Web Server for Embedded Systems

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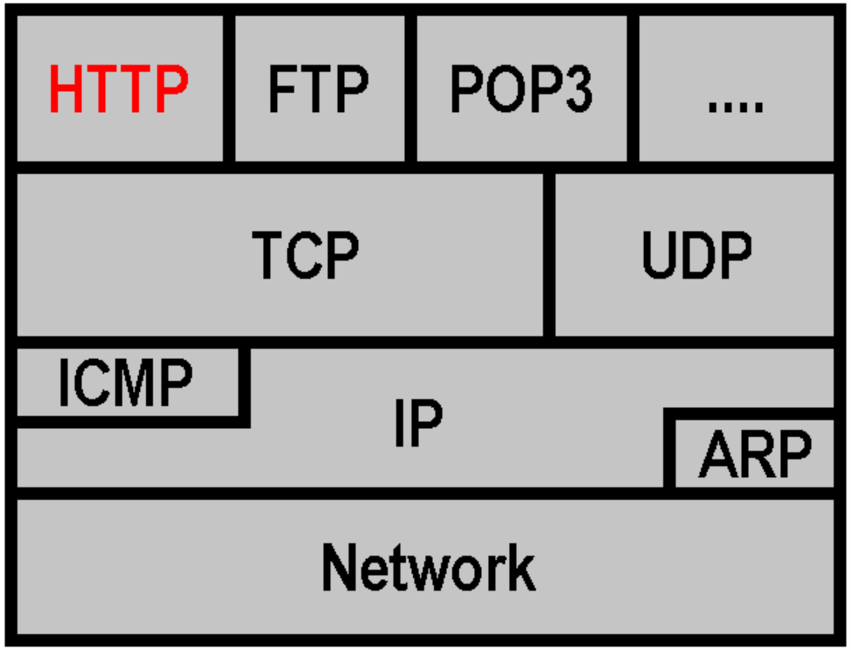
TCP/IP Protocol Basics

* Networking technology is organized in layers. The base is the OSI Reference Model. Each layer only communicates with the layers immediately above or below it.



HTTP FTP POP3 ....

TCP UDP

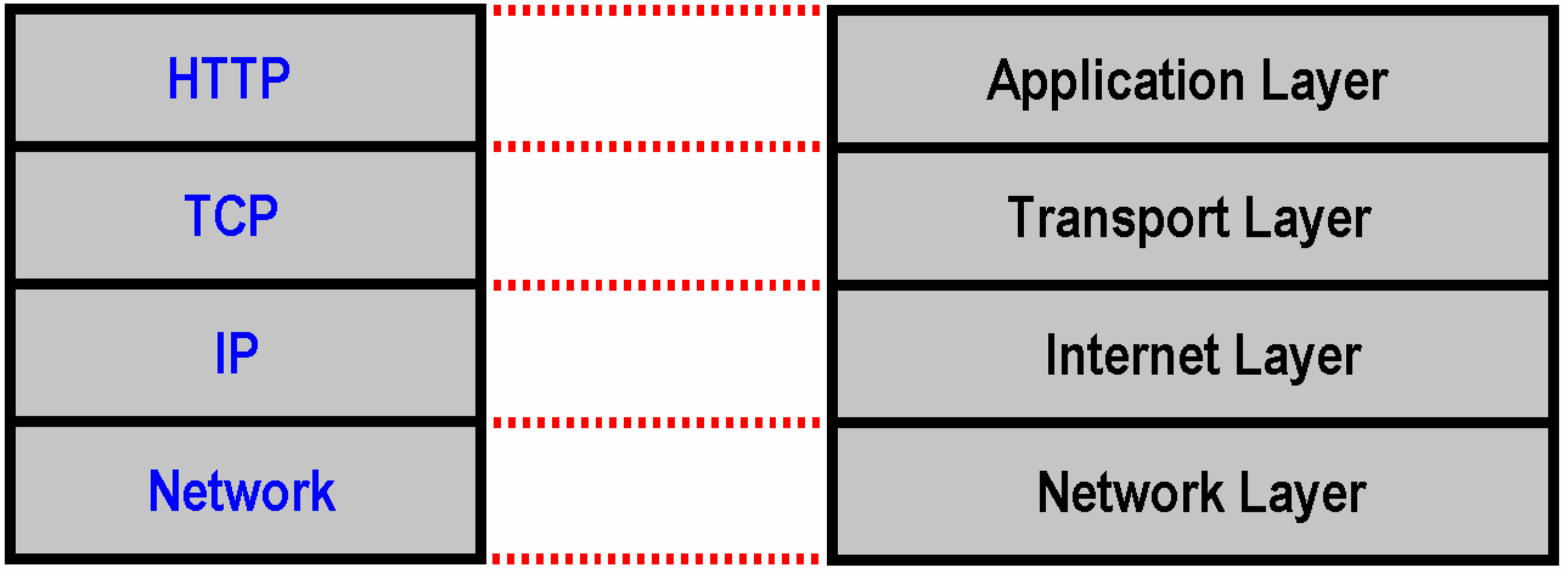
ICMP IP ARP

Network

* HTTP define the rules by which Web browers, Web servers, proxies, and other Web systems establish and maintain communications with each other.

TCP/IP Protocol Basics

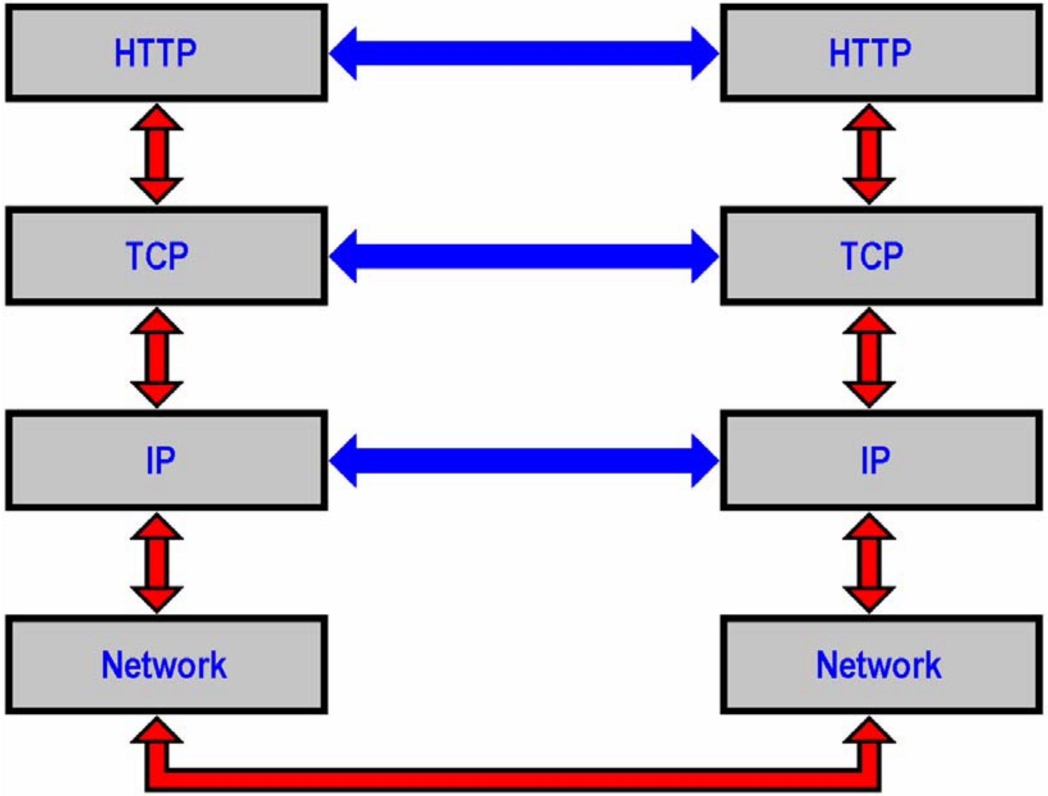
* The OSI Reference Model is based on seven layers. HTTP (and a TCP/IP protocol stack) is using only four protocol layers within a computer system.



* The lowest layer is the **network layer**. The protocol layer above the network layer is the **Internet Protocol** (IP). Next is the **Transmission Control Protocol** (TCP). The final protocol layer is **HTTP**, a TCP/IP application protocol.

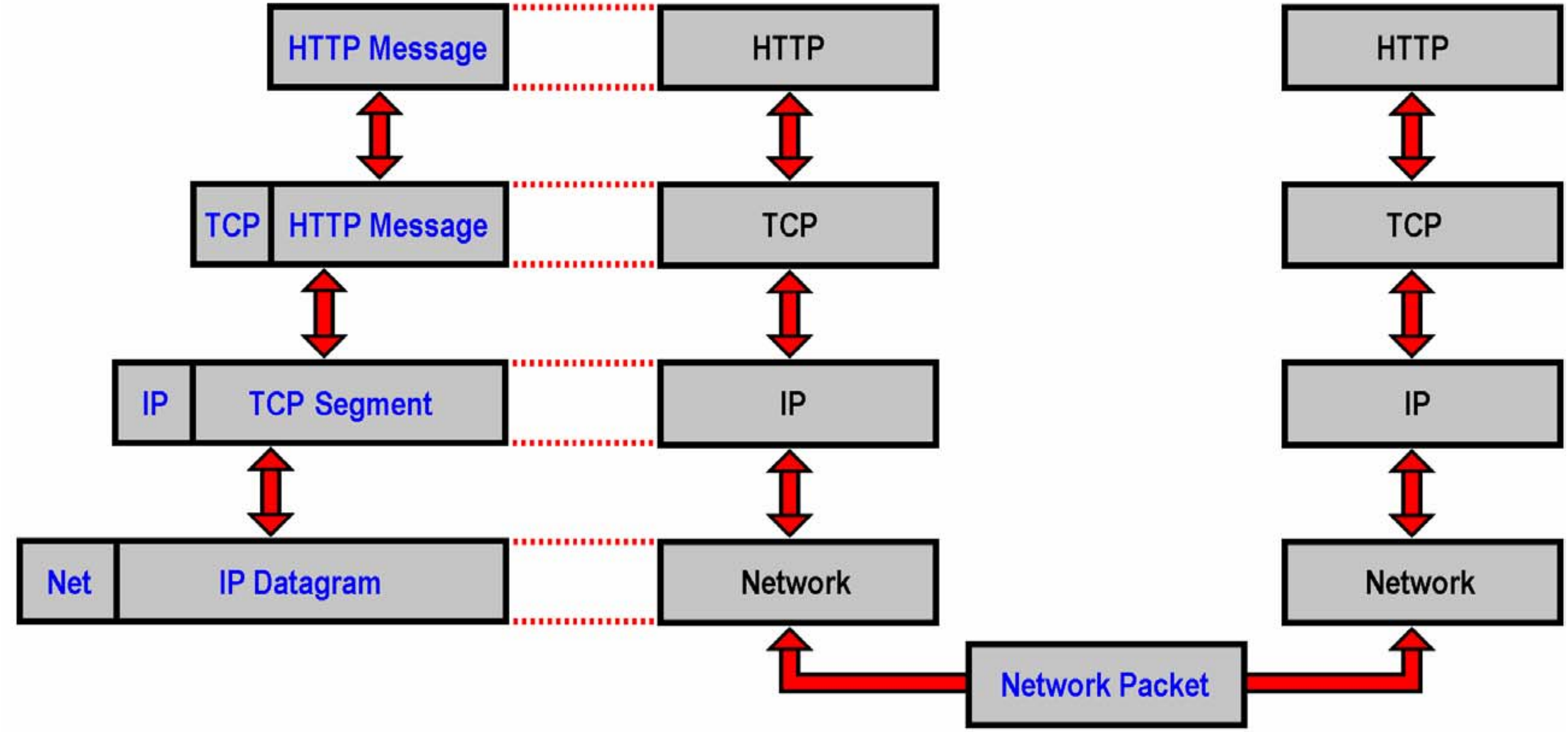
TCP/IP Protocol Basics

* There is a logical and physical communication between each protocol layer. HTTP reads or writes data from/to TCP. That protocol interacts directly with IP. IP interacts with the protocol controlling the network layer (i.e. Ethernet or PPP).



