在上一篇文章《驱动开发：内核封装WSK网络通信接口》中，LyShark已经带大家看过了如何通过WSK接口实现套接字通信，但WSK实现的通信是内核与内核模块之间的，而如果需要内核与应用层之间通信则使用TDK会更好一些因为它更接近应用层，本章将使用TDK实现，TDI全称传输驱动接口，其主要负责连接Socket和协议驱动，用于实现访问传输层的功能，该接口比NDIS更接近于应用层，在早期Win系统中常用于实现过滤防火墙，同样经过封装后也可实现通信功能，本章将运用TDI接口实现驱动与应用层之间传输字符串，结构体，多线程收发等技术。

- TDI传输字符串
- TDI多线程收发
- TDI传数结构实现认证

SDK库提取，将其命名为MyTDI.hpp放入到代码同级目录下。

▶ 拷贝SDK代码参考自《WINDOWS黑客编程技术详解》甘迪文

```
#include <ntifs.h>
#include <tdikrnl.h>
#include <ntstatus.h>

// TCP驱动设备名称
#define COMM_TCP_DEV_NAME L"\\Device\\Tcp"

// 地址转换的宏
#define INETADDR(a, b, c, d) (a + (b<<8) + (c<<16) + (d<<24))
#define HTONL(a) (((a & 0xFF)<<24) + ((a & 0xFF00)<<8) + ((a & 0xFF0000)>>8) +
(a&0xFF000000)>>24)
#define HTONS(a) (((a & 0xFF)<<8) + ((a & 0xFF00)>>8))

// 完成回调函数
NTSTATUS TdiCompletionRoutine(PDEVICE_OBJECT pDevObj, PIRP pIrp, PVOID pContext)
{
  if (NULL != pContext)
  {
    KeSetEvent((PKEVENT)pContext, IO_NO_INCREMENT, FALSE);
  }
  return STATUS_MORE_PROCESSING_REQUIRED;
}

// TDI初始化设置
NTSTATUS TdiOpen(PDEVICE_OBJECT *ppTdiAddressDevObj, PFILE_OBJECT
*ppTdiEndPointFileObject, HANDLE *phTdiAddress, HANDLE *phTdiEndPoint)
{
  NTSTATUS status = STATUS_UNSUCCESSFUL;
  PFILE_FULL_EA_INFORMATION pAddressEaBuffer = NULL;
  ULONG ulAddressEaBufferLength = 0;
  PTA_IP_ADDRESS pTaIpAddr = NULL;
  UNICODE_STRING ustrTDIDevName;
  OBJECT_ATTRIBUTES ObjectAttributes = { 0 };
  IO_STATUS_BLOCK iosb = { 0 };
  HANDLE hTdiAddress = NULL;
  PFILE_OBJECT pTdiAddressFileObject = NULL;
  PDEVICE_OBJECT pTdiAddressDevObj = NULL;
  PFILE_FULL_EA_INFORMATION pContextEaBuffer = NULL;
  ULONG ulContextEaBufferLength = 0;
```

```
  HANDLE hTdiEndPoint = NULL;
  PFILE_OBJECT pTdiEndPointFileObject = NULL;
  KEVENT irpCompleteEvent = { 0 };
  PIRP pIrp = NULL;

  do
  {
    // 为本地地址拓展属性结构申请内存及初始化
    ulAddressEaBufferLength = sizeof(FILE_FULL_EA_INFORMATION) +
TDI_TRANSPORT_ADDRESS_LENGTH + sizeof(TA_IP_ADDRESS);
    pAddressEaBuffer = (PFILE_FULL_EA_INFORMATION)ExAllocatePool(NonPagedPool,
ulAddressEaBufferLength);
    if (NULL == pAddressEaBuffer)
    {
      break;
    }
    RtlZeroMemory(pAddressEaBuffer, ulAddressEaBufferLength);
    RtlCopyMemory(pAddressEaBuffer->EaName, TdiTransportAddress, (1 +
TDI_TRANSPORT_ADDRESS_LENGTH));
    pAddressEaBuffer->EaNameLength = TDI_TRANSPORT_ADDRESS_LENGTH;
    pAddressEaBuffer->EaValueLength = sizeof(TA_IP_ADDRESS);

    // 初始化本机IP地址与端口
    pTaIpAddr = (PTA_IP_ADDRESS)((PUCHAR)pAddressEaBuffer->EaName +
pAddressEaBuffer->EaNameLength + 1);
    pTaIpAddr->TAAddressCount = 1;
    pTaIpAddr->Address[0].AddressLength = TDI_ADDRESS_LENGTH_IP;
    pTaIpAddr->Address[0].AddressType = TDI_ADDRESS_TYPE_IP;
    pTaIpAddr->Address[0].Address[0].sin_port = 0;      // 0表示本机任意随机端口
    pTaIpAddr->Address[0].Address[0].in_addr = 0;      // 0表示本机本地IP地址
    RtlZeroMemory(pTaIpAddr->Address[0].Address[0].sin_zero, sizeof(pTaIpAddr-
>Address[0].Address[0].sin_zero));

    // 创建TDI驱动设备字符串与初始化设备对象
    RtlInitUnicodeString(&ustrTDIDevName, COMM_TCP_DEV_NAME);
    InitializeObjectAttributes(&ObjectAttributes, &ustrTDIDevName,
OBJ_CASE_INSENSITIVE | OBJ_KERNEL_HANDLE, NULL, NULL);

    // 根据本地地址拓展属性结构创建本地地址对象
    status = ZwCreateFile(&hTdiAddress, GENERIC_READ | GENERIC_WRITE |
SYNCHRONIZE,
      &ObjectAttributes, &iosb, NULL, FILE_ATTRIBUTE_NORMAL,
      FILE_SHARE_READ, FILE_OPEN, 0, pAddressEaBuffer, ulAddressEaBufferLength);
    if (!NT_SUCCESS(status))
    {
      break;
    }

    // 根据本地地址对象句柄获取对应的本地地址文件对象
    status = ObReferenceObjectByHandle(hTdiAddress,
      FILE_ANY_ACCESS, 0, KernelMode, &pTdiAddressFileObject, NULL);
    if (!NT_SUCCESS(status))
    {
      break;
    }
```

```
    // 获取本地地址文件对象对应的驱动设备
