The Dead Drops of Online Terrorism: How Jihadists Use Anonymous Online Platforms

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Abstract

The proliferation on terrorist online postings and their documented impact on recruitment of fighters and activation of lone-wolf operations caused governments and security agencies to launch various countermeasures. These measures—such as "deplatforming" or removal of terrorist online content, suspension of social media accounts, and pressuring social media companies to remove terrorist propaganda—have led terrorists to seek new alternatives. One of the more sophisticated ways extremists and terrorists are recently communicating is through the use of virtual dead drops. The dead drop, a term taken from the espionage terminology, was used to secretly pass information items using a clandestine location. Recently, the physical dead drop has been transformed to a digital one mainly in the form of anonymous sharing portals and cloud services. This study reveals the various platforms used by terrorist groups like the Islamic State, al Qaeda and al Shabaab to store and disseminate material on online dead drops. Scanning these dead drops led to a database containing all links used for directing to the virtual dead drops and the content posted herein, including texts, photos, videos, news broadcasts, weapon manuals ('cook books') and infographics. The database was subjected to a systematic content analysis, using a codebook with a list of criteria such as the platforms used for the dead drops, date of publication, type of content posted, a brief description of the content and extra links included in the posts, audience reaction (comments, likes, retweeting). The findings reveal that Jihadists are using the dead drops with growing sophistication, relying on more outlets and more links to the same content. Some groups are systematically using several anonymous platforms to publish their daily report, providing their followers with multiple ways to access and download propaganda content. This method allows them to reach larger audiences, to maintain their online presence for a longer time and to avoid total removal of their postings. The findings lead to several implications regarding the dialectic nature of the struggle between online terrorism and counter terrorism and the required preemptive measures.

Keywords: Online terrorism, anonymous platforms, cloud-share platforms, Internet, social media, terrorist propaganda

Introduction

The documented connection between the growing spread of violent extremist and terrorist content on the Internet and social media, and the increase of terrorist attacks and successful recruitment of foreign fighters, caused governments and security agencies to launch various countermeasures.[1,2,3,4,5] These measures include removal of online terrorist content, suspension of social media accounts, hacking websites and pressuring social media companies to remove terrorist propaganda as well as monitor the "chatter" for intelligence purposes (with the added value of Big Data analysis). Attempting to adapt to these countermeasures and maintain their online campaigns, groups like ISIS had to diversify their communication campaigns by moving from mainstream online platforms to fringe platforms.[6] Indeed, they have substituted popular platforms such as Facebook, Twitter and YouTube with encrypted platforms like Telegram, Signal, and WhatsApp, as well as with anonymous sharing portals. As Stern and Modi (2010) argued, "terrorists respond to changes in their environments by changing their mission and changing their shape. What is important in such events is that information logistics is essential in disseminating messages of terror."[7]

As revealed by a report by Fisher, Prucha and Winterbotham on "Mapping the Jihadist Information Ecosystem"[8], terrorists are innovative in responding to disruption efforts by authorities and counter terrorism agencies and find new ways to distribute content. As their study reveals, "While previously online jihadi activity was focused on posting content directly on major platforms, the research shows major platforms are now often

used to share URLs instead to facilitate access to content stored elsewhere. The major platforms are therefore being used as 'beacons' directing users to the material." Several studies revealed how the public digital storage Internet Archive is used by terrorists and extremists.[9] In June 2021, The Counter Extremism Project (CEP) reported that their researchers discovered a large cache of explosive manuals on the Internet Archive, finding 37 different manuals totaling more than 1,000 pages. The collection had been online for five years and received more than 10,000 views before it was removed by the Internet Archive. These manuals were made by various sources, including ISIS supporters and a weapons research group affiliated with the al-Nusra Front.[10]

One of the more sophisticated ways extremists and terrorists are using online communication to avoid detection is the use of virtual dead drops. The dead drop, a term taken from the espionage terminology, was used to secretly pass information items using a clandestine location for interim storage. Recently, the physical dead drop has been transformed to a digital one mainly in the form of anonymous sharing portals. Anonymous sharing portals are a catch-all name for online sites that are openly available, have no login requirement and thus provide anonymity and allow for sharing links of which content is to be collected, shared and mass distributed. Thus, these portals and sites act as a way to build in redundancy and protect against widespread content loss due to deplatforming. As such, they actually are the "Black Boxes" of cyber communication, being opaque from the outside. Consequently, anonymous sharing portals such as *JustPaste.it, Sendvid.com,* and *Dump.to* have become some of the most-used sites by ISIS and other terrorist and extremist groups. These websites can be used as supplementary sites in addition to YouTube, Twitter and Facebook. In Shehabat and Mitew's study 'Black-boxing the Black Flag: Anonymous Sharing Platforms and ISIS Content Distribution Tactics', the authors explore anonymous sharing portals and how ISIS uses them.[11]

The Dead Drops Platforms

There are several anonymous sharing platforms. The most popular is *JustPaste.it*, a Polish-made site that does not require registration, is not open to search engines and specific contents are accessible only by a given or shared link. This site also offers advanced features such as formatting and exporting to PDF, pasting text directly from a word processor or a web page, importing and pasting of images, secure content publishing and password-protected access. More important, from the terrorist point of view, is the ability to protect the contents from automated searches by web crawlers and algorithms by allowing the use of encrypt tags. The site received international attention after it became clear that ISIS supporters and operatives used it to post and disseminate information. ISIS used this site for disseminating video clips, images of executions and beheadings, texts promoting its radical ideology, and its online magazine Dabiq and its later editions. As reported by Stalinsky and Sosnow (2016), "*JustPaste.it* has been the most important content-sharing website for jihadis."[9] Very often, as reported by Shehabat and Mitew (2018), links to items uploaded on *JustPaste.it* have been shared on social media such as Twitter, Facebook, Telegram, and other social media platforms to aid in exposure.[13]

