AN EFFICIENT COMMUNICATION AND ENERGY-EFFICIENT SLEEPING TECHNIQUE IN CELLULAR NETWORK

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Abstract : Presently a days the greater part of the people groups are utilized portable phones,therefore the quantity of base stations and base station utilization's are additionally increased.The expanding interest of high limit in cell systems requires enormous vitality consumption.Thus,energy proficiency is turned out to be real objective in cell networks.In a phone network,the base stations are utilized more measure of energy.So,energy effectiveness component is connected to the base stations.In this case we are used a mechanism to on/off base stations according to the users.If a base station does not contain any client then it is go into the sleeping mode,otherwise it is proceed to its dynamic mode.In this case a user-centric clustering mechanism is considered.In this technique another system is likewise used,this case the base stations check their closest neighbor base stations.Then tally the quantity of active base stations and sleeping base stations.If any client need to interface another client under another base station and the majority of the base stations are sleeping.At,this case the resting base stations are naturally go into the wake up state.And help to associate the clients.

***IndexTerms* - Base Station,Cellular Networks,Base Station Sleeping,Base Station Clustering.**

I. INTRODUCTION

These days the expanding number of smartphones,tablets,laptopes and so forth are remotely associated with the web has caused an extensive measure of activity increment inthe cellular network[2].A cellular network is a mobile network that provides services by using a large number of base stations with limited power, each covering only a limited area.In request to give sufficent limit a lot of base stations have been deployed[3] which prompts substatial energy utilization.Studies[4],[5]shows that base stations are already used in 60-80\% of total energy consumption in cellular networks.Therefore energy efficiency of base stations are the main goals in cellular network.

In order to reduce energy consumption in base stations there are many techniques can be used.e.g,transmit power control in single-antena system[6],[7] and multi-antena system[8],processing and speed scaling control[9],Base station sleeping[10]-[20],smart base station deployement [21],[22] etc.Base station sleeping technique is the main technique,in this case underutilized base stations are going to the sleep mode ie,an inactive mode.In this case these sleeping stations are transfered their load to neighbouring stations.Evaluations shows that the base station sleeping technique can possibly save large amount of energy.The key-question is that when and which base stations are should going to sleep.

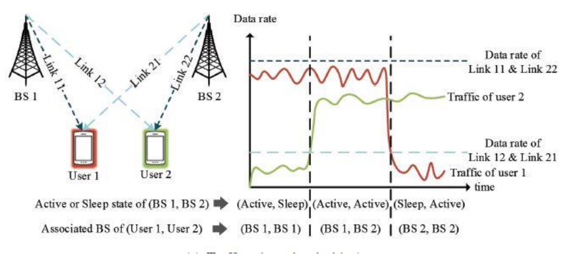

Fig 1. Traffic adaptation in ideal case

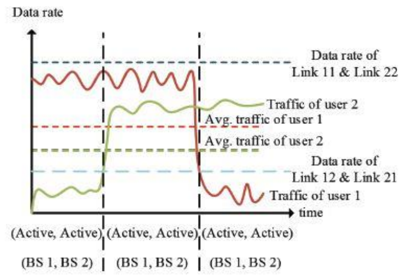

Fig2. Traffic adaptation with the average traffic demand

Another challenge inthe design of base station activation policy is that turning off a BS can make edge users.Consider an example is in Fig 1 ,when base station 2 is entering into sleeping mode the user 2 is switched to base station 1.now the user 2 is an edge user.This time the channel quality of the user 2 is decreased.To avoid this we can use a user-centric clustering method[23],[24] that allowing each user to form its own base station cluster.

There are numerous methods are accessible for base stations vitality management.[25] talk about the dynamic tasks of the base stations inthe cell network.In this case the repetitive base stations are turned off during low traffic, for example, night.In [26] shows that 90% of energy savings can possible by simple base station technique that deactivates base stations until 95\% coverage is guaranteed when the total traffic is less than 10\%of the peak.In [27] show that the base station sleeping technique can save energy upto 53%.Both theses technique is almost same method so these techniques can reached to the same conclusion.

