# Incident report

## Executive summary:

On April 28 at 00:30 we received an alert from IDS suspicious network activity. After investigation we discovered that our public-facing MSSQL server was brute-forced and used to deliver a C2 beacon, injecting it into a legitimate Windows process for privilege escalation. As a result, several malicious files were uploaded, including Blue Sky ransomware. Incident was contained, compromised server isolated, all signatures of malicious presence were eliminated before any significant data breach or encryption.

## Incident details:

Name: SQL Brute-force
Date/Time: 28.4.24 00:29:56 UTC
Incident type: ransomware, brute-force

## Impact assessment:

Scope:

Devices affected -1 (DESKTOP-7EQVM78)
Users affected - (sa)

Data types:

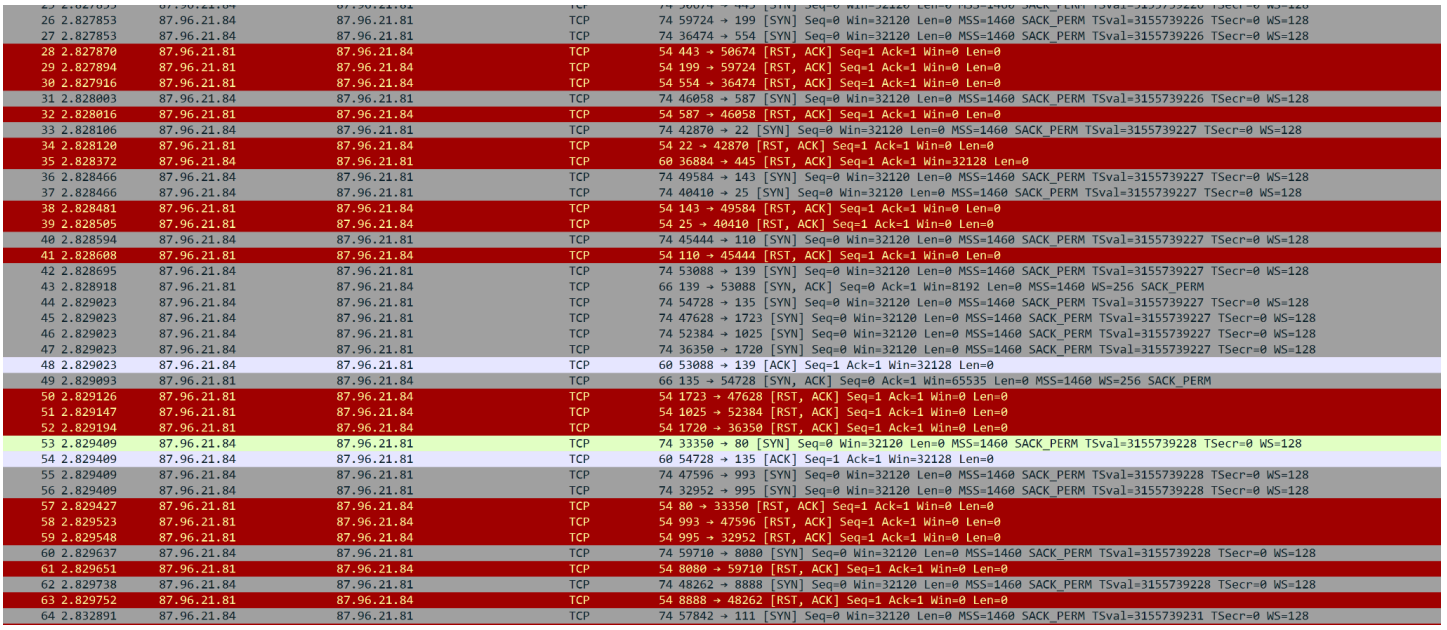
credentials
hosts

Downtime - 22 minutes

## Summary:

Timeline:

00:29.56 – port scan, port 1433 discovered



| | | | | | |
|---|---|---|---|---|---|
| 26 | 2.827853 | 87.96.21.84 | 87.96.21.81 | TCP | 74 59724 → 199 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739226 TSecr=0 WS=128 |
| 27 | 2.827853 | 87.96.21.84 | 87.96.21.81 | TCP | 74 36474 → 554 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739226 TSecr=0 WS=128 |
| 28 | 2.827870 | 87.96.21.81 | 87.96.21.84 | TCP | 54 443 → 50674 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 29 | 2.827894 | 87.96.21.81 | 87.96.21.84 | TCP | 54 199 → 59724 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 30 | 2.827916 | 87.96.21.81 | 87.96.21.84 | TCP | 54 554 → 36474 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 31 | 2.828003 | 87.96.21.84 | 87.96.21.81 | TCP | 74 46058 → 587 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739226 TSecr=0 WS=128 |
| 32 | 2.828016 | 87.96.21.81 | 87.96.21.84 | TCP | 54 587 → 46058 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 33 | 2.828106 | 87.96.21.84 | 87.96.21.81 | TCP | 74 42870 → 22 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 34 | 2.828120 | 87.96.21.81 | 87.96.21.84 | TCP | 54 22 → 42870 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 35 | 2.828372 | 87.96.21.84 | 87.96.21.81 | TCP | 60 36884 → 445 [RST, ACK] Seq=1 Ack=1 Win=32128 Len=0 |
| 36 | 2.828466 | 87.96.21.84 | 87.96.21.81 | TCP | 74 49584 → 143 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 37 | 2.828466 | 87.96.21.84 | 87.96.21.81 | TCP | 74 40410 → 25 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 38 | 2.828481 | 87.96.21.81 | 87.96.21.84 | TCP | 54 143 → 49584 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 39 | 2.828505 | 87.96.21.81 | 87.96.21.84 | TCP | 54 25 → 40410 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 40 | 2.828594 | 87.96.21.84 | 87.96.21.81 | TCP | 74 45444 → 110 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 41 | 2.828608 | 87.96.21.81 | 87.96.21.84 | TCP | 54 110 → 45444 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 42 | 2.828695 | 87.96.21.84 | 87.96.21.81 | TCP | 74 53088 → 139 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 43 | 2.828918 | 87.96.21.81 | 87.96.21.84 | TCP | 66 139 → 53088 [SYN, ACK] Seq=0 Ack=1 Win=8192 Len=0 MSS=1460 WS=256 SACK_PERM |
| 44 | 2.829023 | 87.96.21.84 | 87.96.21.81 | TCP | 74 54728 → 135 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 45 | 2.829023 | 87.96.21.84 | 87.96.21.81 | TCP | 74 47628 → 1723 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 46 | 2.829023 | 87.96.21.84 | 87.96.21.81 | TCP | 74 52384 → 1025 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 47 | 2.829023 | 87.96.21.84 | 87.96.21.81 | TCP | 74 36350 → 1720 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739227 TSecr=0 WS=128 |
| 48 | 2.829023 | 87.96.21.84 | 87.96.21.81 | TCP | 60 53088 → 139 [ACK] Seq=1 Ack=1 Win=32128 Len=0 |
| 49 | 2.829093 | 87.96.21.81 | 87.96.21.84 | TCP | 66 135 → 54728 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0 MSS=1460 WS=256 SACK_PERM |
| 50 | 2.829126 | 87.96.21.81 | 87.96.21.84 | TCP | 54 1723 → 47628 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 51 | 2.829147 | 87.96.21.81 | 87.96.21.84 | TCP | 54 1025 → 52384 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 52 | 2.829194 | 87.96.21.81 | 87.96.21.84 | TCP | 54 1720 → 36350 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 53 | 2.829409 | 87.96.21.84 | 87.96.21.81 | TCP | 74 33350 → 80 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739228 TSecr=0 WS=128 |
| 54 | 2.829409 | 87.96.21.84 | 87.96.21.81 | TCP | 60 54728 → 135 [ACK] Seq=1 Ack=1 Win=32128 Len=0 |
| 55 | 2.829409 | 87.96.21.84 | 87.96.21.81 | TCP | 74 47596 → 993 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739228 TSecr=0 WS=128 |
| 56 | 2.829409 | 87.96.21.84 | 87.96.21.81 | TCP | 74 32952 → 995 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739228 TSecr=0 WS=128 |
| 57 | 2.829427 | 87.96.21.81 | 87.96.21.84 | TCP | 54 80 → 33350 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 58 | 2.829523 | 87.96.21.81 | 87.96.21.84 | TCP | 54 993 → 47596 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 59 | 2.829548 | 87.96.21.81 | 87.96.21.84 | TCP | 54 995 → 32952 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 60 | 2.829637 | 87.96.21.84 | 87.96.21.81 | TCP | 74 59710 → 8080 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739228 TSecr=0 WS=128 |
| 61 | 2.829651 | 87.96.21.81 | 87.96.21.84 | TCP | 54 8080 → 59710 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 62 | 2.829738 | 87.96.21.84 | 87.96.21.81 | TCP | 74 48262 → 8888 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739228 TSecr=0 WS=128 |
| 63 | 2.829752 | 87.96.21.81 | 87.96.21.84 | TCP | 54 8888 → 48262 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0 |
| 64 | 2.832891 | 87.96.21.84 | 87.96.21.81 | TCP | 74 57842 → 111 [SYN] Seq=0 Win=32120 Len=0 MSS=1460 SACK_PERM TSval=3155739231 TSecr=0 WS=128 |

