

Servers on the Internet

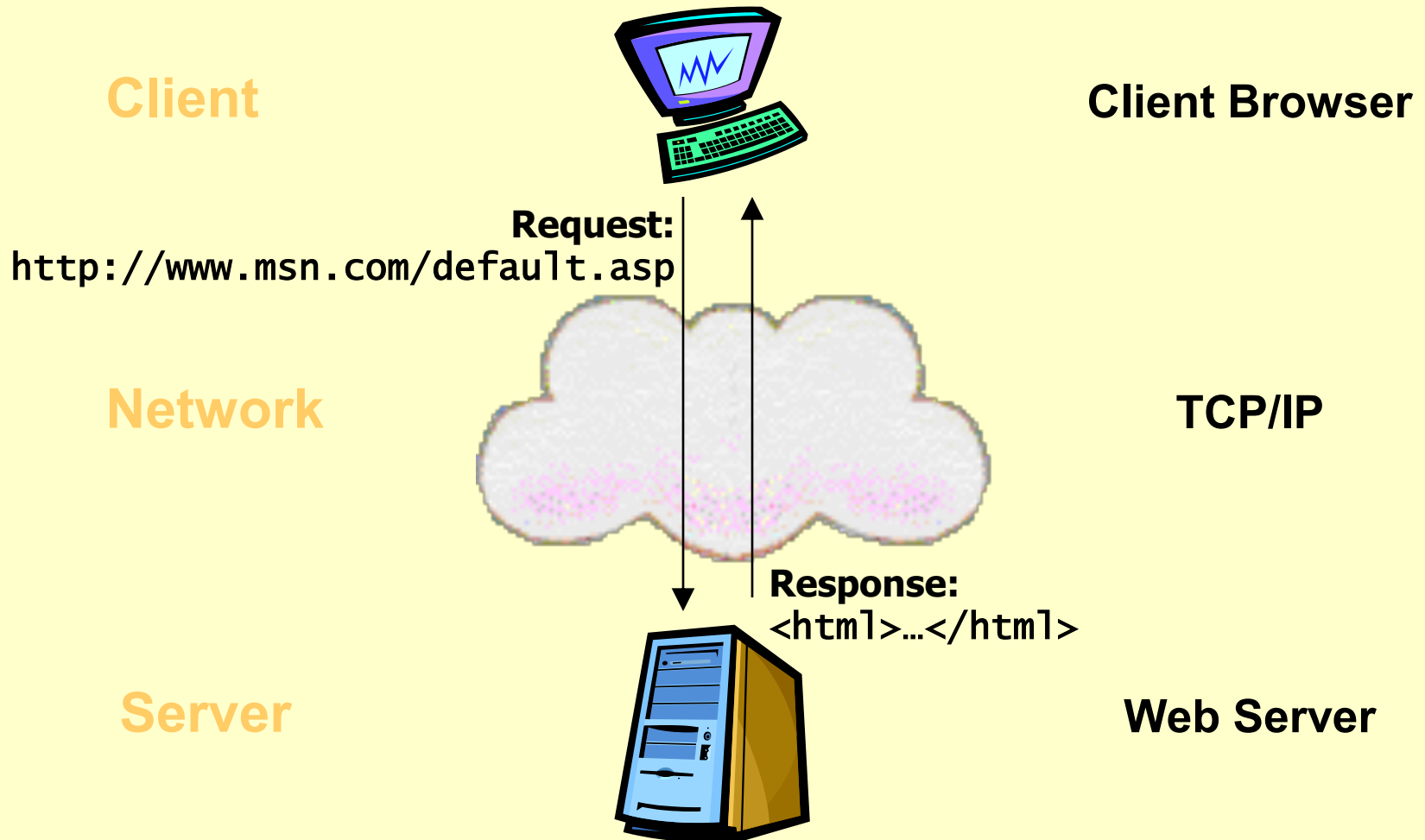
- HTTP - HyperText Transport Protocol
- FTP - File Transport Protocol
- Gopher - Text and Menus
- NNTP - Network News Transfer Protocol
- DNS - Distributed Name Service
- telnet - log into a remote computer
- Web services
 - coming soon to a web server near you

