhead. It has been shown to be very effective in increasing the service levels as well as the throughput in the system with minimal effect on energy consumption and packet delay variation. The dynamic channel allocation algorithm has more impact on the performance compared to the cooperative load balancing algorithm. Thus the CDCA showed that these two algorithms can be used simultaneously, maximizing the improvements in the system

Path 1:
1. The source node transmits the data to the source CH.
2. The CH will check the neighbor node.
3. If the destination found, the RREQ is sent.
4. If the RREQ is accepted it will send the ACK to the source.
5. The transmission gets started with the path**.**

Path 2:
1. The source node transmits the data to the source CH.
2. The CH will check the neighbor node.
3. If the destination is not found, it will broadcast the RREQ to all cluster head.
4. The congestion level is monitored at each CH.
5. If more congested, move to other CH**.**

Path 3:
1. The source node transmits the data to the source CH.
2. The CH will check the neighbor node.
3. If the destination is not found, it will broadcast the RREQ identified by Tang.K and Gerla.M (2000) to all cluster head.

4. The congestion level is monitored at each CH.
5. If less congested, congestion level is calculated (CDCA).
6. Neighborhood node is checked for destination node availability.
7. If destination found, ACK sent from the destination CH to source CH.
8. Data transmission gets started.

III. CONCLUSION

Channel allocation is a process which has to be properly maintained in the network. Limited spectrum is also the main reason why the channel allocation is in main consideration in each and every network. Thus this analysis shows that the channel utilization is best at CDCA method. This makes the performance of the network to be good with less call blocking. As a future work, this algorithm can be optimized by using the Genetic or Fuzzy logic.

REFERENCES

[1] Bhavana Sharma,Shaila Chugh,Vishmay Jain, Investigation Of Adaptive Multipath routing For Load Balancing In MANET. International Journel Of Engineering And Advanced Technology ISSN:2249-8958,Volume-2,Issue-5.2013

[2] K. M. Mahesh, and S.R. Das,"On-demand Multipath Distance Vector Routing in Ad Hoc Networks".Proceedings of IEEE ICNP,2001

[3] Amjad ali,Wang Huigang,2012,Node Centric load Balancing Routing Protocol for Mobile Ad Hoc Network.Proceeding of the international Muti conference of Engineers and computer Scientists.

[4] Saigala, Ajit K. Nayakb,*, Sateesh K. Pradhanc, R. Malla Vikrant,"Load balanced routing in mobile ad hoc networks", 2003.

[5] N.S.Kavitha, P.Malathi & Jim Mathew Philip, "Congestion Control in Mobile Ad Hoc Networks", International Journal of Network and Mobile Technologies, Vol.2, No.1, 2001

[6] Load Balancing In Wireless Mobile Ad Hoc Networks, Arnab Maji,10606016, Under The Guidance Of Prof. Suchismita Chinara,2010

[7] Bora Karaoblu,Wendi Heinzelman, "Multicasting vs.Broadcasting:What are the Trade-offs?"

[8] Mehran Abolhasan, Justin Lipman, Tadeusz A. Wysocki," Load-Balanced Route Discovery for Mobile Ad hoc Networks"2004.

[9] Yahya Tashtoush, Omar Darwish, Mohammad Hayajneh,2014, Fibonacci sequence based multipath load balancing approach,elvier.

[10] Amjad Ali, Wang Huiqiang," Node Centric Load Balancing Routing Protocol for Mobile Ad Hoc Networks"vol –I,2012

[11] Vikrant Saigala, Ajit K. Nayakb,*, Sateesh K. Pradhanc, R. Malla" Load balanced routing in mobile ad hoc networks"2003.

[12] Bora Karaoglu, Member, IEEE, Wendi Heinzelman, Senior Member, IEEE "Cooperative Load Balancing and Dynamic Channel Allocation for Cluster-based Mobile Ad Hoc Networks"2014.

[13] Hesham A. Ali 1, Taher T. Hamza2 and Shadia Sarhan3 Manet Load Balancing Parallel Routing Protocol, Vol. 9, July 2012.

[14] S.S pravinthraja, Dr.K.Umamahaseeari "A Survey On Multi Model Bio-Matrix" International journal of engineering and technology research, volume 1,Issue 2,Oct-dec 2013.

[15] Dr. R. B. Patel "MANETs and Dynamic Source Routing Protocol"

[16] R. Vinod Kumar, Dr.R.S.D.Wahida Banu "Load-balancing Approach for AOMDV in Ad-hoc Networks"2010

[17] Deepanshu Shukla, Leena Chandran-Wadia and Sridhar Iyer "Mitigating the Exposed Node Problem in IEEE 802.11 Ad Hoc Networks"

[18] Xiaomin Ma, *Member, IEEE* and Xianbo Chen, *Student Member, IEEE* Performance Analysis of IEEE 802.11 Broadcast, vol-27,2008

[19] Jung-Yoon Kim,1 Geetam S. Tomar,2,3 Laxmi Shrivastava,4Sarita Singh Bhadauria,4 and Won-Hyoung Lee1Research Article "Load Balanced Congestion Adaptive Routing for Mobile Ad Hoc Networks" july 2014.

[20] Abdel Rahman H. Hussein, Sufian Yousef, and Omar Arabiyat," A Load-Balancing and Weighted Clustering Algorithm in Mobile Ad-Hoc Network"

[21] Andr´e Schumacher, Harri Haanp¨a¨a, Satu Elisa Schaeffer, and Pekka Orponen, "Load

Balancing by Distributed Optimisation in Ad Hoc Networks"

[22] N.S.Kavitha ,Dr.P.Malathi and Jim Mathew Philip, "Improving throughput and controlling congestion collapse in mobile ad hoc networks" Bonfring International journal of research in communication engineering, vol-1,December 2011.

[23] Jim Mathew Philip, Dr.P.Malathi and N.S.Kavitha, "Promoting fairness in mobile ad hoc networks , Bonfring International journal of research in communication engineering, vol-1,December 2011.

[24] Prerna Setia, Hunat Uppal, "Simulation And Performance of Analysis of Proactive, Reactive and Hybrid Routing Protocols Using Static and Mobile Environment in MANET", International Journal of Science and Research, Oct 2013.

[25] Ramkumar. V. D, "Efficient Routing Protocol for Highly Dynamic Mobile Ad Hoc Networks", International Journal of Computer Science and Mobile Computing, Jul 2013.

[26] Safna Sulaiman, Tintu Alphansa Thomas, "A Neighbour Coverage-Based Rebroadcast in MANETs Based on Energy Efficient Rebroadcast Probability", International Journal of Computer Science and Network Security, Oct 2014.

[27] Shengbo yang ,chai kiat yeo,bu sang lee,"Towards Reliable Data Delivery For Highly Dynamic Mobile Ad Hoc Networks",IEEE Transactions On Mobile Computing, 2011

[28] Shengbo Yang, Chai Kait Yeo, Bu Sung Lee, "Towards Reliable Data for Highly Dynamic MANET", IEEE Transactions, Mar 7 2011.

[29] Umamaheswaran.A,Gopikrishnan.S,Sarany a,R"Reliable Data Transfer on Dynamic Nodes Using Packet Hiding Methods in Ad Hoc Networks", International Journal of Innovative Research in Science, Engineering and Technology, Jul 18, 2013.