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RESEARCH ARTICLE

Load Adaptive BSN: Enhancing Cellular Base Station Network (BSN) Efficiency by Monitoring Data Traffic

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Abstract- In the cellular Base station (BS) network, energy consumption is not proportion to their carried traffic load. The 3G traffic displays high fluctuations both in time and over space also incurs energy waste, but energy consumption of current 3G network is not load adaptive. In this paper, we propose a Load-Adaptive Base Station Network (BSN), a solution that enables the BSN to adapt itself with respect to the current data traffic in the network. Load-Adaptive BSN seeks to achieve load-adaptive energy consumption in communication subsystem. Traffic–driven approach is used to reduce communication System traffic. RNC-Radio Network Controller collects traffic information from all the Base Station. It generates the on/off methods. By using the Temporal-Spatial traffics dynamics, we power off under-utilized Base Stations under light traffic. Base Station splits into virtual grids. By using Virtual grid based technique, the under-utilized base stations are identified and are replaced by another equivalent base station within the same virtual grid. The goal is to achieve system-wide adaptability in energy efficiency in the BS network and to ensure negligible performance degradation while achieving energy efficiency.

Keywords – Energy efficiency, Cellular traffic, Base station

I. INTRODUCTION

During the last ten years, there has been a tremendous growth in cellular networks. The number of subscribers and the demand for cellular data traffic has risen tremendously with the introduction of Smart phones. Hence, cellular network operators find facing new challenges in wireless cellular networks inevitable and also they have to maintain their costs at minimum level.

Energy efficiency in cellular networks is a important growing concern for cellular operators to not only maintain profitability, but also to reduce the overall environment effects [2]. In this paper, we present a Load-Adaptive BSN, to improve the power efficiency of cellular networks, explore some research issues and challenges and suggest some techniques to enable an energy efficient cellular network. Since base stations consume a maximum portion of the total energy used in a cellular system, we will first concentrate on energy savings in base stations [2]. The reasons for dealing with the data traffic only are: first, out of the SMS, voice and data traffic, the data traffic can be seen as the worst case because it generates the highest amount of bits that need to be transmitted and it consist of more irregular patterns; second we believe that the growth rate of data traffic is much higher than the rate of the other types of traffic, and thus data traffic will prevail in future networks [2].

We design a solution that approximates an Energy-Proportional (EP) 3G system using non-EP BS components, in order to cope with temporal-spatial traffic dynamics. The main instrument of our proposal is to completely power off under-utilized Base stations when their traffic load is light and power them on when the traffic load becomes heavy. The challenge is to devise a distributed solution that uses a small number of active Base stations, while satisfying three requirements of traffic capacity, communication coverage, and minimal on/off switching of each BS [1]. To this end, we take a location-dependent profile-based approach. We divide the network into grids, so that Base stations in each local grid cell can replace each other when serving users. We then perform location-dependent profiling to estimate the aggregate traffic among base stations in the grid [1]. Based on the peak/idle of the traffic profile, the corresponding set of active Base stations are decided for all duration. It turns out that, if we select the active sets appropriately, we only need to power on a sleep BS and shut down an active BS at most only once or twice during each 24-hour period [1].

II. RELATED WORK

Energy optimization in wireless networks draws much of the research attention in the recent times. However, many of the researches heavily depend on the particular technology that is being concerned. They typically exploit some protocol properties and modify the timings or retransmissions, or force the terminal to go to the sleep/standby mode. From the users' viewpoint, the most important factor is probably the limited battery life of mobile terminals. It does not surprise that many authors therefore propose methods for energy savings which are aimed at reducing the consumption of the terminal. This proposed solution tends to be technologically independent and infrastructure oriented in terms that we are concerned about the savings in the Base Transceiver Station (BTS) subsystem of a cellular network.

Energy efficiency in cellular networks is a growing concern for cellular operators to not only maintain profitability, but also to reduce the overall environment effects [2]. This emerging trend of achieving energy efficiency in cellular networks is motivating the standardization authorities [2].

Energy efficiency of any deployment is impacted by the power consumption of each individual network element and the dependency of transmit power and load [12]. In wireless communications micro cells are potentially more energy efficient [11].

