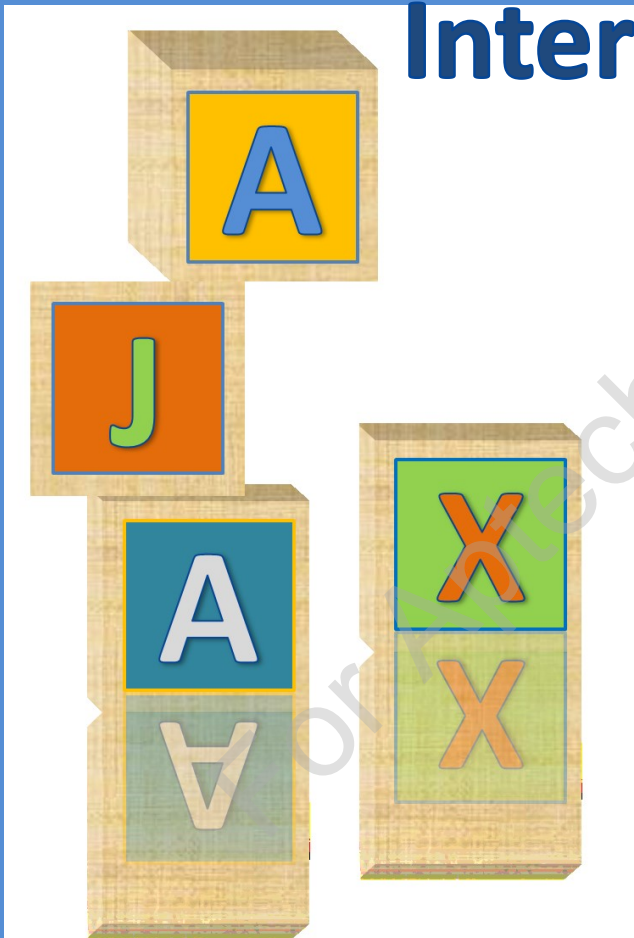# Programming ASP.NET AJAX

## Session: 1

## Internet Applications and AJAX

- Explain Asynchronous JavaScript and XML (AJAX)

- List the different AJAX Frameworks

- Describe the architecture of ASP.NET AJAX

- Describe ASP.NET 4.5 AJAX

- Describe ASP.NET 4.5 AJAX Extensions

- Explain the process of creating an ASP.NET AJAX application

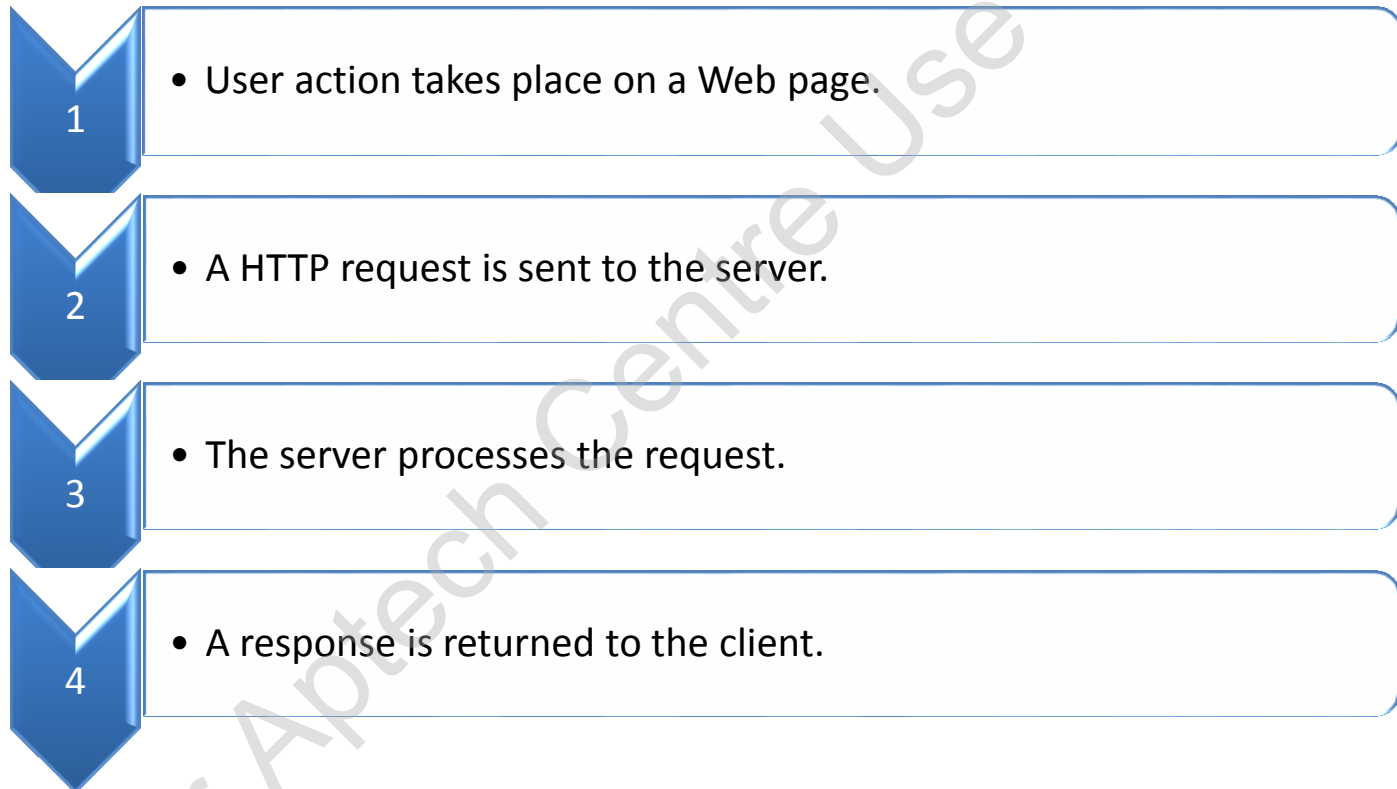- Web portals have Web servers which process client requests.

- Database stores data.

- Processing takes place at the Web server.

