OAuth Client ID Spoofing: Why Fake Client IDs Are Gaining Traction for Stealthy Enumeration

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July 13, 2026 Rachel Rabin

Key Takeaways

- Proofpoint has observed OAuth client ID spoofing emerging as a novel technique, increasingly leveraged in cloud campaigns.
- Microsoft Entra ID returns different responses depending on whether a supplied OAuth client ID is valid and whether it corresponds to a registered application.
- This behavior enables account enumeration without a registered OAuth application and allows attackers to infer password validity or account state without generating a successful sign in event.
- Researchers observed multiple campaigns at scale abusing spoofed OAuth application identifiers, with distinct tooling, infrastructure, and execution patterns indicating independent adoption by multiple threat actors.
- To detect similar activity, defenders should monitor sign-in logs for events without an application name, which may indicate spoofed client IDs.

Intro

What if attackers could enumerate your entire organization's accounts without generating a single successful sign-in event?

The Entra sign in logs are a primary telemetry source for identifying malicious authentication activity, including user enumeration, password spraying, and initial access attempts. To evade

detection, attackers routinely distribute requests using rotating user agents (as seen in *UNK_CustomCloak*) and proxy services that cycle source IPs per request.

Proofpoint researchers have identified multiple campaigns where attackers extend this evasive tradecraft by spoofing the OAuth client ID (application ID), a globally unique identifier (GUID) assigned to applications. The identifier is passed as client_id in authentication requests and recorded as the application ID in Entra sign-in logs.

Spoofed client IDs enable account enumeration without a registered OAuth application and allow attackers to infer both password and account validity without generating a successful sign-in event.

Simulating client ID spoofing

To understand how client ID spoofing works in practice, we simulated the technique against Entra ID.

Client ID spoofing was performed by issuing POST requests to Microsoft's OAuth 2.0 token endpoint (/common/oauth2/token) using the Resource Owner Password Credentials (ROPC) flow, which allows direct submission of username and password credentials.

```
# Setting up the web request
$BodyParams = @{
    'resource'    = 'https://graph.windows.net'
    'client_id'   = $ClientId
    'client_info' = '1'
    'grant_type'  = 'password'
    'username'    = $User
    'password'    = $Password
    'scope'       = 'openid'
}
$PostHeaders = @{'Accept' = 'application/json'; 'Content-Type' = 'application/x-www-form-urlencoded'}

Write-Host -ForegroundColor "DarkGray" "   [>] Endpoint    POST /common/oauth2/token"
Write-Host ""
```

Figure 1: ROPC request with client ID parameter

The resulting *AADSTS *error codes allow unauthenticated requestors to infer the validity of usernames and passwords, as well as the enforcement of controls such as multi-factor authentication (MFA) or Conditional Access (CA).

A custom PowerShell module (Invoke-ClientIdSpoofEnum) was developed to observe how Entra ID responds and logs requests with client_id values across the following scenarios:

- Valid client ID associated with registered applications
- Valid client ID associated with unregistered applications
- Randomly generated UUIDs with a valid structure
- Invalid client ID

Valid client ID + registered application

When a valid client_id corresponds to a registered application, Entra processes the request as expected, with both the application ID and application name populated in the sign in logs.

Application	Azure Active Directory PowerShell
Application ID	1b730954-1685-4b74-9bfd-dac224a7b894
Resource	Windows Azure Active Directory

Figure 2: Sign-in log entry for registered application ID

Valid client ID + unregistered application

When the supplied client_id is syntactically valid but does not correspond to a real application, only the application ID is recorded in the sign-in log, without a corresponding application name.

Application	
Application ID	aaaaaaaa-aaaa-aaaa-aaaa-aaaaaaaaaaaa
Resource	Windows Azure Active Directory
Resource ID	00000002-0000-0000-c000-000000000000

Figure 3: Application name not populated for spoofed Application ID

The response can be used to infer whether the account exists and whether the password is correct without a registered application.

