StandaloneRunner.md

github.com/nasbench/Misc-Research/blob/main/LOLBINs/StandaloneRunner.md

 nasbench
Update StandaloneRunner.md

Arbitrary Command Execution Via Windows Kit's StandaloneRunner

`StandaloneRunner.exe` is a utility included with the Windows Driver Kit (WDK) used for testing and debugging drivers on Windows systems. It allows developers to execute and debug driver packages in a standalone environment without needing to install them on a target system.

Paths:

- `C:\Program Files (x86)\Windows Kits\10\Testing\StandaloneTesting\Internal\arm\standalonerunner.exe`
- `C:\Program Files (x86)\Windows Kits\10\Testing\StandaloneTesting\Internal\arm64\standalonerunner.exe`
- `C:\Program Files (x86)\Windows Kits\10\Testing\StandaloneTesting\Internal\x64\standalonerunner.exe`
- `C:\Program Files (x86)\Windows Kits\10\Testing\StandaloneTesting\Internal\x86\standalonerunner.exe`

> **Note**
>
> If you wanna test this directly without reading the details you can jump directly here

Investigating The Source

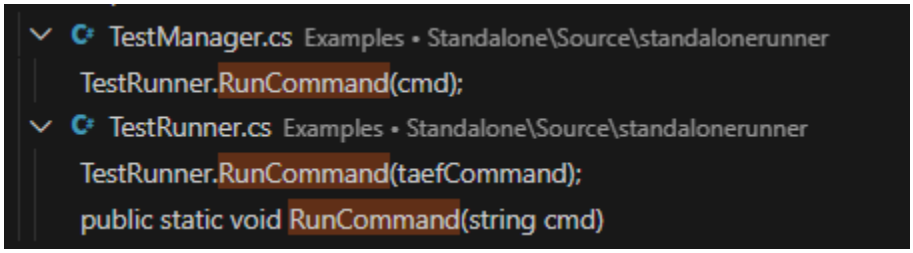
As one does while hunting for new LOLBINs, I was investigating the source code of windows application written in .NET and I stumbled upon the `StandaloneRunner.exe` utility. One function in particular caught my eye which was the `RunCommand` function.

```
public static void RunCommand(string cmd)
{
    cmd = TestRunnerUtil.ParseParams(cmd, TestRunner.GlobalParams);
    ProcessStartInfo startInfo = new ProcessStartInfo();
    startInfo.WorkingDirectory = TestRunner.WorkingDir.FullName;
    startInfo.UseShellExecute = false;
    startInfo.RedirectStandardOutput = true;
    startInfo.RedirectStandardError = true;
    startInfo.FileName = "CMD.exe";
    startInfo.Arguments = "cmd /c " + cmd;
    Console.WriteLine(string.Format((IFormatProvider) CultureInfo.CurrentCulture, "Running {0}", new
object[1]
    {
        (object) cmd
    }));
    Process p = Process.Start(startInfo);
    if (cmd.Contains("te.exe"))
        TestRunner.RunTAEF(p);
    p.WaitForExit();
}
```

From a first glance, it seems that we have a function that accepts a command as a parameter and execute it via `cmd.exe`. The next set of steps was to read through the code and try to find a way to reach the call to this function.

Tracing Execution

Checking the callers of the `RunCommand` function, we find 2 functions referencing it. Namely `HandleReboot` part of `TestManager.cs` and `RunTest` part of `TestRunner.cs` and



While `RunTest` is interesting, I will not be covering it in this writeup. Instead i'll be focusing on `HandleReboot`.

```
private static void HandleReboot()
{
    string[] strArray = File.ReadAllLines("reboot.rsf");
    string str = strArray[0];
    TestManager.interactive = bool.Parse(strArray[1]);
    TestRunner.Init(str, "..\\..\\Results");
    bool flag1 = false;
    int num;
    for (num = 0; num < 60 || flag1; ++num)
    {
    bool flag2 = false;
    foreach (FileSystemInfo file in TestRunner.WorkingDir.GetFiles())
    {
        if (file.Name.Equals("rsf.rsf"))
        flag2 = true;
    }
    if (!flag2)
    {
        Process[] processesByName = Process.GetProcessesByName("Te");
        if (processesByName.Length >= 1)
        {
        Console.WriteLine("Waiting for TAEF.");
        processesByName[0].WaitForExit();
        flag1 = true;
        }
        else
        {
        TestRunner.CopyResults();
        Console.WriteLine("TAEF finished running.");
        TestManager.PromptForExit();
        TestManager.CleanupAndExit(0);
        }
    }
    else
        Thread.Sleep(1000);
    }
    if (num != 60)
    return;
    Console.WriteLine("Warning: reboot state file was found, but TAEF did not run.  Manually
restarting.");
    string cmd = File.ReadAllText("command.txt");
    Directory.SetCurrentDirectory(Path.Combine(str, "working"));
    TestRunner.RunCommand(cmd);
    TestRunner.CopyResults();
    Console.WriteLine("TAEF finished running.");
    TestManager.PromptForExit();
    TestManager.CleanupAndExit(0);
}
```