Well-known cases of using *JustPaste.it* by ISIS include the posting of a threat to Twitter employees who shut down ISIS accounts and publishing the names and addresses of American armed forces personnel (i.e., doxing). The posting on *JustPaste.it* was presented as a reaction to Twitter's censorship causing the suspension of 20,000 accounts suspected of ISIS association in February 2015. Fishwick (2015) noted that "JustPaste.it's role in Islamic State's propaganda machine has largely gone unnoticed,"[14] while Silverman (2014) argued that "jihadists discovered it as well, and the site soon became one of the favored tools of the Islamic State for sharing news, official communiques, and graphic propaganda."[15] Interestingly, most of these postings should have been deleted by JustPaste.it according to the platform's Terms of Service stating that "Any content that may spread hate or cause harm will be removed instantly." The site is owned and operated by Mariusz Żurawek, a Polish entrepreneur from Wroclaw. He maintains the site independently and argues: "It's not my choice that ISIS has selected my site ... As long as I'm cooperating with the police, removing content, not allowing ISIS to make propaganda, I think it's good for the site that many people will know about it."[16] In 2014, *JustPaste.it* removed some graphic postings that were calling ISIS operatives to launch their own content-sharing pages. In response, new sharing sites emerged, including *Manbar.me* in 2014, *nasher.me* in 2015, and *Alors.ninja* in

July 2015. These sites enabled ISIS to post and share propaganda material such as photos of attacks, battles and raids. Later, ISIS introduced *PasteMaker* and *Share Text*, which mirror the encrypted messages of *JustPaste.it*. Despite using these platforms occasionally, ISIS kept using *JustPaste.it*.[17]

Another online dead-drop site is *Sendvid.com*, providing a platform for anonymous video sharing thus substituting YouTube and Dailymotion. The potential was noted by various illegal groups including terrorists. ISIS, for example, posted its high-quality videos such as Flames of War 1 and 2, Message Covered with Blood, and Healing of the Hearts on *Sendvid.com*. As noted by Shehabat and Mitew (2018), "Sendvid is a crucial element of ISIS's information logistics as videos linked to Sendvid can also be shared via other social networks such as Facebook, Twitter, archive.org, Tumblr, Telegram, dump.to and email, or can be stored in users' Google Drive or Dropbox for future retrieval."[18] Dump.to is an alternative to *JustPaste.it* and was used by ISIS to "share, upload and converge links from similar sharing sites such as *JustPaste.it* and *sendvid.com* where all types of data can be stored and shared via a link to ISIS's affiliate networks."[19] ISIS uses *Dump.to* for "documents, video, voice messages, and music to be stored and shared, which in turn allows ISIS affiliates to aggregate, edit, curate, reclassify, and republish jihadi propaganda content."[20]

Terrorists and extremists are also migrating to cloud-sharing services. One such new platform is Telegram's blogging platform called *Telegraph*. This is an anonymous blog that offers the opportunity to share content with others without the need to own a Telegram account. Although Telegram did remove some Islamic State content and profiles from their platform, on Telegram's app *Telegraph*, terrorist groups—especially the Islamic State—have been posting, sharing and spreading their messages.[21] ISIS and its supporters are also using the Internet Archive platform to upload their content and thus frustrate efforts to delete their online propaganda. Internet Archive is used by ISIS by taking a screenshot of a page and then sharing the links to an Internet Archive location so if the content is taken down online it will available on the web archive. The Internet Archive, a San Francisco–based nonprofit organization committed to preserving the Internet and all of its content, became a useful platform for extremists and terrorists. In his report on "The Dark Side of Internet Archive", Fisher-Birch (2018) notes that "The site is rife with videos that offer instructions on making explosives as well as propaganda and recruitment videos made by terrorist and extremist groups."[22] The report reveals that a variety of terrorist groups such as ISIS, al-Qaeda, and the banned British neo-Nazi group National Action are storing on Internet Archive instructions like bomb-making videos, beheading clips, seductive calls to commit terrorist attacks, and attempts to recruit new members and followers. In her report "Digital Decay: Tracing Change Over Time Among English-Language Islamic State Sympathizers on Twitter", Alexander (2017) presents findings from the data set of tweets by ISIS sympathizers.[23] The report noted the Internet Archive was one of the top file-sharing services that was referenced in links within the tweets. In 2017 14.3 percent of all the ISIS-related material that was shared online was done so through *archive.org* compared with 6.9 percent on YouTube and 0.8 percent on Twitter.[24]

An additional platform used is Amazon Drive: Designed for storing and sharing videos, images, text and other content, it has been adopted by several terrorist and extremist groups. They found it to be a stable and reliable platform for disseminating their content. First, they upload the content and then share the links with followers and sympathizers, primarily through social media. According to Amazon's website, "All photos, videos and other files you upload to Amazon Drive are securely and privately stored in your Files and your Amazon Photos library." While Amazon has guidelines for its many platforms, including specific bans on terrorism, bigotry, hatred, or illegal discrimination, it has not been very active in removing terrorist content.

A study conducted by Ayad, Amarasingam and Alexander (2021) attempted to reveal the "Cloud Caliphate", the online repositories of Islamic State materials seemingly managed by sympathizers of the Islamic State.[25] The scan retrieved more than 90,000 items of propaganda content stored online. Using the initial links to a non-password-protected version of the cache promoted by pro-Islamic State accounts on Twitter, researchers gained access to what seemed to be the full extent of the 2.2-terabyte repository. This "Cloud Caliphate" is functioning as the archive of choice for a series of Islamic State websites and serves as a means to keep the memory of the "caliphate" alive. The study ends with the call "to identify, document, and study accessible

repositories and take stock of the methods used to build, promote, and maintain such resources"in order to really understand the propaganda dynamics and the options for countering this new challenge.[26]

The present article is an attempt to reveal the various platforms used by terrorist groups like the Islamic State, al Qaeda and al Shabaab to store and disseminate material on a variety of virtual dead drops like anonymous platforms and cloud services. We attempt to answer several research questions:

> RQ1: What are the platforms used by terrorist groups as their virtual dead drops?
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> RQ2: Who are the terrorist groups using the dead drops?
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> RQ3: What type of information is stored in these dead drops?
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> RQ4: Are there differences in the use of dead drops across terrorist groups?
>
> RQ5: Are there changes over time in the use of these dead drops?

