

**NIST Internal Report
NIST IR 8471**

Cloud Test Data Creation and Population Document

Version 1.1

Richard Ayers

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Draft Stage 1

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Technology Laboratory*

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Abstract

This test data creation and population document provides an overview of data creation, population and documentation of artifacts created for cloud-based applications specified in Version 1.1 of [*Cloud & Remotely Stored Data Extraction \(CDX\) Using Account Credentials: Specification, Test Assertions, and Test Cases*](#). Version 1.1 provides additional documentation addressing data population for: Reddit, Telegram and Signal.

Due to the frequency of application updates that may occur during testing, it is advised to document the version number of the current application under test to maintain the fairness and integrity of the tool verification process.

Comments and feedback are welcome. This document and future revisions are available for download at: <https://www.cftt.nist.gov>.

Keywords

Cloud Forensics; Computer Forensics; Digital Forensics; Tool Testing.

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1. Introduction

This guide describes data artifacts identified for specific cloud-based services and steps to create, populate, and document various data types for cloud-based service applications. Additionally, the document describes each step for populating cloud-based service applications using the “*CFTT CDX Cloud Datasets*” (Computer Forensic Tool Testing Cloud Data Extraction Datasets) downloadable at: https://drive.google.com/file/d/1PcHONGSATdbdeWq8mNIO71-1Zw19RIA0/view?usp=drive_link

If the “*CFTT CDX Cloud Datasets*” are used to populate cloud-based applications, the dataset will need to be downloaded and uncompressed on the computer used for data population of cloud-based applications. Testing a tool for data extraction and reporting of cloud-based applications with a documented dataset provides the ability to verify accuracy of the tool being tested, and since the datasets are the same, it makes comparison of reports between labs easier.

Appendix A is a template for documenting the data when testing a tool capable of extracting cloud-based content from various applications. Data artifacts selected for various cloud-based services should be of types that are important for your lab. Use Appendix A to include additional types of data your lab may require.

The guide is divided into the following sections and appendix to describe how to document and populate applications within the following types of cloud-based services:

- Section 1: Storage
- Section 2: Email
- Section 3: Location
- Section 4: Productivity
- Section 5: Social-Media and Messaging
- Appendix A: Cloud data artifact template

Data population for cloud-based services require either a **pre-existing account** or the creation of a new account to allow for data population and documentation. You will need **two accounts** for each service provider (e.g., Google, Microsoft, Facebook, Twitter, TikTok). Documentation of credentials and the associated profile information is suggested for each service used in testing. The individual tester may either create their own cloud datasets or download the “*CFTT CDX Cloud Datasets*.”

Caution should be exercised if one decides to populate cloud-based services themselves, rather than using the “*CFTT CDX Cloud Datasets*”, the creation of cloud-based application data should not include any Personal Identifiable Information (PII) or clues to one’s identity or frequented locations of interest.

The “*CFTT CDX Cloud Datasets*” zip file contains subfolders: **storage**, **email**, **location**, **productivity** and **social_media**. Each subfolder contains various file types for each category to be used in testing. The file “README_FIRST.txt” contained in the CFTT CDX Cloud Datasets root folder provides details on the folder structure and all files included. Each subfolder also contains a file (e.g., application_info.html) that provides details (i.e., filename, md5, sha1,

sha256, created time, file size) for each individual file used for populating each cloud-based service type.

Note that file size and hash values may change based upon how the files are processed by a specific cloud-based application. For instance, when uploading a graphic, video or audio file, the cloud application may compress the contents or change the resolution which, in turn modifies the hash, file size, etc.

2. Storage Services

Data population for Storage Service accounts (e.g., Google Drive, iCloud, One Drive) require users to upload a variety of file types and document information about each file type uploaded to the cloud-based service used. It is recommended to create an account for each storage service that will be used when testing (i.e., if one does not have a pre-existing account) a tools ability to extract and report storage service content.

2.1. Google Drive, iCloud, One Drive

Data population for storage service accounts begins by either accessing or creating accounts (e.g., Google Account #1, iCloud Account #1, One Drive Account #1) that will provide the ability to upload data contents to a specific storage service.

The following data and profile information is suggested when populating and documenting data contents for **Google Drive**, **iCloud** and **One Drive** storage service.

- **Account Profile Data:** username, password, profile picture
- **Upload the following file types:** Audio (mp3, wav), Document (doc, pdf, txt), Graphic (bmp, gif, heic, jpg, png, tiff), Video (mov, mp4, avi, wmf, 3gp)
- **File Upload Data:** filename, file content, file size, creation date timestamp, last viewed date timestamp, hash (md5, sha1) of uploaded file

Step1: Access the storage service account and document the login credentials

Step2: Add user information to the storage service account e.g., profile picture, full name, organization. Profile information content will vary depending on the storage service account.

