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Client Server Architecture and Interface

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BLOCK-1: BASICS OF CLIENT SERVER ARCHITECTURE

BLOCK-2: DEVELOPMENT OF CLIENT/SERVER

BLOCK-3: SERVER-SIDE TECHNOLOTY WITH ASP.NET-1

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CLIENT SERVER ARCHITECTURE AND INTERFACE

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Introduction, Internet Networking Protocol, Addressing, the Structure of a Socket, Classes of Utility for Networking, Transmission Control Protocol (TCP), Sockets in Brief, TCP Socket Server, TCP Client Socket

BLOCK 1: BASICS OF CLIENT-SERVER ARCHITECTURE

Block Introduction

In a client/server design, the server acts as the producer and the client as the consumer in a computing environment. Such a setup will function when a client computer sends a request for a resource or process to a server across a network connection, which the server then executes and delivers to clients. This section will go into detail about client/server environments, technologies, and the significance of application processing synchronisation. The study and concept of client/server architecture will be the main focus of the block, which also teaches the ideas behind the characteristics and functions of client and server modelling. You'll get a sense of the different kinds of services that are offered, along with information about their features and usefulness.

You will make an effort to grasp and comprehend the fundamentals of the Object Request Broker with interference from CORBA in this block. You are given a thorough explanation of the Remote Procedure Call concept and related client-server applications. You will see examples of the various Client Server configurations in action.

In order to call and speak with one another, services are needed. In some applications, services can communicate with one another by using procedure or language calls. In a typical distributed system, services are run at specific locations and can simply call each other using HTTP/REST or RPC mechanisms. Recent micro service-based applications typically run in virtual environments with dynamically changing numbers of service instances and locations.

We will go into detail about the fundamentals of client-side and server-side applications with services in this section. The study and concept of client-side services, such as printing, remote access, utility, message, network, application, and database services, will be the main focus of this block.

Your suggestion on object linking and embedding will be presented.You will be required to learn and comprehend server-side applications including request processing, printing, database services, security, file services, and communication services in this block. You are given an explanation of the Dynamic Data Exchange (DDE) concept.

Block Objective

After learning this block, you will get detailed information about:

- Client/Server Computing

- Peer to Peer Computing

- Characteristics of Client/Server Computing

- Components of Client/Server Architecture

- Basic structure of Client/Server Architecture

- Benefits and drawbacks of Client/Server Architecture

Block Structure

Unit 1: Introduction to Client/Server

Unit 2: Client/Server Architecture and Servers

Unit 3: Client Side Services

UNIT 1: INTRODUCTION TO CLIENT/SERVER

Unit Structure

1.0   Learning Objectives

1.1   Client/Server Computing Introduction

1.2   Distinguish between client/server and peer-to-peer computing

1.3   Characteristics of Client/Server Computing

1.4   Client/Server Architecture's Components

1.5   Let Us Sum Up

1.6   Answers for Check Your Progress

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1.8   Assignment

1.9   Activities

1.10   Case Study

1.11   Further Readings

1.0 Learning Objectives

After learning this unit, you will get detailed understanding about:

- Client/Server Computing
- Clients
- Servers
- Middleware
- Peer-to-Peer Computing
- Components

1.1 Client/Server Computing Introduction

Before understanding Client/Server Computing, we need to understand about client and server that what exactly client and server is.

Client: Client is one that tries to communicate with the web server. Client delivers the web request to the specified web server, and the server responds in accordance with the request through Transmission Control Protocol (TCP), used for network communication. There are several types of clients: thick clients, thin clients and diskless clients or nodes.

A thick client (rich client) is a client that makes the set of data processing processes itself. For example, a computer running an art program that eventually segments the outcome of its effort on a network is rich client. A computer that runs practically individually as an individual device except to send or receive files through a network is called a workstation.

A thin client is a least type of client. Thin clients use the properties of the host computer. A thin client usually only grant managed data delivered by the application server that executes the set of data processing which are needed. A device consuming web application is a thin client.

A diskless node is a mixture of the two client models thick and thin. It practices nearbybut stocks determined data on the server. This system chains features from both thick, support of multimedia and good presentation, and thin clients, great manageability and elasticity. A diskless node is a device that goes an online version of the video game.

Server: A server is a piece of software that handles client requests. It is unrelated to the volume of clients. When the server gets requests from any client, it responds to that client with the help of Transmission Control Protocol (TCP).

In client-server computing, the server fulfils the client's request for a resource. While a client only interacts with one server at a time, a server may provide services to numerous clients concurrently. Normally, a computer network is used for communication between the client and server, but occasionally, they may coexist on the same system.
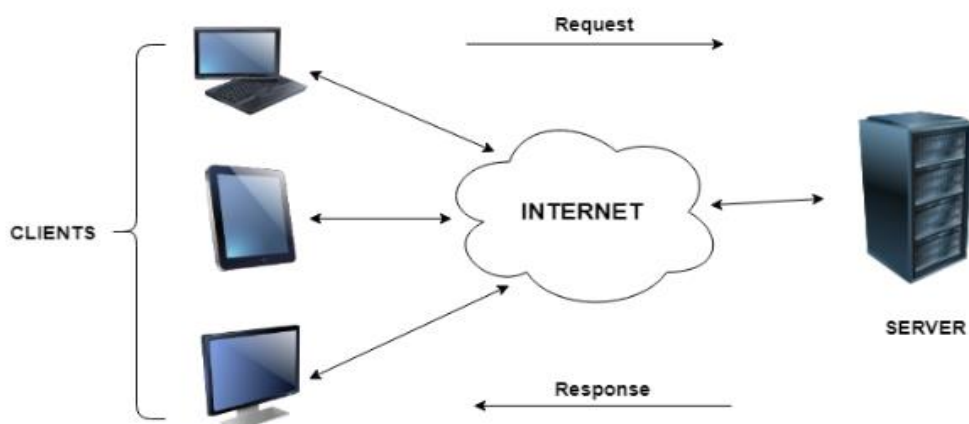

Fig. 1.1 Client/Server Computing

According to the figure, you can understand more about Client/Server computing. There are multiple clients and a server. Clients are requesting to the server through internet or TCP and server is responding back to the clients in accordance with their requests.A computer server's job is to store, retrieve, and serve files and data to other computers on its network.

There are several types of servers: Web server, Email server, Proxy server, Game server, Streaming video server, Print server etc.

Check your progress-1

1. Client is:

    a. that tries to communicate with the web server
    b. that handles client requests
    c. that may provide services to numerous clients
    d. None of these

2. Server is:

    a. that tries to communicate with the web server
    b. that handles client requests and provide services to numerous clients
    c. delivers the web request
    d. None of these

1.2 Distinguish between Client/Server and Peer-to-Peer Computing

Peer-to-Peer Computing: The nodes in the peer-to-peer computing are equal participants in data sharing. In this type each computer is known as "node" or "peer" and when they connects each other is called Peer-to-Peer computing. Each node receives an equal share of all the jobs. The nodes exchange information and resources with one another as necessary.The peer-to-peer network's computers are autonomous.

Client/Server Computing is already clarified in our previous topic. Now let us have a look on what are the main differences in between Client/Server and Peer-to-Peer Computing. There are various types of it like unstructured, structured and hybrid networks. In unstructured network, it simplifies local optimizations, but shared resources can be hard to classify. Files can be kept with more than one node, and the most useful files are simply found when a hunt request is sent to the network.

A fewer file is not shared by many nodes and can be absent in the list of requests. This type of networks occupies more CPU time and memory, but they are fewer exaggerated by the number of nodes who link or consent the network. This is known as churn rate.

These are shown in the table below:

Table 1.1 Distinguish between Client/Server Computing and Peer-to-Peer Computing

	Client/Server	Peer-to-Peer
1	A server is a hub node that provides support for numerous client nodes.	Together, the nodes utilise their resources and interact with one another.
2	The nodes communicate with one another through the server.	Each node is equal and directly communicates with the others to exchange data.
3	Between two nodes, a dedicated path is established (sender and receiver)	There is no such dedicated path in place.
4	There are only two nodes, therefore data storage in the path or at the node end is handled by a central server. Through the centralised server, the message created at the sender's end is sent straight to the receiver.	Each node performs the roles of a sender and a receiver, storing receiving data before transmitting it to the subsequent node. Each node in a peer-to-peer network can recover the information if it is lost for any cause thanks to this functionality.
5	The data is not saved by the nodes while it is being transmitted. The nodes have no way to send the data again if it is lost for some reason until the central server delivers it once more.	If a data packet is lost, the related node can resend it because it has the capacity to retain data.
6	More reliable and scalable.	It performs worse as the system's number of peers' increases.

According to the table 1.1, we got conclusion that in client/server computing a web server can communicate with so many clients and in peer-to-peer computing all are communicates with one another according to their requirement of resources. In peer-to-peer computing all are equal at the time of sharing data.

1.3 Characteristics of Client/Server Computing

There are several characteristics of Client/Server computing. These are as follows:

- Request and response is the basis of client-server computing. The server receives a request from the client and responds with the requested data.
- In order for the client and server to communicate with each other effectively, they need use a standard protocol. At the application layer, all communication protocols are accessible.
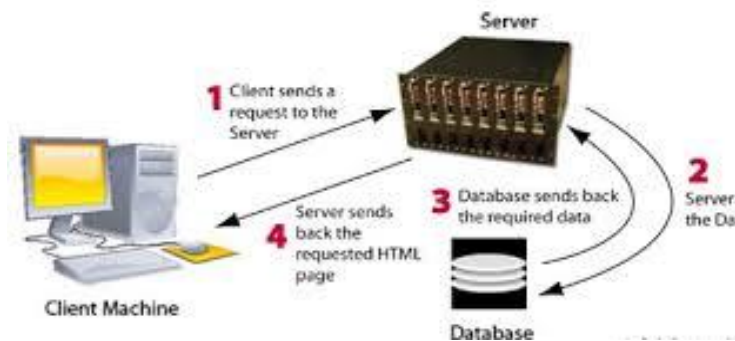
Fig. 1.2 Client/Server System

- A server can only handle so many client requests concurrently. In order to reply to the requests, a system based on priority is used.
- By overflowing a server with fake requests, denial of service attacks make it difficult for it to respond to legitimate client requests.
- A web server is an illustration of a client-server computing system. The web pages are returned to the clients that requested them.

Check your progress-2

1. How many servers are in Client/Server computing:
   a. 5
   b. 1
   c. 9
   d. 2

2. Which one is more reliable?
   a. Peer-to-Peer
   b. Client/Server Computing

1.4 Client/Server Architecture's Components

A few components are necessary for any architecture to function. The client-server architecture is also built on the three interrelated parts that are stated below:

- Client Computers or Workstations
- Servers
- Network Devices or Middleware

Client Computers (Workstations): The user system known as a workstation is also referred to as the "client's computer". Different operating systems are used by these workstations. On workstations, Microsoft Windows is frequently used. Even yet, the OS utilised on the client's workstation is considerably less expensive than the OS taken into account for server machines. A client is a controlling device of computer or computer itself which makes available a user as well as access of the network. Clients are simply users of computers who request to servers to run software and or get the responses. In short we can say client requests to the server according to their need and get the response back from the server.

Servers: A high-performance device that can handle many requests coming in at once from numerous workstations while maintaining a quick processing speed, higher storage capacity, and strong memory. A server can operate as a domain controller, mail server, database server, file server, and many more types of operations simultaneously. These different types of server are as follows:

- **Application Servers**: A server that hosts applications or software that transmits a business application through a communication protocol is known as an application server.

  An application server works with a web server to grip applications for dynamic contentfrom web applications. A web server practices a web server plug-in to create and preserve tireless HTTP and HTTPS connections with an application server.

  The current application server stages are:
  - J2EE,
  - WebLogic,
  - Glassfish,
  - JBoss Enterprise Application Stage,
  - Apache Tomcat, and

- o Apache Geronimo
- **Audio/Video Servers:** To organise, store, and then deliver video clips and full-length videos as needed, video servers use specialised technologies. To provide high-quality streaming digital video, these technologies include codecs and transcoding tools, as well as broadcast quality features.
- **Chat Servers:** A computer specifically designed to handle and support chatting and its users serve as a chat server. For instance, thousands of dedicated IRC servers have been set up; each of these servers is regarded as a conversation server.
- **Fax Servers:** A fax server's main job is to receive documents from users, convert them to fax format, and send the documents to the target recipient (s). In addition to receiving fax calls, a fax server can store received faxes in a folder on the local area network (LAN), route them to users through email, or print them to a printer attached to the LAN.
- **FTP Servers:** It is usual practice to use an FTP server, which is a computer that makes files accessible for download using the FTP protocol, to enable remote data exchange between computers. An integral part of the FTP architecture, an FTP server facilitates file transfers over the internet.

  An FTP server is mainly the computer where all the files are uploaded at first. Every server has a File Transfer Protocol (FTP) address, which a user may access using a browser or an FTP client to connect to the server across a TCP/IP network. The visitor is able to download and upload files since the server supports both of these operations.

  FileZilla Client, FTP Voyager, WinSCP, CoffeeCup Free FTP, and Core FTP are a few examples of clients for the File Transfer Protocol (FTP) that is available for free downloads. Without even being aware of it, a lot of individuals have utilised FTP in the past. You have utilised File Transfer Protocol (FTP) if you have ever downloaded a file from a website.
- **Groupware Servers:** Software called a groupware server enables users to collaborate online or over an intranet, regardless of their physical location, in a virtual setting. The size and nature of the project largely determine how many clients must be connected to this server.

  The software that makes up groupware may be broken down into two distinct categories: server and client. The programme may be placed on one or more

computers in a network, which are referred to as "servers," depending on the size of the company and the number of people that will be using it.

- **IRC Servers:** One or more IRC servers connecting to one another make up an IRC network. You will see the same channels and users by connecting to any of the servers on a given network.Over 2,000 IRC servers and approximately 500 IRC networks, which are essentially conglomerations of related servers, are still in operation throughout the globe as of today.

- **List Servers:** A list server (mailing list server) is a programme that manages subscription requests for mailing lists and sends out new messages, newsletters, or other postings from the list's members to the list's subscribers when they are sent out on a scheduled basis or as they are received.

- **Mail Servers:** A mail server is a programme that receives incoming email from nearby users and distant senders and forwards outgoing messages for delivery. It is also referred to as a mail transfer agent, or MTA; mail transport agent; mail router; or internet mailer. Here are the 9 greatest free mail servers for Windows in 2022: hMail Server, MailEnable, Zimbra, Apache James, Axigen Free email server, FirstClass, Kolab Groupware, iRedMail, Zentyal

- **News Servers:** The software that manages Usenet articles is referred to as a news server. Also included in this definition is a computer that is used exclusively or largely for handling Usenet. Only news server providers offer access to Usenet.

- **Proxy Servers:** A device or router known as a proxy server acts as a gateway for users to access the internet. As a result, it aids in preventing online intruders from accessing a private network. It is a server, and because it stands between end users and the websites they visit online, it is referred to as an "intermediary."

- **Telnet Servers:** The phrase "teletype network" is the origin of the term.A remote computer, usually a server, can have its command line opened via the client-server protocol called Telnet. This utility allows users to ping a port and determine whether it is open.Over a TCP/IP network, you may connect to distant computers by using a protocol known as telnet. These remote machines are referred to as hosts (such as the internet). You are able to establish a connection to a telnet server by using telnet client software on your own computer (that is, the remote host).

- **Web Servers:** A web server is software and hardware that responds to client requests sent over the World Wide Web using the HTTP (Hypertext Transfer Protocol) and

other protocols. A web server's primary responsibility is to show website content by storing, processing, and sending webpages to users.

- **Z39.50 Servers:** The Library of Congress created and maintains Z39.50, a worldwide standard client-server, application layer communications protocol for finding and retrieving data from databases through TCP/IP computer networks. Both ISO standard 23950 and ANSI/NISO standard Z39.50 address it.

Check your progress-3

1. Web Server:
   a. It aids in preventing online intruders from accessing a private network.
   b. Manages Usenet articles
   c. Responds to client requests sent over the World Wide Web using the HTTP (Hypertext Transfer Protocol)
   d. Receives incoming email from nearby users and distant senders and forwards outgoing messages for delivery.

Network Devices (Middleware): It is software which stands in the middle of an operating system and the programmes that implement on it. Middlewaresimplifies communication and data management for distant applications. It is also known as plumbing as it links two applications so as to data and databases may be eagerly conveyed among the channel. Middleware allows users to create requests like submitting forms on the browser or allows the server of the web to make available the dynamic web pages according to the profile of user.

A specialised medium is used to connect workstations and servers to one another. A network device is the name for such a media. The client-server architecture uses various networking devices, each of which operates and has certain attributes.

- Hubs are used to connect to a server with different workstations.
- Repeaters are used to transmit data from one device to another.
- Bridges are employed for segmenting isolated networks.

1.5 Let Us Sum Up

In this unit we have learnt that client/server acts as computing technology that computes faster than the peer-to-peer computing with the help of networking devices. Server has a huge

capacity to store information from the client's computers. Whenever client needs the information it requests to the server and server responds on that particular request.

From this unit we got that with the help of client/server computing, the processing of web applications becomes faster. For advancement of any industry it is most useful.

1.6 Answers for Check Your Progress

Check your progress 1:

Answers: (1-a), (2-b)

Check your progress 2:

Answers: (1-b), (2-b)

Check your progress 3:

Answers: (1-c)

1.7 Glossary

1. **Client/Server:** The distributed system interaction model where a programme on one end communicates with a programme on the other end and waits for a response.

2. **Transmission Control Protocol (TCP):** Transmission Control Protocol, or TCP, is a communications standard that enables computer hardware and software to exchange messages over a network.

3. **Middleware:** Software elements known as middleware are put together into an application pipeline to handle requests and responses.

4. **Hubs:** A network hub is a node that broadcasts data to every computer or Ethernet-based device connected to it.

5. **Denial of service attacks:** A Denial-of-Service (DoS) attack is an attack meant to shut down a machine or network, making it inaccessible to its intended users. DoS attacks accomplish this by flooding the target with traffic, or sending it information that triggers a crash.

6. **Fat Client:** It is also known as Thick Client or Rich Client. It makes the set of data processing processes itself.

7. **MTA or Mail Transfer Agent:** MTA is simply a programme that accepts arriving email from immediate users and distant senders and forward outward messages for delivery.Message transfer agents are pieces of software that, when used within the context of the Internet email system, are responsible for transferring electronic mail messages from one computer to another using the SMTP protocol. Additionally, depending on the circumstances, you may hear people refer to mail servers, mail exchangers, or MX hosts.

1.8 Assignments

- Explain Client/Server Computing.
- What is the difference between peer-to-peer computing and client/server computing?

1.9 Activities

Do research into the features of client-server applications?

1.10 Case Study

Try to find out the running client/server applications and peer-to-peer applications.

1.11 Further Readings

- Dewire, Dawna Travis, Client/server computing, McGraw-Hill, 1993.
- Orfali, Robert, Dan Harkey. Client/server programming with OS/2, Van Nostrand Reinhold, 1992.
- Renaud, Paul E., 1957, Introduction to Client/Server Systems, 2nd Edition, Wiley, c1996.

UNIT 2: CLIENT/SERVER ARCHITECTURE AND SERVERS

Unit Structure

2.0 Learning Objectives

After learning this unit, you will get detailed understanding about:

- Client/Server Architecture
  - Structure
  - Types
  - Benefits and drawbacks
- Object Request Broker (ORB)
- Stored Procedure
- Remote Procedure Call (RPC)

2.1 Client/Server Architecture

A distributed system architecture known as client-server is one in which the client and server workloads are divided. Clients are those who make requests for resources or services, and a server is the one that offers those resources. The server has a number of programmes on hand

to share resources with clients as needed. Client and server can share a system or be connected by a network.

In a client-server design, all resources are centralised on a single server. The server can handle a large number of customers and is highly secure. Client service will never be interrupted thanks to Client/Server Architecture's Service Oriented Design.
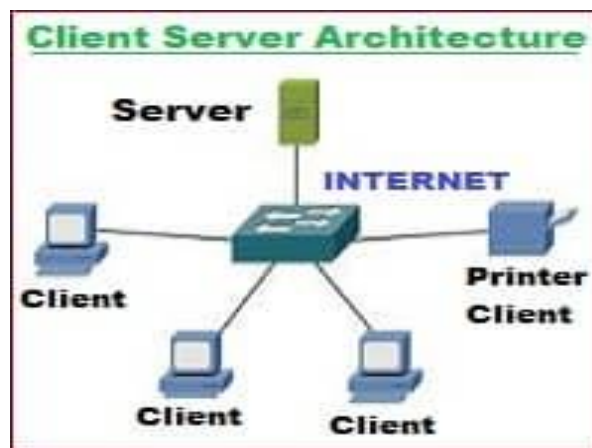

Fig.2.1 Client/Server Architecture

By replying to the clients' inquiries rather than performing an entire file transfer, client/server architecture saved network bandwidth. The database server took the place of the file server.

