基于嵌入式Web服务器监控系统的研究与设计

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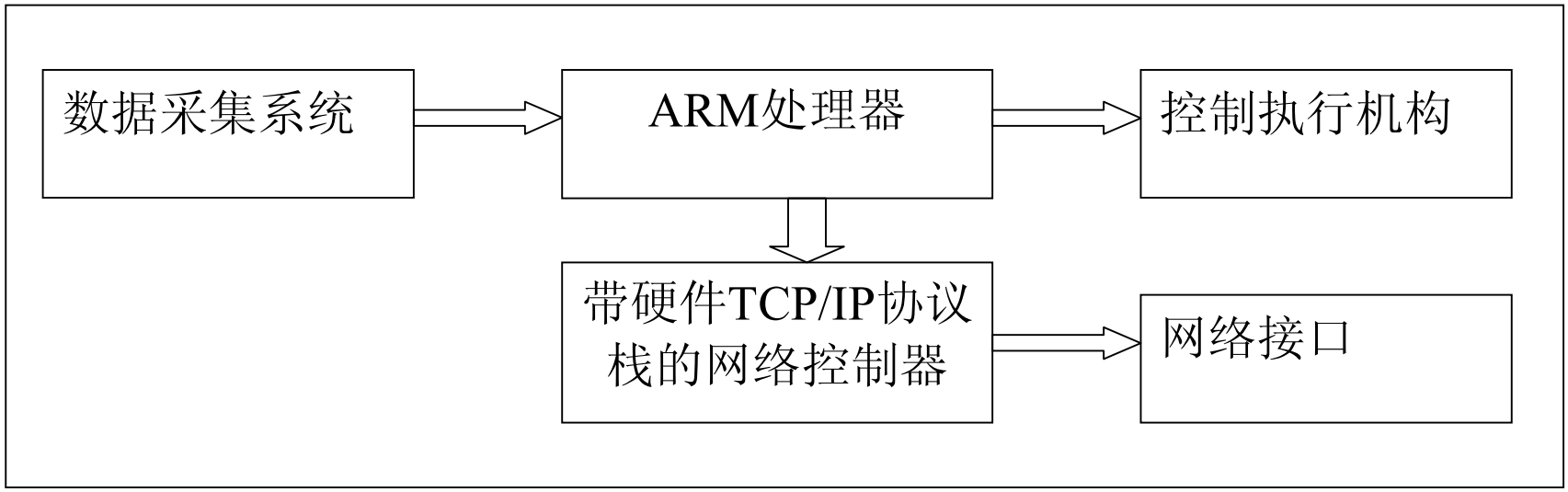
- 专　　业：通信工程
- 姓　　名：罗　龙

