

303 – How was it leaked

Team Information

Team Name : DogeCoin

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Instructions

Description There is a suspicious employee. Despite the company's policy of avoiding using cloud services, the employee has used many cloud applications. Analyze the image file of the employee's PC and find traces of internal data leakage!

Target	Hash (MD5)
Alice/Desktop.ad1	44e102ba99f4ed03c0d2cad1990463de

Questions

No.	Problem Description	Points
1	Identify the following information. <ul style="list-style-type: none">- OS version & build number- Installation date- Host name- Account information	10
2.1	By analyzing Slack App, identify the following information. <ul style="list-style-type: none">- Slack workspace (with domain, workspace name, accounts) & Channel lists in which the employee is participating	20

2.2	Analyze information about files downloaded by Slack App. <ul style="list-style-type: none"> - The downloaded files' name, path, download time - The contents of the downloaded documents, such as title, subtitle, author, related domain, account, etc. 	20
3.1	Describe all information related to the FTP service. <ul style="list-style-type: none"> - Connected server information - Account information used - Directory path information of local-server connection - Time information related to file transmission 	20
3.2	Describe the data leakage that occurred through FTP service in detail based on timeline analysis. <ul style="list-style-type: none"> - List of leaked data - The list of data the employee was trying to leak 	30
4.1	Analyze the following information by analyzing Google Drive. <ul style="list-style-type: none"> - Synchronization option (Account, local-remote sync path, etc.) - Number of files and directory structure on the cloud 	20
4.2	By analyzing the Google Drive sync folder, describe user activity such as upload, download, creation, copy, move, deletion, etc. in the last two days based on timeline analysis.	100
4.3	Develop an automation tool to solve #4.2 and submit it with source code.	30
5	Describe the following information related to Internet usage, based on timeline analysis. <ul style="list-style-type: none"> - File download history - Search history 	20
6	Describe the following information based on timeline analysis in detail. <ul style="list-style-type: none"> - Traces of using other cloud services - Traces of connection from external network - Traces of anti-forensics 	30

Teams must:

- Develop and document the step-by-step approach used to solve this problem to allow another examiner to replicate team actions and results.
- Specify all tools used in deriving the conclusion(s).

Tools used:

Name:	FTK Imager	Publisher:	AccessData
Version:	4.5		
URL:	https://accessdata.com/product-download		

Name:	DB Browser for SQLite	Publisher:	DigitalOcean
Version:	3.12.2		
URL:	https://sqlitebrowser.org/		

Name:	REGA	Publisher:	DFRC
Version:	1.5.3		
URL:	http://forensic.korea.ac.kr/tools.html		

Name:	DCode	Publisher:	Digital Detective
Version:	5.4		
URL:	https://www.digital-detective.net/dcode/		

Name:	ChromeCacheViewer	Publisher:	NirSoft
Version:	2.25		
URL:	https://www.nirsoft.net/utils/chrome_cache_view.html		

Name:	BrowsingHistoryView	Publisher:	NirSoft
Version:	2.48		
URL:	https://www.nirsoft.net/utils/browsing_history_view.html		

Name:	IE10Analyzer	Publisher:	Moai
Version:	1.0.0.6		
URL:	http://moaistory.blogspot.com/2016/08/ie10analyzer.html		

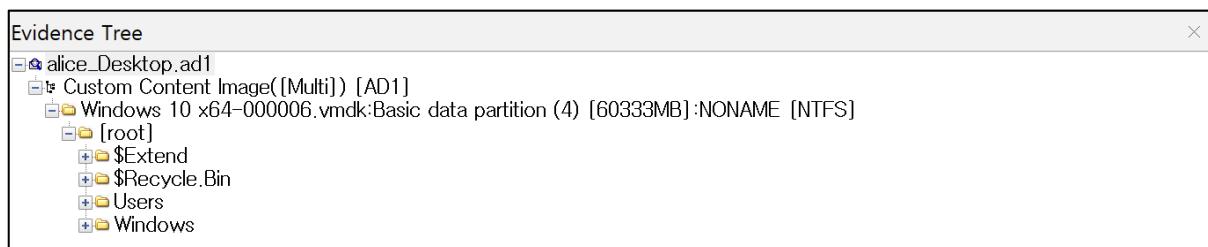
Name:	SRUM Dump	Publisher:	MarkBaggett
Version:	2.3		
URL:	https://github.com/MarkBaggett/srum-dump		

Step-by-step methodology:

No. 1 Identify the following information.

해당 문제에서 요구하는 정보 (OS 정보 및 사용자 정보 등)을 구하기 위해 윈도우 레지스트리 Artifact를 조사하였습니다.

다음의 경로에 있는 파일을 덤프 하였으며 레지스트리 파일들을 정상적으로 확인할 수 없어, “REGA”라는 툴의 복원 기능을 통해 각 하이브의 Key Value를 확인하였습니다.



[그림 1] 이미지 파일 내부

Name	Size	Type	Date Modif...
TxR	1	Direct...	2021-04-1...
systemprofile	1	Direct...	2019-12-0...
RegBack	1	Direct...	2019-12-0...
Journal	1	Direct...	2019-12-0...
bbimigrate	1	Direct...	2021-04-1...
userdiff.LOG2	0	Regul...	2021-04-1...
userdiff.LOG1	8	Regul...	2021-04-1...

[그림 2] 윈도우 레지스트리 파일 경로 내부 (C:\Windows\System32\config)

운영체제의 설치 정보를 구하기 위해 다음의 경로에서 InstallDate를 구하여서 시간을 변환해보았으나, 다른 Artifact에서 이전의 시기대에서 활동 내역이 확인되었습니다. 이는 윈도우 업데이트를 통해 갱신된 시간 정보임을 확인하였고, 최초 설치 일자를 확인하기 위해서 다른 경로의 시간정보를 확보하여 변환하였습니다. 그 결과 최초 설치 시간을 “2021. 4. 11. 오후 2:48:51” (UTC+9)로 확인할 수 있었습니다.

EditionSubVersion	REG_SZ	
InstallationType	REG_DWORD	Client
InstallDate	REG_DWORD	60767A5D
ProductName	REG_SZ	Windows 10 Pro
ReleasedId	REG_SZ	2009
SoftwareType	REG_SZ	System
LER	REG_DWORD	00000340
Pathname	REG_SZ	C:\Windows
ProductId	REG_SZ	00230-80000-0000-AA674
DigitalProductId	REG_BINARY	A4 00 00 00 00 00 00 30 33 33 30 2D 38 30 30 30 ...
DigitalProductId4	REG_BINARY	F8 04 00 00 04 00 00 30 00 33 00 36 00 31 00 32 00 2...
InstallTime	REG_QWORD	DE 2A 79 23 ED 30 D7 01
DisplayVersion	REG_SZ	2012
PendingInstall	REG_DWORD	00000000
RegisteredOrganization	REG_SZ	
RegisteredOwner	REG_SZ	dfc.alice@gmail.com

[그림 3] 이미지의 운영체제 정보 (HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\InstallDate)

InstallDate	REG_DWORD	607380C3
InstallTime	REG_QWORD	95 3D 88 59 96 2E D7 01
Pathname	REG_SZ	C:\Windows
ProductId	REG_SZ	00330-80000-0000-AA499
ReleasedId	REG_SZ	Windows 10 Pro
SoftwareType	REG_SZ	System
LER	REG_DWORD	00000498
MigrationScope	REG_DWORD	00000005

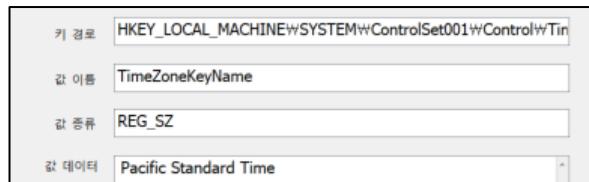
[그림 4] 이미지의 윈도우 업데이트 정보 (HKEY_LOCAL_MACHINE\SYSTEM\Setup\Source OS (Updated on 4/13/2021 09:49:26))

터치리포트	복원	검색결과	사용자 계정 정보
Administrator	Empty	500	500
Guest	Empty	501	501
DefaultAccount	Empty	503	503
WDAGUtilityAccount	Empty	504	504
dfcal	alice dfc	1001	1001

[그림 5] 이미지의 계정 정보



[그림 6] 이미지의 호스트 이름 정보 (HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Control\ComputerName\ComputerName)



[그림 7] 이미지의 타임존 정보 (HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Control\TimeZoneInformation)

이전 버전	이름	버전	제작자	설치 시간 (UTC+09:00)	설치 경로	소스	삭제 명령
x64 (64bits)	File Shredder 2.5	5.5.1 (u)	Pow Tools	2021-04-17 15:28:49 Sat	C:\... Pow...	"C:\Pro...	
x86 (32bits)	Microsoft Edge	89.0.774...	Microsoft Corporation	2021-04-17 00:03:52 Sat	C:\... Pro...	"C:\Pro...	
x86 (32bits)	Chrome	90.0.443...	Google LLC	2021-04-16 23:47:22 Fri	C:\... Pro...	"C:\Pro...	
x64 (64bits)	Microsoft Edge			2021-04-15 16:11:13 Thu			
x64 (64bits)	Microsoft Update Health Tools	2.75.0.0	Microsoft Corporation	2021-04-14 16:36:49 Wed	C:\... MsiExec...		
x64 (64bits)	Backup and Sync from Google	3.55.362...	Google, Inc.	2021-04-14 16:17:05 Wed	C:\... MsiExec...		
x64 (64bits)	Sync	2.0.14.139	Sync	2021-04-14 16:14:53 Wed	C:\... MsiExec...		
x86 (32bits)	FileZilla Client 3.53.1	3.53.1	Tim Kosse	2021-04-13 22:09:32 Tue	C:\... "C:\Pro...		
x86 (32bits)	Microsoft Edge Update	1.3.143.45		2021-04-13 22:09:32 Tue			
x86 (32bits)	TeamViewer	15.16.8	TeamViewer	2021-04-13 22:09:32 Tue	C:\... "C:\Pro...		
x86 (32bits)	Microsoft Visual C++ 2015-2019 Redistributable (x64) - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:32 Tue			
x86 (32bits)	Microsoft Visual C++ 2019 X86 Minimum Runtime - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:32 Tue	C:\... MsiExec...		
x86 (32bits)	Microsoft Visual C++ 2015-2019 Redistributable (x86) - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:32 Tue			
x86 (32bits)	Microsoft Visual C++ 2019 X86 Additional Runtime - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:32 Tue	C:\... MsiExec...		
x64 (64bits)	7-Zip 19.00 (x64)	19.00	Igor Pavlov	2021-04-13 22:09:30 Tue	C:\... C:\Prog...		
x64 (64bits)	Update for Windows 10 for x64-based Systems (KB4480730)	2.55.0.0	Microsoft Corporation	2021-04-13 22:09:30 Tue	C:\... MsiExec...		
x64 (64bits)	VMware Tools	11.1.5.1...	VMware, Inc.	2021-04-13 22:09:30 Tue	C:\... MsiExec...		
x64 (64bits)	Update for Windows 10 for x64-based Systems (KB4023057)	2.67.0.0	Microsoft Corporation	2021-04-13 22:09:30 Tue	C:\... MsiExec...		
x64 (64bits)	UpdateAssistant	1.25.0.0	Microsoft Corporation	2021-04-13 22:09:30 Tue	C:\... MsiExec...		
x64 (64bits)	Microsoft Visual C++ 2019 X64 Minimum Runtime - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:30 Tue	C:\... MsiExec...		
x64 (64bits)	Microsoft Visual C++ 2019 X64 Additional Runtime - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:30 Tue	C:\... MsiExec...		

[그림 8] 이미지에 설치된 응용 프로그램 목록

[표 1] OS 및 계정 정보

OS 버전 및 빌드 넘버	Windows 10 Pro, 19042								
OS 설치 일자 (UTC+9)	2021. 4. 11. 오후 2:48:51								
인증 소유자	dfc.alice@gmail.com								
컴퓨터 명	DESKTOP-PNTNPNV								
계정 정보	<table border="1"> <tr> <td>계정</td><td>dfcal</td></tr> <tr> <td>전체 이름</td><td>alice dfc</td></tr> <tr> <td>SID</td><td>1001</td></tr> <tr> <td>RID</td><td>1001</td></tr> </table>	계정	dfcal	전체 이름	alice dfc	SID	1001	RID	1001
계정	dfcal								
전체 이름	alice dfc								
SID	1001								
RID	1001								

No. 2.1 By analyzing Slack App, identify the following information.

해당 문제를 토대로 이미지를 분석한 결과, "Slack"이 설치되어 있음을 확인하였고, 이에 대한 정보 조사를 위해 "C:\Users\dfcal\AppData\Roaming\Slack\IndexedDB\https_app.slack.com_0.indexeddb.blob\1\00"를 확인하였습니다. 그 결과 총 2개의 바이너리 파일 (8: Python Developers, 9: dfc_workspace) 이 발견되었으며 두 개의 워크스페이스에 가입된 상태로 사용하였음을 파악할 수 있었습니다.

분석 결과, 각 IndexedDB 내부에 주요 정보 (사용자, 채널, 업로드 파일 등)가 JSON과 유사한 형태로 저장되어 있음을 확인하였습니다. 이에 정규식과 스트링 검색을 통해 해당 바이너리 파일 안에 사용자의 가입 워크스페이스 정보와 채널 목록을 아래와 같은 형태로 확인할 수 있었습니다.

```
unt_by_teamo" T01TUCMU6F7I { "app_countI" invited_countI { { { "memberso" U01U3KSREJYo" filesA $ "activityA $ "starsA $ "mentionsA $ "id" U01U3KSREJY "team_id" T01TUCMU6F7" name" dfc.alice" deletedF" color" 9f69e7" real_name" alice dfc" tz" America/Los_Angeles" tz_label" Pacific Daylight Time" tz_offsetI.. "profileo" title" "phone" "skype" "real_name" alice dfc" real_name_normalized" "alice dfc" display_name" "display_name_normalized" "fieldso{ "status_text" "status_emoji" "status_expirationI" "avatar_hash" 567da7d7aaafc" image_original" rhttps://s3-us-west-2.amazonaws.com/slack-files2/avatars/2021-04-10/1955672874948_567da7d7aafc48a9ede8_original.png" is_custom_imageT" email" dfc.alice@gmail.com" status_text_canonical" "team" T01TUCMU6F7" image_24"Ahttps://ca.slack-edge.com/T01TUCMU6F7-U01U3KSREJY-567da7d7aafc-24" image_32"Ahttps://ca.slack-edge.com
```

[그림 9] 워크스페이스 사용자 정보

```
h... .X.8.... "creator" U01U3KSREJY" last_setN ... .A{ "previous_namesA $ "latest" 0000000000.000000" is_memberT" last_read" 0000000000.000000" priority_" is_starredF" is_thread_onlyF" is_read_onlyF" is_org_mandatoryF" is_org_defaultF" _name_lc" working"$_show_in_list_even_though_no_unreadsF" scroll_topI "history_is_being_fetchedF" unread_highlight_cntI "unread_highlightsA $" unread_countI "unreadA $" "$has_fetched_history_after_scrollbackF" oldest_msg_ts0" connectedTeamIdsA $" internalTeamIdsA $" "isNonExistentF" isUnknownF" fromAnotherTeamF{." C01TUCMUAG5o" id" C01TUCMUAG5" name c ..d." is_channelT" is_groupF" is_i
```

[그림 10] Join된 채널의 정보 (영어)

```
..... ..... G I F I. .X... .t...! ..L... ..0.8...! "creator" U01U3KSREJY" last_setN ... .A{ "previous_namesA $" latest" 0000000000.000000" is_memberT" last_read" 1618118455.000200" priority_" is_starredF" is_thread_onlyF" is_read_onlyF" is_org_mandatoryF" is_org_defaultF" _name_lc c ..d."$_show_in_list_even_though_no_unreadsF" scroll_topI "history_is_being_fetchedF" unread_highlight_cntI "unread_highlightsA $" unread_countI "unreadA $" "$has_fetched_history_after_scrollbackF" oldest_msg_ts0" connectedTeamIdsA $" internalTeamIdsA
```

[그림 11] Join된 채널의 정보 (한글)

사용자가 가입된 채널의 정보는 평문으로 표기되었지만, 한글의 경우에는 리틀 엔디안 유니코드 (UTF-8)로 저장되어 디코딩 과정을 아래와 같이 수행해주었습니다.

```
63047CC7 18BC ➔ 0x0463 ➔ 0xC77C 일 ➔ 0xBC18 반  
63049CB7 64B3 ➔ 0x0463 ➔ 0xB79C 랜 ➔ 0xB364 덤
```

[그림 12] 한글 채널 명 디코딩 과정

위의 분석 과정을 통해 추출한 Slack의 사용자 정보는 다음과 같습니다.

