



Università di Pisa

Dipartimento di Informatica

Web application development landscape: technologies and models

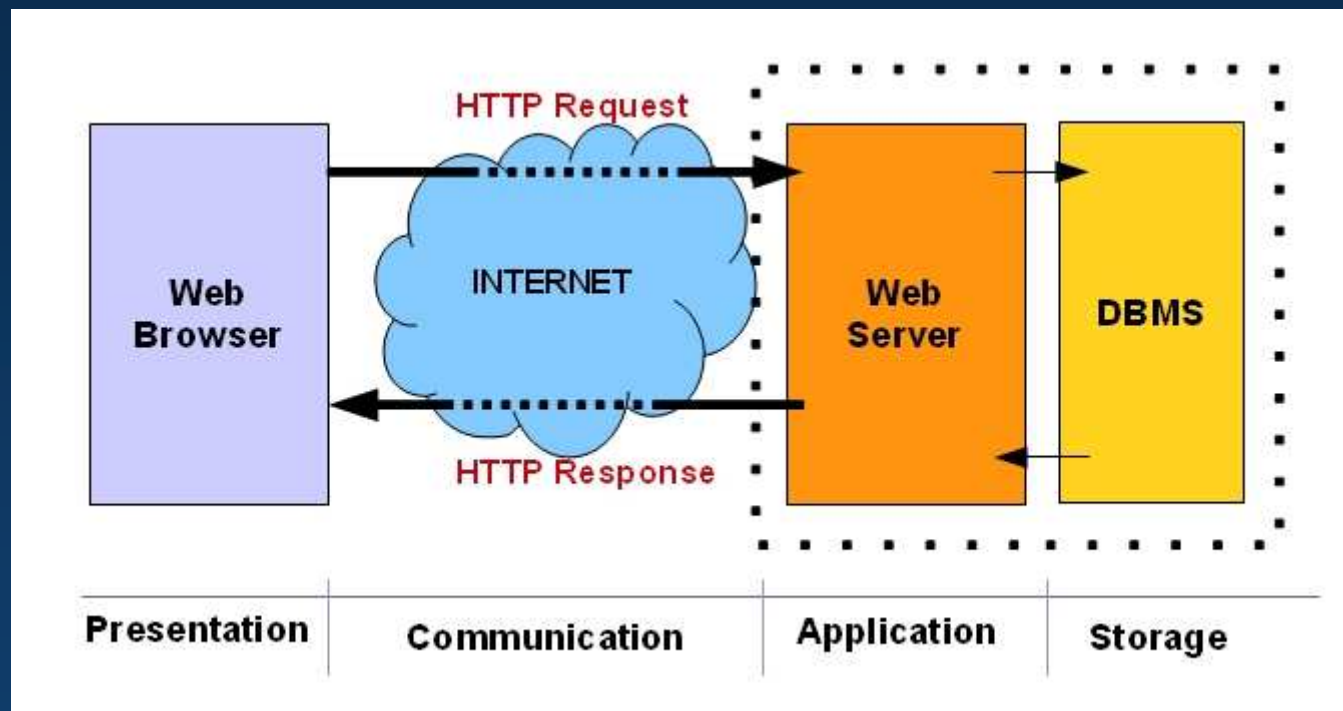
by Andrea Nicchi

Relatore: Prof. Antonio CISTERNINO

Controrelatore: Prof. Giuseppe ATTARDI

WEB APPLICATION

“an Information System providing facilities to access complex data and interactive services via the Web” [10.02]



[10.02] Gnaho, C. (2001), *Web-Based Information Systems Development – A User Centered Engineering Approach*, Lecture Notes in Computer Science, Vol. 2016, pp. 105 – 118.;



TABLE OF CONTENTS

- **Web Document;**
- **HTTP Protocol;**
- **Web Browser;**
- **Web Server and Content Delivering;**
- **AJAX and REST;**
- **State Management: Session Control;**
- **Web application development approaches;**
- **Example: Shopping Cart.**

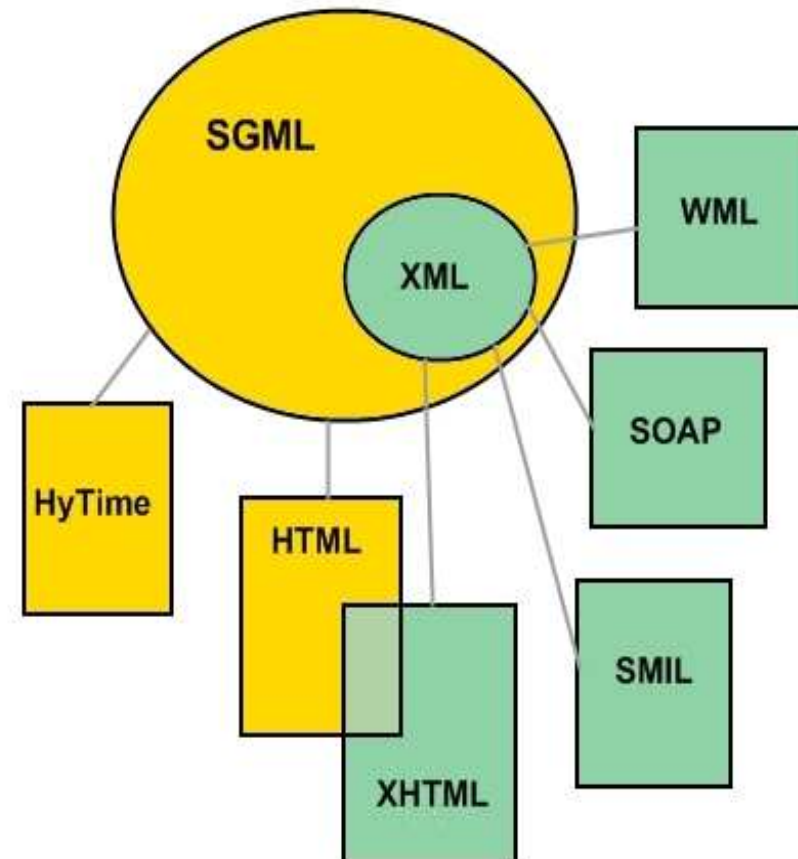
WEB DOCUMENT

Formalisms used for representing a web document:

- **GML: IBM 1969;**
 - **SGML: ANSI 1983;**

 - **HTML 4.01 - 1999;**
 - **XHTML 1.0 (bridge to XML);**
- ↓
- **HTML 5 - 2007.**

HTML provides a *semantic* description of the content and establishes a document *structure* (a hierarchy of elements)