Method

To examine the use of online dead drops by terrorist groups, we applied several stages of data collection and analysis. The first step involved creating a content database based on several basic criteria: we selected any terrorist content that included material designed for intimidation, radicalization, recruitment, online guidance to use weapons and explosives, calls for attacks and, in addition, materials published either on an anonymous sharing platform or available to download from a cloud-share platform. It should be noted that anonymous platforms such as *JustPaste.it* and *Telegraph* don't have a home page and it is possible to access the content only if one has the direct link. Therefore, to create the database we had to search for the links. We searched Twitter for any links to anonymous platforms and cloud sharing: Twitter was chosen since Stalinsky and Sosnow already noted the "use of Twitter and other services to share links to extensive content that they post on content-sharing web services such as JustPaste.it is well documented."[12] On Twitter, we searched for terrorist postings containing the following keywords, all associated with anonymous and cloud-share platforms: *JustPaste.it, Telegra.ph, dump.to, Noteshare.id, pastethis.at, manbar.me, nasher.me*, *files.fm, pixeldrain, OneDrive, Nextcloud, cloud drive, Top4top, Yandex.Disk, MixDrop, 4shared, Cloudmail, Archive.today, PCloud, UsersDrive*, and *Dropapk. to*. For example, on *Archive.today,* a cloud-sharing platform popular among terrorists, we searched daily for terrorist content by looking into all the screenshots saved on the web archive under the host *JustPaste.it*, *telegra. ph, noteshare.id, pastethis.at, manbar.me, nasher.me,* and *dump.to*. In addition, we followed @takedownterror account's initiative to keep track of the most frequently anonymous sharing platforms used by terrorists and added those to the dead drop data. In the third stage we analyzed the database of the content accumulating after both stages of our search. The database includes the links used for directing to the virtual dead drops and the content posted there, including text, photos, videos, news broadcasts, weapon manuals ('cook books'), and infographics.

The database, composed by this inductive process, was subjected to a systematic content analysis, using a codebook with a list of criteria such as the platform used for the dead drops, date of publication, type of content posted, a brief description of the content, extra links included in the posts and audience reaction (comments, likes, retweeting). We chose content analysis since, as highlighted by Krippendorff [28], content analysis not only gives the chance to the researcher to highlight trends and patterns from a large body of data but also provides an objective method of research. In fact, we created and analyzed two databases, one for the anonymous platforms and one for the cloud-share platforms. Our six-month scan (December 2020 to May 2021) revealed numerous postings on the dead-drop sites, as described in Table 1.

Table 1: Postings by Terrorists on Dead Drops (December 2020—May 2021)

Name of the Platform	Number of Items Analyzed	Type of Content
Justpaste.it	43	• Daily report • Al Naba magazine issue • Propaganda video • Photo report • Infographic • Telegram and hoop messenger accounts • List of extra links
Telegra.ph	27	• Daily report • Al Naba magazine issue • Propaganda video • Photo report • Infographic • Telegram and hoop messenger accounts • List of extra links
Files.fm	118	• Mp4 file news report video • Mp4 file propaganda video • PDF/Word file transcription of propaganda video • Zip file Al Naba magazine • Video file Al Naba newspaper • PDF file propaganda book
Pixeldrain	60	• Mp4 file propaganda video • PDF file Al Naba magazine • Zip file Al Naba magazine • Zip file infographics
Mediafire	60	• Mp4 file propaganda video • PDF file Al Naba magazine • Zip file Al Naba magazine • Zip file infographic
Onedrive	12	• Mp4 file audio speech • Mp4 file propaganda video
Nextcloud	40	• Mp4 file propaganda video
Top4top	44	• PDF/Word file transcription of a speech • PDF/Word file transcription of a propaganda video • PDF file propaganda documents • Mp4 file propaganda video • PDF file Al Naba magazine
Extra anonymous platforms • *Dump.to* • *Noteshare.id* • *Pastethis.at* • *Manbar.me* • *Nasher.me*	Total : 34 • 11 • 2 • 8 • 8 • 5	• Al Naba magazine issue (*dump.to*) • Single article (*noteshare.id, pastethis, manbar.me*) • Propaganda video (*pastethis.at*) • Photo report (*nasher.me, manbar.me, pastethis.at, dump.to*) • List of extra links (*dump.to, manbar.me, pastethis.at, noteshare.id*)

Analysis

Our analysis is based on the five Research Questions we outlined. First we examine the various platforms used for the dead drops (RQ1), the terrorist groups using them (RQ2), the content posted using the dead drops (RQ3), the differences across groups (RQ4); and finally, the changes over time in the patterns of use and content posted (RQ5). For the sake of clarity, in the first part of the analysis we will present each platform used, the groups using them, illustrative examples of the content available on this platform and differences across

groups. In the second part of the analysis, we will present the evolution over time in the use of online dead drops. Answering our first three Research Questions (the platforms, the users and the content) is the following descriptive analysis, differentiating between two types of platforms: a. anonymous posting platforms and b. cloud hosting platforms.

