A Heterogeneous Cellular Communication System for Moving Users: A 5G Prospective

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Coverage of Topics

- Introduction
- Problem Specification
- Proposed Contribution
- Performance Analysis
- Conclusions

Introduction(unique feature of 5G)

1.Massive MIMO

2.Device Centric Communication,

3.Smarter Device-to-Smarter Deice

4.Native support M2M Communication

5.Millimeter wave communication

5G Specification

1. 1000 times more system capacity
2. 10 times higher spectral efficiency
3. 100 time more energy efficiency
4. 25 times more average cell throughput

Motivation

1. Need a communication system, where the basic requirement of 5G must be fulfill
2. Support the Green Communication
3. Support the Minimum Infrastructure interface

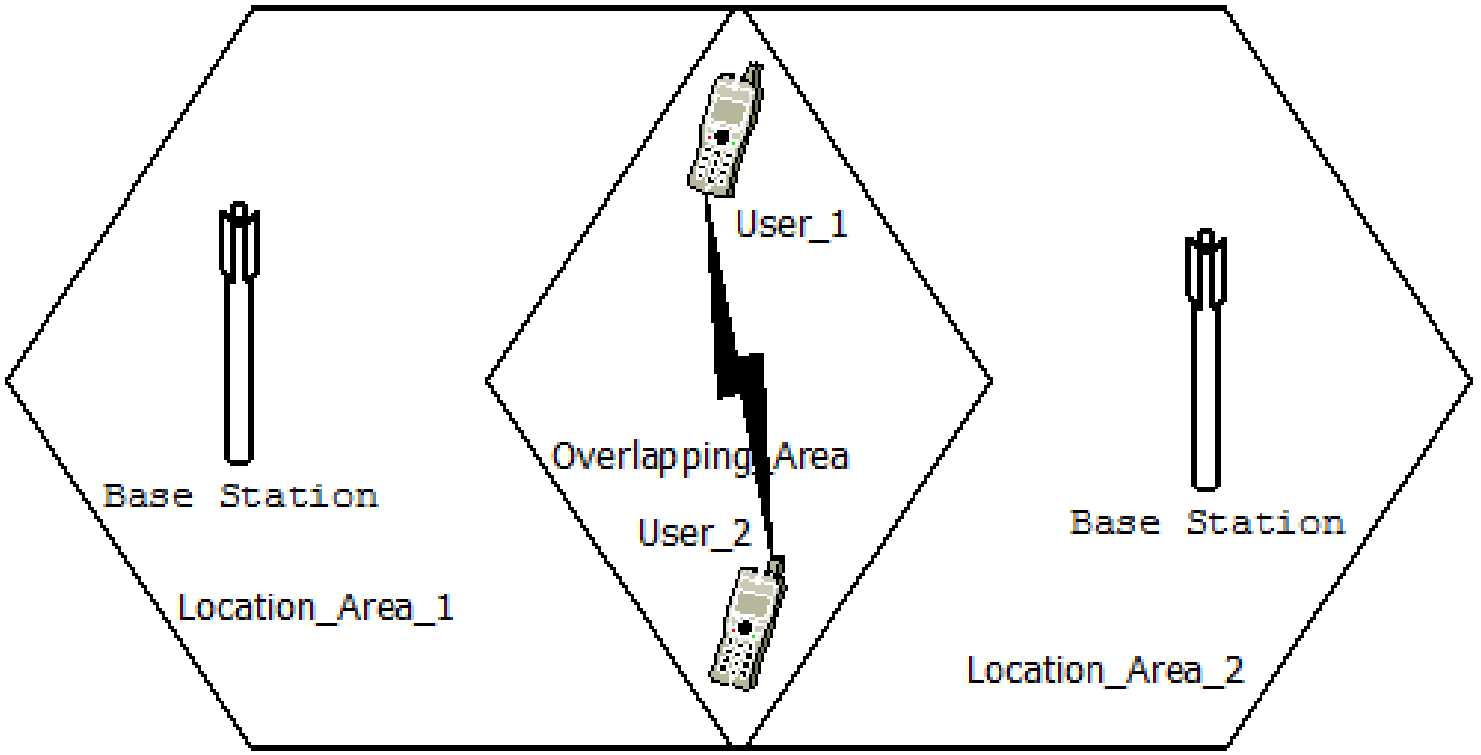
Contribution

Introducing a D2D communication system for the 5G networks.