HyperText Markup Language (HTML)

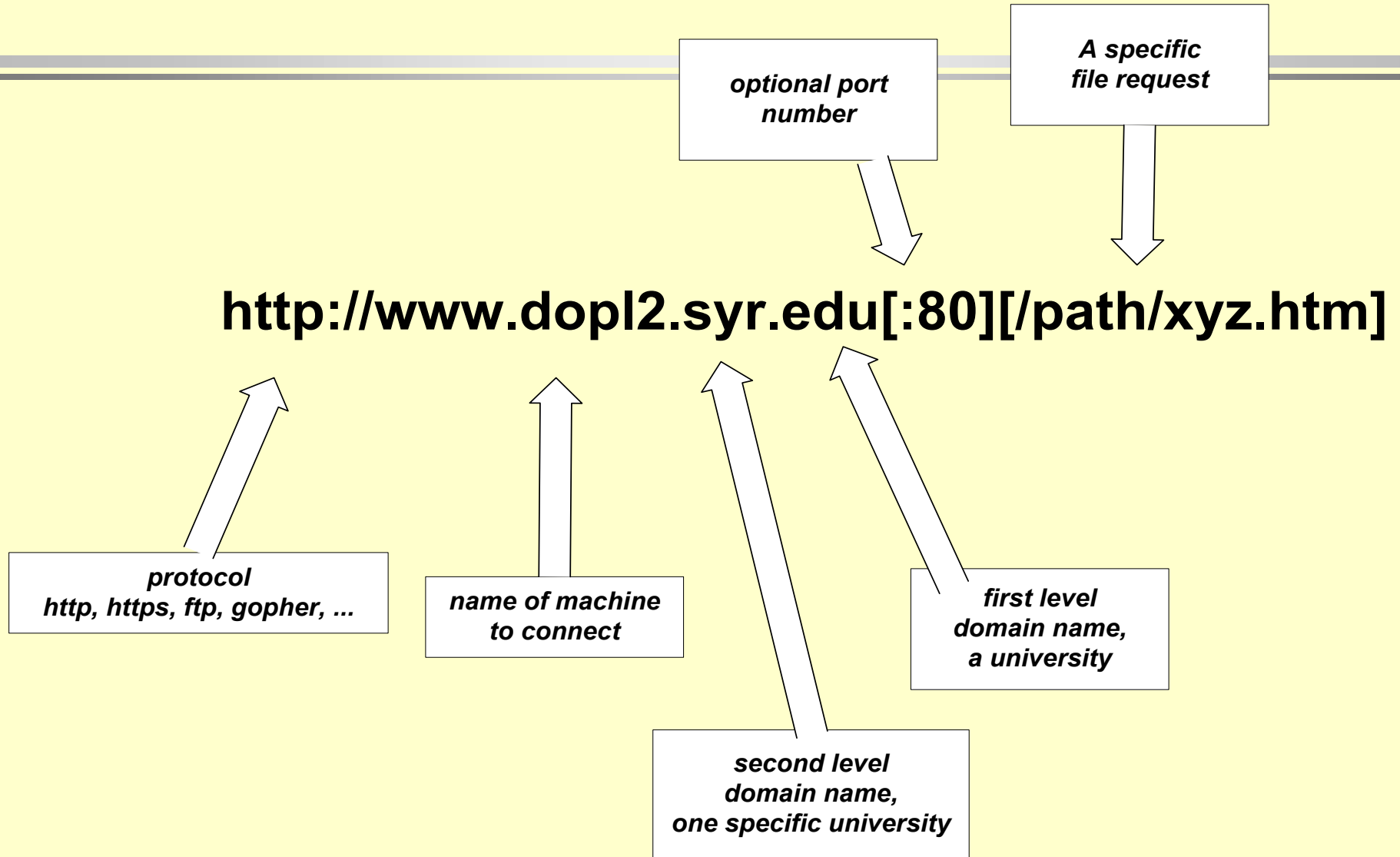
- The markup language used to represent Web pages for viewing by people
 - Designed to display data, not store/transfer data
- Rendered and viewed in a Web browser
- Can contain ***links*** to images, documents, and other pages
- Not extensible – uses only tags specified by the standard
- Derived from Standard Generalized Markup Language (SGML)
- HTML 3.2, 4.01, XHTML 1.0

