

Appendix 1

TECHNICAL ANALYSIS DPIA G SUITE ENTERPRISE
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Traffic analysis G Suite Enterprise

1. Description of technical set-up and research methods

When a Dutch government employee uses G Suite Enterprise, in principle the data processing takes place on Google's cloud servers. It is not possible to inspect via traffic interception how Google processes diagnostic data in its system generated logs about the use of the Core services, the Additional Services, or the Google Account.

Google makes some of these system generated log files available to administrators. These logs for administrators are audit logs. Through the audit logs it is possible for administrators (and Privacy Company) to inspect some of the data Google collects about the interactions from end-users with its cloud servers. On 26 March 2020 all available audit logs were exported from the administrator console¹ that contained information about the activities performed by the two test accounts. From the 19 available logs, 13 logs contained information that was within the scope of this DPIA and therefore used for this analysis. These results are described below, in Section 1.5.

In order to map the data processing in the audit logs, first a large number of test scripts was executed on Windows and MacOS and in the different installed iOS and Android apps (the Android apps tested on the Chromebook with the ChromeOS). These scripts contain a selection of representative user actions in the G Suite Core Services.

Where possible, Additional Services and functionality that is included with the Core Services were used in combination with the Core Services, the Features Spelling and grammar, Explore (to insert images from the Web) and Translate. The scenarios were developed in order to reproduce the everyday actions of an employee of a Dutch government organisation. The scenarios were executed on 17 December 2019 (macOS and Android apps on Chromebook), 31 January 2020 (Windows) and 3 February 2020 (iOS).

Privacy Company has ensured that the research is reproducible and repeatable. This has been achieved by working with written scenarios in which the number of actions was limited. There was a pause of 30 seconds between each action. Screenshots have been made of all actions. All data have been recorded.

1.1 Settings in test set-up G Suite

For this DPIA a test environment was created in G Suite Enterprise with the default privacy settings. Google for example by default enables access to all Additional Services for which Google acts as data controller. Privacy Company has tested six Additional Services in combination with the Core Services (Chrome OS and the Chrome browser counted as a single service).

1.2 Tested versions G Suite

Google does not display update data or version history for G Suite Enterprise web applications. Privacy Company has conducted its technical research on three operating systems (Chromebook, macOS and Windows 10 Business Premium), with a Chrome browser. The version of the browser differs per operating system.

¹ <https://admin.google.com/u/1/ac/reporting/audit/admin>

Operating system	Chrome browser
Chrome OS on Lenovo Chromebook S330	Mozilla/5.0 (X11; CrOS aarch64 12607.58.0) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/79.0.3945.86 Safari/537.36
Chrome on macOS	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_2) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/79.0.3945.117 Safari/537.36
Chrome on Windows 10 Business Premium	Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/79.0.3945.130 Safari/537.36
Android apps tested on Chromebook ²	
iOS 12.3.1	

1.3 Interception outgoing data traffic

Privacy Company has intercepted the outgoing data from the three devices with Mitmproxy version 5.0.1 (software that makes it possible to inspect the content of traffic with and without TLS encryption).

The Mitmproxy was used as follows:

- Configure the laptop or phone to use the proxy
- Start the Mitmproxy
- Launch the specific mobile application
- Log in with a Google Account as needed
- Run the scripted scenario. Make screenshots of each step.
- Once the script is fully executed, stop the Mitmproxy.

Interception of the traffic generated by the iOS apps was not possible with the regular MiTM procedure, because the traffic is protected against interception with certificate pinning. In stead, the traffic was intercepted with Wireshark. This has resulted in a higher level of uncertainty about the contents of the captured network traffic on iOS.

Privacy Company has saved the log files and compared the network endpoints with the limited public information Google publishes about them.³

Google instructs administrators to allow traffic from the following URLs:⁴

URL	Purpose
https://oauth2.googleapis.com/token https://www.googleapis.com/oauth2/v4/token	Authentication
https://www.googleapis.com/calendar/	Calendar
http://crl.geotrust.com/crls/secureca.crl http://g.symcb.com/crls/gtglobal.crl http://pki.google.com/GIAG2.crl http://g.symcd.com http://clients1.google.com/ocsp	Certificate Revocation Lists
https://www.google.com/m8/feeds/contacts/	Contacts
https://www.google.com/m8/feeds/gal	Global Address Book
https://mail.google.com/mail/r/ https://www.googleapis.com/gmail/	Mail
https://www.googleapis.com/drive/	Notes
https://www.googleapis.com/tasks/	Tasks

² The Chromebook contains the same Android runtime and app store as Android on a smartphone. Therefore, there should be no difference in the test results.

³ Google, Set up a G Suite host name whitelist, URL: <https://support.google.com/a/answer/9012184?hl=en>.

⁴ Google, Troubleshoot network traffic issues, URL: <https://support.google.com/a/answer/2622308?hl=en>.

1.4 Telemetry data

In reply to questions from Privacy Company, Google provided some information about the telemetry data it processes. Google asked Privacy Company not to include this information in the public DPIA report, as Google generally considers information about the existence and contents of telemetry data confidential.

This is not entirely correct.⁵ Google itself publishes a description in its general (consumer) Privacy Policy: *"We also collect information about the interaction of your apps, browsers, and devices with our services, including IP address, crash reports, system activity, and the date, time, and referrer URL of your request.*

If you're using an Android device with Google apps, your device periodically contacts Google servers to provide information about your device and connection to our services. This information includes things like your device type, carrier name, crash reports, and which apps you've installed."⁶

Some more information can be found in (specialist) information for Android developers. Google explains: *"Since Android version 9, Google collects telemetry data from the device. The diagnostic data include information about app usage, battery and process statistics and crashes. In previous versions of Android, the telemetry stack was limited and didn't capture the information needed to identify and resolve system reliability and device or app issues. This made identifying root causes of issues difficult, if not impossible. Android 9 includes the statsd telemetry feature, which solves this deficiency by collecting better data faster. statsd collects app usage, battery and process statistics, and crashes. The data is analyzed and used to improve products, hardware, and services."⁷*

It follows from this explanation that Google processes telemetry data from -at least- Android devices, for the purpose of 'improving' products, hardware and services. It is not clear if Google collects the same telemetry data from Chromebooks and the Chrome OS, because it was not technically possible to decode this traffic.

Google publishes a list of all available raw stats log events for apps on Android devices, also known as 'atoms'.⁸ As shown in the detailed examples below, these log events include

- The local IP addresses with which the device is connected to the internet and its MAC address,
- What apps are used and when,
- Bluetooth use including the hashed MAC addresses
- When biometric authentication is used
- Occurrence (not contents) of crashes and WTF's (What a Terrible Failure).

The local IP addresses with which the device is connected to the internet and its MAC address

```
/*  
 * Logs the reception of an incoming network packet causing the main system to wake up for  
 * processing that packet. These events are notified by the kernel via Netlink NFLOG to Netd  
 * and processed by WakeupController.cpp.  
 */
```

⁵ The existence of telemetry data is mentioned in a discussion forum about fairphone. *"Unfortunately the google apps are not the only preinstalled components on the FP3 that have undocumented telemetry capabilities and regularly or sporadically talk home."* URL: <https://forum.fairphone.com/t/telemetry-spyware-list-of-privacy-threats-on-fp3-android-9/55179/8>

⁶ Ibid.

⁷ Google, Android 9 Release Notes, URL: <https://source.android.com/setup/start/p-release-notes>. Google refers to more information at frameworks/base/cmds/statsd/.

⁸ The Android Open Source Project, atoms.proto, URL: <https://android.googlesource.com/platform/frameworks/base/+refs/heads/master/cmds/statsd/src/atoms.proto>

```

message PacketWakeupOccurred {
    // The uid owning the socket into which the packet was delivered, or -1 if the packet was
    // delivered nowhere.
    optional int32 uid = 1 [(is_uid) = true];
    // The interface name on which the packet was received.
    optional string iface = 2;
    // The ethertype value of the packet.
    optional int32 ethertype = 3;
    // String representation of the destination MAC address of the packet.
    optional string destination_hardware_address = 4;
    // String representation of the source address of the packet if this was an IP packet.
    optional string source_ip = 5;
    // String representation of the destination address of the packet if this was an IP packet.
    optional string destination_ip = 6;
    // The value of the protocol field if this was an IPv4 packet or the value of the Next Header
    // field if this was an IPv6 packet. The range of possible values is the same for both IP
    // families.
    optional int32 ip_next_header = 7;
    // The source port if this was a TCP or UDP packet.
    optional int32 source_port = 8;
    // The destination port if this was a TCP or UDP packet.
    optional int32 destination_port = 9;
}

```

What apps are used and when

```

message AppStartOccurred {
    // The uid if available. -1 means not available.
    optional int32 uid = 1 [(is_uid) = true];
    // The app package name.
    optional string pkg_name = 2;
    enum TransitionType {
        UNKNOWN = 0;
        WARM = 1;
        HOT = 2;
        COLD = 3;
    }
    // The transition type.
    optional TransitionType type = 3;
    // The activity name.
    optional string activity_name = 4;
    // The name of the calling app. Empty if not set.
    optional string calling_pkg_name = 5;
    // Whether the app is an instant app.
    optional bool is_instant_app = 6;
    // Device uptime when activity started.
    optional int64 activity_start_millis = 7;
    optional android.app.AppTransitionReasonEnum reason =
8;
    optional int32 transition_delay_millis = 9;
    // -1 if not set.
    optional int32 starting_window_delay_millis = 10;
    // -1 if not set.
    optional int32 bind_application_delay_millis = 11;
    optional int32 windows_drawn_delay_millis = 12;
    // Empty if not set.
    optional string launch_token = 13;
    // The compiler filter used when when the package was
    optimized.
}

```

```

    optional int32 package_optimization_compilation_filter =
14;
    // The reason why the package was optimized.
    optional int32 package_optimization_compilation_reason =
15;
}

```

Bluetooth use including the hashed MAC addresses

```

/**
 * Logs when profiles on a Bluetooth device connects and disconnects.
 *
 * Logged from:
 *
packages/apps/Bluetooth/src/com/android/bluetooth/btservice/RemoteDevices.java
 *
 * Next Tag: 6
 */
message BluetoothConnectionStateChanged {
    // The state of the connection.
    // Eg: CONNECTING, CONNECTED, DISCONNECTING, DISCONNECTED.
    optional android.bluetooth.ConnectionStateEnum state = 1;
    // An identifier that can be used to match connect and disconnect events.
    // Currently is last two bytes of a hash of a device level ID and
    // the mac address of the bluetooth device that is connected.
    // Deprecated: use obfuscated_id instead, this one is always 0 for Q+
    optional int32 obfuscated_id = 2 [deprecated = true];
    // The profile that is connected. Eg. GATT, A2DP, HEADSET.
    // From android.bluetooth.BluetoothAdapter.java
    // Default: 0 when not used
    optional int32 bt_profile = 3;
    // An identifier that can be used to match events for this device.
    // Currently, this is a salted hash of the MAC address of this Bluetooth device.
    // Salt: Randomly generated 256 bit value
    // Hash algorithm: HMAC-SHA256
    // Size: 32 byte
    // Default: null or empty if the device identifier is not known
    optional bytes new_obfuscated_id = 4 [(android.os.statsd.log_mode) =
MODE_BYTES];
    // An identifier that can be used to match events for this device.
    // The incremental identifier is locally generated and guaranteed not derived
    // from any globally unique hardware id.
    // For paired devices, it stays consistent between Bluetooth toggling for the
    // same remote device.
    // For unpaired devices, it stays consistent within the same Bluetooth adapter
    // session for the same remote device.
    // Default: 0 if the device's metric id is unknown.
    optional int32 metric_id = 5;
}

```

When biometric authentication is used

```

/**
 * Logs when a biometric acquire event occurs.
 *
 * Logged from:
 * frameworks/base/services/core/java/com/android/server/biometrics
 */