The simulation results confirm an important trade-off between operating and embodied energies, which can provide some practical guidelines for designing energy-efficient cellular access networks [9].

We focus on optimizing the energy consumption of wireless cellular networks [15]. Optimizing capacity, coverage and their trade-off has been well studied in the design of cellular networks [15].

Energy-efficiency, one of the major design goals in wireless cellular networks, has received much attention lately, due to increased awareness of environmental effects and economic issues for mobile network operators [16].

III. EXISTING SYSTEM

The used energy is un-proportionally large under less traffic load. The ON/OFF Base station status left area loses across coverage when the Base Stations is under off condition. Use location information and transmission range of each BS to determine whether Base Stations in spatial proximity are equivalent or not. Location coordinates can be acquired by GPS or other systems when operators deploy their infrastructure [1].

The group-based traffic profiling improves energy efficiency when traffic load is heavy, compared with the individual profiling. The individual approach profiles each BS and sums up all as the grid profile. The group-based profiling can exploit multiplexing gain among the Base Stations within the same grid [1]. In existing System, user clients are directed from about –to-sleep Base Station to other active Base Station. In existing System, mostly focus to solve various forms of efficiency optimizations. Base Station uncovered some regions. It forms like a circle. So wastage becomes high. ON and OFF mode is not possible.

IV. PROPOSED SYSTEM

By using the inherent temporal-spatial traffic dynamics and node deployment heterogeneity, the under-utilized Base Stations under light traffic are powered off. The evaluation also shows that though the Load Adaptive BSN schema is simple, energy saving and close to optimal, and it improves efficiency of the BS infrastructure for 3G UMTS. We completely power off under-utilized Base Stations [1]. When their traffic load is light and powers them on when the load becomes heavy. The challenge is how to devise a distributed, practical solution that uses a small number of active Base Stations, while satisfying three major requirements of traffic capacity, communication coverage, and minimal on/off switching.

Load Adaptive Base Station Network (Load Adaptive BSN), a solution that approximates a Load Adaptive 3G system using non-EP BS components, in order to cope with temporal-spatial traffic dynamics. It minimizes the transferring time and requesting time. There is no wastage occur because signals divided into virtual grids. While loading base station, the traffic is minimized. Two Base Stations can easily communicate without any breaks.

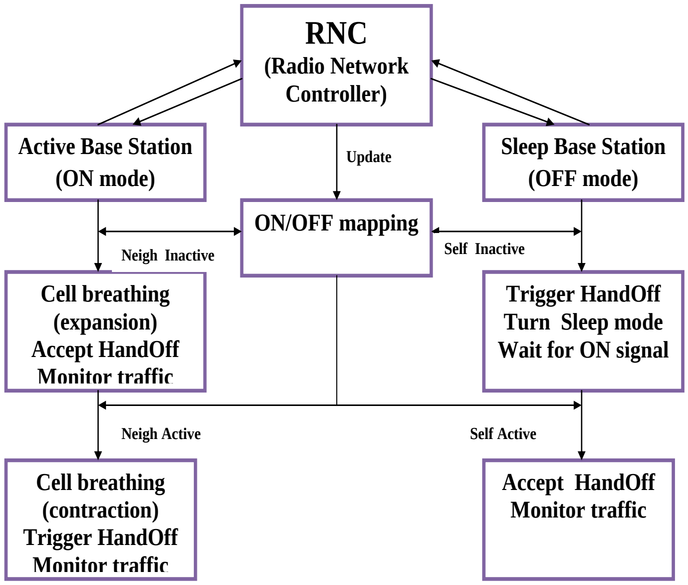

Figure 1: System flow of Load Adaptive BSN

The overall design of Load-Adaptive BSN takes a virtual grid-based, location-dependent profiling approach. We split the network into grids, so that Base Stations in each grid cell can replace each other when serving user clients. Once the grid is formed, we perform location-dependent profiling, which estimates the traffic envelope for the aggregate BS traffic in the grid. Given the peak and idle hours of the traffic profile, we decide the corresponding set of active Base Stations for all duration. It turns out that, if we choose the sets appropriately, we only need to power on a sleep BS and shut down an active BS only once during each 24-hour period. This minimal on/off switching among base stations works well with the cooling subsystem, which requires tens of minutes when adjusting to the operating temperature inside each BS upon power-on. We insert diversity at certain Base Stations to provide higher room to adjust its coverage in order to increase the chance to power off neighbor Base Stations. This way, Load Adaptive BSN offers a distributed solution that uses a small number of active Base Stations. It also satisfies three requirements of traffic capacity (i.e., traffic does not exceed BS capacity), communication coverage (i.e., each location is covered by at least an active BS), and minimal on/off switching of each BS (i.e., we avoid powering on/off each BS frequently).

