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Web Information Systems

Sistemi Informativi Aziendali – A.A. 2015/2016

Summary

1. Definition
2. Application Domains
3. Reference Architecture

Definition

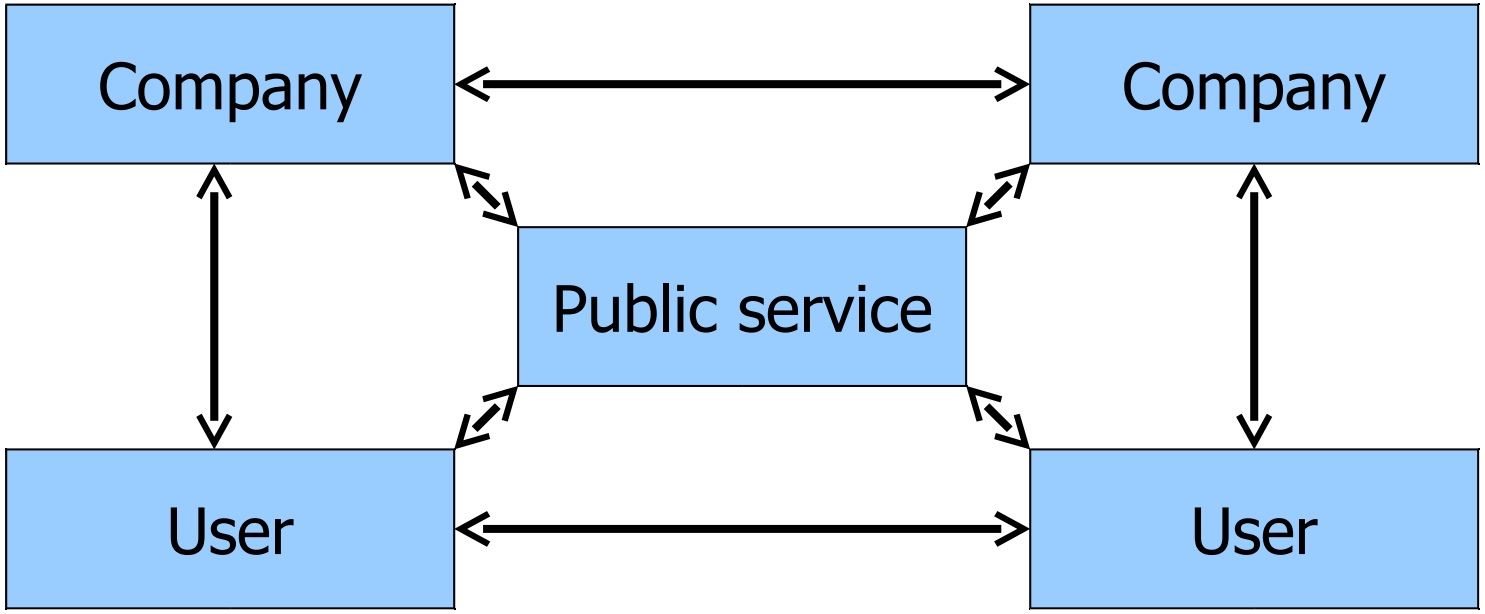
Web Information Systems

Definition

- Web Information System (WIS)
  - Communication between computers and hosts takes place in the Internet or through a Virtual Private Network (VPN) based on the internet standards
  - Access to information and services is supported by program that manage the user interface, known as browser

Cap. 3
Pag. 93

Actors



Collaboration models

- B2B (business to business): collaboration among companies
- B2C (business to consumer): on-line shops
- C2C (consumer to consumer): auctions, buy-sell notices
- Government to business : on-line taxes, services to companies
- Government to citizens : on-line taxes

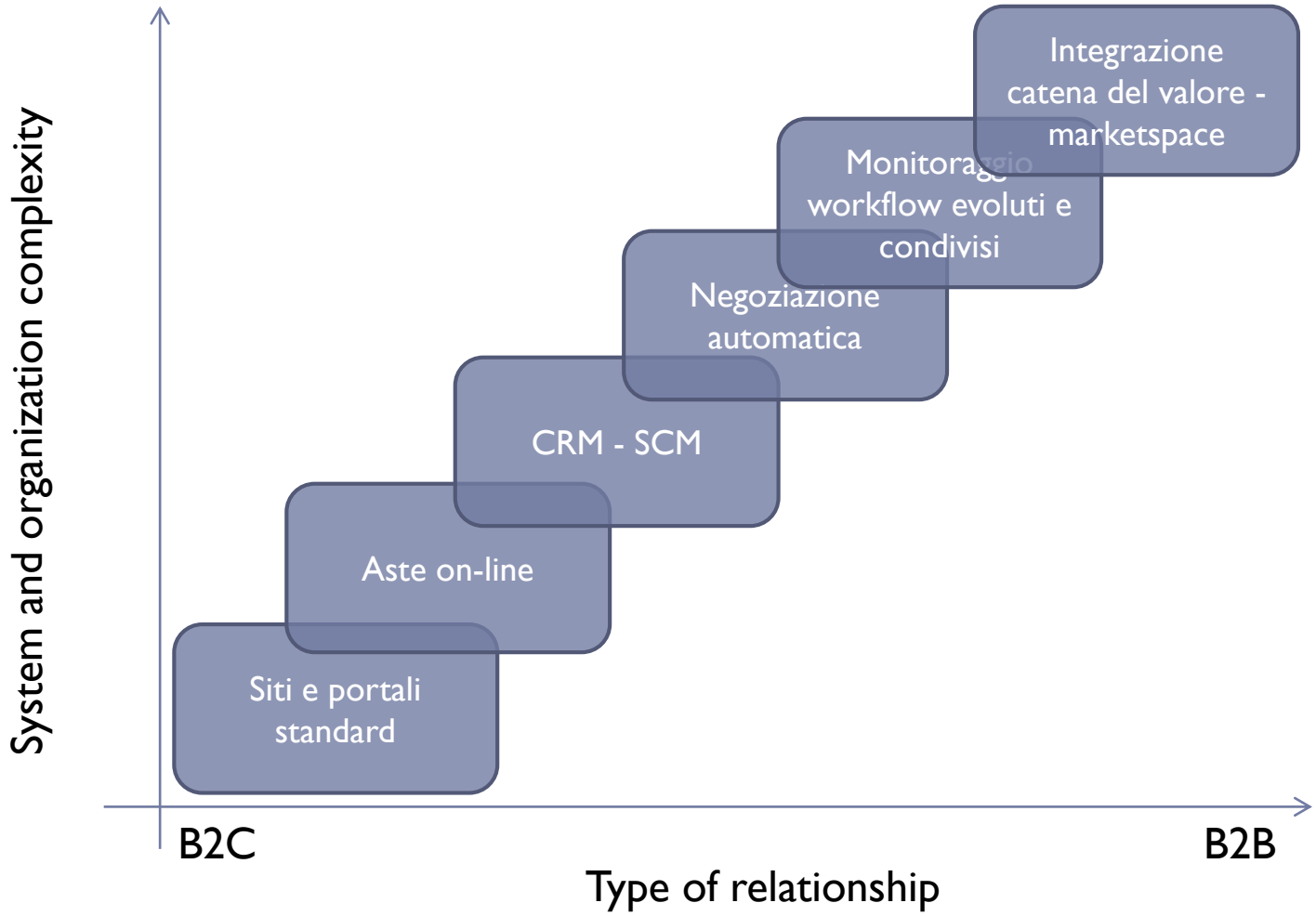
Application Domains

Web Information Systems

Examples

- On-line shops of consumer goods
- On-line auctions
- Thematic portal (links, user community, latest news)
- Distribution of components or raw materials
- Services (bank, finance, insurance, travel, consultancy, …)
- Publications (newspapers, encyclopedias, press agencies, …)

A possible taxonomy



sistemi informativi d'impresa p. 101

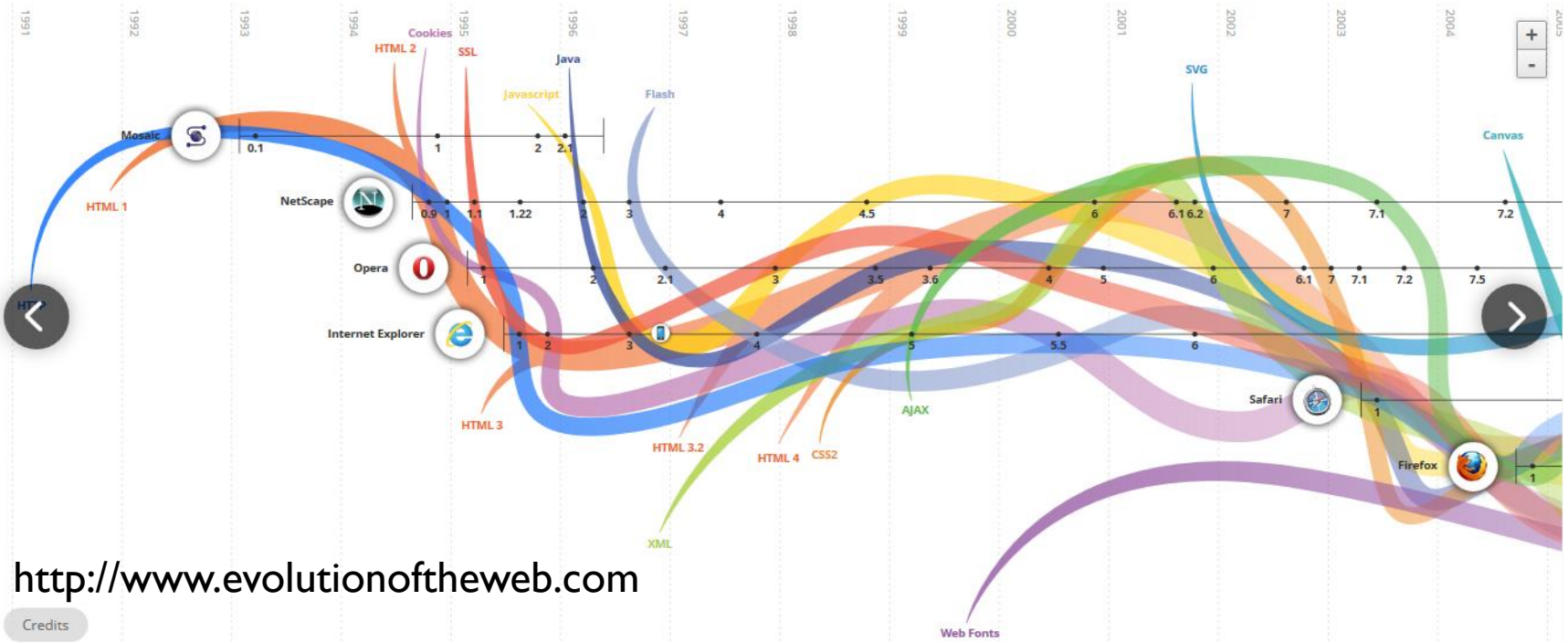
Levels of complexity

- Informative sites
  - Who we are / Products / Services / Contacts
  - Newsletter, Journal, Blog, …
- Ordering sites
  - Product selection, configuration, purchase
- Management systems
  - CRM, SCM, ERP, MRP, …
- Autonomous systems
  - Negotiation, transaction, monitoring
- Portals, marketplace, marketspace
  - Aggregation of several related companies/products