Anonymous Posting Platforms

JustPaste.it

The most frequently used platform of anonymous posting by terrorist groups is *JustPaste.it*. Terrorist groups using Paste.it usually direct their audiences to *JustPaste.it* by posting links on Twitter, in other posts published on other anonymous platforms or on the site *archive.is* (titled 'Archive Today' on its website), a platform that allows for storing screenshots of web pages. Terrorists can use this site by snapshotting it and then sharing the links, directing the users to the dead drop on *JustPaste.it*. This way there is a possibility that the link will not be available on the *JustPaste.it* site itself but it will be online and archived on *Archive.today.*

Our analysis reveals that the Islamic State—including its factions in Iraq, Afghanistan, Egypt, Syria, Pakistan, West and Central Africa, as well as Al Shabaab, the jihadist fundamentalist group based in East Africa and Yemen and the Taliban (The Islamic Emirate of Afghanistan)—is using the most frequently *JustPaste.it*. During our search period we found that the Islamic State has published at least one daily post on this dead drop. We also found that *JustPaste.it* is used more by terrorist groups and less by individuals supporters of these groups.

The Islamic State has been using *JustPaste.it* as one of the main anonymous platforms in combination with *Telegra.ph* (the anonymous platform created by Telegram) to share their content after other platforms such as *nasher.me* and *manbar.me* were taken down. Unlike other terrorist groups, the Islamic State uses *JustPaste. it* more frequently to spread terrorist content by including multiple links to other JustPaste/Telegraph posts, including various radical and extreme contents. Our database reveals that the Islamic State and its news agencies are using *JustPaste.it* for multiple purposes. First, the Islamic State is providing a daily update of the Islamic State action through a detailed news report including the number of people they either injured, killed or kidnapped, the number of weapons seized, and the number of villages destroyed or raided. Sometimes these daily posts are just updated with the latest news while in other cases a new report is created and posted. Every day the Islamic State presents in its daily report news items such as descriptions of the Mujahiddin actions in Iraq, Syria, Africa and other theaters of Jihad. Additionally, the Islamic State uses *JustPaste.it* to share photographic reports of its actions and screenshots of the latest issue of its current magazine (Al Naba magazine). For example, one of the photo reports from March 2021 shows the "Caliphate's Soldiers" attacking two Congolese army barracks. A detailed description of the Islamic State actions is attached to the photo report mentioning that during the attack against the barracks of the Congolese Army in a few villages of the Ronzuri area in Beni, the Islamic State affiliate did not only kill a few members of the Congolese army but also seized various weapons and ammunition. Another photo report included shows the Islamic State soldiers kidnapping and killing a member of the Egyptian army near Rafah, a Palestinian city in the Gaza Strip.

JustPaste.it, as mentioned before, is also used as a way to provide extra links to other extreme and radical content. In fact, each daily report post includes several links to other cloud-sharing platforms in case of removal of the original posting as well as links to previous daily reports, the latest issue of their magazine, video versions of the daily reports, propaganda videos, PDF books, infographics and video and radio transcripts in multiple languages. During Ramadan, several infographics included in the reports are dedicated to the principles and the rules of Ramadan especially how to fast, when to pray as well as the value of offering food to those in need. The material posted offers two-way communication for interactive platforms like Telegram official accounts and bot accounts. Other than the daily reports, the Islamic State publishes frequently special posts on *JustPaste. it* highlighting specific occasions such as the appearance of a new propaganda video, the publication of a new issue of Al Naba, or new infographics. In these instances, the posts are completely different from the daily reports since they are shorter and focus on a single topic but provide a long list of links to multiple sharing

platforms. Finally, the Islamic State uses *JustPaste.it* to post analyses of documents (e.g., the analysis in English of Zawahiri's letter to Zarqawi).

Another active actor on *JustPaste.it* is al Shabaab, whose presence on this platform increased significantly since we started our data collection in February 2021. Yet, their use of this platform differs from that of the Islamic State. First, their use is not as frequent as that of the Islamic State since they are not publishing a daily report but they are using the platform sporadically to share propaganda content. Yet, similarly to the Islamic State, al Shabaab postings come mostly Al Kata'ib, the group's media outlet. The links to *JustPaste.it* posts are available either on an archive platform or shared on Twitter by some of Al Shabaab's supporters. Unlike other terrorist postings on *JustPaste.it*, al Shabaab seems to follow the "traditional" postings on anonymous platforms by publishing single-topic posts. From the data collected, al Shabaab used the platform mostly as a venue for spreading their propaganda videos. These posts are rather simple and include the title of the video, the poster of the video and a list of links to cloud-sharing platforms to access the streaming, download of the content with different video resolutions as well as the transcript of it in English with multiple file option (PDF and DOC). As other terrorist groups, al Shabaab uses *JustPaste.it* for sharing its propaganda on a more secure platform that will not be tracked by counter terrorism.

The Taliban (or the Islamic Emirate) is also using *JustPaste.it* but as our analysis reveals, its presence on this platform is more sporadic and also mostly conducted by individual supporters. Similarly, the Taliban and its supporters use the platform for multiple purposes: to repost Taliban statements concerning multiple topics (e.g., accusing CIA agents for killing women and children or highlighting the need to punish the Americans for their intervention in Afghanistan) and to provide links to their official website and blogs.

Telegraph

Telegram is a freeware, cross-platform, cloud-based instant messaging (IM) software and application service. Telegram provides end-to-end encrypted voice and video calls and optional end-to-end encrypted "secret" chats. Users can send text and voice messages, animation, make voice and video calls, and share an unlimited number of images, documents, video clips, contacts, and audio files. In January 2021, Telegram surpassed 500 million monthly active users. It was one of the most downloaded apps worldwide in January 2021. Other than providing a secure messaging app, Telegram also launched an anonymous blogging platform named *Telegraph*. *Telegraph* is an anonymous platform with a minimalist interface that allows users to publish articles anonymously as well as posting videos, pictures, and more. The anonymity provided by *Telegraph* attracted several terrorist groups and their followers. From the data we collected, it was evident that the Islamic State uses *Telegraph* frequently.