主要内容

- 1、方案选择
- 2、硬件设计
- 3、软件设计
- 4、功能演示
- 5、实物欣赏
- 6、设计总结

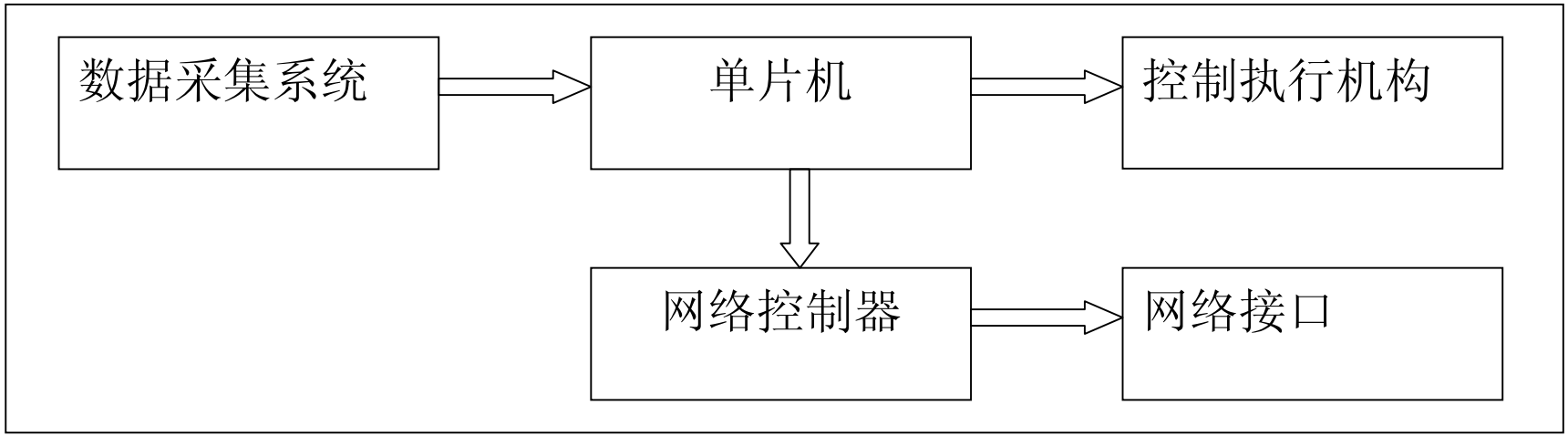
方案一



优点：CPU负担小、数据传输快、功能强

缺点：成本高、体积大、功耗大

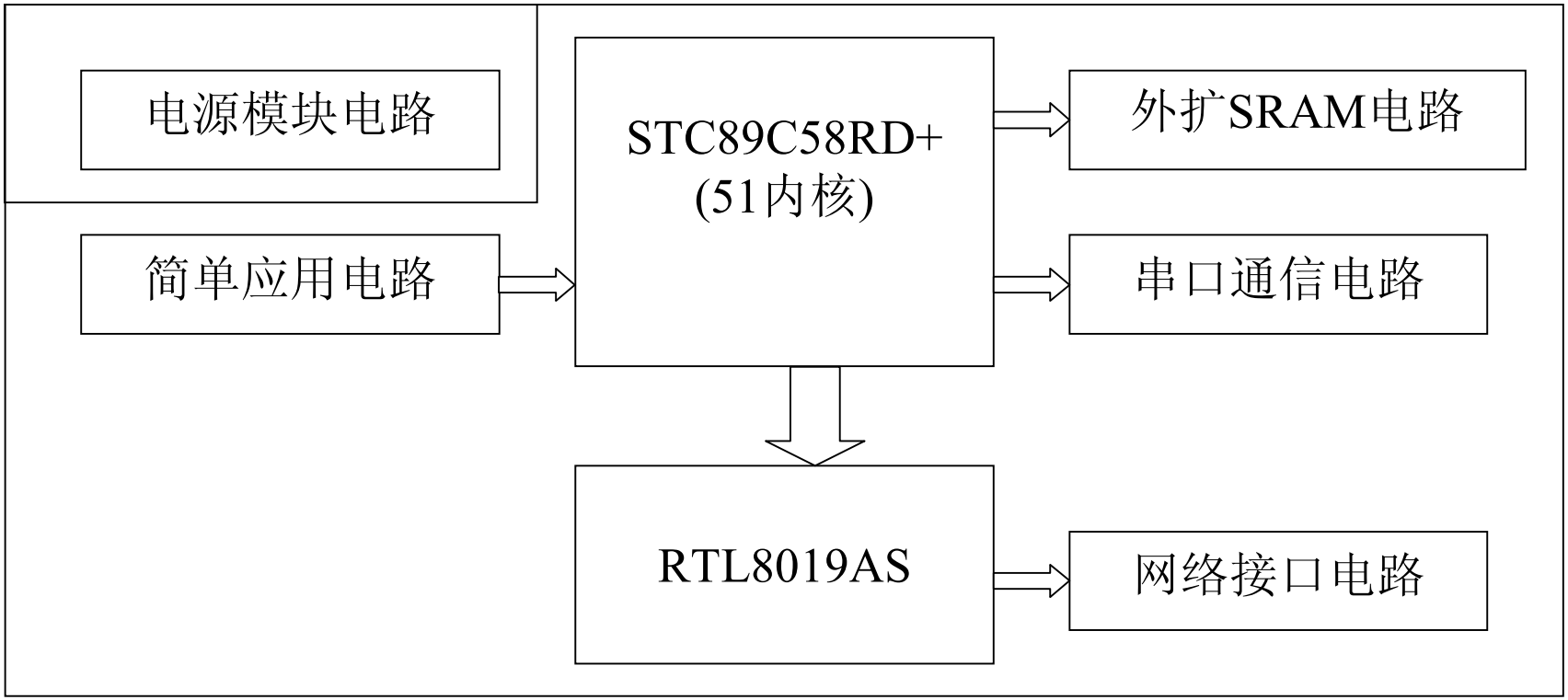
方案二



优点：开发简单、成本低、功耗低、应用广泛

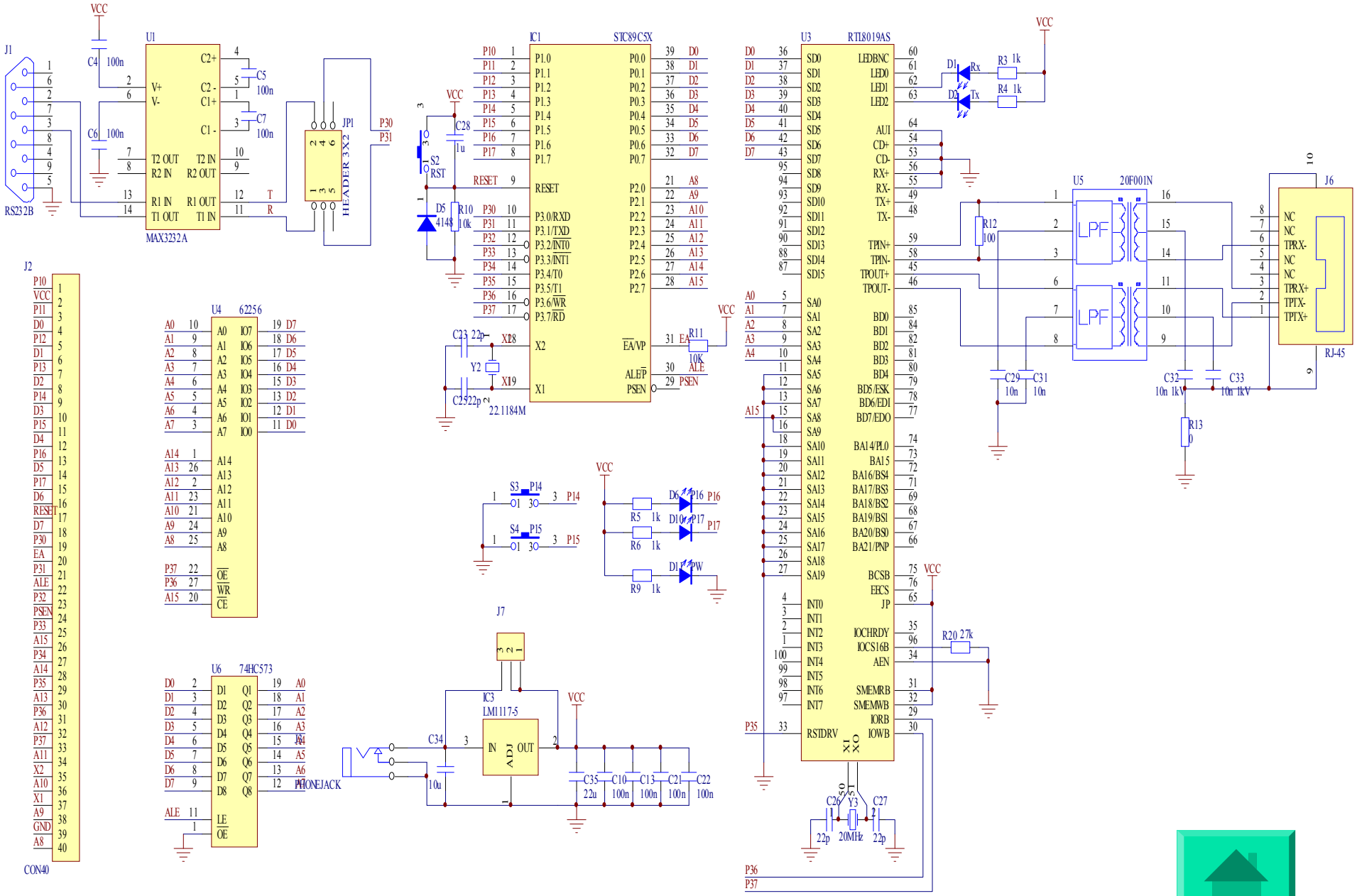
缺点： CPU负担重、速度慢

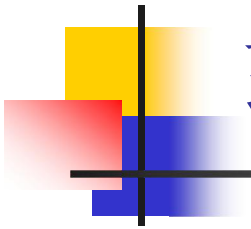
硬件设计



8019： 实现底层协议DLC、MAC，并提供网络接口

89C58：实现嵌入式TCP/IP协议栈和具体的应用

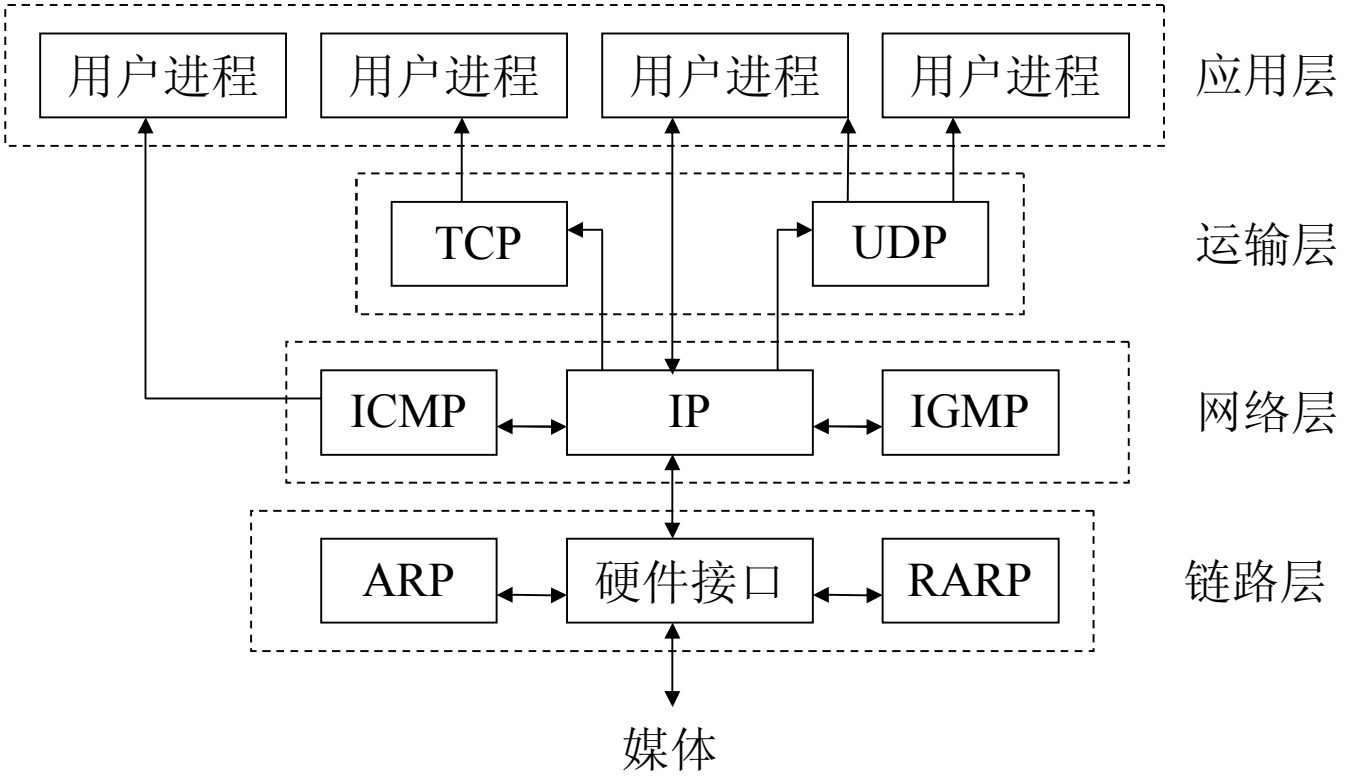

VCC
U1
MAX3232A
RS232B
C4 100n
C5 100n
C6 100n
C7 100n
JP1
HEADER 3X2
P30
P31
T
R
IC1
STC89C5X
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
RESET
P3.0/RXD
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P3.6/WR