Reference Architecture

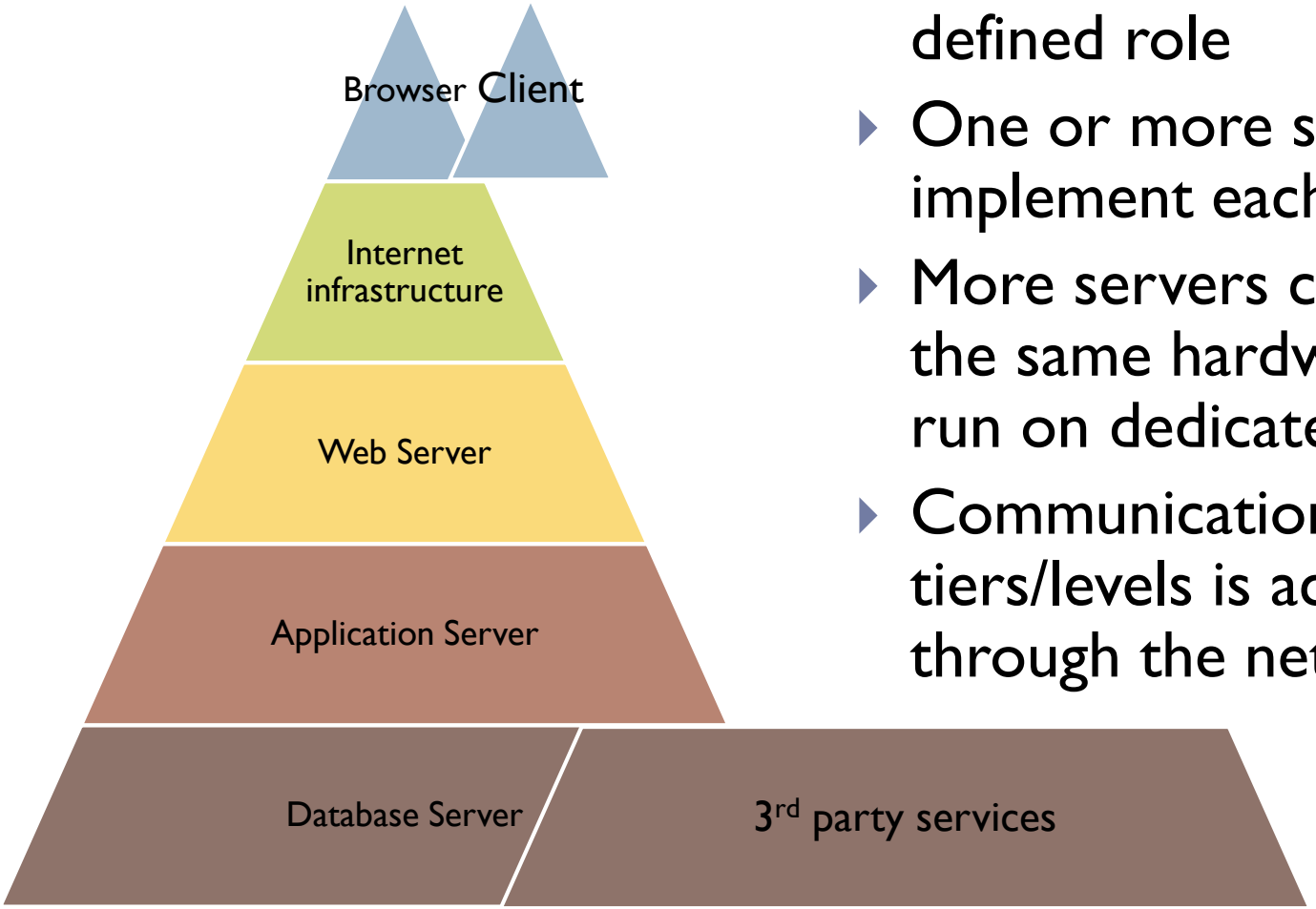
Web Information Systems

Evolution of web architectures



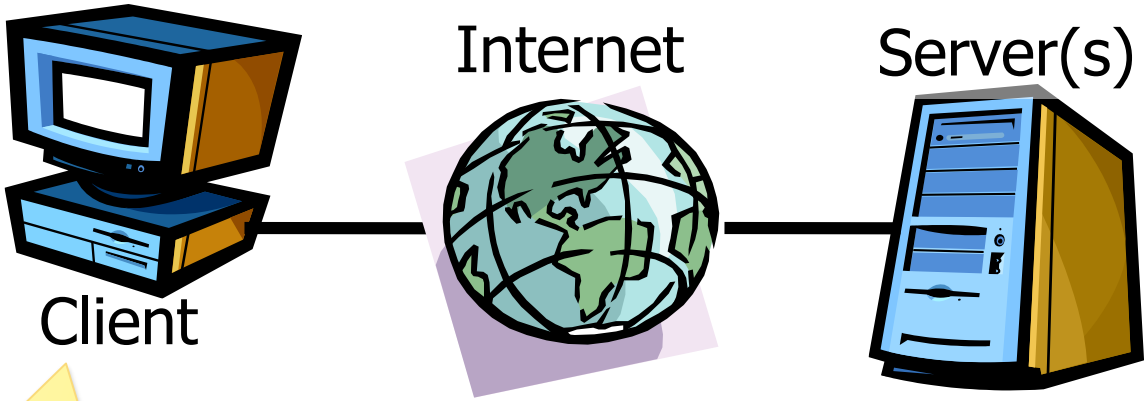
http://www.evolutionoftheweb.com

N-tier (N-level) architecture



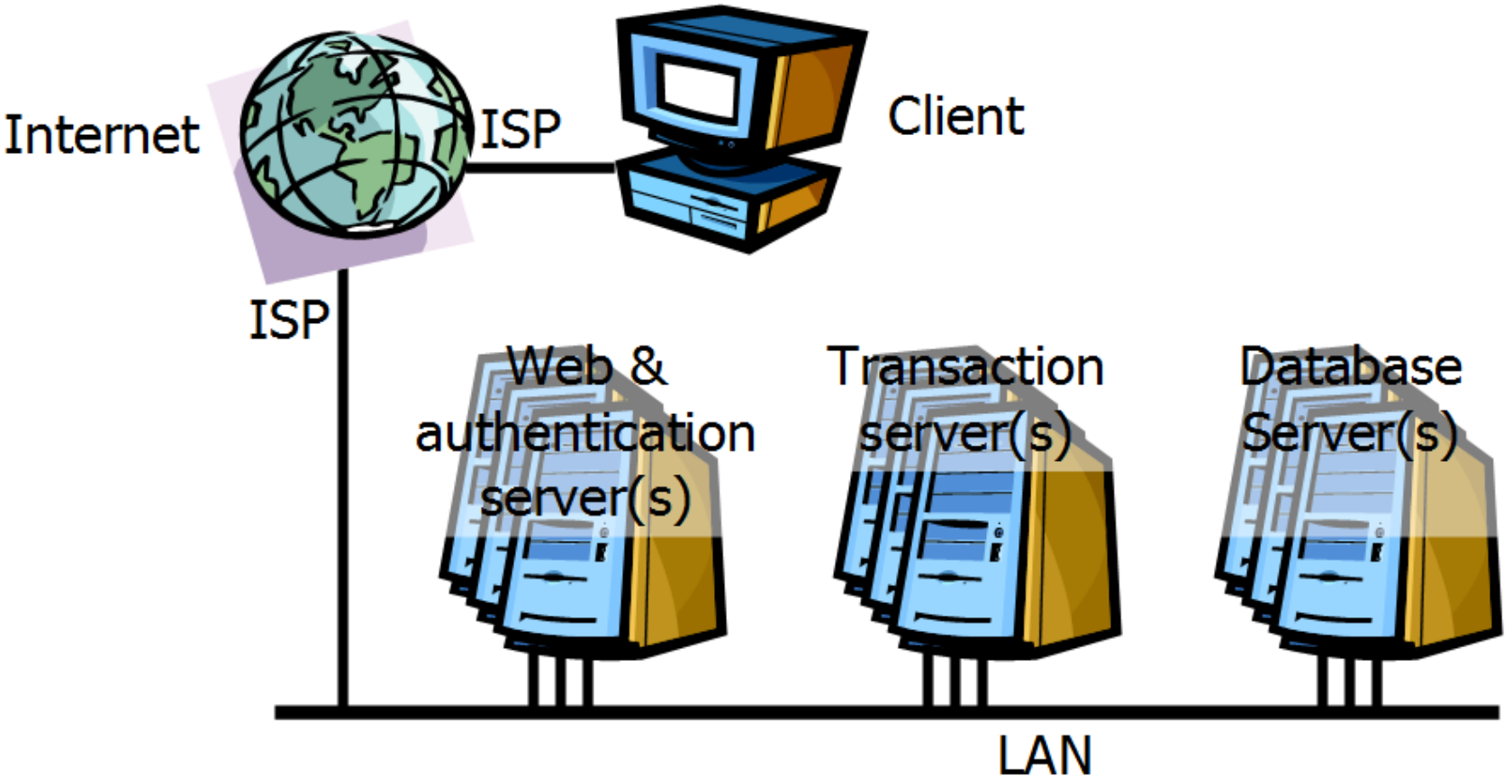
- Each level/tier has a well defined role
- One or more servers implement each tier/layer
- More servers can share the same hardware or can run on dedicated devices
- Communication between tiers/levels is achieved through the network

Architettura generale



- Historically, a web browser
- Also:
  - Mobile app
  - Desktop app
  - Other server application

General Architecture



Components

- One or more connections to the Internet by means of an Internet Service Provider (ISP).
- One or more servers implementing each tier/level of the architecture.
- One or more physical networks for interconnecting the servers.
- One or more network devices (router, firewall, switch) which implement communication and security policies.

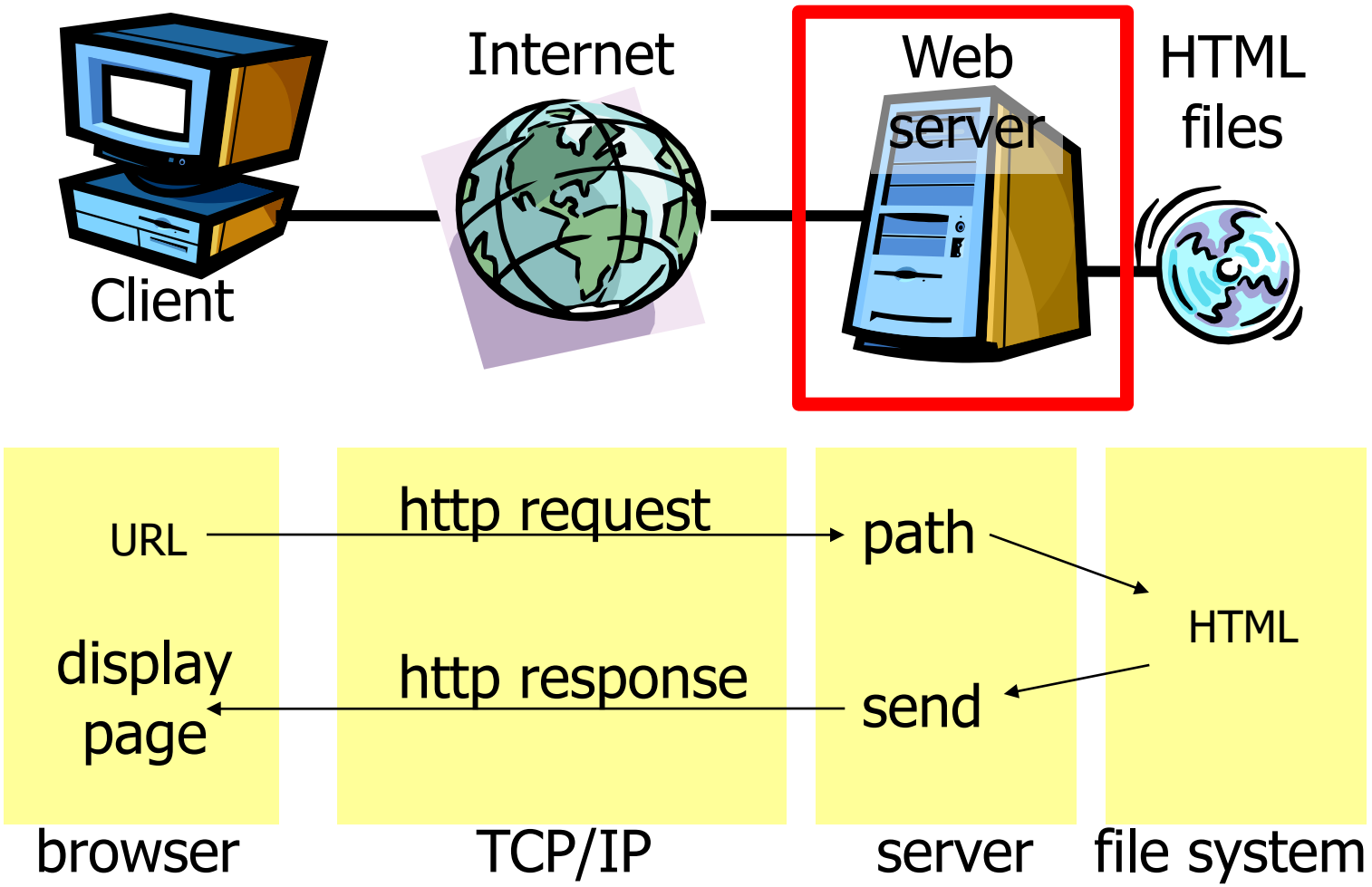
Definition

- "Server"may be defined as:
  - Logical definition:
    A **process** that runs on a host that relays information to a **client** upon the client sending it a **request**.
  - Physical definition:
    A **host computer** on a network that holds information (eg, Web sites) and responds to requests for information

Web server

- Manages the HTTP protocol (handles requests and provides responses)
  - Receives client requests
  - Reads static pages from the filesystem
  - Activates the application server for dynamic pages (server-side)
  - Provides an HTML file back to the client
- One HTTP connection for each request
- Multi-process, Multi-threaded or Process pool

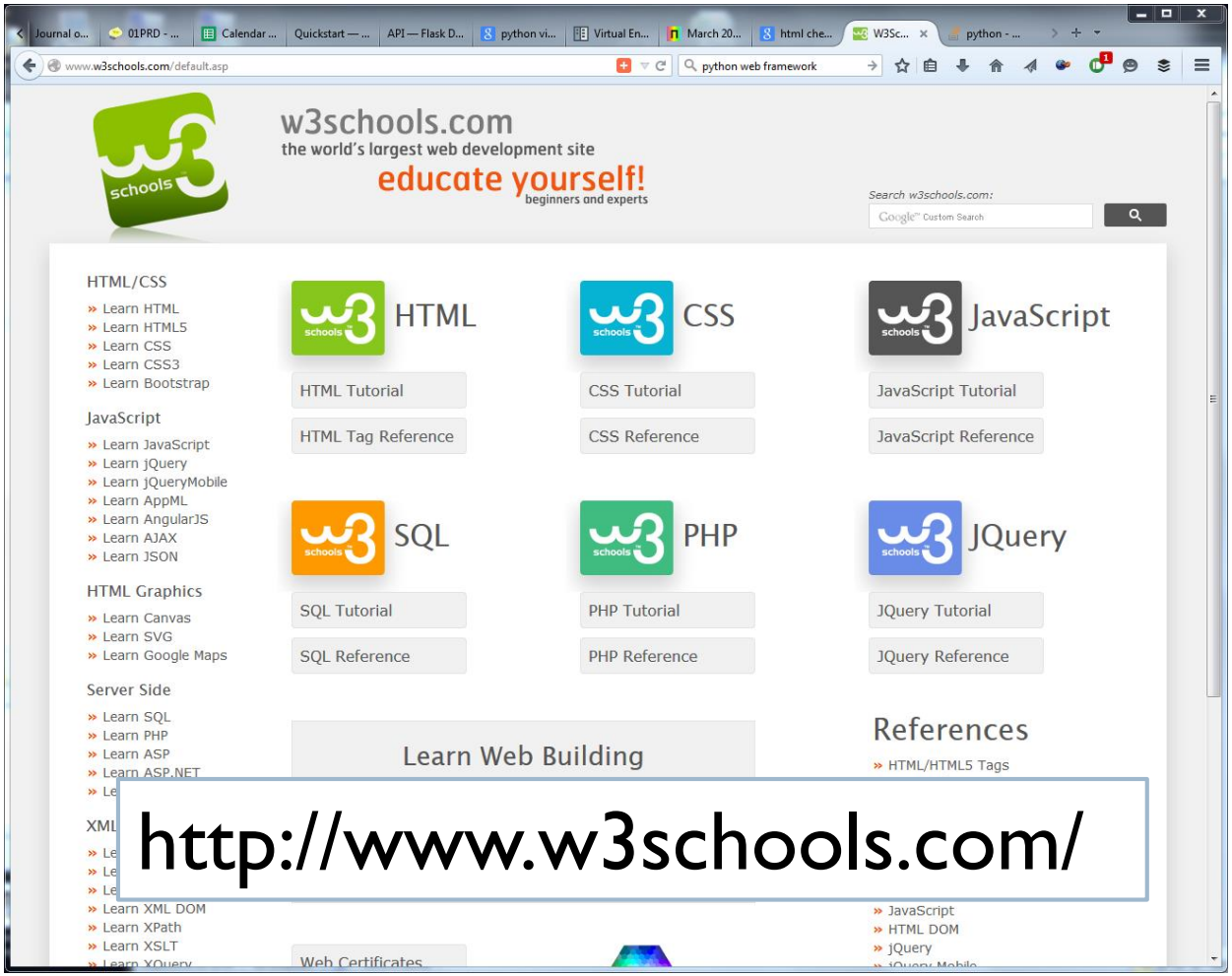
Example


Internet
Web server
HTML files
Client
URL
http request
path
HTML
display page
http response
send
browser
TCP/IP
server
file system