Step3: Upload the following file types to the service being tested: mp3, wav, doc, pdf, txt, bmp, gif, heic, jpg, png and tiff

Step4: Hash each file used for data population and document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If you are using the “*CFTT CDX Cloud Datasets*” upload the following files (audio, document, graphic, video) contained within the subfolders: google_drive, icloud and one_drive, each of which reside beneath the \CFTT CDX Cloud Datasets\storage folder. Files to upload are prefaced with google, icloud and one_drive. This provides different files to upload to each storage service.

3. Email Services

Data population for Email Service accounts (e.g., Gmail, Outlook) require users to create and receive incoming and outgoing emails some of which contain file attachments (e.g., audio, document, graphic, video) and document the location (folder the email resides – inbox, sent, draft), the datetime stamp, email header, and any file attachment details.

3.1. Gmail, Outlook

For email service data population, begin by either accessing or creating two accounts such as: Gmail Account #1, Gmail Account #2, Outlook Account #1 and Outlook Account #2 that will provide the ability to send and receive emails.

The following data and profile information is suggested when populating **Gmail** and **Outlook** email services.

- Account Profile Data: username, password, profile picture
- Contacts: name, email address, date timestamp of last time contacted, number (#) of times contacted, last viewed date timestamp (Note: Contacts may have to be created within the application)
- Email Data: direction (incoming, outgoing), status (read, unread), creation date, submitted date, delivered date, sender address, receiver address, subject, email body, file attachment filename, file attachment content, file size, file hash, folders where email data resides (drafts, inbox, sent\outbox), email header

Step1: Access the sending email account (e.g., Gmail Account #1, Outlook Account #1) and document the login credentials

Step2: Add user information to the storage service account e.g., profile picture, full name, organization. Depending on the email service account, profile information content will vary

Step3: Create outgoing emails (sent) to (e.g., Gmail Account #2, Outlook Account #2) that contain only text and individual emails that contain audio, document, graphic and video file attachments (e.g., mp3, wav, docx, pdf, txt, bmp, gif, heic, jpg, png, tiff, 3gp, avi, mov, mp4, wmv). Note: Different file attachments are required for incoming, outgoing and draft messages

Step4: Create Draft outgoing emails (not sent) to Gmail Account #2, Outlook Account #2 that contain only text and individual emails that contain attachments as mentioned in Step3

Step5: Hash each file attached in emails, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” sample emails are in the subfolders (draft, incoming, outgoing) each of which are located beneath \CFTT CDX Cloud Datasets\email\gmail and \CFTT CDX Cloud Datasets\email\outlook. Files located in these folders serve as the textual portion of the email. The textual portion of the email is to be copied and pasted into the body of the email service being tested.

For emails with file attachments, the files to be attached are located in the following subfolders: incoming_attachments, outgoing_attachments and draft_attachments. For example: \CFTT CDX

Cloud Datasets\email\gmail\incoming\incoming_attachments. Additionally, the textual portion of each email specifies the location\path and filename to be attached.

The textual portion or body of the email to copy and paste is prefaced with gmail_outgoing, gmail_incoming, gmail_draft and outlook_outgoing, outlook_incoming, outlook_draft. This provides different files to upload to each email service. For example, gmail_outgoing2_mp3_attachment.txt, gmail_incoming7_bmp_attachment.txt, etc. There are also sample emails containing non-Latin text for: Spanish, German, Russian, Chinese, Japanese and Arabic (e.g., gmail_draft18_Spanish_text.txt, outlook_incoming23_Arabic.txt).

Step6: Document each email as stated above

Step7: Access the receiving email account: Gmail Account #2, Outlook Account #2 and document the login credentials and respond to received emails as using the gmail_incoming, outlook_incoming templates located in email\gmail\incoming and email\gmail\outgoing

4. Location Services

Data population for Location Service (e.g., Google Maps) require users to create a variety of location data that includes specific longitude and latitude coordinates. Data population for location services entails activating location access on your mobile device or personal computer. The steps to turn on location access are performed by allowing the location service to use your location. The creation of location data can be performed by the following: taking a geotagged photo, taking a geotagged video, opening google maps and following a route to a destination or opening the location service and searching for a location and adding the location of interest or creating a route.

Note: Caution should be exercised if one decides to populate cloud-based location services themselves, rather than using the “*CFTT CDX Cloud Datasets*”, the creation of cloud-based application data should not include any clues to one’s identity or frequented locations of interest.

4.1. Google Location

Begin by either accessing or creating an account such as: Google Account #1. If a Google account was created when populating storage service: Google Drive, you can log in to Google with these credentials as used when accessing Google Drive.

When creating location-related data, it is suggested to create routes and travel to a destination and mark various points of interest using google maps. Documentation of location data includes the physical addresses of locations of interest and starting, end points of a route. Geotagging photos and videos can be accomplished by turning on location services and allowing access to location services for your device’s internal camera. Routes in the form of kml or kmz files, geotagged photos and videos are to be uploaded to your google maps. Login to your Google account select maps, click the menu, click “your places”, select “create maps”. You can create a custom route/path if you choose to do so, make sure and give your maps a descriptive title.