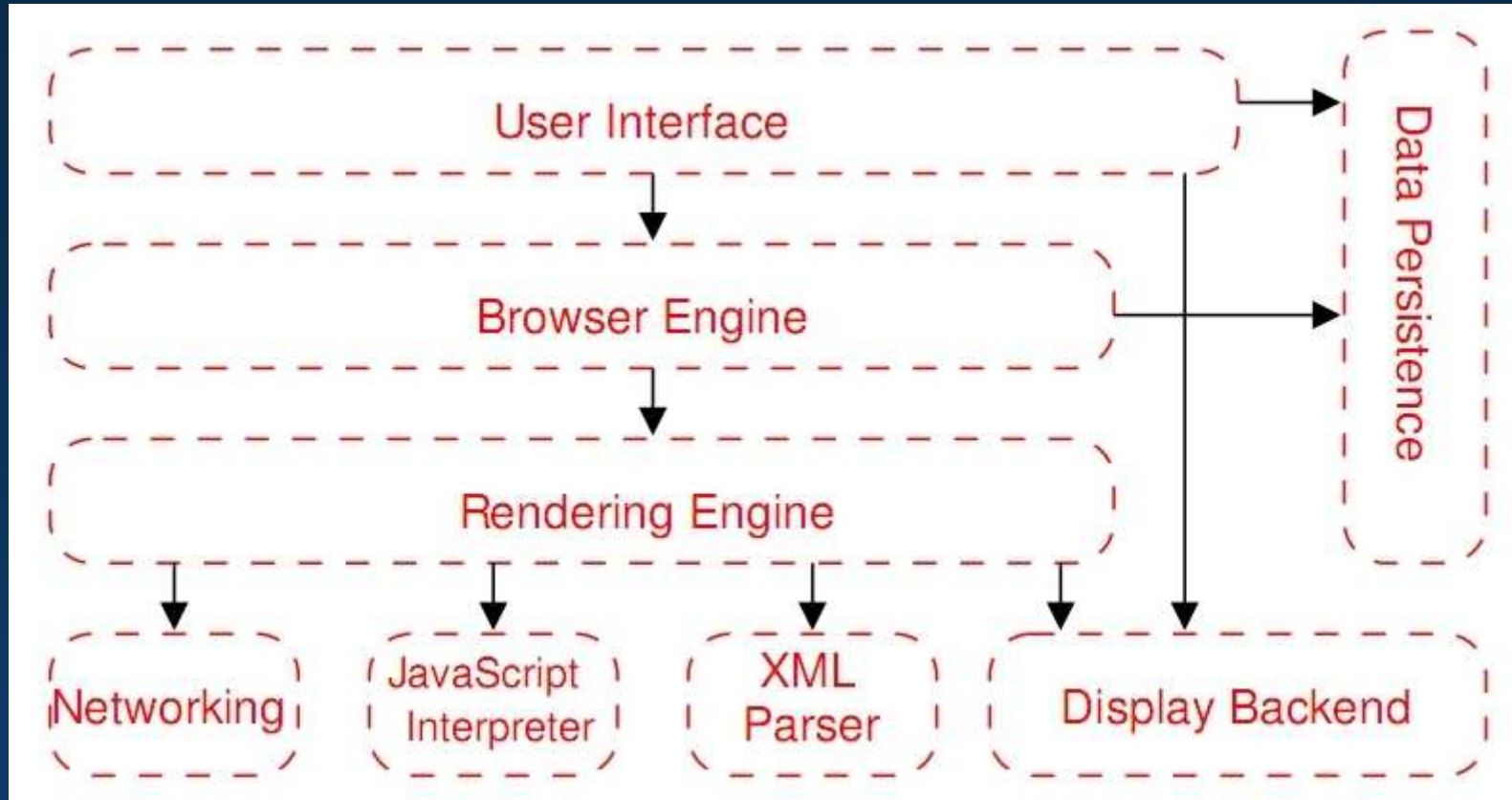


HTTP PROTOCOL

Defines: the way of exchange of the messages and the format of the messages

- Client/server structure, connection-oriented, stateless, no attempt is made to recover from failure;
- HTTP uses the resource identification mechanism provided by *Uniform Resource Identifier (URI)* ⇒ (URI, URN);
- Request-Response Message Paradigm;
- HTTP MIME support content type.

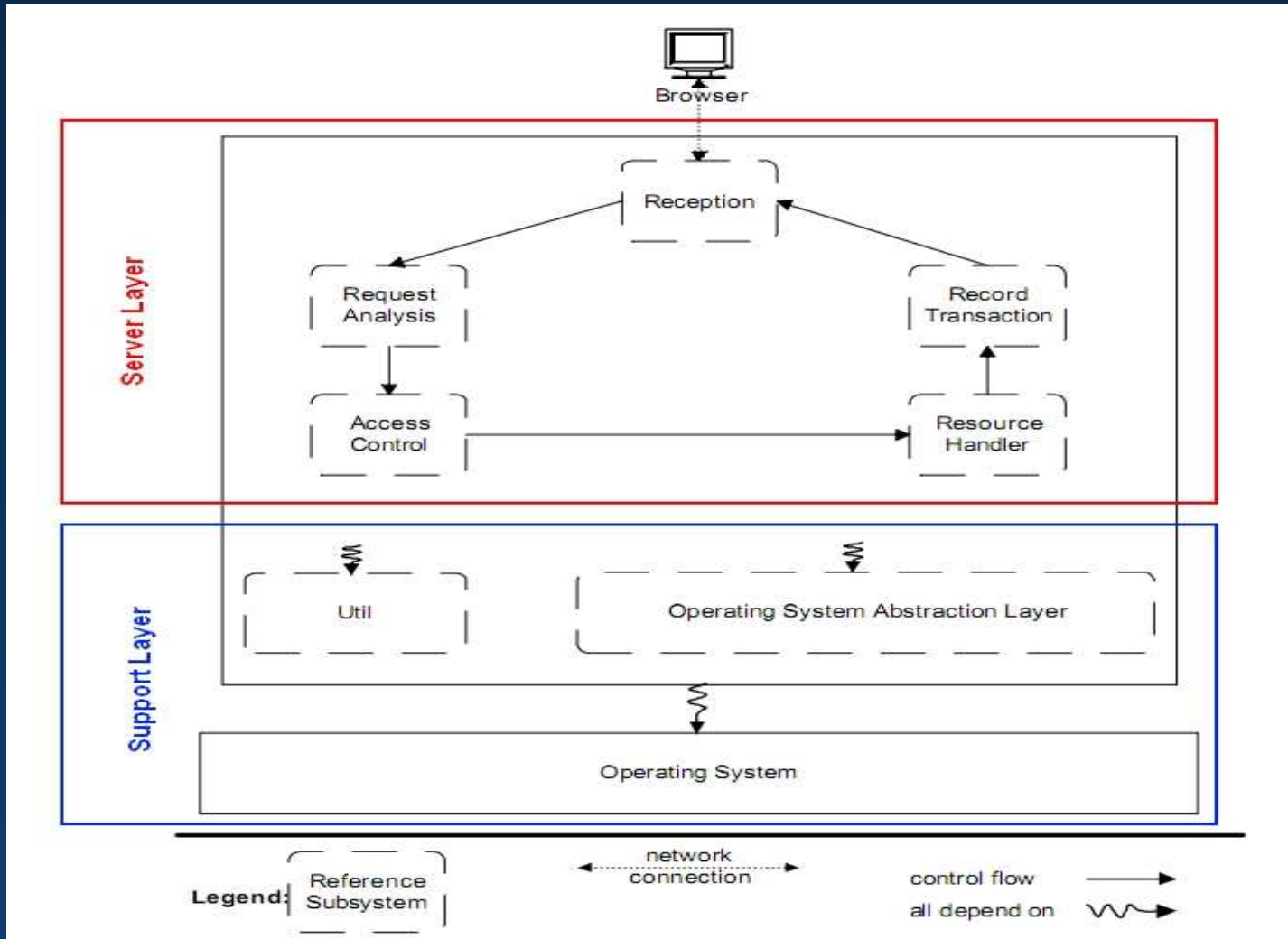
BROWSER: reference architecture



- Conceptual Mozilla FireFox Architecture;
- Concrete Microsoft Internet Explorer.

[4.01] Alan Grosskurth, Michael W. Godfrey, *Architecture and evolution of the modern web browser*, David R. Cheriton School of Computer Science, University of Waterloo, Waterloo, 2006;

WEB SERVER: reference architecture





WEB SERVER

- Processing Model (Process-based, Thread-based and Hybrid model)
- Pool size behaviour (Static approach and Dynamic approach)

COMMERCIAL WEB SERVER

- Conceptual architecture Apache Server 1.4;
- Concrete architecture Microsoft IIS 7.0;



WEB SERVER CONTENT DELIVERING

■ Static Content

- Simple HTML
- As-is page (header+content)

■ Dynamic Content

- CGI: Common Gateway Interface
- FastCGI: Fast Common Gateway Interface
- SSI: Server Side Include (.shtml)
- PHP: PHP Hypertext Preprocessor /Personal Home Page
- Java Servlet
- JSP: Java Server Pages (Java Beans, JSP 2.0 JSTL+EL)
- JSF: JavaServer Faces
- ASP: Active Server Pages (ISAPI extension)
- ASP .NET Web Forms
- ASP .NET MVC (Front Controller + MVC Model 2)



AJAX

(Asynchronous Javascript And XML or Asynchronous Javascript And XMLHttpRequest)

What retrieving content from the server to be inserted into the current page and transmitting new or update information to the server, without causing a total refresh or re-rendering of the current page.

By DHTML (*JavaScript, CSS and DOM*) + XMLHttpRequest (*XHR*)

How ● **AJAX WITH HTML HIDDEN FRAME** (<frameset>);

● **AJAX WITH HTML INTERNAL FRAME** (<iframe>);

● **XMLHttpRequest object.**



REST

(REpresentational State Transfer)

A new approach to the web application design.

“a coordinated set of architectural constraints that attempts to minimize latency and network communication while at the same time maximizing the independence and scalability of component implementations” (Fielding 2000).

Architectural elements:

- 1) data elements (resources, resource identifiers, representation);
- 2) connecting elements (client, server, cache, resolver, tunnel);
- 3) processing elements/components (user agents, origin server, intermediate comp.).



REST applied to HTTP

- 1) **nouns** (URI);
- 2) **verbs** (actions: POST, GET, PUT,...);
- 3) **metadata** (MIME-types,...);
- 4) **contents** (Content-type MIME type).