It has high throughput over the network

Proposed communication network has less latency, lower energy consumption, lower communication costs, and support many low-rate connections

Contribution



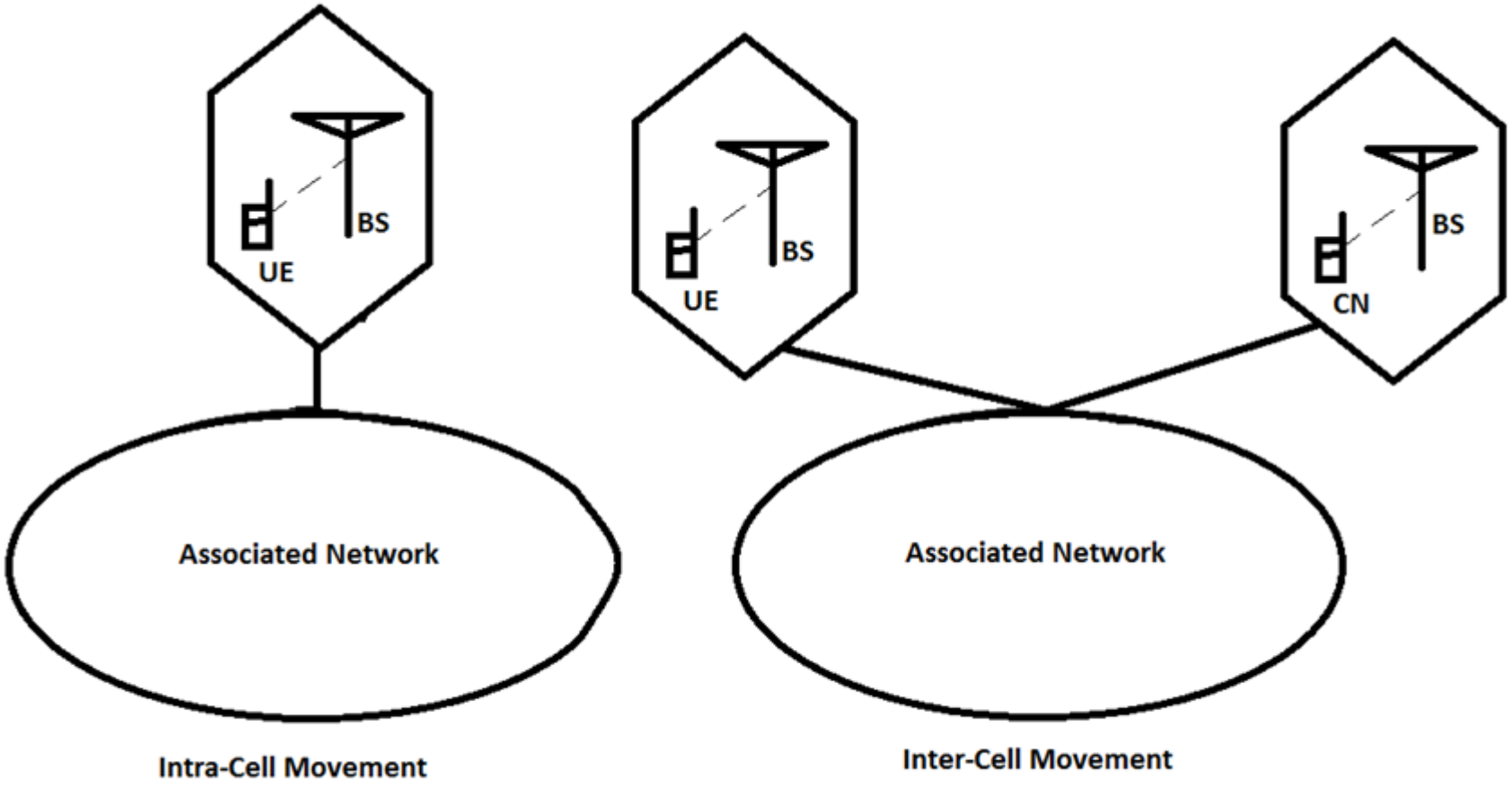
Algorithm

1. The User Equipment (UE) initiates the call.
2. The BS used to start the communication and put an effort to pass the request packet to BSC/ MSC.
3. The MSC/ BSC used to setup a call between the UE and Corresponding Node (CN).
4. The UE starts the communication with the help of the BS.

Algorithm

5. The network compute the position of the UE and CN
6. If the UE and CN are in the neighboring cell or the overlapping area the MSC will transfer the call to D2D communication system
7. This handover will take place with respect to signal strength

Performance Analysis



Notation for Performance

Symbol	Description
η	Proportionality constant
ν	Per unit per association lookup cost
χ	Liner Coefficient of LM
$\lambda_{CALL}/\lambda_{cell}$	Average number of call to a target MT per unit time in a LA/cell, is a Poission distribution random variable rate
T_c / T_p	Transmission Cost/ Processing Cost