P3.7/RD
X2
X1
EA/VP
ALE/P
PSEN
C28 1u
S2 RST
D5 4148
R10 10k
C23 22p
C22 22p
Y2
22.1184M
R11 10K
U3
RTL8019AS
LEDBNC
LED0
LED1
LED2
AUI
CD+
CD-
RX+
RX-
TX+
TX-
TPIN+
TPIN-
TPOUT+
TPOUT-
BCSB
EECS
JP
IOCHRDY
IOCS16B
AEN
SMEMRB
SMEMWB
IORB
IOWB
RSTDRV
X1
XO
D1 Rx
D2 Tx
R3 1k
R4 1k
R12 100
U5 20F001N
LPF
C29 10n
C31 10n
C32 10n 1kV
C33 10n 1kV
R13 0
J6
RJ-45
NC
TPRX-
TPRX+
TPTX-
TPTX+
R20 27k
C26 22p
Y3 20MHz
C27 22p
J2
CON40
U4 62256
U6 74HC573
PHONEJACK
S3 P14
S4 P15
D6 P16
D10 P17
D14 PW
R5 1k
R6 1k
R9 1k
J7
IC3
LM1117-5
ADJ
IN
OUT
C34 10u
C35 22u
C10 100n
C13 100n
C21 100n
C22 100n