V. CONCLUSION

Heterogeneous BS capacity further signifies the opportunity to utilize more capable Base Stations for energy savings. Fewer Base Stations with higher capacity can afford equivalent aggregate capacity by a larger number of less-capable Base Stations. It has a high traffic and Less Accuracy. The key insight gained is to leverage traffic diversity and near-term stability both in time and over space, thus exploiting temporal-spatial multiplexing to save more energy and achieve energy savings on the infrastructure side. It will increase transmit power at client devices when sending uplink data traffic during idle hours.

VI. FUTURE WORK

We leave for further work the impact on quality of service for traditional voice traffic [2] and to achieve energy savings on the infrastructure side. It will increase transmit power at client devices when sending uplink data traffic during idle hours [1] (say, late evenings or weekends).

In the proposed system, when the closest BS powers off, a mobile client will move to an active BS but distant BS, thus incurring additional energy for uplink transmissions. However, its impact on the client device is not as severe as it appears [1].

REFERENCES

[1] Chunyi Peng, , Suk-Bok Lee, Songwu Lu, and Haiyun Luo, Member, IEEE , “GreenBSN: Enabling Energy-Proportional Cellular Base Station Networks” Mobile Computing, IEEE Transactions on (Volume:13 , Issue: 11)

[2] Z. Hasan, H. Boostanimehr, and V. K. Bhargava, “Green cellular networks: A survey, some research issues and challenges,” IEEE Communications Surveys and Tutorials, vol. 13, no. 4, pp. 524–540, 2011.

[3] 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.

[4] ABI Research, “Mobile networks go green–minimizing power consumption and leveraging renewable energy,” 2008.

[5] G. P. Fettweis and E. Zimmermann, “Ict energy consumption–trends and challenges,” in 11th International Symposium on Wireless Personal Multimedia Communications, Lapland, Finland, Sep 2008.

[6] L. A. Barroso and U. Holzle, “The case for energy-proportional computing,” in IEEE Computer, 2007, pp. 33–37.

[7] C. Peng, S.-B. Lee, S. Lu, H. Luo, and H. Li, “Traffic-driven power saving in operational 3g cellular networks,” in ACM MOBICOM, 2011.

[8] G. America, “Global 3G deployments UMTS HSPA HSPA+,” Feb 2010.

[9] Humar, X. Ge, L. Xiang, M. Jo, M. Chen, and J. Zhang, “Rethinking energy efficiency models of cellular networks with embodied energy,” IEEE Network, March-April 2011.

[10] K. Dufkova, M. Bjelica, B. Moon, L. Kencl, and J.-Y. Le Boudec, “Energy savings for cellular network with evaluation of impact on data traffic performance,” in European Wireless, 2010.

[11] O. Arnold, F. Richter, G. Fettweis, and O. Blume, “Power consumption modeling of different base station types in heterogeneous cellular networks,” in Future Network and Mobile Summit’10, 2010.

[12] T. Edler and S. Lundber, “Energy efficiency enhancements in radio access networks,” in Ericisson Review, 2004.

[13] P. K. Panigrahi, “Green energy: A perspective for indian rural telecom,” Journal of Green Engineering, vol. 2, 2012.

[14] M. A. Marsan, L. Chiaraviglio, D. Ciullo, and M. Meo, “Optimal energy savings in cellular access networks,” in GreenComm’09, 2009.

[15] S. Bhaumik, G. Narlikar, S. Chattopadhyay, and S. Kanugovi, “Breathe to stay cool: Adjusting cell sizes to reduce energy consumption,” in Green Networking, 2010.

[16] 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 Journal on Selected Areas in Communications (JSAC), vol. 29, pp. 1525–1536, 2011