

# Proposing SMOCUNM – Security Mechanism for Offline Cloud User at Near line Mode

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## ABSTRACT

This paper discussed about different types of offline cloud technologies uses in different types of offline cloud services. Authors designed a new methodology named “SMOCUNM” (Security Mechanism for offline cloud user at near line mode) for implementing the security feature at Near Line mode in offline cloud services. Near Line mode actually provides saved data on system hard drive on on-going basis that cannot be accessed frequently. The motivation to utilize Near Line mode is it provides security on the time of connection re-establishment when offline cloud user comes back to online after completion of his or her task. The chances of viruses and threats may be reduced by utilizing this new designed methodology on the time of data uploading on the cloud server. The other benefits to utilize this Near Line mode for security purposes is its low cost, fast response and quick back up with unlimited storage access anywhere-anytime even in a matter of seconds.

## Keywords

Offline cloud service, Offline cloud technology, online mode, offline mode, near line mode, security, cloud data storage.

## 1. INTRODUCTION

Offline cloud services pay high value or most popular now a days especially for those areas or regions where there is bad internet connectivity or you can say there is no internet connectivity [5]. The reason to develop such kind of service by cloud service provider is to reduce the dependency of cloud users on the internet up to some extent and continue their task anywhere-anytime in the absence of internet connection [21]. For running any offline cloud service, an offline cloud web based application requires five basic core elements viz. CSS, DB, HTML5, Java Script and Manifest file. Each has their own function & that can be shown in fig.1:

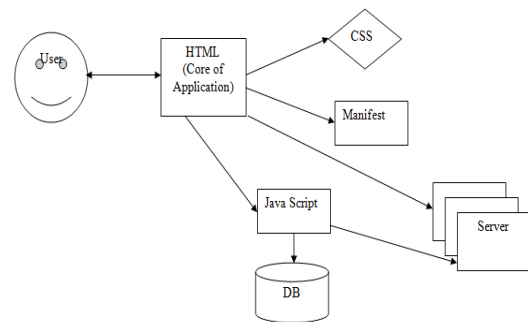


Fig.1:Core Elements of offline Cloud Web Application[28]  
[Accessed on-3dec2015].

- **CSS:** It describes how HTML page is rendered. Most importantly, it shows its default rendering behavior display.
- **DB:** Its main function is to provide local database storage.
- **HTML5:** It act as a core of the application used in offline access. Its main function is to provides cache that helps to calculate speed and reduce the load on servers.[15]
- **Java script:** its main function is to control the application.
- **Manifest:** Manifest is mandatory deployment descriptor component of an offline web applications-it simply lists all the files that need to be loaded.

As offline cloud user start working on any offline web application then at first, cloud user use the basic architecture of core elements as shown in fig. 1 then whole data is to be saved on system hard drive. Once the data is saved on the disk , the cloud user re-establish a connection. On the time of

connection re-establishment the offline data is automatically uploaded on the cloud server by utilizing its distinct/unique feature of automated synchronization. This is a valuable automated tool for iCloud that offers automatic backup. It would be sure that this approach to work offline would not be dis-appear anytime in future. The major goal of offline cloud service is to reduce its support and maintenance cost as an example Fujitsu support [20] and 3D Experience support that works even on online mode but provides facility for offline access [25] where the list of different offline cloud services as shown in table in table 1:

Table 1: Online and Offline Cloud Services[32][33][34][35][8].

S.No	Online Cloud Services	Free Storage Space Availability	Offline Cloud Services	Free Storage Space Availability
1	Zip Cloud	.	Zipbox- Kind of cloud box.	.
2	Mozzy Stash-	2 GB	Google Maps- Covers 400 MB Area	.
3	SpiderOak	5GB	Chrome Book	.
4	AVGLiveDrive	5GB	SolidWorks 3D Experience	.
5	Wuala by LaCie	5GB+ Security	SOS-Support offline Service	.
6	Netflix Service	.	.	.
7	Hulu Service	.	.	.
8	SlingBox Service	.	.	.
9	Vimeo Service	.	.	.
10	MP4 File Service	.	.	.

