Cloud based Incremental Backup for Fast Recovery of Files

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***Abstract*— Backup is the process of copying data. So it can be used for restoring data after any corruption. Normally full backup is carried out. But it takes longer time and storage space. Incremental backup is one of the technologies which overcome problems that can arise when full backup is carried out. It backs up only the data that has changed since the last full backup. This can be done either file or block level. Thereby restoration time and storage space can be saved from incremental backup. Also restoration of incremental backup can be improved by keeping recent versions of file system. The backup data are stored in cloud. It enhances the way of accessing backup data.**

***IndexTerms*— Full Backup (FB), Incremental Backup (IB)**

I. INTRODUCTION

Backup is the activity of copying files or databases, so that their additional copies may be restored in case of a data loss accident. There are two aspects related to backup. One is storage media and another is data volumes expansion. In information technology, a backup refers to the copying and archiving of computer data so it may be used to restore the original after a data loss event. Backups have two distinct purposes. The primary purpose is to recover data after its loss, be it by data deletion or corruption. Backups are done to prevent the loss of data. Data loss can occur as a result of a disaster, hardware failure, software errors, or user errors. Disasters include a flood or fire at the site destroying the media the data is stored on. A common hardware failure is disk drive failure. Software errors might include a software bug introduced by a software update that erroneously modifies or deletes data before the bug is noticed. User errors include the accidental modification or deletion of important data. Backup system contains at least one copy of all data considered saving, and data storage requirements can be significant. Organizing this storage space and managing the backup process can be a complicated undertaking. A data repository model may be used to provide structure to the storage. Nowadays, there are many different types of data storage devices that are useful for making backups. Every backup scheme should validate the reliability of the data being backed up.

II. EXISTING SYSTEM

Backups can be performed in two ways, at the logical level or at the physical level. Logical backups process data at the file system level. An example of this is the Unix Tar utility. Given a directory to backup, the Tar utility descends the file system hierarchy reading directories and files. It serializes them into a formatted data stream that can be stored to disk or tape. The advantage of logical backups is that by using their own storage format they can be made largely independent of the file system and can thus backup and restore to a wide variety of platforms. The disadvantage is that their independent format may limit their ability to retain certain file system specific meta-data such as extended attributes, access control lists, resource forks, and other data. Another disadvantage is performance. The data on a physical disk drive is laid out in physical blocks of a particular size. File systems store files as a sequence of logical blocks and map these logical blocks to physical blocks on the disk. Since the backup program operates at the file system level it can only access the data as logical blocks. These blocks may not be laid out as sequential physical blocks on the device, resulting in increased read/write head movement to access the data. Physical backups process data at the device level. As an example, a simple backup scheme might copy all of the physical blocks from one physical device to another device with the same physical block size and sufficient capacity. This scheme illustrates two advantages of physical backup. First, it need not understand the contents of the blocks it backs up at all. This means that it will back up the entire file system, all of the data and meta-data will be preserved, regardless of what file system is being used. Second, because the backup operates at the device level it can read the blocks sequentially allowing high performance due to reduced seeking. The disadvantages of physical backup are also illustrated. Because the backup operates at a lower level and does not understand the file system, the entire file system must be backed up and restored as a single unit. It is not possible, without understanding something about the file system, to restore a sub-set of the backup data, such as a single file or directory. Nor can the data be restored to a different file system. Of course the scheme given has a more severe disadvantage. Because it does not know anything about the blocks it backs up it may well be wasting time backing up a large number of empty blocks.

