Lab05 DNS resolver

3/19/2017

Tasks for Lab05

1. Find the fore mentioned header files in your system
   - in.h, types.h, netdb.h, endian.h, socket.h, …
2. Find the ***host byte order*** of your machine
3. Use ***man*** to learn the usage of
   - netstat, ifconfig, ping, traceroute

Tasks for Lab05

4. Write a program to find the DNS information of a given host (需验收)
   - The host may be specified in domain name or IP address, e.g.,
     - ./<*exefile*> www.baidu.com
     - ./<*exefile*> 8.8.8.8
   - Use *gethostbyaddr()* and *gethostbyname()*
   - Your program shall list the official name, all the aliases, all the IP addresses in numbers-and-dots format

Framework (for reference)

```
#include <xxx.h>
#include <yyy.h>
……

int main (int argc, char *argv[]){
    struct hostent *h;
    ……
    if (#some fault-tolerance conditions#){
            h = gethostbyname(argv[1]);
    }
    else{
            printf("Fault ! ");
    }
    printf("Official name is: %s", h->h_name);
    printf("……", ……);
}
```

Useful headers

Some Parameters

Get it !

Some Fault-tolerance

Print the Info one by one

Review Host entry

- The return of *gethostbyaddr()* and *gethostbyname()* is a "hostent". Try to print each item in this struct.
- You can find the details using "*man*" in Linux or search it on Google.

```
/* Description of data base entry for a single host.  */
struct hostent{
  char *h_name;                 /* Official name of host.*/
  char **h_aliases;             /* Alias list.*/
  int h_addrtype;               /* Host address type.*/
  int h_length;                 /* Length of address.*/
  char **h_addr_list;           /* List of addresses from name server.*/
#define h_addr  h_addr_list[0]  /* The first address in the address list.*/
};
```

Output(1)

- Getting what we need…

```
student@BUPTIA:~$ gcc -o resolver HostInfo.c
student@BUPTIA:~$ ./resolver v.qq.com
Localhost DNS address is: BUPTIA
Looking information for host: v.qq.com
        Official host name: p21.tcdn.qq.com

        Host aliases:v.qq.com
        Host aliases:v.tc.qq.com
        Host aliases:v.tcdn.qq.com

        IP address 1 is: 218.30.98.22
        IP address 2 is: 220.181.91.150
        IP address 3 is: 218.30.98.20
        IP address 4 is: 106.38.181.144
        IP address 5 is: 106.38.181.157
        IP address 6 is: 218.30.98.21
        IP address 7 is: 220.181.91.152
student@BUPTIA:~$
```

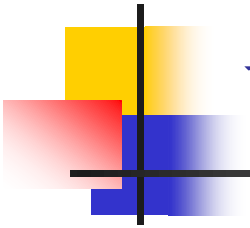
```
student@BUPTIA:~$ ./resolver 211.68.68.2
Localhost DNS address is: BUPTIA
Looking information for host: 211.68.68.2
        Official host name: mx1.bupt.edu.cn

        IP address 1 is: 211.68.68.2
student@BUPTIA:~$
```

```
student@BUPTIA:~$ ./resolver 8.8.8.8
Localhost DNS address is: BUPTIA
Looking information for host: 8.8.8.8
       Official host name: google-public-dns-a.google.com

       IP address 1 is: 8.8.8.8
student@BUPTIA:~$
```

Output(2)

- Some times we can not get information on IP address given

```
student@BUPTIA:~$ ./resolver www.baidu.com
Localhost DNS address is: BUPTIA
Looking information for host: www.baidu.com
Official host name: www.a.shifen.com
         Host aliases:www.baidu.com

 IP address 1 is: 220.181.111.188
 IP address 2 is: 220.181.112.244
student@BUPTIA:~$ ./resolver 220.181.111.188
Localhost DNS address is: BUPTIA
Looking information for host: 220.181.111.188
No further host IP information found for: 220.181.111.188
student@BUPTIA:~$
```



一些提示(1)

- 指针 vs. 数组
  - 指针：变量的地址
  - 数组：具有相同类型，且按顺序排列的一组变量的集合

    - char name[5]="Alice";
    - char *name_ptr;
      name_ptr= name;

      *name_ptr = name[0] ='A'

一些提示(2)

