

上海交通大学

SHANGHAI JIAO TONG UNIVERSITY

实验报告

LAB REPORT



数据通信

Winsock ex1

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一、实验要求

Task 1: Write a sockets program to get the host name for a given IP address.

Project name: gethostname

Command: gethostname (printing out the host name of your local computer)

Command: gethostname xxx.xxx.xxx.x (printing out the host name of a remote host)

Task 2: Write a sockets program to get the IP address of a given host name.

Project name: gethostaddress

Command: gethostaddress www.sjtu.edu.cn

二、实验原理

1、GetHostAddress 基本步骤

- (1) 创建 Winsock 应用
- (2) 初始化 Winsock
- (3) 获取 hostname 结果保存在 result 中，使用 getaddrinfo 函数，并关闭 Winsock
- (4) 打印地址信息，result 以链表储存该信息，每一个节点存放一个 ip 及其信息

2、核心函数 getaddrinfo

```
/* int WSAAPI getaddrinfo (
    _In_opt_ PCSTR pNodeName, //host (node) name or a numeric host address string
    _In_opt_ PCSTR pServiceName, //a service name or port number represented as a string
    _In_opt_ const ADDRINFOA *pHints, // provides hints about the type of socket the caller supports
    _Out_ PADDRINFOA *ppResult // A pointer to a linked list of one or more addrinfo structures
                                   // that contains response information about the host.
); */
```

因此传入的第一个参数是 hostname，第二个是端口号也就是服务号，第三个是已定义好的 hints，最后一个是返回的 result 链表。在链表的每一个节点中，是如下的结构：

```

typedef struct addrinfo {
    int          ai_flags;        //indicate options used in the getaddrinfo function
    int          ai_family;       //AF_INET or AF_INET6,
    int          ai_socktype;     //SOCK_STREAM, SOCK_DGRAM
    int          ai_protocol;     //IPPROTO_TCP, IPPROTO_UDP
    size_t       ai_addrlen;      //
    char         *ai_canonname;   //The canonical name for the host.
    struct sockaddr *ai_addr;     //A pointer to a sockaddr structure
    struct addrinfo *ai_next;     //A pointer to the next structure in a linked list
} ADDRINFOA, *PADDRINFOA;

```

这些信息在第 4 步中都会打印出来。

3、GetHostName 基本步骤

- (1) 创建 Winsock 应用
- (2) 初始化 Winsock
- (3) 处理没有参数的情况，即返回本机 hostname
- (4) 从本机或远端获得 hostname
- (5) 打印 hostname
- (6) 关闭 Winsock

4、核心函数 gethostname、getnameinfo

```

int gethostname(
    _Out_ char *name, //A pointer to a buffer that receives the local host name.
    _In_  int  namelen //The length, in bytes, of the buffer pointed to by the name parameter.
);

```

If no error occurs, **gethostname** returns zero.

gethostname 用于处理无参数的情况，得到本机 hostname，成功则返回 0.

```

int WSAAPI getnameinfo(
    _In_  const struct sockaddr FAR *sa, //A pointer to a socket address structure
    _In_  socklen_t                  salen, //length of sockaddr structure in bytes
    _Out_ char FAR                   *host, //
    _In_  DWORD                       hostlen, //
    _Out_ char FAR                   *serv, //
    _In_  DWORD                       servlen, //
    _In_  int                         flags //used to customize processing of the getnameinfo function
);

```

Getnameinfo 用于有参数情况，输入 ip 地址，得到主机名及服务信息，成功则返回 0.

三、实验结果

1、gethostaddress

```

C:\Users\hp\Desktop\数据通信\winsock_ex1\GetHostAddress\Debug>GetHostAddress www.baidu.com 80
Calling getaddrinfo with following parameters:
    nodename = www.baidu.com
    servname (or port) = 80

getaddrinfo returned success
getaddrinfo response 1
    Flags: 0x0
    Family: AF_INET (IPv4)
    IPv4 address 115.239.210.27
    port = 80
    Socket type: SOCK_STREAM (stream)
    Protocol: IPPROTO_TCP (TCP)
    Length of this sockaddr: 16
    Canonical name: (null)
getaddrinfo response 2
    Flags: 0x0
    Family: AF_INET (IPv4)
    IPv4 address 115.239.211.112
    port = 80
    Socket type: SOCK_STREAM (stream)
    Protocol: IPPROTO_TCP (TCP)
    Length of this sockaddr: 16
    Canonical name: (null)

```

```

C:\windows\system32\cmd.exe
C:\Users\hp\Desktop\数据通信\winsock_ex1\GetHostAddress\Debug>GetHostAddress laptop-2eq8gq4u 80
Calling getaddrinfo with following parameters:
    nodename = laptop-2eq8gq4u
    servname (or port) = 80

getaddrinfo returned success
getaddrinfo response 1
    Flags: 0x0
    Family: AF_INET6 (IPv6)
    IPv6 address fe80::81c4:71db:2205:35d
    port = 80
    Socket type: SOCK_STREAM (stream)
    Protocol: IPPROTO_TCP (TCP)
    Length of this sockaddr: 28
    Canonical name: (null)
getaddrinfo response 2
    Flags: 0x0
    Family: AF_INET6 (IPv6)
    IPv6 address fe80::e0f1:532f:fee4:305b
    port = 80
    Socket type: SOCK_STREAM (stream)
    Protocol: IPPROTO_TCP (TCP)
    Length of this sockaddr: 28
    Canonical name: (null)
getaddrinfo response 3
    Flags: 0x0
    Family: AF_INET6 (IPv6)
    IPv6 address fe80::f4b3:6286:94ce:f20e
    port = 80
    Socket type: SOCK_STREAM (stream)
    Protocol: IPPROTO_TCP (TCP)
    Length of this sockaddr: 28
    Canonical name: (null)
getaddrinfo response 4
    Flags: 0x0
    Family: AF_INET6 (IPv6)
    IPv6 address fe80::b97c:e7ab:d220:1988
    port = 80
    Socket type: SOCK_STREAM (stream)

```

2、gethostname

```
C:\windows\system32\cmd.exe
Microsoft Windows [版本 10.0.17134.706]
(c) 2018 Microsoft Corporation。保留所有权利。

C:\Users\hp>cd C:\Users\hp\Desktop\数据通信\winsock_ex1\GetHostName\Debug

C:\Users\hp\Desktop\数据通信\winsock_ex1\GetHostName\Debug>GetHostName 127.0.0.1
getnameinfo returned hostname = LAPTOP-2EQ8GQ4U

C:\Users\hp\Desktop\数据通信\winsock_ex1\GetHostName\Debug>GetHostName
Local Host Name : LAPTOP-2EQ8GQ4U

C:\Users\hp\Desktop\数据通信\winsock_ex1\GetHostName\Debug>GetHostName 8.8.8.8
getnameinfo returned hostname = google-public-dns-a.google.com

C:\Users\hp\Desktop\数据通信\winsock_ex1\GetHostName\Debug>
```

四、实验总结

这次的实验主要是基本了解了一下 Winsock 的基本步骤，简单运用了获取地址和获取主机名的几个函数，并对结果进行处理后输出。由于代码是老师给的样例，所以细节的代码都没有自己写过，只能是通过看代码学习一下整体框架、原理、步骤，以便之后的实验中如果碰到相似的步骤可以重用代码。之前我自己 socket 编程用的是 python，但是 python 给的是封装地更好的 API，C++ 的 Winsock 相对来讲更底层一些，对于我们学习 socket 编程和数据通信原理很有帮助。