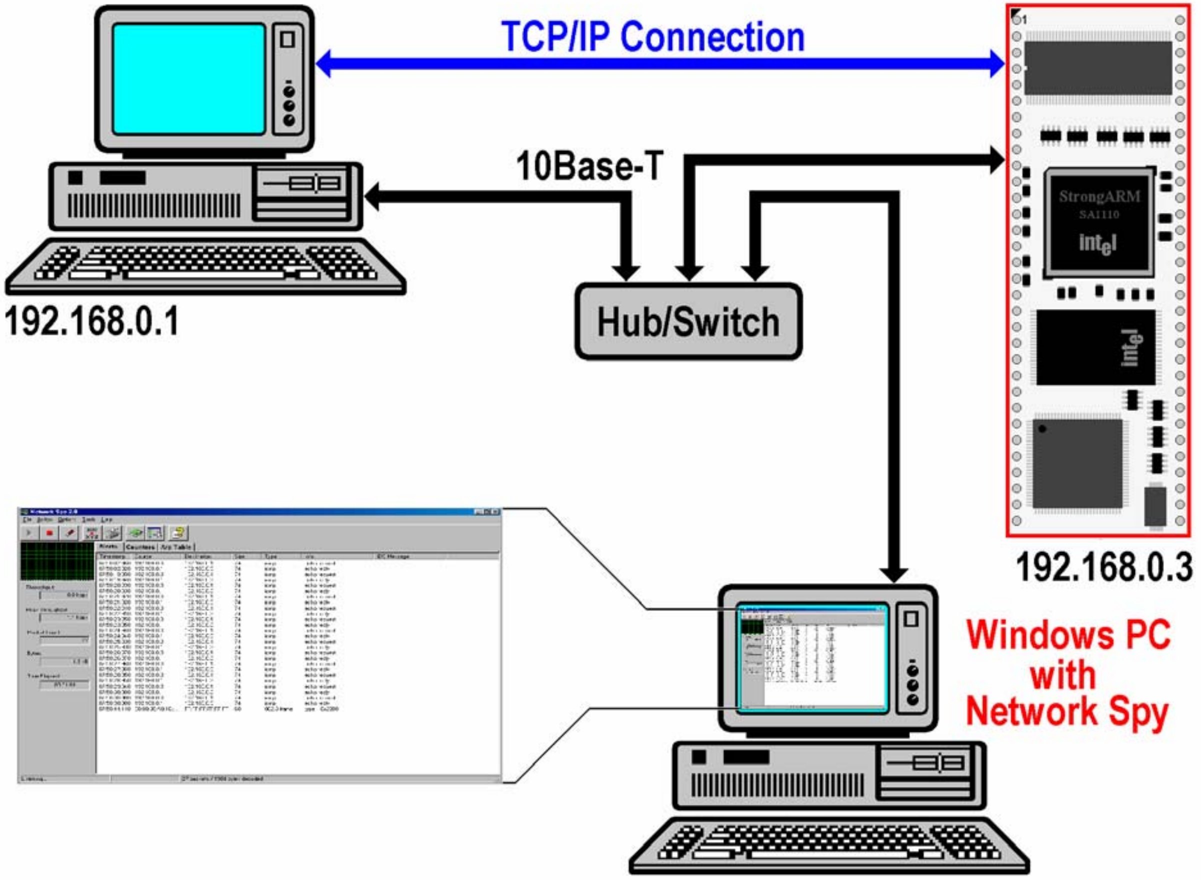
TCP/IP Protocol Basics

* A protocol is using a own header and a own name for the unit of data it sends and receives. Each protocol layer adds and removes it´s own specific information.



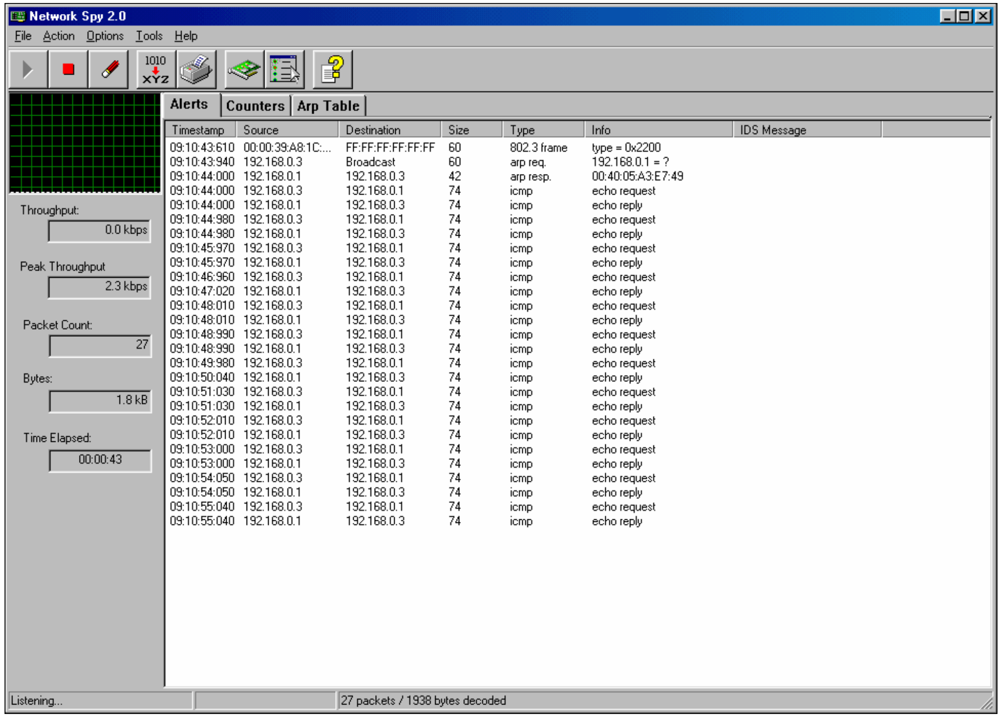
Debugging TCP/IP Connections

* Use a network monitor program (i.e. Ethernet sniffers) . This kind of programs enables you to capture and examine network packets.



Debugging TCP/IP Connections

* Most network monitor programs comes complete with a suite of TCP/IP protocol parsers and decoders. With the aid of these tools, captured traffic can be analyzed.



Throughput: 0.0 kbps

Peak Throughput: 2.3 kbps

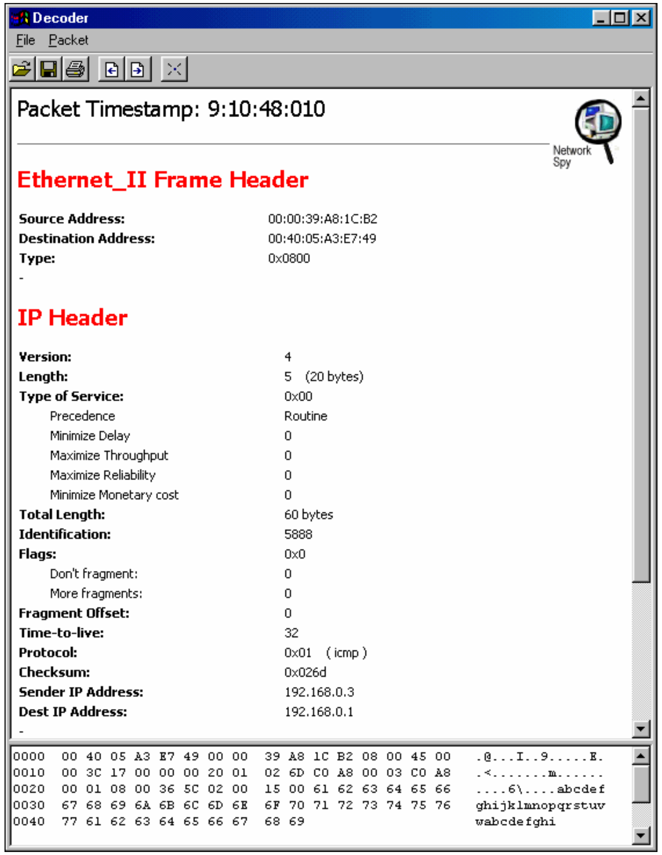
Packet Count: 27

Bytes: 1.8 kB

Time Elapsed: 00:00:43

Timestamp	Source	Destination	Size	Type	Info	IDS Message
09:10:43:610	00:00:39:A8:1C:...	FF:FF:FF:FF:FF:FF	60	802.3 frame	type = 0x2200	
09:10:43:940	192.168.0.3	Broadcast	60	arp req.	192.168.0.1 = ?	
09:10:44:000	192.168.0.1	192.168.0.3	42	arp resp.	00:40:05:A3:E7:49	
09:10:44:000	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:44:000	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:44:980	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:44:980	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:45:970	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:45:970	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:46:960	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:47:020	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:48:010	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:48:010	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:48:990	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:48:990	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:49:980	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:50:040	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:51:030	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:51:030	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:52:010	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:52:010	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:53:000	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:53:000	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:54:050	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:54:050	192.168.0.1	192.168.0.3	74	icmp	echo reply	
09:10:55:040	192.168.0.3	192.168.0.1	74	icmp	echo request	
09:10:55:040	192.168.0.1	192.168.0.3	74	icmp	echo reply	

Listening... | 27 packets / 1938 bytes decoded



Packet Timestamp: 9:10:48:010

Ethernet_II Frame Header

Source Address: 00:00:39:A8:1C:B2
Destination Address: 00:40:05:A3:E7:49
Type: 0x0800
-

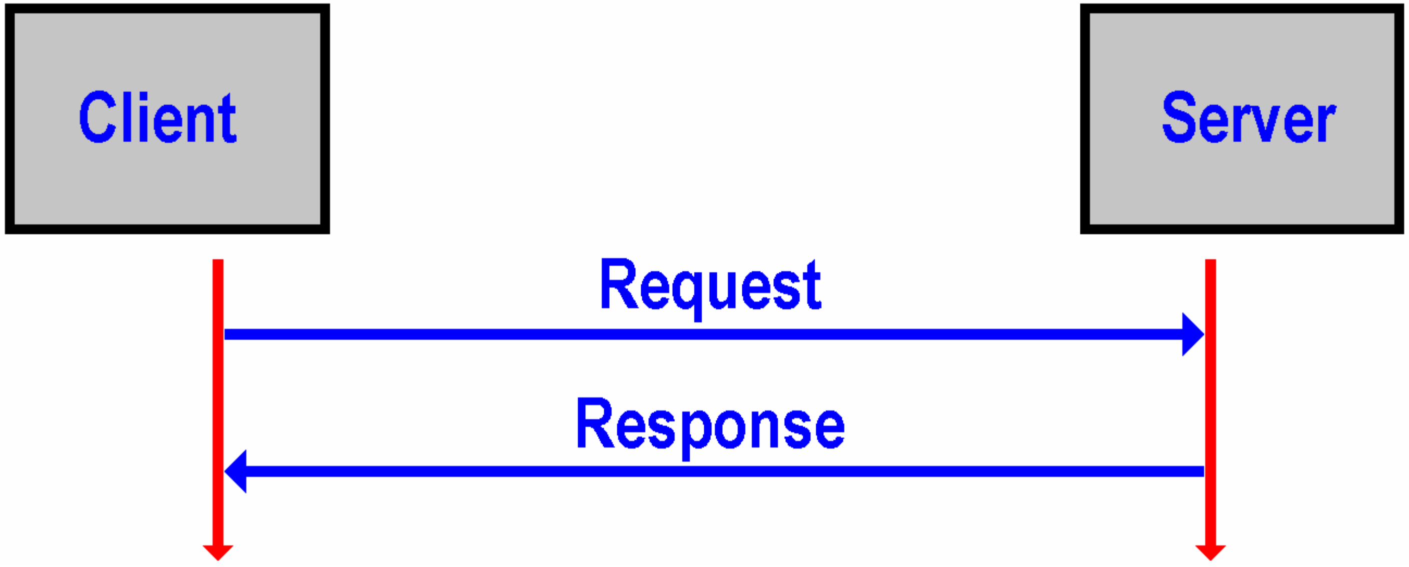
IP Header

Version: 4
Length: 5 (20 bytes)
Type of Service: 0x00
Precedence Routine
Minimize Delay 0
Maximize Throughput 0
Maximize Reliability 0
Minimize Monetary cost 0
Total Length: 60 bytes
Identification: 5888
Flags: 0x0
Don't fragment: 0
More fragments: 0
Fragment Offset: 0
Time-to-live: 32
Protocol: 0x01 (icmp)
Checksum: 0x026d
Sender IP Address: 192.168.0.3
Dest IP Address: 192.168.0.1
-

```
0000  00 40 05 A3 E7 49 00 00  39 A8 1C B2 08 00 45 00   .@...I..9.....E.
0010  00 3C 17 00 00 00 20 01  02 6D C0 A8 00 03 C0 A8   .<.......m......
0020  00 01 08 00 36 5C 02 00  15 00 61 62 63 64 65 66   ....6\....abcdef
0030  67 68 69 6A 6B 6C 6D 6E  6F 70 71 72 73 74 75 76   ghijklmnopqrstuv
0040  77 61 62 63 64 65 66 67  68 69                     wabcdefghi
```