The following data are suggested when populating **Google Maps**:

- Account Profile Data: name, username, profile picture
- Document location (longitude, latitude) of a route either GPS or creating a route using Google maps
- Document location (longitude, latitude) of a destination when taking geotagged photos
- Document location (longitude, latitude) of a destination when recording geotagged videos
- Document the date and timestamp of each photo, video and route

Step1: Login to the Google account and document the login credentials

Step2: Add user information to the Google account e.g., profile picture, full name, organization.

Depending on the email service account, profile information content will vary. This may have already been populated if performed when creating a Google account for Storage Services

Step3: On your mobile device make sure log in to Google and open the “Google Maps” application allowing “Google Maps” to use your location

Step4: Begin a route in “Google Maps” by entering an address you will physically drive to and begin the route

Step5: Upon arrival of the destination, click done and save the route to your device

Step6: Take various pictures and record video with location services turned on, creating geotagged photos and videos. Document the longitude and latitude coordinates of each photo and video by clicking on “Get Info”

Step7: Hash each file (graphic, video, routes: kml, kmz), document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” upload the geotagged photos and videos located in the \CFTT CDX Cloud Datasets\location\google_location\graphic, \CFTT CDX Cloud Datasets\location\google_location\video, \CFTT CDX Cloud Datasets\google_location\routes\kml or kmz subfolders to Google Maps. The file: \CFTT CDX Cloud Datasets\location\google_location\location_coordinates.rtf contains the coordinate data and create timestamp information for each graphic, video file and the start-to-end points of routes for verification.

5. Productivity Services

Data population for Productivity Services (e.g., Google Contacts, iCloud Contacts, Google Calendar) require users to create and document data about each individual calendar entry and contact. Calendar entry data can vary based upon additional information (e.g., notes, recurrence) provided. Contact data can also vary based upon how much information is provided.

Note: Caution should be exercised if one decides to populate cloud-based location services themselves, rather than using the “CFTT CDX Cloud Datasets”, the creation of cloud-based application data should not include any clues to ones identify or frequented locations of interest.

5.1. Google Calendar

Begin by either accessing or creating an account such as: Google Account #1. If a Google account was created when populating storage service: Google Drive, you can log in to Google with these credentials as used when accessing Google Drive.

Document and create the data described below:

- Account Profile Data: username
- Calendar Data: calendar name, event description, location of event, start date, end date, event recurrence date range

Step1: Access the Google account and document the login credentials

Step2: Add user information to the Google account e.g., profile picture, full name, organization. Depending on the email service account, profile information content will vary. This may have already been populated if performed when creating a Google account for Storage Services

Step3: Navigate to the Calendar application

Step4: Create various calendar entries and provide event descriptions, location of event, start date, end date, event recurrence date range

Step5: Document all Calendar data

NOTE: If using the “*CFTT CDX Cloud Datasets*” access the file: Google_Calendar located in the \CFTT CDX Cloud Datasets\productivity\google calendar. The file contains 12 calendar entries that can be used to populate the Google Calendar. Entries contained in the Google_Calendar document will need to be copied and pasted into the Google Calendar application.

5.2. Google Contacts, iCloud Contacts

Begin by either accessing or creating an account such as: Google Account #1, iCloud Account #1. If a Google account was created when populating storage service: Google Drive, you can log in to Google with these credentials as used when accessing Google Drive. For iCloud accounts, profile information will need to be created.

Document and create the data entries described below:

- Account Profile Data: username
- Contact Data: name, contact photo, phone number, email, address, city, state, zip, contact website, groups, creation date of contact

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, full name, organization. Depending on the email service account, profile information content will vary. This may have already been populated if performed when creating a Google account for Storage Services

Step3: Navigate to the Contacts application

Step4: Create various Address book entries and include all input data on all available fields such as: Full name, contact photo, phone number, email, address, city, state, zip, contact website, groups and document the creation datetime stamp of each individual contact

Step5: Document all Contact data

NOTE: If using the “*CFTT CDX Cloud Datasets*” contact data are in the \CFTT CDX Cloud Datasets\productivity\google_contacts, \CFTT CDX Cloud Datasets\productivity\icloud_contacts folders. If using these datasets – upload each contact to the service being tested. Contact entries contained in service folders will need to be copy and pasted into the associated Contact application (i.e., Google, iCloud).

6. Social Media and Messaging Services

Data population for Social Media Services requires users to create 2 accounts that will provide the ability to send and receive direct messages, comment on posts, etc., offered in social media applications. Profile information for social media applications typically involves documentation of the following:

- Username, Email address, Login credentials
- Password
- Profile picture
- Additional information: DOB (Date of Birth), Gender, Workplace, Education, Family members, # of friends/followers, # of people following, etc.