```

```

message BiometricAcquired {
    // Biometric modality that was acquired.
    optional android.hardware.biometrics.ModalityEnum modality = 1;
    // The associated user. Eg: 0 for owners, 10+ for others. Defined in
    android/os/UserHandle.java.
    optional int32 user = 2;
    // If this acquire is for a crypto operation. e.g. Secure purchases, unlock password
    storage.
    optional bool is_crypto = 3;
    // Action that the device is performing. Acquired messages are only expected for enroll
    and
    // authenticate. Other actions may indicate an error.
    optional android.hardware.biometrics.ActionEnum action = 4;
    // The client that this acquisition was received for.
    optional android.hardware.biometrics.ClientEnum client = 5;
    // Acquired constants, e.g. ACQUIRED_GOOD. See constants defined by
    <Biometric>Manager.
    optional int32 acquire_info = 6;
    // Vendor-specific acquire info. Valid only if acquire_info == ACQUIRED_VENDOR.
    optional int32 acquire_info_vendor = 7;
    // Dictates if this message should trigger additional debugging.
    optional bool debug = 8;
}

```

Occurrence (not contents) of crashes and WTF's (What a Terrible Failure).

```

/**
 * Logs when an app crashes.
 * Logged from:
 *
 frameworks/base/services/core/java/com/android/server/am/ActivityManagerService.java
 */
message AppCrashOccurred {
    optional int32 uid = 1 [(is_uid) = true];
    optional string event_type = 2;
    // The name of the process.
    // system_server if it is not by an app
    optional string process_name = 3;
    // The pid if available. -1 means not available.
    optional sint32 pid = 4;
    optional string package_name = 5;
    enum InstantApp {
        UNAVAILABLE = 0;
        FALSE = 1;
        TRUE = 2;
    }
    optional InstantApp is_instant_app = 6;
    enum ForegroundState {
        UNKNOWN = 0;
        BACKGROUND = 1;
        FOREGROUND = 2;
    }
    optional ForegroundState foreground_state = 7;
    optional android.server.ErrorSource error_source = 8;
}
/**
 * Logs when a WTF (What a Terrible Failure) happened.
 * Logged from:

```



```

*
frameworks/base/services/core/java/com/android/server/am/ActivityManagerService.java
*/
message WTFOccurred {
    optional int32 uid = 1 [(is_uid) = true];
    optional string tag = 2;
    // The name of the process.
    // system_server if it is not by an app
    optional string process_name = 3;
    // The pid if available. -1 means not available.
    optional sint32 pid = 4;
    optional android.server.ErrorSource error_source = 5;
}

```

Google also provides some public documentation about the crash data it collects through *Google Chrome and other projects*.⁹ With the help of Breakpad, Chrome OS and the Chrome browser send crash reports as a minidump file. “A *minidump file* contains:

- *A list of the executable and shared libraries that were loaded in the process at the time the dump was created. This list includes both file names and identifiers for the particular versions of those files that were loaded.*
- *A list of threads present in the process. For each thread, the minidump includes the state of the processor registers, and the contents of the threads' stack memory. These data are uninterpreted byte streams, as the Breakpad client generally has no debugging information available to produce function names or line numbers, or even identify stack frame boundaries.*
- *Other information about the system on which the dump was collected: processor and operating system versions, the reason for the dump, **and so on.**”*

Privacy Company has not been able to (separately) capture or analyse the telemetry traffic. Google does not offer any tools similar to the Data Viewing Tool provided by Microsoft for end-users to see what telemetry data have been sent from their apps. Nor does Google provide access via tools for admins to see the data sent to Google.

Privacy Company has had lengthy discussions with Google about different options to inspect the contents of the telemetry data. Though Google engineers have provided limited insight, on screen, in some data collected by Google in a test account from an engineer, Google has not provided any documentation about the entire path of the data collection or shown any results of specific actions requested by Privacy Company.

Because of this lack of transparency, Privacy Company cannot establish the contents of the telemetry data. In its limited view of the telemetry that Google collects, Privacy Company has observed personal data and sensitive content data (in the Chrome browser *Enhanced Spellcheck*), Privacy Company has to assume that some, if not all telemetry data contain (1) personal data in the form of unique user and device information (2) information about app usage with timestamps, and (3) sometimes very sensitive content data.

⁹ Google Chromium, starting with Breakpad, URL: https://chromium.googlesource.com/breakpad/breakpad/+master/docs/getting_started_with_breakpad.md

1.5 Access Requests to Google as processor and as controller

Two test accounts have been created and used for this research. The account floor.terra@ivpoz.nl was used for Android apps (running on Chromebook), macOS and Windows 10 and the account floor.terra2@ivpoz.nl was used to test the processing of data on iOS and ChromeOS. In order to be able to compare the collected data from the outgoing traffic with the data that Google collects, Privacy Company has tried to obtain access to the personal data processed by Google in two different ways.

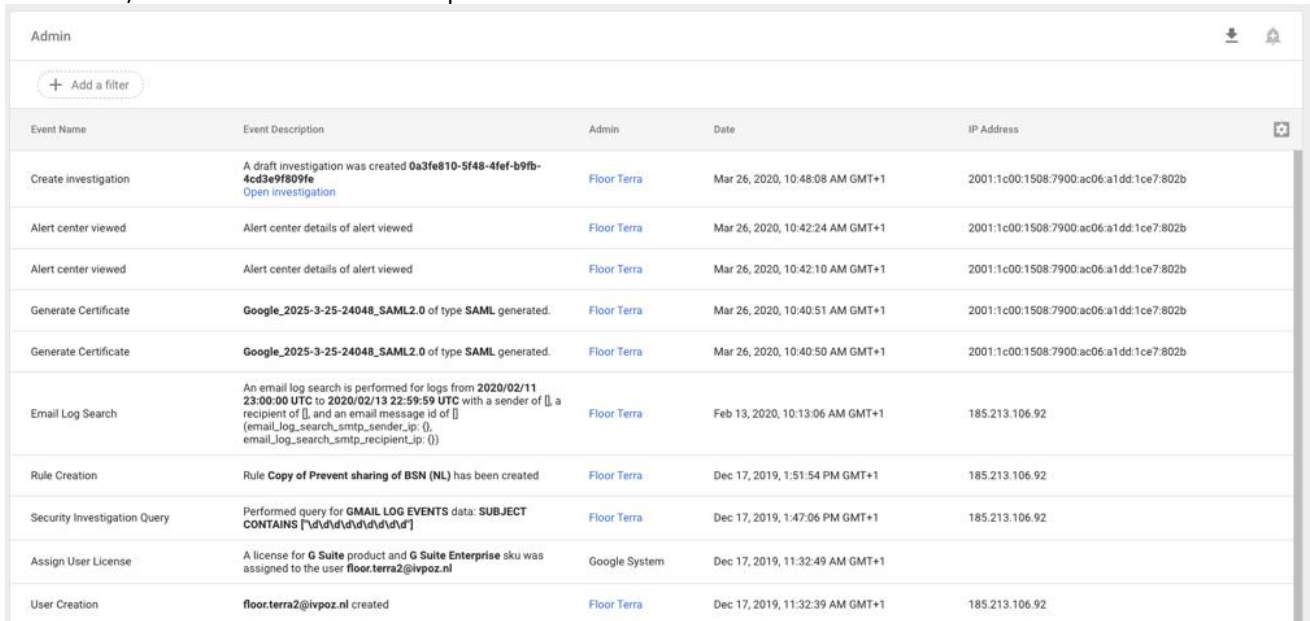
First, Privacy Company has sent formal data subject access requests to Google for the two test accounts in Google's role as data controller for the Additional Services, the Google account and all Diagnostic Data (including data collected through telemetry, cookies/pixels and similar tracking technologies). The request were sent on 4 February 2020. Google did not provide any personal data in response to this access request, but referred by e-mail of 27 February 2020 to the information available in-product for users and in the console for system administrators. These results are discussed in more detail in the DPIA.

Second, Privacy Company analysed all available personal data about the two test accounts which Google makes available in its role as data processor through the admin console. Google processes Diagnostic Data on its own cloud servers. This data flow cannot be monitored from the users' terminal devices. After all, the data are only processed on Google's own servers. Therefore, in its role of system administrator of the test environment, Privacy Company has accessed all the log files Google makes available for the two test accounts.

The following 19 log files are available for G Suite Enterprise administrators. 13 of these log files contained information in the scope of this analysis.

1. Admin
2. Login
3. SAML – out of scope
4. LDAP – out of scope
5. Drive
6. Calendar
7. Context-Aware Access – out of scope
8. Devices
9. Password Vault – out of scope
10. Token
11. Groups
12. Hangouts Chat
13. Google+
14. Voice – out of scope
15. Hangouts Meet
16. User Accounts
17. Access Transparency -out of scope
18. Rules
19. Email Log Search

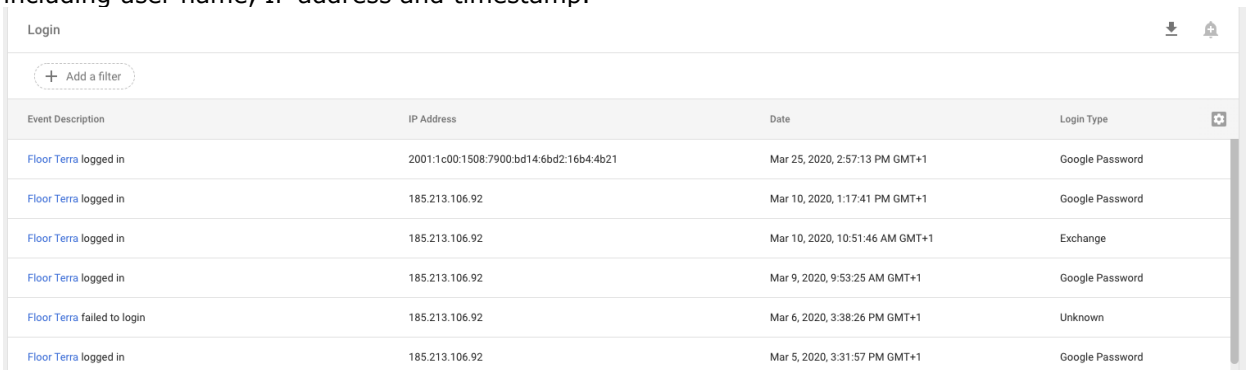
1. **Admin** audit log contains a log of activities by the G Suite administrator, including the username, IP-address and timestamp.



The screenshot shows the 'Admin' audit log interface. It features a header with the title 'Admin', a filter button '+ Add a filter', and download and notification icons. The main content is a table with the following columns: Event Name, Event Description, Admin, Date, and IP Address. The table lists several events such as 'Create investigation', 'Alert center viewed', 'Generate Certificate', 'Email Log Search', 'Rule Creation', 'Security Investigation Query', 'Assign User License', and 'User Creation'.