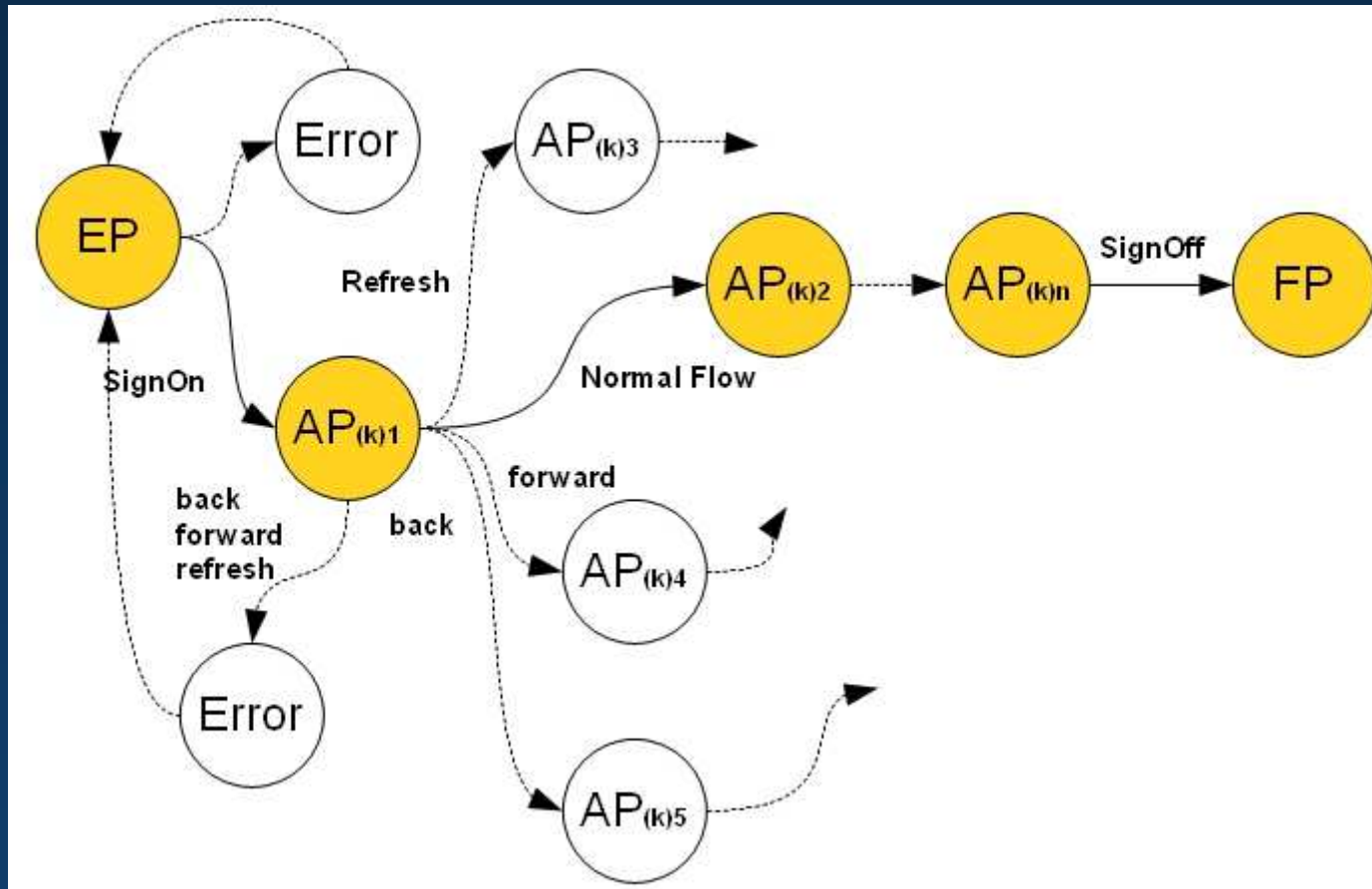


Web Application State Management

- **Session Control;**
- **State Mngt Patterns;**
- **Web Application Approaches;**

Web Application State Management

Flow control problem



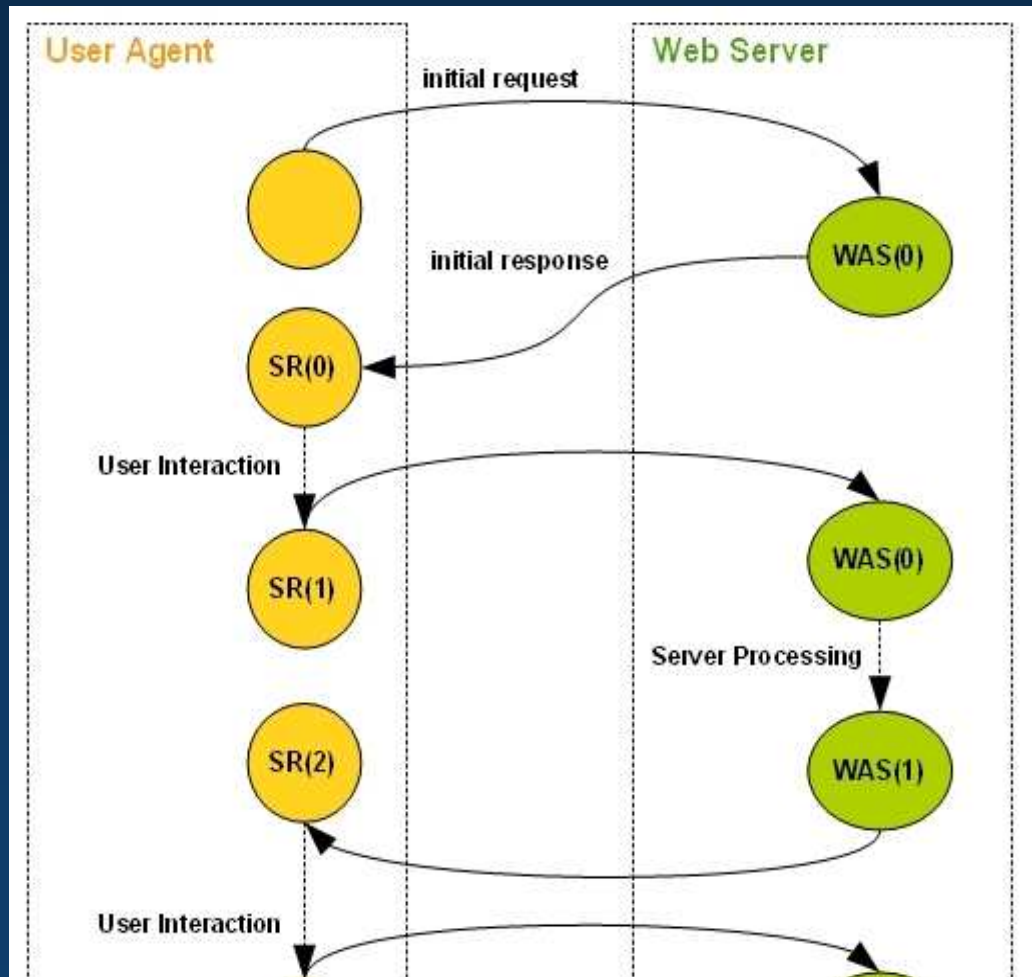
User interacts:

- browser;
- web page.

EP stands for Entry Page, **AP(k)*i*** stands for Application Page *i* of the Session *k* and **FP** stands for Final Page

Web Application State Management

Session control problem



WAS(i): stands for Web Application State at the stage i ;
SR(j): stands for State Representation j .

A web application session is a sequence of related user requests and web server responses, which are treated as a single interaction.



WEB APPLICATION: SESSION CONTROL

■ Client-side mechanisms (client's web page or client's local storage)

- Cookies
- Hidden fields (visible with view source)
- ViewState/Control State ("invisible" with view source – compressed and encoded)
- Query Strings

■ Server-side mechanisms

- Application Object (multiple session vars, Lock, Unlock)
- Session Object
- File/Database