III. INCREMENTAL BACKUP

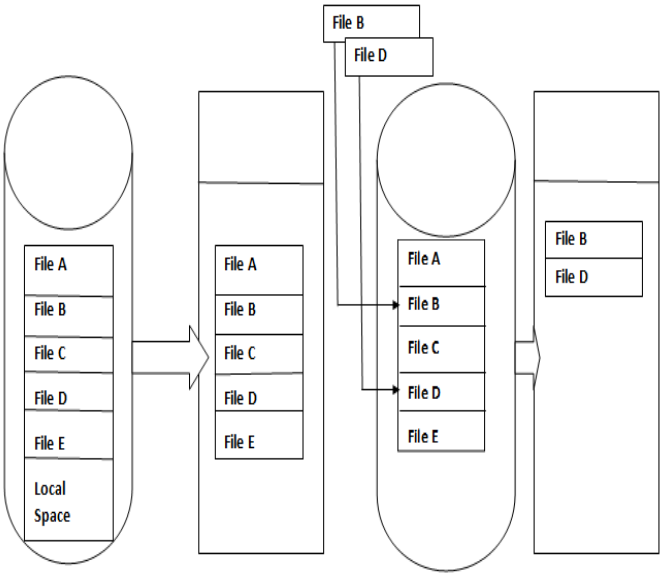

Figure 1: Full backup versus Incremental backup

Full backup is the starting point for all other backups and contains all the data in the folders and files that are selected to be backed up. Because the full backup stores all files and folders, frequent full backups result in faster and simpler restore operations. Because full backups are so time consuming, incremental backups were introduced as a way of decreasing the amount of time that it takes to do a backup. Incremental backups only backup the data that has changed since the previous backup.

IV. PROPOSED SYSTEM

The objective of incremental backup is to save the only changed portion the data. Thereby the time and space required for backup process could be reduced. Incremental backup can implemented either file level or block level. In file level incremental backup, whole content of changed file is loaded.

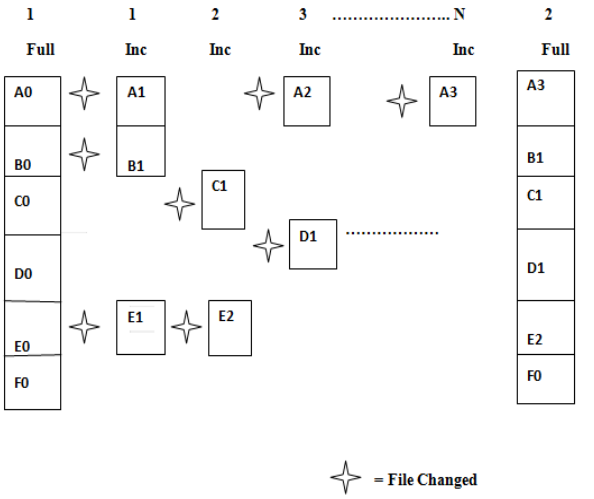

Figure 2: File-level incremental Backup on file systems

Backup 1 is full backup. Therefore it copies all the data (changed and unchanged) to the secondary media. Backup 2 through n-1 are incrementals. That means it copies only changed data since last full backup and incrementals. From the above figure, found that files A, B, and E changed after the full backup and were therefore backed up in Backup 2. Backup 4 backed up files A and D because both files were modified sometime after Backup 3 occurred. File F did not change hence, it was not backed up in any of the incremental backups. Another example is considered initial/full backup is performed on Monday. On Tuesday scans for files that have changed since Monday's backup and only backs up the changes to those files and creating a second version of them. On Wednesday scans for files that have changed since Monday and Tuesday's backup and only backs up the changes to those files and creating third version of them. And so it goes on, continually scanning and backing up changes to files and creating versions. Those 'days' can also be hours, or even minutes, depending on the work. It helps users recover to exact points in time before a file was corrupted and still in its most up to date, and clean, form. Save time and potentially hours of lost productivity. Some of the functions used for implementing file level incremental backup are

- Getmtime ()
- Strftime ()

a) Getmtime ()

It is the one of the functions in the OS module. Syntax: Getmtime (path) return the time of last modification of path. The return value is a number giving the number of seconds since the epoch. Raise an error if the file does not exist or is inaccessible.

b) Strftime()

The method Strftime () converts a tuple representing a time as returned by Getmtime () or local time () to a string as specified by the format argument. Syntax: strftime (format, t), where t is the time in number of seconds to be formatted and format is the directive which would be used to format given time. If t is not provided, the current time as returned by local time () is used.

But this approach has some problems. If there is a very large file, and that file gets appended or slightly modified in some way, then there is a lot of waste. For example, a log file that is several gigabytes in size, and then a single line is appended to the end of the file. Another issue arises when large volumes of data require backup, but there is limited network bandwidth to transfer these backups. The solution is to backup only the changes in the files rather than the whole file every time. This can be achieved through block level incremental backup.

A. BLOCK - LEVEL INCREMENTAL BACKUP

In block-level incremental backup divides the specified volume into a number of subordinate data blocks that are then backed up. The initial backup is considered the "Parent backup" and will be a full backup of the volume to establish the baseline blocks to be monitored. After the initial full backup is performed, calculate check-sum value of each block. For each incremental backup check-sum value of block is calculated and then monitors each block to detect any changes. As scheduled, incrementally backs-up only those blocks those have changed since the previous backup.