HTTP Protocol Basics

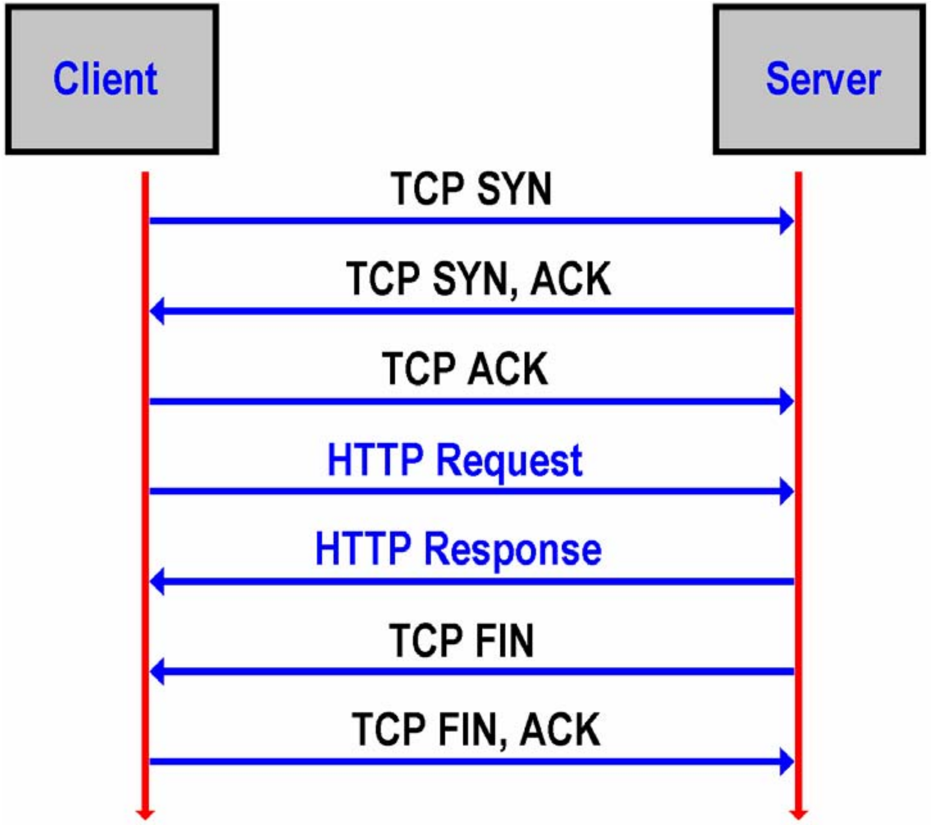
* HTTP follows client/server rules and procedures. The main difference between HTTP clients and servers is the responsibility for initiating communication. Only a client can do that.



* The server waits for a client request and reacts with a response. Typical the Web browser, in it´s rule of client, send a HTTP request to a server. The server returns a HTTP response.

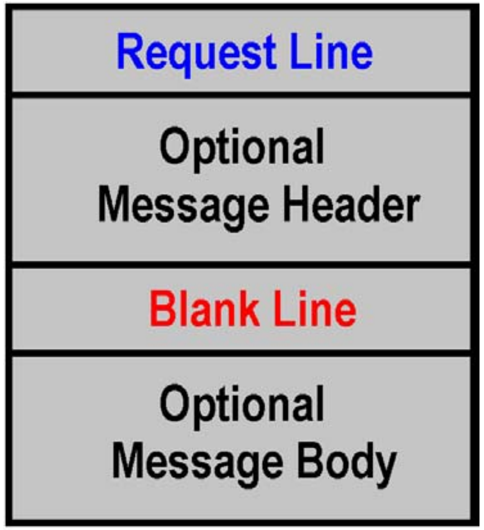
HTTP Protocol Basics

* HTTP requires a TCP connection. The client is responsible for initiating the HTTP communication to the server. After the TCP connection is establish the client can send a HTTP request.



HTTP Protocol Basics

* The structure of HTTP messages is very simple. Each request begins with a request line. This text line indicates the HTTP method, the resource, and the HTTP version. Optional message header and body follows.



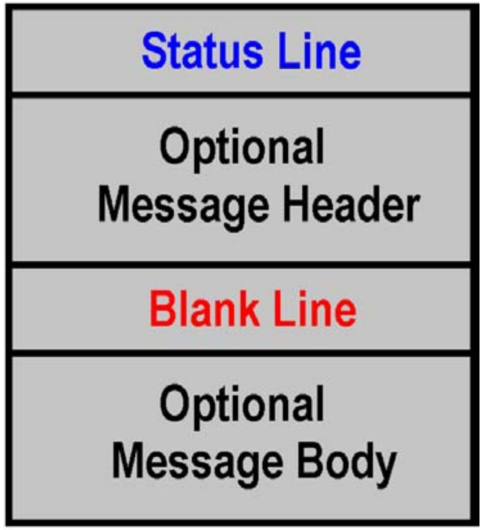
Request Line

Optional Message Header

Blank Line

Optional Message Body

HTTP Request



Status Line

Optional Message Header

Blank Line

Optional Message Body

HTTP Response

* The response begins with a status line. This text line starts with the HTTP version that the server supports. Then a status code follows within the status line. A optional header and body follows with the response.

HTTP Protocol Basics (HTTP Methods)

* **CONNECT**: Asks (proxy) server to establish a tunnel.

* **DELETE**: Asks server to delete the indicated resource.

* **GET**: Asks server to return requested resource.

* **HEAD**: Asks server for header information about a special resource.

* **OPTIONS**: Asks server to indicate the options it supports for a resource.

* **POST**: Asks server to pass the message body to a indicated resource.

* **PUT**: Asks server to accept the message body as the indicated resource.

* **TRACE**: Asks server simply to respond to the request.

HTTP Protocol Basics (HTTP Status Codes)

* **100 - 199**: Informational. The server received the client request but the final result is not yet available.

* **200 - 299**: Success. The server was able to act on the client request successfully.

* **300 - 399**: Redirection. The client should redirect the request to a different server or resource.

* **400 - 499**: Client Error. The request contained an error that prevented the server from acting on it successfully.

* **500 - 599**: Server Error. The server failed to act on a request even though the request appears to be valid.

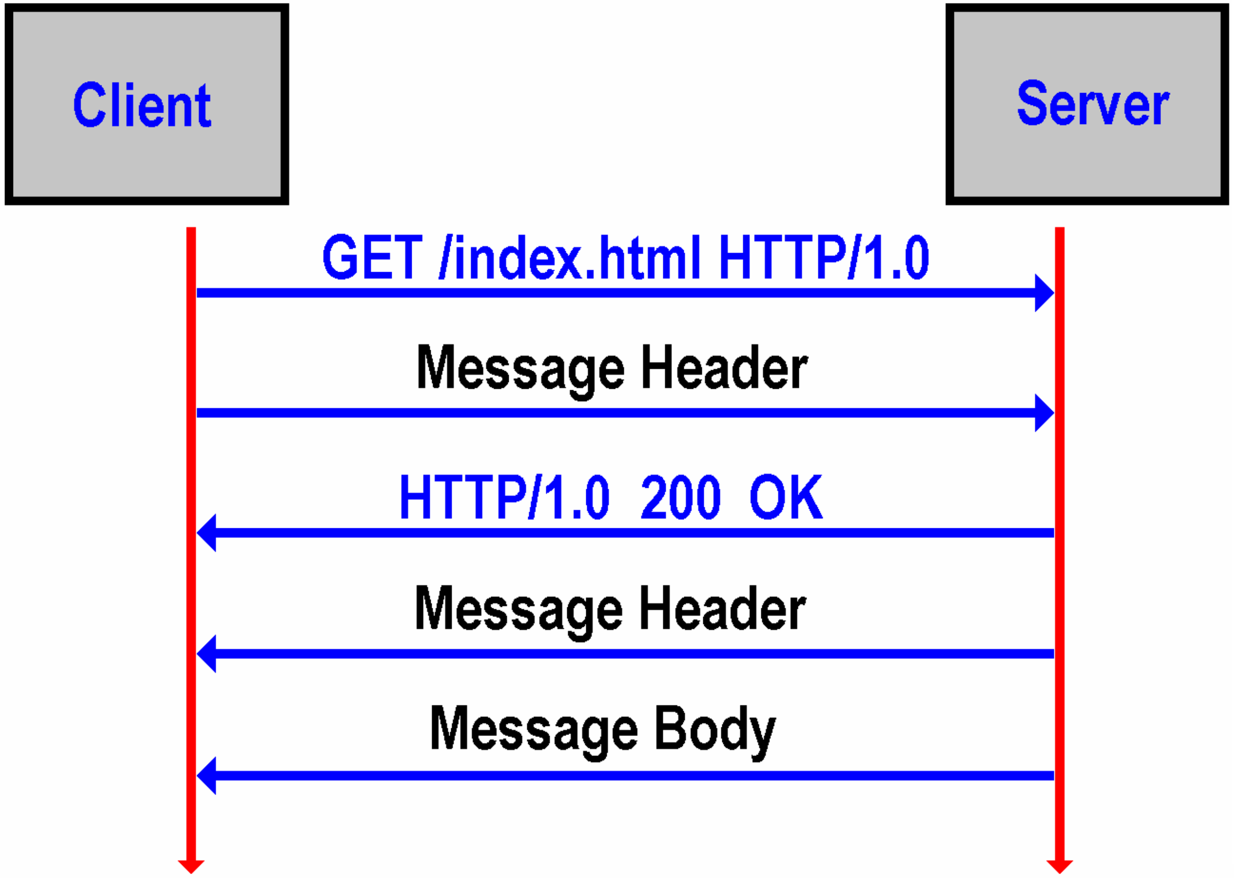
HTTP Protocol Basics

* The message header contains with **Content-type** the MIME (Multipurpose Internet Mail Extension) type of the message body.

`text/plain`	ASCII text
`text/html`	HTML formatted text
`application/pdf`	Document formatted in Adobe PDF
`image/gif`	Image encoded in GIF format
`image/jpeg`	Image encoded in JPEG format
`audio/basic`	Sound file
`video/mpeg`	Video clip coded in MPEG format

HTTP Protocol Basics

* A typical GET request consist of a request line and a message header. The server returns the status line, a message header and the requested resource.



