WFP框架是微软推出来替代TDIHOOK传输层驱动接口网络通信的方案，其默认被设计为分层结构，该框架分别提供了用户态与内核态相同的AIP函数，在两种模式下均可以开发防火墙产品，以下代码我实现了一个简单的驱动过滤防火墙。

WFP 框架分为两大层次模块,用户态基础过滤引擎`BFE (BaseFilteringEngine)`,以及内核态过滤引擎`KMFE (KMFilteringEngine)`,基础过滤引擎对上提供C语言调用方式的API以及RPC接口,这些接口都被封装在`FWPUCLNT.dll`模块中,开发时可以调用该模块中的导出函数.

- WFP程序工作流程:
- 使用 FwpmEngineOpen() 开启 WFP 引擎,获得WFP使用句柄
- 使用 FwpmTransactionBegin() 设置对网络通信内容的过滤权限 (只读/允许修改)
- 使用 FwpsCalloutRegister(),FwpmCalloutAdd(),FwpmFilterAdd() 选择要过滤的内容,并添加过滤器对象和回调函数.
- 使用 FwpmTransactionCommit() 确认刚才的内容,让刚才添加的回调函数开始生效.
- 使用 FwpmFilterDeleteById(),FwpmCalloutDeleteById(),FwpsCalloutUnregisterById()函数撤销对象和回调函数.
- 使用 FwpmEngineClose() 关闭WFP引擎类句柄.

默认情况下WFP一次需要注册3个回调函数,只有一个是事前回调,另外两个是事后回调,通常情况下我们只关注事前回调即可,此外WFP能过滤很对内容,我们需要指定过滤条件标志来输出我们所需要的数据.

- 一般可设置为`FWPM_LAYER_ALE_AUTH_CONNECT_V4`意思是设置IPV4过滤.
- 还需要设置一个GUID值,该值可随意设置,名称为`GUID_ALE_AUTH_CONNECT_CALLOUT_V4`宏.