    pTdiAddressDevObj = IoGetRelatedDeviceObject(pTdiAddressFileObject);
    if (NULL == pTdiAddressDevObj)
    {
      break;
    }

    // 为上下文拓展属性申请内存并初始化
    ulContextEaBufferLength = FIELD_OFFSET(FILE_FULL_EA_INFORMATION, EaName) +
TDI_CONNECTION_CONTEXT_LENGTH + 1 + sizeof(CONNECTION_CONTEXT);
    pContextEaBuffer = (PFILE_FULL_EA_INFORMATION)ExAllocatePool(NonPagedPool,
ulContextEaBufferLength);
    if (NULL == pContextEaBuffer)
    {
      break;
    }
    RtlZeroMemory(pContextEaBuffer, ulContextEaBufferLength);
    RtlCopyMemory(pContextEaBuffer->EaName, TdiConnectionContext, (1 +
TDI_CONNECTION_CONTEXT_LENGTH));
    pContextEaBuffer->EaNameLength = TDI_CONNECTION_CONTEXT_LENGTH;
    pContextEaBuffer->EaValueLength = sizeof(CONNECTION_CONTEXT);

    // 根据上下文创建TDI端点对象
    status = ZwCreateFile(&hTdiEndPoint, GENERIC_READ | GENERIC_WRITE |
SYNCHRONIZE,
      &ObjectAttributes, &iosb, NULL, FILE_ATTRIBUTE_NORMAL, FILE_SHARE_READ,
      FILE_OPEN, 0, pContextEaBuffer, ulContextEaBufferLength);
    if (!NT_SUCCESS(status))
    {
      break;
    }
    // 根据TDI端点对象句柄获取对应的端点文件对象
    status = ObReferenceObjectByHandle(hTdiEndPoint,
      FILE_ANY_ACCESS, 0, KernelMode, &pTdiEndPointFileObject, NULL);
    if (!NT_SUCCESS(status))
    {
      break;
    }

    // 设置事件
    KeInitializeEvent(&irpCompleteEvent, NotificationEvent, FALSE);

    // 将TDI端点与本地地址对象关联，创建TDI的I/O请求包:TDI_ASSOCIATE_ADDRESS
    pIrp = TdiBuildInternalDeviceControlIrp(TDI_ASSOCIATE_ADDRESS,
      pTdiAddressDevObj, pTdiEndPointFileObject, &irpCompleteEvent, &iosb);
    if (NULL == pIrp)
    {
      break;
    }

    // 拓展I/O请求包
    TdiBuildAssociateAddress(pIrp, pTdiAddressDevObj, pTdiEndPointFileObject,
NULL, NULL, hTdiAddress);

    // 设置完成实例的回调函数
```

```
    IoSetCompletionRoutine(pIrp, TdiCompletionRoutine, &irpCompleteEvent, TRUE,
TRUE, TRUE);

    // 发送I/O请求包并等待执行
    status = IoCallDriver(pTdiAddressDevObj, pIrp);
    if (STATUS_PENDING == status)
    {
      KeWaitForSingleObject(&irpCompleteEvent, Executive, KernelMode, FALSE,
NULL);
    }

    // 返回数据
    *ppTdiAddressDevObj = pTdiAddressDevObj;
    *ppTdiEndPointFileObject = pTdiEndPointFileObject;
    *phTdiAddress = hTdiAddress;
    *phTdiEndPoint = hTdiEndPoint;

  } while (FALSE);

  // 释放内存
  if (pTdiAddressFileObject)
  {
    ObDereferenceObject(pTdiAddressFileObject);
  }
  if (pContextEaBuffer)
  {
    ExFreePool(pContextEaBuffer);
  }
  if (pAddressEaBuffer)
  {
    ExFreePool(pAddressEaBuffer);
  }
  return status;
}

// TDI TCP连接服务器
NTSTATUS TdiConnection(PDEVICE_OBJECT pTdiAddressDevObj, PFILE_OBJECT
pTdiEndPointFileObject, LONG *pServerIp, LONG lServerPort)
{
  NTSTATUS status = STATUS_SUCCESS;
  IO_STATUS_BLOCK iosb = { 0 };
  PIRP pIrp = NULL;
  KEVENT connEvent = { 0 };
  TA_IP_ADDRESS serverTaIpAddr = { 0 };
  ULONG serverIpAddr = 0;
  USHORT serverPort = 0;
  TDI_CONNECTION_INFORMATION serverConnection = { 0 };

  // 创建连接事件
  KeInitializeEvent(&connEvent, NotificationEvent, FALSE);

  // 创建TDI连接I/O请求包:TDI_CONNECT
  pIrp = TdiBuildInternalDeviceControlIrp(TDI_CONNECT, pTdiAddressDevObj,
pTdiEndPointFileObject, &connEvent, &iosb);
  if (NULL == pIrp)
  {
```

```
    return STATUS_INSUFFICIENT_RESOURCES;
  }

  // 初始化服务器IP地址与端口
  serverIpAddr = INETADDR(pServerIp[0], pServerIp[1], pServerIp[2],
pServerIp[3]);
  serverPort = HTONS(lServerPort);
  serverTaIpAddr.TAAddressCount = 1;
  serverTaIpAddr.Address[0].AddressLength = TDI_ADDRESS_LENGTH_IP;
  serverTaIpAddr.Address[0].AddressType = TDI_ADDRESS_TYPE_IP;
  serverTaIpAddr.Address[0].Address[0].sin_port = serverPort;
  serverTaIpAddr.Address[0].Address[0].in_addr = serverIpAddr;
  serverConnection.UserDataLength = 0;