Adopted standards

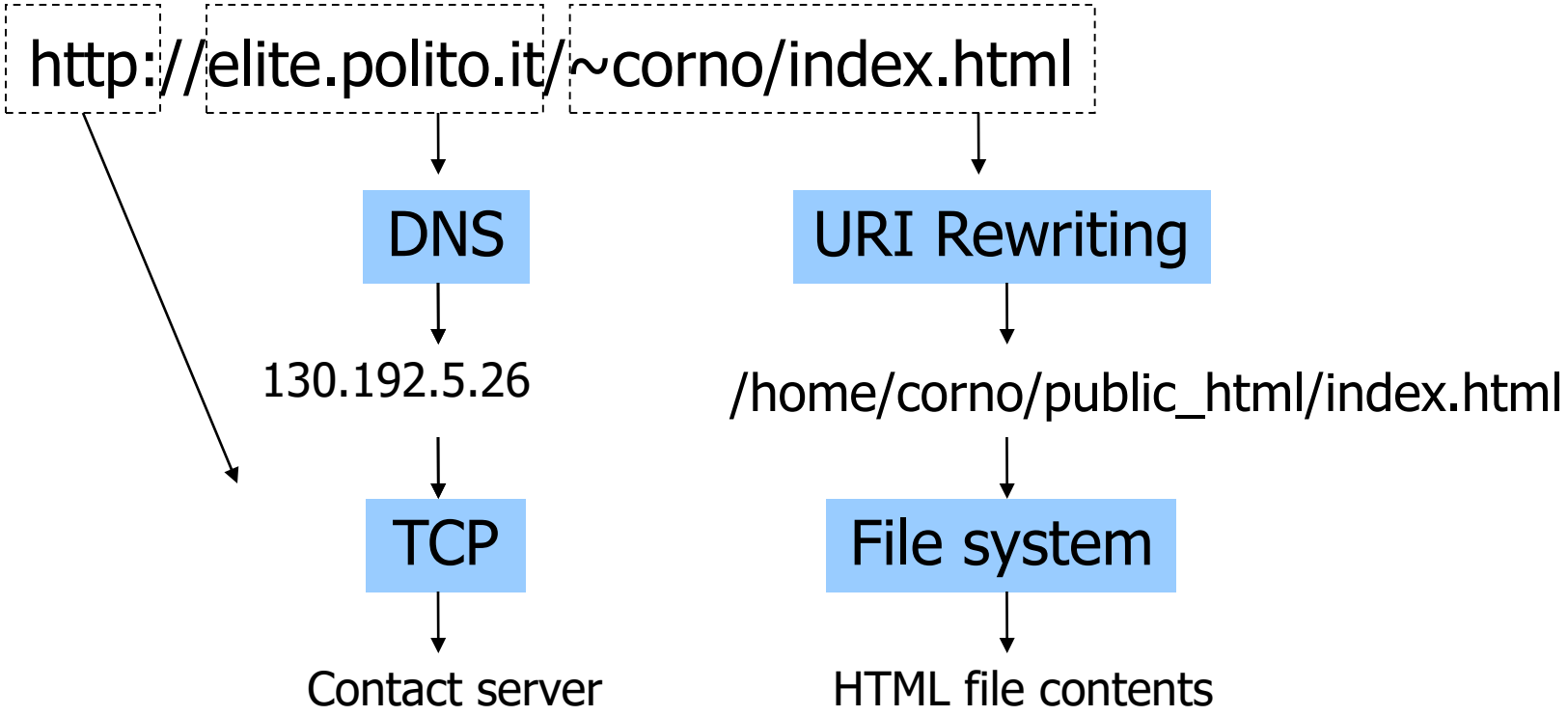
- URL (uniform resource locator) for finding web pages
- HTML (hyper text markup language) for writing web pages
- GIF (graphics interchange format) for images
- HTTP (hyper text transfer protocol) for client-server interaction
- TCP/IP (transmission control protocol over internet protocol) for data transfer

HTML in 5 minutes



URL

RFC 2396
http://www.w3.org/Addressing/



URI Basics

- http://www.sadev.co.za/users/1/contact

Scheme Hostname Query

- http://www.sadev.co.za?user=1&action=contact

Scheme Userinfo Hostname Port

- http://rob:pass@bbd.co.za:8044

Scheme Hostname Query Fragment

- https://bbd.co.za/index.html#about

HTTP protocol

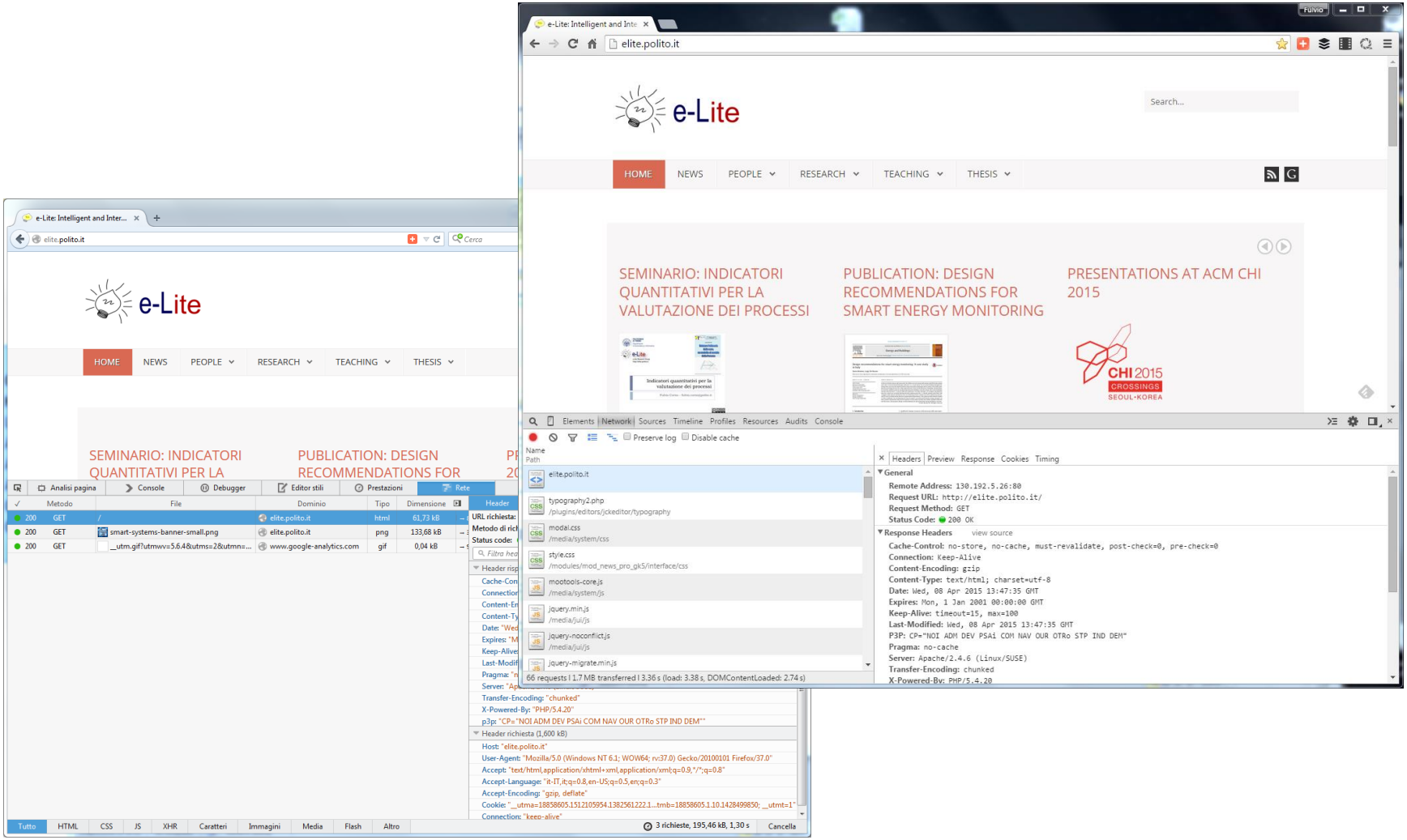
RFC 2616, RFC 2617
http://www.w3.org/Protocols

```
GET /~corno/index.html HTTP/1.0
Accept: text/html
Accept: image/gif
User-Agent: FireChrome SuperBrowser 9.45
```

```
HTTP/1.0 200 OK
Date: Monday, 01-Jan-2001 00:00:00 GMT
Server: Apache 1.3.0
MIME-Version: 1.0
Last-Modified: 31-Dec-2000
Content-type: text/html
Content-lemgth: 3021

<HTML> . . .
```

Browser developer tools



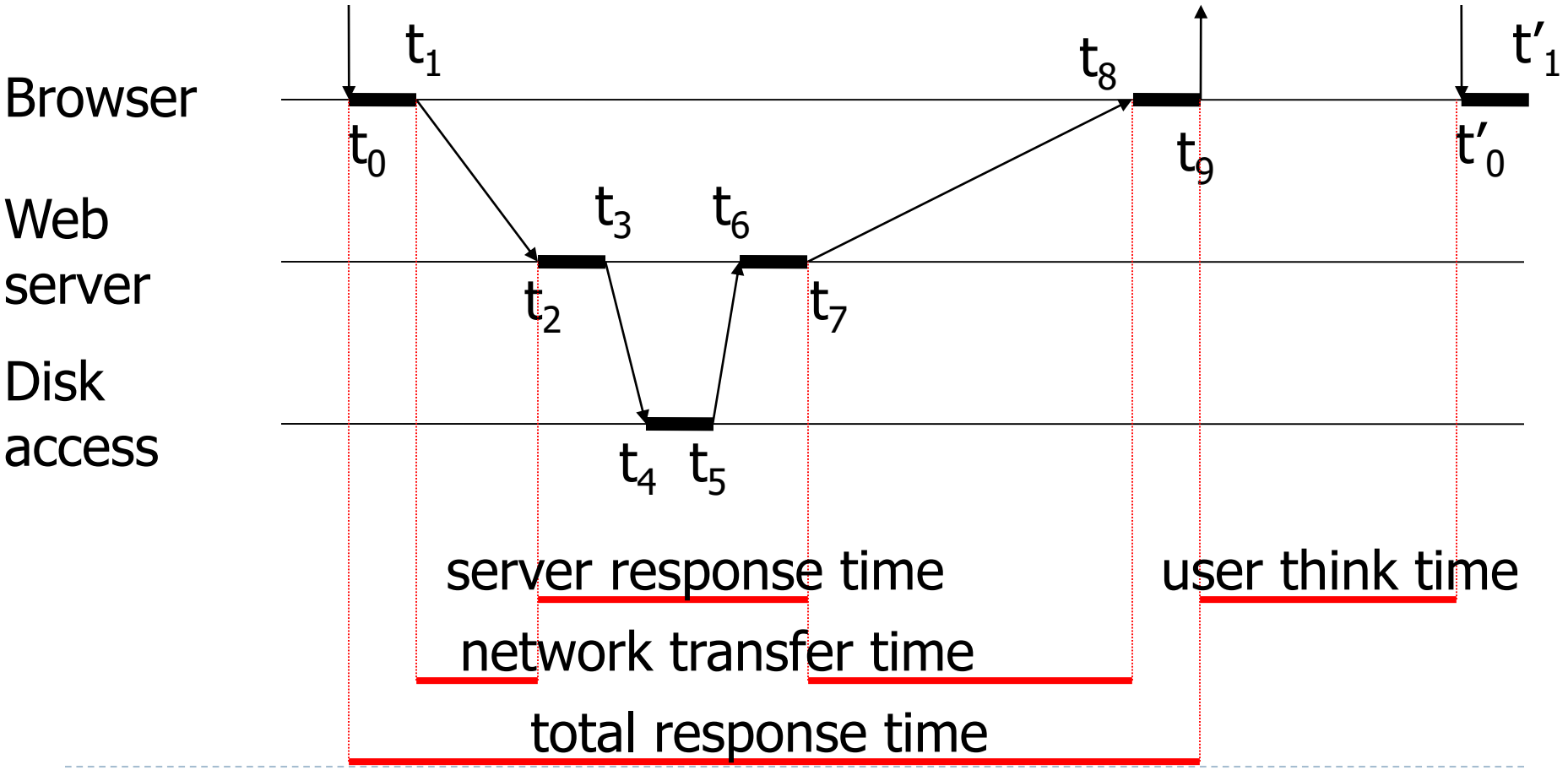
Performance measures

- Latency: time required for providing a 0 byte http page. Includes the server activation time, the request decoding time, the file access time, the transmission time and the time for closing the connection.
  - Unit of measure: http/s or s/http
- Throughput: maximum speed at which infinite-sized pages can be sent.
  - Unit of measure: Bytes (Mbytes)/s
- #Requests / s

