

Web Programming

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Internet History

- The first node of **ARPAnet** was established at UCLA in 1969.
- In the late 1970s and 1980s, many networks were developed (BITNET, CSNET, NSFnet) locally.
- Internet is a huge collection of computers connected in a communications network.

Estimation of Users connected to the Internet

<https://datareportal.com/reports/digital-2022-global-overview-report>

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INTERNET USERS OVER TIME

NUMBER OF INTERNET USERS (IN MILLIONS) AND YEAR-ON-YEAR CHANGE



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OVERVIEW OF INTERNET USE

ESSENTIAL INDICATORS OF INTERNET ADOPTION AND USE



SOURCES: KEPIOS ANALYSIS; ITU; GSMA INTELLIGENCE; EUROSTAT; GWI; CIA WORLD FACTBOOK; ONNIC; API; LOCAL GOVERNMENT AUTHORITIES; UNITED NATIONS; TIME SPENT AND MOBILE SHARE DATA FROM GWI (Q3 2021), BASED ON A BROAD SURVEY OF INTERNET USERS AGED 16 TO 64. SEE [GWI.COM](#) FOR MORE DETAILS. **ADVISORY:** DUE TO COVID-19-RELATED DELAYS IN RESEARCH AND REPORTING, FIGURES FOR INTERNET USER GROWTH MAY UNDER-REPRESENT ACTUAL TRENDS. SEE NOTES ON DATA FOR MORE DETAILS. **COMPARABILITY:** SOURCE AND BASE CHANGES.

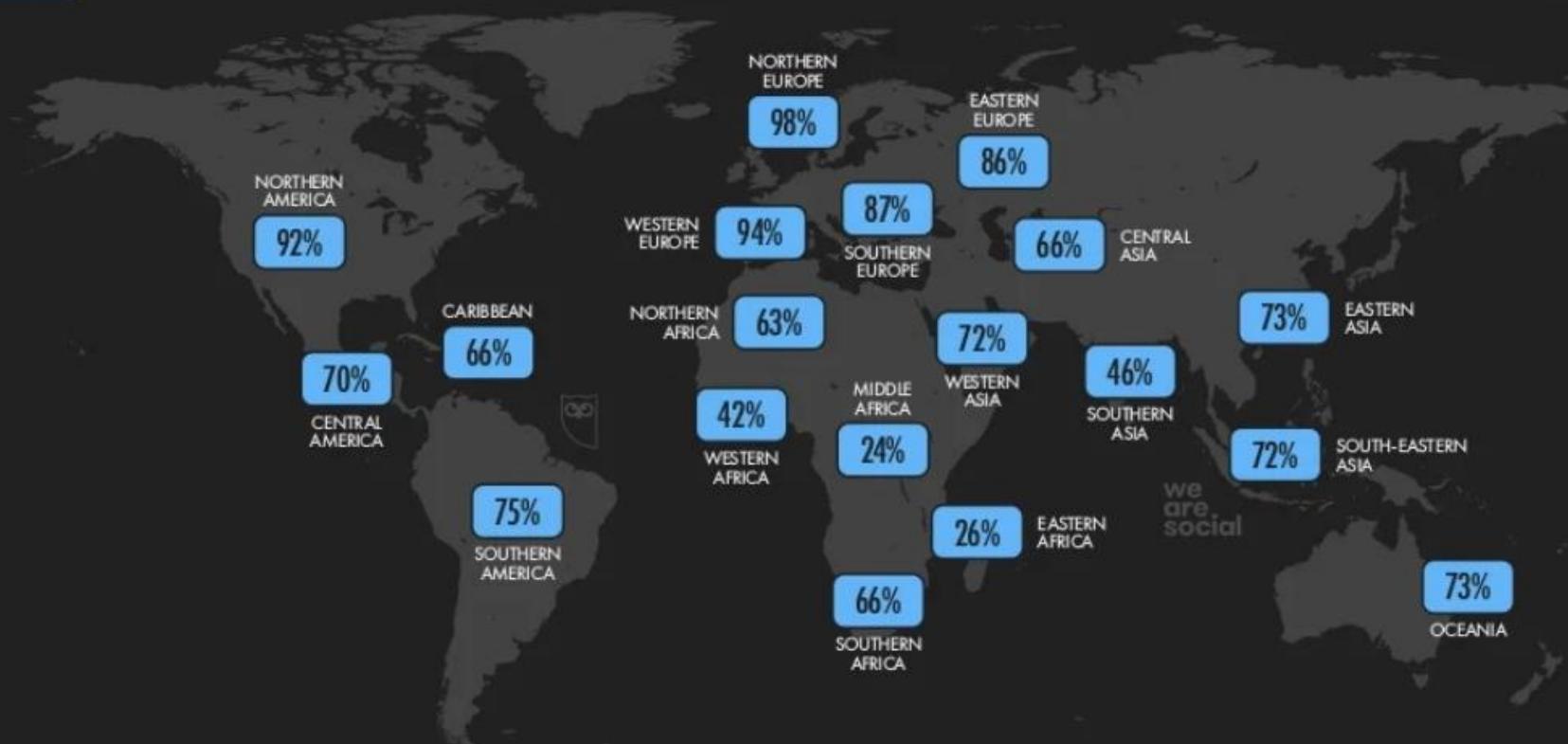
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INTERNET ADOPTION

INTERNET USERS AS A PERCENTAGE OF TOTAL POPULATION



GLOBAL OVERVIEW



SOURCES: KEPiOS ANALYSIS, ITU, GSMA INTELLIGENCE, EUROSTAT, GWI, CIA WORLD FACTBOOK, CNIC, API, LOCAL GOVERNMENT AUTHORITIES, UNITED NATIONS. NOTE: REGIONS BASED ON THE UNITED NATIONS GEOSCHEME. COMPARABILITY: SOURCE AND BASE CHANGES.

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INTERNET ADOPTION RANKING

COUNTRIES AND TERRITORIES WITH THE HIGHEST AND LOWEST LEVELS OF INTERNET ADOPTION



HIGHEST LEVELS OF INTERNET ADOPTION

#	HIGHEST ADOPTION	% OF POP.	Nº OF USERS
01=	BAHRAIN	99.0%	1,748,389
01=	KUWAIT	99.0%	4,310,821
01=	DENMARK	99.0%	5,765,876
01=	ICELAND	99.0%	340,935
01=	IRELAND	99.0%	4,951,504
01=	LUXEMBOURG	99.0%	632,194
01=	NORWAY	99.0%	5,433,568
01=	UNITED ARAB EMIRATES	99.0%	9,935,967
01=	LIECHTENSTEIN	99.0%	37,938
01=	QATAR	99.0%	2,925,565

LOWEST LEVELS OF INTERNET ADOPTION

#	LOWEST ADOPTION	% OF POP.	Nº OF USERS
232	NORTH KOREA	<0.1%	[BLOCKED]
231	CENTRAL AFRICAN REPUBLIC	7.1%	355,057
230	ERITREA	8.0%	290,533
229	COMOROS	8.5%	76,141
228	SOUTH SUDAN	10.9%	1,251,667
227	SOMALIA	13.7%	2,266,393
226	NIGER	14.5%	3,721,749
225	KIRIBATI	14.6%	17,848
224	BURUNDI	14.6%	1,816,078
223	DEM. REP. OF THE CONGO	17.6%	16,504,983

SOURCES: KEPiOS ANALYSIS; ITU; GSMA INTELLIGENCE; EUROSTAT; GWI; CIA WORLD FACTBOOK; CHNIG; APRI; LOCAL GOVERNMENT AUTHORITIES; UNITED NATIONS. **NOTES:** VALUES HAVE BEEN CAPPED AT 99% OF THE TOTAL POPULATION. THE INTERNET (AT LEAST AS THE REST OF THE WORLD KNOWS IT) REMAINS BLOCKED FOR EVERYDAY CITIZENS IN NORTH KOREA. **COMPARABILITY:** SOURCE AND BASE CHANGES.

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UNCONNECTED POPULATIONS

COUNTRIES AND TERRITORIES WITH THE LARGEST UNCONNECTED POPULATIONS AND THE LOWEST LEVELS OF INTERNET ADOPTION



ABSOLUTE: LARGEST UNCONNECTED POPULATIONS

#	LOCATION	UNCONNECTED POPULATION	% OF POP. OFFLINE
01	INDIA	742,003,000	53.0%
02	CHINA	421,432,000	29.1%
03	PAKISTAN	144,434,000	63.5%
04	BANGLADESH	114,511,000	68.5%
05	NIGERIA	104,888,000	49.0%
06	ETHIOPIA	89,502,000	75.0%
07	DEM. REP. OF THE CONGO	77,293,000	82.4%
08	INDONESIA	73,047,000	26.3%
09	BRAZIL	49,375,000	23.0%
10	TANZANIA	46,794,000	75.0%

RELATIVE: LOWEST LEVELS OF INTERNET ADOPTION

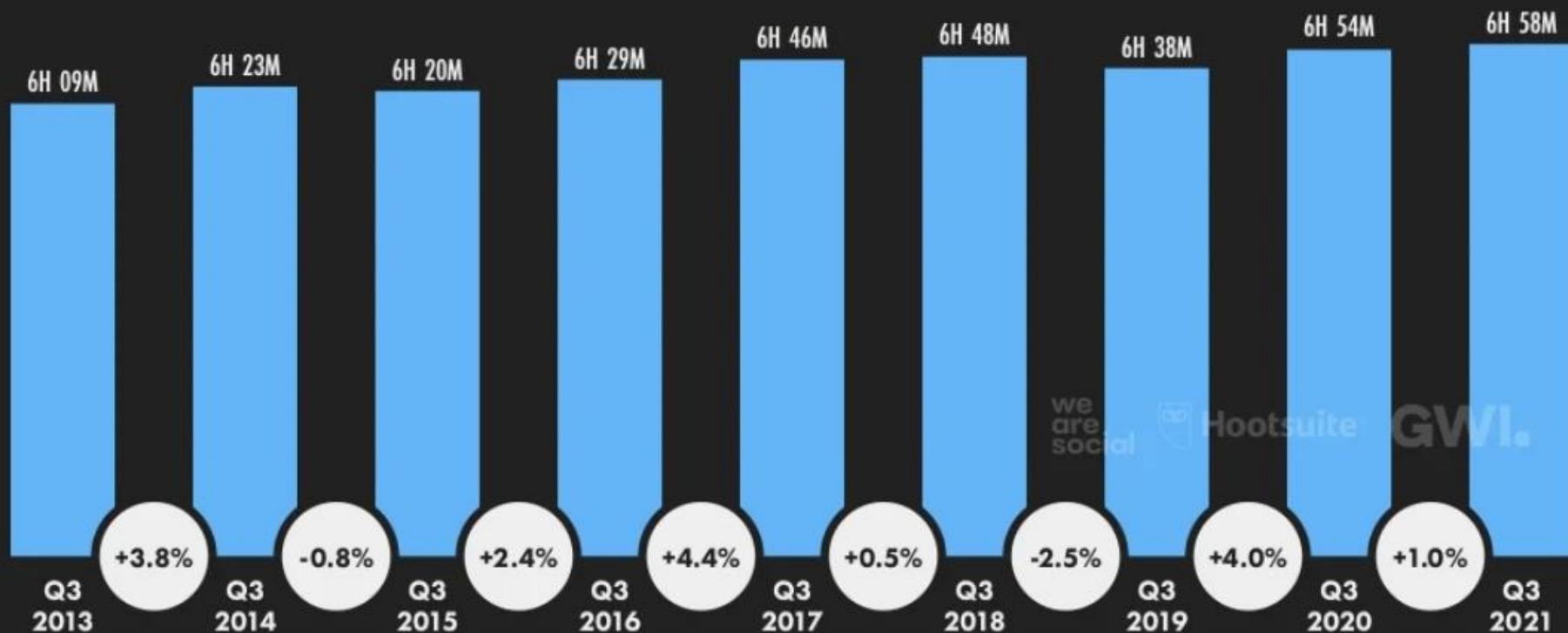
#	LOCATION	% OF POP. OFFLINE	UNCONNECTED
232	NORTH KOREA	>99.9%	25,938,000
231	CENTRAL AFRICAN REPUBLIC	92.9%	4,613,000
230	ERITREA	92.0%	3,341,000
229	COMOROS	91.5%	822,000
228	SOUTH SUDAN	89.1%	10,248,000
227	SOMALIA	86.3%	14,333,000
226	NIGER	85.5%	21,881,000
225	KIRIBATI	85.4%	105,000
224	BURUNDI	85.4%	10,623,000
223	DEM. REP. OF THE CONGO	82.4%	77,293,000

