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Data Routing Algorithm in Mobile Cloud Computing Network

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Abstract: **Cloud computing technology provides assistance to companies and users to share computing resources instead of having personal devices or local servers to handle the applications. Mobile cloud computing networking [MCCN] is a novel approach. MCCN is an integration of cloud –based resources and mobility. This paper gives an overview of mobile cloud network model, their challenges and technology of LTE. But sometimes it is difficult in cloud to built spontaneous network and configures its parameters. This paper gives brief view of the routing algorithm used to enhance the capacity of access network in mobile cloud services based on merging of computation and networking in heterogeneous mobile cloud networks.**

Keywords: Mobile cloud computing network, Heterogeneous network, LTE [Long-Term Evolution].

1. INTRODUCTION

Cloud computing technology provides assistance to users and companies to share computer resources on pay-as-you-use basis. Cloud technology came into existence in late 2000s.

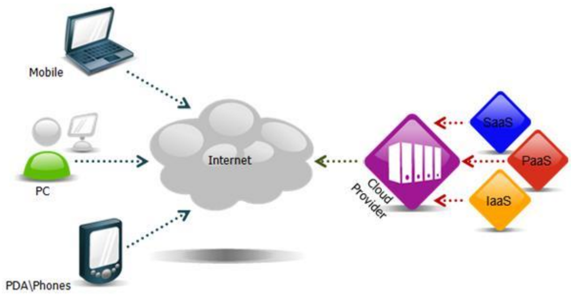


Fig 1: Cloud computing structure

In cloud the service providers provides a variety of services such as

1. SaaS [Software as a Service]
2. PaaS [Platform as a Service]
3. IaaS [Infrastructure as a Service]

In cloud the resources such as storage, computing power are not present at the user's location.

Pros of cloud computing are cost, storage, access, speed, scalability.

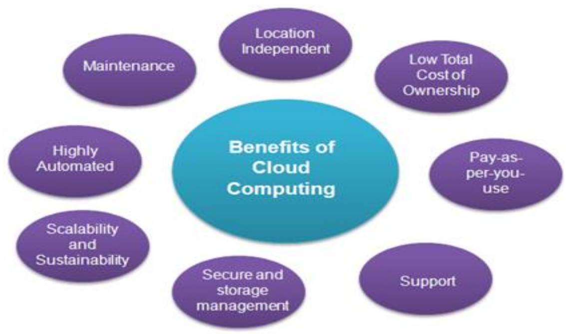


Fig 2: Pros of cloud computing

Cons of could compute are security, privacy, internet access dependent, standardization, service level agreements, suppliers interoperability.

The popularity of mobile devices and also increased demand of mobile applications made to converged as mobile cloud computing based on user palatable. Some statistics of mobile computing are given below.

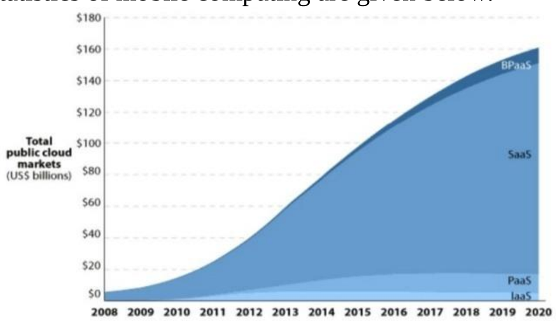


Fig 3: Statistics of mobile cloud computing

The important challenges in cloud computing are network capacity, reliability in some applications related to disasters, healthcare, interactive applications and real time media content analysis, where it is important to keep these applications working in real time streaming, using efficient resources and high QOS can be accessed anytime and from anywhere.

	Cloud infrastructure attributes		
Applications	Compute intensity (*High* – required for compute-intensive apps)	Network bandwidth (*High* – required for content-heavy, large data transfer apps)	Network latency (*Low* – required for high interactivity
Web-mail (Yahoo!, gmail)	Low	Low	High
Social networking (Facebook)	Low	Medium	Medium
Web browsing	Low	Low	High
Online gaming	High	Medium	Low
Augmented reality	High	Medium	Low
Face recognition	High	Medium	Low
HD video streaming	High	High	Low
Language translation	High	Medium	Low

Fig 4: cloud computing Challenges

In MCCN network, security is considered as bottleneck. So an adaptive data routing model is used to overcome the situations when mobile devices come across high volume of traffic and disconnection situation. Why we use an adaptive data routing algorithm?