2.2Types of Client/Server Architecture

Client-server architecture has several layers of functionality. The types where various layers function according to their type are listed below:

- 1 Tier Architecture
- 2 Tier Architecture
- 3 Tier Architecture
- N Tier Architecture

1 Tier Architecture: On a single device, this type of architecture includes a variety of options. Data, configuration settings, and marketing logic are all part of the setting. Because of the services, 1 Tier architecture is one of the more dependable sources, but managing such architecture can be challenging because data can be found in many different variations. There are a few layers below that support one-tier architecture.
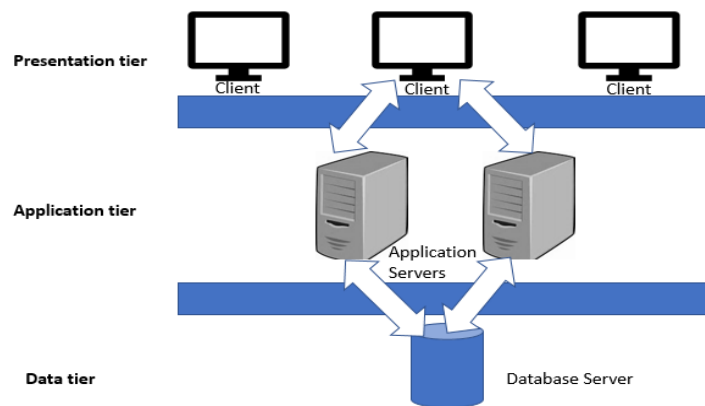
Fig. 2.2 Types of Client/Server Architecture

- Presentation Layer
- Business Layer
- Data Access Layer

A special software package assists in the seamless operation of all the layers. Local devices are used to store the data.
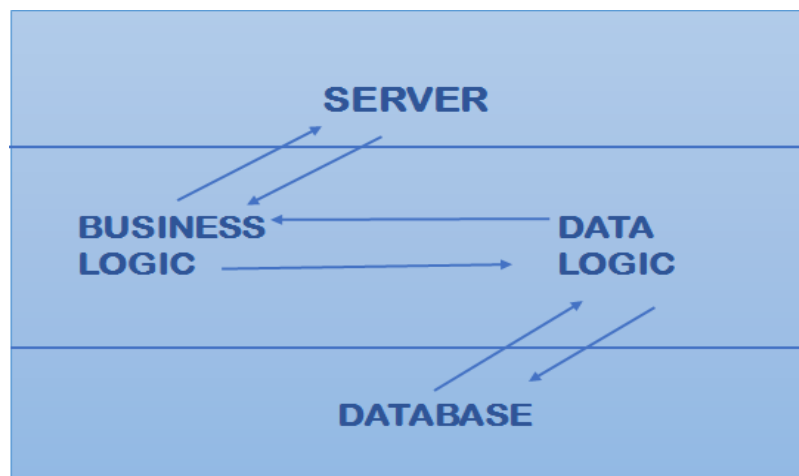
Fig. 2.2 1 Tier Architecture

2 Tier Architecture: The client machine stores the user interface in this sort of client-server setup, while the server stores the database. Business and database logic are saved on either the client or the server, but they must remain unmodified. A fat client thin server architecture is one in which the business logic and data logic are stored on the client. Thin client fat server architecture is used when both business logic and data logic are housed on the server. This kind of architecture is more inexpensive and superior overall.

When a client communicates directly with a server, a two-tier design is useful. There isn't a server in between. Small spaces are where it is most frequently employed. On this case, the user interface is situated in the desktop environment of the user, whereas the DBMS services are typically situated on a server.

Fig. 2.3 2 Tier Architecture

3 Tier Architecture: In this type of client-server setup, additional middleware is employed, which means that client requests are routed through that layer before middlewar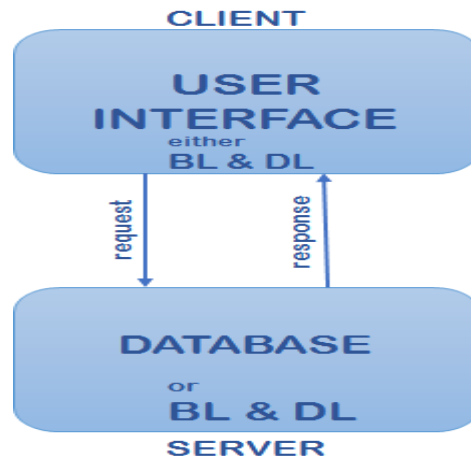e accepts the server's response and passes it on to the client. This architecture outperforms the 2-tier architecture and has none of its shortcomings. It is expensive and simple to manage. All of the business logic and data access logic are stored in the middleware. An n-tier architecture is one in which there are many instances of Business Logic and Data Logic. Middleware's functions include database staging, queuing, programme execution, scheduling, etc. File servers, message servers, application servers, transaction processing monitors, and other types of middleware are examples. It provides the highest performance and increases flexibility.

Message servers, application servers, or transaction processing monitors are just a few examples of how middleware is deployed. The middleware handles a variety of tasks, including database staging, application execution, and queuing. Additionally, it includes scheduling and prioritisation for ongoing tasks.

Fig. 2.4 3 Tier Architecture

Three major layers make up the structure.

- Presentation Layer (Users' Tier)
- Application layer (Business Tier)
- Data Tier (Data Tier)

All the tiers may be managed by several layers. Since the user device controls the presentation layer. The application layer is handled by the business tier or middleware, and the database tier is handled by the server machine.

N Tier Architecture: The method is scaled, taking into account three layers. The strategy is often referred to as "Multi-tier architecture." Each function, including display, application processing, and data management functionalities, can be placed in this design as a separate layer.

Check your progress 1

1. Which layer is not making up the structure of 3 Tier Architecture?
   a. Network Layer
   b. Application Layer
   c. Data Layer
   d. Presentation Layer
2. BL stands for:
   a. Basic Layer
   b. Block Layer
   c. Business Layer
   d. None of these

2.3Client/Server Architecture's benefits and drawbacks

There are several benefits and drawbacks of Client/Server Architecture. Few of them are given below.

Benefits of Client/Server Architecture:

Below, we'll concentrate on the client-server architecture's benefits.

- In a client-server design, there is a centralised network with complete authority over the procedures and operations.

- Data storage takes place in the centre of the architecture.

- The equipment used in architecture can be managed from a central location.

- Data backup, network security, and all other relevant issues are handled centrally.

- Users have the right to access any file stored on the central storage at any time.

- There are no geographical restrictions on access to the material. Any information is accessible from anywhere.

- As the growth demands scalability of users or any other factors, the design can be enhanced.

- It provides service incorporation, which makes sure that it gives users permission to view company data on their device and that any unauthorised log-in attempts are deleted.

- Customers have the option to share any resources on different platforms and locations.

- The client-server architecture is implemented using a distributed paradigm, which makes sure that the client is unaffected whether the server is upgraded, moved, or replaced.

- Given the demands placed on clients, systems, devices, and networks, the design can handle enormous weight.

- The design offers a simple user interface, a method for discovering files, and a management system for maintaining an orderly pattern for all of the files.

- By reducing data replication, the architecture makes it easier to deal with data overload.

Drawbacks of Client Server Architecture:

Below, we'll concentrate on the client-server architecture's drawbacks.

- If the main server fails, the users will suffer.

- An OS with certain networking capabilities is required by the architecture.

- Hardware and software tool configurations incur significant expenditures.

- Technical and qualified personnel are required for network maintenance, particularly for server equipment.

- Multiple requests sent at once may result in "traffic congestion problems".

- The cost of the architecture makes it mostly available to major businesses and organisations; regular clients cannot afford it.

2.4 Object Request Broker (ORB)

The entity that wants to conduct an operation on the object is known as the Client, and the code and data that actually implement the object are known as the Object Implementation. The ORB is in charge of all the processes necessary to identify the object implementation for the request, get the object implementation ready to accept the request, and convey the information included in the request. No matter where the object is situated, what programming language it is implemented in, or any other factor that is not reflected in the object's interface, the client never sees that information in the interface.
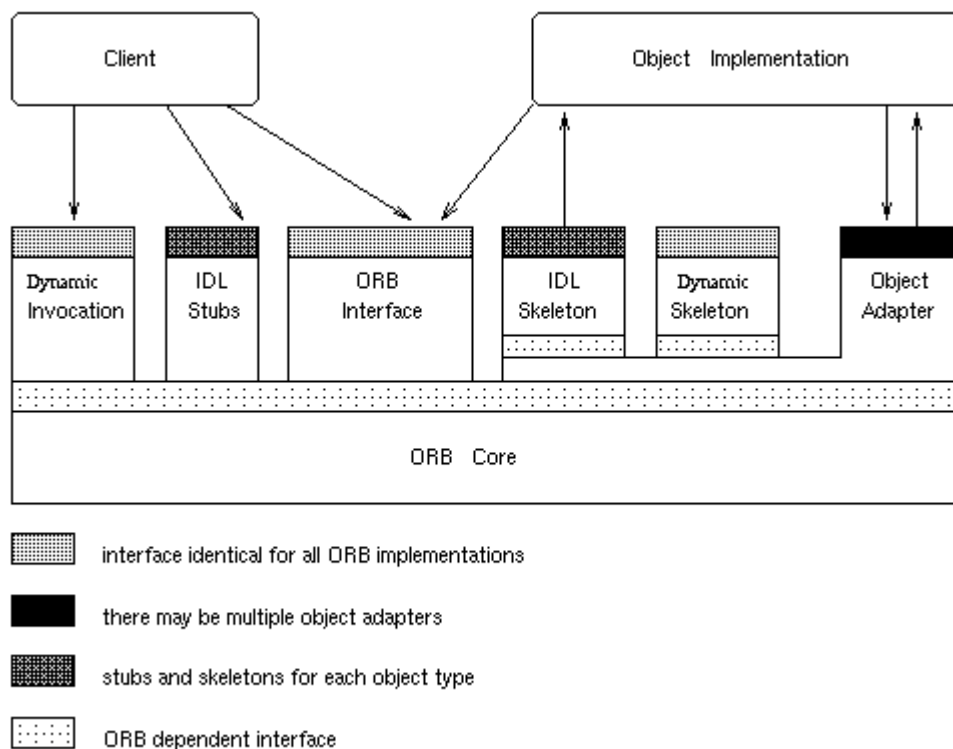

Fig. 2.5 Interfaces of Object Request Broker

The Dynamic Invocation interface (the same interface regardless of the target object's interface) or an OMG IDL stub can be used by the client to submit a request (the specific stub depending on the interface of the target object). For some tasks, the Client can also communicate with the ORB directly.

The OMG IDL produced skeleton or a dynamic skeleton are both ways that the Object Implementation receives a request as an up-call. While processing a request or at other times, the object implementation may call the object adapter and the ORB.

There are two approaches to define how an object's interface is defined. The OMG Interface Definition Language is an interface defining language that allows for the statically defined definition of interfaces (OMG IDL). According to the activities that can be carried out on them and the parameters for those operations, this language describes the different sorts of objects. Alternatives or additional options include adding interfaces to the Interface Repository service, which represents interface components as objects and enables runtime access to these components (Dynamic Interface Invocation). The Interface Description Language (which may be expanded beyond the scope of this document's definition) and the Interface Repository have similar expressive capabilities in any ORB implementation.

By having access to an object reference, being aware of the object's type, and knowing the operation that should be carried out, the client can carry out requests. By using object-specific stub routines or creating the request dynamically, the client starts the request.

The receiver of the message cannot know how the request was invoked because both the dynamic and stub interfaces meet the identical request semantics.

Through dynamic skeleton, the ORB locates the relevant implementation code, communicates parameters, and transfers control to the object implementation. The object implementation may use the Object Adapter to access some ORB services while processing the request. Control and output values are returned to the client when the request has been fulfilled.

Which Object Adapter to utilise is up to the object implementation? The type of services the Object Implementation needs will determine this choice.

Object Implementation: To establish its identity, generate new objects, and get services that depend on the ORB, the object implementation interacts with the ORB in a number of different ways. The main way it accomplishes this is by using an Object Adapter, which offers an interface to ORB services that is practical for a specific kind of object implementation.

The object adapter, skeleton, and ORB Core coordinate to call the proper method of the implementation whenever an invocation takes place. That method's parameter specifies the object being called, which the method can utilise to find the object's data. In accordance with the skeleton definition, further parameters are provided. The function returns once it is finished, which causes output parameters or exception results to be sent back to the clients.

The ORB may be informed when a new object is created so that it is aware of where to find the implementation for that object. In most cases, the implementation describes how to start the implementation if it is not already running as well as registering itself as an implementer of the relevant interface.
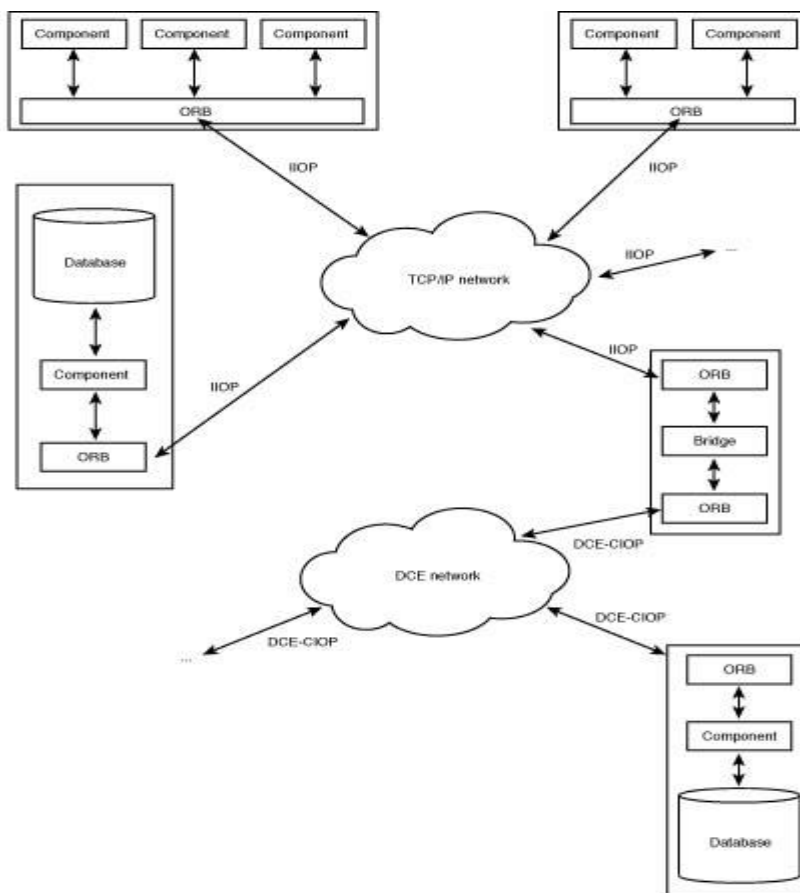

Fig. 2.6 Distributed CORBA application model

Protocols of ORB: There are two types of ORB protocols.

- The General Inter-ORB Protocol (GIOP)
- The Internet Inter-ORB Protocol (IIOP)

The General Inter-ORB Protocol (GIOP): For communication between ORBs, a high-level standard protocol called the General Inter-ORB Protocol (GIOP) is used. Since GIOP is a generalised protocol, it is not used directly; rather, a different protocol specialises it so that it can be used directly. The CORBA specification is unaffected by network protocols.

For TCP/IP and DCE, GIOP-based protocols are available. Additionally, proprietary protocols defined and used by vendors can be used to communicate across CORBA components.

The Internet Inter-ORB Protocol (IIOP): The GIOP is specialised into the Internet Inter-ORB Protocol (IIOP). On TCP/IP-based networks, IIOP is the required protocol for ORB-to-ORB communication. To be deemed compliant with CORBA 2.0, an ORB must support IIOP (but it may also support various extra protocols).

On top of protocols like IIOP that are derived from GIOP, CORBA applications are created. TCP/IP, DCE, or whichever underlying transport protocol the network employs sits on top of these protocols. A bridge can be used in an application architecture to connect, for example, DCE-based application components with IIOP-based ones. This means that CORBA applications are not restricted to using only one of these protocols. You can see that the CORBA architecture uses the underlying transport layer as its base to develop another layer, the inter-ORB protocol layer, rather than replacing network transport protocols. The fact that CORBA does not mandate the use of a specific network transport protocol is another important factor in compatibility between CORBA applications.

Check your progress 2

1. ORB stands for:
   a. Object Response Broker
   b. Objective Requirement Broker
   c. Object Request Broker
   d. Object Reply Breaker

2.5 Stored Procedures

A stored procedure is a collection of SQL statements that have been given a name and are kept together in a relational database management system (RDBMS) so they may be used and shared by various programmes.

Although stored procedures can access or alter data in a database, they are not bound to a particular database or object, which has several benefits.

Advantages of Stored Procedures:

- An essential layer of protection is added by a stored procedure between the user interface and the database.
- Because end users can add or modify data but not develop procedures, it enables security through data access controls.
- Since data is entered consistently while using a stored procedure, data integrity is maintained.
- Because statements in a stored method just need to be written once, productivity is increased.
- Compared to embedding inquiries in a graphical user interface, stored procedures have advantages (GUI).
- When an issue occurs in an application, it is simpler to troubleshoot because stored processes are modular.
- The performance of stored processes can be adjusted, so there's no need to change the GUI's source code.
- Building a query with stored procedures is simpler than through a GUI.
- Because commands are performed as a single batch of code when using stored procedures, network traffic between clients and servers can be reduced. This implies that only the call to run the procedureis delivered across a network.

Check your progress 3

1. CORBA stands for_____.

    a. Architecture for the Common Object Request Broker

    b. Architecture for the Computing Object Request Broker

    c. The architecture of the common object response broker

    d. None of these

2. Which of the following components acts as the connecting point between the client applications and the server applications, as well as the object request Broker (ORB)?

    a. CORBA IDL stubs and skeletons;

b. ORB and the ORB Interface

c. Clients and servers in a network

d. None of these

2.6 Remote Procedure Call (RPC)

An inter-process communication method used for client-server based applications is called a remote procedure call. It is sometimes referred to as a function call or a subroutine call.

The RPC translates and transmits a request message from the client to the server. A procedure or function call to a distant server may be included in this request. The requested response is sent back to the client by the server as soon as it receives the request. While the server is handling the call, the client is blocked, and execution is not restarted until the server has finished.

The following is the order of events in a remote procedure call:

- The client calls the client stub.
- The client stub includes the arguments in the message and makes a system call to the server to send it.
- The operating system of the client transmits the message from the client to the server.
- The server operating system sends the message to the server stub.
- The server stub strips the arguments from the message.
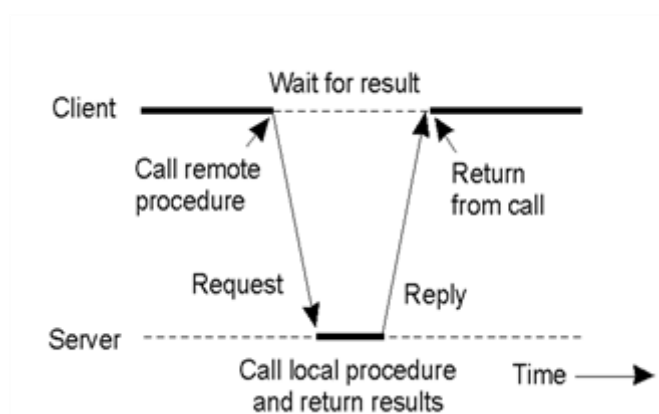- The server stub then invokes the server operation.

Fig. 2.7 Remote Procedure Call (RPC)

Benefits of RPC: The following are a few RPC benefits:

- Process-oriented and thread-oriented models are supported through remote procedure calls.

- RPC hides its core message passing system from the user.

- Remote procedure calls require the least amount of time and effort to rewrite and develop the code.

- Both a distributed environment and a local environment can use remote procedure calls.

- RPC skips over a lot of the protocol layers in order to perform better.

Drawbacks of RPC: The following are a few RPC drawbacks:

- There are numerous approaches to implement the remote procedure call notion. It is not a must.

- RPC does not provide hardware architectural flexibility. It just relies on interactions.