In[28] This case consider some decision policies such as Markov decision process .This case the base station can sleep when the system is empty,and turn on when the number of users is greater than some threshold or after a period of time.The authors of [10] proposes dynamic sleeping and clustering algorithms,that reduces the energy.The sleeping problem is combinational problem and also develop a greedy algorithm.Simply says that it develop a theoretical framework for BS energy saving also they formulate a toatl cost minimisation. In[11] provide an optimal sleep/wakeup schems. They develop a sleeping process known as Markov decision process,which also minimizes the energy.Thsese process is based on the information on traffic load and user localization in the cell,in the cases where this information is complete, partial or delayed.

In[29] it discuses about how small corporation clusters can extracted from large cellular systems.It also discuses static clustering concepts.It conclude static clustering method is similer to optimal UE-specific clustering and easy to use.This case the clustering problems are stated as binary linear optimization problems and it investigated static clustering concept as a simple way to break down large cellular systems into reasonably sized cooperation clusters.

II. PROPOSED SYSTEM

In this case consider a cellular network consisting of S disjoint cell site.Each cell site have its own coordinator.Cell site consist of many number of users and base stations.The central coordinator and base station in this system architecture may correspond to central unit (CU) and digital unit (DU) in 5G architecture in 3GPP and baseband unit (BBU) and remote radio head (RRH) in cloud-RAN.If a base station that cannot contain any user at that time the base station enter into the sleep mode.otherwise it remains its active mode.

In this case at every 10000ms the base stations are checked their mode.at that time any user can reach under that base station it is suddenly changed to active mode,otherwise it remains sleep mode.Base stations have a rest mode to diminish vitality utilization and a joint transmission work by collaborating with different BSs in a similar cell site.We accept an opened framework, and the schedule opening file is indicated by t. Toward the beginning of each schedule opening, we choose which BSs go to rest mode and how to frame a group for every client, and amid the availability, real transmissions happen under the given BS rest mode and grouping state. We accept that the length of a schedule opening is adequately vast contrasted with a period size of client booking.