  serverConnection.UserData = 0;
  serverConnection.OptionsLength = 0;
  serverConnection.Options = 0;
  serverConnection.RemoteAddressLength = sizeof(TA_IP_ADDRESS);
  serverConnection.RemoteAddress = &serverTaIpAddr;

  // 把上述的地址与端口信息增加到I/O请求包中,增加连接信息
  TdiBuildConnect(pIrp, pTdiAddressDevObj, pTdiEndPointFileObject, NULL, NULL,
NULL, &serverConnection, 0);

  // 设置完成实例回调函数
  IoSetCompletionRoutine(pIrp, TdiCompletionRoutine, &connEvent, TRUE, TRUE,
TRUE);

  // 发送I/O请求包并等待执行
  status = IoCallDriver(pTdiAddressDevObj, pIrp);
  if (STATUS_PENDING == status)
  {
    KeWaitForSingleObject(&connEvent, Executive, KernelMode, FALSE, NULL);
  }
  return status;
}

// TDI TCP发送信息
NTSTATUS TdiSend(PDEVICE_OBJECT pTdiAddressDevObj, PFILE_OBJECT
pTdiEndPointFileObject, PUCHAR pSendData, ULONG ulSendDataLength)
{
  NTSTATUS status = STATUS_SUCCESS;
  KEVENT sendEvent;
  PIRP pIrp = NULL;
  IO_STATUS_BLOCK iosb = { 0 };
  PMDL pSendMdl = NULL;

  // 初始化事件
  KeInitializeEvent(&sendEvent, NotificationEvent, FALSE);

  // 创建I/O请求包:TDI_SEND
  pIrp = TdiBuildInternalDeviceControlIrp(TDI_SEND, pTdiAddressDevObj,
pTdiEndPointFileObject, &sendEvent, &iosb);
  if (NULL == pIrp)
  {
    return STATUS_INSUFFICIENT_RESOURCES;
  }
```

```
  // 创建MDL
  pSendMdl = IoAllocateMdl(pSendData, ulSendDataLength, FALSE, FALSE, pIrp);
  if (NULL == pSendMdl)
  {
    return STATUS_INSUFFICIENT_RESOURCES;
  }
  MmProbeAndLockPages(pSendMdl, KernelMode, IoModifyAccess);

  // 拓展I/O请求包,添加发送信息
  TdiBuildSend(pIrp, pTdiAddressDevObj, pTdiEndPointFileObject, NULL, NULL,
pSendMdl, 0, ulSendDataLength);

  // 设置完成实例回调函数
  IoSetCompletionRoutine(pIrp, TdiCompletionRoutine, &sendEvent, TRUE, TRUE,
TRUE);

  // 发送I/O请求包并等待执行
  status = IoCallDriver(pTdiAddressDevObj, pIrp);
  if (STATUS_PENDING == status)
  {
    KeWaitForSingleObject(&sendEvent, Executive, KernelMode, FALSE, NULL);
  }

  // 释放MDL
  if (pSendMdl)
  {
    IoFreeMdl(pSendMdl);
  }
  return status;
}

// TDI TCP接收信息
ULONG_PTR TdiRecv(PDEVICE_OBJECT pTdiAddressDevObj, PFILE_OBJECT
pTdiEndPointFileObject, PUCHAR pRecvData, ULONG ulRecvDataLength)
{
  NTSTATUS status = STATUS_SUCCESS;
  KEVENT recvEvent;
  PIRP pIrp = NULL;
  IO_STATUS_BLOCK iosb = { 0 };
  PMDL pRecvMdl = NULL;
  ULONG_PTR ulRecvSize = 0;

  // 初始化事件
  KeInitializeEvent(&recvEvent, NotificationEvent, FALSE);

  // 创建I/O请求包:TDI_SEND
  pIrp = TdiBuildInternalDeviceControlIrp(TDI_RECV, pTdiAddressDevObj,
pTdiEndPointFileObject, &recvEvent, &iosb);
  if (NULL == pIrp)
  {
    return STATUS_INSUFFICIENT_RESOURCES;
  }

  // 创建MDL
  pRecvMdl = IoAllocateMdl(pRecvData, ulRecvDataLength, FALSE, FALSE, pIrp);
```

```
  if (NULL == pRecvMdl)
  {
    return STATUS_INSUFFICIENT_RESOURCES;
  }
  MmProbeAndLockPages(pRecvMdl, KernelMode, IoModifyAccess);

  // 拓展I/O请求包,添加发送信息
  TdiBuildReceive(pIrp, pTdiAddressDevObj, pTdiEndPointFileObject, NULL, NULL,
pRecvMdl, TDI_RECEIVE_NORMAL, ulRecvDataLength);

  // 设置完成实例回调函数
  IoSetCompletionRoutine(pIrp, TdiCompletionRoutine, &recvEvent, TRUE, TRUE,
TRUE);

  // 发送I/O请求包并等待执行
  status = IoCallDriver(pTdiAddressDevObj, pIrp);
  if (STATUS_PENDING == status)
  {
    KeWaitForSingleObject(&recvEvent, Executive, KernelMode, FALSE, NULL);
  }

  // 获取实际接收的数据大小
  ulRecvSize = pIrp->IoStatus.Information;

  // 释放MDL
  if (pRecvMdl)
  {
    IoFreeMdl(pRecvMdl);
  }
  return status;
}

// TDI关闭释放
VOID TdiClose(PFILE_OBJECT pTdiEndPointFileObject, HANDLE hTdiAddress, HANDLE
hTdiEndPoint)
{
  if (pTdiEndPointFileObject)
  {
    ObDereferenceObject(pTdiEndPointFileObject);
  }
  if (hTdiEndPoint)
  {
    ZwClose(hTdiEndPoint);
  }
  if (hTdiAddress)
  {
    ZwClose(hTdiAddress);
  }
}
```