- Costs have increased as a result of the remote procedure call.

2.7 Let Us Sum Up

The client/server architecture, which we learned about while studying this unit, is a client/server computing architecture in which the server serves as the producer and the client serves as the consumer. When a client computer uses a network connection to transmit a request for a resource or a service to a server, the server processes the request and returns it to the client.

According to research, there are several servers that perform a variety of tasks, from hosting websites and hosting email and video to securing internal networks. The Object Request Broker is a middleware that manages communication between clients and servers using the CORBA specification.

A potent method for building distributed, client-server based systems is the Remote Procedure Call.

2.8 Answers for Check Your Progress

Check your progress 1:

Answers: (1-a), (2-c)

Check your progress 2:

Answers: (1-c)

Check your progress 3:

Answers: (1-a), (2-b)

2.9 Glossary

1. **CORBA:** The Object Management Group (OMG) has established the Common Object Request Broker Architecture (CORBA) standard, which enables software components created in different programming languages and running on various systems to communicate with one another.

2. **GUI:** Models, views, and controllers are the three sorts of components (objects) that make up a Graphical User Interface application. The model represents the data and functions that make up the application logic. The user can see the model data in the view.

3. **API:** The technological framework for creating a software interface that exposes backend data and application functionality for use in external applications is known as application programming interface architecture.

4. **RPC:** A programme can utilise Remote Procedure Call, a software communication protocol, to ask a programme running on another computer on a network for a service without having to be familiar with the specifics of the network.

5. **RDBMS:** SQL is used by RDBMS, which stands for Relational Database Management System. People utilise the Relational Database Management System in the real world to gather information, process it, and offer services.

2.10 Assignment

Write a short note on Remote Procedure Call (RPC) in client/server model?

2.11 Activities

Gather information about the client-server architecture configuration.

2.12 Case Study

To what extent may CORBA objects be migrated from one server to another?

2.13 Further Readings

- Orfali, Robert, Dan Harkey. Client/server programming with OS/2, Van Nostrand Reinhold, 1992.

- Renaud, Paul E., 1957, Introduction to Client/Server Systems, 2nd Edition, Wiley, c1996.

- Dewire, Dawna Travis, Client/server computing, McGraw-Hill, 1993.

UNIT 3: CLIENT SIDE SERVICES

Unit Structure

3.0 Learning Objectives

3.1   Introduction

3.2   Services

3.3   Clients

3.4   Dynamic Data Exchange (DDE)

3.5   Object Linking and Embedding (OLE)

3.6   Let Us Sum Up

3.7   Answer for Check Your Progress

3.8   Glossary

3.9   Assignment

3.10 Activities

3.11 Case Study

3.12 Further Readings

3.0 Learning Objectives

After learning this unit, you will get detailed understanding about:

- Services
    - Print Services
    - Remote Services
    - Utility Services
    - Message Services
    - Network Services
    - Application Services
    - Database Services
- Clients
    - GUI Clients
    - Non GUI Clients
    - OOUI (Object Oriented User Interface) Clients
- Dynamic Data Exchange (DDE)
- Object Linking and Embedding (OLE)

3.1 Introduction

Many tasks in client/server applications require a combination of resources that can be handled by the client workstation processor and the server workstation processor. The database server responds to a request made by a client application, which locally processes the request by determining the invoice amount and formatting the result for display on a workstation screen.

3.2 Services

Many of the functions that servers can offer are referred to as "services," such as executing computation for a client or sharing data or resources among many clients. Both a single client and a single server can accommodate many clients.

It should be highlighted that client workstations will perform business operations by combining a variety of personal productivity items with unique applications. The services will allow users to copy and paste content from many sources. The client is primarily the recipient of services from one or more server processors that offer presentation-related services. The user's input and the finished product are shown at the client workstation. On the client's side, there are a lot more services provided which are as follows:

- **Print Services:** Even when the working printer is active on the client side, the network operating system will still permit the client to generate print requests. It is a type of software that handles and redirects printing requests. The client has the option to check the print queue's status at any moment, and they are also informed when the print is finished. The same is true for fax services.

- **Remote Services:** When using a remote service, the client can access any backup services by using an application that runs on a distant server. Applications that work remotely are required in this case, such as those for downloading data from a host or checking a stock list. The network operating system will assist in executing client workstation programmes that start such remote applications. The services associated with remote applications will include working from home, which enables individuals to connect to the office network while working remotely.

- **Utility Services:** The operating system on the client side makes various local functions easier to use so that tasks like edit, copy, move, comparison, and help can be completed quickly.

- **Message Services:** Clients will easily be able to transmit and receive synchronous messages from the network. In order to manage this role, the message services will here supply buffering, scheduling, and settlement of specific services.

- **Network Services:** It has been observed that the client workstation will frequently employ a particular protocol, such as a service packet or an API, to transmit and receive the necessary structured network communications. These supported protocols typically include of IPX, TCP/IP, NETBIOS, Ethernet, Token Ring, and FDDI.

- **Application Services:** In addition to the remote execution of some services that network systems offer, there are other services, such as custom apps, that have their own APIs that are fixed in RPC and call on specific services from remote servers.

- **Database Services:** Certain database service queries can only be submitted client-side and require a specific syntax. When a certain standard language with a specific form is used, a specific similar programme returns on numerous platforms with distinct syntactic structures.

Check your progress 1:

1. Which of the following statements describes a server-side security service?

   a. Applications necessitate the use of LAN and WAN communication services.
   b. Users must register with a valid user ID and password.
   c. High-quality printers are required to accept print from the client.
   d. None of the above

2. What are the primary qualities of a file server?

   a. Manages file activities and is network accessible.

   b. Serves as a fat client and is distributed over a network.

   c. Manages file operations on a single PC.

   d. None of the above

3.3 Clients

DTOs enable strong-typed generic service clients to be provided without the need for code generation or additional build stages, resulting in a successful end-to-end type-safe communication gateway from client to server.

Web applications built with ASP.NET Core frequently use client-side web technologies including HTML, CSS, and JavaScript. Complex web apps can benefit from the Separation of Concerns principle by separating the content of the page (the HTML) from its layout and style (the CSS), and its behaviour (through JavaScript). When these issues are not linked, future modifications to the application's behaviour, structure, or design can be made more quickly.

While HTML and CSS are generally stable, JavaScript is developing at a dizzying pace because to the application frameworks and tools that developers use to create web-based apps.

- **HTML:** Web pages and web apps are often created using the standard markup language, HTML. Its components, which stand in for prepared text, pictures, form inputs, and other structures, serve as the foundation for pages. An HTML document is the first thing that is returned when a browser requests a URL, whether to fetch a page or an application. Additional details concerning this HTML document's appearance and layout, such as CSS or JavaScript code for behaviour, may be included or referenced.

- **CSS:** HTML elements can have their appearance and organisation changed using CSS (Cascading Style Sheets). An HTML element can have CSS styles applied directly to it, created separately on the same page, or defined in a separate file and referenced by the page. Depending on how they are applied to a specific HTML element, styles can cascade. A style that only applied to a specific element, for instance, would take precedence over one that applied to the entire document. Similarly, a style applied to an element's CSS class would override an element-specific style, which would then be overridden by a style directed at a particular instance of that element through its ID.

  It's best to retain styles in their own distinct stylesheet files and to apply consistent and reusable styles throughout the application using selection-based cascading. A style should only be applied to a specific individual element, not an entire class of

elements or an element that has a particular CSS class applied to it. Placing style rules within HTML should be avoided.

- **CSS Pre-processors:** Conditional logic, variables, and other programming language features are not supported by CSS stylesheets. Due to the fact that the same colour, font, or other setting is used on numerous different permutations of HTML elements and CSS classes, huge stylesheets can contain quite a deal of repetition. Your stylesheets can adhere to the DRY principle by using CSS pre-processors, which add support for variables and logic.

  Sass and LESS are the most used CSS pre-processors. Since both extend CSS and are backward compatible with it, a valid Sass or LESS file is one that extends CSS. Both Sass and LESS are commonly used as part of your local development process; Sass is based on Ruby and LESS is based on JavaScript. Both come with command-line utilities.

- **JavaScript:**The ECMAScript language specification contains a standard for JavaScript, a dynamic, interpreted computer language. It is the web's primary programming language. Similar to CSS, JavaScript can be defined as distinct files, blocks of script within a page, or properties within HTML elements. Similar to CSS, it is advised to isolate JavaScript into distinct files to keep it as far away from the HTML present on certain web pages or application views.

  There are a few actions that you'll frequently need to carry out when dealing with JavaScript in your web application:

  - Choosing an HTML element, then getting or changing its value.
  - Requesting data from a Web API.
  - Directing a request to a Web API (and responding to a call back with its result).
  - Carrying out validation.

  All of these activities can be completed with JavaScript alone, although several libraries are available to make them simpler. JQuery, one of the original and best-performing of these libraries, is still a popular option for making certain chores on web pages simpler. jQuery doesn't give many of the features that Angular and React do for Single Page Applications (SPAs).

- **SPA Framework:** Because they were all considered from the beginning, SPA frameworks like Angular offer these features in a more integrated way.

Additionally, jQuery is an imperative library, which means that in order to use it for anything; you must call its functions. A large portion of the labour and functionality that SPA frameworks offer may be accomplished declaratively, necessitating no actual coding.

A notable illustration of this functionality is data binding. In jQuery, getting or setting an element's value typically only necessitates one line of code. Every time you want to modify the value of the element, which may happen in numerous functions on a page, you must write this code. Visibility of an element is another prevalent example. There may be numerous locations in jQuery where you would write code to regulate whether specific items were visible. Data binding would eliminate the necessity for writing any code in each of these scenarios. A view model on the page would simply be bound to the value or visibility of the relevant components, and any changes to that view model would instantly update the bound elements.

- **Angular SPAs:** One of the most used JavaScript frameworks worldwide is Angular. Since Angular 2, the team completely rewrote the framework and changed the name from AngularJS to angular. The updated version of Angular, which has been around for a while, is still a reliable framework for creating single page applications.

  Components are used to construct Angular applications. Components manage a section of the website by fusing specific objects with HTML templates. Here's a straightforward component from the Angular documentation:

```
import { Component } from '@angular/core';
@Component({
selector: 'my-app',
template: `<h1>Hello {{name}}</h1>`
})
export class AppComponent { name = 'Angular'; }
```

  The @Component decorator function, which accepts metadata about the component, is used to define components. The ID of the element on the page where this component will be shown is identified by the selector attribute. The

component's name property, which is defined on the final line, has a placeholder that matches to the template property, which is a straightforward HTML template. Angular apps can operate at a higher level of abstraction and with less total code than apps created using just JavaScript (also known as "vanilla JS") or with jQuery because they work with components and templates rather than DOM elements. Your client-side script files must follow a certain organisational structure mandated by Angular. Module and component script files are typically found in an app folder in Angular apps, which follow a standard folder structure. The building, deploying, and testing-related Angular scripts are often found in a higher-level folder.

- **React:** React solely cares about views, in contrast to Angular, which provides a complete Model-View-Controller pattern implementation. You will need to use other libraries to create an SPA because it is only a library and not a framework. Numerous libraries are available that can be combined with React to create robust single page applications.

  Use of a virtual DOM is one of React's key characteristics. Performance (the virtual DOM can determine which portions of the actual DOM need to be updated) and testability are two benefits the virtual DOM offers React (no need to have a browser to test React and its interactions with its virtual DOM).

  React integrates HTML directly within its JavaScript code as JSX, as opposed to maintaining a strict boundary between code and markup (with possible references to JavaScript appearing in HTML properties). JSX is a syntax similar to HTML that can be reduced to just JavaScript. For example:

  ```
  <ul>
  { authors.map(author =>
  <li key={author.id}>{author.name}</li>
  )}
  </ul>
  ```

  Knowing JavaScript already should make learning React simple. In comparison to Angular or other well-known libraries, there isn't nearly as much of a learning curve or particular syntax to master.

- **Ember:** Another potent JavaScript framework based on the MVC design paradigm is EmberJS. EmberJS combines the greatest features of AngularJS and ReactJS.

  Like AngularJS, EmberJS operates on the two-way binding paradigm. Additionally, it offers a synchronised environment for the model and view.

  Ember launched the Fastboot.js module, which enables server side DOM rendering comparable to ReactJS, to overcome the performance barrier of two-way binding in complicated UI rendering.

- **Meteor:** A full stack framework called MeteorJS enables the development of fully functional mobile and web applications using only JavaScript. Additionally, it offers improved performance.

  Meteor JS has every capability a developer might possibly need to create a front end, back end, business logic, and database administration. A sizable community that is always available for assistance is supporting this.

  To create a web application, simply a working knowledge of JavaScript and Meteor JS is needed. Because Meteor JS is modular, libraries and packages can be utilised as needed.

  Node.js is used to run the server-side packages. Database activities are sped up since all database changes are instantly reflected back to the user interface and vice versa.

- **Aurelia:** Durandal Inc. is the manager of the open source front-end technology Aurelia JS. It expands Durandal JS's functionalities. To support the most recent web app development, libraries, tools, and frameworks have been included. For developers using AngularJS or Durandal JS, switching to Aurelia JS is simple.

  The framework of Aurelia JS is extremely modularized. It is made up of a lot of separate little libraries. In other words, one has the choice between using the full framework, a select number of the necessary libraries, or expanding the libraries to construct a custom framework.

- **Polymer:** Other frameworks are not like Polymer JS. Google is the one who publishes and controls it. It uses the idea of web components to expand HTML's capabilities.

  A user can construct new unique HTML elements by using the web component technology available in browsers.

Using browser-based technologies like web components, service workers, and others, Polymer JS allows users the structure and power to quickly develop bespoke HTML elements.

- **Knockout:** The MVVM pattern that Knockout JS uses sets it apart from Angular and Ember. It is a compact, lightweight, and independent JavaScript framework. Declarative bindings, automatic UI refresh, dependency tracking, and templating are further features offered.

- **Backbone:** A lightweight but feature-rich JavaScript framework is Backbone JS. Many large corporations, including Pinterest, Foursquare, Walmart, etc., use it. The fact that Backbone JS is straightforward and simple to learn is its best feature. Additionally, using it with other external JavaScript frameworks is quite versatile.

- **Mercury:** Mercury JS is a recently published JavaScript framework, and the community of JavaScript developers and bespoke software development firms are taking notice of it and giving it positive reviews.
It utilises a similar virtual DOM rendering idea and draws inspiration from React JS. It is a fully modular, contemporary JavaScript framework.

- **Vue:** A modern framework for creating user interfaces is called Vue. Vue, in contrast to other monolithic frameworks, is created from the ground up to be gradually adopted. The core library is straightforward to use and connect with other libraries and current projects because it only focuses on the view layer. On the other hand, when combined with contemporary tools and accompanying libraries, Vue is perfectly capable of powering sophisticated Single-Page Applications. Vue just needs its script to be present in an HTML file:

```
<!-- development version, includes helpful console warnings -->
<scriptsrc="https://cdn.jsdelivr.net/npm/vue/dist/vue.js"></script>
```

When the framework is present, you may use Vue's simple templating vocabulary to declaratively render data to the DOM: In HTML,

```
<div id="app">
  {{ message }}
</div>
```

And then in JavaScript:

```javascript
var app = new Vue({
el: '#app',
data: {
message: 'Hello Vue!'
  }
})
```

To display "Hello Vue!" on the page, this is sufficient. However, take note that Vue doesn't just render the message to the div once. If the value of message changes, the value in the div> is immediately updated to reflect it because it enables databinding and dynamic updating.

- **Blazon Web Assembly:** Blazor WebAssembly is a single-page application (SPA) framework for.NET developers who want to create dynamic client-side web applications. Without using plugins or recompiling code into different languages, Blazor WebAssembly uses open web standards. All current web browsers, including mobile browsers, support Blazor Web Assembly.

  web Assembly enables the execution of.NET programmes within web browsers (abbreviated wasm). A small bytecode format called Web Assembly is designed for quick download and maximum execution performance. An open web standard, Web Assembly is supported by browsers without the need for plugins.

  JavaScript interoperability, also known as JavaScript interop or JS interop, allows Web Assembly code to utilise all of the browser's features.

  The JavaScript sandbox of the browser houses any.NET code that is launched via Web Assembly, giving the sandbox's security against malicious client machine activity.

There are three types of clients:

- **GUI Clients:** These are applications where users occasionally contact the server after engaging with a graphical user interface (Example: Windows 3.x, NT 3.5) Every aspect of a strong, contemporary language is present in C#. Visually creating your user interface in C# with the Windows Forms Designer and Toolbox is the fastest and most practical method. User interface functionality is

encapsulated in Windows Forms controls, which are reusable parts used in client-side Windows applications.

A control is a form element that displays data or accepts user input. All controls that are presented on a Form have underlying functionality that is provided by the Control class.
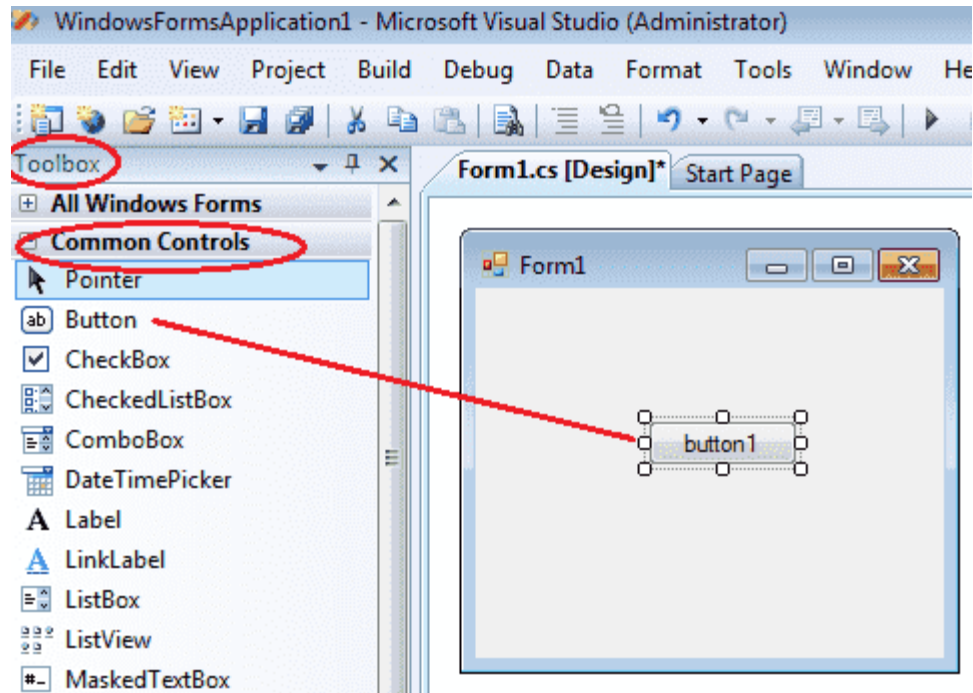

Fig. 3.1 GUI Clients-Window

- **Non GUI Clients:** These are programmes that produce server requests with little to no human involvement. Software that doesn't need a graphical user interface can be created. In order to communicate with a computer system, an interface is used. A display is necessary for GUI, or graphic user interface. However, a display on the host machine is not necessary for Command Line Interface, or CLI. CLI applications are simple to construct. The majority of them run on servers. It is not much more difficult than starting a programme if you understand how the command line operates and know the appropriate switches to apply for the tool you're attempting to utilise.

The goal of the GUI was to simplify things for the typical user. Given that Microsoft is dumbing down the GUI so much that it forces professionals to perform more clicks and movements, the CLI allows the professional to complete tasks faster than the GUI.

Command line programmes like the GNU and LLVM toolchains, the Kernel, linter tools like valgrind and cppcheck, build systems like cmake, version control systems like git, etc. are among the many excellent software applications.

- **OOUI (Object Oriented User Interface) Clients:** These are apps that offer seamless access to information in highly visual formats through an object-oriented user interface that is extremely iconic. (Mac OS, Windows 95, and NT 4.0 are examples.) Similar to networked and distributed desktop programmes, OOUI is a toolkit and framework for creating larger websites.
  - Modern JavaScript is used throughout, both on the server and client side in the browser using Node.js.
  - The entire user interface is managed client-side.
  - RESTful client-server communication exchanges structured data (JSON)
  - HTML, CSS, and JavaScript are all namespaces (derived from file structure)

Check your progress 2:

1. What kinds of functionality does the GUI client offer?

  a. It makes user interfaces available to users.
  b. It makes use of visual components that are helpful in displaying information.
  c. It creates an atmosphere that is favourable to users.
  d. All of these things.

