DECLARATION

The work embodied in this Dissertation titled **"Cloud Storage Forensics"** submitted for the partial fulfillment of the degree of **M.Sc in Cybersecurity and Digital Forensics** is the original research work carried out by me. The research work does not form the basis for the award of any degree, diploma, associateship, fellowship or other titles in the Rashtriya Raksha University or similar institutions of higher learning. All the ideas and references have been duly acknowledged.

Parth Gondaliya

Date: 17/11/2025

CERTIFICATE

This is to certify that the Dissertation titled **"Cloud Storage Forensics"** was carried out by **Gondaliya Parth Vinodbhai (Enrollment no : 240031102551037)** studying at **School of Information Technology, Artificial Intelligence and Cybersecurity** for partial fulfillment of **M.Sc in Cybersecurity and Digital Forensics** degree to be awarded by Rashtriya Raksha University. This research work has been carried out under my guidance and supervision and it is up to my satisfaction. The Dissertation is fit to be considered for evaluation for the degree of **M.Sc in Cybersecurity and Digital Forensics**.

Date: 17/11/2025

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I would like to express my sincere gratitude to everyone who contributed to the successful completion of this minor project.

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This project has taught me a lot, and I'm thankful to everyone who played a part in it.

With Sincere Regards,

Parth Gondaliya

M.Sc in Cybersecurity and Digital Forensics

TABLE OF CONTENTS

LIST OF FIGURES

Abstract

Cloud Storage Forensics

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Cloud storage services such as PCloud, MEGA, OneDrive, and Google Drive are now widely used for storing and sharing data. However, as these platforms grow, they also create new challenges for digital forensic investigators, especially because the actual data is stored on remote servers that cannot be accessed directly. This project explores how much useful forensic evidence can be recovered from a user's device when cloud storage services are used.

To study this, different user actions—like uploading, downloading, deleting, and syncing files—were performed on multiple cloud services. Tools such as Autopsy, FTK Imager, Hex Editor Neo, Hindsight, Wireshark, and VMware were used to examine both the disk and RAM for traces of activity. The analysis showed that even though cloud systems keep their internal data hidden, a significant amount of evidence remains on the user's computer. This includes log files, database entries, browser histories, cached information, user IDs, and sometimes even sensitive details found in RAM.

The results highlight the differences between cloud providers: some focus strongly on security and encryption, while others leave behind more detailed local artifacts that help investigators. The study also reflects on the difficulties faced during cloud investigations, such as encrypted data, fast-changing environments, and legal restrictions across countries.

Overall, this project provides a practical understanding of how cloud storage forensics works and offers a clear methodology for identifying and analyzing client-side evidence. These findings can help forensic investigators better handle cases involving cloud-based data.

1. Introduction

1.1 Purpose

The rapid growth and improvement of cloud technology is taking digital forensics to a whole new level. The main goal of this project was to investigate cloud storage and understand how files can be examined—whether they still exist or have been deleted. Our analysis shows that several artifacts remain even after files are erased from cloud storage. We also found that the number and type of artifacts change depending on actions such as creating, deleting, uploading, transferring, or moving files within the application.

1.2 Introduction of cloud computing

Cloud computing and cloud forensics are two closely related fields that have evolved together over the past few decades.

Cloud Computing is referred to as accessing and storing data and providing services related to computing over the internet. It simply refers to remote services on the internet manage and access data online rather than any local drives. The data can be anything like images, videos, audios, documents, files etc.

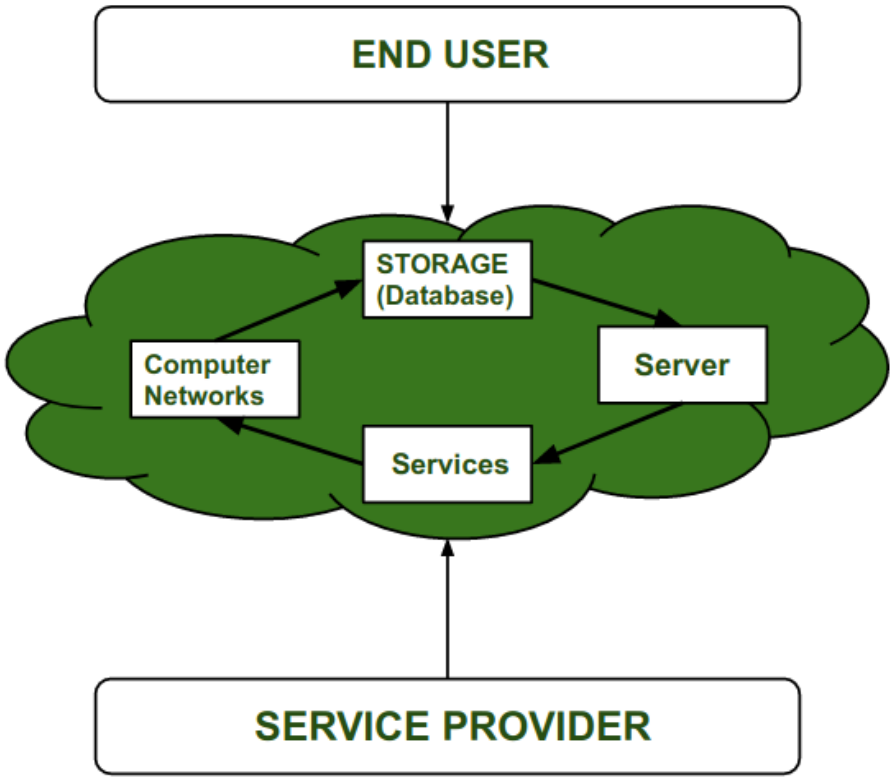


Figure 1 : flow of cloud

1.3 Cloud service provider's

Cloud computing is in high demand, and many major organizations now provide cloud services. Some of the leading cloud service providers like Amazon AWS, Microsoft Azure, Google Cloud, and Alibaba Cloud.

1.4 Term cloud computing

The term "cloud computing" was coined describe the concept of delivering computing services on the internet, without the need for on premise hardware and infrastructure. The word "cloud" was used as a metaphor for the internet, which is often represent as a cloud in network diagram.

The idea behind cloud computing is that computing resources, such as processing power, storage, and application are made available also to users over the internet, much like electricity is provided through power grids. Users can access these resources on-demand and pay only for what they use, rather than investing in expensive hardware and infrastructure of that may sit idle for long period of time.

The term "cloud" also reflects the idea that the underlying hardware and infrastructure are abstracted away from the user, who only sees the services and applications that are made available through the cloud platform. This abstraction allows cloud providers to manage the underlying infrastructure more efficiently, while also providing greater flexibility and scalability to users.

1.5 History of cloud computing

Before modern computing evolved, systems relied on a client–server architecture where all data and control were stored on the server side. If a user wanted to access any information, they first had to connect to the server and then receive the necessary permissions. However, this model had several disadvantages. To overcome those issues, distributed computing was introduced. In this approach, multiple computers were connected through a network, allowing users to share resources whenever required. Although distributed computing improved flexibility, it still came with certain limitations.

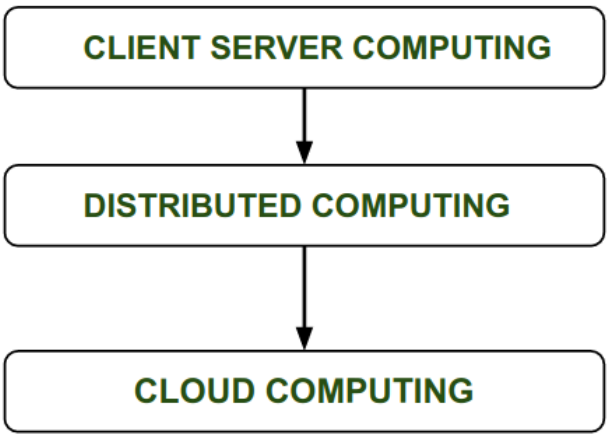


Figure 2 : flow of Work

"Computing may someday be sold as a utility, just like water and electricity," said John McCarthy in a 1961 speech at MIT. Although it was a visionary idea, people were not prepared to embrace it at the time. The concept didn't get much attention, and not much research was done on it because they thought the technology already in place was adequate for their needs. But as technology advanced, McCarthy's concept started to become more well-known. The idea was eventually implemented after a number of years. In 1999, Salesforce.com was among the first to successfully implement it, signaling the start of contemporary cloud computing services.

- When businesses began distributing enterprise apps online, it signaled the beginning of a significant change in the way software and services were offered, which in turn led to the rise of cloud computing.
- **2002:** Amazon launched Amazon Web Services (AWS), which provided computing power and online storage.
- **2006:** Google Docs, which enables users to create and share documents directly through the cloud, was introduced by Google in 2006.
- **2006:** Amazon formally extended AWS, offering businesses all over the world scalable, adaptable, and reasonably priced cloud solutions.
- **2007:** The launch of Dropbox, a file-hosting service that provided simple file synchronization and storage, developed by an MIT student.

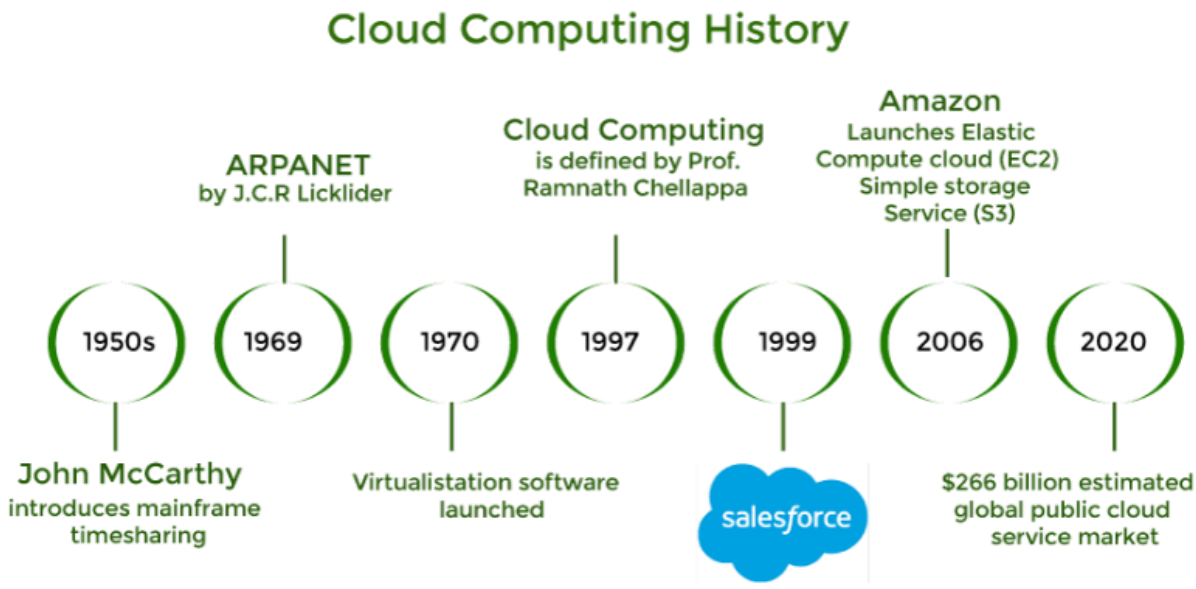


Figure 3 : Time line of cloud History

- **2008:** Google made App Engine generally available, which allowed developers to create and deploy applications without managing the underlying infrastructure.
- **2010:** Market entry in the cloud by Microsoft, named Azure, offering services much like AWS, was focused strongly on enterprise-level solutions.

- **2012:** Google launched Google Drive, enabling people or enterprises to store, share, and collaborate on files in the cloud.
- **2015:** Multi-cloud solutions became a strategic approach for many organizations to address performance, reliability, and cost efficiency by using several cloud providers.
- **2020:** Cloud computing began to focus more on security, adding more advanced capabilities such as AI, machine learning, and automation to make cloud platforms more powerful and intelligent.
- **2023:** The integration of advanced AI models, including OpenAI's GPT-4 with cloud platforms, increased the possibilities of AI in business, research, and realworld applications.

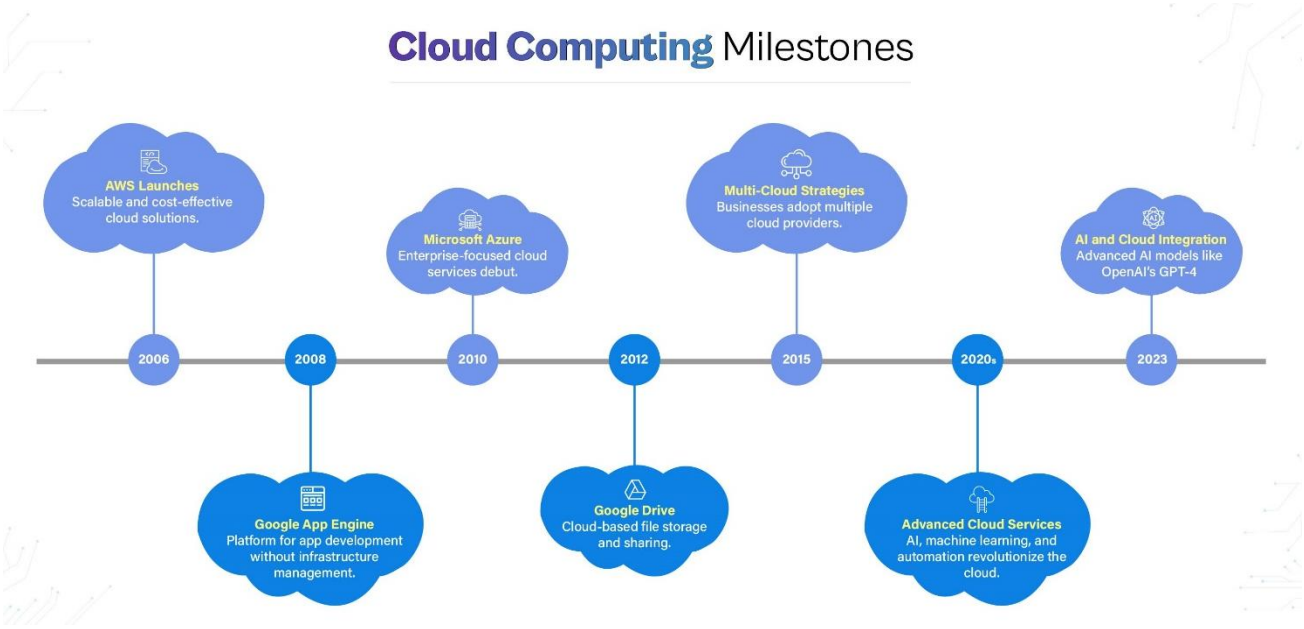


Figure 4 : Milestones of cloud History

2. Background study/ Literature review

2.1 Google Drive Forensics by Security Blue Team (2024)

This paper analyses the Google Drive desktop application's leftovers from a forensic point of view on Windows OS. The author points that regular activities—like uploading, deleting, or syncing files—will result in the registry keys, log folders, and some SQLite databases used by the DriveFS service being updated. Even if a cloud user deletes files, sometimes metadata and activity entries are left on the device which allows the detective to re-create the timeline of file interactions. The paper also emphasizes the importance of memory analysis and states that the running Drive processes store temporary information in RAM, which can be used to disclose filenames or session activity. To sum up, it shows that Google Drive has a huge variety of artefacts at the endpoint level that can accurately be used to revive user actions during a forensic examination.

2.2 MEGA Cloud Client Forensics (Mishra et al., 2022)

This study provides a detailed examination of the MEGA cloud client on Windows and Android devices. The authors conduct controlled user operations such as uploading, downloading, and sharing to spot a great variety of artefacts that include cached metadata, recent file lists, logs, and timestamps. The traces left on the device are very useful for user activity reconstruction since they persist even after the content has been deleted from the cloud. On Android, the investigation points to the application-specific folders and preference files that contain the user activity records, whereas the Windows platform holds the MEGA logs, configuration files, and registry entries. The researchers say that the MEGA service is reliable when it comes to leaving behind forensic traces that can help researchers investigating the use of cloud storage on different platforms.

2.3 pCloud Forensic Analysis from a Volatile Memory Perspective (Ahmad & Hamid, 2020)

This paper highlights the generally neglected domain of volatile-memory forensics when investigating cloud storage. The researchers demonstrate, by analyzing RAM after various actions such as uploading and downloading files using the pCloud client, that memory contains some very important temporary artifacts. These include session tokens, API references, partial filenames, and metadata related to recent user activities. Because such artifacts do not always show up in disk-based logs or databases and may be lost after the system is shut down, the authors stress the importance of live-memory acquisition in investigations dealing with cloud applications. These findings do indeed reinforce the view that RAM forms a very important source of evidence, particularly in modern cloud clients relying on encrypted or transient processes.

2.4 OneDrive Forensics on Windows Systems (2025)

This most recent research covers how the OneDrive desktop client stores information about user activity on Windows devices. Key registry entries, as found by the authors, hold account information, synced folder locations, and unique cloud identifiers, all aiding to confirm user profiles and access paths. They also analysed OneDrive's core database, SyncEngineDatabase.db, which tracks local file interactions with cloud-only items that have never been fully downloaded. In addition, their research reviewed OneDrive log files stored on the user profile, illustrating how file upload, download, rename, and deletion events are recorded over time. Collectively, these artefacts paint a clear picture of user behaviour, underscoring OneDrive as a strong source for client-side evidence in cloud-storage forensic investigations.

3. Important components of cloud architecture

3.1 Cloud Computing architecture

Cloud computing architecture is made up of several loosely connected components. Overall, it can be broadly divided into two main parts:

1. Front ends
2. Back ends

Each of these components is connected through a network, typically the internet. The diagram below provides a visual representation of the overall cloud computing architecture:

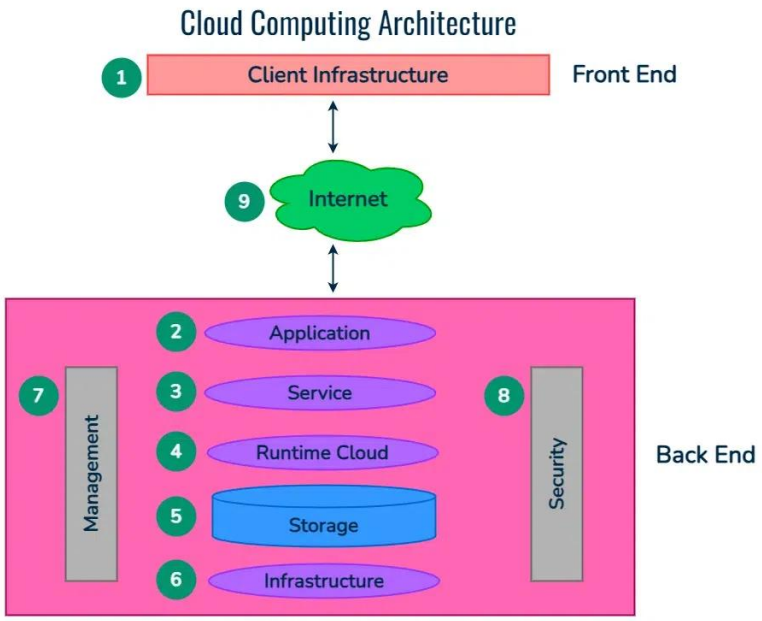


Figure 5 : general Cloud Components

Cloud computing architecture encompasses several critical building blocks. Among them are the client-side infrastructure, applications, services, runtime environments, data storage systems, management tools, and security mechanisms. All the components mentioned above collectively create a complete cloud computing architecture.

3.1.1 Front end:

The client interacts with the cloud through the front end side, which includes the user interface and the client-side application. Both of these are essential for accessing any cloud platform. The front end typically consists of web browsers for ex. Chrome, Firefox, or Opera, as well as client applications and mobile devices.

3.1.2 Back end:

The backend is responsible for managing all the resources needed to deliver cloud computing services. It includes components such as security systems, large-scale data storage, servers, virtual machines, and traffic management tools. Together, these elements ensure that the cloud operates smoothly, securely, and efficiently.

3.2 Types of cloud computing

There are different types of ways cloud technology is implemented. The model is determined for you to base on a thorough assessment of the operations of the business. The best solution is the one that meets your outmost needs there are three different ways to deploy cloud services on a Public cloud, Private cloud and Hybrid cloud.

3.2.1 Public cloud:

The third-party cloud service provider owns and runs the business of providing cloud compute resources such as servers, software, storage, hardware all over the internet. A typical example of a public Cloud is Azure from Microsoft All hardware, software and auxiliary system are owned and run by the cloud service provider. The public cloud service is delivered to users via a web browser

3.2.2 Private cloud:

The Private cloud is operated in the same manner as the public except for the resource of the Private cloud is used by one organization. The infrastructure could be located on the company’s premises or may be outsourced to a third-party business to host on behalf of the organization. This means the service is run on a private network

3.2.3 Hybrid cloud:

The Hybrid cloud model is a merger of the public and private clouds making it possible to share computing resources between the 2 architecture, a good implementation of the hybrid cloud provides higher elasticity to the company. This because the business has many options in deployment which best for the effective and efficient use of the organization's existing resources.

4. Benefits of cloud computing

4.1 Accessibility Anywhere

Cloud computing allows employees, clients, and customers to access data from any device and location. Everyone stays updated whether they're in the office or on the go.

4.2 Less Hardware and Software

You won't have to purchase or look after any server, cables, or routers. The cloud service takes care of everything and charges a monthly fee, which reduces the overall cost of a business.

4.3 Centralized Security

Data is stored in the provider's data centers, where it is securely backed up. Using encryption and two factor authentication are among the features that provide better protection against data loss or breaches.

4.4 High Performance and Availability

Cloud infrastructure offers quick performance and almost no downtime at all. The providers are the ones who take care of the updates and fixes automatically thus allowing the users to enjoy their uninterrupted operations.

4.5 Quick Application Deployment

Applications can be deployed immediately within the same time frame of waiting for hardware installation. This benefits the process of business changes and the ability to scale up or down flexibly.

4.6 Real-Time Insights

Cloud platforms provide instant access to relevant data, in turn helping businesses to make smarter and faster decisions by interpreting information in real-time.

4.7 Business Continuity

During a catastrophe, the safe keeping of data and systems is achieved thanks to remote backups ensuring continuation of business operations.

4.8 Cost Efficiency

Though an initial investment is required, the maintenance costs that are normally associated with on-premises servers are eliminated by cloud computing, thus making it a long term money saver. The flexibility is provided by the pay-as-you-go pricing model.

4.9 Virtualization

An auto-scaling property makes it convenient to scale up or down just as easier to avoid maintenance, overhead, and human verifications that are changes in the operating environment.

4.10 Eco-Friendly

The implementation of cloud computing in the IT industry results in a considerable reduction of energy consumption as well as carbon footprint, which is up to 90%, thus it is considered a more environment-friendly and sustainable IT solution.

5. Cloud storage architecture

Cloud storage different from traditional storage. Operationally, cloud storage is designed and deliver a wide range of online cloud storage services, while conventional storage systems is mainly built for high-performance computing and transaction processes. Performance-wise, emphasis in cloud storage lies in data security, reliability, and efficiency. Serving a greater number of users, offering more comprehensive services, and running in a more complex and ever changing network environment, cloud storage is faced with much greater technological challenges than traditional storage in providing high-quality services.

Cloud storage systems support not only access to traditional files, such as those based on the POSIX standard, but also manage large-scale data and provide public service function, maintaining data in background from data management perspective.

Commonly, cloud storage is divided into four layers, which are the data storage layer, data management layer, data service layer, and the user access layer. Figure 1 shows the cloud storage architecture as proposed by Zhou Ke et al. (2010).

5.1 Data storage layer:

The cloud storage system provides various storage services, and all the data stored within forms a huge shared pool. This must be appropriately structured and managed so that efficient storing and fast access are ensured. Traditional methods of data organization rely on a single server, which cannot handle the high throughput and large storage demands of multiple users across a wide-area network.

While peer-to-peer storage systems improve performance, they entail a very large number of nodes and complex coding techniques in order to maintain data reliability. Organizing data using different cloud storage services is far more suitable for modern online storage needs.

Cloud storage relies on data centers distributed across different regions. Geographical dispersal enables the system to provide services of high quality for a big number of users located in diversely spread areas. The storage layer manages enormous amounts of data in a unified manner by interconnecting various types of storage devices. It also allows centralized management, real-time monitoring, and dynamic expansion of storage capacity at any time.

Overall, cloud storage systems work as service-oriented, distributed storage environments that can handle large-scale, reliable, and flexible data storage.

5.2 Data management layer:

The Data Management layer provide a public management interface to the upper layers for each kind of cloud service. The key functionalities include user management, security management, replica management, and policy or strategy management. In this way, it works like a bridge that connects seamlessly the applications of the upper level with the lower-level storage services.

In addition, it lets different storage devices cooperate, enabling them to provide a broader range of services and better performance.

5.3 Data service layer:

This layer interacts directly with the user and is the most flexible part of the system. Depending on the user's needs, different application interfaces can developed to provide services such as data storage, public resource access, multi-user data sharing, or data backup.

5.4 User access layer:

This layer allows authorized users to log in to the cloud storage platform from any location through a standard public interface, giving them seamless access to their stored data.

6. Advantages/disadvantage of cloud storage

6.1 Advantages of cloud storage

The main advantage of these services as Goggle Drive, Apple I Cloud, Mega Drive, and Microsoft OneDrive to users is their data is stored in a virtual location in the cloud while a local version exists on their computer system or smartphone. Its synchronization with the cloud does not require any user interaction after the installation of the Client Application. This is means there always an offline version of the data stored locally for easy access while the backup is in the cloud and updates any time there is internet connectivity.

6.1.1 Anywhere, Anytime Access

No matter where you are, you can log in to your files with just an internet connection. This global accessibility supports remote work and collaboration, allowing employees to co-edit documents in real-time (e.g. Google Drive, Microsoft 365).

6.1.2 Scalability and Flexibility

Need an extra 10TB for a seasonal campaign? Scale up instantly. Experiencing a quiet quarter? Scale back down. Cloud providers' pay-as-you-go or tiered pricing models make it easy to adapt to business fluctuations.

6.1.3 Cost Efficiency

Cloud storage reduces or eliminates:

- Server infrastructure costs
- Physical storage facility expenses
- Specialist staff overheads
- You pay for what you use, avoiding under- or over-investment.

6.1.4 Ransomware/Malware Protection

Ransomware is one of the most dangerous types of malware, and unfortunately, it appears in the news far too often. One of the scariest things about ransomware is that it doesn't just infect the local computer it also searches the entire network for shared folders and files to encrypt.

The good news is that cloud storage can help protect your data. Since cloud platforms require proper authentication and maintain secure backups, it becomes much harder for ransomware or other malware to access, encrypt, or destroy your files. This added layer of protection can be a major advantage during an attack.

6.1.5 No Maintenance Required

With cloud storage, your subscription fee helps cover the company's costs for maintaining and upgrading its servers.

6.2 Disadvantages of cloud storage

6.2.1 Vulnerability

Most PCs and servers that store data depend on an internet connection. Since cloud solutions are naturally internet-based, they are constantly connected to other computers and servers. This connectivity, while essential, also makes the vulnerable to attacks from malicious users on the network.

6.2.2 Internet Dependency

An internet connection is a key resource for cloud storage. It was a significant disadvantage in the past but this isn't the case any more since the internet has blended into our daily life to such a great extent. Offline file storage and later retrieval is allowed but the internet must be there all the time when the system wants to carry out updating or syncing of the data.

6.2.3 Cost

Even though cloud storage is usually a cheap option, it can still not be used for short-term or very small-scale projects depending on the pricing structure of the provider. Sometimes, consumers get trapped in lengthy agreements. To illustrate, when a user needs storage for only six months but the provider requires a minimum two-year subscription, the user ends up paying for an extra 18 months, which is not a sensible financial decision.

6.2.4 Issues in Security and Privacy

Concerns about security and privacy are among the major drawbacks of cloud storage. Storing confidential data in the cloud requires handing it over to a third-party provider, which means users must place a high level of trust in the cloud vendor. This dependency can create uncertainty, especially when handling sensitive or critical information.

7. Cloud storage forensics

Digital forensic is defined as the process of gathering and analysing electronic evidence for legal purposes, criminal investigation or civil dispute.

It's difficult to make a case legally when it has to do with cloud computing as the digital forensic analyst has to acquire and analyse the electronic evidence adhering to the same standards as with traditional server-based system. This not easy as the Investigator will have to establish the exact cloud service provider and identify the user details and password for the cloud storage account. Such details can be retrieved by taking a forensic image of the computer/Mobile Device for analysis.

These type of Cloud services are also be referred to as Synchronization services. This means that as the user stores the information on a digital device is synchronized, a copy of the data is saved in remote server Spread across several locations of data center.

With the rate of growth cloud service there a high likelihood of such crimes occurrence - A criminal could leak confidential information of companies stored in a cloud storage service by hacking a cloud service that allows account holders to store documents and images access them everywhere with any digital device.

An example if an investigator in Ghana identifies a suspect has stored data with a cloud storage service in the USA. The process of gaining access and securing the data relies on agreements and MOUs across those countries with valued legal systems. This process to get legal authorization may take longer to achieve due to several reasons. While this happening the suspect may continue to have access to an account and compromise the evidence.

One of the difficult parts of an investigation in cloud storage service is the challenge to find which user credential did from the time of subscription to the service till the completion of the service term.

Once the authorization and authentication to the cloud storage account is made the forensic investigator can begin legal process with the service provider to protect the data under investigation. The process can bring challenges especially when the data center of the cloud storage service provider is located in a different jurisdiction to where the crime was committed This call for collaboration and cooperation's among law enforcement agencies.

Computer system user create documents, images, emails and surf the internet. These activities leave traces on the computer which are good source digital evidence. The actual files may not reside on the local machine and such the forensic expert many rely on artifacts Len behind on the system to able to trace user activities. The logs recorded by the cloud service provider can provide audit trails of user acclivities, this information is however kept private and protected by the cloud storage service provider.

8. Problem statement

8.1 Digital Forensics in Cloud Computing

As a result of this rapid adoption of cloud computing, organizations and individuals increasingly store and manage their data on online platforms. This increasing reliance has opened new challenges for forensic investigators because, during conventional investigations, forensic experts had access to these physical devices from which they could gather and analyze evidence. In cloud environment, investigators rarely have such access because the data is distributed over several servers owned and managed by third-party providers, which makes tracing user activities difficult, preservation of digital evidence, or ensuring its integrity challenging.

The key challenge is, therefore, to acquire, preserve, and verify digital evidence from cloud storage systems where one does not have control the physical infrastructure or the exact location of the data.

8.2 Developing a Cloud Forensics Strategy

Today's organizations are under stringent legal and regulatory imperatives to manage what digital information is stored, retained, and discarded. When digital data is stored in the cloud, it often resides in multiple countries and is subject to a variety of privacy and data-protection laws. Issues of ownership, retention time, and privacy rights of users may be unclear.

Consequently, there is an increasing demand for the development of a cloud forensics strategy that supports the legality of evidence collection and preservation, respects users' privacy, and adheres to international data regulations. It should also allow organizations to ensure compliance with existing laws and to prepare for forensic investigations if incidents occur.

8.3 Security and Forensic Issues in Cloud Environments

Cloud computing presents many different security and forensic issues. The transient nature of the cloud ensures that user activities, virtual machines, and data flows can change quickly, with the result that it becomes difficult to find out who performed a certain action and accessed given information. In a shared multi-tenant environment, tracing back malicious activity to a specific user or system may pose an especially challenging issue.

Additionally, replication, migration, and synchronization of data by cloud services can affect the nature of the digital evidence; this raises concerns about how cloud storage evidence can retain its integrity and credibility when presented for investigation. The problem gets even more complex when presenting findings in court, since examiners must prove that evidence has not been modified in any way throughout an investigation.

9. Procedure for digital investigation of cloud storage service

There are many forensic investigation models proposed. There is a common one that is accepted and seen as standard in digital forensics practice. They are 5 stages process

- Identification of the Electronic Evidence
- Preservation of Electronic Evidence
- Collection of Evidence
- Analysis of Electronic Evidence
- Reporting

9.1 Identification:

The first stage is to find the potential sources of information that will be relevant to the investigation. The search may start from known to unknown areas. Smartphones, Computers and other digital devices.