TDI 传输字符串: 服务端在应用层侦听，客户端是驱动程序，驱动程序加载后自动连接应用层并发送消息。

首先来看 `应用层(服务端)` 代码，具体我就不说了，来看教程的都是有基础的。

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

#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <winsock2.h>

#pragma comment(lib,"ws2_32.lib")
#define PORT 8888

int main(int argc, char *argv[])
{
  printf("hello lyshark.com \n");
  WSADATA WSAData;
  SOCKET sock, msgsock;
  struct sockaddr_in ServerAddr;

  if (WSAStartup(MAKEWORD(2, 0), &WSAData) != SOCKET_ERROR)
  {
    ServerAddr.sin_family = AF_INET;
    ServerAddr.sin_port = htons(PORT);
    ServerAddr.sin_addr.s_addr = INADDR_ANY;

    sock = socket(AF_INET, SOCK_STREAM, 0);
    int BindRet = bind(sock, (LPSOCKADDR)&ServerAddr, sizeof(ServerAddr));
    int LinsRet = listen(sock, 10);
  }

  while (1)
  {
    char buf[1024] = { 0 };
    msgsock = accept(sock, (LPSOCKADDR)0, (int *)0);
    memset(buf, 0, sizeof(buf));

    recv(msgsock, buf, 1024, 0);
    printf("内核返回: %s \n", buf);