Event Name	Event Description	Admin	Date	IP Address
Create investigation	A draft investigation was created 0a3fe810-5f48-4fef-b9fb-4cd3e9f809fe Open investigation	Floor Terra	Mar 26, 2020, 10:48:08 AM GMT+1	2001:1c00:1508:7900:ac06:a1dd:1ce7:802b
Alert center viewed	Alert center details of alert viewed	Floor Terra	Mar 26, 2020, 10:42:24 AM GMT+1	2001:1c00:1508:7900:ac06:a1dd:1ce7:802b
Alert center viewed	Alert center details of alert viewed	Floor Terra	Mar 26, 2020, 10:42:10 AM GMT+1	2001:1c00:1508:7900:ac06:a1dd:1ce7:802b
Generate Certificate	Google_2025-3-25-24048_SAML2.0 of type SAML generated.	Floor Terra	Mar 26, 2020, 10:40:51 AM GMT+1	2001:1c00:1508:7900:ac06:a1dd:1ce7:802b
Generate Certificate	Google_2025-3-25-24048_SAML2.0 of type SAML generated.	Floor Terra	Mar 26, 2020, 10:40:50 AM GMT+1	2001:1c00:1508:7900:ac06:a1dd:1ce7:802b
Email Log Search	An email log search is performed for logs from 2020/02/11 23:00:00 UTC to 2020/02/13 22:59:59 UTC with a sender of [], a recipient of [], and an email message id of [] (email_log_search_smtp_sender_ip: [], email_log_search_smtp_recipient_ip: [])	Floor Terra	Feb 13, 2020, 10:13:06 AM GMT+1	185.213.106.92
Rule Creation	Rule Copy of Prevent sharing of BSN (NL) has been created	Floor Terra	Dec 17, 2019, 1:51:54 PM GMT+1	185.213.106.92
Security Investigation Query	Performed query for GMAIL LOG EVENTS data: SUBJECT CONTAINS [vuvuvuvuvuvuvuvuv]	Floor Terra	Dec 17, 2019, 1:47:06 PM GMT+1	185.213.106.92
Assign User License	A license for G Suite product and G Suite Enterprise sku was assigned to the user floor.terra2@ivpoz.nl	Google System	Dec 17, 2019, 11:32:49 AM GMT+1	
User Creation	floor.terra2@ivpoz.nl created	Floor Terra	Dec 17, 2019, 11:32:39 AM GMT+1	185.213.106.92

2. **Login** audit log contains a log of sign-in (attempts) of users with a Google Account, including user name, IP address and timestamp.



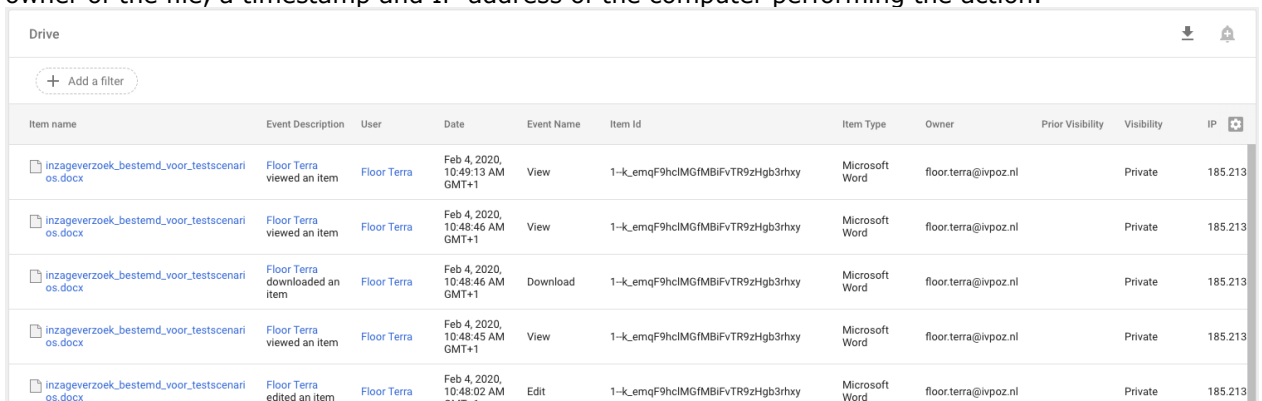
The screenshot shows the 'Login' audit log interface. It features a header with the title 'Login', a filter button '+ Add a filter', and download and notification icons. The main content is a table with the following columns: Event Description, IP Address, Date, and Login Type. The table lists several login events, including successful logins and one failed login attempt.

Event Description	IP Address	Date	Login Type
Floor Terra logged in	2001:1c00:1508:7900:bd14:6bd2:16b4:4b21	Mar 25, 2020, 2:57:13 PM GMT+1	Google Password
Floor Terra logged in	185.213.106.92	Mar 10, 2020, 1:17:41 PM GMT+1	Google Password
Floor Terra logged in	185.213.106.92	Mar 10, 2020, 10:51:46 AM GMT+1	Exchange
Floor Terra logged in	185.213.106.92	Mar 9, 2020, 9:53:25 AM GMT+1	Google Password
Floor Terra failed to login	185.213.106.92	Mar 6, 2020, 3:38:26 PM GMT+1	Unknown
Floor Terra logged in	185.213.106.92	Mar 5, 2020, 3:31:57 PM GMT+1	Google Password

3. **SAML** audit log is out of scope for this DPIA. No data was logged from the tests.

4. **LDAP** audit log is out of scope for this DPIA. No data was logged from the tests.

5. **Drive** audit log contains a log of action taken with documents in Google Drive. This includes actions like uploading, downloading, viewing and editing a file. For each action the filename is recorded, including a link to the actual document in Drive, the username, the owner of the file, a timestamp and IP-address of the computer performing the action.



The screenshot shows the 'Drive' audit log interface. It features a header with the title 'Drive', a filter button '+ Add a filter', and download and notification icons. The main content is a table with the following columns: Item name, Event Description, User, Date, Event Name, Item Id, Item Type, Owner, Prior Visibility, Visibility, and IP. The table lists several actions taken on a document named 'inzageverzoek_bestemd_voor_testscenari os.docx', including viewing, downloading, and editing.

Item name	Event Description	User	Date	Event Name	Item Id	Item Type	Owner	Prior Visibility	Visibility	IP
inzageverzoek_bestemd_voor_testscenari os.docx	Floor Terra viewed an item	Floor Terra	Feb 4, 2020, 10:49:13 AM GMT+1	View	1-k_emqF9hcIMGfMBIFvTR9zHgb3rhyx	Microsoft Word	floor.terra@ivpoz.nl		Private	185.213
inzageverzoek_bestemd_voor_testscenari os.docx	Floor Terra viewed an item	Floor Terra	Feb 4, 2020, 10:48:46 AM GMT+1	View	1-k_emqF9hcIMGfMBIFvTR9zHgb3rhyx	Microsoft Word	floor.terra@ivpoz.nl		Private	185.213
inzageverzoek_bestemd_voor_testscenari os.docx	Floor Terra downloaded an item	Floor Terra	Feb 4, 2020, 10:48:46 AM GMT+1	Download	1-k_emqF9hcIMGfMBIFvTR9zHgb3rhyx	Microsoft Word	floor.terra@ivpoz.nl		Private	185.213
inzageverzoek_bestemd_voor_testscenari os.docx	Floor Terra viewed an item	Floor Terra	Feb 4, 2020, 10:48:45 AM GMT+1	View	1-k_emqF9hcIMGfMBIFvTR9zHgb3rhyx	Microsoft Word	floor.terra@ivpoz.nl		Private	185.213
inzageverzoek_bestemd_voor_testscenari os.docx	Floor Terra edited an item	Floor Terra	Feb 4, 2020, 10:48:02 AM GMT+1	Edit	1-k_emqF9hcIMGfMBIFvTR9zHgb3rhyx	Microsoft Word	floor.terra@ivpoz.nl		Private	185.213

6. **Calendar** audit log contains a log of action taken within Google Calendar. Actions the creation of events and the triggering of notifications. For each event the username, the calendar that the event is in, the title of the event and IP address of the user is logged.

Activity Name	Activity Description	User	Calendar Id	Event Title	Event Id	API Kind	User Agent
Event created	Floor Terra created a new event Allergietest	Floor Terra	floor.terra@ivpoz.nl	Allergietest	ccpm6dr56ssm4bb5c5j3ib9k65h62bb1ccs66bb5cgoj4oj171i6apj66c	Android	google/hana/hana_cheets/9/R79-12607.82.0/6113486/user/release-keys:com.google.android.calendar:2016449208:release:com.google.android.calendar
Subscription added	Floor Terra subscribed floor.terra@ivpoz.nl to event reminder notifications via popup for floor.terra@ivpoz.nl	Floor Terra	floor.terra@ivpoz.nl		ccpm6dr56ssm4bb5c5j3ib9k65h62bb1ccs66bb5cgoj4oj171i6apj66c	Android	google/hana/hana_cheets/9/R79-12607.82.0/6113486/user/release-keys:com.google.android.calendar:2016449208:release:com.google.android.calendar
Event modified	Floor Terra modified Bila	Floor Terra	floor.terra2@ivpoz.nl	Bila	cksjee3574rjgbb16csm8b9k6hi64bb2c9j0bb36gajicj56som6c9p6o	Calendar Web	Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/79.0.3945.130 Safari/537.36,gzip(gfe),gzip(gfe)
Notification triggered	Floor Terra triggered an email notification of type event response to floor.terra@ivpoz.nl	Floor Terra	floor.terra@ivpoz.nl		cksjee3574rjgbb16csm8b9k6hi64bb2c9j0bb36gajicj56som6c9p6o		floor.

User Agent	Recipient Email	Message Id	Remote EWS URL	Error Code	Requested Window Start	Requested Window End	Date	IP Address
google/hana/hana_cheets/9/R79-12607.82.0/6113486/user/release-keys:com.google.android.calendar:2016449208:release:com.google.android.calendar							Feb 4, 2020, 11:23:53 AM GMT+1	185.213.106.92
google/hana/hana_cheets/9/R79-12607.82.0/6113486/user/release-keys:com.google.android.calendar:2016449208:release:com.google.android.calendar							Feb 4, 2020, 11:23:53 AM GMT+1	185.213.106.92
Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/79.0.3945.130 Safari/537.36,gzip(gfe),gzip(gfe)							Feb 4, 2020, 11:20:48 AM GMT+1	185.213.106.92
	floor.terra@ivpoz.nl	<00000000000863933059dbd6434@google.com>					Feb 4, 2020, 11:20:44 AM GMT+1	

7. **Context-Aware Access** audit log is out of scope for this DPIA. No data was logged from the tests.

8. **Devices** audit log contains a log of user's device activities like the registration of the device to the Google account, the periodic synchronization of the device and occasional device software updates. This log contains device identifiers and usernames, linking the device to a specific user, event descriptions and timestamps.

Device Id	Event Description	Date	Event Name	User	Device Type	Application has
3f987cf364ead7b1	Floor Terra's account synced on Pixel 3 XL	Mar 26, 2020, 4:00:13 PM GMT+1	Device Sync	Floor Terra	Android	
3f987cf364ead7b1	OS Security Patch updated on Floor Terra's Pixel 3 XL from 2020-02-04 to 2020-03-04	Mar 25, 2020, 3:31:24 PM GMT+1	Device OS update	Floor Terra	Android	
3f987cf364ead7b1	Floor Terra's account synced on Pixel 3 XL	Mar 16, 2020, 6:21:10 AM GMT+1	Device Sync	Floor Terra	Android	
3f987cf364ead7b1	Floor Terra's account synced on Pixel 3 XL	Mar 12, 2020, 6:32:34 PM GMT+1	Device Sync	Floor Terra	Android	
3f987cf364ead7b1	OS Security Patch updated on Floor Terra's Pixel 3 XL from 2019-12-31 to 2020-02-04	Mar 10, 2020, 10:53:00 AM GMT+1	Device OS update	Floor Terra	Android	

9. **Password Vault** audit log is out of scope for this DPIA. No data was logged from our tests.

10. **Token** audit log contains a log of authentication tokens that applications and websites use to access Google Account data. In our tests authentications tokens to log in to the Chrome browser, Dropbox, iOS and Android are logged. For each event the type (creation, use or revocation), user account, the application or website, the user's IP address and timestamp

are logged.