2. What exactly does it mean to be a non-GUI client?

  a. It can automatically produce server requests without any involvement from a human user.
  b. It can offer user interfaces.
  c. It operates based on orders from the user
  d. None of these

3. What exactly is OOUI?

  a. OOUI is for object-oriented user interface, and it is a sort of user interface that is based on object-oriented programming.

b. In OOUI, users are able to categorise objects according to how they behave.

c. Both A and B are correct.

d. None of the preceding

3.4 Dynamic Data Exchange

Dynamic Data Exchange (DDE) is a technology utilised in early iterations of Microsoft Windows and OS/2 for interprocess communication. Programs can interact with items given by other programmes and react to user activities affecting those objects thanks to DDE. Object Linking and Embedding (OLE) partially replaced DDE, which is now solely kept in Windows systems for backward compatibility.

The information that DDE interlocutors typically want is expressed in terms of hierarchical string keys. DDE, for instance, might identify a cell in Microsoft Excel based on its "application" name. Each application may further categorise data into "topics," which are collections of data that might be served up individually as "items." For instance, if a user wished to retrieve a number from Microsoft Excel that was included in the first row and first column of the spreadsheet "Book1.xls," the application would be "Excel," the topic would be "Book1.xls," and the item would be "r1c1". Additional message broadcasts would then be used to notify the caller application (in reverse) of any internal changes made to the cell as a result of Excel actions.

DDE is frequently utilised for custom-built applications that regulate commercial software. For instance, by starting a DDE conversation with Excel and delivering it DDE commands, a bespoke internal application might utilise DDE to open a Microsoft Excel spreadsheet and fill it with data. The Component Object Model family of technologies mostly replaced this capability. Since the release of Windows 95, DDE has not been utilised by Microsoft internally. As an illustration, Excel now exposes a comprehensive OLE Automation object model, which is the suggested way to interact with Excel. However, the method is still utilised, particularly for the delivery of financial data.

NetDDE: In order to start and maintain the network connections required for DDE dialogues between DDE-aware programmes operating on various machines in a network and transparently exchange data, Wonder ware created an extension for DDE called NetDDE. Client and server apps interact during a DDE discussion. Applications may combine NetDDE with DDE and the DDE management library (DDEML).

3.5 Object Linking and Embedding (OLE)

Microsoft's proprietary Object Linking & Embedding (OLE) technology enables embedding and linking to documents and other objects. OLE Control Extension (OCX), a tool for creating and utilising unique user interface elements, was made available to developers. Technically speaking, an OLE object is any object that implements the IOleObject interface, maybe in addition to a variety of additional interfaces, depending on the needs of the object.

OLE enables an editing programme to export a portion of a document to another editing programme, where it can later be imported together with new content. OLE can be used, for instance, by a desktop publishing system to transfer text to a word processor or a picture to a bitmap editor. The key advantage of OLE is the ability to add various types of data from other apps, such as a text editor and an image editor, to a document. By doing this, a master file and a document in Compound File Binary Format are created. The document that references the master file is immediately affected by changes to the data inside. "Linking" is the term for this (instead of "embedding"). OLE is also utilised for clipboard and drag-and-drop data transfers across several apps.

While embedding doesn't authorize users to have an individual source of data, it does develop it easier to encompass applications. An embedded object contains the actual data for the object, the name of the application that created it, and a picture of the data. The following Works objects can be embedded in a Word Processor document or a Database form:

- Works Spreadsheet
- Works Chart
- Microsoft Draw
- Clip art from the Microsoft ClipArt Gallary
- Microsoft Note – It
- Microsoft WordArt

Embedding OLE Objects: In AutoCAD Architecture, there is a copy of an Excel spreadsheet that can be opened, which seems to be an example of an embedded OLE object.It represents data from another account. Due to the continued lack of a link to the source document, some modifications made to the source document are not examined in destination papers when objects are implanted. Only insert objects if you anticipate being able to use the

application that started them for editing and if you do not anticipate the OLE object being changed when you make changes to the source document.

Linking OLE Object: It is a reference to data present in a different document. Link objects when you wish to reuse the same data across multiple documents, link objects. If the source data is altered, all that is required to update the document containing the OLE objects are the links.

Links have the option of automatic updating. It is crucial to keep in mind that when you link a drawing, you must continue to have access to both the linked document and the source programme. You might need to re-establish the link if you rename or transfer one of them.

3.6 Let Us Sum Up

This course taught us that client/server applications carry out a variety of tasks using a combination of resources that can be handled by both client and server workstation processors. When a client uses services provided by one or more server processors and offers presentation-related services, we can observe that the services will have the capacity to copy and paste data from various sources.

It should be remembered that Microsoft Windows invented the Dynamic Data Exchange protocol, which enables users to communicate their data among apps running either locally or remotely. OLE appears to be an object linking and embedding method that enables users to combine data from different programmes. This allows users to disseminate several sources of data for each required object thanks to object links.

A reference to data that is contained in a different document is all that a linked OLE object is. Link objects when you wish to reuse the same data across multiple documents. Utility programmes created by Java clients are shared by Java clients. A graphic user interface, or GUI, uses electronic devices and icons or indicators. Interface refers to the collaboration between a computer, a software, and people.

Non-GUI clients in Java are just programmes that send server requests without human involvement. Such a client typically either requires multitasking or is able to work without it. A software interface known as an object-oriented user interface allows users to work on specific objects for specific features. It was created using the principles of object-oriented programming as they are used in contemporary computing.

3.7 Answer for Check Your Progress

Check your progress 1:

Answers: (1-b), (2-a)

Check your progress 2:

Answers: (1-d), (2-a), (3-c)

3.8 Glossary

1. **Client** - It is a user, software application or computer which request for services, data or processing of application or computer.

2. **Connection request** - It is a notification which is sent by initiator and received by listener showing request of initiator to start a connection.

3. **Network Interface** - It is a network layer showing generic interface for clients, servers or external processes to access Net functions.

4. **OLE (Object Linking and Embedding) -** OLE which is also known as object linking and embedding permit users to put the data together from various applications.

3.9 Assignment

Explain the Embedded OLE objects with examples.

3.10 Activities

Study the various types of clients.

3.11 Case Study

Study the types of Object-oriented user interface software's in details.

3.12 Further Readings

- Object-Oriented Systems Ambler, S. 1997.
- The client–server model, S smith, 2010.

Block Summary

You have gained knowledge of the foundational concepts of client/server computer technology and its related aspects in this block. The block provides a conceptual framework for the study of client-server interactions using object request brokers. The principles of several servers and their purposes have been explained.

In terms of client-server applications, the block went into detail on the fundamentals of the Remote Procedure Call approach. You're given a thorough explanation of the CORBA specification's concepts as well. You will see examples of client-server specifications used in modelling in action.

In particular for Single Page Web Applications, JavaScript frameworks have become the standard choice for creating quick, interactive, feature-rich web applications with little complexity.

JavaScript frameworks make it simple, quick, and effective to design, maintain, and dynamically produce intricate user interfaces. Your web application's performance is also improved. Because they are front-end technologies, software development firms should include the necessary security measures to guarantee a safe and secure user experience.

Block Assignment

Short Answer Questions

1. List out all the types of Servers.
2. Write a short note on Remote Procedure Call (RPC).
3. What are the characteristics of client/server architecture?
4. Explain the features of Client Services.
5. Write note on Object Linking and Embedding.
6. Write short note on Server Request.

Long Answer Questions

1. Explain client/server architecture in detail.
2. Write a note on Object Request Broker (ORB) in detail.
3. Write short notes on Client side services.

BLOCK 2: DEVELOPMENT OF CLIENT/SERVER

Block Introduction

It has been demonstrated that CASE tools and execution methodologies that repeatedly express system requirements with high and basic user integration effectively clarify analysis phase faults. The term "availability" referred to a system's uptime or capacity to be available for information distribution and doing its assigned tasks whenever they are requested.

We will go into detail about the fundamental network management performance difficulties in this block along with information on system administration. The study and conceptualization of diverse hardware in Client/Server System Development will be the main topics of this block. You'll provide some insight into CASE tools.

You will be required to grasp and comprehend the goals of efficient project management approaches in this module. The idea pertaining to disc storage for data you'll also get an explanation of the equipment. You will see realistic examples of the following processing units at the PC level.

Block Objective

After learning this block, you will get detailed information about:

- Environment of System Development
- Productivity Measures Concept
- CASE tools related Information
- Hardware/Network acquisition Features
- Idea about various service and supports in software
- System Administration Qualities
- Software Distribution Features

Block Structure

Unit 1: Development of Client/Server System Software

Unit 2: System Development of Client/Server

Unit 3: Interface of Socket

UNIT 1: DEVELOPMENT OF CLIENT SERVER SYSTEM SOFTWARE

Unit Structure

1.0 Learning Objectives

After learning this unit, you will get detailed understanding about:

- File system fundamentals
- Principles for file structure and file partitioning,

- Types of files,

- Non-contiguous and contiguous storage allocation, and

- An understanding of disc scheduling

1.1 Introduction

According to the Index Group, external technologies that accelerate programme execution and computer-aided software development are regarded by about 70% of the top IT authorities as the most important ones to adopt.

By reducing the time it takes to start up existing programmes and making them simpler to change or acknowledge, this current category of software tools helps companies recognise more quickly. Old techniques might precipitate a company's demise by blindly automating manual processes that already exist.

1.2 Features dynamic request for Applications Software Development

It has been demonstrated that CASE tools and execution methodologies that repeatedly express system requirements with high and basic user integration effectively clarify analysis phase faults.

- **Platform migration and further reengineering are anticipated approaches:** Applications from the past and the present have been accurately revalued as well as frequently stopped when they don't disperse off. A 16% decrease in incentives for proprietary technologies were benchmarked in 1993, and this as corporations move to expose strategies along with direction computer technology. BPR strategies reduce the expense and complexity of business operations while delegating decision-making authority to people who engage with customers or problems first. Client/server technology is being used by businesses to deliver information to motivated employees at work.

- **Requirement of A Common Interface across Platforms:** Front-end apps that carry out conflicting applications as well as graphical user interfaces (GUIs) that permit a similar appearance and experience are on the rise. The fact that every user from every workstation has access to every application for which they adhere a desire as well as a right without honouring or being wary of the technology is, incidentally, of greater relevance than the single-system appearance issue.

- **Rise in User Application Development:** Additional energy continues to flow into the end user's assistants as workstation energy increases and dollars-per-MIPS declines. According to the Index Group, end users are currently responsible for more than one-third of application development, with IT departments providing a similar benefit. This exacerbates the shrinking conservation projects that the IT department group has been experiencing, which prevents programmers from addressing the urgent demand for new development in the backlog.

1.3 Methods of Client/Server system Development

A methodology serves as a description of a methodical procedure for using technology to accomplish business goals. The procedures involved across the whole life cycle, from BPR and systems planning through to maintenance of systems in production, should be described in the methodology.

These businesses provide client/server computing environment-specific approaches. Every technique does, however, have particular advantages that you should be aware of when choosing a systems integration vendor.

The main tasks involved in each stage of the approach for systems integration life cycles are as follows:

- **Planning**: Initiate system planning, gather data, identify current situation, describe existing systems, define the requirements, analyse applications and architectures, analyse platform of technology, make implementation plan
- **Project Initiation**: Request for screen, examine relationship to long range systems plan, initiate project, make plan for next stage.
- **Definition of Architecture**: Gather data, expand the needs to the next stage of detail, abstract another solutions, develop proposed abstract architecture, choose vendors and products
- **Analysis**: Gather data, make a logical model of new application, define the general requirement information, and make external design of the system.
- **Design**: Prepare preliminary design, prepare design in detail, design system test, make user aids and design conversion system.
- **Development**: Configure and setup the environment for development, code modules, develop user aids, organize system test.

- **Facilities Engineering**: Gather data, do survey of the site, facility requirements documentation, data centre designing, : Gather data, do survey of the site, facility requirements documentation, data centre designing, : Gather data, do survey of the site, facility requirements documentation, data centre designing, planning for preparation of site.

1.4 Project Management

A project's success depends on a variety of factors. Implementing an effective project administration and reporting mechanism is one of the most important. Sound project management practises not only increase the likelihood that planned project methods will materialise, but they also enhance the working environment by maintaining a high level of morale and chromatic attention. Today, when technology is so fluid and the expectation for isolating the creator from the specific technology is so significant, this is especially insulting. The following is a list of the goals of effective project management:

- **Project Planning:** It includes scope of the project's definition, determining project timetables and milestones by defining deliverables, enforcing methodology, identifying tasks and estimates, establishment of staff and organisation of project, documenting assumptions, identifying duties of clients, defining of criteria of acceptance, determination of prices of documents and payments terms too.
- **Management and Control of Project Execution:** Maintaining a personal assurance, develop regular status reporting, keeping track of the project's growth in relation to agreed milestones, follow to definite conclusion- and change-request processes, and retain way of concerns.
- **Project Completion:** Creating definite, clear receiving principles provide a superior product suitable for the well-known principles; achieve a definite authorization of the product.

The architecture specifying domain is heavily weighted in the current client/server technique. The user's fresh paradigm will combine with client/server solutions' limited experience, allowing for the necessary application prototyping. Such qualities will cause architecture to be rethought in a way that is affordable and right in terms of current technology.

Prototyping is typically faster at identifying user requirements than traditional modelling techniques were due to the client/server platform's robust prototyping features.

1.5 Definition of Architecture

The concept of architecture during design implies that an application's architecture will use a variety of technological platforms. You should first assess the necessity of priorities and the requirement for them before selecting application architecture. The following factors must give particular importance consideration and weight:

- **Operational Cost:** The business should initially have all of the cost-related solutions. The expense is necessary to carry out the tasks connected to experienced staff, computer learned, user's cost. There are numerous concerns regarding the costs incurred by the corporation, which result in random users, frightening user, and users with slight tolerance, unrestricted state about teaching to users, outcome on user generating faults.

- **Time of Response:** It is another crucial element that describes actualrapidityconstraint, consumingcomplete time, influenceby reason ofnon-appropriatereply, and outcome of replydelay.

- **Uptime or availability:** The business used to gauge actual demands in this, which were determined based on the number of days and the number of working hours.

- **Safety:** It has to do with the actual safety desires.

- **Elasticity to change:** This causes the easy-going time essential to change an application, which show a discrepancy on a variety of surroundings, including marketing significances, constitutional changes, and technological progressions powering the system.

- **Use of current tools:** It is concerned with modern savings and be subject to advance prospective, which incorporates care and preservation difficulties.

- **System Interface:** It comprises a number of system varieties that are essential for a particular application, which might be interior or exterior and altered.

The business consequences of these application design trials essential to be cautiously measured. Managers can only accurately measure the procedural design choices once this procedure is finished. They must be talented to describe how the knowledge best supports the group objectives.

It is suitable for executives to evaluate the technical design options if they are responsive of the application design concerns. Take note that only architectural features are being chosen

by operate at this time, not products. It's critical to avoid selecting a product previouslyclients are conscious of the leastnecessities.

Check your progress-1

1. The main aims of project management are:
   a. Project Planning
   b. Management and Control of Execution
   c. Project Completion
   d. All of these
2. Uptime or availability is determined on the basis of:
   a. Number of days
   b. Number of Years
   c. Number of months
   d. None of these

1.6 System Development environments

After designing an organisation, a single step that specifies how to use specific tools is included in an application together with the technical structure and necessary tools. Although they have an efficient set of tools and their development environment clearly explains how to use them, it appears that developers won't make good system builders.

It is approved that SDE comprises hardware, software, interfaces, values, repetitions, and preparation that are agreed and used by an establishment to enhance the sustenance provided by its information systems, which are considered for planned planning, managing, and procedures.

- Design aim for choosing a fixed technology policy.
- To support the creation of a single system image, edges that protect the user and creator from the individualities of the technical stage should be engaged.
- Principles approaches must be definite and produced in order to deliver claims with a proficient arrival.
- Constant constituents increase efficiency by control single-system images.
- Working out platforms will confirm that clients and creators acquire more about the situation.

The SDE will include several stages of the systems development life cycle that are fixed together with the desktop, only if durable additional tools for terminal users that have a lot of data. An essential feature of SDE is the suspicious purpose taken to plan returnable constituents. With the hesitation immediate product collection for client/server requests today, settlement via SDE may cut developers off from serious technology. Certain modules that are system by an establishment are comprised in SDE:

- **Integrated navigation:** All processes use a similar process that must be moved between processes. This allows the process to be identified to the next available process. A business analyst, not a developer, should explain navigation. As a result, every user and developer perceives navigation in the same way.

- **Identicaldisplayproject:** It should be stressed that all principles are in place for all types of occupations, and that confident displays are formed by default professionalprocedures. Users and developers become familiar with the many displays used for support, accumulation, modification, omission, and observing, as well as table managementprocesses.

- **Incorporatedsupport:** Nonetheless, context-sensitive assistance services that operates in reaction to the correct problem in the business process. No programming development will be entertained here. It is emphasised that end-users, together with analysts who understand the application, are given access help text that is maintained by users once the system is in production.

- **Incorporated table preservation:** Tables are a programme design concept that asks for standard reference data, such as programme error codes, printer control codes, and so on, which is maintained in a single set of files or databases. Individual table maintenance functions are provided for numerous applications in an organisation. Here, programmers and users just call on its services to create apps to share with ordinary tables.

- **Completesafety:** It should be highlighted that each recognised user has their own security profile, where navigation is linked to security and users have options that can be used in the future. All programmers with users have identical security facilities that are handled by authorised users and apply to table maintenance.

- **Automatic view maintenance:** It should be emphasised that screens are built, navigated as needed, and programme frames are created based on the security profile as well as the business demands for a certain procedure. To extract data from the

database, the developer does not need to write any specific code. All access is granted in accordance with the stated business processes and security.

- **Standard skeleton programs:** It appears that the analyst will answer specific questions that are obtained as an outline programme for all business processes with features such as standard functions that are required by the programmer.

1.7 Productivity Measures Concept

It is investigated that there are many researchers who do the necessary experience investigations in order to conclude that many software development quality, tool, method, or certain grouping has a significant impact on software output. Certain studies will focus first and foremost on the expansion of LSS, with primary software efficiency dimension studies being re-examined alongside global sites. In addition, further hypothetical and experimental investigations of programmer efficiency, cost-benefit analysis, and software cost judgement, and software production enhancement programme must be considered again. Collectively, such studies provide a loosely-grounded framework that identifies various projects that influence software productivity.

There are now various reasons to quantify software productivity that has been documented. The goal is to figure out ways to reduce software development expenses, enhance software quality, and increase the rate at which software is developed, which includes:

- Increasing the volume of work done by current workers
- Performing corresponding amounts of work with smaller staff
- Developing goods of higher complication value with similar staff capacity
- Avoiding the need for additional personnel to increase work Justifying greater levels of capital-to-staff investment
- Reduced error volume in product delivery and reduced time and effort necessary to correct software faults
- Straighten out or reduce software production operations
- Identifying required product faults prior to creation
- Identifying required product faults prior to creation
- Identifying resource consumption patterns to identify production bottlenecks and unused resources
- Identifying high-output individuals for awards

- Identifying low-output personnel for additional training or reassignment

It should be emphasised that there are various reasons for measuring software productivity. It is not ideal to attempt to attain most or all of these goals through a single efficiency capacity effort. For example, unlike people involved in a huge software project, certain of these options may be charged more than others. Similarly, each option requires specific types of data to be present.

Self-reported data from programmers or managers is the least expensive to put in at the same time, even if it is imperfectly correct. However, if efficiency metrics are to be used for personnel evaluation, one should not expect far above-ground dependability or strength in self-reported data. Similarly, if productivity indicators are used to provide resources or rewards, data reporters will have an incentive to enhance their reported production levels.

Alternatively, by encouraging software development, the degree of possibility supplied for meaningful information to project managers and developers to help them improve their expertise and experience through time. External observers gather such information at a lower cost than self-reporting. Similarly, computerised manufacturing performance monitors are employed; although this is still a developing area of technology that requires more insight into what and how should be measured.

Check your progress-2

1. How can we measure the productivity of any software?
   a. Increasing the volume of work performed by current workers
   b. Reducing the number of errors in product delivery
   c. Straightening out or downsizing software production operations
   d. All of these

1.8 CASE

CASE tools are built on an enterprise model of procedure and are computerised, where systems integration is combined with software development. CASE's primary endeavour model is important to the tool's ease. Tools foundations based on deprived models will experience poor integration that is not capable of handling precise categories of information that involve photocopy data entry, that does not have numerous analyst-developer teams, and that is not elastic enough to handle growing new techniques for identifying and building system solutions. Tools with insufficient models limit their users' development capabilities.