SR_{RREQ}/SR_{RREP}	Size of Route Request and reply message for LU
ϖ / ϕ	Per hop LU/ Binding transmission cost.
d/S	Distance threshold/ Area of cell
δ	Per Location database lookup cost

Signaling Cost

The signaling cost is depends(mainly) hops counts, bandwidth consumption and number of active user per LA

Inter-cell Signaling Cost: UE to BS, BS to MSC/BTS, MSC to MSC, MSC to BS(target), BS to CN

Intra-cell Signaling Cost: UE to BS, BS to MSC, MSC to BS(target), BS to CN

Then the cost per unit of distance can be computed as: $C_T^d = N_{UE} \frac{T_C + T_P}{d}$

$T_c = 2(h-1+\eta)\varpi$ and

$$C_T^d = N_{UE} \times \frac{2(h-1+\eta)v + T_p}{d}$$

Similarly, we can calculate the binding update cost

$$C_{BU-T}^d = N_{UE} \times N_{CN} \times \frac{B_{UC}}{d}$$

Where,

$B_{UC} = 2(h-1+\eta)\varphi$

So,

$$C_{BU-T}^d = N_{UE} \times N_{CN} \times \frac{2(h-1+\eta)\varphi}{d}$$

Total Signaling Cost

$$C_{\text{Signal}}^{\text{Traditional}} = \left(N_{MT} \times \frac{2(h\text{-}1+\eta)v + T_P}{d} + N_{UE} \times N_{CN} \times \frac{2(h\text{-}1+\eta)\phi}{d} + N_{UE}^2 \times N_{CN} \times \frac{\chi \ \lambda_{CALL}}{S} \right)$$