首先我们通过上方的流程实现一个简单的网络控制驱动，该驱动运行后可对自身机器访问指定地址端口进行控制，例如实现指定应用断网，禁止指定页面被访问等，在配置WFP开发环境时需要在链接器选项卡中的附加依赖项中增加`fwpkclnt.lib，uuid.lib`这两个库文件，并且需要使用WDM开发模板，否则编译将不通过。

```
// 署名权
// right to sign one's name on a piece of work
// PowerBy: LyShark
// Email: me@lyshark.com

#define NDIS_SUPPORT_NDIS6 1
#define DEV_NAME L"\\Device\\MY_WFP_DEV_NAME"
#define SYM_NAME L"\\DosDevices\\MY_WFP_SYM_NAME"

#include <ntifs.h>
#include <fwpsk.h>
#include <fwpmk.h>
#include <stdio.h>

// 过滤器引擎句柄
HANDLE g_hEngine;

// 过滤器引擎中的callout的运行时标识符
ULONG32 g_AleConnectCalloutId;

// 过滤器的运行时标识符
ULONG64 g_AleConnectFilterId;
```

```
// 指定唯一UUID值(只要不冲突即可,内容可随意)
GUID GUID_ALE_AUTH_CONNECT_CALLOUT_V4 = { 0x6812fc83, 0x7d3e, 0x499a, 0xa0, 0x12,
0x55, 0xe0, 0xd8, 0x5f, 0x34, 0x8b };

// ------------------------------------------------------------------------------
// 头部函数声明
// ------------------------------------------------------------------------------

// 注册Callout并设置过滤点
NTSTATUS RegisterCalloutForLayer(
    IN PDEVICE_OBJECT pDevObj,
    IN const GUID *layerKey,
    IN const GUID *calloutKey,
    IN FWPS_CALLOUT_CLASSIFY_FN classifyFn,
    IN FWPS_CALLOUT_NOTIFY_FN notifyFn,
    IN FWPS_CALLOUT_FLOW_DELETE_NOTIFY_FN flowDeleteNotifyFn,
    OUT ULONG32 *calloutId,
    OUT ULONG64 *filterId,
    OUT HANDLE *engine);

// 注册Callout
NTSTATUS RegisterCallout(
    PDEVICE_OBJECT pDevObj,
    IN const GUID *calloutKey,
    IN FWPS_CALLOUT_CLASSIFY_FN classifyFn,
    IN FWPS_CALLOUT_NOTIFY_FN notifyFn,
    IN FWPS_CALLOUT_FLOW_DELETE_NOTIFY_FN flowDeleteNotifyFn,
    OUT ULONG32 *calloutId);

// 设置过滤点
NTSTATUS SetFilter(
    IN const GUID *layerKey,
    IN const GUID *calloutKey,
    OUT ULONG64 *filterId,
    OUT HANDLE *engine);

// Callout函数 flowDeleteFn
VOID NTAPI flowDeleteFn(
    _In_ UINT16 layerId,
    _In_ UINT32 calloutId,
    _In_ UINT64 flowContext
    );

// Callout函数 classifyFn
#if (NTDDI_VERSION >= NTDDI_WIN8)
VOID NTAPI classifyFn(
    _In_ const FWPS_INCOMING_VALUES0* inFixedValues,
    _In_ const FWPS_INCOMING_METADATA_VALUES0* inMetaValues,
    _Inout_opt_ void* layerData,
    _In_opt_ const void* classifyContext,
    _In_ const FWPS_FILTER2* filter,
    _In_ UINT64 flowContext,
    _Inout_ FWPS_CLASSIFY_OUT0* classifyOut
    );
#elif (NTDDI_VERSION >= NTDDI_WIN7)
VOID NTAPI classifyFn(
```

```
    _In_ const FWPS_INCOMING_VALUES0* inFixedValues,
    _In_ const FWPS_INCOMING_METADATA_VALUES0* inMetaValues,
    _Inout_opt_ void* layerData,
    _In_opt_ const void* classifyContext,
    _In_ const FWPS_FILTER1* filter,
    _In_ UINT64 flowContext,
    _Inout_ FWPS_CLASSIFY_OUT0* classifyOut
    );
#else
VOID NTAPI classifyFn(
    _In_ const FWPS_INCOMING_VALUES0* inFixedValues,
    _In_ const FWPS_INCOMING_METADATA_VALUES0* inMetaValues,
    _Inout_opt_ void* layerData,
    _In_ const FWPS_FILTER0* filter,
    _In_ UINT64 flowContext,
    _Inout_ FWPS_CLASSIFY_OUT0* classifyOut
    );
#endif

// Callout函数 notifyFn
#if (NTDDI_VERSION >= NTDDI_WIN8)
NTSTATUS NTAPI notifyFn(
    _In_ FWPS_CALLOUT_NOTIFY_TYPE notifyType,
    _In_ const GUID* filterKey,
    _Inout_ FWPS_FILTER2* filter
    );
#elif (NTDDI_VERSION >= NTDDI_WIN7)
NTSTATUS NTAPI notifyFn(
    _In_ FWPS_CALLOUT_NOTIFY_TYPE notifyType,
    _In_ const GUID* filterKey,
    _Inout_ FWPS_FILTER1* filter
    );
#else
NTSTATUS NTAPI notifyFn(
    _In_ FWPS_CALLOUT_NOTIFY_TYPE notifyType,
    _In_ const GUID* filterKey,
    _Inout_ FWPS_FILTER0* filter
    );
#endif

// ------------------------------------------------------------------------
// 函数实现部分
// ------------------------------------------------------------------------

// 协议判断
NTSTATUS ProtocalIdToName(UINT16 protocalId, PCHAR lpszProtocalName)
{
    NTSTATUS status = STATUS_SUCCESS;

    switch (protocalId)
    {
    case 1:
    {
        // ICMP
        RtlCopyMemory(lpszProtocalName, "ICMP", 5);
        break;
```

```
    }
    case 2:
    {
        // IGMP
        RtlCopyMemory(lpszProtocalName, "IGMP", 5);
        break;
    }
    case 6:
    {
        // TCP
        RtlCopyMemory(lpszProtocalName, "TCP", 4);
        break;
    }
    case 17:
    {
        // UDP
        RtlCopyMemory(lpszProtocalName, "UDP", 4);
        break;
    }
    case 27:
    {
        // RDP
        RtlCopyMemory(lpszProtocalName, "RDP", 6);
        break;
    }
    default:
    {
        // UNKNOW
        RtlCopyMemory(lpszProtocalName, "UNKNOWN", 8);
        break;
    }
    }

    return status;
}

// 启动WFP
NTSTATUS WfpLoad(PDEVICE_OBJECT pDevObj)
{
    NTSTATUS status = STATUS_SUCCESS;

    // 注册Callout并设置过滤点
    // classifyFn, notifyFn, flowDeleteFn 注册三个回调函数,一个事前回调,两个事后回调
    status = RegisterCalloutForLayer(pDevObj, &FWPM_LAYER_ALE_AUTH_CONNECT_V4,
&GUID_ALE_AUTH_CONNECT_CALLOUT_V4,
        classifyFn, notifyFn, flowDeleteFn, &g_AleConnectCalloutId,
&g_AleConnectFilterId, &g_hEngine);
    if (!NT_SUCCESS(status))
    {
        DbgPrint("注册回调失败 \n");
        return status;
    }