9.2 Preservation:

This step is very important as the digital evidence needs to be preserved by protecting the crime scene and taking shots/pictures of all items in the surroundings. Proper documentation needs to be taken of all items identified at the scene. Chain of custody is adhered to at all times.

9.3 Collection:

Gathering electronic information which may be important to the investigation. Collection may involve removing the electronic devices from the scene of the crime and taking then creating a bit-by-bit copy of it, or printing. Whichever way the evidence its collected care must be taken not to compromise the integrity of it.

9.4 Analysis:

Using various forensic techniques and tools the evidence is subject to forensics analysis or examination and any lead relevant to the investigation is recorded. A conclusion may be drawn based results of the analysis conducted by the investigator.

9.5 Reporting:

Accurate records arc taken through the investigation process. This recorded may verify when need be, at the court of law. The investigator only report evidence related to the Crime and no other activity.

10. Methodology

This study is experimental in nature and involves a practical demonstration of the identification, collection, preservation, analysis, and presentation of digital evidence. The experiment was conducted using four cloud storage services: Google Drive, OneDrive, MEGA Sync, and pCloud.

To perform the analysis, two types of user activities were examined:

- Browser interactions
- Client application interactions

Across these cloud platforms, the following actions were tested using both the desktop client applications and web browsers:

- File download
- File upload
- File deletion
- File sharing

Since access to the internal data centers of cloud service providers is not available for forensic purposes, this investigation relies on evidence of past data possession found on the user's computer system, as suggested by Sham Zawoad et al. (2012).

10.1 Flow of work

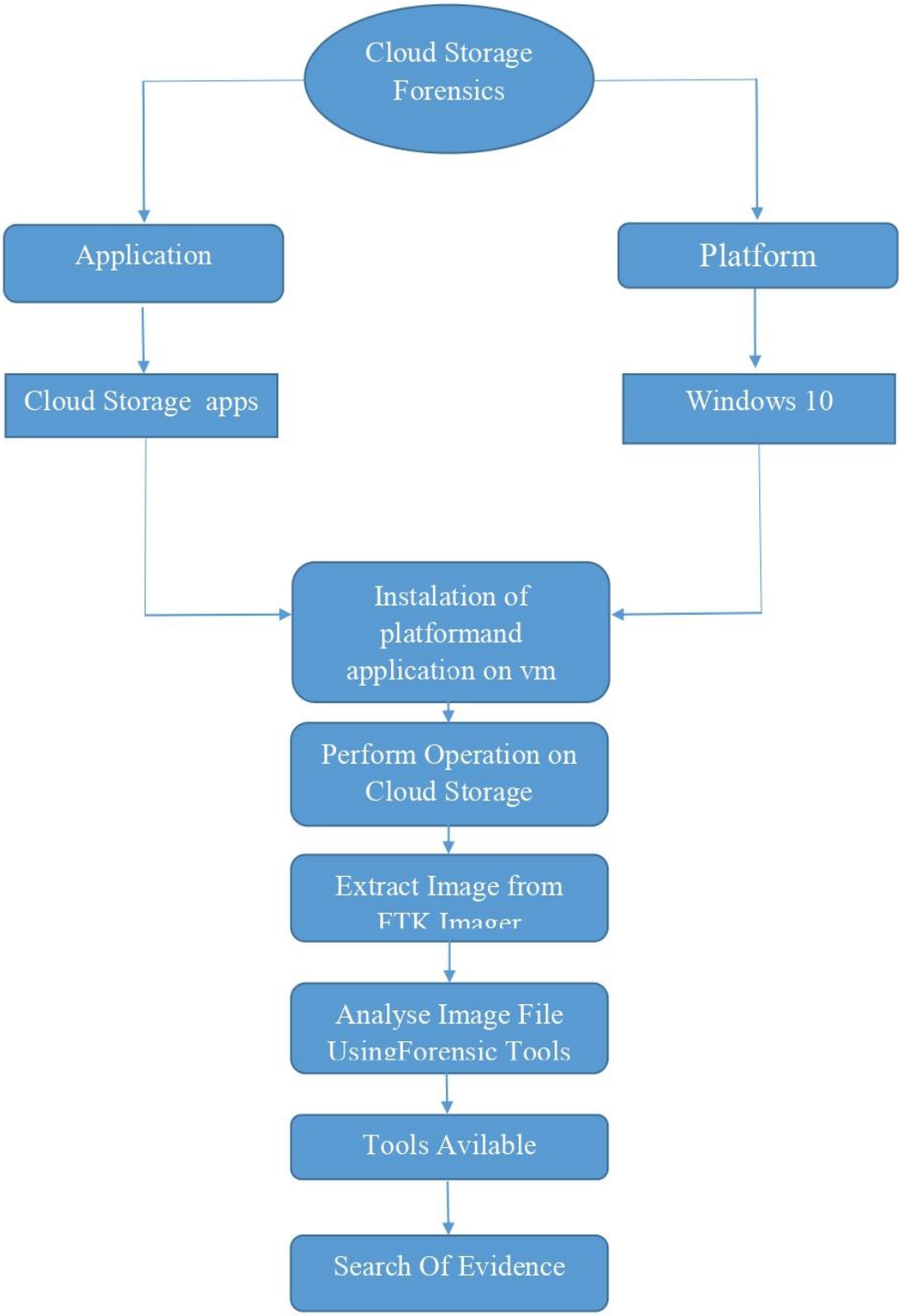


Figure 6 : Work Flow

11. Tools

11.1 Autopsy forensic tool

Autopsy is a digital forensics platform that provides a graphical interface for The Sleuth Kit and other forensic utilities. It is widely used by law enforcement, military investigators, and corporate examiners to analyze digital evidence and determine what activities took place on a computer system. Autopsy can also be used for simple tasks such as recovering deleted photos from a camera's memory card, making it a versatile tool for both professional and personal investigations.

11.2 Easy to use

Autopsy is easy to use, with simple installation and step-by-step wizards. All investigation results are organized in a single, easy-to-navigate tree.

11.3 Extensible

Autopsy is built as an end-to-end platform, offering built-in modules as well as third-party add-ons. These modules provide various forensic functions such as data carving, timeline analysis, keyword search, and file recovery.

- **Timeline Analysis:** Provides an advance graphical interface to view events.
- **Hash Filter:** Identifies known malicious files and ignores known safe ones.
- **Keyword Search:** Uses index search to quickly find files containing specific terms.
- **Web Artifacts:** Extracts browser history, bookmarks, and cookies from Firefox, Chrome, and Internet Explorer.
- **Data Carving:** Recovers deleted files from unallocated space using PhotoRec.
- **Multimedia Analysis:** Extracts EXIF data from photos and allows viewing of videos.
- **Indicators of Compromise:** Scans the system for threats using STIX-based intelligence.

11.4 Fast

Autopsy employs a multi-core setup to perform background tasks in parallel and delivers results to the user immediately upon discovery. It might take several hours for a complete drive search, but you will be informed within minutes if your keywords were found in the user's home directory. For more detailed information refer to the fast results page.

11.5 Cost effective

Autopsy is totally free and open source tool. As budgets are decreasing, cost effective digital forensics solutions are essential. Autopsy offers the same core features as other digital forensics tools, such as web artifact analysis and registry analysis that other commercial tools do not provide.

Product Version: Autopsy 4.21.0
Sleuth Kit Version 4.12.1

11.6 FTK Imager 4.7.1.2

FTK Imager is a forensic imaging tool from AccessData that creates full or segmented disk images, verifies them with MD5 hashes, and can also mount drives and recover deleted files.

11.7 Hex editor neo

Free Hex Editor Neo is the fastest and large files optimized binary file editor for Windows platform developed by HHD Software Ltd. It's distributed under Freemium model and provides you with all basic editing features for free.

11.8 Wireshark

Wireshark is an open source tool for capture and analysing network traffic and packets. Such a tool is often referred to as a network analyser, network protocol analyser or sniffer.

11.9 VMWare

VMware Tools is an important add-on for virtual machines that helps everything run more smoothly. It installs better drivers, improves system performance, and allows the guest operating system to work more naturally and efficiently with the VMware platform.

11.10 Hindsight

Hindsight is a free tool used to analyze web browser artifacts. It supports Chrome and other Chromium-based browsers and can extract data like history, downloads, bookmarks, cookies, autofill, and more. It then correlates this information and presents it in a timeline.

12. PCloud storage service

pCloud is a widely used cloud storage service known for offering excellent security along with unlimited upload and download speeds. Launched in 2013, it has grown by learning from both the successes and shortcomings of competing services. It is also one of the first cloud storage providers to introduce lifetime subscription plans.

With pCloud, there are no limits on file size or download speed. It has strong security features along with trustworthy backup options. Similar to other cloud storage services like Google Drive and Dropbox, pCloud also allows you to back up your social accounts (such as Instagram, Facebook, and Picasa) as well as your WordPress websites.

You can even mark files as “favorites” to access them offline.

12.1 File synchronisation

The pCloud app and web interface offer several file-sharing options, allowing you to send files and folders wherever you need. Its virtual drive feature also expands your computer’s storage, and any files you upload to that drive can be accessed from any device, anytime, and anywhere.

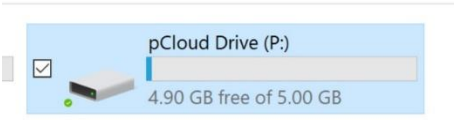


Figure 7 : PCloud Local Drive

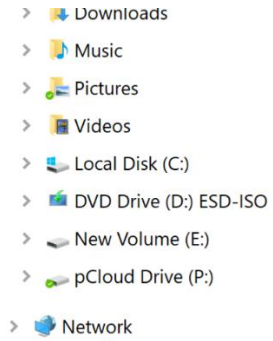


Figure 8 : PCloud listed in the Drive list

You can open your pCloud Drive in your file manager by simply left-clicking or right-clicking the pCloud icon. If you have a Crypto subscription, you can access your Crypto folder and add new folders to your Sync list. You can also use the menu to check your account status and view notifications.

12.2 To add a new local folder to the sync:

- Open the pCloud panel and go to Sync.
- Click Add New and select the local folder.
- Browse to the folder you want to sync.
- Choose the destination folder on your pCloud Drive.
- Select where the folder should sync in your pCloud directory.
- Click Save, then Add Sync.

The sync will begin immediately and the synced folders will be accessible from all devices linked to your pCloud account. You can create multiple sync folders as long as you have enough storage space. If you want your synced folders to be available offline, simply right-click the folder and select “Offline Access (Sync).”

You can choose either the pCloud Drive folder or a local folder for offline access. After making your selection, click **“Save”** to confirm and complete the synchronization setup.

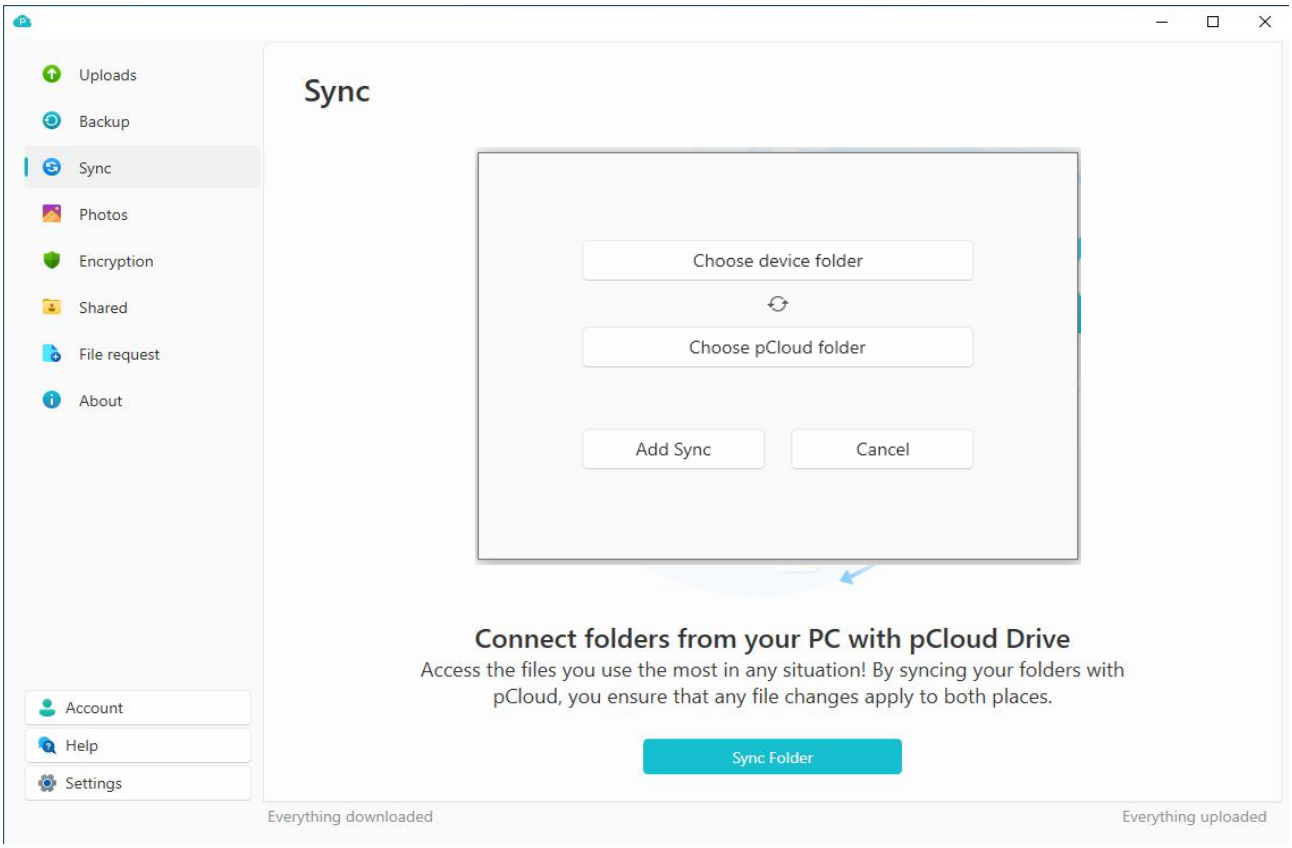


Figure 9 : PCloud Sync Setting

12.3 How to upload files through the website

- Click the Upload icon.
- Choose File upload or Folder upload.
- Click Browse for files or Pick folder.
- Select the files or folder and click Open.

You can also use Remote Upload, which lets you download files directly from a URL. Simply paste the link and click Upload. pCloud will download the file straight to your storage often at high speeds because it pulls the data directly from the source server.

12.4 How to upload files through PCloud Drive

Simply drag and drop, or copy any file or folder into the pCloud virtual drive or into a folder that is synced with pCloud.

12.5 How to retrieve your files

Recovering deleted files in pCloud is easy. Deleted items stay available for 15 days on the free plan, 30 days on premium plans, and up to 365 days with Extended File History. You can also permanently delete backups if needed.

12.6 Ease of use

pCloud is available for Mac, Windows, and Linux, and has a simple interface that's easy to use. You can upload files with the upload button or by dragging them in. It also provides easy file sharing and offers good upload/download speeds with a responsive interface.

12.7 Security and encryption

Utilizes encryption during data transfer to ensure that your files are and at the same time, data encryption across various locations of the server for better security. With, only you keep the keys, thus no access is permitted. Crypto is the subscription that adds an additional of protection for your and your password.

12.8 File versioning

With a selected expiration time, pCloud carefully stores the processes of the files' earlier versions and retrieves them according to the user's requirement. Using the Revisions feature, you can view and recover past versions of any file. Just click the gear icon, choose Revisions, and select the version you want.

File versions are stored for 15 days on the free plan and 30 days on Premium, Premium Plus, or Lifetime plans.

The pCloud Rewind feature lets you view your entire account as it existed at a specific date and time. If you accidentally delete shared content, Rewind allows you to restore or download all non-encrypted files.

12.9 How to use PCloud Transfer

pCloud Transfer lets you send files up to **5 GB** without needing a pCloud account. Just upload the files, enter up to 10 recipient emails, add your email and an optional message. The files are uploaded to pCloud's servers and can be downloaded by all recipients.

12.10 PCloud installation process

Download a PCloud exe and install by GUI by simply pressing the next and install the PCloud is open in the PC.

By default PCloud is Automatically cover almost all common folder like Desktop, Document, Download, Music, Picture, Video any new file is created it will automatically upload to PCloud and save it if we can delete the file it will go to recycle bin but the in PCloud it is stored.

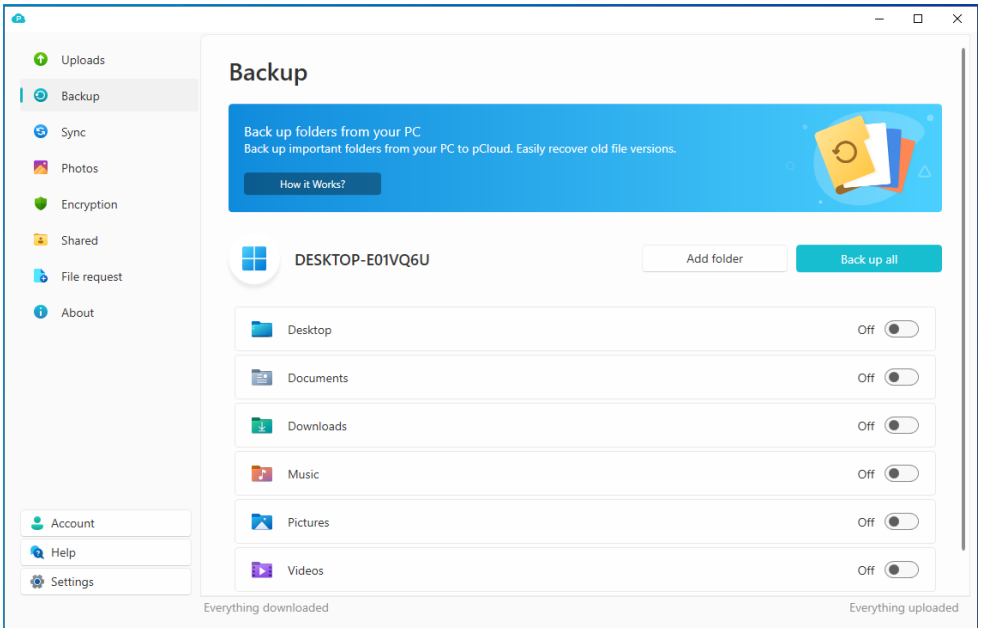


Figure 2 : PCloud Backup Folder

At free level the PCloud is give the 5 GB storage plans is for the life time.

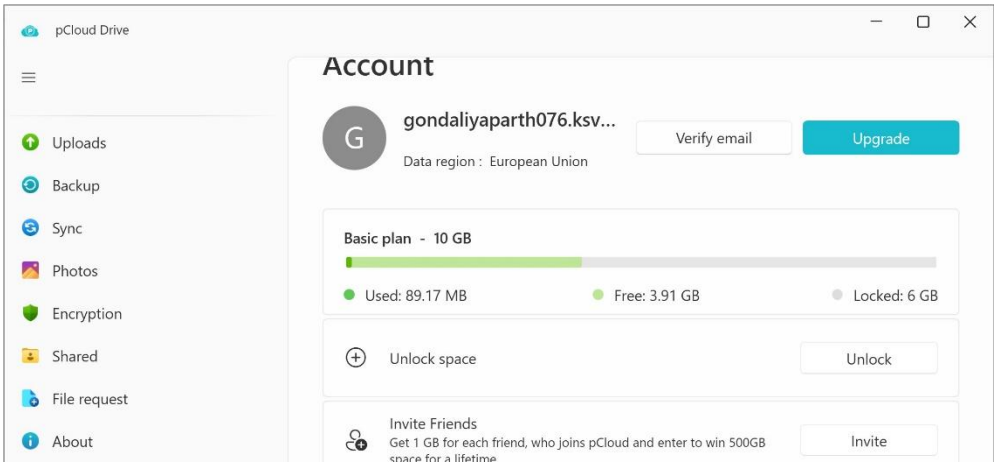


Figure 11 : PCloud 5 GB space Limited Setting

After installed the PCloud it will be create the new disk in the pc with the name PCloud and all storage are there in this drive with the crypt folder for the user private data store facility encrypted data.

It`s file extinction exfat

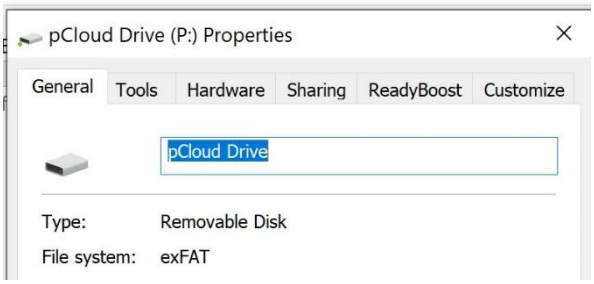


Figure 32 : PCloud Disk Extension

PCloud current version is the 5.0.8

Figure 13 : PCloud Version

For the user private data storage in Encryption service is there for the premium user and free trial for the 15 day for all the user and the it`s security is at top level, character upper-lower case, special symbol, numeric add password 8 char long that also it shown it is medium level strong that why also it will show the not a strong password.

Figure 44 : PCloud Encryption Folder

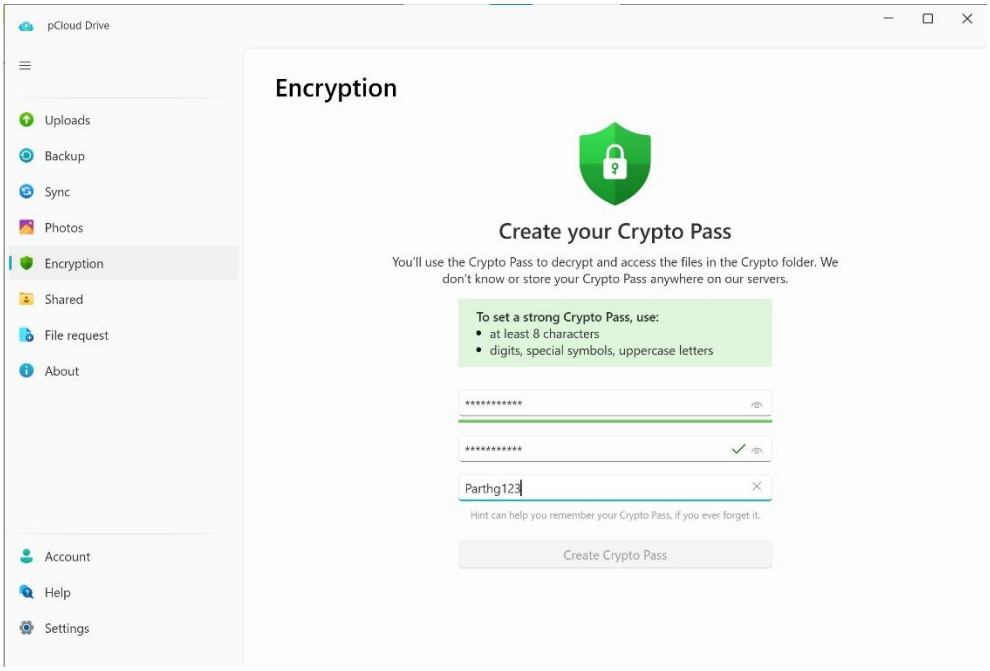


Figure 15 : PCloud Encryption Folder Setting

One drop back is there no password recovery is there.

For see the data of the crypto folder we can unlock from the application after we can see the data otherwise it will show that there is no data in this folder.

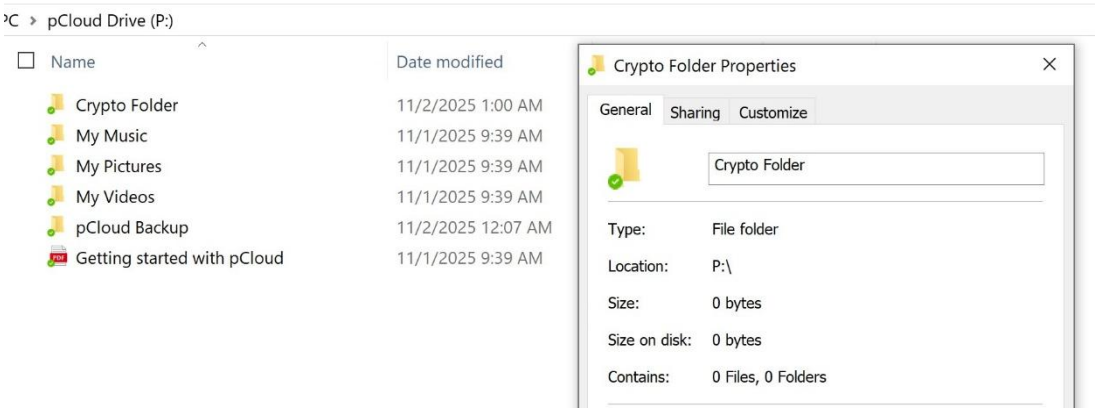


Figure 16 : PCloud Crypto folder empty in lock

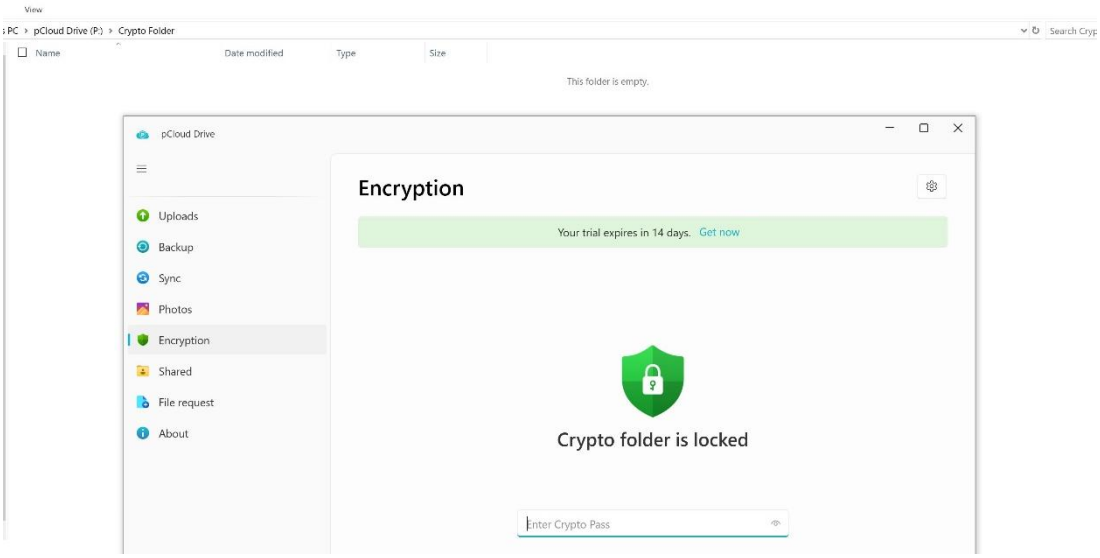


Figure 5 : PCloud Encryption folder lock

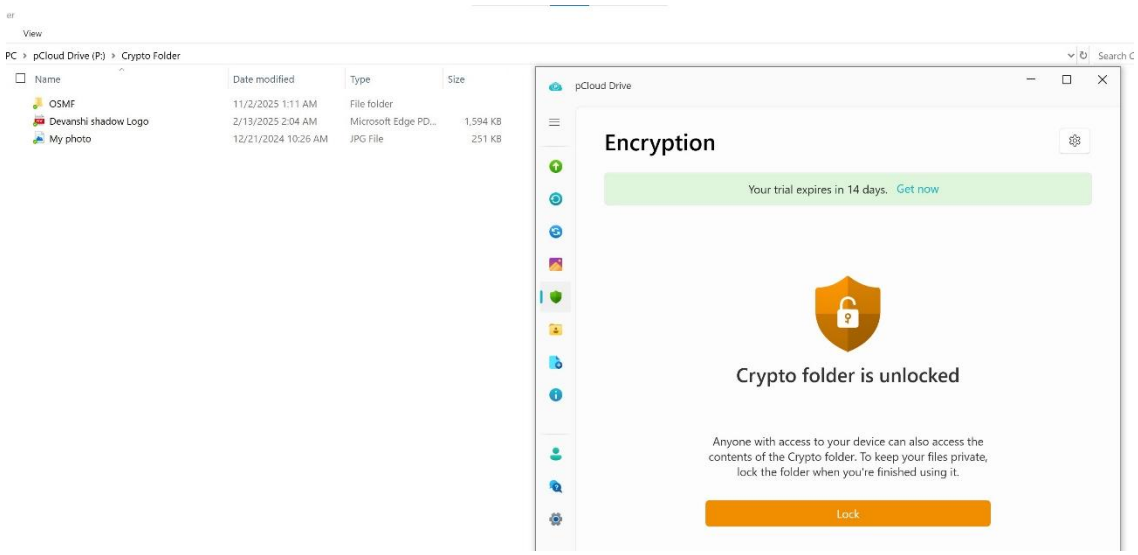


Figure 68 : PCloud crypto folder unlock

Figure 19 : PCloud size shown after unlock

Rewind helps you find and recover old versions of your files, removed shared work or files you accidentally moved to the Trash. Keep in mind, permanently deleted files cannot be recovered. Pick a date and time from the calendar above and rewind the time!

Want to extend Rewind? Get up to one year Extended File History as an add-on. But is work only in the browser by the paid offer only.

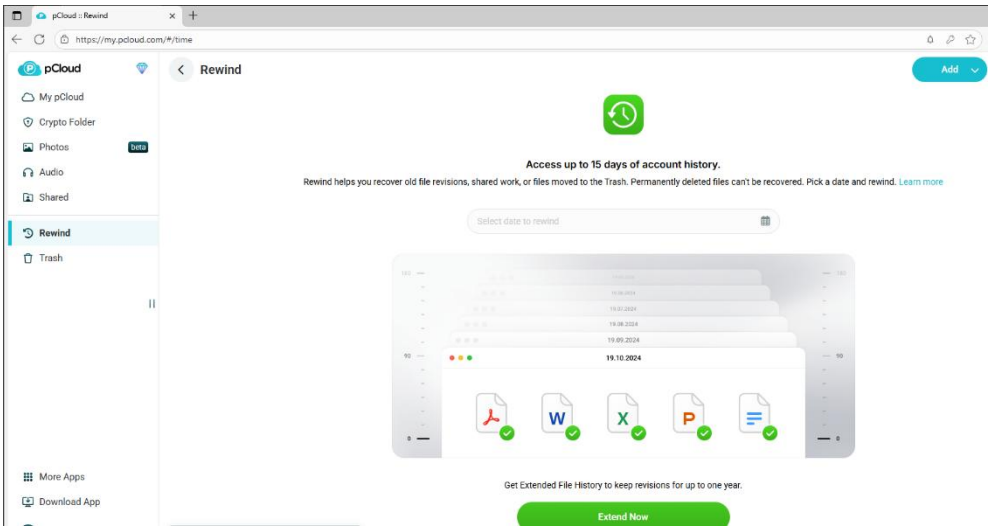


Figure 20 : Rewind state

12.11 RAM dump

RAM DUMP analysis by the FTK ram dump into Hex-Editor.

