在驱动开发中我们有时需要得到驱动自身是否被加载成功的状态，这个功能看似没啥用实际上在某些特殊场景中还是需要的，如下代码实现了判断当前驱动是否加载成功，如果加载成功, 则输出该驱动的详细路径信息。

该功能实现的核心函数是`NtQuerySystemInformation`这是一个微软未公开的函数，也没有文档化，不过我们仍然可以通过动态指针的方式调用到它，该函数可以查询到很多系统信息状态，首先需要定义一个指针。

```
typedef NTSTATUS(*NTQUERYSYSTEMINFORMATION)(
IN ULONG SystemInformationClass,
OUT PVOID   SystemInformation,
IN ULONG_PTR    SystemInformationLength,
OUT PULONG_PTR  ReturnLength OPTIONAL);
```

其次还需要一个`SYSTEM_MODULE_INFORMATION`该结构内可以得到模块入口信息模块名称等，调用`NtQuerySystemInformation`数据会被格式化为`SYSTEM_MODULE_INFORMATION`方便调用。

```
typedef struct _SYSTEM_MODULE_INFORMATION {
    HANDLE Section;
    PVOID MappedBase;
    PVOID Base;
    ULONG Size;
    ULONG Flags;
    USHORT LoadOrderIndex;
    USHORT InitOrderIndex;
    USHORT LoadCount;
    USHORT PathLength;
    CHAR ImageName[256];
} SYSTEM_MODULE_INFORMATION, *PSYSTEM_MODULE_INFORMATION;
```

最后是`SYSTEM_INFORMATION_CLASS`该结构同样是一个未文档化的结构体，本此代码中需要用到的枚举类型是`SystemModuleInformation`其他类型也放这里后期做参考用。

