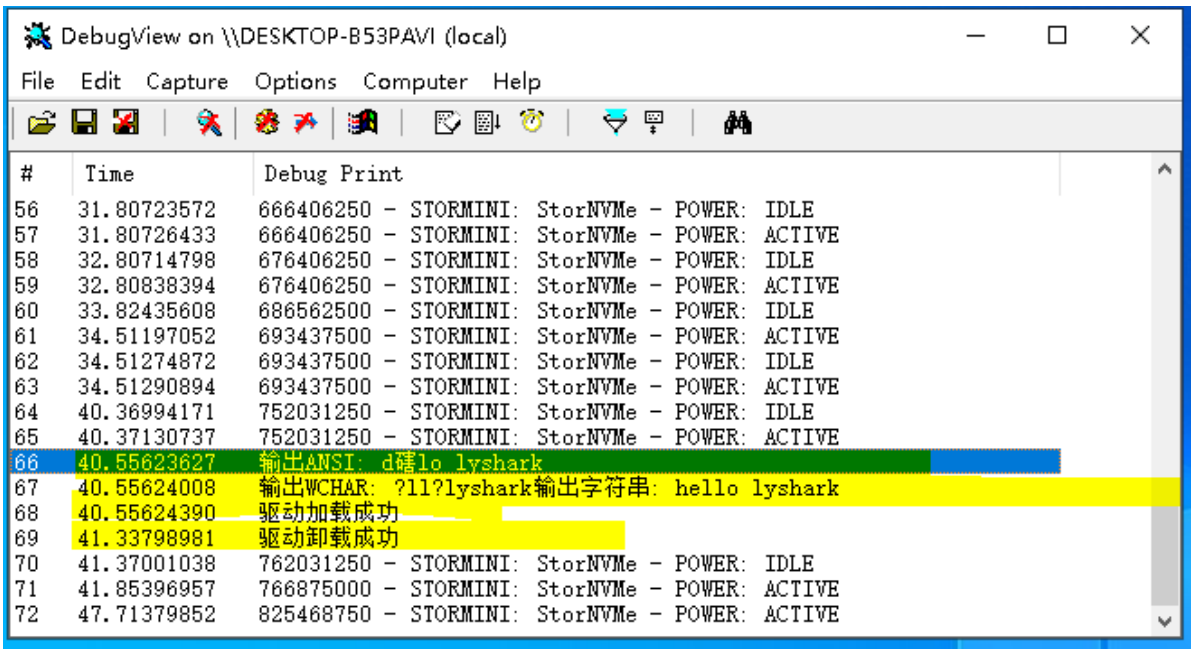
在内核编程中字符串有两种格式`ANSI_STRING`与`UNICODE_STRING`，这两种格式是微软推出的安全版本的字符串结构体，也是微软推荐使用的格式，通常情况下`ANSI_STRING`代表的类型是`char *`也就是ANSI多字节模式的字符串，而`UNICODE_STRING`则代表的是`wchar*`也就是UNCODE类型的字符，如下文章将介绍这两种字符格式在内核中是如何转换的。