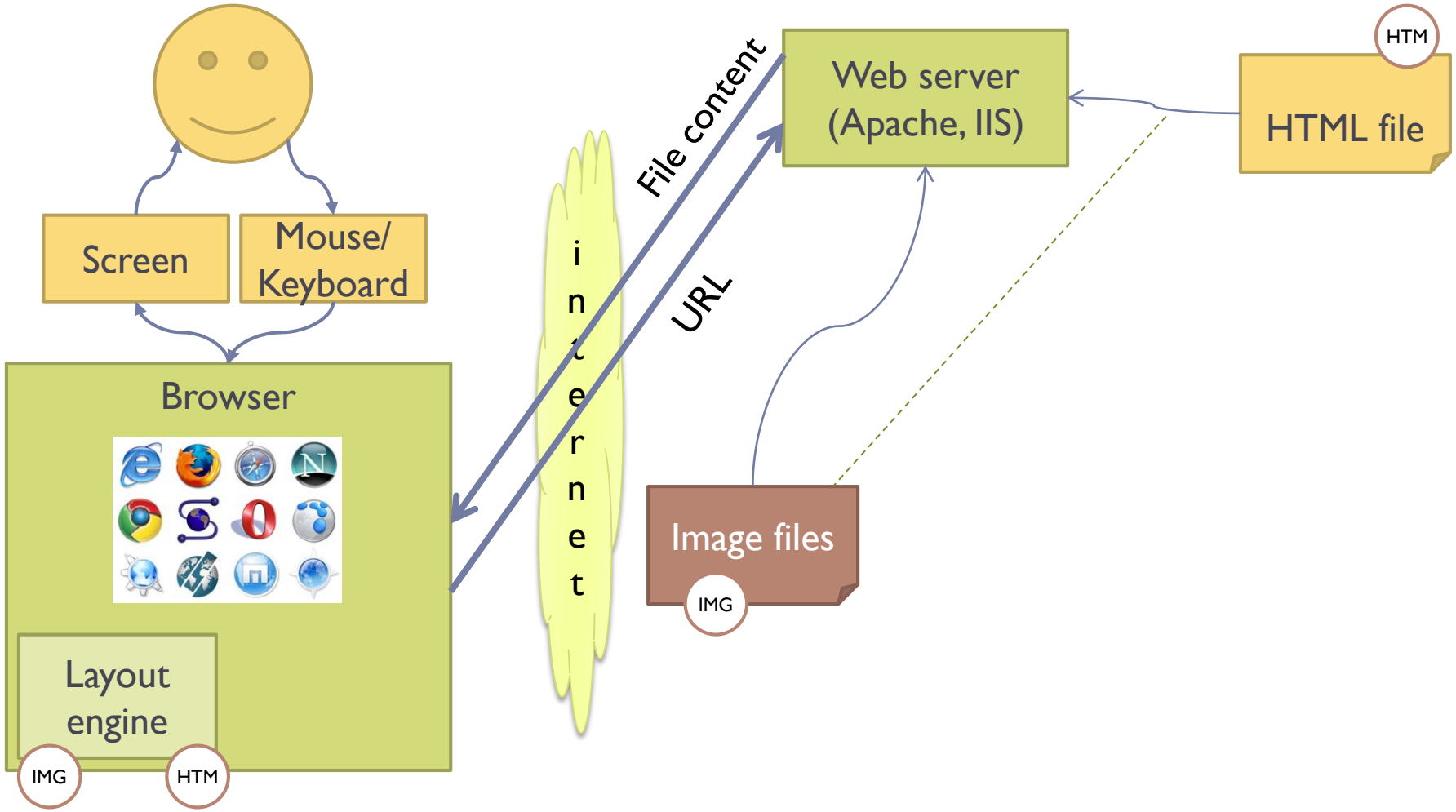
Delay time

- $T = Latency + Size_{HTML} / Throughput$
- This equation is valid if:
  - The other architecture elements (I/O subsystem, network, ...) are not overloaded
  - The web server has not yet reached its maximum workload
- Example:
  - Latency: 0,1s
  - $Size_{HTML}$: 100kBytes
  - Throughput: 800kBytes/s
  - T= 0,1s+ 100KBytes / 800KBytes/s = 0,225s

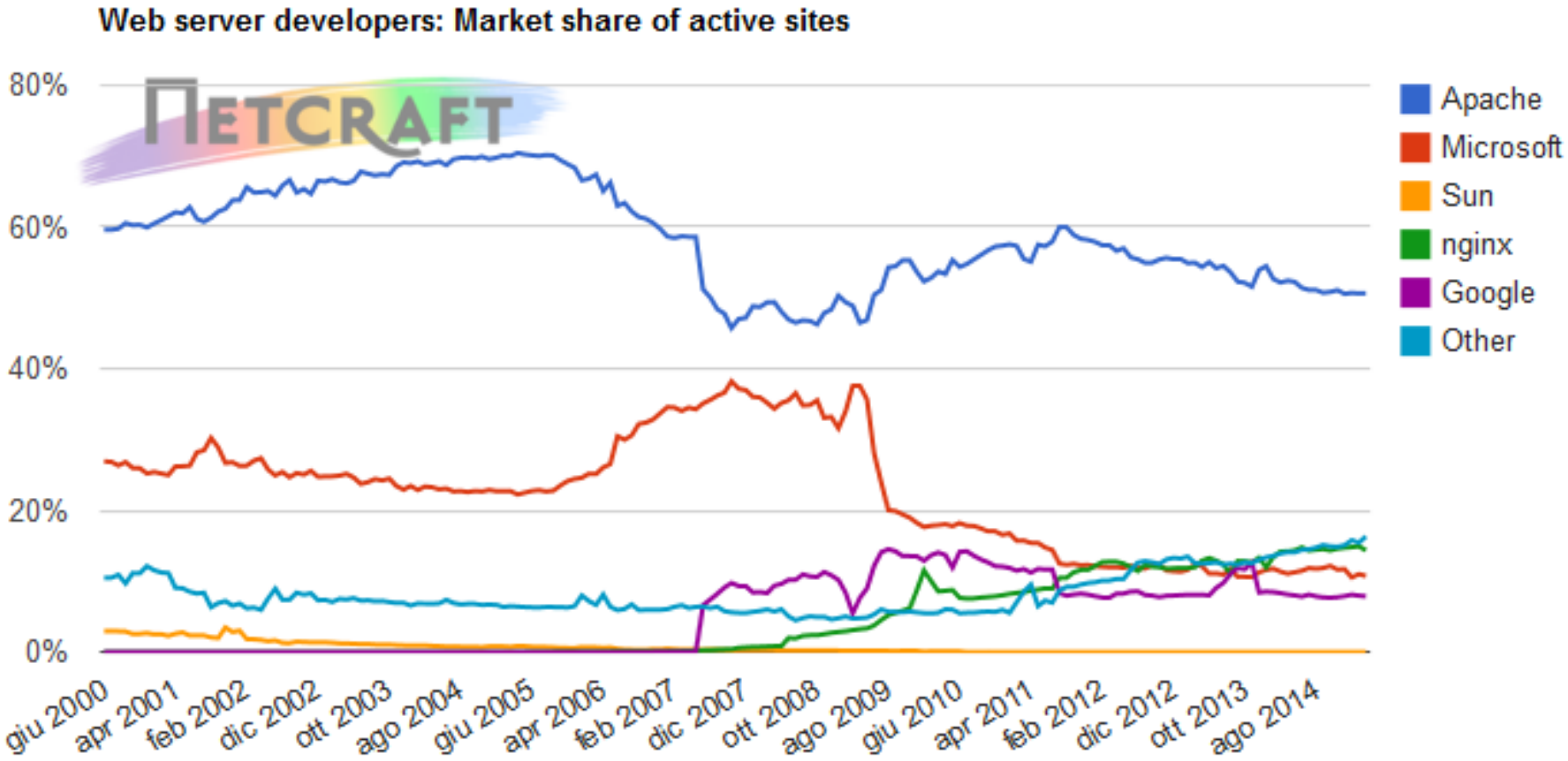
Static web transaction



General web architecture



The most adopted web servers



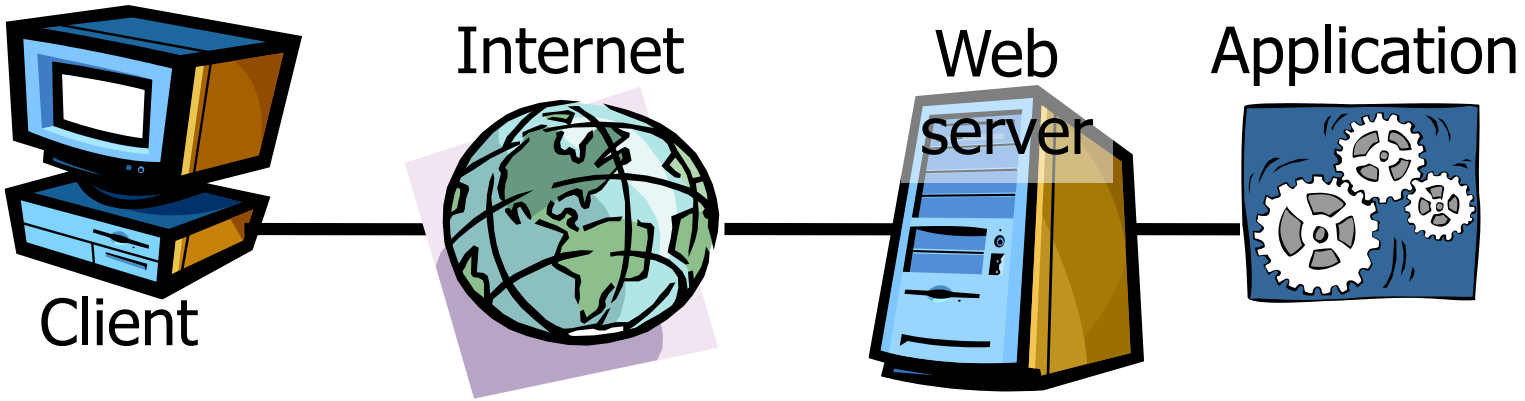
Source: http://news.netcraft.com/

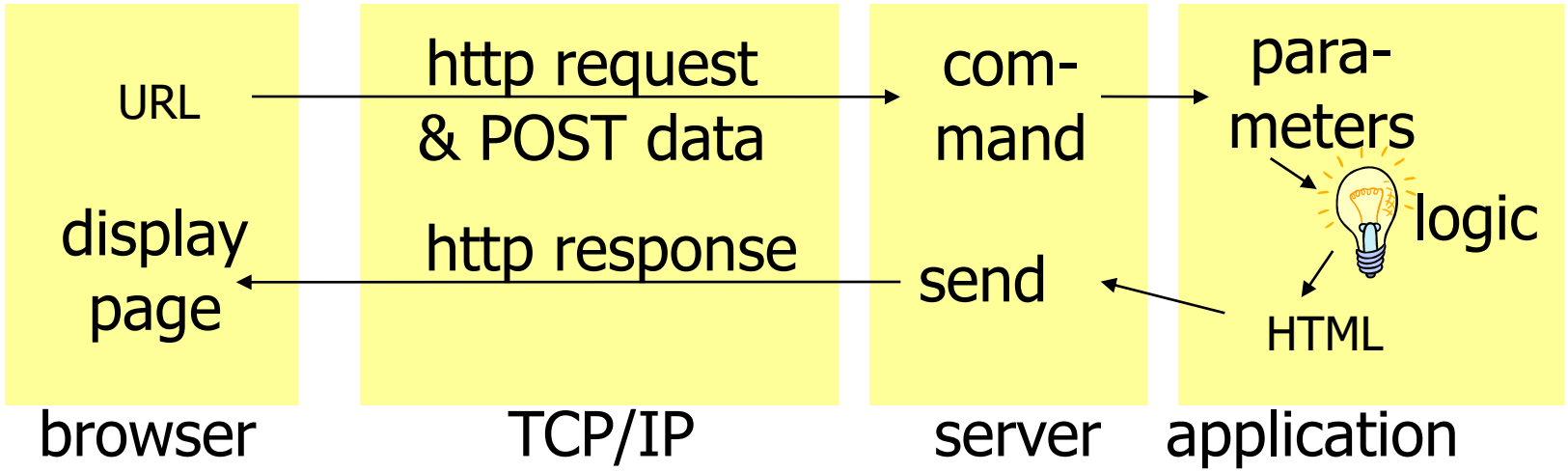
http://news.netcraft.com/archives/2015/03/19/march-2015-web-server-survey.html

Application server

- Dynamic page generation
- Manages the site business logic
- It's the middle tier between the client browser and the data residing on a database
- Implements the session mechanisms
- Different technologies and architectures are available