Internet Technologies

WWW Architecture



Address Resolution



HTTP Protocol

- Client/Server, Request/Response architecture
 - You request a Web page
 - e.g. `http://www.msn.com/default.asp`
 - HTTP request
 - The Web server responds with data in the form of a Web page
 - HTTP response
 - Web page is expressed as HTML
 - Pages are identified as a Uniform Resource Locator (URL)
 - Protocol: `http`
 - Web server: `www.msn.com`
 - Web page: `default.asp`
 - Can also provide parameters: `?name=Leon`

Typical HTTP Transaction

- Client browser finds a machine address from an internet Domain Name Server (DNS).
- Client and Server open TCP/IP socket connection.
- Server waits for a request.
- Browser sends a verb and an object:
 - GET XYZ.HTM or POST form
 - If there is an error server can send back an HTML-based explanation.
- Server applies headers to a returned HTML file and delivers to browser.
- Client and Server close connection.
 - It is possible for the client to request the connection stay open – requires design effort to do that.

Tracing HTTP Message with Tracert

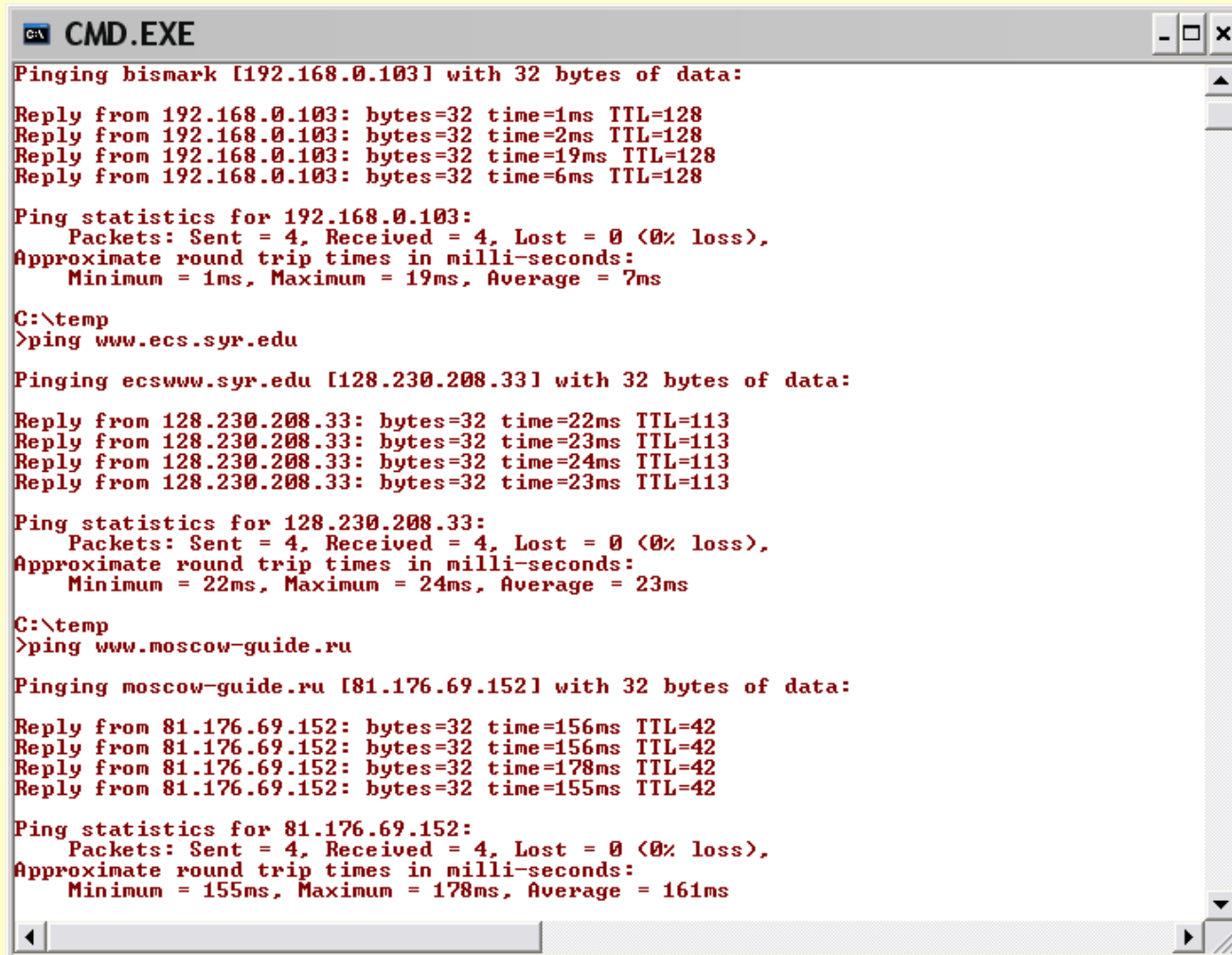
```
C:\>tracert www.moscow-guide.ru

Tracing route to moscow-guide.ru [81.176.69.152]
over a maximum of 30 hops:

  0  1 ms    1 ms    1 ms    192.168.0.1
  1  7 ms    7 ms    7 ms    10.101.208.1
  2  8 ms   10 ms    7 ms    fas3-2.syrcnybsh-rtr01.nyroc.rr.com [24.92.227.138]
  3  7 ms    9 ms    7 ms    srp2-0.syrcnyspp-rtr04.nyroc.rr.com [24.92.227.217]
