What is a Web service?

- *Many people and companies have debated the exact definition of Web services.*
- *At a minimum, however, a Web service is any piece of software that makes itself available over the Internet and uses a standardized XML messaging system*

Due requisiti aggiuntivi

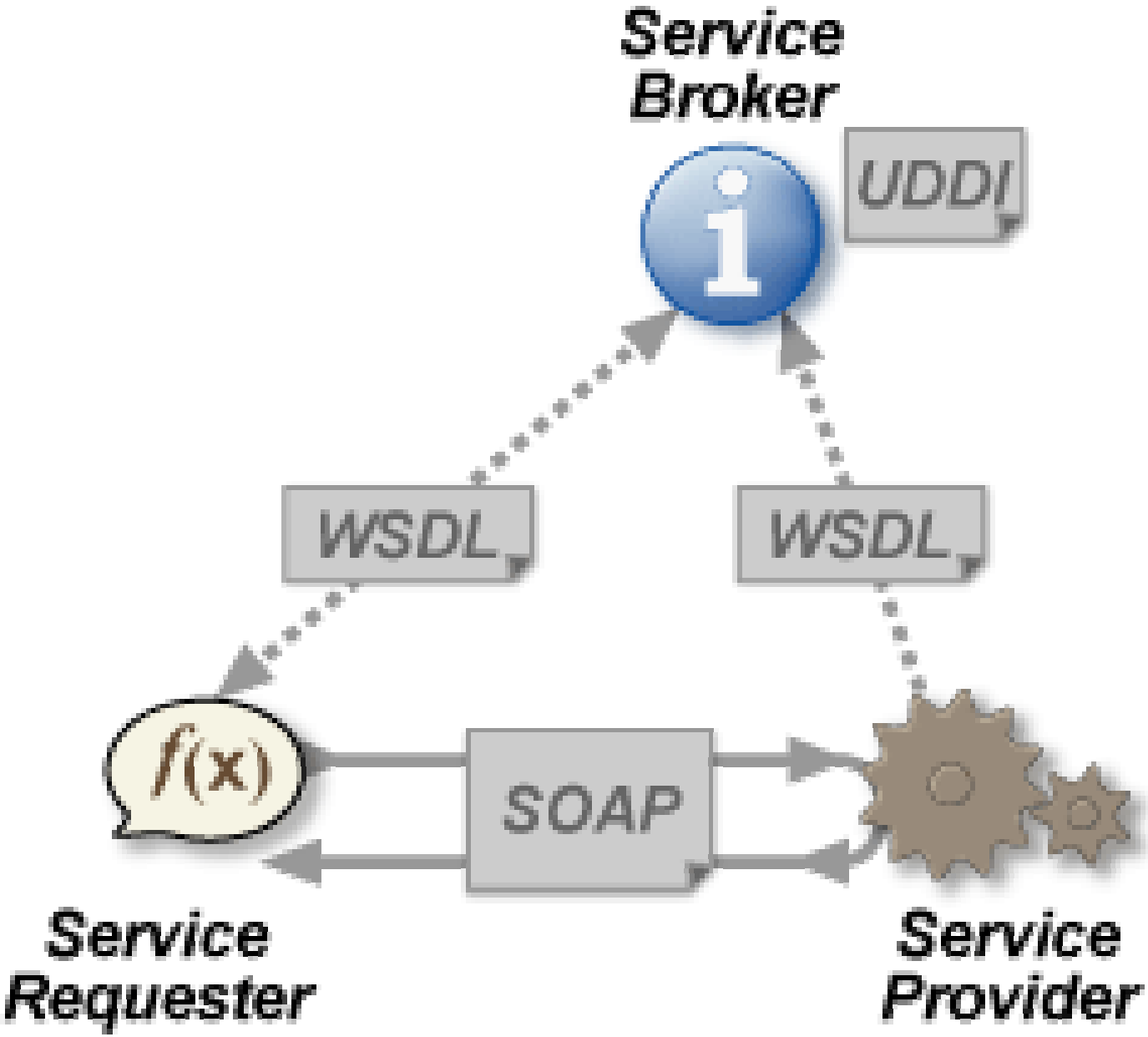
- *First, a Web service can have a public interface, defined in a common XML grammar. The interface describes all the methods available to clients and specifies the signature for each method. Currently, interface definition is accomplished via the Web Service Description Language (WSDL).*
- *Second, if you create a Web service, there should be some relatively simple mechanism for you to publish this fact. Likewise, there should be some simple mechanism for interested parties to locate the service and locate its public interface. The most prominent directory of Web services is currently available via UDDI, or Universal Description, Discovery, and Integration.*

La scoperta dell’acqua calda ?

- *People have been using Remote Procedure Calls (RPC) for some time now, and they long ago discovered how to send such calls over HTTP.*
- *So, what is really new about Web services? The answer is XML.*
- *XML lies at the core of Web services, and provides a common language for describing Remote Procedure Calls, Web services, and Web service directories.*

4 componenti essenziali

- **The Web service protocol stack mainly consists of four areas:**
- Service Transport: It is responsible for transporting messages between network applications and includes protocols such as HTTP, SMTP, FTP, as well as the more recent Blocks Extensible Exchange Protocol (BEEP).
- XML Messaging: It is responsible for encoding messages in a common XML format so that messages can be understood at either end of the network connection. Currently, this area includes such protocols as XML-RPC, SOAP and REST.
- Service Description: It is used for describing the public interface to a specific web service. The WSDL interface format is typically used for this purpose.
- Service Discovery: It centralizes services into a common registry such that network web services can publish their location and description, and makes it easy to discover what services are available on the network. At present, the UDDI API is normally used for service discovery.


Service
Broker
UDDI
WSDL
WSDL
f(x)
SOAP
Service
Requester
Service
Provider

Vantaggi dei web services

- Web services provide interoperability between various software applications running on disparate platforms.
- Web services use open standards and protocols. Protocols and data formats are text-based where possible, making it easy for developers to comprehend.
- By utilizing HTTP, web services can work through many common firewall security measures without requiring changes to the firewall filtering rules. Other forms of RPC may more often be blocked.
- Web services allow software and services from different companies and locations to be combined easily to provide an integrated service.
- Web services allow the reuse of services and components within an infrastructure.
- Loosely coupled thereby facilitating a distributed approach to application integration.