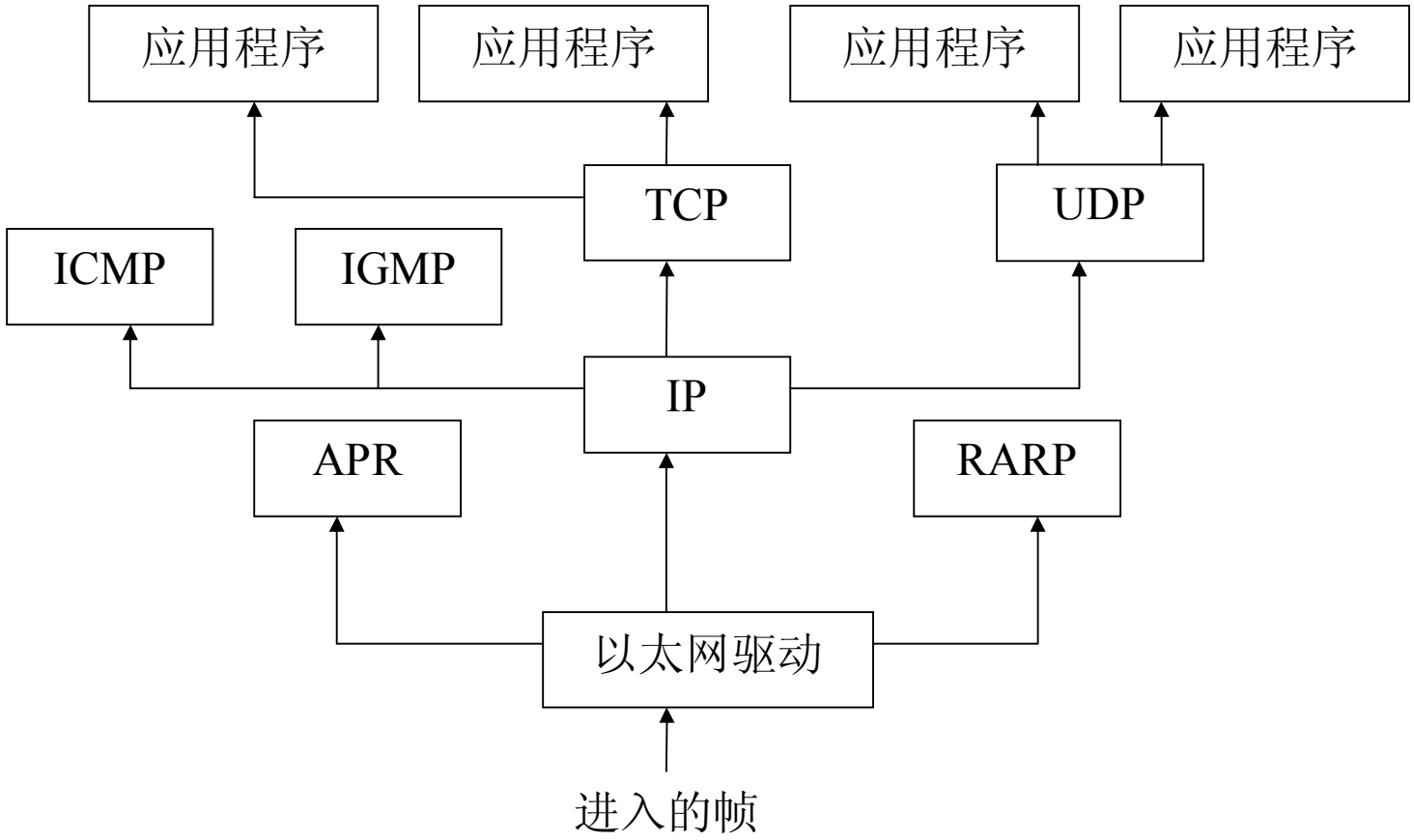
软件设计

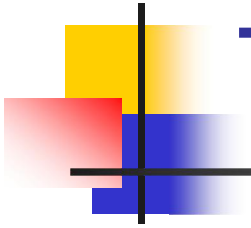
核心:TCP/IP

TCP/IP参考模型分层



数据帧的分用





TCP/IP的核心-TCP

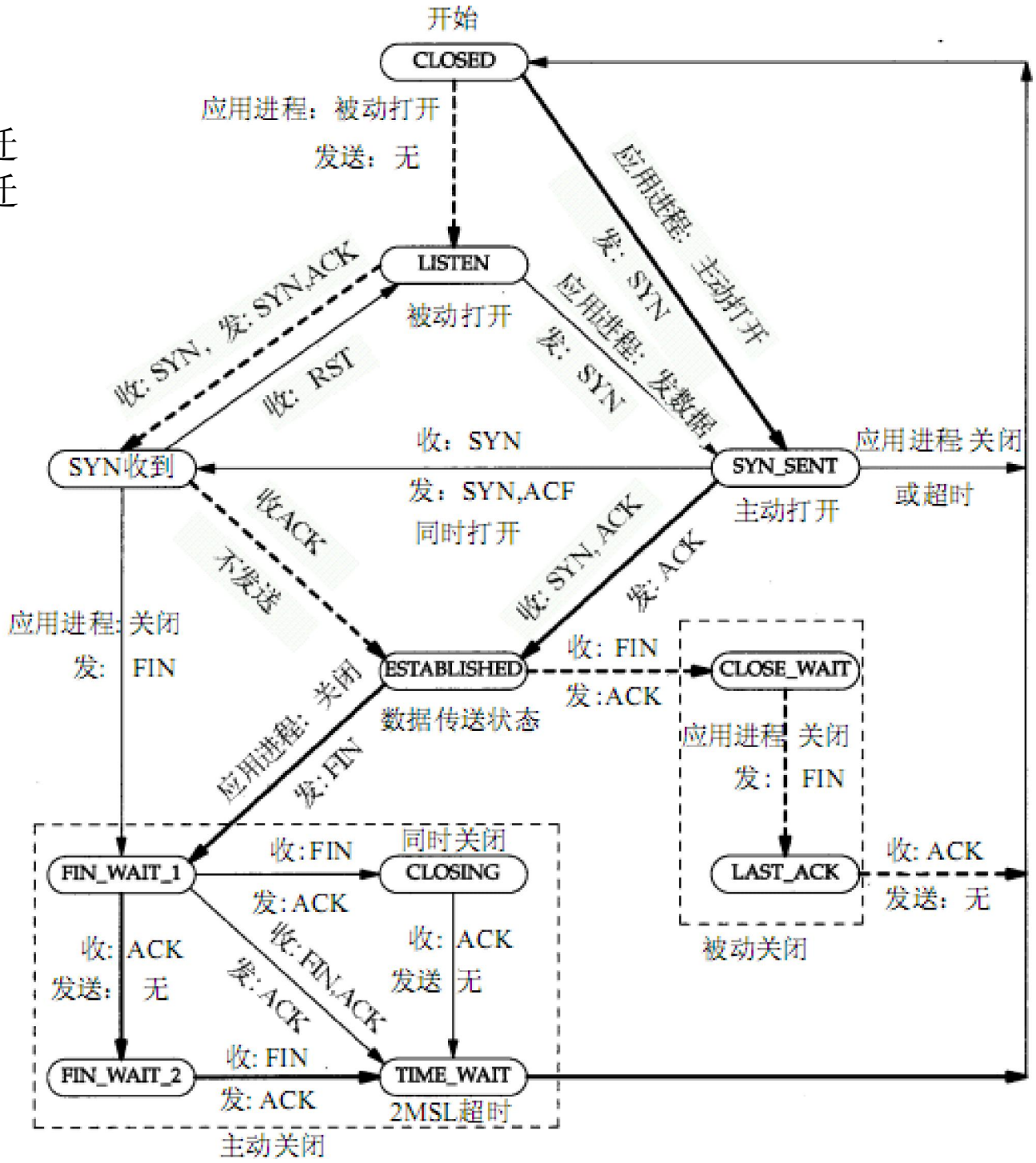
TCP提供可靠的数据传输，其工作过程就是其状态转换过程

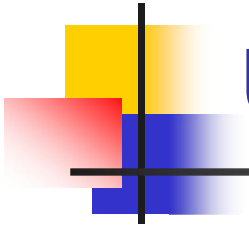
客户机的正常变迁

服务器的正常变迁

连接的建立：三次握手

连接的终止：四次握手