A thorough review of various CASE products reveals that none provide adequate support for the creation of client/server applications as well as GUIs. This type of short support occurs despite the information that functions as network-based applications with host-based application development. There is a strong push to develop solutions that will support the client/server approach. With a large number of client/server requests being moved from a minicomputer or mainframe, the ability to reuse live models and reengineer databases is a wonderfully useful and timesaving feature.

Additional novel development is taking place as CASE tools are individually integrated with development tools from other vendors. When used with an SDE, these development tools enable applications to be sampled and then reengineered back into the CASE tool to produce process and data models. The prototyping approach to rapid application design is the only cost-effective way to construct client/server applications today, thanks to the capability of GUI-based development tools for creating and demonstrating application look and feel.

Users who are accustomed to the ease with which applications can be developed on a workstation will not recognise paper or optical versions of their applications. They can only fully imagine a solution model if they can touch and feel it. This is the benefit of prototyping, which provides a real sense of touch and feel. Aside from that, tools for prototyping should be built throughout the early stages of solution conceptualization using similar products to those used for production development.

1.9 Client/Server System Development –Hardware

Basic Intel-based PCs, Apple Macintoshes, and X-Terminals are all examples of entry-level client workstations. These entry-level clients, which start at around $3,000, also use LAN servers for backup, software aggregation, application demand, and WAN connectivity. For engineering stations that offer enriched capabilities like a gigabyte or more of local storage, high-resolution graphics monitors, 100-MIPS processing, direct WAN connectivity, 1000-dpi colour printing, or reliable multimedia execution tools, high-end client workstations can cost more than $80,000.

In the past two years, the price of a typical client workstation has decreased from $9000 to $4000. With 250Mbytes of available storage right away, LAN connectivity, and a VGA-equivalent monitor, this takes on the illusion of having processing capability that is comparable to an 8Mbyte Intel 33-MHz 486DX PC. This price range is not anticipated to

decline significantly further because GUI software and reengineered application limitations progressively increase the processing power requirements for entry-level PCs.

Client workstations frequently exercise external mainframe and minicomputer hardware platforms running proprietary operating systems in a terminal counterfeit state. On occasion, external services like database and RPC-invoked application services are assigned using non-IBM as well as DEC proprietary operating system platforms.

There are very few tools available in these settings that may be used to create or amass client/server applications. Application services using ongoing applications can be assigned by servers running the IBM, DEC, and UNIX operating systems via terminal emulation or RPC-invoked application services. The original client/server applications in an organisation will be given connection as well as database services by these analogous servers.

Every client workstation must be connected to a LAN or a remote server using a WAN in order to be functional. The workstation is typically connected to the LAN using an Ethernet, Token Ring, FDDI, CDDI, or sporadically a parallel or serial interface. The workstation must have a network interface card (NIC) installed in order to support the protocol processing required by the primary connection types in order to create and maintain the connection. Parallel to the industry-wide decrease in workstation costs, the cost of LAN connectivity has significantly decreased.

Currently, a wide variety of companies provide the connectors' hardware. Each vendor tries to provide customers a variety of advantages in terms of price, activity, and loyalty. Motorola claims that wireless Ethernet connectivity is capable of faster speeds and costs than traditional connections. Existing structures without cable connections and with relatively slow communications requirements can profit from wireless links.

Each workstation must be specifically connected to the WAN or to a communications server connected to the WAN in order to provide WAN connectivity. The majority of modern LANs are built with communications servers. A LAN communications server requires maintenance, expenditures, and in particular network management inputs. Since there is no requirement to wire each workstation to the WAN, a sizable benefit accrues. Autonomously connected workstations to the WAN are required to have an implanted controller card for synchronous communications, as well as a modem and serial connection for asynchronous communications.

1.10 Hardware/Network acquirement

Prior until now, choosing client hardware for end users forced businesses to set standards for different user classes. Such a set of standards makes it easier to gather the user-required client hardware and enables buyers to set up purchase agreements to improve the number of price breaks.

Conveniently, there are numerical considerations to keep in mind while choosing a client workstation in addition to processor type, coprocessor capability, internal bus topology, base unit size, and other factors. Despite several problems, the usage of GUI in client/server applications is one that is frequently disregarded. GUI programmes require VGA or greater screen drivers, and screens larger than the industry-required 15 inches should be required for users who frequently have multiple windows open at once. Additionally, the number of open windows, the monitor's viewing area, and the resolution of full-motion video will all increase. It's crucial to remember that inability to simply read a screen drastically distorts efficiency. Ineffective resolution will result in fatigue and incapacity.

The task at hand must have the necessary bandwidth available to give responsiveness to desktop users. If regular access to data outside of the local area network is required, router-based internetworking is essential. Bridges can be used if infrequent off-LAN interaction is required. In addition, routers offer the benefit of multiprotocol internetworking, which is crucial as businesses integrate 10BaseT Ethernet into active Token Ring environments. As multimedia applications are made available, Fast Ethernet and FDDI are becoming increasingly widespread.

1.11 PC level processing units

Client/server applications diverge in terms of what the client processor, server, and I/O requirements are for processing on the client side. Clients who support protected-mode attractiveness should typically be recruited. This describes how 32-bit processors work, maybe using a 16-bit I/O bus if the I/O condition is poor. Low characterises the client is not required to send or acquire incredible amounts of data, such as photos, which may be 100K bytes or larger, on a defined condition.

In 1994, as multi-windowed and multimedia programmes became more common, many applications would require the bandwidth only provided by a 32-bit I/O bus supporting VESA VL-bus or Intel PCI technology. Windowed apps require significant processing power

in order to set acceptable response times. The needs for mechanisms at the desktop are ostensibly advanced by the openness of application integration via DCE, OLE, as well as DOE. The recommended minimum configuration for desktop processors has the processing power of an Intel 486SX running at 33 MHz. The minimum need will be a processor with the processing power of a 50 MHz Intel 486DX or a 33 MHz Intel Pentium by around 1995.

1.12 Unix

UNIX is an operating system for computers that can manage several users' tasks concurrently. Around 1969, Ken Thompson and Dennis Ritchie of AT&T Bell Labs began developing UNIX. Additionally, UNIX systems include a graphical user interface (GUI) that is comparable to Microsoft Windows and offers a user-friendly environment. For tasks that cannot be performed using graphical software or when a windows interface is not accessible, such as during a telnet session, UNIX knowledge is necessary.

Although they all have certain commonalities, there are numerous UNIX versions. Sun Solaris, GNU/Linux, and MacOS X are among the most widely used UNIX variants.

Check your progress 3

1. Applications designed for client servers may be executed on .

   a. Windows OS
   b. MAC OS
   c. Both of these Operating Systems
   d. None of these

2. PDA stands for,

   a. Individual Digital Assistance;
   b. Digital Assistance for Problems;
   c. Individualized Directory Assistance;
   d. None of These;

1.13 UNIX workstation server Hardware

When client processing requirements are higher, UNIX client workstations are typically used. Clients prefer X-terminals, which are connected through a UNIX presentation server, for some applications that require UNIX. Typically, it is observed that:

- Compared to a typical computer device client, a UNIX client workstation has more working power.

- With the introduction of software from SunSoft, Insignia Solutions, and Locus Computing, it appears that these firms enable DOS and Windows 3.x programme execution work that is available in UNIX window, making UNIX desktop available to user requirements software from both environments.

1.14 Data Storage

It is clear that fixed storage requirements vary by application, coupled with the amount of disc storage needed and certain performance and reliability difficulties. Disk storage devices include things like:

- **Erasable Optical:** When access speed is not crucial and there is a lot of data to store, erasable optical discs are utilised instead of conventional magnetic disc drives.

- **Write once, read many (WORM):** Information that needs to be written to disc just once but read many times is stored on write-once, read-many (WORM) optical drives. Data that shouldn't be updated is commonly archived using this type of storage. Police departments' traffic citations are scanned and saved on WORM drives for future reference about payment or non-payment. The image can't be altered with, thanks to WORM technology. An index into the data on the WORM drive may be kept on a magnetic disc.

- **Compact disk-read only memory (CD-ROM):** Information distributed for read-only usage is stored on optical discs for compact disk-read only memory (CD-ROM). 800MB of data can fit on a single CD-ROM.

- **Optical disk:** With slightly longer access times than conventional magnetic disc storage, optical disc storage technology offers the benefit of high-volume, affordable storage.

- **Tape:** Tape is a fairly common type of inexpensive magnetic storage and is primarily used for backups, despite the fact that disc is the preferred permanent storage medium for most data. These days, digital audiotape is the common backup tape format (DAT). These cassettes offer roughly 1.2 Gigabytes of storage space on a typical cassette tape cartridge. Since tape is a sequential media, direct (random) access to information cannot be supported. Distribution of information by postal tapes can be a cost-effective communications method for vast amounts of information that do not

require real-time transmission or accessibility if an organisation standardises on a single tape format and technology.

- **RAID-Disk Array:** Conventional magnetic disc information is frequently referred to as a single extremely expensive disc. High accessibility and extremely high presentation can both be achieved with a laid-off selection of inexpensive drives. These enable the extension of data files across a number of physical drives so that data can be reflected as a part of the setup. Because multiple corresponding I/O operations can be performed at once, RAID knowledge will result in a noticeable speed gain. RAID technology combined with high capacity caches is used to achieve the best performance. As part of the definition of the architecture, the size will be specified.

- **Mirrored Disk:** When applications promise high reliability, it could make sense to use features that support duplicate discs. Details are automatically recorded on two drives with this feature. This enables the application to continue running even if a disc failure occurs. Both system files and illustration files need to be roughly mirrored. Even though system files are typically read-only, the sheer number of users who are affected by their lack may explain why this is excessive. Activity can advance during acquisition because two reads can be performed simultaneously.

- **Magnetic Tape:** Disk storage uses the SCSI-2 standard controller interface; it exhibits the best performance in a standards-based environment; it is provided by vendors with good disc devices for controller capacity, performance, and dependability. The performance of using high-capacity cache storage will grow quickly. Modern SCSI-2 controllers with customizable 266K cache are a crucial part of the architecture and support discs with typical 3.6-inch dimensions and 1.0-1.6Gbyte capacities. We can observe that the capacity will double when compression software is in use. If GUI software gets bigger, more high-capacity discs will be needed for multimedia applications in 1994 and beyond.

1.15 Network Interface Cards

Processors on the client and server are linked to the LAN by NICs. These offer the actual wire connectivity as well as protocol functionality for message sending and receiving. Token Ring, Ethernet, FDDI are the most widely used network protocol today.

1.16 Power protection Device

Computer hardware and software have been extensively discussed in books, magazines, and journals; many computer specialised companies are committed to assisting you in resolving difficulties that are particularly important to your company goals.

Check your progress 4

1. What exactly is a NIC?

    e.   These devices are magnetic disc drives;

    f.   NICs are used to connect clients and servers to a local area network;

    g.   This device is an optical drive.

    h.   All of the above

1.17 Let Us Sum Up

Using external technologies, the Index Group for Computer-Aided Software Development displays software execution with relevant top IT authorities, as we have learned in this unit. In this, we observe that execution methodologies used by CASE tools specify system requirements with high levels of initial user integration after having effectively clarified analysis phase faults.

A methodology serves as a description of a methodical procedure for using technology to accomplish corporate goals. Many stakeholders contribute positively to a project's performance, which is evident given how important it is to integrate effective project management with reporting mechanisms.

The concept of architecture during design implies that an application's architecture will use a variety of technological platforms. You should first assess the necessity of priorities and the requirement for them before selecting application architecture. After designing an organisation, a single step that specifies how to use specific tools is included in an application together with the technical structure and necessary tools.

1.18 Answers for Check Your Progress

Check your progress 1:

Answers: (1-d), (2-a)

Check your progress 2:

Answers: (1-d)

Check your progress 3:

Answers: (1-c), (2-a)

Check your progress 4:

Answers: (1-b)

1.19 Glossary

1. **NICs (Network Interface Cards)**: A dedicated, permanent connection to a network is provided by a NIC for a computer. It puts into practise the physical layer hardware required for interacting with a data link layer standard, like Ethernet or Wi-Fi. Each card serves as a device and has the ability to prepare, transmit, and manage data flow on the network.

2. **CASE tools**: Computer-aided software engineering is known as CASE. Database development can be supported by CASE tools.

3. **Client-server programmes**: A client programme that uses server programme services is what makes up a client/server application. By contacting the functions in the server application, the client asks the server for services.

4. **UNIX**: UNIX is a multi-user operating system that enables several users to concurrently access the resources of a machine. It was initially intended to be a time-sharing system that could service multiple users at once.

1.20 Assignments

Describe the goals of efficient project management.

1.21 Activities

Learn about the environment for system development.

1.22 Case Study

Study about the procurement of Hardware/Network.

1.23 Further Readings

- Scacchi, W., "Understanding Software Productivity", Advances in Software Engineering and Knowledge Engineering, 1995.
- Boehm, B.W., "Improving Software Productivity", Computer, 20(8), 43-58, 1987.
- Bailey, J. and V. Basili, "A Meta-Model for Software Development Resource Expenditures", Proc. 5th. Intern. Conf. Soft. Computer Society, (1981).
- Boehm, B. and R.W. Wolverton, "Software Cost Modelling: Some Lessons Learned", J. Systems and Software 1(1980).

UNIT 2: SYSTEM DEVELOPMENT OF CLIENT/SERVER

Unit Structure

2.0 Learning Objectives

After learning this unit, you will get detailed understanding about:

- Concept of Input Output devices

- Understand Architecture of Bus

- Detailed stages of dynamic memory allocation controlled I/O

- Understand Bus Architecture

- Detailed aspects of dynamic memory allocationcontrolled I/O

- Basic of Input Output Program

- Concept of DMA Channels

2.1 Introduction

Desktop client conversions are rapidly approaching. Top firms gain a variety of client categories over a period of time. The "heavy-set client" gains control over its programme logic as well as data stored on its own hard disc. The server provides the majority of the running software to the "narrow client." Gartner has invented the term "ultralite" to describe Web clients that lack procedure logic or data. Ultralite clients do not become impotent. They archive significant, graphical facilities that run from a distant server.

The ultralite customer continues to beg because of its administration's comfort. Applications and data are efficiently recognised in a central location. Furthermore, this methodology consumes massive amounts of bandwidth. LAN-connected consumers will embrace quicker topologies as well as speedier gear. Remote offices with ultralite clients will no longer be able to communicate over 56Kb connections.

The movement of copies, graphics data, and programme code is already causing delays on T1 lines. Acceptable activity necessitates regular quicker communication means, as well as higher expenses.At the competitor end, the heavy-set client archetype exhibits many issues. The replication and synchronisation of data amongst thousands of workstations is a critical issue. This issue is exacerbated by replicating to dial-in mobile customers.

Many organisations are increasingly using thin clients as a middle ground.The client runs the applications, and the data is stored on a remote server. Individual software licences are required for both thin and obese customers. Neither can use software metering from an application server. We can create any client/server applications in few seconds by following these steps:

- Create Visual Studio Projects
- Add NetworkComms.Net DLL To Projects
- Copy & Paste Client Source Code
- Copy & Paste Server Source Code
- Run Your Client Server Application

2.2 Facilities and Maintenance

In the past, computer users had a different outlook. Previously, a condition following an hour of operation on a worksheet would cause the system to be paused, where power would fail and a virus would reboot the machine, leaving people frustrated but not surprised.

Similarly, companies have enthused more than single-user PC requests, which furthermore squeeze networking where users in the past have been more broad-minded of fewer precise principles. For example, projects that handle a distributed set of connections of PCs and servers will cost 10 to 30 percent more than projects that handle minicomputers and mainframes. According to other studies, the prices are double.This advanced cost occurs when LANs develop and applications are assembled without an architectural perspective and proper standards to support the design.As client/server computing becomes more prevalent, the demand for mainframe-like performance from client/server systems grows. Condition firms are shifting the corporation's operations into the client/server world, mainframe expectations will succeed, in addition to mainframe support that should be supplied.

Modern understanding of remotely managed LAN applications demonstrates that expenses are comparable to or less than costs for traditional mainframe systems. Successful remote management necessitates systems and application architectures that anticipate the need for sequestered management.

2.3 System Management

As with many things in life, doing things correctly the first time ensures the long-term success of the client/server programme. As a result, it is critical to ensure that client/server hardware is specific as well as assembled in accordance with required organisational standards, which can be checked prior to the start.

As shown, the software is initially loaded by experienced personnel and checked to verify that it is deployed in accordance with standards and work expectations. Many user difficulties are reported as a result of incorrect installation, as well as equipment that seems out of order during installation. Many LAN administration headaches are avoided by using the proper structure, which is handled by skilled installers.

Check Your Progress 1:

1. Which of the following is NOT a component of system administration?

    a. client/server hardware is built in accordance with organisational requirements.

b. Software is installed in accordance with standards and job expectations.

c. Software is tested according to standards by experienced personnel

d. All of these

2.4 Uptime or Availability

Uptime is another term for availability, which refers to the capacity of a system to process information and carries out the tasks that have been assigned to it whenever they are requested to do so. With the technology available today, data centres housing minicomputers and mainframes need to provide availability of at least 99.8 percent. A mix of technical and procedural actions is carried out in order to reach this degree of availability. The majority of availability failures that occur nowadays are the result of human mistake. Data centres adopt stringent protocols to manage change in an effort to reduce this impact.

Regardless of whether the change is to the hardware, the network, the system, or the application software, tight protocols are specified and followed to in order to request the change, verify it, test it, and execute it. It is necessary to develop and test back out processes in order to guarantee that the data centre will be able to revert to its former state in the event that an issue arises after the modification has been implemented.

In order to ensure that the failure of a single component will not bring the entire data centre to a halt, redundant processors and magnetic disc devices, as well as separate electrical power sources, backup diesel generator and battery power sources, are some of the technological features that are used. Fault-tolerant processors from manufacturers like Tandem and Stratus are used in very important computer systems to guarantee that availability is as close to one hundred percent as it can get.

Professionals with a high level of expertise are stationed at the core of a data centre. After any kind of malfunction, it is anticipated that they would be able to swiftly restore the website. Service contracts with vendors are used to provide a level of assurance that the required repairs can be carried out in one, four, or eight hours, as the case may be.

The proper amount of availability that the business requirement requires must be provided by client/server applications, which must be capable of doing so. There are certain characteristics that are reasonably simple to implement, such as having several power supply and a battery backup. Large cities often provide the opportunity to acquire vendor service-

level agreements, which guarantee that breakdowns may be fixed in a timely manner. If the needed service levels cannot be given due of the travel time, repair by replacement will need to be done in smaller cities.

It is not always physically practicable, and it is almost never fiscally practical, to provide highly skilled technical employees at each location. Only via the use of remote LAN administration is it possible to make efficient use of limited resources. For remote administration to be possible there must be a central location with WAN services connecting it to each LAN. Reasonability levels are used to characterise the various service levels associated with network management. Because of this, it is possible to conduct comparative investigations on the performance of specific devices, as well as the availability of server magnetic disc space.

Products like Open vison, Sun Connect, HP Open view, and IBM's Net View and System View may be combined with industry-standard network management protocols to give the degree of availability that is needed at a cost that is realistic. The Open Source Foundation (OSF) has established a Distributed Management Environment (DME) standard for the purpose of managing its Distributed Computing Environments (DCE) standard. This standard is gradually becoming the definition of an object technology-based management platform. Even though this technology is not as established as the DCE standard, experienced solutions from integrators are proving that network operations centres can effectively handle distant systems.

Check your progress: 2

1. Within the framework of client-server technology, what is accurate to say regarding availability?

  a. Availability, also known as system uptime or the capability of the system to be available for the distribution of information.
  b. Client/server applications should be able to provide the appropriate amount of accessibility that is required by business requirements.
  c. Both a and b
  d. None of these possibilities

2.5 Serviceability

The majority of operating systems and hardware for minicomputers and mainframes feature diagnostic services that can locate the specific site of faults. Errors that only occur temporarily are logged so that preventative maintenance may address any issues before they have an impact on availability. Because the equipment is located in a central area, it is possible for skilled specialists to do regular preventative maintenance programmes. Because of this, the glass room is where many companies deploy their initial servers until they have more expertise with remote LAN administration.

Products that are based on standard protocols, such as the Simple Network Management Protocol (SNMP), are able to offer the essential feedback of event notifications in order to enable the remote systems management function. It is essential that the design of the architecture take into consideration the concerns about the standards and goods in order for it to be useful.