00:30:06 – dictionary attack started on MSSQL server (EID 18456)

| | | |
|---|---|---|
| MSSQLSERVER | 18456 | (4) |
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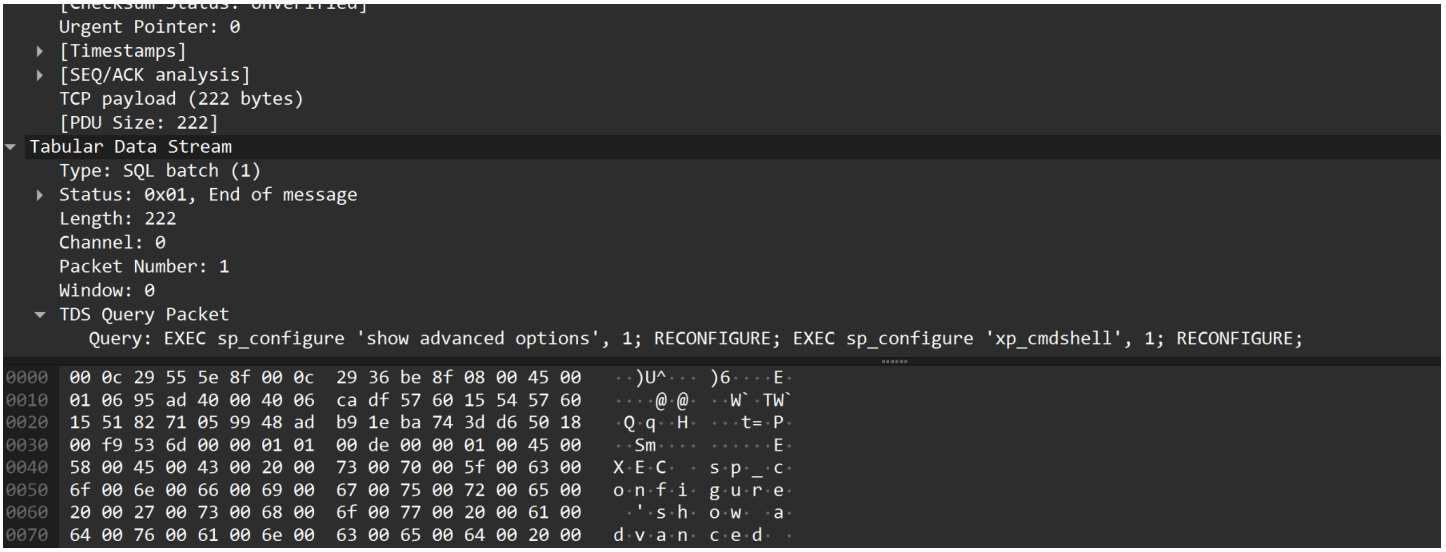
| MSSQLSERVER | 18456 | (4) |

