

## “Design of Efficient Femtocell using LZMA Data Compression Technique”

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**Abstract :** Efficient cellular network is a very hot cake in a next generation wireless system. Energy required to perform operation within a Time and improvement in Spectrum Efficiency are some parameter on which efficient cellular network will build. Femtocell provide a improvement in HO. The use of Data Compression Technology in Femtocell will improve the operational time and the efficiency of cellular network. LZMA is use for data Compression. The result of energy efficient Femtocell provide a green cellular network.

**Keywords :** Femtocell, HO, Data Compression and Aggregation, LZMA.

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### I. Introduction

As the sprouting of smart phones users, the demand of data traffic on high rise. Since commencement of 2000's telecom industry enjoying a expeditious growth. According to neoteric survey 13 % smart phone user occupy 78% all mobile traffic . With this the only 20% data usage seems to occur outdoor and 80% data to be in indoor region [1]. The growth in average mobile data usage on handset will settle to 30% per year in developed and developing country by 2019 13% of SIM enabled devices will be LTE and these will generate 79% of mobile data traffic [2]. As the demand increases QoS goes to bottommost level , increasing call drops and slow data rate betide in network because of the inadequate base station and work load on available base station. The handover scenario totally fails as a number of active users in a particular cell's increases and only the improvement in small cells will fade away these problem.

Our main focus is to improve the handover mechanism in cellular system with the lossless LZMA data compression technique which decreases the transmitting time of data.

### II. LZMA Data Compression Technique

The Data compression technique decrease bits of data results that the decrease in size of data [3] in a frame but the function of the data will not change and this causes many benefits, less time to transfer the data and it shrivel space to store the data. we can say that it is a method to sort the duplicity and to eliminate it .There are two symbolic ways used for the development of this data compression and they are –

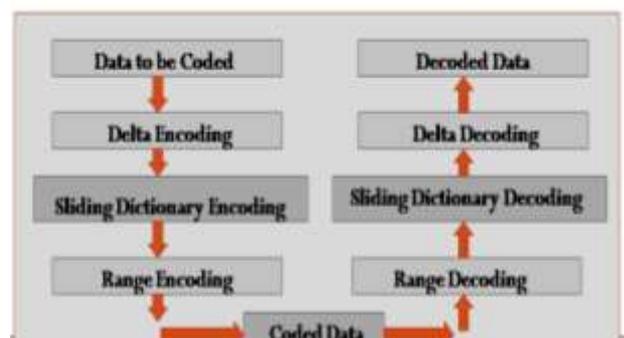
- Lossless Data Compression
- Lossy Data Compression

In Lossless data compression the data is commonly minify but its integrity linger the same, after compression only pinch in the size [4]. Lossless data compression is used in database tables, text file and in medical images because of law of regulations. In case of Lossy Compression data is decreasing by erasing certain amount of information that causes repetition, when data is uncompressed a part of the data always still there [5] it is used where perfect consistency of the original data is not required. video and picture data are some examples of Lossy Compression.

The dictionary based LZMA algorithm codes byte sequences from earlier contents rather than the original data. In this only one coding scheme is available in which all data will follow same format :

- Provide address to already coded contents
- Obtained sequence length
- Create first deviating symbol

If there is no identical byte sequence is available from earlier contents, address is 0 then sequence length is 0 and the latest symbol will be coded. Figure 1. LZMA also uses Delta Filter and Range Encoder in addition to the LZ77 algorithm[6].



### A. Delta Encoding and Decoding

The task of Delta Filter is that it shapes the input data bits for effective compression by the sliding window. It stores or transmits data in the form of sequential data. The output of the first byte delta encoding is data stream. The subsequent bytes are secure as the alternative of its previous and current byte. For a continuously changing real time data delta encoding make the sliding dictionary more efficient [7,8].

### B. Sliding Dictionary Algorithm

There are two types of dictionaries first is static dictionary in which the entries are predefined and constant according to the application of the text. Second is adaptive dictionary in which the entries are taken from the text itself and created on-the-fly. A role buffer is as dictionary and the size of these buffers calculate on the basis parameters of the implementation. Patterns in text are complete to born within range of the search buffer. The offset and length are encoded separately, and a bit-mask is also encoded. Purpose of suitable data structure for the buffers will trim the search time for longest match. Sliding Dictionary encoding is more difficult comparatively decoding as it needs to search the longest match [9].