    char send_buffer[1024] = { 0 };
    memset(send_buffer, 0, 1024);
    strcpy(send_buffer, "Hi,R0 !");
    send(msgsock, send_buffer, strlen(send_buffer), 0);
    closesocket(msgsock);
  }
  closesocket(sock);
  WSACleanup();
  return 0;
}
```

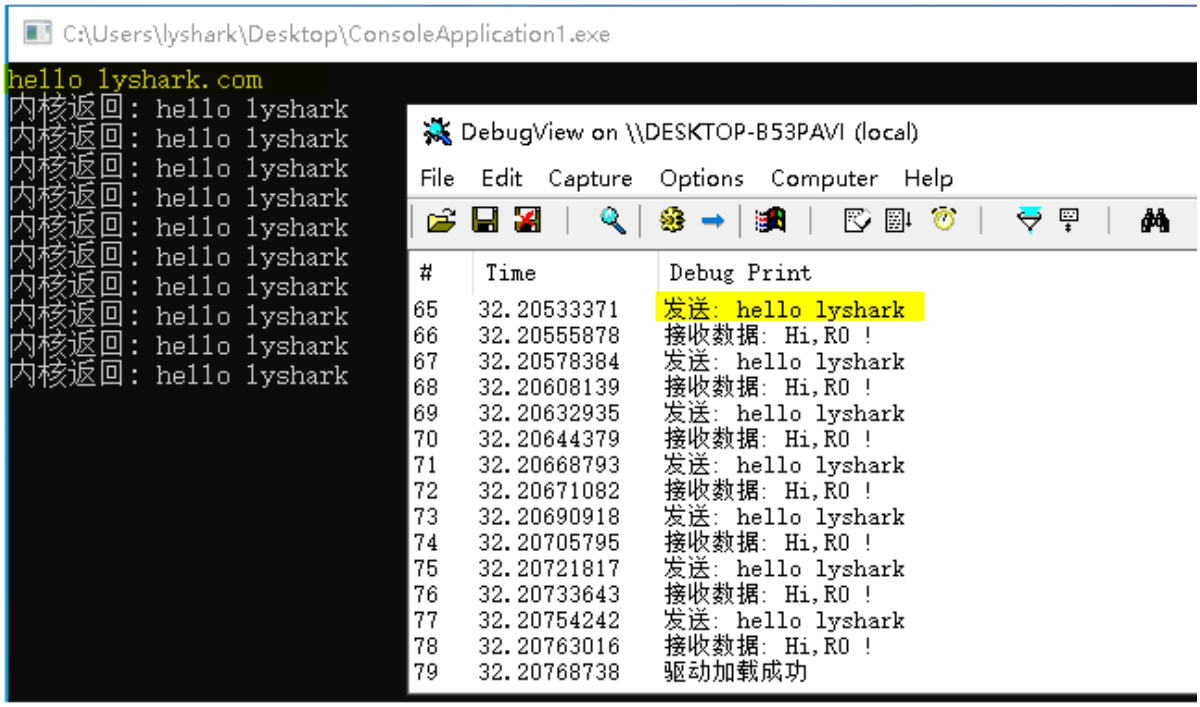
再来是驱动层代码，如下所示；

```
// 署名权
// right to sign one's name on a piece of work
// PowerBy: LyShark
```

```
// Email: me@lyshark.com

#include "MyTDI.hpp"

// 发送接收数据
NTSTATUS SendOnRecv()
{
  NTSTATUS status = STATUS_SUCCESS;
  HANDLE hTdiAddress = NULL;
  HANDLE hTdiEndPoint = NULL;
  PDEVICE_OBJECT pTdiAddressDevObj = NULL;
  PFILE_OBJECT pTdiEndPointFileObject = NULL;
  LONG pServerIp[4] = { 127, 0, 0, 1 };
  LONG lServerPort = 8888;
  UCHAR szSendData[] = "hello lyshark";
  ULONG ulSendDataLength = 1 + strlen(szSendData);
  HANDLE hThread = NULL;

  // TDI初始化
  status = TdiOpen(&pTdiAddressDevObj, &pTdiEndPointFileObject, &hTdiAddress,
&hTdiEndPoint);
  if (!NT_SUCCESS(status))
  {
    return STATUS_SUCCESS;
  }

  // TDI TCP连接服务器
  status = TdiConnection(pTdiAddressDevObj, pTdiEndPointFileObject, pServerIp,
lServerPort);
  if (!NT_SUCCESS(status))
  {
    return STATUS_SUCCESS;
  }

  // TDI TCP发送信息
  status = TdiSend(pTdiAddressDevObj, pTdiEndPointFileObject, szSendData,
ulSendDataLength);
  if (!NT_SUCCESS(status))
  {
    return STATUS_SUCCESS;
  }
  DbgPrint("发送: %s\n", szSendData);

  // 创建接收信息多线程, 循环接收信息

  char szRecvData[1024] = { 0 };
  ULONG ulRecvDataLenngth = 1024;
  RtlZeroMemory(szRecvData, ulRecvDataLenngth);

  // TDI TCP接收信息
  do
  {
    ulRecvDataLenngth = TdiRecv(pTdiAddressDevObj, pTdiEndPointFileObject,
szRecvData, ulRecvDataLenngth);
    if (0 < ulRecvDataLenngth)
    {
```