- 命令行：在操作系统状态下，为执行某个程序而键入的一行字符
- 命令行一般形式：命令名　参数1　参数2.....参数n

```
$ .\copy   source.c   temp.c
```

```
main(int   argc,  char  *argv[])
{   ……
}
```

命令行中参数个数

元素指向命令行参数中各字符串首地址

argv[0]: 可执行文件名
argv[1]: 参数1
argv[2]: 参数2
……

```
$ .\gethost   www.baidu.com
```

argc: 2
argv[0]: “gethost”
argv[1]: www.baidu.com
argv[2]: NULL

一些提示(3)

- 如何判命令行输入的是domain name还是IP地址？
  - 看inet_aton()的返回值

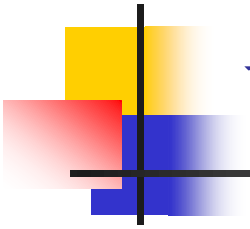
```
#include <arpa/inet.h>
int inet_aton (const char *string, struct in_addr *address);
```

1 – valid string
0– error

Pointer to the string that contains the address in numbers-and-dots notation

Pointer to a long integer into which the binary value is placed

- DNS查询后返回的是指向一个struct hostent的指针，如何引用struct中的分量？
  - struct hostent *ptr;
  - ptr->h_length

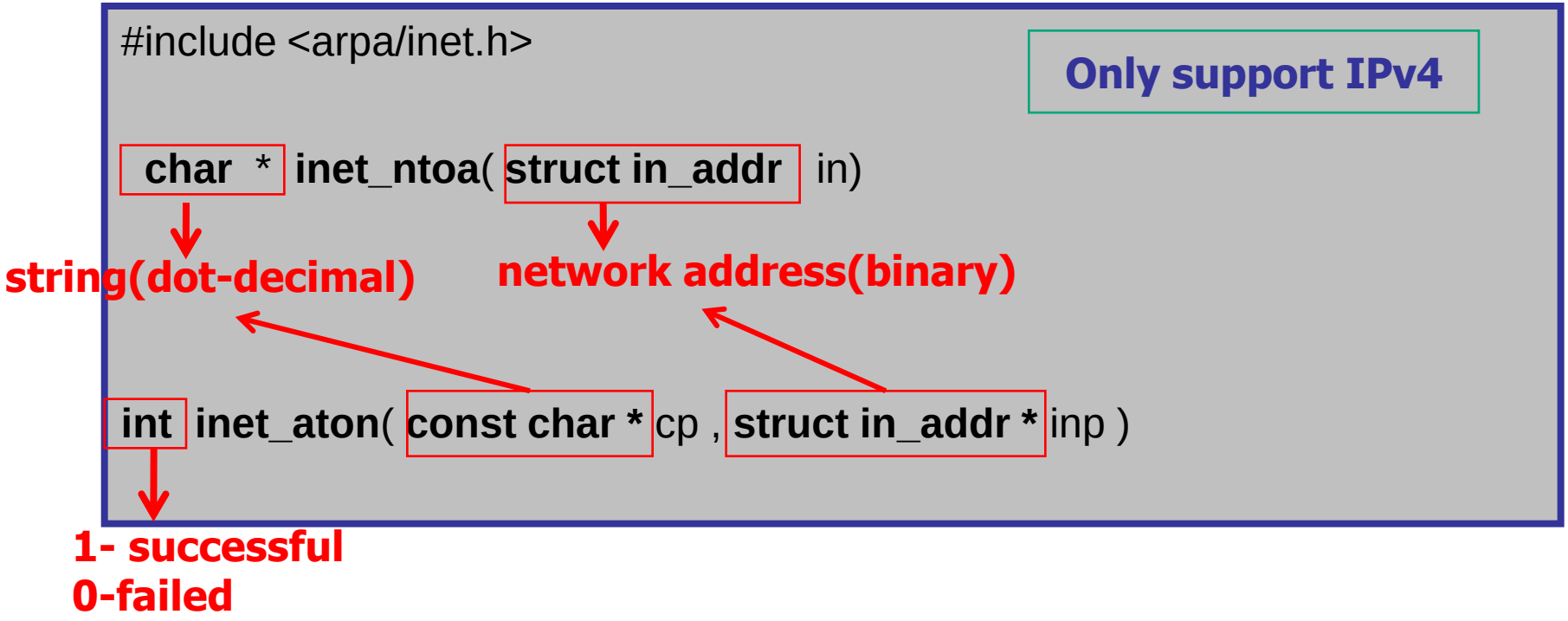


一些提示(3)