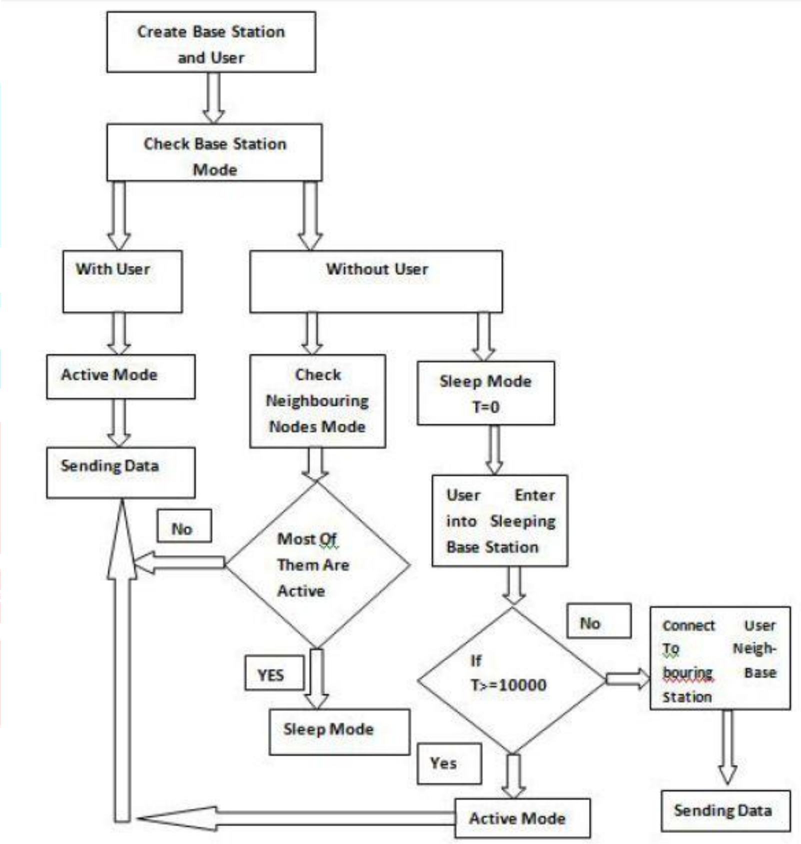

Fig 3.System Architecture

The proposed system shows that fig 3 This case the base stations which does not contain any client ,at that point it experience rest mode else it proceed to its dynamic mode. At the point when a client into the system however that time base station isn't dynamic around then clustering technique is happening. This case client is searching down there active neighboring nodes and after that use the scope of that dynamic base stations. This system mainly focused about the delivery ratio of the communications.this case their is another condition is utilized for the sleeping state.The base station is resting simply after the checking of the status of their neighboring base stations.If all the more neighboring nodes are in active mode then that base station will rest mode else it is remains its rest mode.

In any case, this case their is an impediment is happen ie,sometimes the correspondence isn't conceivable so,this case we can utilize another method.This case the base stations can their neighboring base stations,then check their mode.If the greater part of the neighboring hubs are in rest mode then some of that dozing base stations are dynamic and help for powerful correspondence. [1]For clustering using TEAS clustering algorithm and greedy algorithm is used for base station sleeping.

The ideal resting and grouping choice of spares vitality adaptively to transient and spatial variance of movement entries. For example, if the activity request is low and so line lengths are little, at that point sparing vitality turns out to be more essential (for expanding the goal capacity), and therefore base stations rest and BS group sizes are lessened. On the other hand, with high activity request, base stations wake up what's more, BS group sizes are expanded to improve information rates. These activities misuse the fleeting variety of movement entries. Besides, every client's information rate is weighted by its line length. Subsequently, base stations close to the clients with huge line length utilize vitality all the more forcefully to expand the clients' information rates. In this manner, BS resting and bunching strategies illuminating can spare the vitality utilization by misusing both worldly and spatial variety of movement landings.

The continues clustering and sleeping is difficult.this difficulty can be solved by using the algorithms.The bunching subproblem for guaranteed BS rest mode is an arched program and in this way can be settled proficiently. Consequently, once an ideal BS rest mode is found, it is anything but difficult to figure a joint ideal bunching and sleeping arrangement.Thus this case first determine BS sleeping mode and find the optimal clustering based on the given BS sleeping.The ideal BS rest mode can be dictated via looking through all conceivable BS rest mode states, be that as it may, it requires high many-sided quality. In this way, in this approach, the BS rest mode is resolved in light of the sleeping or active conditions created in the continuation. These conditions include a capacity, called the sleeping weight, of ideal bunching for a given rest mode, and are utilized to decide if a BS should rest or not in the ideal sleeping arrangement. This approach consequently requires two segments of processing an ideal grouping given a rest mode, and deciding regardless of whether a BS ought to rest or not. begin with how to locate an ideal bunching.

III. RESULT AND ANALYSIS

In this project, proposed a method for effective base station sleeping and clustering method.To save energy, a BS can be turned off when their is no user present at that base station range, otherwise it remains its active mode.This case the base station is sleep only after checking all their neighbouring nodes.It check all their neighbouring nodes modes.If most of them are active then this base station going to sleep mode.Otherwise it remains its active mode.This case we have to improve the delivery ratio.For clustering using clustering algorithm and sleeping algorithm is used for base station sleeping.

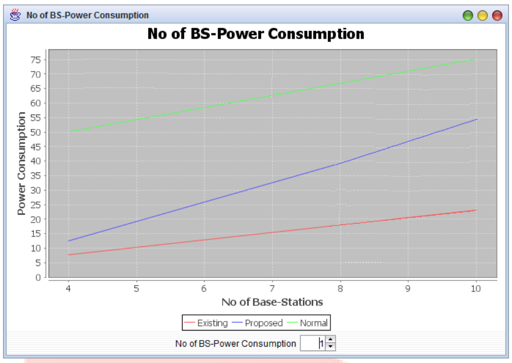

Fig 4. Number of Base Station Delivery Ratio

Fig 5. Number of Base Station Power Consumption

The proposed framework is compare two systems. One is all base stations are active .This case none of the base stations are sleep.all are dynamic. The second case the underutilized base stations are permitted to rest and others are active.This case the base station is active just when any client is available at the range of that base station.otherwise it is enter to rest mode. Think about both the system the proposed framework has high delivery ratio.In the instance of energy efficiency this framework utilize less energy than the all dynamic system and look at the second system the proposed framework utilizes some energy more.