Social media applications typically provide users with the ability to do the following:

- Create a contact list of friends
- Send and receive direct messages
- Send and receive VOIP (Voice Over Internet Protocol) calls
- Create Posts and Stories that may include an audio, graphic or video attachment
- Comment on posts
- Upload audio, graphic and video files

It is suggested when populating a particular social media application to document the content and datetime stamp of various data types provided by the social media platform and the version of the social media application being tested.

6.1. Facebook - Facebook Messenger

Begin by either accessing or creating an account such as: Facebook Account #1 and Facebook Account #2. Two active accounts will provide the ability to send and receive direct messages, comment on posts, stories, etc.

Document and create the data entries for Facebook Account #1, described below:

- Contacts: Name, interaction status (friend, family), profile picture, additional information (phone, DOB, education, family members, etc.)

- Direct Messages: Participants names, message content, creation date, last modified date, file attachments (audio, graphic, video), file size of attachments, file hash of attachments
- Posts: Author name, participants, type (post, comment, story), post content, creation date, file attachments, file content, file size of attachments, hash of attachments
- Comments: Creation date, participant name, comment text content
- Files: Filename, file content, file type (audio, graphic, video), file size, creation date, file hash

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, full name, organization. Depending on the social media application, profile information content will vary

Step3: Send a friend request to Facebook Account #2

Step4: Accept the friend request from Facebook Account #1

Step5: Send direct messages from Facebook Account #1 to Facebook Account #2. Direct messages should contain a variety of only text, emoticons, graphic, audio and video files

Step6: Respond to direct messages from Facebook Account #1 from Facebook Account #2

Step7: From account Facebook Account #1 – create various **Posts** that contain a variety of only text, emoticons, graphic, audio and video files

Step8: From Facebook Account #2 – comment on Facebook Account #1 Posts

Step9: Access your photo album and upload graphic files of type: bmp, gif, heic, jpg, png, tiff and video files of type: .3gp, .avi, .mov, .mp4 and .wmv

Step10: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\facebook folder.

1. Begin by opening the document in the subfolder \profile\facebook_profile_information.pdf and login to Facebook and update the profile information accordingly.
2. Open the \facebook\posts\facebook_posts.pdf document and follow the instruction to create a variety of posts containing only text, audio, document, graphic and video files. The file attachments for posts are located in the subfolders: \facebook\audio, \facebook\documents, \facebook\graphics and \facebook\video. The facebook_posts.pdf document provides specific instructions on which file to attach to each post.
3. Open the \facebook\direct_messages\facebook_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing only text, audio, document, graphic and video files. The file attachments for posts are located in the subfolders: \facebook\audio, \facebook\documents, \facebook\graphics and \facebook\video. The facebook_direct_messages.pdf document provides specific instructions on which file to attach to each direct message. NOTE: In order to send and receive direct messages a 2nd Facebook account must be available.
4. Open the \facebook\stories\facebook_stories.pdf document and follow the instruction to create a variety of posts to share to your stories timeline. Stories will contain a variety of text, audio, graphic and video files. The file attachments for posts are located in the subfolders: \facebook\audio, \facebook\graphics and \facebook\video. The facebook_stories.pdf document provides specific instructions on creating each story.

5. Open the \facebook\photo_album\facebook_photo_album.pdf document and follow the instruction to upload a variety of graphic and video files to the facebook photo album. The photo album will contain a variety of graphic and video files. The file attachments for the photo album are located in the subfolders: \facebook\graphics and \facebook\video. The facebook_photo_album.pdf document provides specific instructions on uploading each specific graphic and video file.

6.2. Twitter

Begin by either accessing or creating an account such as: Twitter Account #1 and Twitter Account #2. Two active accounts will provide the ability to send and receive direct messages, comment on tweets, etc.

Document and create the data entries for Twitter Account #1, described below:

- Contacts: Name, profile picture, bio, # of followers, # of people following, phone, email, date of last contact, # of times contacted, interaction status (follower)
- Chats\Direct Messages: Participants names, direction of message (incoming, outgoing), creation date, chat text, attached filename, attached file content
- Tweets\Posts: Author name, direction of post (incoming, outgoing), creation date, # of re-tweets, # of likes, type (tweet, comment, post)
- File attachments: Filename, file content, creation date

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, full name, organization.

Depending on the social media application, profile information content will vary.

Step3: Follow Twitter Account #2

Step4: Send direct messages from Twitter Account #1 to Twitter Account #2. Direct messages should contain a variety of only text, emoticons, graphic, audio and video files

Step5: Respond to direct messages from Twitter Account #1 from Twitter Account #2

Step6: From account Twitter Account #1 – create various *Tweets* that contain a variety of only text, emoticons, graphic, audio and video files

Step7: From Twitter Account #2 – comment on Twitter Account #1 Tweets.

Step8: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\twitter folder.

