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CELLULAR IoT APPROACH TO ACHIEVE ULTRA LOW COMPLEXITY

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Abstract— Machine to Machine (M2M) communication represents a tremendous growth opportunity for the 3GPP (3rd Generation Partnership Project) ecosystem. Leading to support the widespread technology of improved machine to machine communication called the 'Internet of Things' (IoT), 3GPP operators have to inscribe usage scenarios with devices that are power efficient (with battery life of several years), can be reached in exigent coverage conditions e.g. indoor and basements and parking lots and places similar to these where it is difficult to get a good mobile network coverage, more importantly, are affordable enough so that they can be deployed on a mass scale and even be replaceable.
Key Words: 3GPP, GSM, GPRS, EDGE, IoT .

I. INTRODUCTION

The legacy system supported machine to machine communication which now-a-days is developed by the addition of multiple features to support a new trend in the field of machine to machine communication most commonly known as Internet of Things. The main objective of the method suggested in this study material is to develop a system which supports ultra-low complexity and low throughput for cellular IoT. The important things to be taken into consideration here are involvement of the power efficient devices which should be of affordable rate also.

The goals of the paper is to identify standardization options to meet the requirements of an important future class of applications: providing communications to very large numbers of devices forming part of the "Internet of Things". One of those requirements relates to device cost, which is influenced inter-alia by complexity: accordingly one of the goals is ultra-low complexity. To achieve the cost criteria mentioned we can make use of 'Systems on chip' mechanism which involved fixed cost of logistics, development, manufacture, software maintenance and so on across large numbers of units.

GSM technology is widely used in global cellular communication technology field. For implementing Cellular IoT the software changes that are made to the existing device should be compatible with the legacy GSM system this will scale the economy and carry forward the technology. An evolved GSM device version for the purpose of cellular IoT would benefit from the existing advanced state of integration in its design this will fully deliver the benefits of the evolved system. However the highlighted and projected quantities for Cellular IoT devices using any technology either making use of an existing system or being developed from scratch or clean state are very high and could easily adapt into existing GSM volumes and therefore attract a similar limelight on cost reduction and complexity reduction.

The main performance objectives of this paper is to improve indoor coverage for mobile network at places like basements of the building, parking lots, lifts etc., This indoor coverage should be readily available and reliable. It should be possible to achieve an extended coverage of 20dB when compared to the commercially

available legacy GPRS system. Reduced complexity M2M applications require devices which can be deployed and disposed easily hence the devices that are very cheap are only involved. The study should also consider that the devices being used have a very limited throughput requirement and may not need to support circuit switched services to develop the techniques that can significantly reduce complexity and hence cost.

II. LITERATURE SURVEY

GSM which is abbreviated as Global System for Mobile Communications is a second generation technology in the field of communication which is used to support data services along with voice transmission scheme. Later on GPRS technology which stands for General Packet Radio Services was developed to support advanced features such as multimedia data transmission and Internet based services.

The changes for IoT are made to the physical layer which mainly depends on the coverage classes involved in the transmission. The format of the legacy logical channel is depicted as shown in the block diagram.