[표 2] Slack의 사용자 정보

워크스페이스 정보 (1)	도메인	dfcworkspacehq		
	이름	dfc_workspace		
	사용 계정	dfc.alice (U01U3KSREJY)		
	참여 계정		dfc.charlie	dfc.charlie@gmail.com
			dfc.sybil	dfc.sybil@gmail.com
			dfc.trudy	dfc.trudy@gmail.com
			dfc.isaac	dfc.isaac@gmail.com
워크스페이스 참여 채널 (1)	일반 (C01UA3MCCL9) 랜덤 (C01TUCMUAG5) working (C01TGMLK3FZ) project_dfc (C01UB5N77FB) to_do_list (C01UB5NLD33) notice (C01TUCNSLFP)			
워크스페이스 정보 (2)	도메인	pythondev		
	이름	Python Developers		
	사용 계정	dfc.alice (U01UGMM051T)		
	참여 계정	(참여 사용자가 많고, 특이 활동이 없어서 생략합니다.)		
워크스페이스 참여 채널 (2)	announcements (C07EFBK3R) help (C07EFMZ1N), introductions (C07EHQYFN)			

추가로 “dfcworkspacehq” 워크스페이스 IndexedDB (9) 에 파일 업로드 및 데이터 유출과 관련된 대화가 오간 것을 확인하였으며, 아래와 같은 메시지 구조에 기반해 대화를 복원한 결과는 아래의 표와 같습니다.

```
ng_face{ o" type" "text" "text" " that is useful! { $ { $ { $ " client_msg_id"$c  
ac87a53-db2a-4af5-adaa-a9589211f4cf" type" "message" ts" 1618586185.002000" chann  
el" C01UB5N77FB" no_displayF" user" U01THPLGVHV" _rxn_key"%message-1618586185.00  
2000-C01UB5N77FB" subtype_ "text", Thx :slightly_smiling_face: " that is useful!"  
--meta_o" lastUpdatedTs" 3728.610000000117{ { " 1618586150.000900o" thread_ts_ "slackbot_feels0" _hidden_reply_ " reply_countI " replies_ " latest_reply_ " reply_
```

[그림 13] 채널 내부에서 전송된 대화 정보

[표 3] Slack 대화 로그 (project_dfc 채널)

시간 정보 (UTC+9)	대화	사용자
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2021년 4월 12일 월요일 오후 12:57:17	<@U01U3KSREJY>님이 채널에 참여함	dfc.alice
2021년 4월 14일 수요일 오후 8:07:15	<@U01THPLGVHV>님이 채널에 참여함	dfc.charlie
2021년 4월 14일 수요일 오후 8:12:21	<@U01TRPGBZML>님이 채널에 참여함	dfc.issac
2021년 4월 14일 수요일 오후 8:18:36	<@U01TYGZB998>님이 채널에 참여함	dfc.trudy
2021년 4월 14일 수요일 오후 8:19:50	<@U01TYGZC72N>님이 채널에 참여함	dfc.sybil
2021년 4월 16일 금요일 오후 11:58:09	Guys! Check Plz, This Document.	dfc.alice
2021년 4월 17일 토요일 오전 12:15:50	파일 업로드 (F01UCPFFU3Y, F01UGEL2WCVI, F01V9B2QH5EI) 파일 정보 식별 불가 - DB 내부에 정보 존재하지 않음	dfc.charlie
2021년 4월 17일 토요일 오전 12:16:25	Thx :slightly_smiling_face: that is useful!	dfc.charlie
2021년 4월 17일 토요일 오전 12:16:46	how about this?	dfc.charlie
2021년 4월 17일 토요일 오전 12:20:13	<@U01THPLGVHV> Tell me about it!	dfc.alice
2021년 4월 17일 토요일 오전 12:20:55	It is Types of information the cyber criminals can gain through data leakage flow	dfc.charlie
2021년 4월 17일 토요일 오전 12:21:08	are you understand?	dfc.charlie
2021년 4월 17일 토요일 오전 12:27:42	Check it	dfc.charlie
2021년 4월 17일 토요일 오전 12:27:44	문장 전송 (장문이므로 별첨 참조)	dfc.charlie
2021년 4월 17일 토요일 오전 12:28:28	파일 업로드 (F01UGG9RWKF) windows 10 forensics.pdf	dfc.charlie
2021년 4월 17일 토요일 오전 12:29:44	파일 업로드 (F01URPN00AG) refs_report.pdf	dfc.charlie
2021년 4월 17일 토요일 오전 12:30:25	파일 업로드 (F01UGGMKWER) 94fd963cec1d4d4185f2d27ecea7b1cf.pdf	dfc.charlie
2021년 4월 17일 토요일 오전 12:37:21	ok i will check it	dfc.alice
2021년 4월 17일 토요일 오전 12:37:24	Thx!	dfc.alice

No. 2.2 Analyze information about files downloaded by Slack App.

일전의 조사를 통해서 Slack 채널에 파일 업로드 흔적을 확인하였습니다.

이에 Slack 을 통해서 다운로드 받은 파일 정보를 확인하기 위해 아래의 경로에 있는

“C:\Users\dfcal\AppData\Roaming\Slack\storage\root-state.json”를 참고하였습니다.

그 결과, 아래와 같이 파일 3건의 정보를 확인할 수 있었습니다.

[표 4] Slack App을 통해 다운로드 받은 파일 정보

파일 명	파일 정보 (UTC+9)	
94fd963cec1d4d4185f2d27ecea7b1cf.pdf	저장 경로	C:\Users\dfcal\Downloads\
	다운로드 시작	2021. 4. 17. 00:31:30 AM
	다운로드 종료	2021. 4. 17. 00:31:31 AM
refs_report.pdf	저장 경로	C:\Users\dfcal\Downloads\
	다운로드 시작	2021. 4. 17. 00:31:38 AM
	다운로드 종료	2021. 4. 17. 00:31:39 AM
windows_10_forensics.pdf	저장 경로	C:\Users\dfcal\Downloads\
	다운로드 시작	2021. 4. 17. 00:31:43 AM
	다운로드 종료	2021. 4. 17. 00:31:44 AM

해당 파일들을 저장한 경로 및 기록된 다운로드 링크를 확인하였으나, 삭제되었거나 Private 링크인 관계로 파일을 획득 할 수 없었습니다. 이에 부가 정보를 획득하기 위해 ChromeCacheViewer로 캐시를 조사한 결과, 다운로드 받은 파일과 연결되는 셈네일 캐시 파일을 특정할 수 있었습니다.

	https://files.slack.com/files-tmb/T01TUCMU6F7-F01UGG9RWKF-1505b6cd4f/windows_10_forensics_thumb... image/png 230,393 2021-04-17 오후 ... 2021-04-17 오후 ...	
	https://files.slack.com/files-tmb/T01TUCMU6F7-F01UGGMKWER-152b1-49eb3/94fd963cec1d4d4185f2d27... image/png 27,378 2021-04-17 오후 ... 2021-04-17 오후 ...	
	https://files.slack.com/files-tmb/T01TUCMU6F7-F01URPN00AG-245f929a11/refs_report_thumb_pdf.png image/png 132,234 2021-04-17 오후 ... 2021-04-17 오후 ...	

[그림 14] 다운로드 파일과 관련된 캐시 매팡

	225 Regul...	2021-04-16 오후 3:31:19
	27 Regul...	2021-04-16 오후 3:31:19
	130 Regul...	2021-04-16 오후 3:31:19

[그림 15] C:\Users\dfcal\AppData\Roaming\Slack\Cahce 내부의 다운로드 문서 관련 캐시

해당 캐시들을 조회한 결과, 문서의 표지 이미지를 획득할 수 있었고, 이를 기반으로 해당 문서의 제목, 부제, 저자, 연관 분야 정보 등을 획득 할 수 있었습니다.

```
s_rich_previewF" actionsA $ " channelsA $ " headers_" is_sharedF" comments_cou  
ntI " converted_pdf_{%" F01URPN00AG" commentsA $ " imsA $ " groupsA $ " id"  
F01URPN00AG" is_tombstonedF" createdN @Yk .A" timestampN @Yk .A" name" refs_re  
port.pdf" title" refs_report.pdf" mimetype" application/pdf" filetype" pdf" pret  
ty_type" PDF" user" U01THPLGVHV" editableF" sizeI... " mode" hosted" is_external  
F" external_type" " is_publicT" public_url_sharedF" display_as_botF" username" "  
url_private" Ihttps://files.slack.com/files-pri/T01TUCMU6F7-F01URPN00AG/refs_re
```

[그림 16] Slack에 업로드 된 파일의 메타데이터

또한 파일 관련 데이터와 채팅 데이터를 교차 검증함으로써 아래의 파일 업로드 유저를 식별하였습니다.

```
.com" is_selfT" manual_presence" active" first_loginN @... .A{(" U01THPLGVHV0" f  
ilesA $ " activityA $ " starsA $ " mentionsA $ " id" U01THPLGVHV" team_id" T  
01TUCMU6F7" name" dfc.charlie" deletedF" color" e7392d" real_name" Dfc.charlie"  
tz" Asia/Seoul" tz_label" Korea Standard Time" tz_offsetI.. " profileo" title" "  
phone" " skype" " real_name" Dfc.charlie" real_name_normalized" Dfc.charlie" di  
splay_name" Dfc.charlie" display_name_normalized" Dfc.charlie" fieldso{ " status
```

[그림 17] U01THPLGVHV 유저 ID에 대한 상세 정보

그 결과, 세 파일 모두 “dfc.charlie”라는 이름을 가지는 계정이 업로드하고 “dfc.alice”라는 이름을 가진 계정이 다운로드 한 것을 확인할 수 있었습니다.

[표 5] Slack App을 통해 다운로드 받은 파일 세부 정보

파일 명	파일 정보	
94fd963cec1d4d4185f2d27ecea7b1cf.pdf	제목	DIGITAL FORENSIC ANALYSIS OF SMART WATCHES
	부제	TALLINN UNIVERSITY OF TECHNOLOGY School of Information Technologies, Bachelor's Thesis
	저자	Kehinde Omotola Adebayo
refs_report.pdf	제목	Forensic Analysis of the Resilient File System (ReFS) Version 3.4
	부제	Technical Report CS-2019-05
	저자	Paul Prade, Tobias Groß, Andreas Dewald
windows_10_forensics.pdf	제목	Windows 10 Forensics
	부제	-
	저자	Leahy Center for Digital Forensics & Cybersecurity
관련 도메인	Digital Forensic, Forensic Analysis	

No. 3.1 Describe all information related to the FTP service.

설치 응용 프로그램을 기준으로 FTP 서비스를 식별한 결과 “File Zilla”가 설치되어 있음을 확인하였습니다.

FileZilla를 통해 연결한 FTP 서버의 정보를 확인하기 위해 아래의 Artifact들을 확인하였습니다.

“C:\Users\dfcal\AppData\Roaming\FileZilla\filezilla.xml”,
“C:\Users\dfcal\AppData\Roaming\FileZilla\recentserver.xml”

```
- <Setting name="Tab data" sensitive="1">
- <Tabs>
- <Tab connected="1" selected="1">
<Host>192.168.219.168</Host>
<Port>2221</Port>
<Protocol>0</Protocol>
<Type>0</Type>
<User>alice_ftp</User>
<LogonType>2</LogonType>
<PasvMode>MODE_DEFAULT</PasvMode>
<EncodingType>Auto</EncodingType>
<BypassProxy>0</BypassProxy>
<Site />
<RemotePath>1 0 8 Telegram 15 Telegram Images</RemotePath>
<LocalPath>C:\Users\dfcal\Team_DFC_workspace\personal\image\</LocalPath>
</Tab>
```

[그림 18] XML 내부 데이터

분석 결과, 2개의 FTP 서버에 대해 연결을 시도하였으나, 성공적으로 연결된 1개의 서버에 대해서만 파일 전송 및 다운로드가 발생함을 확인하였습니다. 이에 대한 연결 정보는 아래와 같습니다.

[표 6] FTP 연결 정보

정보	값
연결 서버	192.168.219.168:2221
사용 계정	alice_ftp
로컬/서버 연결 디렉토리 정보 (1)	C:\Users\dfcal\Team_DFC_workspace\work\ è /alice_confidential
로컬/서버 연결 디렉토리 정보 (2)	C:\Users\dfcal\Team_DFC_workspace\personal\image\ è /Telegram/Telegram Images

XML 를 조사하는 과정에서 FileZilla FTP 로그가 “C:\Users\dfcal\AppData\Local\Temp\fz.log”에 존재함을 확인하였고, FTP 사용 시, 파일 업로드 및 저장에 필요한 명령어 “STOR”, “PASV”을 기준으로 요약한 FTP 파일 전송 관련 타임라인은 아래와 같습니다. (FileZilla 로그는 시스템 타임존을 따라가며, 본 이미지의 타임존은 PST 이므로 이를 고려하여 타임라인을 작성하였습니다.)

[표 7] FTP 파일 전송 관련 타임라인 정보

타임 스탬프 (UTC+9)	행위
2021. 04. 17, 15:06:47 PM	C:\Users\dfcal\Team_DFC_workspace\work\What is Information Leakage.gdoc ➔ FTP 서버 /alice_confidential/ 업로드
2021. 04. 17,	C:\Users\dfcal\Team_DFC_workspace\work\What is Information Leakage.docx

15:06:47 PM	è FTP 서버 /alice_confidential/ 업로드
2021. 04. 17, 15:06:47 PM	C:\Users\dfcal\Team_DFC_workspace\work\First\Data Bleanding File One.xlsx ➔ FTP 서버 /alice_confidential/First/ 업로드
2021. 04. 17, 15:06:47 PM	C:\Users\dfcal\Team_DFC_workspace\work\Second\17EA88FB5447411695A0A50F8D6B1FF9.pdf ➔ FTP 서버 /alice_confidential/Second/ 업로드
2021. 04. 17, 15:06:48 PM	C:\Users\dfcal\Team_DFC_workspace\work\Third\ConflInfoPolicy.pdf ➔ FTP 서버 /alice_confidential/Third/ 업로드
2021. 04. 17, 15:08:09 PM	C:\Users\dfcal\Team_DFC_workspace\work\FileSystem\ubifs-root\ ➔ FTP 서버 /alice_confidential/filesystem/ubifs-root 폴더 아래 일부 업로드 시작
2021. 04. 17, 15:10:07 PM	C:\Users\dfcal\Team_DFC_workspace\work\FileSystem\ubifs-root\ ➔ FTP 서버 /alice_confidential/filesystem/ubifs-root 폴더 아래 일부 업로드 종료
2021. 04. 17, 15:14:04 PM	FTP 서버 /Telegram/Telgram Images/ ➔ C:\Users\dfcal\Team_DFC_workspace\personal\image\ 다운로드 시작 (이미지 파일 13건)
2021-04-17 15:14:29 PM	FTP 서버 /Telegram/Telgram Images/ ➔ C:\Users\dfcal\Team_DFC_workspace\personal\image\ 다운로드 완료 (이미지 파일 13건)
2021-04-17 15:14:29 PM	C:\Users\dfcal\Team_DFC_workspace\personal\image\400040200729_183031.jpg ➔ FTP 서버 /Telegram/Telgram Images/ 업로드 시도 (이미 존재하므로 Skip)
2021-04-17 15:14:54 PM	C:\Users\dfcal\Team_DFC_workspace\personal\image\400040200729_183031.jpg ➔ FTP 서버 /Telegram/Telgram Images/ 업로드 시도 (이미 존재하므로 Skip)

No. 3.2 Describe the data leakage that occurred through FTP service in detail based on timeline analysis.