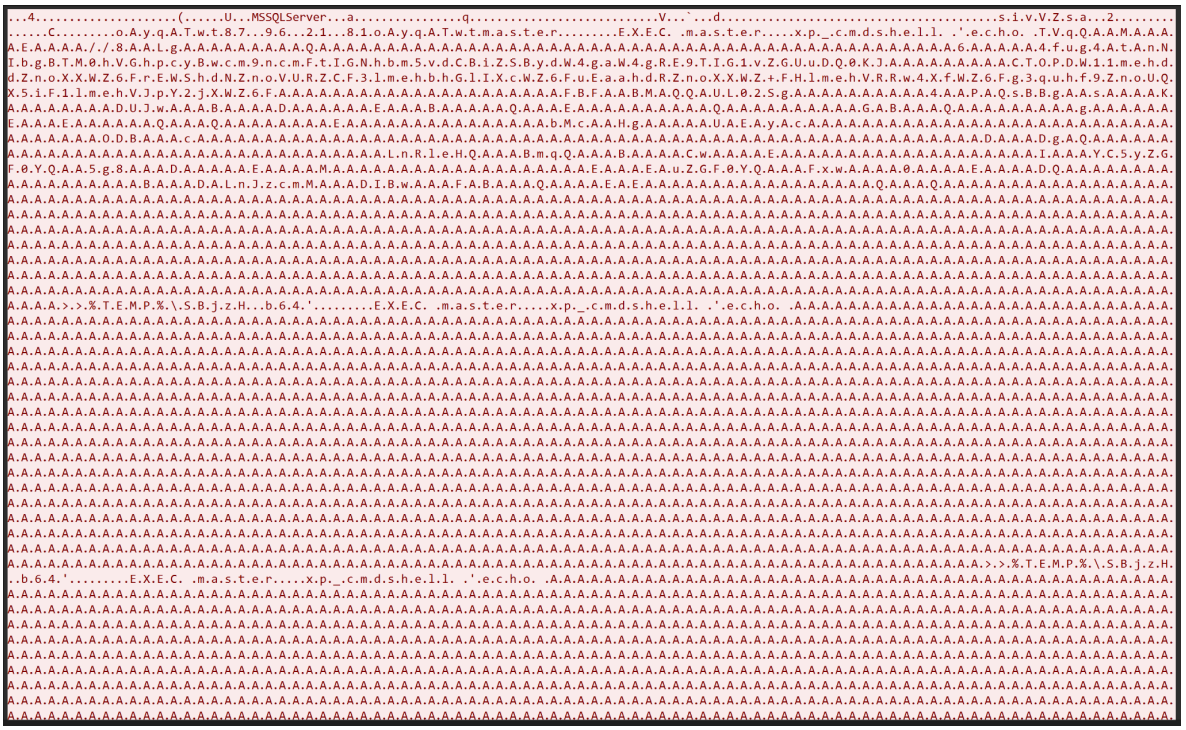
00:30:13 – successful login (EID 18454)