- Following is an example of Web portal designed to cater to pizza stores.
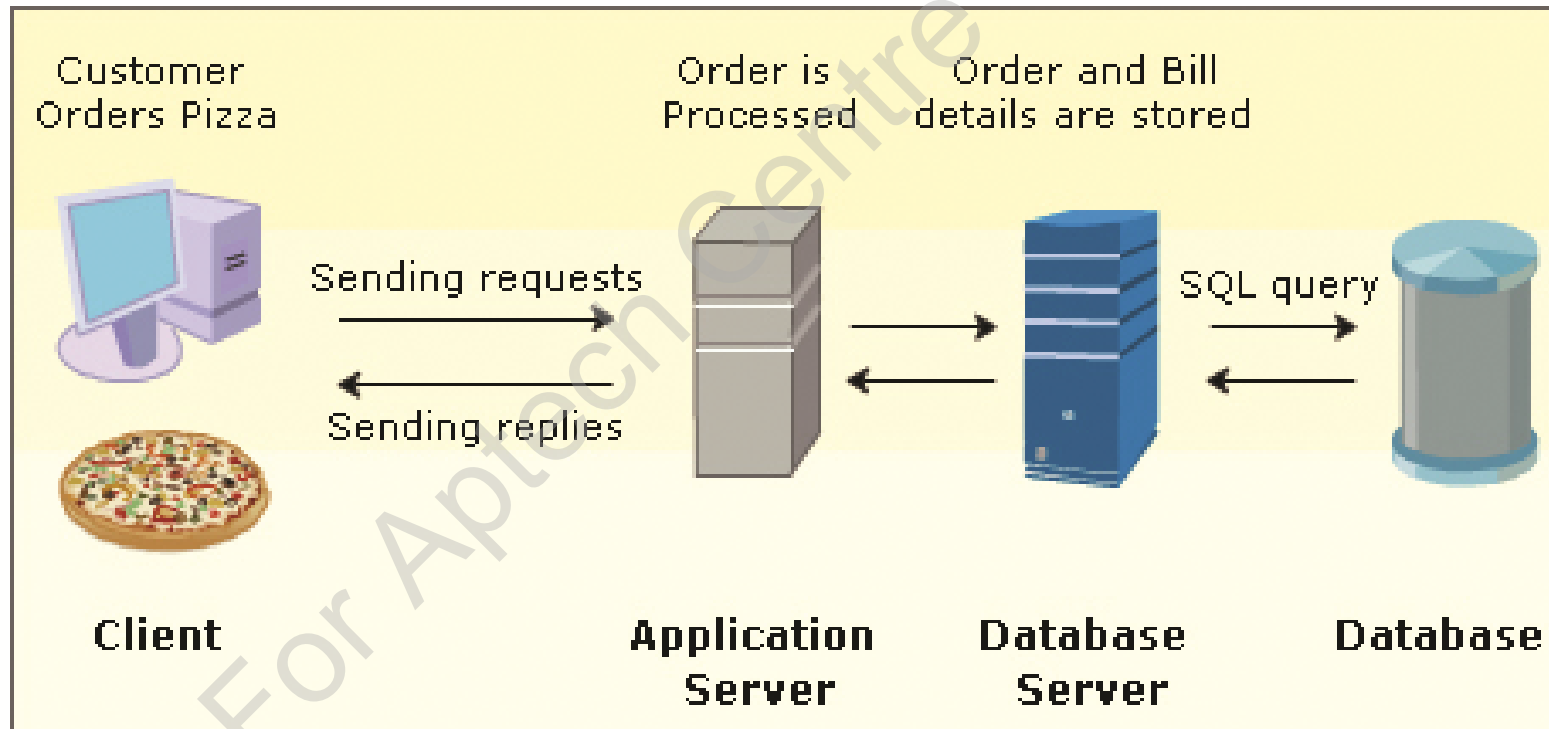


**Pizza Portal Web site**

◆ In Web-based applications, clients are typically the Web browsers that send requests and receive responses.

| | |
|---|---|
| **1** | • User action takes place on a Web page. |
| **2** | • A HTTP request is sent to the server. |
| **3** | • The server processes the request. |
| **4** | • A response is returned to the client. |

◆ Data of a form being sent back to a Web server for processing is called a **postback**.

- Synchronous Web programming results in lengthy postbacks.
- The browser client passes a request to the server synchronously.
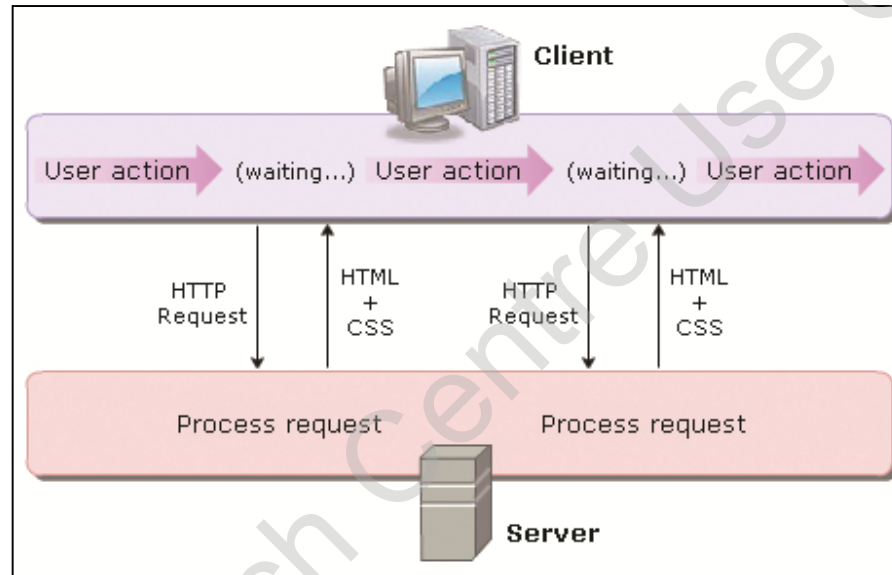


**Synchronous Programming**

- The drawbacks are as follows:
  - Lack of continuous interactivity on Web pages
  - Reduced responsiveness due to long waiting periods
  - Reduced efficiency
  - Decrease in productivity of users

**AJAX**

- Asynchronous programming reduces the problem of lengthy postbacks in the traditional Internet applications.

- User requests are asynchronously passed to the server.



**Asynchronous Programming**
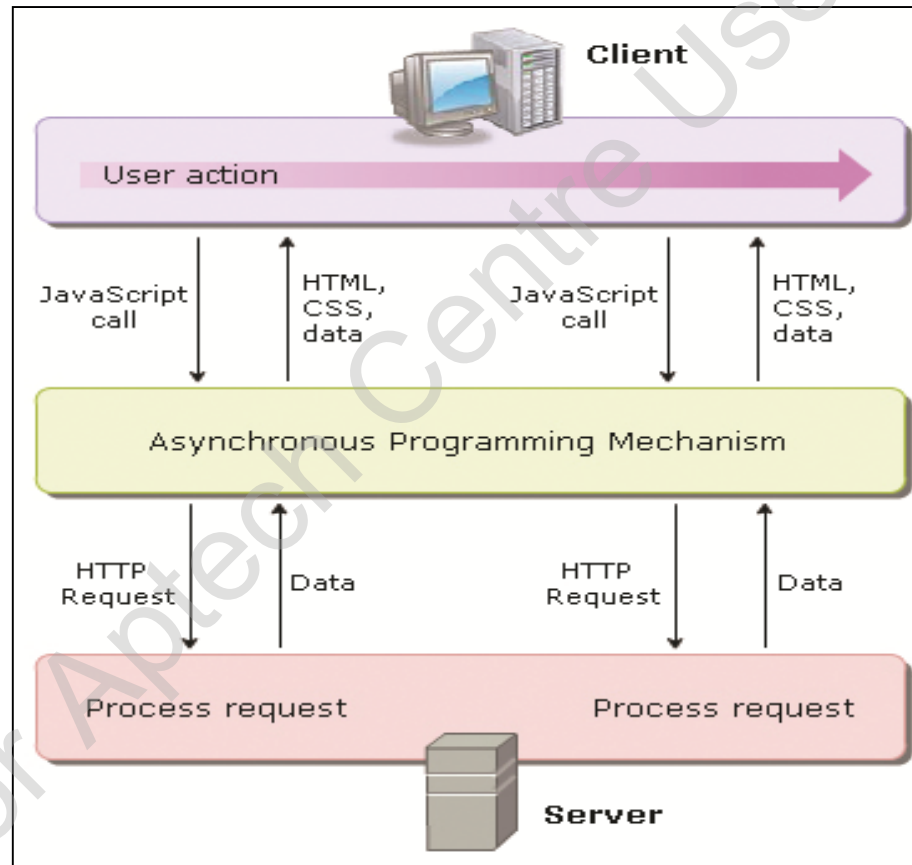
# Rich Internet Applications (RIA)

◆ Rich Web-based applications are called Rich Internet Applications.