AADSTS50034 is returned for an invalid username. This event will not be logged to the sign-in log as Entra ID only logs sign in attempts to valid usernames.

```
PS C:\Users\lab\[redacted]>  Invoke-ClientIdSpoofEnum -User 'doesnotexist@[redacted]' -Password 'pass' -ClientId (G
enerate-ClientId)

------------------------------------------------------------------
  [*] CLIENT ID SPOOF POC | Enumeration Analysis
  [>] 2026-05-07 12:21:31
------------------------------------------------------------------

  [>] Target      doesnotexist@[redacted]
  [>] Client ID   4286b1a7-fc49-43cf-a764-cce21e188b7f
  [+] UUID Valid  Yes
      Expected: App ID in logs, App name if first-party

  [>] Endpoint    POST /common/oauth2/token

------------------------------------------------------------------
  RESPONSE
------------------------------------------------------------------
  [!] Error       invalid_grant
  [!] Code        AADSTS50034
  [>] Details     AADSTS50034: The user account {EUII Hidden} does not exist in the [redacted] directory. To sign into this a
pplication, the account must be added to the directory. Trace ID: 3827f4e5-e075-49d6-858c-b8445aad4300 Correlation ID: 649b5a
9c-bb97-4c63-8e1b-35793ff5c7c7 Timestamp: 2026-05-07 11:21:31Z

------------------------------------------------------------------
  [!] ANALYSIS    User does not exist
------------------------------------------------------------------
```

Figure 4: Custom Invoke-ClientIdSpoofEnum tool showing response when the user is invalid and the client ID is a randomly generated UUIDv4 string that does not correspond to a registered application.

AADSTS50126 is returned for a valid username with an invalid password.

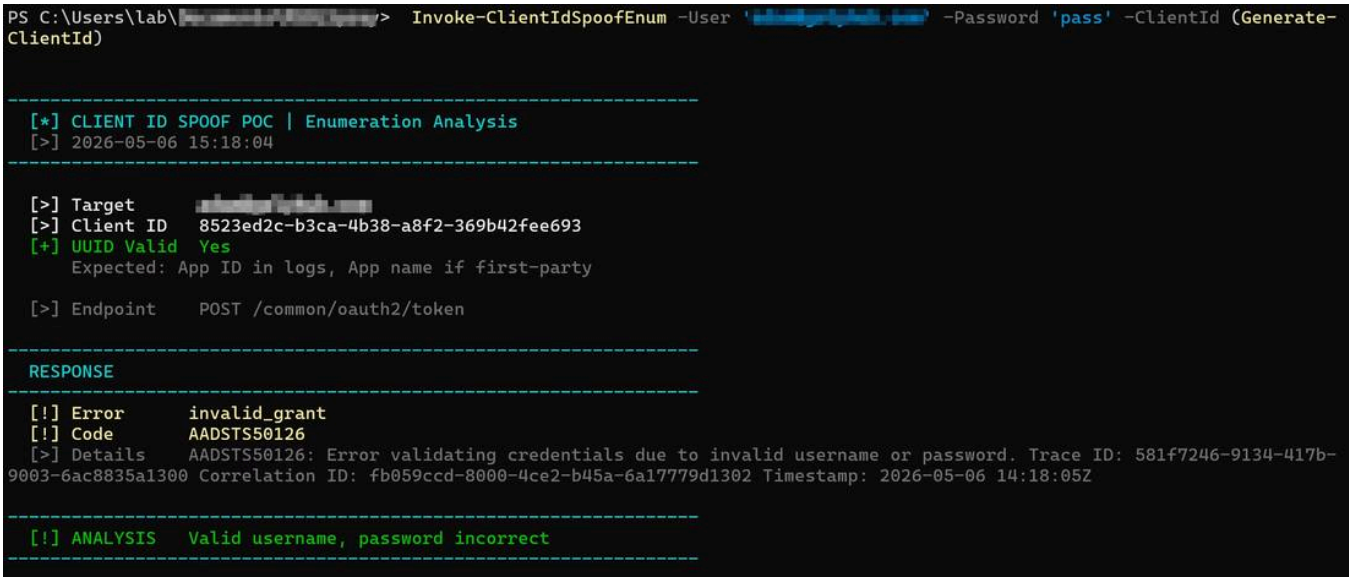


Figure 5: Custom Invoke-ClientIdSpoofEnum tool showing response when the user is valid and the password is invalid