SOURCES: ITU; GSMA INTELLIGENCE; EURO STAT; GW; CIA WORLD FACTBOOK; CNNIC; APB; LOCAL GOVERNMENT AUTHORITIES; UNITED NATIONS. **NOTES:** FIGURES IN THE "% OF POP. OFFLINE" COLUMN REPRESENT THE PERCENTAGE OF THE POPULATION THAT DOES NOT YET USE THE INTERNET. ABSOLUTE VALUES HAVE BEEN ROUNDED TO THE NEAREST THOUSAND. THE INTERNET (AT LEAST AS THE REST OF THE WORLD KNOWS IT) REMAINS BLOCKED FOR EVERYDAY CITIZENS IN NORTH KOREA. **COMPARABILITY:** SOURCE AND BASE CHANGES.

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DAILY TIME SPENT USING THE INTERNET

AVERAGE AMOUNT OF TIME (IN HOURS AND MINUTES) THAT INTERNET USERS AGED 16 TO 64 SPEND USING THE INTERNET EACH DAY ON ANY DEVICE



SOURCE: GWI (Q3 2021). FIGURES REPRESENT THE FINDINGS OF A BROAD GLOBAL SURVEY OF INTERNET USERS AGED 16 TO 64. SEE [GWI.COM](#) FOR FULL DETAILS.

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DEVICES USED TO ACCESS THE INTERNET

PERCENTAGE OF INTERNET USERS AGED 16 TO 64 WHO USE EACH KIND OF DEVICE TO ACCESS THE INTERNET



SOURCE: GWI (Q3 2021). FIGURES REPRESENT THE FINDINGS OF A BROAD GLOBAL SURVEY OF INTERNET USERS AGED 16 TO 64. SEE [GWI.COM](#) FOR FULL DETAILS. NOTES: 'MOBILE PHONE (ANY)' INCLUDES USERS WHO ACCESS VIA A SMARTPHONE OR A FEATURE PHONE. 'LAPTOP OR DESKTOP (ANY)' INCLUDES USERS WHO ACCESS VIA THEIR OWN COMPUTER OR A COMPUTER PROVIDED BY THEIR EMPLOYER. PER CENTAGE CHANGE VALUES REFLECT RELATIVE CHANGE. 'BPS' VALUES SHOW THE CHANGE IN BASIS POINTS, AND REFLECT ABSOLUTE CHANGE.

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SHARE OF WEB TRAFFIC BY BROWSER

PERCENTAGE OF TOTAL WEB PAGES SERVED TO EACH BRAND OF WEB BROWSER RUNNING ON ANY DEVICE



GLOBAL OVERVIEW



we
are.
social



KUPROS



OPERA



D



OPERA



we
are.
social



Hootsuite®

SOURCE: STATCOUNTER. NOTES: FIGURES REPRESENT THE NUMBER OF PAGE VIEWS SERVED TO EACH BROWSER AS A PERCENTAGE OF TOTAL PAGE VIEWS SERVED TO WEB BROWSERS RUNNING ON ANY KIND OF DEVICE IN NOVEMBER 2021. PERCENTAGE CHANGE VALUES REPRESENT RELATIVE YEAR-ON-YEAR CHANGE (I.E. AN INCREASE OF 20% FROM A STARTING VALUE OF 50% WOULD EQUAL 60%, NOT 70%). "BPS" VALUES REPRESENT BASIS POINTS, AND INDICATE THE ABSOLUTE CHANGE. FIGURES MAY NOT SUM TO 100% DUE TO ROUNDING.

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SEARCH ENGINE MARKET SHARE

PERCENTAGE OF TOTAL WEB TRAFFIC REFERRED BY SEARCH ENGINES THAT ORIGINATED FROM EACH SEARCH SERVICE



GLOBAL OVERVIEW



SOURCE: STATCOUNTER. NOTES: FIGURES REPRESENT THE NUMBER OF PAGE VIEW REFERRALS ORIGINATING FROM EACH SERVICE AS A PERCENTAGE OF TOTAL PAGE VIEW REFERRALS ORIGINATING FROM SEARCH ENGINES IN NOVEMBER 2021. PERCENTAGE CHANGE VALUES REPRESENTATIVE YEAR-ON-YEAR CHANGE (I.E. AN INCREASE OF 20% FROM A STARTING VALUE OF 50% WOULD EQUAL 60%, NOT 70%). "BPS" VALUES REFER TO BASIS POINTS, AND INDICATE THE ABSOLUTE CHANGE. FIGURES MAY NOT SUM TO 100% DUE TO ROUNDING.

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SOCIAL MEDIA USERS OVER TIME

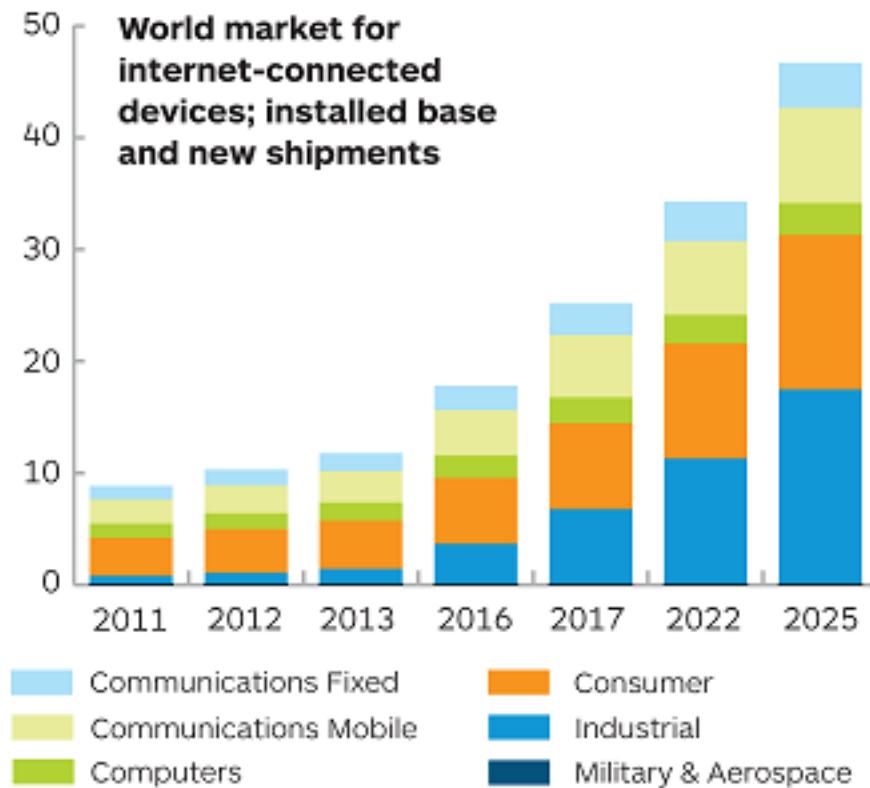
NUMBER OF SOCIAL MEDIA USERS (IN MILLIONS) AND YEAR-ON-YEAR CHANGE (NOTE: USERS MAY NOT REPRESENT UNIQUE INDIVIDUALS)



SOURCES: KEROS ANALYSIS; COMPANY ADVERTISING RESOURCES AND ANNOUNCEMENTS; CNN IQ; TECHKASA; MEDIASCORE; QCDH. ADVISORY: SOCIAL MEDIA USERS MAY NOT REPRESENT UNIQUE INDIVIDUALS. COMPARABILITY: SOURCE CHANGES, BASE CHANGES, AND METHODOLOGY CHANGES. VALUES MAY NOT CORRELATE WITH THOSE PUBLISHED IN PREVIOUS REPORTS.