```
        DbgPrint("接收数据: %s\n", szRecvData);
        break;;
      }

    } while (TRUE);

    // 释放
    TdiClose(pTdiEndPointFileObject, hTdiAddress, hTdiEndPoint);
    return STATUS_SUCCESS;
}

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

NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    for (int x = 0; x < 10; x++)
    {
      SendOnRecv();
    }

    DbgPrint("驱动加载成功 \n");
    Driver->DriverUnload = UnDriver;
    return STATUS_SUCCESS;
}
```

首先运行应用层开启服务端侦听，然后运行驱动程序，会输出如下信息；



TDI 多线程收发包: 实现驱动内部发送数据包后开启一个线程用于等待应用层返回并输出结果，多线程收发在发送数据包后需要创建新的线程等待接收。

首先是服务端代码。

```
// 署名权
```

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

#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <winsock2.h>

#pragma comment(lib,"ws2_32.lib")
#define PORT 8888

int main(int argc, char *argv[])
{
    printf("hello lyshark.com \n");
    WSADATA WSAData;
    SOCKET sock, msgsock;
    struct sockaddr_in ServerAddr;

    if (WSAStartup(MAKEWORD(2, 0), &WSAData) != SOCKET_ERROR)
    {
        ServerAddr.sin_family = AF_INET;
        ServerAddr.sin_port = htons(PORT);
        ServerAddr.sin_addr.s_addr = INADDR_ANY;

        sock = socket(AF_INET, SOCK_STREAM, 0);
        int BindRet = bind(sock, (LPSOCKADDR)&ServerAddr, sizeof(ServerAddr));
        int LinsRet = listen(sock, 10);
    }

    while (1)
    {
        char buf[1024] = { 0 };
        msgsock = accept(sock, (LPSOCKADDR)0, (int *)0);
        memset(buf, 0, sizeof(buf));

        recv(msgsock, buf, 1024, 0);
        printf("内核返回: %s \n", buf);

        char send_buffer[1024] = { 0 };
        memset(send_buffer, 0, 1024);
        strcpy(send_buffer, "Hi,R0 !");
        send(msgsock, send_buffer, strlen(send_buffer), 0);
        closesocket(msgsock);
    }
    closesocket(sock);
    WSACleanup();
    return 0;
}
```

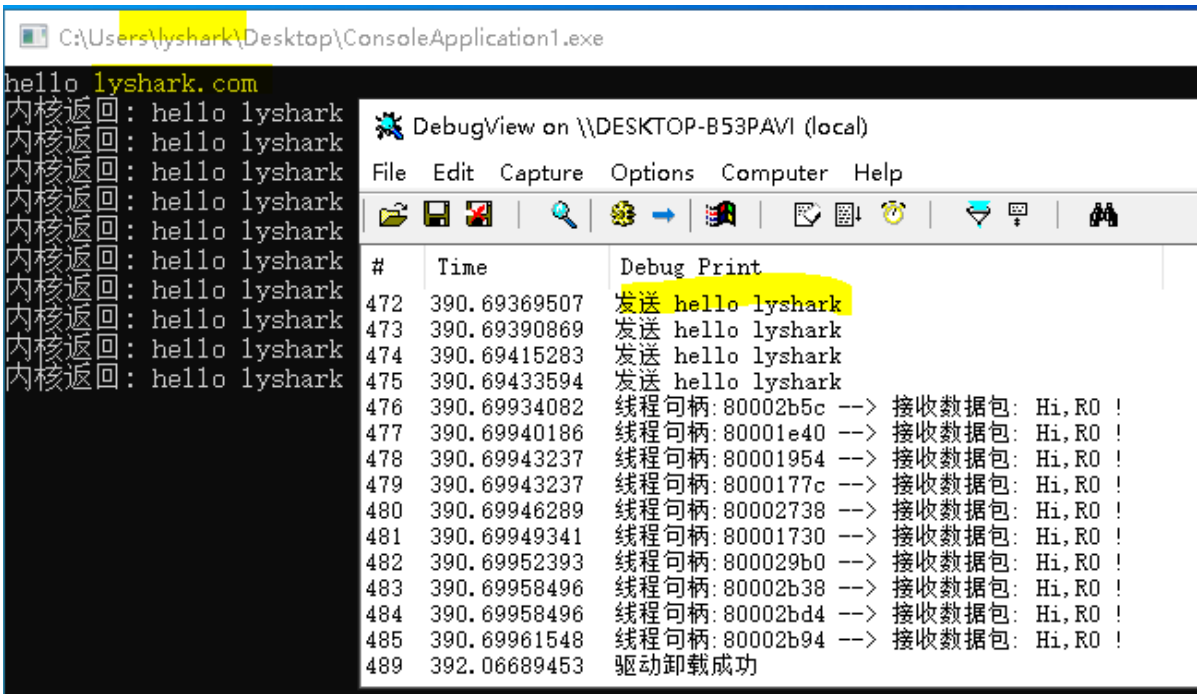
驱动程序代码如下，`RecvThreadProc`主要负责数据接收，`SendThreadData`负责数据发送。