Svantaggi dei web services

- Web services standards features such as transactions are currently nonexistent or still in their infancy compared to more mature distributed computing open standards such as CORBA. This is likely to be a temporary disadvantage as most vendors have committed to the OASIS standards to implement the Quality of Service aspects of their products.
- Web services may suffer from poor performance compared to other distributed computing approaches such as RMI, CORBA, or DCOM. This is a common trade-off when choosing text-based formats. XML explicitly does not count among its design goals either conciseness of encoding or efficiency of parsing. This could change with the XML Infoset standard, which describes XML-based languages in terms of abstractions (elements, attributes, logical nesting). The traditional angle-bracket representation is now seen as an ASCII (or Unicode) serialisation of XML, not XML itself. In this model, binary serialisation is an equally valid alternative. Binary representations such as SOAP MTOM promise to improve the wire efficiency of XML messaging.

XML-RPC

- *XML-RPC is a protocol that uses XML messages to perform Remote Procedure Calls. Requests are encoded in XML and sent via HTTP POST; XML responses are embedded in the body of the HTTP response.*
- *To get a quick sense of XML-RPC, here is a sample XML-RPC request to a weather service (with the HTTP Headers omitted):*

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<methodCall>
        <methodName>weather.getWeather</methodName>
        <params> <param><value>10016</value></param> </params>
</methodCall>
```

- *The request consists of a simple* `<methodCall>` *element, which specifies the method name (*`getWeather`*) and any method parameters (*`zip code`*).*

XML-RPC

- *Here is a sample XML-RPC response from the weather service:*

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<methodResponse>
<params>
        <param> <value><int>65</int></value> </param>
</params>
</methodResponse>
```

- *The response consists of a single* `<methodReponse>` *element, which specifies the return value (the current temperature). In this case, the return value is specified as an integer.*

SOAP

- The name "SOAP" was originally an acronym for Simple Object Access Protocol, but the full name was dropped in Version 1.2 of the SOAP specification, because the focus of SOAP shifted from object access to object inter-operability. Originally designed by Dave Winer, Don Box, Bob Atkinson, and Mohsen Al-Ghosein in 1998 with backing from Microsoft (where Atkinson and Al-Ghosein worked at the time), the SOAP specification is currently maintained by the XML Protocol Working Group of the World Wide Web Consortium.
- There are several different types of messaging patterns in SOAP, but by far the most common is the Remote Procedure Call (RPC) pattern, where one network node (the client) sends a request message to another node (the server), and the server immediately sends a response message to the client.
- Although SOAP can be used in a variety of messaging systems and can be delivered via a variety of transport protocols, the main focus of SOAP is Remote Procedure Calls (RPC) transported via HTTP.

SOAP

- A SOAP message is contained in an envelope. Within this envelope are two additional sections: the header and the body of the message. SOAP messages use XML namespaces.
- The header contains relevant information about the message. For example, a header can contain the date the message is sent, or authentication information. It is not required, but, if present, must always be included at the top of the envelope.
- The somewhat lengthy syntax of XML can be both a benefit and a drawback. Its format is easy for humans to read, but can be complex and can have slow processing times. Because of the lengthy XML format, SOAP is considerably slower than competing middleware technologies such as CORBA. Typically, SOAP is about 10 times slower than binary network protocols such as RMI or IIOP.

SOAP: richiesta

```
<?xml version='1.0' encoding='UTF-8'?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://www.w3.org/2001/09/soap-envelope"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <SOAP-ENV:Body>
    <ns1:getWeather
      xmlns:ns1="urn:examples:weatherservice"
      SOAP-ENV:encodingStyle=" http://www.w3.org/2001/09/soap-
    encoding
      <zipcode xsi:type="xsd:string">10016</zipcode>
    </ns1:getWeather>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

SOAP: risposta

```
<?xml version='1.0' encoding='UTF-8'?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://www.w3.org/2001/09/soap-envelope"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <SOAP-ENV:Body>
    <ns1:getWeatherResponse
      xmlns:ns1="urn:examples:weatherservice"
      SOAP-ENV:encodingStyle="http://www.w3.org/2001/09/soap-
    encoding">
      <return xsi:type="xsd:int">65</return>
    </ns1:getWeatherResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

WSDL

- In a nutshell, WSDL is an XML grammar for specifying a public interface for a Web service. This public interface can include the following:
  - Information on all publicly available functions.
  - Data type information for all XML messages.
  - Binding information about the specific transport protocol to be used.
  - Address information for locating the specified service.

- WSDL is not necessarily tied to a specific XML messaging system, but it does include built-in extensions for describing SOAP services.

UDDI

- The Universal Description, Discovery and Integration (UDDI) protocol is one of the major building blocks required for successful Web services. UDDI creates a standard interoperable platform that enables companies and applications to quickly, easily, and dynamically find and use Web services over the Internet. UDDI also allows operational registries to be maintained for different purposes in different contexts.
- The UDDI project takes advantage of WorldWide Web Consortium (W3C) and Internet Engineering Task Force (IETF) standards such as Extensible Markup Language (XML), and HTTP and Domain Name System (DNS) protocols. Additionally, cross platform programming features are addressed by adopting early versions of the proposed Simple Object Access Protocol (SOAP) known as XML Protocol messaging specifications found at the W3C Web site. The UDDI protocol is the building block that will enable businesses to quickly, easily and dynamically find and transact with one another using their preferred applications.

Companies providing Web Services

These are companies that provide open public web services:

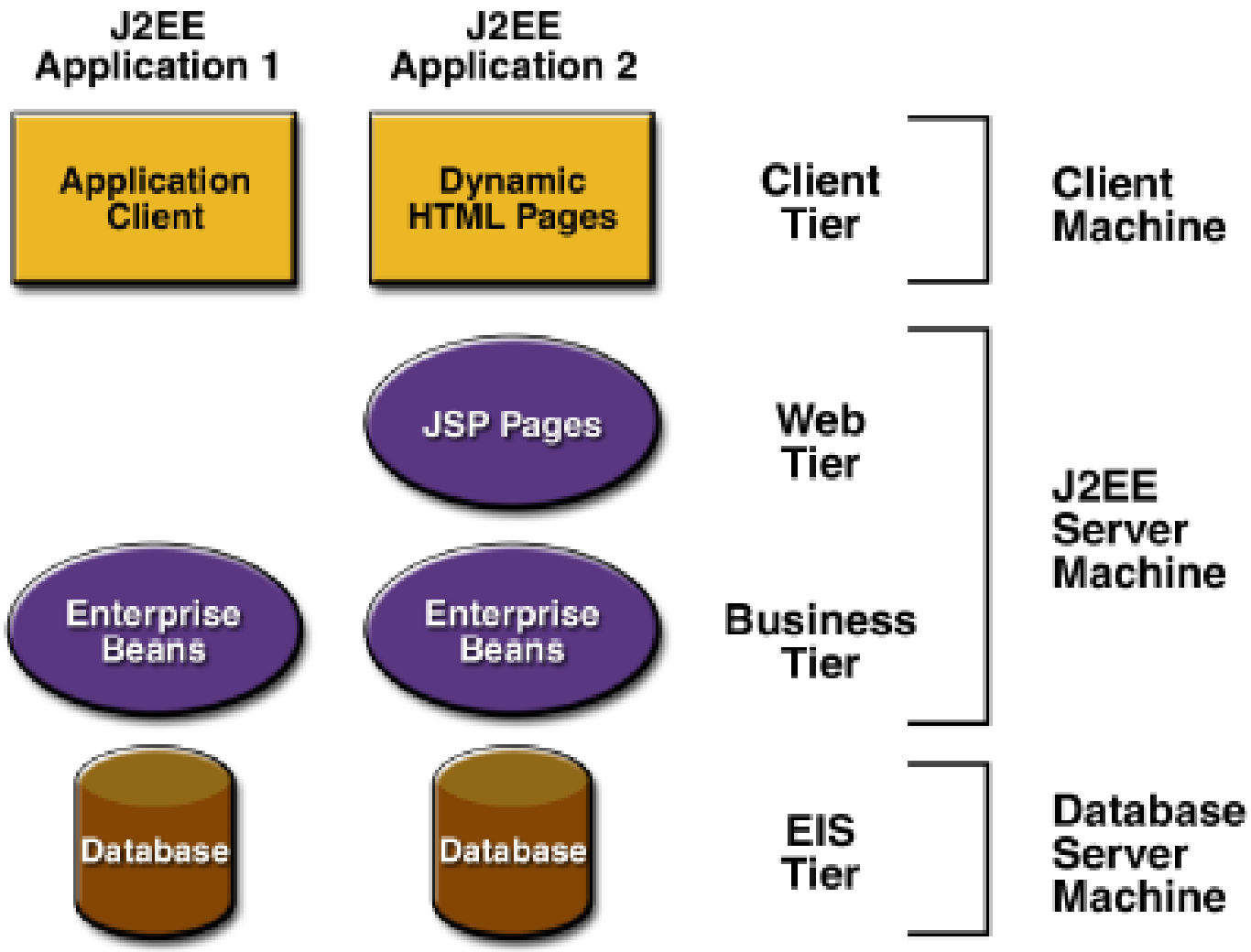
- Amazon.com - Search Products, Product Information, Cart System, Wish List
- Bravenet - Website Hosting and many other services
- eBay - Auction Search, Bidding, Auction Creation
- Google - In Beta - Web Search, Maps
- Yahoo! - Maps, Traffic
- FedEx - Tracking
- PayPal - Payment System
- Mappoint - Maps
- MSN - Virtual Earth

Application server per WS

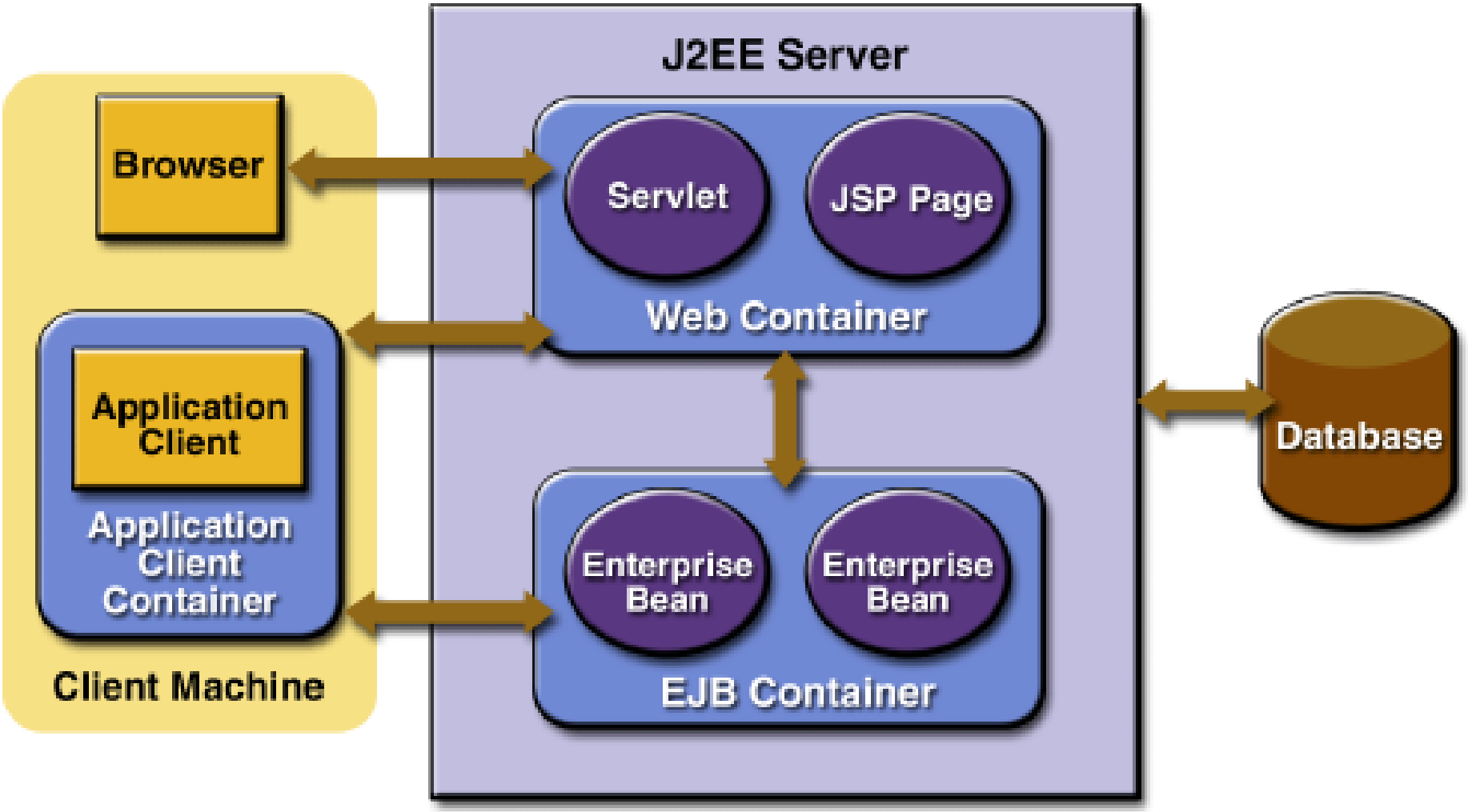
Web services can be deployed by using application server software. A sample of application servers:

- Axis and the Jakarta Tomcat server (both at the Apache project.)
- ColdFusion from Macromedia (Adobe)
- DotGnu from GNU Project
- Java Web Services Development Pack (JWSDP) from Sun Microsystems (based on Jakarta Tomcat)
- JOnAS (part of the ObjectWeb Open Source initiative)
- Microsoft .NET servers from Microsoft
- WebLogic from BEA Systems
- WebSphere Application Server from IBM (based on the Apache server and the Java EE platform)
- Oracle Application Server from Oracle Corporation
- …

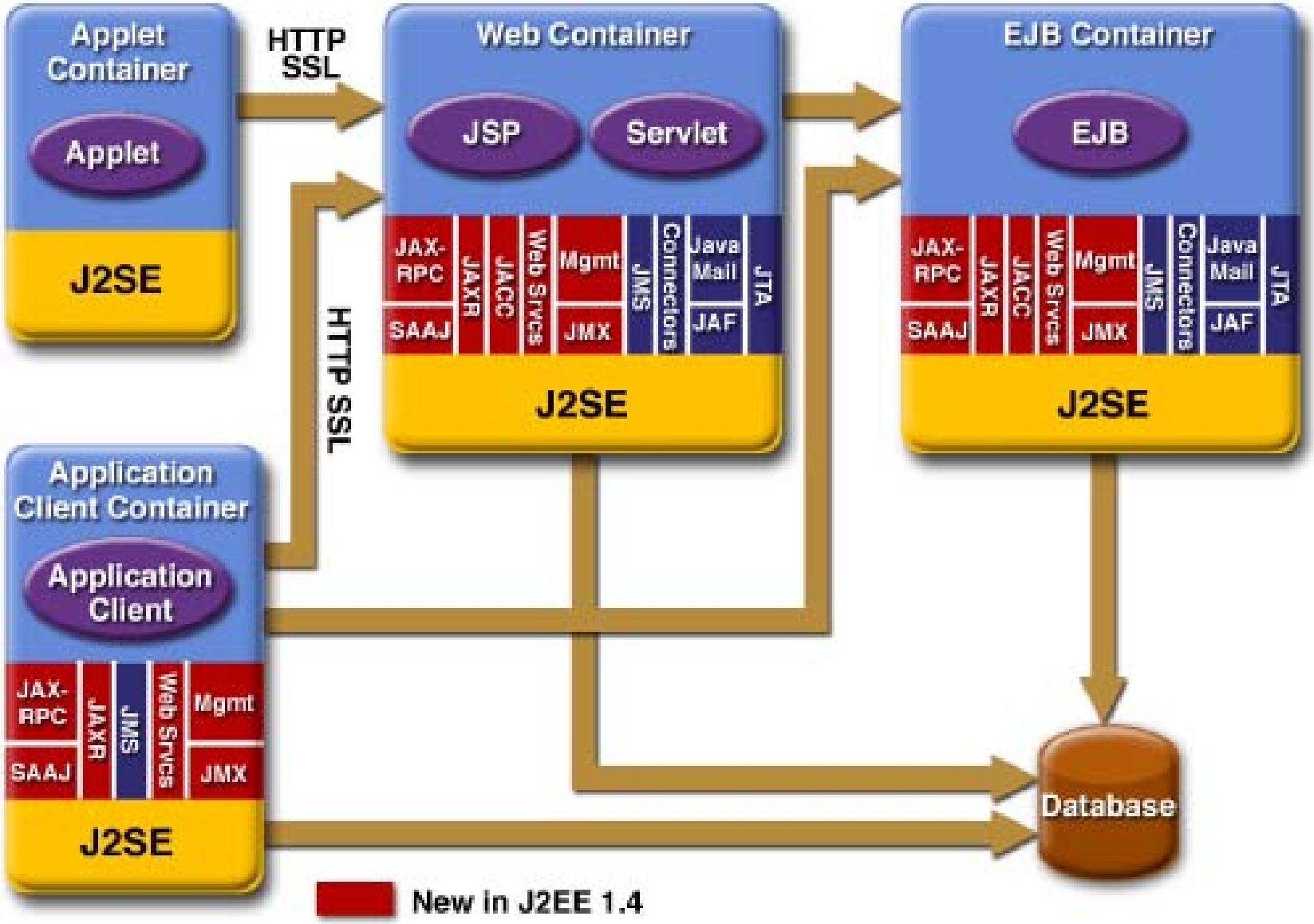
J2EE: schema dei tier



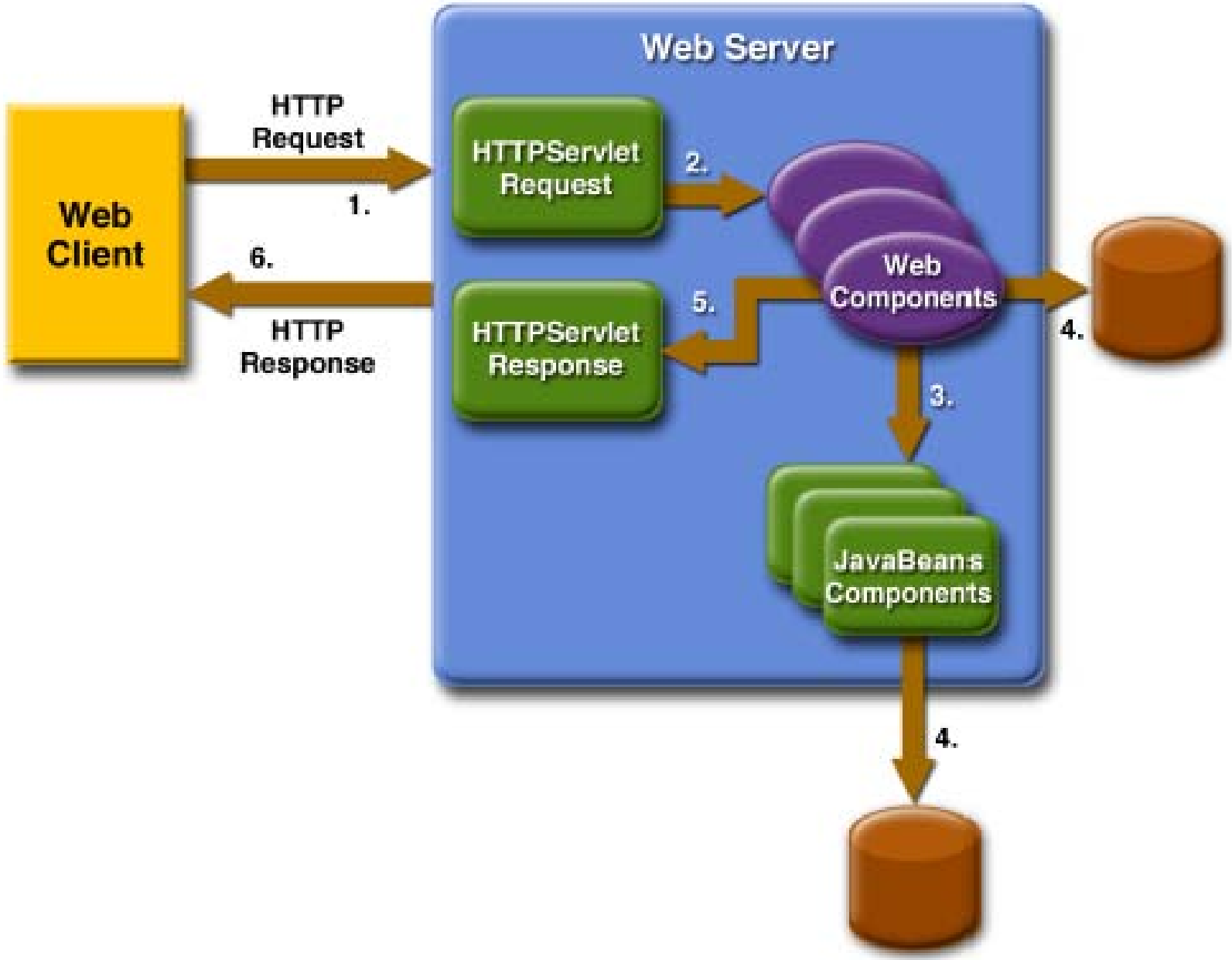
J2EE: i container



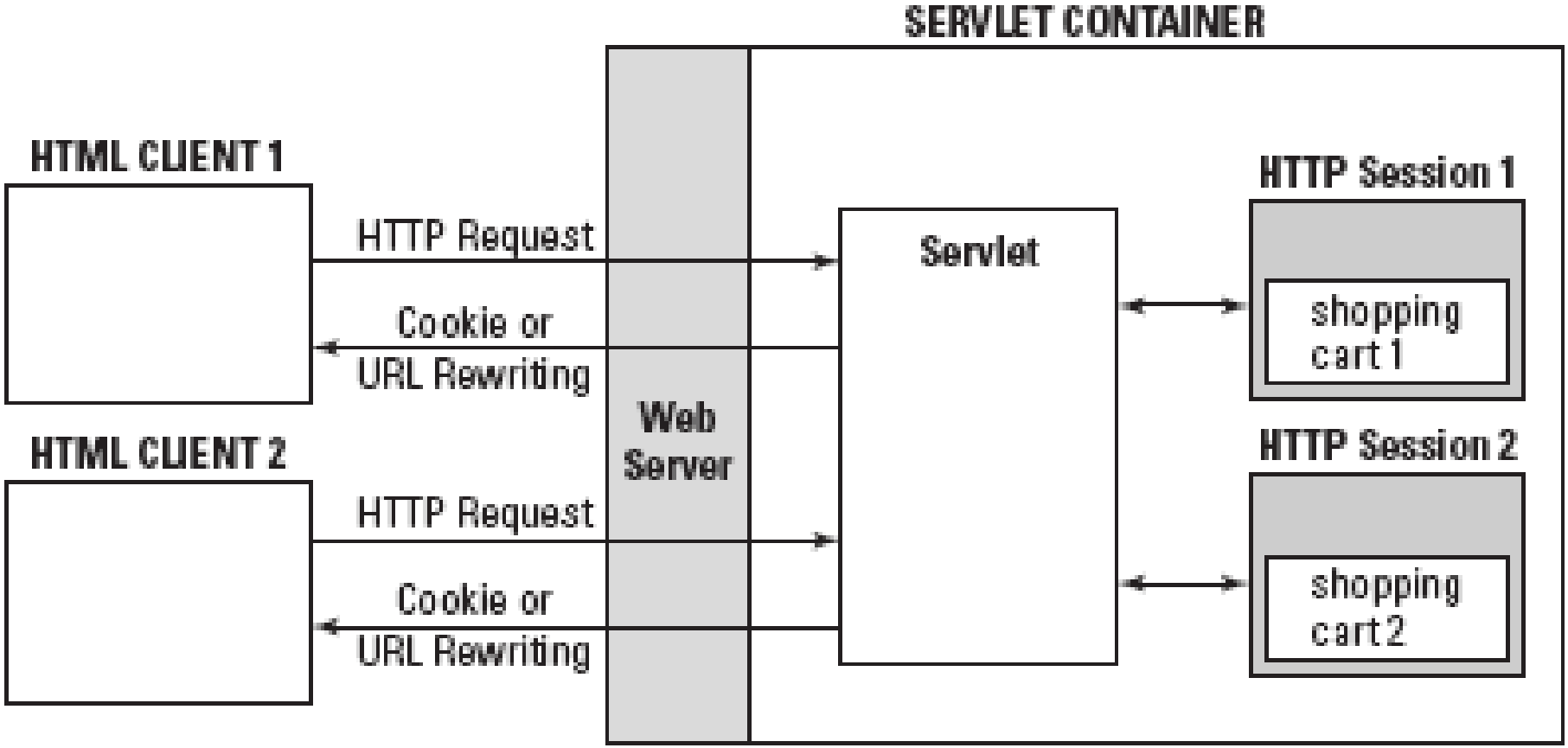
J2EE: quante API !