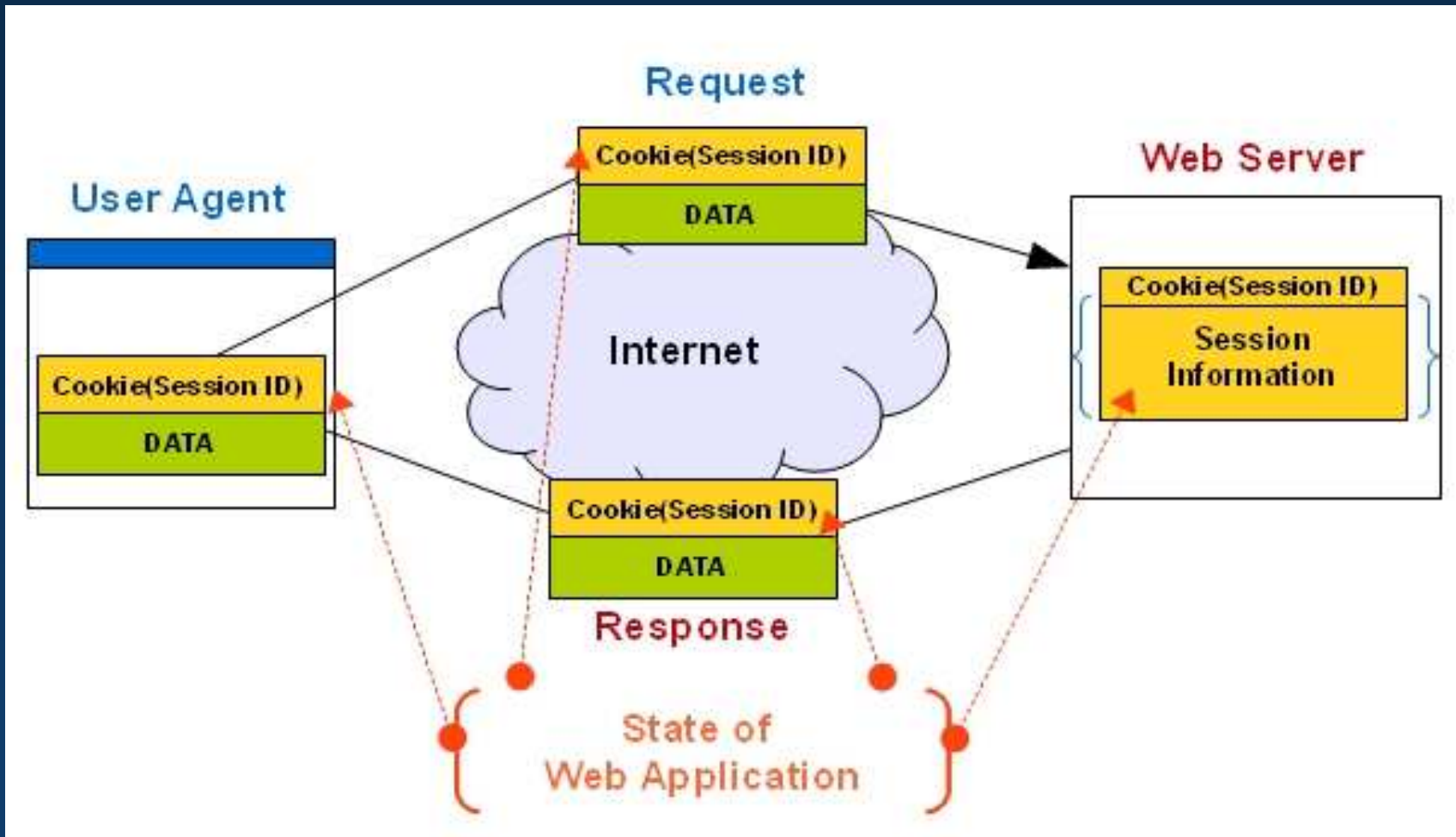


Web Application State Management

- **Session Control;**
- **State Mngt Patterns;**
- **Web Application Approaches;**