(1) List of leaked data

FTP 서비스 (FileZilla) 을 이용해서 유출된 것으로 확인되는 데이터의 목록은 다음과 같습니다. 확정적으로 유출된 데이터는 FTP 로그를 기준으로 FTP 서버에 STOR 된 것으로 판단하였습니다.

[표 8] FTP 로그 기반 유출 관련 타임라인

타임 스탬프 (UTC+9)	행위
2021. 04. 17, 15:06:47 PM	C:\Users\dfcal\Team_DFC_workspace\work\What is Information Leakage.gdoc ➔ FTP 서버 /alice_confidential/ 업로드
2021. 04. 17, 15:06:47 PM	C:\Users\dfcal\Team_DFC_workspace\work\What is Information Leakage.docx ➔ FTP 서버 /alice_confidential/ 업로드
2021. 04. 17, 15:06:47 PM	C:\Users\dfcal\Team_DFC_workspace\work\First\Data Bleanding File One.xlsx ➔ FTP 서버 /alice_confidential/First/ 업로드
2021. 04. 17, 15:06:47 PM	C:\Users\dfcal\Team_DFC_workspace\work\Second\17EA88FB5447411695A0A50F8D6B1FF9.pdf ➔ FTP 서버 /alice_confidential/Second/ 업로드
2021. 04. 17, 15:06:48 PM	C:\Users\dfcal\Team_DFC_workspace\work\Third\ConflInfoPolicy.pdf ➔ FTP 서버 /alice_confidential/Third/ 업로드
2021. 04. 17, 15:08:09 PM	C:\Users\dfcal\Team_DFC_workspace\work\FileSystem\ubifs-root\ ➔ FTP 서버 /alice_confidential/filesystem/ubifs-root 하위 일부 파일 업로드 시작
2021. 04. 17, 15:10:07 PM	C:\Users\dfcal\Team_DFC_workspace\work\FileSystem\ubifs-root\ ➔ FTP 서버 /alice_confidential/filesystem/ubifs-root 하위 일부 파일 업로드 종료

[표 9] FTP를 통한 유출 데이터 목록 (양이 많은 관계로 보고서 끝 첨부 자료에 기재)

(2) The list of data the employee was trying to leak

```
2021-04-16 23:10:12 3388 3 Error: Connection closed by server
2021-04-16 23:10:12 3388 3 Error: File transfer failed
2021-04-16 23:10:12 3388 1 Status: Connection closed by server
2021-04-16 23:10:12 3388 2 Status: Connecting to 192.168.219.168:2221...
2021-04-16 23:10:12 3388 3 Status: Connecting to 192.168.219.168:2221...
2021-04-16 23:10:24 3388 3 Status: Connection attempt failed with "ECONNREFUSED - Connection refused by server".
2021-04-16 23:10:24 3388 3 Error: File transfer failed
2021-04-16 23:10:24 3388 2 Status: Connection attempt failed with "ECONNREFUSED - Connection refused by server".
```

```
2021-04-16 23:11:37 3388 2 Error: File transfer aborted by user
2021-04-16 23:11:37 3388 3 Error: File transfer aborted by user
```

[그림 19] FTP 서버와 연결이 끊어진 로그

“fz.log”를 분석한 결과, “C:\Users\dfcal\Team_DFC_workspace\work” 내부의 파일들을 전송하는 과정에서 FTP 서버와의 연결이 끊어진 사실을 확인하였습니다. 이에 FileZilla 사용 시, 대기열 (Queue)에 포함되었으나 실제로는 FTP 서버 측으로 전송이 이뤄지지 못한 경우를 유출을 시도한 데이터라고 볼 수 있습니다.

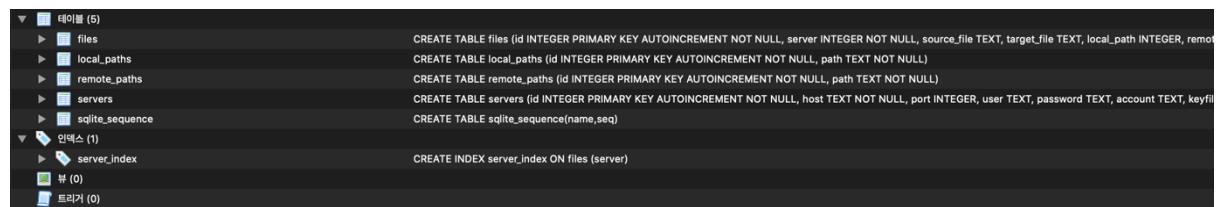
143	867090912	2021-04-17 15:11:37	queue.sqlite3-journal	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3...	File_Created	Normal
144	867091016	2021-04-17 15:11:37	queue.sqlite3-journal	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3...	File_Created / Data_Added	Normal
145	867091120	2021-04-17 15:11:37	queue.sqlite3-journal	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3...	File_Created / Data_Added / Data_Overwritten	Normal
146	867091224	2021-04-17 15:11:37	queue.sqlite3	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3	Data_Overwritten	Normal
147	867091312	2021-04-17 15:11:37	queue.sqlite3	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3	Data_Added / Data_Overwritten	Normal
148	867091400	2021-04-17 15:11:37	queue.sqlite3-journal	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3...	File_Created / Data_Added / Data_Overwritten / File_Closed	Normal
149	867091504	2021-04-17 15:11:37	queue.sqlite3-journal	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3...	File_Closed / File_Deleted	Normal
150	867091680	2021-04-17 15:11:37	queue.sqlite3	\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3	Data_Added / Data_Overwritten / File_Closed	Normal

[그림 20] queue.sqlite3 저장 로그

또한 서버와의 연결 종료 이후, 대기열에 존재하는 파일 목록을 queue.sqlite3에 수정/저장하는 NTFS 로그를 통해서 확인할 수 있었습니다.

[표 10] FTP 로그 기반 유출 시도 관련 타임라인

타임 스템프 (UTC+9)	행위
2021. 04. 17. 15:10:12 PM	FTP 서버와의 연결 재시도 및 종료 (fz.log)
2021. 04. 17. 15:11:37 PM	파일 전송 중지 (fz.log)
2021. 04. 17. 15:11:37 PM	파일 전송 대기열 (queue.sqlite3) 수정/저장 이벤트 발생 (NTFS Log)



[그림 21] queue.sqlite3 내부 스키마

대기열에 대한 Artifact는 “C:\Users\dfcal\AppData\Roaming\FileZilla\queue.sqlite3”에 존재하며, 내부에는 원격 및 로컬 파일에 대한 경로 값이 존재하며, 이는 연결된 하나의 경로가 아니라 Index ID로 구분되어 있으므로 온전한 경로를 구하기 위해서는 이를 매핑하는 작업을 수행해야합니다.

```

1 import sqlite3
2
3
4 class FileZillaMapper:
5
6     def __init__(self):
7         con = sqlite3.connect('/Users/dhyun/Desktop/queue.sqlite3')
8         self.cur = con.cursor()
9
10    def queryLocalPath(self, index):
11        remotePath = self.cur.execute(
12            "SELECT path FROM local_paths WHERE id = " + str(index))
13        data = remotePath.fetchall()
14        if(data):
15            return data[0][0]
16
17    def main(self):
18        data = self.cur.execute(
19            "SELECT source_file, local_path, remote_path FROM files")
20        result = data.fetchall()
21        mapArray = [str(self.queryLocalPath(fs[1])) +
22                    str(fs[0]) for fs in result]
23        for fspath in mapArray:
24            print(fspath)
25
26
27 if(__name__ == "__main__"):
28     handler = FileZillaMapper()
29     handler.main()

```

[그림 22] queue3.sqlite 매핑 스크립트

매핑 스크립트를 통해서 Queue에 들어간 (유출 시도) 데이터 목록은 아래와 같습니다.

[표 11] FTP를 통한 유출 시도 데이터 목록 (양이 많은 관계로 보고서 끝 첨부 자료에 기재)

서버/포트/타입	방향	리포트 번호	작성자	작성일	상태
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_4opus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_4opus	2,007 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_5opus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_5opus	2,007 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_6opus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_6opus	1,440 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_7opus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_7opus	2,007 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_8opus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_8opus	1,926 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_9opus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_9opus	2,007 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_DOTopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_DOTopus	1,276 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_DOTOPUS	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_DOTOPUS	5,112 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_REGUPDATE_FAI	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_REGUPDATE_FAIR	14,724 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_REGUPDATE_STA	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_NUM_REGUPDATE_STA	4,113 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_RMAGER_CO	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_RMAGER_CO	8,622 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_ACOpus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_ACOpus	19,935 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_AGITATORopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_AGITATORopus	23,364 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_BEGINopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_BEGINopus	34,137 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_BERRORopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_BERRORopus	34,542 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_BERRORIZATION_CAN	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_BERRORIZATION_CAN	42,560 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_CLIFFopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_CLIFFopus	41,563 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_DUSTBINopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_DUSTBINopus	22,878 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_ENDopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_ENDopus	10,080 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_FAILopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_FAILopus	41,967 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_GYROopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_GYROopus	19,368 일반			
C:\Users\dfcal\Team_DFC_workspace\Work\FileSystem\ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_IRopus	--> /alice_confidential/filesystem/ubifs-root\#Hub\user_f\raw\SoundFile\file\ko_1\SNND_SD_IRopus	24,498 일반			

[그림 23] queue.sqlite3 로드를 통한 매핑 검증

수행한 스크립트의 결과가 올바른지 검증하기 위해, 임의로 설치한 FileZilla에서 queue.sqlite3를 로드한 결과, 스크립트 결과와 동일한 “975”개의 파일이 대기열에 있음을 확인할 수 있었습니다.

No. 4.1 Analyze the following information by analyzing Google Drive.

(1) Synchronization option (Account, local-remote sync path, etc.)

본 문제와 설치된 응용 프로그램을 통해서 구글 드라이브가 설치되어 있음을 파악했습니다.

이에 어떠한 동기화 옵션을 가지는지 파악하기 위해 아래의 Artifact를 분석하였습니다.

“C:\Users\dfcal\AppData\Google\Drive\user_default\sync_config.db”

16 share_notification	value	1
17 local_sync_root_path	value	WW?WC:WUsersWdfcalWTeam_DFC_workspace
18 copy_duplicate_photos	value	1
19 user_email	value	dfc.alice@gmail.com
20 user_id	value	114452910244325281969
21 user_display_name	value	alice dfc
22 domain_policy	default_sync_all	1
23 domain_policy	domain_policy_description_url	NULL
24 win10_icons_upgraded	value	1
25 autostart_upgraded	value	1
26 fcm_token_generation	value	2
27 cloud_graph_generation	value	8
28 snapshot_reconstruct	value	0
29 root_config_0	rowkey	WW?WC:WUsersWdfcalWTeam_DFC_workspace
30 root_config_1	WW?WC:WUsersWdfcalWTeam_DFC_workspace	2
31 root_config_2	WW?WC:WUsersWdfcalWTeam_DFC_workspace	1
32 root_config_3	WW?WC:WUsersWdfcalWTeam_DFC_workspace	0
33 root_config_0	rowkey	WW?WC:WUsersWdfcalWDesktop
34 root_config_1	WW?WC:WUsersWdfcalWDesktop	2
35 root_config_2	WW?WC:WUsersWdfcalWDesktop	1
36 root_config_3	WW?WC:WUsersWdfcalWDesktop	0

[그림 24] 구글 드라이브 동기화 옵션

그 결과 두 개의 폴더에 대해 동기화를 하였다는 사실을 확인할 수 있었으며, 상세 정보는 아래와 같습니다.

[표 12] 구글 드라이브 동기화 옵션

정보	값
사용자 이메일	dfc.alice@gmail.com
사용자 표시 이름	alice dfc
로컬-원격 동기화 경로 (1)	C:\Users\dfcal\Team_DFC_workspace
로컬-원격 동기화 경로 (2)	C:\Users\dfcal\Desktop

(2) Number of files and directory structure on the cloud

클라우드 상의 디렉토리 구조와 파일의 개수를 파악하기 위해 아래의 Artifact를 분석하였습니다.

“C:\Users\dfcal\AppData\Google\Drive\user_default\sync_config.db”

해당 DB의 “cloud_entry” 테이블에 각 폴더와 파일에 대한 “doc_id”가 부여 되어 있으며, 이에 대한 상위 폴더에 대한 정보는 “cloud_relation” 테이블에 기록이 되어 있습니다.

“doc_type”, 해당 Entry의 타입을 표기하는 것으로 0일 경우, 폴더를 나타내는 것이며 1일 경우, 파일을 나타내고 있습니다. (다만 root는 클라우드 상, 최상위 디렉토리를 의미하므로 실제 폴더로 포함하지 않았습니다.)

이러한 정보를 기반으로 SQL Query와 Cloud Relation을 매핑하는 스크립트로 클라우드 상의 디렉토리 구조와 파일의 개수를 구할 수 있었습니다.

```

1 | SELECT filename FROM cloud_entry WHERE doc_type = "0"
2 |
3 |   filename
4 |   root
5 |   Desktop
6 |   project
7 |   personal
8 |   work
9 |   Archive
10 |  FileSystem
11 |  Third
12 |
13 | 여러 없이 실행 완료.
14 | 결과: 21ms의 시간이 걸려서 246 행이 반환되었습니다
15 | 1번쩨 줄:
16 | SELECT filename FROM cloud_entry WHERE doc_type = "0"

```

[그림 25] 폴더 개수 (“root” 제외, 245개)

```

1 | SELECT filename FROM cloud_entry WHERE doc_type = "1"
2 |
3 |   filename
4 |   volume.py
5 |   headers.py
6 |   display.py
7 |   __init__.py
8 |   defines.py
9 |   __init__.py
10 |  settings.py
11 |  debug.py
12 |
13 | 여러 없이 실행 완료.
14 | 결과: 53ms의 시간이 걸려서 1490 행이 반환되었습니다
15 | 1번쩨 줄:
16 | SELECT filename FROM cloud_entry WHERE doc_type = "1"

```

[그림 26] 파일 개수 (1490개)

```

1 import sqlite3
2
3
4 class CloudEntryMapper:
5
6     def __init__(self):
7         con = sqlite3.connect('/Users/dhyun/Desktop/snapshot.db')
8         self.cur = con.cursor()
9
10    def getCloudEntryFile(self):
11        cloudEntry = self.cur.execute(
12            "SELECT doc_id, filename, doc_type FROM cloud_entry WHERE doc_type = 0")
13        data = cloudEntry.fetchall()
14        if(data):
15            return data
16
17    def getQueryParentNode(self, child_id):
18        parentNode = self.cur.execute(
19            "SELECT parent_doc_id FROM cloud_relations WHERE child_doc_id ='" + child_id + "'")
20        data = parentNode.fetchall()
21        if(data):
22            return data[0][0]
23        else:
24            return None
25
26    def getQueryParentPath(self, parent_id):
27        parentPath = self.cur.execute(
28            "SELECT filename FROM cloud_entry WHERE doc_id ='" + parent_id + "'")
29        data = parentPath.fetchall()
30        if(data):
31            return data[0][0]
32        else:
33            return None
34
35    def main(self):
36        cloudEntry = self.getCloudEntryFile()
37        for entry in cloudEntry:
38            dirStructure = [entry[1]]
39            parentNode = self.getQueryParentNode(entry[0])
40            parentNode = self.getQueryParentPath(parentNode)
41            dirStructure.append(parentNode)
42            if(parentNode == None):
43                break
44            parentNode = self.getQueryParentNode(parentNode)
45            parentNode = self.getQueryParentPath(parentNode)
46            dirStructure.append(parentNode)
47            dirStructure = list(reversed(dirStructure))
            dirStructure.pop(0)
            print("\\".join(dirStructure))

```

[그림 27] 클라우드 엔트리 맵핑 스크립트

[표 13] 클라우드에 존재하는 폴더 목록 (양이 많은 관계로 보고서 끝 첨부 자료에 기재)

[표 14] 클라우드에 존재하는 파일 목록 (양이 많은 관계로 보고서 끝 첨부 자료에 기재)

No. 4.2 By analyzing the Google Drive sync folder, describe user activity such as upload, download, creation, copy, move, deletion, etc. in the last two days based on timeline analysis.

