PrintNightmare

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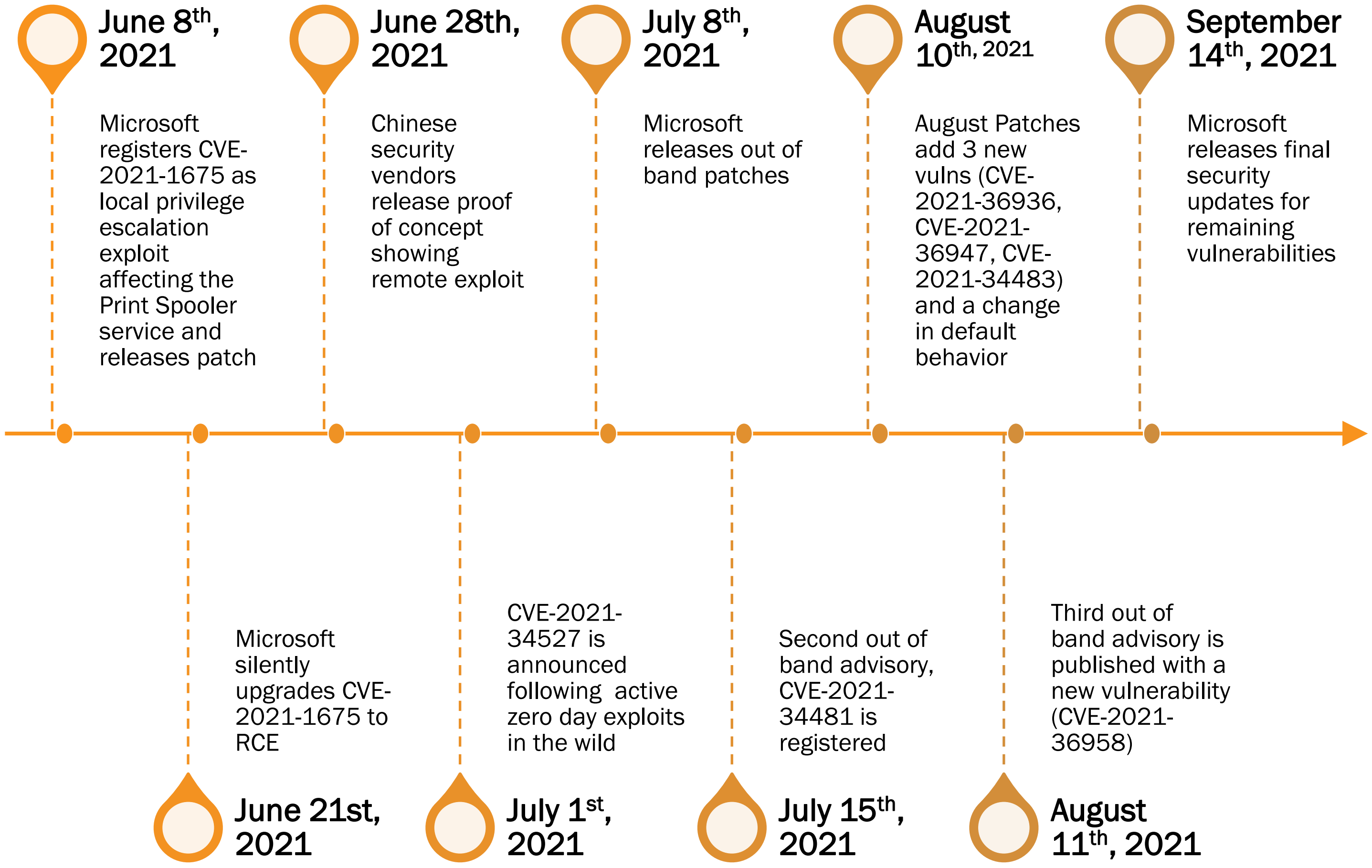
History