◆ In the RIA:

> Web client handles processing.

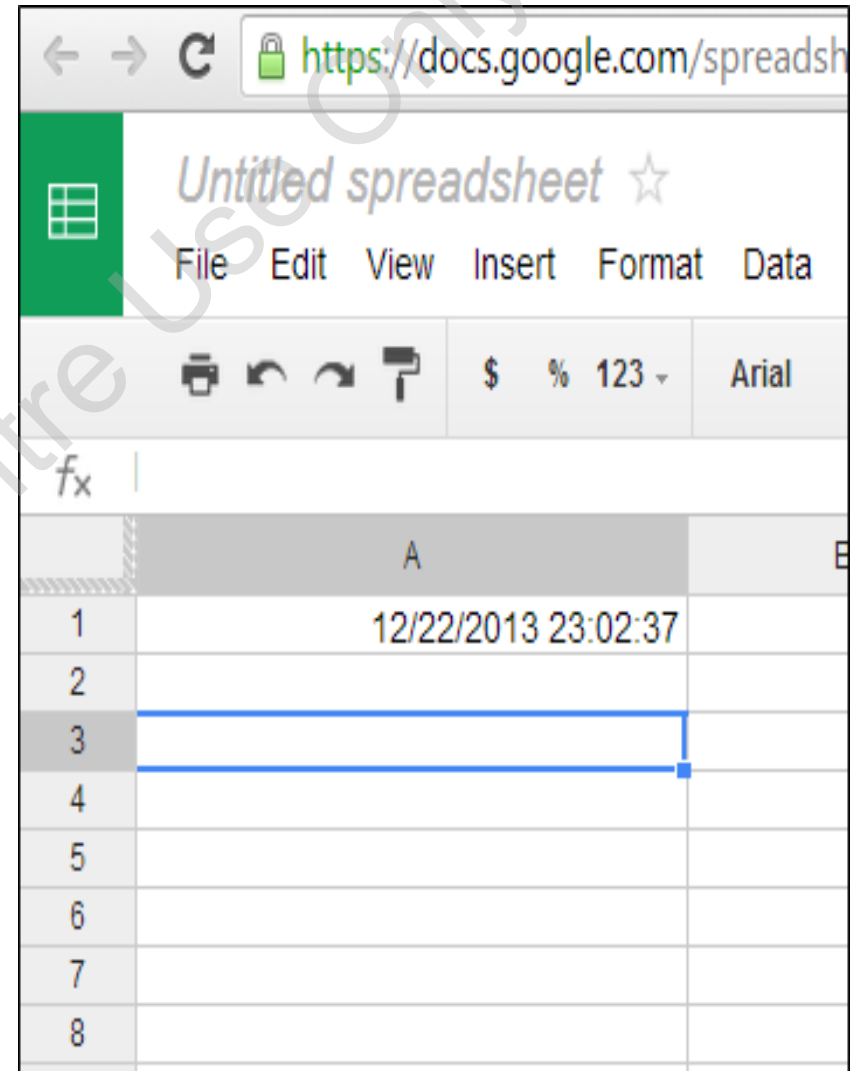> Application server handles state and data processing.

◆ The benefits of RIA are as follows:

**High vitality**

**High interactivity**

**High responsiveness**

**Network efficiency**



https://docs.google.com/spreadsh

Untitled spreadsheet ☆

File  Edit  View  Insert  Format  Data

$f_x$ |

| | A | B |
|---|---|---|
| 1 | 12/22/2013 23:02:37 | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |

**Google Spreadsheets Application**

# Traditional vs. AJAX Applications

**AJAX**

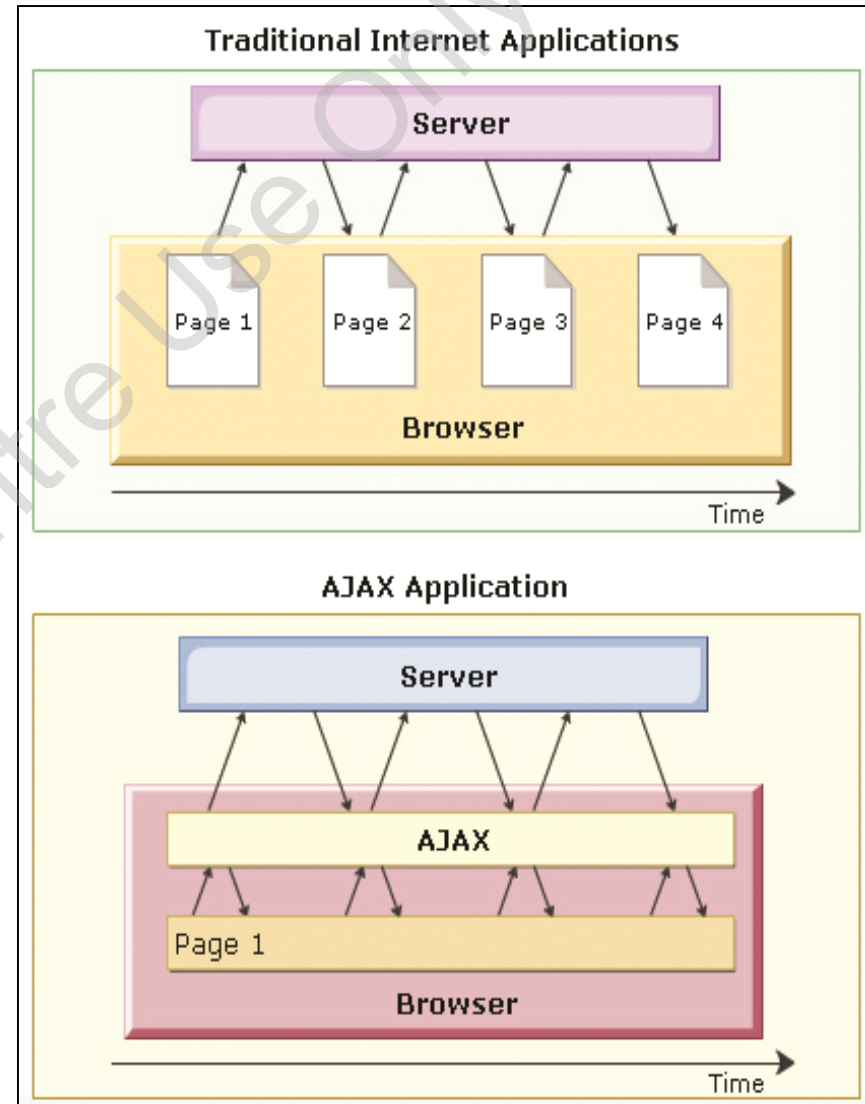| Traditional Internet Applications |
|---|
| Most of the work happens on the Web server. |
| Any user action results in a postback. |
| An inefficient, slow, and cumbersome process is involved. |