해당 문제를 토대로 이미지를 분석한 결과, “Google Drive Backup and Sync”이 설치되어 있었고, 이를 조사하기 위해 이미지 내부의 다음 경로에서 Artifact을 수집했습니다.

pid	1	Regul...	2021-04-17 오전 5:44:49
run_dir	1	Regul...	2021-04-17 오전 5:44:52
snapshot.db	1,576	Regul...	2021-04-17 오전 6:31:23
sync_config.db	32	Regul...	2021-04-14 오전 7:24:29
sync_config.db-shm	32	Regul...	2021-04-17 오전 6:28:58
sync_config.db-sh...	32	File Sl...	
sync_config.db-wal	0	Regul...	2021-04-17 오전 6:28:58
sync_log.log	49,489	Regul...	2021-04-17 오전 6:31:23
uploader.db	20	Regul...	2021-04-15 오후 3:08:23

[그림 28] sync_log.log 수집

특히 타임라인 분석을 기반으로 이를 간의 사용자 행위 (업로드, 다운로드, 생성, 복사, 이동, 삭제)을 서술하라 하였으므로, “C:\Users\dfcal\AppData\Local\Google\Drive\user_default”에 존재하는 “sync_log.log” (이하 Sync 로그) 을 분석하였습니다.

Sync Log는 Plain Text 형태의 로그로, 아래와 같은 구조로 구성됩니다.

Timestamp	Level	PID	Action	Handler	Detail Event
-----------	-------	-----	--------	---------	--------------

[그림 29] Sync 로그 기본 구조

본 이미지에 포함된 다양한 Sync Log 중에서 파일과 관련된 사용자 행위를 식별하기 위해 파일 관련 작업을 수행하는 Handler (**workers.py**)을 특정하여 로그 필터링을 시도하였습니다.

```
cat sync_log.log | grep "workers.py" > min.log
```

[그림 30] 로그 필터링 명령어

```
7 2021-04-14 00:24:31,528 -0700 INFO pid=6908 7572:Worker-0 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'project', route=[])
8 2021-04-14 00:24:31,575 -0700 INFO pid=6908 7572:Worker-0 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'proj
9 2021-04-14 00:24:32,753 -0700 INFO pid=6908 1700:Worker-1 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'personal', rout
10 2021-04-14 00:24:32,799 -0700 INFO pid=6908 1700:Worker-1 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'pers
11 2021-04-14 00:24:33,266 -0700 INFO pid=6908 7572:Worker-0 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'work', route=[])
12 2021-04-14 00:24:33,368 -0700 INFO pid=6908 7572:Worker-0 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'wor
13 2021-04-14 00:24:36,684 -0700 INFO pid=6908 1700:Worker-1 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Archive', rout
14 2021-04-14 00:24:36,730 -0700 INFO pid=6908 1700:Worker-1 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Arch
15 2021-04-14 00:24:37,001 -0700 INFO pid=6908 7572:Worker-0 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'FileSystem', rout
16 2021-04-14 00:24:37,348 -0700 INFO pid=6908 7572:Worker-0 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'File
17 2021-04-14 00:24:37,556 -0700 INFO pid=6908 9876:Worker-2 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Third', route=[])
18 2021-04-14 00:24:37,625 -0700 INFO pid=6908 9876:Worker-2 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Thi
19 2021-04-14 00:24:41,496 -0700 INFO pid=6908 1700:Worker-1 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Second', rout
20 2021-04-14 00:24:41,542 -0700 INFO pid=6908 1700:Worker-1 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Sec
21 2021-04-14 00:24:42,561 -0700 INFO pid=6908 7572:Worker-0 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'First', rout
22 2021-04-14 00:24:42,608 -0700 INFO pid=6908 7572:Worker-0 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Fir
23 2021-04-14 00:24:42,984 -0700 INFO pid=6908 9876:Worker-2 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Japanese', rout
24 2021-04-14 00:24:42,951 -0700 INFO pid=6908 9876:Worker-2 workers.py:206 Worker successfully completed [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'Ja
25 2021-04-14 00:24:46,601 -0700 INFO pid=6908 1700:Worker-1 workers.py:192 Worker starting on [FSChange(Direction.DOWNLOAD, Action.CREATE, name=u'4 Universities', rout
```

[그림 31] 로그 필터링 결과

그 결과, 아래와 같은 구조를 가지는 로그들을 식별 할 수 있었습니다.

Status Message	FSChange Log	FSChange Log	FSChange Log	...
----------------	--------------	--------------	--------------	-----

[그림 32] workers.py 핸들러의 FSChange 로그 구조

Action Name	Object Name	Route
[그림 33] Local Entry 구조		

Action Name	Object Name	Route	MappedPath
[그림 34] Cloud Entry 구조			

Action Name	Object Name	Route	MappedPath
[그림 35] Immutable Cloud Entry 구조			

Workers.py는 1개 이상의 FSChnageLog로 구성되어 있으며, 이벤트에 맞게 다른 구조의 Entry를 가집니다. 이러한 Entry 안에는 FSChangeLog가 발생한 폴더와 파일에 대한 정보가 기입되어 있습니다. 이러한 로그의 특성과 구조를 파악한 뒤 도구를 개발하였으며, 개발한 도구를 기반으로 분석한 결과는 아래와 같습니다.

[표 15] 구글 Sync 로그 주요 타임라인 (2일간의 로그에 대해서는 볼드 처리)

타임 스탬프 (UTC+9)	주요 행위
2021.4.14, 16:24:31 PM	C:\Users\dfcal\Team_DFC_workspace 내부 동기화 시작 (클라우드 다운로드, 문서 및 프로그램 파일 등)
2021.4.14, 16:24:49 PM	C:\Users\dfcal\Desktop 내부 동기화 시작 (로컬에서 업로드, 문서 및 프로그램 파일 등)
2021.4.14, 16:27:32 PM	C:\Users\dfcal\Desktop 내부 동기화 종료 (로컬에서 업로드, 문서 및 프로그램 파일 등)
2021.4.14, 16:43:15 PM	C:\Users\dfcal\Team_DFC_workspace 내부 동기화 종료 (클라우드 다운로드, 문서 및 프로그램 파일 등)
2021.4.16, 00:23:53 AM	C:\Users\dfcal\Team_DFC_workspace\personal 내부 동기화 시작 (로컬에서 삭제, 11건의 이미지 파일)
2021.4.16, 00:24:04 AM	C:\Users\dfcal\Team_DFC_workspace\personal 내부 동기화 종료 (로컬에서 삭제, 11건의 이미지 파일)
2021.4.16, 23:52:39 PM	C:\Users\dfcal\Team_DFC_workspace\project\forensic project 내부 동기화 시작 (로컬에서 삭제, 8건의 문서 파일)
2021.4.16, 23:52:40 PM	동기화 과정에서 에러 발생 및 재시도 성공 googletips (1).docx, ecma376standard_password_plain.docx, example.docx
2021.4.16, 23:52:49 PM	C:\Users\dfcal\Team_DFC_workspace\project\forensic project 내부 동기화 종료 (로컬에서 삭제, 8건의 문서 파일)
2021.4.16, 23:53:20 PM	C:\Users\dfcal\Team_DFC_workspace\project 내부 동기화 시작 (로컬에서 이동 crime_incidents_2013_plain.zip, crime_incidents_2013_CSV.zip) C:\Users\dfcal\Team_DFC_workspace\personal → C:\Users\dfcal\Team_DFC_workspace\project
2021.4.16, 23:55:21 PM	C:\Users\dfcal\Team_DFC_workspace\project 내부 동기화 종료 (로컬에서 이동, crime_incidents_2013_plain.zip, crime_incidents_2013_CSV.zip) C:\Users\dfcal\Team_DFC_workspace\personal → C:\Users\dfcal\Team_DFC_workspace\project
2021.4.16, 23:55:14 PM	C:\Users\dfcal\Team_DFC_workspace 내부 동기화 시작 (클라우드에서 생성, Untitled Document)
2021.4.16, 23:55:15 PM	C:\Users\dfcal\Team_DFC_workspace 내부 동기화 시작 (클라우드에서 생성, Untitled Document)

2021.4.16, 23:55:26 PM	C:\Users\dfcal\Team_DFC_workspace 내부 동기화 시작 (클라우드에서 이름 변경, Untitled Document → What is Information Leakage)
2021.4.16, 23:55:26 PM	C:\Users\dfcal\Team_DFC_workspace 내부 동기화 완료 (클라우드에서 이름 변경, Untitled Document → What is Information Leakage)
2021.4.16, 23:55:37 PM	C:\Users\dfcal\Team_DFC_workspace\work 내부 동기화 완료 (클라우드에서 이동, What is Information Leakage)
2021.4.16, 23:55:37 PM	C:\Users\dfcal\Team_DFC_workspace\work 내부 동기화 완료 (클라우드에서 이동, What is Information Leakage)
2021.4.16, 23:56:26 PM	C:\Users\dfcal\Team_DFC_workspace\work 내부 동기화 시작 (로컬에서 업로드, What is Information Leakage.docx)
2021.4.16, 23:56:28 PM	C:\Users\dfcal\Team_DFC_workspace\work 내부 동기화 종료 (로컬에서 업로드, What is Information Leakage.docx)
2021.4.17, 00:51:13 AM	C:\Users\dfcal\Team_DFC_workspace\personal 내부 동기화 시작 (로컬에서 삭제, cindyloh3333@gmail.com.mbox)
2021.4.17, 00:51:15 AM	C:\Users\dfcal\Team_DFC_workspace\personal 내부 동기화 종료 (로컬에서 삭제, cindyloh3333@gmail.com.mbox)
2021.4.17, 00:52:21 AM	C:\Users\dfcal\Desktop\Arsenal-Image-Mounter-v3.2.126 내부 동기화 시작 (로컬에서 업로드, Arsenal Image Mounter 이미지 마운팅 프로그램)
2021.4.17, 00:53:35 AM	C:\Users\dfcal\Desktop\Arsenal-Image-Mounter-v3.2.126 내부 동기화 종료 (로컬에서 업로드, Arsenal Image Mounter 이미지 마운팅 프로그램)
2021.4.17, 14:45:22 PM	C:\Users\dfcal\Team_DFC_workspace\work 내부 동기화 시작 (클라우드에서 수정, What is Information Leakage.docx)
2021.4.17, 14:45:22 PM	C:\Users\dfcal\Team_DFC_workspace\work 내부 동기화 시작 (클라우드에서 수정, What is Information Leakage.docx)
2021.4.17, 15:13:55 PM	C:\Users\dfcal\Team_DFC_workspace\personal\image 내부 동기화 시작 (로컬에서 업로드, 13건의 이미지 파일)
2021.4.17, 15:14:38 PM	C:\Users\dfcal\Team_DFC_workspace\personal\image 내부 동기화 종료 (로컬에서 업로드, 13건의 이미지 파일)
2021.4.17, 15:16:27 PM	C:\Users\dfcal\Team_DFC_workspace\personal\image 내부 동기화 시작 (로컬에서 삭제, 8건의 이미지 파일)
2021.4.17, 15:16:35 PM	C:\Users\dfcal\Team_DFC_workspace\personal\image 내부 동기화 종료 (로컬에서 삭제, 8건의 이미지 파일)
2021.4.17, 15:28:55 PM	C:\Users\dfcal\Desktop 내부 동기화 시작 (로컬에서 업로드, "File Shredder.lnk")
2021.4.17, 15:28:56 PM	C:\Users\dfcal\Desktop 내부 동기화 종료 (로컬에서 업로드, "File Shredder.lnk")

자세한 사항은 원본 로그나 도구를 이용해 추출한 테이블을 참고해주시길 바랍니다.

No. 4.3 Develop an automation tool to solve #4.2 and submit it with source code.

개발한 도구는 본 하이퍼링크를 통해 [다운로드](#) 받을 수 있습니다.

이름	수정일	크기	종류
► dist	2021년 5월 6일 오후 10:32	--	폴더
► node_modules	2021년 5월 11일 오후 3:41	--	폴더
► res	어제 오전 12:42	--	폴더
► src	그저께 오후 2:38	--	폴더
► yarn.lock	2021년 5월 11일 오후 3:41	57KB	문서
► package.json	2021년 5월 11일 오후 3:44	689바이트	JSON
► tsconfig.json	2021년 5월 6일 오후 10:11	917바이트	JSON
► tslint.json	2021년 5월 9일 오후 2:04	8KB	JSON
► evidence.xlsx	오늘 오전 12:39	131KB	Micros...k (.xlsx)
► run.ts	2021년 5월 11일 오후 3:33	412바이트	MPEG-...스트림
► README.md	2021년 5월 7일 오후 2:03	0바이트	Visual...ode 문서

[그림 36] 개발된 Sync Log Parsing Tool

[표 16] 프로그램 구동 환경

작성 언어	TypeScript (4.0.2)
구동 OS	macOS Catalina 10.15.6
YARN 버전	v1.22.10
Node 버전	v14.15.1

```
dhyun@gimdonghyeon-ui-MacBookPro ~/DFC/DFC-2021-303 ➜ master ➔ yarn
yarn install v1.22.10
[1/4] 🏛️ Resolving packages...
[2/4] 🚀 Fetching packages...
[3/4] 🔗 Linking dependencies...
[4/4] 🏺 Building fresh packages...
✨ Done in 4.81s.
```

[그림 37] yarn 명령어를 통한 프로그램 패키지 설치

```
dhyun@gimdonghyeon-ui-MacBookPro ~/DFC/DFC-2021-303 ➜ master ➔ yarn dev
yarn run v1.22.10
$ npx tsc && node dist/run.js
✨ Done in 2.60s.
```

[그림 38] yarn dev 명령어를 통한 컴파일 및 실행

29	Wed Apr 14 2021 16:24:49 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubি_reader			
30	Wed Apr 14 2021 16:24:49 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubি_reader			
31	Wed Apr 14 2021 16:24:50 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.UPLOAD	Action.CREATE	C:\Users\dfdc\Desktop\confidential			
32	Wed Apr 14 2021 16:24:51 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.UPLOAD	Action.CREATE	C:\Users\dfdc\Desktop\confidential			
33	Wed Apr 14 2021 16:24:53 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubidump			
34	Wed Apr 14 2021 16:24:53 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubidump	ARN4438_AR380_5_FINAL.pdf		
35	Wed Apr 14 2021 16:24:54 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubifs-root			
36	Wed Apr 14 2021 16:24:54 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubifs-root			
37	Wed Apr 14 2021 16:24:55 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.UPLOAD	Action.CREATE	C:\Users\dfdc\Desktop\confidential	ARN4438_AR380_5_FINAL.pdf		
38	Wed Apr 14 2021 16:24:55 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubি_reader\git			
39	Wed Apr 14 2021 16:24:55 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubি_reader\git			
40	Wed Apr 14 2021 16:24:56 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.UPLOAD	Action.CREATE	C:\Users\dfdc\Desktop\work			
41	Wed Apr 14 2021 16:24:56 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.UPLOAD	Action.CREATE	C:\Users\dfdc\Desktop\project			
42	Wed Apr 14 2021 16:24:57 GMT+0900 (대한민국 표준시)	INFO	starting	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubি_reader\build			
43	Wed Apr 14 2021 16:24:57 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.DOWNLOAD	Action.CREATE	C:\Users\dfdc\Team_DFC_workspace\work\FileSystem\ubি_reader\build			
44	Wed Apr 14 2021 16:24:59 GMT+0900 (대한민국 표준시)	INFO	successfully	Direction.UPLOAD	Action.CREATE	C:\Users\dfdc\Desktop\project			

[그림 39] 추출된 XLSX 결과

해당 프로그램은 **TypeScript**로 작성되어 있으며, 패키지 관리 및 설치 편의를 위해 “**yarn**”을 사용합니다. 위의 절차대로 설치 및 실행을 하면, “**res**” 폴더에 저장된 Sync 로그를 파싱하여 XLSX 형태로 Export 해줍니다.