WEB APPLICATION STATE MNGT PATTERNS

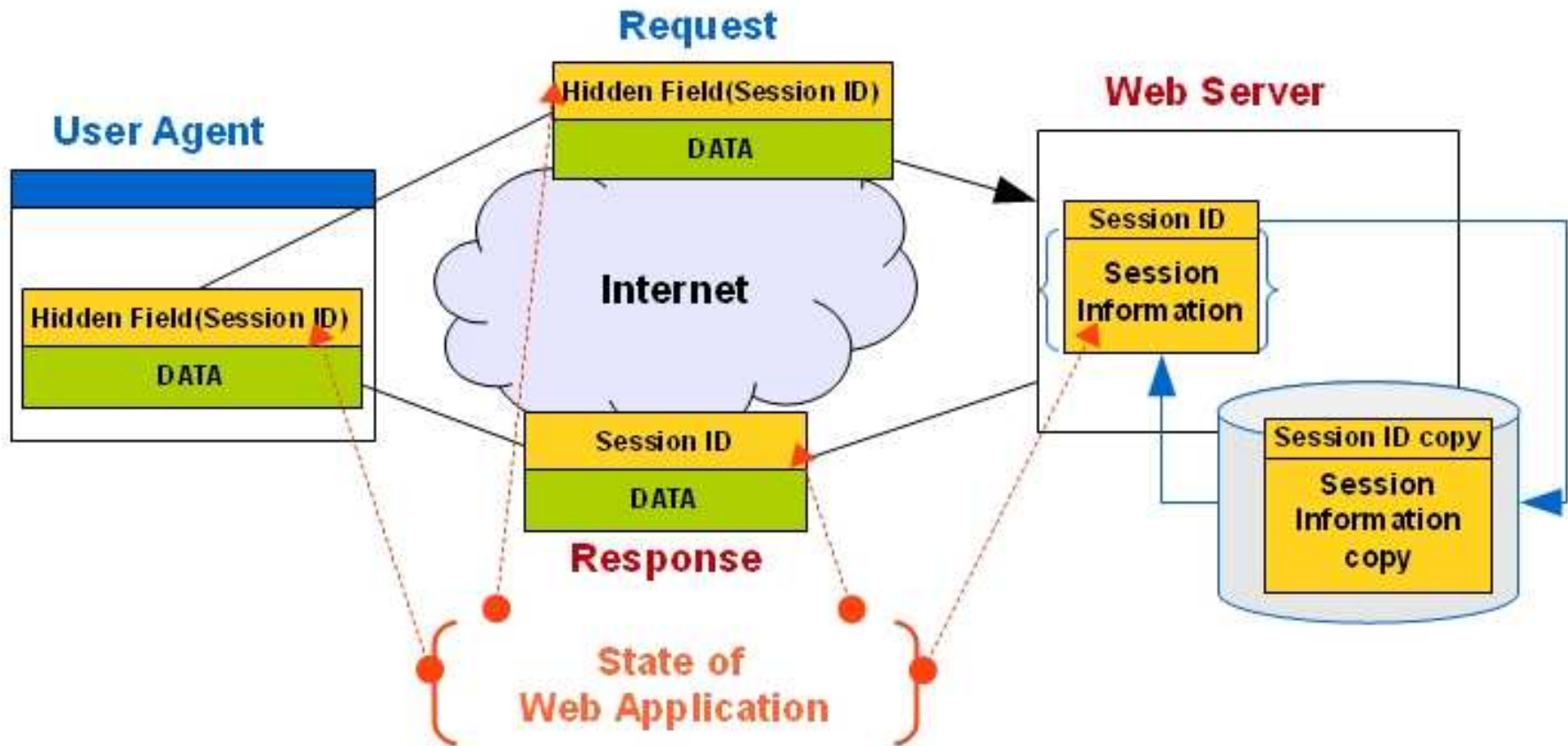
Split context





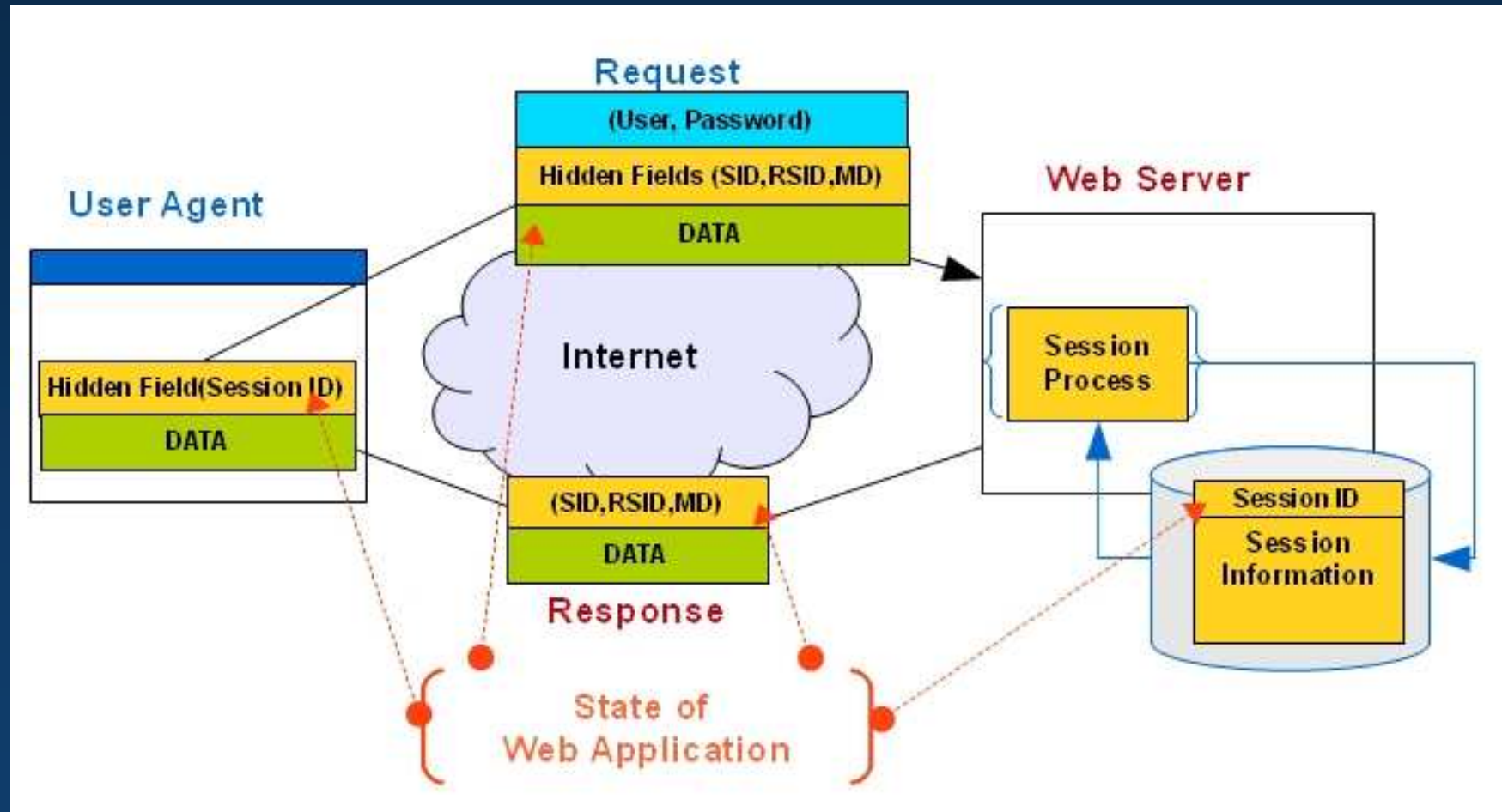
WEB APPLICATION STATE MNGT PATTERNS

Robust split context



WEB APPLICATION STATE MNGT PATTERNS

Secure Robust split context



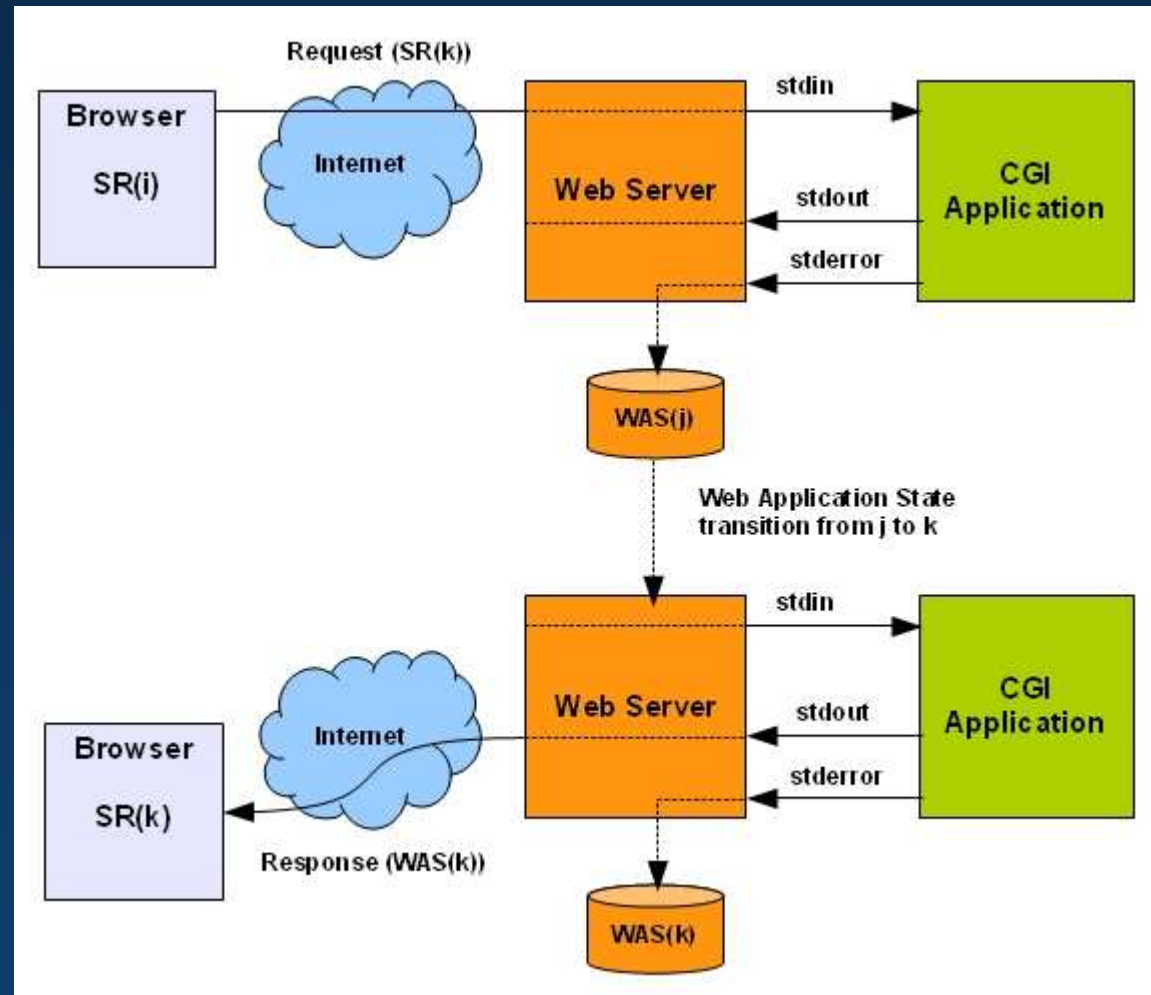


Web Application State Management

- **Session Control;**
- **State Mngt Patterns;**
- **Web Application Approaches;**