在内核开发模式下`初始化字符串`也需要调用专用的初始化函数，如下分别初始化ANSI和UNCODE字符串，我们来看看代码是如何实现的。

```
#include <ntifs.h>
#include <ntstrsafe.h>

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

NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    // 定义内核字符串
    ANSI_STRING ansi;
    UNICODE_STRING unicode;
    UNICODE_STRING str;

    // 定义普通字符串
    char * char_string = "hello lyshark";
    wchar_t *wchar_string = (WCHAR*)"hello lyshark";

    // 初始化字符串的多种方式
    RtlInitAnsiString(&ansi, char_string);
    RtlInitUnicodeString(&unicode, wchar_string);
    RtlUnicodeStringInit(&str, L"hello lyshark");

    // 改变原始字符串（乱码位置，此处仅用于演示赋值方式）
    char_string[0] = (CHAR)"A";          // char类型每个占用1字节
    char_string[1] = (CHAR)"B";

    wchar_string[0] = (WCHAR)"A";         // wchar类型每个占用2字节
    wchar_string[2] = (WCHAR)"B";

    // 输出字符串 %Z
    DbgPrint("输出ANSI: %Z \n", &ansi);
    DbgPrint("输出WCHAR: %Z \n", &unicode);
    DbgPrint("输出字符串: %wZ \n", &str);

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

代码输出效果：

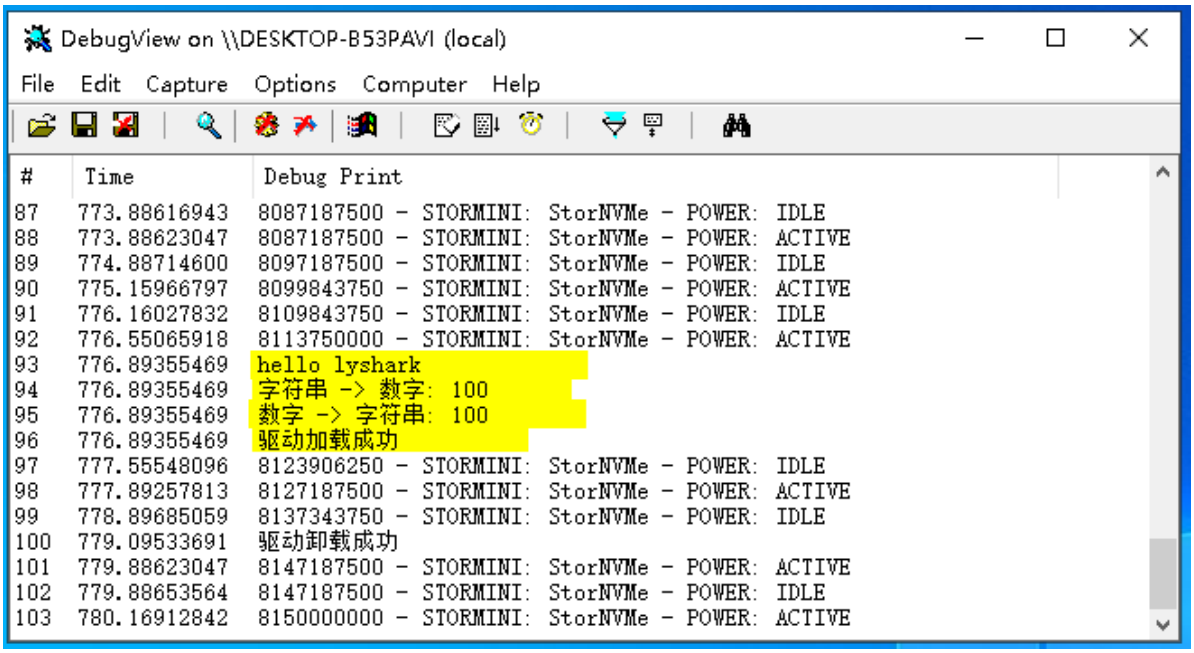



内核中还可实现 `字符串与整数` 之间的灵活转换，内核中提供了 `RtlUnicodeStringToInteger` 这个函数来实现 `字符串转整数`，与之对应的 `RtlIntegerToUnicodeString` 则是将 `整数转为字符串` 这两个内核函数也是非常常用的。

```
#include <ntifs.h>
#include <ntstrsafe.h>

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

// Power: lyshark
NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
  NTSTATUS flag;
  ULONG number;

  DbgPrint("hello lyshark \n");

  UNICODE_STRING uncode_buffer_source = { 0 };
  UNICODE_STRING uncode_buffer_target = { 0 };

  // 字符串转为数字
  // By: LyShark
  RtlInitUnicodeString(&uncode_buffer_source, L"100");
  flag = RtlUnicodeStringToInteger(&uncode_buffer_source, 10, &number);

  if (NT_SUCCESS(flag))
  {
    DbgPrint("字符串 -> 数字: %d \n", number);
  }

  // 数字转为字符串
  uncode_buffer_target.Buffer = (PWSTR)ExAllocatePool(PagedPool, 1024);
  uncode_buffer_target.MaximumLength = 1024;
```

```
  flag = RtlIntegerToUnicodeString(number, 10, &uncode_buffer_target);

  if (NT_SUCCESS(flag))
  {
    DbgPrint("数字 -> 字符串: %wZ \n", &uncode_buffer_target);
  }

  // 释放堆空间
  RtlFreeUnicodeString(&uncode_buffer_target);

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

代码输出效果:

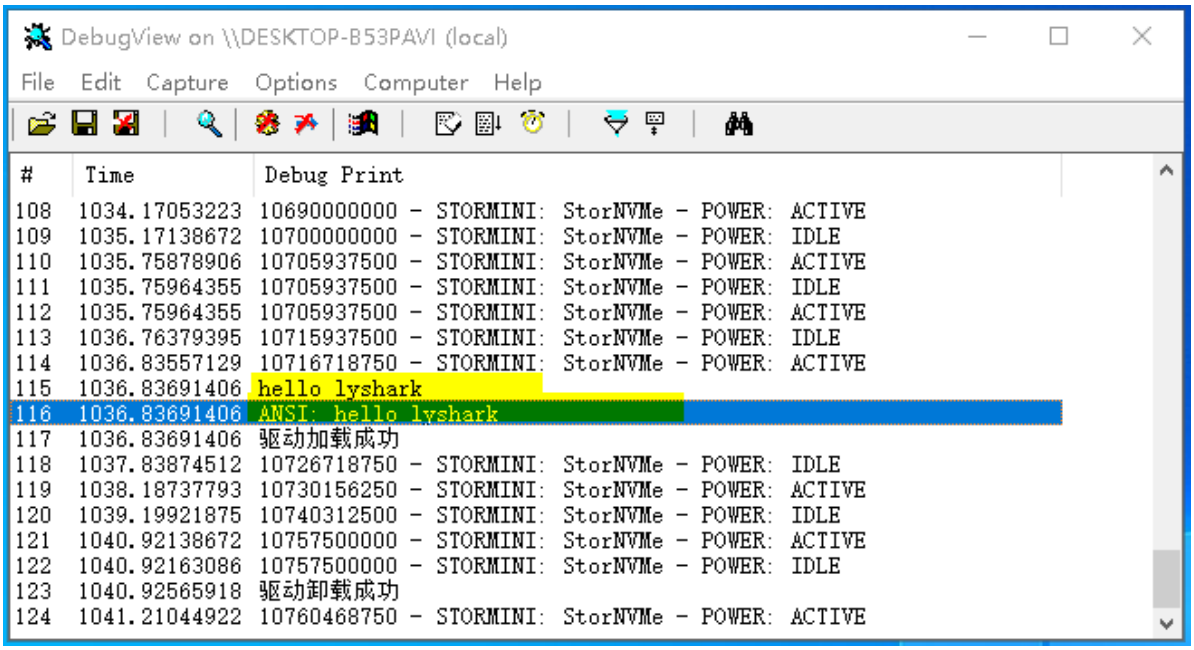



继续看另一种转换模式，将`UNICODE_STRING`结构转换成`ANSI_STRING`结构，代码中调用了`RtlUnicodeStringToAnsiString`内核函数，该函数也是微软提供的。

```
#include <ntifs.h>
#include <ntstrsafe.h>

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

// Power: lyshark
NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    DbgPrint("hello lyshark \n");

    UNICODE_STRING uncode_buffer_source = { 0 };
    ANSI_STRING ansi_buffer_target = { 0 };

    // 初始化 UNICODE 字符串
```

```
    RtlInitUnicodeString(&uncode_buffer_source, L"hello lyshark");

    // 转换函数
    NTSTATUS flag = RtlUnicodeStringToAnsiString(&ansi_buffer_target,
&uncode_buffer_source, TRUE);

    if (NT_SUCCESS(flag))
    {
        DbgPrint("ANSI: %Z \n", &ansi_buffer_target);
    }

    // 销毁ANSI字符串
    RtlFreeAnsiString(&ansi_buffer_target);

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

代码输出效果：

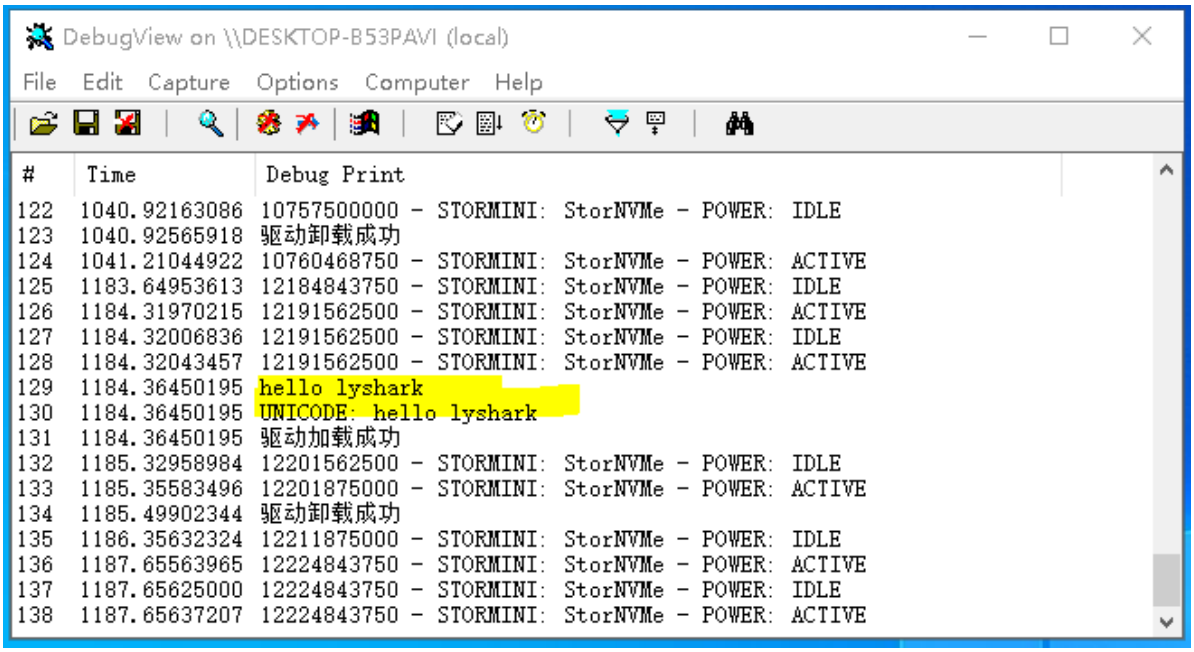



如果将上述过程反过来，将`ANSI_STRING`转换为`UNICODE_STRING`结构，则需要调用`RtlAnsiStringToUnicodeString`这个内核专用函数实现。