1. Begin by opening the document in the subfolder \profile\twitter_profile_information.pdf and login to Twitter and update the profile information accordingly.
2. Open the \twitter\tweets\twitter_posts.pdf document and follow the instruction to create a variety of tweets\posts containing only text, graphic and video files. The file attachments for posts are in the subfolders: \twitter\graphics and \twitter\video. The twitter_tweets.pdf document provides specific instructions on which file to attach to each post.

3. Open the \twitter\direct_messages\twitter_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing only text, graphic and video files. The file attachments for direct messages are located in the subfolders: \twitter\graphics and \twitter\video. The twitter_direct_messages.pdf document provides specific instructions on which file to attach to each direct message.

6.3. WhatsApp

Begin by either accessing or creating an account such as: WhatsApp Account #1 and WhatsApp Account #2. Two active accounts will provide the ability to send and receive direct messages, VOIP phone calls, etc.

Document and create the data entries for WhatsApp Account #1, described below:

- Contacts: Name, email, phone number
- Messages: Participants, creation date, file attachments, file content
- Call Logs: Participants, creation date, duration, status (received, missed), location coordinates (longitude, latitude)

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, full name, organization. Depending on the social media application, profile information content will vary.

Step3: Send direct messages from WhatsApp Account #1 to WhatsApp Account #2. Direct messages should contain a variety of only text, emoticons, graphic, audio and video files

Step4: Respond to direct messages from WhatsApp Account #1 from WhatsApp Account #2

Step5: From account WhatsApp Account #1 – place VOIP phone calls and document the date timestamp, duration and status of the call (e.g., incoming, outgoing, missed)

Step6: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\whatsapp folder.

1. Begin by opening the document in the subfolder \profile\whatsapp_profile_information.pdf and login to WhatsApp and update the profile information accordingly.
2. Open the \whatsapp\direct_messages\whatsapp_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing text, audio, document, graphic and video files. The file attachments for direct messages are located in the subfolders: \whatsapp\audio, \whatsapp\documents, \whatsapp\graphics, \whatsapp\video. The whatsapp_direct_messages.pdf document provides specific instructions on which file to attach to each direct message.
3. Open the \whatsapp\voip_calls\whatsapp_voip_calls.pdf and follow the instructions to create incoming, outgoing and missed voip audio and voip video calls.

6.4. Instagram

Begin by either accessing or creating an account such as: Instagram Account #1 and Instagram Account #2. Two active accounts will provide the ability to send and receive direct messages, comment on posts, etc.

Document and create the data entries for Instagram Account #1, described below:

- Contacts: Name, profile picture, bio, interaction status (friend, family), phone number, email
- Chats\Messages: Participants, creation date, last activity date, filename attachments, filename content
- Posts: Author, body of post, participants, creation date, last modified date, reactions (likes, comments) # of likes, filename attachments, filename content

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, full name, organization.

Depending on the social media application, profile information content will vary.

Step3: Follow Instagram Account #2

Step4: Send direct messages from Instagram Account #1 to Instagram Account #2. Direct messages should contain a variety of only text, emoticons, graphic, audio and video files

Step5: Respond to direct messages from Instagram Account #1 from Instagram Account #2

Step6: From account Instagram Account #1 – post a variety of graphic, audio and video files

Step7: From Instagram Account #2 – comment on Instagram Account #1 Posts.

Step8: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\instagram folder.

1. Begin by opening the document in the subfolder \profile\instagram_profile_information.pdf and login to Instagram and update the profile information accordingly.
2. Open the \instagram\posts\instagram_posts.pdf document and follow the instruction to create a variety of posts containing only text, graphic and video files. The file attachments for posts are located in the subfolders: \instagram\graphics and \instagram\video. The instagram_posts.pdf document provides specific instructions on which file to attach to each post.
3. Open the \instagram\direct_messages\instagram_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing only text, and graphic files. The file attachments for direct messages are located in the subfolders: \instagram\graphics. The instagram_direct_messages.pdf document provides specific instructions on which file to attach to each direct message.

6.5. TikTok

Begin by either accessing or creating an account such as: TikTok Account #1 and TikTok Account #2. Two active accounts will provide the ability to send and receive direct messages, comment on posts, etc.

Document and create the data entries for TikTok Account #1, described below:

- Inbox: # of Likes on a post, comments, followers, mentions by others
- Messages: Participants, creation date, last activity date, attached filename, filename content
- Uploaded Files: Filename, file content, creation date
- Posts: Author, body of post, participants, creation date, last modified date, reactions (likes, comments), # of likes, filename attachment, file content

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, full name, organization.

Depending on the social media application, profile information content will vary.

Step3: Befriend TikTok Account #2

Step4: Send direct messages from TikTok Account #1 to TikTok Account #2. Direct messages should contain a variety of only text and emoticons

Step5: Respond to direct messages from TikTok Account #1 from TikTok Account #2

Step6: From account TikTok Account #1 – post a variety of video files

Step7: From TikTok Account #2 – comment on Instagram Account #1 Posts.