Event Description	Event Name	User	Application Name	Client Id	Scope	IP Address	Date
Dropbox called people.people.get on behalf of Floor Terra	Activity	Floor Terra	Dropbox	801668726815.apps.googleusercontent.com		162.125.34.202	Dec 19, 2019, 12:55:52 PM GMT+1
Floor Terra authorized access to Dropbox for https://www.googleapis.com/auth/contacts.readonly , https://www.googleapis.com/auth/userinfo.email , https://www.googleapis.com/auth/userinfo.profile , https://www.googleapis.com/auth/userinfo.openid scopes	Authorize	Floor Terra	Dropbox	801668726815.apps.googleusercontent.com	https://www.googleapis.com/auth/contacts.readonly , https://www.googleapis.com/auth/userinfo.email , https://www.googleapis.com/auth/userinfo.profile , https://www.googleapis.com/auth/userinfo.openid	162.125.35.209	Dec 19, 2019, 12:55:52 PM GMT+1
Floor Terra authorized access to Google Chrome for https://www.google.com/accounts/OAuthLogin in scopes	Authorize	Floor Terra	Google Chrome	77185425430.apps.googleusercontent.com	https://www.google.com/accounts/OAuthLogin	185.213.106.92	Dec 17, 2019, 1:11:44 PM GMT+1

11. Groups audit log contains a log of group creation and membership changes.

Event Name	Event Description	User	Date
Actor user accepted invitation to a group	Floor Terra accepted an invitation to group overleg01@ivpoz.nl	Floor Terra	Jan 31, 2020, 3:26:25 PM GMT+1
User invited to a group	Floor Terra invited floor.terra2@ivpoz.nl to group overleg01@ivpoz.nl	Floor Terra	Jan 31, 2020, 3:26:02 PM GMT+1
Group created	Floor Terra created group overleg01@ivpoz.nl	Floor Terra	Jan 31, 2020, 3:24:49 PM GMT+1
Group created	Floor Terra created group overleg@ivpoz.nl	Floor Terra	Dec 19, 2019, 1:05:41 PM GMT+1

12. Hangouts Chat audit log contains a single log entry from the test scenario's. A single direct message was started by a user account. The timestamp was logged, the content of the message is not visible.

Event Name	Event Description	User	Date
Direct Message Started	Floor Terra started a direct message.	Floor Terra	Dec 17, 2019, 2:44:49 PM GMT+1

13. Google+ audit log contains a log of all posts and +1's on posts by users within the organization. The logs contain a reference to the specific post or +1, the user account and a timestamp.

Event Name	Event Description	Date	User	Post Visibility	Attachment Type	+1 Context	Post Resource Name
+1 added	Floor Terra added a +1 to a organization-private post	Feb 4, 2020, 11:37:13 AM GMT+1	Floor Terra	organization-private		post	Uggvndil_RZV7HgCoAEC
Post created	Floor Terra created a organization-private post	Feb 4, 2020, 11:36:43 AM GMT+1	Floor Terra	organization-private			Uggvndil_RZV7HgCoAEC
Post created	Floor Terra created a organization-wide post	Feb 4, 2020, 11:35:19 AM GMT+1	Floor Terra	organization-wide			UggeDCKrfl-fXgCoAEC
Post created	Floor Terra created a organization-private post	Feb 4, 2020, 11:35:02 AM GMT+1	Floor Terra	organization-private			UgitymlS8gC_mHgCoAEC
+1 added	Floor Terra added a +1 to a organization-private post	Dec 17, 2019, 2:30:35 PM GMT+1	Floor Terra	organization-private		post	Uggy1Fg7MbmlXgCoAEC
Post created	Floor Terra created a organization-private post	Dec 17, 2019, 2:29:46 PM GMT+1	Floor Terra	organization-private	Link		Uggy1Fg7MbmlXgCoAEC
Post created	Floor Terra created a organization-wide post	Dec 17, 2019, 2:22:26 PM GMT+1	Floor Terra	organization-wide	Link		Ugh9Q5Pce7zQWXgCoAEC
Post created	Floor Terra created a organization-wide post	Dec 17, 2019, 2:19:52 PM GMT+1	Floor Terra	organization-wide	Link		UgijhmMPTIPY70HgCoAEC

14. Voice audit log is out of scope for this DPIA. No data was logged from the tests.

15. Hangouts Meet audit log contains a log of meeting participation by users. The timestamp, username, meeting code, client type, organiser’s e-mail, duration of the meeting, IP address and various network, audio and video parameters are logged that are related to the quality of the connection.

Date	Event Name	Event Description	Meeting Code	Participant Identifier	Participant Outside Organisation	Client Type	Organizer Email	Product Type	Duration	Call Rating out of 5	Participant Name	IP
Mar 11, 2020, 6:02:03 PM GMT+1	Endpoint left	The endpoint left a video meeting	VXHBINUZGF	floor.terra@ivpoz.nl	No	Web		Meet	3722		Floor Terra	2001.1c
Feb 4, 2020, 11:45:42 AM GMT+1	Endpoint left	The endpoint left a video meeting	UHUQJMHFMR	floor.terra2@ivpoz.nl	No	Web	floor.terra@ivpoz.nl	Meet	69		Floor Terra	
Feb 4, 2020, 11:45:23 AM GMT+1	Endpoint left	The endpoint left a video meeting	UHUQJMHFMR	floor.terra@ivpoz.nl	No	Android	floor.terra@ivpoz.nl	Meet	109	3	Floor Terra	
Feb 3, 2020, 1:34:44 PM GMT+1	Endpoint left	The endpoint left a video meeting	PIJVCTYDJY	floor.terra@ivpoz.nl	No	Web	floor.terra2@ivpoz.nl	Meet	76		Floor Terra	
Feb 3, 2020, 1:34:28 PM GMT+1	Endpoint left	The endpoint left a video meeting	PIJVCTYDJY	floor.terra2@ivpoz.nl	No	IOS	floor.terra2@ivpoz.nl	Meet	90		Floor Terra	

16. User Accounts audit log contains a log of changes to user accounts. In our tests only a single password change was logged, combined with timestamp and IP address.

Event Description	Date	IP Address
Floor Terra has changed Account password	Dec 17, 2019, 11:43:21 AM GMT+1	185.213.106.92

17. Access Transparency audit log is out of scope for this DPIA. No data was logged about access by Google administrators during the tests.

18. Rules audit log contains a log of events that have triggered admin-created rules. In the tests, a rule was created preventing the sharing of the Dutch national identity number (BSN). The log contains the name of the rule that has been matched, the identifier of the resource where the BSD has been found, the owner of that resource and a timestamp.

Event Name	Event Description	User	Rule Name	Rule type	Rule resource name	Resource Id	Resource title	Resource type	Resource Owner	Recipients	Data source
Rule Match	Rule matched	Anonymous user	Copy of Prevent sharing of BSN (NL)			1-M1LqLeRtXyhBpjfcj0vs1uoJB5Zlr			floor.terra@ivpoz.nl		
Rule Match	Rule matched	Anonymous user	Copy of Prevent sharing of BSN (NL)			1-k_emqF9hclMGfMBiFvTR9zHgb3rhyx			floor.terra@ivpoz.nl		
Rule Match	Rule matched	Anonymous user	Copy of Prevent sharing of BSN (NL)			1-k_emqF9hclMGfMBiFvTR9zHgb3rhyx			floor.terra@ivpoz.nl		
Rule Match	Rule matched	Anonymous user	Copy of Prevent sharing of BSN (NL)			1rzd_jkxu85uwcWBrgIzr0mTj_wDrzu5D			floor.terra2@ivpoz.nl		
Rule Match	Rule matched	Anonymous user	Copy of Prevent sharing of BSN (NL)			1dKdLfqq43aL4MgNG9T4529s2N97XR8fF			floor.terra2@ivpoz.nl		

19. Email Log Search audit log contains a log of e-mails that are send and received by the Google Accounts. Raw logs are not available to the admin except through a search interface. Logs contain message data like subject, sender and recipients, timestamp and message status (opened and read, seen, marked unimportant, etc.) and the folder the message is stored in.

Reports > Email Log Search

Date: Last 7 days GMT+02:00

Sender: Enter full or partial sender email address Sender IP: Enter full sender IP address

Recipient: Enter full or partial recipient email address Recipient IP: Enter full recipient IP address

Subject:

Message ID: M54AvuzPJel7E_ft7HHx6w.0@notifications.google.com

SEARCH

It may take a few minutes for a message to be logged and appear here.

1-1 of 1

Subject (or Message ID)	Date	Sender
Google Cloud Organization is now available for your domain	Mar 26, 2020, 13:09	3Y5t8Xg4KC4Yxy3sp8-xy1ozv8qyyqvo.mywpvyy1.3o11ks5zy9.xv@chime-notifications.bounces.google.com

1-1 of 1

Reports > Email Log Search

[< Back to results](#)

Message details

Subject: Google Cloud Organization is now available for your domain
 Sender: 3Y5t8Xg4KC4Yxy3sp8-xy1ozv8qyyqvo.mywpvyy1.3o11ks5zy9.xv@chime-notifications.bounces.google.com
 Recipient: One recipient
 floor.terra@ivpoz.nl
 Date: Mar 26, 2020, 13:09
 Message ID: <M54AvuzPJel7E_ft7HHx6w.0@notifications.google.com>
 Message size: 9.72KB
 Attachments: 0
 Direction: Received
 Status: 1/1 Delivered

Recipient details

- floor.terra@ivpoz.nl Mar 26, 2020, 13:09 0.52 seconds Delivered to Gmail mailbox
 Received from an SMTP server with IP address: 209.85.220.69 (TLS enabled)
 250 2.0.0 OK
- Mar 26, 2020, 13:09 Inserted into Gmail delivery pipeline
- Mar 26, 2020, 13:09 Delivered to Gmail mailbox
 No Error

Post-delivery message details

Current status Location: Inbox
 Labels: None
 State: Opened and read, Seen, Marked unimportant

Date: Older than 30 days GMT+02:00

Recipient: Enter exact recipient email address

Message ID:

SEARCH

Detailed delivery logs are not available for messages received after 30 days.

2. Description of investigation results

Test were executed on the webbased applications on Windows 10, macOS and ChromeOS platforms, as well as in the installed iOS and Android apps.

The tests resulted in a high volume of traffic to third parties and to external advertising domains. This has three causes.

First, in five of the Core Services (Docs, Gmail, Hangouts, Sheets and Slides), the Feature *Explore* was used to insert an image from the web. This caused traffic to third party websites with collections of images. This traffic allows the recipient websites to observe that a unique user, with a unique device ID and IP address, has asked for an image with one or more keywords, while working with a specific G Suite Enterprise service.

The second and third data streams to third parties were not directly caused by the Core Services themselves, but initiated by the test user:

- to test the Cloud Identity Services, Dropbox was authorised for single sign-on; and
- to test Google+, the scenarios included visits to two Dutch news websites that placed a lot of advertising cookies.

Other findings are:

- Google DoubleClick collects data when a non-authenticated end user visits a login page for the Core Services. Google has explained the presence of the DoubleClick cookie is legitimate, because these cookies are used *“to determine eligibility for ads personalization. This cookie communicates to DoubleClick whether a specific end user is eligible for personalized ads because of their account status or ads personalization preferences.”*¹⁰
- In another case, a DoubleClick cookie was encountered through an embedded Youtube iframe inside the Drive webpage.¹¹ Google was able to reproduce the event described by the researchers and determined that this DoubleClick cookie was set by mistake and was not intended product behaviour. Google explained that Drive was accidentally showing a welcome video using the YouTube player, without suppressing Ads integration.¹² Privacy Company has verified that Google has fixed this bug.
- The Additional Service Google Maps is integrated with several Core Services. In Calendar traffic to Google Maps takes place when working with Calendar items that contain a location. Traffic to Google Maps was also observed from Google+ posts with a location tag and a page in Sites with an embedded map. The geoservice integration of Maps in Calendar means all addresses entered in the Calendar for meetings are automatically checked and corrected with information from Google Maps. The test end user did not receive a prior request for consent, and was not informed, that Customer Data was going to be shared with Maps. As described in Section 1.4.3 Google explained that such traffic from the Calendar, Google+ and Sites Core Services to the Additional Service Google Maps are also *features* of the Core Services, and the personal data are *anonymised* before the traffic is processed in the shared backend infrastructure. Google’s procedures for anonymisation are described in Section 8.1 of this report.
- The Chrome browser sends telemetry data (Diagnostic Data) about network problems to Google. This is not unique for Google: every website can ask for this information via the *Content Security Policy: Report-To*.¹³
- Traffic was sent from the Windows 10 platform to various Google beacon.gvt2.com domains. Those domains collect information about network connections that the Chrome browser makes to Google domains. These data reveal that the researchers used a proxy server.