| | | |
|---|---|---|
| MSSQLSERVER | 18454 | (4) |

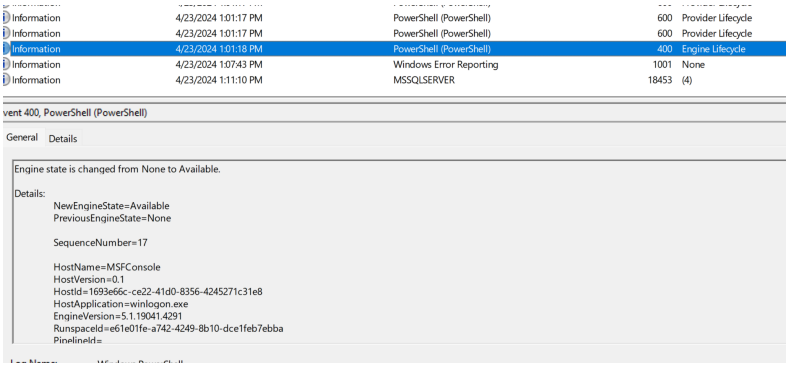
00:30:13 – xp_cmdshell enabled




00:30:39 – base64 encoded powershell script delivered



00:32:08 – script mounted winlogon.exe gaining administrative privileges




00:32:12 - 00:32:14 – malicious files uploaded to the server

| Protocol | Length | Info |
|---|---|---|
| HTTP | 127 | GET /checking.ps1 HTTP/1.1 |
| HTTP | 210 | GET / HTTP/1.1 |
| HTTP | 217 | GET /del.ps1 HTTP/1.1 |
| HTTP | 122 | GET /del.ps1 HTTP/1.1 |
| HTTP | 130 | GET /ichigo-lite.ps1 HTTP/1.1 |
| HTTP | 135 | GET /Invoke-PowerDump.ps1 HTTP/1.1 |
| HTTP | 133 | GET /Invoke-SMBExec.ps1 HTTP/1.1 |
| HTTP | 229 | GET /extracted_hosts.txt HTTP/1.1 |
| HTTP | 135 | GET /Invoke-PowerDump.ps1 HTTP/1.1 |
| HTTP | 124 | GET /javaw.exe HTTP/1.1 |
| HTTP | 122 | GET /del.ps1 HTTP/1.1 |
| HTTP | 130 | GET /ichigo-lite.ps1 HTTP/1.1 |
| HTTP | 135 | GET /Invoke-PowerDump.ps1 HTTP/1.1 |
| HTTP | 133 | GET /Invoke-SMBExec.ps1 HTTP/1.1 |
| HTTP | 229 | GET /extracted_hosts.txt HTTP/1.1 |
| HTTP | 135 | GET /Invoke-PowerDump.ps1 HTTP/1.1 |
| HTTP | 124 | GET /javaw.exe HTTP/1.1 |

00:34:09 – server isolated
00:49:00 – all malicious files identified and quarantined, file system, memory and registry check executed, sa user disabled, SQL server reconfigured

Logs and evidence
Network capture | Event log

Tools used: wireshark, event viewer, network miner, virustotal

IoCs:
Ip address 87.96.21.84
Hashes:
BB4D98715655D6A8C812C18C92EAAB5CC57EEC74ECA581F2760EE4880BAF74D2 checking.ps1
9136924205CF55FA3A3EDBD0191CCA190E559B1619C07743E6DD7A3CD022D33F del.ps1
38FE562136ADE372FC4CEDDE67826AEEA8404E93A54A4A4736DDB4C8C8D4C96D ichigo-lite.ps1
3B463C94B52414CFAAD61ECDAC64CA84EAEA1AB4BE69F75834AAA7701AB5E7D0 Invoke-PowerDump.ps1
2211A127A4467FB15A2112DD48EBE26DF2660F97E6B8BE95DB57BBAFAB806412 Invoke-SMBExec.ps1
3E035F2D7D30869CE53171EF5A0F761BFB9C14D94D9FE6DA385E20B8D96DC2FB javaw.exe

## Containment and eradication:

Containment:

- IP 87.96.21.84 blocked
- User sa disabled
- Affected endpoint isolated

Eradication:

- Malware removed
- Memory and registry integrity checked
- SQL server privileges updated, xp_cmdshell disabled

## Recovery:

SQL server patched
Audit for rogue accounts conducted

## Lessons learned:

Root cause – weak high privileged SQL account policy led to successful bruteforce, not permanently disabled OS command execution and lack of detection rules for suspicious network and endpoint activity allowed malware delivery. Unlimited privileges for SQL server. Incident had potential for significant impact due to strong persistence and evasion presence in ransomware accompanying powershell scripts.
I recommend implementing lockout policy, MFA for administrative accounts, software privilege audit and updating detection rules.
Analysis of logs, network traffic and captured malware showed a well staged attack, armed with a tailored dictionary for successful brute-force attack and an organisation's list of host IP's, which can mean a prior data breach.

## Analysis of accessed evidence allows us to anticipate, what were adversary's vectors of attack according to MITRE ATT&CK

Valid Accounts - T1078
Brute Force - T1110
Command and Scripting Interpreter: Visual Basic - T1059.005
Scheduled Task - T1053.005
Windows Command Shell - T1059.003
PowerShell - T1059.001
Disable or Modify Tools - T1562.001
Process Injection - T1055
LSASS Memory - T1003.001
System Owner/User Discovery - T1033
Network Share Discovery - T1135
Data Encrypted for Impact - T1486
SMB/Windows Admin Shares - T1021.002
Web Protocols - T1071.001
Service Execution - T1569.002
Modify Registry - T1112
Obfuscated Files or Information - T1027
Windows Service - T1543.003
Masquerade Task or Service - T1036.004