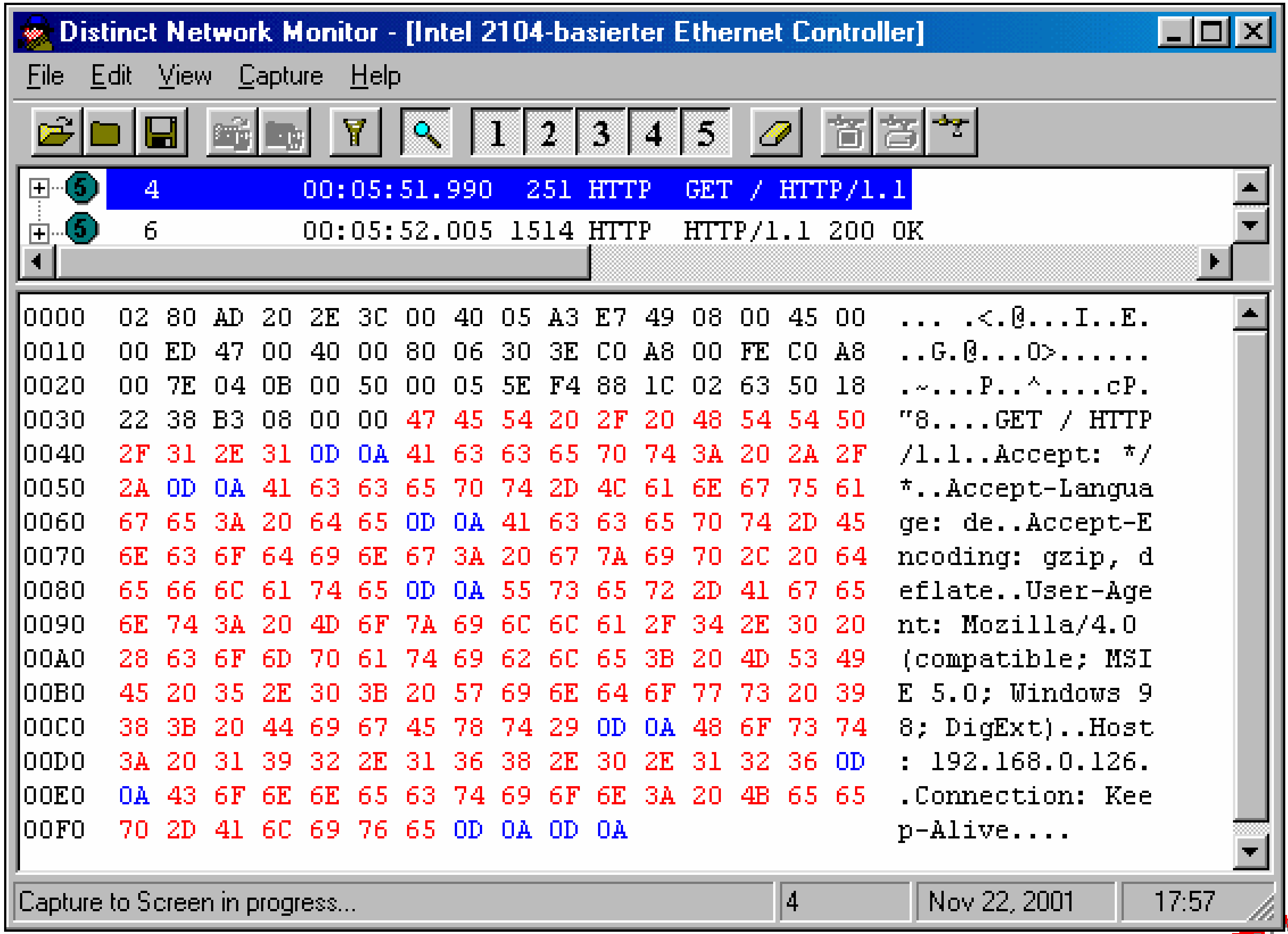
HTTP Protocol Basics

```
GET /test.htm HTTP/1.1
Accept: image/gif, image/jpeg, */*
User selling agent: Mozilla/4.0
Host: 192.168.0.1
```

```
HTTP/1.1 200 OK
Date: Mon, 06 Dec 1999 20:55:12 GMT
Server: Apache/1.3.6 (Linux)
Content-length: 82
Content-type: text/html

<html>
<head>
<title>HTML Test Page</title>
</head>
<body>
HTML Test Page
</body>
</html>
```

HTTP Protocol Basics



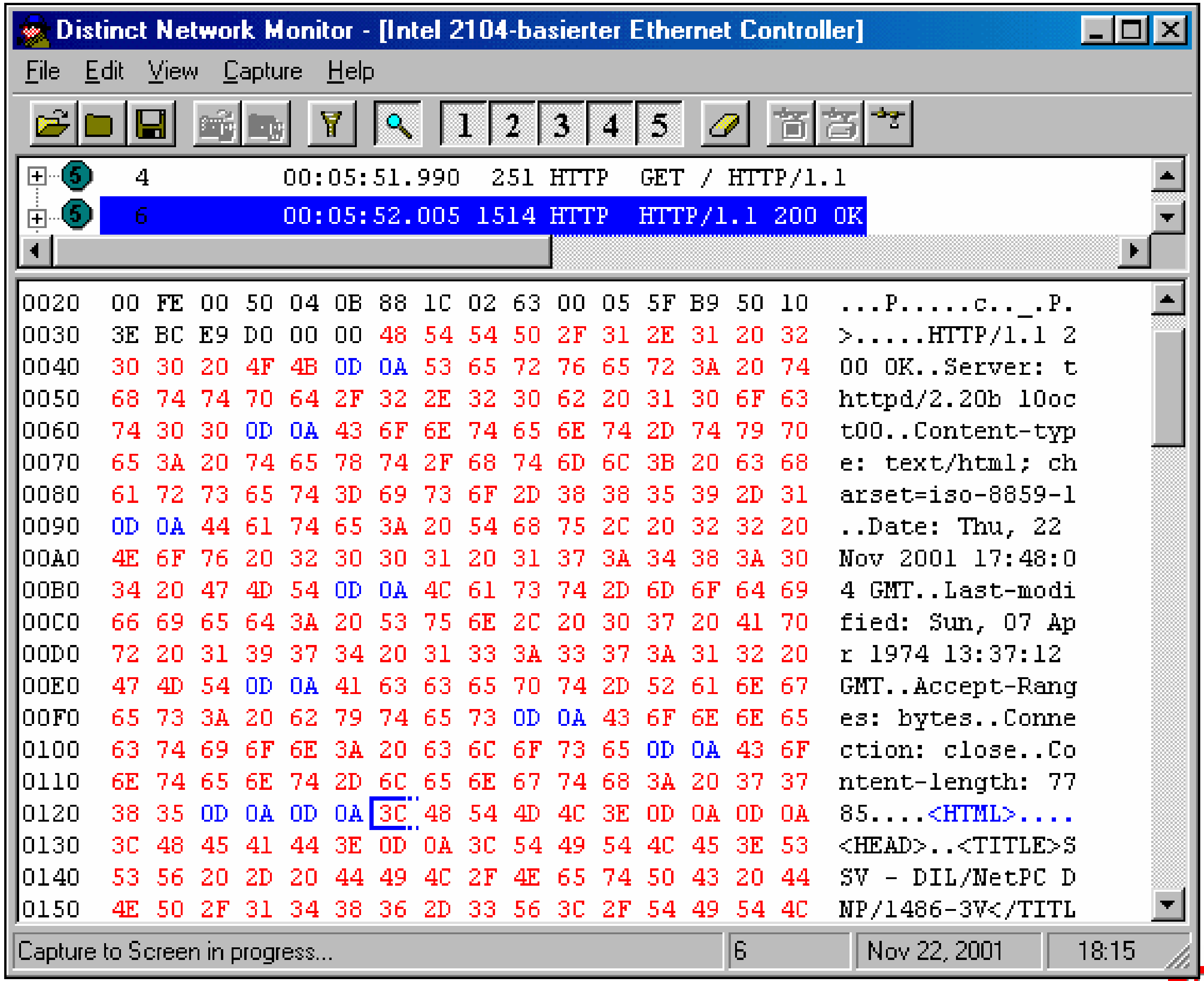
Distinct Network Monitor - [Intel 2104-basierter Ethernet Controller]
File Edit View Capture Help
1 2 3 4 5

```
4     00:05:51.990   251 HTTP  GET / HTTP/1.1
6     00:05:52.005  1514 HTTP  HTTP/1.1 200 OK
```

```
0000   02 80 AD 20 2E 3C 00 40 05 A3 E7 49 08 00 45 00   ... .<.@...I..E.
0010   00 ED 47 00 40 00 80 06 30 3E C0 A8 00 FE C0 A8   ..G.@...0>......
0020   00 7E 04 0B 00 50 00 05 5E F4 88 1C 02 63 50 18   .~...P..^....cP.
0030   22 38 B3 08 00 00 47 45 54 20 2F 20 48 54 54 50   "8....GET / HTTP
0040   2F 31 2E 31 0D 0A 41 63 63 65 70 74 3A 20 2A 2F   /1.1..Accept: */
0050   2A 0D 0A 41 63 63 65 70 74 2D 4C 61 6E 67 75 61   *..Accept-Langua
0060   67 65 3A 20 64 65 0D 0A 41 63 63 65 70 74 2D 45   ge: de..Accept-E
0070   6E 63 6F 64 69 6E 67 3A 20 67 7A 69 70 2C 20 64   ncoding: gzip, d
0080   65 66 6C 61 74 65 0D 0A 55 73 65 72 2D 41 67 65   eflate..User-Age
0090   6E 74 3A 20 4D 6F 7A 69 6C 6C 61 2F 34 2E 30 20   nt: Mozilla/4.0
00A0   28 63 6F 6D 70 61 74 69 62 6C 65 3B 20 4D 53 49   (compatible; MSI
00B0   45 20 35 2E 30 3B 20 57 69 6E 64 6F 77 73 20 39   E 5.0; Windows 9
00C0   38 3B 20 44 69 67 45 78 74 29 0D 0A 48 6F 73 74   8; DigExt)..Host
00D0   3A 20 31 39 32 2E 31 36 38 2E 30 2E 31 32 36 0D   : 192.168.0.126.
00E0   0A 43 6F 6E 6E 65 63 74 69 6F 6E 3A 20 4B 65 65   .Connection: Kee
00F0   70 2D 41 6C 69 76 65 0D 0A 0D 0A                  p-Alive....
```

