

## Recent Innovations in Cloud Computing

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**ABSTRACT:** *In the era of computing when the storage, deployment and accessing of resources are happening on the cloud there is a immediate need to look over the security, reliability and implementing new technologies that can focus on maximizing the use of cloud resources with clear focus on use of renewable resources and improved form of authentication for data transmission. In this paper we tried to introduce few recent trends & innovations that will change the way of deployment on the cloud devices and systems. The paper introduces with a new and improved way of password less authentication technique and later discussed the introduction of decentralization of power systems with the use of 'Smart Meters' in datacenters and storage units. The paper also discusses on the introduction of a newer idea of replacing the trend of 'Internet Service Providers' by 'Decentralized Peer to Peer Networks' that would further reduce the burden on individual servers and furthermore discussed the 'Secure Push Notifications' over mobile networks further enabling secure transactions over accepted terms and conditions between the third party network.*

**Keywords-** *Computing, Decentralization, Peer to Peer Networks, Secure Push Notifications, Third party Networks.*

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### I. Introduction

In the last few decades computing has taken a trend based on Big, Centralized and mainframe systems. And with the growing need and flexibility the deployment options and security features also need to be improved. So with a view of the demand of the end users and to offer better facilities better and improved technologies must be implemented to meet the requirements of the future computing. When new authentication based techniques must be introduced by replacing the current ones, the paper too introduces the concept of 'Smart Meters' by decentralizing power distribution systems in data centers and further focusing on securing data for push messages in mobile devices via third party service providers. At the end the paper discusses on the future scope of introduction of peer to peer decentralized networks thereby reducing the load and burden on individual servers where researchers are continuously trying to meet both ends that is the server and the client side to improve and broaden the scope in the era of cloud computing.

### II. The Next Generation Authentication for Cloud

Smart phones, laptops, tablets and the next generation devices have marketed and flourished the gadget market and innovative & smart technology are gradually taking over the IT world. And as these technologies have flourished and being used by more and more customers there is a need to look over the issues of security and authentication when data is put on the cloud. Be it authentication or data integrity, it all takes into account how we are protecting the access of data over the cloud network. There will some day when the world will be password free, and our hardware devices like our phone or a laptop will work on fingerprint or iris authentication.

#### 2.1. The problem Statement

Password authentication is considered as a problem as far as integrity and confidentiality is concerned. The problem arises when one needs to remember a wide range of passwords and usernames and that too becomes confusing when you are not able to remember a dozens of them. Either one can use the "Password Manager"(3) that is recently in trend where lots of research are going around to collect passwords around a single dimensions or generate password for you. But that too is not the solution since that still can't guarantee integrity and total security. The research should be proposed around using such systems or an application or a hardware system that can uniquely identify and authenticate the user and create a remedy or to remove the password based authentication systems from the whole system.

#### 2.2. FIDO: A step ahead to authentication

Targeting easier yet strong authentication, FIDO i.e. First Identity Online Alliance has proposed two

1.0 specifications of 2 drafts namely, Universal Authentication Framework(UFO) and Universal 2<sup>nd</sup> Factor(U2F) that will offer much stronger form of authentication that may be coming into the market the next year (shown in Fig 1). [1]. The members of the alliance include online service providers, device manufacturers and enterprises, where they can commercialize and make implementations the 1.0 specification. Where non-members will get free deployment to these solutions, members will be allowed to market and implement those solutions for providing strong authentication services. Basically fingerprint, iris or may be voice will serve as the passport for next generation FIDO system authentication

FIDO specifications will follow a outline a set of servers, client software and devices, which includes native apps, browsers and browser plugins. Synaptics, Alibaba, Paypal and Google and Nok Nok labs are the few market leaders who are implementing these implementations As shown in Fig 1 biometrics, hardware tokens and cloud devices can interface with existing and future enabled FIDO authentication systems. Though certain smart phones like Apple iphone6 has a fingerprint authentication but the FIDO technology will be somewhat different. One can use the FIDO as software that can be easily get incorporated into websites or applications that too in different hardware environment for free of charge.