Timeline



June 8th, 2021

Microsoft registers CVE-2021-1675 as local privilege escalation exploit affecting the Print Spooler service and releases patch

June 21st, 2021

Microsoft silently upgrades CVE-2021-1675 to RCE

June 28th, 2021

Chinese security vendors release proof of concept showing remote exploit

July 1st, 2021

CVE-2021-34527 is announced following active zero day exploits in the wild

July 8th, 2021

Microsoft releases out of band patches

July 15th, 2021

Second out of band advisory, CVE-2021-34481 is registered

August 10th, 2021

August Patches add 3 new vulns (CVE-2021-36936, CVE-2021-36947, CVE-2021-34483) and a change in default behavior

August 11th, 2021

Third out of band advisory is published with a new vulnerability (CVE-2021-36958)

September 14th, 2021

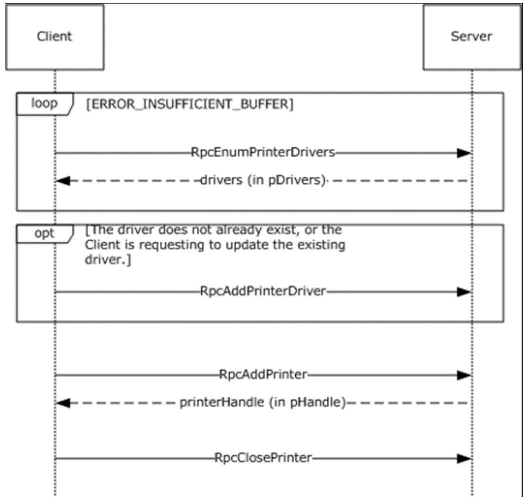
Microsoft releases final security updates for remaining vulnerabilities

From: [1]-[9]

Exploit

Microsoft Point and Print

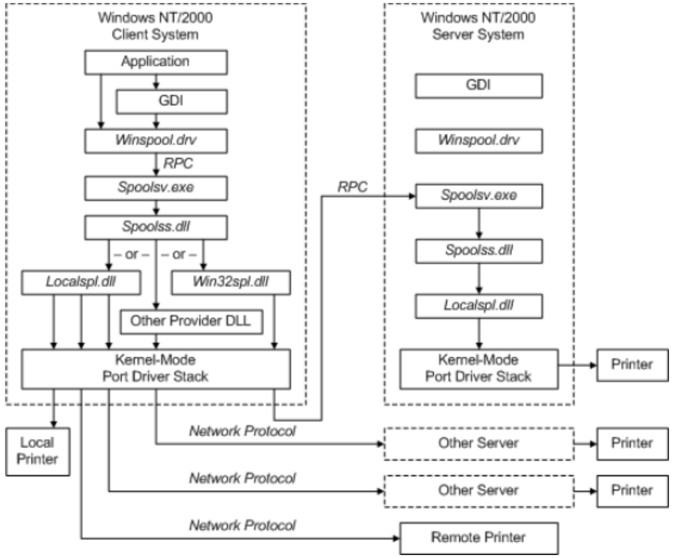
- Allows a user on a Windows client to connect to a printer remotely without installation media
- When a new printer is added to a client two actions occur:
  1. Driver and Queue associated files are downloaded from the server to the client
  2. Details regarding printer configuration parameters are also downloaded