Capture to Screen in progress... | 4 | Nov 22, 2001 | 17:57

HTTP Protocol Basics

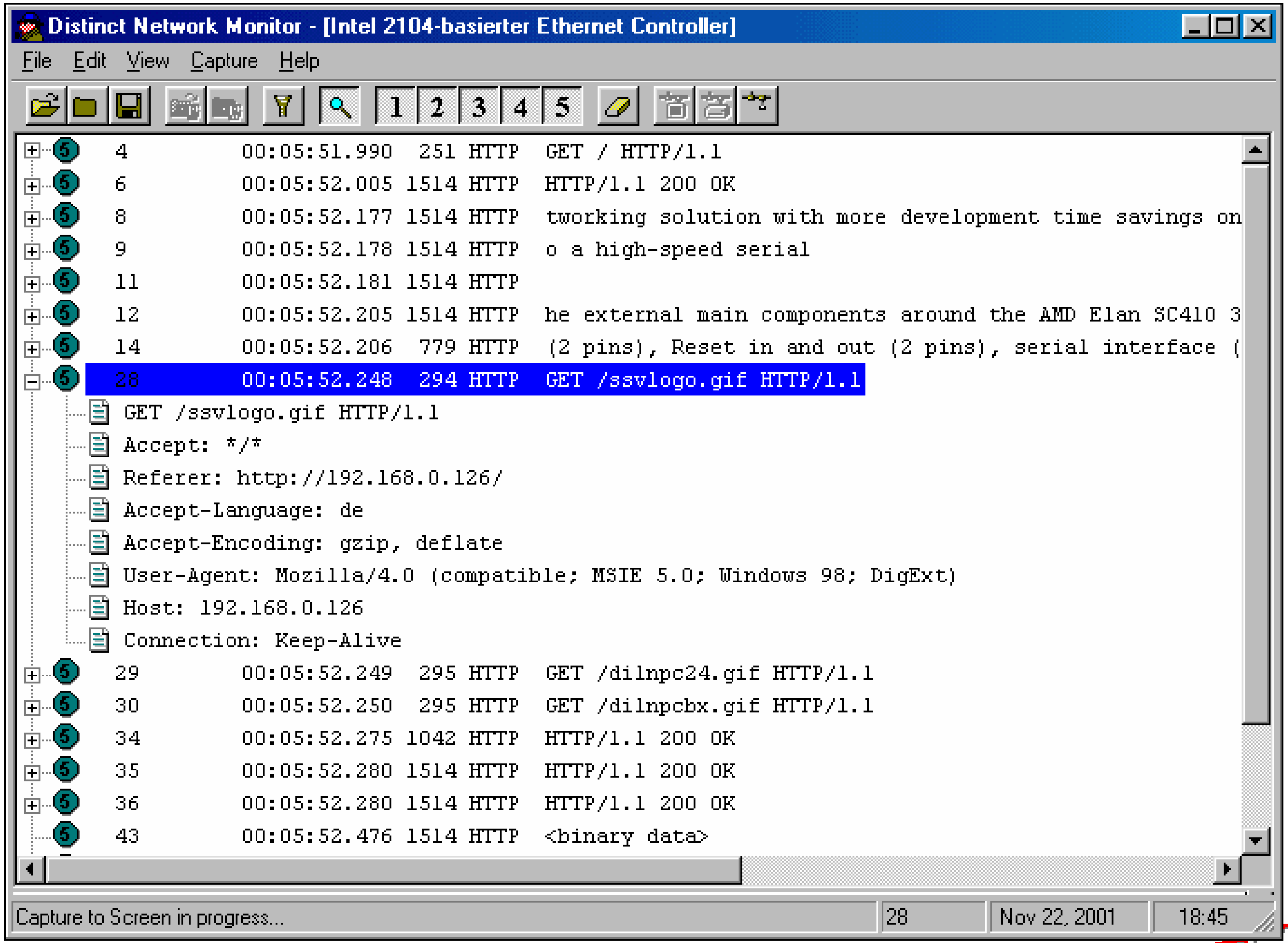

Distinct Network Monitor - [Intel 2104-basierter Ethernet Controller]
File Edit View Capture Help
1 2 3 4 5

```
4    00:05:51.990   251 HTTP   GET / HTTP/1.1
6    00:05:52.005  1514 HTTP   HTTP/1.1 200 OK
```

```
0020   00 FE 00 50 04 0B 88 1C 02 63 00 05 5F B9 50 10   ...P.....c.._.P.
0030   3E BC E9 D0 00 00 48 54 54 50 2F 31 2E 31 20 32   >.....HTTP/1.1 2
0040   30 30 20 4F 4B 0D 0A 53 65 72 76 65 72 3A 20 74   00 OK..Server: t
0050   68 74 74 70 64 2F 32 2E 32 30 62 20 31 30 6F 63   httpd/2.20b 10oc
0060   74 30 30 0D 0A 43 6F 6E 74 65 6E 74 2D 74 79 70   t00..Content-typ
0070   65 3A 20 74 65 78 74 2F 68 74 6D 6C 3B 20 63 68   e: text/html; ch
0080   61 72 73 65 74 3D 69 73 6F 2D 38 38 35 39 2D 31   arset=iso-8859-1
0090   0D 0A 44 61 74 65 3A 20 54 68 75 2C 20 32 32 20   ..Date: Thu, 22
00A0   4E 6F 76 20 32 30 30 31 20 31 37 3A 34 38 3A 30   Nov 2001 17:48:0
00B0   34 20 47 4D 54 0D 0A 4C 61 73 74 2D 6D 6F 64 69   4 GMT..Last-modi
00C0   66 69 65 64 3A 20 53 75 6E 2C 20 30 37 20 41 70   fied: Sun, 07 Ap
00D0   72 20 31 39 37 34 20 31 33 3A 33 37 3A 31 32 20   r 1974 13:37:12
00E0   47 4D 54 0D 0A 41 63 63 65 70 74 2D 52 61 6E 67   GMT..Accept-Rang
00F0   65 73 3A 20 62 79 74 65 73 0D 0A 43 6F 6E 6E 65   es: bytes..Conne
0100   63 74 69 6F 6E 3A 20 63 6C 6F 73 65 0D 0A 43 6F   ction: close..Co
0110   6E 74 65 6E 74 2D 6C 65 6E 67 74 68 3A 20 37 37   ntent-length: 77
0120   38 35 0D 0A 0D 0A 3C 48 54 4D 4C 3E 0D 0A 0D 0A   85....<HTML>....
0130   3C 48 45 41 44 3E 0D 0A 3C 54 49 54 4C 45 3E 53   <HEAD>..<TITLE>S
0140   53 56 20 2D 20 44 49 4C 2F 4E 65 74 50 43 20 44   SV - DIL/NetPC D
0150   4E 50 2F 31 34 38 36 2D 33 56 3C 2F 54 49 54 4C   NP/1486-3V</TITL
```

Capture to Screen in progress... | 6 | Nov 22, 2001 | 18:15

HTTP Protocol Basics

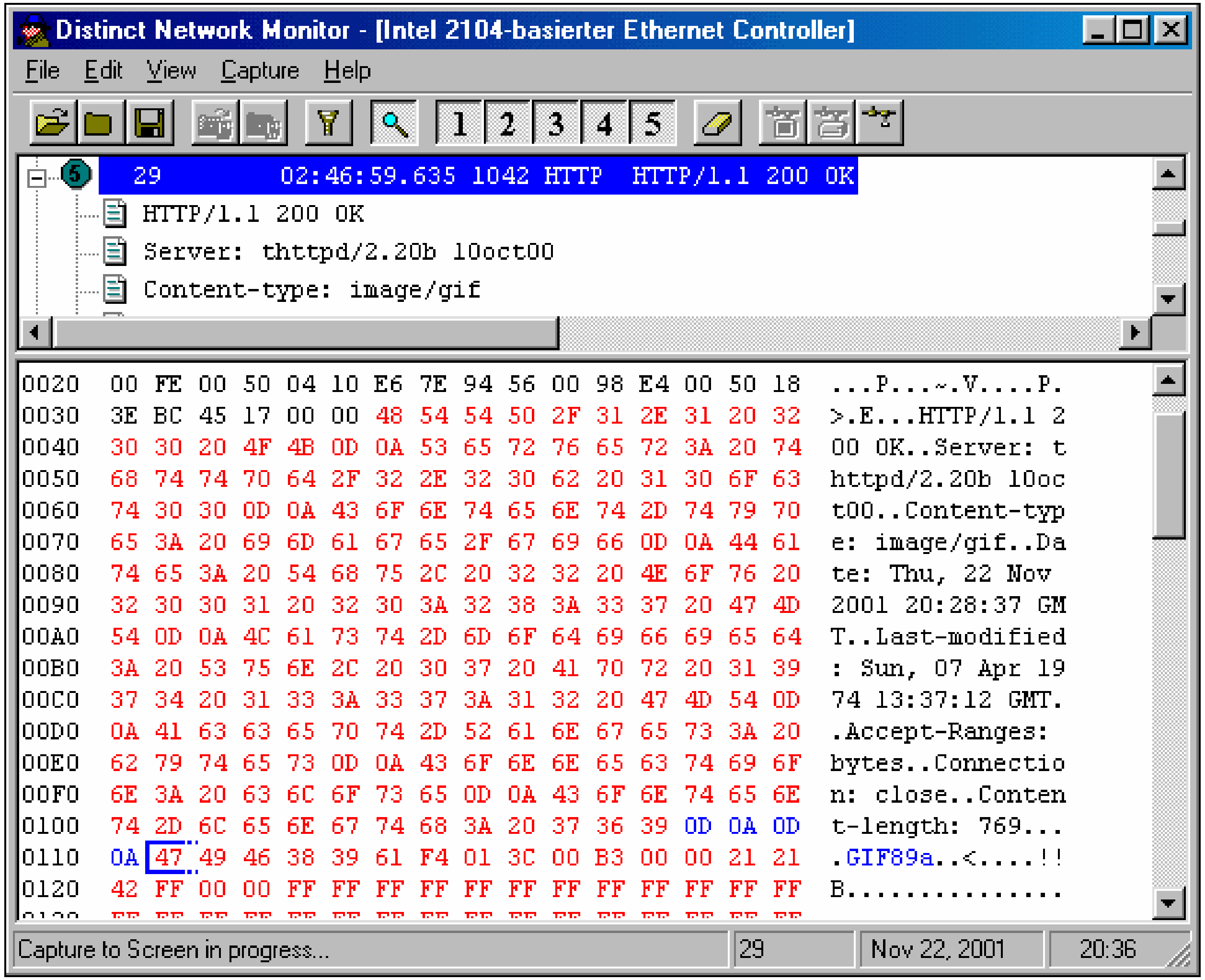


Distinct Network Monitor - [Intel 2104-basierter Ethernet Controller]

```
4     00:05:51.990  251 HTTP  GET / HTTP/1.1
6     00:05:52.005 1514 HTTP  HTTP/1.1 200 OK
8     00:05:52.177 1514 HTTP  tworking solution with more development time savings on
9     00:05:52.178 1514 HTTP  o a high-speed serial
11    00:05:52.181 1514 HTTP
12    00:05:52.205 1514 HTTP  he external main components around the AMD Elan SC410 3
14    00:05:52.206  779 HTTP  (2 pins), Reset in and out (2 pins), serial interface (
28    00:05:52.248  294 HTTP  GET /ssvlogo.gif HTTP/1.1
        GET /ssvlogo.gif HTTP/1.1
        Accept: */*
        Referer: http://192.168.0.126/
        Accept-Language: de
        Accept-Encoding: gzip, deflate
        User-Agent: Mozilla/4.0 (compatible; MSIE 5.0; Windows 98; DigExt)
        Host: 192.168.0.126
        Connection: Keep-Alive
29    00:05:52.249  295 HTTP  GET /dilnpc24.gif HTTP/1.1
30    00:05:52.250  295 HTTP  GET /dilnpcbx.gif HTTP/1.1
34    00:05:52.275 1042 HTTP  HTTP/1.1 200 OK
35    00:05:52.280 1514 HTTP  HTTP/1.1 200 OK
36    00:05:52.280 1514 HTTP  HTTP/1.1 200 OK
43    00:05:52.476 1514 HTTP  <binary data>
```

Capture to Screen in progress... | 28 | Nov 22, 2001 | 18:45

HTTP Protocol Basics



Distinct Network Monitor - [Intel 2104-basierter Ethernet Controller]
File Edit View Capture Help
1 2 3 4 5