Dynamic web transaction

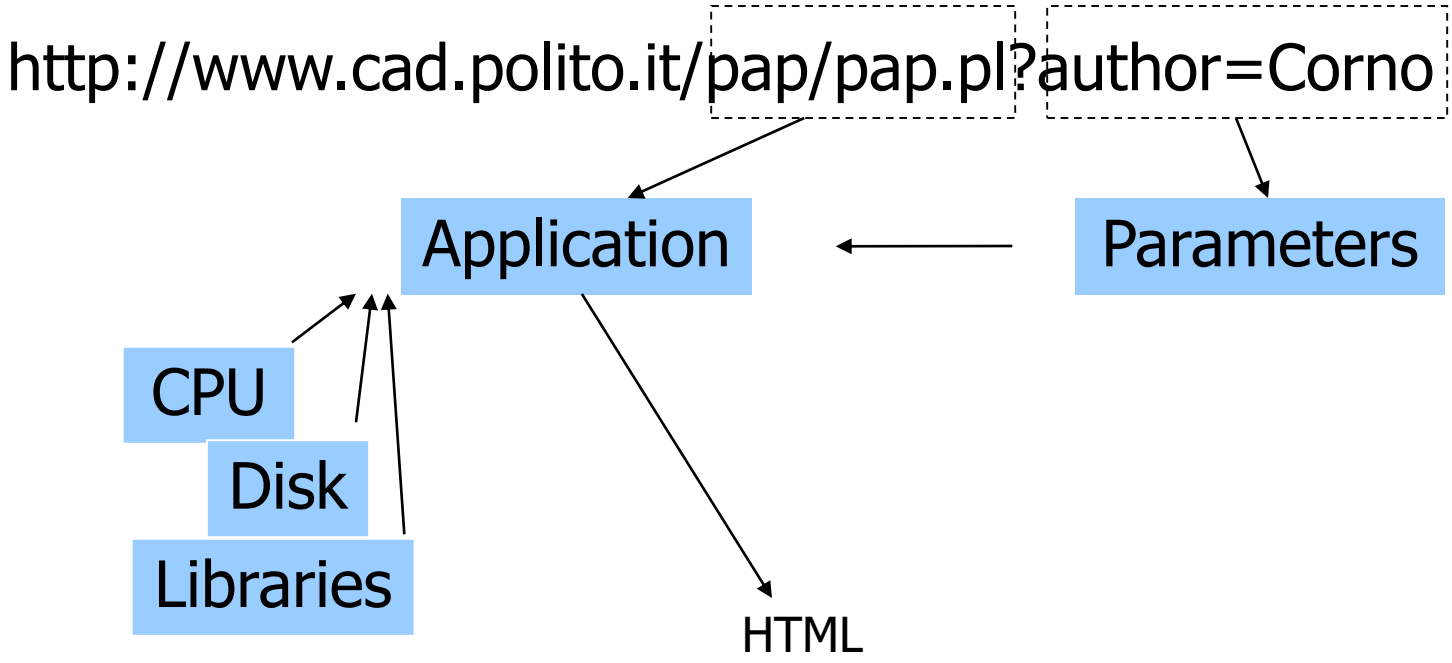




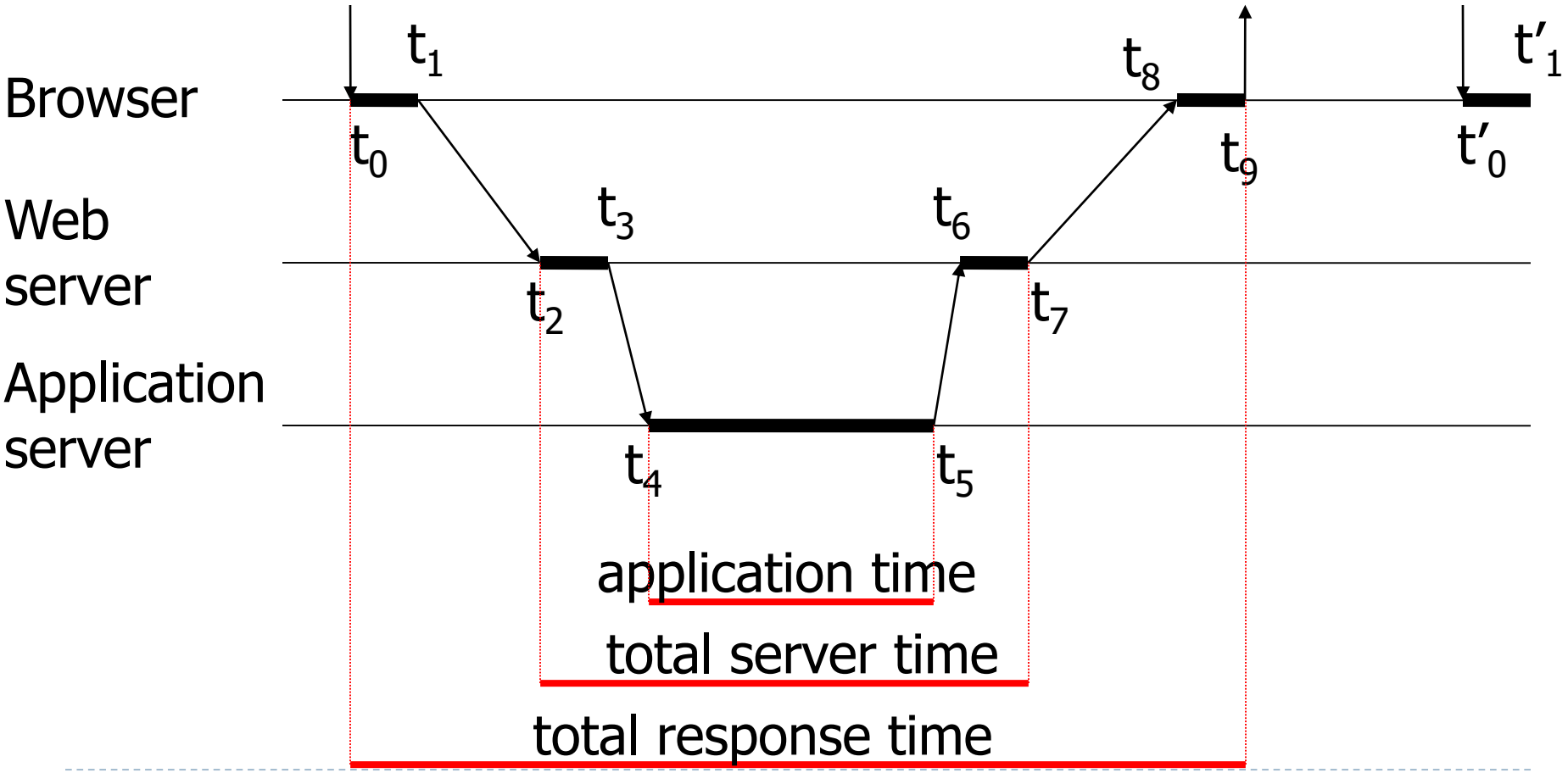
Adopted standards

- HTTP-POST for sending user-specified data
- CGI (common gateway interface), ISAPI (internet information server application programming interface), server-side script, java servlet for integrating application logic into web servers
- ASP (active server pages), PHP, PERL as new languages for application development

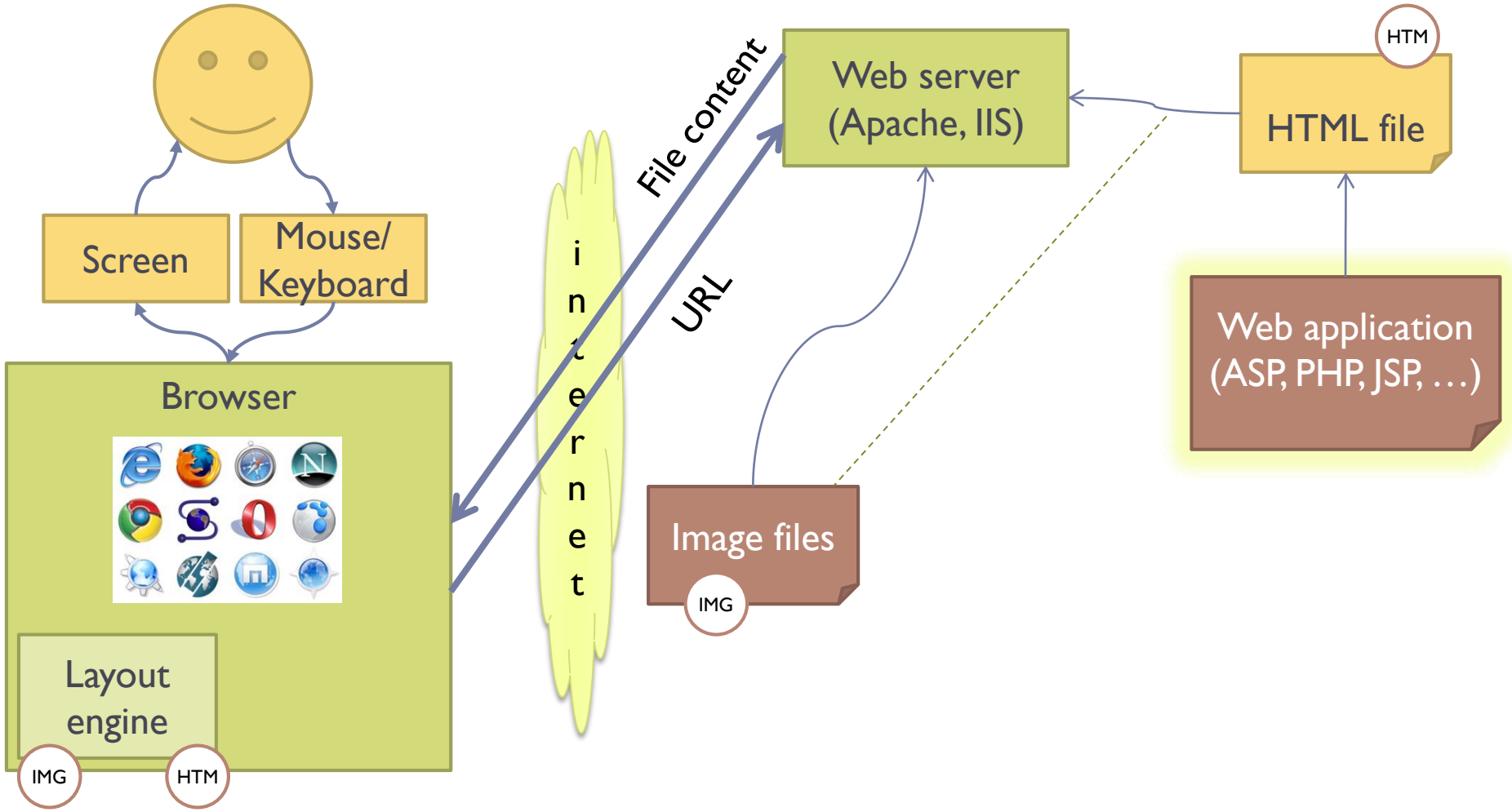
URL (HTTP GET)


http://www.cad.polito.it/pap/pap.pl?author=Corno
Application
Parameters
CPU
Disk
Libraries
HTML

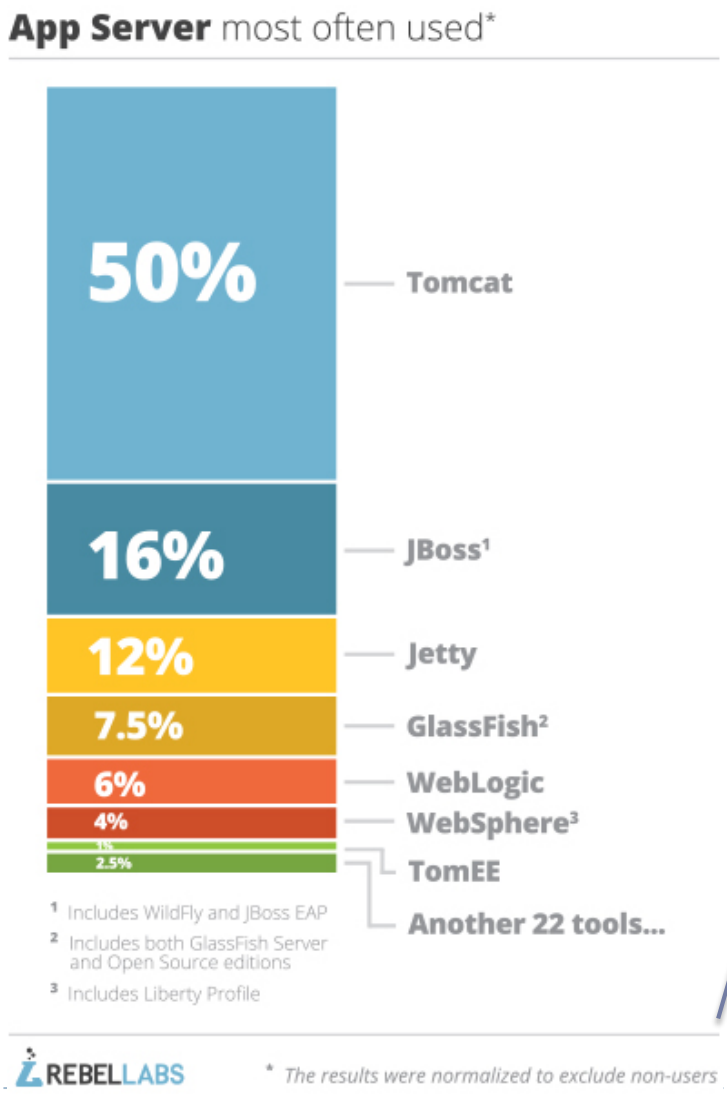
Dynamic web transaction



General web architecture



Application Servers

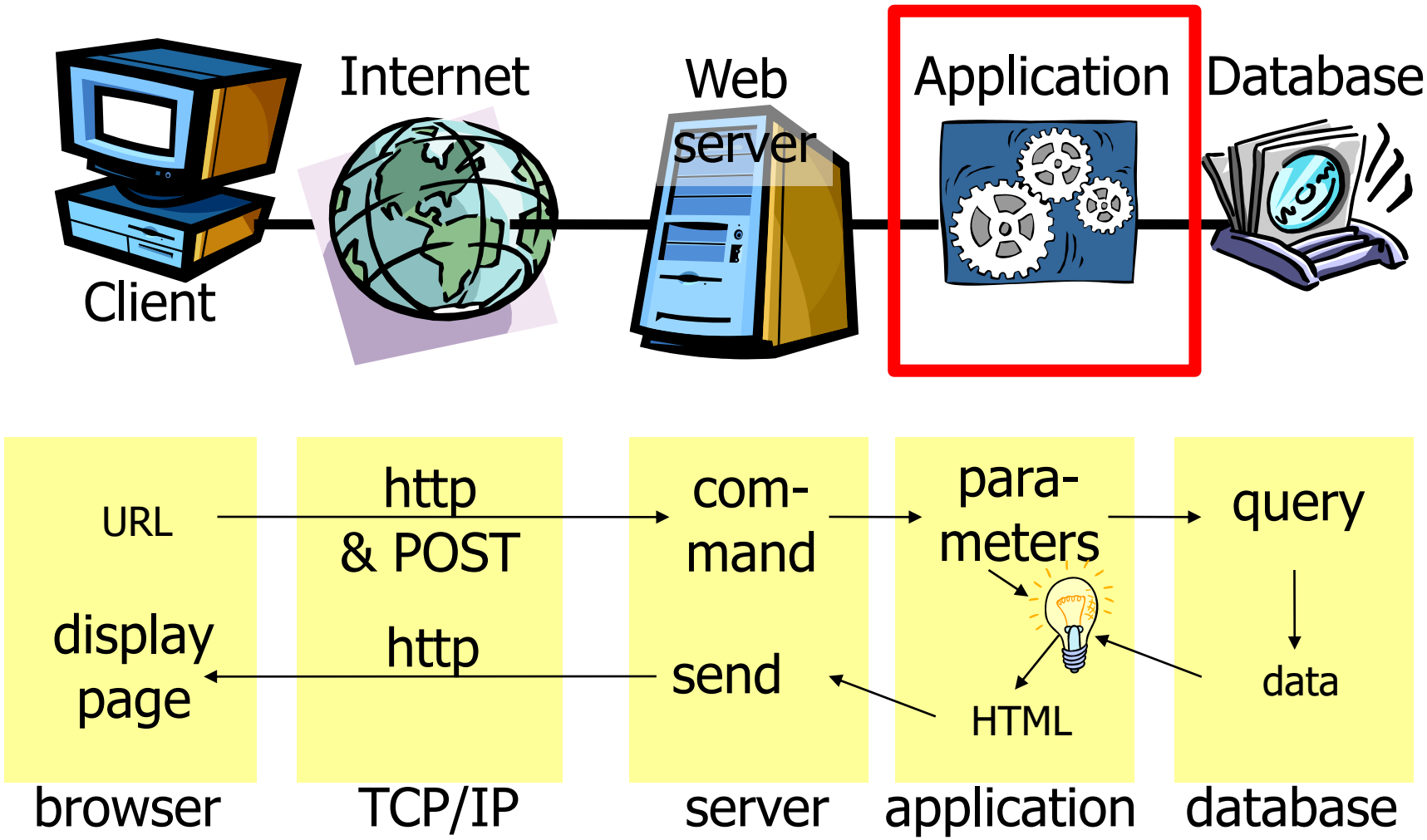


- Several different technologies
  - Java EE
  - .Net
  - PHP
  - Python
  - Ruby
  - Node.js

Database server

- Stores the data on which the application server works.
- Executes the queries issued by the application server:
  - Updates the stored data
  - Inserts new data
  - Provides back query results
- The most frequent/complex queries can be implemented internally as stored procedures (pre-compiled queries with parameters)

Example


Client
Internet
Web server
Application
Database
URL
http & POST
com-mand
para-meters
query
display page
http
send
HTML
data
browser
TCP/IP
server
application
database