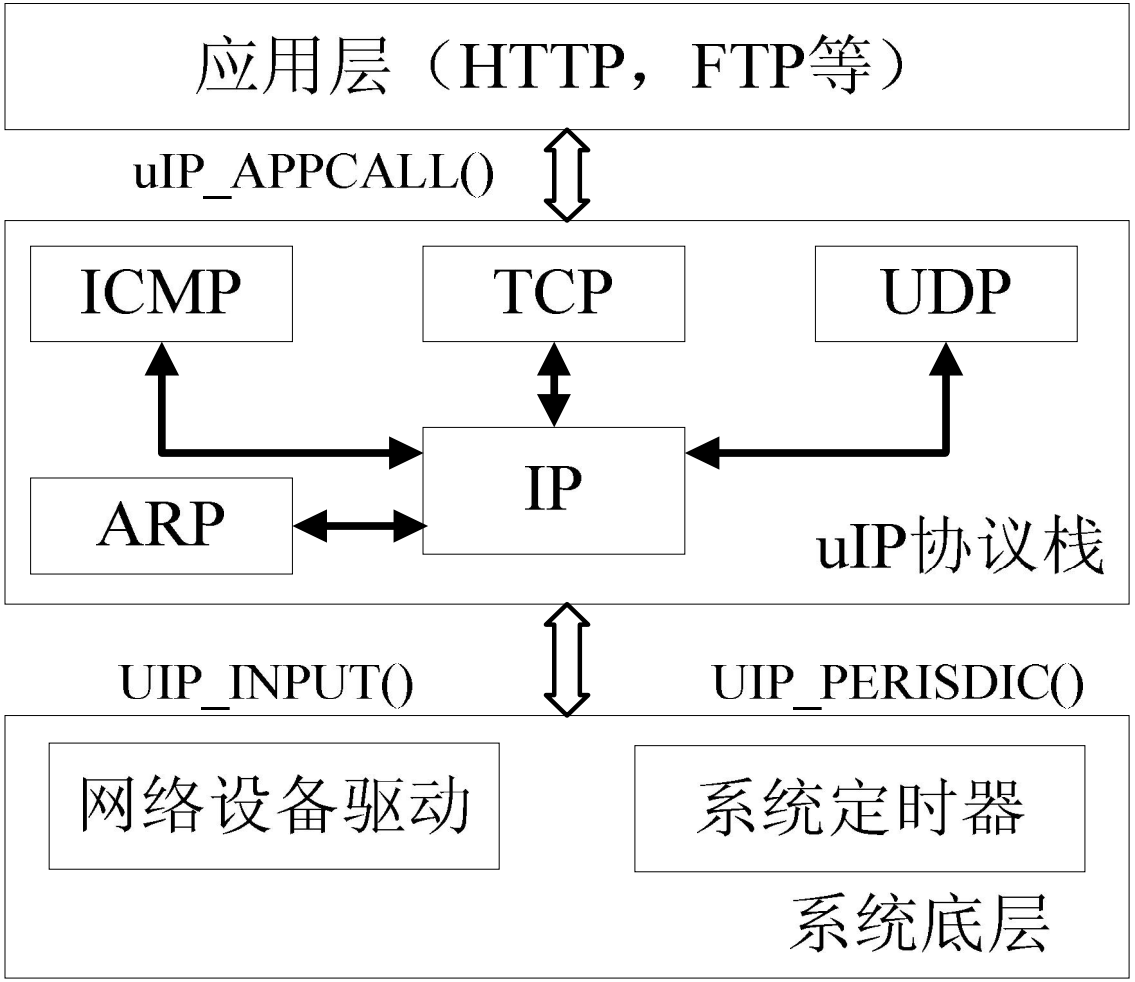


uIP协议栈

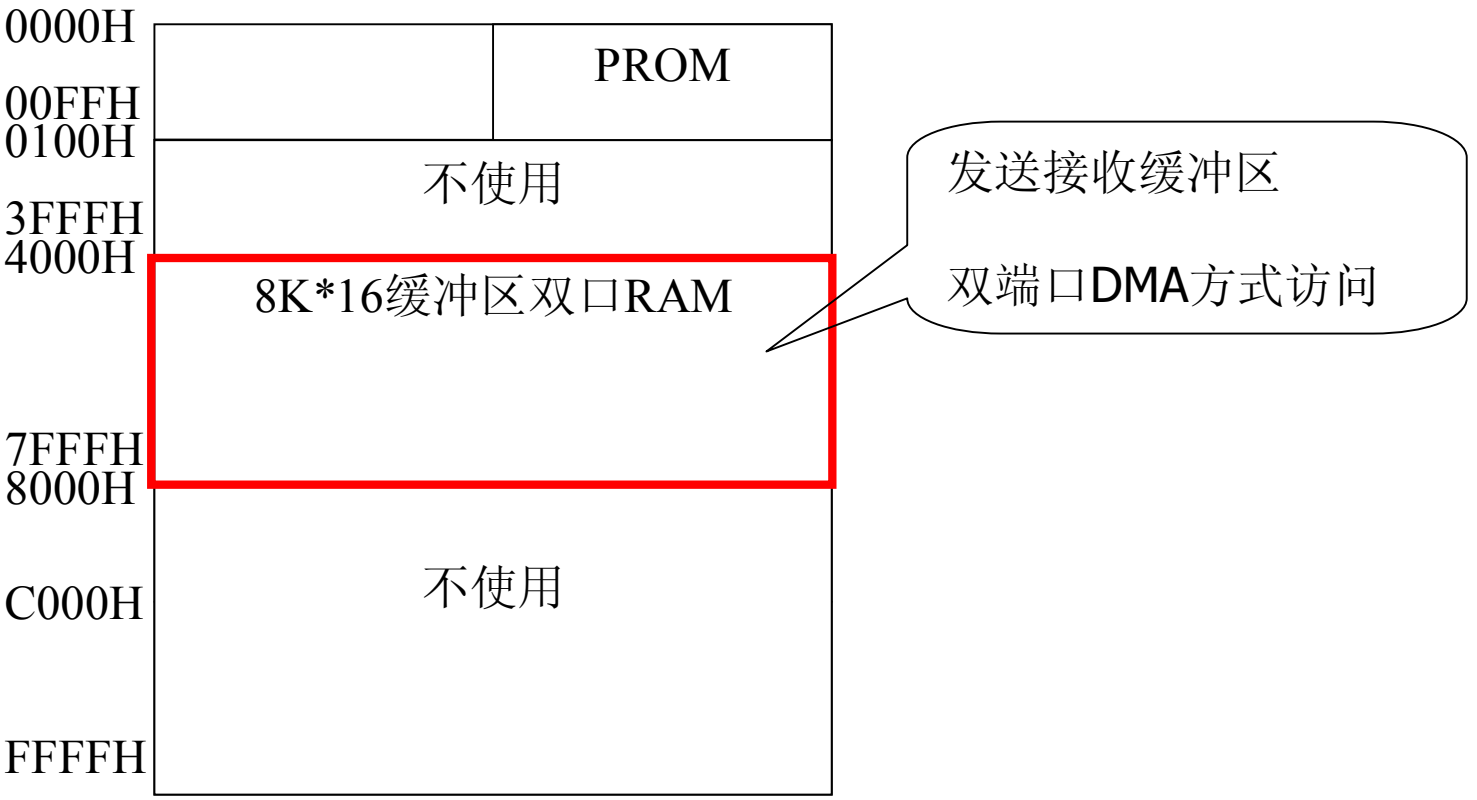
特点：

- 开源、免费
- 支持ARP、IP、ICMP、UDP(可选)、TCP
- RAM和ROM需求低
- 高度可配置
- 支持多个主、被动连接
- 网络设备驱动接口简单

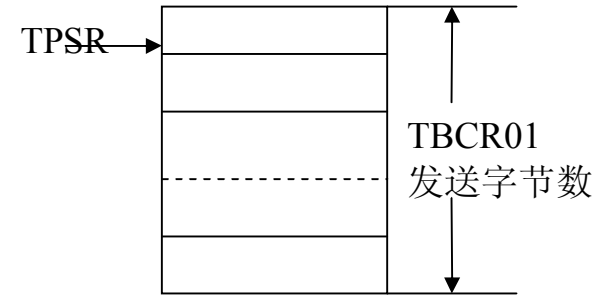
uIP协议栈结构


应用层（HTTP，FTP等）
uIP_APPCALL()
ICMP
TCP
UDP
ARP
IP
uIP协议栈
UIP_INPUT()
UIP_PERISDIC()
网络设备驱动
系统定时器
系统底层