Notably, AADSTS700016 (application identifier not recognized) is returned for a valid username and password. The use of the spoofed app identifier therefore facilitates enumeration of valid username-password pairs without generating a successful sign-in record.

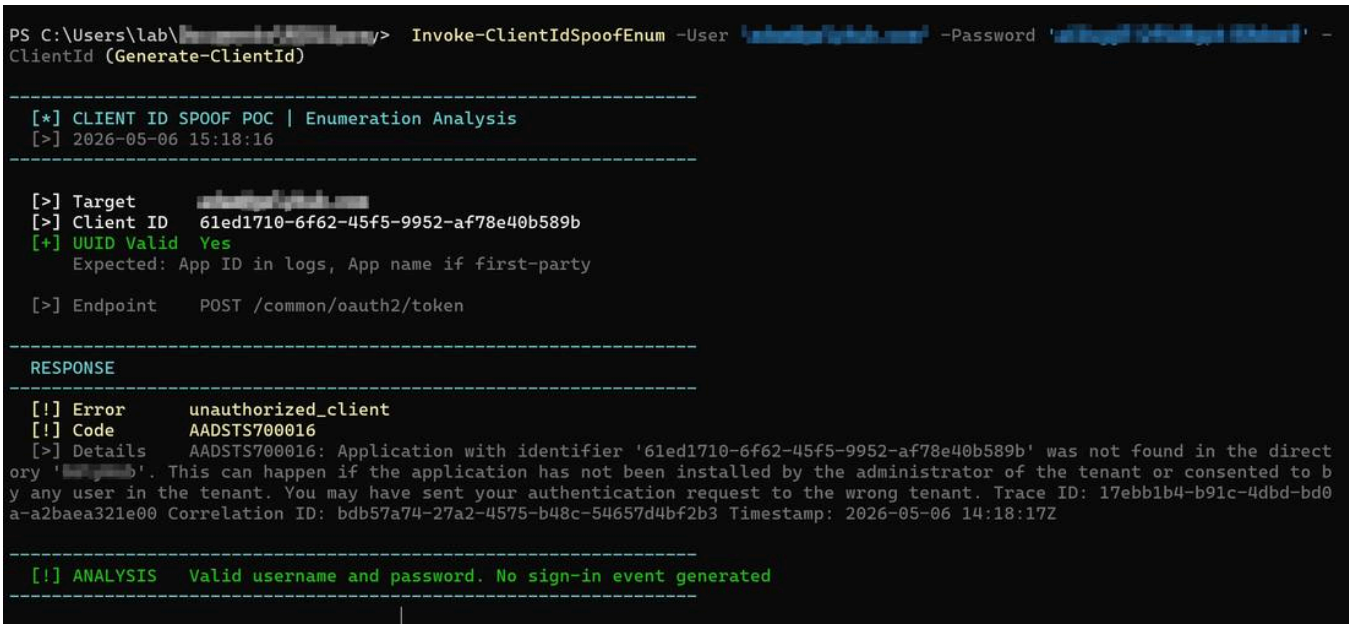


Figure 6: Invoke-ClientIdSpoofEnum for valid username and password

Invalid Client ID

If the spoofed client ID is not a proper UUIDv4, Entra does not reject the request outright. Instead, it still returns AADSTS errors without populating application ID or application name in the signin log.

Attackers can therefore analyze this error response to identify valid accounts and passwords, despite using malformed client IDs.

