« BYPASSING APPLICATION WHITELISTING BY USING DNX.EXE

LATERAL MOVEMENT USING THE MMC20.APPLICATION COM OBJECT »

BYPASSING APPLICATION WHITELISTING BY USING RCSI.EXE

November 21, 2016 by enigma0x3

Over the past few weeks, I have had the pleasure to work side-by-side with Matt Graeber (@mattifestation) and Casey Smith (@subtee) researching Device Guard user mode code integrity (UMCI) bypasses. If you aren't familiar with Device Guard, you can read more about it here: https://technet.microsoft.com/en-us/itpro/windows/keep-secure/device-guard-deployment-guide. In short, Device Guard UMCI prevents unsigned binaries from executing, restricts the Windows Scripting Host, and it places PowerShell in Constrained Language mode.

After discovering an Application Whitelist bypass using dnx.exe, I decided to take a look at what other potential tools existed that allowed for execution of arbitrary C#, which led me to this blog post by Microsoft: https://blogs.msdn.microsoft.com/visualstudio/2011/10/19/introducing-the-microsoft-roslyn-ctp/

I then started looking for a Microsoft compiled version, which led me to the "Microsoft Roslyn CTP" download page. Unfortunately, this requires Visual Studio 2012 and the VS2012 SDK installed, but those are freely available.

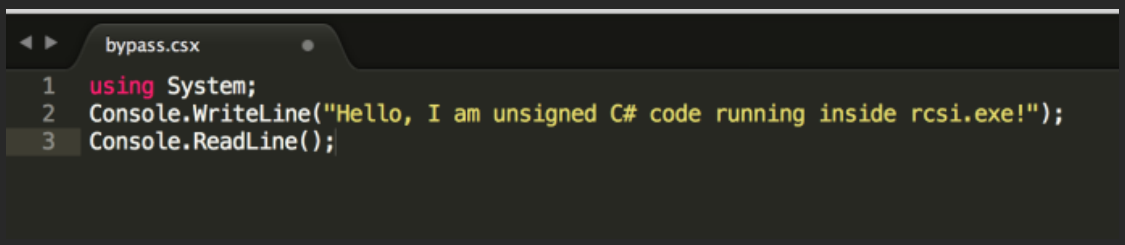
It is stated in that blog that the Microsoft Roslyn CTP contains a new binary called "rcsi.exe". This particular binary is one of the first attempts at integrating Roslyn on the backend (it is now nicely integrated into Visual Studio 15 Update 1, which interfaces with csi.exe). More information on Roslyn can be found here: https://github.com/dotnet/roslyn

Recently, my co-worker Casey Smith (@subtee) blogged about bypassing application whitelisting using csi.exe. The difference between these bypasses is csi.exe is interactive and rcsi.exe is not. Luckily for us, you can utilize the introduction of C# Scripting with rcsi.exe to execute unsigned code.

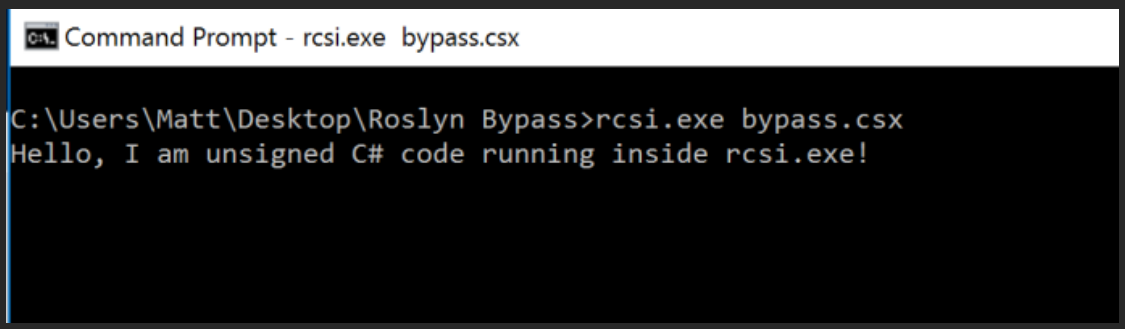
In a Device Guard scenario, rcsi.exe is allowed to execute as it is a Microsoft signed binary that can be installed along side of Visual Studio 2012. In order to execute rcsi.exe on a Device Guard system (assuming it isn't already installed), you will need to gather rcsi.exe and its required dependencies (there are only 2 of them), and transport everything to your target (this is an exercise left up to the reader).

With everything required now on our target host, we can now start down the path of bypassing Device Guard's UMCI. Since rcsi.exe allows for executing C# scripts, we can use it to execute arbitrary, unsigned C# code by passing the binary our own csx script.

For example, we can create a csx file and add whatever C# code we want. Keep in mind that it uses Roslyn, so you don't need to add classes. To demonstrate the execution of unsigned code, we can keep things simple:



Now that we have our C# script created, we can execute our C# using rcsi.exe by simply passing our csx to it. This is done on a PC running Device Guard:



As you can see above, our unsigned C# successfully executed and is running inside of rcsi.exe.

Fortunately, these "misplaced trust" bypasses can be mitigated via code integrity policy FilePublisher file rules. You can read up on creating these mitigation rules here:

http://www.exploit-monday.com/2016/09/using-device-guard-to-mitigate-against.html

You can find a comprehensive bypass mitigation policy here:

https://github.com/mattifestation/DeviceGuardBypassMitigationRules

If you want to know more about "Misplaced Trust" bypasses, you can find @subtee's awesome Bluehat presentation slides here: https://github.com/subTee/BlueHat2016

Cheers!
Matt Nelson

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