Cloud Drive

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***Abstract*— A cloud drive is a Web-based service that provides storage space on a remote server. Cloud drives, which are accessed over the Internet with client-side software, are useful for backing up files. A cloud drive provider may offer a limited amount of online storage space for free and additional storage space for a monthly or yearly fee. The name "cloud" is derived from the symbol for the Internet on flow charts. Cloud drives make it possible for a small business or individual to store and sync documents and other electronic media without having to purchase or maintain external hard drives or file servers. Cloud drive services are recommended for backups of 1 terabyte (TB) or less.**

I. INTRODUCTION

Cloud computing technologies can be implemented in a wide variety of architectures, under different service and deployment models, and can coexist with other technologies and software design approaches. The security challenges in cloud computing presents, however, are formidable, especially for public clouds whose infrastructure and computational resources are owned by an outside party that provide those services to the general public. The emergence of cloud computing promises to have far-reaching effects on the systems and networks of state agencies and other organizations. Many of the features that make cloud computing attractive, however, can also be at odds with traditional security models and controls. The primary purpose of this report is to provide an overview of public cloud computing and the security and privacy considerations involved. More specifically, this document describes the threats, technology risks, and safeguards surrounding public cloud environments, and their treatment.

Cloud storage is a model of networked online storage where data is stored in virtualized pools of storage which are generally hosted by third parties. Hosting companies operate large data canters, and people who require their data to be hosted buy or lease storage capacity from them. The data canter operators, in the background, virtualize the resources according to the requirements of the customer and expose them as storage pools, which the customers can themselves use to store files or data objects. Physically, the resource may span across multiple servers. The safety of the files depends upon the hosting websites.

Cloud storage services may be accessed through a web service application programming interface (API), a cloud storage gateway or through a Web-based user interface.

II CLOUD DRIVE IS ONLINE STORAGE DRIVE

Fig 1: A Cloud Drive

Cloud drive storage is the mounting of storage capacity provided by a cloud storage service so that it appears to the server as a normal drive letter. In this manner, the server can treat the cloud storage as if it were a drive on direct-attached storage or a shared storage filer so files can be easily saved to and restored from the cloud.

This practice makes it easy for applications to access the cloud storage -- no middleware or special cloud storage APIs are required; the application just needs to know what drive letter it should direct its requests to.

The term “cloud drive” has been popularized in part by Amazon, which offers the Amazon Cloud Drive cloud storage service but many other services offer the same interface and access to cloud storage.

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III CLOUD DRIVE ARCHITECTURE

Cloud Drive is a gateway to cloud storage. Cloud Drive supports many cloud data storage providers including Microsoft Azure, Amazon S3, Amazon EC2, Rackspace, EMC Atmos, Nirvanix, GoGrid, vcloud, Zetta, Scality, Dunkel, Mezeo, Box.net, Webdav and FTP. Cloud Drive hides the complexity of the underlying protocols allowing you to deploy cloud storage as simply as deploying storage via an IP SAN.

Cloud Drive is like an IP SAN that never runs out of space. As usage increases, Cloud Drive starts “offloading” data to the cloud data provider. Cloud Drive caches and optimizes traffic to/from cloud storage dramatically increasing performance and availability while also reducing network traffic.

Computers on the LAN access data via the block based iSCSI protocol. The storage service communicates via an internet connection with the cloud data storage provider. When the iSCSI initiator saves data to the data storage server, it initially stores the data in the local cache. Each data unit is uniquely located within the local cache and is flagged as either "online" in the local cache or "offline" in the cloud data storage provider. All data units in the local cache are checked periodically for usage. Least recently used (or "dormant") data units are uploaded to the cloud data storage provider, flagged as "offline" and deleted from the local cache.

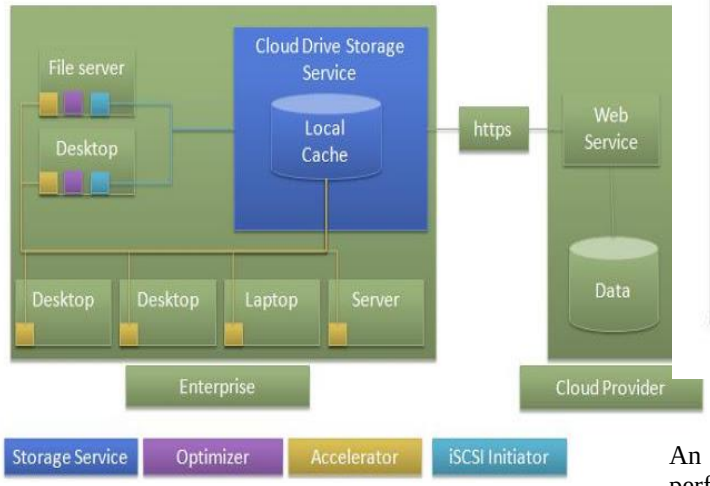

Fig 2:Architecture of cloud Drive

IV CLOUD DRIVE STORAGE SERVICE

A. Over view of data storage

The cloud drive storage service is simple to install and configure. It can be installed on a range of hardware, from laptop for personal use, a server in the office, or a cluster of high end 64 bit servers for the enterprise. Once the service in installed and configured, many clients can connect to it using the iSCSI protocol.