An adaptive data routing algorithms changes their routing decisions based on topology and traffic. With this solution scalability, elasticity of cloud is increased and also power reduction for mobile devices is achieved. This new routing process is known as cognitive data routing in heterogeneous mobile cloud networks (CDRHMCN).

Cognitive radio technology and algorithms are used to solve the problem of spectrum by allowing the unlicensed users (SU) to access available spectrum without affecting the activity of licensed user (PU).

2. RELATED WORK

The mobile cloud networking architecture is as shown in figure 5.

The MCCN architecture consists of 3 models:

1. Client/server model.
2. Cloudlet model.
3. Ad-hoc model.

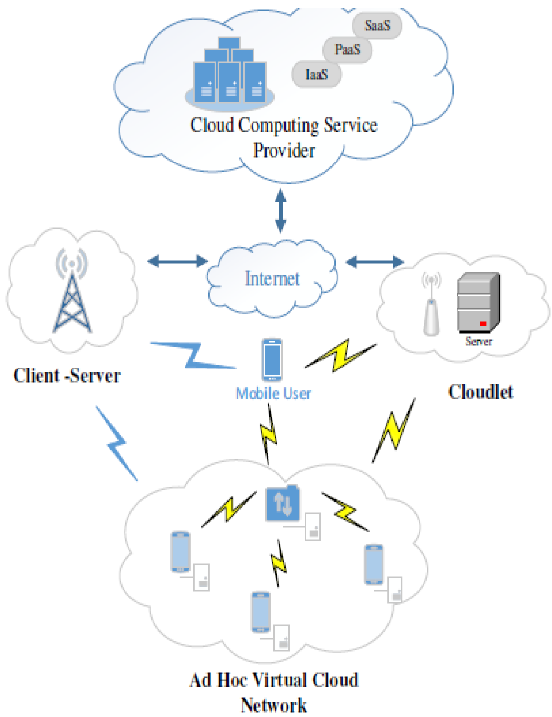


Fig 5: Heterogeneous mobile cloud networking architecture

Client/Server model: In this model tasks and complex applications are offloaded from mobile device (Client) to computational infrastructure server which remains static and provides services to the mobile users.

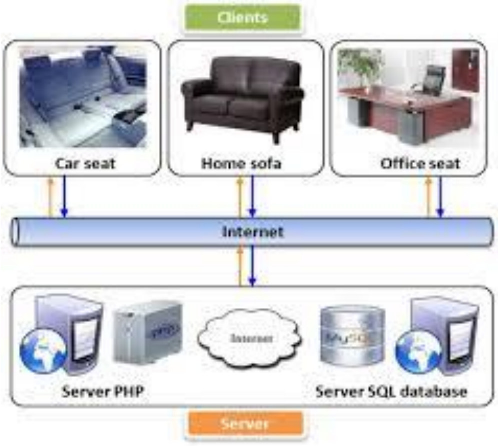


Fig 6: Client /server model

Cloudlet model: A cloudlet model can be viewed as a data center whose goal is to utilize nearby resources and with one hop communication providing a low latency, high bandwidth accessing from mobile user.

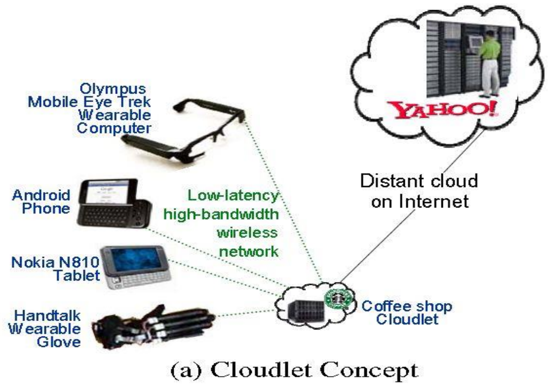


Fig 7: Cloudlet model

Ad-hoc model: In Ad-hoc model mobile devices are formed a virtual cloud by sharing their resources to provide special task for other mobile.

