ABSTRACT
As we all witness the incredible growth of mobile device in past 10-15 years. We can see several thousands of mobile applications available in market which runs on different platforms. With this drastic growth of mobile technology there are various characters of mobile technology that impedes them to provide efficient services. Cloud computing has gained significant attention in last few years. Mobile computing is now integrated with cloud computing to harness the advantages of cloud and overcome underlying challenges of mobile devices. After integration of mobile and cloud computing, there are various security issues that need to be addressed while working on cloud environment. This paper describes few security issues and their possible solutions in mobile-cloud integration. Also overview of cloud computing including its types, features, applications and hierarchy in discussed.

KEYWORDS: – Cloud computing, Cloud services, Mobile computing, Mobile cloud computing, Mobile Applications, Mobile Cloud computing security issues

INTRODUCTION
People all over the world are befalling for Mobile devices. With their ever increasing popularity, the services offered by the providers are hindered with its underlying challenges that include diverse OS version running on mobile devices, diversity of devices, reduced time to market and run time environment. For overcoming these challenges mobile computing has integrated with cloud computing. Cloud computing is currently much in demand. According to Goldman Sachs the cloud infrastructure and platform market is expected to expand at a 19.62% CAGR from 2015 to 2018, reaching $43B by 2018 as shown in figure 1. Also in recent market analysis forecasts that the global market for cloud infrastructure and platforms is expected to grow from $21B to $43B by the end of the forecast period.

In this paper introduction to advent of cloud computing concept including its types, features, applications and hierarchy in discussed. In next section of the paper overview of mobile cloud computing, advantages of mobile cloud computing and its various security issues along with their possible solutions proposed by various authors is conferred.

CLOUD COMPUTING
Cloud computing can be thought of as a total solution that delivers IT as a service. Cloud computing is also known as on-demand computing in which shared resources and information are provided to computers and other devices on demand. Cloud computing has now become highly demanding service due to its various advantages like high computing power, cheap cost of services, high performance, scalability, accessibility, availability etc. Every year there is a growth rate of 50 % of cloud vendors. Let’s take a real life example to explain cloud computing concept of having a meal at home versus ordering the meal from home. Even though objective is purely the consumption of a meal, the approach used is significantly different. If the approach used is to prepare a meal at home then the entire headache of arranging the ingredients required and for preparing the meal is solely yours and after having the meal, cleaning the surrounding also belongs to you. But if the approach used is ordering the meal

Figure 1: Growth chart of cloud computing infrastructure [1]
over the phone or online ordering using some web interface, then we can relate it to cloud computing approach. Here we are taking catering as a service from the restaurant management. The onus of possessing the ingredients, preparation for the dish, cooking the dish, sending it to the address all falls on restaurant administration. This example can be viewed as principles of cloud computing – “on demand availability”, “As-a-service”, “pay for the usage”. There are three types of clouds as shown in the figure 2.

FEATURES AND APPLICATIONS OF CLOUD COMPUTING
Following are some of the features of cloud computing [2]:-
1. On-request self-service. Clients can use computing capabilities directly without any direct interaction with the service providers.
2. Broad network access. Capacities are accessible over the network and accessed through standard components that advance use by heterogeneous slight or thick customer platforms such as cell telephones, tablets, and PDAs and other routine or cloud-based services.
3. Resource pooling. The supplier's registering assets are pooled to serve numerous purchasers utilizing a multi-occupant model, with distinctive physical and virtual assets powerfully relegated and reassigned by interest. Assets incorporate capacity, preparing, memory, system data transfer capacity, and virtual machines.
4. Rapid flexibility. Capacities can be quickly and flexibly provisioned for boundless and can be acquired in any amount whenever needed.
5. Measured service. Usage of resources can be observed, controlled and enhanced through metering capacities. Cloud services are frequently however not generally used in conjunction with, and empowered by, virtualization innovations. Cloud computing has been credited with increasing competitiveness through cost reduction, greater flexibility, elasticity and optimal resource utilization. Figure 3 shows procurement of cloud in different fields to accomplish their business objectives.
CLOUD SERVICE HIERARCHY
The cloud computing infrastructure and platform includes Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). The hierarchy of these services is shown in figure 4.

IaaS: It is a base layer including cloud infrastructure having servers, storage, network and operating systems

PaaS: It provides platform for creating a soft wares having database, operating system, middleware and tool.

SaaS: It provides complete and finished soft wares on demand. It will be available either on license or pay per use basis.

MOBILE CLOUD COMPUTING (MCC)
Mobile Cloud Computing idea can be portrayed as the accessibility of Cloud Computing assets and services for mobile devices. The combination of cloud computing and wireless communication over portable computing devices such as mobile device, PDAs, Laptops etc., has established the framework for a novel computing model, called mobile cloud computing, which permits clients an online access to boundless processing power and storage capacity. This concept can be depicted in figure 5.

MOBILE CLOUD COMPUTING SECURITY ISSUES OVER THE CLOUD
There are various challenges that are Mobile communication issues, Computing issues, Network Access Management issues, Quality of Service issues, Service Convergence issues, security issues etc. Out of all these challenges, security is considered to be a perilous obstacle for cloud computing in its path to triumph. The focus of this paper is on major security issues in mobile cloud computing. On the basis of services provided by Mobile cloud computing security issues can be viewed as three layers as shown in the figure 6:-

1. Backbone layer
   This layer is related to security surveillance in cloud physical system

2. Infrastructure layer
   This layer is related to monitoring VMs in cloud, storage verification, Evaluation and Audits,

3. Application and Platform layer –
   This layer is related to user management, key management, authentication, authorization, encryption and data integration.

As Mobile cloud computing is a combination of cloud computing and mobile computing. So the security issues are classified into two classes: - Cloud security and Mobile Network user’s security.

Cloud security:-The enormous information residing on the cloud must be secured enough so that its integrity, authentication and digital rights are reserved. Mobile Network User’s Security: - The mobile applications running on the devices and the user credentials over the network are of concern under mobile network user security.
## SECURITY SOLUTIONS FOR MOBILE CLOUD COMPUTING

Figure 7 shows the proposed solutions for the security issues in mobile cloud computing.

## CONCLUSION AND FUTURE WORK

As we all know that cloud computing is briskly evolving as a new model for providing many services on demand basis. This rapid development is combined with mobile computing which is at its ever increasing growing phase. In this paper overview of cloud computing along with features, applications, services and types are discussed. This paper also gives brief introduction to mobile cloud computing and discusses security issues concerned with mobile cloud computing in detail along with literature review of the solutions proposed by some of the authors is also discussed. For future work there is need to explore more security issues because cloud computing concept is here to stay for a while and to find more solutions for existing security issues.

## REFERENCES