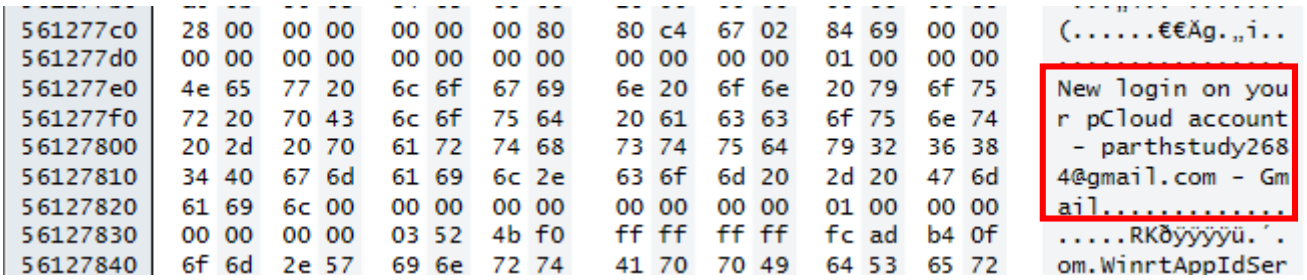


Figure 21 : Email Id shown in Ram Dump

Crypto folder password found by FTK Ram. DUMP

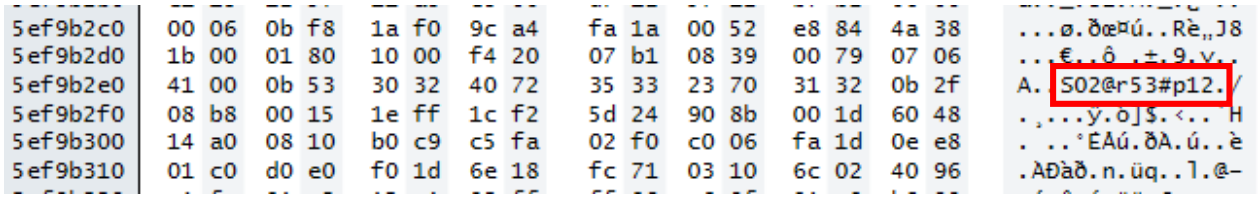


Figure 22 : Crypto Password reveal in Ram Dump

Wireshark this cloud is also the fully encrypted so no one can get the anything from the wire share traffic hand shake is also encrypted.

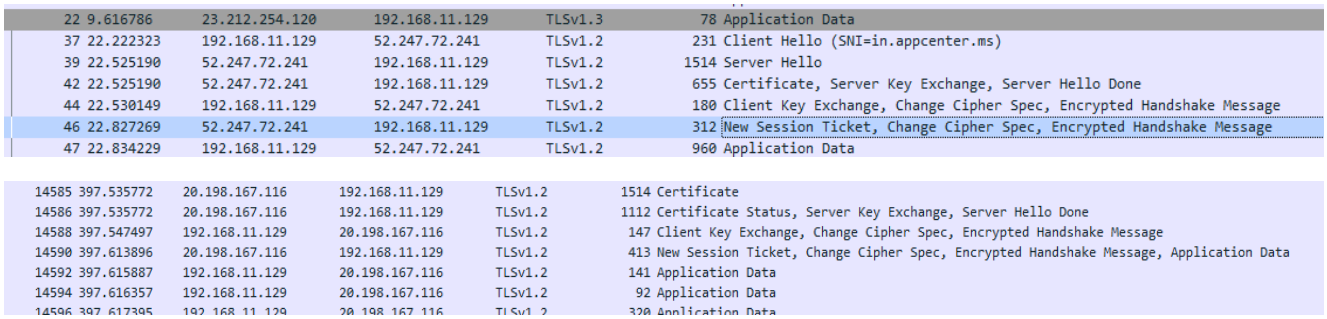


Figure 23 : Encrypted hand shake

12.12 Disk analyses

Name	S	C	O	Modified Time	Change Time
[current folder]				2025-11-06 15:35:36 IST	2025-11-06 15:35:36 IST
[parent folder]				2025-11-07 12:27:51 IST	2025-11-07 12:27:51 IST
Cache				2025-11-06 16:08:10 IST	2025-11-06 16:08:10 IST
EBWebView				2025-11-06 15:36:03 IST	2025-11-06 15:36:03 IST
ntfthumbs				2025-11-06 15:33:59 IST	2025-11-06 15:33:59 IST
data.db	▽		0	2025-11-07 12:18:39 IST	2025-11-07 12:18:39 IST
data.db-shm			0	2025-11-07 12:18:36 IST	2025-11-07 12:18:36 IST
data.db-wal	▽		0	2025-11-07 12:18:39 IST	2025-11-07 12:18:39 IST
wpflog.log	▽		0	2025-11-07 12:18:43 IST	2025-11-07 12:18:43 IST

Figure 24 :7 Pcloud DB Folder

We can find the data base of the PCloud in where the all the user interaction are be save in this file with user email id we can see all the file upload data entry and deleted entry are there with their prices location, created and modified time entry.

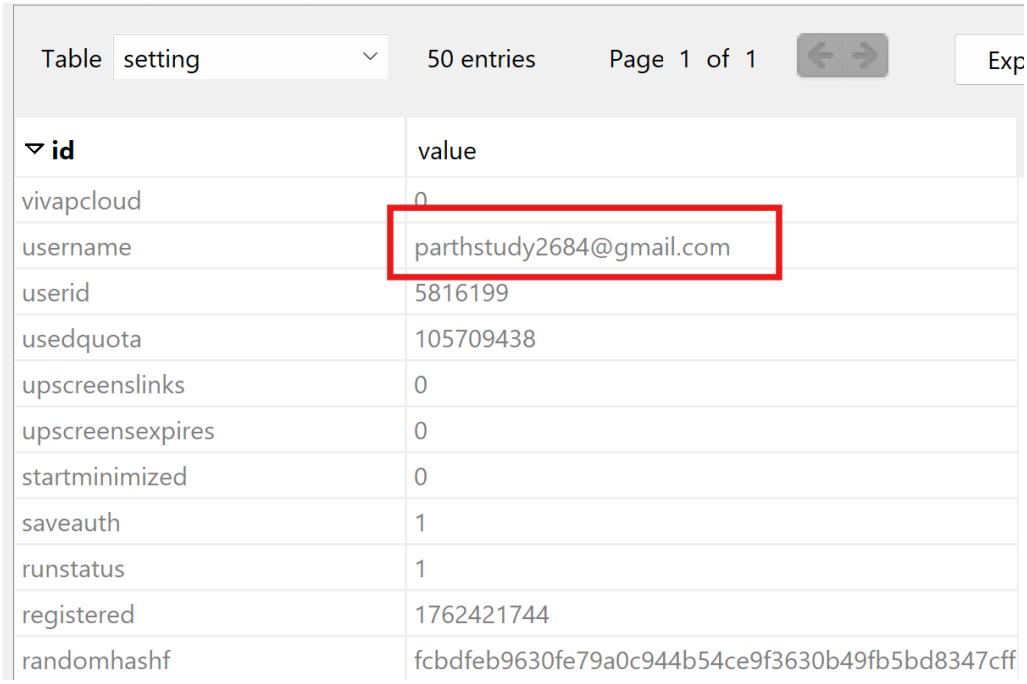


Figure 25 : Pcloud DB find used id

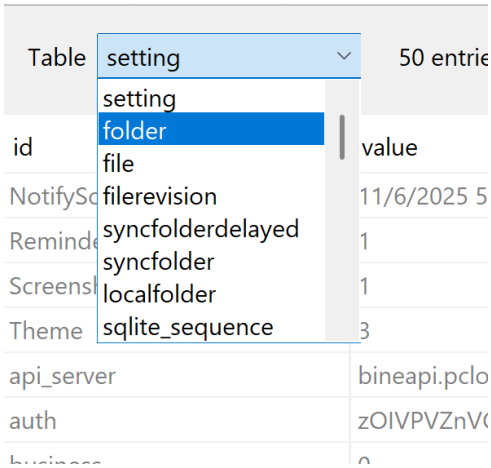


Figure 26 : Pcloud DB Table

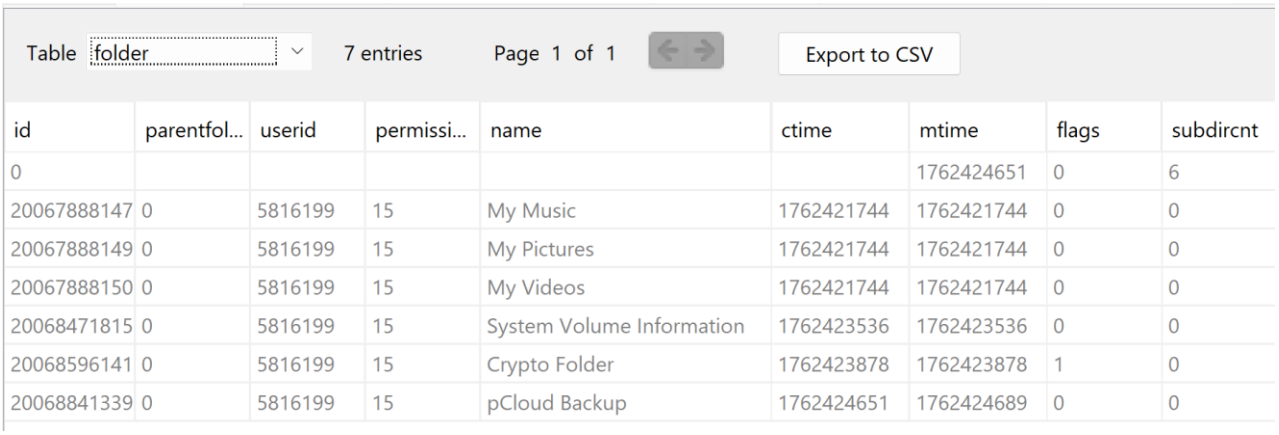


Figure 27 : List of all Folder sync with PCloud

Continually we book the evidence in autopsy so that our report are look good with price evidence details.

Table file 16 entries Page 1 of 1 Export to CSV

id	parentfolde...	userid	size	hash	flags	name	ctime	mtime	category	thumb	icon	art
77974983326	20068841339	5816199	10962360	768167196..	0	ChromeSetup.exe	176240966..	176240967..	0	0	executable	
77970030652	20067888147	5816199	1442376	-38583791..	0	Demo Audio 2.mp3	176242174..	176242174..	3	0	audio	
77974543172	20068596141	5816199	264184	-91773901..	0	GU5YKKRVANYLAM2WJYW6NA...	176241525..	176241525..	0	0	file	
77970030601	0	5816199	16371465	548473439..	0	Getting started with pCloud.pdf	176242174..	176242174..	4	0	document	
77970030656	20067888147	5816199	6698872	565527674..	0	GotJoy.mp3	176242174..	176242174..	3	0	audio	
77970030663	20067888147	5816199	28096964	-83191098..	0	Lovely Day.wav	176242174..	176242174..	3	0	audio	
77970030668	20067888147	5816199	11252576	464549959..	0	Momentum.mp3	176242174..	176242174..	3	0	audio	
77974542403	20068596141	5816199	22511072	276527906..	0	SXLXJATHR34L7APSYBLCXJZIFP5...	176241992..	176241992..	0	0	file	
77972319751	20068471815	5816199	12	-33849626..	0	WPSettings.dat	176242353..	176242353..	0	0	file	
77970030615	20067888149	5816199	666846	-90407254..	0	friends.jpg	176242174..	176242174..	1	1	image	
77970030625	20067888149	5816199	189628	-86337839..	0	happy-family.jpg	176242174..	176242174..	1	1	image	
77970030633	20067888149	5816199	32905	397856546..	0	in-the-sky.jpg	176242174..	176242174..	1	1	image	

Figure28 : Pcloud Files Sync List

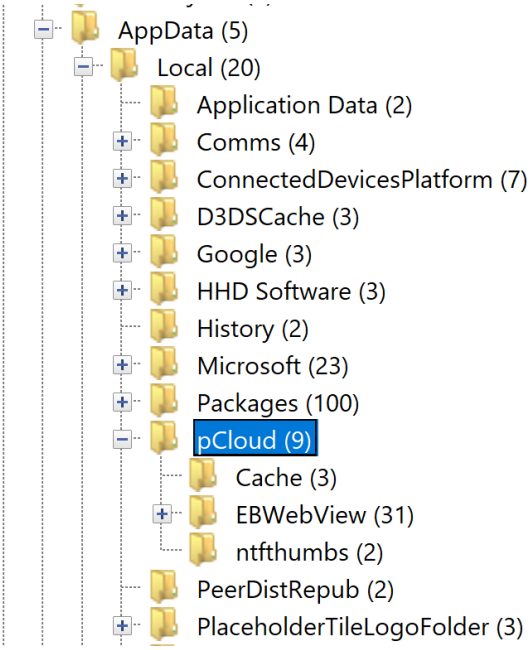


Figure 29 : Pcloud Hidden Folder

12.13 Browser data artifact

Figure 30 : Total Browser History Found

Source Name	S	C	O	URL	Date Accessed	Title
History			5	https://accounts.google.com/ServiceLo...	2025-11-06 15:36:22 IST	Inbox (160) - parthstudy2684@gmail.com - Gmail
History			5	https://mail.google.com/accounts/SetO...	2025-11-06 15:36:22 IST	Inbox (160) - parthstudy2684@gmail.com - Gmail
History			5	https://mail.google.com/mail/u/0/?tab...	2025-11-06 15:36:22 IST	Inbox (160) - parthstudy2684@gmail.com - Gmail
History			5	https://mail.google.com/mail/u/0/?ogbl	2025-11-06 15:36:22 IST	Inbox (160) - parthstudy2684@gmail.com - Gmail
History			5	https://mail.google.com/mail/u/0/?ogbl...	2025-11-06 15:36:30 IST	New login on your pCloud account - parthstudy2684@gmail.com - Gmail
History			5	https://mail.google.com/mail/u/0/?ogbl...	2025-11-06 15:36:30 IST	New login on your pCloud account - parthstudy2684@gmail.com - Gmail
History			5	https://www.google.com/url?q=https://...	2025-11-06 15:36:35 IST	

Figure 31 : Browser History email verify for Pcloud Service

We find the history of the user there the mail id is verified with the PCloud service means that the user use the PCloud service for the store the data.

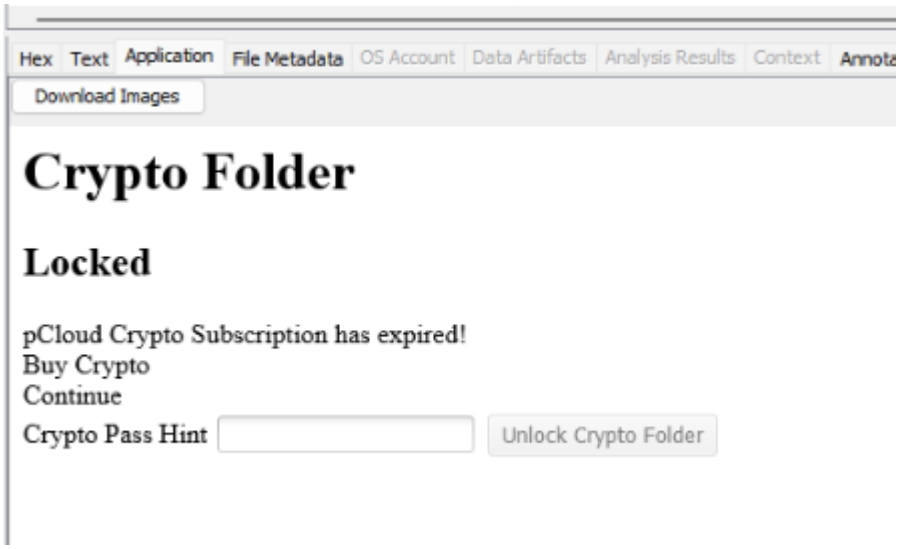


Figure 32 : Cache Preview of crypto folder

From the browser cache data we can find the loaded screen with crypto folder means that user store the private data in the crypto folder for hide the data from the normal users.

Result: 4 of 47 Result

Type	Value
Program Name	pCloud Drive v.5.0.10.0
Date/Time	2025-11-06 09:39:21 IST
Source File Path	/img_Windows 10 Pcloud.vmdk/vol_vol6/Windows/System32/config/SOFTWARE
Artifact ID	-9223372036854775706

Figure 33 : Pcloud Version

We can find the version of the PCloud is used by user for the data store.

We can also find PCloud login data store by browsers accounts with Username.

Type	Value	Source(s)
URL	https://www.pcloud.com/	Recent Activity
Date Created	2025-11-06 15:05:50 IST	Recent Activity
Decoded URL	pcloud.com	Recent Activity
Username	parthstudy2684@gmail.com	Recent Activity
Realm	https://www.pcloud.com/	Recent Activity
Domain	pcloud.com	Recent Activity
Program Name	Google Chrome	Recent Activity
Username	Default	Recent Activity
Source File Path	/img_Windows 10 Pcloud.vmdk/vol_vol6/Users/pCloud/AppData/Local/Google/Chrome/User Data/Default/Login Data	
Artifact ID	-9223372036854773633	

Figure 34 : Pcloud Login data

After doing find all evidence we can create a report in HTML file.

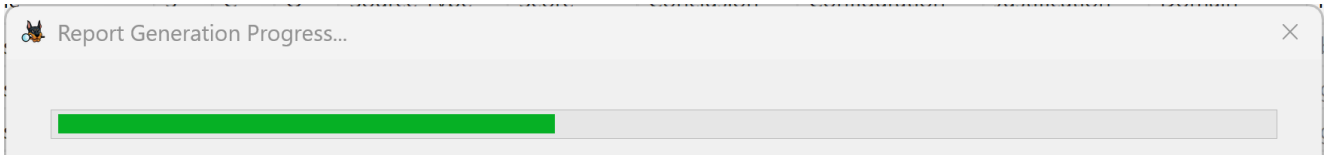


Figure 35 : Report created by the Autopsy

Installed Extensions

Extension Name	Description	Version	App ID
StorageAce	Easily manage Cookies, Local Storage and Session Storage for the sel	2.9.10	cpbgcbmddckpmhfbdckeolkkhk
Chrome Web Store Payments	Chrome Web Store Payments	1.0.0.6	nmmhkkegccagdldgiimedpiccm
pCloud Save	Save your favorite web images, videos, text and more to pCloud - up	2.0.1	npamdkabjncnnoaofdjcaipmncc

Figure 36 : Extention installed

site setting (hsts)	2025-11-06 01:33:58.525	Encoded domain: EUee8fEWEJXzg9tS5msiIFKED/eSKlh6OyfShJAx5qg=	HSTS observed	{'expiry': 1793957638.525803, 'host': 'EUee8fEWEJXzg9tS5msiIFKED/eSKlh
url	2025-11-06 01:34:00.355	https://www.pcloud.com/	pCloud - File Security Made Simple | pCloud	
site setting (hsts)	2025-11-06 01:34:04.878	Encoded domain: RNsIjhzQrppvtsaSJ2jzGCoQt5mAXe0MwsIIjeUIK20=	HSTS observed	{'expiry': 1793957644.878906, 'host': 'RNsIjhzQrppvtsaSJ2jzGCoQt5mAXe0
site setting (hsts)	2025-11-06 01:34:27.395	Encoded domain: 50fvKe0UnIwwQ0FaadZ0bixu8eZ5FfHj29nHjEjOXIA=	HSTS observed	{'expiry': 1793957667.395804, 'host': '50fvKe0UnIwwQ0FaadZ0bixu8eZ5Ff
site setting (hsts)	2025-11-06 01:34:28.763	Encoded domain: nPMi9yOfZAsS8CjA0P+HpxvYNO4gwQIuctXsoxO6H	HSTS observed	{'expiry': 1793957668.763857, 'host': 'nPMi9yOfZAsS8CjA0P+HpxvYNO4gw
autofill	2025-11-06 01:35:28.000		email	parthstudy2684@gmail.com
site setting (modif	2025-11-06 01:35:30.122	http://pcloud.com:80,*	password_protection [in Pre	{'last_modified': '13406895330122756', 'setting': {'password_on_focus_ca
login (username)	2025-11-06 01:35:34.102	https://www.pcloud.com/		parthstudy2684@gmail.com
login (saved crede	2025-11-06 01:35:50.460	https://www.pcloud.com/		parthstudy2684@gmail.com
url	2025-11-06 01:35:56.386	https://www.pcloud.com/how-to-install-pcloud-drive-windows.htm	pCloud - File Security Made Simple | pCloud	
download	2025-11-06 01:36:09.780	https://def3.pcloud.com/cBZ7Jtiz77Zicpgc97ZZZ4EdY0kZAkZZ35FZkZY	Complete - 100% [113782768	C:\Users\pCloud\Downloads\pCloud_Windows_5.0.10_x64.exe
url	2025-11-06 01:36:15.061	https://my.pcloud.com/	pCloud :: File Manager	

Figure 37 : Login history with email id and time-stamp

13. Mega sync

MEGASync is an intuitive software developed by MEGA Limited that allows you to easily synchronize folders across multiple computers. Once you upload your files to the cloud, you can access the same content on your drive within seconds. You can choose to sync your entire MEGA account or set up multiple selective syncs between specific folders on your computer and your MEGA storage. Deleted files are moved to special recovery folders both locally and in your MEGA account, making it easy to restore them if needed. MEGASync also works smoothly with your browser, helping manage MEGA file transfers more efficiently.

MEGA was built on the principle that encryption should not reduce usability. The service is fully accessible without requiring any software installation and remains the only cloud storage provider offering high-performance, end-to-end encryption directly in the browser. The only visible signs of MEGA's encryption system are the entropy collection during signup, the lack of a password reset option, and the unique browser-dependent methods used for file transfers.

Today, millions of users—both personal and business—trust MEGA to securely store and deliver massive amounts of data. MEGA's success comes from making strong security simple and easy to use. MEGASync is available through the web interface, desktop app, mobile apps, and even a command-line tool, making it accessible anywhere, anytime. The service supports Windows, macOS, and Linux, and offers 50 GB of free storage upon signup.

13.1 Installation process

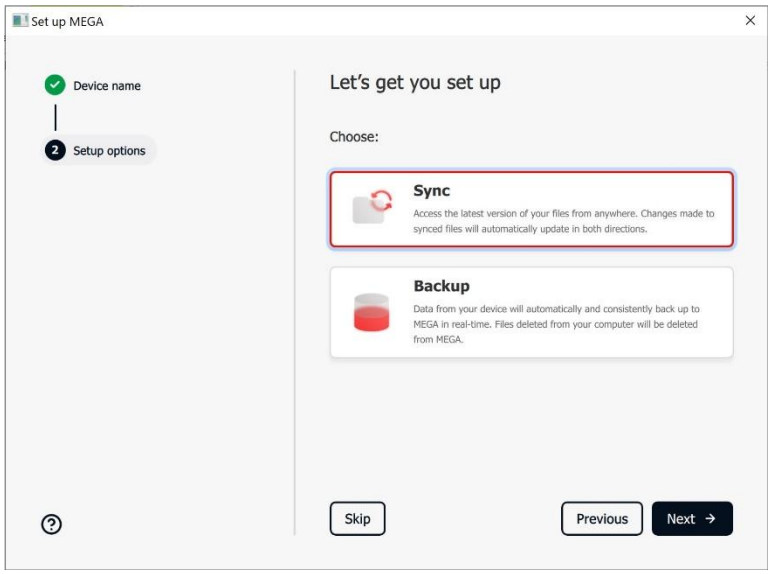


Figure 38 : Mega setup Installation

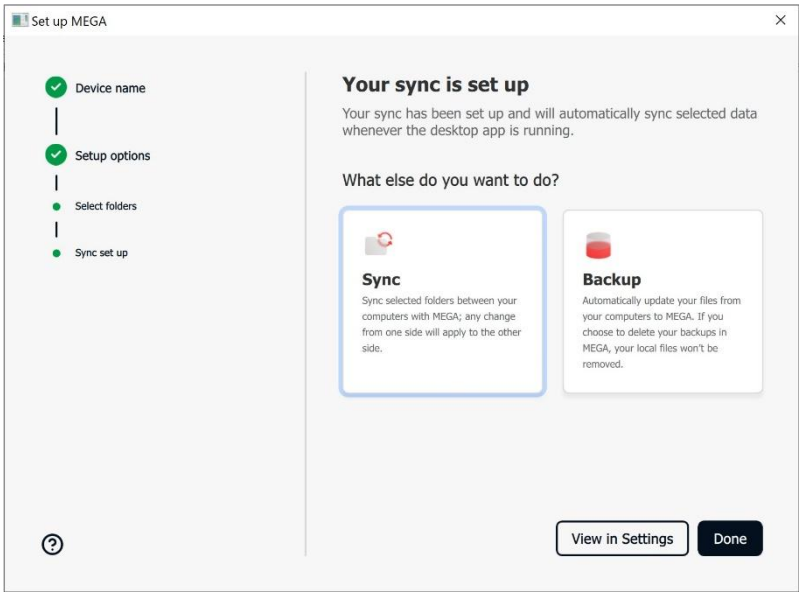


Figure 39 : Sync Setting

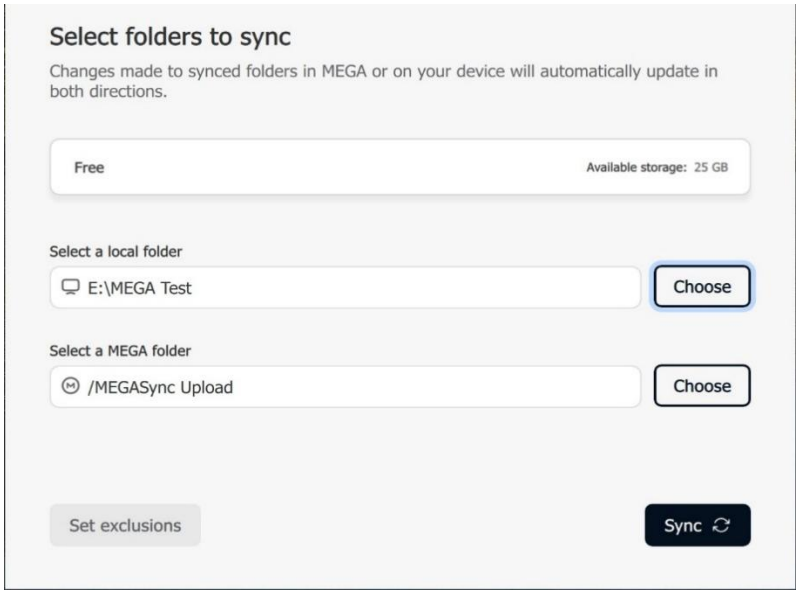


Figure 40 : Sync folder selection

It`s simple just login in the mega cloud and download a.exe file and simply next.. Next and install.

In the starting it will be ask for the location where we create a folder of the mega cloud to store his data and sync folder.

It will ask for the full sync of selective sync means we can sync only important folder of all folder.

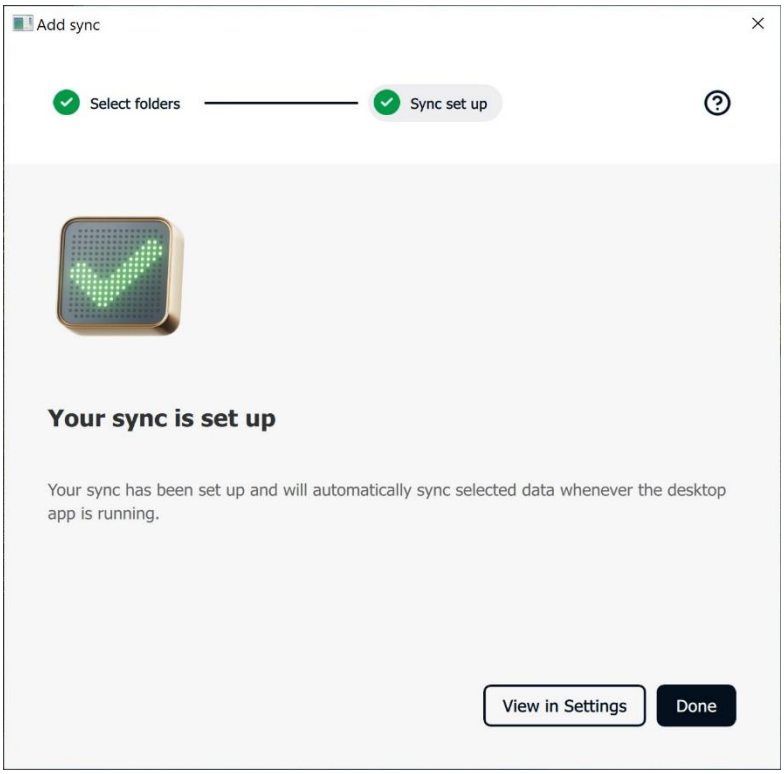


Figure 41 : Complete Setup

After a few second the installation is success install the mega cloud in the PC.

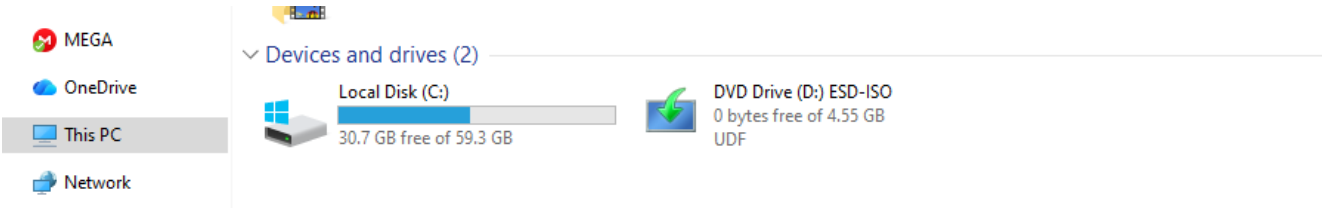


Figure 42 : No Local Disk

In this no disk is created in the this pc just it will give the folder to store the files in the pc and all are worked in the slide notification app that MegaSync in open for the user interaction.

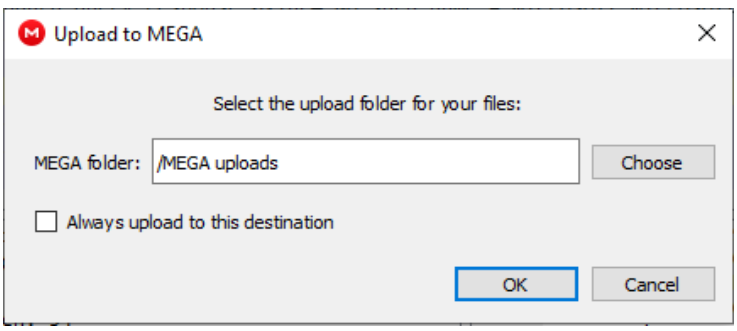


Figure 43 : Sync Folder Setting

We can use the multiple folder for the sync for the upload the data into a cloud

13.2 RAM dump

RAM dump analysis in the 1 cloud user client app is see that is not spared the user password to the ram dump also even if the new password change and immediately create that why also there is no trace in the ram dump of the password only the user id is shown all are in the encrypted.

It is most secured but for forensic analysis it is most difficult to find the user password.