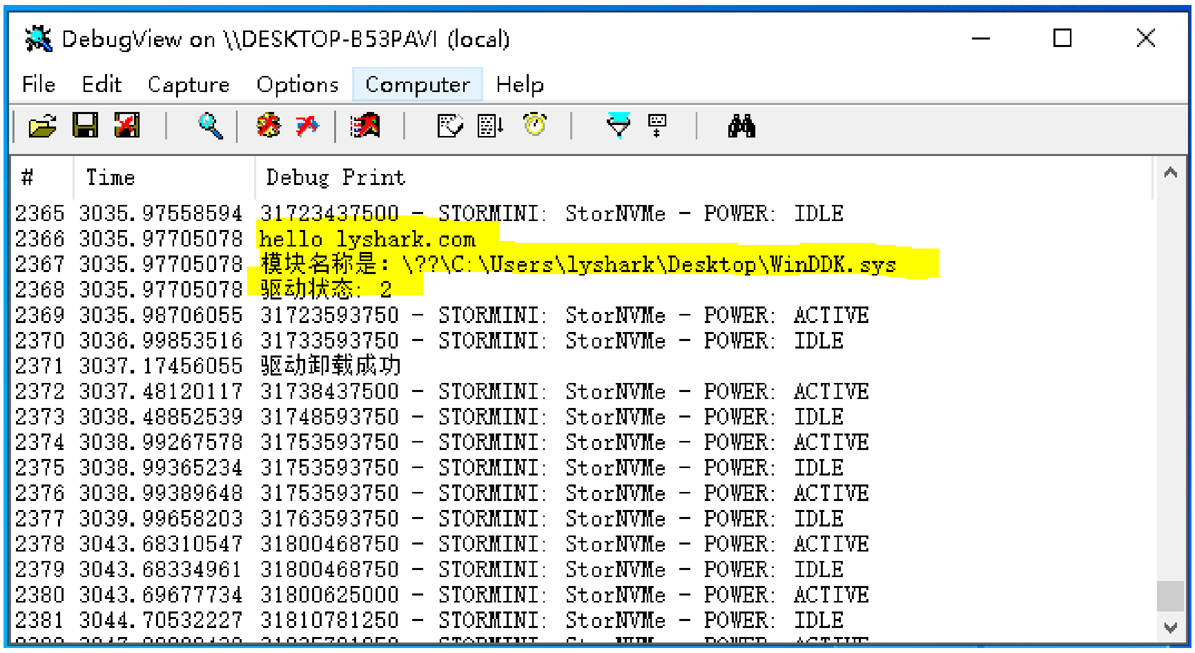
```
typedef enum _SYSTEM_INFORMATION_CLASS
{
    SystemBasicInformation = 0x0,
    SystemProcessorInformation = 0x1,
    SystemPerformanceInformation = 0x2,
    SystemTimeOfDayInformation = 0x3,
    SystemPathInformation = 0x4,
    SystemProcessInformation = 0x5,
    SystemCallCountInformation = 0x6,
    SystemDeviceInformation = 0x7,
    SystemProcessorPerformanceInformation = 0x8,
    SystemFlagsInformation = 0x9,
    SystemCallTimeInformation = 0xa,
    SystemModuleInformation = 0xb,
    SystemLocksInformation = 0xc,
    SystemStackTraceInformation = 0xd,
    SystemPagedPoolInformation = 0xe,
    SystemNonPagedPoolInformation = 0xf,
    SystemHandleInformation = 0x10,
    SystemObjectInformation = 0x11,
    SystemPageFileInformation = 0x12,
    SystemVdmInstemulInformation = 0x13,
    SystemVdmBopInformation = 0x14,
    SystemFileCacheInformation = 0x15,
    SystemPoolTagInformation = 0x16,
    SystemInterruptInformation = 0x17,
    SystemDpcBehaviorInformation = 0x18,
    SystemFullMemoryInformation = 0x19,
    SystemLoadGdiDriverInformation = 0x1a,
    SystemUnloadGdiDriverInformation = 0x1b,
    SystemTimeAdjustmentInformation = 0x1c,
    SystemSummaryMemoryInformation = 0x1d,
    SystemMirrorMemoryInformation = 0x1e,
    SystemPerformanceTraceInformation = 0x1f,
    SystemObsolete0 = 0x20,
    SystemExceptionInformation = 0x21,
    SystemCrashDumpStateInformation = 0x22,
    SystemKernelDebuggerInformation = 0x23,
    SystemContextSwitchInformation = 0x24,
    SystemRegistryQuotaInformation = 0x25,
    SystemExtendServiceTableInformation = 0x26,
    SystemPrioritySeperation = 0x27,
    SystemVerifierAddDriverInformation = 0x28,
    SystemVerifierRemoveDriverInformation = 0x29,
    SystemProcessorIdleInformation = 0x2a,
    SystemLegacyDriverInformation = 0x2b,
    SystemCurrentTimeZoneInformation = 0x2c,
    SystemLookasideInformation = 0x2d,
    SystemTimeSlipNotification = 0x2e,
    SystemSessionCreate = 0x2f,
    SystemSessionDetach = 0x30,
    SystemSessionInformation = 0x31,
    SystemRangeStartInformation = 0x32,
    SystemVerifierInformation = 0x33,
    SystemVerifierThunkExtend = 0x34,
    SystemSessionProcessInformation = 0x35,
    SystemLoadGdiDriverInSystemSpace = 0x36,
    SystemNumaProcessorMap = 0x37,
    SystemPrefetcherInformation = 0x38,
    SystemExtendedProcessInformation = 0x39,
    SystemRecommendedSharedDataAlignment = 0x3a,
    SystemComPlusPackage = 0x3b,
    SystemNumaAvailableMemory = 0x3c,
    SystemProcessorPowerInformation = 0x3d,
    SystemEmulationBasicInformation = 0x3e,
    SystemEmulationProcessorInformation = 0x3f,
    SystemExtendedHandleInformation = 0x40,
    SystemLostDelayedWriteInformation = 0x41,
    SystemBigPoolInformation = 0x42,
    SystemSessionPoolTagInformation = 0x43,
    SystemSessionMappedViewInformation = 0x44,
    SystemHotpatchInformation = 0x45,
    SystemObjectSecurityMode = 0x46,
    SystemWatchdogTimerHandler = 0x47,
    SystemWatchdogTimerInformation = 0x48,
    SystemLogicalProcessorInformation = 0x49,
    SystemWow64SharedInformationObsolete = 0x4a,
    SystemRegisterFirmwareTableInformationHandler = 0x4b,
    SystemFirmwareTableInformation = 0x4c,
    SystemModuleInformationEx = 0x4d,
    SystemVerifierTriageInformation = 0x4e,
    SystemSuperfetchInformation = 0x4f,
    SystemMemoryListInformation = 0x50,