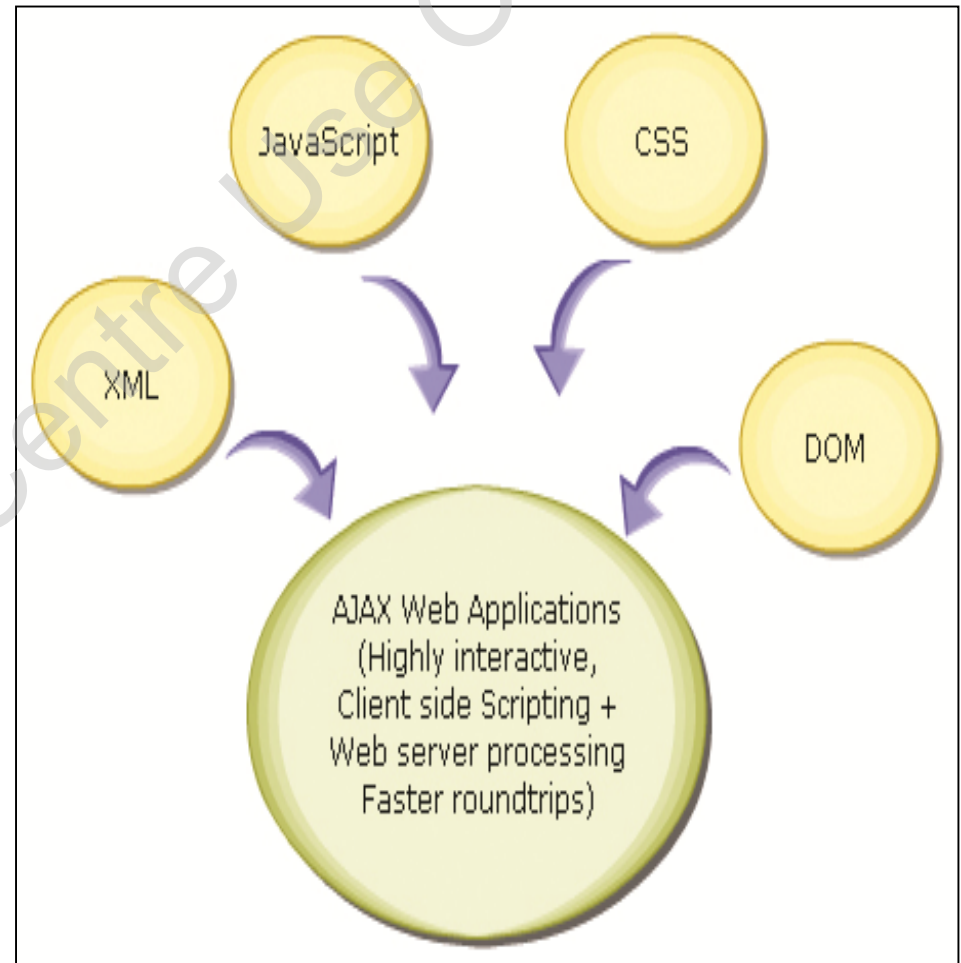| AJAX Applications |
|---|
| A shift away from old traditional approaches. |
| Involves Asynchronous JavaScript and XML (AJAX). |
| Highly efficient, interactive, and responsive Web applications. |



**Traditional Internet Applications vs. AJAX Applications**

- The AJAX approach uses client-side scripting to exchange data with a Web server.

- AJAX proves useful:
    - **For developers** - Refers to a set of development components, tools, and techniques for creating highly interactive Web applications.
    - **For users** - Results in faster roundtrips, and less time for page refreshes.

- The advantages of AJAX are as follows:
    - Asynchronous processing
    - Minimal data transfer
    - Limited processing on the server
    - Better responsiveness



**AJAX**

- The AJAX Framework provides:
  - An AJAX engine
  - Associated client and server libraries
- The AJAX engine is a layer between the user's browser and the Web server.
- The AJAX engine works:

| User types Web site or Web application address. |
| Browser loads AJAX engine. |
| Communication happens with the server. |
| Delays are eliminated. |
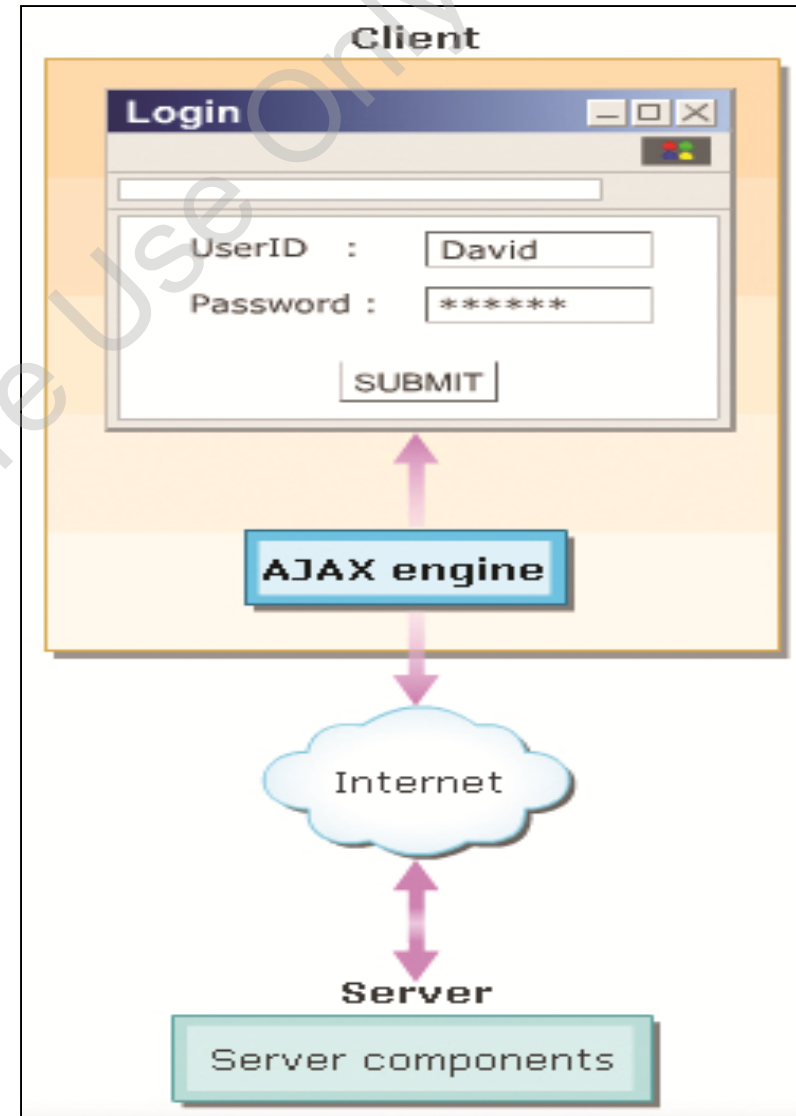