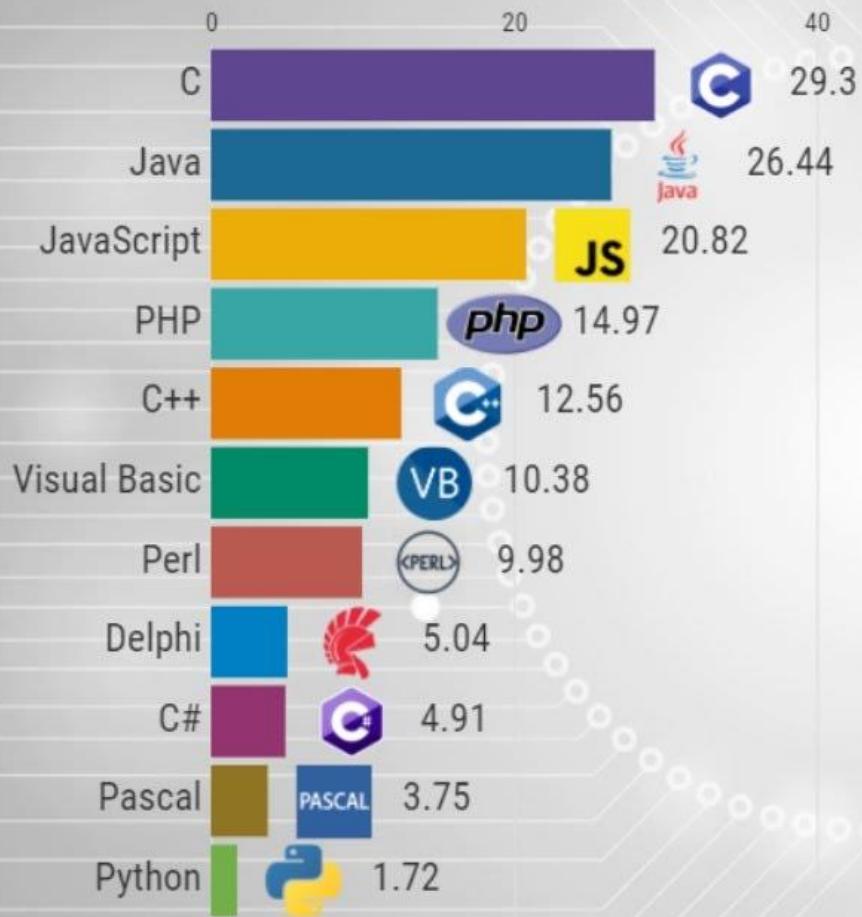
Estimation of Devices connected to the Internet

On beyond consumers: Where the Internet of Things is headed (billions of connected devices)



Nonconsumer sectors will account for the majority of connected devices by 2025

Most Popular Programming Languages



⌚ 2001 Q1

<https://i.ytimg.com/vi/UNSoPa-XQN0/maxresdefault.jpg>

<https://medium.com/codex/7-programming-languages-to-prepare-2022-and-impress-your-boss-bcd29716bd44>

Network Protocols

- TCP
- IP
- HTTP
- SNMP
- Netconf
- ICMP
- DHCP
- FTP
- BGP

Internet Protocol Address

- The Internet devices are identified by numeric addresses for computers
- The IP address is a unique 32-bit number
 - Divided into 4 parts (1 byte each)
 - 191.57.126.0
- Next generation : IPv6 – 128-bit

Domain Name & DNS

- People have difficulty dealing with and remembering numbers, machines on the Internet also have textual names.
 - www.cuhk.edu.hk
 - It is the machine providing web services on the CUHK domain.
- There are name servers on the Internet that provide Domain Name Services (DNS).
 - ns.cuhk.edu.hk, 137.189.6.6
 - It replies the name or IP address of any machine in the CUHK domain.

The World Wide Web

- Generally called “The Web”
- It is a collection of information stored on the networked computers over the world.
- The WWW was proposed in 1989 by Tim Berners-Lee at CERN.

How does the Web work?

- The web information is stored in the **Web pages**.
 - In HTML format.
- Web pages are stored in the computers called **Web servers**.
 - In the Web server file system.
- The computer reading the pages is called **web clients** with specific web browser.
 - Most commonly Internet Explorer or Netscape.
- The web server waits for the request from the web clients over the Internet.
 - Internet Information Server (IIS) or Apache.

Web or Internet?

- They are not the same things.
- The Internet is a collection of computers or networking devices connected together.
 - They have communication between each other.
 - Decentralized design that there is no centralized body controls how the Internet functions.
- The Web is a collection of documents that are interconnected by hyper-links.
 - These documents are accessed by web browsers and provided by web servers.

Internet Terminology

- Client
 - Any computer on the network that requests services from another computer on the network.
- Server
 - Any computer that receives requests from client computers, processes and sends the output.
- Web Page
 - Any page that is hosted on the Internet.
- Web Development
 - The process of creating, modifying web pages.

Web Browser (Web Client)

- It is a program that retrieves information from the Web.
 - Microsoft Internet Explorer
 - Most commonly used browsers
 - Netscape, Mosaic
 - Many different computing platforms
 - Opera
 - The fastest browser on Earth
 - Lynx
 - Text based web client

Lynx – UNIX based

The screenshot shows a Lynx browser window with the following content:

Blogger: Redirecting

Blogger
Push-Button Publishing

You're about to be redirected

The blog that used to be here is now at
<http://minethatdata.com/blog/index.html>.
Do you wish to be redirected?
This blog is not hosted by Blogger and has not been checked for viruses and other forms of malware.

Yes No

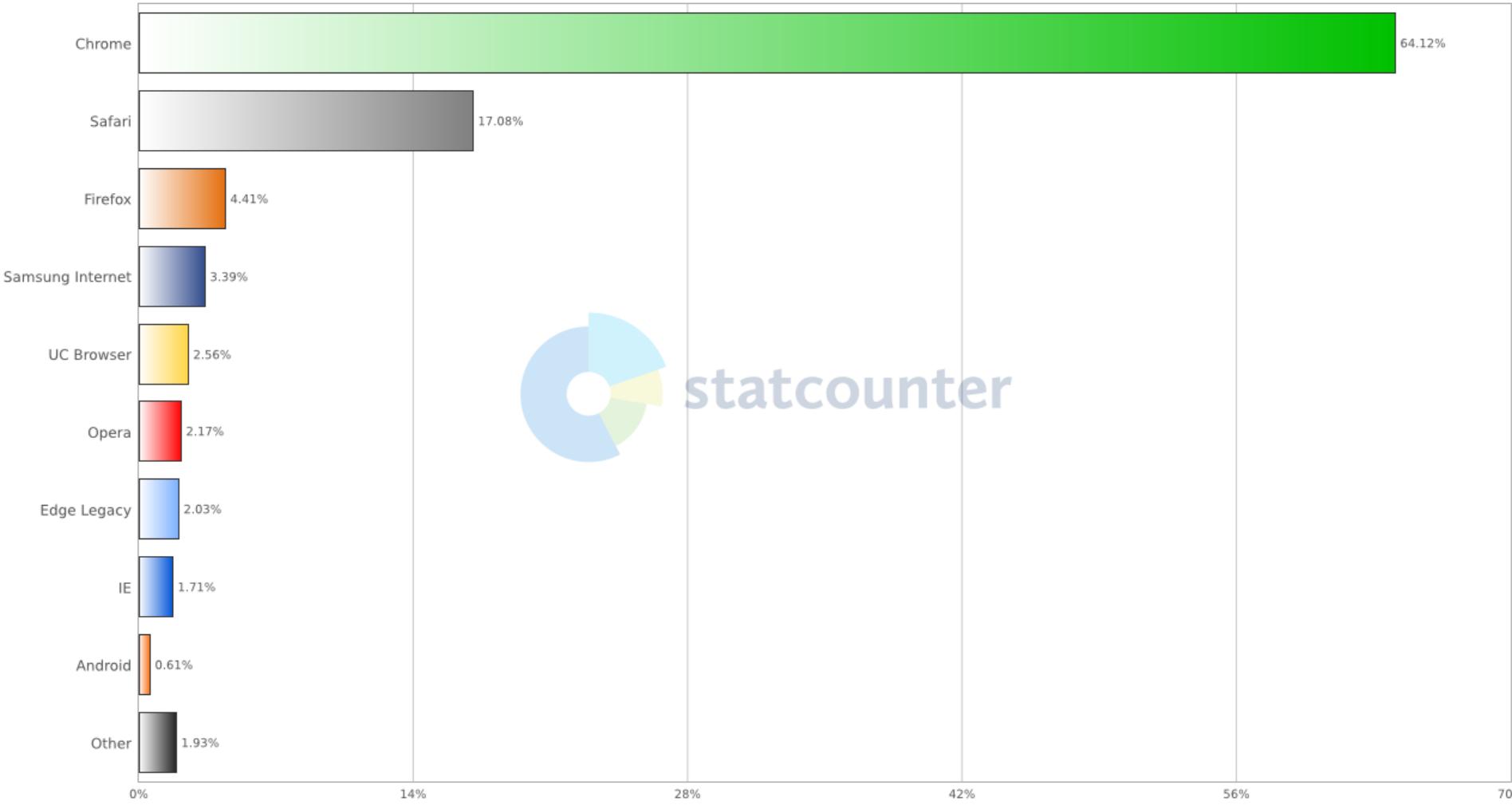
[Home](#) | [Features](#) | [About](#) | [Buzz](#) | [Help](#) | [Discuss](#) | [Languages](#)
[Developers](#) | [Gear](#)
[Terms of Service](#) | [Privacy](#) | [Content Policy](#) | [Copyright](#)
[Google](#)

http://www.blogger.com/

- Text mode browser, fast!

Some Statistics

StatCounter Global Stats
Browser Market Share Worldwide from July 2019 - July 2020