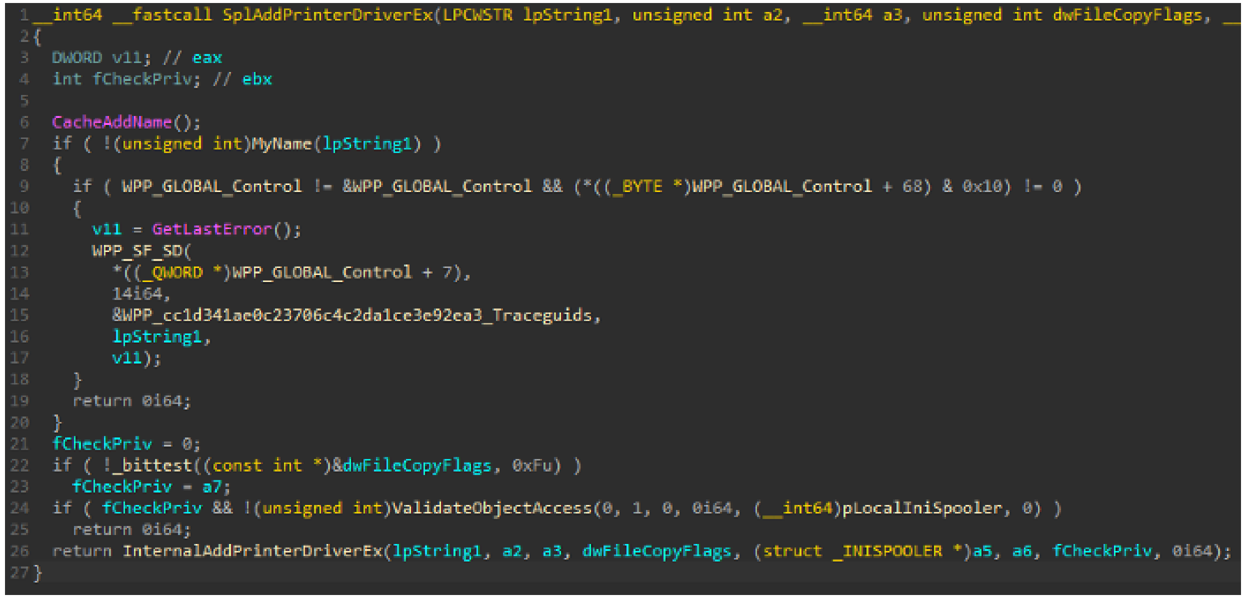

Client
Server
loop
[ERROR_INSUFFICIENT_BUFFER]
RpcEnumPrinterDrivers
drivers (in pDrivers)
opt
[The driver does not already exist, or the Client is requesting to update the existing driver.]
RpcAddPrinterDriver
RpcAddPrinter
printerHandle (in pHandle)
RpcClosePrinter

From: [10]-[11]

Privilege Escalation

- Logic flaw within Localspl.dll which is called by the Printer Spooler Service when loading a new print driver