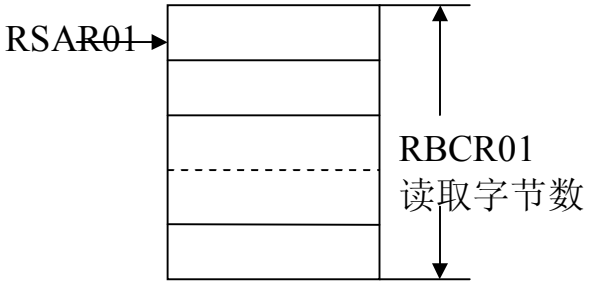
RTL8019AS内部RAM分布



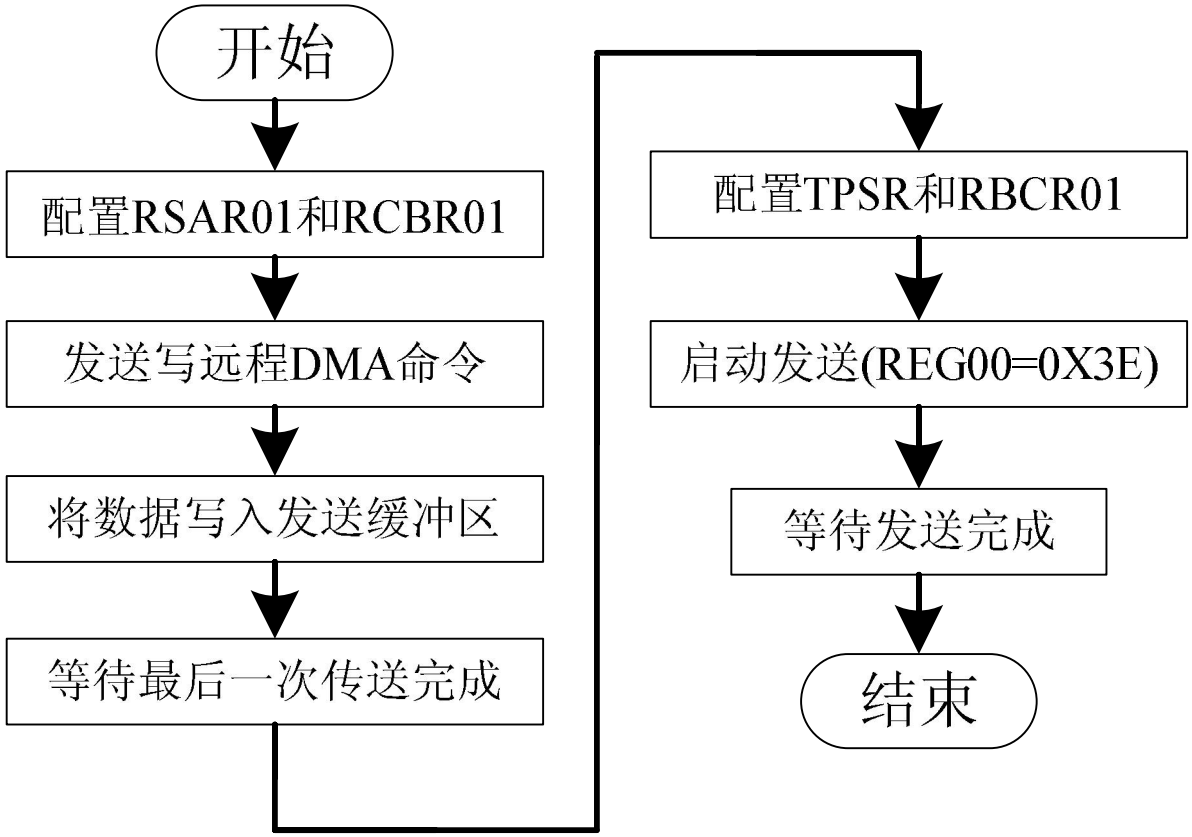
网络设备驱动-发送数据包



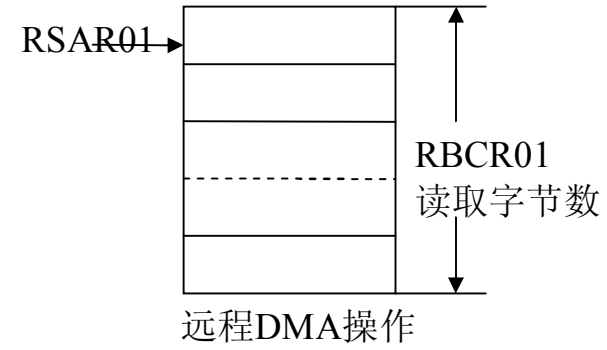
发送缓冲区

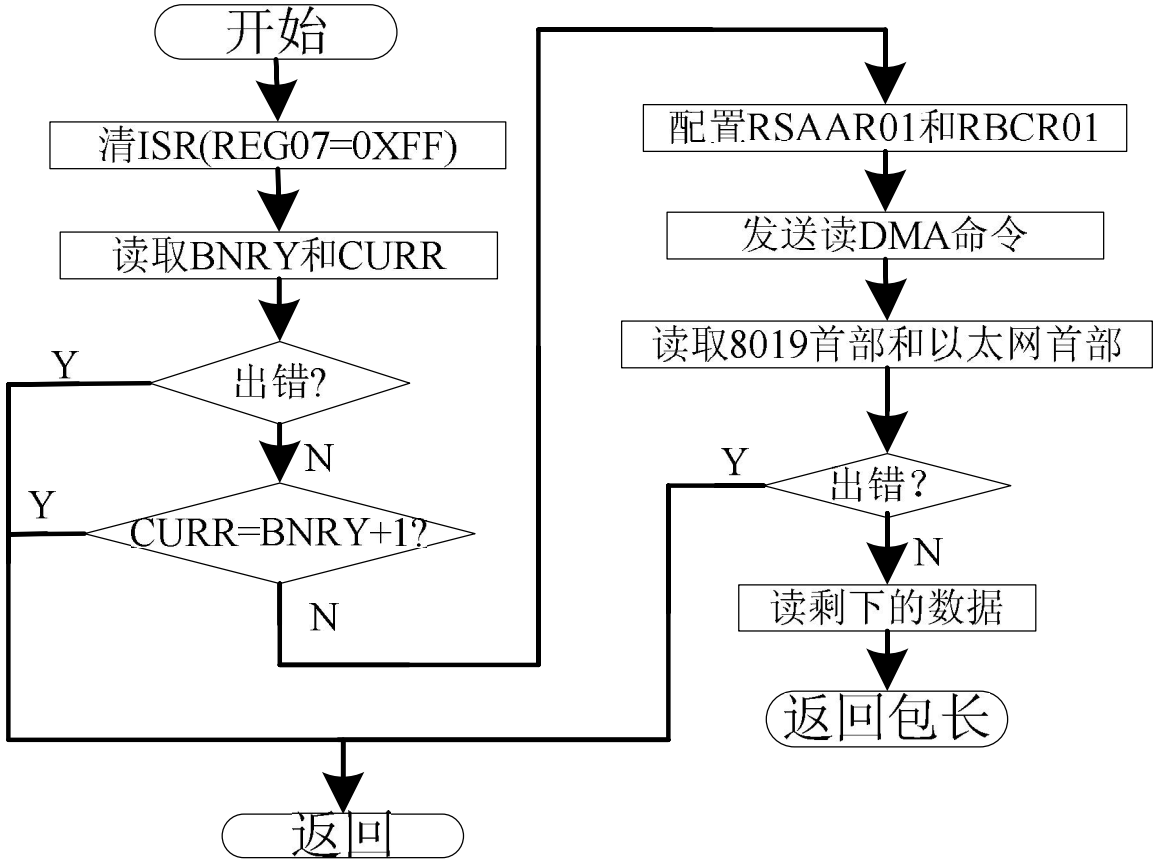


远程DMA操作



网络设备驱动-接收数据包

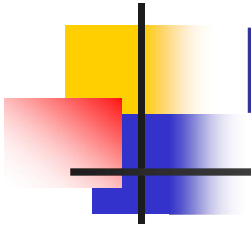




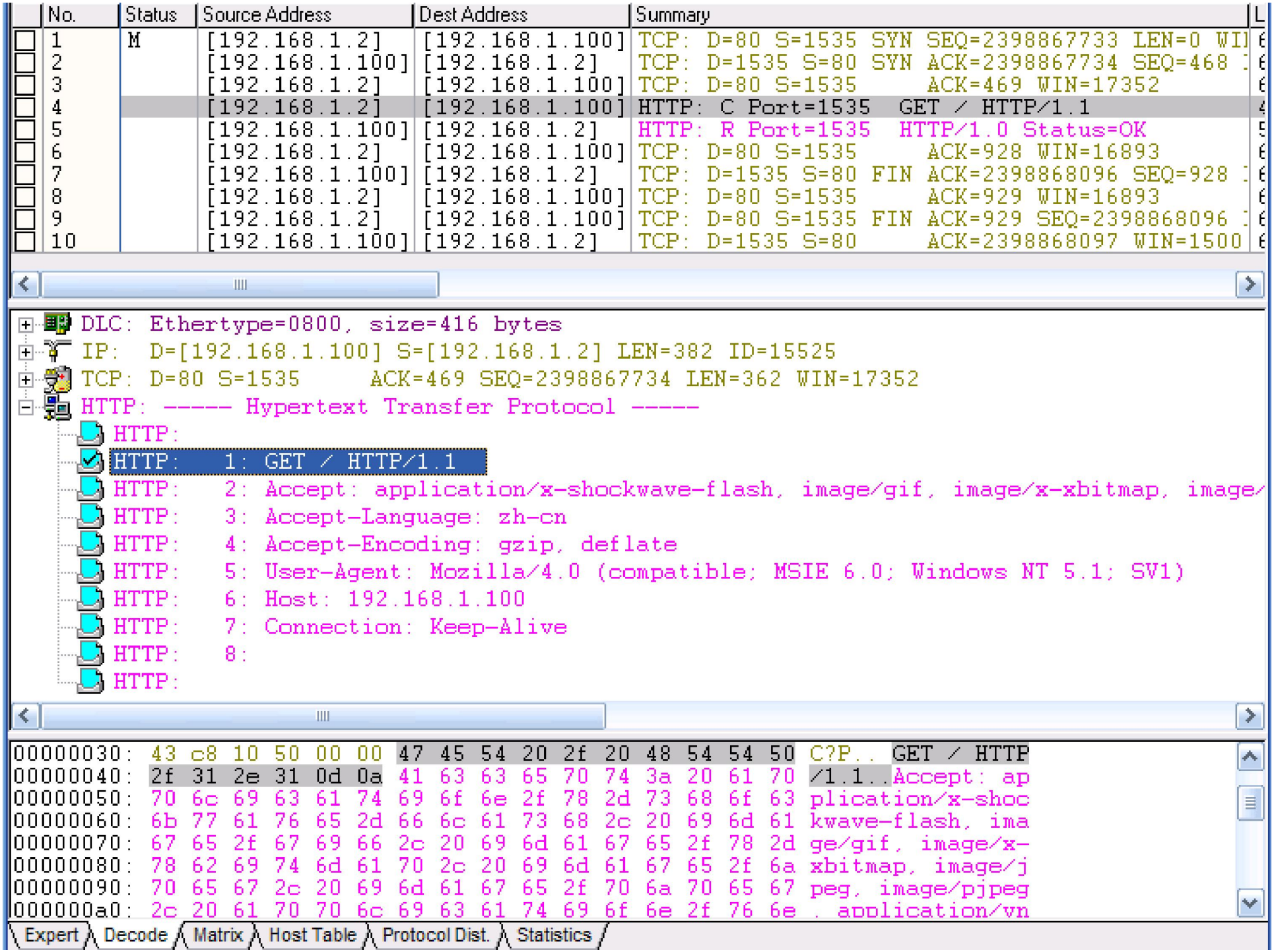
BNRY：已读的页
CURR：将要写入的页

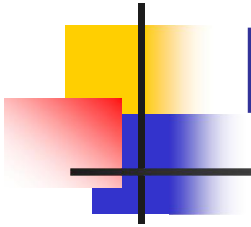
文本传输协议HTTP

HTTP：　客户端和服务器端请求和应答的标准

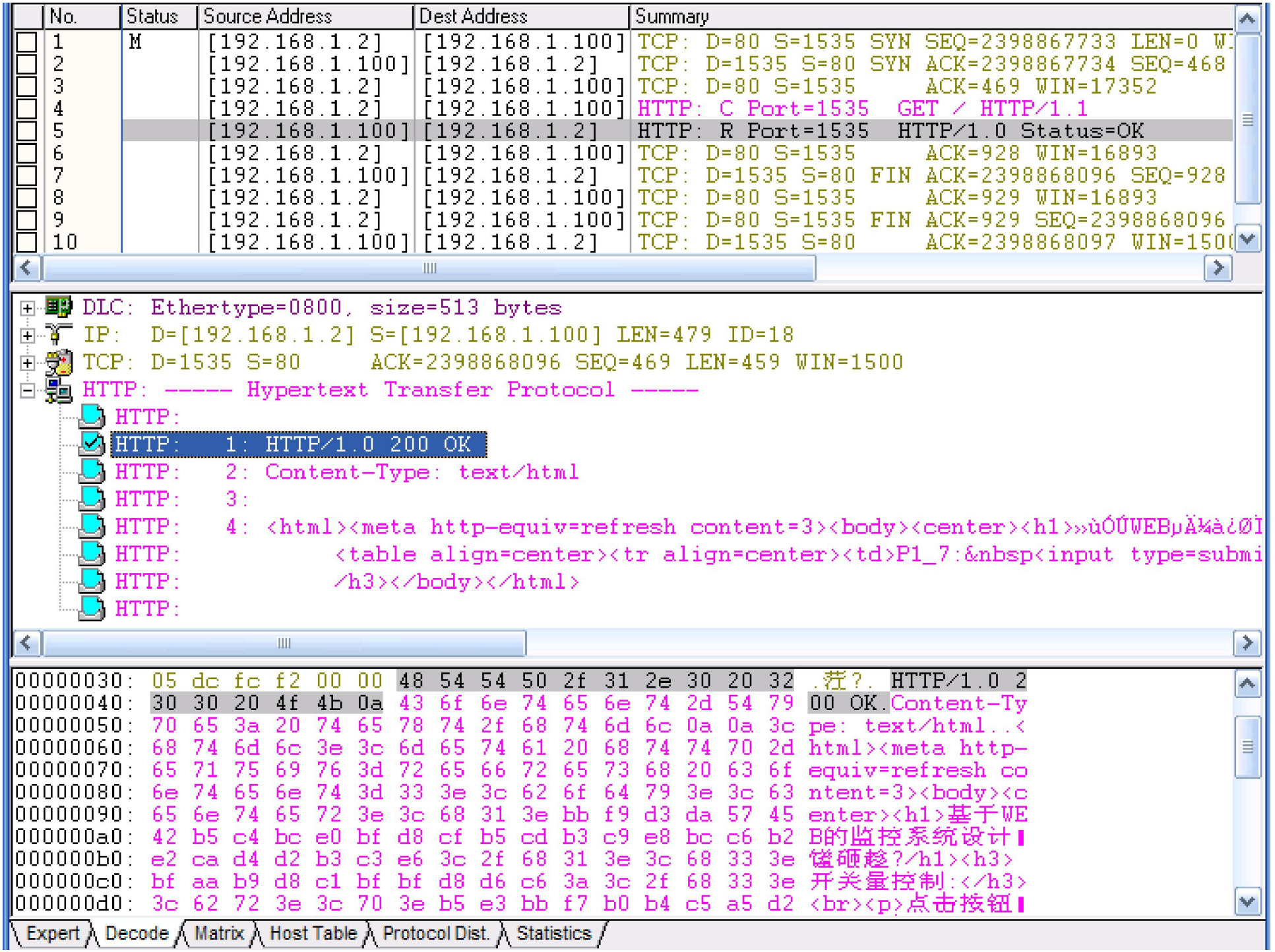


HTTP请求消息


No. Status Source Address Dest Address Summary
1 M [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 SYN SEQ=2398867733 LEN=0 WI
2 [192.168.1.100] [192.168.1.2] TCP: D=1535 S=80 SYN ACK=2398867734 SEQ=468
3 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 ACK=469 WIN=17352
4 [192.168.1.2] [192.168.1.100] HTTP: C Port=1535 GET / HTTP/1.1
5 [192.168.1.100] [192.168.1.2] HTTP: R Port=1535 HTTP/1.0 Status=OK
6 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 ACK=928 WIN=16893
7 [192.168.1.100] [192.168.1.2] TCP: D=1535 S=80 FIN ACK=2398868096 SEQ=928
8 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 ACK=929 WIN=16893
9 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 FIN ACK=929 SEQ=2398868096
10 [192.168.1.100] [192.168.1.2] TCP: D=1535 S=80 ACK=2398868097 WIN=1500
DLC: Ethertype=0800, size=416 bytes
IP: D=[192.168.1.100] S=[192.168.1.2] LEN=382 ID=15525
TCP: D=80 S=1535 ACK=469 SEQ=2398867734 LEN=362 WIN=17352
HTTP: ----- Hypertext Transfer Protocol -----
HTTP:
HTTP: 1: GET / HTTP/1.1
HTTP: 2: Accept: application/x-shockwave-flash, image/gif, image/x-xbitmap, image/
HTTP: 3: Accept-Language: zh-cn
HTTP: 4: Accept-Encoding: gzip, deflate
HTTP: 5: User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1; SV1)
HTTP: 6: Host: 192.168.1.100
HTTP: 7: Connection: Keep-Alive
HTTP: 8:
HTTP:
00000030: 43 c8 10 50 00 00 47 45 54 20 2f 20 48 54 54 50 C?P.. GET / HTTP
00000040: 2f 31 2e 31 0d 0a 41 63 63 65 70 74 3a 20 61 70 /1.1..Accept: ap
00000050: 70 6c 69 63 61 74 69 6f 6e 2f 78 2d 73 68 6f 63 plication/x-shoc
00000060: 6b 77 61 76 65 2d 66 6c 61 73 68 2c 20 69 6d 61 kwave-flash, ima
00000070: 67 65 2f 67 69 66 2c 20 69 6d 61 67 65 2f 78 2d ge/gif, image/x-
00000080: 78 62 69 74 6d 61 70 2c 20 69 6d 61 67 65 2f 6a xbitmap, image/j