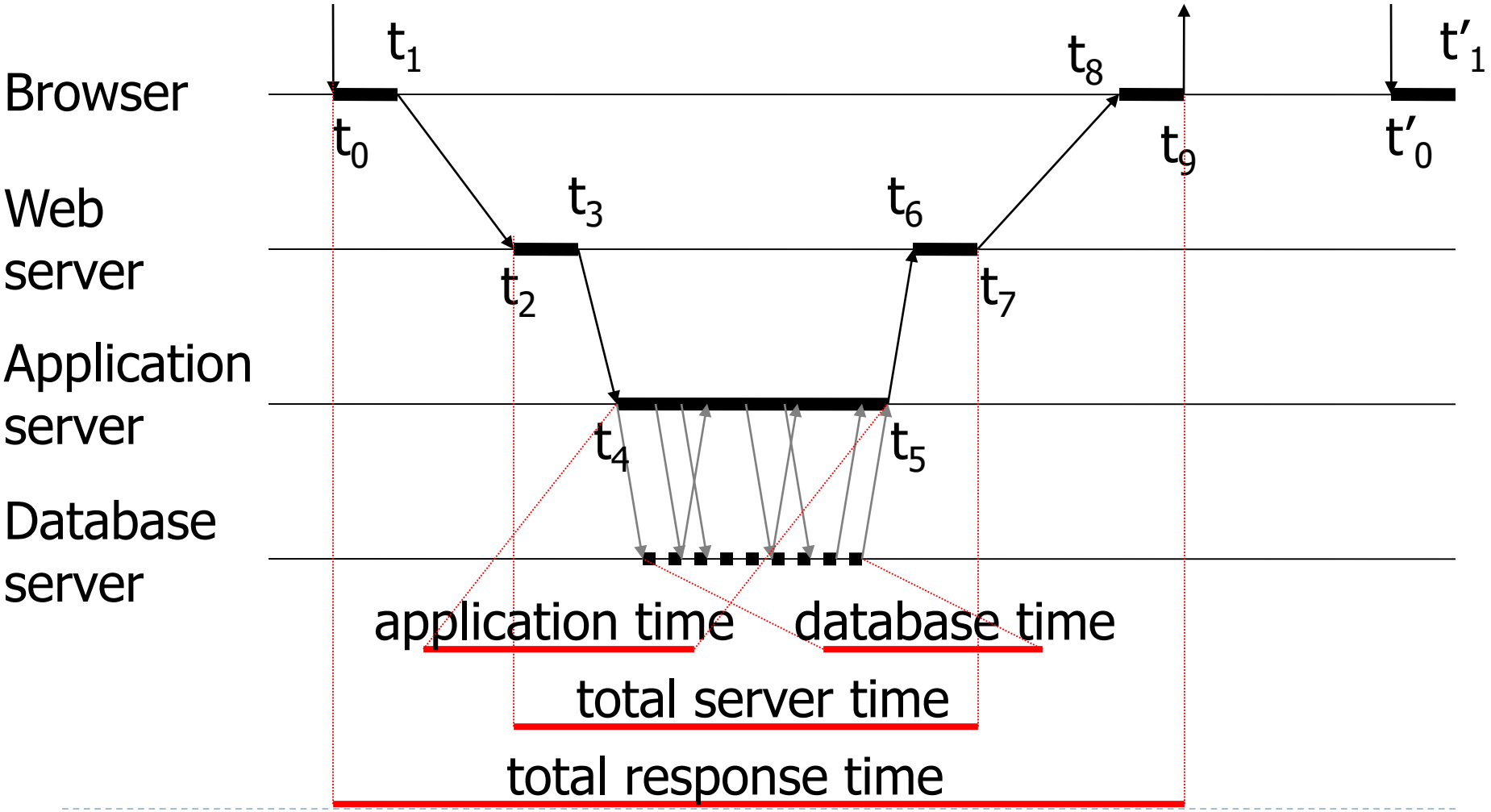
Adopted standards

- Cookies for storing the state of a session
- Java, JavaScript, ActiveX, Flash to program the user interface on the browser
- SQL (structured query language), ODBC (open database connectivity) to access data bases

Database server

- Queries are almost always in SQL
  - SELECT * FROM table;
  - ....
- Often adopts the relational database model
  - Other models can be used
    - Object model
    - Triple model
- The most advanced/complete solutions are called Transaction servers

Database-driven transaction



Example (PHP)

The application composes the query

```
<?php
$query = "SELECT doc_id FROM key_doc_index, keywords WHERE key_doc_index.key_id = keywords.id AND keywords.key = $_REQUEST["query"];";
```

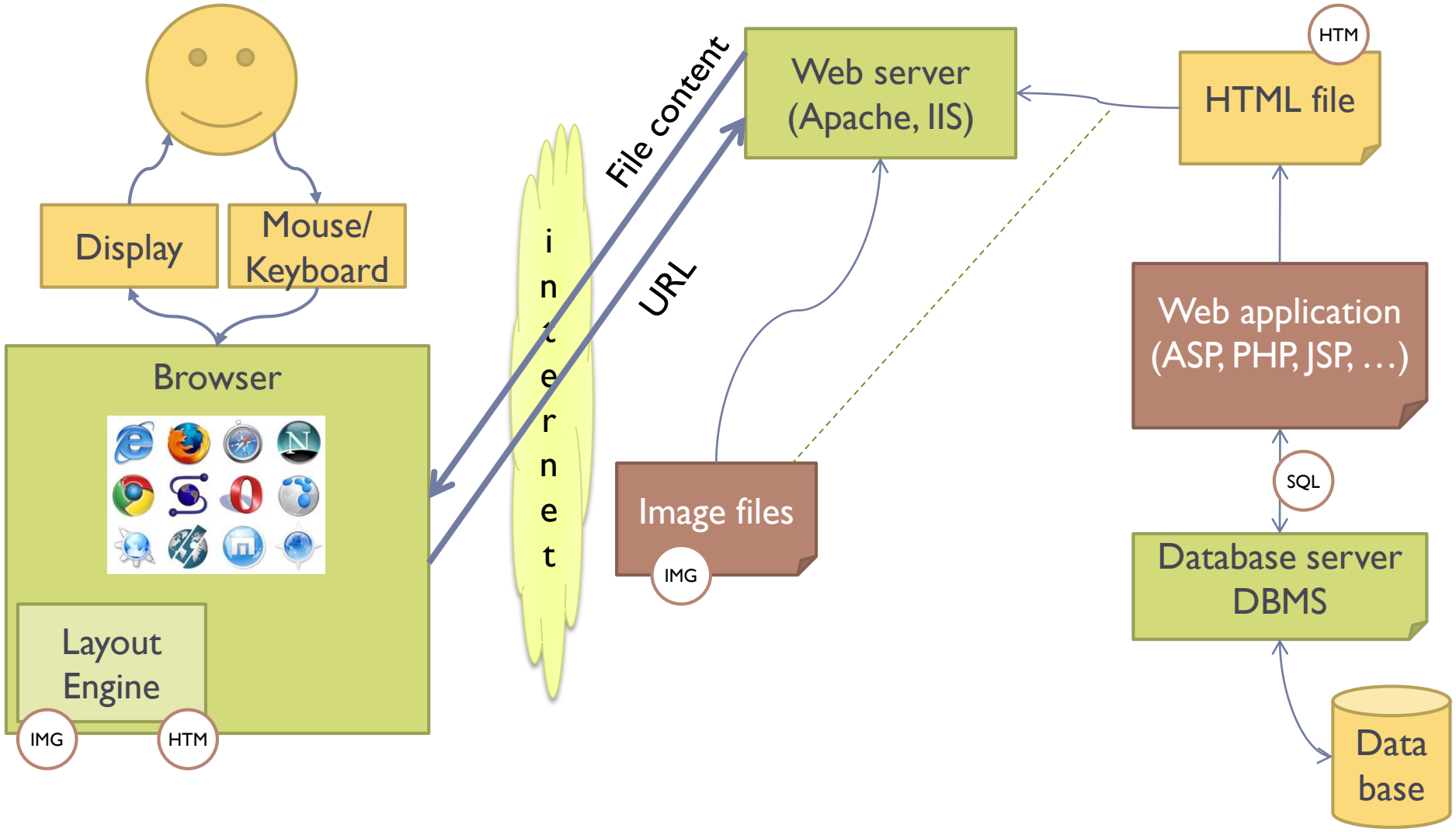
The query is sent to the db-server and a rowset containing the results is returned

```
$rowset = mysql_query($query);
```

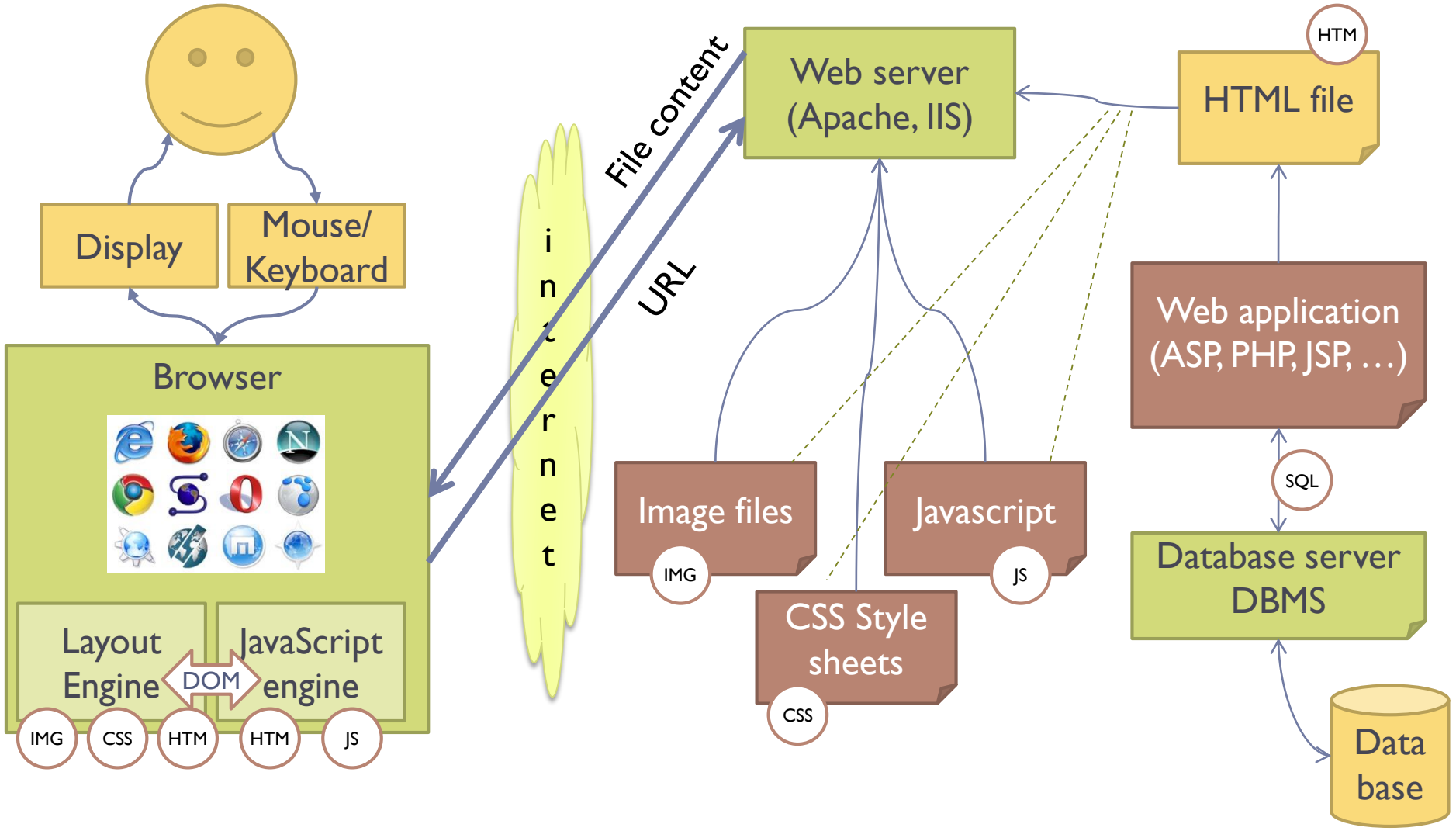
```
while($row = mysql_fetch_row($rowset))
{
//elaborate data
}
?>
```

The application elaborates the data

General web architecture



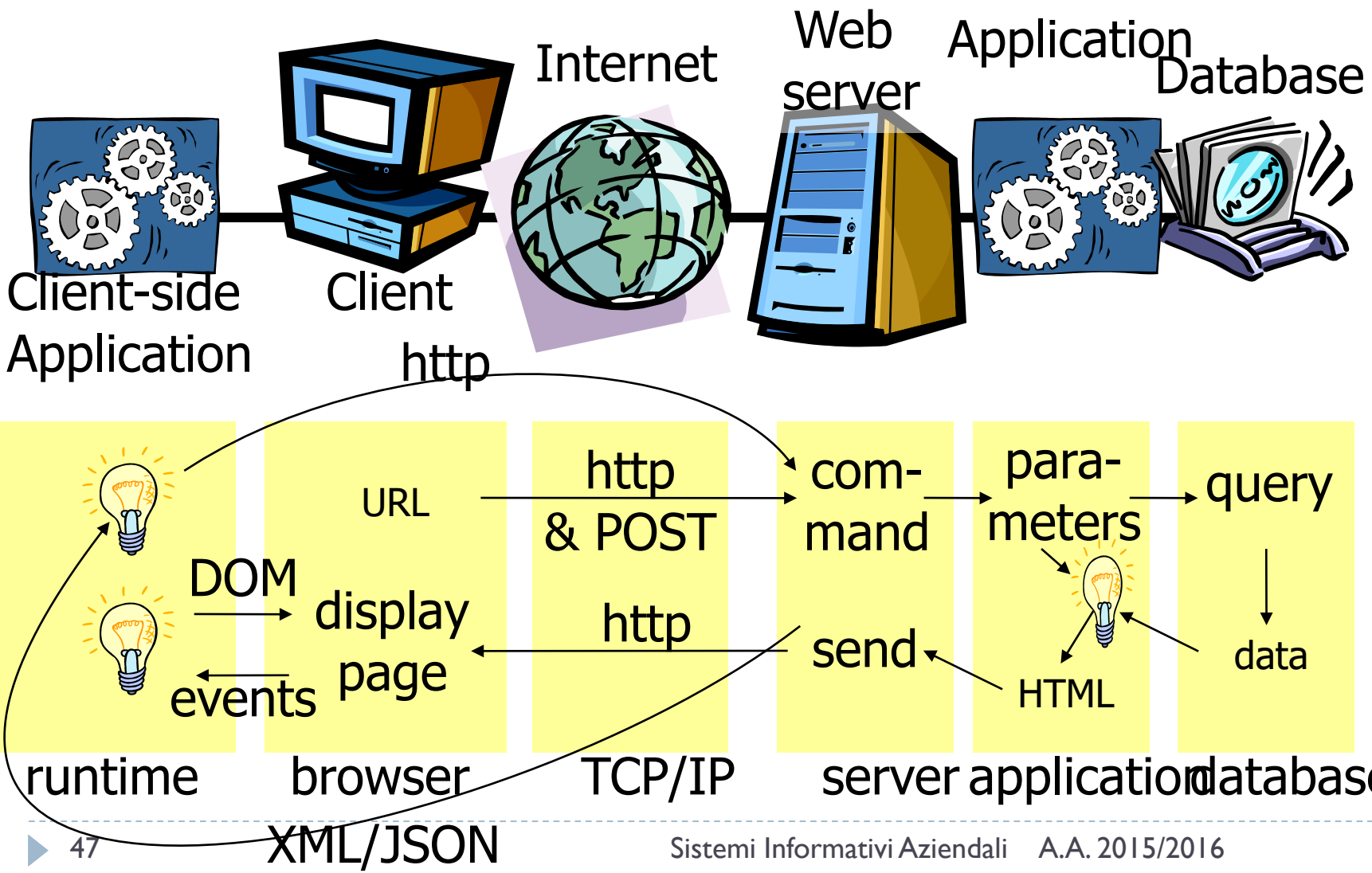
Architettura generale del web



Web 2.0

- Web applications support social interaction models
- Peer exchange and user-contributed content instead of rigid publisher/reader pattern
  - Online communities
- Rich, dynamic, interactive user interfaces
- Integration of contents across web sites (mashups)