No. 5. Describe the following information related to Internet usage, based on timeline analysis.

인터넷 사용에 대한 정보를 확인하기 위해 레지스트리를 기준으로 설치된 웹 브라우저를 확인하였습니다. 그 결과 “IE, Chrome, Edge” 총 3개의 브라우저가 확인되었고 이를 기준으로 주요 검색 기록 및 파일 다운로드 기록을 확인하였습니다. 참조한 아티팩트는 아래와 같습니다.

IE : “C:\Users\(<유저이름>)\AppData\Local\Microsoft\Windows\WebCache\WebCacheV01.dat”

Chrome : “C:\Users\dfcal\AppData\Local\Google\Chrome\User Data\Default\History”

Edge : “C:\Users\dfcal\AppData\Local\Microsoft\Edge\User Data\Default\History”

BrowsingHistoryView		Find one string	Search all columns	Show only
File	Edit			
View	Options			
Help				
Title	Visit Time /	Visit Count	Visited From	Visit Type
URL				
https://microseed-edge.microsoft.com/en-us/?form=MA401KT&OCID=M401KT	2021-04-11 오후 3:09:42	1		Inte
https://microseed-edge.microsoft.com/en-us/?form=MA401KT&OCID=M401KT	2021-04-11 오후 3:09:44	6		Inte
https://microseed-edge.microsoft.com/en-us/?form=MA401KT&OCID=M401KT	2021-04-11 오후 3:09:45	1		Inte
https://microseed-edge.microsoft.com/en-us/?exp=e25&form=MA13E2&form=MA401KT&OCID=M401KT&adobe...	2021-04-11 오후 3:09:46	8		Inte
https://microseed-edge.microsoft.com/en-us/?exp=e25&form=MA13E2&form=MA401KT&OCID=M401KT&adobe...	2021-04-11 오후 3:10:02	2		Inte
https://www.microsoft.com/store/buy/cartcount	2021-04-11 오후 3:10:02	3		Inte
about:blank	2021-04-11 오후 3:10:06	1		Inte
about:start	2021-04-11 오후 3:10:06	4		Inte
https://www.microsoft.com/en-us/edge?form=MA13D0&OCID=MA13D0	2021-04-11 오후 3:10:14	7		Inte
https://microsoft.demdex.net/dest.html?id=0	2021-04-11 오후 3:10:15	1		Inte
about:blank	2021-04-11 오후 3:10:15	1		Inte
https://go.microsoft.com/fwlink/?linkid=2108834&channel=Stable&language=en	2021-04-11 오후 3:10:19	5		Inte
https://www.google.com/search?q=dropbox&q=dropbox&q=chrome.69570433 0 0 0 131433 0 433 0 0 2 131433... dropbox - Google 검색	2021-04-11 오후 3:10:22	1		Inte
https://www.google.com/search?q=dropbox&q=dropbox&q=chrome.69570433 0 0 0 131433 0 433 0 0 2 131433... dropbox - Google 검색	2021-04-12 오후 12:52:42	3	Generated	Chr
https://www.googleadservices.com/pagead/clk?sa=L&ai=DCh5SwiM2Q3,fvNWq2YKhrhLogABAAGj0tA&aee... Dropbox - Dropbox Business	2021-04-12 오후 12:52:47	3	Link	Chr
https://www.dropbox.com/business/landing-t61f7_k-paid_semg_pog_biz_bk_camp=1445920981&kw=dropbox&ek_ad... Try DropBox Business free trial - Dropbox Business	2021-04-12 오후 12:53:48	1	Link	Chr
https://www.dropbox.com/business/funding-t61f7_k-paid_semg_pog_biz_bk_camp=1445920981&kw=dropbox&ek_ad... Try DropBox Business free trial - Dropbox Business	2021-04-12 오후 12:53:48	2	Link	Chr
https://www.google.com/search?q=dropbox&q=dropbox&q=chrome.69570433 0 0 0 2 0 0 10 131433 0 0 10 01... discord - Google 검색	2021-04-12 오후 12:53:02	2	Link	Chr
https://www.google.com/search?q=discord&q=discord&q=chrome.69570433 0 0 0 2 0 0 10 131433 0 0 10 01... discord - Google 검색	2021-04-12 오후 12:53:04	3	Generated	Chr
https://www.google.com/search?q=discord&q=discord&q=chrome.69570433 0 0 0 2 0 0 10 131433 0 0 10 01... discord - Google 검색	2021-04-12 오후 12:53:17	2	Generated	Chr

[그림 40] WebBrowsingHistoryView를 통해 웹 브라우저 Artifacrt를 종합적으로 분석

IE10Analyzer		File	Tool	Help
Table		iedownload(S-1-15-2-362405...)	MSHist012021041220210413(...)	iecompatua(M)
No.	Table Name ▾	EntryId	Type	AccessCount SyncTime CreationTime
49	MSHist012021041620210417(M)	1	9	4 2021-04-11 15:10:26 0
48	MSHist012021041520210416(M)			
46	MSHist01202104120210415(M)			
45	MSHist012021041320210414(M)			
33	MSHist012021041220210413(M)			
32	MSHist012021040520210412(M)			
27	MicrosoftEdge_ieflipahead(M)			
15	MicrosoftEdge_iecompatua(M)			
14	MicrosoftEdge_iecompat(M)			
23	iedownload(S-1-15-2-3624051433-2125758914-1423191267-12) iecompatua(M)			
13	iedownload(S-1-15-2-3624051433-2125758914-1423191267-12) iecompatua(M)			
12	iedownload(S-1-15-2-3624051433-2125758914-1423191267-12) iecompatua(M)			
20	History(S-1-15-2-3624051433-2125758914-1423191267-174)			
35	History(S-1-15-2-3624051433-2125758914-1423191267-174)			
16	History(S-1-15-2-3624051433-2125758914-1423191267-174)			
0	History(M)			
43	DOMStore(S-1-15-2-930279079-325869966-1203931420-3)			
39	DOMStore(S-1-15-2-536077884-713174666-1066051701-32)			
22	DOMStore(S-1-15-2-3624051433-2125758914-1423191267-26)			
26	DOMStore(S-1-15-2-3624051433-2125758914-1423191267-40)			
40	DOMStore(S-1-15-2-2434737943-167758768-3180539153-9)			
8	DOMStore(S-1-15-2-1861897761-1695161497-2927542615-47)			
47	DOMStore(M)			
29	Cookies(S-1-15-2-421345033-1710570203-969709436-280E)			
18	Cookies(S-1-15-2-3624051433-2125758914-1423191267-17)			
25	Cookies(S-1-15-2-3624051433-2125758914-1423191267-17)			
21	Cookies(S-1-15-2-3624051433-2125758914-1423191267-17)			
6	Cookies(S-1-15-2-350187224-1905355452-1037786396-302)			
2	Cookies(S-1-15-2-350187224-1905355452-1037786396-302)			

[그림 41] IE10Analyzer를 통한 IE Artifact 분석

[표 17] 웹 브라우저를 이용/경유한 파일 다운로드 완료 기록

타임 스탬프 (UTC+9)	다운로드 파일	브라우저 및 URL
2021년 4월 11일 일요일 오후 3:10:26	MicrosoftEdgeSetup.exe	IE → https://www.microsoft.com/en-us/edge?form=MA13DO&OCID=MA13DO
2021년 4월 11일 일요일 오후 10:10:26	MicrosoftEdgeSetup.exe	Edge → https://www.microsoft.com/en-us/edge?form=MA13DO&OCID=MA13DO
2021년 4월 11일 일요일 오후 3:15:44	ChromeSetup.exe	Edge → https://www.google.com/chrome/?brand=CHZN&utm_source=google.com&utm_medium=material-callout&utm_campaign=search&utm_content=switch-to-chrome-hide-annoying-ads&utm_keyword=CHZN
2021년 4월 11일 일요일 오후 3:19:04	SlackSetup.exe	Edge → https://slack.com/intl/en-kr/downloads/instructions/windows
2021년 4월 11일 일요일 오후 3:26:48	installbackupandsync.exe	Edge → https://www.google.com/drive/download/
2021년 4월 13일 화요일 오전 12:16:53	ARN4438_AR380_5_FINAL.pdf	Edge → https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN4438_AR380_5_FINAL.pdf
2021년 4월 13일 화요일 오전 12:18:53	git-commander-master.zip	Edge → https://github.com/golbin/git-commander
2021년 4월 13일 화요일 오전 12:20:05	7z1900-x64.exe	Edge → https://www.7-zip.org/
2021년 4월 14일 수요일 오전 2:14:59	sync-installer.exe	Edge → https://www.sync.com/install
2021년 4월 16일 금요일 오후 11:56:07	What is Information Leakage.docx	Edge → https://docs.google.com/document/d/14UavpKwNir2mKjnAENACJ3SIIhaU8sVdZVV7Wwz_32A/edit
2021년 4월 17일 토요일 오전 1:11:34	17EA88FB5447411695A0A50F8D6B1FF9.pdf	Edge → https://cdn.discordapp.com/attachments/831573806127513611/832648243523354654/17EA88FB5447411695A0A50F8D6B1FF9.pdf
2021년 4월 12일 월요일 오후 12:54:11	DiscordSetup.exe	Chrome → https://discord.com/download
2021년 4월 12일 월요일 오후 11:45:01	FileZilla_3.53.1_win64-setup.exe	Chrome → https://filezilla-project.org/download.php
2021년 4월 12일 월요일 오후 11:48:57	TeamViewer_Setup.exe	Chrome → https://www.teamviewer.com/en/download/windows/
2021년 4월 17일 토요일 오후 3:28:26	file_shredder_setup.exe	Chrome → https://www.fileshredder.org/#google_vignette

[표 18] 웹 브라우저를 이용한 인터넷 검색 기록

타임 스탬프 (UTC+9)	검색 키워드	브라우저 및 검색 사이트
2021-04-11 오후 3:15:24	google	Edge (Bing)
2021-04-11 오후 3:18:29	slack	Edge (Bing)
2021-04-11 오후 3:18:35		
2021-04-11 오후 3:19:03	google	Edge (Bing)
2021-04-11 오후 3:19:06		
2021-04-11 오후 3:21:36		
2021-04-11 오후 3:22:15	google drive	Edge (Bing)
2021-04-11 오후 3:23:18		
2021-04-11 오후 3:26:23		
2021-04-12 오후 12:52:42		
2021-04-12 오후 12:52:47	dropbox	Chrome (Google)
2021-04-12 오후 12:53:04		
2021-04-12 오후 12:53:17	discord	Chrome (Google)
2021-04-12 오후 12:53:18		
2021-04-12 오후 11:44:14	google	Chrome (Google)

2021-04-12 오후 11:44:15		
2021-04-12 오후 11:44:34	filezilla	Chrome (Google)
2021-04-12 오후 11:44:35		
2021-04-12 오후 11:47:15	teamviewer	Chrome (Google)
2021-04-12 오후 11:47:17		
2021-04-12 오후 11:48:17	confidential leak out	Chrome (Google)
2021-04-12 오후 11:48:18		
2021-04-12 오후 11:48:23		
2021-04-12 오후 11:48:24		
2021-04-12 오후 11:48:40		
2021-04-12 오후 11:48:41		
2021-04-12 오후 11:49:06		
2021-04-12 오후 11:49:07		
2021-04-13 오전 00:08:03		Edge (Google)
2021-04-13 오전 00:08:55		Edge (Bing)
2021-04-13 오전 00:09:09	how to transfer files from pc used ftp	Edge (Google)
2021-04-13 오전 00:09:11		
2021-04-13 오전 00:09:25		
2021-04-13 오전 00:09:50		
2021-04-13 오전 00:09:51	webex	Edge (Google)
2021-04-13 오전 00:10:09	webex windows	Edge (Bing)
2021-04-13 오전 00:10:12		
2021-04-13 오전 00:13:53	ms office download	Edge (Google)
2021-04-13 오전 00:13:54		
2021-04-13 오전 00:14:18		
2021-04-13 오전 00:14:21	ms office download free	Edge (Google)
2021-04-13 오전 00:14:22		
2021-04-13 오전 00:18:58	7z	Edge (Bing)
2021-04-13 오전 00:19:00		
2021-04-13 오전 00:19:50	youtub	Edge (Bing)
2021-04-13 오전 00:19:53		
2021-04-13 오전 00:20:30	top secret data	Edge (Youtube)
2021-04-14 오전 2:13:06	how to sync google drive	Edge (Google)
2021-04-14 오전 2:13:09		
2021-04-14 오전 2:13:21		
2021-04-14 오전 2:14:48	google drive and sync application	Edge (Google)
2021-04-14 오전 2:14:49		
2021-04-14 오전 2:14:52		
2021-04-14 오전 2:14:54		
2021-04-14 오전 2:16:20	ms office steganography	Edge (Google)
2021-04-14 오전 2:16:23		
2021-04-14 오전 2:16:49	local to google drive synchronize	Edge (Google)
2021-04-14 오전 2:16:50		
2021-04-14 오후 2:46:12	outlook	Edge (Bing)
2021-04-14 오후 2:46:13		
2021-04-17 오전 00:37:57	baidu	Edge (Bing)
2021-04-17 오전 00:38:01		
2021-04-17 오전 00:38:07	赵立坚7问日本核废水排海决定	Edge (Baidu)
2021-04-17 오전 00:38:25	ftp_百度搜索	Edge (Baidu)
2021-04-17 오전 00:46:43	discord file transfer_百度搜索	Edge (Baidu)
2021-04-17 오전 00:57:28	confidential leak out	Chrome (Google)
2021-04-17 오전 00:57:29		

2021-04-17 오전 00:57:44	investigation data leak	Chrome (Google)
2021-04-17 오전 00:57:45		
2021-04-17 오전 00:58:04	ftp data leak	Chrome (Google)
2021-04-17 오전 00:58:05		
2021-04-17 오전 00:59:58	discord file upload	Chrome (Google)
2021-04-17 오전 00:59:59		
2021-04-17 오전 1:03:18	forensic slack channel	Chrome (Google)
2021-04-17 오전 1:03:19		
2021-04-17 오전 1:03:39	open slack developer channel	Chrome (Google)
2021-04-17 오전 1:03:55		
2021-04-17 오전 1:06:16	gmail	Chrome (Google)
2021-04-17 오전 1:08:31	security slack	Chrome (Google)
2021-04-17 오후 3:24:33	anti forensics	Chrome (Google)
2021-04-17 오후 3:24:34		
2021-04-17 오후 3:24:57	how to remove computer used	Chrome (Google)
2021-04-17 오후 3:24:58		
2021-04-17 오후 3:25:12		

No. 6. Describe the following information based on timeline analysis in detail.

(1) Traces of using other cloud services

x64 (64bits)	Sync	2.0.14.139	Sync	2021-04-14 16:14:53	Wed	C:...	MsiExec....
x86 (32bits)	FileZilla Client 3.53.1	3.53.1	Tim Kosse	2021-04-13 22:09:32	Tue	C:₩...	"C:₩Pro...
x86 (32bits)	Microsoft Edge Update	1.3.143.45		2021-04-13 22:09:32	Tue	C:₩...	"C:₩Pro...
x86 (32bits)	TeamViewer	15.16.8	TeamViewer	2021-04-13 22:09:32	Tue	C:₩...	"C:₩Pro...

[그림 42] 설치 프로그램 확인 (Sync)

사용자가 사용한 클라우드 서비스 파악을 위해 웹 브라우저 사용 기록과 설치 프로그램을 확인한 결과, “Sync”라는 클라우드 서비스 프로그램을 설치한 것을 확인할 수 있었습니다.

해당 클라우드 서비스의 사용 흔적을 명확히 파악하기 위해 아래의 경로에 있는 파일을 조사하였습니다.