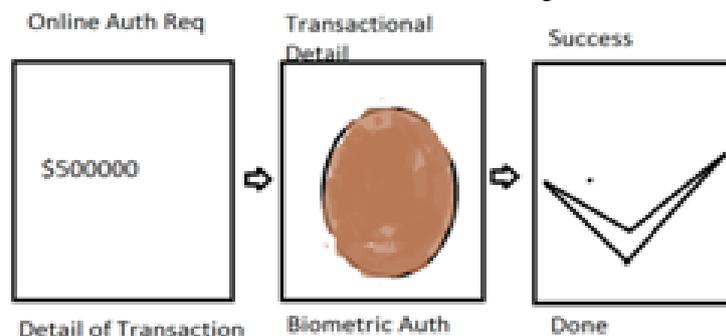


Fig.1. FIDO Authentication

### III. ‘Push Notification Message’ for secure mobile cloud communications

When the whole world is trying to secure the cloud systems over mobile devices, to ensure data notifications over push services to and from mobile devices, it has become a challenge to maintain the data integrity and confidentiality over mobile networks. Recently in a research done by IBM Technologies found that there is a major drawback in the security protocols that can be risky when data notifications are pushed across different mobile networks in turn exposing the sensitive data to the service providers. Such scenarios of mobile data exposure are a serious issue when organizations have to share the customer’s personal credit card number or a transactional activity via a third party network.

#### 3.1. Method of implementation

The complete method for pushing secure notification involves push service platform that in turn receives a push notification message requests from the party that has been shown in Fig 2. To overcome the above challenge, IBM came up with a cloud based service that enables applications which encrypts data notifications; assign them with a unique message identifier (ID) that securely helps to transmit data via the third party service provider in cloud that is registered with the push service platform, which generates a secure push notification message after getting the processing request of the push notification message, and further send the secure push notification message to the targeted mobile computing device through a third party push services that is associated with the target mobile device. [2]

A secure message ID is included in the secure push notification message that in turn corresponds to the content of the message that is associated with the push notification message request and is clearly shown in Fig 2. It further receive a pull message request from the target mobile device after a push service platform is included, the pull message request that is requesting the message content which is associated with the push notification message that corresponds to the message ID, and further sends the requested message content associated with the push notification message to the mobile devices.

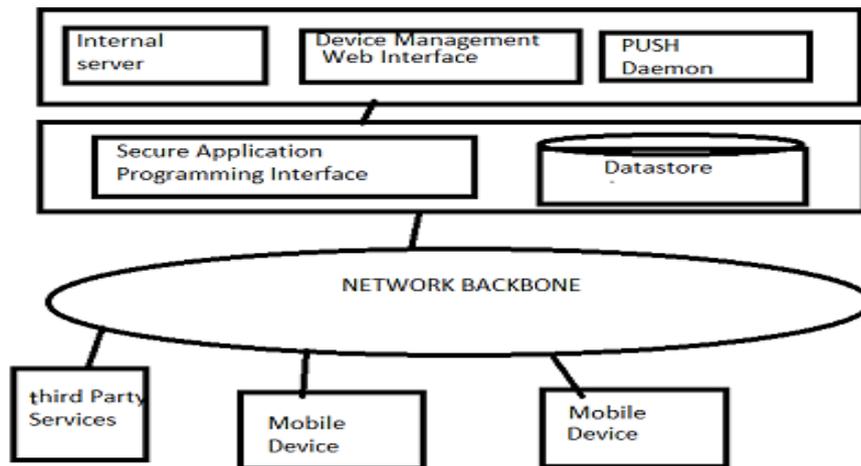


Fig 2. Third Party Push Notification message via Network

#### IV. Bitcloud: Will it replace the current trend of Internet?

##### 4.1. The Problem Statement

The moment we open our browser on our personal computers or our mobile devices, what is the first thought we get. Is the internet connection going slow or the bandwidth we are being provided enough for caring out a certain task? Why can't we stop relying on traditional Internet service providers into a centralized network systems and switch over to some network where we can use decentralized internet service providers? Using some service provider's bandwidth that is relevantly slower access than usual and is shared by a number of users over a centralized network does not creates sense when we are technologically advanced scenarios around us. We can shift to using shared bandwidths over central bandwidth service provider.