    return status;
}
```

```
// 卸载WFP
NTSTATUS wfpUnload()
{
    if (NULL != g_hEngine)
    {
        // 删除FilterId
        FwpmFilterDeleteById(g_hEngine, g_AleConnectFilterId);
        // 删除CalloutId
        FwpmCalloutDeleteById(g_hEngine, g_AleConnectCalloutId);
        // 清空Filter
        g_AleConnectFilterId = 0;
        // 反注册CalloutId
        FwpsCalloutUnregisterById(g_AleConnectCalloutId);
        // 清空CalloutId
        g_AleConnectCalloutId = 0;
        // 关闭引擎
        FwpmEngineClose(g_hEngine);
        g_hEngine = NULL;
    }

    return STATUS_SUCCESS;
}

// 注册Callout并设置过滤点
NTSTATUS RegisterCalloutForLayer(IN PDEVICE_OBJECT pDevObj, IN const GUID
*layerKey, IN const GUID *calloutKey, IN FWPS_CALLOUT_CLASSIFY_FN classifyFn, IN
FWPS_CALLOUT_NOTIFY_FN notifyFn, IN FWPS_CALLOUT_FLOW_DELETE_NOTIFY_FN
flowDeleteNotifyFn, OUT ULONG32 *calloutId, OUT ULONG64 *filterId, OUT HANDLE
*engine)
{
    NTSTATUS status = STATUS_SUCCESS;

    // 注册Callout
    status = RegisterCallout(pDevObj, calloutKey, classifyFn, notifyFn,
flowDeleteNotifyFn, calloutId);
    if (!NT_SUCCESS(status))
    {
        return status;
    }

    // 设置过滤点
    status = SetFilter(layerKey, calloutKey, filterId, engine);
    if (!NT_SUCCESS(status))
    {
        return status;
    }

    return status;
}

// 注册Callout
NTSTATUS RegisterCallout(PDEVICE_OBJECT pDevObj, IN const GUID *calloutKey, IN
FWPS_CALLOUT_CLASSIFY_FN classifyFn, IN FWPS_CALLOUT_NOTIFY_FN notifyFn, IN
FWPS_CALLOUT_FLOW_DELETE_NOTIFY_FN flowDeleteNotifyFn, OUT ULONG32 *calloutId)
{
    NTSTATUS status = STATUS_SUCCESS;
```

```
    FWPS_CALLOUT sCallout = { 0 };

    // 设置Callout
    sCallout.calloutKey = *calloutKey;
    sCallout.classifyFn = classifyFn;
    sCallout.flowDeleteFn = flowDeleteNotifyFn;
    sCallout.notifyFn = notifyFn;

    // 注册Callout
    status = FwpsCalloutRegister(pDevObj, &sCallout, calloutId);
    if (!NT_SUCCESS(status))
    {
        DbgPrint("注册Callout失败 \n");
        return status;
    }

    return status;
}

// 设置过滤点
NTSTATUS SetFilter(IN const GUID *layerKey, IN const GUID *calloutKey, OUT
ULONG64 *filterId, OUT HANDLE *engine)
{
    HANDLE hEngine = NULL;
    NTSTATUS status = STATUS_SUCCESS;
    FWPM_SESSION session = { 0 };
    FWPM_FILTER mFilter = { 0 };
    FWPM_CALLOUT mCallout = { 0 };
    FWPM_DISPLAY_DATA mDispData = { 0 };

    // 创建Session
    session.flags = FWPM_SESSION_FLAG_DYNAMIC;
    status = FwpmEngineOpen(NULL, RPC_C_AUTHN_WINNT, NULL, &session, &hEngine);
    if (!NT_SUCCESS(status))
    {
        return status;
    }

    // 开始事务
    status = FwpmTransactionBegin(hEngine, 0);
    if (!NT_SUCCESS(status))
    {
        return status;
    }

    // 设置Callout参数
    mDispData.name = L"MY WFP LyShark";
    mDispData.description = L"WORLD OF DEMON";
    mCallout.applicableLayer = *layerKey;
    mCallout.calloutKey = *calloutKey;
    mCallout.displayData = mDispData;

    // 添加Callout到Session中
    status = FwpmCalloutAdd(hEngine, &mCallout, NULL, NULL);
    if (!NT_SUCCESS(status))
    {
```

```
        return status;
    }

    // 设置过滤器参数
    mFilter.action.calloutKey = *calloutKey;
    mFilter.action.type = FWP_ACTION_CALLOUT_TERMINATING;
    mFilter.displayData.name = L"MY WFP LyShark";
    mFilter.displayData.description = L"WORLD OF DEMON";
    mFilter.layerKey = *layerKey;
    mFilter.subLayerKey = FWPM_SUBLAYER_UNIVERSAL;
    mFilter.weight.type = FWP_EMPTY;

    // 添加过滤器
    status = FwpmFilterAdd(hEngine, &mFilter, NULL, filterId);
    if (!NT_SUCCESS(status))
    {
        return status;
    }

    // 提交事务
    status = FwpmTransactionCommit(hEngine);
    if (!NT_SUCCESS(status))
    {
        return status;
    }

    *engine = hEngine;
    return status;
}

// Callout函数 classifyFn 事前回调函数
VOID NTAPI classifyFn(_In_ const FWPS_INCOMING_VALUES0* inFixedValues, _In_ const
FWPS_INCOMING_METADATA_VALUES0* inMetaValues, _Inout_opt_ void* layerData,
_In_opt_ const void* classifyContext, _In_ const FWPS_FILTER2* filter, _In_
UINT64 flowContext, _Inout_ FWPS_CLASSIFY_OUT0* classifyOut)
{
    // 数据包的方向,取值 FWP_DIRECTION_INBOUND = 1 或 FWP_DIRECTION_OUTBOUND = 0
    WORD wDirection = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_FLOW_ESTABLISHED_V4_DIRECTION].value.int8;

    // 定义本机地址与本机端口
    ULONG ulLocalIp = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_LOCAL_ADDRESS].value.uint32;
    UINT16 uLocalPort = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_LOCAL_PORT].value.uint16;

    // 定义对端地址与对端端口
    ULONG ulRemoteIp = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_REMOTE_ADDRESS].value.uint32;
    UINT16 uRemotePort = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_REMOTE_PORT].value.uint16;

    // 获取当前进程IRQ
    KIRQL kCurrentIrql = KeGetCurrentIrql();

    // 获取进程ID
```

```
    ULONG64 processId = inMetaValues->processId;
    UCHAR szProcessPath[256] = { 0 };
    CHAR szProtocalName[256] = { 0 };
    RtlZeroMemory(szProcessPath, 256);