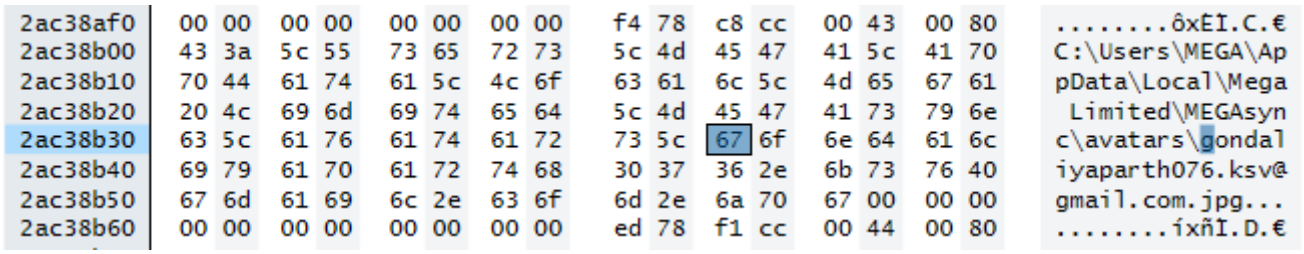


Figure 44 : Email id Found

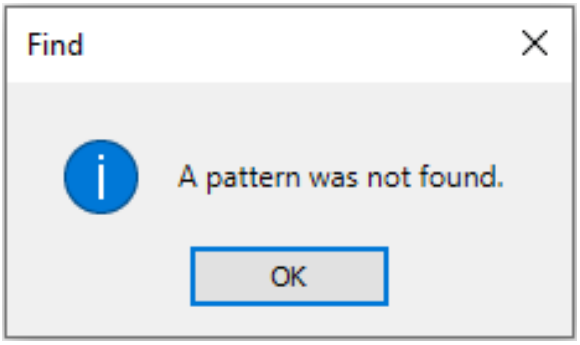


Figure 45 : Password not found

Password is not cached by the FTK Ram dump and the dd, task manager ram dump also the password is not there in the RAM.

```
11/07-06:20:44.903725 4368 DBG  Qt Debug: false
11/07-06:20:44.903730 4368 DBG  Qt Context: default    2
11/07-06:20:44.926838 4368 DBG  Registered resource file: C:/Users/MEGA/AppData/Local/MEGAsync/Resources_common.rcc
11/07-06:20:44.926903 4368 DBG  Qt Debug: false
11/07-06:20:44.926912 4368 DBG  Qt Context: default    2
11/07-06:20:44.936136 4368 DBG  Registered resource file: C:/Users/MEGA/AppData/Local/MEGAsync/Resources_qml.rcc
11/07-06:20:44.936187 4368 DBG  Qt Debug: false
11/07-06:20:44.936192 4368 DBG  Qt Context: default    2
11/07-06:20:44.940785 4368 DBG  Registered resource file: C:/Users/MEGA/AppData/Local/MEGAsync/qml.rcc
11/07-06:20:44.940829 4368 DBG  Qt Debug: false
11/07-06:20:44.940832 4368 DBG  Qt Context: default    2
11/07-06:20:44.948083 4368 DBG  Registered resource file: C:/Users/MEGA/AppData/Local/MEGAsync/Resources_light.rcc
11/07-06:20:45.281392 4368 DBG  libuv version: 1.49.2 [megaapi_impl.cpp:6931]
11/07-06:20:45.286566 8472 ERR  Could not open pipe. Error Code=2 The system cannot find the file specified. [comms_client.cpp:50]
11/07-06:20:45.286726 8472 ERR  runShutDown Couldn't connect [client.cpp:53]
11/07-06:20:45.286735 8472 DBG  Process::Process(""C:\Users\MEGA\AppData\Local\MEGAsync\mega-desktop-app-gfxworker.exe" -n=cecf52bc-7979-4e37-ad80-24a9d9aa4
11/07-06:20:45.287103 8472 DBG  cmdLine = '"C:\Users\MEGA\AppData\Local\MEGAsync\mega-desktop-app-gfxworker.exe" -n=cecf52bc-7979-4e37-ad80-24a9d9aa4f78 -l=
11/07-06:20:45.291703 4368 DBG  curl version: 8.14.1-DEV [net.cpp:209]
11/07-06:20:45.291706 4368 DBG  SSL version: Schannel [net.cpp:214]
11/07-06:20:45.292374 4368 DBG  libz version: 1.3.1 [net.cpp:238]
```

Figure 46 : Log Files

All log are saved into the txt file to easy analysis and in log files also the password is not there only user id is there with proper date and time.

C:\Users\MEGA\AppData\Local\Mega Limited\MEGAsync\logs

C:\Users\MEGA\AppData\Local\Mega Limited\MegaSync

Megaclient_statecache13_MUtpdmdEVFNwa29Hm1_kX2DXDE95GAmM7Efs and its DB name is also encrypted and we can see the some crypto error f in the dB also we can find the list of the data entry are done in the Mega cloud.

Table: nodes — Filter in any column

	nodehandle	parenthandle	name	fingerprint	origFingerprint	type	size	share	fav	mimetype	ctime	flags	counter	node
	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	3868965914693	-1	CRYPTO_ERROR	BLOB		3	4294967295	0	0	0	1687692556	0	BLOB	BLOB
2	143650689403637	18259925636	Welcome to MEGA.pdf	BLOB		0	969609	0	0	4	1687692561	0	BLOB	BLOB
3	222800691780113	70423527430672	Self Photo.jpg	BLOB		0	26018	0	0	1	1687693549	0	BLOB	BLOB
4	100752619359268	168234138634384	LAB - 6_Malware Analysis From File & ...	BLOB		0	392275	0	0	4	1687693553	0	BLOB	BLOB
5	88136169740996	168234138634384	malware 1.pdf	BLOB		0	3131235	0	0	4	1687693554	0	BLOB	BLOB
6	168234138634384	20377692686900	doc	BLOB		1	4294967295	0	0	0	1687693547	0	BLOB	BLOB
7	9940033116853	168234138634384	Prajapati Himil Harshadkumar.pdf	BLOB		0	171914	0	0	4	1687693555	0	BLOB	BLOB
8	70423527430672	20377692686900	photos	BLOB		1	4294967295	0	0	0	1687693547	0	BLOB	BLOB
9	140918014529137	70423527430672	provisnal certificate.jpg	BLOB		0	2204770	0	0	1	1687693555	0	BLOB	BLOB
10	143719474976949	215043782216276	cat-g62b035a58_1920.jpg	BLOB		0	379351	0	0	1	1687696537	0	BLOB	BLOB
11	222232415967397	215043782216276	hd-wallpaper-g69e16c2d8_1920.jpg	BLOB		0	362830	0	0	1	1687696537	0	BLOB	BLOB
12	618697738917	215043782216276	hd-wallpaper-g5930fa713_1920.jpg	BLOB		0	526890	0	0	1	1687696537	0	BLOB	BLOB
13	150293070650085	215043782216276	hd-wallpaper-g58f7e4a77_1920.jpg	BLOB		0	550209	0	0	1	1687696538	0	BLOB	BLOB
14	215043782216276	20377692686900	SAMPLE STUFF	BLOB		1	4294967295	0	0	0	1687696532	0	BLOB	BLOB
15	91907136196304	215043782216276	waterfall-37088.mp4	BLOB		0	32026769	0	0	3	1687696541	0	BLOB	BLOB
16	10008756526181	215043782216276	blooms-113004.mp4	BLOB		0	7016467	0	0	3	1687696536	0	BLOB	BLOB
17	91474617227265	215043782216276	seoul-21985.mp4	BLOB		0	3238956	0	0	3	1687696538	0	BLOB	BLOB
18	141994189921937	18259925636	Demo Audio 2.mp3	BLOB		0	1442376	0	0	2	1687693554	0	BLOB	BLOB
19	73833999523329	18259925636	GotJoy.mp3	BLOB		0	6698872	0	0	2	1687693551	0	BLOB	BLOB
20	71634756360705	18259925636	Lovely Day.wav	BLOB		0	28096964	0	0	2	1687693558	0	BLOB	BLOB
21	18259925636	-1	CRYPTO_ERROR	BLOB		2	-2	0	0	0	1687692556	0	BLOB	BLOB
22	20377692686900	18259925636	MEGAsync Uploads	BLOB		1	-1	0	0	0	1687693546	0	BLOB	BLOB
23	80841441037877	18259925636	Momentum.mp3	BLOB		0	11252576	0	0	2	1687693557	0	BLOB	BLOB
24	168905297382500	89699342371456	Demo Audio 2.mp3	BLOB		0	1442376	0	0	2	1687697729	2	BLOB	BLOB
25	10608989751872	-1	CRYPTO_ERROR	BLOB		4	-4	0	0	0	1687692556	0	BLOB	BLOB
26	89699342371456	215221013978804	2023-06-25	BLOB		1	4294967295	0	0	0	1687697764	2	BLOB	BLOB

1 - 26 of 30 — Go to: 1

Figure 47 : Sync DB

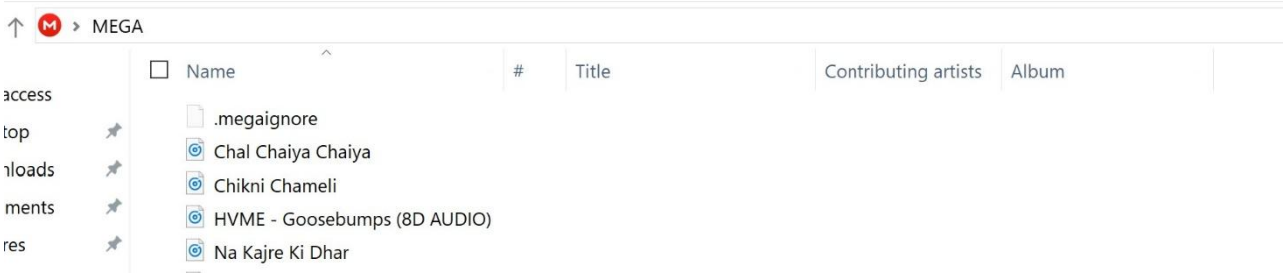


Figure 48 : List of files are Synced in Cloud

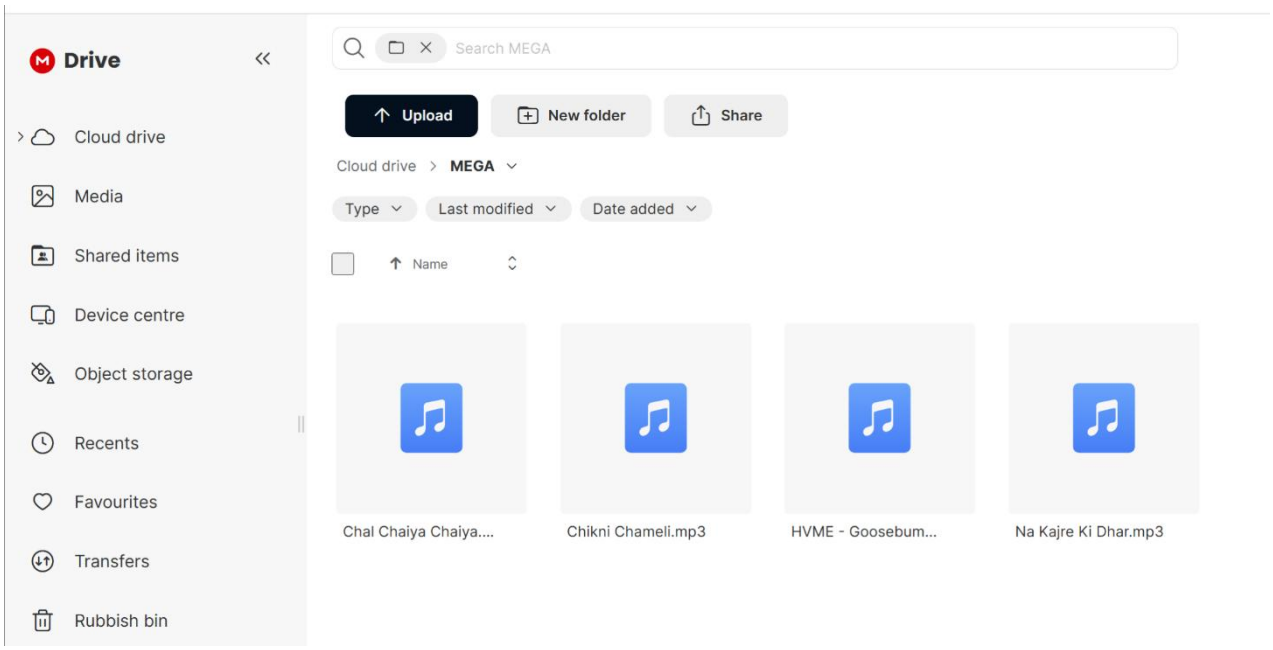


Figure 49 : Browser view of cloud

Figure50 : Files deleted from cloud effect the PC

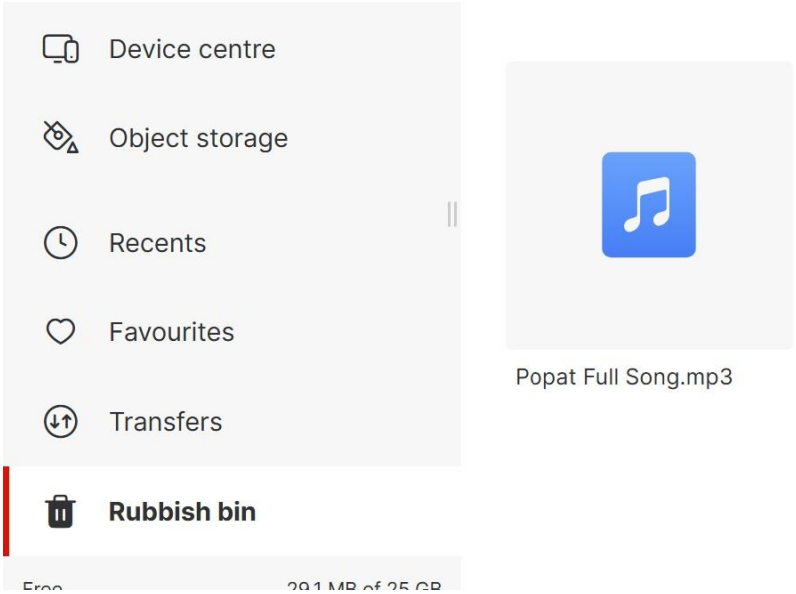


Figure 51 : Same effect on browser

ALL stuff are real time sync and if we can delete the file from the pc and three in the cloud we can see the real time select and that file also be the delete in the cloud and that file in also in the trash in cloud as will in the pc also.

An if we can restore from the cloud so we can get the file back in the folder and the another file is also there in the recycle bin.

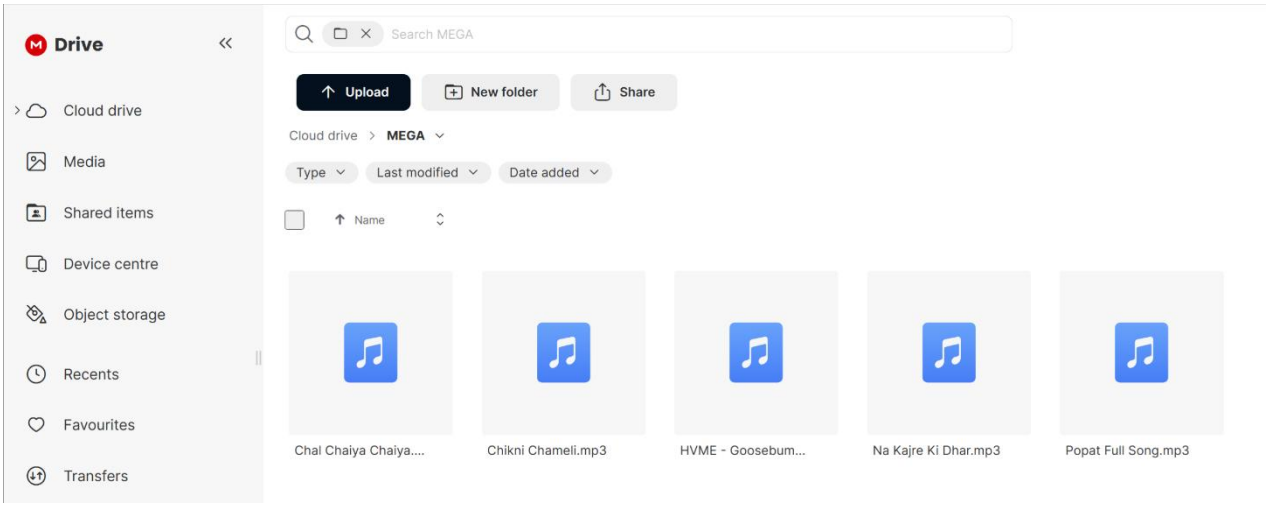


Figure 52 : Restore files from the cloud recycle

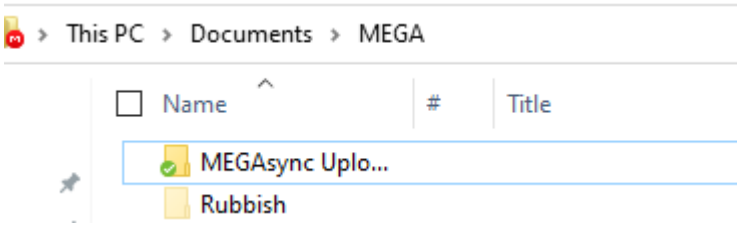


Figure 53 : New file is created in the Folder

File sync we can capture in ram dump with the file name.

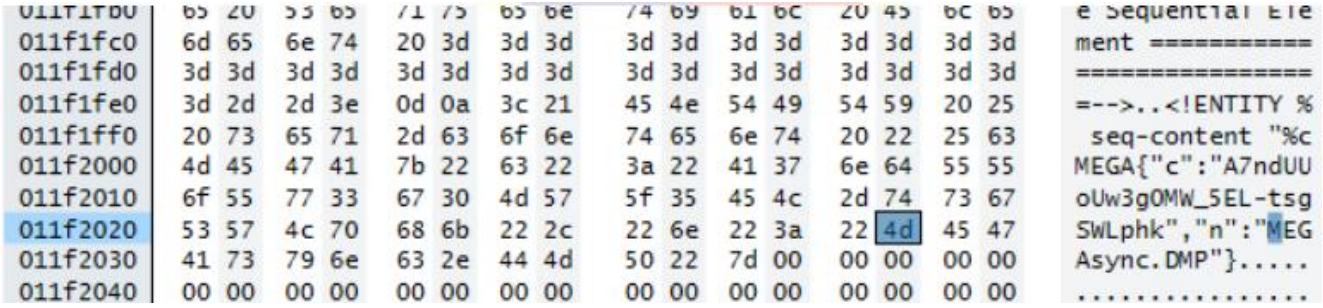


Figure 54 : Encrypted file sync

Wire share this cloud is also the fully encrypted so no one can get the anything from the wire share traffic hand shake is also encrypted

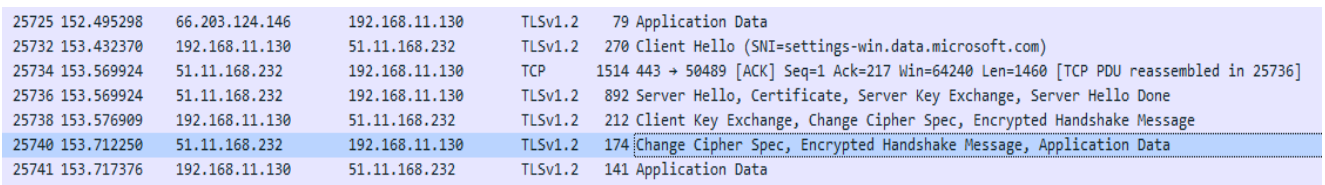


Figure 55 : Encrypted hand shake

13.3 Disk analysis

Open the .vmdk file of the mega drive in the autopsy and it take a time for load the disk and finally loaded in the autopsy.

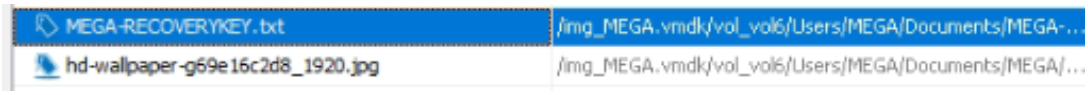


Figure 56 : Cloud Recovery key

We can find the recover key to recover the cloud.

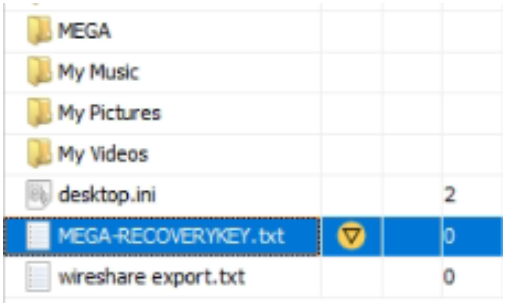
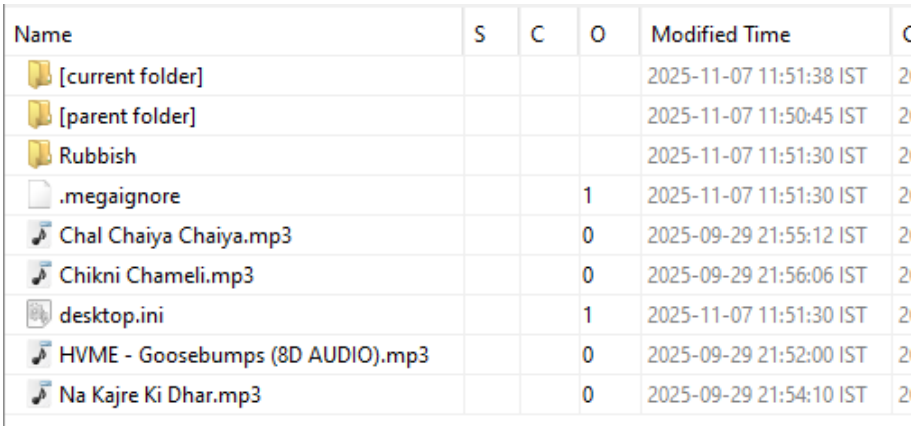


Figure 57 : 8Book Mark the key



Name	S	C	O	Modified Time	C
[current folder]				2025-11-07 11:51:38 IST	2
[parent folder]				2025-11-07 11:50:45 IST	2
Rubbish				2025-11-07 11:51:30 IST	2
.megaignore			1	2025-11-07 11:51:30 IST	2
Chal Chaiya Chaiya.mp3			0	2025-09-29 21:55:12 IST	2
Chikni Chameli.mp3			0	2025-09-29 21:56:06 IST	2
desktop.ini			1	2025-11-07 11:51:30 IST	2
HVME - Goosebumps (8D AUDIO).mp3			0	2025-09-29 21:52:00 IST	2
Na Kajre Ki Dhar.mp3			0	2025-09-29 21:54:10 IST	2

Figure 58 : Deleted file and sync file list

We can find the deleted files also from the cloud via browser also we can find the data deleted from the disk.

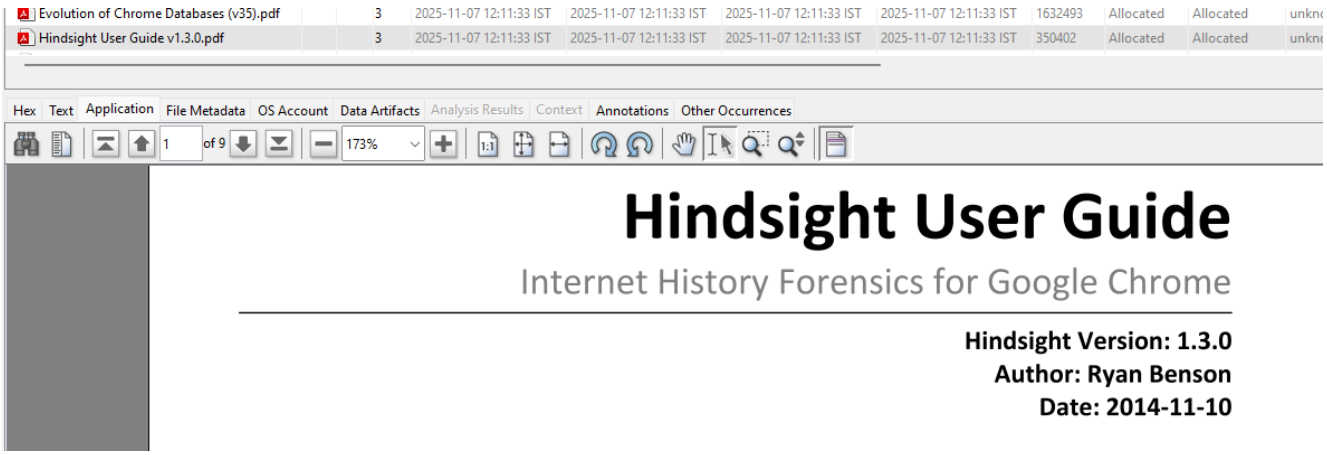


Figure 59 : Confirmed use of the Mega cloud

We can see the welcome pdf guide in the disk means that user is pretty sure that it use the mega cloud in this device.

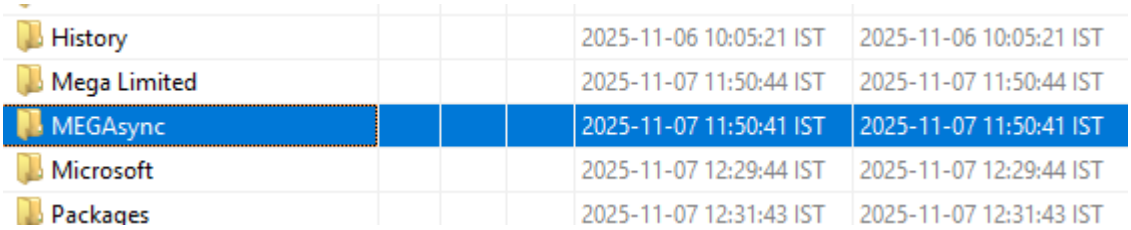


Figure 60 : Mega sync folder

MegaSync folder where all the data are store in the cloud.

Figure 61 : Mega version file

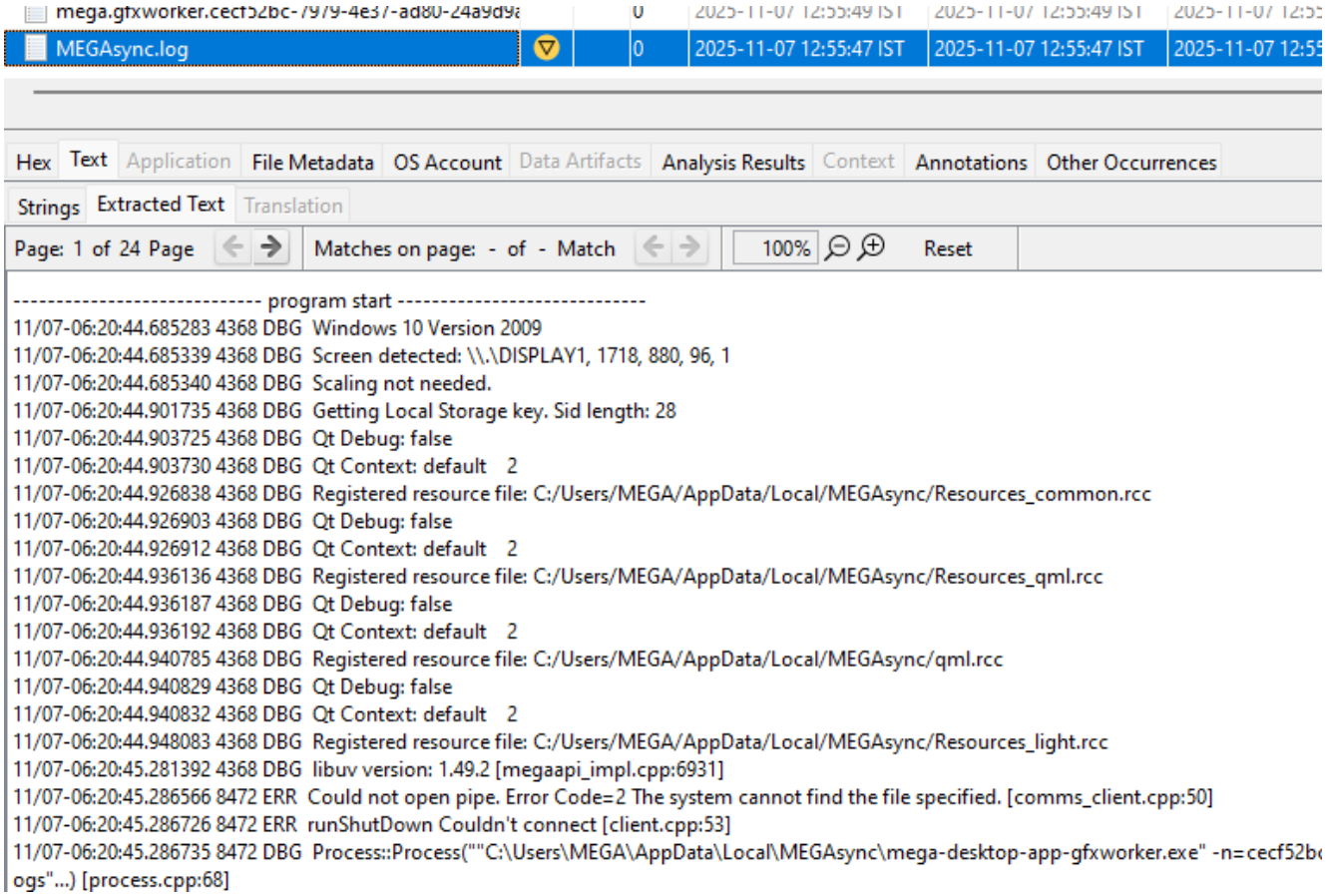


Figure 62 : Log files

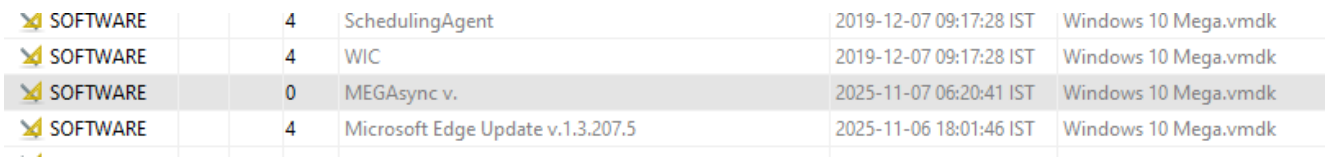


Figure 63 : Successfully installed cloud program

Source Name	S	C	O	Path	Date Accessed	Data Source
hindsight.lnk				C:\Users\MEGA\Downloads\hindsight	2025-11-07 12:15:17 IST	Windows 10 Mega.vmdk
hindsight_gui.lnk				C:\Users\MEGA\Downloads\hindsight\hindsight_gui.py	2025-11-07 12:15:17 IST	Windows 10 Mega.vmdk
memdump.mem.lnk				C:\Users\MEGA\Desktop\memdump.mem	2025-11-07 12:43:07 IST	Windows 10 Mega.vmdk
ms-gamingoverlay---.lnk				No preferred path found	2025-11-07 12:07:27 IST	Windows 10 Mega.vmdk
ms-gamingoverlay--kglcheck-.lnk				No preferred path found	2025-11-06 12:00:31 IST	Windows 10 Mega.vmdk
setup.lnk				C:\Users\MEGA\Downloads\hindsight\setup.py	2025-11-07 12:20:32 IST	Windows 10 Mega.vmdk
The Internet.lnk				No preferred path found	2025-11-06 12:00:31 IST	Windows 10 Mega.vmdk
setup.py.lnk				C:\Users\MEGA\Downloads\hindsight\setup.py	0000-00-00 00:00:00	Windows 10 Mega.vmdk
No preferred path found.lnk				No preferred path found	0000-00-00 00:00:00	Windows 10 Mega.vmdk
hindsight_gui.py.lnk				C:\Users\MEGA\Downloads\hindsight\hindsight_gui.py	0000-00-00 00:00:00	Windows 10 Mega.vmdk
Pictures.lnk				C:\Users\MEGA\Pictures	0000-00-00 00:00:00	Windows 10 Mega.vmdk
Videos.lnk				C:\Users\MEGA\Videos	0000-00-00 00:00:00	Windows 10 Mega.vmdk
Music.lnk				C:\Users\MEGA\Music	0000-00-00 00:00:00	Windows 10 Mega.vmdk
Downloads.lnk				C:\Users\MEGA\Downloads	0000-00-00 00:00:00	Windows 10 Mega.vmdk
Documents.lnk				C:\Users\MEGA\Documents	0000-00-00 00:00:00	Windows 10 Mega.vmdk
Desktop.lnk				C:\Users\MEGA\Desktop	0000-00-00 00:00:00	Windows 10 Mega.vmdk

Figure 64 : All file converted in .lnk which are synced

In the software installation we can find the mega cloud client app installed in the PC.

13.4 Browser artifacts

Source Name	S	C	O	Path	URL
History			4	C:\Users\MEGA\Downloads\ChromeSetup.exe	https://dl.google.com/tag/s/appguid%3D%7B8A69D3...
History			1	C:\Users\MEGA\Downloads\MEGAsyncSetup64.exe	https://mega.nz/MEGAsyncSetup64.exe
History			4	C:\Users\MEGA\Downloads\Git-2.51.2-64-bit.exe	https://github.com/git-for-windows/git/releases/dow...
History			3	C:\Users\MEGA\Downloads\Git-2.51.2-64-bit.exe	https://release-assets.githubusercontent.com/github-...
History				C:\Users\MEGA\Downloads\Hindsight Report (2025-1...	http://localhost:8080/xlsx
KnownGameList.bin:Zone.				/Users/MEGA/AppData/Local/Microsoft/GameDVR/K...	