**Working of AJAX**

**AJAX**

- Has revolutionized Web application development.
- Few technologies that are used to implement it are as follows:
  - JavaScript
  - Java
  - PHP
  - .NET

**JavaScript**

| Name | Description |
|------|-------------|
| **Dojo Toolkit** | Open-source Dynamic HyperText Markup Language (DHTML) toolkit written in JavaScript |
| **jQuery** | JavaScript Framework that provides an AJAX Framework and other utilities |
| **Yahoo! User Interface (UI) Library** | Set of utilities and controls, for building richly interactive Web applications using techniques such as DOM scripting, DHTML, and AJAX |

**AJAX**

## Java

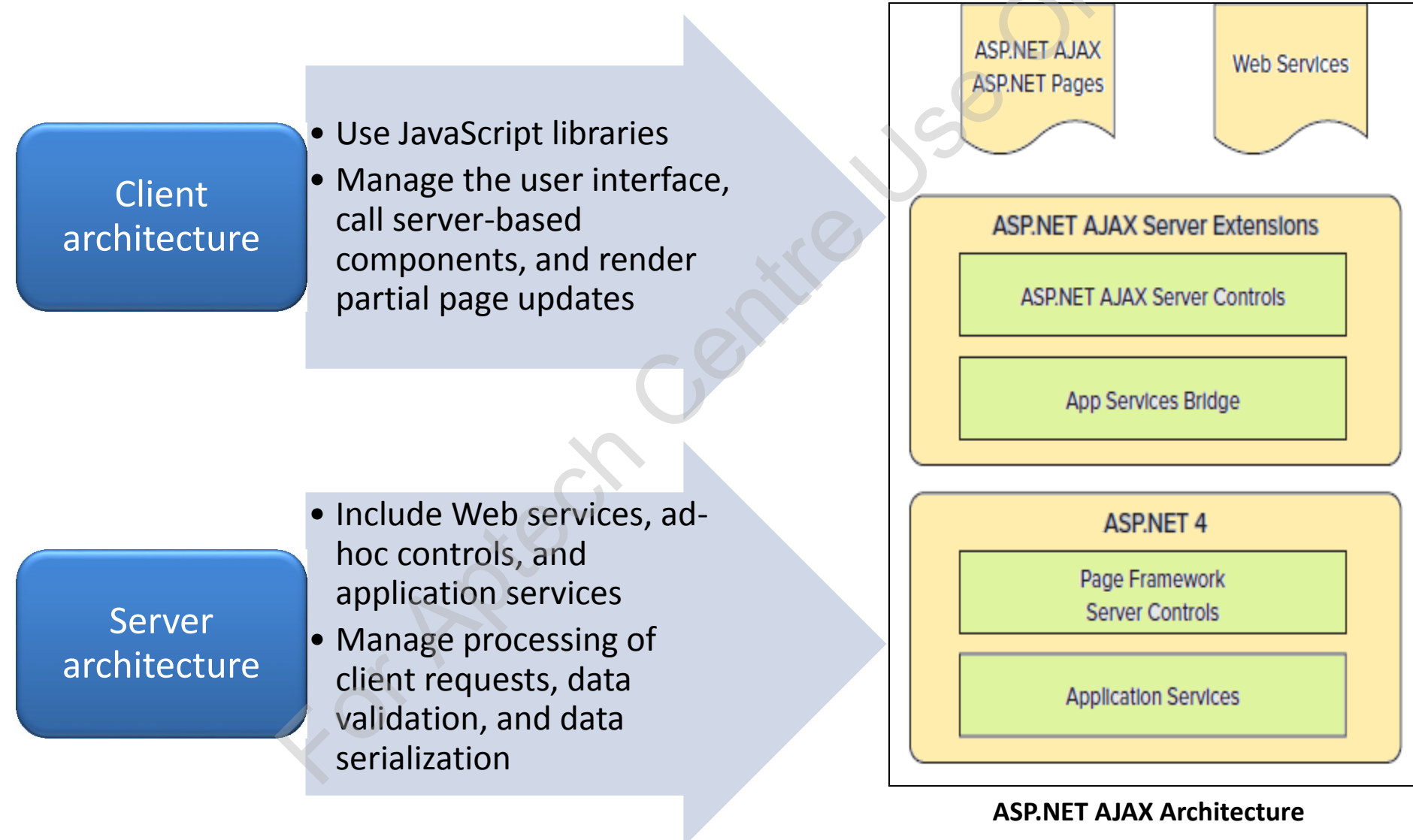| Name | Description |
|------|-------------|
| **Backbase** | Enterprise AJAX for Java Server Faces (JSF) |
| **Echo** | A Java Framework for AJAX servlets |
| **jMaki** | An AJAX Framework that can be plugged into Netbeans or Eclipse |

## PHP

| Name | Description |
|------|-------------|
| **KoolAjax** | Simple, fast, and easy-to-use AJAX component |
| **Sajax** | PHP Framework with a lot of functions |
| **Tigermouse** | Modern AJAX-driven Framework for Web application development |

## .NET

| Name | Description |
|------|-------------|
| **AJAX.NET Professional** | Also called AJAXPro, this is one of the first AJAX Frameworks available for Microsoft .NET 1.1 and 2.0. It is a library developed by Michael Schwarz |
| **ASP.NET AJAX (formerly called Microsoft Atlas)** | This is the AJAX Framework brought out by Microsoft. The latest version ASP.NET 3.5 AJAX is available as part of ASP.NET 3.5 |

# ASP.NET AJAX Architecture

**AJAX**

- ASP.NET AJAX architecture comprises client-script libraries and server-side components.

**Client architecture**
- Use JavaScript libraries
- Manage the user interface, call server-based components, and render partial page updates

**Server architecture**
- Include Web services, ad-hoc controls, and application services
- Manage processing of client requests, data validation, and data serialization

ASP.NET AJAX
ASP.NET Pages

Web Services

ASP.NET AJAX Server Extensions

ASP.NET AJAX Server Controls

App Services Bridge

ASP.NET 4

Page Framework
Server Controls

Application Services

**ASP.NET AJAX Architecture**

# AJAX Client Architecture

Comprises a set of JavaScript (*.js) files which are downloaded on each client machine with ASP.NET AJAX pages.

Client architecture includes layers such as **Components**, **Networking**, and **Core Services.**

Components layer consists of elements and Networking layer manager asynchronous calls over `XMLHttpRequest.`

`XMLHttpRequest` defines an API that allows a browser to communicate to a server without requiring a postback of the entire Web page.

The client library implements object-oriented concepts and cross browser extensions to data types.

Client

Microsoft AJAX Library

Components

Browser Compatibility

Networking

Core Services

**ASP.NET AJAX Client Architecture**

# AJAX Server Architecture

Various server-based components are supported by ASP.NET AJAX.