    // 获取进程路径
    for (ULONG i = 0; i < inMetaValues->processPath->size; i++)
    {
        // 里面是宽字符存储的
        szProcessPath[i] = inMetaValues->processPath->data[i];
    }

    // 获取当前协议类型
    ProtocalIdToName(inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_PROTOCOL].value.uint16,
szProtocalName);

    // 设置默认规则 允许连接
    classifyOut->actionType = FWP_ACTION_PERMIT;

    // 禁止指定进程网络连接
    if (NULL != wcsstr((PWCHAR)szProcessPath, L"iexplore.exe"))
    {
        // 设置拒绝规则 拒绝连接
        classifyOut->actionType = FWP_ACTION_BLOCK;
        classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
        classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
        DbgPrint("[LyShark.com] 拦截IE网络链接请求... \n");
    }

    // 输出对端地址字符串 并阻断链接
    char szRemoteAddress[256] = { 0 };
    char szRemotePort[128] = { 0 };

    char szLocalAddress[256] = { 0 };
    char szLocalPort[128] = { 0 };

    sprintf(szRemoteAddress, "%u.%u.%u.%u", (ulRemoteIp >> 24) & 0xFF,
(ulRemoteIp >> 16) & 0xFF, (ulRemoteIp >> 8) & 0xFF, (ulRemoteIp)& 0xFF);
    sprintf(szRemotePort, "%d", uRemotePort);

    sprintf(szLocalAddress, "%u.%u.%u.%u", (ulLocalIp >> 24) & 0xFF, (ulLocalIp
>> 16) & 0xFF, (ulLocalIp >> 8) & 0xFF, (ulLocalIp)& 0xFF);
    sprintf(szLocalPort, "%d", uLocalPort);

    // DbgPrint("本端: %s : %s --> 对端: %s : %s \n", szLocalAddress, szLocalPort,
szRemoteAddress, szRemotePort);

    // 如果对端地址是 8.141.58.64 且对端端口是 443 则拒绝连接
    if (strcmp(szRemoteAddress, "8.141.58.64") == 0 && strcmp(szRemotePort,
"443") == 0)
    {
        DbgPrint("[LyShark.com] 拦截网站访问请求 --> %s : %s \n", szRemoteAddress,
szRemotePort);
        // 设置拒绝规则 拒绝连接
        classifyOut->actionType = FWP_ACTION_BLOCK;
```

```
        classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
        classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
    }
    else if (strcmp(szRemotePort, "0") == 0)
    {
        DbgPrint("[LyShark.com] 拦截Ping访问请求 --> %s \n", szRemoteAddress);

        // 设置拒绝规则 拒绝连接
        classifyOut->actionType = FWP_ACTION_BLOCK;
        classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
        classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
    }

    // 显示
    DbgPrint("[LyShark.com] 方向: %d -> 协议类型: %s -> 本端地址: %u.%u.%u.%u:%d ->
对端地址: %u.%u.%u.%u:%d -> IRQL: %d -> 进程ID: %I64d -> 路径: %S \n",
    wDirection,
    szProtocalName,
    (ulLocalIp >> 24) & 0xFF,
    (ulLocalIp >> 16) & 0xFF,
    (ulLocalIp >> 8) & 0xFF,
    (ulLocalIp)& 0xFF,
    uLocalPort,
    (ulRemoteIp >> 24) & 0xFF,
    (ulRemoteIp >> 16) & 0xFF,
    (ulRemoteIp >> 8) & 0xFF,
    (ulRemoteIp)& 0xFF,
    uRemotePort,
    kCurrentIrql,
    processId,
    (PWCHAR)szProcessPath);

}

// Callout函数 notifyFn 事后回调函数
NTSTATUS NTAPI notifyFn(_In_ FWPS_CALLOUT_NOTIFY_TYPE notifyType, _In_ const
GUID* filterKey, _Inout_ FWPS_FILTER2* filter)
{
    NTSTATUS status = STATUS_SUCCESS;
    return status;
}

// Callout函数 flowDeleteFn 事后回调函数
VOID NTAPI flowDeleteFn(_In_ UINT16 layerId, _In_ UINT32 calloutId, _In_ UINT64
flowContext)
{
    return;
}

// 默认派遣函数
NTSTATUS DriverDefaultHandle(PDEVICE_OBJECT pDevObj, PIRP pIrp)
{
    NTSTATUS status = STATUS_SUCCESS;
    pIrp->IoStatus.Status = status;
    pIrp->IoStatus.Information = 0;
    IoCompleteRequest(pIrp, IO_NO_INCREMENT);
```

```
    return status;
}

// 创建设备
NTSTATUS CreateDevice(PDRIVER_OBJECT pDriverObject)
{
    NTSTATUS status = STATUS_SUCCESS;
    PDEVICE_OBJECT pDevObj = NULL;
    UNICODE_STRING ustrDevName, ustrSymName;
    RtlInitUnicodeString(&ustrDevName, DEV_NAME);
    RtlInitUnicodeString(&ustrSymName, SYM_NAME);

    status = IoCreateDevice(pDriverObject, 0, &ustrDevName, FILE_DEVICE_NETWORK,
0, FALSE, &pDevObj);
    if (!NT_SUCCESS(status))
    {
        return status;
    }
    status = IoCreateSymbolicLink(&ustrSymName, &ustrDevName);
    if (!NT_SUCCESS(status))
    {
        return status;
    }
    return status;
}

// 卸载驱动
VOID UnDriver(PDRIVER_OBJECT driver)
{
    // 删除回调函数和过滤器,关闭引擎
    WfpUnload();

    UNICODE_STRING ustrSymName;
    RtlInitUnicodeString(&ustrSymName, SYM_NAME);
    IoDeleteSymbolicLink(&ustrSymName);
    if (driver->DeviceObject)
    {
        IoDeleteDevice(driver->DeviceObject);
    }
}

// 驱动入口
NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    NTSTATUS status = STATUS_SUCCESS;
    Driver->DriverUnload = UnDriver;
    for (ULONG i = 0; i < IRP_MJ_MAXIMUM_FUNCTION; i++)
    {
        Driver->MajorFunction[i] = DriverDefaultHandle;
    }

    // 创建设备
    CreateDevice(Driver);

    // 启动WFP
```

```
    WfpLoad(Driver->DeviceObject);

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

上方代码是一个最基本的WFP过滤框架头部函数，声明部分来源于微软的定义此处不做解释，需要注意`GUID_ALE_AUTH_CONNECT_CALLOUT_V4`代表的是一个随机`UUID`值，该值可以任意定义只要不一致即可，驱动程序运行后会率先执行`WfpLoad()`这个函数，该函数内部通过`RegisterCalloutForLayer()`注册了一个过滤点，此处我们必须要注意三个回调函数，classifyFn, notifyFn, flowDeleteFn 他们分别的功能时，事前回调，事后回调，事后回调，而WFP框架中我们最需要注意的也就是对这三个函数进行重定义，也就是需要重写函数来实现我们特定的功能。