    SystemFileCacheInformationEx = 0x51,
    SystemThreadPriorityClientIdInformation = 0x52,
    SystemProcessorIdleCycleTimeInformation = 0x53,
    SystemVerifierCancellationInformation = 0x54,
    SystemProcessorPowerInformationEx = 0x55,
    SystemRefTraceInformation = 0x56,
    SystemSpecialPoolInformation = 0x57,
    SystemProcessIdInformation = 0x58,
    SystemErrorPortInformation = 0x59,
    SystemBootEnvironmentInformation = 0x5a,
    SystemHypervisorInformation = 0x5b,
    SystemVerifierInformationEx = 0x5c,
    SystemTimeZoneInformation = 0x5d,
    SystemImageFileExecutionOptionsInformation = 0x5e,
    SystemCoverageInformation = 0x5f,
    SystemPrefetchPatchInformation = 0x60,
    SystemVerifierFaultsInformation = 0x61,
    SystemSystemPartitionInformation = 0x62,
    SystemSystemDiskInformation = 0x63,
    SystemProcessorPerformanceDistribution = 0x64,
    SystemNumaProximityNodeInformation = 0x65,
    SystemDynamicTimeZoneInformation = 0x66,
    SystemCodeIntegrityInformation = 0x67,
    SystemProcessorMicrocodeUpdateInformation = 0x68,
    SystemProcessorBrandString = 0x69,
    SystemVirtualAddressInformation = 0x6a,
    SystemLogicalProcessorAndGroupInformation = 0x6b,
    SystemProcessorCycleTimeInformation = 0x6c,
    SystemStoreInformation = 0x6d,
    SystemRegistryAppendString = 0x6e,
    SystemAitSamplingValue = 0x6f,
    SystemVhdBootInformation = 0x70,
    SystemCpuQuotaInformation = 0x71,
    SystemNativeBasicInformation = 0x72,
    SystemErrorPortTimeouts = 0x73,
    SystemLowPriorityIoInformation = 0x74,
    SystemBootEntropyInformation = 0x75,
    SystemVerifierCountersInformation = 0x76,
    SystemPagedPoolInformationEx = 0x77,
    SystemSystemPtesInformationEx = 0x78,
    SystemNodeDistanceInformation = 0x79,
    SystemAcpiAuditInformation = 0x7a,
    SystemBasicPerformanceInformation = 0x7b,
    SystemQueryPerformanceCounterInformation = 0x7c,
    SystemSessionBigPoolInformation = 0x7d,
    SystemBootGraphicsInformation = 0x7e,
    SystemScrubPhysicalMemoryInformation = 0x7f,
    SystemBadPageInformation = 0x80,
    SystemProcessorProfileControlArea = 0x81,
    SystemCombinePhysicalMemoryInformation = 0x82,
    SystemEntropyInterruptTimingInformation = 0x83,
    SystemConsoleInformation = 0x84,
    SystemPlatformBinaryInformation = 0x85,
    SystemThrottleNotificationInformation = 0x86,
    SystemHypervisorProcessorCountInformation = 0x87,
    SystemDeviceDataInformation = 0x88,
    SystemDeviceDataEnumerationInformation = 0x89,
    SystemMemoryTopologyInformation = 0x8a,
    SystemMemoryChannelInformation = 0x8b,
    SystemBootLogoInformation = 0x8c,
    SystemProcessorPerformanceInformationEx = 0x8d,
    SystemSpare0 = 0x8e,
    SystemSecureBootPolicyInformation = 0x8f,
    SystemPageFileInformationEx = 0x90,
    SystemSecureBootInformation = 0x91,
    SystemEntropyInterruptTimingRawInformation = 0x92,
    SystemPortableWorkspaceEfiLauncherInformation = 0x93,
    SystemFullProcessInformation = 0x94,
    SystemKernelDebuggerInformationEx = 0x95,
    SystemBootMetadataInformation = 0x96,
    SystemSoftRebootInformation = 0x97,
    SystemElamCertificateInformation = 0x98,
    SystemOfflineDumpConfigInformation = 0x99,
    SystemProcessorFeaturesInformation = 0x9a,
    SystemRegistryReconciliationInformation = 0x9b,
    MaxSystemInfoClass = 0x9c,
} SYSTEM_INFORMATION_CLASS;
```