The Islamic State has been using *Telegraph* for a long time and in a very consistent way. Our data reveals that like in the case of *JustPaste.it*, the main benefit of the platform in combination with cloud-share platform is to remain anonymous and under the radar of countermeasures applied by the authorities or the social media operators. *Telegraph* is used by the Islamic State for multiple purposes. The first type of content shared on *Telegraph* is the daily report. These reports are very similar to those posted on *JustPaste.it* and contain the news from the Islamic State's news agency, covering events in Iraq, Central and West Africa, Sinai and the Levant. The news, according to the Islamic State, revolves mainly around the group's actions and military successes. It is clear that the Islamic State, following its heavy losses in Syria and Iraq, is trying to regenerate its image by providing evidence to its ongoing fighting, conquests and the victimization of the enemies and tributes to their martyrs. An example of the information provided from March 2021: the conquest of Palma in Mozambique and the killing of more than 55 soldiers. Here as well, these daily posts often include the online publication of Al Naba magazine, links to the previous Islamic State's reports, propaganda video clips, daily reports in video format, religious books and publications. To encourage interaction, they also post the official accounts of the Islamic State's news agency as well as official Hoop Messenger accounts. Some of the posts include links to access material posted on other cloud-sharing platforms. Finally, some posts on Telegraph are used as databases with lists of multiple links to all forms of propaganda material: videos, audio recordings, books and

other items. Some of the links to the group's postings on *Telegraph* were found on *archive.is* but mostly in other *JustPaste.it* posts, highlighting how the Islamic State is trying to connect its audiences and followers to various dead drops and increase exposure.

Cloud-sharing Platforms

Cloud-sharing is a system in which the user is allotted storage space on a server, providing end users with the ability to access files with any Internet-capable device from any location. At its simplest, it is a secure virtual space that any user can access via his/her browser or a desktop application. The actual location of the stored files is usually in a data center somewhere, in a server, on a hard drive or solid-state drive. Usually, the users have the ability to grant access privileges to other users as they see fit. Terrorist organizations use these cloud-sharing platforms in combination with anonymous platforms to share propaganda online without being flagged and consequently their content stays online longer. As our study revealed, terrorists use multiple cloud-sharing platforms. The most commonly used are *files.fm, Pixeldrain, Mediafire, OneDrive, CloudShare, Nextcloud, Cloudflare, Yandex.Disk, Mixdrop, 4shared, Cloudmail, Top4top, pCloud, UsersDrive,* and *Dropapk. to*. The links terrorists post to direct their audiences to these cloud platforms are in their posts on anonymous-share platforms or directly on Twitter. Our scan of these cloud-sharing platforms reveals that terrorists provide multiple links to identical content they stored on various clouds in order to protect these materials from being completely removed. Moreover, the material is available in multiple format and language options, resolutions, and the option in certain cases to stream the content. The content that terrorists share on cloud-share platforms is not only about propaganda and news reports; it is broader and more varied, including, for example directions on how IS members should deal with COVID-19 or how to defend themselves from hackers, religious books and more. We also noted in our scan that terrorists do not use the option to publish password-protected links on cloud-sharing platforms, maybe in order to increase the reach and exposure of their material. In one exceptional case, when the posting included sensitive information concerning Mossad agents's identities, the cloud-sharing links were published on *manbar.me* and the password itself was included in the anonymous platform post. The terrorists using the cloud-sharing platforms, as our data show, are mainly the Islamic State and its affiliated groups as well as al Shabaab, al Qaeda and its affiliated groups and the Taliban. While terrorists are using numerous cloud services, the following section will review the most popular platforms.

Files.fm

The most frequently used cloud service used by terrorists is *Files.fm*, a cloud-storage platform that is private and encrypted, offering to stream the content before downloading it and the options to comment and if desired, to set up a password for accessing the material stored. The platform offers multiple plans; with the free one it offers storage up to 20 GB and upload up to 5 GB, messaging and an encrypted data channel. While the free plan offers only a few features, the pro plan offers the option to create password-protected links, direct download links, disable downloads (view only) and unlimited P2P traffic. The latest version is the business plan that offers unlimited-size files, and 2FA security service (2FA is the Two-Factor Authentication feature, when the clients' accounts on *Files.fm* are more secure and protected from unauthorized access due to the fact that they require an additional code when signing in).

Files.fm cloud-sharing platform has been used by several terrorist groups and as our scan reveals, mostly by the Islamic State especially for storing propaganda content. We noted that very often the links to the *Files.fm* files were posted on several social media (especially *JustPaste.it*) thus attempting to attract a broader audience and to avoid removal of a single guiding link. For example, we found that three links to the Islamic State's files stored on *Files.fm* were mostly added to the daily report post on *JustPaste.it*, directing to the stored Arabic video version of the daily report. Other than the daily report the Islamic State uses this cloud-sharing platform for other types of content, including the latest issue of Al Naba online magazine, infographics, propaganda videos such as the documentary published by Hadm al Aswar, a pro-Islamic State media outlet, entitled "Preparing Lions to Slaughter the Jews". Furthermore, the Islamic State uses this specific cloud-sharing service to enable its followers to download PDF files of Jihadi religious books such as the book of the Ummah or the Thalaathat-ul-

Usool (The Three Principle and Their Proof). The links directing to these *Files.fm* files are often included in the daily posts published on *JustPaste.it* and *Telegraph*. These multiple links provide various sizes and file options, different video resolutions and various video formats.