Figure 65 : Browser history

Source Name	S	C	O	Source Type	Score	Conclusion	Configuration	Justification	Category
MEGAsync.exe				File	Likely Notable		Cloud Storage		MEGAsync

Figure 66 : Mega cloud .exe

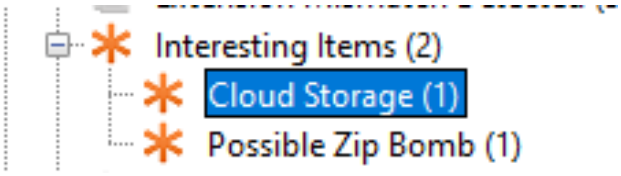


Figure 67 : Autospy themself create cloud storage separated

Source Name	S	C	O	URL	Date Created	Decoded URL	Username	Realm	Domain	Program Name	Data Source
Login Data				https://mega.nz/	2025-11-07 11:49:27 IST	mega.nz	Default	https://mega.nz/	mega.nz	Microsoft Edge	Windows 10 Mega.vmdk
Login Data				https://mega.nz/	2025-11-07 11:49:27 IST	mega.nz	Person 1	https://mega.nz/	mega.nz	Google Chrome	Windows 10 Mega.vmdk

Figure 68 : mega login details

Result: 1 of 1 Result Web Account

Type	Value	Source(s)
URL	https://mega.nz/	Recent Activity
Date Created	2025-11-07 11:49:27 IST	Recent Activity
Decoded URL	mega.nz	Recent Activity
Username		Recent Activity
Realm	https://mega.nz/	Recent Activity
Domain	mega.nz	Recent Activity
Program Name	Microsoft Edge	Recent Activity
Username	Default	Recent Activity
Source File Path	/img_Windows 10 Mega.vmdk/vol_vol6/Users/MEGA/AppData/Local/Microsoft/Edge/User Data/Default/Login Data	
Artifact ID	-9223372036854775595	

Figure 69 : Recent activity of login mega cloud

History		0	2025-11-07 12:41:52 IST	2025-11-07 12:41:52 IST	2025-1
History-journal			2025-11-07 12:41:52 IST	2025-11-07 12:41:52 IST	2025-1
LOCK			2025-11-07 11:47:43 IST	2025-11-07 11:47:43 IST	2025-1
LOG			2025-11-07 12:21:37 IST	2025-11-07 12:21:37 IST	2025-1
LOG.old			2025-11-07 12:15:35 IST	2025-11-07 12:21:37 IST	2025-1
Login Data		0	2025-11-07 11:49:27 IST	2025-11-07 11:49:27 IST	2025-1
Login Data For Account		4	2025-11-07 11:47:34 IST	2025-11-07 11:47:34 IST	2025-1
Login Data For Account-journal			2025-11-07 11:47:34 IST	2025-11-07 11:47:34 IST	2025-1
Login Data-journal			2025-11-07 11:49:27 IST	2025-11-07 11:49:27 IST	2025-1

Figure 70 : Login DATA files

Login data history.

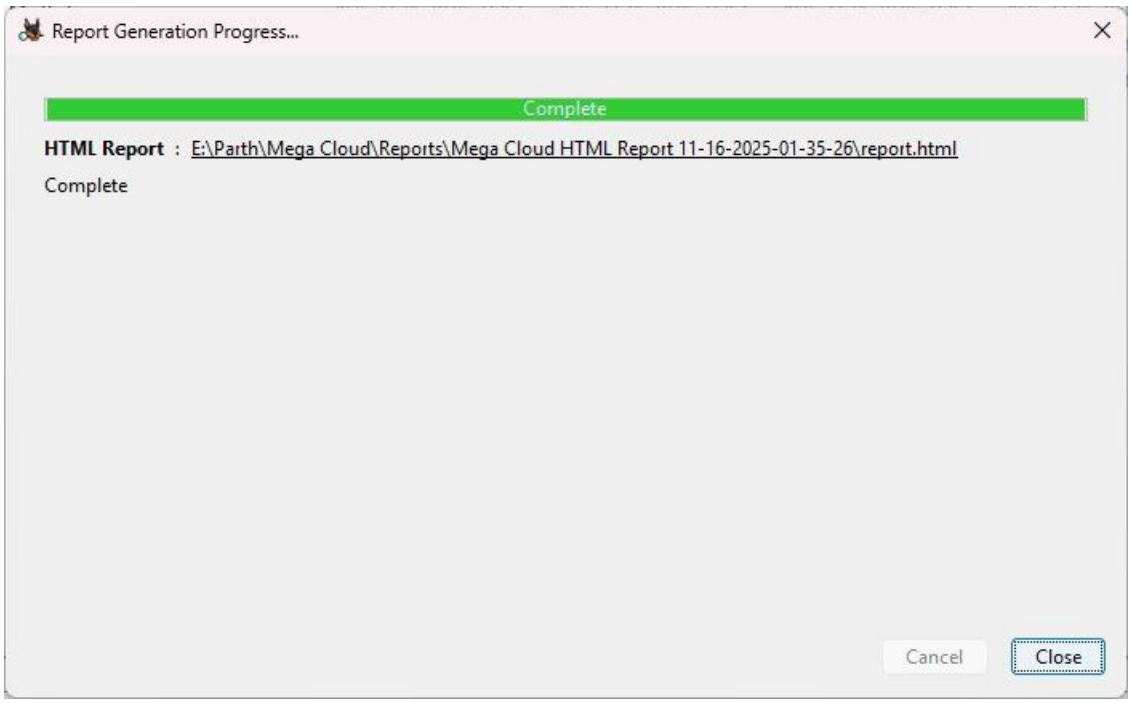


Figure 71: Report make from autopsy successfully

After successfully find all the data and evidence from the cloud drive done it by book mark we can create a report.

13.5 Live browser artefact

url	2025-11-06 22:18:06.098	https://www.google.com/search?q=mega&oq=mega&gs_lcrp=EgZjaH	mega - Google Search	
url	2025-11-06 22:18:06.622	https://www.google.com/search?q=mega&oq=mega&gs_lcrp=EgZjaH	mega - Google Search	
url	2025-11-06 22:18:09.062	https://mega.io/	MEGA: Protect your Online Privacy	
url	2025-11-06 22:18:15.316	https://mega.nz/register	Create Your Account - MEGA	
autofill	2025-11-06 22:18:46.000		register-name2	Parth
autofill	2025-11-06 22:18:46.000		register-familyname2	Gondaliya
url	2025-11-06 22:18:46.686	https://mega.nz/login	Login - MEGA	
autofill	2025-11-06 22:19:23.000		login-name2	gondaliyaparth076.ksv@gmail.com
url	2025-11-06 22:19:23.233	https://mega.nz/fm	MEGA	
login (never save)	2025-11-06 22:19:27.886	https://mega.nz/		
url	2025-11-06 22:19:27.910	https://mega.nz/fm/uM1WnBiT	MEGA	
url	2025-11-06 22:19:28.399	https://mega.io/webclient/loggedin.html		
url	2025-11-06 22:19:49.282	https://www.google.com/search?q=mega&oq=&gs_lcrp=EgZjaHJvbW	mega - Google Search	
site setting (hsts)	2025-11-06 22:19:50.019	Encoded domain: EUee8fEWEJXzg9tS5msiIFKED/eSKlh6OyfShJAx5qg=	HSTS observed	{'expiry': 1794032390.019265, 'host': 'EUee8fEWE
url	2025-11-06 22:19:52.181	https://mega.io/desktop	MEGA Desktop App: Windows, Mac and Linux	

Figure 72 : hindsight browser history by timeline

engagement [in Prefere	{'last_modified': '13406971766548792', 'setting': {'lastEngagementTime':
profile_path	C:\Users\MEGA\AppData\Local\Google\Chrome\User Data
cache_path	(optional - only needed if outside of the profile path)
log_path	hindsight.log
temp_dir	hindsight-temp
: 500 Internal Server Error	

Figure 73 : hindsight browser history find

14. One drive

14.1 installation process

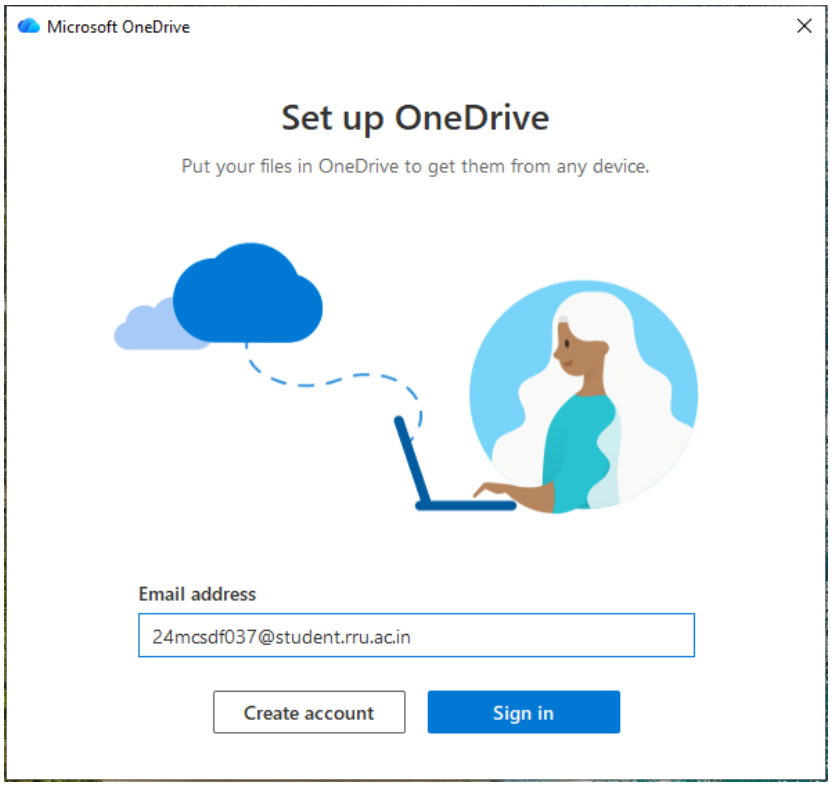


Figure 74 : installation steps

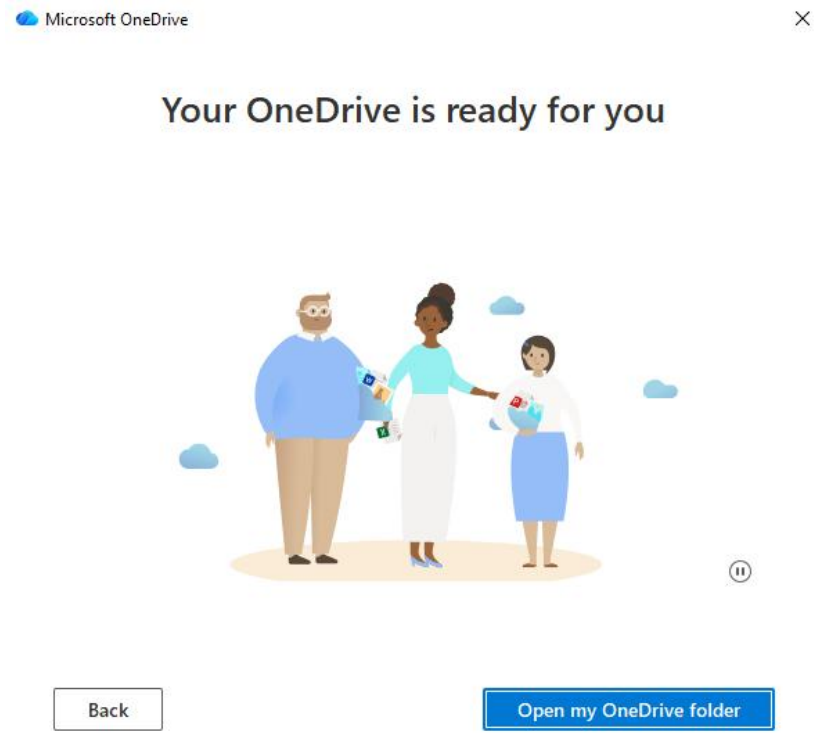


Figure 75 : successfully installed

One drive not required any installation process it is By default instated in every windows so we just enable it so that RegShot is not in use in this installation.

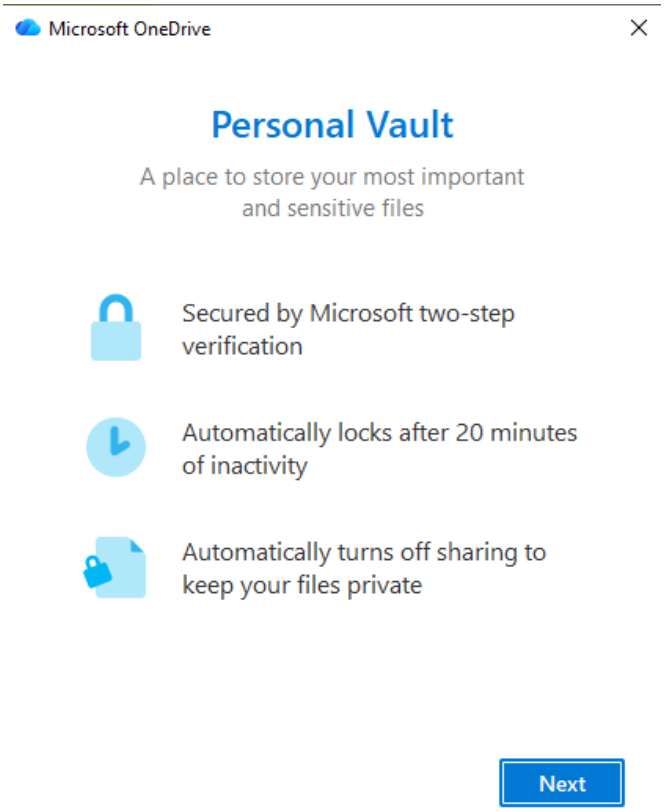


Figure 76 : Personal vault setup

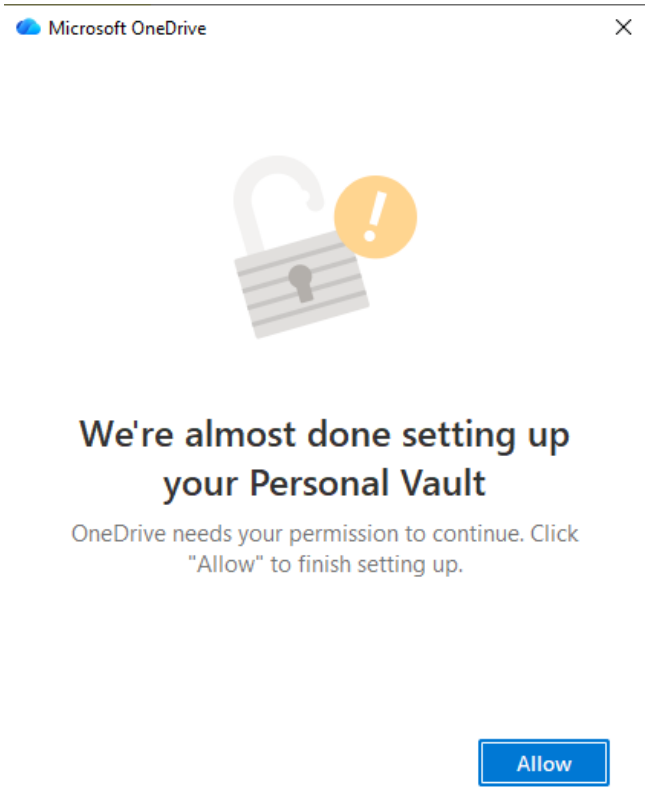


Figure 77 : Personal vault setup

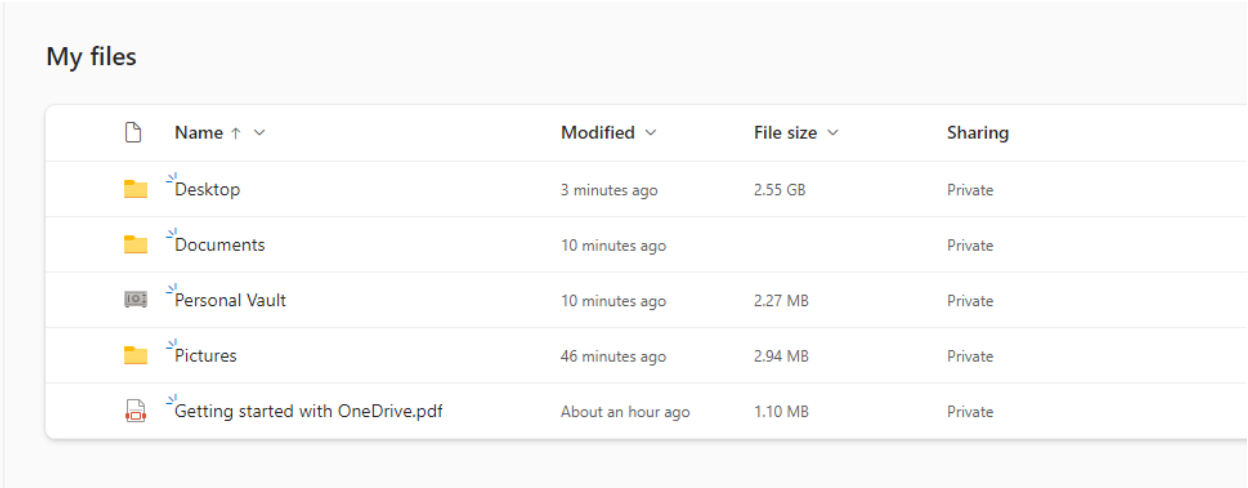


Figure 78 : Sync folder list

One drive contacts the important folder in the windows like Desktop, Documents, Picture, and one drive is also provide the personal vault for the store the personal data in the drive.

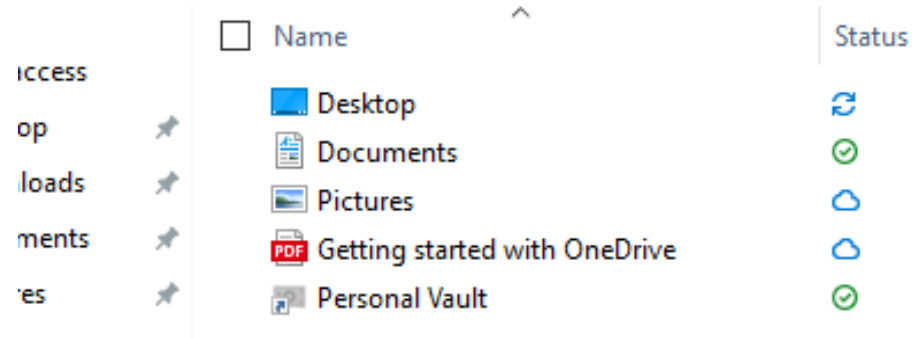


Figure 79 : sync status

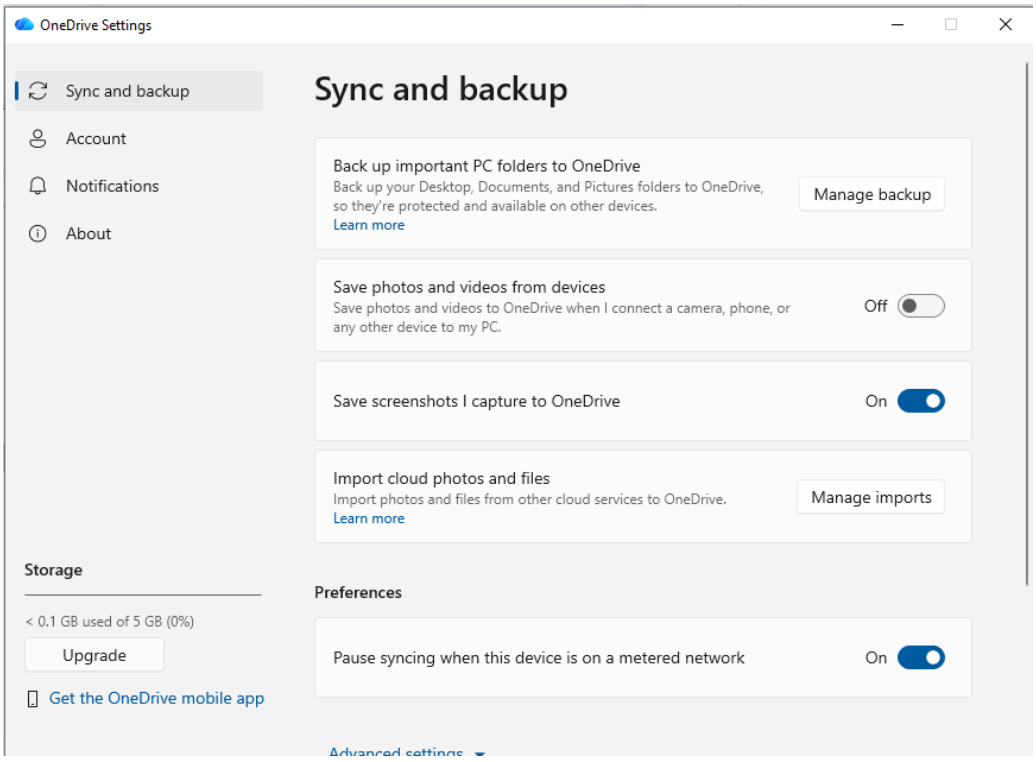


Figure 80 : Sync and backup folder setting

One drive given a 5GB storage free signup and there are also be the paid service also for the more extra space in OneDrive.

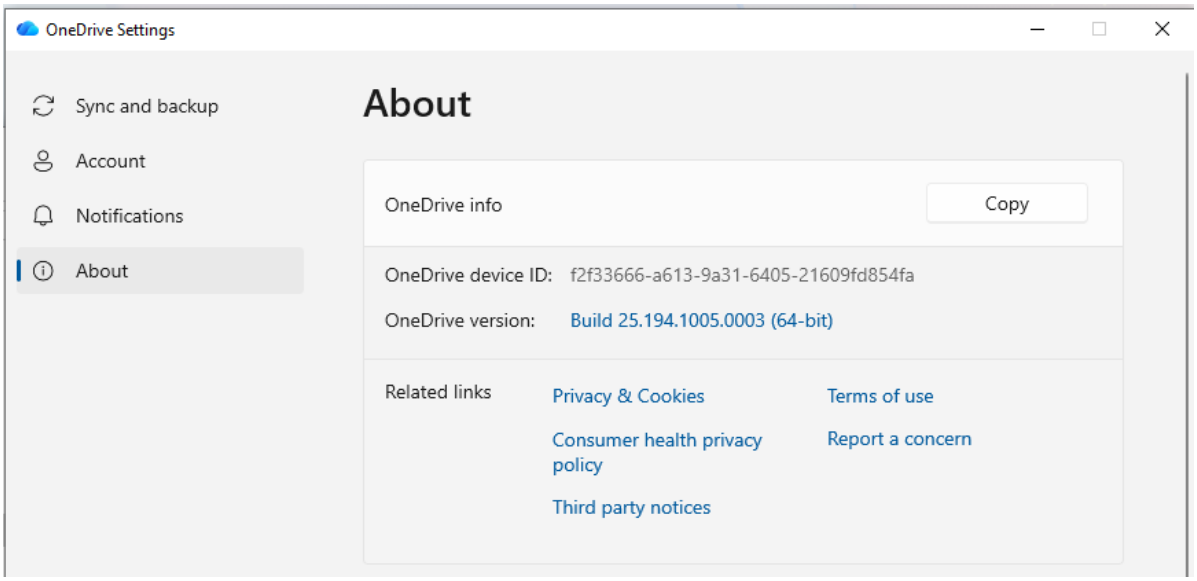


Figure 81 : Version of the one drive

OneDrive version is shown in about section.

14.2 RAM dump

```
0c39cb30  1d f9 ac 00  00 00 fb 00  00 00 01 00  00 00 0c 00  .ù¬...û.........
0c39cb40  00 00 1f 49  73 52 6f 61  6d 69 6e 67  45 6e 63 72  ...IsRoamingEncr
0c39cb50  79 70 74 69  6f 6e 4b 65  79 41 76 61  69 6c 61 62  yptionKeyAvailab
0c39cb60  6c 65 00 00  00 0c 00 00  00 04 74 72  75 65 00 00  le........true..
0c39cb70  00 0c 00 00  00 09 46 69  72 73 74 4e  61 6d 65 00  ......FirstName.
0c39cb80  00 00 0c 00  00 00 05 50  61 72 74 68  00 00 00 0c  .......Parth....
0c39cb90  00 00 00 08  55 73 65 72  4e 61 6d 65  00 00 00 0c  ....UserName....
0c39cba0  00 00 00 1c  32 34 6d 63  73 64 66 30  33 37 40 73  ....24mcsdf037@s
0c39cbb0  74 75 64 65  6e 74 2e 72  72 75 2e 61  63 2e 69 6e  tudent.rru.ac.in
0c39cbc0  00 00 00 0c  00 00 00 08  4c 61 73 74  4e 61 6d 65  ........LastName
0c39cbd0  00 00 00 0c  00 00 00 09  47 6f 6e 64  61 6c 69 79  ........Gondaliy
0c39cbe0  61 00 00 00  0c 00 00 00  03 55 49 44  00 00 00 0c  a........UID....
0c39cbf0  00 00 00 10  30 30 30 33  34 30 30 32  39 41 44 43  ....000340029ADC
0c39cc00  38 35 31 35  00 00 00 0c  00 00 00 0e  53 61 66 65  8515........Safe
0c39cc10  43 75 73 74  6f 6d 65 72  49 64 00 00  00 0c 00 00  CustomerId......
0c39cc20  00 10 65 39  64 39 64 34  36 61 36 38  35 36 37 62  ..e9d9d46a68567b
0c39cc30  62 66 00 00  00 0c 00 00  00 08 57 41  5f 53 74 61  bf........WA_Sta
0c39cc40  74 65 00 00  00 06 00 00  00 00 00 00  00 00 00 00  te..............
0c39cc50  00 0c 00 00  00 11 57 41  5f 52 65 76  69 73 69 6f  ......WA_Revisio
0c39cc60  6e 4e 75 6d  62 65 72 00  00 00 0c 00  00 00 01 32  nNumber........2
0c39cc70  00 00 00 0c  00 00 00 05  57 41 5f 49  64 00 00 00  ........WA_Id...
0c39cc80  0c 00 00 00  10 30 30 30  33 34 30 30  32 39 41 44  .....000340029AD
0c39cc90  43 38 35 31  35 00 00 00  0c 00 00 00  0a 57 41 5f  C8515........WA_
0c39cca0  50 72 6f 76  69 65 72 00  00 04 01 00  00 02 80 00  Provier.......€.
0c39ccb0  00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00  ................
0c39ccc0  00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00  ................
0c39ccd0  00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00  ................
0c39cce0  02 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00  ................
```

Figure 82 : User id Reveal Ram Dump

At the installation time it will show the user first name and last name in the ram dump also in the ram dump the user name is shown but the password is encrypted and at the sync time full file location is show in the RAM dump.

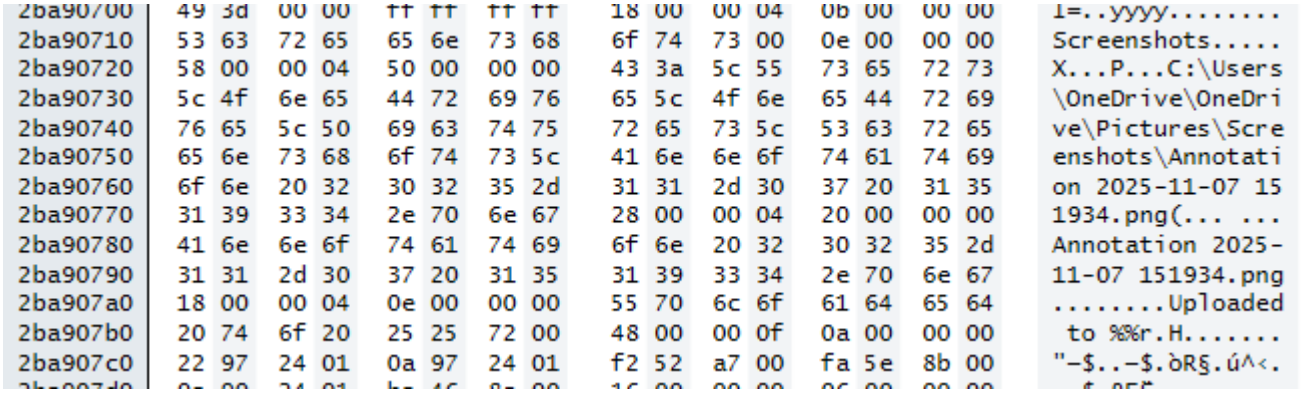


Figure 83 : Sync File Location reveal in ram dump

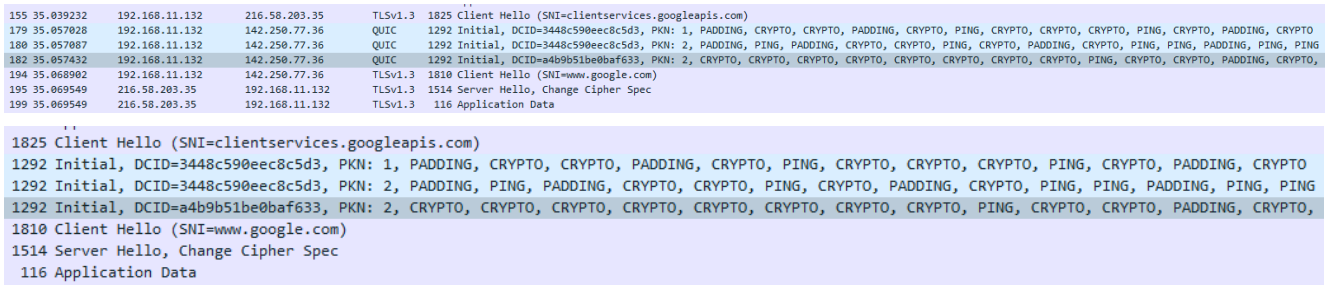


Figure 84 : Encrypted hand shake

Setup log file in the plain text.