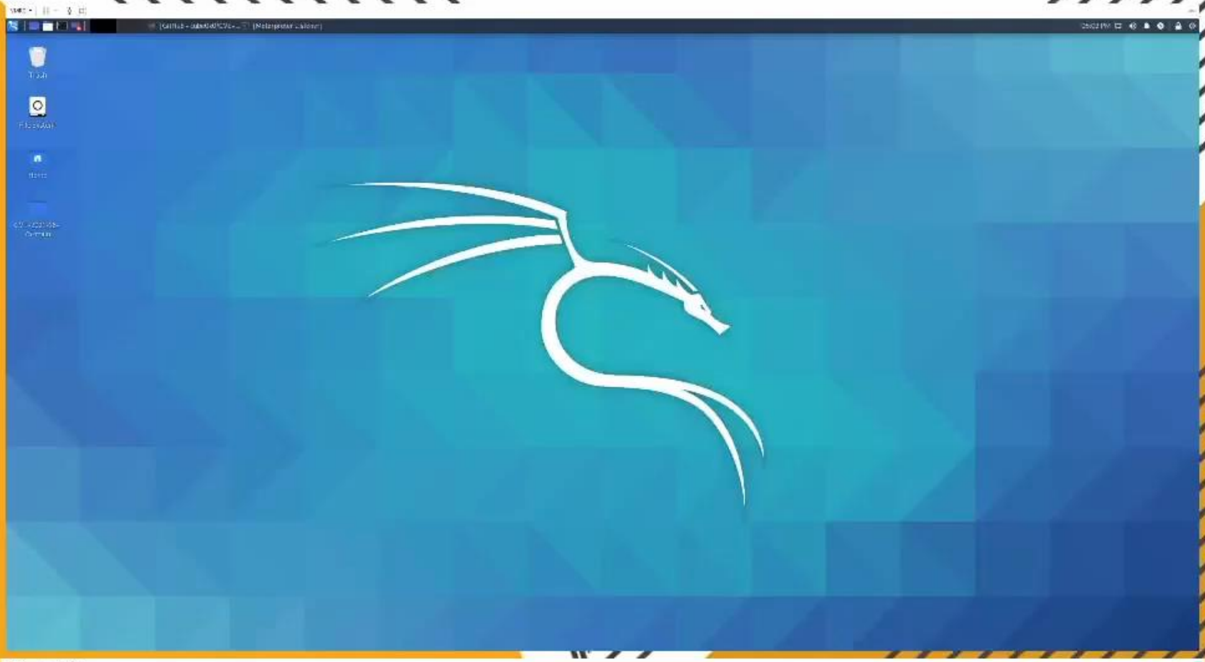
```
__int64 __fastcall SplAddPrinterDriverEx(LPCWSTR lpString1, unsigned int a2, __int64 a3, unsigned int dwFileCopyFlags, _
{
  DWORD v11; // eax
  int fCheckPriv; // ebx

  CacheAddName();
  if ( !(unsigned int)MyName(lpString1) )
  {
    if ( WPP_GLOBAL_Control != &WPP_GLOBAL_Control && (*((_BYTE *)WPP_GLOBAL_Control + 68) & 0x10) != 0 )
    {
      v11 = GetLastError();
      WPP_SF_SD(
        *((_QWORD *)WPP_GLOBAL_Control + 7),
        14i64,
        &WPP_cc1d341ae0c23706c4c2da1ce3e92ea3_Traceguids,
        lpString1,
        v11);
    }
    return 0i64;
  }
  fCheckPriv = 0;
  if ( !_bittest((const int *)&dwFileCopyFlags, 0xFu) )
    fCheckPriv = a7;
  if ( fCheckPriv && !(unsigned int)ValidateObjectAccess(0, 1, 0, 0i64, (__int64)pLocalIniSpooler, 0) )
    return 0i64;
  return InternalAddPrinterDriverEx(lpString1, a2, a3, dwFileCopyFlags, (struct _INISPOOLER *)a5, a6, fCheckPriv, 0i64);
}
```

From: [13]