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

```
#include "LySocket.hpp"

typedef struct _MY_DATA
{
    PDEVICE_OBJECT pTdiAddressDevObj;
    PFILE_OBJECT pTdiEndPointFileObject;
    HANDLE hTdiAddress;
    HANDLE hTdiEndPoint;
}MY_DATA, *PMY_DATA;

// 接收信息多线程
VOID RecvThreadProc(_In_ PVOID StartContext)
{
    PMY_DATA pMyData = (PMY_DATA)StartContext;
    NTSTATUS status = STATUS_SUCCESS;
    char szRecvData[1024] = { 0 };
    ULONG ulRecvDataLenngth = 1024;
    RtlZeroMemory(szRecvData, ulRecvDataLenngth);

    // TDI TCP接收信息
    do
    {
        ulRecvDataLenngth = TdiRecv(pMyData->pTdiAddressDevObj, pMyData->pTdiEndPointFileObject, szRecvData, ulRecvDataLenngth);
        if (0 < ulRecvDataLenngth)
        {
            DbgPrint("线程句柄:%x --> 接收数据包: %s\n", pMyData->hTdiEndPoint, szRecvData);
            break;;
        }

    } while (TRUE);

    // 释放
    TdiClose(pMyData->pTdiEndPointFileObject, pMyData->hTdiAddress, pMyData->hTdiEndPoint);
    ExFreePool(pMyData);
}

// 多线程发送
NTSTATUS SendThreadData()
{
    NTSTATUS status = STATUS_SUCCESS;
    HANDLE hTdiAddress = NULL;
    HANDLE hTdiEndPoint = NULL;
    PDEVICE_OBJECT pTdiAddressDevObj = NULL;
    PFILE_OBJECT pTdiEndPointFileObject = NULL;
    LONG pServerIp[4] = { 127, 0, 0, 1 };
    LONG lServerPort = 8888;
    UCHAR szSendData[] = "hello lyshark";
    ULONG ulSendDataLength = 1 + strlen(szSendData);
    HANDLE hThread = NULL;

    // TDI初始化
```

```
    status = TdiOpen(&pTdiAddressDevObj, &pTdiEndPointFileObject, &hTdiAddress,
&hTdiEndPoint);
    if (!NT_SUCCESS(status))
    {
        return STATUS_SUCCESS;
    }

    // TDI TCP连接服务器
    status = TdiConnection(pTdiAddressDevObj, pTdiEndPointFileObject, pServerIp,
lServerPort);
    if (!NT_SUCCESS(status))
    {
        return STATUS_SUCCESS;
    }

    // TDI TCP发送信息
    status = TdiSend(pTdiAddressDevObj, pTdiEndPointFileObject, szSendData,
ulSendDataLength);
    if (!NT_SUCCESS(status))
    {
        return STATUS_SUCCESS;
    }
    DbgPrint("发送 %s\n", szSendData);

    // 创建接收信息多线程，循环接收信息
    PMY_DATA pMyData = ExAllocatePool(NonPagedPool, sizeof(MY_DATA));
    pMyData->pTdiAddressDevObj = pTdiAddressDevObj;
    pMyData->pTdiEndPointFileObject = pTdiEndPointFileObject;
    pMyData->hTdiAddress = hTdiAddress;
    pMyData->hTdiEndPoint = hTdiEndPoint;

    PsCreateSystemThread(&hThread, 0, NULL, NtCurrentProcess(), NULL,
RecvThreadProc, pMyData);
}

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");

    for (int x = 0; x < 10; x++)
    {
        SendThreadData();
    }
    Driver->DriverUnload = UnDriver;
    return STATUS_SUCCESS;
}
```

运行应用层服务端等待侦听，运行驱动程序输出如下效果；



TDI 传数结构实现认证: 驱动内部发送结构体给应用层，应用层验证结构体成员，此功能可实现对驱动程序的控制机制，例如是否允许驱动加载卸载等，通常用于驱动辅助认证。

应用层代码

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

#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <winsock2.h>

#pragma comment(lib,"ws2_32.lib")
#define PORT 8888

// 传输结构体
typedef struct
{
    int uuid;
    char username[256];
    char password[256];
}SocketData;

int main(int argc, char *argv[])
{
    printf("hello lyshark.com \n");

    WSADATA WSAData;
    SOCKET sock, msgsock;
    struct sockaddr_in ServerAddr;

    if (WSAStartup(MAKEWORD(2, 0), &WSAData) != SOCKET_ERROR)
    {
        ServerAddr.sin_family = AF_INET;
```