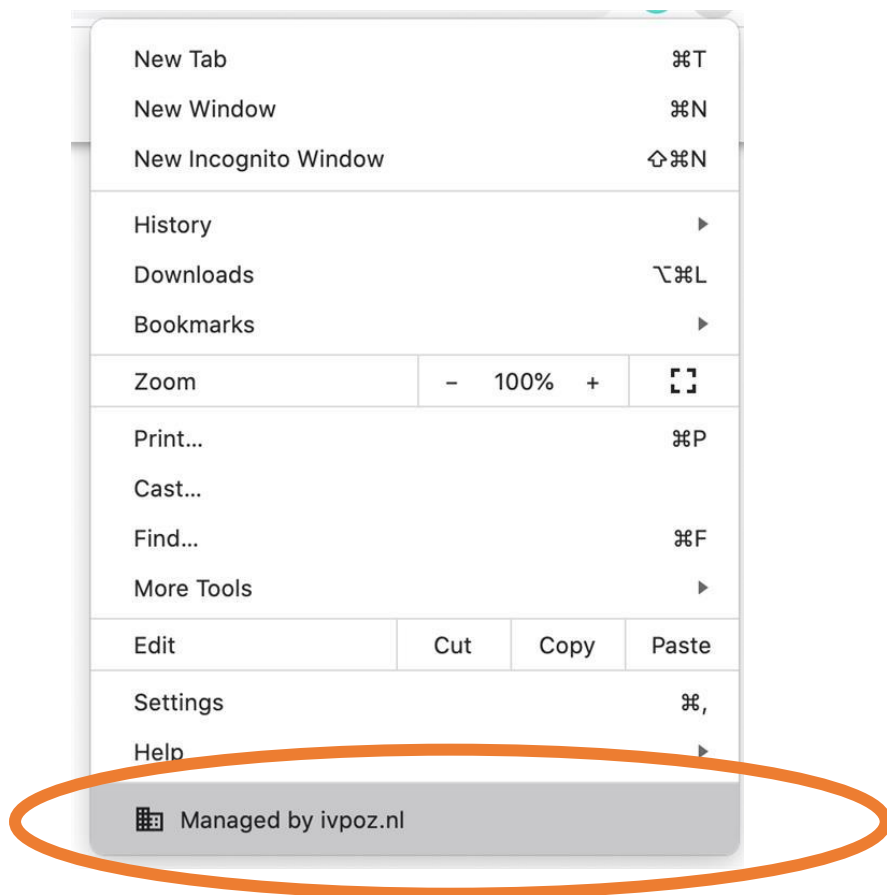
¹⁰ Response Google 5 June 2020.

¹¹ https://drive.google.com/drive/my-drive_page.

¹² Response Google 5 June 2020.

¹³ https://en.wikipedia.org/wiki/Content_Security_Policy

Chrome looks like Enterprise managed browser



In reply to Google's response about the possibility to turn off the *Enhanced Spellchecker* in the Chrome browser, Privacy Company has installed the Chrome Enterprise Upgrade. This is a separate paid service, with a separate Chrome Enterprise Upgrade agreement¹⁴ and a separate Data Processing Amendment.¹⁵ Privacy Company verified that it is possible to centrally disable the *Enhanced Spellchecker* with Chrome Enterprise.

The Chrome Agreement is defined as follows: "The Google Cloud Master Agreement which is comprised of the General Terms, Order Forms and Chrome Services Schedule; Chrome Services License Agreement; Chrome License Agreement; License Agreement for Chrome Device Management; License Agreement for Chrome Device Management for Work and Education; Chrome for Work License Agreement for Chrome Device Management Services; Chrome for Work Agreement for Chrome Device Management Services (Online Direct); Chrome OS for Enterprise License Agreement for Chromebook Admin Console Management Services; Chrome Browser Cloud Management License Agreement; a via Reseller version of any of the foregoing agreements; or any other agreement under which Google agrees to provide the Services to Customer (as applicable)."¹⁶

¹⁴ Google, Chrome Service Licence Agreement, URL: https://admin.google.com/terms/chrome/3/1/en/chrome_device_management.html

¹⁵ Google Data Processing Amendment to Chrome Agreement (Version 1.1), Last modified: Feb 6, 2019, URL: https://www.google.com/chrome/terms/dpa_terms.html

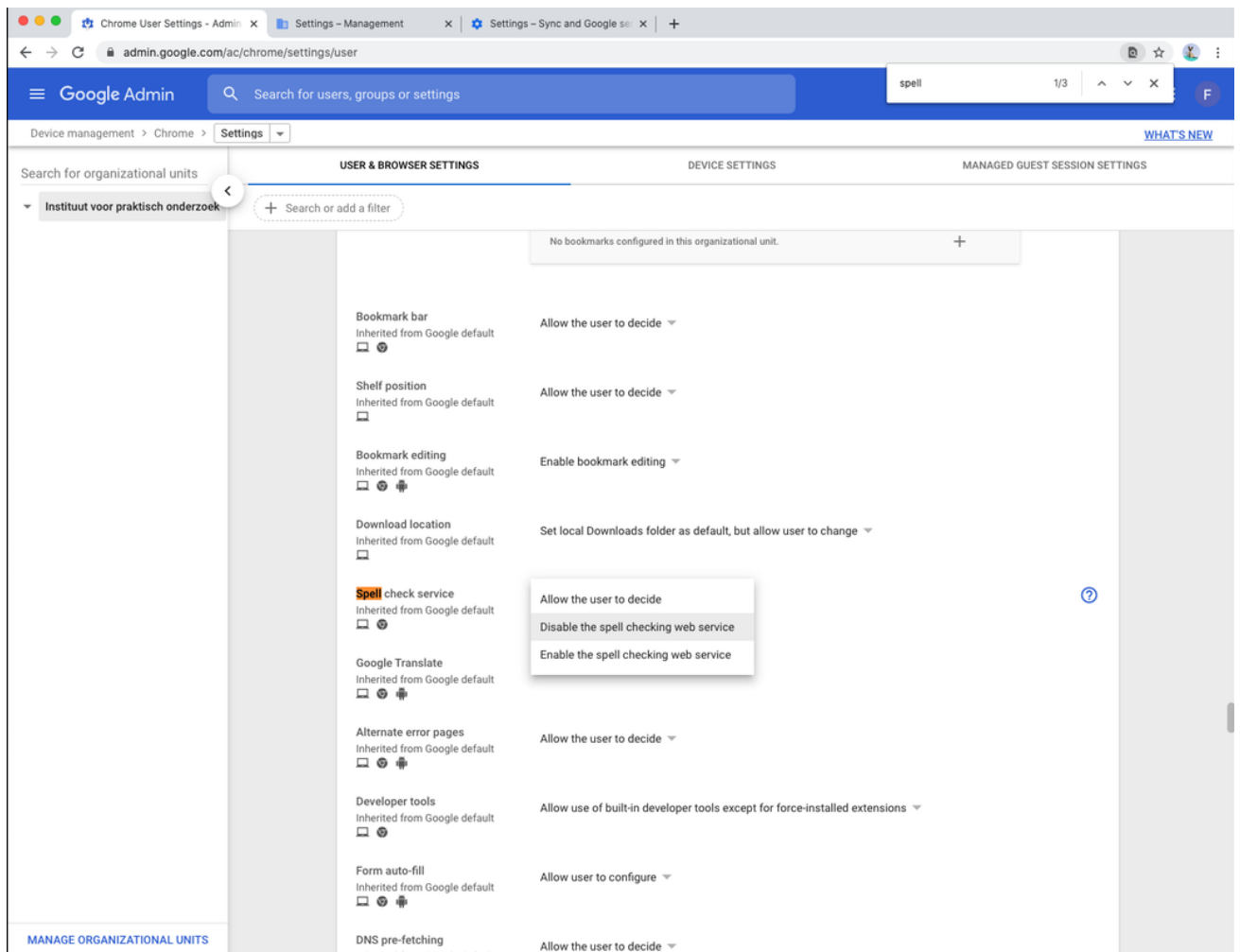
¹⁶ Idem, 2 Definitions, 2.1

In the DPA, Google defines the categories of data it collects as follows:

“Categories of Data

*Data relating to individuals provided to Google via the Services, by (or at the direction of) Customer, its Affiliates, its Administrators, or End Users and may include the following categories of data: MAC address, network IP address, device location (if specified by Administrators), enrollment ID, Customer Hardware End Users’ login credentials, Customer Hardware End User’s last activity time, Customer Hardware End User app installation, **and other data.**”*

Admin options in Chrome Enterprise



No control has been found to turn off the data collection without disabling the *Enhanced Spellcheck*. If the admin turns Off the *Enhanced Spellcheck*, Google explains that the user can still use a the *Basic Spellcheck*, a downloaded dictionary on the device.¹⁷

¹⁷ Google Chrome Enterprise SpellCheckServiceEnabled, URL: <https://cloud.google.com/docs/chrome-enterprise/policies/?policy=SpellCheckServiceEnabled>

Enhanced Spellcheck turned Off in Chrome Enterprise

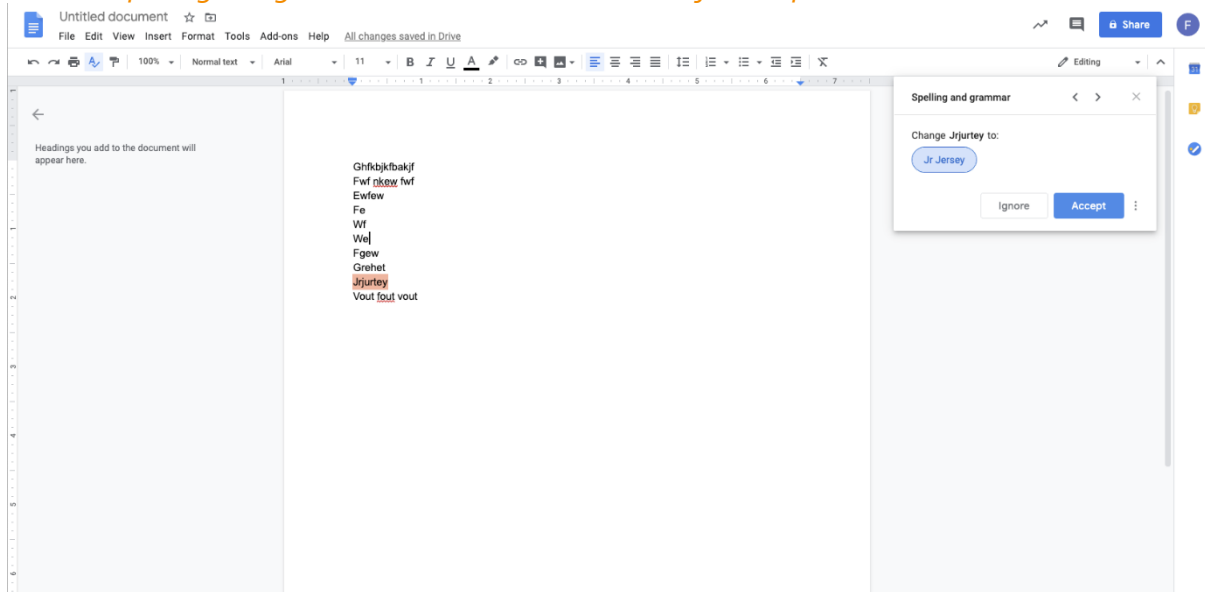
The screenshot shows the Chrome Enterprise Policy List for 'SpellCheckServiceEnabled'. The policy is set to 'Disabled' for 'ANY PLATFORM' and 'CHROME 81'. The description states: 'Google Chrome can use a Google web service to help resolve spelling errors. If this setting is enabled, then this service is always used. If this setting is disabled, then this service is never used.' The supported features include 'Dynamic Policy Refresh: Yes', 'Per Profile: Yes', and 'Can Be Recommended: Yes'. The Windows registry location is 'Software\Policies\Google\Chrome\SpellCheckServiceEnabled', the Mac/Linux preference name is 'SpellCheckServiceEnabled', and the example values are '0x00000000' for Windows, 'false' for Linux, and '<false />' for Mac.