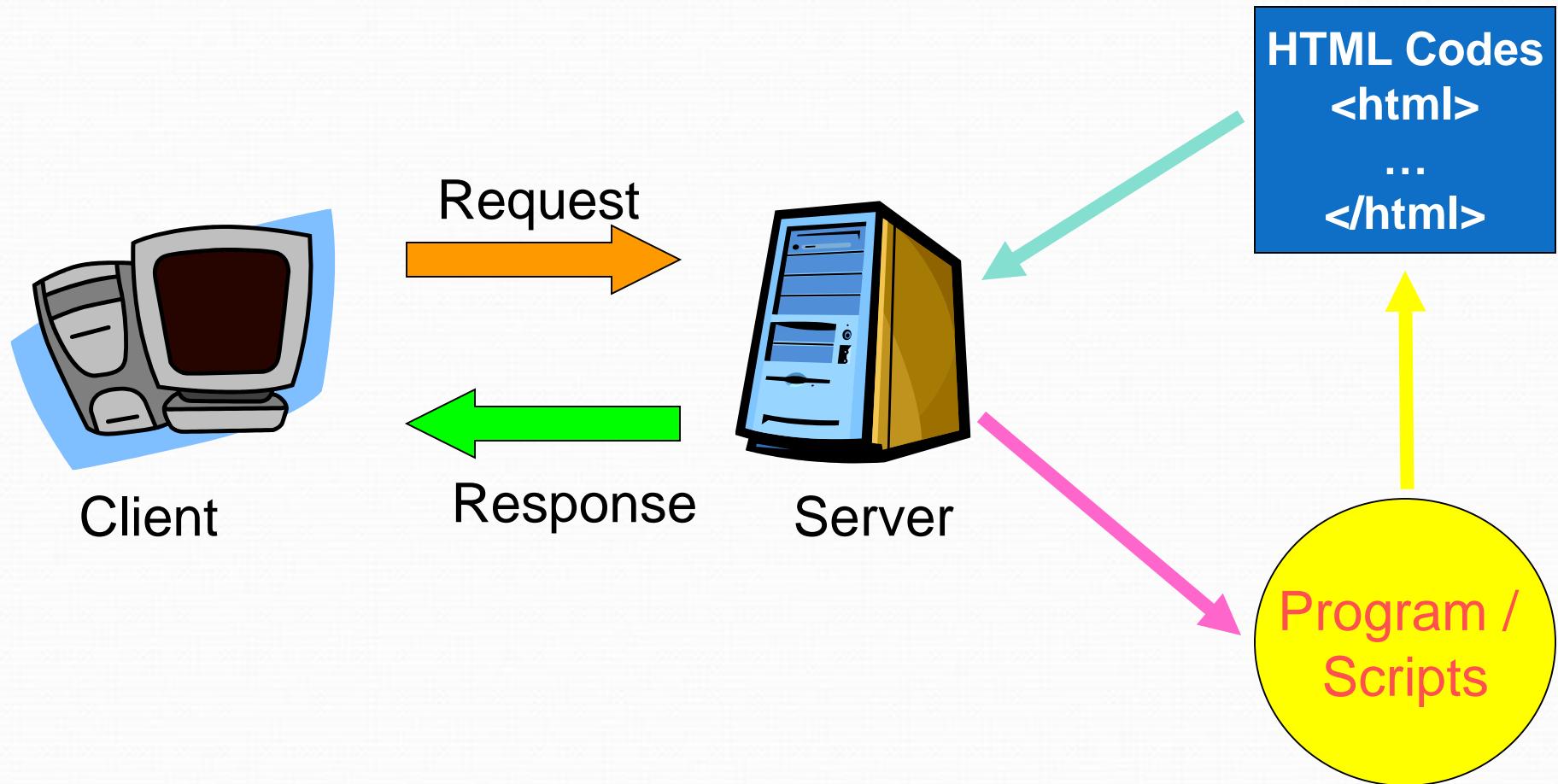


<https://gs.statcounter.com/browser-market-share#monthly-201907-202007-bar>

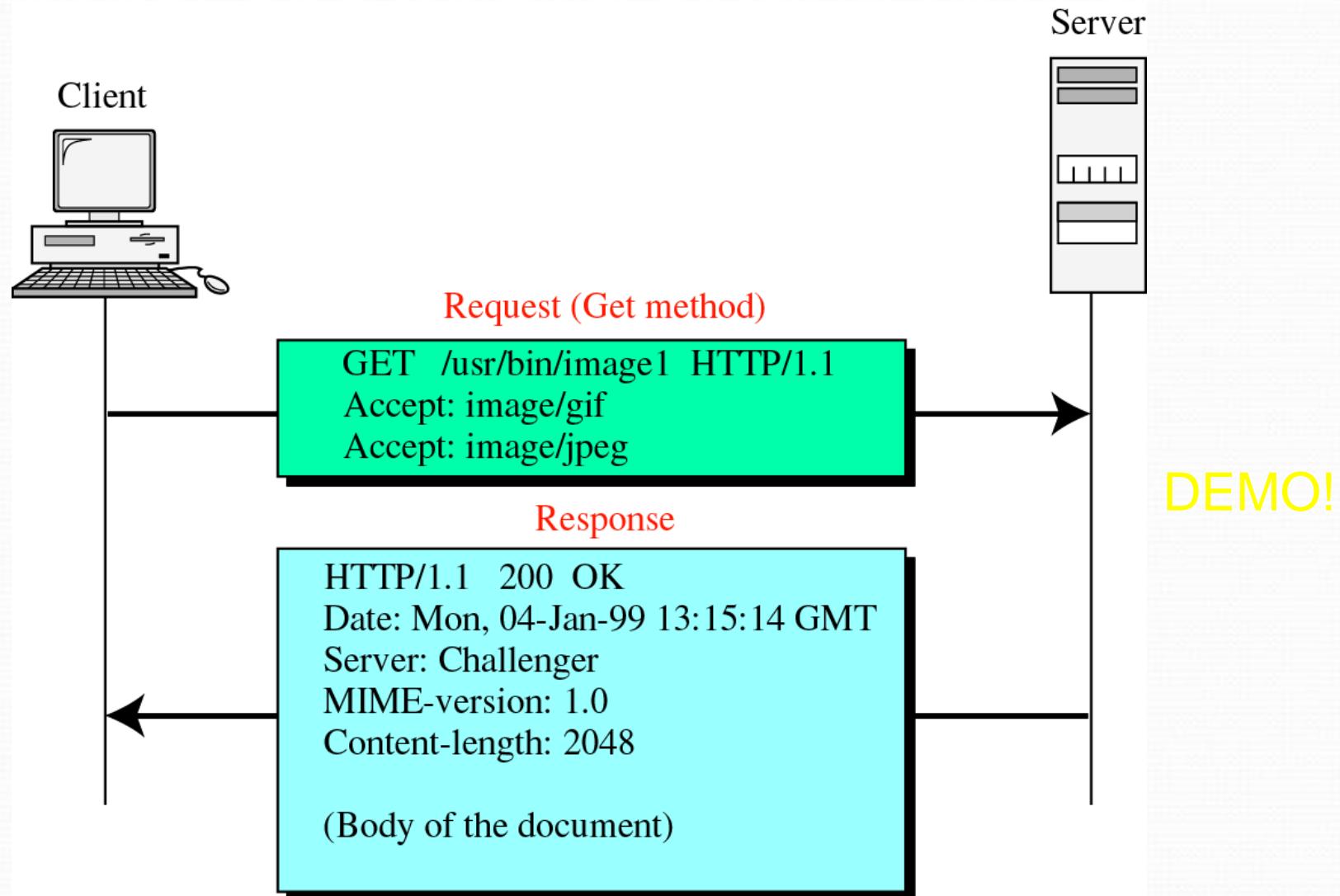
Web Server

- It is a program that waits for requests from the web browser.
- It provides four major functions
 - Serving web pages
 - Running gateway programs (CGI) and returning output
 - Controlling access to the server
 - Monitoring and logging all access
- E.g. Apache, IIS, Tomcat, ...

HTTP Request/Response Model



HTTP



Valid HTTP Request/Response messages

- Provides additional information

GET /index.html HTTP/1.0

Host: www.anyhost.com

User-Agent : Mozilla/4.5 [en] (WinNT;
I)

Accept : image/gif, image/jpeg, */*

Accept-language : en

Accept-charset : iso-8859-1, *, utf-8

HTTP/1.0 200 OK

Last-Modified: Mon, 20 Dec 1999 ...

Date: Tue, 11 Jan 2002 ...

Status: 200

Content-Type: text/html

Servlet-Engine: Tomcat Web Server

Content-Length: 59

<html>

...

</html>

Example – Request/Response

```
orchid.cse.cuhk.edu.hk - default - SSH Secure Shell
File Edit View Window Help
orchid.cs.cuhk.hk:/uac/lec/cccheung> telnet www 80
Trying 137.189.91.192...
Connected to fortress.cs.cuhk.hk.
Escape character is '^]'.

get index.html
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<HTML><HEAD>
<TITLE>400 Bad Request</TITLE>
</HEAD><BODY>
<H1>Bad Request</H1>
Your browser sent a request that this server could not understand.<P>
Invalid URI in request get index.html<P>
<HR>
<ADDRESS>Apache/1.3.27 Server at www.cse.cuhk.edu.hk Port 80</ADDRESS>
</BODY></HTML>
Connection closed by foreign host.

Connected to orchid.cse.cuhk.edu.hk           SSH2 - 3des-cbc - hmac-md5  71x17
```

Universal Resource Locators (URL)

- It is also called “Uniform Resource Locators” which is used to identify resources on the Internet.
- It has the following general format:
 - Scheme:object-address
 - Schemes can be
 - http, ftp, gopher, telnet, file, mailto, news
 - Object-address
 - //fully-qualified-domain-name/document-path
 - E.g. <http://www.cse.cuhk.edu.hk/index.html>

URI

URN

dmn.tld/page.htm

ste.org/img.png

URL

https://dmn.tld/page.htm

ftp://ste.org/file.pdf

data.htm

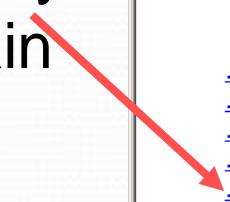
Who manages the Internet?

- There is no such a central authority manages the whole Internet.
- The Internet is managed in a hierarchical fashion with several organizations on the top.
 - Internet Assigned Numbers Authority (IANA)
 - Regional Internet Registry for Europe (RIPE)
 - Asian Pacific Network Information Center (APNIC)
 - American Registry for Internet Numbers (ARIN)



Top-Level Domains

Country code domain

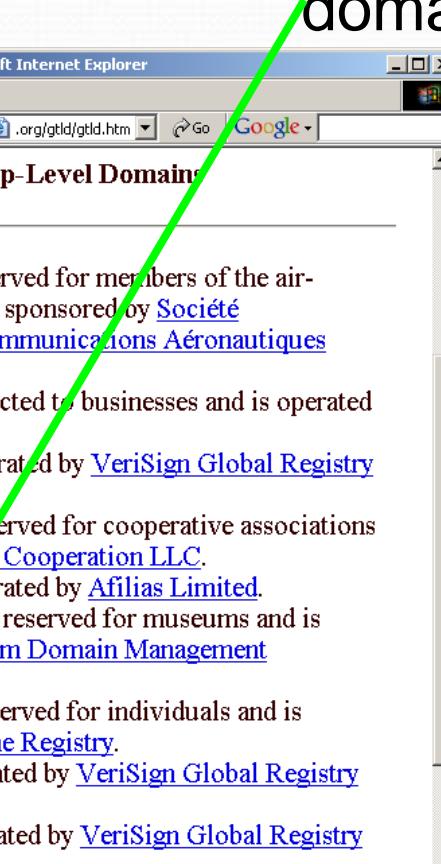


Root-Zone Whois Information

Index by TLD Code

[a](#) [b](#) [c](#) [d](#) [e](#) [f](#) [g](#) [h](#) [i](#) [j](#) [k](#) [l](#) [m](#) [n](#) [o](#) [p](#) [q](#) [r](#) [s](#) [t](#) [u](#) [v](#) [w](#) [x](#) [y](#) [z](#)

[.ac – Ascension Island](#)
[.ad – Andorra](#)
[.ae – United Arab Emirates](#)
[.af – Afghanistan](#)
[.ag – Antigua and Barbuda](#)
[.ai – Anguilla](#)
[.al – Albania](#)
[.am – Armenia](#)
[.an – Netherlands Antilles](#)
[.ao – Angola](#)
[.aq – Antarctica](#)
[.ar – Argentina](#)
[.as – American Samoa](#)
[.at – Austria](#)
[.au – Australia](#)
[.aw – Aruba](#)
[.az – Azerbaijan](#)
[.ba – Bosnia and Herzegovina](#)
[.bb – Barbados](#)
[.bd – Bangladesh](#)
[.cl – Chile](#)



Generic Top-Level Domains

- The [.aero domain](#) is reserved for members of the air-transport industry and is sponsored by [Société Internationale de Télécommunications Aéronautiques \(SITA\)](#).
- The [.biz domain](#) is restricted to businesses and is operated by [NeuLevel, Inc.](#).
- The [.com domain](#) is operated by [VeriSign Global Registry Services](#).
- The [.coop domain](#) is reserved for cooperative associations and is sponsored by [Dot Cooperation LLC](#).
- The [.info domain](#) is operated by [Afilias Limited](#).
- The [.museum domain](#) is reserved for museums and is sponsored by the [Museum Domain Management Association](#).
- The [.name domain](#) is reserved for individuals and is operated by [Global Name Registry](#).
- The [.net domain](#) is operated by [VeriSign Global Registry Services](#).
- The [.org domain](#) is operated by [VeriSign Global Registry Services](#).
- The [.pro domain](#) is being established; it will be restricted to credentialed professionals and related entities and is operated by [RegistryPro](#).