```
NTSTATUS RegisterCalloutForLayer
(
    IN const GUID* layerKey,
    IN const GUID* calloutKey,
    IN FWPS_CALLOUT_CLASSIFY_FN classifyFn,
    IN FWPS_CALLOUT_NOTIFY_FN notifyFn,
    IN FWPS_CALLOUT_FLOW_DELETE_NOTIFY_FN flowDeleteNotifyFn,
    OUT UINT32* calloutId,
    OUT UINT64* filterId
}
```

既然是防火墙那么必然`classifyFn`事前更重要一些，如果需要监控网络流量则需要在事前函数中做处理，而如果是监视则可以在事后做处理，既然要在事前进行处理，那么我们就来看看事前是如何处理的流量。

```
// Callout函数 classifyFn 事前回调函数
VOID NTAPI classifyFn(_In_ const FWPS_INCOMING_VALUES0* inFixedValues, _In_ const
FWPS_INCOMING_METADATA_VALUES0* inMetaValues, _Inout_opt_ void* layerData,
_In_opt_ const void* classifyContext, _In_ const FWPS_FILTER2* filter, _In_
UINT64 flowContext, _Inout_ FWPS_CLASSIFY_OUT0* classifyOut)
{
    // 数据包的方向,取值 FWP_DIRECTION_INBOUND = 1 或 FWP_DIRECTION_OUTBOUND = 0
    WORD wDirection = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_FLOW_ESTABLISHED_V4_DIRECTION].value.int8;