Step8: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\tiktok folder.

1. Begin by opening the document in the subfolder \profile\tiktok_profile_information.pdf and login to TikTok and update the profile information accordingly.
2. Open the \tiktok\posts\tiktok_posts.pdf document and follow the instruction to create a variety of posts containing video files. The file attachments for posts are located in the subfolders: \tiktok\video. The tiktok_posts.pdf document provides specific instructions on which file to attach to each post.
3. Open the \tiktok\direct_messages\tiktok_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing only text and emoticons.

6.6. Discord

Begin by either accessing or creating an account such as: Discord Account #1 and Discord Account #2. Two active accounts will provide the ability to send and receive direct messages, and VOIP, video chats.

Document and create the data entries for Discord Account #1, described below:

- Profile information: Username, Profile Picture, About
- Messages: Participants, creation date, last activity date, attached filename, filename content
- Call Logs: Participants, creation date, duration, status (received, missed), location coordinates (longitude, latitude)

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, username, about the user.

Step3: Send direct messages from Discord Account #1 to Discord Account #2. Direct messages should contain a variety of only text, emoticons, graphic, audio, document and video files

Step4: Respond to direct messages from Discord Account #1 from Discord Account #2

Step5: From account Discord Account #1 – place VOIP phone calls and document the date timestamp, duration and status of the call (e.g., incoming, outgoing, missed)

Step6: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\discord folder.

1. Begin by opening the document in the subfolder \profile\discord_profile_information.pdf and login to Discord and update the profile information accordingly.
2. Open the \discord\direct_messages\discord_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing text, audio, document, graphic and video files. The file attachments for direct messages are located in the subfolders: \discord\audio, \discord\documents, \discord\graphics, \discord\video. The discord_direct_messages.pdf document provides specific instructions on which file to attach to each direct message.
3. Open the \discord\voip_calls\discord_voip_calls.pdf and follow the instructions to create incoming, outgoing and missed voip audio and voip video calls.

6.7. Reddit

Begin by either accessing or creating an account such as: Reddit Account #1 and Reddit Account #2. Two active accounts will provide the ability to send and receive direct messages, comment on posts, etc.

Document and create the data entries for Reddit Account #1, described below:

- Contacts: Name, profile picture, bio
- Chats\Messages: Participants, creation date, last activity date, message content
- Posts: Author, body of post, participants, creation date, last modified date, reactions (likes, comments) # of likes, filename attachments, filename content

Step1: Access the account(s) and document the login credentials.

Step2: Add user information to the account(s) e.g., profile picture, full name, organization. Depending on the social media application, profile information content will vary.

Step3: Follow Reddit Account #2.

Step4: Send direct text messages from Reddit Account #1 to Reddit Account #2.

Step5: Respond to direct messages from Reddit Account #1 from Reddit Account #2.

Step6: From account Reddit Account #1 – post a variety of graphic and video files.

Step7: From Instagram Reddit #2 – comment on Reddit Account #1 Posts.

Step8: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file.

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\reddit folder.

1. Begin by opening the document in the subfolder \profile\reddit_profile_information.pdf and login to Reddit and update the profile information accordingly.
2. Open the \reddit\posts\reddit_posts.pdf document and follow the instruction to create a variety of posts containing only text, graphic and video files. The file attachments for posts are located in the subfolders: \reddit\graphics and \reddit\video. The reddit_posts.pdf document provides specific instructions on which file to attach to each post.
3. Open the \reddit\direct_messages\reddit_direct_messages.pdf document and follow the instruction to create a variety of text direct messages.

6.8. Telegram

Begin by either accessing or creating an account such as: Telegram Account #1 and Telegram Account #2. Two active accounts will provide the ability to send and receive direct messages, and VOIP, video chats.

Document and create the data entries for Telegram Account #1, described below:

- Profile information: Username, Profile Picture, About
- Messages: Participants, creation date, last activity date, attached filename, filename content
- Call Logs: Participants, creation date, duration, status (received, missed), location coordinates (longitude, latitude)

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, username, about the user.

Step3: Send direct messages from Telegram Account #1 to Telegram Account #2. Direct messages should contain a variety of only text, emoticons, graphic, audio, document and video files

Step4: Respond to direct messages from Telegram Account #1 from Telegram Account #2

Step5: From account Telegram Account #1 – place VOIP phone calls and document the date timestamp, duration and status of the call (e.g., incoming, outgoing, missed)

Step6: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\telegram folder.