For the end user it is not clear when the Basic or the Enhanced Spellcheck is used that is embedded in the Chrome browser, and when the Feature Grammar and spelling is used that is embedded in the G Suite Core Services. Misspelled words are automatically marked with red underlining. If an end user clicks right with the mouse, both the Basic and the Enhanced Spellcheck can be used. When an end user selects Spelling and grammar from the top menu bar in the Core Service, the Feature *Spelling and grammar* is used.

Enhanced Spellcheck with right mouse button

The screenshot shows a document editor with a right-click context menu open over the word 'vout'. The menu options are: 'vout', 'Feedback on suggestion', 'Ignore all', 'Always correct to "vout"', and 'Add "vout" to dictionary'. The word 'vout' is misspelled and underlined in red. The context menu is circled in orange.

Feature Spelling and grammar in the Core Service Doc from top menu bar



2.2 DoubleClick data

According to Google, the presence of DoubleClick data can be explained as a way to prevent ads personalisation. Google emphasises this is just one example of the purposes for which data can be legitimately shared with DoubleClick. Google disputes that such sharing of data would be illegitimate and challenges Privacy Company to provide evidence. Google does not provide an explanation why preventing of ads personalisation would be necessary in the Core Services, or an explanation of other possible purposes to send traffic to DoubleClick when using the Core Services in the G Suite Enterprise license. In its public documentation Google provides a limited description of the purposes of DoubleClick cookies, namely: *"We also use one or more cookies **for advertising** we serve across the web. One of the main advertising cookies on non-Google sites is named 'IDE' and is stored in browsers under the domain doubleclick.net. Another is stored in google.com and is called ANID. We use other cookies with names such as DSID, FLC, AID, TAID, and exchange_uid. Other Google properties, like YouTube, may also use these cookies **to show you more relevant ads**[emphasis added by Privacy Company]."*¹⁸

¹⁸ Google, Types of cookies used by Google, URL: <https://policies.google.com/technologies/types?hl=en-US>

2.3 Traffic to gvt2.com

Traffic to beacons.gcp.gvt2.com

Request	Response	Details
POST https://beacons.gcp.gvt2.com/domainreliability/upload HTTP/2.0		
:authority	beacons.gcp.gvt2.com	
content-length	757	
content-type	application/json; charset=utf-8	
user-agent	Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/79.0.3945.130 Safari/537.36	
accept-encoding	gzip, deflate, br	
accept-language	nl-NL,nl;q=0.9,en-US;q=0.8,en;q=0.7	
<pre>{ "entries": [{ "http_response_code": 204, "network_changed": false, "protocol": "SPDY", "request_age_ms": 72498, "request_elapsed_ms": 420, "sample_rate": 0.05, "server_ip": "192.168.51.244:8080", "status": "ok", "url": "https://docs.google.com/", "was_proxied": true }, { "failure_data": { "custom_error": "net::ERR_ABORTED" }, "network_changed": false, "protocol": "", "request_age_ms": 64388, "request_elapsed_ms": 24, "sample_rate": 1.0, "server_ip": "", "status": "aborted", "url": "https://docs.google.com/", "was_proxied": false }, { "failure_data": { "custom_error": "net::ERR_ABORTED" }, "network_changed": false, "protocol": "", "request_age_ms": 71465, "request_elapsed_ms": 7102, "sample_rate": 1.0, "server_ip": "", "status": "aborted", "url": "https://docs.google.com/", "was_proxied": false }], "reporter": "chrome" }</pre>		

3. Technical research results

3.1 Research results iOS: domains found in network traffic

On iOS test scenarios were only executed in the installed apps, not the browser-based services such as the Cloud Identity service.

iOS	Hangouts Meet	Cloud Search	Docs	Sheets	Hangouts Chat	Google+	Calendar	Drive	Gmail	Slides
0.0.0.0	8	14	86	69	37	27	37		106	64
192.168.2.1 <i>All 192.*.*.* IP addresses are part of the local test network</i>	14	124	156	128	48	99	135	1	148	112
192.168.2.2	11982	55141	48598	47993	10119	8377	22907		24840	90990
192.168.2.255				24		1				9
192.168.2.4								9289		
169.254.244.243 <i>Local network</i>		1	2	4		2	12		1	4
17.173.66.103 <i>All 17.*.*.* IP addresses belong to Apple</i>				7						
17.248.138.12					5					
17.42.254.12										7
17.42.254.14						5				
17.248.146.150	4									
17.173.66.180									5	
17.248.146.209	11									
17.57.146.21	19	185	274	148	291	86			275	380
17.248.146.74	10									
17.248.176.76						5				
224.0.0.251 <i>Multicast DNS</i>	15	5	34	9		5	47	1	3	93
255.255.255.255 <i>Broadcast packets on local network</i>	8	14	86	69	37	27	37		106	64
93.184.220.29									10	
mesu.g.aaplimg.com <i>The domain aaplimg.com belongs to Apple</i>				27						
time-ios.g.aaplimg.com				2	2					
updates-http.g.aaplimg.com									153	
valid-apple.g.aaplimg.com		31								
world-gen.g.aaplimg.com									12	13
a104-125-69-195.deploy.static.akamaitechnologies.com <i>Use of Akamai content delivery network probably by Apple, is not a subprocessor of Google,</i>						12				
api-glb-ams.smoot.apple.com						20				
accounts.google.com		108				1190				
calendar.google.com		238					184			

iOS	Hangouts Meet	Cloud Search	Docs	Sheets	Hangouts Chat	Google+	Calendar	Drive	Gmail	Slides
docs.google.com		266	84	3188						4219
inbox.google.com		272							1258	
accounts-cctld.l.google.com		41				53				
clients.l.google.com	1208	62						37		
googlemail.l.google.com		71					37		1186	
gstaticadssl.l.google.com		142	2330	1130						1155
mobile-gtalk.l.google.com					352					
ssl-google-analytics.l.google.com							53			
static-doubleclick-net.l.google.com		39								
youtube-ui.l.google.com		242								
play.google.com						251				
support.google.com				862						
www.google.com		73	47							
appsitemsuggest-pa.googleapis.com		3578					46	133		
gcs-eu-00002.content-storage-upload.googleapis.com	8047		5624	3462	431	1682				1867
datamixer-pa.googleapis.com						247				
firebase-dynamiclinks-ipv4.googleapis.com		38					36			
fonts.googleapis.com		66								
growth-pa.googleapis.com				80			46	35		
hangoutsusermedia-pa.googleapis.com					34					
locker-pa.googleapis.com									143	
maps.googleapis.com		370					699			
oauthaccountmanager.googleapis.com		93	250			95		63	93	
people-pa.googleapis.com		223	119	107	105	75	92		130	87
photos.googleapis.com					298					
play.googleapis.com			1874					186	164	
safebrowsing.googleapis.com			77		40				35	
taskassist-pa.googleapis.com									1660	
www.googleapis.com	37	18100	380	139		51	301	725	229	211
ci5.googleusercontent.com									81	
ci6.googleusercontent.com									76	
googlehosted.l.googleusercontent.com		1368	1768	622		33	1862	7856	356	3608
photos-ugc.l.googleusercontent.com		60								
encrypted-tbn0.gstatic.com			1010							
encrypted-tbn1.gstatic.com			48							
encrypted-tbn3.gstatic.com			46							
maps.gstatic.com		136								
ssl.gstatic.com		1797	87	1119		173	58	190		1576
www.gstatic.com					838				78	

iOS	Hangouts Meet	Cloud Search	Docs	Sheets	Hangouts Chat	Google+	Calendar	Drive	Gmail	Slides
i.ytimg.com <i>ytimg.com stands for YouTube image</i>		121								
s.ytimg.com		187								
ed-in-f127.1e100.net <i>f127.1e100.net is owned by Google</i>	76									
sof02s17-in-f1.1e100.net		1								
sof02s17-in-f10.1e100.net	37	326								
sof02s18-in-f10.1e100.net				1032						
sof02s18-in-f42.1e100.net					2082					
sof02s21-in-f10.1e100.net	76									
sof02s21-in-f161.1e100.net	2									
sof02s28-in-f10.1e100.net	1766					49				
sof02s32-in-f1.1e100.net				660						
sof02s32-in-f10.1e100.net	325									
sof02s32-in-f3.1e100.net		890								
sof02s33-in-f10.1e100.net					106					
sof02s34-in-f10.1e100.net		103								
zrh04s05-in-f106.1e100.net				100						
gsa.apple.com.akadns.net <i>The domain akadns.net belongs to Akamai Technologies Inc.</i>				27						
lcdn-locator-usuqo.apple.com.akadns.net							30			
identity.ess-apple.com.akadns.net									150	
profile.ess-apple.com.akadns.net									27	
query.ess-apple.com.akadns.net									32	
albert.gcsis-apple.com.akadns.net									30	
buy.itunes-apple.com.akadns.net								37		
p11-buy.itunes-apple.com.akadns.net		74					35			
gsp64-ssl.ls-apple.com.akadns.net			24				24		28	
gsp-ssl-dynamic.ls4-apple.com.akadns.net						28				
aidc.origin-apple.com.akadns.net									30	
eu-central-courier-4.push-apple.com.akadns.net							172			
eu-nw-courier-4.push-apple.com.akadns.net								27		
a1806.dscb.akamai.net						37				
a1441.g4.akamai.net							15		15	
a239.gi3.akamai.net									16	
e9338.d.akamaiedge.net							27			
e17437.dscb.akamaiedge.net						88	23			
e673.dsce9.akamaiedge.net		26	75			1014	106			
e673.dscg.akamaiedge.net						99				
e6987.e9.akamaiedge.net						29				

iOS	Hangouts Meet	Cloud Search	Docs	Sheets	Hangouts Chat	Google+	Calendar	Drive	Gmail	Slides
e9959.e9.akamaiedge.net						71				
defra.ce.apple-dns.net		2770	372		508		434		445	92
nlhfd1.ce.apple-dns.net		3897	1761		323		3531		2078	403
fmfmobile.fe.apple-dns.net									27	
gateway.fe.apple-dns.net	48	362	225	97	96	139	648		773	330
keyvalueservice.fe.apple-dns.net									793	
setup.fe.apple-dns.net									30	
me.apple-dns.net		30	82	482	36	50	37		174	828
pagead.l.doubleclick.net		44					39		72	
pagead46.l.doubleclick.net		51								
no-reverse-yet.comsave.nl <i>ICMP pings to 185.213.106.89, for which no reverse dns is available</i>			52							

3.2 Research results Windows 10 domains found in network traffic

WINDOWS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	GMail	Google+	Hangout Chat	Hangout Meet	Slides	Sites	Sheets
t.co		x												
dropbox.com <i>All these advertising domains below result from the use of Cloud Identity to sign-in with Dropbox</i>		x												
static.ads-twitter.com		x												
cx.atdmt.com		x												
sjs.bizographics.com		x												
sslwidget.criteo.com		x												
widget.us.criteo.com		x												
bolt.dropbox.com		x												
marketing.dropbox.com		x												
www.dropbox.com		x		x										
dropboxcaptcha.com		x												
cfl.dropboxstatic.com		x												
ucb1cdf44854dbd0dd52db27b44.pr eviews.dropboxusercontent.com		x												
www.facebook.com		x												
yt3.ggpht.com													x	