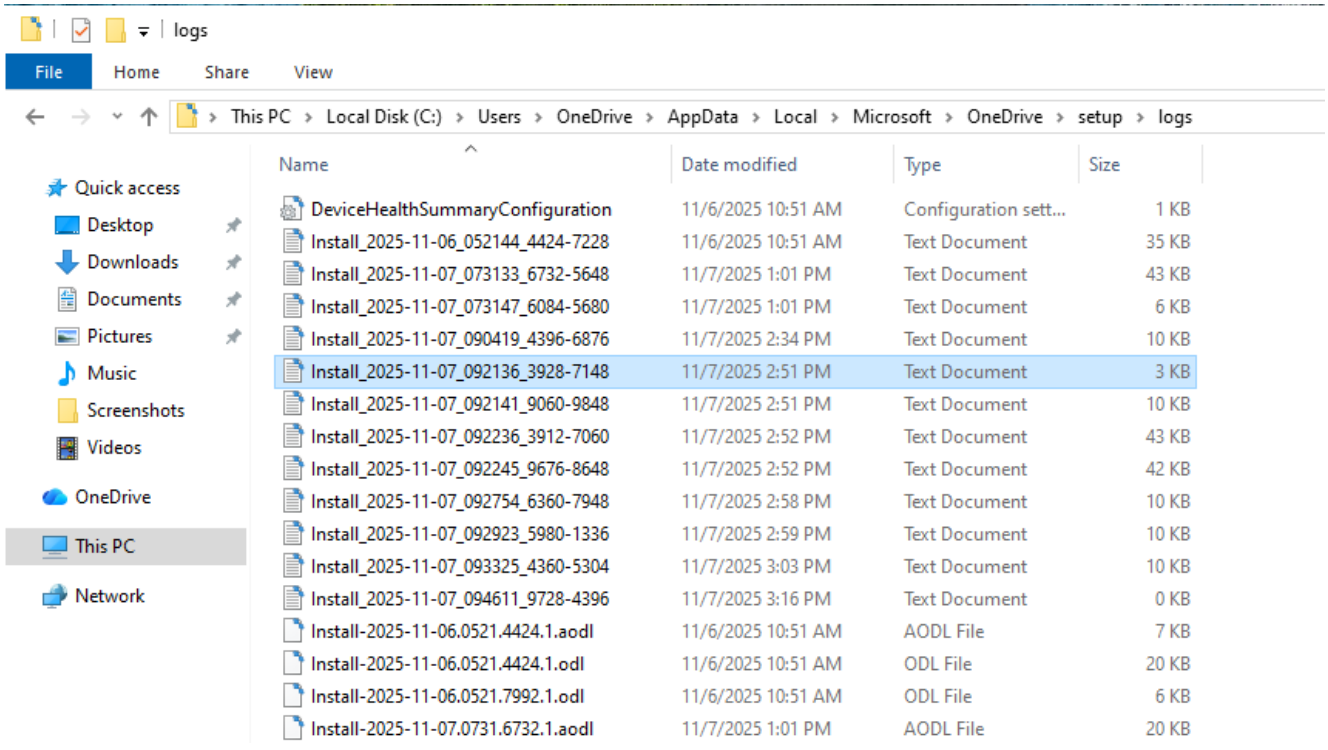


Figure 85 : 9Log Files

Sync log file in the plain text with all the details file remain for the sync and file download and upload, client id (CID) , bytes of the sync , etc. all info are there in the syncdiagnistics.log file

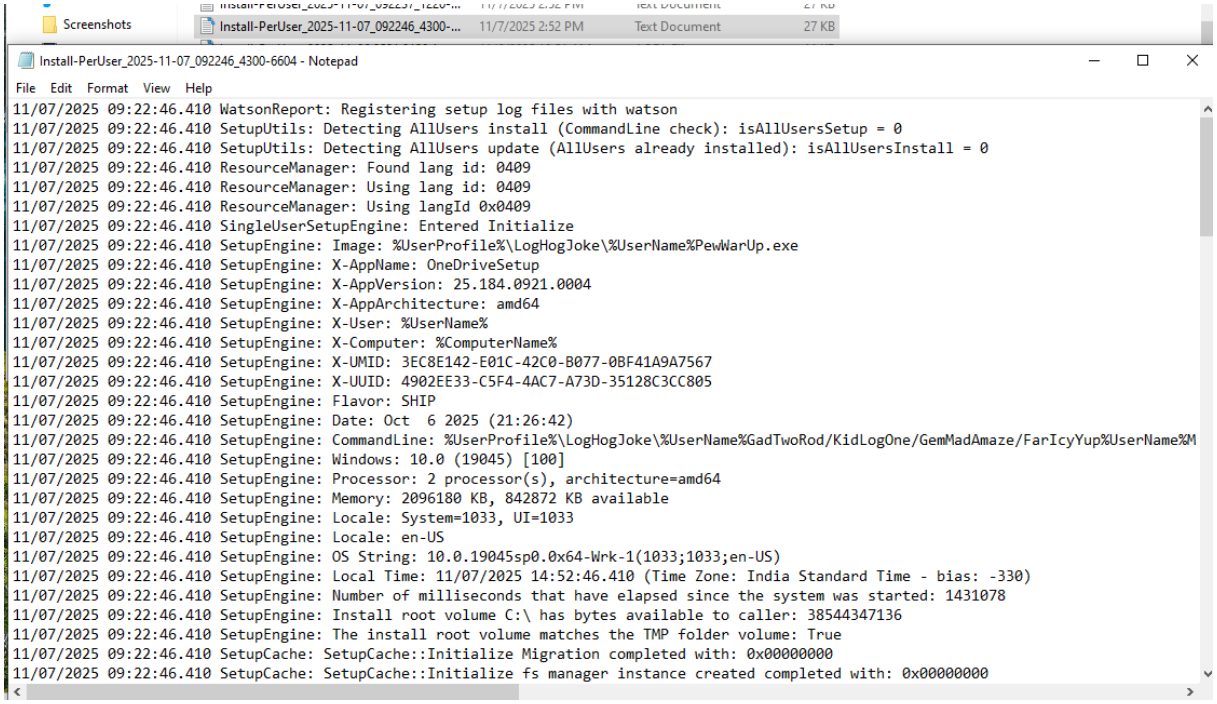


Figure 86 : Log File show in plain text

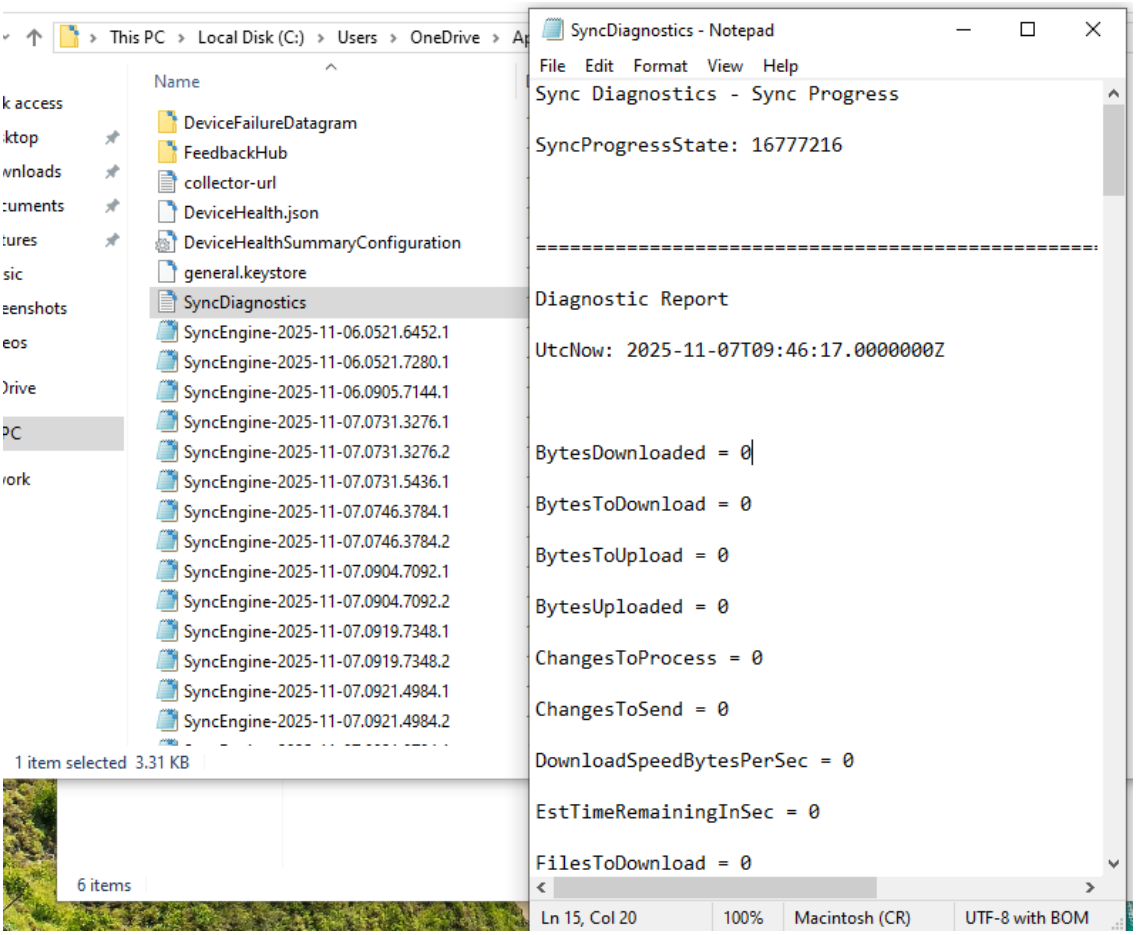


Figure87 : SyncDiagnostics.log for track all thinks

OneDrive also the hold the info of the device also in plain text with the version and the last report time in plain text.

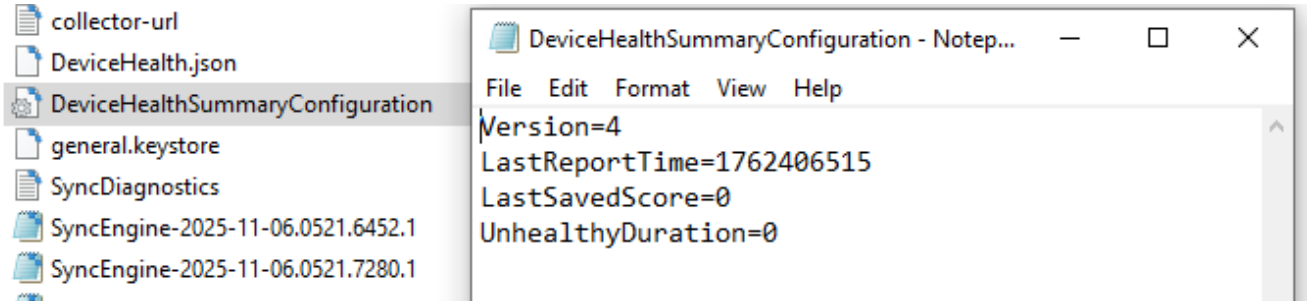


Figure 88 : Device health summary track

14.3 Disk creation

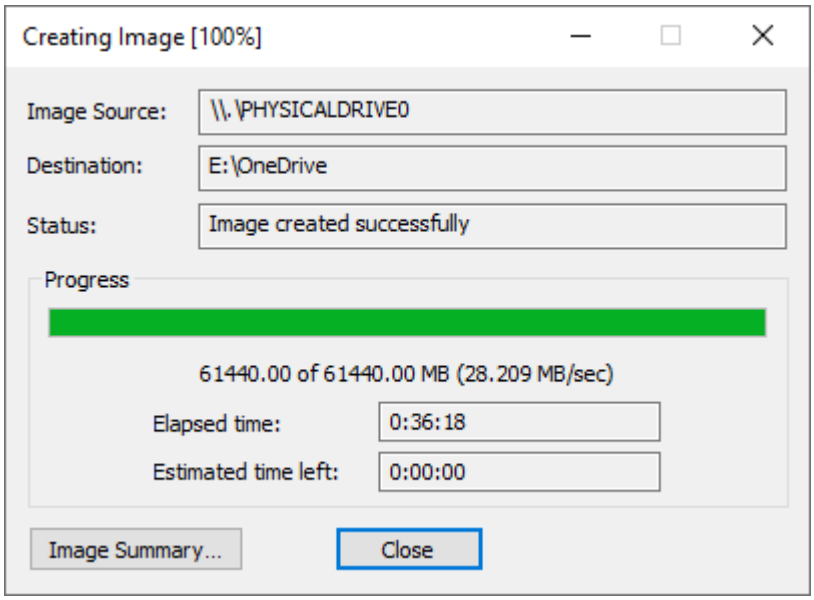


Figure 89 : image creation

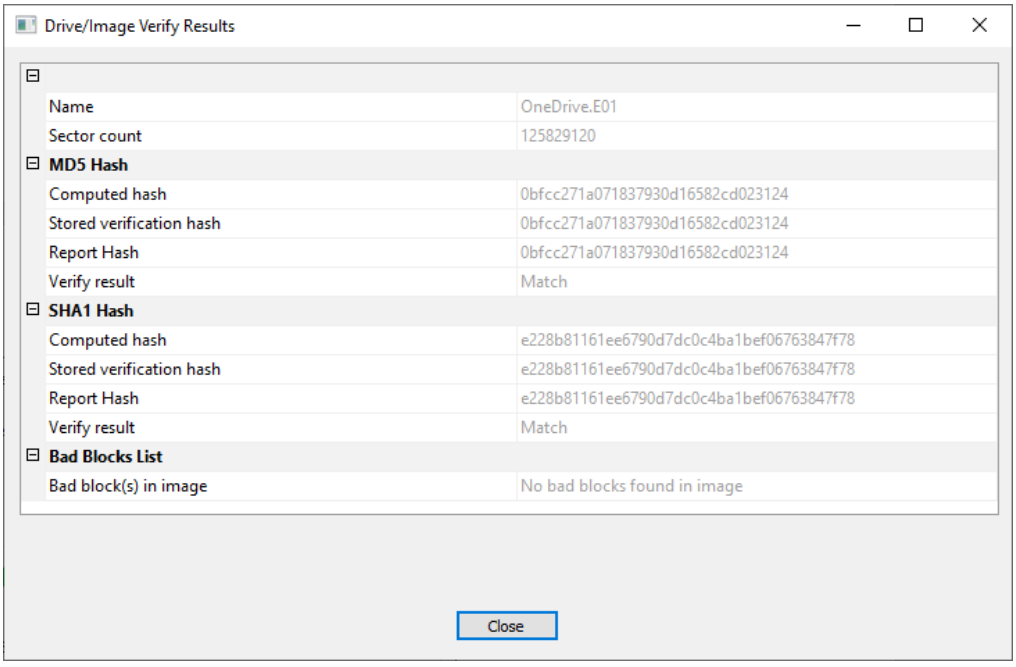


Figure 90 : successfully created image

14.4 Disk analysis

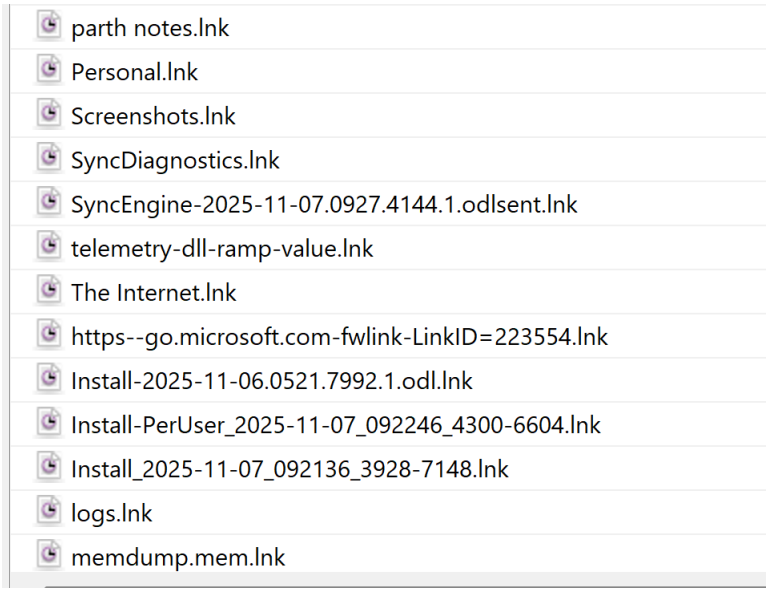


Figure 91 : 10all files in .lnk

Type	Value	Source(s)
Path	C:\Users\OneDrive\OneDrive\Documents\parth notes.pdf	RecentActivity
Path ID	27542	RecentActivity
Date Accessed	0000-00-00 00:00:00	RecentActivity
Source File Path	/img_Windows 10 OneDrive.vmdk/vol_vol6/Users/OneDrive/AppData/Roaming/Microsoft/Windows/Recent/AutomaticDestinations/5f7b5f1e01b83767.automaticDestinations-ms/parth notes.pdf.lnk	
Artifact ID	-9223372036854775754	

Figure 92 : .ink file location

We can find the use of the cloud storage for the hide the doc or the make the back up of the data on the cloud storage for the make the more secret and like that we can see that there are the total 3 folder are use in the one drive of the cloud storage Desktop, Documents, Picture and setting default pdf of the OneDrive.

Name	S	C	O	Modified Time	C
[current folder]				2025-11-07 16:31:11 IST	2(
[parent folder]				2025-11-07 16:30:49 IST	2(
Desktop				2025-11-07 15:45:32 IST	2(
Documents				2025-11-07 15:44:28 IST	2(
Pictures				2025-11-07 15:14:31 IST	2(
.849C9593-D756-4E56-8D6E-42412F2A707B			0	2025-11-07 16:31:11 IST	2(
desktop.ini			0	2025-11-07 15:00:14 IST	2(
Getting started with OneDrive.pdf			0	2025-11-07 14:51:36 IST	2(
Personal Vault.lnk			0	2025-11-07 16:31:11 IST	2(

Figure 93 : list of all files are in cloud

But in the one drive the features of the personal vault that vault is also be used for the put the .doc safe

Desktop we can find all the files are user and deleted from the desktop.

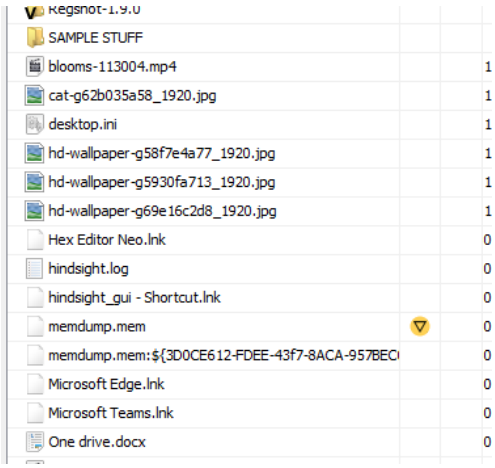


Figure 94 : all deleted and move files

Here the amylase is confuse that desktop is empty means that all data in the Desktop are in the cloud data that`s why we cannot find the any 1 thing in the desktop.

Name	S	C	O	Modified Time	Change Time	Access Time	Created Time	Size	Flags(Dir)	Flags(Meta)
[current folder]				2025-11-06 10:49:42 IST	2025-11-06 10:49:42 IST	2025-11-06 10:49:42 IST	2025-11-06 10:49:42 IST	48	Allocated	Allocated
[parent folder]				2025-11-07 16:30:49 IST	2025-11-07 16:30:49 IST	2025-11-07 16:30:49 IST	2025-11-06 10:49:42 IST	256	Allocated	Allocated

Figure 95 : Real Desktop image

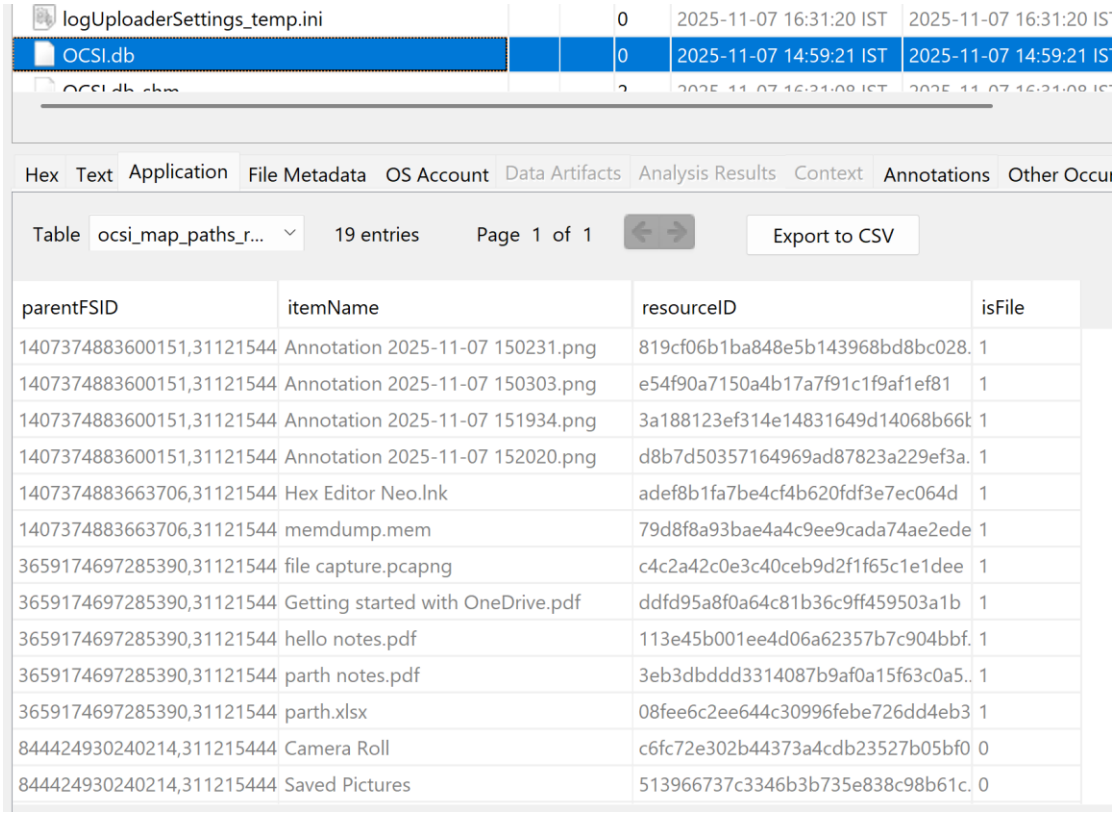


Figure 96 : Real Desktop image

I have to find OCSI.db file. This is a OneDrive configuration and sync information database. It is a SQLite database used internally by Microsoft OneDrive to store sync metadata, account configuration, cached file information, and operational state for a users OneDrive account.

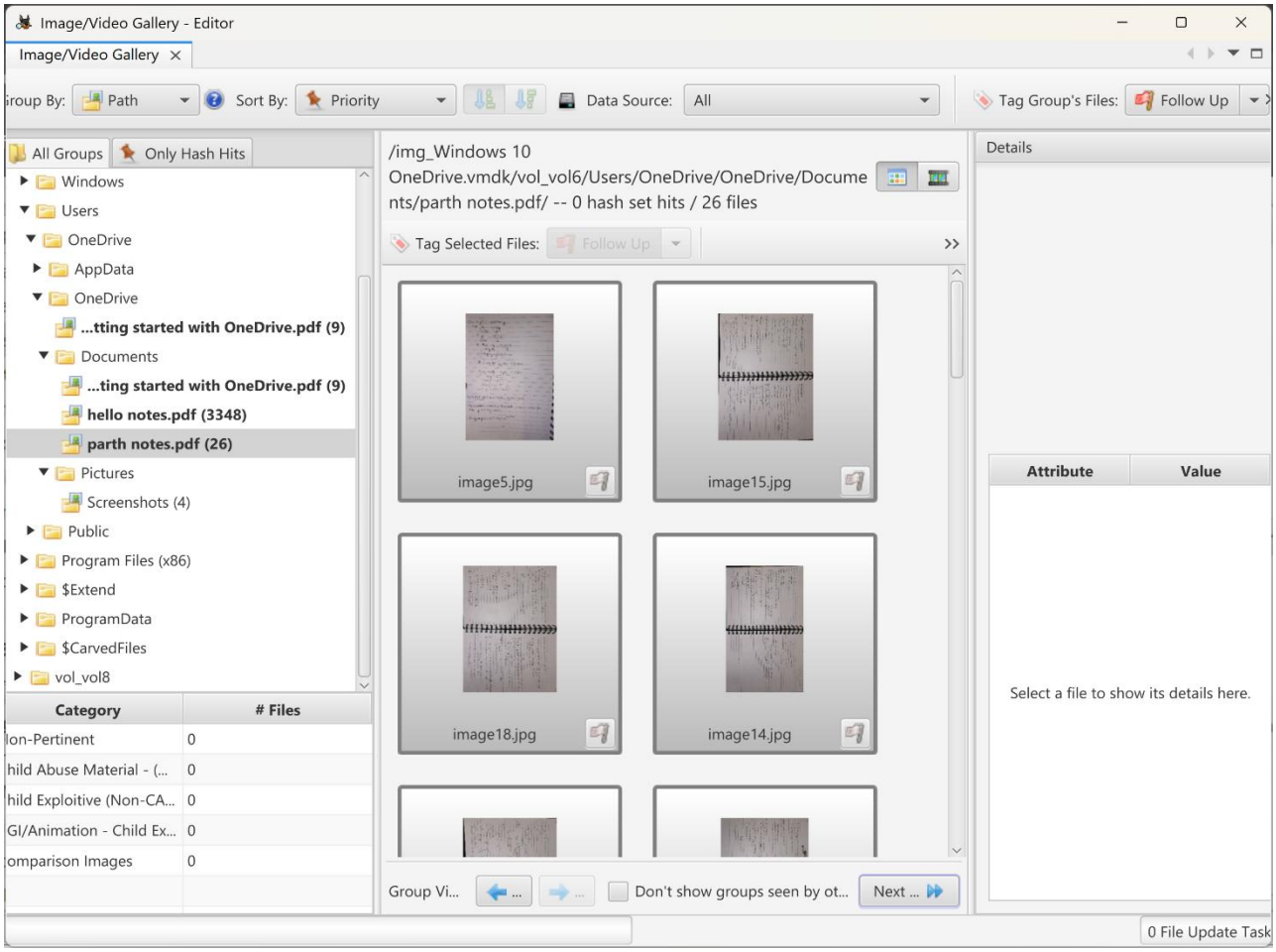


Figure 97 : Found PDF file as image

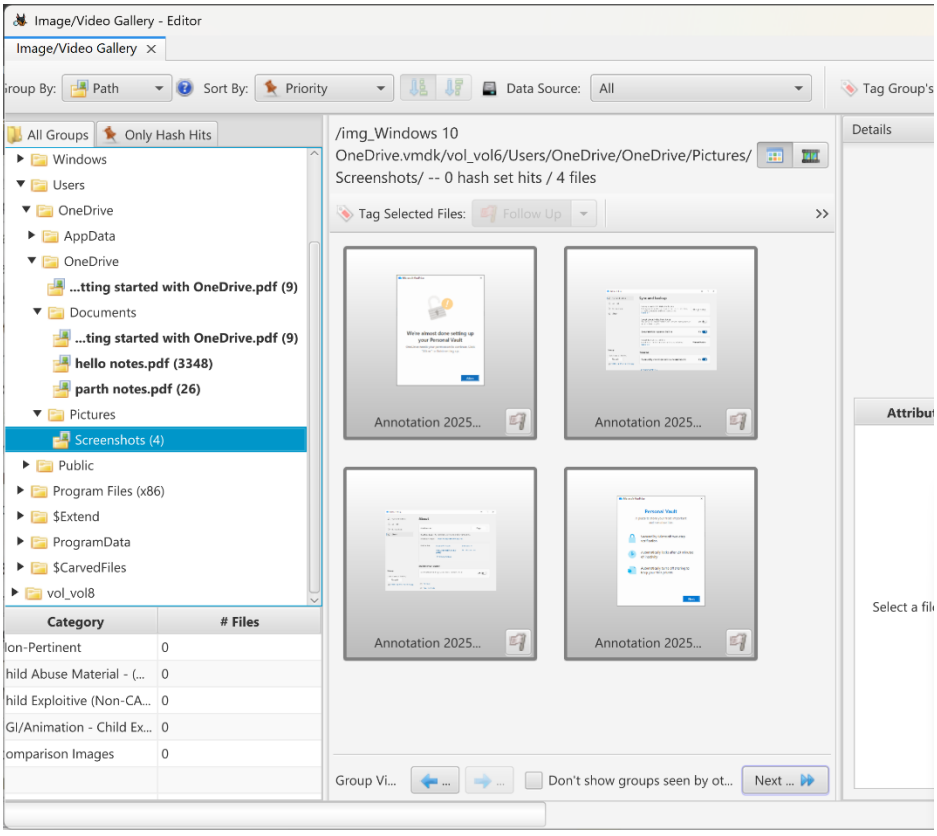
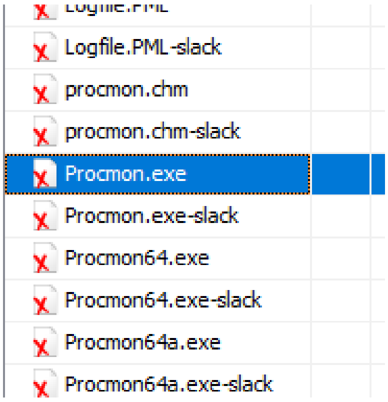


Figure 98 : screenshots found

We can find all the image are there in the drive with all screen short, pdf and other data.

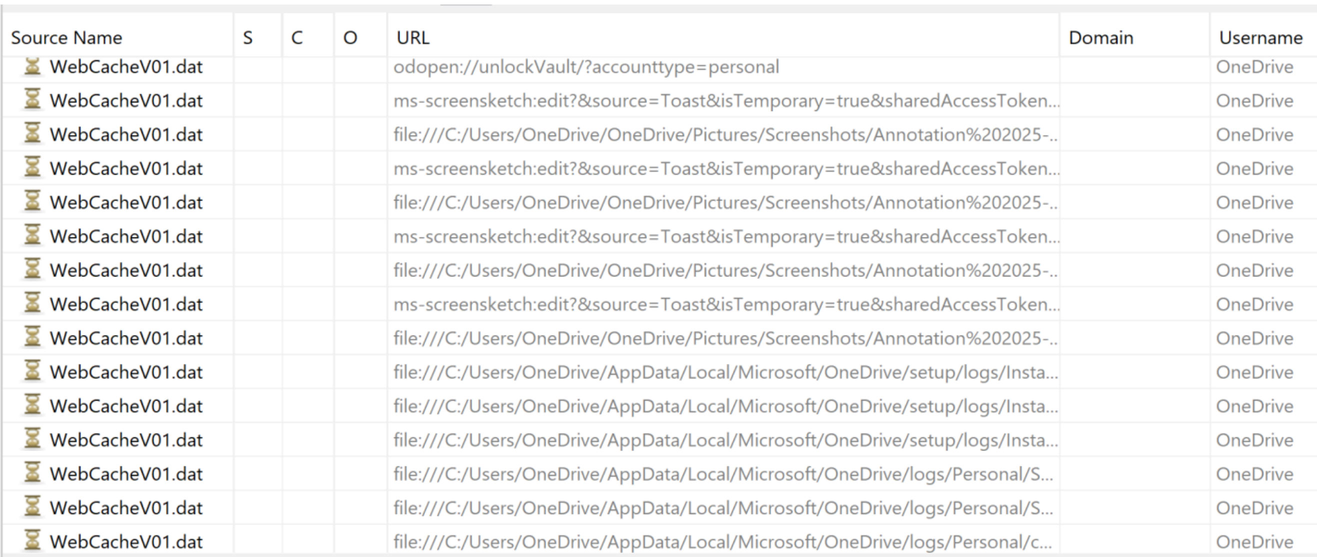


Logfile.PML
Logfile.PML-slack
procmon.chm
procmon.chm-slack
Procmon.exe
Procmon.exe-slack
Procmon64.exe
Procmon64.exe-slack
Procmon64a.exe
Procmon64a.exe-slack

Figure 99 : files are deleted

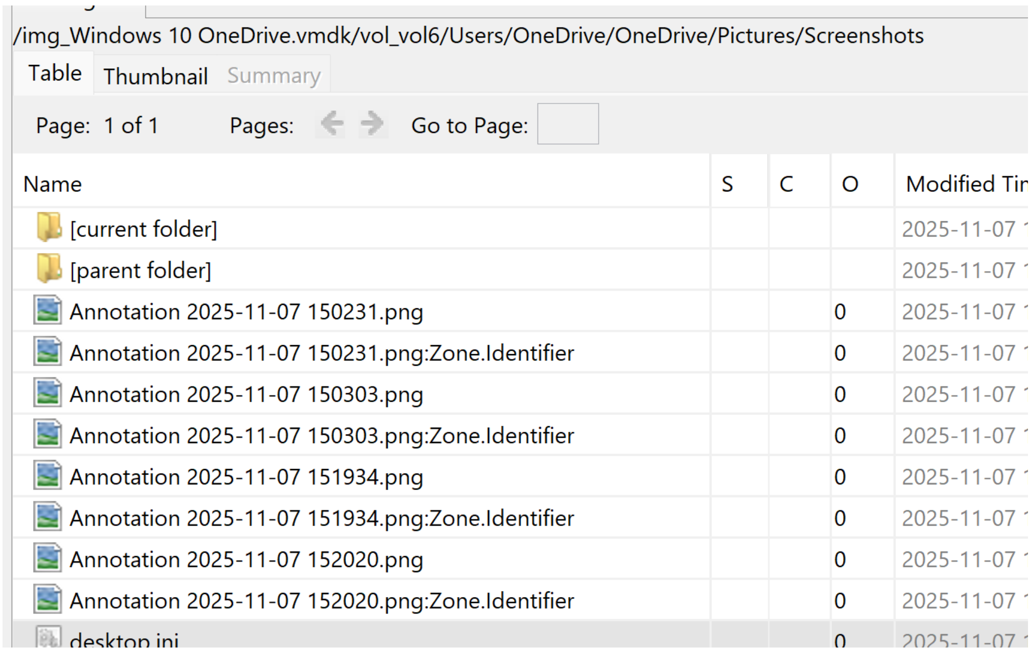
Some software are deleted by the user after the uploaded in the one drive.