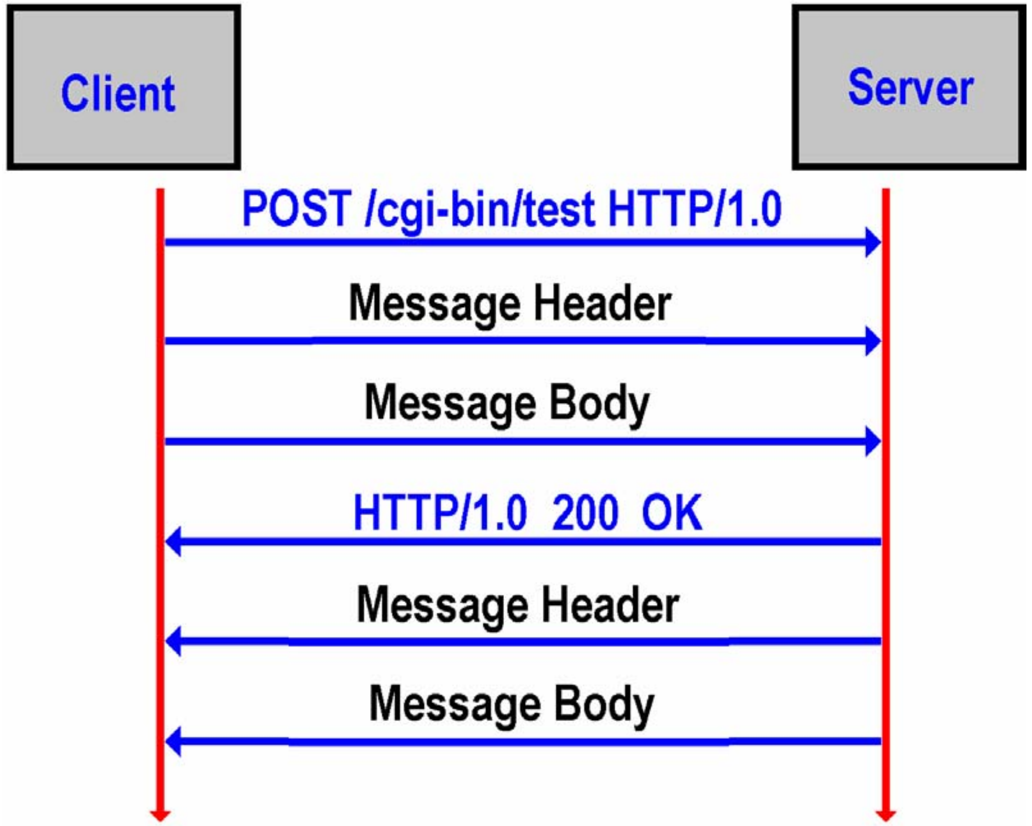
```
29        02:46:59.635 1042 HTTP  HTTP/1.1 200 OK
  HTTP/1.1 200 OK
  Server: thttpd/2.20b 10oct00
  Content-type: image/gif
```

```
0020   00 FE 00 50 04 10 E6 7E 94 56 00 98 E4 00 50 18   ...P...~.V....P.
0030   3E BC 45 17 00 00 48 54 54 50 2F 31 2E 31 20 32   >.E...HTTP/1.1 2
0040   30 30 20 4F 4B 0D 0A 53 65 72 76 65 72 3A 20 74   00 OK..Server: t
0050   68 74 74 70 64 2F 32 2E 32 30 62 20 31 30 6F 63   httpd/2.20b 10oc
0060   74 30 30 0D 0A 43 6F 6E 74 65 6E 74 2D 74 79 70   t00..Content-typ
0070   65 3A 20 69 6D 61 67 65 2F 67 69 66 0D 0A 44 61   e: image/gif..Da
0080   74 65 3A 20 54 68 75 2C 20 32 32 20 4E 6F 76 20   te: Thu, 22 Nov
0090   32 30 30 31 20 32 30 3A 32 38 3A 33 37 20 47 4D   2001 20:28:37 GM
00A0   54 0D 0A 4C 61 73 74 2D 6D 6F 64 69 66 69 65 64   T..Last-modified
00B0   3A 20 53 75 6E 2C 20 30 37 20 41 70 72 20 31 39   : Sun, 07 Apr 19
00C0   37 34 20 31 33 3A 33 37 3A 31 32 20 47 4D 54 0D   74 13:37:12 GMT.
00D0   0A 41 63 63 65 70 74 2D 52 61 6E 67 65 73 3A 20   .Accept-Ranges:
00E0   62 79 74 65 73 0D 0A 43 6F 6E 6E 65 63 74 69 6F   bytes..Connectio
00F0   6E 3A 20 63 6C 6F 73 65 0D 0A 43 6F 6E 74 65 6E   n: close..Conten
0100   74 2D 6C 65 6E 67 74 68 3A 20 37 36 39 0D 0A 0D   t-length: 769...
0110   0A 47 49 46 38 39 61 F4 01 3C 00 B3 00 00 21 21   .GIF89a..<....!!
0120   42 FF 00 00 FF FF FF FF FF FF FF FF FF FF FF FF   B...............
```

```
Capture to Screen in progress...   29   Nov 22, 2001   20:36
```

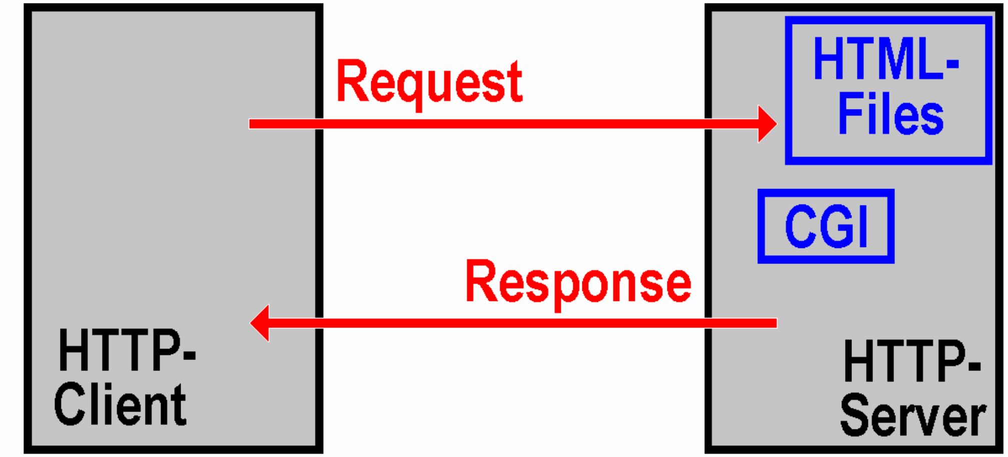
HTTP Protocol Basics

* A POST request consist of a request line, a message header, and a message body. The server returns status line, message header, and the output of the CGI program within the message body.



Web Server Basics

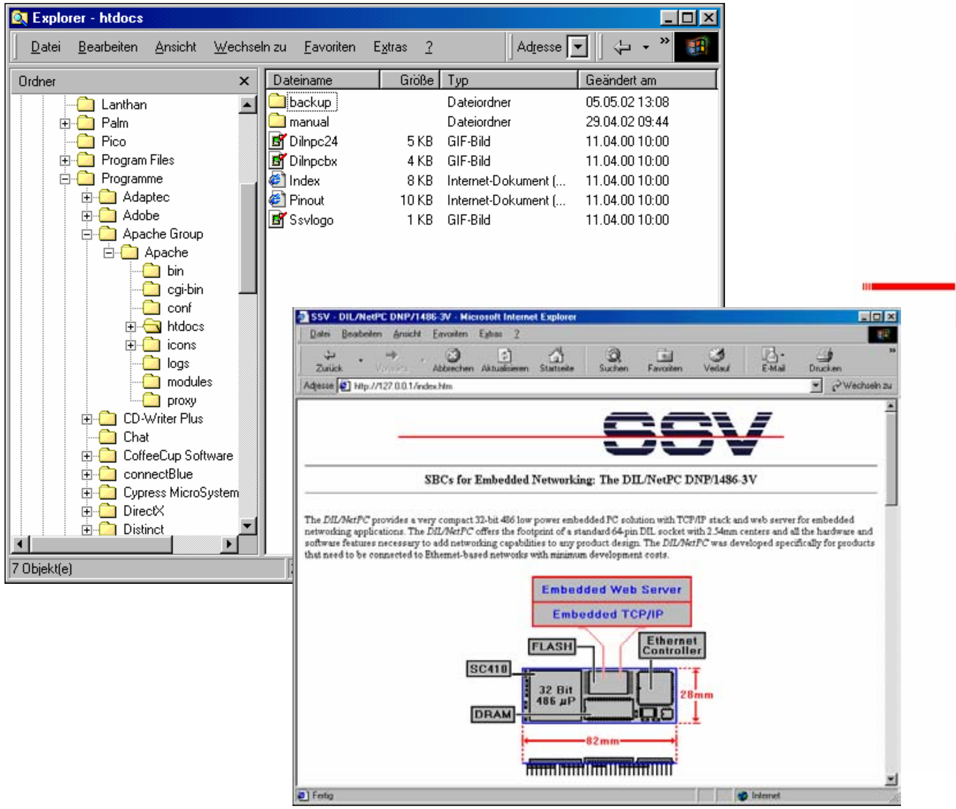
* Simplified a Web server can be imagined like a special kind of a file server. The “files” are the resources (static content: HTML files, GIF and JPEG pictures ...). The Web server deliver these resources with a very special communication protocol (HTTP).



* A Web server can not only deliver static content. There are different technologies (CGI, Server-Side-Includes) for generate dynamic content.

Web Server Basics

* Web server needs storage space for the resources (HTML files, GIF and JPEG pictures ...). Typical these resources are stored within special directories of a file system.

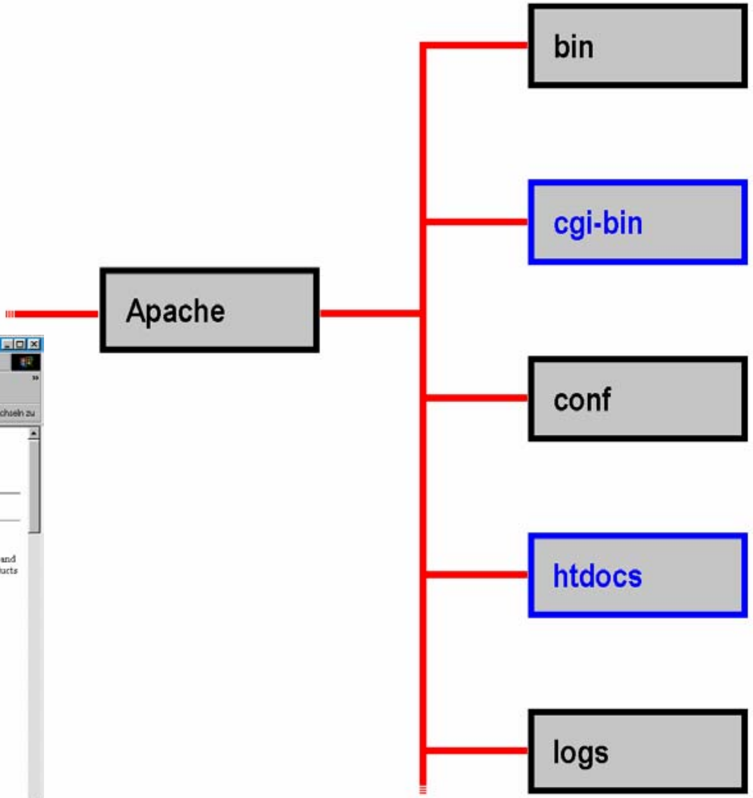


Dateiname	Größe	Typ	Geändert am
backup		Dateiordner	05.05.02 13:08
manual		Dateiordner	29.04.02 09:44
Dilnpc24	5 KB	GIF-Bild	11.04.00 10:00
Dilnpcbx	4 KB	GIF-Bild	11.04.00 10:00
Index	8 KB	Internet-Dokument (...	11.04.00 10:00
Pinout	10 KB	Internet-Dokument (...	11.04.00 10:00
Ssvlogo	1 KB	GIF-Bild	11.04.00 10:00

SSV - DIL/NetPC DNP/1486-3V - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück
Vorwärts
Abbrechen
Aktualisieren
Startseite
Suchen
Favoriten
Verlauf
E-Mail
Drucken
Adresse
http://127.0.0.1/index.htm
Wechseln zu
Fertig
Internet

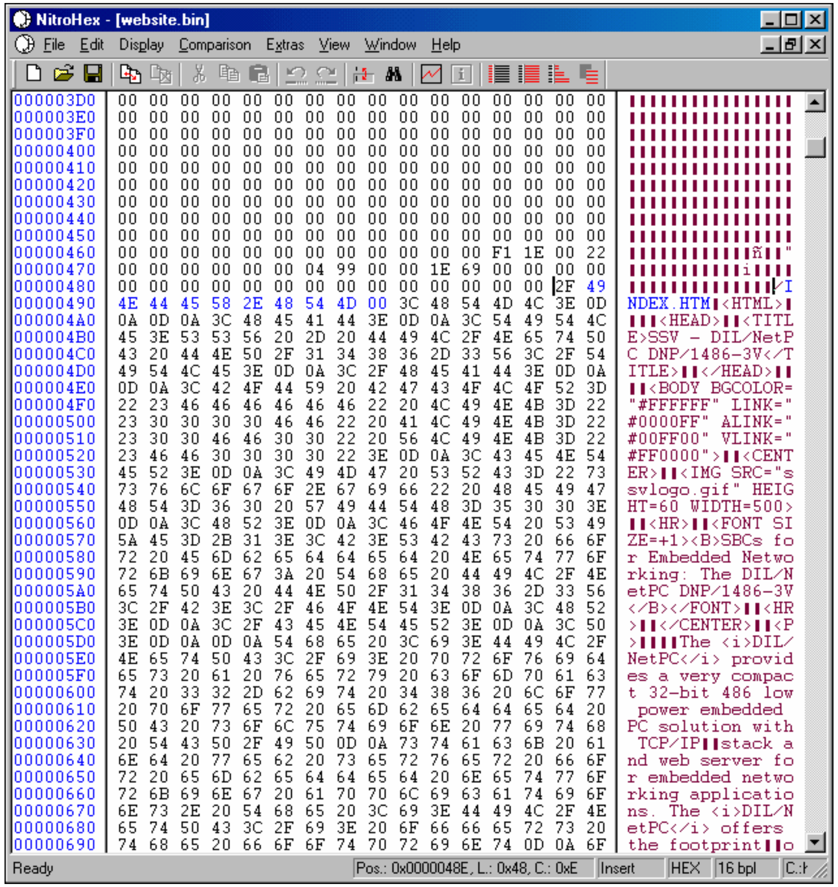
SBCs for Embedded Networking: The DIL/NetPC DNP/1486-3V

The *DIL/NetPC* provides a very compact 32-bit 486 low power embedded PC solution with TCP/IP stack and web server for embedded networking applications. The *DIL/NetPC* offers the footprint of a standard 64-pin DIL socket with 2.54mm centers and all the hardware and software features necessary to add networking capabilities to any product design. The *DIL/NetPC* was developed specifically for products that need to be connected to Ethernet-based networks with minimum development costs.