The storage service reduces the data storage requirements while maintaining performance by moving the least recently used data to the cloud data storage provider as well as one or more of the data storage accelerators. Cloud Drive accelerates performance by assuming that actual writes to data can happen any time before a subsequent read to the same data. Cloud Drive accelerates performance by scheduling this "delayed" write data to periods of low activity and by not downloading data from the cloud data storage provider when the "delayed" write data has wholly overwritten data stored in the cloud. Cloud Drive further accelerates performance by assuming that delete operations can happen any time after the data is downloaded.

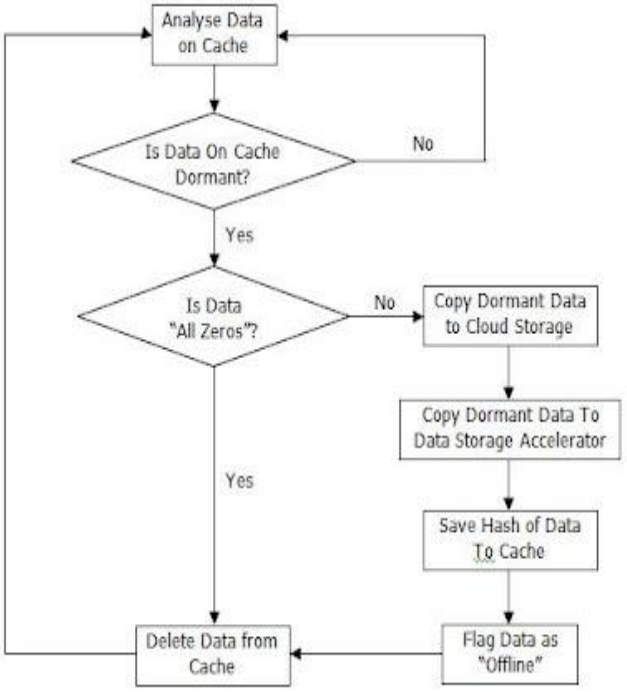

Fig 3:Flow chart

B. Cloud Drive Optimizer

An optional component, cloud drive optimizer, improves performance, reduces bandwidth and reduces your data storage requirements. The optimizer should be installed on all iSCSI clients using the cloud drive storage service.

The data storage optimizer has access to the virtual hard drive to optimize the data stored in the local cache. The optimizer periodically reads virtual hard drive or virtual file share metadata including directories, filenames, permissions and attributes in order to maintain that data in the local cache. In this way, the data storage optimizer also accelerates performance of the data storage server by preventing data other than file data from being identified as "dormant". The data storage optimizer also reduces storage requirements of the data storage server by periodically overwriting "all zeros" to unused parts of the virtual hard drive. The data storage optimizer is also adapted to periodically run disk checking utilities against the virtual hard drive to prevent important internal file systems data structures from being marked as dormant.

C. Cloud drive Network Accelerator

An optional component, cloud drive network accelerator, improves the performance and availability of the Storage Service. This component can be installed on all computers in the home, office or enterprise.

The network accelerators allow the office to reclaim all those "small spaces" of data storage already available on the 10's, 100's or 1000's of computers within the enterprise. A typical office with 100 computers having on average 100 GB of space available could potentially reclaim 100 x 100 GB = 10 TB of data storage space by reclaiming and consolidating this unused space. Network accelerators boost performance and

improve resilience to slowness or unavailability of the cloud data storage providers by redundantly storing data uploaded to the cloud data storage provider on the local network in the already existing "unused spaces"
Network accelerators work like a massive cache within the enterprise. In the above example, the Storage Services local cache is complimented by a 10 TB onsite cache running throughout the enterprise.