```
#include <ntifs.h>
#include <ntstrsafe.h>

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

// Power: lyshark
NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    DbgPrint("hello lyshark \n");
```

```
    UNICODE_STRING uncode_buffer_source = { 0 };
    ANSI_STRING ansi_buffer_target = { 0 };

    // 初始化字符串
    RtlInitString(&ansi_buffer_target, "hello lyshark");

    // 转换函数
    NTSTATUS flag = RtlAnsiStringToUnicodeString(&uncode_buffer_source,
&ansi_buffer_target, TRUE);
    if (NT_SUCCESS(flag))
    {
        DbgPrint("UNICODE: %wZ \n", &uncode_buffer_source);
    }

    // 销毁UNICODE字符串
    RtlFreeUnicodeString(&uncode_buffer_source);

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

代码输出效果：



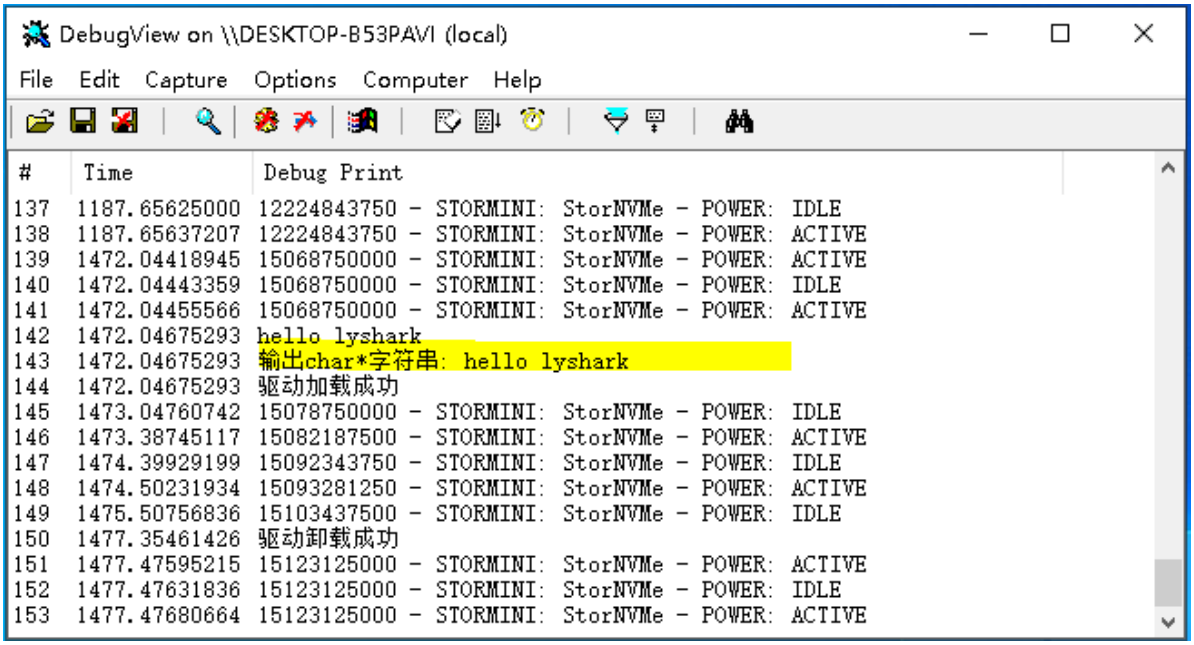

如上代码是内核通用结构体之间的转换类型，又是还需要将各类结构体转为普通的字符类型，例如下方的两个案例：

例如将`UNICODE_STRING`转为`CHAR*`类型。

```
#define _CRT_SECURE_NO_WARNINGS
#include <ntifs.h>
#include <windef.h>
#include <ntstrsafe.h>

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