Server controls have additional script code resulting in better user experience.

JavaScript Object Notation (JSON), which passes structured data across the Web, is one of the core components.

JSON is a text-based data interchange format.

In JSON, data is described using data structures such as collections and arrays.

Server

AJAX Features for ASP.NET

Script Support

Web Services

Application Services

Server Controls

**ASP.NET AJAX Server Architecture**

# Technologies in AJAX

**AJAX**

**Following table lists the technologies and their description.**

| Name | Description |
|---|---|
| `XMLHttpRequest` | ➢ Defines an API used by scripting languages<br>➢ Fetches data in other formats |
| **JavaScript** | ➢ Provides the capabilities to communicate with the back-end server<br>➢ Is the only client-side scripting environment supported by most Web browsers |
| **DHTML/DOM Support** | ➢ Facilitates dynamic update of form elements |
| **XML or JSON** | ➢ Communicates with the Web server<br>➢ Exchanges data in a standard fashion |
| **CSS** | ➢ Allows users to create and apply styles<br>➢ Is used by AJAX server controls to generate visually attractive Web pages |

**AJAX**

## ASP.NET 4.5 AJAX

## ASP.NET AJAX

### ASP.NET AJAX

- JavaScript Type System
- Server Control Integration
- Cross-Browser Support
- Rich UI Support

**Features of ASP.NET 4.5 AJAX**

| Support for using UpdatePanels with WebParts |
| --- |
| Support to use the ASP.NET Profile, Role, and Login application services |
| Ability to have server-side history management |
| New server control extenders |
| Support for exposing Web service methods on the server |
| Support for JSON data being displayed as HTML |
| Support for live data binding |
| Client-side template rendering |
| Declarative instantiation of client components |

# ASP.NET AJAX Extensions

**AJAX**

- Are a set of controls and services that include AJAX support.
- Allow simulations of AJAX behavior on existing Web sites.
- Are built-in in ASP.NET 4.5 with Visual Studio 2013.
- Controls' list can be seen under **AJAX Extensions** tab in the **Toolbox**.
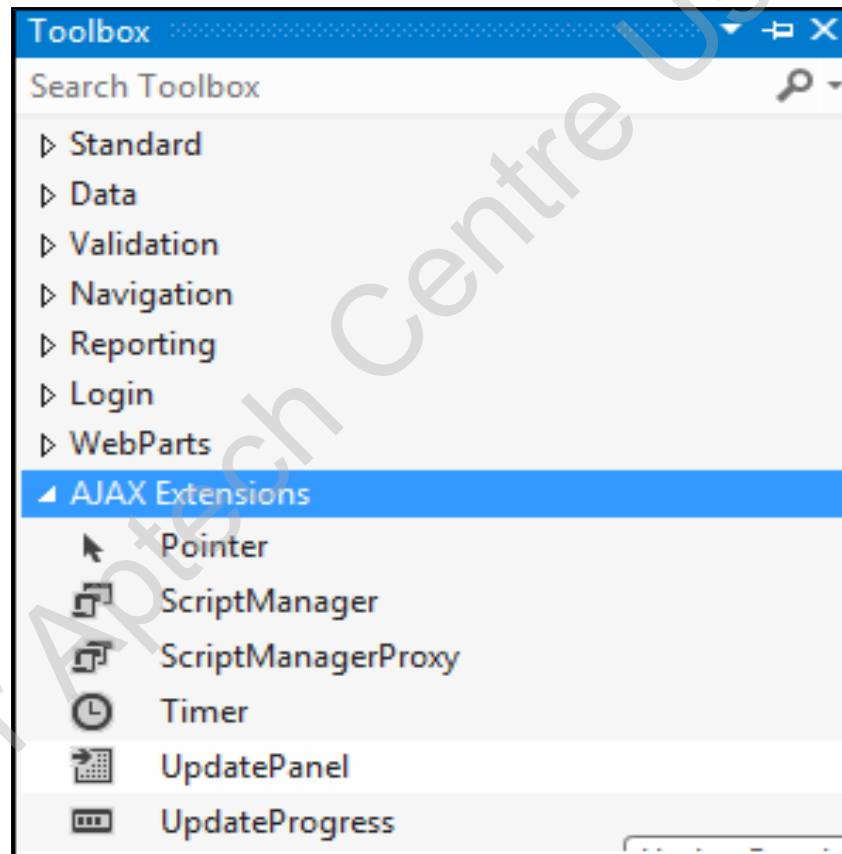


**AJAX Extensions Tab**

- ASP.NET AJAX server extensions are categorized into three areas namely:
  - Server Controls and Components
  - Web Services Bridge
  - Application Services Bridge

## Server Controls and Components

- Provide AJAX capabilities to new and existing Web sites.

| Name | Description |
|------|-------------|
| `MicrosoftAjax.js` | ➢ Includes functions to extend JavaScript with object-oriented types and constructs. |
| `System.Web.UI.ScriptManager` | ➢ Manages and organizes the download of proper JavaScript files and client-side data. |
| `System.Web.UI.UpdatePanel` | ➢ Specifies a region of a page that can be refreshed through an AJAX postback without posting back the entire page. |
| `System.Web.UI.Timer` | ➢ A control that performs postbacks at specified intervals. |

## Web Services Bridge

◆ Allows the user to call external Web services from client-side scripts.



**Web Services Bridge**

## Application Services Bridge

◆ Enables the user to include ASP.NET application services such as authentication and user profiles in AJAX applications.
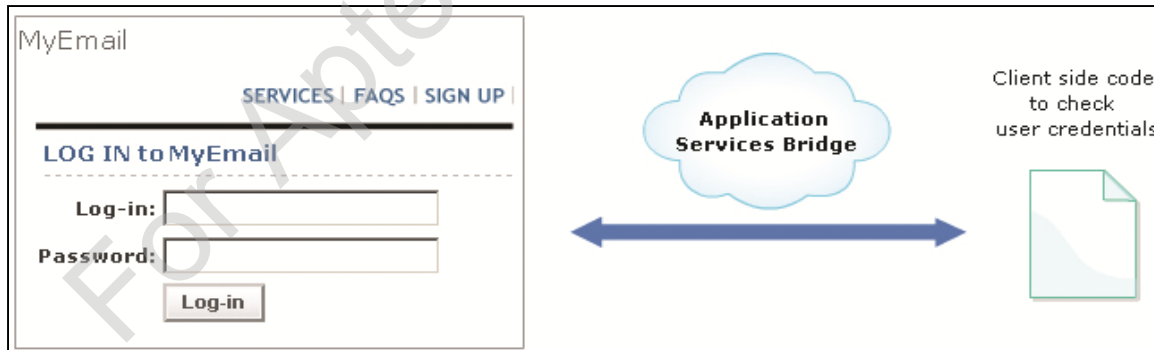


**Application Services Bridge**

- In Visual Studio 2013 Integrated Development Environment (IDE) and .NET Framework 4.5, there is built-in support for ASP.NET AJAX.

  - Select the **New Web Site** or **New Project** option in Visual Studio 2013 and find two AJAX templates.