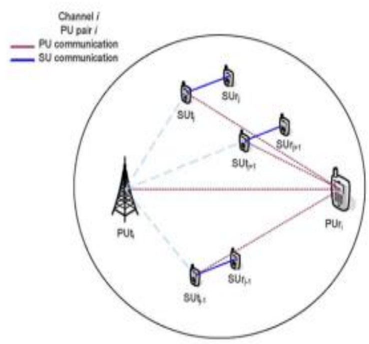


Fig 8: Ad-hoc model

3. CHALLENGES IN MCCN

Challenges arise when using mobile devices in cloud are depicted in figure 9.

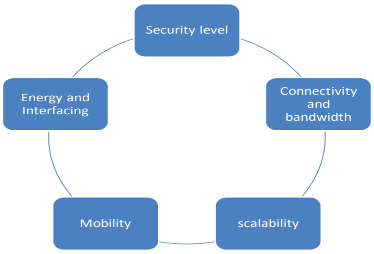


Fig 9: Challenges in mobile cloud network

4. COGNITIVE DATA ROUTING IN HETEROGENEOUS MOBILE CLOUD NETWORKING MECHANISM

As cognitive data routing algorithm provides solutions to bottleneck problems. By assuming the availability of various type of resources and alternative wireless connectivity. Heterogeneous in mobile cloud networks comes from the infrastructures, variety of hardware and technologies like Mobile devices, cloud and Wireless networks.

We propose an LTE cellular network that contains of cellular base station (e Node B) and mobile devices connected to it. LTE was designed to increase the capacity and speed of the cellular networks. In LTE download rate is100Mbps and Uplink rate is of 50Mbps. LTE supports both TDD [Time division duplexing] and FDD [Frequency division duplexing].

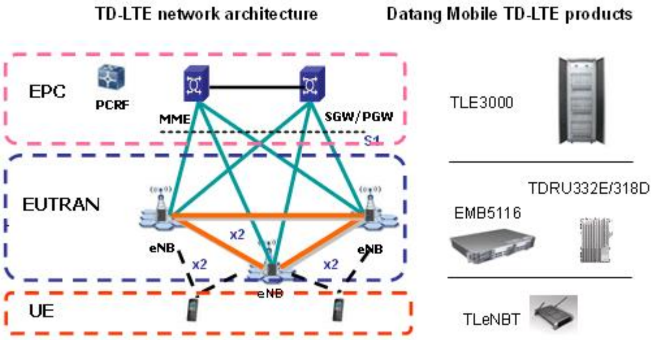


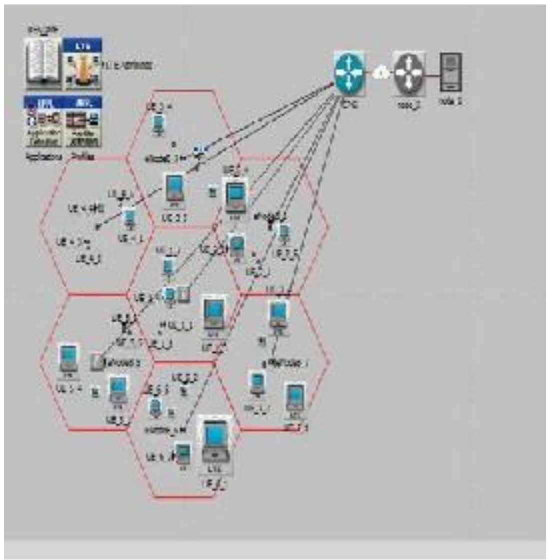
Fig 10: LTE

In LTE to do necessary analysis and decision of nodes has a command and control functions that is used to initiate the procedure with the following steps.

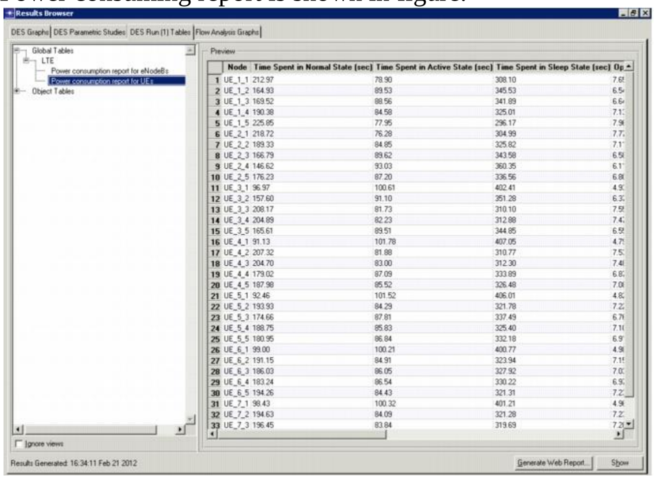
1. Resource scanner
2. Selecting Algorithm
3. Decision and execution
4. Partitioning

5. SIMULATIONS

Using opnet17.5 version, which supports LTE for modeling heterogeneous mobile cloud computing networking along with Visual Studio 2012 version.