00000090: 70 65 67 2c 20 69 6d 61 67 65 2f 70 6a 70 65 67 peg, image/pjpeg
000000a0: 2c 20 61 70 70 6c 69 63 61 74 69 6f 6e 2f 76 6e , application/vn
Expert Decode Matrix Host Table Protocol Dist. Statistics



HTTP响应消息


No. Status Source Address Dest Address Summary
1 M [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 SYN SEQ=2398867733 LEN=0 W
2 [192.168.1.100] [192.168.1.2] TCP: D=1535 S=80 SYN ACK=2398867734 SEQ=468
3 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 ACK=469 WIN=17352
4 [192.168.1.2] [192.168.1.100] HTTP: C Port=1535 GET / HTTP/1.1
5 [192.168.1.100] [192.168.1.2] HTTP: R Port=1535 HTTP/1.0 Status=OK
6 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 ACK=928 WIN=16893
7 [192.168.1.100] [192.168.1.2] TCP: D=1535 S=80 FIN ACK=2398868096 SEQ=928
8 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 ACK=929 WIN=16893
9 [192.168.1.2] [192.168.1.100] TCP: D=80 S=1535 FIN ACK=929 SEQ=2398868096
10 [192.168.1.100] [192.168.1.2] TCP: D=1535 S=80 ACK=2398868097 WIN=150
DLC: Ethertype=0800, size=513 bytes
IP: D=[192.168.1.2] S=[192.168.1.100] LEN=479 ID=18
TCP: D=1535 S=80 ACK=2398868096 SEQ=469 LEN=459 WIN=1500
HTTP: ----- Hypertext Transfer Protocol -----
HTTP:
HTTP: 1: HTTP/1.0 200 OK
HTTP: 2: Content-Type: text/html
HTTP: 3:
HTTP: 4: <html><meta http-equiv=refresh content=3><body> <h1>»ùÓÚWEBµÄ¼à¿ØÏ
HTTP: <table align=center><tr align=center><td>P1_7: <input type=submi
HTTP: /h3></body></html>
HTTP:
00000030: 05 dc fc f2 00 00 48 54 54 50 2f 31 2e 30 20 32 .荏?. HTTP/1.0 2
00000040: 30 30 20 4f 4b 0a 43 6f 6e 74 65 6e 74 2d 54 79 00 OK.Content-Ty
00000050: 70 65 3a 20 74 65 78 74 2f 68 74 6d 6c 0a 0a 3c pe: text/html..<
00000060: 68 74 6d 6c 3e 3c 6d 65 74 61 20 68 74 74 70 2d html><meta http-
00000070: 65 71 75 69 76 3d 72 65 66 72 65 73 68 20 63 6f equiv=refresh co
00000080: 6e 74 65 6e 74 3d 33 3e 3c 62 6f 64 79 3e 3c 63 ntent=3><body><c
00000090: 65 6e 74 65 72 3e 3c 68 31 3e bb f9 d3 da 57 45 enter><h1>基于WE
000000a0: 42 b5 c4 bc e0 bf d8 cf b5 cd b3 c9 e8 bc c6 b2 B的监控系统设计
000000b0: e2 ca d4 d2 b3 c3 e6 3c 2f 68 31 3e 3c 68 33 3e 馐硕趁?/h1><h3>
000000c0: bf aa b9 d8 c1 bf bf d8 d6 c6 3a 3c 2f 68 33 3e 开关量控制:</h3>
000000d0: 3c 62 72 3e 3c 70 3e b5 e3 bb f7 b0 b4 c5 a5 d2
<p>点击按钮
Expert Decode Matrix Host Table Protocol Dist. Statistics