Registrations in the domains listed above may be made through dozens of competitive registrars. For a list of the currently operating accredited registrars, go to the [InterNIC](#).

Gener
domai

IP Address Space



INTERNET PROTOCOL V4 ADDRESS SPACE

(last updated 2002-08-06)

The allocation of Internet Protocol version 4 (IPv4) address space to various registries is listed here. Originally, all the IPv4 address spaces was managed directly by the IANA. Later parts of the address space were allocated to various other registries to manage for particular purposes or regional areas of the world. RFC 1466 documents most of these allocations.

Address Block	Registry - Purpose	Date
000/8	IANA - Reserved	Sep 81
001/8	IANA - Reserved	Sep 81
002/8	IANA - Reserved	Sep 81
003/8	General Electric Company	May 94
004/8	Bolt Beranek and Newman Inc.	Dec 92
005/8	IANA - Reserved	Jul 95
006/8	Army Information Systems Center	Feb 94
007/8	IANA - Reserved	Apr 95
008/8	Bolt Beranek and Newman Inc.	Dec 92
009/8	IBM	Aug 92
010/8	IANA - Private Use	Jun 95
011/8	DoD Intel Information Systems	May 93
012/8	AT&T Bell Laboratories	Jun 95
013/8	Xerox Corporation	Sep 91
014/8	IANA - Public Data Network	Jun 91



015/8	Hewlett-Packard Company	Jul 94
016/8	Digital Equipment Corporation	Nov 94
017/8	Apple Computer Inc.	Jul 92
018/8	MIT	Jan 94
019/8	Ford Motor Company	May 95
020/8	Computer Sciences Corporation	Oct 94
021/8	DDN-RVN	Jul 91
022/8	Defense Information Systems Agency	May 93
023/8	IANA - Reserved	Jul 95
024/8	ARIN - Cable Block (Formerly IANA - Jul 95)	May 01
025/8	Royal Signals and Radar Establishment	Jan 95
026/8	Defense Information Systems Agency	May 95
027/8	IANA - Reserved	Apr 95
028/8	DSI-North	Jul 92
029/8	Defense Information Systems Agency	Jul 91
030/8	Defense Information Systems Agency	Jul 91
031/8	IANA - Reserved	Apr 99
032/8	Norsk Informasjonsteknologi	Jun 94
033/8	DLA Systems Automation Center	Jan 91
034/8	Halliburton Company	Mar 93
035/8	MERIT Computer Network	Apr 94
036/8	IANA - Reserved (Formerly Stanford University - Apr 93)	Jul 00
037/8	IANA - Reserved	Apr 95
038/8	Performance Systems International	Sep 94
039/8	IANA - Reserved	Apr 95
040/8	Eli Lily and Company	Jun 94
041/8	IANA - Reserved	May 95
042/8	IANA - Reserved	Jul 95

Who defines the Web standards?

- The Web standards are not defined or setup by the browser companies or Microsoft, but the World Wide Web Consortium (W3C).
- The specifications form the Web standards.
 - HTML, CSS, XML, XHTML, ...

W3C

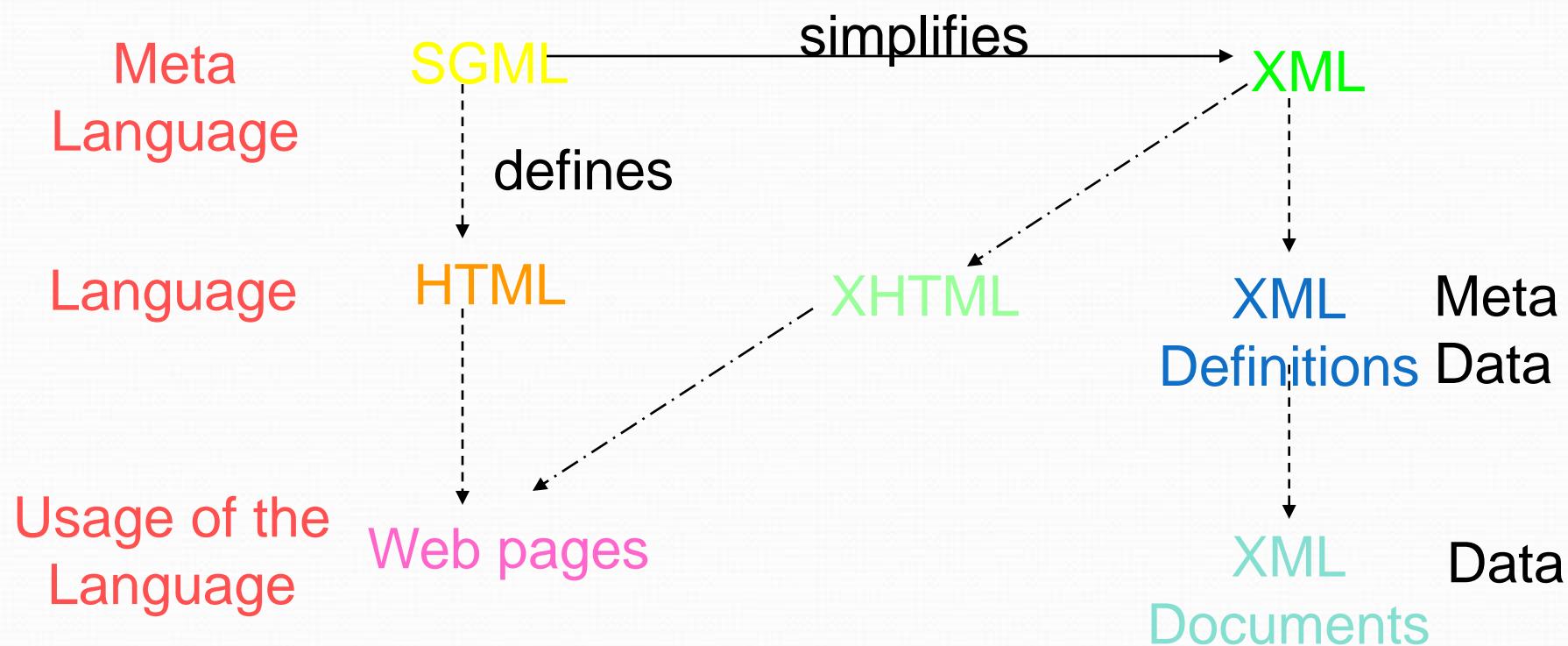
- Quoted from W3C:
 - W3C's long term goals for the Web are:
 1. ***Universal Access***: To make the Web accessible to all by promoting technologies that take into account the vast differences in culture, languages, education, ability, material resources, and physical limitations of users on all continents;
 2. ***Semantic Web*** : To develop a software environment that permits each user to make the best use of the resources available on the Web;
 3. ***Web of Trust*** : To guide the Web's development with careful consideration for the novel legal, commercial, and social issues raised by this technology.

Web Programming Languages

The History of Markup

- In the early 1970s
 - GML (the Generalized Markup Language)
 - “:h1.The Content is placed here”
- Since the 1980s
 - SGML (the Standard GML)
 - HTML
- Currently
 - XML
 - Not intended to replace HTML!
 - XHTML does by providing better data description, ...

SGML, HTML and XML



HTML

- Hyper Text Markup Language
 - Use to describe the general form and layout of documents to be displayed by the browser.
 - Compose of “Content” and “Controls”
- The Difference Between XML and HTML.
 - XML and HTML were designed with different goals: XML was designed to carry data - with focus on what data is. HTML was designed to display data - with focus on how data looks.

WML

- Wireless Markup Language
 - Formerly called HDML (Handheld Devices Markup Languages)
 - Allows the text portions of web pages to be displayed on cell phones or PDAs via wireless media.
 - It is part of the Wireless Application Protocol (WAP).



XML

- eXtensible Markup Language (XML)
- It provides a standard way to represent information so as to allow information to be stored and interchanged among any Internet-connected devices.
 - It is not a markup language.
 - It is a meta-markup language that specifies rules for creating markup languages.
 - Browsers use XML parsers to isolate and extract the information from XML documents.

XML Example

http://www3.brinkster.com/skng/b3weather.asmx?wsdl - Microsoft Internet Explorer

File Edit View Favorites Tools Help Links Yahoo Mail IEEE 1720 2720 Old HP Dictionary RTHK Text-to-Speech mingpao CUHK ACM TVB.COM >

Address http://www3.brinkster.com/skng/b3weather.asmx?wsdl Go Google >

```
<?xml version="1.0" encoding="utf-8" ?>
- <definitions xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/" targetNamespace="http://www.b3.com.hk"
  xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:tm="http://schemas.xmlsoap.org/wsdl/mime/textMatching/" xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"/>
  <types>
    - <s:schema elementFormDefault="qualified" targetNamespace="http://www.b3.com.hk">
      - <s:element name="LocalForecast">
        <s:complexType />
      </s:element>
      - <s:element name="LocalForecastResponse">
        <s:complexType>
          - <s:sequence>
            <s:element minOccurs="0" maxOccurs="1" name="LocalForecastResult" type="s:string" />
          </s:sequence>
        </s:complexType>
      </s:element>
      - <s:element name="LocalForecastUpdateTime">
        <s:complexType />
      </s:element>
      - <s:element name="LocalForecastUpdateTimeResponse">
        <s:complexType>
          - <s:sequence>
            <s:element minOccurs="0" maxOccurs="1" name="LocalForecastUpdateTimeResult" type="s:string" />
          </s:sequence>
        </s:complexType>
      </s:element>
      - <s:element name="Local5daysForecast">
        <s:complexType />
      </s:element>
      - <s:element name="Local5daysForecastResponse">
        <s:complexType>
          - <s:sequence>
            <s:element minOccurs="0" maxOccurs="1" name="Local5daysForecastResult" type="s:string" />
          </s:sequence>
        </s:complexType>
      </s:element>
      - <s:element name="Local5daysForecastUpdateTime">
        <s:complexType />
      </s:element>
      - <s:element name="Local5daysForecastUpdateTimeResponse">
        <s:complexType>
          - <s:sequence>
            <s:element minOccurs="0" maxOccurs="1" name="Local5daysForecastUpdateTimeResult" type="s:string" />
          </s:sequence>
        </s:complexType>
      </s:element>
```

MathML Example

- $E = mc^2$

MathML Presentation Markup Example

```
<mrow>  
    <mi>E</mi><mo>=</mo><mi>m</mi>  
    <msup>  
        <mi>c</mi>  
        <mn>2</mn>  
    </msup>  
</mrow>
```

XHTML

- The eXtensible HyperText Markup Language
 - A Reformulation of HTML 4 in XML 1.0
 - Consists all HTML 4.0.1 predefined components combined with XML standards
- A way of making XML documents that look and act like HTML documents.
- Using XHTML helps you strengthen the structure and syntax of your markup.