    // 定义本机地址与本机端口
    ULONG ulLocalIp = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_LOCAL_ADDRESS].value.uint32;
    UINT16 uLocalPort = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_LOCAL_PORT].value.uint16;

    // 定义对端地址与对端端口
    ULONG ulRemoteIp = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_REMOTE_ADDRESS].value.uint32;
    UINT16 uRemotePort = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_REMOTE_PORT].value.uint16;

    // 获取当前进程IRQ
    KIRQL kCurrentIrql = KeGetCurrentIrql();
```

```
    // 获取进程ID
    ULONG64 processId = inMetaValues->processId;
    UCHAR szProcessPath[256] = { 0 };
    CHAR szProtocalName[256] = { 0 };
    RtlZeroMemory(szProcessPath, 256);

    // 获取进程路径
    for (ULONG i = 0; i < inMetaValues->processPath->size; i++)
    {
        // 里面是宽字符存储的
        szProcessPath[i] = inMetaValues->processPath->data[i];
    }

    // 获取当前协议类型
    ProtocalIdToName(inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_PROTOCOL].value.uint16,
szProtocalName);

    // 设置默认规则 允许连接
    classifyOut->actionType = FWP_ACTION_PERMIT;

    // 禁止指定进程网络连接
    if (NULL != wcsstr((PWCHAR)szProcessPath, L"qq.exe"))
    {
        // 设置拒绝规则 拒绝连接
        classifyOut->actionType = FWP_ACTION_BLOCK;
        classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
        classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
    }

    // 输出对端地址字符串 并阻断链接
    char szRemoteAddress[256] = { 0 };
    char szRemotePort[128] = { 0 };

    char szLocalAddress[256] = { 0 };
    char szLocalPort[128] = { 0 };

    sprintf(szRemoteAddress, "%u.%u.%u.%u", (ulRemoteIp >> 24) & 0xFF,
(ulRemoteIp >> 16) & 0xFF, (ulRemoteIp >> 8) & 0xFF, (ulRemoteIp)& 0xFF);
    sprintf(szRemotePort, "%d", uRemotePort);

    sprintf(szLocalAddress, "%u.%u.%u.%u", (ulLocalIp >> 24) & 0xFF, (ulLocalIp
>> 16) & 0xFF, (ulLocalIp >> 8) & 0xFF, (ulLocalIp)& 0xFF);
    sprintf(szLocalPort, "%d", uLocalPort);

    // DbgPrint("本端: %s : %s --> 对端: %s : %s \n", szLocalAddress, szLocalPort,
szRemoteAddress, szRemotePort);

    // 如果对端地址是 8.141.58.64 且对端端口是 443 则拒绝连接
    if (strcmp(szRemoteAddress, "8.141.58.64") == 0 && strcmp(szRemotePort,
"443") == 0)
    {
        DbgPrint("拦截网站访问请求 --> %s : %s \n", szRemoteAddress, szRemotePort);
        // 设置拒绝规则 拒绝连接
        classifyOut->actionType = FWP_ACTION_BLOCK;
        classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
```

```
        classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
    }
    else if (strcmp(szRemotePort, "0") == 0)
    {
        DbgPrint("拦截Ping访问请求 --> %s \n", szRemoteAddress);

        // 设置拒绝规则 拒绝连接
        classifyOut->actionType = FWP_ACTION_BLOCK;
        classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
        classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
    }

    /*
    // 显示
    DbgPrint("方向: %d -> 协议类型: %s -> 本端地址: %u.%u.%u.%u:%d -> 对端地址:
%u.%u.%u.%u:%d -> IRQL: %d -> 进程ID: %I64d -> 路径: %S \n",
    wDirection,
    szProtocalName,
    (ulLocalIp >> 24) & 0xFF,
    (ulLocalIp >> 16) & 0xFF,
    (ulLocalIp >> 8) & 0xFF,
    (ulLocalIp)& 0xFF,
    uLocalPort,
    (ulRemoteIp >> 24) & 0xFF,
    (ulRemoteIp >> 16) & 0xFF,
    (ulRemoteIp >> 8) & 0xFF,
    (ulRemoteIp)& 0xFF,
    uRemotePort,
    kCurrentIrql,
    processId,
    (PWCHAR)szProcessPath);
    */
}
```

当有新的网络数据包路由到事前函数时，程序中会通过如下案例直接得到我们所需要的数据包头，`ProtocalIdToName` 函数则是一个将特定类型数字转为字符串的转换函数。

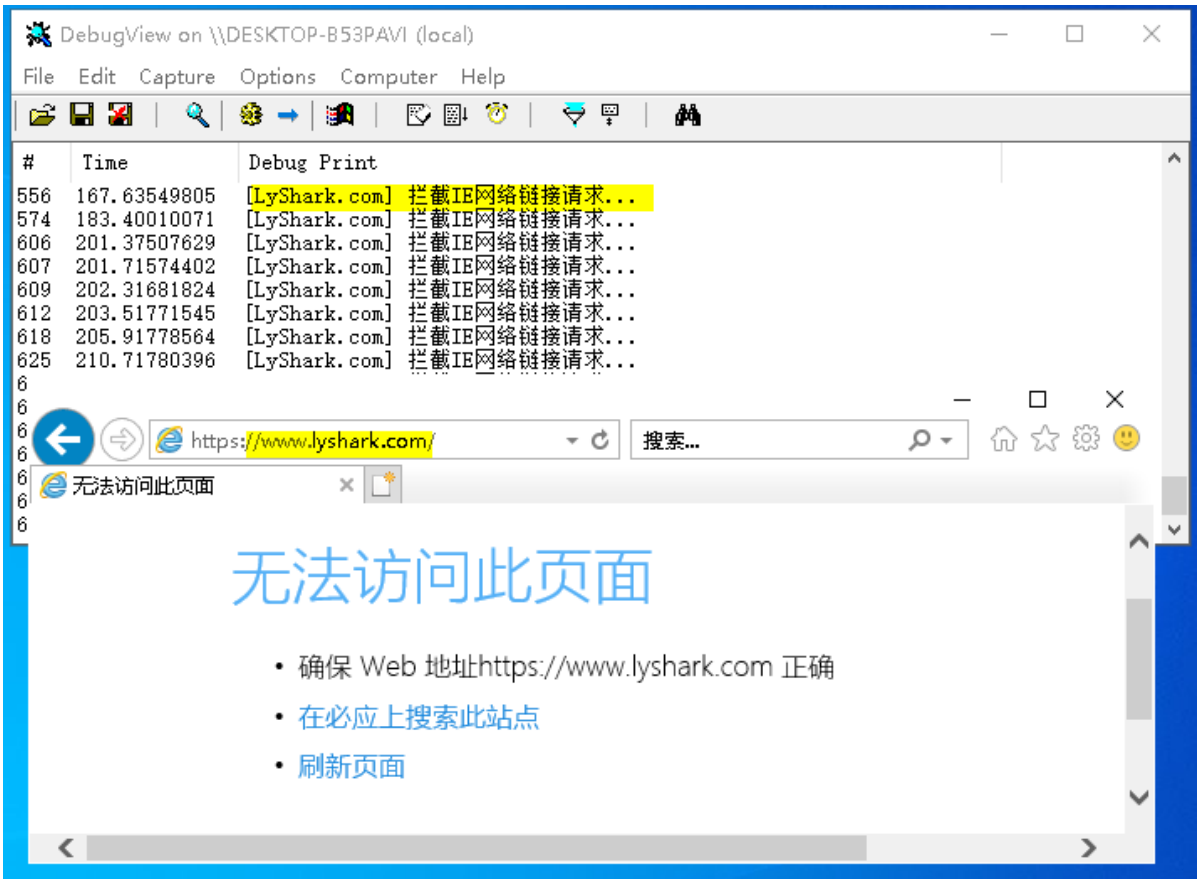
```
// 数据包的方向,取值 FWP_DIRECTION_INBOUND = 1 或 FWP_DIRECTION_OUTBOUND = 0
WORD wDirection = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_FLOW_ESTABLISHED_V4_DIRECTION].value.int8;