Check your progress: 3

1. With regard to Serviceability, which of the following statements is more accurate?

    a.   Hardware displays diagnostic services, which locate where faults are occurring in the system.

    b.   It is common knowledge that mistakes are only temporary

    c.   The ability to bring up problems and discover their answers

    d.   All of the above

2.6 Distribution of Software

The local minicomputer and mainframe environments both contribute to executable software beginning with its own library. Individual location changes allow for software preservation and development. Working software remains in place on servers distributed throughout an enterprise in scattered client/server representation. Changes to the system with application software necessitate replication throughout the company, resulting in a fantastic complexity in application serviceability.

When a variety of distinct hardware platforms are used in a UNIX environment, additional complications arise. Despite the fact that the software's foundation level is well-matched from

corner to corner with many platforms, the working binary form of software is not well-matched.

It has been observed that working libraries are built on machines with similar physical hardware, which causes major issues with software transmission across networks of disparate computer stages. It should be emphasised that testing can be performed at any time before modifications are posted.Many organisations solve specific demands by simply installing any hardware platforms from the field in a central support site.

There are certain requirements that deal with distributed technologies. The benefit of a personal computer is that it can be easily altered, which is a disadvantage in manufacturing environments. Out-of-the-way support personnel should be able to locate remote technology hardware and software configuration. As a result, they will know which software versions to post and provide knowledgeable support for problems.

Check your progress: 4

1. The result of crystallisation is the instrument made of crystals in order:

    i.   Microsoft
    j.   BBN
    k.   IBM
    l.   None of the above

2. Which of the following is a tool that is used for managing networks?

    e.   Open Vision,
    f.   Net View,
    g.   UNMA,
    h.   All of the above

2.7 Problems related to Performance Network Management

It has been discovered that a core minicomputer and mainframe environment with skilled technical support employees as well as working staff will take care of the presentation on an unfinished basis. IBM, in collaboration with Digital Equipment Corporation, has characteristics in massive computer operating systems that demonstrate the essential energy modification skills. If the inclination to explain presentation humiliating, system

administrators can add hardware or make changes to improve performance sooner than it has an effect on user neighbourhood.

It has been discovered that within a client/server system, neither UNIX, Windows NT, nor OS/2 have such straightforward performance catering tools. Many tools, such as Network General's Sniffer, are available to handle LAN traffic independently. UNIX, Windows NT, and OS/2 will exhibit limited characteristics, which explain work preference. Certain retailers market products to meet such requirements.

Fortunately, the cost of hardware for client workstations or Windows NT, OS/2, and UNIX servers remains stable while adding extra capacity to improve performance, which is generally not the primary cost consideration for a client/server system.

2.8 Case Study: National Systems utilizes Web MAP to modernize critical call centre application

Business Situation

Call centre agents work from a variety of remote locations, including their homes, making installation and upkeep of a VB6-based desktop application time-consuming and costly. NSC desired a software-as-a-service solution. Mobilize the solution. Net used Web MAP to transform 78k lines of VB6 code to HTML5, preserving the application's appearance and feel to avoid employee misunderstanding.

Benefits

- Significant time and money savings from converting legacy VB6 applications to HTML5
- Same UX as VB applications, therefore no agent retraining was necessary
- Allowing in-house developers to focus on higher-value projects.

Customer Profile

National Systems Corp operates call centres and offers online ordering for Pizza Hut and other quick-service restaurants. Hundreds of thousands of orders are processed each night, with peak rates exceeding 20 orders per second.

National Systems Corporation is a market leader in quick-service food call centre and online ordering support. NSC is used by Pizza Hut to process hundreds of thousands of pizza orders

per day, with peak occasions such as Super Bowl Sunday and Halloween driving order rates to 20 orders per second or higher. NSC agents operate from call centres all across the world as well as from home. When a customer contacts Pizza Hut to place an order, the call is routed to an accessible agent, who then produces the detailed order, which is subsequently transmitted via satellite to the local Pizza Hut's POS system. Pizza Hut requires NSC to maintain five 9s of dependability, or 99.999 percent up time with no more than five minutes of unscheduled down time each year.

The VB6-based desktop application designed for call centre agents proved difficult to install and support across so many different user platforms. Following an internal analysis of all available solutions, they chose Mobilize.Web MAP Net's (Modernization Accelerator Program) to modernise the 78,000 lines of VB6 code and convert it to HTML5 for simple and flexible web deployment.

Using Web MAP to automatically transform source code can be 4X less expensive than a complete rewrite. Furthermore, new code contains 10-50 errors every 1000 lines of code on average (KLOC). Mobilize.Net, as usual, was able to provide NSC with a fixed-price project with a confirmed delivery date, which they met. NSC agents can now work from any connected device and use the call centre application with minimal or no IT support.

Background

More than 6500 sites are supported. NSC is a global leader in providing cutting-edge computer telephony integration (CTI) systems to contact centres, companies, and small businesses of all kinds. National Systems Corporation, headquartered in Chicago, Illinois, provides comprehensive systems, service, and support to a diverse range of customers ranging from your neighbourhood pizzeria to some of the world's most sophisticated call centres.

In other locations, NSC takes 25 percent to 100 percent of Pizza Hut orders through online and phone centre channels. National Systems' dedication to 99.999 percent availability and dependability is a key business advantage. Pizza Hut has worked with numerous different vendors before settling on the performance and business stability that National Systems has provided them over the past 12 years.

Situation

With a mix of physical and virtual contact centres in several time zones ranging from the Philippines to Alaska and across the United States, NSC discovered that deploying and running a desktop version of their call centre application was difficult and costly. For this application, a browser-based, hosted (SaaS) solution seemed ideal.

Solution

NSC first considered all possibilities before deciding on Mobilize.WebMAP Net's offering to convert their existing code base to modernise their essential TMS application. The project entailed building an exact copy of the old programme in HTML5 so that it could be deployed as a SaaS application and accessed via almost any browser on any device. Mobilize.two Net's decades of experience converting millions of lines of source code to more modern platforms made converting 78,000 lines of VB6 source code on a set pricing, fixed delivery date schedule no problem.NSC offers their own application hosting solutions to prevent reliance on third-party service providers. The end result was a more efficient, simply deployed call centre solution that requires no re-training of existing agents and is re-tooled to accommodate future requirements.

2.9 Let Us Sum Up

While studying this unit, we discovered that computer users previously had a different vision where condition per hour on worksheet causes the system to suspend where power fails and virus causes the system to restart. It is well understood that availability refers to the ability of a system to access information and accept tasks at any moment it is requested.

Working software remains in place on servers distributed throughout an enterprise in scattered client/server representation. Changes to the system with application software necessitate replication throughout the company, resulting in a fantastic complexity in application serviceability.

2.8 Answers for Check Your Progress

Check your progress 1:

Answers: (1-d)

Check your progress 2:

Answers: (1-c)

Check your progress 3:

Answers: (1-d)

Check your progress 4:

Answers: (1-b), (2-d)

2.9 Glossary

1. **SaaS:**Software as a service (or SaaS) is a method of delivering software as a service through the Internet. Instead of installing and maintaining software, you simply access it through the Internet, liberating yourself from the complexities of software and device maintenance.

2. **IBM:**International Business Machine Corporation is an American global technology corporation headquartered in Armonk, New York, with operations in over 171 countries.

2.10 Assignment

Write a short note onProblems related to Performance Network Management?

2.11 Activities

Gather information about the Obtainability.

2.12 Case Study

Generalise the management of the system.

2.13 Further Readings

- Boehm, B.W., "Improving Software Productivity", Computer, 20(8), 43-58, 1987.

UNIT 3: INTERFACE OF SOCKET

Unit Structure

3.0 Learning Objectives

After learning this unit, you will get detailed understanding about:

- The fundamentals of networking, including the ISO stack, as it relates to TCP/IP inside the C# framework by using its core socket classes.
- How programmes may be conceptually and physically deployed throughout a network environment.
- The purpose of this unit is to provide readers with an in-depth look at the.NET basic classes
- How they may be used to access networks and the internet as a client utilising several types of network protocols, like HTTP, TCP, and UDP.
- How to change an IP address and do a DNS query in order to set up a socket connection between the client and the server.
- Analysis of the structure of sockets and investigate the process of developing client and server software to establish a connection between two sockets.

3.1 Introduction

The interaction between clients and servers often takes place via the usage of sockets. In a typical arrangement of the system, the server is located on one computer while the clients are located on separate workstations. The clients establish a connection to the server, during which time they swap pieces of information, and then they disconnect. A socket has a consistent pattern of events that occur.

In computer networks, sockets are the components that are responsible for establishing connections between two or more computers as well as for the transfer of data from one computer to another. Each individual computer that is part of the network is referred to as a node. The IP addresses of the nodes and a network protocol are used by sockets in order to establish a safe channel of communication and then use this channel to transmit data.

3.2 Internet Networking Protocol

A networking protocol is a standardised set of rules that decides how different systems will connect with one another across different networks. In spite of their differences, two computer systems are able to interact with one another and comprehend one other provided they employ the same protocols. When it comes to the creation of communication protocols

for networks, the OSI reference model gives vendors, engineers, and others with vital rules to follow. Within the context of a packet-switched network, the Internet Protocol (IP) acts as an intermediary that makes it easier for client and server applications to send and receive data with one another.

In a network that uses packet switching, the data that moves down the various paths of the network is broken up into discrete, routable units that are referred to as packets. If a communication link between two places on a network suddenly fails, the packets may still be sent to where they are going as long as there is another connection between the two sites on the network. The protocols that make up the internet are organised into a tiered protocol stack, which consists of the application, presentation, network, transport, Data Link Layer, and physical layers. This stack works together to make the internet function. Each successive layer in the protocol stack is responsible for providing a certain set of services to the layer on top of it.
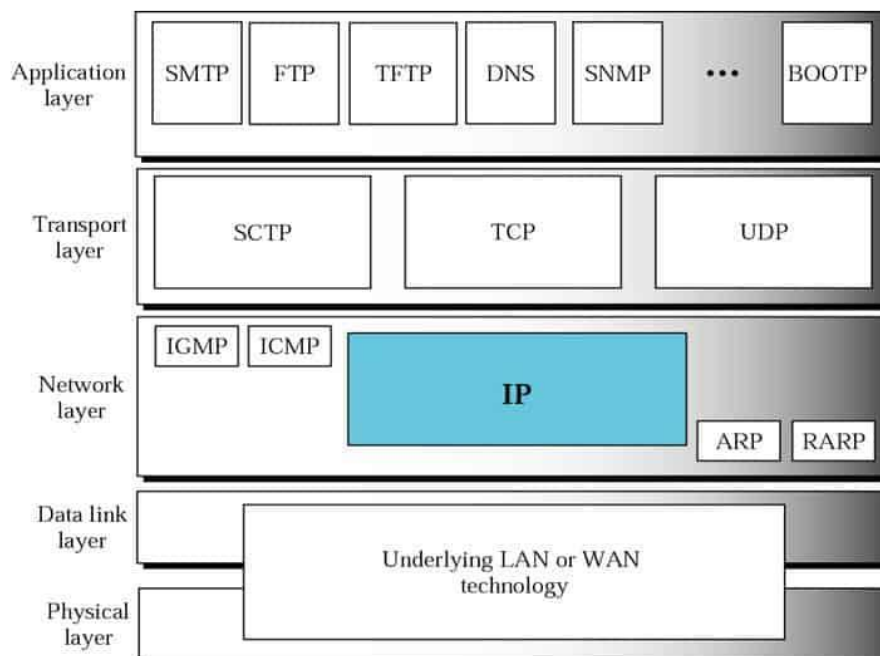
Fig. 3.1 Networking Protocols

The transmission of data from one process to another is the responsibility of the transport layer. A piece of a message that is sent from one operation to another in the form of a packet is referred to as "packetizing."Within the framework of a client-server relationship paradigm, two processes interact with one another. A process on the local host, known as a client, requires services from another process, known as a server, which is often running on a distant host.

3.3Addressing

An address is required if we need to deliver anything to a single location out of a number of possible destinations. A MAC address is required at the Data Link Layer, while a 32-bit IP address is required at the Network Layer (choose from A, B, C, D and E class). A datagram in the Network Layer needs a destination IP address in order for it to be delivered, and it also needs a source IP address in order for it to get a reply from the destination.

To choose one of many processes operating on the destination host, we require a transport layer address, also known as a port number. This number is provided by the operating system of the destination host. The port numbers in the internet paradigm range from 0 to 65535 and are selected at random by the software for the transport layer that is operating on the client host. These port numbers may be found on the internet. Ephemeral ports are another name for them (range from 1024 to 49151). In addition to that, the server process has to declare itself by providing a port number. The ports, on the other hand, can't just be picked at random. The process at the client site that wants to visit that server and utilise its services will not know the port number if the computer at the server site starts a server process and sets a random number as the port number. This is because the port number is assigned by the computer at the server site. Therefore, the internet has come to the conclusion that well-known port numbers, also known as universal port numbers, should be used for servers (range 0 to 1023).

Check Your Progress 1:

1. A networking protocol is a standardised set of:

    a. Computers.

    b. Clients.

    c. Servers.

d.Rules.

3.4The Structure of a Socket

Both TCP and UDP are examples of transport protocols, which are essentially protocols that allow programmes to send data over a network. Both of them make use of ports in order to keep track of several talks that are happening at the same time and to connect with higher OSI levels. The ports are equipped with a device that may determine how other computers access the services. Along with the source and destination IP addresses, a TCP or UDP communication's source port and destination port are included in its header information. This information is included when the message is generated. The result of this is a socket.

In the same way as streams do, sockets each represent one end of a connection that runs between two different end points on the network. WinSock32 is an implementation of sockets that is included with Windows. System.Net sits atop WinSock32 as the most important component. Socket APIs. Because the library may be used to both reply to an already established network connection as well as initiate a new network conversation, it is ideal for usage in client-server applications. They are often implemented in labor-intensive server applications like web servers, for example. The many implementations of sockets found in System.Net. This operation is used to create a new socket end point, which allocates operating system resources that can subsequently be utilised to carry out incoming and outgoing communication. Socket this is the operation that is used to create a new socket end point.The following components are able to be used to define the socket namespace:

- **Bind**: In order to establish a local name, servers are required to bind a socket to a certain address. A bind allows the socket to receive messages off of it and transmit its own in addition to enabling external communication to connect to and send messages via new end points.
- **Listen**: The socket notifies the operating system of its desire to participate in message queues by performing an optional listen action, in which the message queues ingest incoming requests for further processing. This demonstrates the socket's interest in participating in the message queues.
  When a socket accepts an incoming request, it creates a new socket that the client may use to read from and write to. This new socket allows the socket to continue communicating with the client.Connect is a method that is used in order to establish a connection to a server-side network end point. After the request has been received and

processed by the target end point, the socket may be used to read data from and write data to the socket.

- **Send**: after a socket is linked to an end point, sending data will launch a message that the other point will be able to receive once some time has passed.

- **Receive**: Once an end point to which a socket is connected transmits data, a socket may consume that data by receiving it after the end point has finished sending the data.

- **Close**: a connection's session is considered complete after a socket has been closed, which frees up all of the resources that the socket was using to hold the connection's data.

Whenever a socket is formed, it will often fall into one of two categories: server-side sockets or client-side sockets. It is typical practise for the server-side programme whose job it is to handle network requests to remain seated inside a loop as it swiftly consumes and sends out the requests. The fundamental pattern consists of creating, binding, listening to, and accepting requests until the application is terminated. Take, for example, a web server like IIS or Apache, which is responsible for managing incoming requests and handling them accordingly. The client-side socket is responsible for communicating with the many end points that are already present on the network. In addition to transmitting and receiving data, the only activity that must be performed is connecting to the server.

Check your progress: 2

1. A bind component allows the socket to

   a. Participate in message queues by performing an optional listen action.
   b. Receive messages off of it and transmit its own in addition to enabling external communication to connect
   c. Close the connection session
   d. None of these possibilities

3.5 Classes of Utility for Networking

System.Net and System.Net.Sockets are the two namespaces that are of the utmost importance when it comes to networking. In general, System.Net is concerned with higher-level activities such as downloading and uploading a file and performing web requests using HTTP and other protocols. On the other hand, System.Net.Sockets offers classes that may be used to do lower-level actions.

- **IPAddress Class:** An Internet Protocol address, often known as an IP address, is a number with either 32 bits or 128 bits that is used to identify a particular machine on a network. An Internet address, which is used by IP, and a port number, which is the extra address that is interpreted by the transport protocol, are the two pieces of information that are utilised by TCP/IP in order to identify a particular application (TCP or UDP). An Internet Protocol address is symbolised by the IPAddress class. The IPAddress class is where the IP addresses abstraction is encapsulated in the.NET framework. This class may either parse a string containing the dotted-quad representation of an IP address by using its Parse () method or it can accept as an argument a long integer that represents an IP address. For example:

  IPAddress ipa = IPAddress.Parse("192.168.1.10");
  Console.WriteLine("IP address is="+ipa.ToString());

  In addition, the IPAddress class has a number of permanent static attributes that, when used together, might provide a unique address. One example of this kind of address is the computer's loopback address.

  Console.WriteLine("IP address is=" + IPAddress.Loopback.ToString());
  Console.WriteLine("Broadcast address is=" + IPAddress.Broadcast.ToString());

- **Dns Class:** In order to retrieve an IP address, the DNS class is able to connect with the DNS server that is set as the default. The IPHostEntry class is utilised in this situation to acquire information about the host, and the two static methods Resolve () and GetHostByAddress() are called upon to do so.

- **IPHostEntry Class:** The information that is pertinent to a particular host computer is encapsulated inside the IPHostEntry class. The IPAddress class, the IPHostEntry class, and the Dns class are all used here to demonstrate how the SocketPro class works. The programme takes a list of names or IP addresses as command-line parameters and prints the name and an IP address of the local host, followed by the names and IP addresses of the hosts specified on the command line. Finally, the programme prints the names and IP addresses of any remote hosts that were specified.

```
using System;
using System.Net;
usingSystem.Net.Sockets;
namespaceSocketPro
{
class Program
   {
static void GetHostInfo(string host)
     {
try
        {
           // Attempt to resolve DNS for given host or address
IPHostEntryhostInfo = Dns.GetHostEntry(host);

           // Display host name
Console.WriteLine("\tHost Name: " + hostInfo.HostName);

           // Display list of IP addresses for this host
Console.Write("\tIP Addresses: ");
foreach (IPAddress ipaddr in hostInfo.AddressList)
          {
Console.Write(ipaddr.ToString() + " ");
          }
Console.WriteLine();
        }
catch (Exception)
```

```
                {
        Console.WriteLine("\tUnable to resolve host: " + host + "\n");

                }
            }
        static void Main(string[] args)
            {
        foreach (String arg in args)
                {
        Console.WriteLine("\nTesting for="+arg);
        GetHostInfo(arg);
                }
        Console.ReadKey();
                }
            }
        }
```

The following is an example of what the output might look like if you opened the application executable at the command line after building this programme and provided necessary inputs like the host name or the IP address.

Check your progress: 3

1. System.Net.Socketsdoesn't offer:

    a.   TCPclass

    b.   DNS class

    c.   IPHostEntry class

    d.   IPAddress class

3.6 Transmission Control Protocol (TCP)

The Transmission Control Protocol (TCP) classes are what allow a connection to be established and data to be sent between two socket endpoints (an IP address and a port). TCP provides the TcpClient and TcpListener classes, which may be used to create a socket connection on well-known ports like 80, 443 and 21. The TcpClient class makes it possible to create and utilise a TCP connection, while the Start() function of the TcpListener class makes it possible to listen for a TCP connection request that is sent from the client. You may return

a socket for communication with the remote computer by making use of the AcceptSocket() function whenever a connection request is received.

You will need to construct two apps in order to illustrate the functionality of these classes. In the first application, we will implement the feature of transmitting a file by establishing a socket connection on a certain port, and in the second application, we will wait for that connection in order to receive the file.