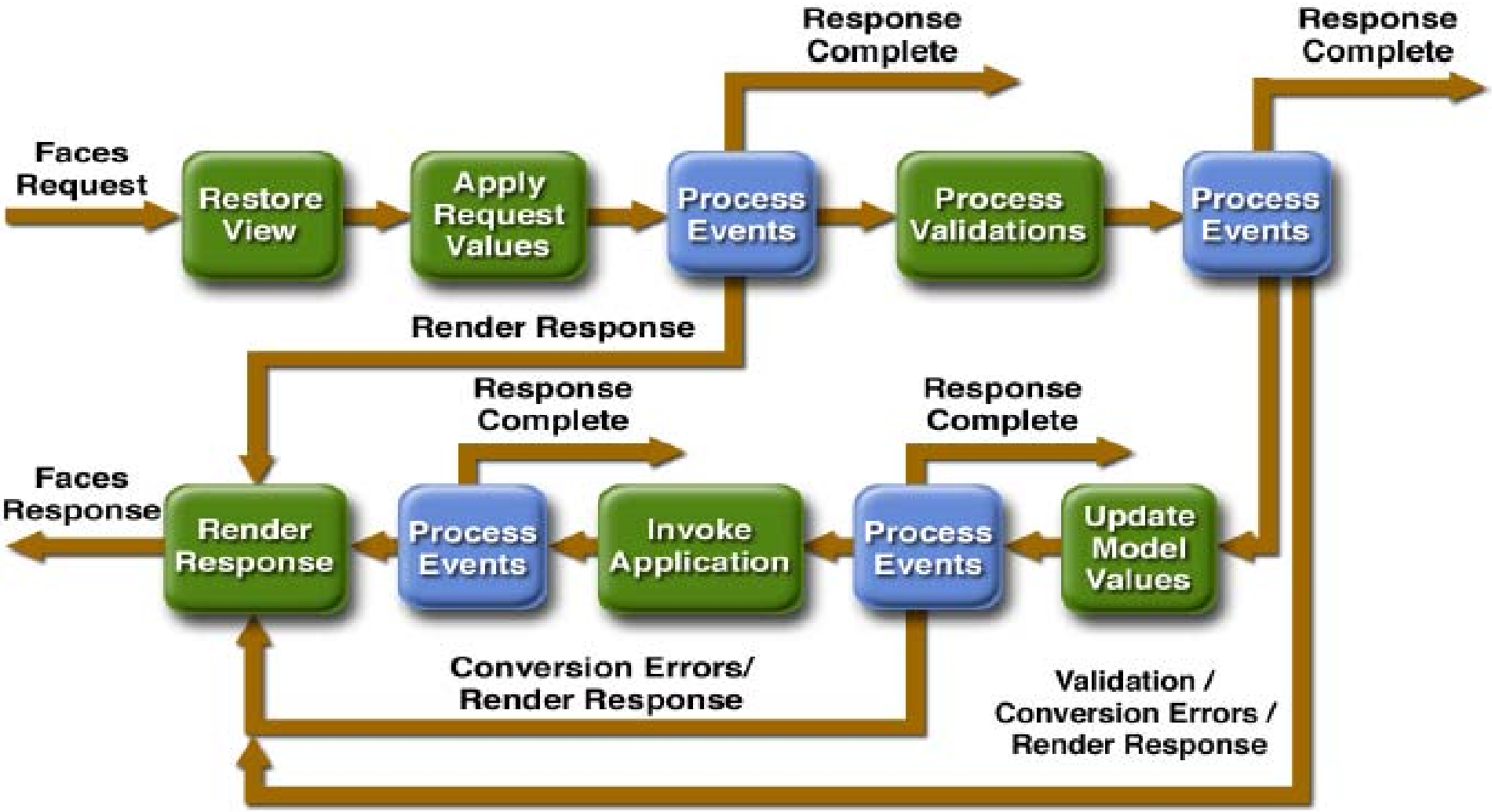
J2EE: il flusso di una richiesta



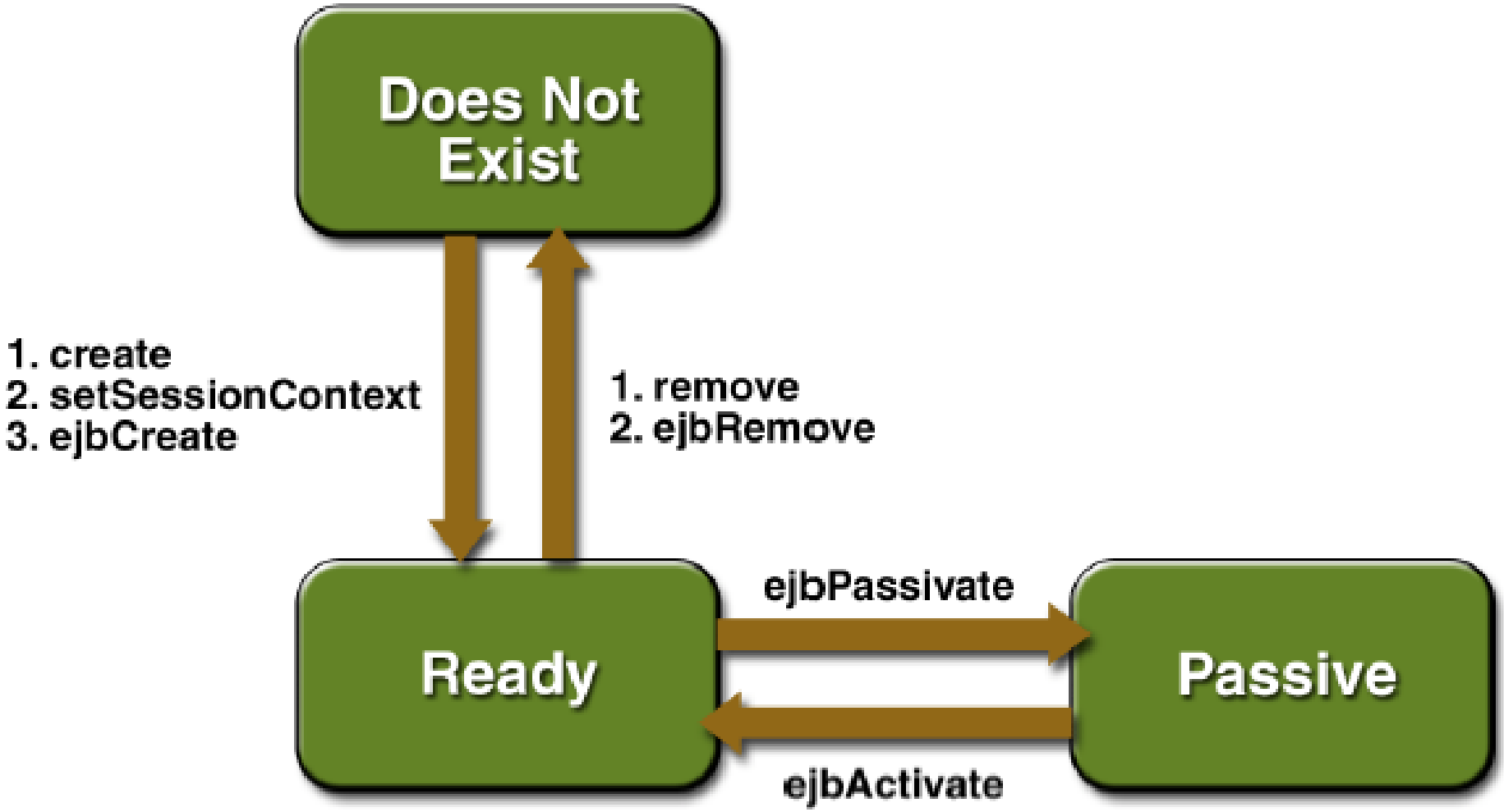
J2EE: session tracking con servlet