The working of above discussed all cloud services is based on some older and some new offline cloud technologies that are listed in table 2:

Table 2: Online & Offline Cloud Technologies [27].

S.NO	Older offline storage Techniques	New Offline Storage Techniques
1	Cookies	Web Storage
2	Plug In Based Storage	Web SQL Database
3	Browser Specific Features	Indexed Database
4	Offline storage in the era of HTML5	File Storage

Correspondingly, Table 3 represents the list of several different cloud services with its free storage availability space:

Table3: Free Storage Space Availability in Different Cloud Storage Services[13][16][28][30][31].

S.No	Name of the Cloud Storage Services	FREE Cloud Storage Space
1	Dropbox	Up to 25GB
2	Google Drive	15 GB
3	Box	10GB
4	Sky Drive	Up to 7 GB
5	Sugar Sync	Up to 5GB
6	MEGA	Up to 50 GB Store files and 8GB Backup
7	Tresorit	3 GB + End- to-End Encryption
8	Pcloud	750 GB+ Provide own online privacy
9	Cubby	Up to 5GB
10	Ubuntu	Up to 5GB
11	Version Cloud	New DropBox Type- + 500 MB
12	Zip Cloud	Unlimited Free Cloud Storage(upto 100 MB)AND ATTACH FILES UP TO 300 MB
13	Gmail	Upto 15 GB and Email files up to 10 GB
14	Office 365	Paid No** and \$15 Dollars for 30 Days
15	Microsoft one Drive	15 GB
16	Apple iCloud Drive	5 GB
17	HighTail	2 GB
18	One Drive	5GB
19	Amazon Cloud Drive	No**
20	Syncloud	2 GB
21	Linear notes	
		NOT FREE **

Each offline cloud technology has its own function that can be described in table 4 and table 5:

Table 4: list of Older Offline Technologies with its function[27].

S.NO	Older Offline Technologies	Functions
1	Cookies	Only to provide little amount of data storage
2	Plug-In based Storage	It provides extension named Google Gears that is uncommon and right version for usage and gives better qualitative results when accessing its service
3	Browser Based Specific Features	Its working is same like Plug-in Based storage but must of working with specific browser only
4	Offline Storage in the Era of HTML5	Its main function is the right utilization of origins of data storage as an example they uses the formula like 1: N where N is the number of distinct storage mechanisms.

Table 5: list of New Offline Technologies with its function[27].

S.NO	New Offline Technologies	Functions
1	Web Storage	Only applicable for string values and correspondingly provides Serialization that provides local and session storage. It is generally used for security purposes and removed when window is closed.
2	Web SQL Database	It's a offline SQL Database and implemented in SQLite.
3	Indexed Database	Its function is to provide standard mapping like local storage but having index with some certain fields especially in game levels. Because of our games cannot be moved from all games data structures.
4	File System API(Application Program Interface)	Its main function is to create file folder hierarchies.

All these above discussed 5 new offline cloud technologies are implemented practically but some of the technologies are too tough and not easily implemented by cloud service providers. The list of those technologies are listed below:

- Storing Binary data.
- Extracting Binary Resources.

- Handling Simultaneous data Operations.
- Structuring File Data.
- By storing miscellaneous data.
- Ensuring Cross Browser Capability [27].

Take care, some of the implemented offline cloud services gives some additional benefits that's why professionals prefer more:

- Less Risk [9].
- Automated Synchronization Feature. - That provides a facility of automatic backup and it is sure this feature would not be disappear anywhere-anytime.
- Guest Operating System can be easily added during scheduling [6].
- File sharing at offline mode on simple mouse button clicking [4] as an example Google Gear is an extension of source browser that helps to create offline web apps for file sharing [24].
- Reduce support and maintenance cost [2].
- Flexible bandwidth usage help us for saving cache in cloud without effecting the quality of service that ultimately maximize the co-operation between cloud acceleration & peer assistance [3].