本系统的HTML文件

```
<html>
<meta http-equiv=refresh content=3>
<body>
  <center>
    <h1>基于WEB的监控系统设计测试页面</h1>
    <h3>开关量控制:</h3>
    <br><p>点击按钮以开启或关闭LED 1对应LED灭 0对应LED亮</p>
  </center>
  <form action=swc.html>
    <table align=center>
      <tr align=center>
        <td>P1_7: <input type=submit name=sw7 value=1></td>
        <td>P1_6: <input type=submit name=sw6 value=1></td>
      </tr>
    </table>
  </form>
  <center>
  <h3>环境温度: 29.93&degC</h3>
</body>
</html>
```

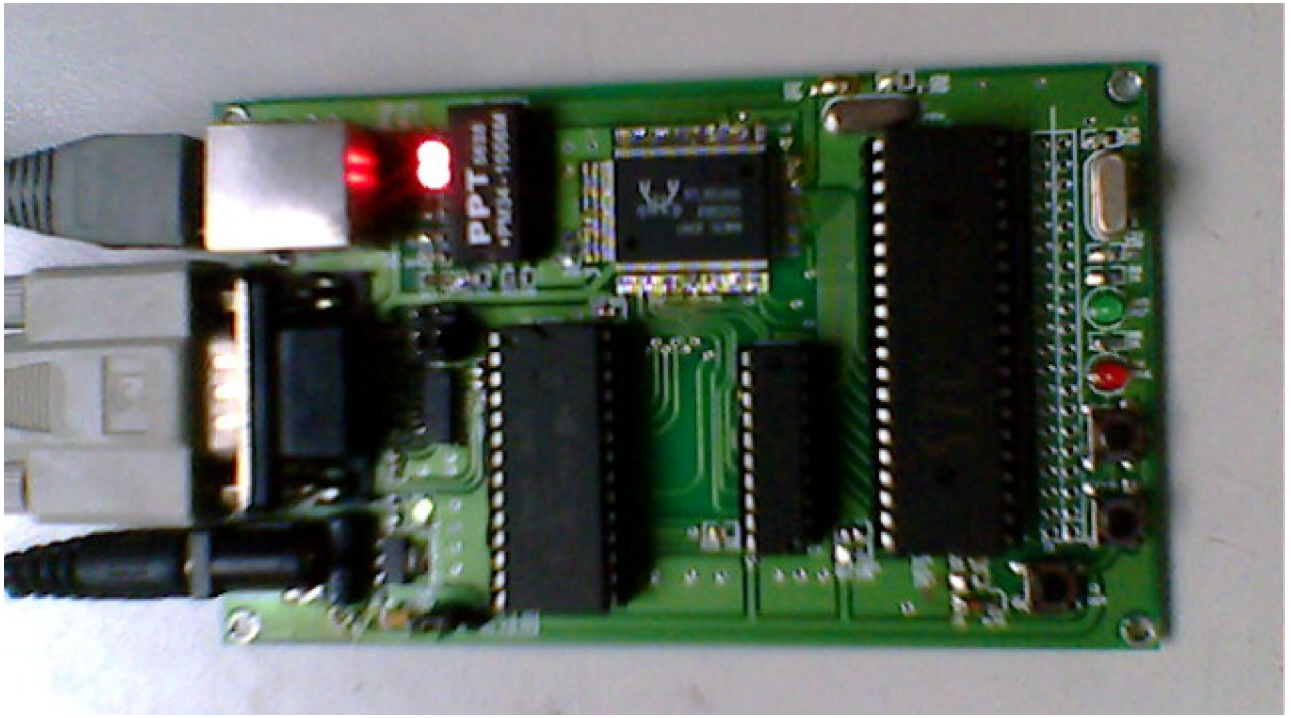
一个简单Web Server的工作过程

视频演示

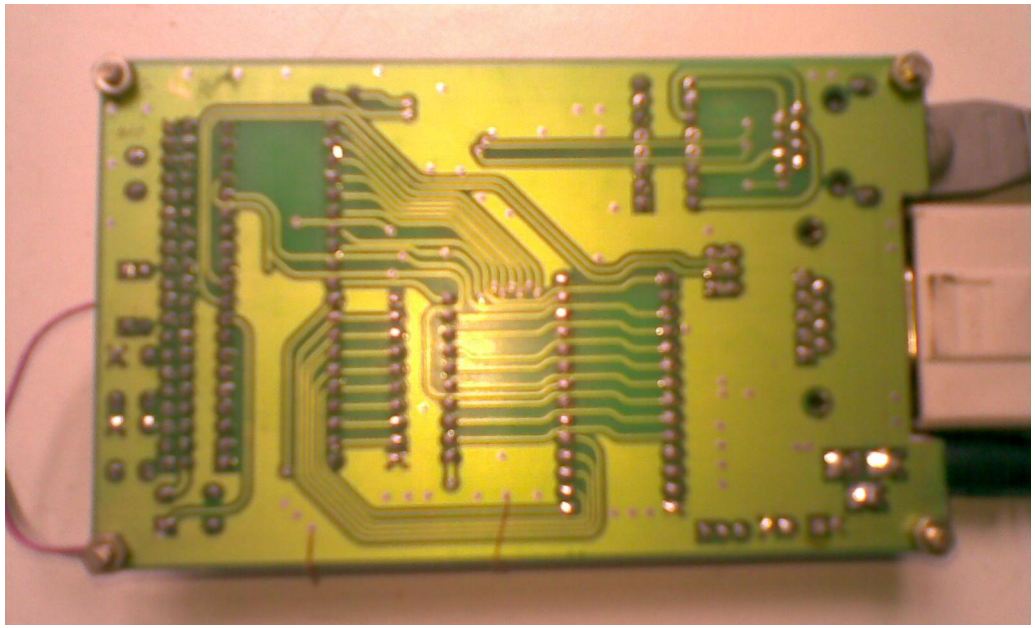
功能演示

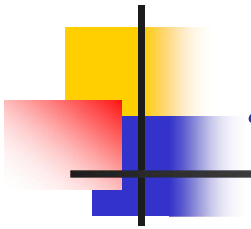
- 1、ARP功能演示
- 3、PING功能演示
- 4、Web Server功能演示
- 5、RS232与RJ45相互转换功能演示

硬件正面



硬件背面





总结

成果：

- 实现了TCP/IP协议
- 实现了简单的Web服务
- 实现了RS232与RJ45接口的相互转换

不足：

- 没有实现DHCP
- 没有添加DNS的支持
- 没有添加文件系统
- 没有添加保密服务

谢谢大家!