Keeping with the same idea and tracing who's calling `HandleReboot` we find a call from `Main`.

```
public static void Main(string[] args)
{
    Directory.SetCurrentDirectory(Path.GetDirectoryName(Assembly.GetExecutingAssembly().Location));
    if (File.Exists("reboot.rsf"))
    TestManager.HandleReboot();
    ....
    ....
    ....
}
```

This means we only need to trigger a call to `HandleReboot` and it'll call `RunCommand` for us. Let's do that.

Achieving Arbitrary Execution

First from main we see that there's a check for a file called `reboot.rsf` in the current directory of execution. If it exists a call is made to `HandleReboot`.

```
if (File.Exists("reboot.rsf"))
    TestManager.HandleReboot();
```

That's the first step. We need to create a file with that name.

Stepping inside the `HandleReboot` function we see that the contents of the `reboot.rsf` are being read. Specifically parsing the first line as a string to passing it to a function called `Init`. Whilst the 2nd line is parsed as a boolean value in order to potentially the value of a variable called `Interactive`.

```
private static void HandleReboot()
{
    string[] strArray = File.ReadAllLines("reboot.rsf");
    string str = strArray[0];
    TestManager.interactive = bool.Parse(strArray[1]);
    TestRunner.Init(str, "..\\..\\Results");
    ....
    ....
    ....
}
```

In our use case the `Interactive` value isn't going to be used. The only thing we need to make sure, is to provide a valid value inside of the file. Both `True` and `False` will pass the call.

We're more interested in the `Init` function as their might be other condition we need to pass. So we'll look at it next.

```
public static void Init(string testDir, string resultsDir)
{
    TestRunner.WorkingDir = TestRunner.MakeWorkingDir(testDir);
    TestRunner.OutputDir = new DirectoryInfo(Path.Combine(resultsDir,
DateTime.Now.ToString("yyyyMMddHHmmss", (IFormatProvider) CultureInfo.CurrentCulture) + "_" +
Path.GetFileName(testDir)));
}
```

This functions has 2 purposes basically. Setting up a new working directory via the `MakeWorkingDir` function and creating an output directory where the results of the execution would "theoretically" be saved.

Let's look at `MakeWorkingDir` first.

```
public static DirectoryInfo MakeWorkingDir(string testDir)
{
    string path = Path.Combine(testDir, "working");
    if (Directory.Exists(path))
    return new DirectoryInfo(path);
    DirectoryInfo directory = Directory.CreateDirectory(Path.Combine(testDir, "working"));
    foreach (string file in Directory.GetFiles(testDir))
    File.Copy(file, Path.Combine(directory.FullName, Path.GetFileName(file)), true);
    foreach (string file in Directory.GetFiles(Path.Combine("..\\..\\Setup",
TestRunner.architecture)))
    File.Copy(file, Path.Combine(directory.FullName, Path.GetFileName(file)), true);
    return directory;
}
```

The function makes combined path with our input directory read from the `reboot.rsf` first line and a directory called `working`. If this new directory hierarchy exists it returns, else it creates it and copy some files.

For our case we're gonna take the easy way out. In order to bypass this function we're gonna make sure a directory structure with the hierarchy `<custom_name>\working\` exists and reachable from the execution directory.

Continuing from the `Init` function. As the `resultsDir` variable value is hardcoded in the code with a relative path `..\\..\\Results`. We just need to make sure that the location 2 directory above is writable.

Now that we took care of the `Init` function "conditions" let's move on to the next step which is a loop.

```
bool flag1 = false;
int num;
for (num = 0; num < 60 || flag1; ++num)
{
bool flag2 = false;
foreach (FileSystemInfo file in TestRunner.WorkingDir.GetFiles())
{
    if (file.Name.Equals("rsf.rsf"))
    flag2 = true;
}
if (!flag2)
{
    Process[] processesByName = Process.GetProcessesByName("Te");
    if (processesByName.Length >= 1)
    {
    Console.WriteLine("Waiting for TAEF.");
    processesByName[0].WaitForExit();
    flag1 = true;
    }
    else
    {
    TestRunner.CopyResults();
    Console.WriteLine("TAEF finished running.");
    TestManager.PromptForExit();
    TestManager.CleanupAndExit(0);
    }
}
else
    Thread.Sleep(1000);
}
```

This loop is executed 60 times (as long as `flag1` is also `False` but that doesn't matter to use and you'll see why in a bit) and for every execution it'll loop on every file inside the "WorkingDir" to look for a file called `rsf.rsf` to set the value of `flag2` to `True` (this will be important in a moment).