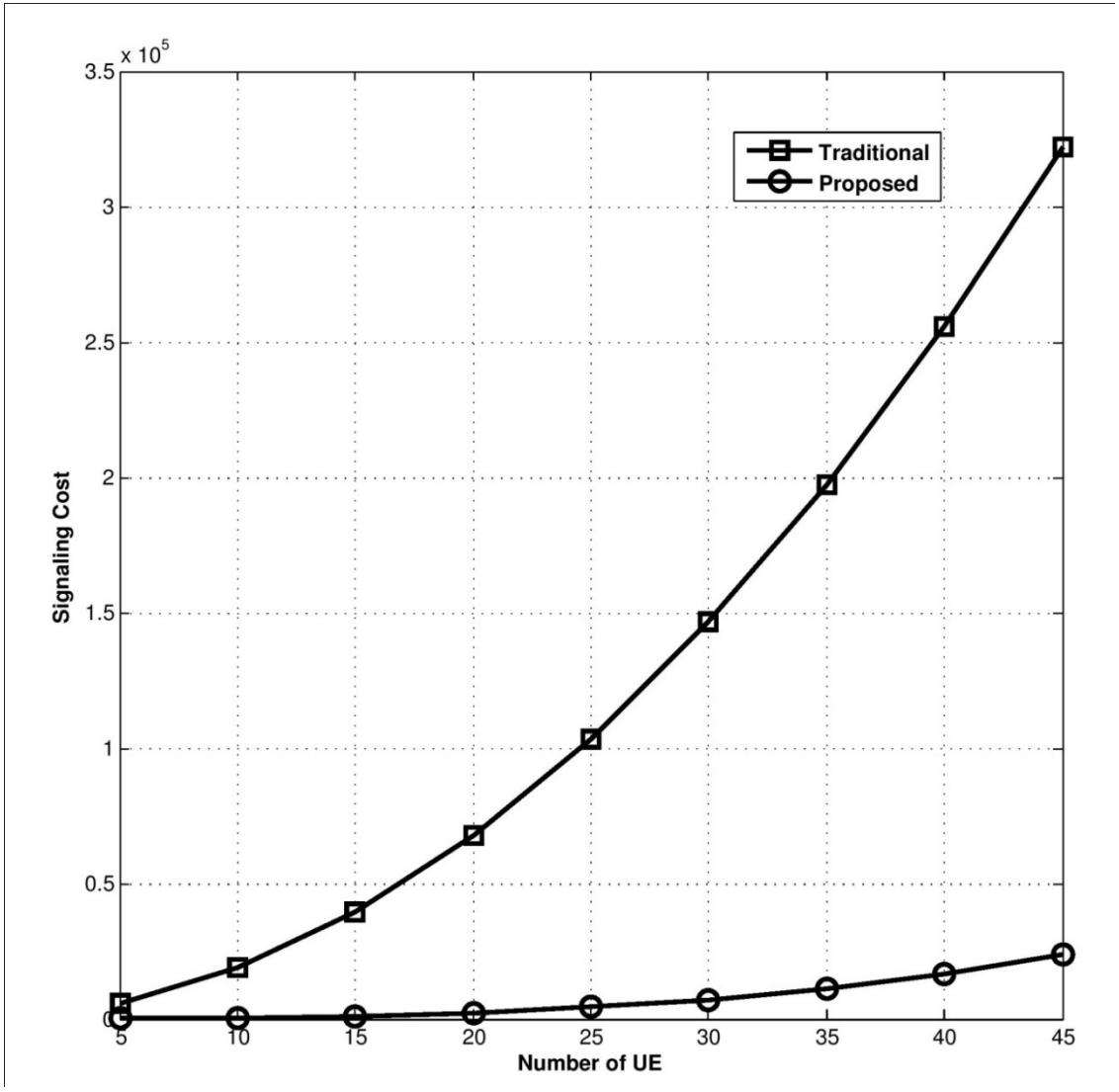
$$\times \left(SR_{RREQ} + SR_{RREP} \right) \times \left(D_p \times 120 \right)$$

$$C_{\text{Proposed}} = \left(N_{UE} \times \frac{2(h\text{-}1+\eta)v + T_P}{d} + N_{UE} \times N_{CN} \times \frac{2(h\text{-}1+\eta)\phi}{d} + N_{UE}^2 \times N_{CN} \times \frac{\chi \ \lambda_{CALL}}{S} \right)$$

$$\times \left(SR_{RREQ} + SR_{RREP} \right) \times \left(D_p \right) + \left(\frac{2(h\text{-}1+\eta)v + T_P}{d} + \frac{2(h\text{-}1+\eta)\phi}{d} + \frac{\chi \ \lambda_{CALL}}{S} \right)$$