Due to all of these great benefits of offline cloud service is too popular but correspondingly it has one major drawback that is documents are not edited at offline mode [23] even when cloud service providers work on offline service then it does not show any reduction in functionality [23] in FIREBASE [18] & STROM platform [11][1]. Both platforms give good performance at offline mode. The important key point is not all windows support offline access facility as like windows 7. The main reason is missing of CSC Service. This is the only reason you cannot share it when you try to start, then surely get error [26]. Similarly in case of adobe creative cloud, cloud user will not access this service for long time [26] due to its limitations but if it is used with box.net application [10] [12] then it gives an additional facility to save separate files and folders at free of cost and correspondingly it provides automatic updates in iPad and iPhones to sync files [7] at offline mode. These files used at offline mode named as "M-Files". These files load fast that reduce bandwidth consumption that ultimately avoid version issues [22].

The main idea of this research paper is to provide security of offline cloud user at near line mode. The basic working of an offline cloud user can be easily shown in figure 2:

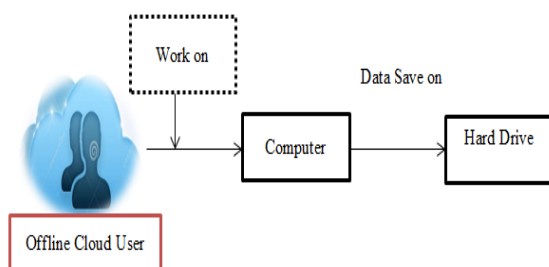


Fig.2: Working of Offline Cloud user

Once the data is saved successfully, by the offline cloud user then the whole content is transferred into system hard drive & when user back to come online then the data is to be automatically uploaded on the cloud server by utilizing its distinct automatic synchronization feature. The main benefit to utilize this distinct feature is it will not be disappear anywhere, anytime. But in between the re-establishment of connection it may be possible the virus in the system may attach with confidential data that correspondingly ready for uploading on the cloud server. The author's contribution is to provide the security of offline cloud user at near line mode during re-establishment of connection. This mode defines as a compromise between the online and offline mode. The benefit to provide security at near line mode is to save human effort, time as well as cost before uploading data on cloud server and the other benefit is it provides unlimited storage, easy backup and an access anytime in a matter of seconds [17]. This near line mode is also fully integrated with google and other cloud storage services that does not need to adopt new programming model or data manipulation methods to store and retrieve data from near line storage [14]. As study completed by the authors they noticed the mission of google is how much time is saved while accessing offline cloud services as like time import and export. The main limitation of near line mode is the recently uploaded data will not be frequently used [19]. It declares the readable version at near line (that is you can only view or read the data but not download from the cloud server). Authors must be take care the data uploaded on the cloud server must be error-free especially on the time of data uploading on cloud server. If cloud user has some doubt of error then can applies different security algorithms for the prevention of the data. So, by utilizing this new designed methodology named "SMOCUNM" authors can easily provide security at near line mode on the time of connection re-establishment. The main benefit is it provides prior and early precautions to the offline cloud user from the different types of viruses, worms and threads. In addition, it automatically reduces human effort by applying various automated cloud testing mechanisms once the security at near line mode will be provided. Hence, authors say this ultimately improves user experience at offline mode [3]. So researchers suggest while working on offline mode cloud service providers may try to enable offline mode document editing option will be implemented as soon as possible.