  - **ASP.NET AJAX Server Control** project template is used to create a Web server control for ASP.NET Web Forms pages.

  - **ASP.NET AJAX Server Control Extender** project template is used to extend the capabilities of existing AJAX components.

  - Once the Web site is created, AJAX capabilities should be added, using the `ScriptManager` and `UpdatePanel` controls.
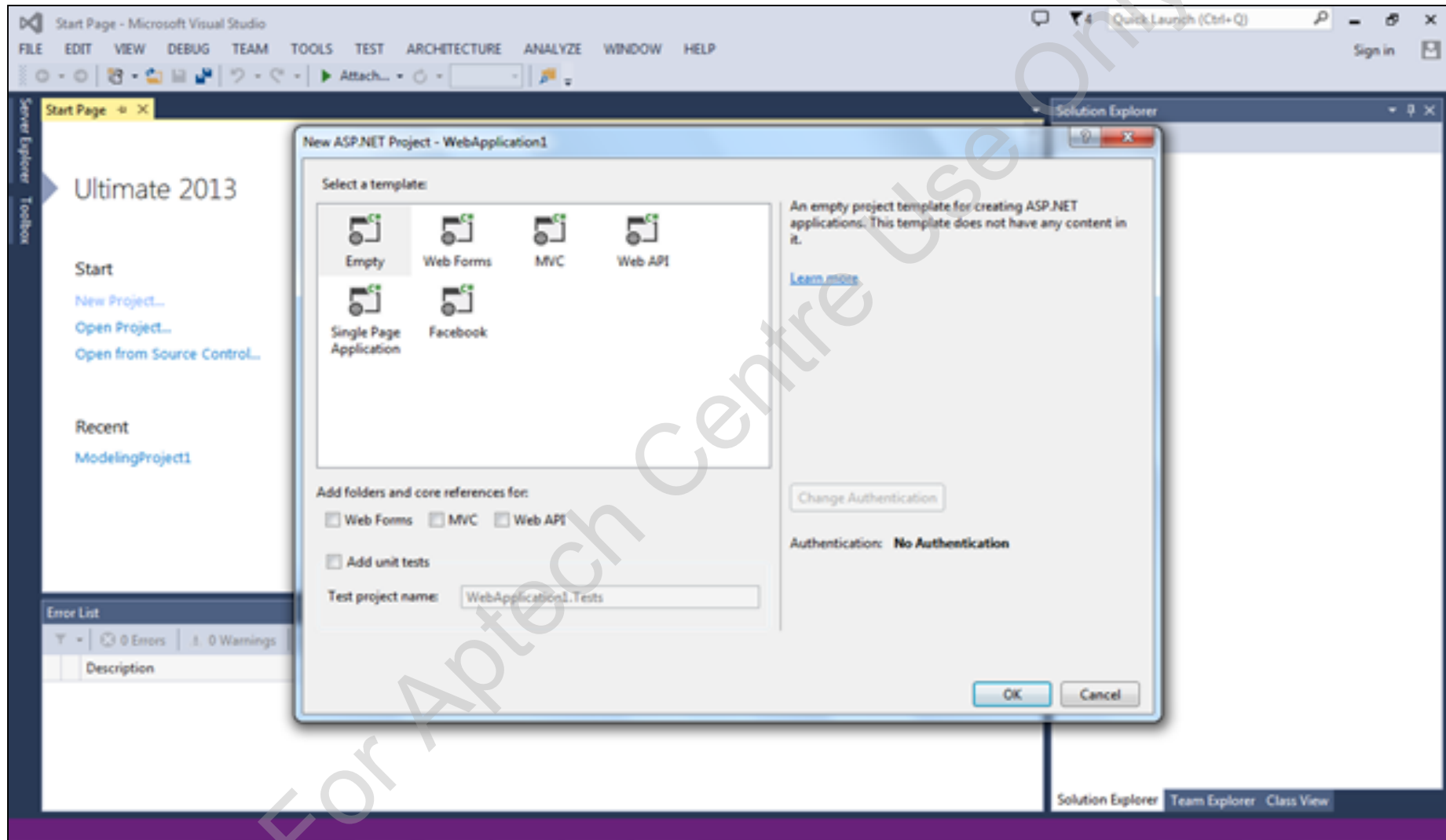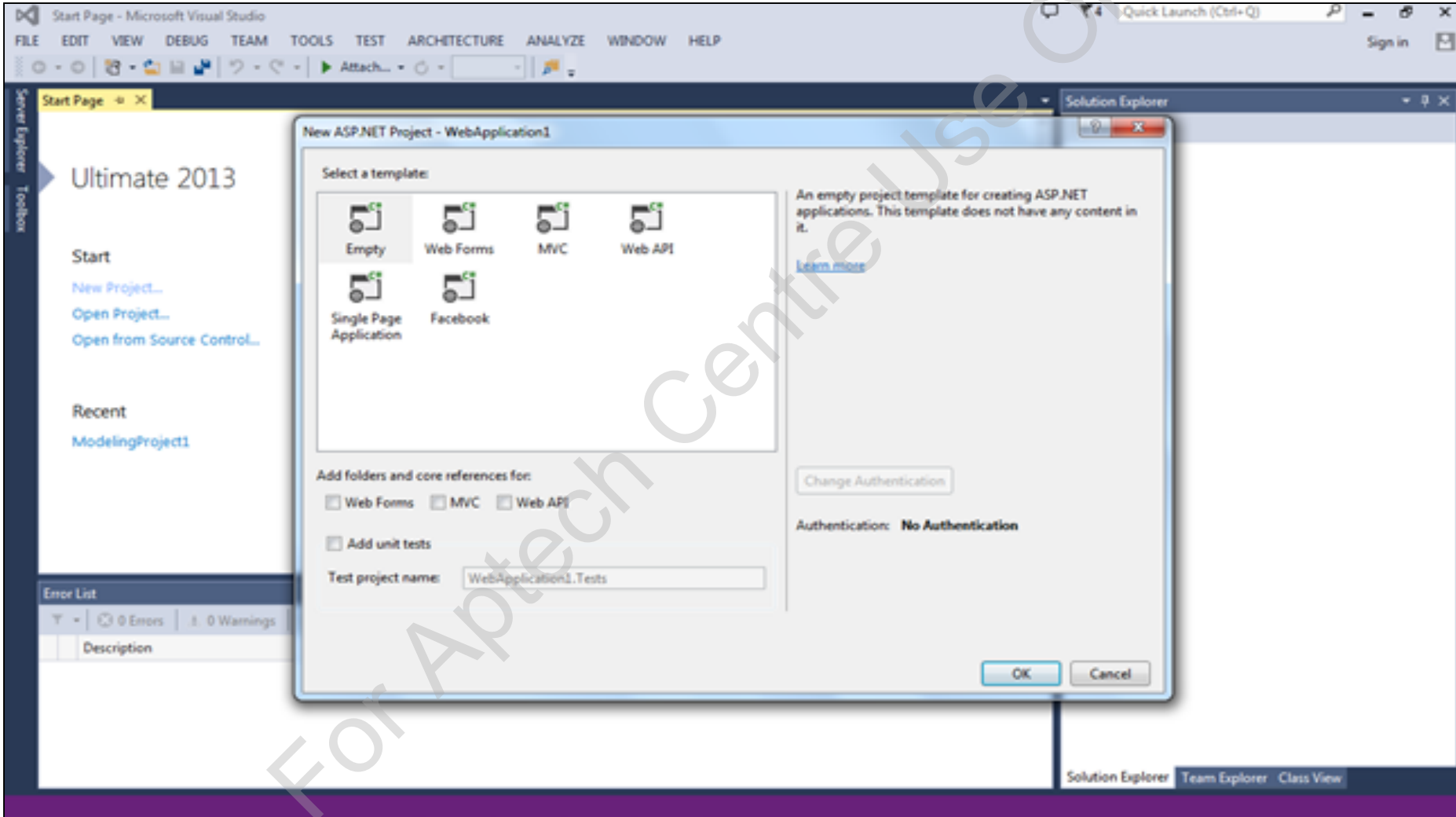
**ASP.NET Project Templates**