最后的`JudgeLoadDriver()`是核心函数，我们看下该函数具体是如何实现的，原理很简单。

- 1.通过MmGetSystemRoutineAddress得到动态的地址。
- 2.动态调用m_NtQuerySystemInformation得到参数。
- 3.判断自身是否被加载，如果是输出路径。

```
#include <ntifs.h>
#include <windef.h>
#include <stdlib.h>

typedef NTSTATUS(*NTQUERYSYSTEMINFORMATION)(
IN ULONG SystemInformationClass,
OUT PVOID   SystemInformation,
IN ULONG_PTR    SystemInformationLength,
OUT PULONG_PTR  ReturnLength OPTIONAL);

typedef struct _SYSTEM_MODULE_INFORMATION {
    HANDLE Section;
    PVOID MappedBase;
    PVOID Base;
    ULONG Size;
    ULONG Flags;
    USHORT LoadOrderIndex;
    USHORT InitOrderIndex;
    USHORT LoadCount;
    USHORT PathLength;
    CHAR ImageName[256];
} SYSTEM_MODULE_INFORMATION, *PSYSTEM_MODULE_INFORMATION;

typedef enum _SYSTEM_INFORMATION_CLASS
{
    SystemBasicInformation = 0x0,
    SystemProcessorInformation = 0x1,
    SystemPerformanceInformation = 0x2,
    SystemTimeOfDayInformation = 0x3,
    SystemPathInformation = 0x4,
    SystemProcessInformation = 0x5,
    SystemCallCountInformation = 0x6,
    SystemDeviceInformation = 0x7,
    SystemProcessorPerformanceInformation = 0x8,
    SystemFlagsInformation = 0x9,
    SystemCallTimeInformation = 0xa,
    SystemModuleInformation = 0xb,
    SystemLocksInformation = 0xc,
} SYSTEM_INFORMATION_CLASS;

// 判断当前Driver是否加载成功
// By: LyShark
ULONG JudgeLoadDriver()
{
    NTQUERYSYSTEMINFORMATION m_NtQuerySystemInformation = NULL;
    UNICODE_STRING NtQuerySystemInformation_Name;
    PSYSTEM_MODULE_INFORMATION ModuleEntry;
    ULONG_PTR RetLength, BaseAddr, EndAddr;
    ULONG ModuleNumbers, Index;
    NTSTATUS Status;
    PVOID Buffer;
    RtlInitUnicodeString(&NtQuerySystemInformation_Name,
L"NtQuerySystemInformation");
    m_NtQuerySystemInformation =
(NTQUERYSYSTEMINFORMATION)MmGetSystemRoutineAddress(&NtQuerySystemInformation_Na
me);
    if (m_NtQuerySystemInformation == NULL)
    {
        DbgPrint("获取NtQuerySystemInformation函数失败！\n");
        return 1;
    }

    RetLength = 0;
    Status = m_NtQuerySystemInformation(SystemModuleInformation, NULL, 0,
&RetLength);
    if (Status < 0 && Status != STATUS_INFO_LENGTH_MISMATCH)
    {
        DbgPrint("NtQuerySystemInformation调用失败！错误码是：%x\n", Status);
        return 1;
    }
    Buffer = ExAllocatePoolWithTag(NonPagedPool, RetLength, 'lysh');
    if (Buffer == NULL)
    {
        DbgPrint("分配内存失败! \n");
        return 1;
    }

    Status = m_NtQuerySystemInformation(SystemModuleInformation, Buffer,
RetLength, &RetLength);
    if (Status < 0)
    {
        DbgPrint("NtQuerySystemInformation调用失败 %x\n", Status);
        return 1;
    }

    ModuleNumbers = *(ULONG*)Buffer;
    ModuleEntry = (PSYSTEM_MODULE_INFORMATION)((ULONG_PTR)Buffer + 8);
    for (Index = 0; Index < ModuleNumbers; ++Index)
    {
        BaseAddr = (ULONG_PTR)ModuleEntry->Base;
        EndAddr = BaseAddr + ModuleEntry->Size;
        if (BaseAddr <= (ULONG_PTR)JudgeLoadDriver && (ULONG_PTR)JudgeLoadDriver
<= EndAddr)
        {
            DbgPrint("模块名称是: %s\n", ModuleEntry->ImageName);
            return 2;
        }
        ++ModuleEntry;
    }

    return 0;
}

VOID UnDriver(PDRIVER_OBJECT driver)
{
    DbgPrint("驱动卸载成功 \n");
}

NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    DbgPrint("hello lyshark.com \n");

    ULONG ul = JudgeLoadDriver();

    DbgPrint("驱动状态: %d \n", ul);

    Driver->DriverUnload = UnDriver;
    return STATUS_SUCCESS;
}
```