D. Cloud drive Solution

Cloud Drive increases the apparent availability of the cloud data storage provider. If the local cache satisfies 99% of requests for data without requiring the cloud data storage provider, the apparent availability of the cloud data storage provider is increased 100 fold and 99% of data accesses occur at local network speeds rather than the network connection speeds to the cloud data storage provider. Cloud Drive also manages the data formatting and communication with the cloud data storage provider while allowing seamless access to data using standard protocols such as iSCSI and NFS. Further, Cloud Drive allows concurrent processing of read and writes requests to different data as well as synchronized and serialized access to the same data.
Cloud Drive virtualizes data storage by allowing a limited amount of physical data storage to appear many times larger than it actually is. Cloud Drive allows fast, expensive physical data storage to be supplemented by cheaper, slower remote data storage without incurring substantial performance degradation Cloud Drive also reduces the physical data storage requirements to a small fraction of the total storage requirements, while the rest of the data can be "offloaded" into slower, cheaper online cloud data storage providers.

V TYPES OF CLOUD DRIVES

Dropbox

- Free space: 2GB
- Premium space: $99/year for 100GB
- File size limit: Unlimited
- Platforms: Windows, Mac, Linux, iOS, Android, BlackBerry
- Best for: Seamless syncing

Google Drive

- Free space: 5GB
- Premium space: $59.88/year for 100GB
- File size limit: 10GB
- Platforms: Windows, Mac, iOS, Android
- Best for: Web apps

Apple iCloud

- Free space: 5GB
- Premium space: $100/year for 50GB
- File size limit: 25MB free/250MB paid
- Platforms: Mac, iOS, Windows
- Best for: Heavy iTunes/Mac users

Microsoft SkyDrive

- Free space: 7GB
- Premium space: $50/year for 100GB
- File size limit: 2GB
- Platforms: Windows, Mac, iOS, Android, Windows Phone
- Best for: Windows/Office integration Free space

VI SECURITY ISSUES ASSOCIATED WITH CLOUD

There are a number of security issues/concerns associated with cloud computing but these issues fall into two broad categories: Security issues faced by cloud providers (organizations providing software-, platform-, or infrastructure-as-a-service via the cloud) and security issues faced by their customers. In most cases, the provider must ensure that their infrastructure is secure and that their clients' data and applications are protected while the customer must ensure that the provider has taken the proper security measures to protect their information.

A. Cloud security controls

Cloud security architecture is only effective if the correct defensive implementations are in place. An efficient cloud security architecture should recognize the issues that will arise with security management. The security management addresses these issues with security controls. These controls are put in place to safeguard any weaknesses in the system and reduce the effect of an attack. While there are many types of controls behind a cloud security architecture, they can usually be found in one of the following categories:

B. Deterent controls

These controls are set in place to prevent any purposeful attack on a cloud system. Much like a warning sign on a fence or a property, these controls do not reduce the actual vulnerability of a system

C. Preventative controls

These controls upgrade the strength of the system by managing the vulnerabilities. The preventative control will safeguard vulnerabilities of the system. If an attack were to occur, the preventative controls are in place to cover the attack and reduce the damage and violation to the system's security.

D. Corrective controls

Corrective controls are used to reduce the effect of an attack. Unlike the preventative controls, the corrective controls take action as an attack is occurring.

E. Detective controls

Detective controls are used to detect any attacks that may be occurring to the system. In the event of an attack, the detective control will signal the preventative or corrective controls to address the issue.

F. Dimensions of cloud security

Correct security controls should be implemented according to asset, threat, and vulnerability risk assessment matrices. While cloud security concerns can be grouped into any number of dimensions (Gartner names seven while the Cloud Security Alliance identifies fourteen areas of concern) these dimensions have been aggregated into three general areas: Security and Privacy, Compliance, and Legal or Contractual Issues.

G. Security and Privacy

1) Identity Management

Every enterprise will have its own identity management system to control access to information and computing resources. Cloud providers either integrate the customer's identity management system into their own infrastructure, using federation or SSO technology, or provide an identity management solution of their own.

2) Physical and personnel security

Providers ensure that physical machines are adequately secure and that access to these machines as well as all relevant customer data is not only restricted but that access is documented.

3) Availability

Cloud providers assure customers that they will have regular and predictable access to their data and applications.

4) Application Security

Cloud providers ensure that applications available as a service via the cloud are secure by implementing testing and acceptance procedures for outsourced or packaged application code. It also requires application security measures be in place in the production environment

5) Privacy

Finally, providers ensure that all critical data (credit card numbers, for example) are masked and that only authorized users have access to data in its entirety. Moreover, digital identities and credentials must be protected as should any data that the provider collects or produces about customer activity in the cloud.

6) Legal Issues

In addition, providers and customers must consider legal issues, such as Contracts and E-Discovery, and the related laws, which may vary by country.

VII ADVANTAGES AND DISADVANTAGES

It seems that everyone with a computer or mobile device spends a lot of time acquiring data and then trying to find a way to store it.