- **Application of TcpSend**

In the next example, we will demonstrate how to establish a socket connection on port 2112 in order to transmit a file that has been uploaded from the localhost to the remote server. Through the use of a host name and a port number, the TcpClient is created in this example. You open the source code file when you have successfully retrieved an instance of the NetworkStream class, and then you start reading bytes.

```
using System;

using System.Net;

usingSystem.Net.Sockets;

using System.IO;

usingSystem.Text;

usingSystem.Windows.Forms;

namespaceTcpAction

{

public partial class tcpSend : Form

    {

publictcpSend()

        {

InitializeComponent();
```

```csharp
    }
private void btnSend_Click(object sender, EventArgs e)

    {
stringHostName = txtHost.Text;

intprt = Int32.Parse(txtPort.Text);

TcpClienttc = new TcpClient(HostName,prt);

NetworkStream ns = tc.GetStream();

FileStream fs = File.Open(txtFile.Text, FileMode.Open);

int data = fs.ReadByte();

while (data != -1)

        {
ns.WriteByte((byte)data);

data = fs.ReadByte();

        }
fs.Close();

ns.Close();

tc.Close();

    }
private void btnOpen_Click(object sender, EventArgs e)

    {
OpenFileDialogofd = new OpenFileDialog();

ofd.ShowDialog();

stringstr = ofd.FileName;
```

txtFile.Text = str.ToString();

```
    }

  }

}
```

- **Application of TcpReceive**

After the completion of the transmission on one end of the connection, the file that was successfully received is shown by the Tcp Receive programme on the other end of the connection. In this step, you will open a new stream for reading by making use of the TcpClient object that was returned by the AcceptTcpClient() function. In order to transform incoming data from the network into a string format, we are developing a StreamReader class.

```
using System;

using System.IO;

using System.Net;

usingSystem.Net.Sockets;

usingSystem.Threading;

usingSystem.Windows.Forms;

namespacetcpReceive

{

public partial class Form1 : Form

  {

public delegate void testDelegate(string str);

public Form1()

    {
```

```csharp
InitializeComponent();

        Thread t = new Thread(new ThreadStart(ListenData));

t.Start();

    }

public void test(string str)

    {

txtData.Text = str;

    }

public void ListenData()

    {

        IPAddress ipad = IPAddress.Parse("127.0.0.1");

        Int32 prt = 2112;

TcpListenertl = new TcpListener(ipad, prt);

tl.Start();

TcpClienttc = tl.AcceptTcpClient();

NetworkStream ns = tc.GetStream();

StreamReadersr = new StreamReader(ns);

string result = sr.ReadToEnd();

Invoke(new testDelegate(test), new object[] { result });

tc.Close();

tl.Stop();

    }

  }
```

}

After you have successfully compiled both files, you should first run the Tcp Receive application to put it into listen mode so that it can receive the file. Next, you should run the Tcp Send Data application and later specify the host name as 127.0.0.1 (localhost), the port (2111), and upload a file before hitting the Send Data button.
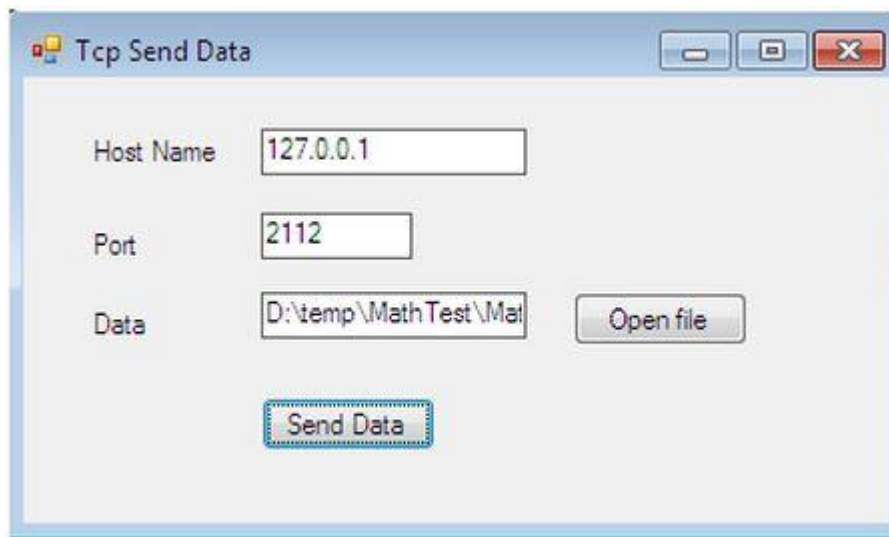
Fig. 3.2 Sending Data

When we upload a file and transfer it over the network, this file is received by the Tcp Receive programme, which then displays the contents of the file into a TextBox in the following format:
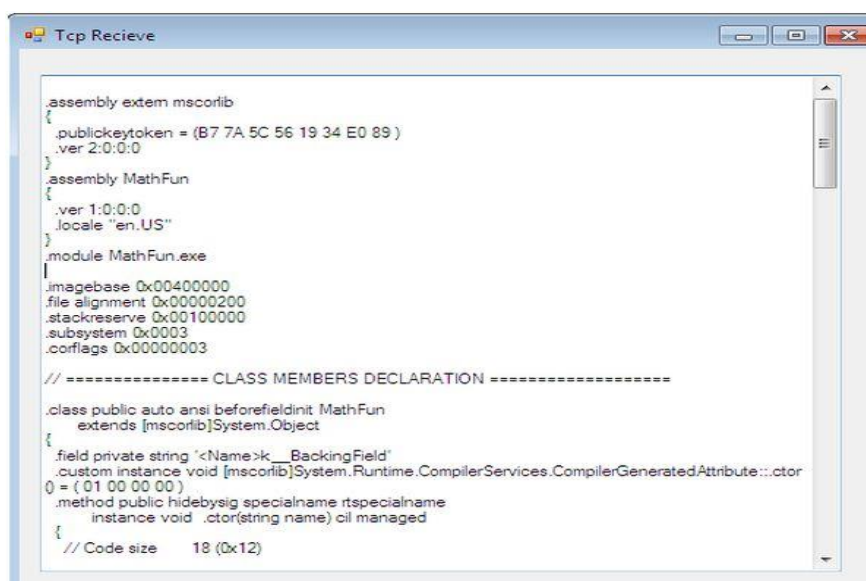
Fig. 3.3 Receiving Data

Check your progress: 4

1. TCP provides the _____ classes, which may be used to create a socket connection on well-known ports.

    a. TCPSender

    b. TCPClient

    c. TCPReceiver

    d. TCPAll

2. In order to transform incoming data from the network into a string format, we are developing a

    a. StreamCaller class

    b. StreamReader class

    c. StreamWriter class

    d. None of these

3.7 Sockets in Brief

Prior to delving into the specifics of the.NET socket classes, it is imperative that we first provide a high-level overview of sockets on Microsoft Windows and a short history of their development. The Berkeley Software Distribution (BSD) of UNIX was the first to have its own dedicated socket built. A version of sockets for Microsoft Windows called WinSock 1.1 was initially released in 1992, and it is currently on version 2.0; In order to allow access to the underlying sockets interface, Microsoft implemented a.NET Socket class, which is a wrapper around the WinSock socket functions and has most of the versatility (and complexity) of sockets interface exposed. WinSock 1.1 was the first version of sockets for Microsoft Windows to be released. After that, the.NET Socket wrapper class was used to implement three higher-level socket classes called TcpClient, TpListener, and UdpClient.
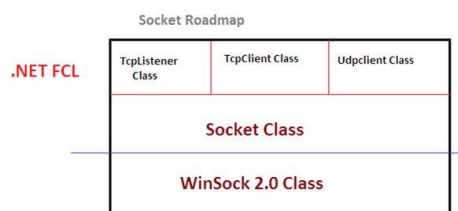
Fig. 3.4 Socket Classes of .Net

3.8 TCP Socket Server

The role of the server is to provide an endpoint for clients to connect to and then to wait passively for connections to come in. The standard procedure for a TCP server begins with the construction of a TcpListener instance, followed by the provision of the local address and port, and finally the invocation of the Start() function. This socket will first use the AcceptTcpClient() method of the TcpListener class to obtain the next incoming client connection once it has finished listening for connections on the port that has been set. Calling AcceptTcpClient() results in the creation of a new instance of TcpClient for the newly established connection, which is then returned by the function. This happens whenever a new client connection is established. After that, communication with the client is carried out using the Read() and Write() methods of the NetworkStream class, and ultimately, the client socket connection and stream are terminated utilising the Close() methods of both the NetworkStream class and the TcpClient class.

```
using System;

using System.Net;

usingSystem.Net.Sockets;

using System.IO;

usingSystem.Text;

namespaceTCPserver

{

class Program

   {

privateconst int BUFSIZE = 32;

static void Main(string[] args)

     {

if (args.Length> 1) // Test for correct of args
```

```csharp
throw new ArgumentException("Parameters: [<Port>]");

intservPort = (args.Length == 1) ? Int32.Parse(args[0]) : 7;

TcpListener listener = null;

try
    {
        // Create a TCPListener to accept client connections

listener = new TcpListener(IPAddress.Any, servPort);

listener.Start();
    }
catch (SocketException se)
    {
Console.WriteLine(se.Message);

Environment.Exit(se.ErrorCode);
    }
byte[] rcvBuffer = new byte[BUFSIZE]; // Receive buffer

intbytesRcvd; // Received byte count

for (; ; )
{ // Run forever, accepting and servicing connections

TcpClient client = null;

NetworkStream ns = null;

try
        {
client = listener.AcceptTcpClient(); // Get client connection
```

```csharp
ns = client.GetStream();

Console.Write("Handling client - ");

            // Receive until client closes connection

inttotalBytesEchoed = 0;

while ((bytesRcvd = ns.Read(rcvBuffer, 0, rcvBuffer.Length)) > 0)

        {

ns.Write(rcvBuffer, 0, bytesRcvd);

totalBytesEchoed += bytesRcvd;

            }

Console.WriteLine("echoed {0} bytes.", totalBytesEchoed);

ns.Close();

client.Close();

            }

catch (Exception e)

        {

Console.WriteLine(e.Message);

ns.Close();

        }

    }

  }

}
```

Compile this programme and then open a command prompt after you're done. Here, enter the name of the programme together with a port number such as 20 (the default port number is 7, if you don't mention any port at all) on which you wish to establish communication, as seen below:
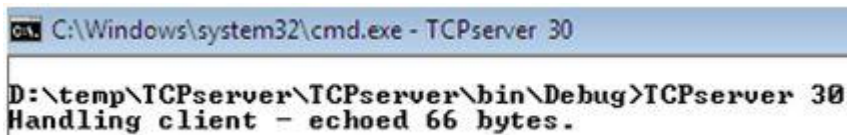
```
D:\temp\TCPserver\TCPserver\bin\Debug>TCPserver 20
```

Fig. 3.5 Compilation of application through command prompt

Using telnet to connect to a specific port on the server, such as port 30, will allow you to determine whether or not the standard echo server is operational:

Telnet 127.0.0.1 30

After entering some data, you will be able to log out the Telnet terminal. In the event that the server is successful in establishing a socket connection on port 30, the server will react by displaying the character bytes in the following format:

```
C:\Windows\system32\cmd.exe - TCPserver 30

D:\temp\TCPserver\TCPserver\bin\Debug>TCPserver 30
Handling client - echoed 66 bytes.
```

Fig. 3.6 Server in mode of listening

3.9 TCP Client Socket

The communication between a TCP client and a server that is waiting to be connected passively is started by the client. The client on a TCP connection will normally go through all three processes. In the beginning, a TcpClient object has to be constructed. You have the option of creating an implicit TCP connection in the function Object() { [native code] } by providing the remote host and port, or creating an explicit TCP connection by using the Connect() function. Second, communicate by utilising the stream that the socket provides. A NetworkStream is stored inside of a connected instance of TcpClient, and this stream may be utilised just like any other.NET I/O stream. In the end, you should terminate the connection by using the Close() function of the TcpClient class.

```csharp
using System;

using System.IO;

using System.Net;

usingSystem.Net.Sockets;

usingSystem.Text;

namespaceTCPclient

{

class Program

    {

static void Main(string[] args)

        {

if ((args.Length< 2) || (args.Length> 3))

            {

throw new ArgumentException("Parameters: <Server><Word> [<Port>]");

            }

        String server = args[0]; // Server name or IP address

        // Convert input String to bytes

byte[] byteBuffer = Encoding.ASCII.GetBytes(args[1]);

        // Use port argument if supplied, otherwise default to 7

intservPort = (args.Length == 3) ? Int32.Parse(args[2]) : 7;

TcpClient client = null;

NetworkStream ns = null;

try
```

```csharp
{
    // Create socket that is connected to server on specified port

    client = new TcpClient(server, servPort);

    Console.WriteLine("Connected to server......");

    ns = client.GetStream();

        // Send the encoded string to the server

    ns.Write(byteBuffer, 0, byteBuffer.Length);

    Console.WriteLine("Sent {0} bytes to server...", byteBuffer.Length);

    inttotalBytesRcvd = 0; // Total bytes received so far

    intbytesRcvd = 0; // Bytes received in last read

        // Receive the same string back from the server

    while (totalBytesRcvd<byteBuffer.Length)

        {
    if ((bytesRcvd = ns.Read(byteBuffer, totalBytesRcvd,

    byteBuffer.Length - totalBytesRcvd)) == 0)

            {
    Console.WriteLine("Connection closed prematurely.");

    break;

            }
    totalBytesRcvd += bytesRcvd;

        }
    Console.WriteLine("Received {0} bytes from server: {1}", totalBytesRcvd,

    Encoding.ASCII.GetString(byteBuffer, 0, totalBytesRcvd));
```
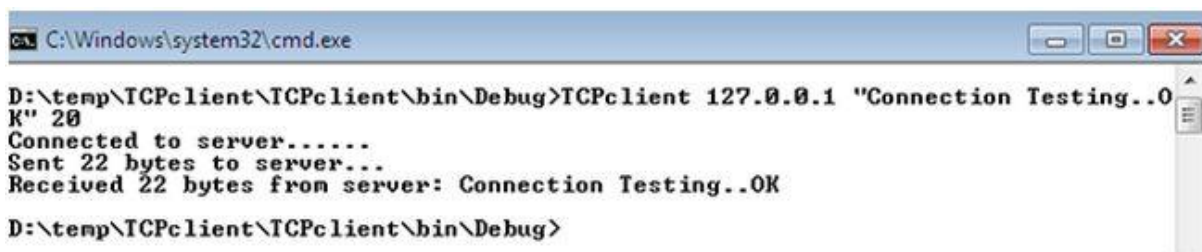
```
        }

catch (Exception e)

    {

Console.WriteLine(e.Message);

    }

finally

    {

ns.Close();

client.Close();

        }

    }

  }

}
```

At this point, all that's left to do is launch TCPclient.exe from the command line and transmit some string data to server 127.0.0.1 over port 20. The following will be repeated as an echo of the output:

```
C:\Windows\system32\cmd.exe

D:\temp\TCPclient\TCPclient\bin\Debug>TCPclient 127.0.0.1 "Connection Testing..O
K" 20
Connected to server......
Sent 22 bytes to server...
Received 22 bytes from server: Connection Testing..OK

D:\temp\TCPclient\TCPclient\bin\Debug>
```

Fig. 3.7 Connecting Sockets

Before beginning to operate the client, it is necessary to make sure that the server is still in the listening mode. As soon as the data starts to flow from the client side, the total amount of bytes that have been input returns instantly as follows:

Fig. 3.8 Server in mode of listening

To confirm that there is communication between the client and server sockets, you may use the Windows netstat command to check whether or not the socket was successfully established on port 20.

Fig. 3.9 Testing of Socket

3.10 Let Us Sum Up

In this article, the process of creating client-server applications via the use of socket programming using the TcpListener and TcpClient classes has been presented. In this section, we have learned how to manage the specifics of establishing a network connection between client and server applications. In addition, we have learned how to transport data between the server and the client so that they may carry out beneficial actions. You have also been exposed to the fundamental.NET basic classes that are included under the System.Net namespace. These classes deal with opening the client connection on the network.

3.11 Answers for Check Your Progress

Check your progress 1:

Answers: (1-d)

Check your progress 2:

Answers: (1-b)

Check your progress 3:

Answers: (1-a)

Check your progress 4:

Answers: (1-b), (2-b)

3.12 Glossary

1. **Socket:**The interaction between clients and servers often takes place via the usage of sockets. In a typical arrangement of the system, the server is located on one computer while the clients are located on separate workstations. The clients establish a connection to the server, during which time they swap pieces of information, and then they disconnect. A socket has a consistent pattern of events that occur.

2. **TCP:**The Transmission Control Protocol (TCP) is the method of communication that is used by the majority of socket connections.

3. **UDP:** In contrast to TCP, which involves the establishment of a connection between the client and the server, the UDP protocol just involves the transmission of datagrams. In a similar manner, the server is not required to accept a connection and instead just waits for incoming datagrams. When a datagram arrives, it contains the sender's address, which the server utilises to ensure that the data is sent to the appropriate client.

3.13 Assignment

Explain the structure of the socket.

3.14 Activities

Study about the different layers used in Transmission Control Protocol.

3.15Further Readings

- David Makofske, Michael Donahoo, Kenneth Calvert, "TCP/IP Sockets in C#", 2004.

Block Summary

You have learned and comprehended the fundamental objectives of successful project management, as well as information on the System Development environment, in this block. The block provides information about the research and concept of System Management, as well as the obtainability and serviceability of software. In terms of hardware configuration, you have been properly explained on the fundamentals of Client/Server System Development.

The module goes over the fundamentals of performance network administration. You have a thorough understanding of the concepts of Distribution of Software and System Development. You will be shown how to use various data storage disc storage devices practically.We have also acquired knowledge about sockets, in which two nodes communicate with one another and one node functions as a listener while the other node works as a client.

Block Assignment

Short Answer Questions

1. What are the features of project management?
2. Describe the environment of system development.
3. What is System Management?
4. Discuss Serviceability.
5. What is TCP?
6. What is Socket?

Long Answer Questions

1. Explain various measures of productivity in detail.
2. Write a note on Obtainability.
3. Write short notes on problems of performance network management.
4. Write a note on the TCP Client Socket and TCP Server Socket.

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Client-Server Architecture and Interface (C#)

BLOCK 3:   SERVER-SIDE TECHNOLOTY WITH ASP.NET-1

UNIT 1

INTRODUCTION TO ASP.NET

UNIT 2

UNDERSTANDING ARCHITECTURE OF ASP.NET

UNIT 3

INFORMATION PASSING AND STATE MANAGEMENT

UNIT 4

INTRODUCTION TO SERVER CONTROLS

BLOCK 3: SERVER-SIDE TECHNOLOGY WITH ASP.NET - 1

Block Introduction

In this block we will discuss about how web technology works. How can we request a page through our browser? How it will be processed by a server? And How we get response from the server?

We are going to learn a technology called ASP.NET, which produced and marketed by Microsoft Corporation. Leaning this technology will empower you to build dynamic and interactive website like Facebook, Amazon or Flipkart.

We will learn what is ASP.NET, its coding model, directory structure, different properties and methods of webpage and so on. Finally, we will see different types of controls available in the ASP.NET and learn how to use some standard controls into our website.

Block Objective

The objective of the block is to aware students, about web-based client-server architecture. Student will learn how to build dynamic and Interactive websites using ASP.NET. After learning this block student will understand, what is the role of Client (Browser) and a Server? Even student can also learn, what is webserver

Main objective of this block is to aware students, about programming in web environment using C#.NET as a programming language. Student will know about coding model of ASP.NET and built-in directory structure of ASP.NET

Finally, the block will clear the concept client-server architecture in web-based environment. They will learn about different web technologies to pass information from one page to another using QueryString, Cookies, and Session

variables. Students will know different types of controls available in the ASP.NET and also learn how program some standard controls.

Block Structure

BLOCK 3:   **SERVER-SIDE TECHNOLOGY WITH ASP.NET-1**

UNIT1   **INTRODUCTION TO ASP.NET**

Objectives, Introduction, ASP and ASP.NET, Execution model of ASP.NET, New Features added to ASP.NET, IIS, Creating new website into Visual Studio, Let Us Sum Up

UNIT2   **UNDERSTANDING ARCHITECTURE OF ASP.NET**

Objectives, Introduction, Coding models, ASP.NET pages, Code-render block, Built-in Directory structure, Let Us Sum Up

UNIT3   **INFORMATION PASSING AND STATE MANAGEMENT**

Objectives, Introduction, Passing information from one page to another, HttpRequest and HttpResponse objects, State management, Global application class, Let us Sum Up

UNIT4   **INTRODUCTION TO SERVER CONTROLS**

Objectives, Introduction, Page object, Page rendering, Introduction to server controls, Standard server controls, Let us Sum Up

UNIT 1 INTRODUCTION ASP.NET

Unit Structure

1.0   LEARNING OBJECTIVES

In this unit, we will discuss about the basics of ASP.NET. We will discuss the server-side technology and web-infrastructure.