Power consuming report is shown in figure.



	Node	Time Spent in Normal State (sec)	Time Spent in Active State (sec)	Time Spent in Sleep State (sec)	Op
1	UE_1_1	212.97	78.90	308.10	7.6
2	UE_1_2	164.93	89.53	345.53	6.5
3	UE_1_3	169.52	88.56	341.89	6.6
4	UE_1_4	190.38	84.58	325.01	7.1
5	UE_1_5	225.85	77.95	296.17	7.9
6	UE_2_1	218.72	76.28	304.99	7.7
7	UE_2_2	189.33	84.85	325.82	7.1
8	UE_2_3	166.79	89.62	343.58	6.5
9	UE_2_4	146.62	93.03	360.35	6.1
10	UE_2_5	176.23	87.20	336.56	6.8
11	UE_3_1	96.97	100.61	402.41	4.9
12	UE_3_2	157.60	91.10	351.28	6.3
13	UE_3_3	208.17	81.73	310.10	7.5
14	UE_3_4	204.89	82.23	312.88	7.4
15	UE_3_5	165.61	89.51	344.85	6.5
16	UE_4_1	91.13	101.78	407.05	4.7
17	UE_4_2	207.32	81.88	310.77	7.5
18	UE_4_3	204.70	83.00	312.30	7.4
19	UE_4_4	179.02	87.09	333.89	6.8
20	UE_4_5	187.98	85.52	326.48	7.0
21	UE_5_1	92.46	101.52	406.01	4.8
22	UE_5_2	193.93	84.29	321.78	7.2
23	UE_5_3	174.66	87.81	337.49	6.7
24	UE_5_4	188.75	85.83	325.40	7.1
25	UE_5_5	180.95	86.84	332.18	6.9
26	UE_6_1	99.00	100.21	400.77	4.9
27	UE_6_2	191.15	84.91	323.94	7.1
28	UE_6_3	186.03	86.05	327.92	7.0
29	UE_6_4	183.24	86.54	330.22	6.9
30	UE_6_5	194.26	84.43	321.31	7.2
31	UE_7_1	98.43	100.32	401.21	4.9
32	UE_7_2	194.63	84.09	321.28	7.2
33	UE_7_3	196.45	83.84	319.69	7.2

In this scenario by using LTE network nodes can utilize resources by switching the mobile node from cloudlet, client/server or ad-hoc models to utilize the resources and providing data routing in successful manner. By this network capacity, coverage area, network throughput increases by using CDRHMCN algorithm. Consuming of power and delay is minimized. The average throughput in the ad-hoc model with high range of QOS is shown in figure 13.

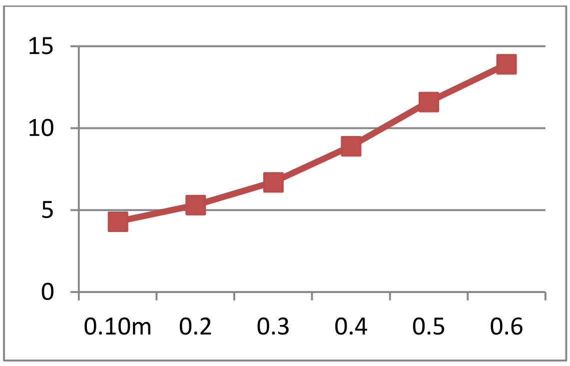


Fig13: the average throughput in the ad-hoc model.

6. CONCLUSION AND FUTURE WORK

In heterogeneous mobile cloud computing network requires adaptive data routing algorithm to overcome the critical networking challenges. By considering throughput, delay we can assess the performance of the network. Future work, there is need to overcome the security in mobile level as well as in cloud level, it is necessary to improve the storage capacity, battery life time, power consumption on MCN.

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