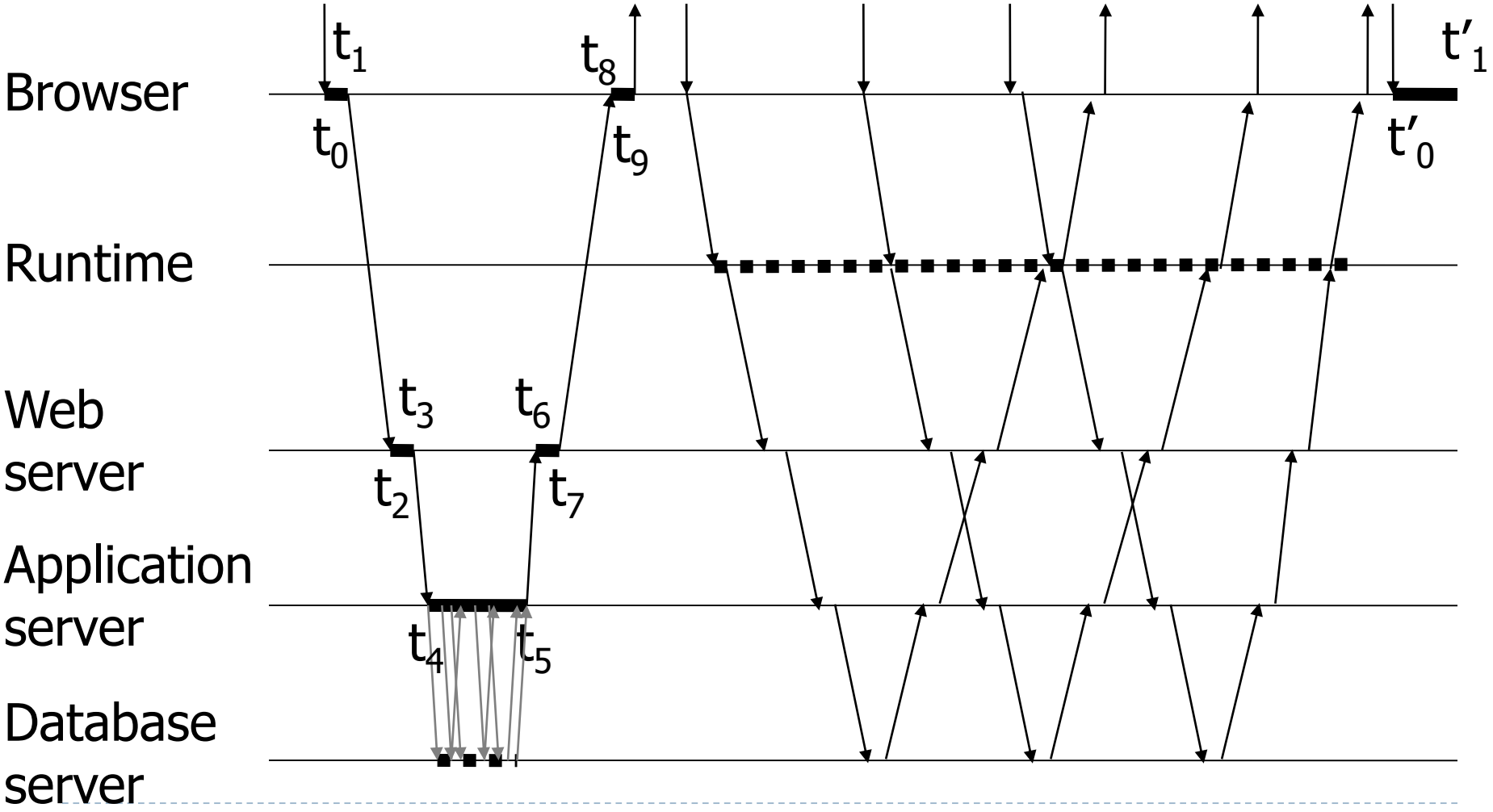
Rich-Client Asynchronous Transactions



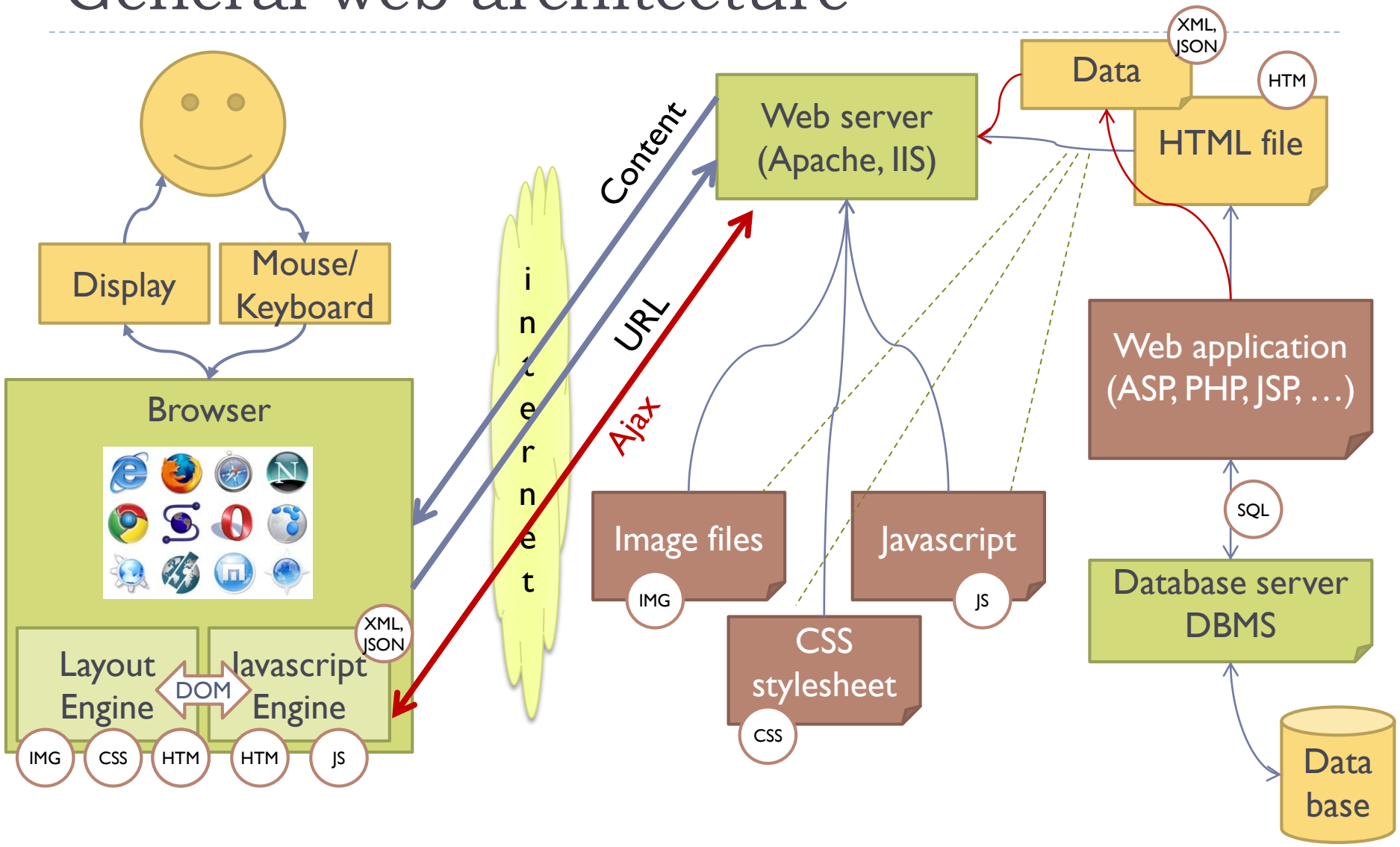
Adopted standards

- Dynamic HTML: DOM, Javascript, CSS
  - JavaScript, Flash to handle a runtime environment on the browser
  - DOM (XHTML Document Object Model) to allow on-the fly modification of the web page
  - CSS 2.1 to modify attribute and handle objects
- AJAX: Asynchronous Javascript and XML
  - XMLHttpRequest for asynchronous communication to the server
  - Data transfer formats: JSON, XML, RDF, RSS, Atom, FOAF, ...
- Mash-up technology