HTML – OK, XHTML - !OK

```
<!DOCTYPE HTML>
<HTML>
<HEAD>
<TITLE>My Title</TITLE>
</head>

<body>It is an acceptable HTML, but
an unacceptable XHTML
</BODY>

...
<table WIDTH=80%> ← Incorrect
<table width="80%"> ← Correct
```

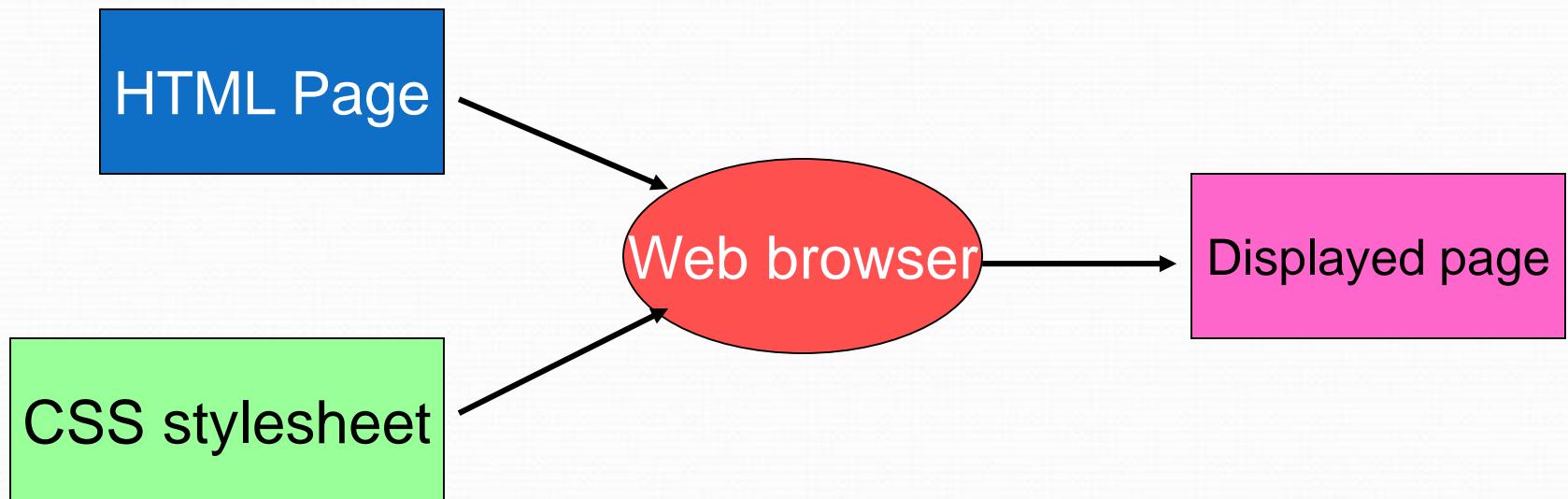
HTML 5

- **HTML5** is the latest version of Hypertext Markup Language, the code that describes web pages. It's actually three kinds of code: HTML, which provides the structure; Cascading Style Sheets (CSS), which take care of presentation; and JavaScript, which makes things happen.

Cascading Style Sheets (CSS)

- Provides a powerful and flexible way to control the details of web documents.
- HTML is more concerned about the content, CSS is used to impose a particular style on the document.
- Named cascading style sheets because they can be defined at three different levels to specify the style of a document.
 - Inline, document level, external.

Using Stylesheets to add presentation



CSS Example

The screenshot displays two versions of a website for "The HTML Writers Guild" side-by-side, illustrating the use of CSS for layout and design.

Left Side (Original Layout):

- Header:** "The HTML Writers Guild - Microsoft Internet Explorer".
- Image:** A small logo icon for "THE HTML WRITERS GUILD".
- Main Content:**
 - Welcome Section:** "Welcome to the HTML Writers Guild".
 - About the Guild:** A brief paragraph about the organization's history and membership.
 - Join the Guild and IWA!** A section encouraging membership with a list of benefits.
 - Footer:** "Your Support Network" and a "W3C MEMBER W3.org" badge.

Right Side (Stylized Version):

- Header:** "Web Site Design - The HTML Writers Guild - Microsoft Internet Explorer".
- Image:** A larger logo icon for "THE HTML WRITERS GUILD".
- Main Content:**
 - Welcome Section:** "Welcome to the HTML Writers Guild".
 - Resources Sidebar:** A vertical sidebar with links to "RESOURCES", "LISTS", "CLASSES", "SERVICES", "BOOKS", "INTERACT", "JOIN!", "GUTENBERG", "NEWS", "EVENTS", "CONTACT", "SITEMAP", and "SEARCH".
 - Content Areas:**
 - hwgMembership:** Includes a "Join" button and a "More info..." link.
 - hwgeClasses:** Includes a list of online courses, an "Enroll" button, and links to "All Open eClasses" and "Log on eClassroom".
 - Building Excellence in Web Design:** A section about the Guild's training programs.

Client-Side and Server-side Programming

- Client-side code
 - ECMAScript
 - **ECMAScript** is a programming language based on several technologies like JavaScript and JScript. VBScript – Microsoft.
 - ECMA Script is the official name of JavaScript. ES 6 is the version of JavaScript 2015. For making JS popular ECMA Script was named to JavaScript because of popularity of JAVA.
 - Embedded in <script> elements and execute in the browser, provides immediate feedback to the user.
 - Reduces the load on a server, reduces network traffic.
 - Server-side code
 - Execute on the server
 - CGI/Perl, ASP, PHP, ColdFusion, JSP
 - The code remains hidden from users, and browser independent.
 - Can be combined with good results.

Client-side & Server-side Technologies

Client-Side	Server-Side
<p>HTML, XML, XHTML Cascading Style Sheets (CSS) Scripting languages - JavaScript, VBScript Java Applets ActiveX controls Plug-ins and Helpers application</p>	<p>CGI/Perl PHP ColdFusion Scripting Languages - ASP, JSP, Java Servlets ISAPI/NSAPI programs</p>

JavaScript

- There is no relationship between Java and JavaScript – misleading!
- They both contain “Objects”.
- It provides a computational capability in web documents.
- It is used in creating, accessing, modifying a document.

What can JavaScript do?

- Control document appearance and content
- Control the browser
- Interact with the user
- Read and Write Client State with Cookies
 - my.yahoo.com
- Interact with Applets
- What it cannot do?
 - Read/write files
 - Protect your system

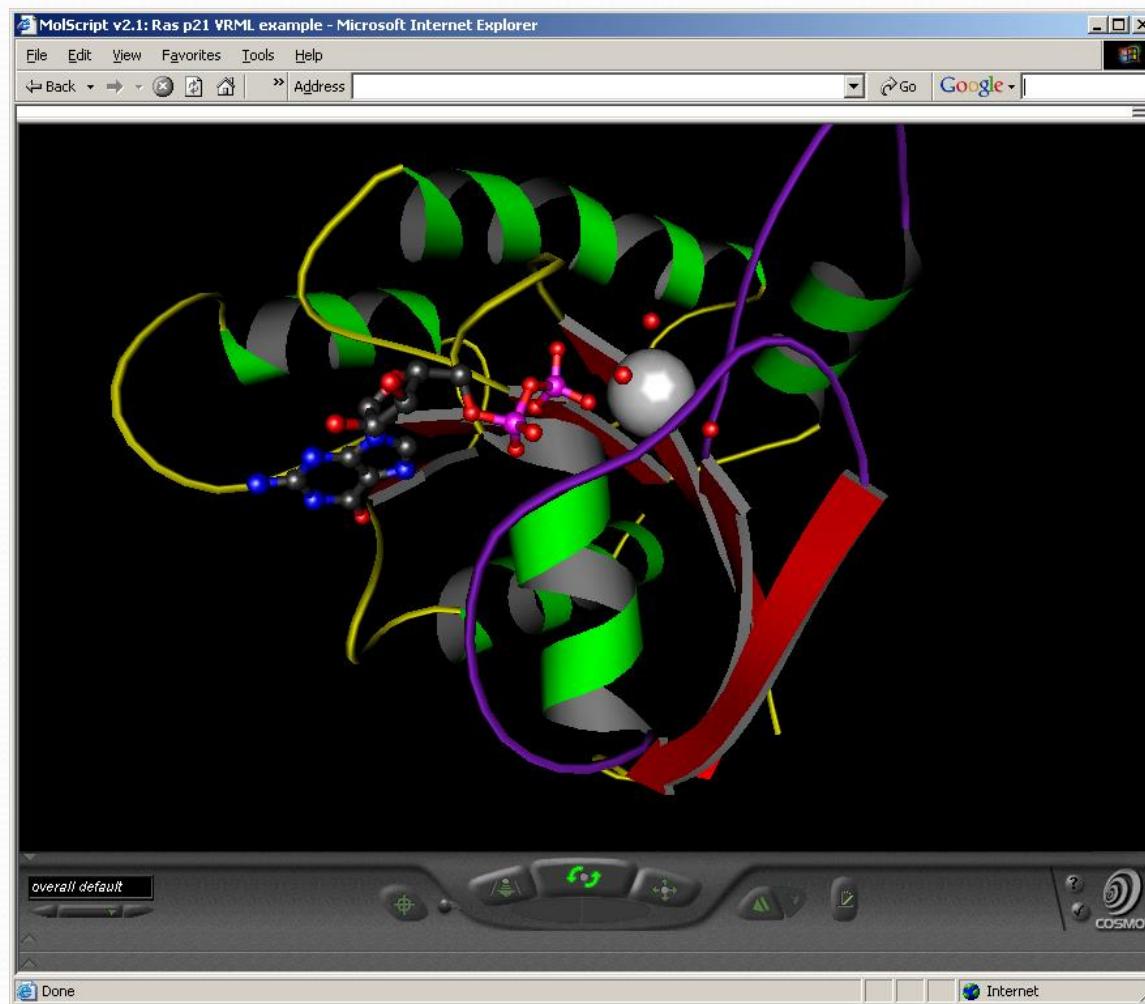
DHTML

- It is used to describe a set of animated web documents that built from HTML, style sheets and scripts.
- There are three main parts of DHTML
 - Positioning
 - Style modifications
 - Event handing
- It relies on the browser for the display and manipulation of the web pages.

VRML

- **Virtual Reality Modeling Language (VRML) is a language for the animation and 3D modeling on the Internet.**
- The user can connect the online VRML website and move around the “3D world”.