// 定义本机地址与本机端口
ULONG ulLocalIp = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_LOCAL_ADDRESS].value.uint32;
UINT16 uLocalPort = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_LOCAL_PORT].value.uint16;

// 定义对端地址与对端端口
ULONG ulRemoteIp = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_REMOTE_ADDRESS].value.uint32;
UINT16 uRemotePort = inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_REMOTE_PORT].value.uint16;

// 获取当前进程IRQ
KIRQL kCurrentIrql = KeGetCurrentIrql();
```

```
// 获取进程ID
ULONG64 processId = inMetaValues->processId;
UCHAR szProcessPath[256] = { 0 };
CHAR szProtocalName[256] = { 0 };
RtlZeroMemory(szProcessPath, 256);

// 获取进程路径
for (ULONG i = 0; i < inMetaValues->processPath->size; i++)
{
    // 里面是宽字符存储的
    szProcessPath[i] = inMetaValues->processPath->data[i];
}

// 获取当前协议类型
ProtocalIdToName(inFixedValues-
>incomingValue[FWPS_FIELD_ALE_AUTH_CONNECT_V4_IP_PROTOCOL].value.uint16,
szProtocalName);
```

拦截浏览器上网： 防火墙的默认规则我们将其改为放行所有`classifyOut->actionType = FWP_ACTION_PERMIT;`，当我们需要拦截特定进程上网时则只需要判断调用原，如果时特定进程则直接设置拒绝网络访问。

```
// 设置默认规则 允许连接
classifyOut->actionType = FWP_ACTION_PERMIT;