Sync Log : C:\Users\dfcal\AppData\Local\Sync.Logs

Sync Config : C:\Users\dfcal\AppData\Local\Sync.Config

먼저 Sync 프로그램의 사용자와 동기화 폴더 등 기본정보를 파악하기 위해, 아래의 파일을 참조했습니다.

설정 값 관련 DB : C:\Users\dfcal\AppData\Local\Sync.Config\1.1\cfg.db

해당 DB에서 “prefs”라는 테이블에 아래와 같이 Sync에 대한 설정 값이 저장되어 있음을 확인했습니다. 이에 기반한 주요한 설정 값은 아래의 표와 같습니다.

테이블: prefs				
	name	val	preserved	editable
84	isready	1	0	0
85	syncinfofilename	.syncinfo	1	0
86	sharedfolder	C:/Users/dfcal/Sync	1	0
87	updatetime	1618641064	0	1

[그림 43] Sync에 대한 설정 값

[표 19] Sync 설정 값

이름	값
공유 폴더 경로	C:/Users/dfcal/Sync
사용자 명	dfc.alice@gmail.com
기기 명	DESKTOP-PNTNPNV
마지막 업데이트 시간	2021년 4월 17일 토요일 오후 3:31:04

설정 값 조사 결과, “C:/Users/dfcal/Sync”를 기준으로 클라우드와 동기화되고 있음을 확인할 수 있었습니다. 이에 동기화된 파일들을 확인하기 위해, 이미지에서 해당 경로를 탐색하였지만 해당 폴더가 존재하지 않아서 동기화된 파일의 흔적을 파악할 수 없었습니다.

이에 클라우드에 동기화된 파일들을 파악하기 위해, Sync의 로그를 살펴보았으며 파일 동기화와 관련된 로그 일부를 확인할 수 있었습니다. 로그의 위치는 아래와 같습니다.

파일 동기화 관련 Log : C:\Users\dfcal\AppData\Local\Sync.Logs\1.1\sync-worker.log

```

dhyun@gimdongBookPro ~/Desktop cat sync-worker.log | grep "1630"
Thu Apr 15 08:19:49 2021 net.c(1630): sending 2 files 9792 bytes to `https://secure13.sync.com/upload.fcgi?command=uploadmultichunk&canbackoff=1&userid=122123000
Thu Apr 15 08:20:20 2021 net.c(1630): sending 2 files 1262107 bytes to `https://secure22.sync.com/upload.fcgi?command=uploadmultichunk&canbackoff=1&userid=122123000
Thu Apr 15 08:20:21 2021 net.c(1630): sending 2 files 17933 bytes to `https://secure22.sync.com/upload.fcgi?command=uploadmultichunk&canbackoff=1&userid=122123000
Thu Apr 15 08:21:11 2021 net.c(1630): sending 2 files 4406 bytes to `https://secure22.sync.com/upload.fcgi?command=uploadmultichunk&canbackoff=1&userid=122123000
Thu Apr 15 08:21:11 2021 net.c(1630): sending 23 files 1822592 bytes to `https://secure22.sync.com/upload.fcgi?command=uploadmultichunk&canbackoff=1&userid=122123000
Fri Apr 16 08:51:08 2021 net.c(1630): sending 2 files 2950570 bytes to `https://m108.sync.com/upload.fcgi?command=uploadmultichunk&canbackoff=1&userid=122123000

```

[그림 44] 파일 동기화 로그 (루트 엔트리 제외, 32개)

해당 로그를 분석한 결과, 총 “32”개의 엔트리에 대해 로컬에서 클라우드로 동기화를 시도한 흔적을 확인하였습니다. 동기화된 엔트리가 어떤 경로를 가지는지 확인하기 위해 아래의 Artifact를 확인하였습니다.

동기화 파일 목록 DB : C:\Users\dfcal\AppData\Local\Sync.Config\1.1\state.db

해당 DB의 특정 테이블에서 동기화한 파일의 local Path (view_localpath_details)와 Remote Path (view_remotepath_details)를 확인할 수 있으며, Download Queue (downqueue)와 Upload Queue (upqueue)를 확인함으로써 동기화를 시도했거나 실패한 파일을 확인할 수 있습니다.

	labelid	label		id	pid	filetype	blobid	size	mtime	servtime	perms	active	pathrc
	필터	필터		필터	필터	필터	필터	필터	필터	필터	필터	필터	필터
1		0		0	0	2	0	0	0	0	0	0	1
2	810510855401432556	web	2710046406	0	2		0	0	0 1618384534356	0	1	382286499957020754	
3	0		2710046407	0	2		0	0	0 1618384534356	0	1	0	
4	-779657839418483865	Data Bleanding File One.xlsx	2715223289	2710046407	1	10998611470004	9672	161736024200000	1618499994165	0	1	-655360413490326396	
5	-1417420764019243148	Second	2715223768	2710046407	2		0	0	0 1618500017837	0	1	514187168961394042	
6	-1313664424899936901	Third	2715223834	2710046407	2		0	0	0 161850019665	0	1	-3819609415667337613	
7	4708809368907543966	ConfInfoPolicy.pdf	2715223877	2715223834	1	10998614270004	17789	161736087100000	1618500025019	0	1	-136900877442858792	
8	-8105393924908213221	17EA88FB5447411695A0A50F8D6B1F9.pdf	2715223904	2715223768	1	10998614400004	1258003	161736092000000	1618500028140	0	1	-4822753651199256967	

[그림 45] state DB 내부 데이터

downqueue와 upqueue에 별도의 데이터가 존재하지 않았으며, 동기화 로그에도 실패에 대한 로그가 존재하지 않으므로, Local Path의 파일이 모두 클라우드에 정상적으로 동기화 되었음을 알 수 있습니다.

파일들의 Local Path 와 Remote Path를 제대로 식별하기 위해서는 해당 DB 역시, 다른 클라우드 및 파일 전송 프로그램과 유사하게 Index (Label) 데이터를 맵핑해줘야 하므로 아래와 같은 스크립트를 작성하였습니다.

```

1 import sqlite3
2 from operator import itemgetter, attrgetter
3
4 class SyncMapper:
5
6     def __init__(self):
7         con = sqlite3.connect('./state.db')
8         self.cur = con.cursor()
9
10    def getLabels(self):
11        labels = self.cur.execute("SELECT labelid FROM labels")
12        data = labels.fetchall()
13        if(data):
14            return [label for labels in data for label in labels]
15
16    def queryLocalPath(self, index):
17        remotePath = self.cur.execute("SELECT labelid, pid, label, timestamp FROM view_localpath_details WHERE labelid='\\\" + index + "\\\"")

```

[그림 46] Local Path 맵핑 스크립트

맵핑된 파일을 대상으로 TimeStamp를 추가로 맵핑하였고, 이전에 확보한 로그와 종합하여 생성한 타임라인은 아래의 표와 같습니다.

[표 20] 타 클라우드 사용 흔적 관련 타임라인

타임스탬프 (UTC+9)	행위
2021년 4월 16일 금요일 오전 12:19:48	C:\Users\dfcal\Sync\Data Bleanding File One.xlsx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:20:16	C:\Users\dfcal\Sync\Second 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:20:17	C:\Users\dfcal\Sync\Third 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:20:17	C:\Users\dfcal\Sync\Third\ConflInfoPolicy.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:20:17	C:\Users\dfcal\Sync\Second\17EA88FB5447411695A0A50F8D6B1FF9.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:09	C:\Users\dfcal\Sync\forensic project 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\IR100 - Event Log.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\VOL300 - NAS Volume Analysis.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\calendar.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\AF100 - Extract a password from the JPEG picture file.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\googletips.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\VOL100 - OMG… My USB.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\xzdiff-letter.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\password.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\lzmainfo-letter.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\VOL500 - File Recovery based on File 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\xzgrep-letter.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\AF500 - Developing MP4 Format Verifier.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\xzmore-letter.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\VxWorks Firmware Analysis.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\ecma376standard_password_plain.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\example.docx 로컬 → 클라우드 동기화

2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\xz-letter.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\ecma376standard_password.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\example_password.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\xzless-letter.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\glossary.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\xzdec-letter.pdf 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\IoT500 - Developing tools and images for IoT analysis.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\AR100 - Windows 10's new artifact.docx 로컬 → 클라우드 동기화
2021년 4월 16일 금요일 오전 12:21:11	C:\Users\dfcal\Sync\forensic project\googletips (1).docx 로컬 → 클라우드 동기화
2021년 4월 17일 토요일 오전 12:51:07	C:\Users\dfcal\Sync\cindyloh3333@gmail.com.mbox 로컬 → 클라우드 동기화

(2) Traces of connection from external network

외부 네트워크와의 연결을 확인하기 위해, 다양한 윈도우 아티팩트 (윈도우 이벤트 로그 및 레지스트리 등) 을 확인한 결과, 외부 네트워크로 연결 (Windows RDP 및 네트워크 로그인, 블루투스 페어링, 등) 에 대한 흔적을 찾을 수 없었습니다. 이에 설치된 어플리케이션을 조사하였으며, 외부 네트워크 연결과 연관이 있을 것이라 유력한 “TeamViewer” 프로그램이 설치되어 있음을 확인할 수 있었습니다.

x86 (32bits)	TeamViewer	15.16.8	TeamViewer	2021-04-13 22:09:32 Tue	C:\w...	"C:\w\Pro...
x86 (32bits)	Microsoft Visual C++ 2015-2019 Redistributable (x64) - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:32 Tue	C:\w...	"C:\w\Pro...
x86 (32bits)	Microsoft Visual C++ 2019 X86 Minimum Runtime - 14.24.28127	14.24.28...	Microsoft Corporation	2021-04-13 22:09:32 Tue	C:\... MsiExec...	

[그림 47] TeamViewer 설치 확인

TeamViewer의 연결 정보를 확인하기 위해, TeamViewer 어플리케이션 Artifact가 저장되는 “Program Files” 폴더를 확인하려 하였으나, 해당 폴더가 디스크 이미지에 존재하지 않음을 확인하였습니다.

어플리케이션 Artifact를 획득할 수 없는 상황에서, 윈도우 Artifact에서 “TeamViewer” 관련 흔적을 수집 및 분석을 하였고, SRUM에 대해 분석한 결과는 아래와 같습니다.

	SRUM ENTRY CREATE	Application	User SID	Interface	Profile	Profile Flags	Bytes Sent	Bytes Received
1	2021-04-15 5:41:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	681
2	2021-04-15 6:43:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	503
30	2021-04-15 7:11:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	210
45	2021-04-15 8:13:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	510
55	2021-04-15 8:13:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	412
96	2021-04-15 8:13:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	70
117	2021-04-15 9:23:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	851
130	2021-04-16 15:37:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	703
168	2021-04-16 16:17:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	22139626
199	2021-04-17 6:31:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer_service.exe	S-1-5-18 (Local System)	IF_TYPE_ETHERNET_CSMACD	0	Zero	0	557492
200	2021-04-17 6:31:00	\Device\HarddiskVolume4\Program files (x86)\TeamViewer\Teamviewer.exe	S-1-5-21-532621032-2203342852-3268876266-1001 (unknown)	IF_TYPE_ETHERNET_CSMACD	0	Zero	30020	211840

[그림 48] TeamViewer 관련 SRUM 데이터

SRUM 덤프에서 TeamViewer 키워드를 필터링한 결과, 원격 연결 및 파일 전송 연결이 수행될 시 발생되는 프로세스 쌍 (teamviewer_service, teamviewer)의 네트워크 활동을 확인할 수 있었습니다.

1	864581872	2021-04-17 14:58:51	Connections_incoming.txt	\Program Files (x86)\TeamViewer\Connections_incoming.txt	File_Created
2	864581984	2021-04-17 14:58:51	Connections_incoming.txt	\Program Files (x86)\TeamViewer\Connections_incoming.txt	File_Created / Data_Added
3	864582096	2021-04-17 14:58:51	Connections_incoming.txt	\Program Files (x86)\TeamViewer\Connections_incoming.txt	File_Created / Data_Added / File_Closed

[그림 49] TeamViewer 외부 연결 Artifact 생성 NTFS 로그

TeamViewer는 양쪽에서 연결 요청이 가능하므로, 연결 요청 지점을 식별하기 위해 로그 확보를 시도하였습니다. 그러나 “Program Files (x86)” 폴더가 해당 이미지에 포함되어 있지 않으므로 다른 Artifact를 통해서 연결 지점을 확인하였습니다.

NTFS Log를 확인한 결과, 외부로부터의 연결이 성립될 시 연결 정보가 기록되는 “Connections_incoming.txt” 로그 파일의 최초 생성 및 수정 로그를 확인하였습니다. 이를 통해서 해당 시스템에 TeamViewer가 설치된 이후로, “2021. 04. 17. 14:58:51” 시점에 외부로부터 TeamViewer 연결이 있었음을 확인할 수 있습니다.

104	864582208	2021-04-17 14:58:51	tvprint.db-journal	\Users\dfcal\AppData\Local\TeamViewer\RemotePrinting\tvprint.db-journal	File_Created
105	864582304	2021-04-17 14:58:51	tvprint.db-journal	\Users\dfcal\AppData\Local\TeamViewer\RemotePrinting\tvprint.db-journal	File_Created / Data_Added
106	864582400	2021-04-17 14:58:51	tvprint.db-journal	\Users\dfcal\AppData\Local\TeamViewer\RemotePrinting\tvprint.db-journal	File_Created / Data_Added / Data_Overwritten
107	864582496	2021-04-17 14:58:51	tvprint.db-journal	\Users\dfcal\AppData\Local\TeamViewer\RemotePrinting\tvprint.db-journal	File_Created / Data_Added / Data_Overwritten
108	864582592	2021-04-17 14:58:51	tvprint.db-journal	\Users\dfcal\AppData\Local\TeamViewer\RemotePrinting\tvprint.db-journal	File_Closed / File_Deleted
109	864582688	2021-04-17 14:58:51	tvprint.db	\Users\dfcal\AppData\Local\TeamViewer\RemotePrinting\tvprint.db	File_Created / Data_Added / Data_Overwritten

[그림 50] TeamViewer 원격 제어 모드로 연결할 시 발생하는 패턴

또한 TeamViewer는 파일 전송 모드 / 원격 제어 모드라는 두개의 모드가 존재하며, 외부에서 어떤 모드로 접근하였는지 확인이 필요합니다.

동일하게 확인할 수 있는 로그가 주어진 이미지에 존재하지 않으므로, 다른 Artifact를 통해 연결 모드를 특정하였습니다. “tvprint.db”는 “원격 제어 모드”로 연결했을 때 Modify 이벤트가 발생하는데, NTFS 로그를 통해서 외부 연결 시점으로 추정되는 시간과 동일한 시간대에 해당 파일에 대한 Modify 이벤트가 발생했음을 확인할 수 있습니다. 이러한 사실들을 종합해보면 해당 시스템을 대상으로 “2021. 04. 17. 14:58:51”에 TeamViewer를 통해서 원격 접속 모드로 외부의 네트워크 연결이 있었음을 확인할 수 있습니다.

2818	3119	2021-04-17 6:31:00	!!TeamViewer_Service.exe!2021/03/15:09:12:09 c4613cl	S-1-5-18 (Local System)	17825794 2021-04-17 06:31:00
2846	3147	2021-04-17 6:31:00	!!TeamViewer.exe!2021/03/15:09:22:30 35312fa!	S-1-5-21-532621032-2203342852-3268876266-1001 (unknown)	17760258 2021-04-17 06:17:00
2862	3163	2021-04-17 6:31:00	!!TeamViewer.exe!2021/03/15:09:22:30 35312fa!	S-1-5-21-532621032-2203342852-3268876266-1001 (unknown)	17760514 2021-04-17 06:17:00
3008	3309	2021-04-17 6:31:00	!!TeamViewer/Desktop.exe!2021/03/15:09:11:11 a4b07f!	S-1-5-18 (Local System)	17694722 2021-04-17 05:59:00

[그림 51] TeamViewer 세션 종료 관련 SRUM

또한 SRUM에서 원격 연결 세션을 종료할 시, 발생하는 “TeamViewer/Desktop.exe”的 EndTime을 통해서 해당 연결의 종료 시간 또한 특정할 수 있습니다.