VRML Example



Server Slide Include (SSI)

- Some pages end with the .shtml extension instead of the .html or .htm
 - The web server reads the document and parses it for directives.
 - **<!--#include file="mailform1.txt" -->**
 - **<!--#exec cmd="./calprog.cgi" -->**
 - Follows the instructions and creates an enhanced document.
 - The new document is sent to the client browser.

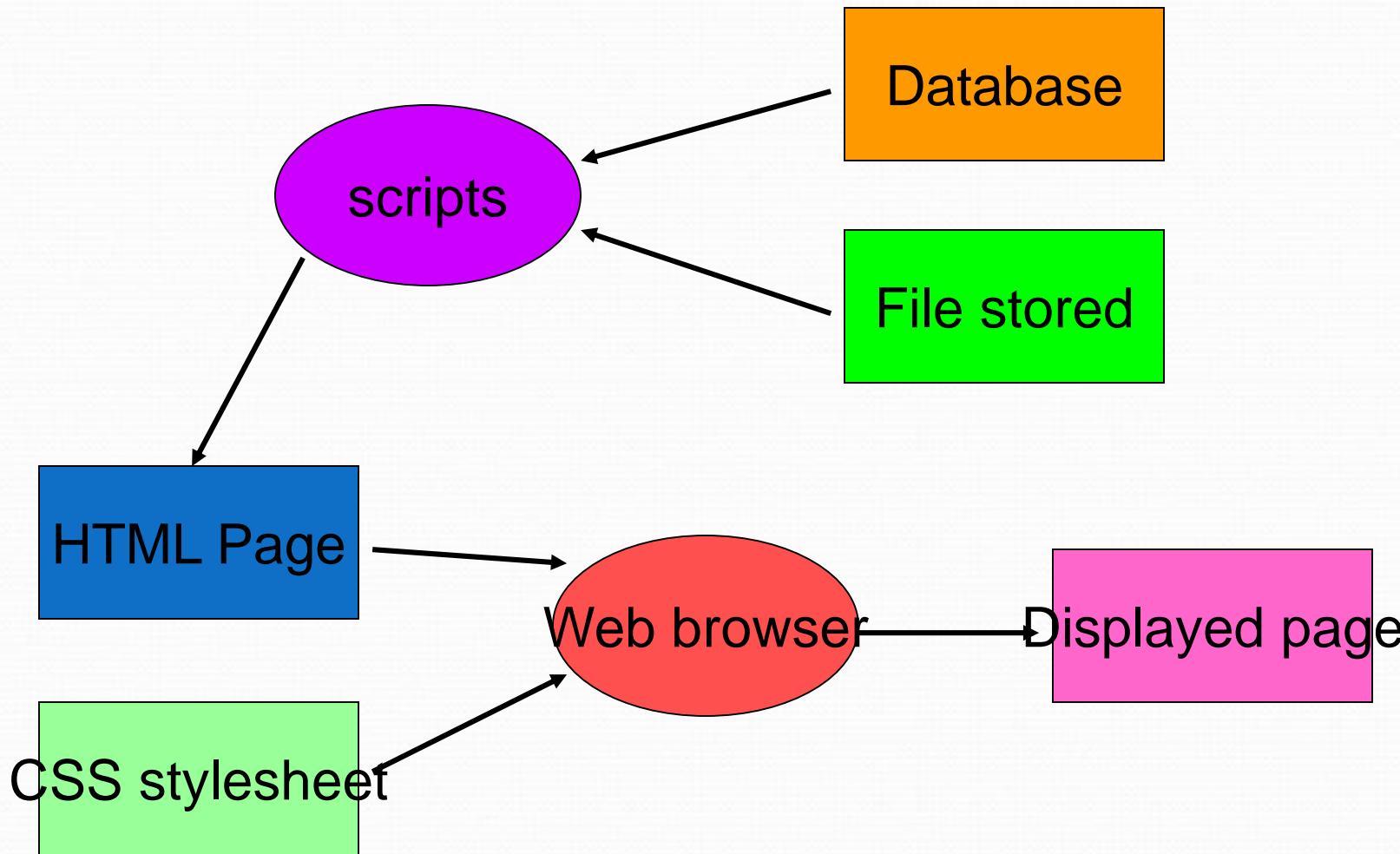
CGI/Perl

- When the page is loaded by a browser, the tag of the webpage call the script and then execute by the server.
- It is different from the Java applets or JavaScript which are executed by the client's system.

CGI / Perl

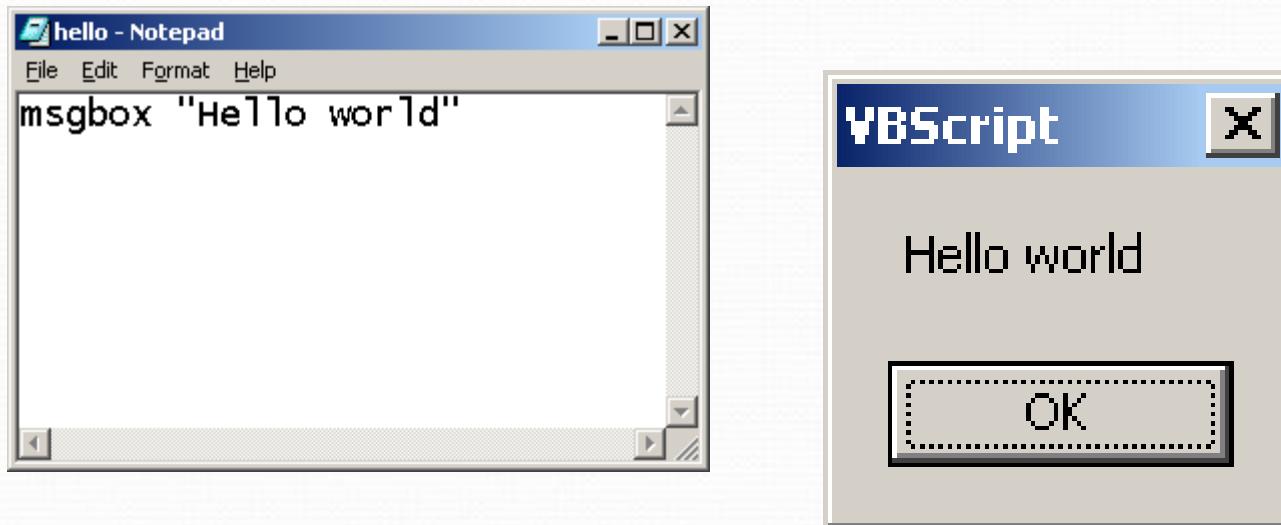
- Common Gateway Interface (CGI) is a standard way in which a browser communicate to run a program on the server and return the output to the browser.
 - It can be written in any programming language (most common is Perl).
 - It is a powerful string pattern-matching language.

Using Scripts



VBScript

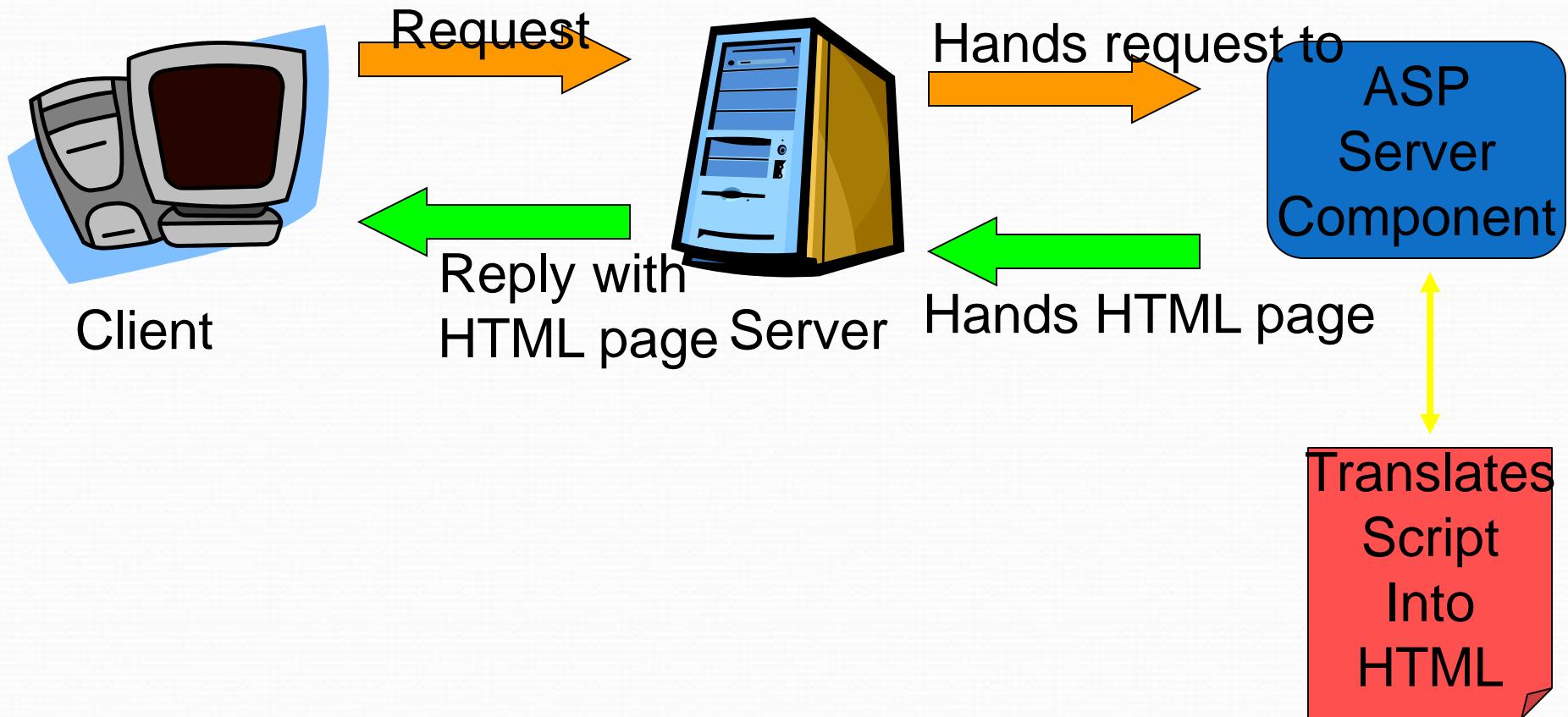
- VBScript is the short form for Visual Basic Scripting from Microsoft.
- Try to edit a file “hello.vbs”
 - MsgBox “Hello world”



ASP

- Active Server Page was developed by Microsoft and it is a popular technology for developing dynamic web sites.
 - It allows the author includes scripting code (VBScript or JScript) in regular web pages.
 - In complex code, COM (ActiveX) components are used.
 - Must run on an active server pages server
 - IIS, Personal Web Server, ...
 - The latest version is ASP.NET

How to load an ASP page?