Application	
Application ID	
Resource	Windows Azure Active Directory
Resource ID	00000002-0000-0000-c000-000000000000

Figure 7: Application name and Application ID not populated for an invalid UUIDv4 client ID

Why do attackers spoof the client ID?

When a spoofed client ID is used, no corresponding application name is recorded in the sign-in log. This means that detections that look for surges against a specific application name may miss this activity entirely, as the field is blank.

The observed logging behavior allows unauthenticated attackers to enumerate users and infer password validity without generating a successful sign-in event. Even when enumeration is detected, defenders may not realize that valid credentials were identified and may overlook compromised credentials entirely.

Traditional enumeration tools target hardcoded first-party applications, commonly CLI tools like Azure AD PowerShell, that exist in all tenants and have historically been a gap for MFA enforcement. However, surges in authentication requests to a single application quickly raise alarms for SOC teams. By fragmenting authentication attempts across many fictional applications, activity becomes harder to correlate and may evade per-application detections and rate limiting.

Organizations may attempt to mitigate traditional enumeration attacks by applying Conditional Access policies scoped to applications commonly targeted for enumeration. Spoofed client IDs won't trigger CA policies that are scoped to a specific application.

UNK_PyReq2323

The campaign tracked by Proofpoint as **UNK_pyreq2323** first emerged on January 14, 2026. The attacker distributed enumeration attempts across more than 700,000 spoofed client IDs.

The observed authentication requests were from the user agent:

python-requests/2.32.3

Activity peaked in late January and early February before declining by early March. The campaign originated from AWS infrastructure and targeted over one million unique user accounts across nearly 4,000 tenants. This high volume of failed attempts triggered account lockouts for approximately 28% of targeted users.

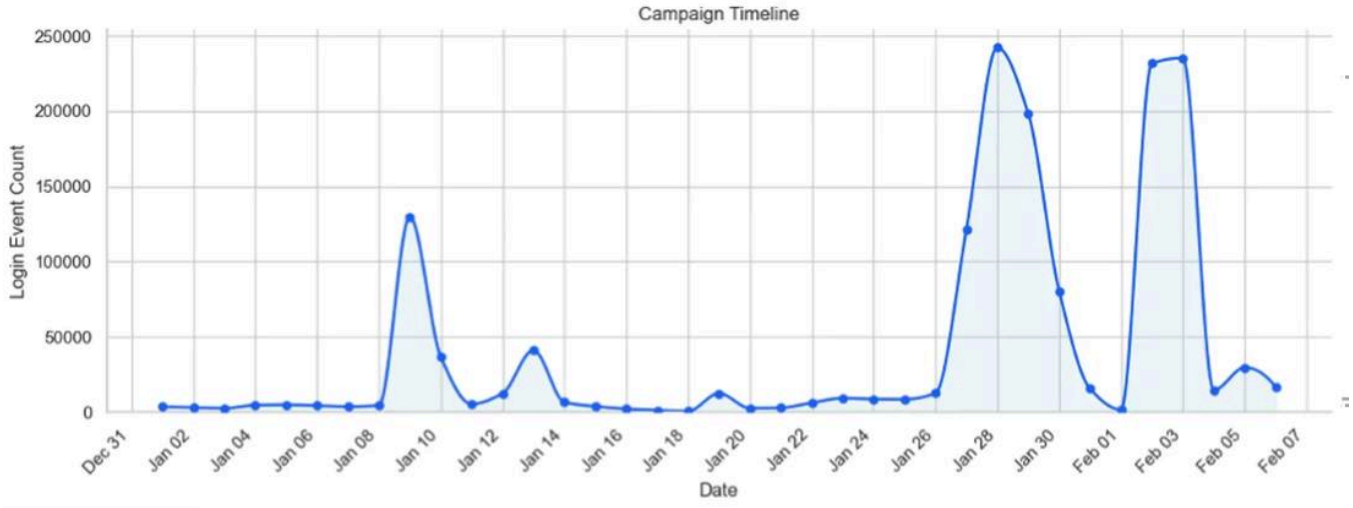


Figure 8: Timeline of UNK_pyreq2323

Client ID Spoofing Details

The method for spoofing client IDs was unsophisticated, using the prefix for the application "Exchange Online".