WINDOWS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	GMail	Google+	Hangout Chat	Hangout Meet	Slides	Sites	Sheets
google.com	x		x	x	x	x	x	x	x	x	x	x	x	x
ssl.google-analytics.com				x										
www.google-analytics.com		x									x			
aa.google.com	x		x	x	x	x	x	x				x	x	x
accounts.google.com	x	x	x	x	x	x	x	x	x	x		x	x	x
adservice.google.com		x									x			
apis.google.com	x		x	x	x	x	x	x	x	x	x	x	x	x
calendar.google.com	x		x						x				x	
chat.google.com										x				
chrome.google.com	x					x	x			x				
0.client-channel.google.com	x		x					x		x	x			
cello.client-channel.google.com			x		x	x	x	x				x	x	x
android.clients.google.com									x					
clients1.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
clients2.google.com		x						x		x				
clients4.google.com	x		x	x	x	x	x	x	x		x	x	x	x
clients5.google.com								x						
clients6.google.com			x		x	x	x	x			x	x	x	x
addons-pa.clients6.google.com	x		x		x	x	x					x		x
appswaldo-pa.clients6.google.com								x						
blobcomments-pa.clients6.google.com						x								
calendar-pa.clients6.google.com	x		x											
calendarsuggest.clients6.google.com	x													
chat-pa.clients6.google.com								x						
cloudsearch.clients6.google.com						x								
enterprisesearch-pa.clients6.google.com					x							x		
hangouts.clients6.google.com											x			
people-pa.clients6.google.com	x		x	x	x		x	x		x	x	x		x
reminders-pa.clients6.google.com	x		x											
scone-pa.clients6.google.com											x			
signaler-pa.clients6.google.com	x		x		x	x	x	x		x	x	x	x	x
taskassist-pa.clients6.google.com								x						
tasks-pa.clients6.google.com	x		x											
cloudsearch.google.com			x											
contacts.google.com	x		x					x	x	x	x			
docs.google.com			x	x	x	x	x					x	x	x
drive.google.com			x		x	x	x	x				x	x	x

WINDOWS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	GMail	Google+	Hangout Chat	Hangout Meet	Slides	Sites	Sheets
gg.google.com					x		x					x		x
groups.google.com				x									x	
hangouts.google.com								x						
lh3.google.com			x		x	x	x					x	x	x
mail.google.com	x		x					x						
mail-ads.google.com								x						
maps-api-ssl.google.com														
<i>Caused by using an embedded maps in a page.</i>													x	
meet.google.com										x	x			
ogs.google.com	x		x	x	x	x	x	x	x	x		x	x	x
play.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
plus.google.com									x		x			
sites.google.com													x	
plus.url.google.com											x			
www.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
www.googleadservices.com		x												
ajax.googleapis.com											x			
clientservices.googleapis.com							x	x		x			x	x
fonts.googleapis.com	x	x	x		x	x	x			x	x	x	x	x
khms0.googleapis.com													x	
khms1.googleapis.com													x	
maps.googleapis.com	x												x	
safebrowsing.googleapis.com	x	x	x		x		x	x	x	x	x	x	x	x
storage.googleapis.com											x			
www.googleapis.com	x		x					x	x					
www.googletagmanager.com		x									x			
drive-thirdparty.googleusercontent.com			x		x	x	x			x		x		x
lh3.googleusercontent.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
lh4.googleusercontent.com			x		x		x			x	x	x	x	x
lh5.googleusercontent.com			x		x							x	x	x
lh6.googleusercontent.com										x		x	x	x
www-ataridrive-opensocial.googleusercontent.com													x	
www-atariimage-opensocial.googleusercontent.com													x	
www-ritz-opensocial.googleusercontent.com														x

WINDOWS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	GMail	Google+	Hangout Chat	Hangout Meet	Slides	Sites	Sheets
www-ritzmove-opensocial.googleusercontent.com														x
r2---sn-5hne6ns6.googlevideo.com													x	
r2---sn-5hnednlk.googlevideo.com													x	
r3---sn-5hne6nsd.googlevideo.com													x	
csi.gstatic.com			x	x									x	x
encrypted-tbn0.gstatic.com					x							x	x	x
encrypted-tbn3.gstatic.com												x		
fonts.gstatic.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
maps.gstatic.com <i>Caused by using an embedded maps in a page.</i>													x	
ssl.gstatic.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
www.gstatic.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
beacons.gvt2.com <i>The Domain gv2t.com is owned by Google, used for Content-Security-Policy Report-To URLs.</i>			x		x		x							
beacons2.gvt2.com									x					
beacons3.gvt2.com		x		x										x
beacons4.gvt2.com			x								x			
beacons.gcp.gvt2.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x
beacons5.gvt3.com							x	x			x			
snap.licdn.com <i>The domain licdn.com belongs to LinkedIn = Microsoft</i>		x												
images.pexels.com <i>Third party picture service Pexels and a result of searching and embedding pictures in pages during testscenario.</i>													x	
pixnio.com <i>Third party picture service Pixnio and a result of searching and embedding pictures in pages during testscenario.</i>													x	
bs.serving-sys.com <i>The domain serving-sys.com belongs to Sizmek Technologies, an ad network</i>		x												
secure-ds.serving-sys.com		x												
tags.tiqcdn.com		x												
analytics.twitter.com		x												

WINDOWS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	GMail	Google+	Hangout Chat	Hangout Meet	Slides	Sites	Sheets
csp.withgoogle.com							x							
sp.analytics.yahoo.com		x												
s.yimg.com <i>Yimg stands for YouTube Images</i>		x												
accounts.youtube.com		x												
www.youtube.com													x	
i.ytimg.com													x	
i9.ytimg.com													x	
egnwrcmgv								x						
egpgoplvcxrb								x						
about.google											x			
www.blog.google											x			
ijwxxmdgdjbjgbm								x						
b92.yahoo.co.jp		x												
kjlgzxxgveowj								x						
klwsvhzzp								x						
lfprghcfvw								x						
static.criteo.net		x												
8166291.fls.doubleclick.net		x												
googleads.g.doubleclick.net		x											x	
securepubads.g.doubleclick.net													x	
stats.g.doubleclick.net											x			
survey.g.doubleclick.net											x			
static.doubleclick.net <i>DoubleClick traffic is a result of embedding a Youtube clip in a site.</i>													x	
connect.facebook.net		x												
beacon.krxd.net <i>The domain krxd.net belongs to data management platform Krux en is used for pixel tracking</i>		x												
cdn.krxd.net		x												
consumer.krxd.net		x												
www.google.nl		x									x		x	
opqihxfatlstx <i>Non-existing domain to test network connectivity</i>								x						
insight.adsrvr.org		x												
js.adsrvr.org		x												

WINDOWS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	GMail	Google+	Hangout Chat	Hangout Meet	Slides	Sites	Sheets
upload.wikimedia.org <i>Image insertion into a page</i>													x	
pvzwbdateichss								x						
rgoptcfzclpj								x						

3.3 Research results macOS: domains found in network traffic

macOS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Forms	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault	Gmail
Gt.co		x												
ad.360yield.com <i>360yield.com is an advertising network</i>							x							
ice.360yield.com							x							
match.360yield.com							x							
ads-sanoma.adhese.com <i>adhese.com is an ad network</i>							x							
user-sync.adhese.com							x							
dsp.adfarm1.adition.com <i>adition.com is an ad network</i>							x							
acdn.adnxs.com <i>adnxs.com is an ad network</i>							x							
ams1-ib.adnxs.com							x							
cdn.adnxs.com							x							
ib.adnxs.com							x							
secure.adnxs.com							x							
static.ads-twitter.com		x												
cdn.arkoselabs.com <i>Arkoselabs is a fraud prevention company in the USA</i>		x												
client-api.arkoselabs.com		x												
dropbox-api.arkoselabs.com		x												
cx.atdmt.com <i>atdmt.com is an ad network</i>		x												
sjs.bizographics.com <i>adhese.com is an ad network</i>		x												
cdnjs.cloudflare.com <i>Cloudflare is a content delivery</i>							x							

macOS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Forms	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault	Gmail
<i>network</i>														
ads.creative-serving.com <i>creative-serving.com is an ad network</i>							x							
bidder.criteo.com <i>Criteo is an ad network</i>							x							
sslwidget.criteo.com		x												
widget.us.criteo.com		x												
api.cxense.com							x							
id.cxense.com							x							
scdn.cxense.com							x							
scomcluster.cxense.com							x							
sp1cluster.cxense.com							x							
csm.cxpublic.com							x							
d5p.de17a.com							x							
dropbox.com		x												
bolt.dropbox.com		x		x										
marketing.dropbox.com		x												
www.dropbox.com		x		x										
dropboxcaptcha.com		x												
cfl.dropboxstatic.com		x												
uc7339d4e42774bdc71529 cb5d69.previews. dropboxusercontent.com		x												
staticxx.facebook.com							x							
www.facebook.com		x					x							
cdns.gigya.com							x							
accounts.eu1.gigya.com							x							
cdns.eu1.gigya.com							x							
gscounters.eu1.gigya.com							x							
ssl.google-analytics.com				x			x							
www.google-analytics.com		x		x			x						x	
aa.google.com				x							x		x	
accounts.google.com	x	x	x	x	x	x	x	x		x	x	x	x	
admin.google.com														
adservice.google.com														
<i>Loaded by accessing the Dropbox site, visiting the www.google.com domain or by visiting the gsuite.google.com domain (Groups scenario)</i>		x		x			x							
apis.google.com	x			x	x	x	x	x	x	x	x	x		

macOS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Forms	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault	Gmail
apps.google.com														
calendar.google.com	x		x				x							
chat.google.com					x			x						
0.client-channel.google.com	x		x				x		x					
cello.client-channel.google.com				x	x	x				x	x	x		
android.clients.google.com							x							
clients1.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	
clients2.google.com							x							
clients4.google.com	x		x	x	x	x	x		x	x	x	x	x	
clients6.google.com			x	x	x	x	x		x	x	x	x		
addons-pa.clients6.google.com	x		x	x										
appswaldo-pa.clients6.google.com							x							
blobcomments-pa.clients6.google.com			x											
calendar-pa.clients6.google.com	x		x											
chat-pa.clients6.google.com							x							
enterprisesearch-pa.clients6.google.com					x					x				
hangouts.clients6.google.com									x					
people-pa.clients6.google.com	x		x	x	x	x	x	x	x	x	x	x	x	
realtimesupport.clients6.google.com														
reminders-pa.clients6.google.com	x		x											
signaler-pa.clients6.google.com	x		x	x	x	x			x	x	x	x		
taskassist-pa.clients6.google.com							x							
tasks-pa.clients6.google.com	x		x											
cloudsearch.google.com			x											
contacts.google.com	x		x				x	x						
docs.google.com				x	x	x				x	x	x		
drive.google.com			x	x		x					x			
ediscovery.google.com														x
gg.google.com										x	x	x		
groups.google.com				x										
gsuite.google.com				x										
hangouts.google.com							x							
id.google.com			x											
lh3.google.com			x	x	x	x				x	x			

macOS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Forms	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault	Gmail
mail.google.com							x							
mail-ads.google.com							x							
maps-api-ssl.google.com											x			
meet.google.com								x	x					
myaccount.google.com														
ogs.google.com	x		x		x	x	x			x		x		
play.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	
plus.google.com							x							
sites.google.com											x			
support.google.com					x	x					x			
plus.url.google.com							x							
www.google.com	x	x	x	x	x	x	x	x	x	x	x	x		
www.googleadservices.com		x												
ajax.googleapis.com							x							
clientservices.googleapis.com						x	x	x			x			
commondatastorage. googleapis.com					x									
content.googleapis.com			x											
fonts.googleapis.com		x	x	x	x	x			x		x	x		
khms0.googleapis.com											x			
maps.googleapis.com	x										x			
safebrowsing.googleapis.com		x			x	x	x	x		x		x		
translate.googleapis.com							x							
www.googleapis.com	x		x	x	x	x	x							
tpc.googlesyndication.com <i>Related to Google Adsense ads</i>							x							
www.googletagmanager.com		x		x										
drive-thirdparty.google usercontent. com				x				x						
lh3.googleusercontent.com		x	x	x	x	x	x	x	x	x	x		x	
lh4.googleusercontent.com			x		x	x	x	x	x	x				
lh5.googleusercontent.com	x				x		x			x		x		
lh6.googleusercontent.com						x	x	x		x	x	x		
www-ataridrive-opensocial. googleusercontent.com											x			
www-freebird-opensocial. googleusercontent.com						x								
www-ritz-opensocial. googleusercontent.com													x	