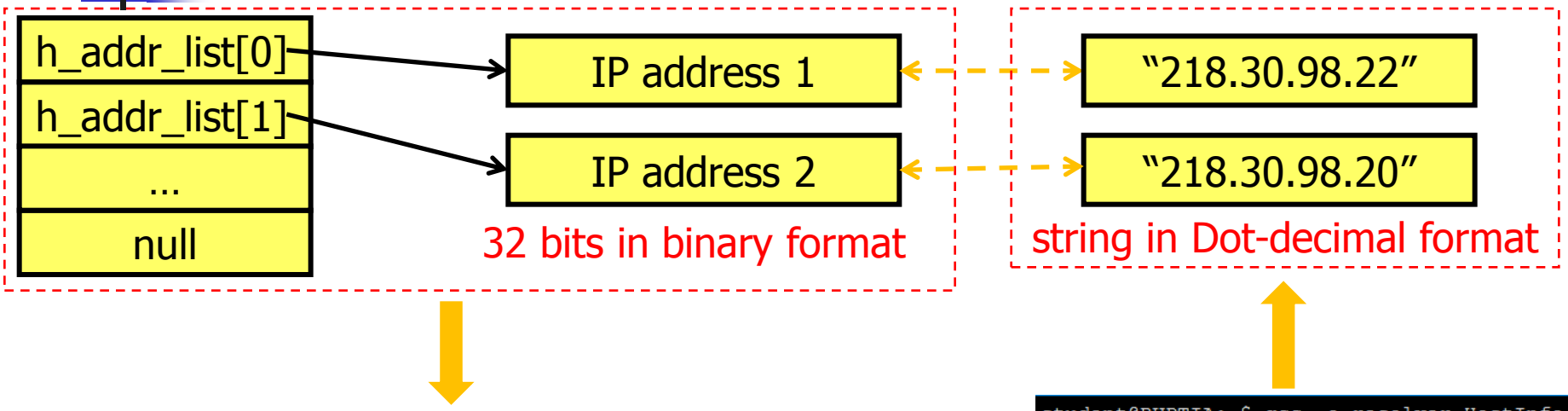
- 如何访问到alias列表和IP地址列表中的每个值？
  - for (p=ptr->h_alias; *p!=NULL; p++)
- 如何打印IP地址？
  - inet_ntoa ()或inet_ntop ()
- 段错误：程序要访问的内存超出了系统给这个程序的内存空间。指针没有初始化是一个常见的原因。

一些提示(4)

- Conversion between binary data (unsigned long) and dot-decimal notation

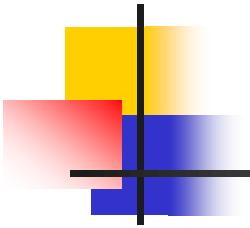


一些提示(5)




```
struct in_addr *ip;
ip = (struct in_addr *)(h_addr_list[0]);
printf(" IP address 1 is: %s\n", inet_ntoa( *ip ));
ip = (struct in_addr *)(h_addr_list[1]);
printf(" IP address 2 is: %s\n", inet_ntoa( *ip ));
...
```

```
student@BUPTIA:~$ gcc -o resolver HostInfo.c
student@BUPTIA:~$ ./resolver v.qq.com
Localhost DNS address is: BUPTIA
Looking information for host: v.qq.com
Official host name: p21.tcdn.qq.com
        Host aliases:v.qq.com

        Host aliases:v.tc.qq.com

        Host aliases:v.tcdn.qq.com

 IP address 1 is: 218.30.98.22
 IP address 2 is: 218.30.98.20
 IP address 3 is: 106.38.181.157
 IP address 4 is: 218.30.98.21
 IP address 5 is: 220.181.91.150
 IP address 6 is: 106.38.181.144
 IP address 7 is: 220.181.91.152

student@BUPTIA:~$
```



一些提示(6)

- 可以使用8.8.8.8作为逆向解析对象
- 或者学习使用nslookup命令，先查询某个域名的IP地址，再查询其IP地址是否可以逆向解析