14.5 Browser artifact



Source Name	S	C	O	URL	Domain	Username
WebCacheV01.dat				odopen://unlockVault/?accounttype=personal		OneDrive
WebCacheV01.dat				ms-screensketch:edit?&source=Toast&isTemporary=true&sharedAccessToken...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/OneDrive/Pictures/Screenshots/Annotation%202025-...		OneDrive
WebCacheV01.dat				ms-screensketch:edit?&source=Toast&isTemporary=true&sharedAccessToken...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/OneDrive/Pictures/Screenshots/Annotation%202025-...		OneDrive
WebCacheV01.dat				ms-screensketch:edit?&source=Toast&isTemporary=true&sharedAccessToken...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/OneDrive/Pictures/Screenshots/Annotation%202025-...		OneDrive
WebCacheV01.dat				ms-screensketch:edit?&source=Toast&isTemporary=true&sharedAccessToken...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/OneDrive/Pictures/Screenshots/Annotation%202025-...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/AppData/Local/Microsoft/OneDrive/setup/logs/Insta...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/AppData/Local/Microsoft/OneDrive/setup/logs/Insta...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/AppData/Local/Microsoft/OneDrive/setup/logs/Insta...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/AppData/Local/Microsoft/OneDrive/logs/Personal/S...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/AppData/Local/Microsoft/OneDrive/logs/Personal/S...		OneDrive
WebCacheV01.dat				file:///C:/Users/OneDrive/AppData/Local/Microsoft/OneDrive/logs/Personal/c...		OneDrive

Figure 100 : browser history



/img_Windows 10 OneDrive.vmdk/vol_vol6/Users/OneDrive/OneDrive/Pictures/Screenshots

Table Thumbnail Summary

Page: 1 of 1 Pages: Go to Page:

Name	S	C	O	Modified Tir
[current folder]				2025-11-07
[parent folder]				2025-11-07
Annotation 2025-11-07 150231.png			0	2025-11-07
Annotation 2025-11-07 150231.png:Zone.Identifier			0	2025-11-07
Annotation 2025-11-07 150303.png			0	2025-11-07
Annotation 2025-11-07 150303.png:Zone.Identifier			0	2025-11-07
Annotation 2025-11-07 151934.png			0	2025-11-07
Annotation 2025-11-07 151934.png:Zone.Identifier			0	2025-11-07
Annotation 2025-11-07 152020.png			0	2025-11-07
Annotation 2025-11-07 152020.png:Zone.Identifier			0	2025-11-07
desktop.ini			0	2025-11-07

Figure 101 : Screenshots data found

Local State				Default	000340029ADC8515		Personal	Profile 1	24mcsdf037@student.rru.ac.in	Microsoft Edge

Hex | Text | Application | Source File Metadata | OS Account | Data Artifacts | Analysis Results | Context | Annotations | Other Occurrences

Result: 1 of 1 Result

Type	Value
Path	Default
User ID	000340029ADC8515
Domain	
Short Cut	Personal
Name	Profile 1
Username	24mcsdf037@student.rru.ac.in
Program Name	Microsoft Edge
Source File Path	/img_Windows 10 OneDrive.vmdk/vol_vol6/Users/OneDrive/AppData/Local/Microsoft/Edge/User Data/Local State
Artifact ID	-9223372036854775628

Figure 102 : Email ID found profile

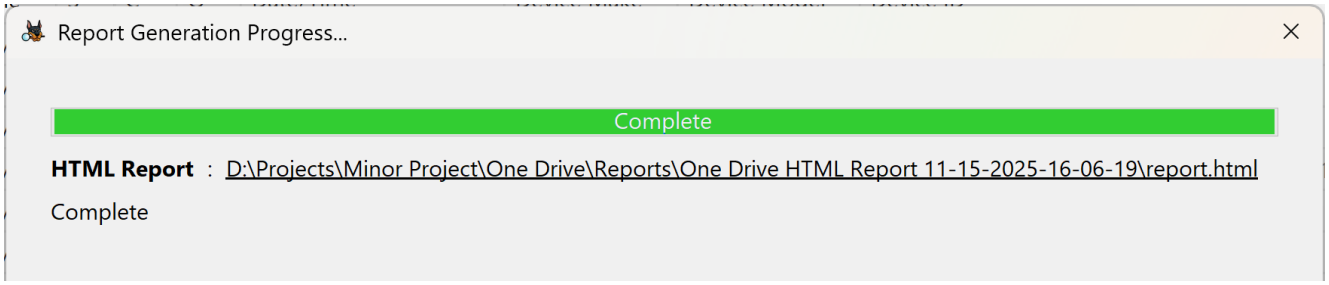


Figure 103 : created successfully report

14.6 Live browser artifact

site setting (modified	2025-11-15 03:49:40.538	https://[*.]microsoft.com,*	cookie_controls_metadata [in P	{'last_modified': '1340768098053
url	2025-11-15 03:49:51.586	https://go.microsoft.com/fwlink/p/?LinkID=2119709&clcid=0x4009&culture=	Continue	
url	2025-11-15 03:49:51.586	https://onedrive.live.com/about/auth?signin=1&culture=en-in&country=in	Continue	
url	2025-11-15 03:49:51.586	https://onedrive.live.com/?gologin=1	Continue	
url	2025-11-15 03:49:51.586	https://login.live.com/login.srf?wa=wsignin1%2E0&rpsnv=180&ct=17632073	Continue	
url	2025-11-15 03:49:52.932	https://onedrive.live.com/?view=1&gologin=1	Microsoft OneDrive	
site setting (modified	2025-11-15 03:49:52.934	https://[*.]live.com,*	cookie_controls_metadata [in P	{'last_modified': '1340768099293
site setting (modified	2025-11-15 03:49:52.935	https://login.live.com:443,*	media_engagement [in Preferen	{'expiration': '1341545699293538
url	2025-11-15 03:49:54.310	https://onedrive.live.com/?view=1	Home - OneDrive	
site setting (modified	2025-11-15 03:49:54.951	https://onedrive.live.com:443,*	app_banner [in Preferences.prof	{'last_modified': '1340768099495
url	2025-11-15 03:50:01.872	https://onedrive.live.com/?view=1	Home - OneDrive	
url	2025-11-15 03:50:07.399	https://onedrive.live.com/?view=0	My files - OneDrive	
url	2025-11-15 03:50:12.338	https://onedrive.live.com/?view=3	OneDrive	
url	2025-11-15 03:50:13.532	https://onedrive.live.com/?view=3	OneDrive	
url	2025-11-15 03:50:15.117	https://onedrive.live.com/?view=1	Home - OneDrive	
site setting (engagem	2025-11-15 03:50:24.347	https://onedrive.live.com:443,*	lastEngagementTime in Preferen	{'last_modified': '1340768102434
site setting (modified	2025-11-15 03:50:24.347	https://onedrive.live.com:443,*	site_engagement [in Preferences	{'last_modified': '1340768102434
url	2025-11-15 03:50:24.563	https://onedrive.live.com/?view=0	My files - OneDrive	
url	2025-11-15 03:50:26.057	https://onedrive.live.com/?view=1	Home - OneDrive	
site setting (characte	2025-11-15 03:50:30.000	www.microsoft.com	Status: Live	last_loaded: 1763207430updates,
site setting (modified	2025-11-15 03:50:30.779	https://www.microsoft.com:443,*	media_engagement [in Preferen	{'expiration': '1341545703077983
site setting (characte	2025-11-15 03:50:31.000	onedrive.live.com	Status: Live	last_loaded: 1763207431updates,
site setting (modified	2025-11-15 03:50:31.735	https://onedrive.live.com:443,*	media_engagement [in Preferen	{'expiration': '1341545703173537
url	2025-11-15 03:50:36.584	http://localhost:8080/	Hindsight	
site setting (modified	2025-11-15 03:50:36.586	http://localhost,*	cookie_controls_metadata [in P	{'last_modified': '1340768103658
site setting (engagem	2025-11-15 03:50:36.587	http://localhost:8080,*	lastEngagementTime in Preferen	{'last_modified': '1340768103658

Figure 104 : histroy of one drive login

2025-11-15 03:42:06.434	www.microsoft.com	HSTS observed	{'expiry': 1794742926.4343, 'host': 'AVsuOZgBg0wdpKMoxm8zihjqET8kI4Xl8bCS
2025-11-15 03:42:29.000	onedrive.live.com	Status: Live	last_loaded: 1763206949
2025-11-15 03:42:31.110	https://portal.office.com/onedrive?msafed=0&wsucxt=2&username=2mcsdf	Sign in to your account	
2025-11-15 03:42:31.110	https://portal.office.com/login?login_hint=2mcsdf037%40student.rru.ac.in&	Sign in to your account	
2025-11-15 03:42:31.110	https://login.microsoftonline.com/common/oauth2/authorize?client_id=000	Sign in to your account	
2025-11-15 03:42:53.000		loginfmt	24mcsdf037@student.rru.ac.in
2025-11-15 03:42:53.000	login.microsoftonline.com	Status: Live	last_loaded: 1763206973
2025-11-15 03:42:54.794	https://login.live.com:443,*	client_hints [in Preferences.profi	{'last_modified': '13407680574794564', 'setting': {'client_hints': [14]}}
2025-11-15 03:42:54.814	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:00.362	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:00.371	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:00.380	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:00.384	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:00.398	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:00.401	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:00.404	https://login.live.com/oauth20_authorize.srf?scope=openid+profile+email+o	Enter your code	
2025-11-15 03:43:14.122	https://login.live.com/ppsecure/post.srf?mkt=en-US&username=24mcsdf03	Enter your code	
2025-11-15 03:43:19.000	login.live.com	Status: Live	last_loaded: 1763206999
2025-11-15 03:43:20.535	https://login.live.com/ppsecure/post.srf?mkt=en-US&username=24mcsdf03	Continue	
2025-11-15 03:43:21.466	https://login.microsoftonline.com/common/federation/oauth2msa	Working...	

Figure 105 : onedrive login id

local storage	https://onedrive.live.com	mats-telemetry-profile-id	019a8759-b611-7213-ae21-0305e438ee73
local storage	https://onedrive.live.com	migrationStoree9d9d46a68567bbf	{"version":2,"isMigrated":true}
local storage	https://onedrive.live.com	msal.1-00000000-0000-0000-e9d9-d46a685	{"id":"019a8759-b612-7000-94e6-627d91e064b4","nonce":
local storage	https://onedrive.live.com	msal.1-00000000-0000-0000-e9d9-d46a685	{"id":"019a8759-b612-7000-94e6-627d91e064b4","nonce":
local storage	https://onedrive.live.com	msal.1-00000000-0000-0000-e9d9-d46a685	{"id":"019a8759-b612-7000-94e6-627d91e064b4","nonce":
local storage	https://onedrive.live.com	msal.1-00000000-0000-0000-e9d9-d46a685	{"id":"019a8759-b612-7000-94e6-627d91e064b4","nonce":
local storage	https://onedrive.live.com	msal.1-00000000-0000-0000-e9d9-d46a685	{"id":"019a8759-b612-7000-94e6-627d91e064b4","nonce":
local storage	https://onedrive.live.com	msal.1-00000000-0000-0000-e9d9-d46a685	{"id":"019a8759-b612-7000-94e6-627d91e064b4","nonce":
local storage	https://onedrive.live.com	msal.1.account.keys	["msal.1-00000000-0000-0000-e9d9-d46a68567bbf.918804
local storage	https://onedrive.live.com	msal.1.token.keys.865367a6-9c28-4844-88c	{"idToken":["msal.1-00000000-0000-0000-e9d9-d46a68567
local storage	https://onedrive.live.com	msal.865367a6-9c28-4844-88ce-259d34dba	{"homeAccountId":"00000000-0000-0000-e9d9-d46a68567
local storage	https://onedrive.live.com	msal.version	4.22.0
session storage	https://onedrive.live.com/	BrowserStorageTest	
session storage	https://onedrive.live.com/	BrowserStorageTest	
session storage	https://onedrive.live.com/	experimentLogCache	90343true90366true
session storage	https://onedrive.live.com/	experimentLogCacheTime	2025-11-15T11:49:53.1804327Z

Figure 106 : onedrive local and session storage

15. Google drive

15.1 Introduction to google drive:

Google Drive is a cloud-based storage service that allows users to store files online using internet, access them from anywhere, and share them easily. It was launched by Google in April 2012 and has since become one of the most popular cloud storage platforms worldwide.

As of recent data, Google Drive has over 2.6 billion active users globally, a significant increase from earlier figures. It provides 15 GB of free storage for individual users, which is shared across Google services like Gmail, Google Photos, and Google Drive itself. If you need more space, you can upgrade to one of Google One's paid plans, which offer options starting from 100 GB to 2 TB and more.

Google Drive is compatible with numerous devices, as stated below:

1. **Windows**
2. **macOS**
3. **Android**
4. **iOS**

Google Drive is a wonderful service if you want to sync, store, and share files with ease across your devices because it provides apps for desktops and mobile phones. Moreover, its close integration with other Google Workspace applications (e.g. Docs, Sheets, and Slides) turns it into a very powerful tool both for individuals and groups working together professionally.

So, whether you're backing up photos, collaborating on documents, or just storing files for safekeeping, Google Drive offers a flexible and reliable cloud storage solution.

15.2 Installation

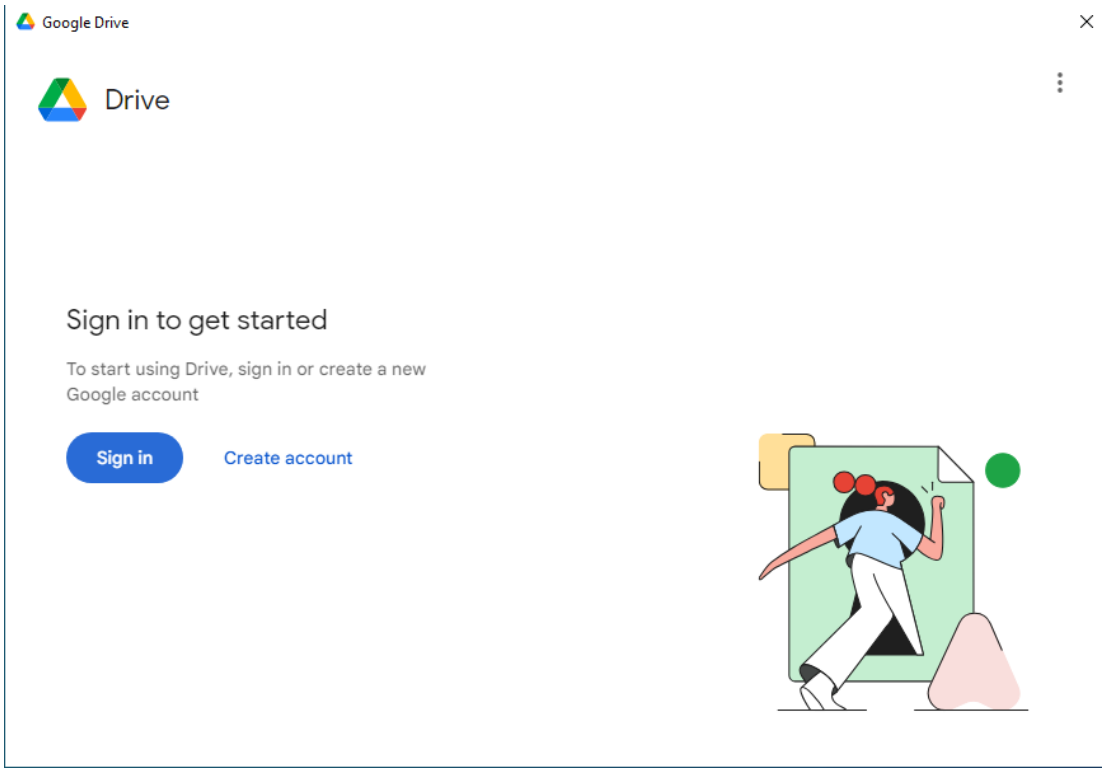


Figure107 : Gdrive login page

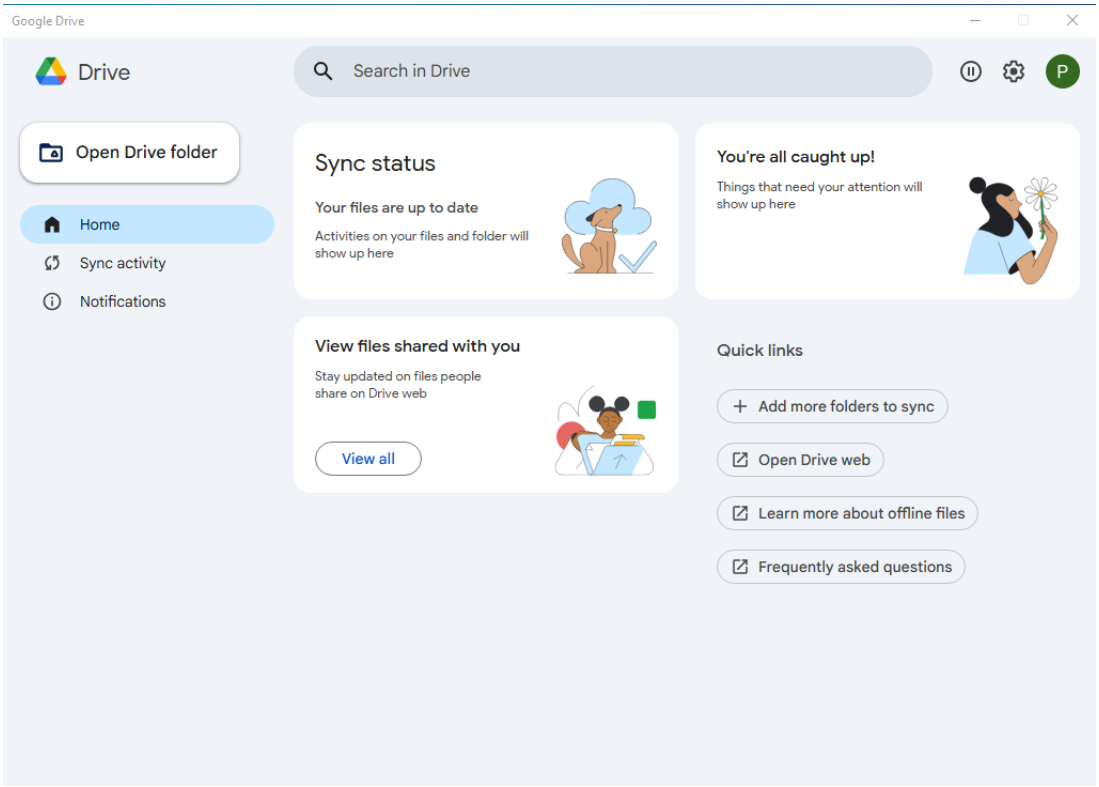


Figure 108 : Gdrive successfully installed

Google Drive is installed successfully in the local pc.

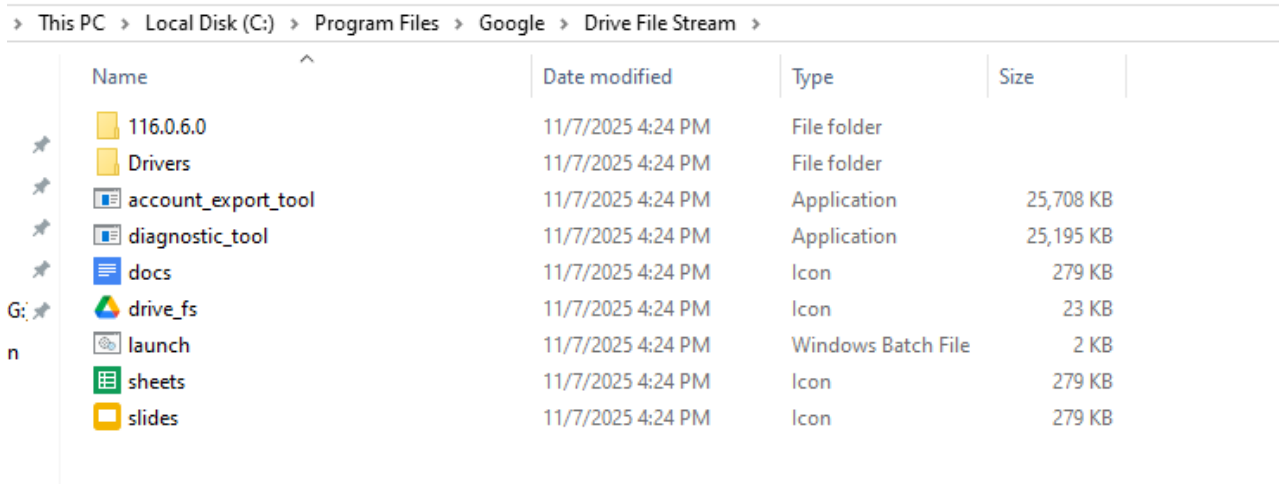


Figure 109 : Gdrive installed path

Google Drive Client installed inside the program file folder

Location “C:\Program Files\Google\Drive File Stream”

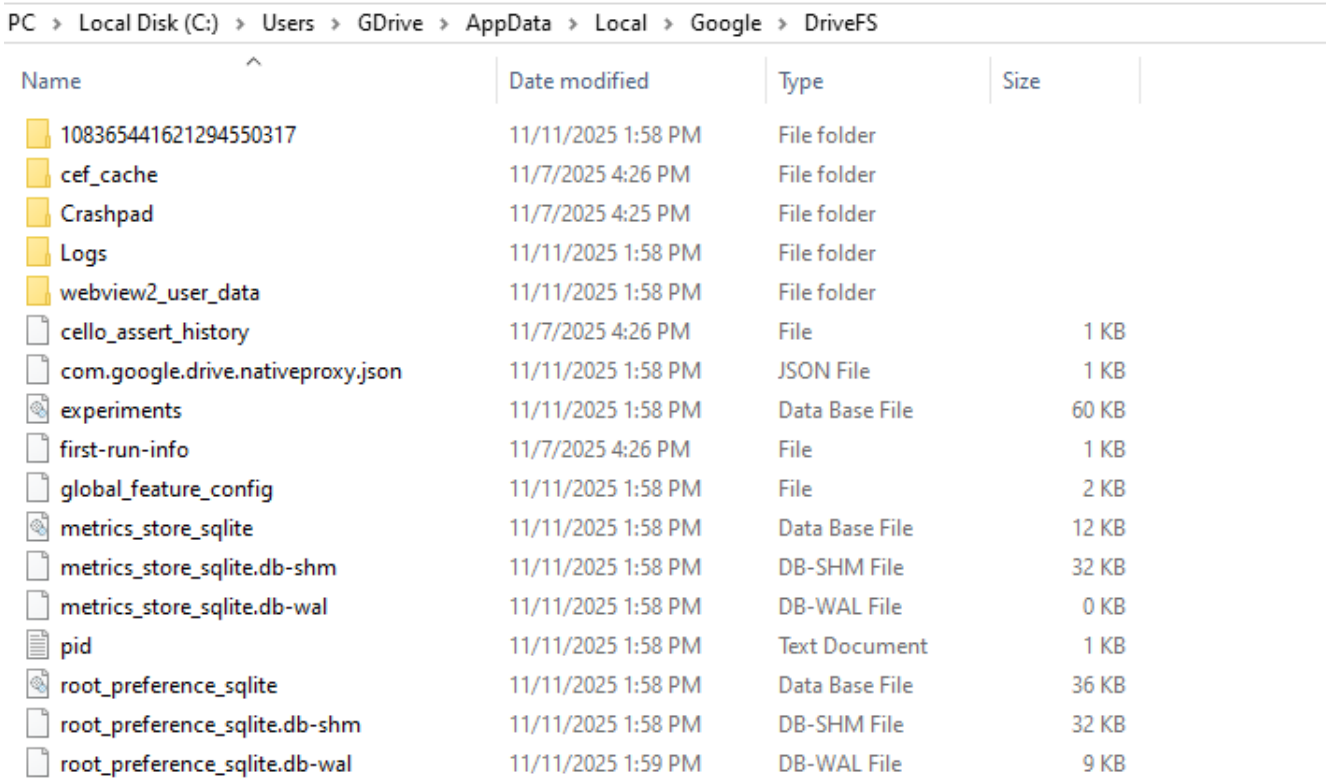


Figure 110 : Gdrive DB files

Client configuration is stored in the user profile, so we have different profiles for each user in the hidden file from the location “C:\Users\GDrive\AppData\Local\Google\DriveFS”

In the updated version the user_default folder is not created instead of the drive is created an encrypted folder in number only in that folder the user data is stored.

Location is look like “C:\Users\GDrive\AppData\Local\Google\DriveFS\106807315777188389081”

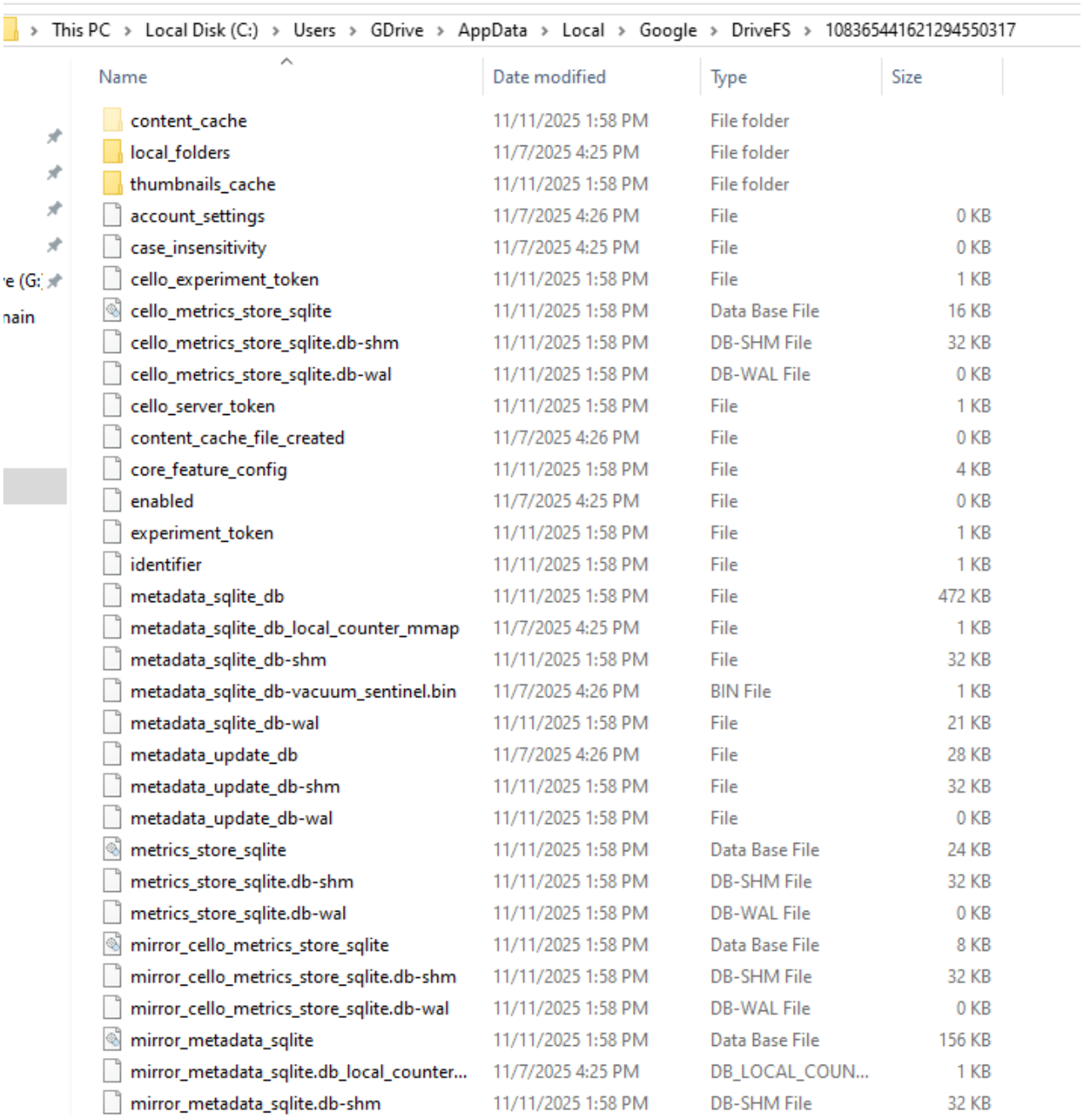


Figure 111 : Gdrive User Data files

Some other files are also installed by the drive installation like Google slide, sheet and docs.