macOS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Forms	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault	Gmail
gstatic.com														
csi.gstatic.com			x	x	x	x				x	x	x		
encrypted-tbn0.gstatic.com					x	x				x		x		
encrypted-tbn1.gstatic.com							x							
encrypted-tbn2.gstatic.com							x							
encrypted-tbn3.gstatic.com										x				
fonts.gstatic.com		x			x	x	x				x	x		
maps.gstatic.com							x				x			
ssl.gstatic.com	x	x	x	x	x	x	x	x	x	x	x	x	x	
www.gstatic.com	x	x	x	x	x	x	x	x	x	x	x	x		
script.hotjar.com							x							
static.hotjar.com							x							
vars.hotjar.com							x							
id5-sync.com							x							
content.jwplatform.com							x							
snap.licdn.com		x												
sync.mathtag.com							x							
ads.pubmatic.com							x							
hopenbid.pubmatic.com							x							
image2.pubmatic.com							x							
image4.pubmatic.com							x							
image6.pubmatic.com							x							
simage2.pubmatic.com							x							
simage4.pubmatic.com							x							
pxhere.com										x				
get.pxhere.com										x				
pixel.quantserve.com							x							
sb.scorecardresearch.com							x							
bs.serving-sys.com		x					x							
secure-ds.serving-sys.com		x												
api.smartocto.com							x							
measure.smartocto.com							x							
tentacles.smartocto.com							x							
sync.search.spotxchange.com							x							
ads.stickyadstv.com							x							
sonata-notifications. taptapnetworks.com							x							
sync.tidaltv.com							x							
tags.tiqcdn.com		x					x							

macOS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Forms	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault	Gmail
kmnl.tns-nipo.com							x							
ad.turn.com							x							
analytics.twitter.com		x												
w.usabilla.com							x							
dev.visualwebsiteoptimizer.com							x							
csp.withgoogle.com					x			x				x		
s.yimg.com <i>Yimg.com stands for YouTube Images</i>		x												
accounts.youtube.com		x					x							
sat.sanoma.fi							x							
goo.gl							x							
vc.hotjar.io							x							
b92.yahoo.co.jp		x												
s0.2mdn.net							x							
c1.adform.net							x							
track.adform.net							x							
x.bidswitch.net							x							
static.criteo.net		x					x							
2507573.fls.doubleclick.net				x										
8166291.fls.doubleclick.net		x												
cm.g.doubleclick.net							x							
googleads.g.doubleclick.net		x		x										
stats.g.doubleclick.net				x										
survey.g.doubleclick.net				x										
sync-tm.everesttech.net							x							
connect.facebook.net		x					x							
bea4.v.fwmrm.net							x							
cdn.jsdelivr.net							x							
beacon.krxd.net		x					x							
cdn.krxd.net		x					x							
consumer.krxd.net		x					x							
usermatch.krxd.net							x							
ad.sxp.smartclip.net							x							
accounts.google.nl														
www.google.nl		x		x										
media.nu.nl							x							
www.nu.nl							x							
ads.pexi.nl							x							

macOS	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Forms	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault	Gmail
dash.pexi.nl							x							
static.pexi.nl							x							
account.sanomaseservices.nl							x							
security.nl							x							
www.security.nl							x							
bin.snmmd.nl							x							
consent.snmmd.nl							x							
sss.snmmd.nl							x							
insight.adsrvr.org		x												
js.adsrvr.org		x												
match.adsrvr.org							x							

3.4 Research results Chromebook Android and web apps: domains found in network traffic

Chromebook	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	Gmail	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault
t.co	x												x		
static.ads-twitter.com	x														
cdn.arkoselabs.com	x														
client-api.arkoselabs.com	x														
dropbox-api.arkoselabs.com	x														
cx.atdmt.com	x														
static.bigspark.com	x														
sjs.bizographics.com	x														
consent.cookiebot.com	x														
sslwidget.criteo.com	x														
widget.us.criteo.com	x														
dropbox.com	x														
bolt.dropbox.com	x			x									x		
marketing.dropbox.com	x														
www.dropbox.com	x			x									x		
dropboxcaptcha.com	x														
cfl.dropboxstatic.com	x														
ucba2f8ae72bae8b8cb444e6165e.previews.dropboxusercontent.com	x														
www.facebook.com	x														
google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Chromebook	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	Gmail	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault
ssl.google-analytics.com				x											
www.google-analytics.com		x													x
aa.google.com		x		x									x		
accounts.google.com	x	x	x	x	x	x	x			x	x	x	x	x	
adservice.google.com		x						x							
apis.google.com	x	x		x	x	x	x		x	x	x	x	x	x	
calendar.google.com	x										x				
chat.google.com					x					x					
0.client-channel.google.com	x	x	x	x	x	x	x	x		x	x	x	x	x	x
cello.client-channel.google.com	x	x	x	x	x	x	x	x		x	x	x	x	x	x
android.clients.google.com									x						
clients1.google.com	x	x	x	x	x	x	x	x	x	x		x	x	x	
clients2.google.com		x		x							x	x	x	x	
clients4.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
clients5.google.com					x									x	
clients6.google.com	x	x	x	x	x	x	x	x		x	x	x	x	x	x
addons-pa.clients6.google.com	x	x			x	x	x	x		x		x		x	
appsitemsuggest-pa.clients6.google.com					x		x	x						x	
appswaldo-pa.clients6.google.com	x							x							
blobcomments-pa.clients6.google.com						x									
calendar-pa.clients6.google.com	x														
calendarsuggest.clients6.google.com	x														
chat-pa.clients6.google.com	x	x	x	x	x	x	x	x		x	x	x	x	x	x
cloudsearch.clients6.google.com					x	x								x	
enterprisearch-pa.clients6.google.com					x										
hangouts.clients6.google.com											x				
people-pa.clients6.google.com	x	x		x	x	x	x	x		x	x	x	x	x	x
signaler-pa.clients6.google.com	x	x	x	x	x	x	x	x		x	x	x	x	x	x
taskassist-pa.clients6.google.com	x							x							
tasks-pa.clients6.google.com	x														
cloudsearch.google.com			x												
contacts.google.com	x	x		x				x	x	x	x	x	x	x	
docs.google.com	x	x			x	x	x	x				x	x	x	
drive.google.com	x	x	x	x	x	x	x	x		x	x	x	x	x	
ediscovery.google.com															x
gg.google.com													x		
groups.google.com				x									x		
hangouts.google.com	x	x	x	x	x	x	x	x			x	x	x	x	x
id.google.com								x							
lh3.google.com		x	x		x	x	x	x				x	x	x	

Chromebook	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	Gmail	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault
mail.google.com	x	x	x	x	x	x	x	x		x	x	x	x	x	x
mail-ads.google.com		x		x							x	x	x	x	
maps-api-ssl.google.com													x		
meet.google.com											x				
ogs.google.com	x				x	x	x		x		x	x		x	
play.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
plus.google.com									x						
sites.google.com													x		x
support.google.com							x						x		
tasks.google.com	x										x				
www.google.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
www.googleadservices.com		x													
ajax.googleapis.com		x													
clientservices.googleapis.com						x	x	x		x			x	x	x
content.googleapis.com								x							
fonts.googleapis.com		x			x		x				x		x	x	
khms1.googleapis.com													x		
maps.googleapis.com	x												x		
update.googleapis.com							x								
www.googleapis.com		x		x	x		x				x	x	x	x	
ade.google syndication.com		x													
pagead2.google syndication.com		x													
tpc.google syndication.com		x													
www.googletagmanager.com		x													
www.googletagservices.com		x													
ci3.googleusercontent.com					x										
ci4.googleusercontent.com												x		x	
ci5.googleusercontent.com					x			x			x				
drive-thirdparty.googleusercontent.com		x			x	x	x			x		x	x	x	
lh3.googleusercontent.com		x	x		x	x	x	x	x	x	x	x	x	x	
lh4.googleusercontent.com		x	x				x			x	x	x		x	
lh5.googleusercontent.com	x				x		x					x		x	
lh6.googleusercontent.com					x		x					x		x	
mail-attachment.googleusercontent.com								x							
www-ataridrive-opensocial.googleusercontent.com													x		
www-freebird-opensocial.googleusercontent.com							x								
www-gmi-opensocial.googleusercontent.com								x							
www-gms-opensocial.googleusercontent.com								x							
www-ritz-opensocial.googleusercontent.com														x	

Chromebook	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	Gmail	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault
secure.gravatar.com <i>The domain belongs to WordPress.com</i>		x													
csi.gstatic.com				x	x		x	x				x	x	x	
encrypted-tbn0.gstatic.com					x		x	x				x		x	
encrypted-tbn1.gstatic.com								x							
encrypted-tbn2.gstatic.com								x							
encrypted-tbn3.gstatic.com								x							
fonts.gstatic.com		x	x			x		x			x		x	x	
maps.gstatic.com													x		
ssl.gstatic.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
www.gstatic.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
r1---sn-5hnekn76.gvt1.com <i>The domain gvt1.com belongs to Google</i>							x								
r2---sn-5hnekn7z.gvt1.com							x								
r3---sn-5hnekn76.gvt1.com							x								
r3---sn-5hnekn7z.gvt1.com							x								
r4---sn-5hne6nsk.gvt1.com							x								
r4---sn-5hne6nsz.gvt1.com							x								
r5---sn-5hnekn7s.gvt1.com							x								
redirector.gvt1.com							x								
beacons.gvt2.com						x		x		x		x			
beacons2.gvt2.com												x			
beacons3.gvt2.com															
beacons4.gvt2.com												x			
beacons5.gvt2.com		x													
beacons.gcp.gvt2.com	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
beacons5.gvt3.com		x													
snap.licdn.com		x													
i.pinimg.com <i>Attaching an image to an e-mail</i>								x							
bs.serving-sys.com <i>During testing of the cloud identity feature an external site (Dropbox) was loaded with tracking</i>		x													
secure-ds.serving-sys.com		x													
tags.tiqcdn.com		x													
analytics.twitter.com		x											x		
app.wecantrack.com		x													
cdn.wecantrack.com		x													
csp.withgoogle.com					x										
s.yimg.com <i>Yimg stands for YouTube Images</i>		x													
accounts.youtube.com		x													
www.youtube.com						x									

Chromebook	Calendar	Cloud Identity	Cloud Search	Groups	Docs	Drive	Forms	Gmail	Google+	Hangouts Chat	Hangouts Meet	Slides	Sites	Sheets	Vault
creative-libraries.lemonpi.io	x														
d.lemonpi.io	x														
log.lemonpi.io	x														
b92.yahoo.co.jp	x														
s0.2mdn.net	x														
static.criteo.net	x														
ad.doubleclick.net	x														
8166291.fl.doubleclick.net	x														
googleads.g.doubleclick.net	x					x		x							
googleads4.g.doubleclick.net	x														
securepubads.g.doubleclick.net	x														
stats.g.doubleclick.net	x														
static.doubleclick.net						x									
connect.facebook.net	x														
beacon.krxd.net	x														
cdn.krxd.net	x														
consumer.krxd.net	x														
www.dropbox.nl	x														
adservice.google.nl	x							x							
www.google.nl	x							x							
www.greetz.nl								x							
<i>Attaching an image to an e-mail</i>															
shop.hadieth.nl								x							
<i>Attaching an image to an e-mail</i>															
www.iphoned.nl	x														
www.nu.nl						x									
images.weserv.nl	x														
insight.adsrvr.org	x														
js.adsrvr.org	x														