Another group using this cloud sharing is al Shabaab. Like the Islamic State, al Shabaab, uses *Files.fm* cloud mainly for propaganda purposes and in a similar method, posts the links guiding to the cloud files. The content stored by al Shabaab on *Files.fm* includes video clips created by the Harakat Al Shabaab Al Kataib Media such as the one entitled "From the Frontiers of Glory". The video includes footage of Al Shabaab Mujahiddin fighting against Somali and Burundian soldiers, dead Somali soldiers and the mujahiddin seizing weapons and destroying the enemy outposts. The content stored by al Shabaab on *Files.fm* includes video clips of their messages, such as the message to the people of Djibouti by the group's spokesperson Sheik Abu Ubdeydah Ahmad Omar. Al Shabaab also relies on the use of multiple links directing to the cloud file, using platforms and providing their followers with various file types and sizes. Thus, for example, the Sheik Abu Ubdeydah Ahmad Omar's message is available on *Files.fm* in multiple video resolutions as well as transcriptions of the speech in PDF and Word formats. Al Qaeda is also using *Files.fm*. Yet, al Qaeda uses *Files.fm* sporadically and it is not one of their most-used cloud platforms. Moreover, the majority of the links directing to the cloud files are published on Twitter and not on anonymous platforms. Al-Hurr, one of al Qaeda's Media outlets, has been using this cloud-share platform to share propaganda videos such as the one focusing on al Qaeda's messages to the Muslims of Kashmir.

Pixeldrain

Another cloud platform used by terrorist groups is *Pixeldrain*. This platform does not require registration and is free of charge. The free version allows advertisers to get the user's IP address and browser fingerprint while the premium version can be paid with bitcoin and preserves the user's anonymity. *Pixeldrain* also offers different paid options to prolong the storage time, allowing the option of up to 1,920 days with the so-called infinity plan. Our scan revealed that this platform is used mostly by the Islamic State and its affiliates. *Pixeldrain* is one of the cloud-sharing platforms used by the Islamic State to store and present the issues of Al Naba magazine and infographics, sometimes with the zip file option. Like in other platforms, the Islamic State uses *Pixeldrain* as an additional outlet to share propaganda video clips with multiple video resolutions (e.g., Islamic State of Sinai's video entitled "The Epic Makers"). Consequently, for each propaganda video, there are at least five *Pixeldrain* links so that the followers have the option to download the file with 1080p, 720p, 480p, 360p and 240p. Most of the *Pixeldrain* postings revealed by our scan have a close expiring date, indicating that the Islamic State's operatives are using mostly free accounts and not the premium accounts offering longer periods.

Although Al Shabaab is not using cloud-share platforms in the same extensive way as the Islamic State, it uses *Pixeldrain* to store and share its propaganda video clips such as the video message to the people of Djibouti by Sheikh Abu Ubeydah Ahmad Omar. The link to *Pixeldrain* appears with other links on a *JustPaste* post. The directing links also lead to *Pixeldrain* which presents the English transcript (PDF or DOC file) of the Al Shabaab spokesperson's message. Like the Islamic State, Al Shabaab uses multiple *Pixeldrain* files to provide its followers with the option to download the file in different resolutions and consequently different size files (e.g., the propaganda video published by Al-Kataib Media entitled "Verily Our Soldiers Will Be the Victors").

Mediafire

Mediafire is a file-hosting, file-synchronization and cloud-storage platform that offers the user up to 50 GB of free space, no download limit with ad-supported downloads. Using the business and premium plan one can have ad-free sharing and downloads, no captcha codes, password-protected files and one-time links. *Mediafire* has been used in combination with other platforms as a way to spread terrorist content and especially propaganda videos such as the one published by the Islamic State's al Khayr media foundation entitled "The State of Islam Will Remain". This video includes footage of Mujahidin's fighting to conquer a city or to maintain their outposts. The links to the *Mediafire* cloud storage of such videos are included in *JustPaste.it* postings

posts devoted to the recent release of propaganda videos highlighting the Islamic State's success and resilience, despite territorial losses. *Mediafire* is also used by the Islamic State for storing and sharing its new releases of online magazines as well as infographics. Here as well, different *Mediafire* links are posted to provide users the options to download the file in different sizes and video resolutions. From the data we collected there has been no case where the Islamic State shared *Mediafire* links to on social media such as Twitter or Facebook as they prefer posting these links on *JustPaste.it* or *Telegraph*.

OneDrive

OneDrive is a personal cloud storage platform that offers the option to upload multimedia from mobile devices with a user-friendly interface. Its links are not designed as anonymous. However, there is an option to generate anonymous guest links. *OneDrive* is used by terrorist groups to keep the flow of terrorist content online and provide safer storage and dissemination.

OneDrive is a cloud-share platform that has been rarely used by the Islamic State but, as our scan revealed, this platform is used to share content that is different than other Islamic State's cloud-sharing platforms. For example, the Al Furqan Foundation, one of the Islamic State's media production units, used a *OneDrive* link to share the audiotape of the speech of the official spokesman of the Islamic State Sheikh Al-Muhajir Abu Hamza Al-Qurashi titled "Tell Stories So That They May Reflect".

Unlike the Islamic State, Al Shabaab uses this cloud-sharing platform more frequently, especially to share propaganda videos through anonymous platforms. An example of the use of *OneDrive* by Al Shabaab is the propaganda video created by the official outlet Al-Kataib Media, titled "The Blessed Manda Bay Raid". The video included drone footage from when Al Shabaab attacked the US airfield and base at Manda Bay Airfield in Kenya. The links to the *OneDrive* contents were included in a *JustPaste.it* article and the links to the *JustPaste.it* article were found on Twitter.

Nextcloud

Nextcloud is a cloud-sharing platform that works similarly to Dropbox and Google Drive and provides a cloud platform based on Open Standards and Free Software. Thanks to the easy web and mobile interfaces, it allows the users to share files with others, create and send password-protected public links and upload files to the cloud. *Nextcloud* provides the option to let users upload and edit files anonymously. Similar to their use of cloud-share platforms, Islamic State operatives use *Nextcloud* to share propaganda videos by adding *Nextcloud* links to several *JustPaste.it* articles. For example, one of the propaganda videos the Islamic State shared when using *Nextcloud* was produced by the Al Furqan media outlet, and titled "They Answered the Call". This video includes footage of fighting as well as of the combatants' daily life in training camps plus highlights of their social activities such as helping people in need by donating money and food. Like with other cloud-share platforms, the Islamic State included for each new release of a propaganda video at least five *Nextcloud* links, one for each video resolution.