## 2. A ROADMAP- DATA MOVEMENT BY OFFLINE CLOUD USER

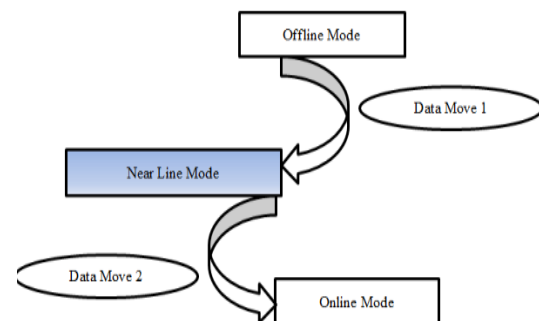
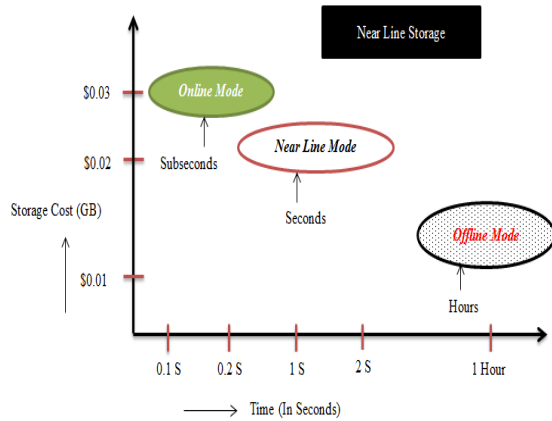


Fig. 3: Data Moves from Offline Mode to Online Mode.

### 3. GRAPHICAL REPRESENTATION FROM OFF (OFFLINE) TO ON (ONLINE) SERVICE



**Fig.4: Movement of User- From Offline to Online[17][28][29] [Accessed on 3/12/2015].**

Movement of data from offline to online mode:

Equation 1:  $O_{ff} \rightarrow N_e$ .

Equation 2:  $N_e \rightarrow O_n$ .

From Eq.1, Eq.2.

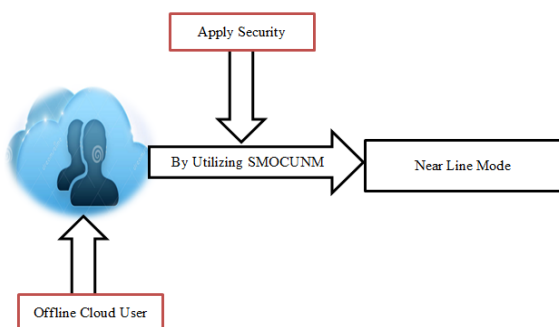
Hence,  $O_{ff} \rightarrow O_n$ .

Table 6: Online to Offline Services.

Off	Offline
Ne	Near Line
On	Online

The most important key point of offline cloud user at offline mode is when the data is saved once of system hard drive then transfer into cloud server and at last cloud user must have need to come online once again at once for successful updating. Hence, researchers said the complete dependency of offline cloud user is not eliminated till now.

### 4. RESEARCH DESIGN



**Fig. 5: Interaction of Offline Cloud User with NearLine Mode through SMOGUNM.**

### 5. PROPOSED ALGORITHM- STEPS (SMOCUNM)

Steps for SMOGUNM (On, Ne, Ws, Ds, V, OCU, Du)

Steps for SMOGUNM (On, Ne, Ws, Ds, V, OCU, Du)

Table 7: Nomenclature for SMOGUNM

On	Online Mode
Ne	Near Line Mode
Ws	Work Status
Ds	Data Status
V	VIRUS
O <sub>ff</sub> CU	Offline Cloud User
Du	Data Upload
Dst	Data Storage
HD	Hard Disk
CS	Cloud Server

Step-1) Initialize OCU.

Step-2) CHK Ws of O<sub>ff</sub>CU. IF Ws: = TRUE Then D<sub>st</sub>: = HD.  
// Data is successfully stored on the system hard drive.

Step-3) IF (O<sub>ff</sub>CUWs = 0)

```
{
    Ws = Task Completed.
}
```

ELSE

```
{
    Move to Step 2.
}
```

Step-4) Apply SMOGUNM for Checking the Presence of V.  
// Apply security at Near Line Mode on the time of re-establishment of Internet Connection.