PHP



- It is not an acronym for anything.
 - An open source web scripting language.
 - A PHP page is always interpreted by the server when it is requested.
 - The latest version is PHP 7.
 - Have to learn an entirely new language.
 - Reference: <http://www.php.net/>

Netscape

File Edit View Go Bookmarks Tools Window Help

Mail Home Search Bookmarks

```
<html>
<head>
<title>Background Colors change based on the day of the
week</title>
</head>
<?
$today = date("l");
print("$today");
if($today == "Sunday")
{
$bgcolor = "#FEFOC5";
}
elseif($today == "Monday")
{
$bgcolor = "#FFFFFF";
}
elseif($today == "Tuesday")
{
$bgcolor = "#FBFFC4";
}
elseif($today == "Wednesday")
{
$bgcolor = "#FFEODD";
}
elseif($today == "Thursday")
{
$bgcolor = "#E6EDFF";
}
elseif($today == "Friday")
{
$bgcolor = "#E9FFE6";
}
else
{
// Since it is not any of the days above it must be
}
```

PHP Example

Netscape

Background Colors change based on the day of t...

File Edit View Go Bookmarks Tools Window Help

Mail Home Search Bookmarks

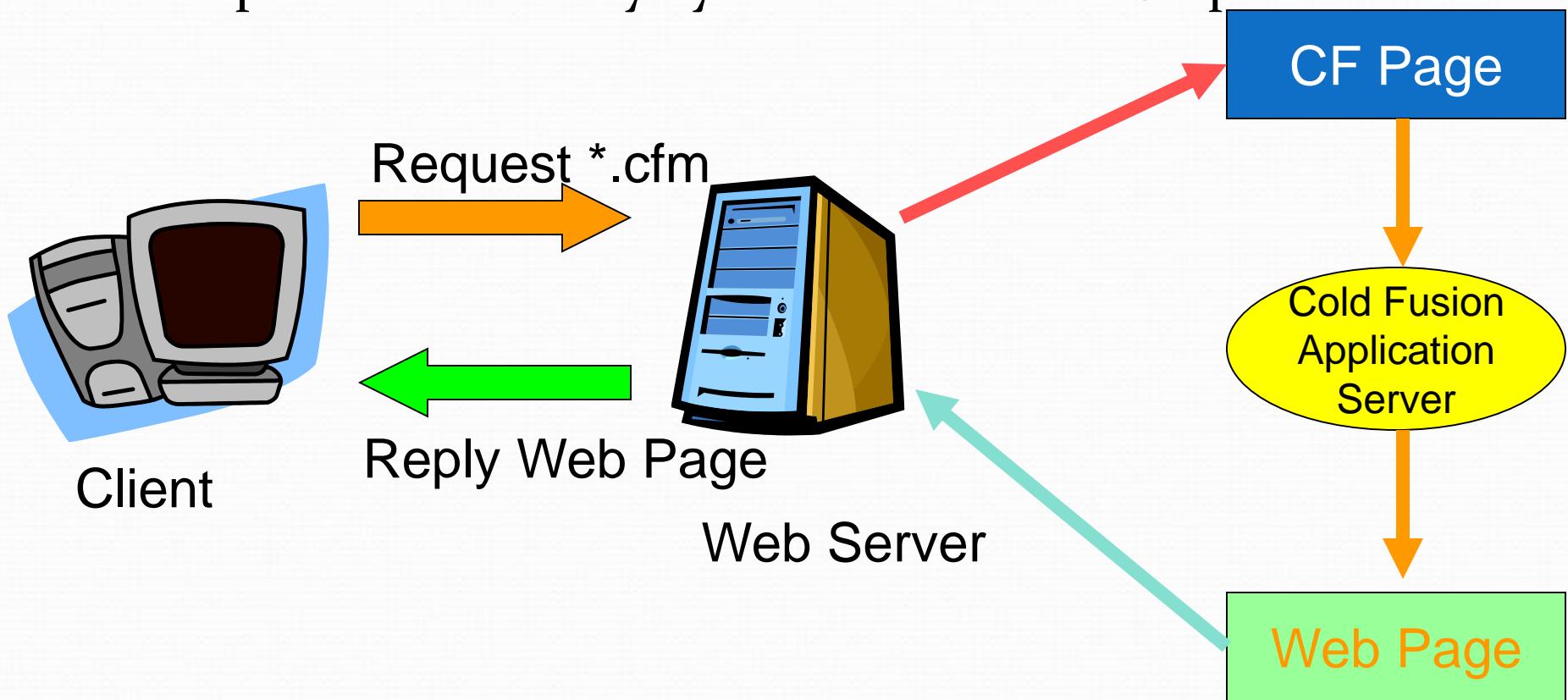
Monday

This just changes the color of the screen based on the day of the week

Done

ColdFusion

- It is a Web application development environment produced initially by the Macromedia Corporation.



JAVA / Java applet

- Instead of running a program on the web server, a special kind of Java program (applet) is downloaded to the browser.
- JavaScript is less powerful than Java.
- JavaScript code is physically part of an HTML document, but applets are stored separately from the HTML files.

Java 2 Platforms

- J₂EE
- J₂SE
- J₂ME

Java Servlets

- They are Java application programs that are resident on the server and are alternatives to CGI programs.
- Java Servlets allow you to build
 - Web page based on the user's input data
 - Web page that changes frequently
- More efficient, easier to use, more powerful and portable.

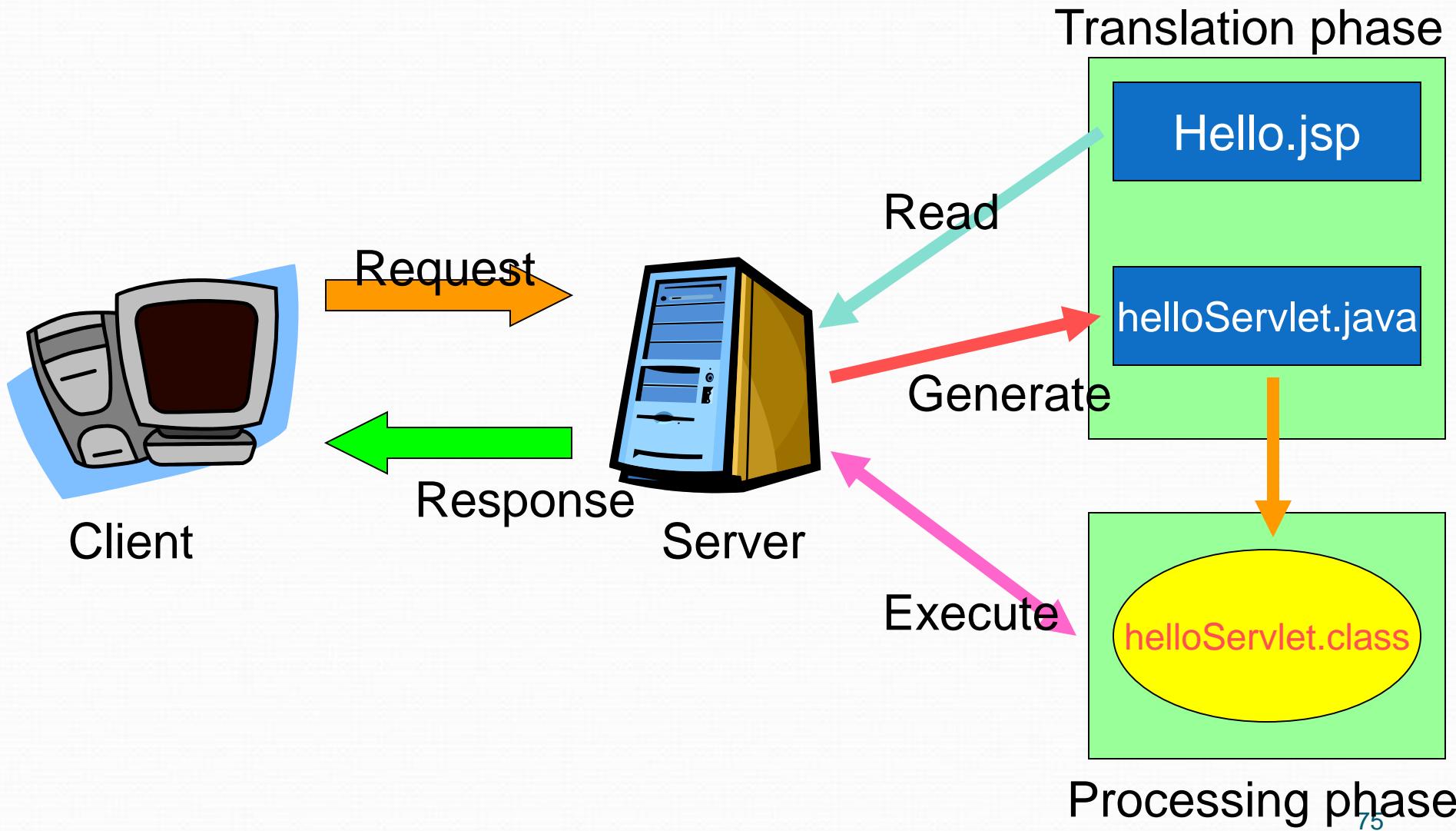
Servlets Advantages

- Platform and vendor independence
 - Supported by all the major web servers
- Integration
 - Take advantages of all the Java technologies, JDBC, Enterprise JavaBeans (EJB).
- Efficiency
 - A single process that runs until the servlet-based application is shut down.
- Scalability – extremely scalable.
- Robustness and security
 - A strongly typed programming language.

What is JSP?

- It is JavaServer Pages that built on top of Java servlets in late 1999.
- In the early days of the Web, the only tool for developing dynamic web content was CGI. For every request, the web server creates a process (not efficient).
- The Java Servlet API has introduced in 1997, however, HTML code has to be embedded inside programs. (lot of “out.println()”)
- JSP provides a development model for the web authors to experience all the server-side technologies.

JSP page translation and processing phases



Example Java Servlet & JSP

```
import java.io.*;  
import javax.servlet.*;  
import javax.servlet.http.*;  
  
public class HelloWorld extends HttpServlet {  
  
    public void doGet(HttpServletRequest req, HttpServletResponse res)  
        throws ServletException, IOException {  
  
        res.setContentType("text/html");  
        PrintWriter out = res.getWriter();  
        out.println("<HTML>");  
        out.println("<HEAD><TITLE>Hello World</TITLE></HEAD>");  
        out.println("<BODY>");  
        out.println("<BIG>Hello World</BIG>");  
        out.println("</BODY></HTML>");  
    }  
}
```

```
<HTML>  
<HEAD>  
<TITLE>Hello</TITLE>  
</HEAD>  
  
<BODY>  
<H1>  
<%  
if (request.getParameter("name") == null)  
{  
    out.println("Hello World");  
} else {  
    out.println("Hello, " +  
    request.getParameter("name"));  
}  
%>  
</H1>  
</BODY>  
</HTML>
```