```
        ServerAddr.sin_port = htons(PORT);
        ServerAddr.sin_addr.s_addr = INADDR_ANY;

        sock = socket(AF_INET, SOCK_STREAM, 0);
        int BindRet = bind(sock, (LPSOCKADDR)&ServerAddr, sizeof(ServerAddr));
        int LinsRet = listen(sock, 10);
    }

    while (1)
    {
        char buf[8192] = { 0 };
        msgsock = accept(sock, (LPSOCKADDR)0, (int *)0);
        memset(buf, 0, sizeof(buf));

        // 接收返回数据
        recv(msgsock, buf, sizeof(SocketData), 0);

        // 强转结构体
        SocketData* msg = (SocketData*)buf;

        printf("UUID = %d \n", msg->uuid);
        printf("名字 = %s \n", msg->username);
        printf("密码 = %s \n", msg->password);

        // 验证通过则继续使用
        if ((strcmp(msg->username, "lyshark") == 0) && (strcmp(msg->password,
"123") == 0))
        {
            char send_buffer[8192] = { 0 };
            memset(send_buffer, 0, 8192);
            strcpy(send_buffer, "success");
            send(msgsock, send_buffer, strlen(send_buffer), 0);
            closesocket(msgsock);
        }
        // 不通过则禁止驱动加载
        else
        {
            char send_buffer[8192] = { 0 };
            memset(send_buffer, 0, 8192);
            strcpy(send_buffer, "error");
            send(msgsock, send_buffer, strlen(send_buffer), 0);
            closesocket(msgsock);
        }
    }
    closesocket(sock);
    WSACleanup();
    return 0;
}
```

驱动层代码

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

```
#include "LySocket.hpp"

// 传输结构体
typedef struct
{
    int uuid;
    char username[256];
    char password[256];
}SocketData;

// 验证账号密码是否正确
BOOLEAN CheckDriver()
{
    NTSTATUS status = STATUS_SUCCESS;
    HANDLE hTdiAddress = NULL;
    HANDLE hTdiEndPoint = NULL;
    PDEVICE_OBJECT pTdiAddressDevObj = NULL;
    PFILE_OBJECT pTdiEndPointFileObject = NULL;
    LONG pServerIp[4] = { 127, 0, 0, 1 };
    LONG lServerPort = 8888;

    // TDI初始化
    status = TdiOpen(&pTdiAddressDevObj, &pTdiEndPointFileObject, &hTdiAddress,
&hTdiEndPoint);
    if (!NT_SUCCESS(status))
    {
        return STATUS_SUCCESS;
    }

    // TDI TCP连接服务器
    status = TdiConnection(pTdiAddressDevObj, pTdiEndPointFileObject, pServerIp,
lServerPort);
    if (!NT_SUCCESS(status))
    {
        return STATUS_SUCCESS;
    }

    SocketData ptr;

    RtlZeroMemory(&ptr, sizeof(SocketData));

    // 填充结构
    ptr.uuid = 1001;
    RtlCopyMemory(ptr.username, "lyshark", strlen("xxxxxxx"));
    RtlCopyMemory(ptr.password, "123123", strlen("xxxxxx"));

    // TDI TCP发送信息
    status = TdiSend(pTdiAddressDevObj, pTdiEndPointFileObject, &ptr,
sizeof(SocketData));
    if (!NT_SUCCESS(status))
    {
        return STATUS_SUCCESS;
    }

    // 创建接收信息多线程，循环接收信息
    char szRecvData[8192] = { 0 };
```

```
    ULONG ulRecvDataLenngth = 8192;
    RtlZeroMemory(szRecvData, ulRecvDataLenngth);

    // TDI TCP接收信息
    do
    {
        ulRecvDataLenngth = TdiRecv(pTdiAddressDevObj, pTdiEndPointFileObject,
szRecvData, ulRecvDataLenngth);
        if (0 < ulRecvDataLenngth)
        {
            DbgPrint("接收数据: %s\n", szRecvData);

            if (strncmp(szRecvData, "success", 7) == 0)
            {
                // 释放
                TdiClose(pTdiEndPointFileObject, hTdiAddress, hTdiEndPoint);
                return TRUE;
            }
            else if (strncmp(szRecvData, "error", 5) == 0)
            {
                // 释放
                TdiClose(pTdiEndPointFileObject, hTdiAddress, hTdiEndPoint);
                return FALSE;
            }
            break;;
        }
    } while (TRUE);

    // 释放
    TdiClose(pTdiEndPointFileObject, hTdiAddress, hTdiEndPoint);
    return STATUS_SUCCESS;
}

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");

    BOOLEAN ref = CheckDriver();

    if (ref == FALSE)
    {
        DbgPrint("[LyShark.com] 驱动已过期,无法加载 \n");
        Driver->DriverUnload = UnDriver;
        return STATUS_SUCCESS;
    }

    DbgPrint("[*] 驱动正常使用 \n");
    Driver->DriverUnload = UnDriver;
    return STATUS_SUCCESS;
}
```

运行应用层服务端，并运行驱动程序，则会验证该驱动是否合法，如果合法则加载不合法则拒绝；