// 禁止指定进程网络连接
if (NULL != wcsstr((PWCHAR)szProcessPath, L"iexplore.exe"))
{
    // 设置拒绝规则 拒绝连接
    classifyOut->actionType = FWP_ACTION_BLOCK;
    classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
    classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
    DbgPrint("[LyShark.com] 拦截IE网络链接请求... \n");
}
```

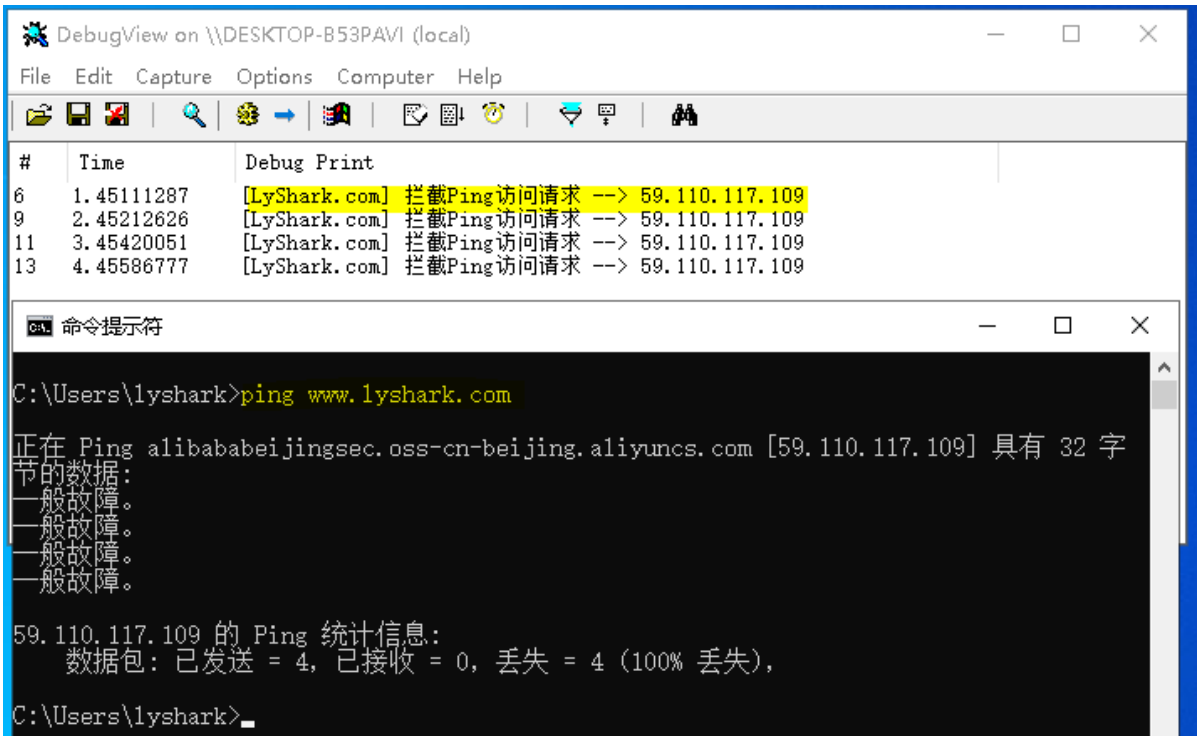
当这段驱动程序被加载后，则用户使用IE访问任何页面都将提示无法访问。



拦截指定IP地址： 防火墙的另一个重要功能就是拦截主机自身访问特定网段，此功能只需要增加过滤条件即可实现，如下当用户访问 `8.141.58.64` 这个IP地址是则会被拦截，如果监测到用户时Ping请求则也会被拦截。

```
// 如果对端地址是 8.141.58.64 且对端端口是 443 则拒绝连接
if (strcmp(szRemoteAddress, "8.141.58.64") == 0 && strcmp(szRemotePort, "443") ==
0)
{
    DbgPrint("拦截网站访问请求 --> %s : %s \n", szRemoteAddress, szRemotePort);
    // 设置拒绝规则 拒绝连接
    classifyOut->actionType = FWP_ACTION_BLOCK;
    classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
    classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
}
else if (strcmp(szRemotePort, "0") == 0)
{
    DbgPrint("拦截Ping访问请求 --> %s \n", szRemoteAddress);

    // 设置拒绝规则 拒绝连接
    classifyOut->actionType = FWP_ACTION_BLOCK;
    classifyOut->rights = classifyOut->rights & (~FWPS_RIGHT_ACTION_WRITE);
    classifyOut->flags = classifyOut->flags | FWPS_CLASSIFY_OUT_FLAG_ABSORB;
}
```

当这段驱动程序被加载后，则用户主机无法访问 `8.141.58.64` 且无法使用ping命令。



抓取底层数据包： 如果仅仅只是想要输出流经自身主机的数据包，则只需要对特定数据包进行解码即可得到原始数据。

```
// 输出对端地址字符串 并阻断链接
char szRemoteAddress[256] = { 0 };
char szRemotePort[128] = { 0 };

char szLocalAddress[256] = { 0 };
char szLocalPort[128] = { 0 };

sprintf(szRemoteAddress, "%u.%u.%u.%u", (ulRemoteIp >> 24) & 0xFF, (ulRemoteIp >>
16) & 0xFF, (ulRemoteIp >> 8) & 0xFF, (ulRemoteIp)& 0xFF);
sprintf(szRemotePort, "%d", uRemotePort);

sprintf(szLocalAddress, "%u.%u.%u.%u", (ulLocalIp >> 24) & 0xFF, (ulLocalIp >>
16) & 0xFF, (ulLocalIp >> 8) & 0xFF, (ulLocalIp)& 0xFF);
sprintf(szLocalPort, "%d", uLocalPort);

// 显示
DbgPrint("[LyShark.com] 方向: %d -> 协议类型: %s -> 本端地址: %u.%u.%u.%u:%d -> 对端
地址: %u.%u.%u.%u:%d -> IRQL: %d -> 进程ID: %I64d -> 路径: %S \n",
wDirection,
szProtocalName,
(ulLocalIp >> 24) & 0xFF,
(ulLocalIp >> 16) & 0xFF,
(ulLocalIp >> 8) & 0xFF,
(ulLocalIp)& 0xFF,
uLocalPort,
(ulRemoteIp >> 24) & 0xFF,
(ulRemoteIp >> 16) & 0xFF,
(ulRemoteIp >> 8) & 0xFF,
(ulRemoteIp)& 0xFF,
uRemotePort,
kCurrentIrql,
processId,
```

```
(PWCHAR)szProcessPath);
```

当这段驱动程序被加载后，则用户可看到流经本机的所有数据包。