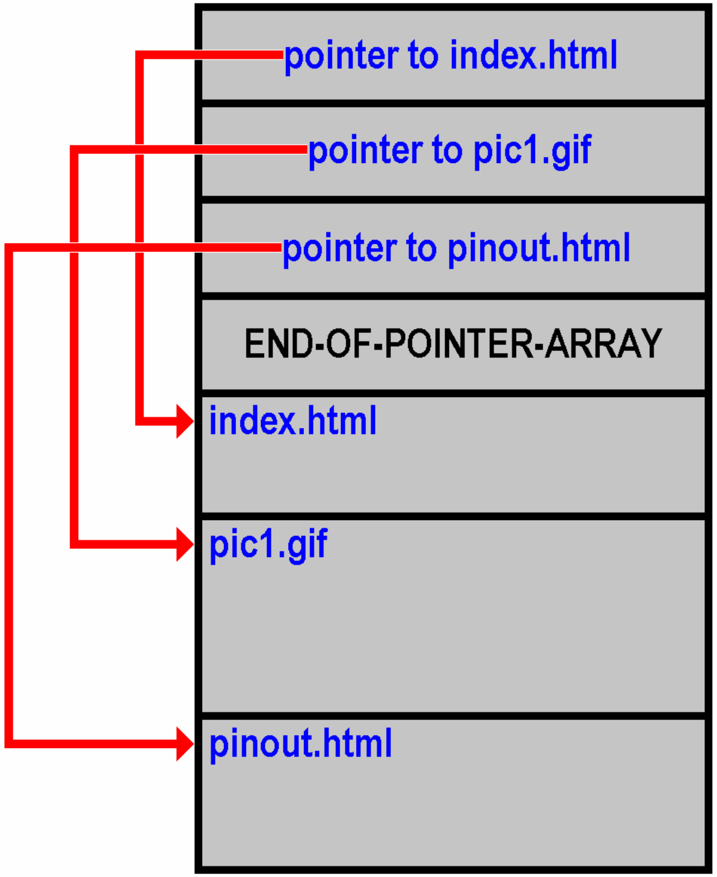
Web Server Basics

* Microcontroller-based (O/S-free) embedded Web server are using a **Resource Image File** within the firmware memory instead of a file system.



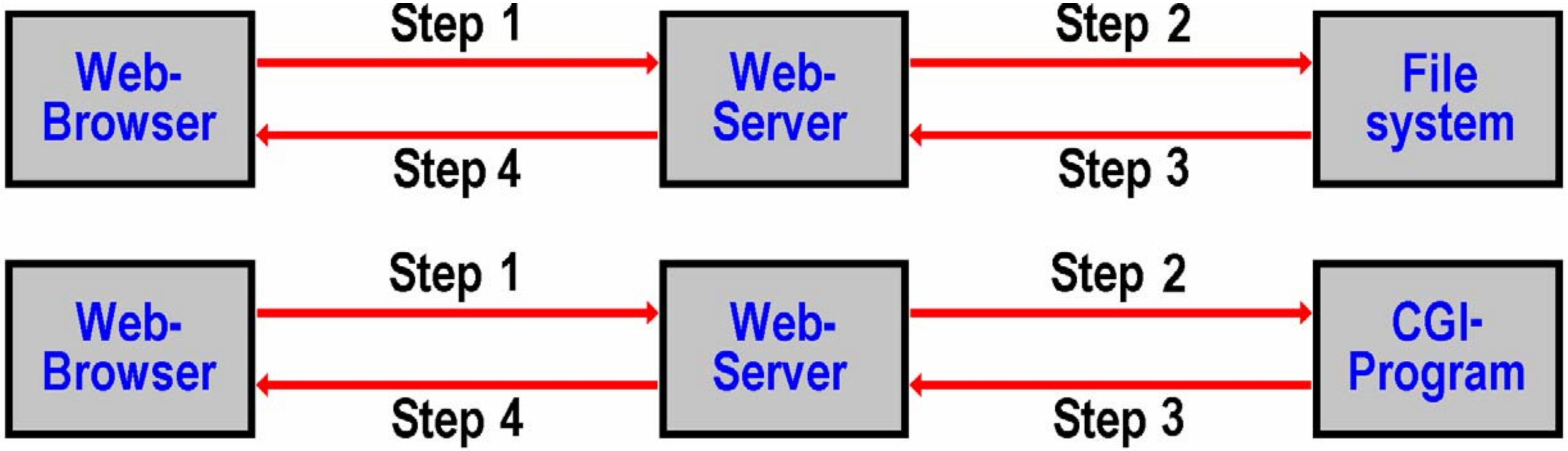
```
000003D0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
000003E0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
000003F0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
00000400  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
00000410  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
00000420  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
00000430  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
00000440  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
00000450  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
00000460  00 00 00 00 00 00 00 00 00 00 00 00 F1 1E 00 22  ▮▮▮▮▮▮▮▮▮▮▮▮ñ▮▮"
00000470  00 00 00 00 00 00 04 99 00 00 1E 69 00 00 00 00  ▮▮▮▮▮▮▮▮▮▮▮i▮▮▮▮
00000480  00 00 00 00 00 00 00 00 00 00 00 00 00 00 2F 49  ▮▮▮▮▮▮▮▮▮▮▮▮▮▮/I
00000490  4E 44 45 58 2E 48 54 4D 00 3C 48 54 4D 4C 3E 0D  NDEX.HTM▮<HTML>▮
000004A0  0A 0D 0A 3C 48 45 41 44 3E 0D 0A 3C 54 49 54 4C  ▮▮▮<HEAD>▮▮<TITL
000004B0  45 3E 53 53 56 20 2D 20 44 49 4C 2F 4E 65 74 50  E>SSV - DIL/NetP
000004C0  43 20 44 4E 50 2F 31 34 38 36 2D 33 56 3C 2F 54  C DNP/1486-3V</T
000004D0  49 54 4C 45 3E 0D 0A 3C 2F 48 45 41 44 3E 0D 0A  ITLE>▮▮</HEAD>▮▮
000004E0  0D 0A 3C 42 4F 44 59 20 42 47 43 4F 4C 4F 52 3D  ▮▮<BODY BGCOLOR=
000004F0  22 23 46 46 46 46 46 46 22 20 4C 49 4E 4B 3D 22  "#FFFFFF" LINK="
00000500  23 30 30 30 30 46 46 22 20 41 4C 49 4E 4B 3D 22  #0000FF" ALINK="
00000510  23 30 30 46 46 30 30 22 20 56 4C 49 4E 4B 3D 22  #00FF00" VLINK="
00000520  23 46 46 30 30 30 30 22 3E 0D 0A 3C 43 45 4E 54  #FF0000">▮▮<CENT
00000530  45 52 3E 0D 0A 3C 49 4D 47 20 53 52 43 3D 22 73  ER>▮▮<IMG SRC="s
00000540  73 76 6C 6F 67 6F 2E 67 69 66 22 20 48 45 49 47  svlogo.gif" HEIG
00000550  48 54 3D 36 30 20 57 49 44 54 48 3D 35 30 30 3E  HT=60 WIDTH=500>
00000560  0D 0A 3C 48 52 3E 0D 0A 3C 46 4F 4E 54 20 53 49  ▮▮<HR>▮▮<FONT SI
00000570  5A 45 3D 2B 31 3E 3C 42 3E 53 42 43 73 20 66 6F  ZE=+1><B>SBCs fo
00000580  72 20 45 6D 62 65 64 64 65 64 20 4E 65 74 77 6F  r Embedded Netwo
00000590  72 6B 69 6E 67 3A 20 54 68 65 20 44 49 4C 2F 4E  rking: The DIL/N
000005A0  65 74 50 43 20 44 4E 50 2F 31 34 38 36 2D 33 56  etPC DNP/1486-3V
000005B0  3C 2F 42 3E 3C 2F 46 4F 4E 54 3E 0D 0A 3C 48 52  </B></FONT>▮▮<HR
000005C0  3E 0D 0A 3C 2F 43 45 4E 54 45 52 3E 0D 0A 3C 50  >▮▮</CENTER>▮▮<P
000005D0  3E 0D 0A 0D 0A 54 68 65 20 3C 69 3E 44 49 4C 2F  >▮▮▮▮The <i>DIL/
000005E0  4E 65 74 50 43 3C 2F 69 3E 20 70 72 6F 76 69 64  NetPC</i> provid
000005F0  65 73 20 61 20 76 65 72 79 20 63 6F 6D 70 61 63  es a very compac
00000600  74 20 33 32 2D 62 69 74 20 34 38 36 20 6C 6F 77  t 32-bit 486 low
00000610  20 70 6F 77 65 72 20 65 6D 62 65 64 64 65 64 20   power embedded 
00000620  50 43 20 73 6F 6C 75 74 69 6F 6E 20 77 69 74 68  PC solution with
00000630  20 54 43 50 2F 49 50 0D 0A 73 74 61 63 6B 20 61   TCP/IP▮▮stack a
00000640  6E 64 20 77 65 62 20 73 65 72 76 65 72 20 66 6F  nd web server fo
00000650  72 20 65 6D 62 65 64 64 65 64 20 6E 65 74 77 6F  r embedded netwo
00000660  72 6B 69 6E 67 20 61 70 70 6C 69 63 61 74 69 6F  rking applicatio
00000670  6E 73 2E 20 54 68 65 20 3C 69 3E 44 49 4C 2F 4E  ns. The <i>DIL/N
00000680  65 74 50 43 3C 2F 69 3E 20 6F 66 66 65 72 73 20  etPC</i> offers 
00000690  74 68 65 20 66 6F 6F 74 70 72 69 6E 74 0D 0A 6F  the footprint▮▮o
```

Ready | Pos.: 0x0000048E, L.: 0x48, C.: 0xE | Insert | HEX | 16 bpl | C:\



Web Server Basics

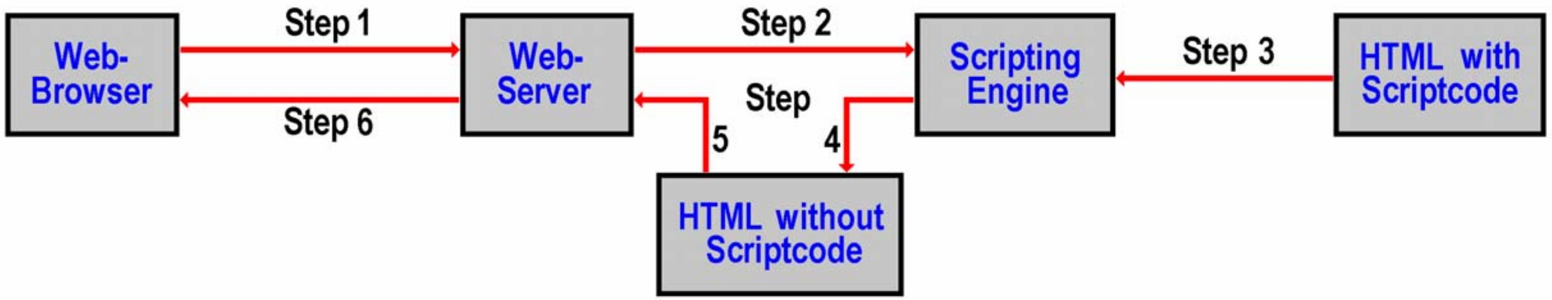
* With step 1 the browser sends a GET request for a specific resource to the Web server. Then (step 2) the server try to read this resource. If the resource accessible, the server reads the resource (step 3) and deliver the content to the Web browser (step 4).