00000002-0000-0ff1-ce00-000000000000

Rather than enumerating IDs sequentially, the threat actor randomized the final six digits of the identifier. This resulted in spoofed IDs being used on up to 12 users and never retried for the same user.

The table below presents a selection of observed client IDs, including the three lowest and three highest values. Analysis of the timestamps associated with each client ID shows no ascending or descending pattern, confirming they were not generated sequentially but are random.

|

00000002-0000-0ff1-ce00-000000100001

| | |

00000002-0000-0ff1-ce00-000000100003

| | |

00000002-0000-0ff1-ce00-000000100005

| | |

00000002-0000-0ff1-ce00-000000425603

| | |

00000002-0000-0ff1-ce00-000000544540

| | |

00000002-0000-0ff1-ce00-000000645372

| | |

00000002-0000-0ff1-ce00-000000999997

| | |

00000002-0000-0ff1-ce00-000000999998

| | |

00000002-0000-0ff1-ce00-000000999999

| |

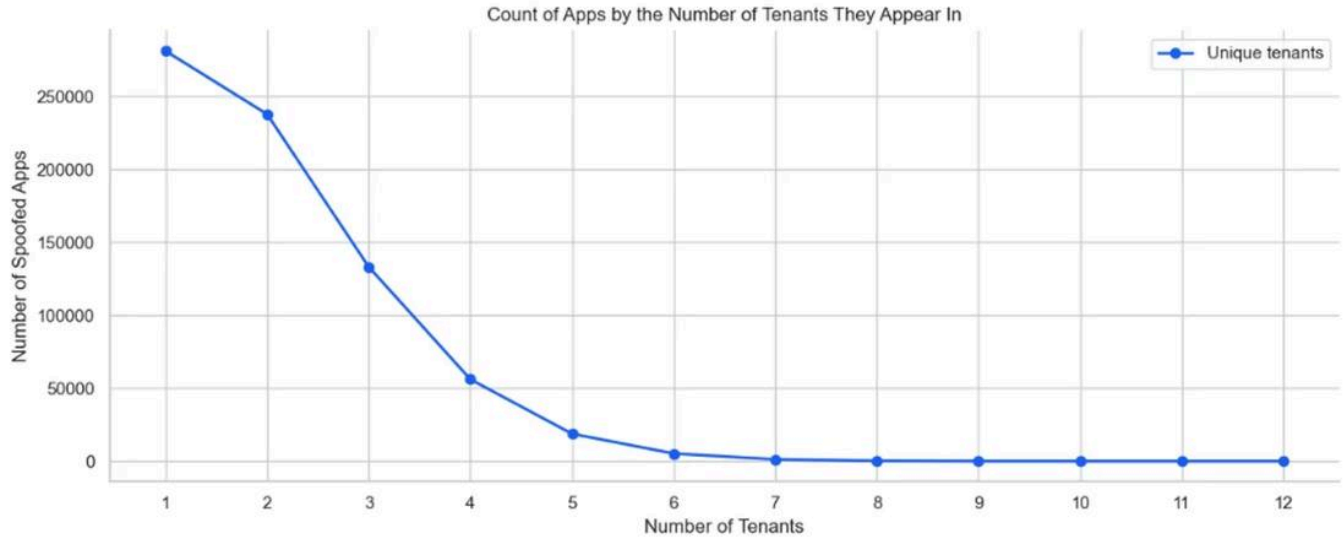


Figure 9: Most spoofed app IDs were used for 1–3 users, for a maximum of 12

UNK_OutFlareAZ Dec 2025

Beginning in December 2025, Proofpoint researchers observed a large-scale enumeration campaign tracked as **UNK_OutFlareAZ** originating primarily from Cloudflare infrastructure. The activity used the same client ID spoofing technique, but operated at a greater scale, targeting more than 2 million users and 3.7 million spoofed application IDs.