After that it checks if `flag2` is still `False` it'll execute some code, but if it's true, it'll sleep for 1 second.

> **Note**
>
> The content of `WorkingDir` if you remember was set in the `Init` function and is `<custom_name>\working\`

To bypass this loop we just need to create a file named `rsf.rsf` inside of our `WorkingDir` (i.e `<custom_name>\working\`) and wait 1 minute (60 sleeps)

Next is the final step before reaching the `RunCommand` function.

```
Console.WriteLine("Warning: reboot state file was found, but TAEF did not run.  Manually
restarting.");
string cmd = File.ReadAllText("command.txt");
Directory.SetCurrentDirectory(Path.Combine(str, "working"));
TestRunner.RunCommand(cmd);
TestRunner.CopyResults();
Console.WriteLine("TAEF finished running.");
TestManager.PromptForExit();
TestManager.CleanupAndExit(0);
```

The command to be executed is read from a file called `command.txt` and that's it. Now we have arbitrary command execution. Let's put all of this together.

Putting Everything Together

To recap. In order to achieve command execution we need the following.

- Copy `standalonerunner.exe` and `standalonexml.dll` to a directory of your choosing.
- Create a file named `reboot.rsf` inside the execution directory and fill it with the following content.

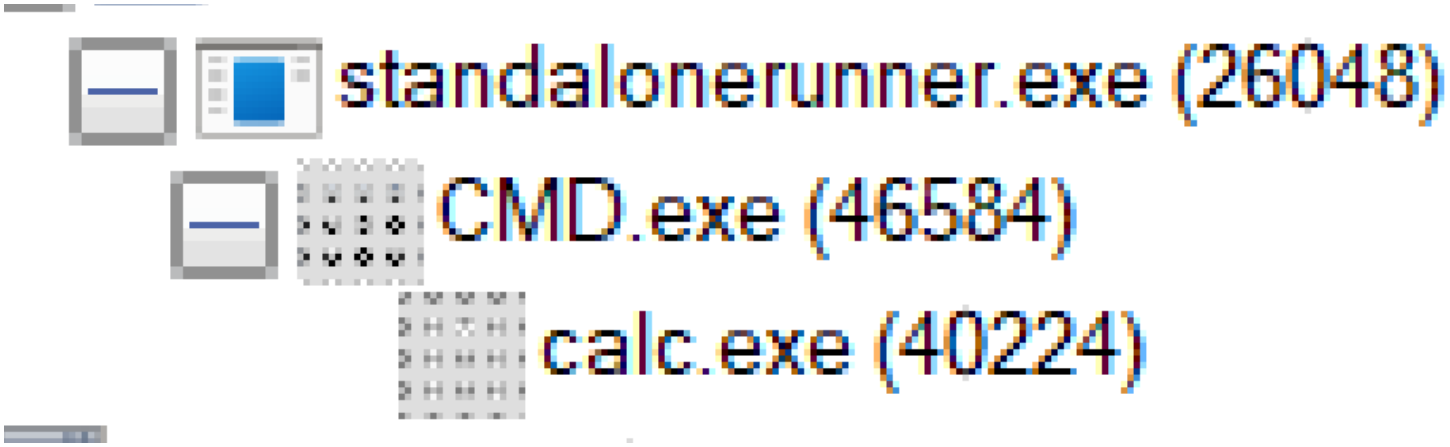
```
myTestDir
True
```

- Mimick the expected results of `MakeWorkingDir` by creating the following hierarchy from the execution directory `myTestDir\working`.
- Create a file named `rsf.rsf` and copy inside `myTestDir\working`.
- Create a file named `command.txt` in the execution directory and fill it with the following content.

```
calc
```

That's it!

Once you execute `standalonerunner.exe` and wait 60 seconds you should see a calculator pop up.



> **Note**
>
> A small ceveat if you want to test this. The COM `{0D972387-817B-46E7-913F-E9993FF401EB}` class needs to be registered on the system in order for this binary to work. You can do so by calling regsvr32 as follows. `regsvr32 "C:\Program Files (x86)\Windows Kits\10\Testing\Runtimes\WDTF\RunTime\WDTF.DLL"` This will not be an issue in machines using the utility already.