IV. CONCLUSION

In this paper we have to consider joint Base Station sleeping and clustering algorithm for energy saving in cooperative cellular network.In TAES calculations, if the achievable information rate is exorbitant contrasted with activity request (and consequently the system build-up diminishes), at that point vitality is spared by sleeping BSs.That way, TAES calculations spare vitality without limit misfortune and in addition they don't require any data for what's to come activity varieties. For BS bunching issue, we proposed an ideal calculation that has polynomial multifaceted nature. For BS sleeping issue, we proposed TAES ideal calculation and TAES eager calculation. TAES ideal calculation finds an ideal arrangement with diminished hunt space contrasted with the thorough hunt. TAES ravenous calculation finds a close ideal arrangement with polynomial intricacy with provable optimality hole.

REFERENCES

[1] Ali Jihwan Kim,Hyang-Won Lee,Song Chong,Traffic-Aware Energy-Saving Base Station Sleeping and Clustering in Cooperative Networks

[2] Cisco System, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2014-2019. A Cisco White Paper, Feb. 2015..

[3] Small Cell Forum, “Small Cells Deployment Market Status Report,” Feb. 2015.

[4] M. Marsan, L. Chiaraviglio, D. Ciullo, and M. Meo, “Optimal Energy Savings in Cellular Access Networks,” in Proc. IEEE International Conference on Communications (ICC) Workshops, June 2009, pp. 1–5.

[5] X. Wang, A. V. Vasilakos, M. Chen, Y. Liu, and T. T. Kwon, “A Survey of Green Mobile Networks: Opportunities and Challenges,” Mob. Netw. Appl., vol. 17, no. 1, pp. 4–20, Feb 2012.

[6] M. Chiani, A. Conti, and R. Verdone, “Partial compensation signal-levelbased up-link power control to extend terminal battery duration,” IEEE transactions on vehicular technology, vol. 50, no. 4, pp. 1125–1131, 2001.

[7] J. Kwak, K. Son, Y. Yi, and S. Chong, “Greening Effect of Spatio-Temporal Power Sharing Policies in Cellular Networks with Energy Constraints,” IEEE Transactions on Wireless Communications, vol. 11,no. 12, pp. 4405–4415, Dec. 2012.

[8] X. Ge et al., “Energy-efficiency optimization for MIMO-OFDM mobile multimedia communication systems with QoS constraints,” IEEE Transactions on Vehicular Technology, vol. 63, no. 5, pp. 2127–2138,2014.

[9] K. Son and B. Krishnamachari, “SpeedBalance: Speed-scaling-aware Optimal Load Balancing for Green Cellular Networks,” in Proc. IEEE INFOCOM, March 2012, pp. 2816–2820. Vehicular Technology, vol. 63, no. 5, pp. 2127–2138, 2014.

[10] K. Son, H. Kim, Y. Yi, and B. Krishnamachari, “Base Station Operation and User Association Mechanisms for Energy-Delay Tradeoffs in Green Cellular Networks,” IEEE JSAC, vol. 29, no. 8, pp. 1525–1536, September 2011.