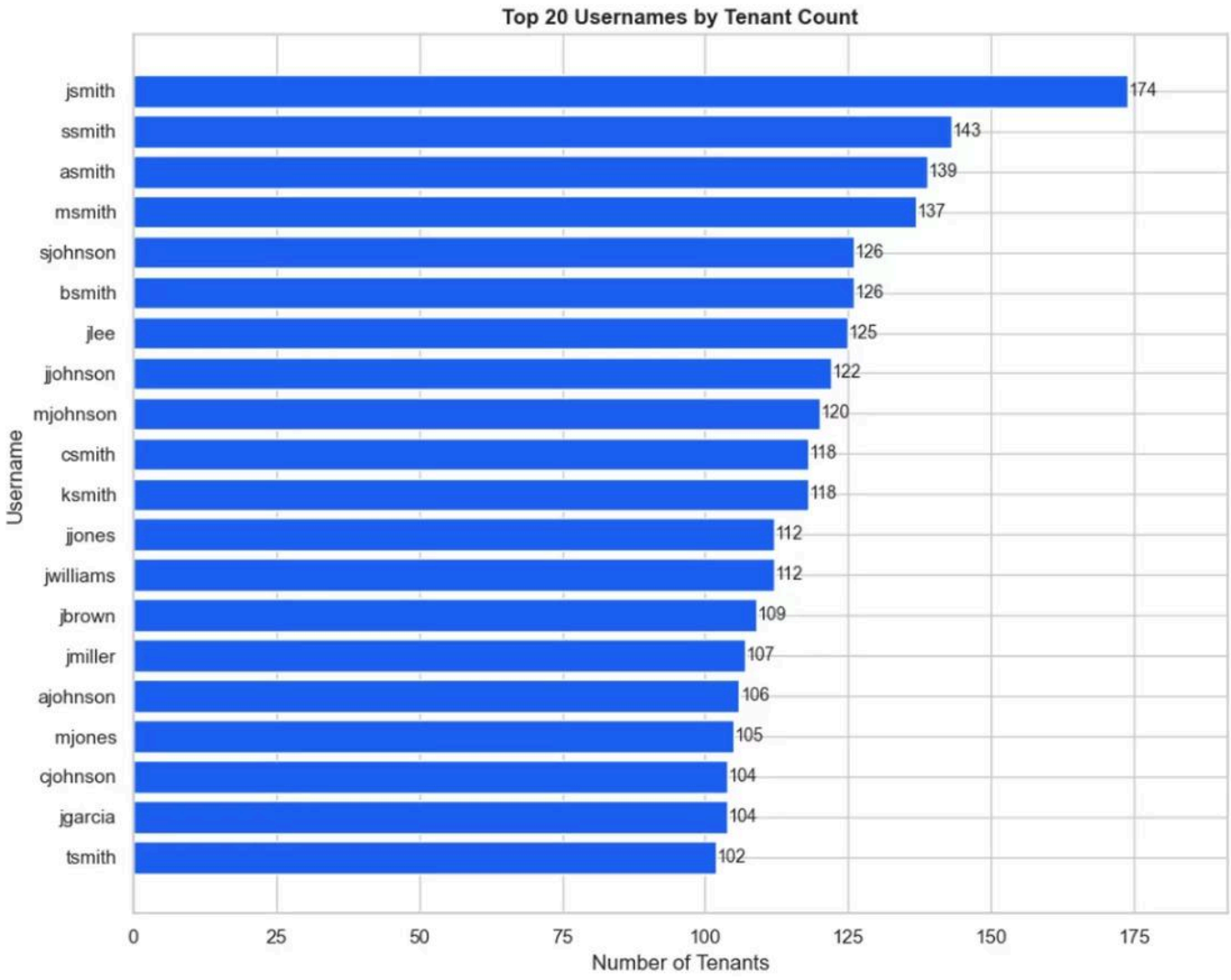
The observed authentication requests were from the user agent:

Microsoft Office/16.0 (Windows NT 10.0; Microsoft Outlook 16.0.12026; Pro.