## 1. Create a new Web site



**New Web Site Dialog Box**
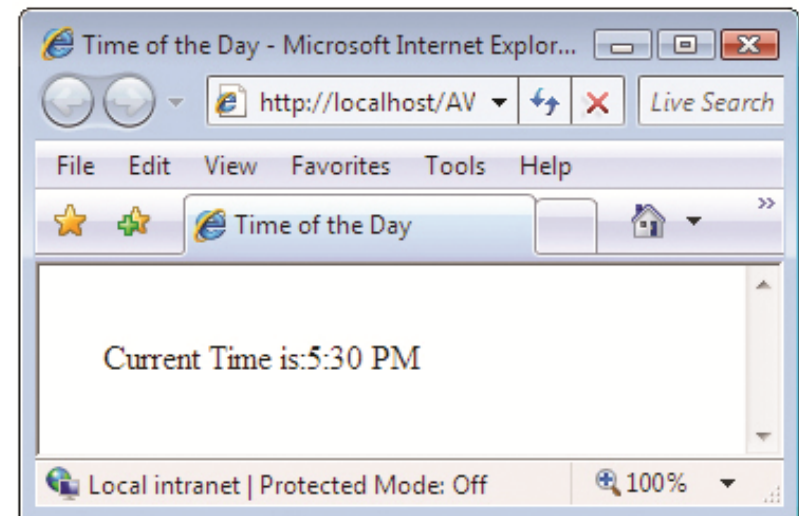
## 2. Add extension controls
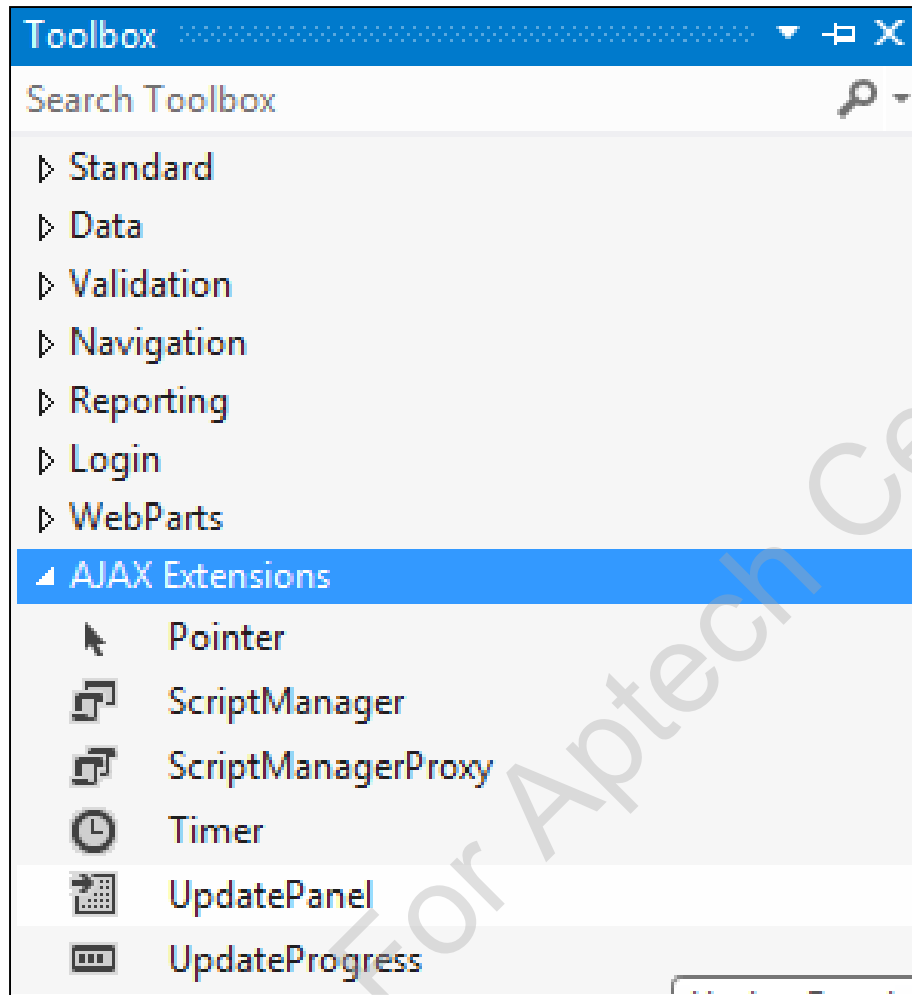


**ScriptManager and UpdatePanel Controls**

## 3. Add server controls
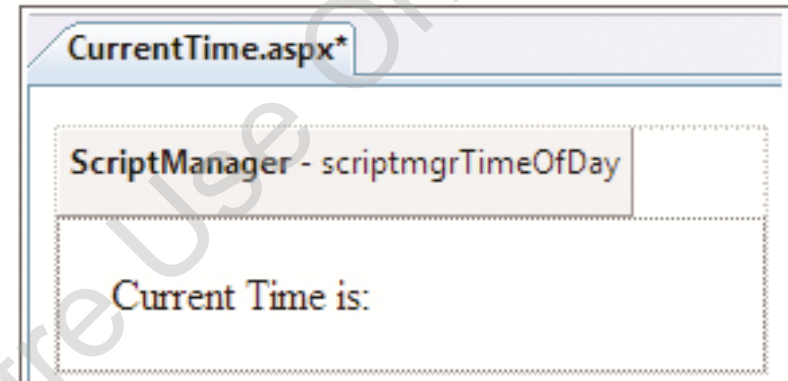


**Label Added Inside the UpdatePanel Control**

## 4. Output - Example



**Output**

- AJAX improves performance of the page by enabling users to carry on with their tasks after sending a request to the server.

- Partial Page updates enable the application to update only a part of a page without having to reload the entire page.

- Client integration with ASP.NET application services enables forms authentication, roles, and user profiles.

- Auto-generated proxy classes simplify calling the Web service methods from client script.

- Server controls can be customized to include client capabilities.

- Results are displayed very quickly because only a subset of data moves between the client and server.

- Support is provided for the popular browsers, such as Microsoft Internet Explorer, Mozilla Firefox, and Apple Safari.