[표 21] 외부 네트워크 연결 흔적 관련 타임라인

타임 스템프 (UTC+9)	주요 행위
2021. 04. 17. 14:58:51	TeamViewer (원격 제어 모드) 외부로부터 연결 요청 및 성립
2021. 04. 17. 14:59:00	TeamViewer (원격 제어 모드) 외부로부터 연결 종료

(3) Traces of anti-forensics

안티 포렌식 수행 여부를 확인하기 위해, 설치된 프로그램을 조사해본 결과, “File Shredder”이라는 프로그램이 설치되어 있음을 확인하였습니다. 해당 프로그램의 사용 여부와 안티 포렌식의 범위에 대해 파악하기 위해, NTFS Filesystem Log (\$UsnJrnL, \$LogFile)를 추출하여 분석하였습니다.

368	549991062	File Deletion		19.jpg	\Users\lEUser\Desktop\files\19.jpg
369	549991109	2021-05-14 14:59:24	Renaming File	19.jpg -> 1586885.ZZZ	\Users\lEUser\Desktop\files\1586885.ZZZ
370	549991480	File Deletion		1586885.ZZZ	\Users\lEUser\Desktop\files\1586885.ZZZ
371	549992164	File Deletion		20.jpg	\Users\lEUser\Desktop\files\20.jpg
372	549992211	2021-05-14 14:59:24	Renaming File	20.jpg -> 1591071.ZZZ	\Users\lEUser\Desktop\files\1591071.ZZZ
373	549992582	File Deletion		1591071.ZZZ	\Users\lEUser\Desktop\files\1591071.ZZZ
374	549993275	File Deletion		21.jpg	\Users\lEUser\Desktop\files\21.jpg
375	549993322	2021-05-14 14:59:24	Renaming File	21.jpg -> 1586812.ZZZ	\Users\lEUser\Desktop\files\1586812.ZZZ
376	549993695	File Deletion		1586812.ZZZ	\Users\lEUser\Desktop\files\1586812.ZZZ
377	549994388	File Deletion		22.png	\Users\lEUser\Desktop\files\22.png
378	549994435	2021-05-14 14:59:24	Renaming File	22.png -> 1593508.ZZZ	\Users\lEUser\Desktop\files\1593508.ZZZ
379	549994806	File Deletion		1593508.ZZZ	\Users\lEUser\Desktop\files\1593508.ZZZ
380	54999528	File Deletion		23.jpg	\Users\lEUser\Desktop\files\23.jpg
381	549995575	2021-05-14 14:59:24	Renaming File	23.jpg -> 1591492.ZZZ	\Users\lEUser\Desktop\files\1591492.ZZZ
382	549995950	File Deletion		1591492.ZZZ	\Users\lEUser\Desktop\files\1591492.ZZZ
383	54999639	File Deletion		24.png	\Users\lEUser\Desktop\files\24.png
384	549996686	2021-05-14 14:59:24	Renaming File	24.png -> 1587172.ZZZ	\Users\lEUser\Desktop\files\1587172.ZZZ

[그림 52] 실험용 이미지에서 확인된 NTFS 로그

임의의 PC에 대해서 동일한 프로그램으로 안티 포렌식을 수행한 결과, “File Shredder”이란 프로그램은 파일의 이름을 {숫자.ZZZ}, 폴더의 이름을 {숫자} 형식으로 이름을 변경한 후, 삭제하는 패턴을 가지고 있는 것을 확인할 수 있었습니다.

1	868309648	2021-04-17 15:30:43	17EA88FB5447411695A0A50F8D6B1FF9.pdf	Data_Overwritten	Normal
2	868309784	2021-04-17 15:30:43	17EA88FB5447411695A0A50F8D6B1FF9.pdf	Data_Overwritten / Data_Truncated	Normal
3	868309920	2021-04-17 15:30:43	17EA88FB5447411695A0A50F8D6B1FF9.pdf	Data_Overwritten / Data_Truncated / File_Closed	Normal
4	868310056	2021-04-17 15:30:43	17EA88FB5447411695A0A50F8D6B1FF9.pdf	File_Renamed_Old	Normal
5	868310192	2021-04-17 15:30:43	2857702.ZZZ	File_Renamed_New	Normal
6	868310280	2021-04-17 15:30:43	2857702.ZZZ	File_Renamed_New / File_Closed	Normal
7	868310368	2021-04-17 15:30:43	2857702.ZZZ	File_Closed / File_Deleted	Normal
8	868310456	2021-04-17 15:30:43	7z1900-x64.exe	Data_Overwritten	Normal
9	868310544	2021-04-17 15:30:43	7z1900-x64.exe	Data_Overwritten / Data_Truncated	Normal
10	868310632	2021-04-17 15:30:43	7z1900-x64.exe	Data_Overwritten / Data_Truncated / File_Closed	Normal
11	868310720	2021-04-17 15:30:43	7z1900-x64.exe	File_Renamed_Old	Normal
12	868310808	2021-04-17 15:30:43	2862067.ZZZ	File_Renamed_New	Normal
13	868310896	2021-04-17 15:30:43	2862067.ZZZ	File_Renamed_New / File_Closed	Normal
14	868311040	2021-04-17 15:30:43	2862067.ZZZ	File_Closed / File_Deleted	Normal

[그림 53] 주어진 이미지 파일에서 확인된 NTFS 로그

실제 이미지에서 추출한 파일 시스템 로그를 분석한 결과, 실험용 이미지와 동일한 패턴을 가지는 로그들을 확인할 수 있었고, 이를 토대로 수행되었다고 판단한 안티 포렌식 행위는 아래와 같습니다.

[표 22] 안티 포렌식 흔적 관련 타임라인

타임 스템프 (UTC+9)	주요 행위
2021. 04. 17, 15:30:43 PM	C:\Users\dfcal\Downloads\17EA88FB5447411695A0A50F8D6B1FF9.pdf 파일 삭제
	C:\Users\dfcal\Downloads\7z1900-x64.exe 파일 삭제
	C:\Users\dfcal\Downloads\94fd963cec1d4d4185f2d27ece7b1cf.pdf 파일 삭제
	C:\Users\dfcal\Downloads\ChromeSetup.exe 파일 삭제
	C:\Users\dfcal\Downloads\desktop.ini 파일 삭제
	C:\Users\dfcal\Downloads\DiscordSetup.exe 파일 삭제
2021. 04. 17, 15:30:44 PM	C:\Users\dfcal\Downloads\FileZilla_3.53.1_win64-setup.exe 파일 삭제
	C:\Users\dfcal\Downloads\file_shredder_setup.exe 파일 삭제
	C:\Users\dfcal\Downloads\git-commander-master.zip 파일 삭제
	C:\Users\dfcal\Downloads\installbackupandsync.exe 파일 삭제
	C:\Users\dfcal\Downloads\MicrosoftEdgeSetup.exe 파일 삭제
	C:\Users\dfcal\Downloads\refs_report.pdf 파일 삭제
	C:\Users\dfcal\Downloads\SlackSetup.exe 파일 삭제
2021. 04. 17, 15:30:45 PM	C:\Users\dfcal\Downloads\sync-installer.exe 파일 삭제
	C:\Users\dfcal\Downloads\TeamViewer_Setup.exe 파일 삭제
	C:\Users\dfcal\Downloads\windows 10 forensics.pdf 파일 삭제
	C:\Users\dfcal\Downloads\ 폴더 삭제

분석된 결과를 기반으로 “File Shredder”라는 도구로 “C:\Users\dfcal\Downloads\” 폴더 및 하위 파일에 대해 안티 포렌식을 수행하였음을 확인할 수 있었습니다.

분석 결과

위의 분석 결과들을 통해서 구성한 사용자의 간략한 타임라인은 다음과 같습니다.

[표 23] 전체 타임라인 요약

타임 스템프 (UTC+9)	주요 행위
2021. 4. 11. 14:48	원도우 운영체제 설치
2021. 4. 11. 15:15	데이터 유출 관련 키워드 검색 및 응용 프로그램 설치 파일 다운로드
2021. 4. 14. 16:27	Google Backup and Sync를 통해 로컬의 “Team_DFC_workspace” 파일 일부 클라우드로 동기화
2021. 4. 16. 00:19	Sync를 통해 로컬의 “Team_DFC_workspace” 파일 일부 클라우드로 동기화
2021. 4. 16. 23:58	Slack “dfcworkspacehq” 채널에서 대화 및 문서 다운로드
2021. 4. 17. 00:37	데이터 유출 관련 키워드 검색
2021. 4. 17. 14:58	TeamViewer를 통해 외부에서 원격 제어모드로 연결
2021. 4. 17. 14:59	TeamViewer를 통한 외부의 원격 제어모드 연결 세션 종료
2021. 4. 17. 15:06	FileZilla를 통해 FTP 서버 “alice_confidential”에 로컬의 “Team_DFC_workspace” 파일 일부 업로드
2021. 4. 17. 15:10	FileZilla를 통해 FTP 서버 연결 재시도 및 세션 종료
2021. 4. 17. 15:14	FileZilla를 통해 FTP 서버 “Telegram”에 로컬의 이미지 일부 업로드
2021. 4. 17. 15:24	안티 포렌식 관련 키워드 검색
2021. 4. 17. 15:28	File Shredder 설치 파일 다운로드
2021. 4. 17. 15:30	File Shredder를 통해 “Downloads” 폴더 삭제

해당 타임라인을 통해서 본 디스크 이미지의 시스템 사용자는 업무 관련 파일들이 있는 것으로 추정되는 “Team_DFC_workspace” 폴더의 파일들을 여러 클라우드 및 FTP 서버에 업로드하였는 것을 확인할 수 있었습니다. 또한 메신저나 웹 브라우저로 파일 유출 관련 정보에 대해 지속적으로 수집하며, 원격 접속 도구나 파일 삭제 도구를 활용한 정황이 있습니다. 일부 행위를 미루어 보아 사용자는 로컬의 파일을 외부에 무단으로 업로드 및 유출 함으로써 속한 회사의 Policy를 위반한 것으로 확인이 됩니다.

별첨

클라우드 서비스 및 FTP SQLite3 Artifact Mapper Script

https://drive.google.com/file/d/1XEBVKaeTnOXG_a8C93oGt4hQe1U4UDIE/view?usp=sharing

Slack으로 전송된 문장

How to Prevent Data Leak

These five steps will help you strengthen security and prevent data leak problems:

1. *Classify your data according to its value and sensitivity.* The first step in preventing data leaks is to know which data can be freely shared, and exactly who should be allowed to access the other data you store. Using data discovery and classification, you can <<https://blog.netwrix.com/2020/11/05/data-classification-and-dlp/>> organize all your data into categories so you can protect it appropriately.
2. *Proactively identify and mitigate IT risks.* You won't know where you're most vulnerable unless you regularly assess your risks. To implement effective <<https://blog.netwrix.com/2018/01/16/how-to-perform-it-risk-assessment/>> and <<https://blog.netwrix.com/2020/03/20/it-risk-management/>>, consider using an industry standard like the <<https://blog.rsisecurity.com/basics-of-the-nist-risk-assessment-framework/>> framework from the National Institute of Standards and Technology (NIST). The NIST <<https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-30r1.pdf>> document lays out the procedures for the assessment.
3. *Protect your data according to its value and sensitivity.* Next, deploy the right <<https://blog.netwrix.com/2018/02/01/top-20-critical-security-controls-for-effective-cyber-defense/>>. The NIST 800-53 standard can help you choose appropriate controls. Best practices include: "Identity and access management (IAM), a framework that helps businesses implement and manage policies for access to sensitive information" Encryption, which is the process of encoding data so that cannot be read even if it falls into the wrong hands" Data access governance, which includes applying <<https://blog.netwrix.com/2019/04/30/what-is-the-principle-of-least-privilege/>> the principle of least privilege> to ensure that users have only the access permissions they need to do their jobs" Change management and auditing, which can help you avoid misconfigurations and other security gaps" User and entity behavior analytics (UEBA), which helps you spot unusual activity that could lead to a data leak
4. *Train all employees on security awareness.* The <https://www.netwrix.com/download/collaterals/2020_Cyber_Threats_Report.pdf?itm_source=blog&itm_medium=context&itm_campaign=none&itm_content=none&cID=70170000000kgEZ|Netwrix> 2020 Cyber Threats Report> showed that 58% of companies are worried that their employees will ignore security rules, putting data at risk. To reduce the risk of costly mistakes, perform security training for all employees, including executives, on a regular basis.
5. *Enable timely detection.* Detecting improper activity promptly can help you avoid or reduce the scope of a data leak. For example, alerts on changes to critical configuration parameters can enable you to immediately close a security gap, and spotting a user copying sensitive data to a local machine can enable you to intervene before the machine leaves the premises.
6. *Be ready to recover.* Finally, a process must be put in place to recover any content that is lost in a data leak. Be sure to implement a test a thorough recovery plan for all important data.

FTP를 통해 유출된 데이터 목록

C:\Users\dfcal\Team_DFC_workspace\work\What is Information Leakage.gdoc
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FTP를 통한 유출 시도 데이터 목록

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C:\Users\dfcal\Team_DFC_workspace\work\FileSystem\ubifs-root\ubi_user_fs\raw\share\alsa\cards\SI7018\sdncc-mixer.alisp

Google 클라우드 상의 디렉토리 구조 (폴더)
Desktop
Desktop\Arsenal-Image-Mounter-v3.2.126
Desktop\Arsenal-Image-Mounter-v3.2.126\lib
Desktop\Arsenal-Image-Mounter-v3.2.126\arm
Desktop\Arsenal-Image-Mounter-v3.2.126\lib\arm64
Desktop\Arsenal-Image-Mounter-v3.2.126\lib\x64
Desktop\Arsenal-Image-Mounter-v3.2.126\lib\x86
Desktop\confidential
Desktop\project
Desktop\project\git-commander-master
Desktop\project\git-commander-master\bin
Desktop\project\git-commander-master\config
Desktop\project\git-commander-master\config\key
Desktop\project\git-commander-master\controller
Desktop\project\git-commander-master\doc
Desktop\project\git-commander-master\model
Desktop\project\git-commander-master\view
Desktop\project\git-commander-master\view\style
Desktop\work
root
root\personal
root\personal\Document
root\personal\image
root\project
root\project\4 Universities
root\project\Japanese Census Data
root\project\MSNBC web usage
root\project\forensic project
root\work
root\work\Archive
root\work\FileSystem
root\work\FileSystem\ubi_reader
root\work\FileSystem\ubi_reader\.git

root\work\FileSystem\ubi_reader\git\branches
root\work\FileSystem\ubi_reader\git\hooks
root\work\FileSystem\ubi_reader\git\info
root\work\FileSystem\ubi_reader\git\logs
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root\work\FileSystem\ubi_reader\git\logs\refs\heads
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root\work\First
root\work\Second
root\work\Third

Google 클라우드 상의 디렉토리 구조 (파일)
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_LOGGING_START.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_KIDNAP_RECOVERING.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_SD_WHEELLEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_FUNCTION_RESERVATION_CANCEL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_MODE_ZZ.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_SD_BEGIN_ERROR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_SYSTEM_POWER_ON.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_ERROR_AGITATOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_FUNCTION_RESERVATION_DAILY_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_NOTICE_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_SD_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_NUM_8.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_NOTICE_UPDATE_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_ERROR_WHEEL_ENCODER_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-TW_1\SND_NUM_4.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_SUCTION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NUM_DOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_BLACKBOX_LOADING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SMART_UPDATE_REBOOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_HOMING_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SMART_REG_IMPOSSIBLE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_HOMING_CLEANING_END_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_DUSTBIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_CLEANING_SECTOR_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_RESERVATION_DAILY_SELECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NUM_5.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NOTICE_UPDATE_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_RESERVATION_SET_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_LOWBATTERY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_CLEANING_SPOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NETWORK_REMOTE_CONNECT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_RESERVATION_CANCEL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NUM_1.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NETWORK_REMOTE_DISCONNECT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_DUSTBIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_BATTERY_LOW.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_CLIFF.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_REPEAT_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_KEYLOCK_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_WHEEL_DROP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_WHEEL_ENCODER_RIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NUM_2.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_MODE_SB.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_WHEEL_STUCK_RIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_MODE_SPOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_NUM_3.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SYSTEM_SILENCE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_LOGGING_NOMEMORY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_CLEANING_ZIGZAG_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_IR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_LOGGING_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_LOGGING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_WHEELLEFTSENSOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_CLEANING_ZIGZAG.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_TURBO_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_AGITATOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_BLACKBOX_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_WHEELLEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_MUTE_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_BLACKBOX_FULL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_BEGIN_ERROR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SMART_NICKNAME_CHANGE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SYSTEM_POWER_ON.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_CLEANING_SECTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_STUCK.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_SD_USS.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_FUNCTION_CANCELED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_ERROR_WHEEL_ENCODER_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\SND_LOGGING_NOTAVAILABLE.opus