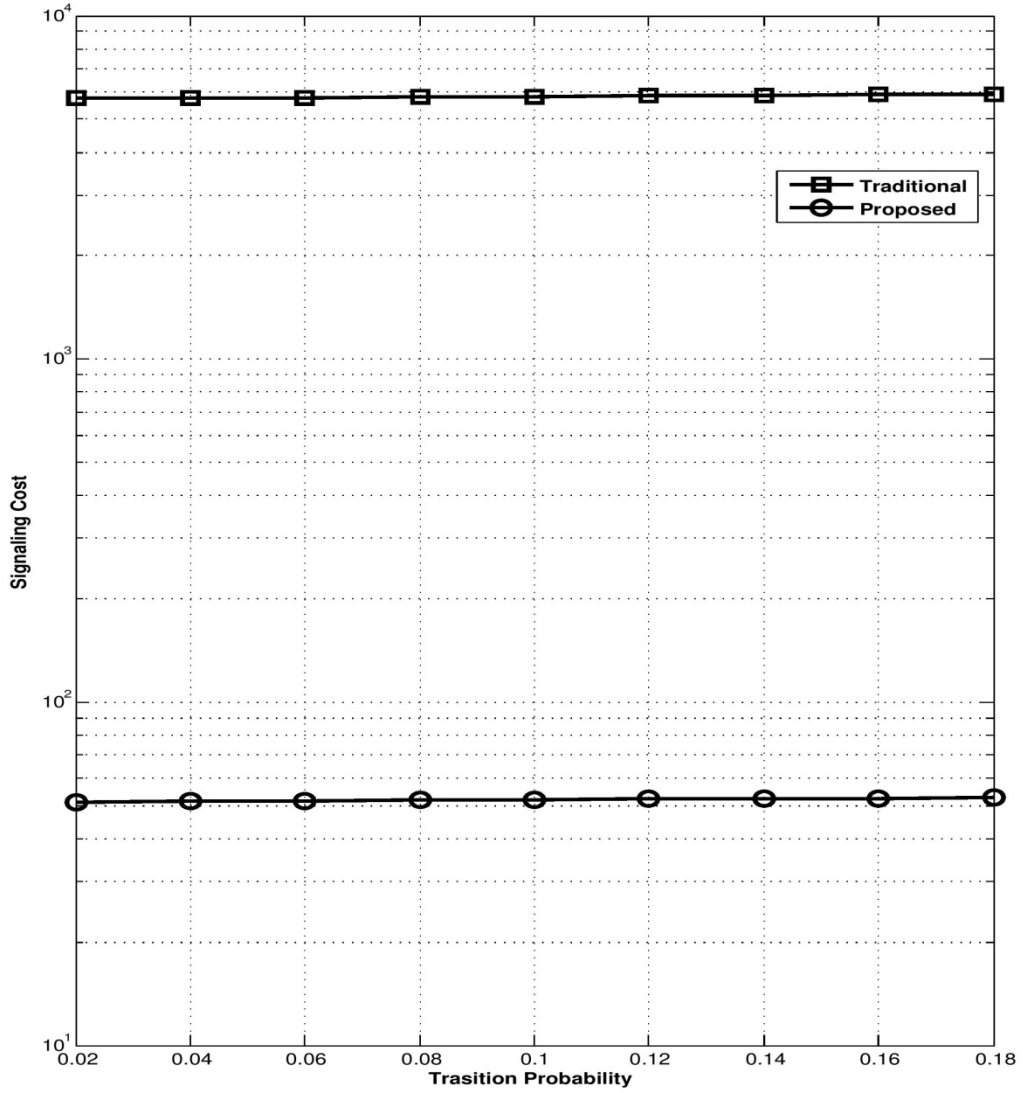
$$\times \left(SR_{RREQ} + SR_{RREP} \right) \times \left(D_p \times 119 \right)$$