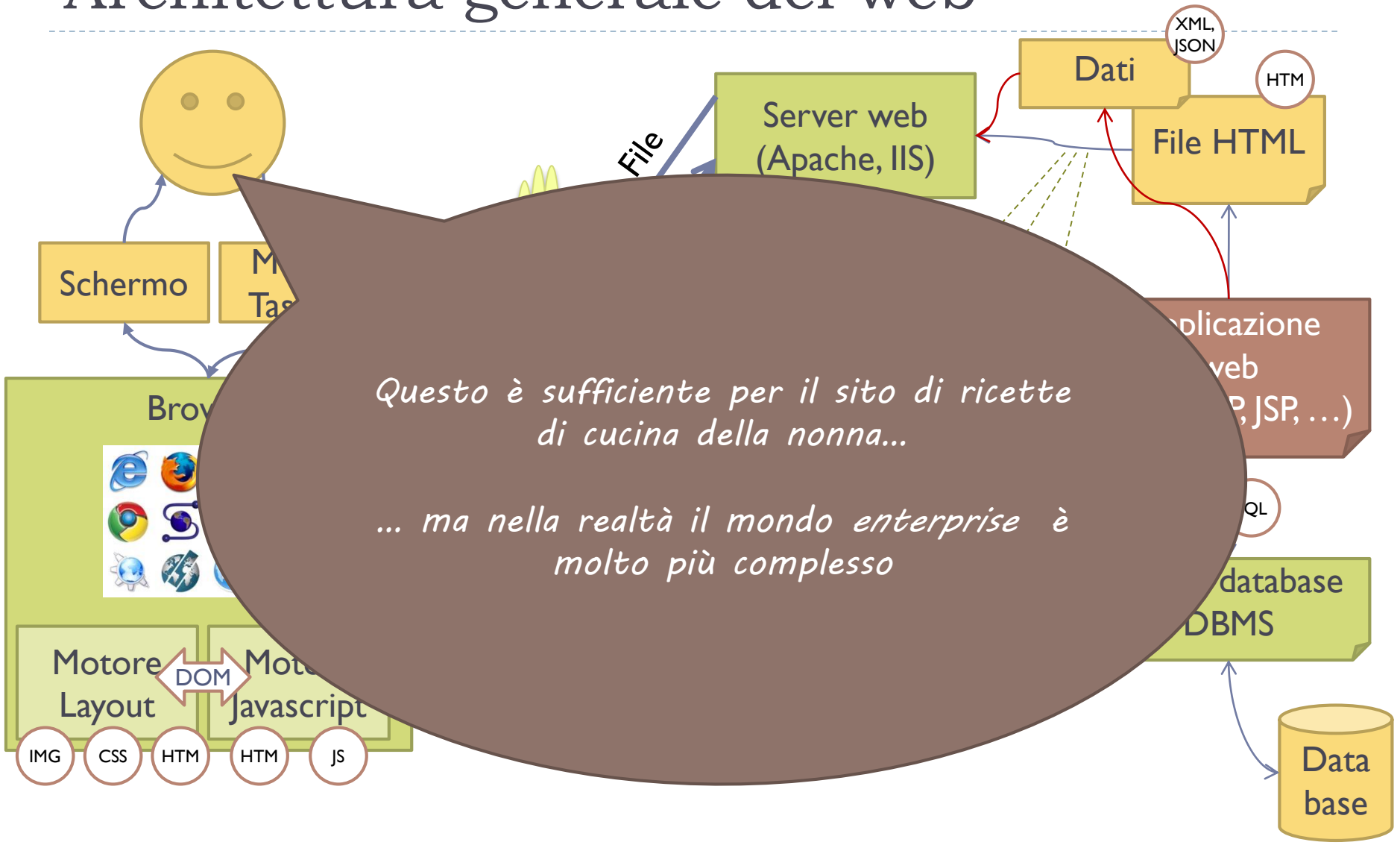
Rich-client transaction



General web architecture



Architettura generale del web

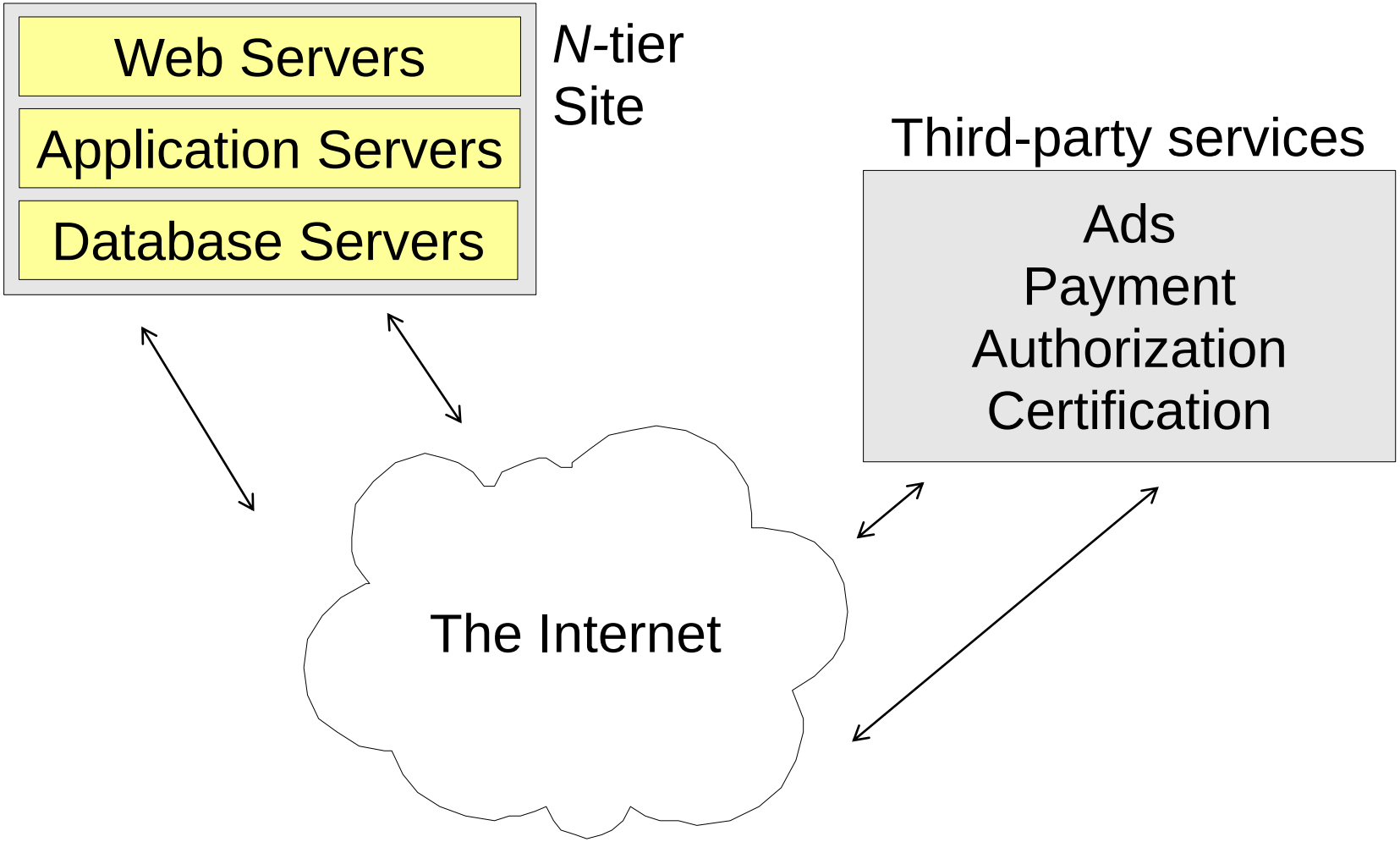


The real word is different…

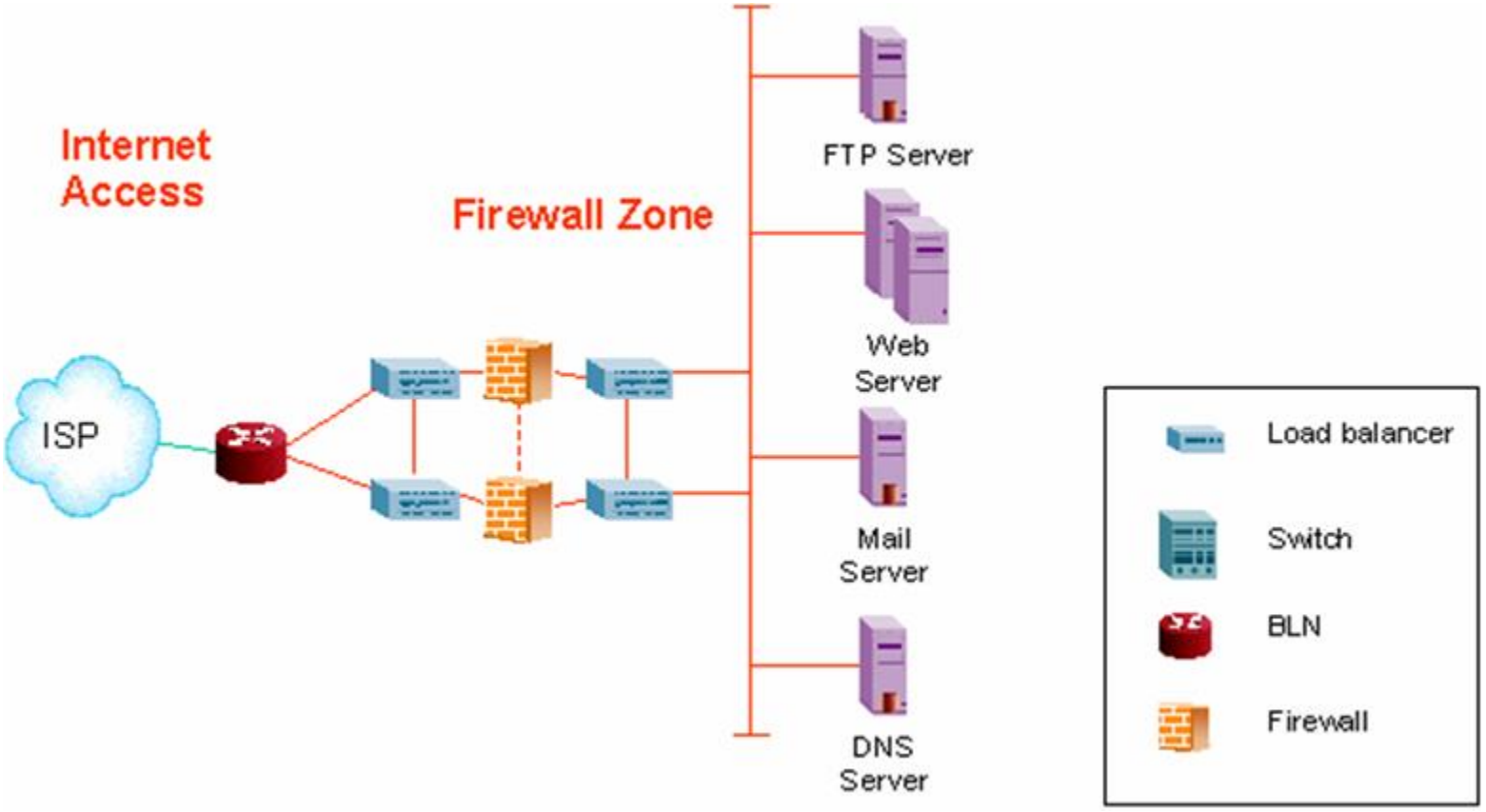
- The users
- Functionality
- Flexibility
- Portability
- Reliability
- Security
- Integrity
- Maintenance
- Performance
- Scalability

- Costs
- Maintenance
- Development times
- Interactions with existing systems
- Interactions with the "physical" world

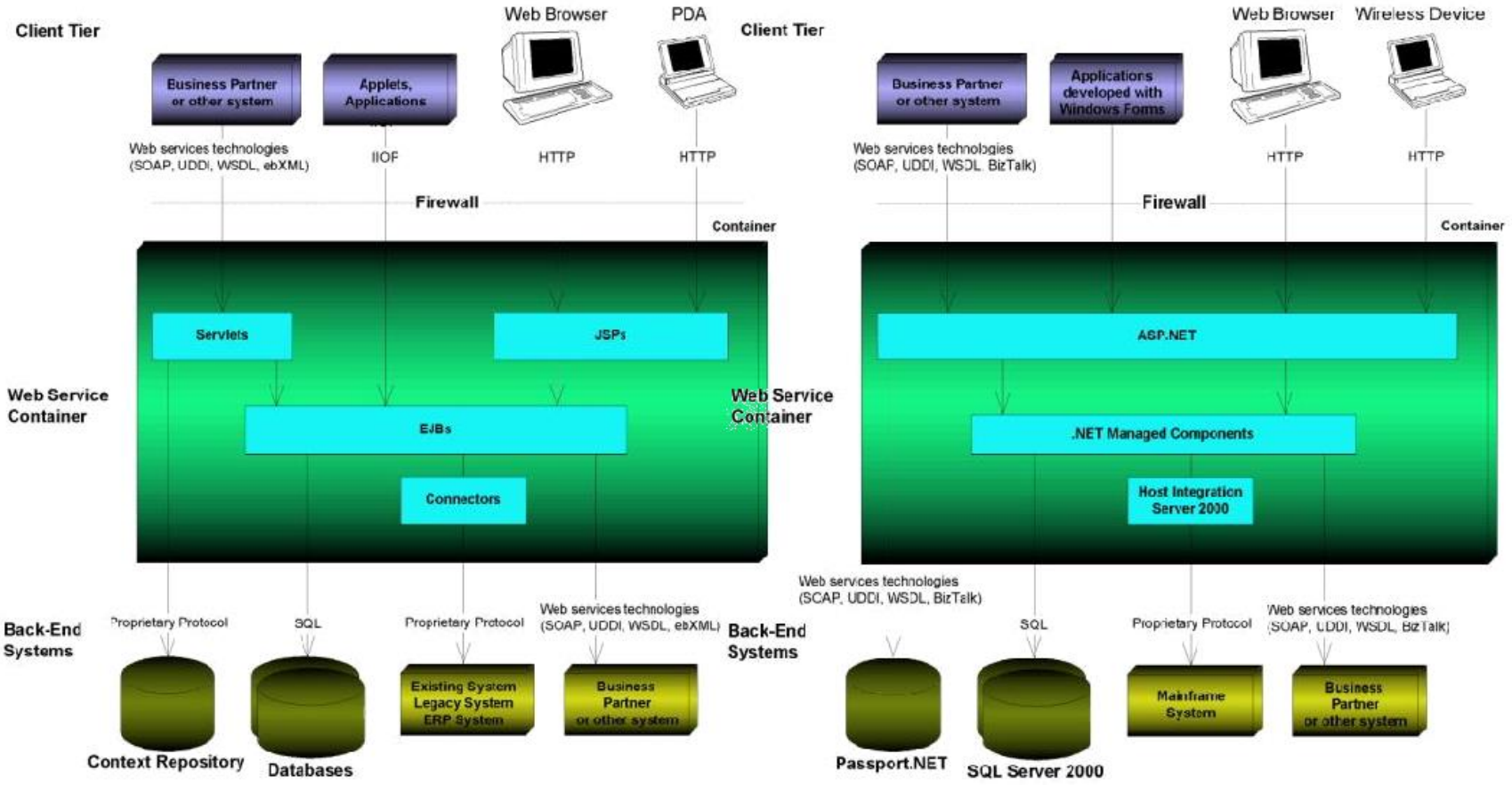
E-business architectures



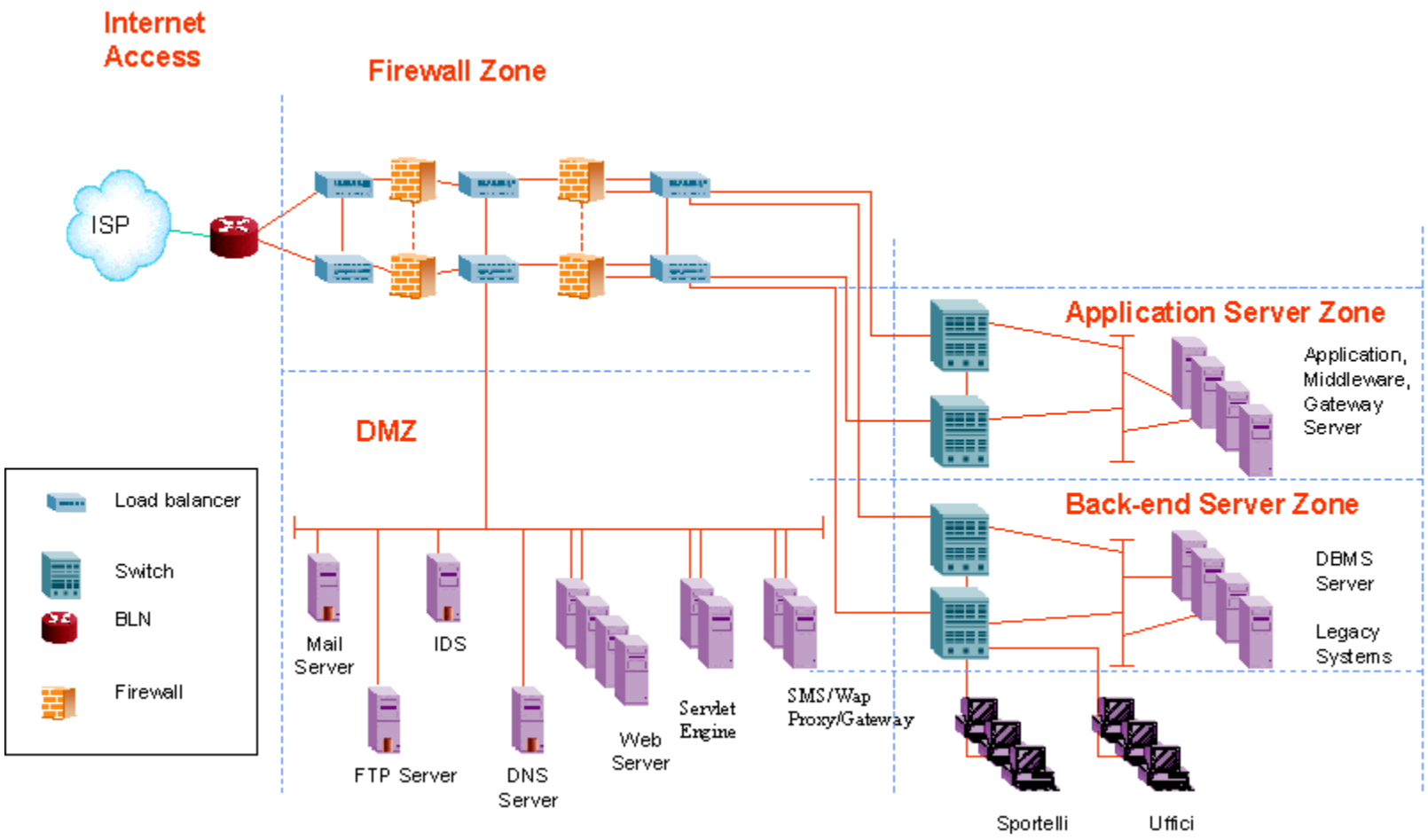
Informative site – complete



Legacy systems are always there…



Ordering site – typical structure



Interacting with other suppliers…

- Application Server needs to require services available on an external host
  - Ordering services (e.g. payment)
  - Informative services (e.g. stock quotes)
  - Security services (e.g. authentication)
- A web page contains sections originating from different sites
  - "Portal" approach, sections are indepent (e.g. iGoogle)
  - "Application" approach, sections interact and share data (*mashup*)

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