```
// powerBY: LyShark
NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    DbgPrint("hello lyshark \n");

    UNICODE_STRING uncode_buffer_source = { 0 };
    ANSI_STRING ansi_buffer_target = { 0 };
    char szBuf[1024] = { 0 };

    // 初始化 UNICODE 字符串
    RtlInitUnicodeString(&uncode_buffer_source, L"hello lyshark");

    // 转换函数
    NTSTATUS flag = RtlUnicodeStringToAnsiString(&ansi_buffer_target,
&uncode_buffer_source, TRUE);

    if (NT_SUCCESS(flag))
    {
        strcpy(szBuf, ansi_buffer_target.Buffer);
        DbgPrint("输出char*字符串: %s \n", szBuf);
    }

    // 销毁ANSI字符串
    RtlFreeAnsiString(&ansi_buffer_target);

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

代码输出效果:




如果反过来，将 `CHAR*` 类型转为 `UNICODE_STRING` 结构呢，可以进行中转最终转为 `UNICODE_STRING` 结构体。

```
#define _CRT_SECURE_NO_WARNINGS
```

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

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

// powerBY: LyShark
NTSTATUS DriverEntry(IN PDRIVER_OBJECT Driver, PUNICODE_STRING RegistryPath)
{
    DbgPrint("hello lyshark \n");

    UNICODE_STRING uncode_buffer_source = { 0 };
    ANSI_STRING ansi_buffer_target = { 0 };

    // 设置CHAR*
    char szBuf[1024] = { 0 };
    strcpy(szBuf, "hello lyshark");

    // 初始化ANSI字符串
    RtlInitString(&ansi_buffer_target, szBuf);

    // 转换函数
    NTSTATUS flag = RtlAnsiStringToUnicodeString(&uncode_buffer_source,
&ansi_buffer_target, TRUE);
    if (NT_SUCCESS(flag))
    {
        DbgPrint("UNICODE: %wZ \n", &uncode_buffer_source);
    }

    // 销毁UNICODE字符串
    RtlFreeUnicodeString(&uncode_buffer_source);

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

代码输出效果:

DebugView on \\DESKTOP-B53PAVI (local)

File Edit Capture Options Computer Help

| # | Time | Debug Print |
|---|---|---|
| 160 | 1600.48962402 | 16353281250 - STORMINI: StorNVMe - POWER: IDLE |
| 161 | 1600.84045410 | 16356718750 - STORMINI: StorNVMe - POWER: ACTIVE |
| 162 | 1601.84057617 | 16366718750 - STORMINI: StorNVMe - POWER: IDLE |
| 163 | 1601.94750977 | 驱动卸载成功 |
| 164 | 1602.57849121 | 16374062500 - STORMINI: StorNVMe - POWER: ACTIVE |
| 165 | 1602.57934570 | 16374062500 - STORMINI: StorNVMe - POWER: IDLE |
| 166 | 1604.77258301 | hello lyshark |
| 167 | 1604.77258301 | UNICODE: hello lyshark |
| 168 | 1604.77258301 | 驱动加载成功 |
| 169 | 1604.78942871 | 16396250000 - STORMINI: StorNVMe - POWER: ACTIVE |
| 170 | 1604.78967285 | 16396250000 - STORMINI: StorNVMe - POWER: IDLE |
| 171 | 1604.78979492 | 16396250000 - STORMINI: StorNVMe - POWER: ACTIVE |
| 172 | 1605.79370117 | 16406250000 - STORMINI: StorNVMe - POWER: IDLE |
| 173 | 1606.07885742 | 16409062500 - STORMINI: StorNVMe - POWER: ACTIVE |
| 174 | 1607.05871582 | 驱动卸载成功 |
| 175 | 1607.08361816 | 16419218750 - STORMINI: StorNVMe - POWER: IDLE |
| 176 | 1607.58032227 | 16424062500 - STORMINI: StorNVMe - POWER: ACTIVE |