**Enhancement of MTC Performance in LTE Networks by**

**Maximizing Random Access Procedure Throughput**

A fundamental requirement for any cellular system is the possibility for the device to request a connection setup, commonly

referred to as random access procedure. In LTE (long term evolution) networks, the distribution of a limited number of radio resources

among H2H (Human-to-Human) users and increasing number of MTC (Machine-Type-Communication) devices in M2M

(Machine-to-Machine) communications is one of the main problems.

An analytical model is conducted to compute the throughput for

message 1 and message 2. This is done using a Markov chain model for the four messages signalling flow with buffering for message 4.

This model is used in LTE 3GPP (Third-Generation Partnership Project) random access. The network performance will be enhanced by determining a dedicated arrival rate corresponding to maximum throughput of message 2 that will assist the network planner to

optimize the network performance. In this paper, a deduced arrival rate less than 3.333 requests/ms has been concluded as a fact that can maximize network throughput.

The throughput of successful request has been found from experiments to obey the relation

Theta’=maxa Theta(a)

Pi(a)=Pr(Ank=i)=((ab/k)^i)/i!)\*e^(-a\*b/k)

Where

Pi(a)=Probability of aggregate request

Pr(Ank=i)=Probability of RACH (Random Access Channel) requests

Preamble ‘k’

a=Input Model Parameter

b=Periodicity

k=Preamble Number

Lambda=(a\*b)/k=Arrival Rate of Fresh Requests

Theta=Throughput of successful requests when system is stable=f(a)

Ank = Total number of RACH requests with preamble k

RACH=Random Access Channel

i=Number of RACH requests with parameter k

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