Signaling Cost Vs Number of UE



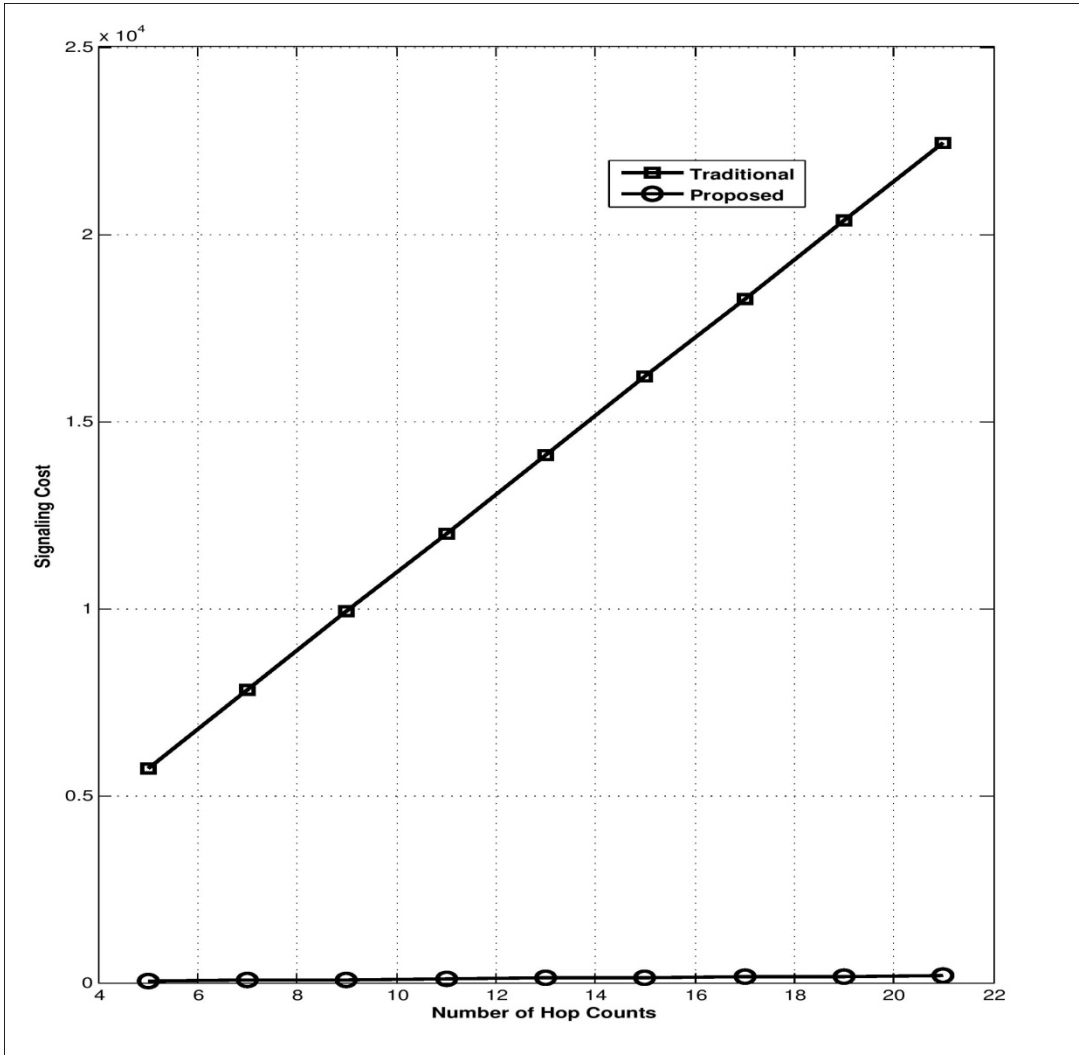
hop distance = 5threshold for handover= is 50 meters. The transition probability constant = 0.02. size of route request and route reply packet size = 256 Initial transmission and processing cost is assumed as 0.02 units. The area of the each cell is 500 m^2

Signaling Cost Vs Transition Probability of UE in a cell



UE =5 to 45,CN =5 to 45 The transition probability constant = 0.02 to 0.16. size of route request and route reply packet size = 256 Initial transmission and processing cost is assumed as 0.02 units. The area of the each cell is 500 m^2

Signaling Cost Vs Number of Hop counts for the CN



UE = CN =5 The transition probability constant = 0.02 to 0.16. Hops counts = 5 to 21. The area of the each cell is 500 m^2

CONCLUSIONS

Proposed a device to device communication system for 5G communication system.

In the overlapping area, start the device to device communication. The initial phase of the communication is network centric communication and after that it will handover to user centric mode.

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