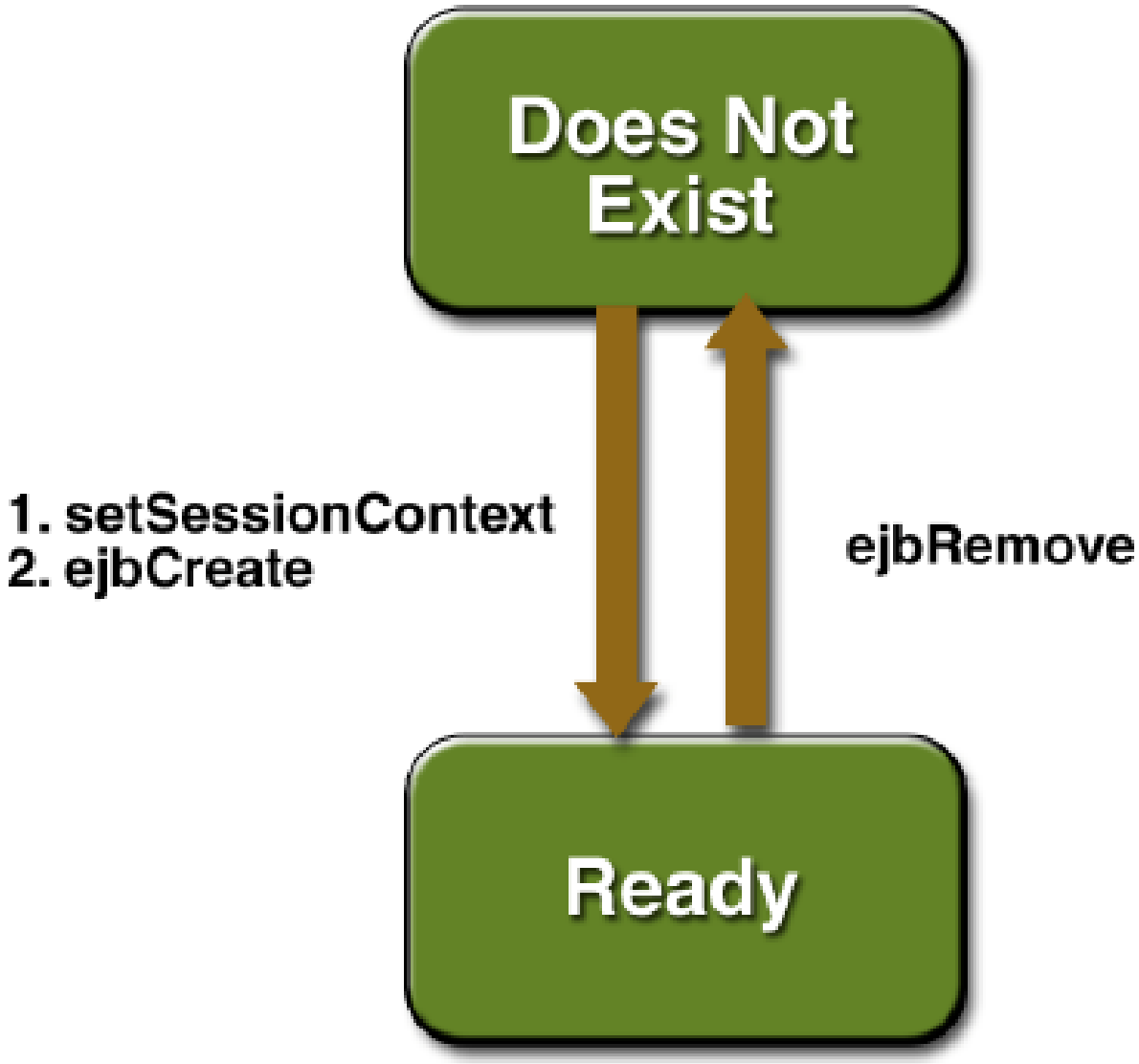
J2EE: Java Server Faces



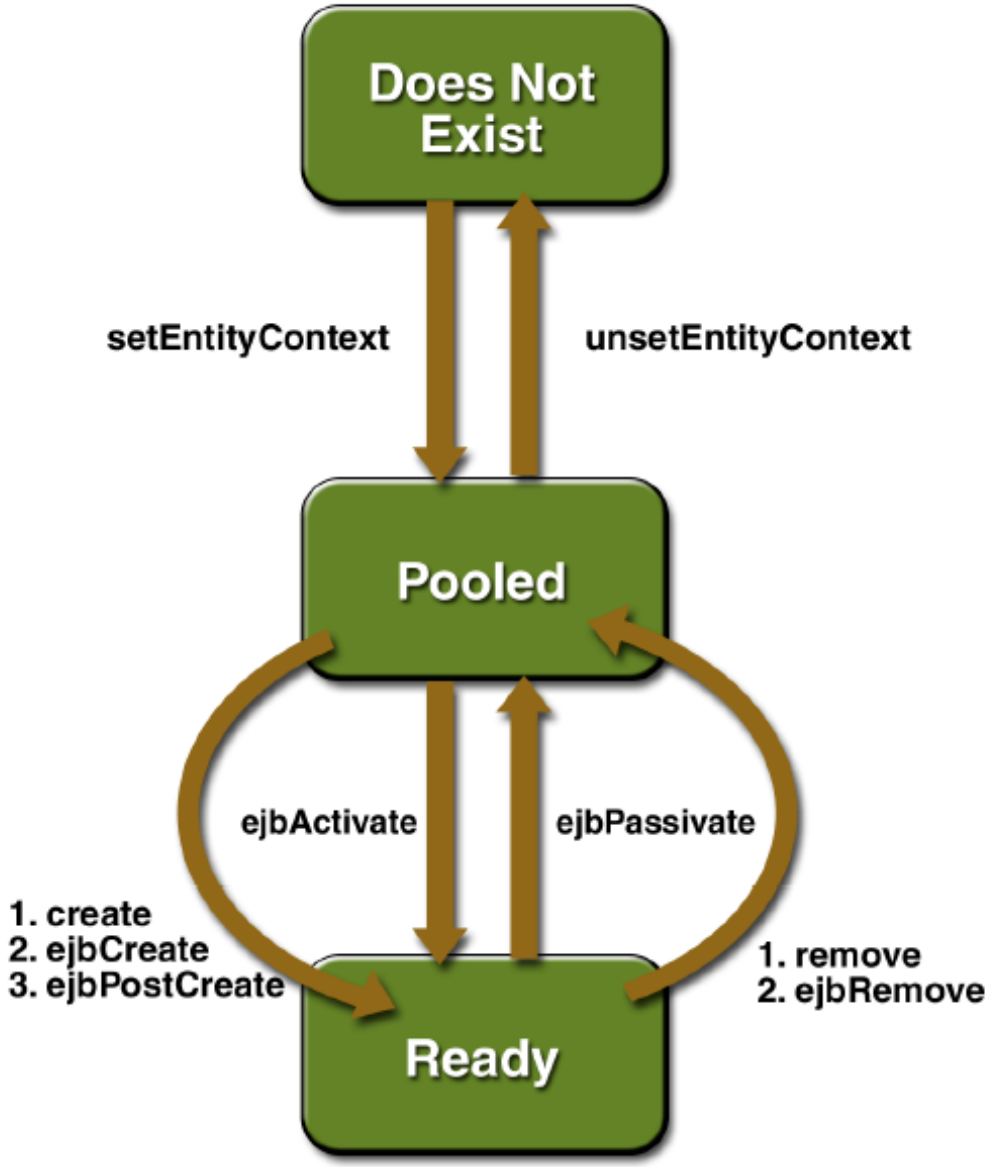
J2EE: stateful session bean life cycle



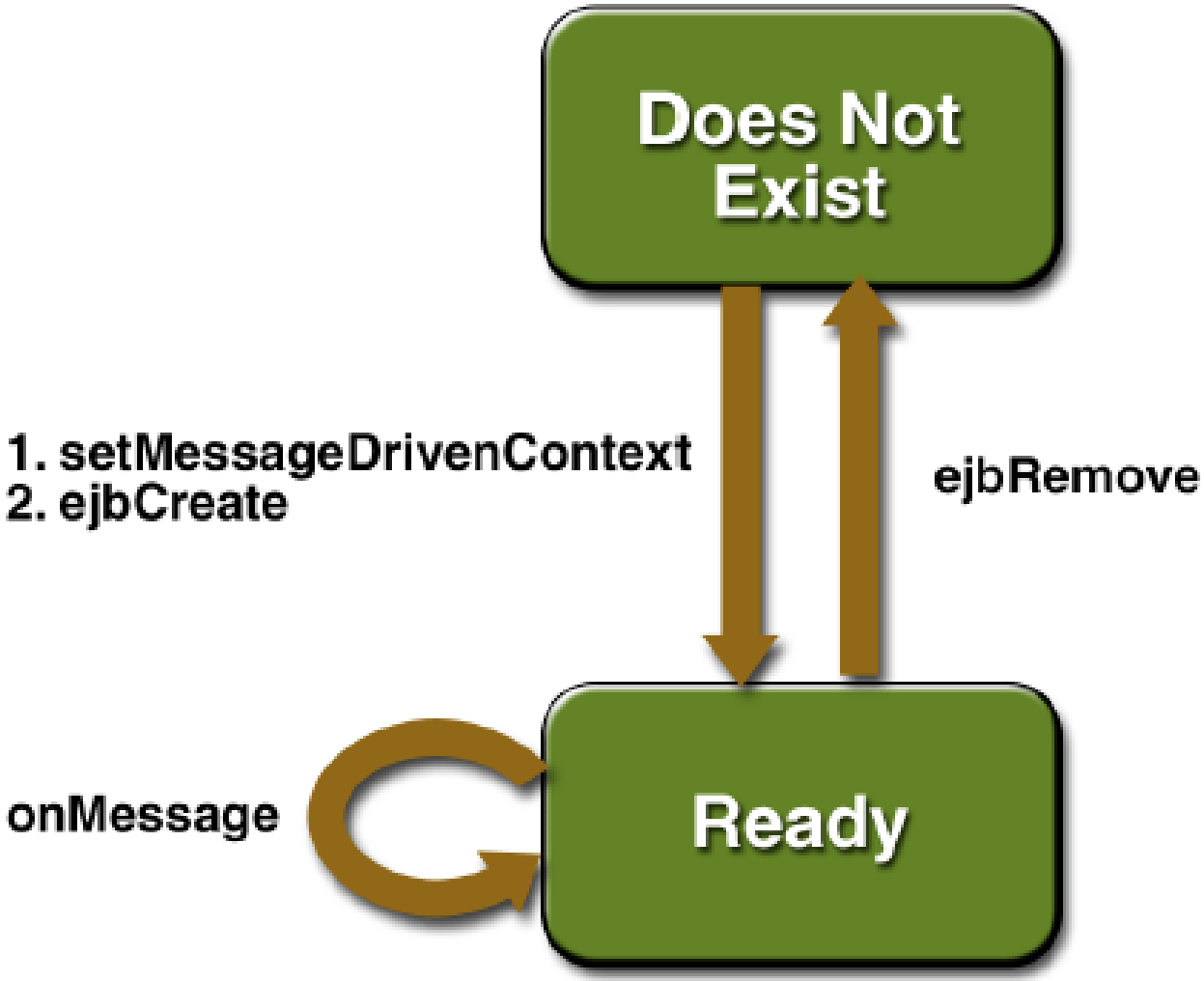
J2EE: stateless session bean life cycle



J2EE: entity bean life cycle



J2EE: message driven bean life cycle



J2EE: struttura di un web module