* If the GET request points to **cgi-bin**, then the server runs the indicated program (step 2) and receives some output from this program (step 3). The outputs goes with the HTTP response to the Web browser.

Web Server Basics

* A other way for generating dynamic content is SSI (Server-Side-Include). The basic idea of this technology is to include script language statements to HTML pages. For interpreting the script statements the Web server needs the help of a **Scripting Engine** (i.e. PHP interpreter).

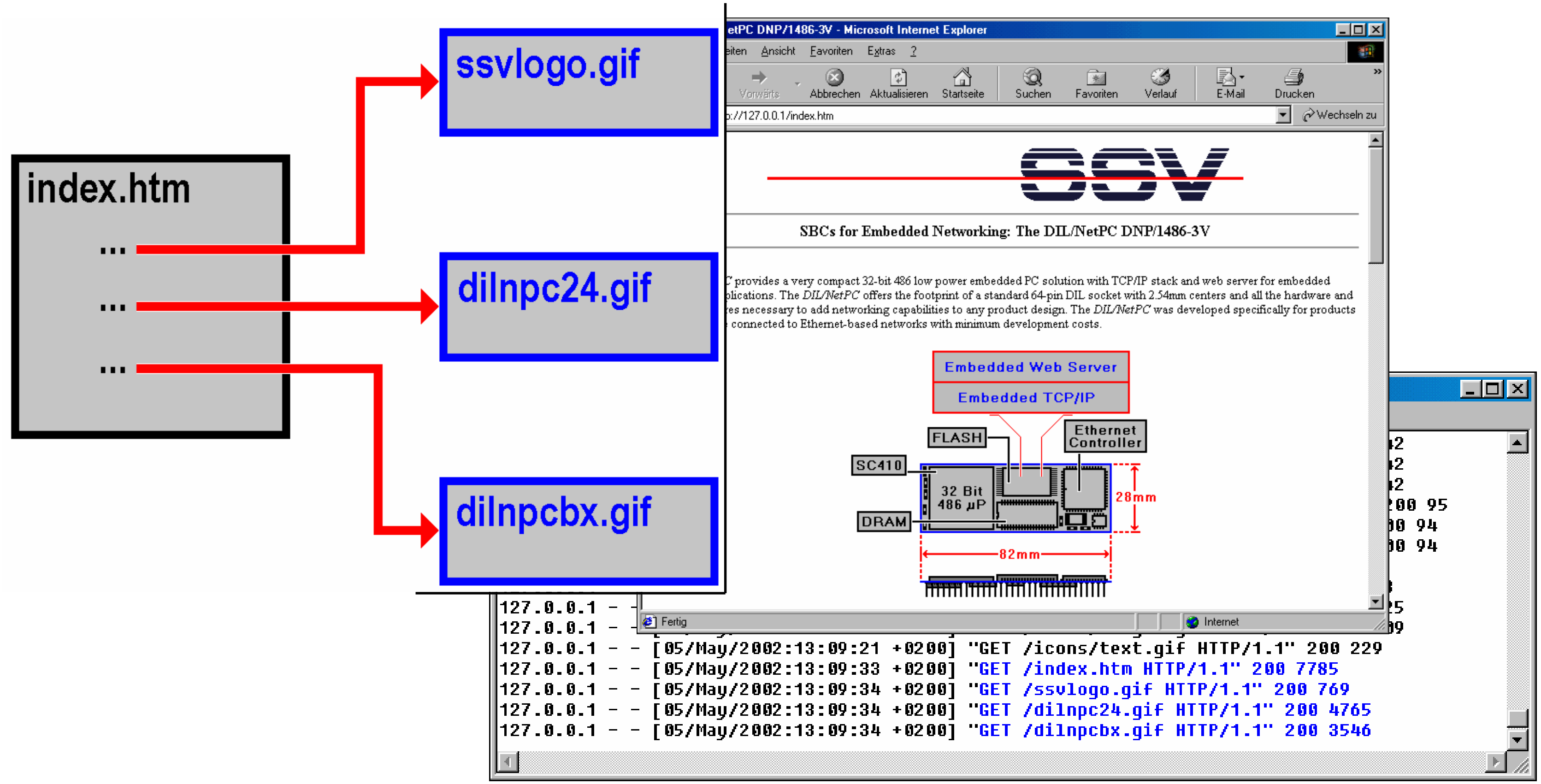


* Step 1 delivers the HTTP request to the Web server. Then the server starts the Scripting Engine (step 2). This program reads the requested HTML page and parses and executes the embedded script code (step 3).

* The output of a Scripting Engine is HTML without script code (step 4) direct to the Web server (step 5). With step 6 the Web server deliver the script-free HTML page to the Web browser.

Web Server Basics

* Web resources are linked together. A browser parses the HTML file direct after the first GET. Then the browser issues a additional GET for each (hyper) link.



p://127.0.0.1/index.htm

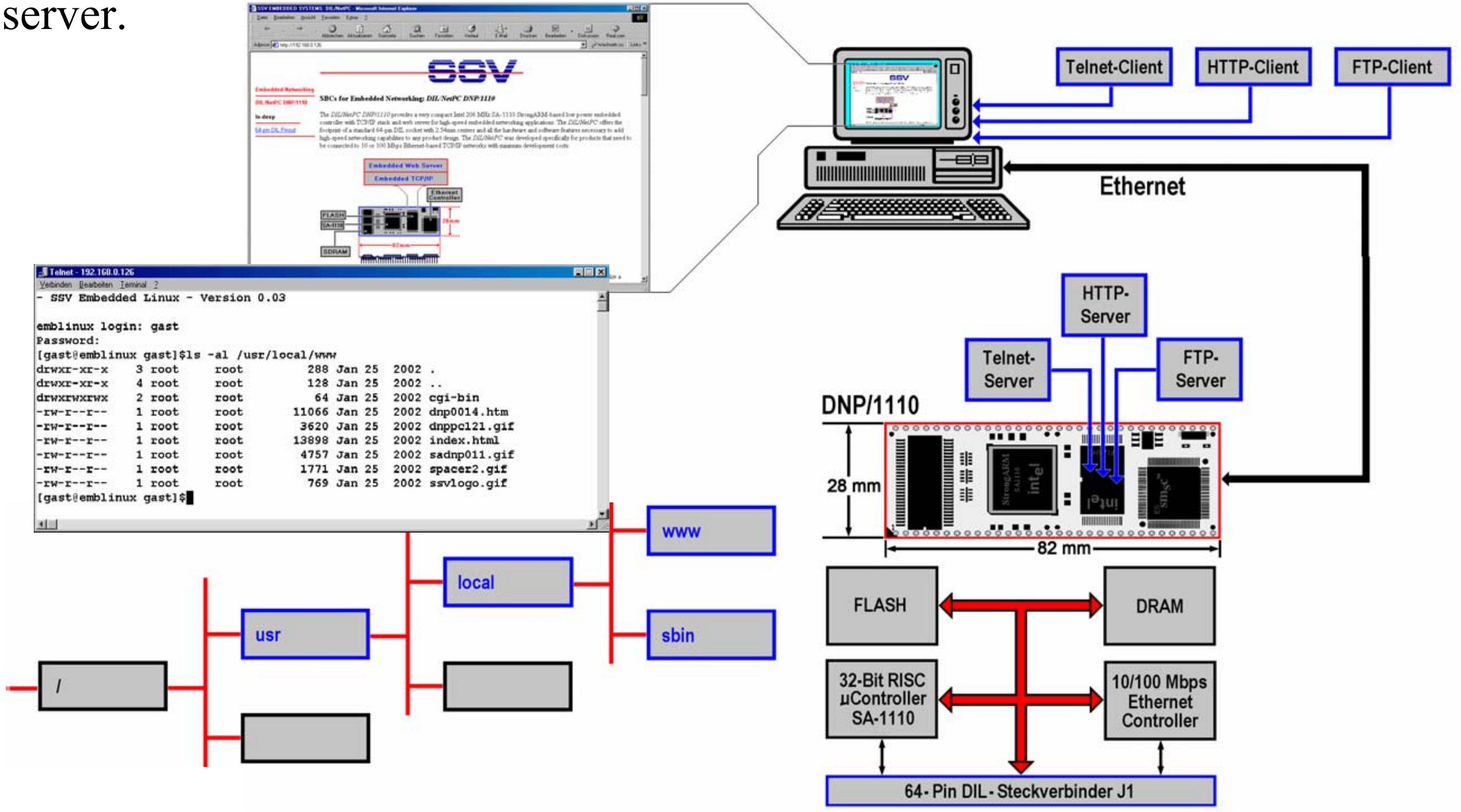
SBCs for Embedded Networking: The DIL/NetPC DNP/1486-3V

C provides a very compact 32-bit 486 low power embedded PC solution with TCP/IP stack and web server for embedded plications. The *DIL/NetPC* offers the footprint of a standard 64-pin DIL socket with 2.54mm centers and all the hardware and es necessary to add networking capabilities to any product design. The *DIL/NetPC* was developed specifically for products connected to Ethernet-based networks with minimum development costs.

```
127.0.0.1 - -
127.0.0.1 - -
127.0.0.1 - - [05/May/2002:13:09:21 +0200] "GET /icons/text.gif HTTP/1.1" 200 229
127.0.0.1 - - [05/May/2002:13:09:33 +0200] "GET /index.htm HTTP/1.1" 200 7785
127.0.0.1 - - [05/May/2002:13:09:34 +0200] "GET /ssvlogo.gif HTTP/1.1" 200 769
127.0.0.1 - - [05/May/2002:13:09:34 +0200] "GET /dilnpc24.gif HTTP/1.1" 200 4765
127.0.0.1 - - [05/May/2002:13:09:34 +0200] "GET /dilnpcbx.gif HTTP/1.1" 200 3546
```

Solution Demonstration

* DIL/NetPC DNP/1110 with embedded Linux and **thttpd** (Open Source) Web server.



Telnet - 192.168.0.126

```
- SSV Embedded Linux - Version 0.03

emblinux login: gast
Password:
[gast@emblinux gast]$ls -al /usr/local/www
drwxr-xr-x    3 root     root          288 Jan 25  2002 .
drwxr-xr-x    4 root     root          128 Jan 25  2002 ..
drwxrwxrwx    2 root     root           64 Jan 25  2002 cgi-bin
-rw-r--r--    1 root     root        11066 Jan 25  2002 dnp0014.htm
-rw-r--r--    1 root     root         3620 Jan 25  2002 dnppc121.gif
-rw-r--r--    1 root     root        13898 Jan 25  2002 index.html
-rw-r--r--    1 root     root         4757 Jan 25  2002 sadnp011.gif
-rw-r--r--    1 root     root         1771 Jan 25  2002 spacer2.gif
-rw-r--r--    1 root     root          769 Jan 25  2002 ssvlogo.gif
[gast@emblinux gast]$
```

Verbinden Bearbeiten Terminal ?
/
usr
local
www
sbin
Telnet-Client
HTTP-Client
FTP-Client
Ethernet
HTTP-Server
Telnet-Server
FTP-Server
DNP/1110
28 mm
82 mm
FLASH
DRAM
32-Bit RISC µController SA-1110
10/100 Mbps Ethernet Controller
64-Pin DIL-Steckverbinder J1

Stay Connected

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Stay Connected

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