##### 4.2. Bitcloud: The proposal

The basic idea behind the implementation of a model like Bitcloud is shown in Fig 3 that was recently proposed by a group of developer team and the total idea is based on decentralize network in place of the traditional service providers. The proposal aims to replace the current internet network by a peer to peer system for sharing the bandwidth [3]. All the tasks like routing, providing storage and computing in exchange for cash will be completed by the individual users. Just as bitcoin is believed to revolutionize the economic scenario, if proper technologies are implemented and developments are done, then individual net users will be credited on how much bandwidth they contribute to the network. Currently the team embers of this project are searching for more thinkers and developers who can support for proper working of the project to be completed.

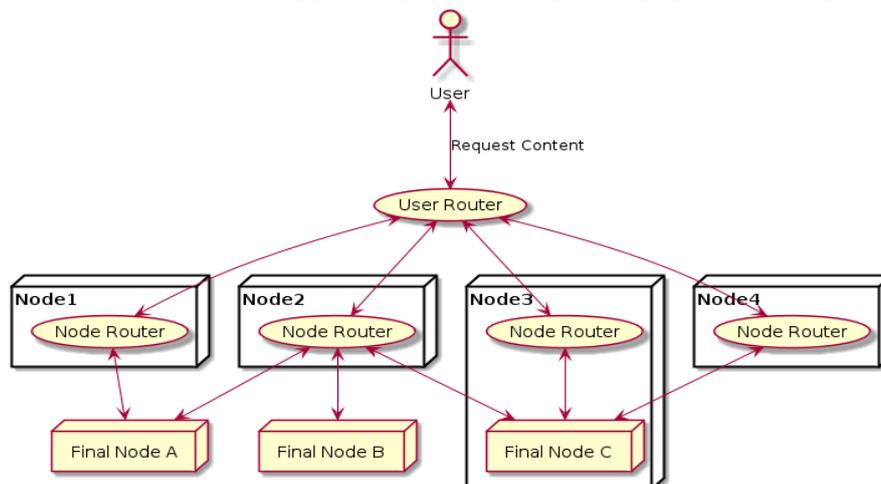


Fig.3. A typical scenario of Bitcloud

Bitcloud will be based on a mesh network system as shown in the above Fig 3, for which every node (individual) will be credited financially for routing in the mesh network and every individual will be taken into account for sharing the bandwidth that will in turn replace the need of centrally oriented Internet Service Providers. The currency that will be exchanged for the bitcloud operations will be called as “cloudcoins” that will be almost like “bitcoins”. For an example if someone wants to pay for personal cloud storage and allow direct streaming over the network, then they have to pay the bitcloud network where the payment will be received by the individual who will provide the personal cloud storage. Recently WeTube have taken an initiative to work on the idea of decentralization where no individual have to depend on a same central server like that of Netflix and Youtube that too with improved security and peer to peer connectivity facilities.

## **V. Smart Grids will help in decentralization**

Smart Grids-The Intelligent electricity meters that will help to regulate the fluctuations of power supply over the datacenters where the basic aim will be aimed to monitor and further regulate consumptions on the basis of power supply and to maintain their connectivity over the cloud network without any interruptions. Few researchers from the Max Planck Institute for Dynamics and Self Organization has illustrated the use of smart meters can match the demand of electricity and supply decentralized.

