M2M COMMUNICATION IN THE LTE NETWORK

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Abstract

LTE network is designed and optimized as IP based architecture In most cases the M2M data will be transmitted over LTE mobile network.. In comparison with broadband type of applications, the M2M traffic presents a real challenge. It is a consequence of small packet size of the M2M data which is transmitted as irregular bursts by a large number of end stations. It is necessary at least minimize overloading of the base station in LTE network

Technology Machine-to-Machine (M2M) communication enables in comparison with traditional Human-to-Human (H2H) sending the data between individual nodes or between nodes and central node (gateway) without human interaction. For the service providers and network operators, emerging M2M services represent a very promising business. The transmitted data in LTE network could have also different requirements for delivering (delay, jitter, throughput) so the Quality of Service (QoS) is important topic when the M2M messages are transmitted through the LTE network.

Normally, a capillary M2M communication network should be used to cover the areas in high-rise buildings or a densely populated region.

The ubiquitous wireless technologies are considered as an integral part of the current modern life-style. The number of mobile devices is still growing, therefore there is no wonder that full attention from the telecommunication operators is de-voted to the research and development of wireless technologies in recent years. The biggest challenge for telecommunication operators lies in a rapidly growing number of mobile devices accessing the current cellular networks and causing overloading of these networks.

In recent years, a major percentage of (mobile) data traffic have been generated by human controlled devices. Internet of Things (IoT) is a new paradigm for devices that are becoming connected to the Internet and are able to communicate with each other without human interaction. We can assume that the Machine-to-Machine (M2M) devices will be widely deployed in the near future [1]. Traditionally, M2M communications (MTC), refer to a form of data communications, which require none or little interactions of human being in its communication processes. re are in total 14 characteristic features of MTC as listed by 3rd Generation Partnership Project (3GPP), which may support mobility, packet switched data only and secure connections.

LTE network is primary developed as IP based architecture for broadband type of applications, hence the narrowband M2M applications with rather low data rates and with the small packet size might have a considerable impact on these LTE networks. The proper integration of M2M services into LTE networks will be crucial for the telecommunication operators [2]. The most problems questions are how many end stations should be handled by base station in LTE network and what is the maximum amount of transmitted data before the overload of base station occurs.

Physical(PHY)-layer architecture plays an essential role in creating reliable communication links for MTC.

As different devices may operate in distinct wireless technologies, compatibility among devices becomes a vital issue on MTC. With the help of smart terminals as another option to access multiple wireless networks, it is possible to use a node as an extension. Each node could be set up with any interfaces including IEEE 802.11, IEEE 802.15.4 and IEEE 802.15.1, to choose the one with the best connection based on

channel condition as well as their wireless technology characteristics. It is necessary to establish a platform of hybrid node in order to assure the co-existence and survival of the communications among these MTC devices working in different technologies . In this way, the requirements and benefits exist to promote for developing an M2M MAC overlay scheme with multiple wireless radio interfaces, such that vicinity nodes can be detected and connected using a proper interface with an aim to achieve the best performance. Furthermore, for some legacy standards utilizing 2.4 GHz carrier frequency as their PHY layer, need to redesign routing protocols and algorithms for ad hoc MTC networking, as what has already been carried out in IEEE 802.11 (AODV, DSR, etc.). Or to design of new algorithms based on artificial intelligence, which are able to maximize the benefits from the processing capacities and characteristic features of hybrid nodes .

Cellular M2M communications possess the advantages of wider coverage and ready-for-use convenience for providing MTC to a large number of M2M devices. Cellular networks were designed primarily not to deal with a large number of short packets transmitted from MTC terminals. On the other hand, capillary M2M communication networks are suitable for solving the problems with a large number of short data packets sent from capillary M2M devices. In such a scenario, all M2M devices in a mesh or tree topology connection should be connected to the core network (such as a cellular network) via gateways. Different devices work in different data rates independently, depending on the services or applications they are involved in capillary M2M communication. AS most MTC devices are limited in transmission range because of cost/size/power constraints, hierarchical deployments that provide reliable and efficient interworking between multiple communication protocols (PAN/LAN/WAN) . M2M devices can be connected to M2M servers directly through WAN connections (e.g., cellular 3G/4G) or M2M gateways (aggregation point). Typically, connection through a gateway is preferred when MTC devices are sensitive to cost, power or location .

In thesis study delay and requests for a reconnection due to depleted network capacity. Also shown reducing LTE network load due to spreading requests on sending M2M data in time from end stations. And most important question is overloading of the eNodeB (base station in LTE network).

Conclusion

In this thesis to is analyzed the impact of deployment M2M services and find the capacity limits or weak points in order to avoid ineffective expenditures. Study of the capacity performance of LTE network. Will be find the limits for specific M2M file downloading scenario and for the maximum end stations connected simultaneously to eNodeB. Based on the results , we can conclude that we can identified the scenario where the eNodeB was not able to handle network traffic generated by mobile clients and network resources were exhausted.

References:

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