Proofpoint has consistently observed this user agent over several years across multiple enumeration campaigns, where it has been widely propagated through attacker tooling.

The campaign occurred in two distinct waves: the first ramped up from December 10 and peaked in late December (~242K users), while a second, larger wave began in early February, escalated through March, and peaked on March 15 (~720K users).

A notable portion of usernames appeared across multiple tenants, following generic naming conventions like dsmith, msmith, and jbrown. Because Entra ID only logs attempts against valid accounts, this pattern suggests attackers reused a common wordlist of generic usernames across many organizations.



Client ID Spoofing Details

The spoofing approach employed in **UNK_OutFlareAZ **was more mature when compared to the **UNK_pyreq2323**. Rather than randomizing the last digits within a known first party application identifier, the threat actor generated a fully randomized UUIDv4, using a unique client id for each authentication attempt.

Example of spoofed app ids:

|

f9bae775-ef31-44c0-ad33-f50f62b3aba8

| | |

89274bc8-5605-4639-b850-1d5fc2de4bad

| | |

ad48e616-54a3-4c53-b7f7-605d493d54ba

| | |

2e2fa57b-e41e-40e6-b2d6-5aa448cef563

| | |

574f120a-5094-4f2d-930a-9e926221f0f2

| | |

fff3c7ac-36d1-46b8-80a9-212095b76264

| |

Campaigns Compared

While both campaigns leveraged OAuth client ID spoofing for user enumeration, differences in user agents, infrastructure, client ID generation, and enumeration patterns suggest they were conducted by distinct tools or operators.

Both campaigns used valid UUIDs rather than malformed identifiers and exhibited patterns consistent with precompiled username wordlists. However,** UNK_OutFlareAZ **enumerated users alphabetically while **UNK_pyreq2323** did not.

The client ID spoofing methods also differed: **UNK_pyreq2323** modified the trailing digits of a known application ID, reusing spoofed IDs across up to 12 users, while **UNK_OutFlareAZ **generated a unique client ID per request, a more sophisticated approach that limits correlation.

These variations point to independent adoption of the same underlying technique, reinforcing Proofpoint's assessment that OAuth client ID spoofing is becoming increasingly common tradecraft among threat actors.

Comparison of Campaigns

|

Tracked as

|

UNK_pyreq2323

|

UNK_OutFlareAZ

| | |

User Agent

|

python-requests/2.32.3

|

Microsoft Office/16.0 (Windows NT 10.0; Microsoft Outlook 16.0.12026; Pro

| | |

Infrastructure

|

AWS

|

Cloudflare + others

| | |

App ID Method

|

00000002-0000-0ff1-ce00-000000XXXXXX (last 6 digits randomized, non-zero)

|

Fully random UUID v4

| | |

Reuse

|

Max 12 users per ID

|

Max 1 user per ID

| | |

Enumeration Style

|

Non-alphabetical

|

Alphabetical

| | |

Campaign Duration

|

Jan-Mar 2026

|

December 2025

Feb-March 2026

| | |

Likely Tooling

|

Python-based

|

Possible forked from existing tool based on UA

| |

Conclusion

OAuth client ID spoofing enables attackers to enumerate accounts and validate credentials at scale, without generating a successful sign-in event in Entra ID logs. The emergence of multiple campaigns with unique tools and infrastructure suggests this technique is gaining traction among threat actors targeting cloud environments.

Beyond evading sign-in telemetry, spoofed client IDs offer additional advantages such as distributing attacks across apparent applications and potentially evading downstream detections that rely on the application name field being populated.

Defenders should treat sign-in log entries with blank application IDs, or those without a correspond application name, as potential indicators of client ID spoofing, and recognize that an AADSTS700016 error code may signal compromised credentials, not just a failed login attempt.

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