  4  8 ms    7 ms    7 ms    srp10-0.syrcnyspp-rtr01.nyroc.rr.com [24.92.224.137]
  5  7 ms    7 ms    8 ms    srp8-0.syrcnyspp-rtr02.nyroc.rr.com [24.92.224.138]
  6  11 ms   11 ms   11 ms    son0-1-1.albnywav-rtr03.nyroc.rr.com [24.92.224.170]
  7  13 ms   12 ms   11 ms    pop1-alb-P7-0.atdn.net [66.185.133.229]
  8  14 ms   12 ms   11 ms    bb1-alb-P0-1.atdn.net [66.185.148.100]
  9  18 ms   15 ms   19 ms    bb2-nye-P3-0.atdn.net [66.185.152.71]
 10  16 ms   29 ms   16 ms    pop1-nye-P1-0.atdn.net [66.185.151.51]
 11  16 ms   15 ms   15 ms    0.so-2-0-0.BR1.NYC4.ALTER.NET [204.255.173.33]
 12  17 ms   15 ms   15 ms    0.so-6-0-0.XL1.NYC4.ALTER.NET [152.63.21.78]
 13  16 ms   18 ms   15 ms    0.so-4-0-0.TL1.NYC9.ALTER.NET [152.63.0.173]
 14  *      18 ms   16 ms    0.so-7-0-0.IL1.NYC9.ALTER.NET [152.63.9.245]
 15  15 ms   40 ms   15 ms    0.so-1-0-0.IR1.NYC12.ALTER.NET [152.63.23.62]
 16  95 ms   94 ms   95 ms    so-0-0-0.TR2.LND9.ALTER.NET [146.188.15.26]
 17  96 ms   97 ms   94 ms    so-6-0-0.XR1.LND9.ALTER.NET [146.188.15.42]
 18  94 ms   94 ms   94 ms    POS3-0.cr1.lnd10.gbb.uk.uu.net [158.43.150.97]
 19  99 ms   98 ms   99 ms    pos3-0.cr1.lnd8.gbb.uk.uu.net [158.43.253.142]
 20 104 ms   98 ms   99 ms    ge0-0.gw1.lnd8.gbb.uk.uu.net [158.43.188.25]
 21 149 ms  149 ms  150 ms    rtcomm-gw.customer.ALTER.NET [146.188.66.50]
 22 156 ms  156 ms  156 ms    msk-dsr7-ge1-0-0-0.rt-comm.ru [217.106.7.200]
 23 156 ms  159 ms  155 ms    81.176.69.152

Trace complete.
```