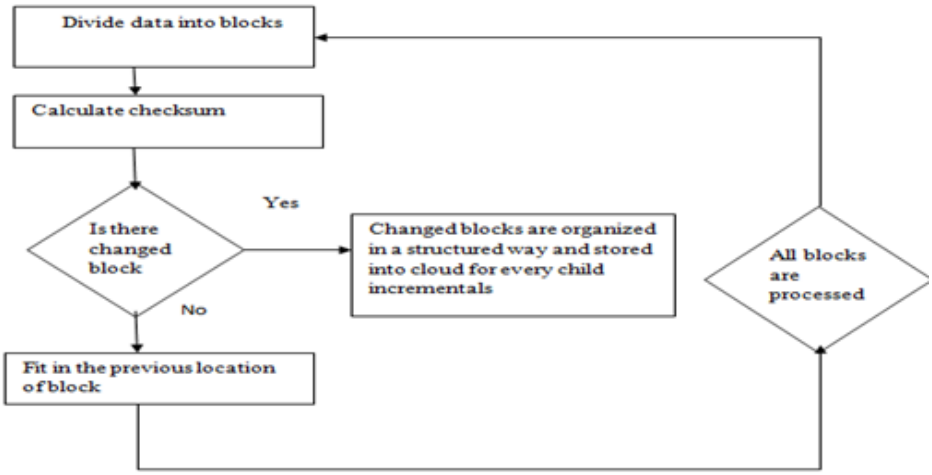

Figure 3: Flow-chart for organization of block

B. RESTORATION

Restoring an incremental backup restores a subset of a backup set that includes a full backup, and any number of incremental backups. Whenever an application opens a file for writing, the file system automatically creates a new instance of the file, with a version number appended to the name. Version numbers start at 1 and count upward as new instances of a file are created. When an application opens a file for reading, it can either specify the exact file name including version number, or just the file name without the version number, in which case the most recent instance of the file is opened. Thus restoration can be improved by maintaining the versions of each file. Also keep the recent version.

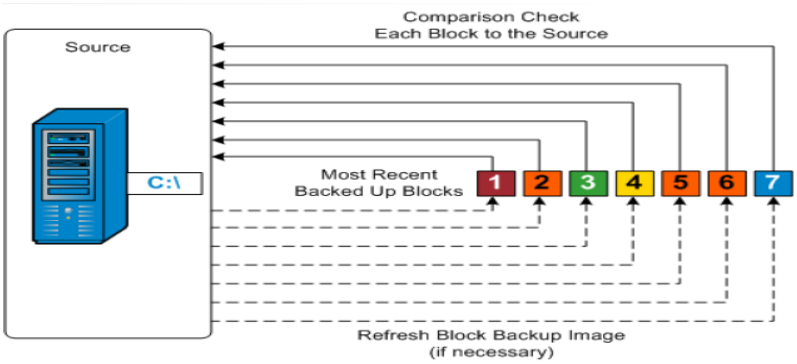

Figure 4: Restoration

If need to restore the volume information, then locate the most recent backed up version of each block and rebuild the entire volume using these most current blocks. For restoration verify type backup will look at the most recent backup of each individual block and compare the content and information to the source. This comparison verifies that the latest backed up blocks represent the corresponding information at the source. If left alone, the incremental backups would continue, as often as 96 times each day.