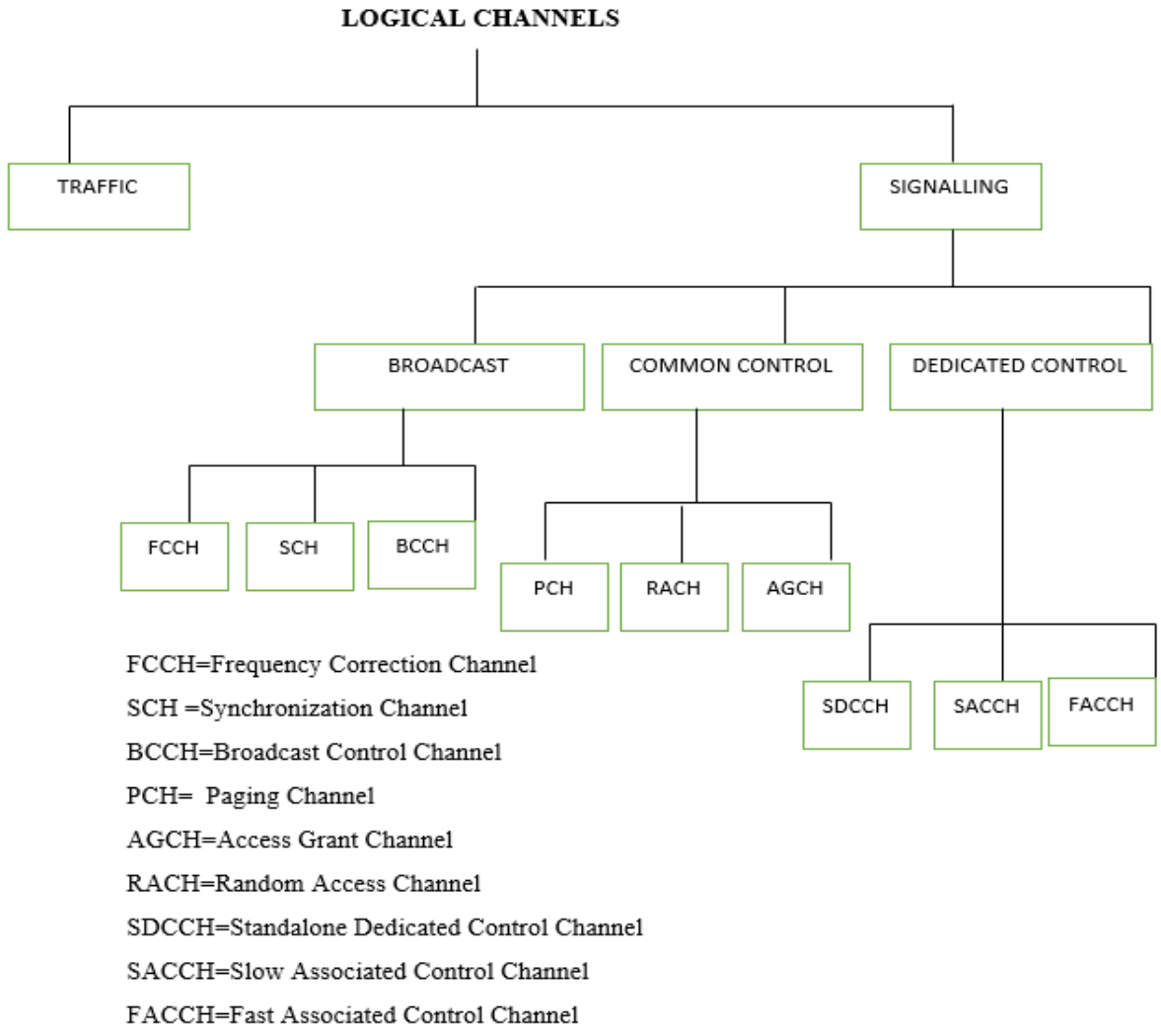


Figure 1: Logical channels in GSM

Manufacturers have been attaching things to the Internet before we called it the Internet. By the mid-1990s, Web servers were being added to implanted products. Current

M2M manufacturers have been inserting Internet-connected systems into high-value asset tracking, alarm systems, eet management and the things related for more than 15 years. These M2M systems are challenging to build even though some are based on industry standard protocols.

However, it is getting simpler to integrate M2M systems as more powerful processors are merged into the end nodes. And since these processors support high-level operating systems (OSes) and languages, the platform can influence intelligent frameworks. These systems are typically tied into high-end business service layers and are managed by a network operations center (NOC). IoT has developed immensely as a result of these needs.

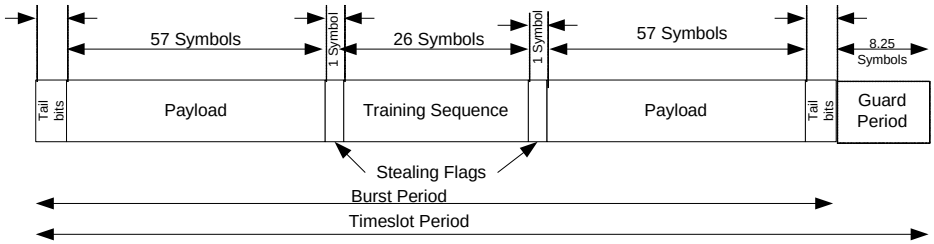
III.DESIGN AND ARCHITECTURE

The main thing involved in cellular IoT is transmission of burst data with the help of repetitive transmission according to the coverage class involved in the area of the receiver. If we consider the Burst Builder Functional Library mainly then we come across two main burst formats involved in burst data transmission. The general format of these bursts are depicted as below.