Top4top.io

Top4top.io is an Arab cloud-based storage system for uploading and downloading images, audio and video files of large sizes. *Top4top* is very popular in the Middle East and it is one of the favorite cloud service of the Islamic State. The Islamic State includes *Top4top* links in their *JustPaste.it* and *Telegraph* postings thus sharing PDF copies of the newest issue of Al Naba and propaganda videos. An example of the terrorist content shared with a *Top4top* link is the propaganda video created by the Al Battar media foundation, titled "the Muslim Prisoners of Patience". This video includes footage of Jihadi prisoners' daily lives as well as footage of martyrs dying in battle and gruesome footage of beheadings. The links to *Top4top*'s Al Battar video were posted on *JustPaste.it*. Al Qaeda has also used this platform in numerous cases to share propaganda videos and PDF documents of their spokespersons' speeches. Through its Al Sahaab (meaning: "the cloud") news media agency, Al Qaeda is

promoting the exposure to content by offering *Top4top* links to download propaganda documents in English such as the one titled "If You Repeat the Crime We Shall Repeat the Punishment". Another group, al Shabaab, also relies on *Top4top* to share its propaganda campaigns. For example, links to *Top4top* have been included in a *JustPaste.it* posting, to share Al Shabaab Al Kataib media outlet videos and English transcription of texts. An example of such video is one titled "Punish Them Severely to Disperse Those Who are Behind Them". This video includes footage of a few Al Shabaab terrorist attacks more specifically destroying Somali army tanks and trucks with rocket launchers.

Our scan of terrorist use of cloud-sharing revealed a vast range of platforms. In addition to those presented above, we found also *Yandex.Disk, MixDrop, 4shared, CloudMail, pCloud, UsersDrive,* and *Dropapk.to*. On all of these platforms we found terrorist materials and especially that of Jihadi groups. For example, on *Mixdrop* the Islamic State stores its video titled "Spirits in the Mountain", produced by the Turjuman al Asawirti, an Islamic State media production outlet. This video includes beheading footage of Islamic State prisoners, two speeches by former US presidents Barack Obama and Donald Trump about the heavy prices of fighting the Islamic State, and the commitment of the Islamic State to destroy its enemies and establish a global Islamic State. Another example is the propaganda video of al Qaeda titled "The Wound of the Rohingya is the Wound of the Ummah". Looking more like a brief documentary, this video includes audio clips of Sheikh Ayman al Zawahiri and real footage of Myanmar soldiers' atrocities against civilians while showing support for al Qaeda from the Rohingya community. On *CloudMail*, the Islamic State shares a video created by Hadm Alaswar media production, a sublevel pro Islamic State media outlet, entitled "Time to Pay". This video focuses on depicting the Islamic State martyrs as victims of the West, presenting real footage of Muslim orphan children and calling other Mujahidin to substitute the martyrs and bring about victory and justice. On *UsersDrive*, for example, Al Furqan, Islamic State media outlet, presents the "Trample of War", a propaganda video shot in Africa by the Islamic State–affiliated group Talea al-Ansar. This video provides footage of the Mujahidin fighting in the Sahel and a segment from an interview with French President Emmanuel Macron.

Evolution over Time

Our study has allowed us to track certain changes in the use of virtual dead drops by terrrorist actors and thus answer our Research Question 5 about possible evolution in the use of dead drops. It is clear that they migrated from "older" anonymous platforms such as *nasher.me, Manbar.me, NoteShare* or *PasteThis* to newer platforms such as *Just.Paste.it* and *Telegraph*. The content changed as well: before moving to newer platforms, the Islamic State used to publish posts dedicated to a single topic with just a few links while presently—except for sporadic cases like the launching of a new Islamic State propaganda campaign or the release of a new issue of Al Naba magazine—they create multi-topic posts. Moreover, some of the groups, especially the Islamic State, have added new features to their online propaganda in the form of daily reports that include news items from multiple countries, as well a list of links connecting the reader to various types of content. This ultimately serves to promote a broader range of propaganda content (e.g., books, magazines, audio and video clips).

The changing content included a change in the content from positive items to more negative items. For example, when scanning "older" postings on *nasher* and *Manbar*, we found photo reports of the livestock and poultry market in an Islamic State–conquered city Hawija in the Kirkuk Province of Iraq, photo reports of streets and public toilet repairs or photo reports of the distribution of food baskets to the poor. Such positive items are no longer featured in newer platforms like *JustPaste.it* and *Telegraph*, where violent, aggressive, threatening texts and visuals are the dominant themes. Before moving to *JustPaste.it* and *Telegraph*, the Islamic State was using specific platforms for specific types of content (e.g., using *Dump.to* to publish photo reports) while more recently those photo reports are included in the daily reports or in any dead-drop postings that have become multimedia platforms. These changes are also reflecting changes in terrorist propaganda strategy. For example, it is clear from our database that newer postings are clearly including more text while postings on the former anonymous platforms like *Manbar, nasher, PasteThis* and *NoteShare* focused on visual content (e.g., infographics, photo reports). Today the Islamic State is presenting longer news reports, combining texts with visuals. We also noted a significant decrease in the reactions of users to the content posted on most of the used

anonymous platforms. Thus, photo reports published in the past by the Islamic State on *Dump.to* received multiple comments while now the majority of the articles published on JustPaste or *Telegraph* do not receive any kind of comments from the users.