### C. Range Coder

Range encoder encodes all the symbols of the message into a single number to achieve greater compression ratios because of the time limit to performing the operation is shrink. The range encoder works on the following steps.

- Provide a large enough range of integers and probability evaluation for the symbols.
- Divide the initial range into sub-ranges whose size are symmetrical to the probability of the symbol.
- Encode each symbol of the message by trimming the current range slide to just that sub-range which corresponds to the next symbol to be encoded.

The decoder and encoder must have the same probability estimation, copied from already transferred data [10].

### III. Femtocell

Femto-base stations received a lot of attenuation from mobile operators, because they offload the macro network but still use the orthodox types of mobile air interface (GSM, W-CDMA, CDMA). Therefore, the end user can still use existing handsets and enjoy next generation service at the highest bandwidth [11-12-13].

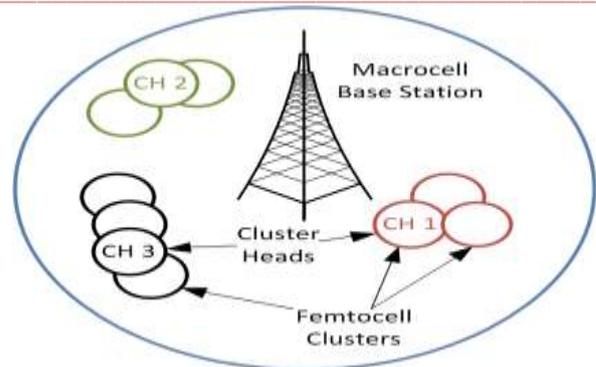


Fig : Clustered femtocell network

The macro network is a key concern for operators keeping indoor user off, and a differentiator for femto. Because indoors users are behind wall with high attenuation (typically 10-20dB)[14-15]. They consume more power from the terminal and the base station, and reduces the overall macrocell capacity and coverage. Covering indoor users with femtocell base stations have two advantages, not only does it provide better coverage and superior network for indoor user, but it free up macrocell resources to serve healthy network for outdoor users [16]. According network type, handover can be categorized in two types. Inter-network handover is occurred between different systems of network, such as handover between LTE and UMTS. Inner-network handover is triggered by inner network such as handover in same system [17]. The improvement in handover scenario save the energy of user's devices.

### IV. Result

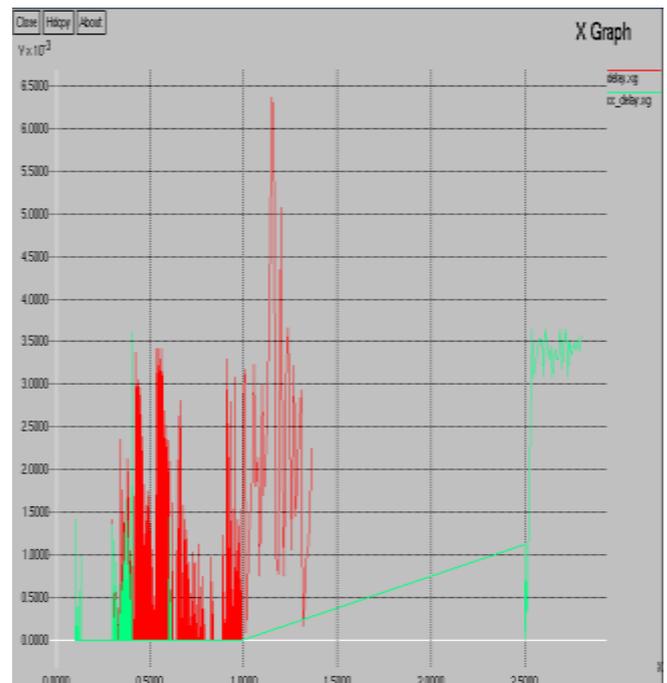


Fig : compared with simple and compressed data

Graph represents the comparison of delay with simple data and compressed data. Time is plotted along Y-axis and Delay is plotted along X-axis. The delay gets reduced because of compressed data. Spectral efficiency of compressed data is more compared to Spectral efficiency of simple data. It varies as the changes in source and destination and as increasing the number of communication. That means we say, the LZMA compressed data decrease Delay and increase the Spectral Efficiency in Cellular Network.

### V. Conclusion

The proposed LZMA Data Compression Technique reduce the delay and increase Spectral Efficiency results that it takes less time to perform the operation and reduce the data loss and increase energy saving and form a Green Cellular Network. On this results we conclude that a LZMA Data Compression Technique increase Femtocell Efficiency.

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