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_WHEELRIGHTSENSOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_JIG_NATIONAL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_RESERVATION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_KIDNAP_RECOVERED_CONTINUE_HOMING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_NUM_9.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_PSD.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_MODE_ZZ.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_BATTERY_LOW_CHARGING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_NUM_6.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SMART_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_HOMING_END_RETURN_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_REPEAT_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_KEYLOCK_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_BEGIN_RESERVATION_CANCELED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_AGITATOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_MOP.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_ERROR_WHEEL_STUCK_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_ACC.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_OF5.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_CONTINUE_PRECEDING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_MACRO_RETRY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_MACRO_SECTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_RESUME.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_NETWORK_NETJIG_RESET.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_MUTE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_ERROR_WHEEL_MOTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_RETRY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_TURBO_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_KIDNAP_RECOVERING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_GYRO.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_LEARNING_ACTIVATED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_REGUPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_RESERVATION_DAILY_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_NETWORK_ONETOUCH_SUCCESS.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_RMANAGER_CONNECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_RESERVATION_ONCE_SELECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_ZIGZAG_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_REGUPDATE_COMPLETE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_ERROR_POWER_SWITCH.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_REGUPDATE_FAIL.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_NUM_8.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SYSTEM_POWER_OFF.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_NOTICE_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_NOTICE_UPDATE_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_ERROR_RESERVATION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_KEYLOCK_SET.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_SECTOR_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SYSTEM_BIRTH.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_RESULTOK.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_REPEAT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SD_SUCTION.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_BATTERY_CHARGING_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_SYSTEM_DDING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_CLOCK_SET_BEGIN.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_CLEANING_MACRO.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_VOICE_CHANGE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_BLACKBOX_LOADING_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\zh-CN_0\ SND_FUNCTION_RESERVATION_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\ SND_FUNCTION_TURBO_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\ SND_ERROR_SUCTION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\ SND_SYSTEM_DDING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\ SND_SD_AGITATOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\ SND_SD_PSD.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\ SND_KIDNAP_RECOVERING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\ SND_SD_RESULTOK.opus

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_POWER_SWITCH.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_5.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_LOGGING_NOTAVAILABLE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_8.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_SECTOR_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_KEYLOCK_SET.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_MODE_ZZ.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SYSTEM_BIRTH.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_RETRY.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_WHEEL_DROP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BATTERY_LOW_CHARGING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NETWORK_ONETOUCH_SUCCESS.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SYSTEM_POWER_OFF.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_WHEEL_ENCODER_RIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_DOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SMART_REG_IMPOSSIBLE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_KEYLOCK_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_RMANAGER_CONNECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_LOGGING_NOMEMORY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_CANCELED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_WHEELRIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_CLIFF.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_HOMING_CLEANING_END_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_REPEAT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_2.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_JIG_NATIONAL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SMART_NICKNAME_CHANGE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_HOMING_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_3.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_4.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_WHEELRIGHTSENSOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SYSTEM_POWER_ON.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_ZIGZAG_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_REPEAT_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_RESERVATION_DAILY_SELECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_RESUME.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_BEGIN_RESERVATION_CANCELED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_9.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BATTERY_LOW_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_6.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SMART_UPDATE_REBOOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_KIDNAP_RECOVERED_CONTINUE_HOMING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_AGITATOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_MUTE_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_SECTOR_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_WHEEL_MOTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_DUSTBIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NOTICE_UPDATE_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BLACKBOX_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_SECTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_WHEEL_STUCK_RIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NETWORK_REMOTE_CONNECT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_7.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_CLOCK_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NOTICE_UPDATE_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_BEGIN_ERROR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_KEYLOCK_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NETWORK_REMOTE_DISCONNECT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_GYRO.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_1.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_SPOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BLACKBOX_LOADING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_JIG_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_MACRO.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_ZIGZAG.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_HOMING_END_RETURN_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NETWORK_NETJIG_RESET.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_REGUPDATE_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_IR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SYSTEM_SILENCE.opus

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_RESERVATION_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_DUSTBIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_LOWBATTERY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BATTERY_LOW.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_TURBO_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NOTICE_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_OVERCOME_OBSTACLE_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_CLOCK_SET_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_MACRO_SECTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_REGUPDATE_START.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_STUCK.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_WHEEL_ENCODER_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_LOGGING_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_ACC.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_RESERVATION_ONCE_SELECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_REGUPDATE_COMPLETE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_SUCTION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SMART_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_RESERVATION.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_CONTINUE_PRECEDING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_OF5.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_NUM_0.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_REPEAT_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_RESERVATION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BLACKBOX_LOADING_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_RESERVATION_SET_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_USS.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_WHEELLEFTSENSOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_MACRO_RETRY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_SD_WHEELLEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BATTERY_CHARGING_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_BLACKBOX_FULL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_CLEANING_ZIGZAG_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_RESERVATION_CANCEL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_LOGGING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_VOICE_CHANGE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_FUNCTION_MUTE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_1\SND_ERROR_WHEEL_STUCK_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_MODE_SB.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_BATTERY_CHARGING_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_SECTOR_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NOTICE_UPDATE_END.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SMART_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_IR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_BLACKBOX_FULL.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NETWORK_ONETOUCH_SUCCESS.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_LOWBATTERY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NETWORK_REMOTE_CONNECT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_LOGGING_NOMEMORY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_ZIGZAG_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_SPOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_JIG_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_BATTERY_LOW_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_TURBO_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NETWORK_NETJIG_RESET.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_REGUPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_REPEAT_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_RESERVATION_DAILY_SELECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_RESERVATION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_WHEELLEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_RESUME.opus

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_DUSTBIN.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_WHEEL_ENCODER_RIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_MODE_ZZ.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_USS.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_BLACKBOX_LOADING_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SYSTEM_BIRTH.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_WHEEL_DROP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_ZIGZAG_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_KEYLOCK_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_REGUPDATE_COMPLETE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_WHEELRIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_HOMING_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_CLIFF.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_MACRO.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_CONTINUE_PRECEDING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NETWORK_REMOTE_DISCONNECT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_STUCK.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_MUTE_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_KIDNAP_RECOVERED_CONTINUE_HOMING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_WHEEL_STUCK_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_HOMING_CLEANING_END_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_KEYLOCK_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_JIG_NATIONAL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_WHEEL_ENCODER_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_CLOCK_SET_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_POWER_SWITCH.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SYSTEM_SILENCE.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_BEGIN_ERROR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SMART_UPDATE_REBOOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_AGITATOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_CLOCK_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_END.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_RESERVATION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_DUSTBIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_ACC.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_KEYLOCK_SET.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SYSTEM_POWER_OFF.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_HOMING_END_RETURN_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_RESERVATION_DAILY_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_TURBO_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_MODE_SPOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_REGUPDATE_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_LOGGING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_OVERCOME_OBSTACLE_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_RESULTOK.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NUM_DOT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_RESERVATION_SET_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NOTICE_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_SUCTION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_REPEAT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_VOICE_CHANGE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_BATTERY_LOW_CHARGING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SYSTEM_POWER_ON.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_BLACKBOX_LOADING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_RETRY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_MACRO_SECTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_RESERVATION_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_CANCELED.opus

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_WHEEL_STUCK_RIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_KIDNAP_RECOVERING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NUM_5.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_FUNCTION_REPEAT_ENABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_SECTOR_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_SUCTION.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NOTICE_UPDATE_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_MACRO_RETRY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NUM_0.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_LOGGING_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NUM_7.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_NUM_6.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_ERROR_WHEEL_MOTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SYSTEM_DDING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_SD_WHEELLEFTSENSOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_CLEANING_SECTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_BLACKBOX_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ko_0\SND_RMANAGER_CONNECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ja_0\SND_CLEANING_ZIGZAG_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\ja_0\SND_CLEANING_SECTOR_OVERCOME_OBSTACLE_DISABLED.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\share\alsa\sound.rc
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_REGUPDATE_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_NETWORK_ONETOUCH_SUCCESS.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_BEGIN_RESERVATION_CANCELED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_CLEANING_SECTOR.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_NUM_3.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_JIG_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_NETWORK_REMOTE_DISCONNECT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_REGUPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_HOMING_SEARCH_CHARGER.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_FAIL.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_ERROR_STUCK.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SYSTEM_BIRTH.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_OVERCOME_OBSTACLE_DISABLED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_WHEELRIGHT.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_BATTERY_LOW_CHARGING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_CLOCK_SET_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_CLEANING_SECTOR_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_LOWBATTERY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_ERROR_WHEEL_STUCK_LEFT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_CLIFF.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_HOMING_CLEANING_END_SEARCH_CHARGER.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_RESERVATION_SET_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_BLACKBOX_FAIL.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SMART_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_CLEANING_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_ERROR_WHEEL_STUCK_RIGHT.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_OVERCOME_OBSTACLE_ENABLED.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_CLEANING_MACRO.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SYSTEM_POWER_ON.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_GYRO.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_HOMING_END_RETURN_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_KIDNAP_RECOVERED_CONTINUE_HOMING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_ERROR_WHEEL_ENCODER_RIGHT.opus

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_BLACKBOX_FULL.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_NOTICE_UPDATE_START.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_NOTICE_UPDATE_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_BEGIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_CLEANING_ZIGZAG_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_KIDNAP_RECOVERING.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SMART_REG_IMPOSSIBLE.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_SD_MOP.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_BATTERY_LOW.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_CLOCK_SET_END.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_CLEANING_MACRO_RETRY.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_KEYLOCK_SET.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_MUTE_ENABLED.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_ERROR_DUSTBIN.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_FUNCTION_RESERVATION_DAILY_SELECTED.opus
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_REGUPDATE_COMPLETE.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_ERROR_RESERVATION.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\SoundFiles\en_1\SND_CLEANING_ZIGZAG_OVERCOME_OBSTACLE_DISABLED.opus
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-WIFILITE-TW\original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-WIFILITE-TW\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-WIFILITE-TW\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-WIFILITE-TW\script\wificonf.l302d
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-WIFILITE-TW\script\wificonf.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\share\alsa\cards\SI7018\sdnlp-mixer.alisp
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\share\alsa\cards\SI7018\sdnlp-mixer.alisp
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\default_files.md5
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\vision_checksum.md5
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\md5_result.txt

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\asix.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\soc_test_color
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\CBR74755291.md5
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\cam_set_for_dual
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\check_fsystem.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\test\record_test
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\dhcprelay
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\setlogcons
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\rpjig.afx
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\loadfont
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\chpasswd
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\dhclient
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\telnetd
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\rdtdate
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\dropbear
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\dropbearmulti
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\chroot
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\httpd
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\dhcpcd
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\inetd
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\sbin\udhcpcd
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\dhcpd.leases
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\SLAM_control.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\broker.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Camera.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Jig_vision.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Dnn.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\cameracal.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Model.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\config_client_dnn.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\slam_param.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\BlackBox.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\SoundList.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\config_local.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\config_client.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\apJig.conf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\config.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\playback.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Motion.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Obstacle_r1.0.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\dhcpd.leases~
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Event.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Testmode.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\cc_param_Huentek.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Sound.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\SLAM.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\DAIS.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\SLAM.bak
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\deviceID.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\collector.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\config_voice.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\dhcpd.conf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\config_voice_d.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Name.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\servicelist
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\general.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\App.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\JIGOK.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\config_client_2.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Planner.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Navi.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\time.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\Jig_micom.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\JigCameraTest.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rcfg\input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\blackbox.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\adhoc.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\run_hit.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\symlink.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\run_apmode.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\updater.sh

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\log_end.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\setAPmode.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\wificonn.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\setSTAS5370.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\setServerInformation_MT76X7.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\log_start.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\DHcp.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\downloader.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\ConnectAP.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\setAPInformation_MT76X7.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\wps_start.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\rpkill.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\rpcon.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\DetectWifiErrorReason.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\CheckV2FolderTree.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\autoconn.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\voice_jig_conn.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\udhcpc.script
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\spacecheck.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\setAPInformation.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\aplay.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\setAP5370Manual.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rscript\restartConnectAP.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\now
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\linksuccess
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEMOP-TW\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEMOP-TW\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\rpmain.axf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEMOP-TW\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEMOP-TW\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEMOP-TW\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-EEU\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-EEU\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-EEU\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-EEU\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEWP-EEU\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEWP-EEU\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEWP-EEU\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITEWP-TH\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-TH\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-TH\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-TH\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-TH\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-TH\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-FR\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-FR\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-FR\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIWP-FR\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-TH\rcfg\wificonf_I302d
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-TH\rcfg\wificonf.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFI-KR\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFI-KR\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFI-KR\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFI-KR\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFI-KR\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIMOP-TW\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIMOP-TW\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIMOP-TW\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIMOP-TW\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFIMOP-TW\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-RU\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-RU\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-RU\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-RU\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-RU\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFI-KR\rcfg\wificonf.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFI-KR\rcfg\wificonf_I302d
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-SG\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-SG\rcfg\cc_param_Huentek_1-9inch.cfg
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-SG\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-SG\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-SG\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-KR\rcfg\wificonf_I302d
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-KR\rcfg\wificonf.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modeleopt\HIT-WIFILITE-KR\rcfg\Function.xml

root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N2-KR\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N2-KR\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N2-KR\rcfg\Media.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N2-KR\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N2-KR\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-US\rscrip\wificonf.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-US\rscrip\wificonf_I302d
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-SG\rscrip\wificonf_I302d
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-SG\rscrip\wificonf.sh
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-US\rcfg\Media.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-US\rcfg\Input.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-US\rcfg\5370_original.dat
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-US\rcfg\SmartControl.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\modelopt\HIT-N-US\rcfg\Function.xml
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rbin\decode.axf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rbin\rkhit_cc.axf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rbin\pllog.axf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rbin\update.axf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rbin\HIT_Startup.axf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bist\flash_test
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\rbin\dhcpd
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bist\clock_test
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bist\test_IEC60730.sh
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bist\cpu_register_test
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bist\irq_timer_test
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bist\cpu_pc_test
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\rtnet5370sta.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\mt76x7_wifi_hit_n.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\rt5370ap.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\rtutil5370ap.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\mt76x7_wifi_hit_i.ipv6.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\wpa_supplicant.conf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\login_enable
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\rtnet5370sta.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\wps_start
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\rtutil5370sta.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\mt76x7_wifi_hit_i.ko
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root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\rc.local
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\mt76x7_wifi_hit_n.ipv6.ko
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\rc.shutdown
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\etc\resolv.conf
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libogg.so.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libopusfile.so.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libopusfile.so
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libz.so.1
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libasound.so.2.0.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libopus.so.0.5.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libopus.so
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libopus.so.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libasound.so
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libcrypto.so.1.0.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libcurl.so.4
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libbz2.so.1.1.4
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libopusfile.so.0.3.1
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libcurl.so
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libcurl.so.4.0.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libssl.so.1.0.0
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libasound.so.2
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libogg.so
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libz.so
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\reset
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\lib\libogg.so.0.8.2
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\whoami
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\tail
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\dropbearconvert
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\add-shell
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\tr
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\xargs
root\work\FileSystem\ubifs-root\ubi_user_fs\raw\bin\dos2unix
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