For some computer /mobile owners, finding enough storage space to hold all the data they've acquired is a real challenge. Some people invest in larger hard drives. Others prefer external storage devices like thumb drives or compact discs. Desperate few might delete entire folders worth of old files in order to make space for new information. But some are choosing to rely on a growing trend: cloud storage.

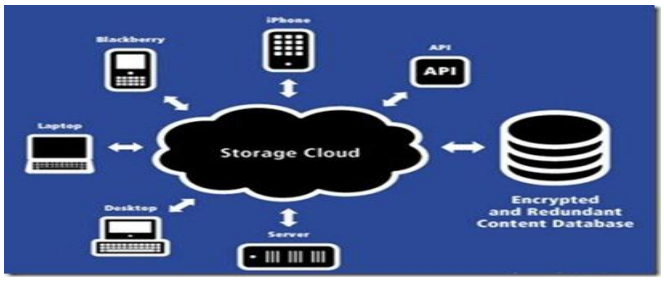

Fig 4: Data storage

A. Advantages of cloud data storage

Storing extremely large volumes of information on a local area network (LAN) is expensive. High capacity electronic data storage devices like file servers, Storage Area Networks (SAN) and Network Attached Storage (NAS) provide high performance, high availability data storage accessible via industry standard interfaces. However, electronic data storage devices have many drawbacks, including that they are costly to purchase, have limited lifetimes, require backup and recovery systems, have a physical presence requiring specific environmental conditions, require personnel to manage and consume considerable amounts of energy for both power and cooling.

Cloud data storage providers, such as AmazonS3, provide cheap, virtually unlimited electronic data storage in remotely hosted facilities. Information stored with these providers is accessible via the internet or Wide Area Network (WAN). Economies of scale enable providers to supply data storage cheaper than the equivalent electronic data storage devices.

Cloud data storage has many advantages.

- It's cheap, doesn't require installation, doesn't need replacing.
- It has backup and recovery systems.
- It has no physical presence.
- It requires no environmental conditions.
- It requires no personnel and doesn't require energy for power or cooling.
- No need for extra hardware (i.e. SD card, thumb drive).
- Convenient.
- Automatic synchronization.

Cloud data storage however has several major drawbacks, including performance, availability, incompatible interfaces and lack of standards.

B. Disadvantages of cloud data storage

Performance of cloud data storage is limited by bandwidth. Internet and WAN speeds are typically 10 to 100 times slower than LAN speeds. For example, accessing a typical file on a LAN takes 1 second, accessing the same file in cloud data storage may take 10 to 100 seconds. While consumers are used to slow internet downloads, they aren't accustomed to waiting long periods of time for a document or spread sheet to load.

Availability of cloud data storage is a serious issue. Cloud data storage relies on network connectivity between the LAN and the cloud data storage provider. Network connectivity can be affected by any number of issues including global networks disruptions, solar flares, severed underground cables and satellite damage. Cloud data storage has many more points of failure and is not resilient to network outages. Network outages mean the cloud data storage is completely unavailable.

Cloud data storage providers use proprietary networking protocols often not compatible with normal file serving on the LAN. Accessing cloud data storage often involves ad hoc programs to be created to bridge the difference in protocols.

The cloud data storage industry doesn't have a common set of standard protocols. This means that different interfaces need to be created to access different cloud data storage providers. Swapping or choosing between providers is complicated as their protocols are incompatible.

The cloud drive data storage is small enough to be used on laptops while having enterprise class features that enable it to be scaled out to the largest organization.

DISAVDVANTAGES

- Requires constant connection, either via data or wifi
- Potentially slow over 3G or weak Wifi
- Streaming movies is difficult, if not impossible (at least with Dropbox, etc.)
- Eats up a limited data plan quickly

C. Applications of Cloud drive

Cloud Drive can be used for:

1. Online backup and real-time protection of your data
2. Syncing and collecting your data in one place
3. Sharing documents, movies and photos
4. Streaming music to you mobile devices
5. Access to all your data in one place
6. Mobile access on the go through apps for iPhone, iPad and Android phones
7. Securing your data with encryption and password protection
8. Recovering previous versions of files, even if you accidentally deleted them.

VIII CONCLUSIONS

This paper mainly focuses on cloud data storage. Various cloud drives can be used to store data in cloud. In the paper, we have mainly concentrated on cloud drives i.e. different types of cloud drives.Through out the system lifecycle, risks that are identified must be carefully balanced against the security and privacy controls available and the expected benefits from their utilization. Too many controls can be inefficient and ineffective, if the benefits outweigh the costs and associated risks. State agencies and organizations should work to ensure an appropriate balance between the number and strength of controls and the risks associated with cloud computing solutions.

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