1. Begin by opening the document in the subfolder \profile\telegram_profile_information.pdf and login to Telegram and update the profile information accordingly.
2. Open the \telegram\direct_messages\telegram_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing text, audio, document, graphic and video files. The file attachments for direct messages are located in the subfolders: \telegram\audio, \telegram\documents, \telegram\graphics, \telegram\video. The telegram_direct_messages.pdf document provides specific instructions on which file to attach to each direct message.
3. Open the \telegram\voip_calls\telegram_voip_calls.pdf and follow the instructions to create incoming, outgoing and missed voip audio and voip video calls.

6.9. Signal

Begin by either accessing or creating an account such as: Signal Account #1 and Signal Account #2. Two active accounts will provide the ability to send and receive direct messages.

Document and create the data entries for Signal Account #1, described below:

- Profile information: Username, Profile Picture, About
- Messages: Participants, creation date, last activity date, attached filename, filename content

Step1: Access the account(s) and document the login credentials

Step2: Add user information to the account(s) e.g., profile picture, username, about the user.

Step3: Send direct messages from Signal Account #1 to Signal Account #2. Direct messages should contain a variety of only text, emoticons, graphic, audio, document and video files

Step4: Respond to direct messages from Signal Account #1 from Signal Account #2

Step5: Hash each file used for data population, document the filename, file content (description), file size, file creation and last viewed date timestamp of each file

NOTE: If using the “*CFTT CDX Cloud Datasets*” navigate to the \CFTT\social media\telegram folder.

1. Begin by opening the document in the subfolder \profile\telegram_profile_information.pdf and login to Telegram and update the profile information accordingly.
2. Open the \telegram\direct_messages\telegram_direct_messages.pdf document and follow the instruction to create a variety of direct messages containing text, audio, document, graphic and video files. The file attachments for direct messages are located in the subfolders: \telegram\audio, \telegram\documents, \telegram\graphics, \telegram\video. The telegram_direct_messages.pdf document provides specific instructions on which file to attach to each direct message.

Appendix A. Artifact Templates

This appendix provides users with an example template that lists the artifacts that the tool tests attempt to extract for each cloud service listed above. Each cloud service has a unique set of supported applications that create extractable artifacts. Some cloud services may have unique artifacts that are unrelated to specific applications.

- Storage: Google Drive, iCloud, and One Drive
- Email: Gmail, and Outlook
- Location: Google Location
- Productivity: Google Calendar, Google Contacts, iCloud Contacts
- Social Media and Messaging: Facebook, Twitter, WhatsApp, Instagram, TikTok, Discord, Reddit, Telegram, Signal

A.1. Storage Services

Table 1: Storage Services

Service (Storage)	Artifact Group	Artifact
Google Drive	Account Profile	Profile picture
		Username
		Password
		Token
	Files	Filename
		File content
		Size
		Creation Date
		Last viewed Date
		Hash
iCloud	Account Profile	Username
		Password
		Token
	Files	Filename
		File content
		File Type
		File Size
		Time of Last Update
One Drive	Account Profile	Username
		Password
		Token
	Files	Filename
		File content
		Size
		Creation Date

Service (Storage)	Artifact Group	Artifact
		Last Viewed Date
		Hash

A.2. Email Services

Table 2: Email Services

Service (Email)	Artifact Group	Artifact	
Gmail	Account Profile	Name	
		Username	
		Password	
		Token	
		Contacts	
		Full Name	
		Email Address	
		Last Time Contacted Date	
		# of Times Contacted Date	
		Last viewed Date	
	Email Data		Direction (incoming, outgoing)
			Status (read, unread)
			Creation Date
			Sender, Receiver email addresses
			Subject
			Email body
			Attachment Filename
			Attachment File content
			File size
			Folder: Drafts, Inbox, Sent
			Email header
			Hash
		Outlook	Account Profile
Password			
Token			
Contacts	Name		
	Email Data		
	Sender, Receiver email addresses		
	Subject		
	Creation Date		
	Submitted Date		
	Delivered Date		
	Email Body		
	Text		
	Attachment Filename		
	Attachment File content		
	Email header		

A.3. Location Services

Table 3: Location Services

Service (Location)	Artifact Group	Artifact
Google Location	Account Profile	Name
		Username
		Password
		Token
		Profile Picture
	Location Data	Kml Filename
		Kml File content
		Creation Date
		Longitude, Latitude coordinates

A.4. Productivity Services

Table 4: Productivity Services

Service (Productivity)	Artifact Group	Artifact	
Google Calendar	Account Profile	Username	
		Password	
		Token	
	Calendar Data	Calendar Name	
		Event Description	
		Location of Event	
		Start Date	
		End Date	
		Event Recurrence Date Range	
	Google Contacts	Account Profile	Email
			Password
			Token
		Contact Data	Name
Contact Photo			
Phone Number			
Email			
Address, City, St, Zip			
Contact website			
Groups			
Creation Date			
iCloud Contacts	Account Profile	Email	
		Password	
		Token	
	Contact Data	Name	

		Contact Photo
		Phone Number
		Email
		Address, City, St, Zip
		Contact info: notes, company
		Facebook username