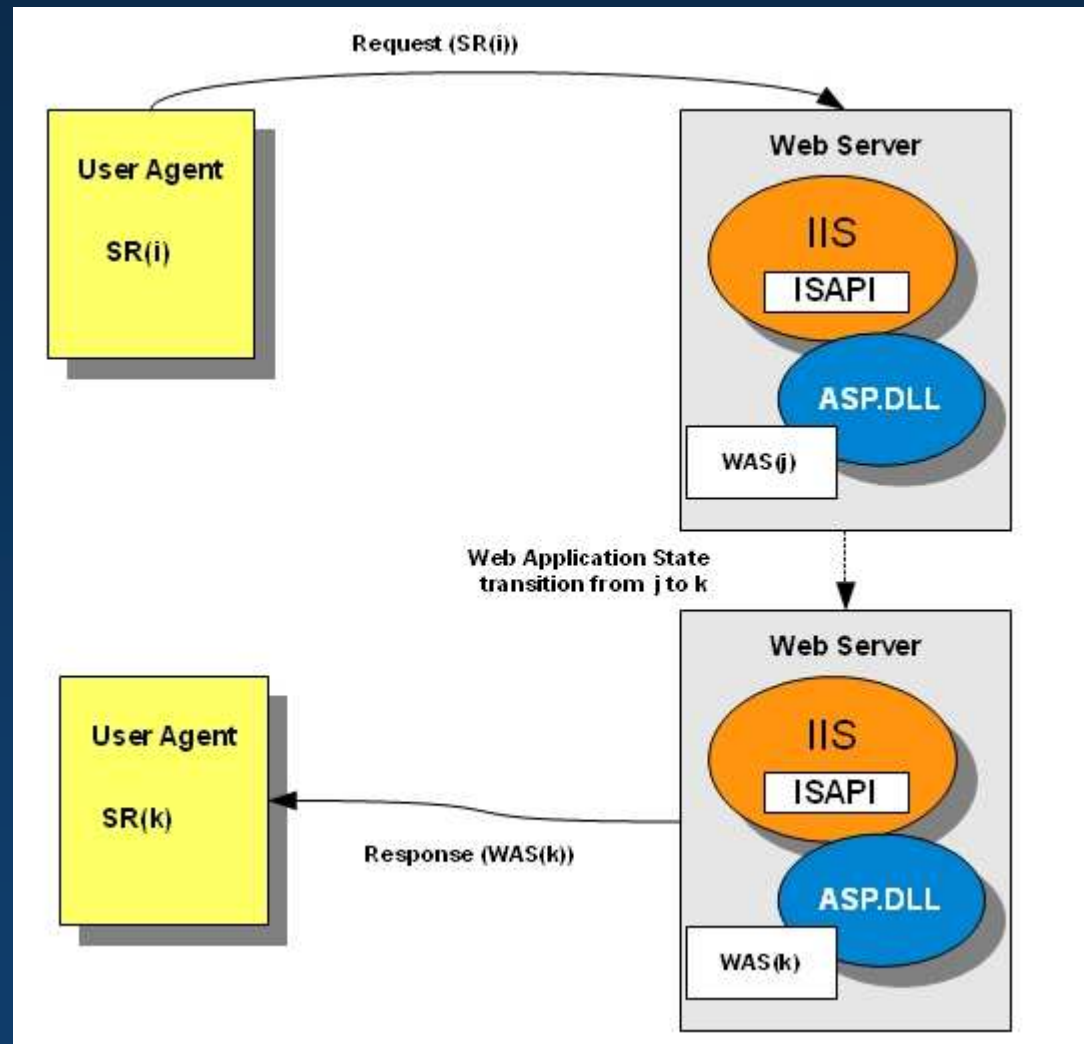


CGI Web Application



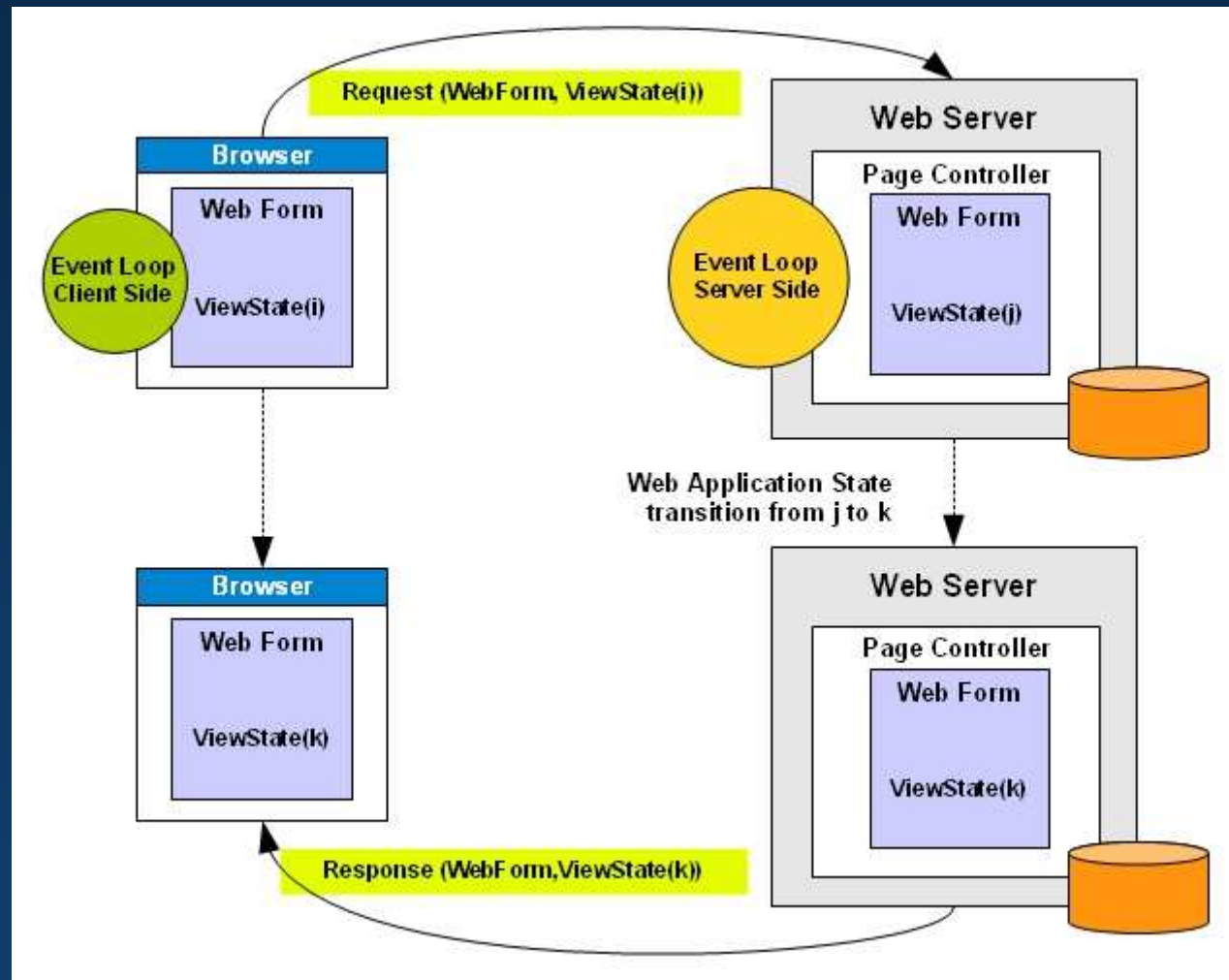


ASP/PHP/JSP Web Application



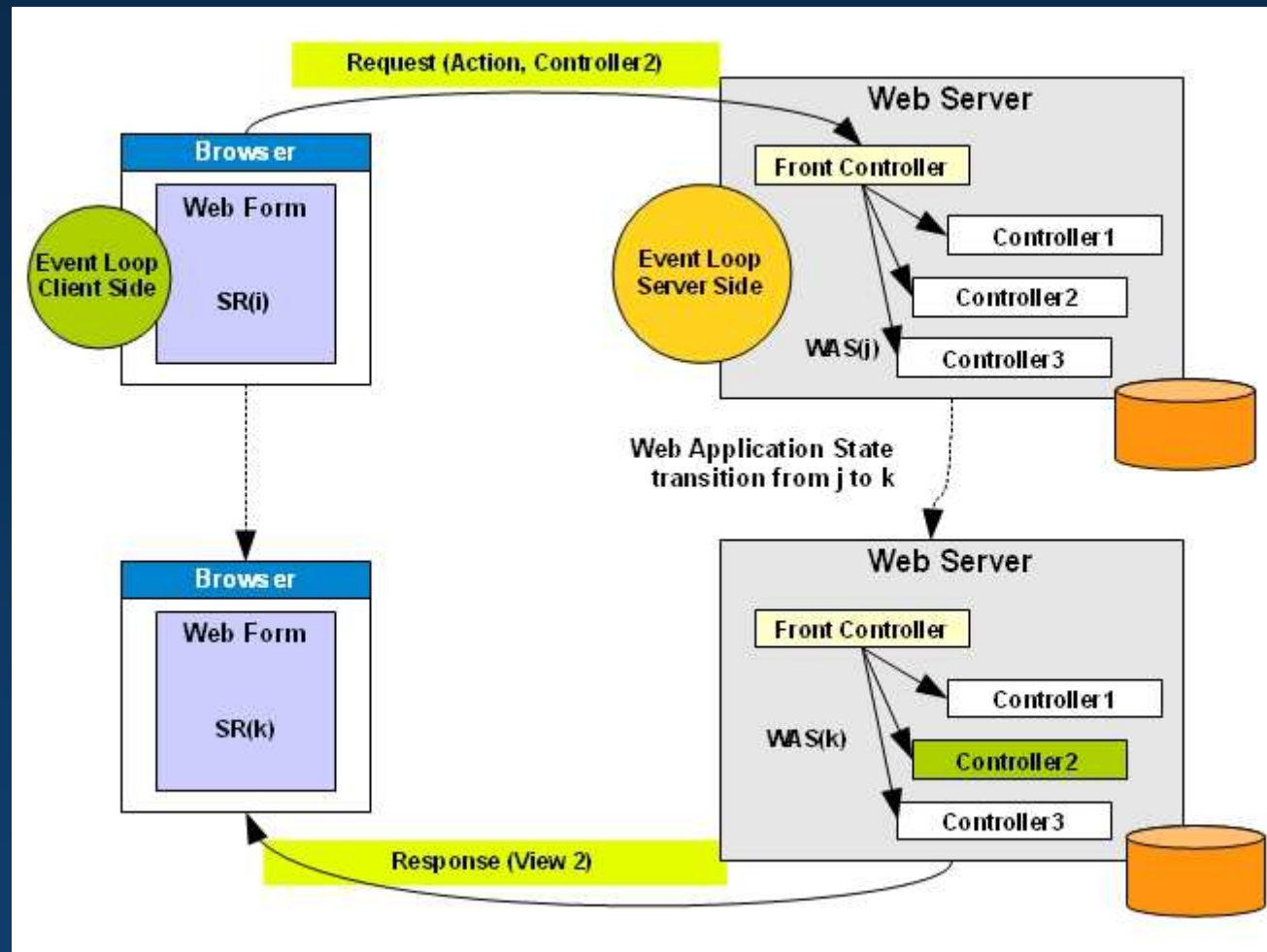


ASP.NET Web Form Web Application



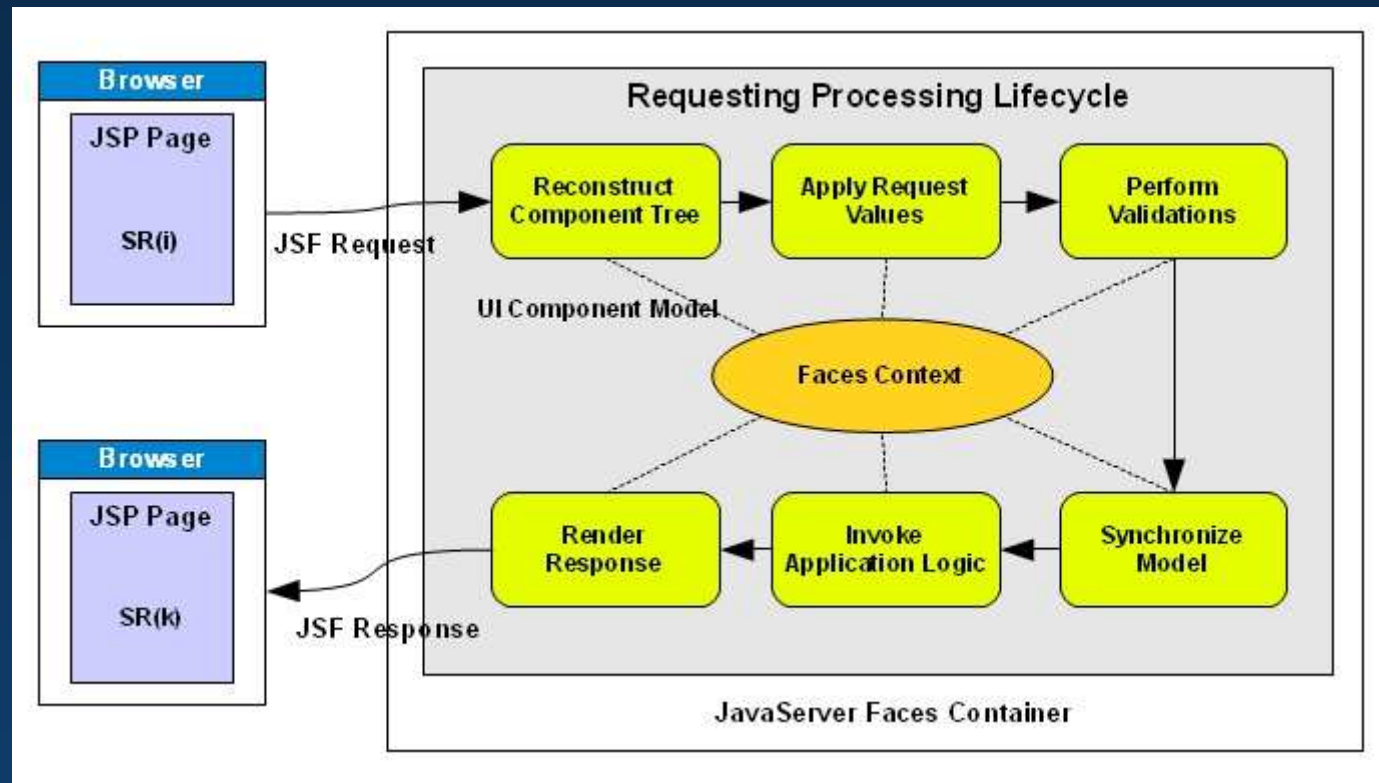


ASP.NET MVC Web Application