Demo

Attacking Machine:
Kali Linux
Fake Printer
192.168.50.205



Target Machine:
Windows Server 2019
Domain Controller
192.168.50.128

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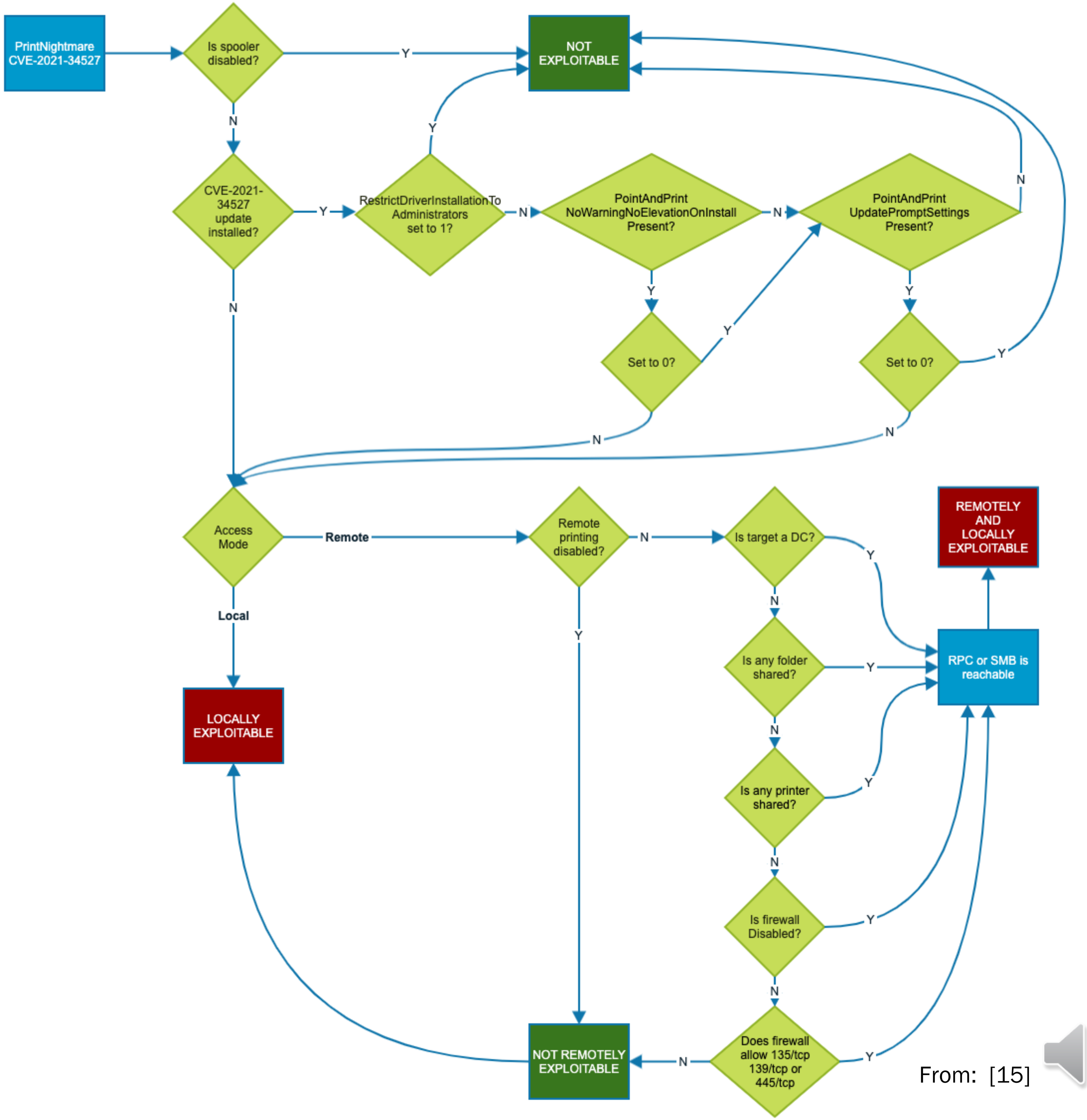
Mitigation

Vulnerability Workflow


PrintNightmare CVE-2021-34527
Is spooler disabled?
Y
N
NOT EXPLOITABLE
CVE-2021-34527 update installed?
Y
N
RestrictDriverInstallationTo Administrators set to 1?
Y
N
PointAndPrint NoWarningNoElevationOnInstall Present?
N
Y
PointAndPrint UpdatePromptSettings Present?
N
Y
Set to 0?
Y
N
Set to 0?
Y
N
Access Mode
Remote
Local
LOCALLY EXPLOITABLE
Remote printing disabled?
N
Y
Is target a DC?
Y
N
Is any folder shared?
Y
N
Is any printer shared?
Y
N
Is firewall Disabled?
Y
N
Does firewall allow 135/tcp 139/tcp or 445/tcp
Y
N
NOT REMOTELY EXPLOITABLE
RPC or SMB is reachable
REMOTELY AND LOCALLY EXPLOITABLE

From: [15]

Conclusion

- Limit the use of unnecessary services on critical infrastructure
- Block RPC and SMB with a host firewall
- Ensure UAC prompt is required, or restrict installation completely to administrators

References

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