Pinging Various URLs



```
C:\>CMD.EXE

Pinging bismark [192.168.0.103] with 32 bytes of data:

Reply from 192.168.0.103: bytes=32 time=1ms TTL=128
Reply from 192.168.0.103: bytes=32 time=2ms TTL=128
Reply from 192.168.0.103: bytes=32 time=19ms TTL=128
Reply from 192.168.0.103: bytes=32 time=6ms TTL=128

Ping statistics for 192.168.0.103:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 19ms, Average = 7ms

C:\temp
>ping www.ecs.syr.edu

Pinging ecswww.syr.edu [128.230.208.33] with 32 bytes of data:

Reply from 128.230.208.33: bytes=32 time=22ms TTL=113
Reply from 128.230.208.33: bytes=32 time=23ms TTL=113
Reply from 128.230.208.33: bytes=32 time=24ms TTL=113
Reply from 128.230.208.33: bytes=32 time=23ms TTL=113

Ping statistics for 128.230.208.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 22ms, Maximum = 24ms, Average = 23ms

C:\temp
>ping www.moscow-guide.ru

Pinging moscow-guide.ru [81.176.69.152] with 32 bytes of data:

Reply from 81.176.69.152: bytes=32 time=156ms TTL=42
Reply from 81.176.69.152: bytes=32 time=156ms TTL=42
Reply from 81.176.69.152: bytes=32 time=178ms TTL=42
Reply from 81.176.69.152: bytes=32 time=155ms TTL=42

Ping statistics for 81.176.69.152:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 155ms, Maximum = 178ms, Average = 161ms
```


Programming the Web

- Client-Side Programming
 - JavaScript
 - Dynamic HTML
 - .Net controls
- Server-Side Programming
 - ASP script
 - Server components
 - C# code-behind
 - ADO
 - Web controls used on ASPX pages
 - Web services

Web Processing Models

- ***HyperText Transfer Protocol (HTTP)***
 - Universal access
 - HTTP is a "request-response" protocol specifying that a client will open a connection to server then send request using a very specific format. Server will respond and then close connection.
- ***HyperText Markup Language (HTML)***
 - Web of linked documents
 - Unlimited scope of information content
- ***Graphical Browser Client***
 - Sophisticated rendering makes authoring simpler
- ***HTML File Server***
 - Using HTTP, Interprets request, provides appropriate response, usually a file in HTML format
- ***Three-Tier Model***
 - Presentation, application logic, data access

Programming the Web

Client-Side Code

- What is client-side code?
 - Software that is downloaded from Web server to browser and then executes on the client
- Why client-side code?
 - Better scalability: less work done on server
 - Better performance/user experience
 - Create UI constructs not inherent in HTML
 - Drop-down and pull-out menus
 - Tabbed dialogs
 - Cool effects, e.g. animation
 - Data validation

Programming the Web

Server-Side Code

- What is server-side code?
 - Software that runs on the server, not the client
 - Receives input from
 - URL parameters
 - HTML form data
 - Cookies
 - HTTP headers
 - Can access server-side databases, e-mail servers, files, mainframes, etc.
 - Dynamically builds a custom HTML response for a client