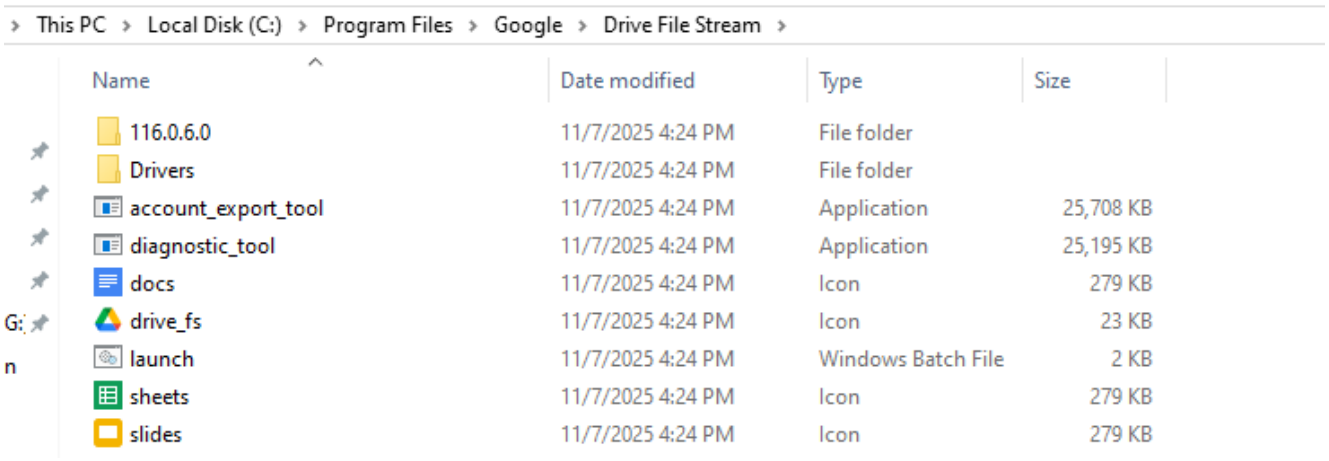


Figure 112 : Other files are also installed by GDrive

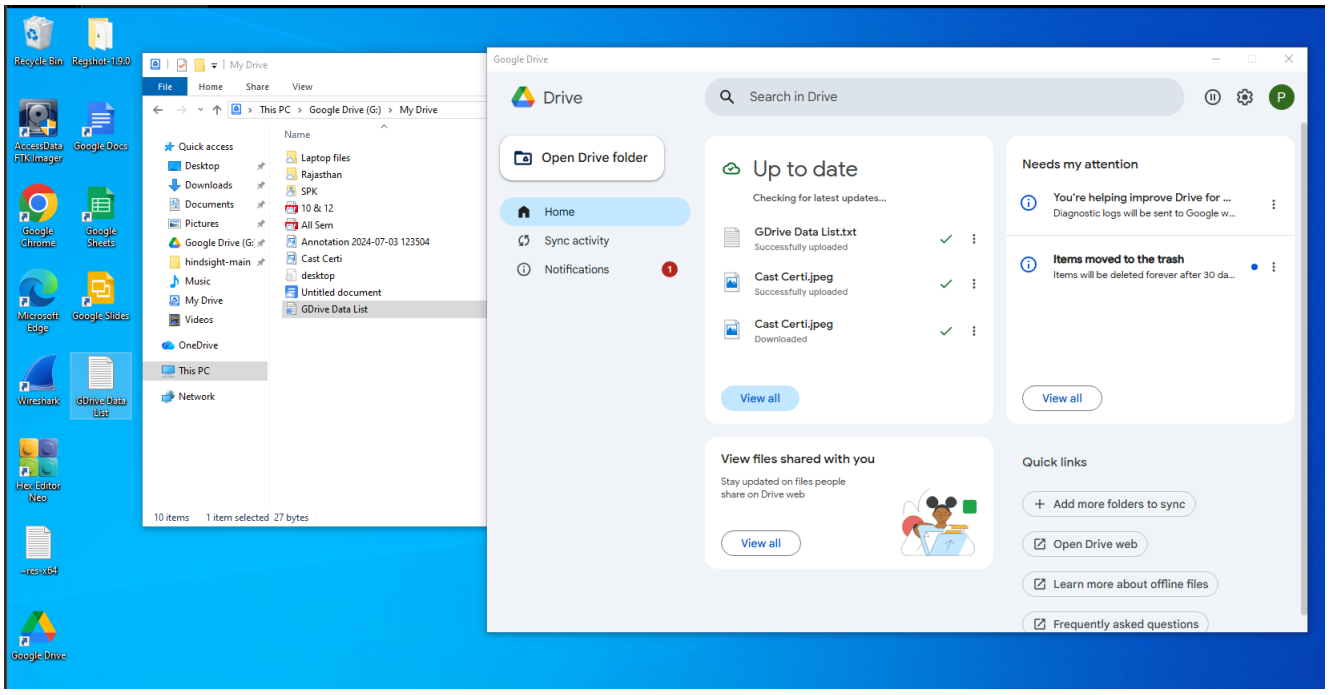


Figure 113 : Gdrive local Disk

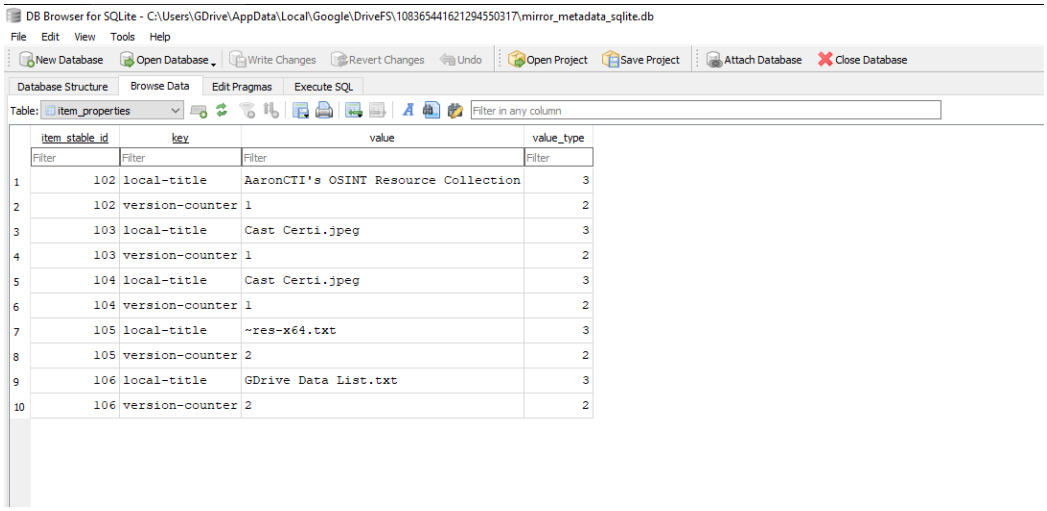
metadata_sqlite_db	11/11/2025 1:58 PM	File	472 KB
metadata_sqlite_db_local_counter_mmap	11/7/2025 4:25 PM	File	1 KB
metadata_sqlite_db-shm	11/11/2025 1:58 PM	File	32 KB
metadata_sqlite_db-vacuum_sentinel.bin	11/7/2025 4:26 PM	BIN File	1 KB
metadata_sqlite_db-wal	11/11/2025 1:58 PM	File	21 KB
metadata_update_db	11/7/2025 4:26 PM	File	28 KB
metadata_update_db-shm	11/11/2025 1:58 PM	File	32 KB
metadata_update_db-wal	11/11/2025 1:58 PM	File	0 KB
metrics_store_sqlite	11/11/2025 1:58 PM	Data Base File	24 KB
metrics_store_sqlite.db-shm	11/11/2025 1:58 PM	DB-SHM File	32 KB
metrics_store_sqlite.db-wal	11/11/2025 1:58 PM	DB-WAL File	0 KB
mirror_cello_metrics_store_sqlite	11/11/2025 1:58 PM	Data Base File	8 KB
mirror_cello_metrics_store_sqlite.db-shm	11/11/2025 1:58 PM	DB-SHM File	32 KB
mirror_cello_metrics_store_sqlite.db-wal	11/11/2025 1:58 PM	DB-WAL File	0 KB
mirror_metadata_sqlite	11/11/2025 1:58 PM	Data Base File	156 KB

Figure 114 : List of DB files created by Drive

Into the updated drive setup the work for the forensics is made easy before that we can check the two file like sync. DB and config.DB but in the but we can check only the mirror_metadata_sqlite.db in this we can have all types details even if the file is permanently deleted from the drive storage that`s why also we can see the all file meta data only

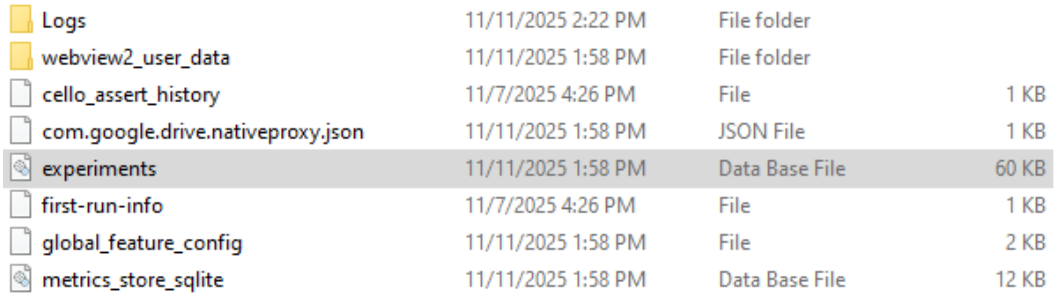
META DATA ARE FOUND DETAILS LIKE:

FILE ID, IS THE FOLDER OR NOT, File type modify date, views date, file size, file title.



	item_stable_id	key	value	value_type
1	102	local-title	AaronCTI's OSINT Resource Collection	3
2	102	version-counter	1	2
3	103	local-title	Cast Certi.jpeg	3
4	103	version-counter	1	2
5	104	local-title	Cast Certi.jpeg	3
6	104	version-counter	1	2
7	105	local-title	~res-x64.txt	3
8	105	version-counter	2	2
9	106	local-title	GDrive Data List.txt	3
10	106	version-counter	2	2

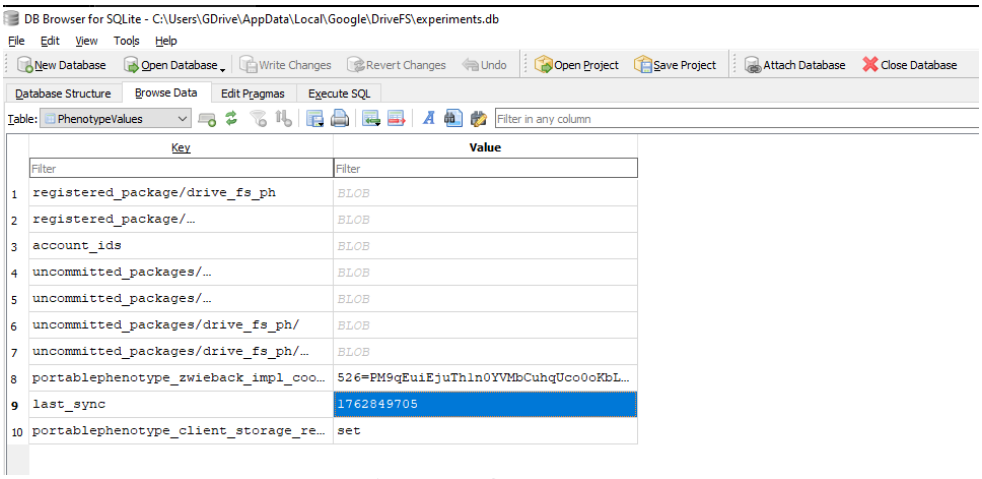
Figure 115 : Sync Data entry DB file



Logs	11/11/2025 2:22 PM	File folder	
webview2_user_data	11/11/2025 1:58 PM	File folder	
cello_assert_history	11/7/2025 4:26 PM	File	1 KB
com.google.drive.nativeproxy.json	11/11/2025 1:58 PM	JSON File	1 KB
experiments	11/11/2025 1:58 PM	Data Base File	60 KB
first-run-info	11/7/2025 4:26 PM	File	1 KB
global_feature_config	11/11/2025 1:58 PM	File	2 KB
metrics_store_sqlite	11/11/2025 1:58 PM	Data Base File	12 KB

Figure 116 : Data Entry Details with Epoch Time

In the experiment. DB sync data is always-label but it is in epoch time we can converted that time by any online epoch time converter.



	Key	Value
1	registered_package/drive_fs_ph	BLOB
2	registered_package/...	BLOB
3	account_ids	BLOB
4	uncommitted_packages/...	BLOB
5	uncommitted_packages/...	BLOB
6	uncommitted_packages/drive_fs_ph/	BLOB
7	uncommitted_packages/drive_fs_ph/...	BLOB
8	portablephenotype_zwieback_impl_coo...	526=PM9qEuiEjuThln0YVMbCuhqUco0oKbL...
9	last_sync	1762849705
10	portablephenotype_client_storage_re...	set

Figure 117 : Sync DB entry

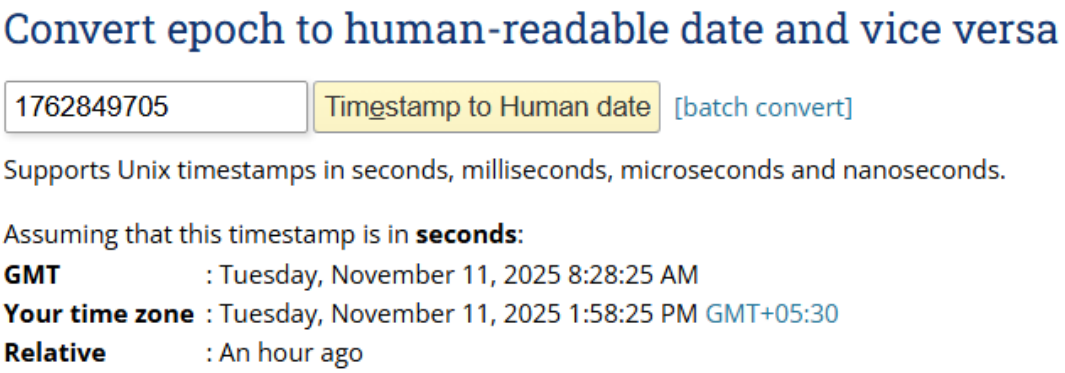


Figure 118 : File Sync Epoch Time

15.3 RAM dump

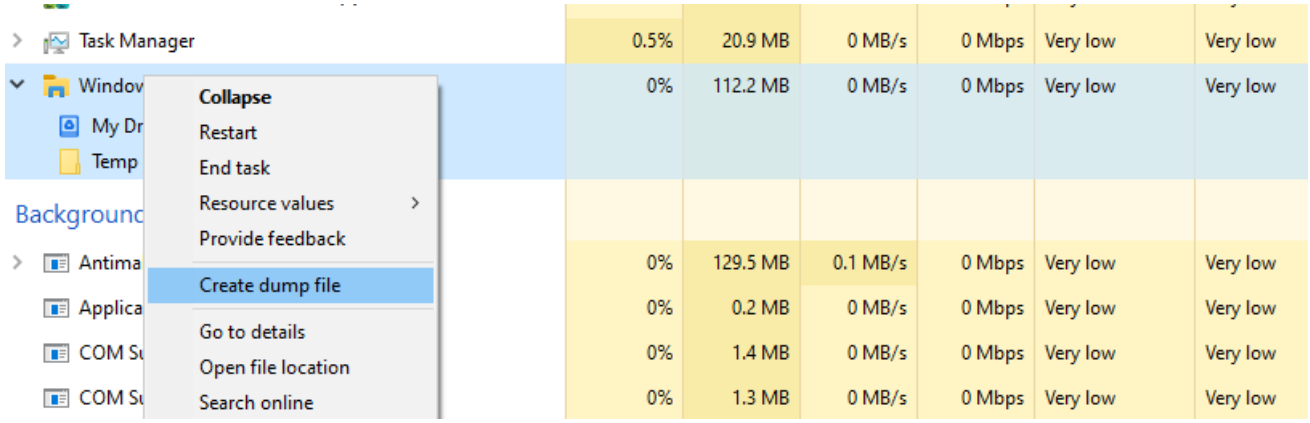


Figure 119 : Ram Dump through Task Manager

We can create a ram dump by FTK imager tools also and from task manager create dump also help for create ram dump.

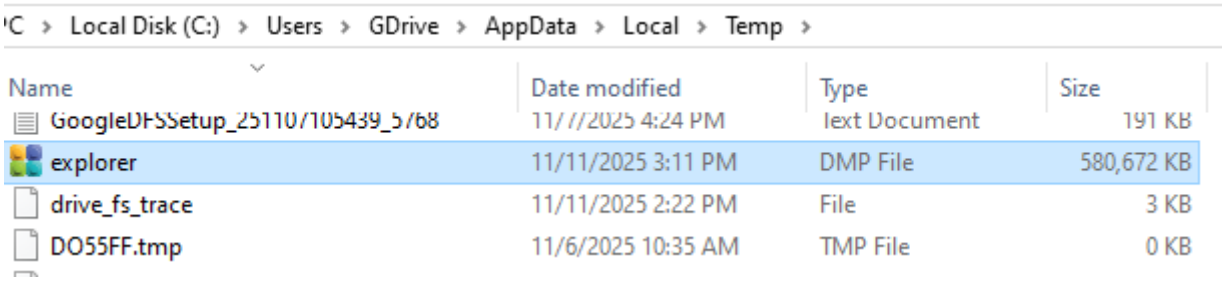


Figure 120 : Ram Dump Files

At the sync time the file was upload to drive at time in ram dump we can see the file name and its destination.

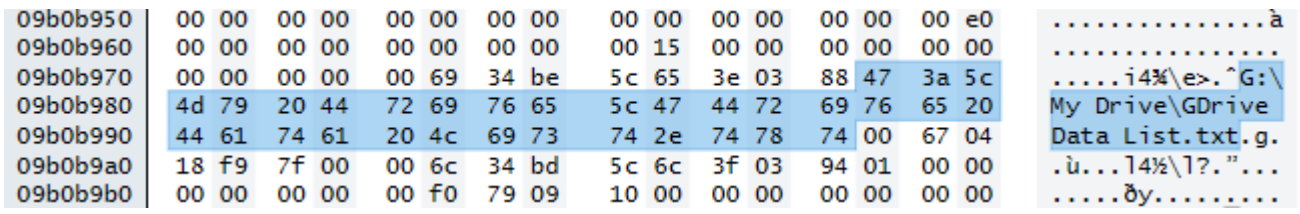


Figure 121 : File Location Reveal at Sync Time

15.4 Browser side forensic

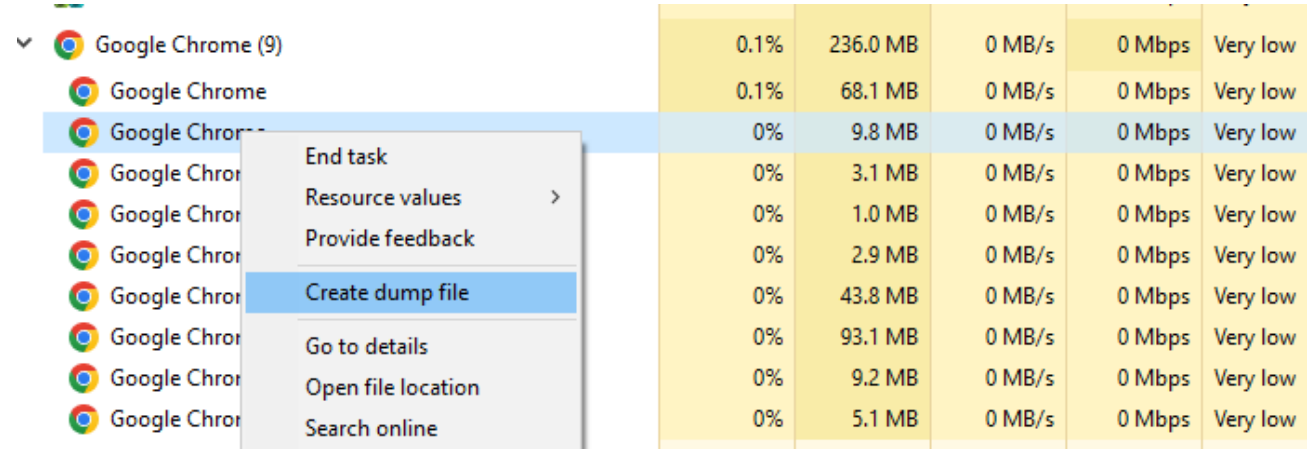


Figure 122 : Dump File Created

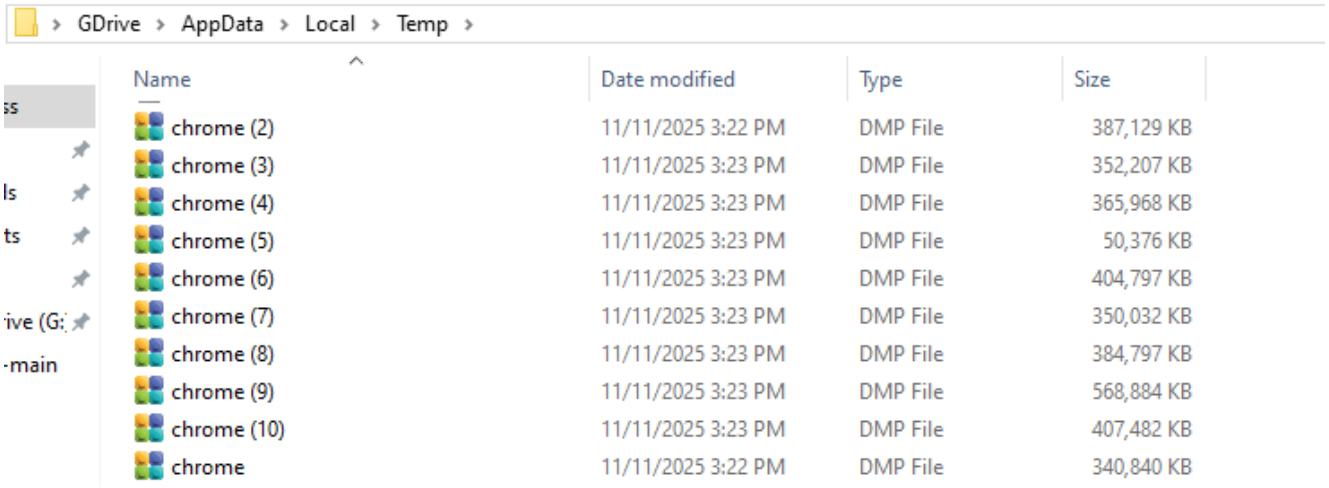


Figure 123 : Dump File Stored in Temp Folder

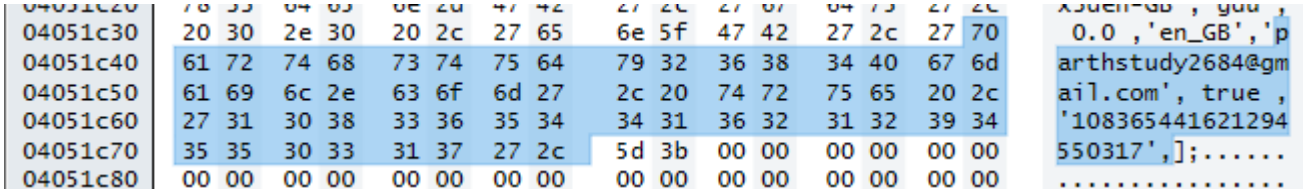


Figure 124 : Email Id found in Ram Dump

From the browser we can successfully extracted the email id of the user drive in plain text.

15.5 Disk analysis

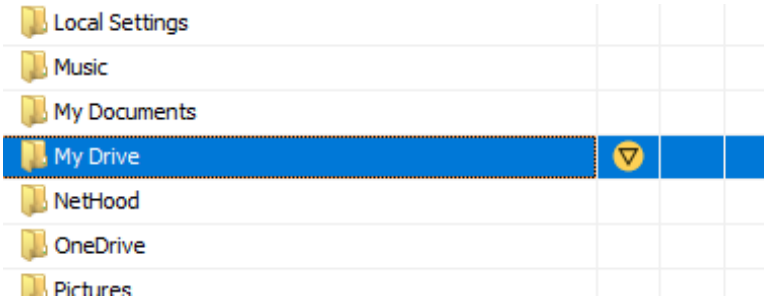


Figure 125 : Find GDrive location

We can find the separated folder in name by my drive in the disk analysis so that the we can understand that the Google drive is install in this user pc.

Source Name	S	C	O	Source Type	Score	Conclusion	Configuration	Justification	Category
GoogleDriveFS.exe				File	Likely Notable		Cloud Storage		Google Stream

Figure 126 : Gdeive installed .exe

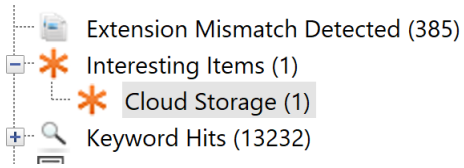


Figure 127 : Autopsy Suggested Cloud installed in this user

WebCacheV01.dat			file:///C:/Users/GDrive/Downloads/Regshot-1.9.0.7z
WebCacheV01.dat			file:///C:/Users/GDrive/Desktop/~res-x64.txt
WebCacheV01.dat			file:///C:/Users/GDrive/Desktop/GDrive%20Data%20List.txt
History		1	https://www.instagram.com/stories/jaydipnarigara/

Figure 128 : Browser history

mirror_cello_metrics_store_sqlite.db			0	2025-11-11 13:58:27 IST
mirror_cello_metrics_store_sqlite.db-shm			0	2025-11-11 13:58:33 IST
mirror_cello_metrics_store_sqlite.db-wal			0	2025-11-11 15:44:37 IST
mirror_metadata_sqlite.db			0	2025-11-11 13:58:27 IST
mirror_metadata_sqlite.db-shm			0	2025-11-11 13:58:33 IST
mirror_metadata_sqlite.db-vacuum_sentinel.bin			0	2025-11-07 16:26:07 IST

Figure 129 : Sync DB

108365441621294550317.lnk				C:\Users\GDrive\
Downloads.lnk				C:\Users\GDrive\
DriveFS.lnk				C:\Users\GDrive\
GDrive Data List.lnk				C:\Users\GDrive\
hindsight-main (2).lnk				C:\Users\GDrive\
hindsight-main.lnk				C:\Users\GDrive\
hindsight.lnk				C:\Users\GDrive\
hindsight_gui.lnk				C:\Users\GDrive\
Regshot-1.9.0.7z.lnk				C:\Users\GDrive\
requirements.lnk				C:\Users\GDrive\
setup.lnk				C:\Users\GDrive\

Figure 130 : uploaded successfully document are in lnk

Table PhenotypeValues 6 entries Page 1 of 1

Key	Value
account_ids	BLOB Data not shown
uncommitted_packages/drive_fs_ph/	BLOB Data not shown
portablephenotype_zwieback_impl_cookie_key	BLOB Data not shown
last_sync	BLOB Data not shown
registered_package/drive_fs_ph	BLOB Data not shown
portablephenotype_client_storage_reset_version_key_2	BLOB Data not shown

Figure 131 : GDrive DB we can't find the Last sync

webview2_user_data			2025-11-11 13:58:30 IST	2025-11-11
cello_assert_history		0	2025-11-07 16:26:04 IST	2025-11-07
com.google.drive.nativeproxy.json		0	2025-11-11 13:58:31 IST	2025-11-11
experiments.db		0	2025-11-11 13:58:31 IST	2025-11-11
first-run-info		0	2025-11-07 16:26:07 IST	2025-11-07
global_feature_config		0	2025-11-11 13:58:27 IST	2025-11-11
metrics_store_sqlite.db		0	2025-11-11 13:58:30 IST	2025-11-11

Figure 132 : Experiment. DB

metrics_store_sqlite.db-shm		0	2025-11-11 13:58:30 IST	2
metrics_store_sqlite.db-wal		0	2025-11-11 15:12:06 IST	2
pid.txt		0	2025-11-11 13:58:31 IST	2
root_preference_sqlite.db		0	2025-11-11 13:58:28 IST	2
root_preference_sqlite.db-shm		0	2025-11-11 13:58:30 IST	2
root_preference_sqlite.db-wal		0	2025-11-11 13:59:19 IST	2

Figure 133 : Root-Preference.DB

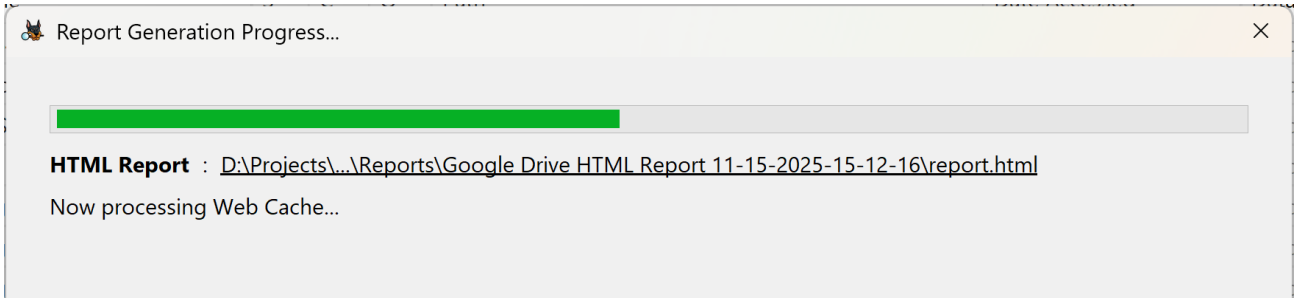


Figure 134 : Google Drive report created successfully

url	2025-11-15 08:56:05.526	https://accounts.google.com/v3/signin/challenge/pwd?TL=ANzgctSKE7-vWJI	Welcome	
autofill	2025-11-15 08:56:06.000		identifier	parthstudy2684@gmail.com
site setting (engagem	2025-11-15 08:56:09.288	https://accounts.google.com:443,*	lastEngagementTime in Preferen	{'last_modified': '13407699369288495', '
site setting (modified	2025-11-15 08:56:09.288	https://accounts.google.com:443,*	site_engagement [in Preferences	{'last_modified': '13407699369288495', '
site setting (characte	2025-11-15 08:56:15.000	accounts.google.com	Status: Live	last_loaded: 1763225775
site setting (modified	2025-11-15 08:56:16.081	https://accounts.google.com:443,*	fedcm_idp_signin [in Preference	{'last_modified': '13407699376081717', '
site setting (modified	2025-11-15 08:56:16.621	https://accounts.youtube.com:443,*	client_hints [in Preferences.profi	{'last_modified': '13407699376621692', '
site setting (modified	2025-11-15 08:56:17.401	https://accounts.google.co.in:443,*	client_hints [in Preferences.profi	{'last_modified': '13407699377401365', '
site setting (modified	2025-11-15 08:56:17.817	https://accounts.google.com:443,*	media_engagement [in Preferen	{'expiration': '13415475377817500', 'last
url	2025-11-15 08:56:25.945	chrome-extension://cpbgcbmddckpmhfbdckeolkkhkjjmplo/src/options/optic	StorageAce - Cookies, Local Storage and Session Storage Manager	
site setting (modified	2025-11-15 08:56:44.254	https://accounts.google.com:443,*	client_hints [in Preferences.profi	{'last_modified': '13407699404254083', '
site setting (modified	2025-11-15 08:56:45.643	https://drive.google.com:443,*	client_hints [in Preferences.profi	{'last_modified': '13407699405643058', '

Figure 135 : finding a history with auto fill data

local storage	https://drive.google.com	pushNotifications::promoDate::0434984250	1763312215146
local storage	https://drive.google.com	ui:previousBuild	drive.web-frontend_20251110.09_p1
local storage	https://drive.google.com	__sak	
local storage	https://drive.google.com	pse/591286274::[[42,1],"0434984250501155	Ch9bWzQyLDFdLCIwNDM0OTg0MjUwNTAxMTU1NjIzNyJdEi8KEggBwgYIIAA
session storage	https://drive.google.com/	ui:tabFirstStartTimeMsec	1763225811795
session storage	https://drive.google.com/	gapi.sessionStorageTest	

Figure 136 : Local and session storage

Account Information			
	access_point	66	
	account_id	108365441621294550317	
	email	parthstudy2684@gmail.com	
	full_name	Parth Gondaliya	
	gaia	108365441621294550317	
	given_name	Parth	
	hd	NO_HOSTED_DOMAIN	
	is_supervised_child	0	
	is_under_advanced_protection	FALSE	
	last_downloaded_image_url_with_size	https://lh3.googleusercontent.com/a/ACg8ocJMACBJ-iJZnYibf0xLp3jbiI1vQKOrZJdTMqlsKcnCpbcpMw=s256-c-ns	
	locale	en	
	picture_url	https://lh3.googleusercontent.com/a/ACg8ocJMACBJ-iJZnYibf0xLp3jbiI1vQKOrZJdTMqlsKcnCpbcpMw=s96-c	
Local file paths			
Autofill			
	enabled	<not present>	
Clearing Chrome Data			
	clear_lso_data_enabled	<not present>	
Per Host Zoom Levels			These settings persist even when the history is cleared, and may be useful in some cases.
Sync Settings			
	gaia_id	108365441621294550317	
	has_setup_completed	TRUE	

Figure 137 : email id used to search and profile name

Findings

	Ram Dump			Disk Analysis			Networking
	Email ID	Password	Internal Store password	DB	Sync Plain files	Browse ring history	Secured network TLSV2
Pcloud	✓	×	✓	✓	✓	✓	✓
Mega	✓	×	-	✓	✓	✓	✓
GDrive	✓	×	-	✓	✓	✓	✓
OneDrive	✓	×	×	✓	×	✓	✓

Challenges

Cloud environments raise several challenges for forensic examiners. Various research works have proved that traditional investigation approaches are often ineffective or even impossible to apply when working with state-of-the-art cloud services. Among the main challenges, there are geographical, legal, and privacy-related issues.

Cloud investigations are specifically complicated, as they involve thousands of virtual machines, multiple interconnected servers, and large numbers of cloud users-yet only one of these users may be relevant to the case. Collecting evidence from shared infrastructure risks disrupting services for other unrelated users, which is a major concern.

Furthermore, cloud systems operate at the back end, mostly invisible to users. Identity management is often reduced to a level of username and password, which can easily be intercepted or abused due to the open and distributed nature of the cloud. It is tough to ensure the authenticity of user activity since there is no physical control or interaction.

There is also a considerable shortage of dependable tools that are especially purposed for cloud forensics. The cloud ecosystem is very diverse, ranging from different platforms to diverse architectures, leading to a lack of standardization. This fragmentation makes it difficult to develop effective forensic tools capable of extracting data across multiple cloud environments.

Conclusions

Cloud technology growth and increased capability are rapidly changing the face of digital forensics. The aim of this project was to investigate cloud storage platforms and analyze how files, whether existing or deleted, can be analyzed and recovered. Our findings show that a number of artifacts remain even after files are deleted or after cloud storage applications are uninstalled. The number and type of artifacts vary depending on such actions as file creation, deletion, transfers, and movements within the application.

Different tools for virtualization security play an important role. Some provide general security functions like antivirus or backup, while others focus on the security of cloud environments or virtual machines. Since each type of tool serves a different purpose, organizations often deploy multiple solutions together-especially for applications handling sensitive or business-critical data.

Based on the forensic analyses performed in this work, some of the key observations include:

- Valuable information can be recovered by analyzing artifacts left behind by cloud storage clients.
- Google Drive uses **SQLite databases** to store file-related information.
- Google Drive should ideally implement encryption for its database files.
- The **mirror.log** file in Google Drive contains useful details about deleted files.
- RAM analysis can reveal configuration details and, in some cases, user identifiers or passwords.
- Traditional Windows artifacts can provide additional information relevant to the investigation.
- Although recovering evidence of deleted files is challenging, careful log analysis can often retrieve it.
- The **OneDrive SyncDiagnostics.log** file is helpful for examining recent synchronization activities.
- Traditional Windows artifacts such as browser history, thumbnails, and *pagefile.sys* also contain relevant evidence.
- Password recovery for OneDrive, MEGA, or pCloud Crypto is extremely difficult due to strong encryption.

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