A.5. Social Media and Messaging Services

Table 5: Social Media and Messaging Services

Service (Social Media and Messaging)	Artifact Group	Artifact	
Facebook	Account Profile	Username	
		Email	
		Password	
		Token	
		User info: Phone, DOB, Education, Family members, etc.	
		Contacts	
	Contacts	Name	
		Facebook ID	
		Interaction Status (Friend, Family)	
		Work Place	
		Contact info: Phone, DOB, Education, Family members, etc.	
		Posts	
	Facebook Messenger	Messages	Author Name
			Participants Names
			Type: comment, posts
			Post content
			Create Date
			Attachment Filename
			Attachment File content
			Participants (To, From)
Message content			
Creation Date			
Last Modified Date			
Attachment Filename			
Attachment File content			
File Size			
Hash			
Calls	Calls	Participants (To, From)	
		Creation Date	
		Duration	
Comments	Comments	Creation Date	
		Participant Name (From)	
		Comment text content	

Service (Social Media and Messaging)	Artifact Group	Artifact
	Files	
		Filename
		File content
		File types: Audio, Graphic, Video
		Create Date
		Hash
Twitter	Account Profile	
		Username
		Email
		Profile Picture
		Password
		Token
	Contacts	
		Name
		Profile Picture
		Bio
		# of Followers
		# of People Following
		Phone
		Email
		Date of Last Contact
		# of Times Contacted
		Interaction Status (Follower)
	Chats	
		Participants (To, From)
		Direction (incoming, outgoing)
		Creation Date
		Chat text
		Attachment Filename
		Attachment File content
	Tweets\Posts	
		Author
		Direction (incoming, outgoing)
		Create Date
		Text of Tweet\Post
		# of re-Tweets
		# of Likes
		Type (Tweet, Comment, Post)
	Files	
		Filename
		File Content
		File Attachment
		Creation Date
WhatsApp	Account Profile	
		Username
		Password
		Token
	Contacts	
		Name
		Email
		Phone Number
	Messages	

Service (Social Media and Messaging)	Artifact Group	Artifact
		Participants (To, From)
		Creation Date
		Attachment Filename
		File content
	Call Logs	
		Participants (To, From)
		Creation Date
		Duration
		Status (Received, Missed)
		Location (Longitude, Latitude)
Instagram	Account Profile	
		Username
		Profile Picture
		Password
		Token
	Contacts	
		Name
		Profile Picture
		Bio
		Interaction Status (Friend, Family)
		Phone Number
		Email
		Date of last contact
		# of times contacted
	Chats\Messages	
		Participants (To, From)
		Creation Date
		Last Activity Date
		Attachment Filename
		Attachment File content
	Posts	
		Author
		Body of Post
		Participants
		Creation Date
		Last Modified Date
		Reactions (Likes, Comments)
		# of Likes
		Attachment Filename
		Attachment File content
TikTok	Account Information	
		Username
		Profile Picture
		Bio
		# of Followers
		# of Following
	Inbox	
		Likes
		Comments
		Mentions
		Followers
	Messages	

Service (Social Media and Messaging)	Artifact Group	Artifact
		Participants (To, From)
		Creation Date
		Last Activity Date
		Attachment Filename
		Attachment File content
	Files	
		Filename
		File Content
		File Attachment
		Creation Date
	Posts	
		Author
		Body of Post
		Participants
		Creation Date
		Last Modified Date
		Reactions (Likes, Comments)
		# of Likes
		Attachment Filename
		Attachment File content
Discord	Profile Information	
		Username
		Profile Picture
		About
	Chats	
		Participants (To, From)
		Direction (incoming, outgoing)
		Creation Date
		Chat text
		Attachment Filename
		Attachment File content
	Call Logs	
		Participants (To, From)
		Creation Date
		Duration
		Status (Received, Missed)
Reddit	Account Information	
		Username
		Profile Picture
		Bio
	Messages	
		Participants (To, From)
		Creation Date
		Message Content
	Posts	
		Author
		Body of Post
		Participants
		Creation Date
		Last Modified Date
		Reactions (Likes, Comments)

Service (Social Media and Messaging)	Artifact Group	Artifact
		# of Likes
		Attachment Filename
		Attachment File content
Telegram	Profile Information	
		Username
		Profile Picture
		About
	Chats	
		Participants (To, From)
		Direction (incoming, outgoing)
		Creation Date
		Chat text
		Attachment Filename
		Attachment File content
	Call Logs	
		Participants (To, From)
		Creation Date
		Duration
		Status (Received, Missed)
Signal	Profile Information	
		Username
		Profile Picture
		About
	Chats	
		Participants (To, From)
		Direction (incoming, outgoing)
		Creation Date
		Chat text
		Attachment Filename
		Attachment File content

Appendix B. Change Log

Date	Type of Edit	Change	Location
1/3/2025	Additions	Social Media	Section 6 and A.5