代码运行效果如下所示:


DebugView on \\DESKTOP-B53PAVI (local)
File Edit Capture Options Computer Help

```
#    Time            Debug Print
2365 3035.97558594 31723437500 - STORMINI: StorNVMe - POWER: IDLE
2366 3035.97705078 hello lyshark.com
2367 3035.97705078 模块名称是: \??\C:\Users\lyshark\Desktop\WinDDK.sys
2368 3035.97705078 驱动状态: 2
2369 3035.98706055 31723593750 - STORMINI: StorNVMe - POWER: ACTIVE
2370 3036.99853516 31733593750 - STORMINI: StorNVMe - POWER: IDLE
2371 3037.17456055 驱动卸载成功
2372 3037.48120117 31738437500 - STORMINI: StorNVMe - POWER: ACTIVE
2373 3038.48852539 31748593750 - STORMINI: StorNVMe - POWER: IDLE
2374 3038.99267578 31753593750 - STORMINI: StorNVMe - POWER: ACTIVE
2375 3038.99365234 31753593750 - STORMINI: StorNVMe - POWER: IDLE
2376 3038.99389648 31753593750 - STORMINI: StorNVMe - POWER: ACTIVE
2377 3039.99658203 31763593750 - STORMINI: StorNVMe - POWER: IDLE
2378 3043.68310547 31800468750 - STORMINI: StorNVMe - POWER: ACTIVE
2379 3043.68334961 31800468750 - STORMINI: StorNVMe - POWER: IDLE
2380 3043.69677734 31800625000 - STORMINI: StorNVMe - POWER: ACTIVE
2381 3044.70532227 31810781250 - STORMINI: StorNVMe - POWER: IDLE
```

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