The new use of dead drops relies on more outlets and more links to the same content. Some terrorist groups are using systematically several anonymous platforms to publish day after day their latest report, providing their followers with multiple ways to access and download propaganda content. This method allows them to reach larger audiences, maintain their online presence for a longer time and avoid total removal of their postings. Another major change is that many of the newer dead drops are not posted by the group itself as was the case in the past, but by supporters, followers and sympathizers. Our scan also reveals an impressive increase in the use of dead drops, either in the forms of anonymous platforms or cloud sharing. For example, the Islamic State added to its anonymous daily posts another messaging app called *Hoop Messenger* to provide an additional option for contacting the group and also to give another venue to share propagada. *Hoop Messenger* was included in few posts in December 2020 and January 2021 but then abandoned until April 2021, giving more space to *Telegram* accounts. We also noted an increasing number of link postings on social media directing to content stored in cloud-sharing platforms. For example, the Islamic State increased its postings of links to cloud sites on platforms like *Files.fm*. These links directed the users to a variety of propaganda content (such as daily-report videos, transcription of videos in other languages, PDF books, infographics and newest magazine issues).

Conclusions

In the short time that the Internet has been publicly available (since the early 1990s) and the even shorter time that it has been widely used (since the late 1990s), it has revolutionized, for better or for worse, multiple aspects of lives in all corners of the world: politics, commerce, communications, education and entertainment. Couple the Internet's ubiquitous and extensive influence with the unprecedented rate of development in Internet technology, and there is little doubt that the medium will continue to evolve and affect the world's populations. One of the emerging threats is the free online flow of hate speech, incitement and violent extremism. Terrorists have used online services for more than two decades and have become more sophisticated in doing so. As terrorist use of the new media became more intensive, sophisticated, and alarming, so did the various countermeasures launched by governments, military, and counter-terrorist agencies. But the never-ending dialectic struggle between cyber-savvy terrorists and counter-terrorism professionals requires new thinking, preemptive measures and future-oriented policies.

This study has several limitations: our sampling relied on a search based on content and keywords (looking for any terrorist content that included material designed for radicalization, recruitment, online guidance to use weapons and explosives, calls for attacks, etc.) We searched on anonymous sharing platforms or cloud-sharing platforms. This means that our sample is far from being representative of the entire population of dead drops. Moreover, our data collection covered six months, and thus does not reflect changes or dynamics over a longer time frame.

As this study reveals, terrorist groups are reacting to countermeasures of deplatforming, removal of content, blocking access and pressuring social media companies to regulate their services. The use of dead drops in the form of using anonymous platforms and cloud sharing poses a real challenge to countering online terrorism and extremism. From a theoretical perspective, our findings should be interpreted within the framework of the new terrorist and extremist online ecosystem. As Fisher, Prucha, and Winterbotham suggested [8], the new online ecosystem is a large and complex network, connecting a vast array of platforms across the surface and dark web. Thus, the use of dead drops by jihadist movements joins other changes in their operating environment online and exploits a sophisticated online ecosystem characterized by speed of distribution, agility, and resilience of the network structure. This online struggle for survival and relevance creates an evolutionary process involving constant innovations and modifications.

From a practical perspective, our findings show that despite the efforts made by the *Global Internet Forum to Counter Terrorism* (GIFCT) and *Tech Against Terrorism* to enforce regulations and removal of terrorist online content, the cyber-savvy terrorists are moving to new forms of online presence. In 2018 the *JustPaste.it* owner and founder decided to join the *Global Internet Forum to Counter Terrorism* (GIFCT) and specifically to use the GIFTC hash-sharing database to locate terrorist content on his platform. *JustPaste.it* informed *Tech Against Terrorism* that thanks to the database, *JustPaste.it* "has been able to remove 10–12,000 articles including terrorist content."[24] It is indeed a promising way to empower smaller platforms with the tools to track down terrorist content on their platforms. Yet, the GIFTC forum's limited potency should be noted: the companies or the platforms are not required to report the content brought up by the database nor take down the terrorist content found. As our findings reveal, *JustPaste.it* and other platforms are still hosting terrorist postings and material on a daily basis, suggesting that even if the GIFTC database is used, its effectiveness is rather limited.

By posting their content on anonymous platforms and directing users to them and to other platforms, terrorists make their online existence harder to detect and remove. Although all these abused platforms and services are privately owned, it is largely in the hands of states and governments to react to abuses by extremists and terrorists. Public-Private Partnerships (PPPs) are widely seen as a necessity to combat terrorist use of the Internet in general and certainly more so in the case of new unregulated and anonymity-providing platforms. PPPs have been defined as collaboration between a public sector (government) entity and a private sector (for-profit) entity to achieve a specific goal or set of objectives. These partnerships have been discussed in narrow ways in the scholarly literature with regard to online security, new platforms and regulating privately owned platforms. In light of the challenges that PPPs face, the public and private sectors would be well served by showing why government-business partnerships are necessary and how their existence benefits online security. PPPs are more likely to achieve concrete objectives when both government and business immediately benefit from the collaboration.

To conclude, our findings suggest that counter-terrorism agencies should consider specific measures for dealing with anonymous and cloud-share platforms. The strategy has to be based on each platform's specific characteristics; for example, in the case of anonymous platforms the fact that the URLs posted to direct audiences to the dead drops do not include any sort of keywords or information but just random numbers and letters. In addition, countering online terrorist propaganda should take into consideration the dynamic nature of the dead-drop technique. Terrorists are not only exploiting the advantages of these anonymous services, namely anonymity, freedom of speech, lack of regulation and free access, but they also change their strategies, methods and propaganda dynamics, making it harder to harder to track them down.

Finally, so far the war on online terrorism has been mainly responsive and reactive. Counter-terrorism agencies have been monitoring online terrorism and attempted to respond with various measures. This resulted in a cat-and-mouse dialectic struggle. Instead, as this study may suggest, we should look forward and consider future platforms and challenges. Preemptive thinking should focus on emerging trends on the next generation of platforms and online services. There are numerous incentives that can be offered to the planners, designers and developers of the future for considering counter-terrorism measures in their plans and design. Governmental support and rewards are certainly some of the promising incentives.

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