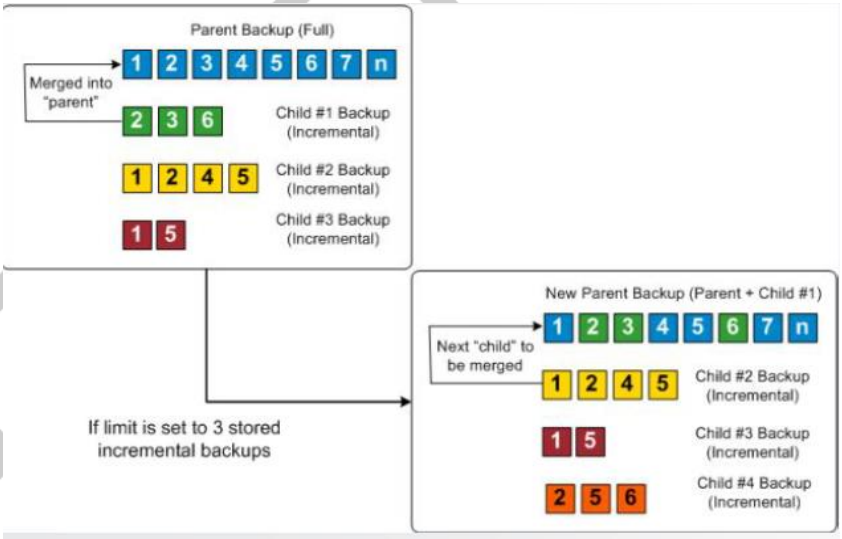

Figure 5: Restoration in Incremental Backup

These periodic backups will accumulate a large chain of backup blocks to be monitored each time a new backup is performed, and also require added space to store these ever-growing backup images. To minimize this potential problem, it allows setting a limit for the number of incremental child backups to be stored. When the specified limit is exceeded, it will merge the earliest (oldest) incremental child backup into the parent backup to create a new baseline image consisting of the "parent plus oldest child" blocks. This cycle of merging the oldest child backup into the parent backup will repeat for each subsequent backup, allowing you to perform incremental backups forever, while maintaining the same number of stored (and monitored) backup images.

C. CLOUD STORAGE

One of the major issues in backup process is backup data storage place. Traditionally the backup data are stored in secondary storage device like hard disk. But the main disadvantages of hard disk backups are that they are easily damaged, especially while being transported. So here in my project the backup data are stored in cloud. Because this service allow the users to access the backup data from any location via the Internet. Also this cloud backup enables usability, accessibility and disaster recovery.

V. PERFORMANCE ANALYSIS

The performance measures for proposed system are evaluated relevant to the two performance parameters, storage space and Recovery time. Storage space means storage space that are needed for storing backup data both full and incremental backup. Recovery time means time needed for recovering the updates.

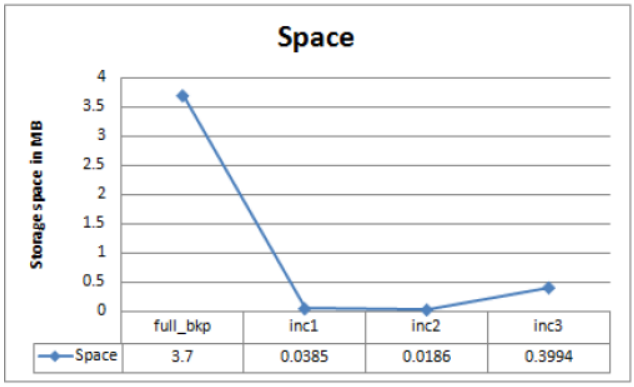

Figure 6: Space

From the figure, it can be inferred that incremental backup takes less space for storing backup data as compared to full backup.

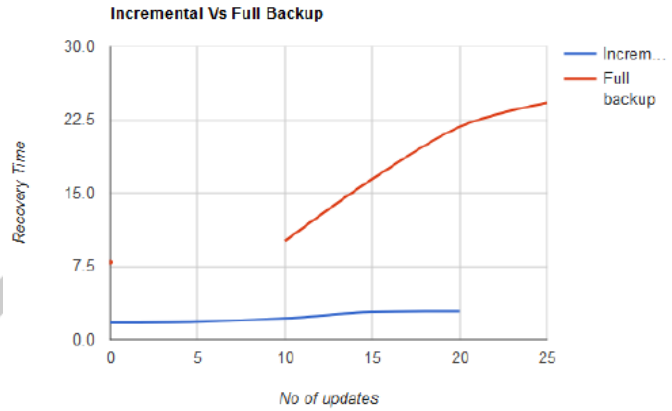

Figure 7: Recovery time in Incremental versus Full backup

From the figure, it can be inferred that the recovery time needed for performing Incremental backup is least compared to full backup. From the analysis, concluded that Incremental backup is better than full in terms of recovery time.

VI. CONCLUSION

There is no need to backup unchanged data at every time. It requires additional requirements, that are time and space. Keeping full backup as a base backup, an incremental backup on files is performed. It can be implemented either file level or block incremental. Performing through file level incremental backup it seems to be take less time and space compared to full backup. Also proposed system can be improved by keeping recent version of file along with block-level incremental backup for addressing file-level incremental problems with better storage space and restoration. Recovery time can be also improved. Also backup storage place on cloud can improve accessibility, usability and disaster recovery.

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