### **5.1 Problem Statement**

When the datacenters are connected centrally over a single electricity supply they are more prone to hacker attacks and raised data protection issues and that in turns give rise to complex design of vast communication infrastructure that would further connect to complex electric meters that is quite undesirable. With the advent of use of more renewable resources over the years the issues of power fluctuations have taken a rise. On a research done it was found that due to the use of solar and wind energy centrally there seemed to be a rise in electrical fluctuations over the regions, that doesn't happens in traditional coal-fired power stations, providing constant supply.

So to achieve that the researchers from the Max Planck Institute for Dynamics and Self Organization have devised the use of Smart Meters that would regulate the use of power decentralized from different sources i.e. solar, wind and traditional sources. Suppose some region is provided by huge amount of solar and wind energy at a particular time, to achieve the energy regulations the Smart Meters can be functional where power consumptions over cooling units of datacenters and warehouses can be cranked up. These Smart Meters will either be installed at household or company premises and transmits the data they connect automatically to the energy supplier. Thus depending on the available supply of electricity industrial requirements could be switched on or off.

### **5.2 Problem Solution**

So up to now it's quite clear that the centralization of such power supply over a broad network could be certainly vulnerable since if the data of the all the consumers and industries are to be collected centrally, there might be risks of data getting hacked. So as shown below in Fig 4, by use of decentralize networks, a system has been generated by Max Planck researchers where electricity is not provided by large power plants and is supplied by numerous small generators and the Smart Meters installed at the specific units could regulate power consumptions directly and decentralized without the involvement of central control systems<sup>[4]</sup>. A mathematical model has been devised which got stimulated with electric generators and consumers. Later they tested for the stability and whether the frequency variations & fluctuations could be adapted over the decentralized power monetary systems and the concept is shown in Fig 4. They later found that Smart Metres don't react to small fluctuations over frequency and balances, intervene and regulate consumptions accordingly within a fraction of seconds. A decentralized control system will offer immense advantage in the years to come to offer stable, secure & reliable transmission.

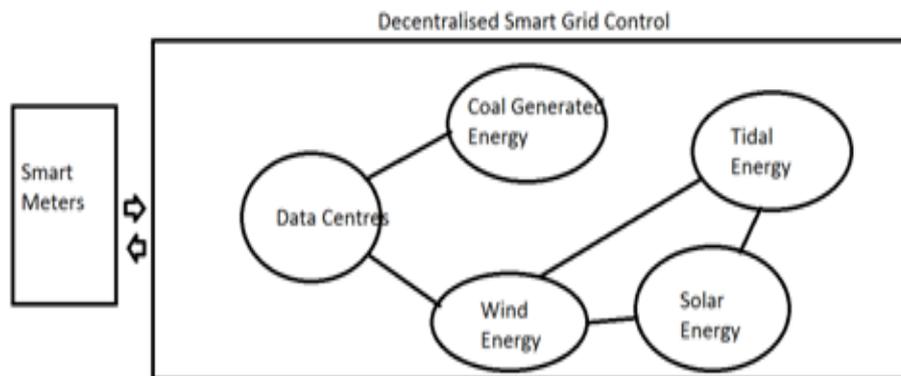


Fig.4. Decentralization of Smart Grids and Control Devices

## VI. CONCLUSION

Consider the biggest IT giants like IBM, Google, Dell in the industry who are providing the cloud services, it can be concluded that these upcoming new technological advancements will bring revolution to the cloud environment. When dozens of cloud services will be offered that too with an improved security mechanisms that has been discussed throughout the paper with improved technological solutions and on the same physical systems it will prove to be a boon in the coming future. The strategies of moving towards decentralized datacenters using 'Smart Meters' too brings hope towards the advent of Green Cloud Technology. The day may not be too far when we can shift from highly burdened servers to peer to peer systems for data sharing and use password less authentication techniques for mobile and personal computing systems. And at the end, the most discussed issue of mobile security these days is said to find a solution over the secure notification services that is proposed to be absolutely free and can be used by a simple subscription over the network providers in iPhones and Android devices and might be available by the year end.

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