Step-5) IF (V = 0)

```
{
    Ds = READY TO SEND AT NEARLINE MODE.
}
```

ELSE

```
{
    Otherwise MOVE to Step 4. //
    RECHECK the code once again.
}
```

Step-6) AFTER THAT Ne Ds → Forward to On.

Step-7) HENCE, Du: = Cloud Server. // secured data is successfully send on cloud server.

Step-8) End.

## 6. COMMUNICATION FLOW METHODOLOGY: SMOCUNM

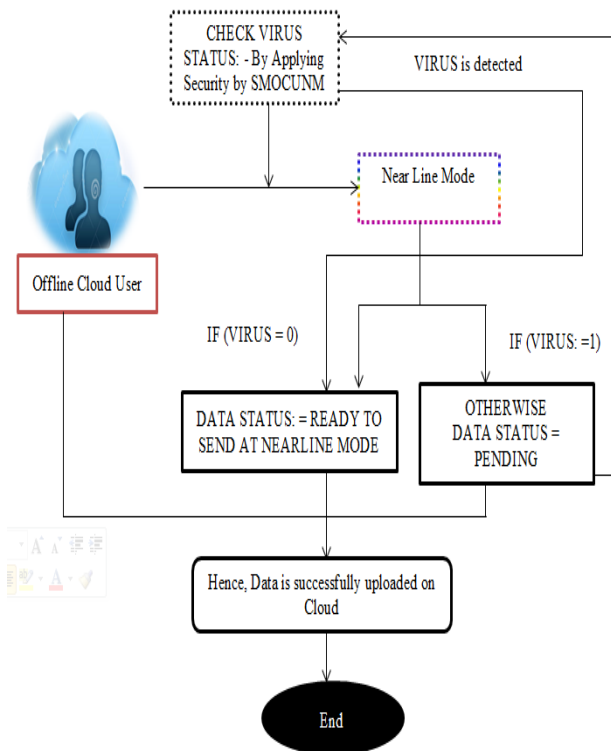


Fig. 6: Communication between Offline Cloud User and Cloud Server

## 7. WORKING

At first, as discussed in figure 2 when offline cloud user work on system at offline mode then the whole data is to be saved on system hard drive. In the 2<sup>nd</sup> step, once data is successfully saved on system hard drive, after that offline cloud user try for re-establishment of connection for data uploading on cloud server. During the re-establishment of connection (it includes the time span when user send request to the browser till the internet is connected with the internet) this proposed methodology named “SMOCUNM” is applied for checking the presence of viruses and threats with successfully stored confidential data. At third step, if virus is detected by the SMOCUNM then once again sends back that specific confidential data to step 2 and again SMOCUNM is applied once more otherwise data forward to Near Line mode to online mode. Hence, at last step, that confidential data is successfully uploaded on the cloud server.

## 8. CONCLUSIONS

Different types of offline cloud technologies uses in different types of offline cloud services with its free storage space availability is discussed in this paper. Security at near line mode may be increased by applying new designed methodology named SMOCUNM (Security Mechanism for Offline Cloud User at Near Line Mode). The significance to design this new designed methodology is to provide protection of offline cloud user confidential data from different types of viruses, threats and worms when data resides at Near Line mode. The benefit to work with Near Line mode is it provides intermediate type of data storage that is actually not immediately available but can make online quickly without human intervention. In the end, authors said while utilizing this new designed methodology at Near Line

mode authors easily provide protection of data from viruses and threats before uploading data on the cloud server ( or before re-establishment of connection when user back to online). Authors concluded things will be possible in future without internet connection. And the dependency of users on internet may be reduced up to some extent by utilizing offline cloud services.

## 9. FUTURE SCOPE

In future, the strength of security will be extended by providing more tighten security block that will be separately implemented on the platform of offline cloud technology. The parameters considerations taken by authors while designing the algorithm will be important factor.

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