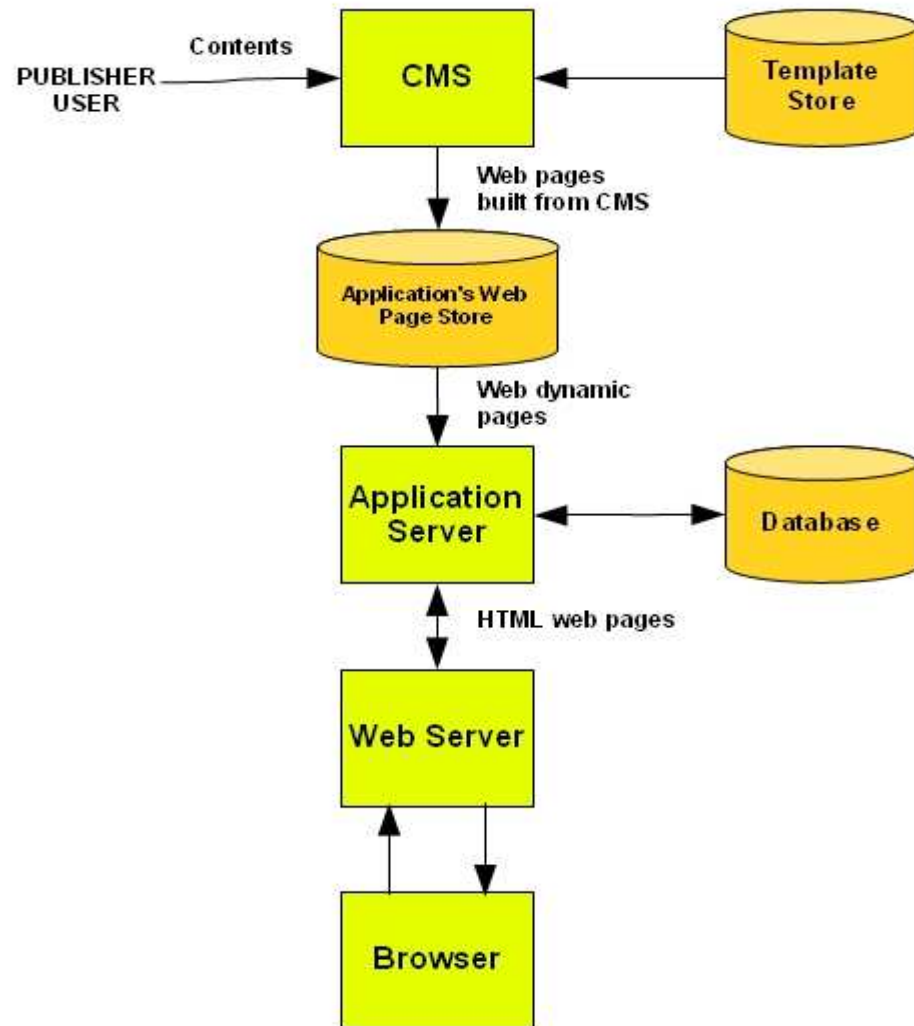




JSF Web Application



CMS based Web Application



CMS-based Web applications as a Web application for the management and control of content

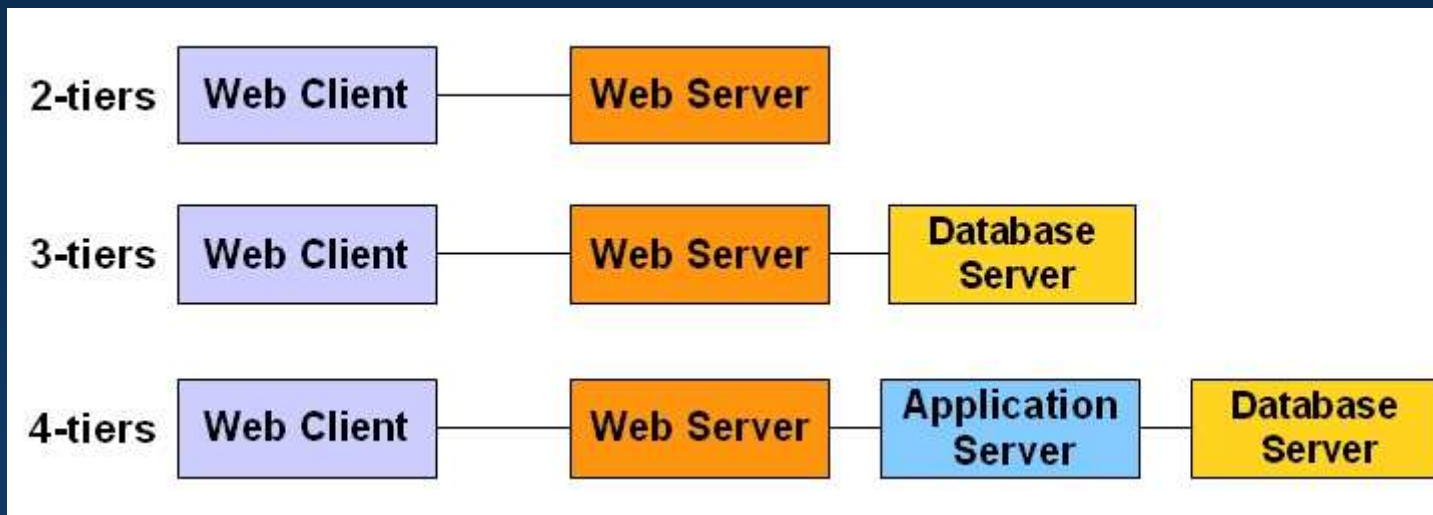
a set of *built-in* functionalities such as:

- set of templates;
- database connection;
- API for session control, authentication, authorization etc.
- integrated shopping cart management;
- integrated search engine



Web Application Conceptual Architecture

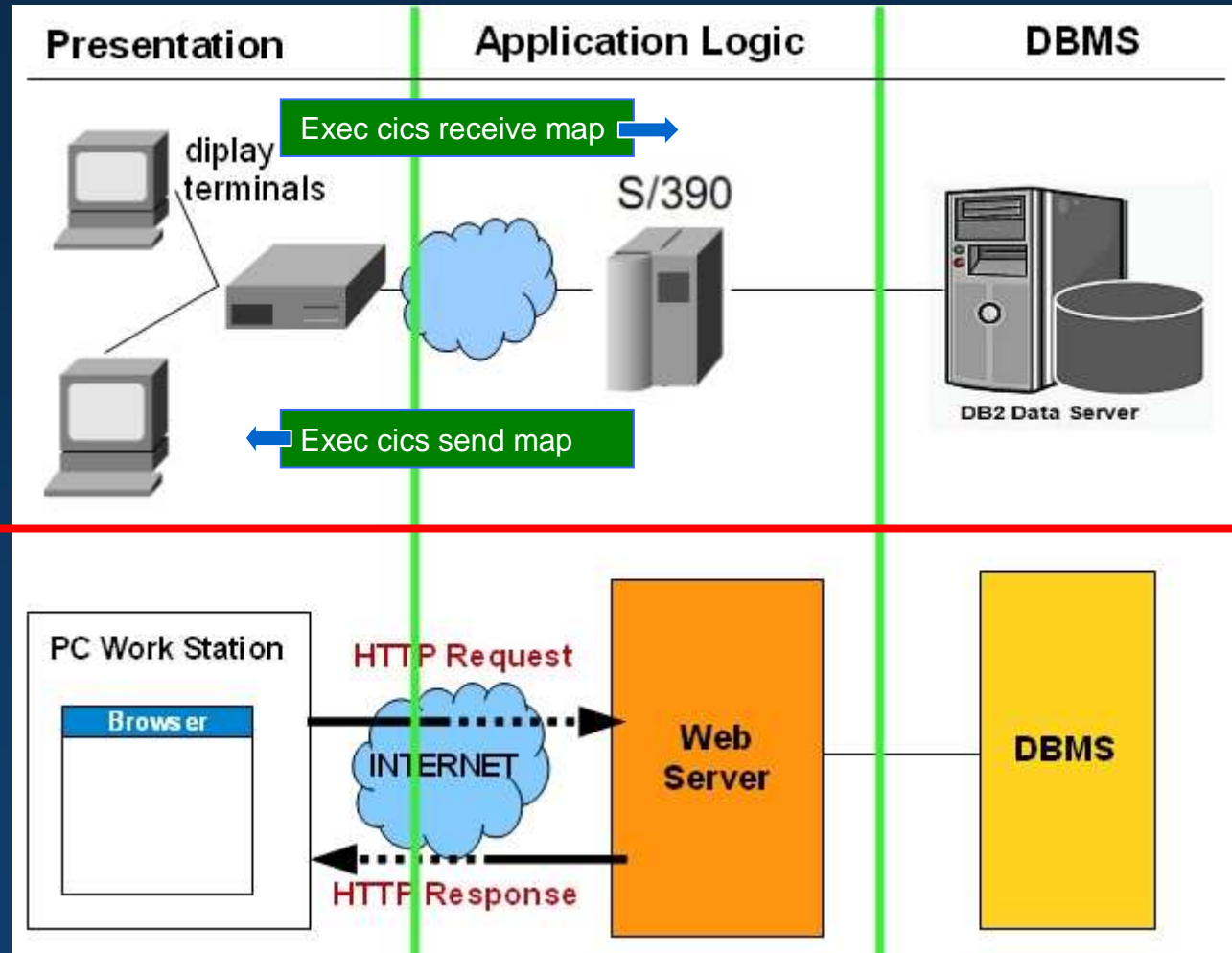
The following architectural patterns describe the various type of Web Applications.





Web Application Conceptual Architecture

the technology changes but the architecture doesn't change

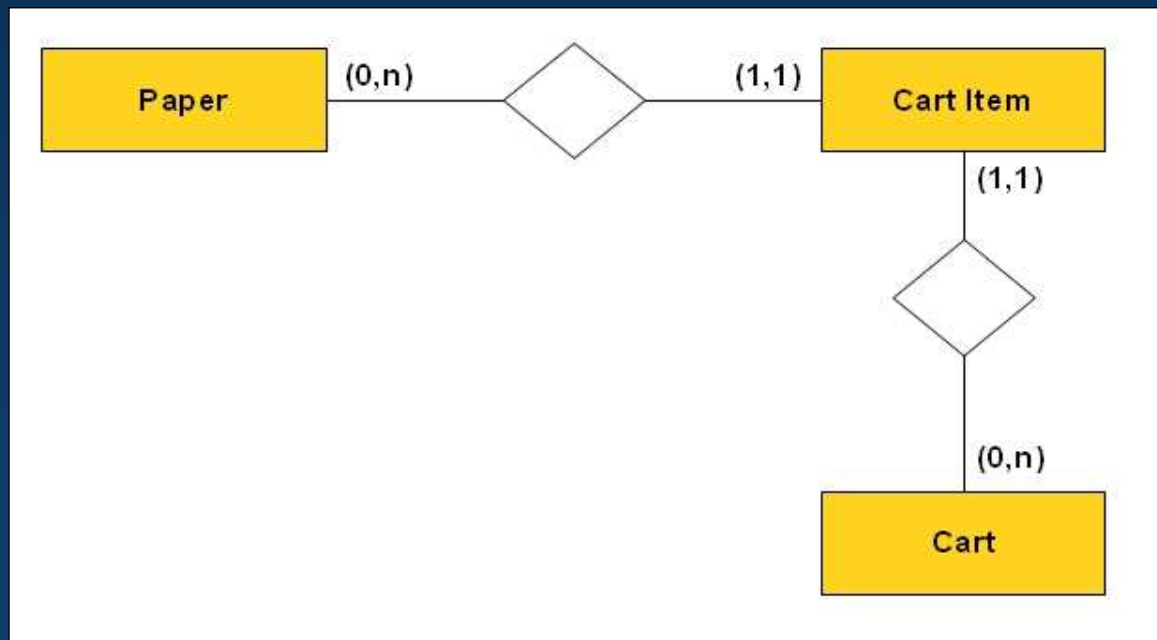




Shopping Cart Web Application

Paper Shopping Store

- <http://www.coronarie.it/shoc/Store.asp>.
- <http://www.volucer.it/ShoCRP/RPStore.php>





Shopping Cart Web Application


<http://www.coronarie.it/shoc/Store.asp>

SOFTWARE | Cogitationis vis

Paper Shopping Cart

Store Cart New Cart



The Current Session ID is : 503251584




Title: THE WEB BROWSER VIEWPORT

Abstract: The browser viewport is a window or other viewing area in the browser through which users consult a document.

Price: 4 Euro





Title: JavaFX: PROCEDURAL ABSTRACTION

Abstract: Anyone who has introduced a subroutine to provide a function that can be used in other programs has used procedural abstraction. Procedures allows us to abstract a single action or task.

Price: 5,5 Euro

Add to Cart



Shopping Cart Web Application

<http://www.volucer.it/ShoCRP/RPStore.php>

The screenshot displays a shopping cart interface with two items listed. Each item has a thumbnail image, a title, an abstract, and a price. The first item is 'JavaFX: PROCEDURAL ABSTRACTION' with a price of 4.10 €. The second item is 'REST (Representational State Transfer) Web Services' with a price of 3.00 €. Below the items is a summary table with the following data:

Session ID	52
Cart Name	Cart of 28/06/2010
User	Authenticated
Start Time	2010-06-28 20:24:32
Order Total	4.00

A blue arrow points to the Session ID field, which is highlighted with a red border. To the right of the summary table is a shopping cart icon with a plus sign.



Web application development landscape: technologies and models

**GRAZIE !!!
PER L'ATTENZIONE**