A. *Burst formats*

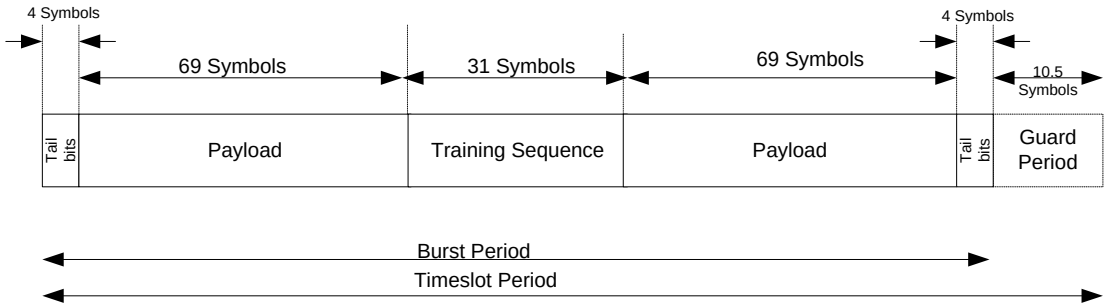
A burst is the physical content transmitted in one timeslot and is 156.25 symbols duration (576.9 us). Burst building is the process of combining the information with air interface overheads. The following types of bursts are used in our implementation.

i. *Normal Symbol Rate***:** NSR burst contains 116 encrypted symbols and there is a guard period of 30.46 μs that is 8.25 symbols in the timeslot. Nothing is transmitted during the guard period. Guard period is the delay provided in order to avoid overlapping.



Normal Burst

ii. *Higher symbol rate***:** For HSR, a timeslot is divided into 187,5 reduced symbol periods. It Contains 138 encrypted symbols in the timeslot. The guard period is of 10.5 symbol duration.



Higher Symbol Rate Burst

Burst Builder Functional Library (BBFL) is the software component that comes after CCFL in downlink transmission chain. The primary task of this functional library is building various types of bursts as indicated by its name, but apart from that, it also handles certain other supporting tasks related to transmission of bursts like collecting and transferring configuration parameters required by HW on timeslot basis. Other than this, Burst Builder supports test pattern transmission and BCCH Transmission to support Hardware Testing Requirements.

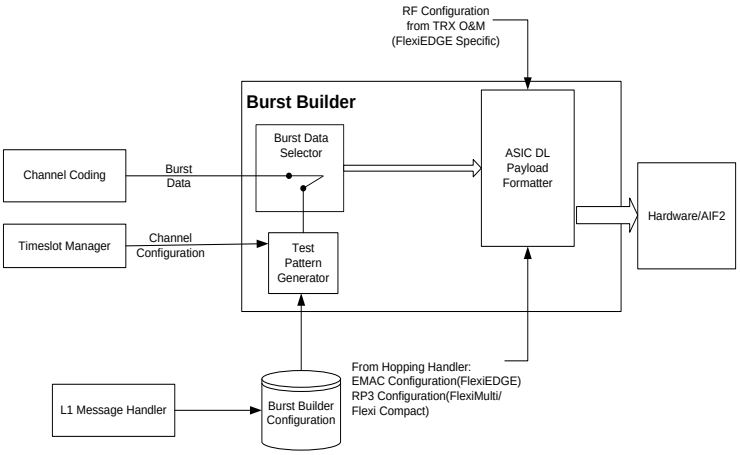


Figure 2: Burst Builder Functional Diagram

IV. CONCLUSION

Integrating the additional changes into the existing GERAN system to cater for the additional requirements coming from the objectives of this study such as extended coverage and low-complexity and low throughput will allow devices used in a Cellular System for Ultra Low Complexity and Low Throughput Internet of Things to co-exist with devices in the existing legacy GSM devices . This indicates that the same radio resources are distributed and that GSM to a large extent utilize existing system design. Furthermore, evolving the GERAN specification allows: - Support of existing legacy network requirements, including different network operations (for example multiband operation), non- hopping and hopping channels, etc. - Existing requirements to be reduced to the minimum needs applicable for Ultra Low Complexity and Low Throughput devices, such as decrease in modulation and coding schemes supported, limited mobility requirements, reduced RLC/MAC functionality, reduced and simplified signaling procedures and MS idle mode behavior.

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I'm a student of National Institute of Engineering College located in Mysore. The paper publication is a part of my curriculum and also, I'm much interested to do a paper. The paper is related to "Cellular IoT approach to achieve ultra-low complexity and low throughput in the system ". Here by I'm requesting you to correct me wherever I am wrong because, I am new to this world and help me to get success in this work

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