[11] L. Saker, S.-E. Elayoubi, R. Combes, and T. Chahed, “Optimal Control of Wake Up Mechanisms of Femtocells in Heterogeneous Networks,” IEEE Journal on Selected Areas in Communications, vol. 30, no. 3, pp. 664–672, April 2012.
[12] Y. Wu, N. B. Shroff, and Z. Niu, “Energy Minimization in Cooperative Relay Networks with Sleep Modes,” in Proc. WiOpt, May 2012, pp.200–207.
[13] K. Adachi and S. Sun, “Power-efficient Dynamic BS Muting in Clustered Cellular System,” in Proc. IEEE Personal Indoor and Mobile Radio Communications (PIMRC), Sept 2012, pp. 1149–1154.
[14] P. Frenger, P. Moberg, J. Malmodin, Y. Jading, and I. Godor, “Reducing Energy Consumption in LTE with Cell DTX,” in Proc. IEEE Vehicular Technology Conference (VTC Spring), May 2011, pp. 1–5.
[15] A. De Domenico, R. Gupta, and E. Strinati, “Dynamic Traffic Management for Green Open Access Femtocell Networks,” in Proc. IEEE Vehicular Technology Conference (VTC Spring), May 2012, pp. 1–6.
[16] R. Gupta, E. Calvanese Strinati, and D. Ktenas, “Energy Efficient Joint DTX and MIMO in Cloud Radio Access Networks,” in Proc. IEEE Cloud Networking (CLOUDNET), Nov 2012, pp. 191–196.
[17] G. Cili, H. Yanikomeroglu, and F. Yu, “Cell Switch off Technique Combined with Coordinated Multi-point (CoMP) Transmission for Energy Efficiency in beyond-LTE Cellular Networks,” in IEEE ICC, June 2012,pp. 5931–5935.
[18] S. Han, C. Yang, and A. Molisch, “Spectrum and Energy Efficient Cooperative Base Station Doze,” IEEE Journal on Selected Areas in Communications, vol. 32, no. 2, pp. 285–296, February 2014.
[19] A. Bousia, E. Kartsakli, A. Antonopoulos, L. Alonso, and C. Verikoukis, “Game-theoretic infrastructure sharing in multioperator cellular networks,” IEEE Transactions on Vehicular Technology, vol. 65, no. 5, pp. 3326–3341, 2016.
[20] A. Antonopoulos, E. Kartsakli, A. Bousia, L. Alonso, and C. Verikoukis,“Energy-efficient infrastructure sharing in multi-operator mobile networks,” IEEE Communications Magazine, vol. 53, no. 5, pp. 242–249, 2015.
[21] C. Gao, W. Zhang, J. Tang, C. Wang, S. Zou, and S. Su, “Relax, but Do Not Sleep: A new perspective on Green Wireless Networking,” in Proc. IEEE INFOCOM, April 2014, pp. 907–915.
[22] H. Ghazzai, E. Yaacoub, M.-S. Alouini, Z. Dawy, and A. Abu-Dayya,“Optimized LTE cell planning with varying spatial and temporal user densities,” IEEE Transactions on Vehicular Technology, vol. 65, no. 3, pp. 1575–1589, 2016.
[23] J. Kim, H.-W. Lee, and S. Chong, “Virtual Cell Beamforming in Cooperative Networks,” IEEE Journal on Selected Areas in Communications,vol. 32, no. 6, pp. 1126–1138, June 2014.
[24] J. Gong, S. Zhou, L. Geng, M. Zheng, and Z. Niu, “A Novel Precoding Scheme for Dynamic Base Station Cooperation with Overlapped Clusters,” IEICE Trans. Commu., vol. 96, no. 2, pp. 656–659, Feb. 2013.
[25] E. Oh, B. Krishnamachari, X. Liu, and Z. Niu, “Toward dynamic energyefficient operation of cellular network infrastructure,” IEEE Communications Magazine, vol. 49, no. 6, pp. 56–61, June 2011.
[26] C. Peng, S.-B. Lee, S. Lu, H. Luo, and H. Li, “Traffic-driven Power Saving in Operational 3G Cellular Networks,” in Proc. ACM MobiCom.New York, NY, USA: ACM, 2011, pp. 121–132.
[27] J. Wu, S. Zhou, and Z. Niu, “Traffic-Aware Base Station Sleeping Control and Power Matching for Energy-Delay Tradeoffs in Green Cellular Networks,” IEEE Transactions on Wireless Communications, vol. 12, no. 8, pp. 4196–4209, August 2013.
[28] J. Wu, S. Zhou, and Z. Niu, “Traffic-Aware Base Station Sleeping Control and Power Matching for Energy-Delay Tradeoffs in Green Cellular Networks,” IEEE Transactions on Wireless Communications,vol. 12, no. 8, pp. 4196–4209, August 2013.
[29] P. Marsch and G. Fettweis, “Static Clustering for Cooperative Multi-Point (CoMP) in Mobile Communications,” in Proc. IEEE International Conference on Communications (ICC), 2011, pp. 1–6.