After working through this unit, you should be able to:

- Learn, what is ASP, ASP.NET? and why it is needed.
- Understand how client makes request and server respond it in web-infrastructure.
- Know features of ASP.NET and its IDE.
- Create a new website in ASP.NET using Visual Studio.

1.1   INTRODUCTION

ASP.NET is a web-application development platform provided and marketed by Microsoft Corporation, which allows web-developer to develop dynamic and Interactive web-sites, web-applications and web-services. In this unit we will discussed about ASP.NET, role of the client as well as server in web-technologies, its new features and much more.

1.2   ASP and ASP.NET

ASP.NET is an enhanced version for website development which is derived from its ancestor classical ASP. Let us see, what is ASP? And what is ASP.NET? in details:

1.2.1 ASP

ASP stand for Active Server Pages. The last release of ASP was Classical ASP 3.0. In more general form, we can explore ASP is called a server-side technology, which enables website developers to build dynamic and Interactive websites.

But the question arises in your mind that why we need a server-side technology. Earlier developers were developing desktop based (Form based) applications. In one computer, developer needs to install Visual Studio 6.0 and they build their applications. After developing the application, they need to compile the application and the application has to be compiled into Setup.exe file. A Setup.exe file is a package of all the classes and development code in the binary form. Once a setup file becomes ready, it has to be written into CD-ROM or DVD-ROM (Now a days we are using Pen-drive as our portable storage device). In the target machine or machines where actually that application has to work, developers are installing that CD-ROM and execute the Setup.exe. This starts a deployment process in the target machine, and the application developed into developer's machine, will be installed into the target computer.

Once the Setup (deployment process) is done any machine, Client can use that application. Now, think can we use the same application into another machine? Answer is No. We need to Setup again into another machine and then we can use that application.

Then what if, we want to run our application in every machine which is connected to either network or Internet (without deploying that application). Here, Server-side technology comes into the picture. To run a particular application several resources like compilers, class library etc. are required in a particular machine. What if we put all required resources on one machine? Active Server Pages (ASP) do exactly the same thing.

In the ASP, all required resources are placed all together in a one machine, which called a web-server. The role of a web-server is to accept the requests from different client machines, it finds the requested web-page from the web-site, it processes the web-page and convert it into that language which a client can understand. Finally, a web-server servers the compiled, translated and processed page to that client which has made a request for particular page as a response.

In the Active Server Page (ASP), web-site (collection of web-pages) are placed (hosted) on the server (web-server). Client should be connected with server by mean of network or Internet. Client should have one software which is Browser (Internet Explorer, Mozilla Firefox, Google Chrome, Opera, Netscape navigator or any other browser). From the browser, a request for particular page is sent to the server. Server accepts the request of browser (client), it search for requested

page, compile it and translate it into HTML (as we all know that Browser can understand only HTML) and serve that translated response to the requested browser.

Check Your Progress-1

1. In a web architecture, website must be hosted on _____.

[A] Router   [B] Client

[C] Server   [D] Browser

2. In a web-based client-server architecture Client is a _____.

[A] Browser   [B] Apache

[C] IIS   [D] All of the above

3. Server translate the requested page by a browser into _____ language.

[A] Java   [B] VB.NET

[C] C#.NET   [D] HTML

1.2.2 ASP.NET

ASP.NET is a web application development framework, which is developed and marketed by Microsoft Corporation to allow developers to build dynamic and interactive websites, web-applications and web-services. ASP.NET was first released in January 2002 with version 1.0 of the .NET Framework, and it is a successor to Microsoft's Active Server Pages (Classical ASP 3.0) technology. ASP.NET is built on the Common Language Runtime (CLR), allowing developers to write ASP.NET code using any supported .NET language (C#.NET or VB.NET).

So, ASP.NET is nothing, it is a same Server-side technology with power of .NET framework. .NET Framework consists of [1] FCL: Framework Class Library and [2] CLR: Common Language Runtime. Framework Class Library gives a thousand of readily available classes, which makes ease development of web-pages in ASP.NET and Common Language Runtime provides managed execution on the server.

1.2.3 Server

Now, as we have understood that ASP.NET is server-side technology and browsing a webpage of any website, requires Browser which sends HTTP request to the web-server and all processing work is done at server-side, then one question will arise in your mind that what is server?

Well, Server is that machine, in which we install IIS (Internet Information Services). It is a kind of software. Once IIS is installed into any machine, then it will act as a web-server. It can understand the requests coming from different clients (HTTP request) and it can deliver the web-pages hosted (stored) on that machine in the form of HTTP response. Here, Server needs to render (translate) the coding of the web-page into HTML language, which is understood by a Browser (client). To execute the code and convert it into HTML it requires different types of compilers like Language compiler, CLR etc. Not only that it also requires the Class Library which is used in the development of the web-pages. To provide these components, we install .NET Framework into the server (Remember .NET Framework consists of FCL and CLR both). In short, server is a machine in which we are installing a software service called IIS, we are hosting the web-site and we are installing .NET Framework.

1.2.4 Client

In web technologies client is nothing but a machine which has a software to browse web-pages (Browser) and network or Internet connectivity. Browser understand HTML (Hypertext Markup Language). HTML is not a language (as it does not allow you to declare the variables, you can not write any executable statements like if condition or any loop). HTML is a markup language, which has some predefined tags to design web-pages. To make web-pages dynamic we need to add a scripting language like JavaScript. Because the complier of JavaScript is available in most browsers, it is known as Client-side scripting language or Client-side technology.

Here, you will think if HTML and JavaScript code will be executed by a Browser then in which language, we will develop the code? Yes, we will write code into our web-pages into .NET languages like C#.NET or VB.NET. Code written in C#.NET or VB.NET will be executed by a server whereas code written in HTML and JavaScript will be executed by a client.

1.2.5 Other Server-side Technology

Now, might think that ASP.NET is a server-side technology developed by Microsoft, then is there any other server-side technology is there? The answer is yes. Many other server-side technology exits. PHP (Hypertext Pre-Processor) is also server-side technology which you can use to build dynamic and Interactive web-sites. To develop the PHP web-pages you need to write the code in the PHP language. In this technology, you need to install web-server Apache. As in the ASP.NET, code written in VB.NET or C#.NET language is executed by server, in the case of

PHP, code written in PHP script will be executed by server, whereas code written in JavaScript and HTML will be executed by a server.

1.3   Execution Model of ASP.NET Web-Pages:

As shown in the figure given below, the webpage made in the ASP.NET, has to be placed on the server. Server is the machine on which we have installed web-server software IIS and .NET Framework. Now, when the browser makes a request, and getting response from the server, following steps are performed by the server:

1. Browser makes a HTTP request for the specific webpage and send that request to the server. Here browser act as client software.
2. This HTTP request will be propagated through the Network of Internet and reach to the server on which IIS is installed. IIS accept this request and starts preparing response for the requested browser. The communication between the Client (Browser) and Server (IIS) is done by using HTTP (Hypertext Transfer Protocol).
3. IIS now find the requested page by a browser and send it to ASP.NET engine for further processing.
4. The webpage can have designing (which will be usually done in HTML resided in the .aspx file) and coding (in VB.NET or C#.NET which is usually stored in Code-Behind

file) to implement various functionalities. ASP.NET Engine now merge these files into one file and prepare complete class file.
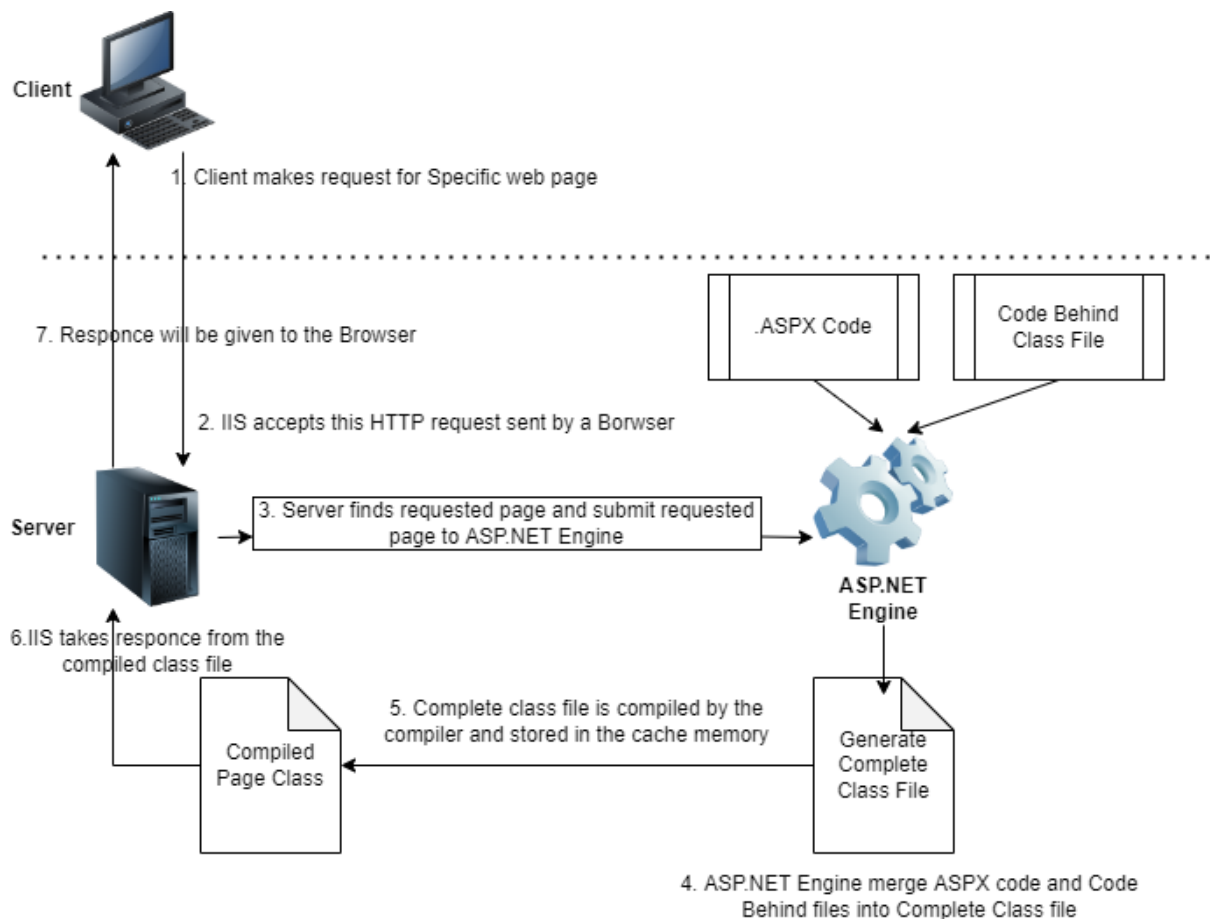
5. This complete class file will be compiled by compiler and compiled class file will be cached for further reference.
6. Webserver now take the response from this compiled class and serve it to the requested browser in the HTML using HTTP Protocol.
7. If the request coming again for the same page from the same browser or any other browser, in this case the compiled class will be taken from the cache and response is given to the browser immediately. To server the request for precompiled class files the whole process will not be repeated again.
8. Suppose if the developer of a webpage has made any changes in the design file or in the code-behind file then it will be automatically detected by the timestamps of source file and cached file, and whole process of compilation is repeated again, to server the client with recent content by the server.

1.4   NEW FEATURES ADDED IN THE ASP.NET

If we compare ASP.NET with classical ASP 3.0, ASP.NET has included the following additional features:

1. **64-Bit Support:** ASP.NET provides support for 64-bit hardware architecture. If ASP.NET website is designed in any 32-bit machine or with 64-bit machine, it can be hosted on any IIS based web-server without any type of conflicts in the version. IIS itself can also be installed in any computer system whether it is of 32-bit Windows OS or 64-bit Windows OS.
2. **Support for ACL:** ASP.NET provide also provide support for ACL (Access Control List). Using Access Control List developers of a website can easily implement security with significantly less effort.
3. **New features added in ADO.NET:** In ASP.NET provides abstract layer control in the designing of website. Developers of website, just need to drag and drop the control like SqlDataSource and configure it with very few and easy wizard steps. One abstract control contains connection, dataset or data reader (default is dataset), data adapter and command builder as a package. This will give liberty to the developer from writing enormous amount of code for managing connectivity with the database tables.
4. **Support for FTP:** ASP.NET comes up with, built-in support for FTP (File Transfer Protocol). With this feature, developers of a website, can open the websites into their (local) machines directly from the webserver and can do any kind of modifications into the webpages on live site.
5. **New Ping class:** The feature of Ping (Packet Internet Groper) class is provided by the ASP.NET, which is used to test network connectivity.
6. **Support for SMTP services:** ASP.NET also supports SMTP (Simple Mail Transfer Protocol). SMTP is important protocol used to send mail. Website Developers just need to create the object of SMTPClient class, set the host (IP of the machine in which SMTP service is running) and port (of SMTP service) property, and invoke send method to send any mail. Developers need to pass arguments such as Email address of sender, Email addtess of recipient, Title of the message and body of the message while invoking the send() method.
7. **Support to Generics:** ASP.NET supports Generic classes.

1.5 IDE:

IDE stands for Integrated Development Environment, it is a software, which provides development environment. For the ASP.NET, a popular IDE is used called Visual Web Developer. It is to be noted that in the development of ASP.NET webpages, IDE is optional. Without installing IDE, you can develop ASP.NET web pages using following steps:

1. Install IIS services (Internet Information Services) into the machine. We assume that any one browser software is already available in the system. If not there, install it too.
2. One Notepad or any other available, Editor and write the code. Save this code with <page_name>.aspx (like home.aspx of default.aspx) in the directory called C:\Inetpub\wwwroot directory.
3. This is the default directory for placing your .aspx pages. You can also create any other directory and place your .aspx pages under that directory, but make sure you need to configure your IIS accordingly.
4. Open the browser and in the URL type: http://localhost/<pagename>.aspx and hit enter button.
5. Your webpage will run in the Browser. If you feel and want to make any changes in the page, then again open the page in the editor (Notepad), do the changes, save those changes, and refresh the page in the Browser (by pressing F5 key), and the changes you have committed to the webpage, gets reflected into the browser.

So, the use of IDE, is not mandatory in the development of ASP.NET webpages. Still, we need to use IDE, because its servers many benefit as listed below:

1. **Prewritten essential HTML code:** When we add a new, webpage into the website using visual web developer IDE, the new page is added with some predefined HTML essential tags as shown in the figure.
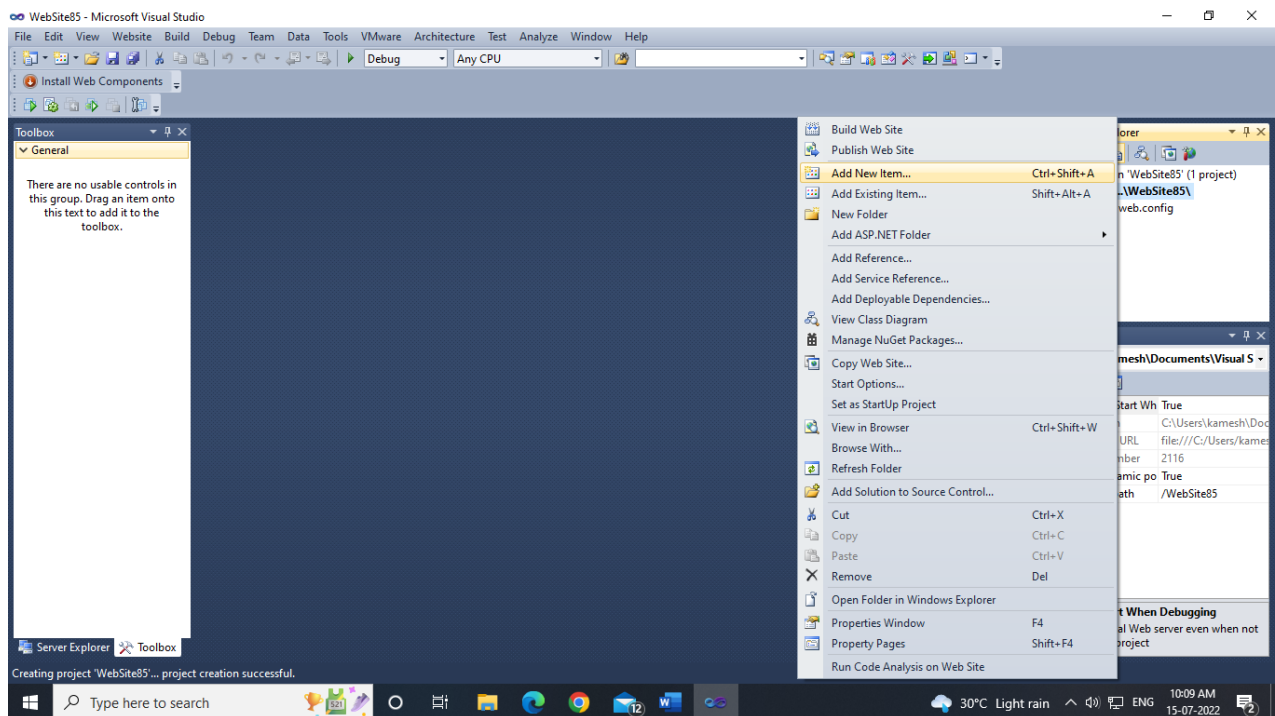
To add a new webpage into the website, you need to do right-click on the name of the website in the solution explorer, then you need to choose an option Add New Item… The following dialog box will appear.
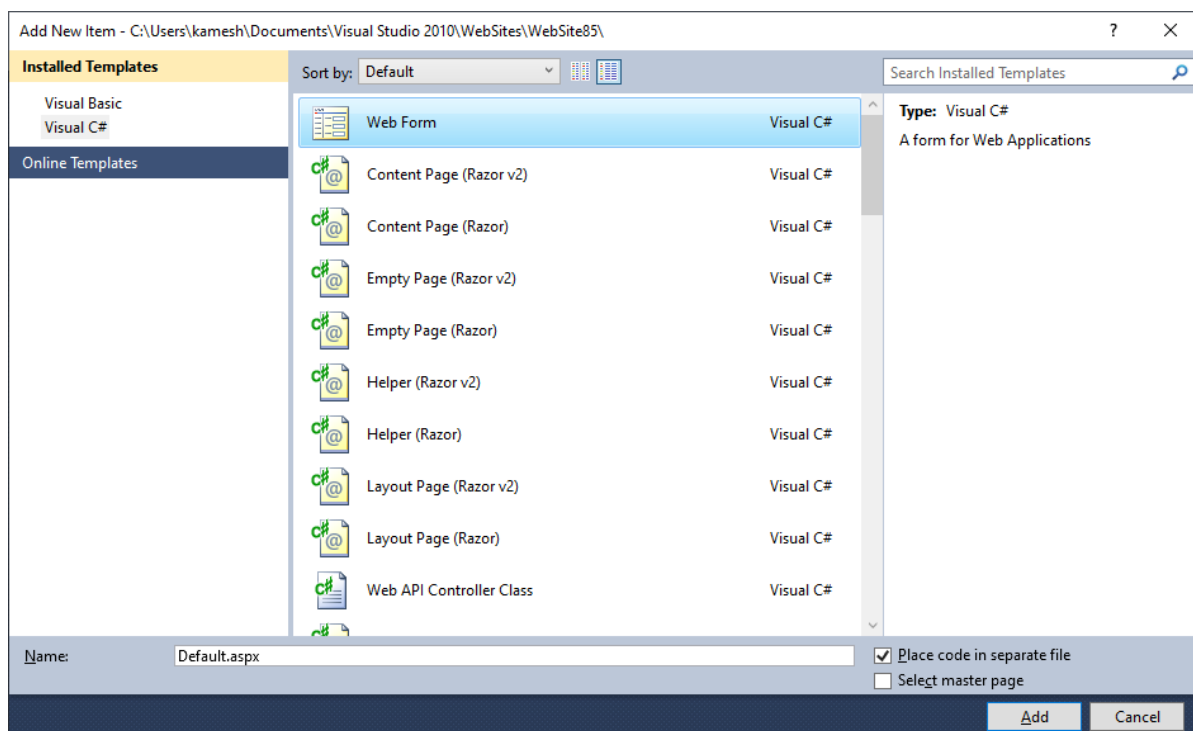
From the dialog box you need to choose language of the from the Left side pane to 'Visual C#', From the middle pane choose 'Web Form', in the bottom side give a name to your web page.

The default name of the web page will be 'default.aspx'. Now click on Add button, which will add a new webpage into your website.

The new web page will have some essential HTML tags, as shown below:
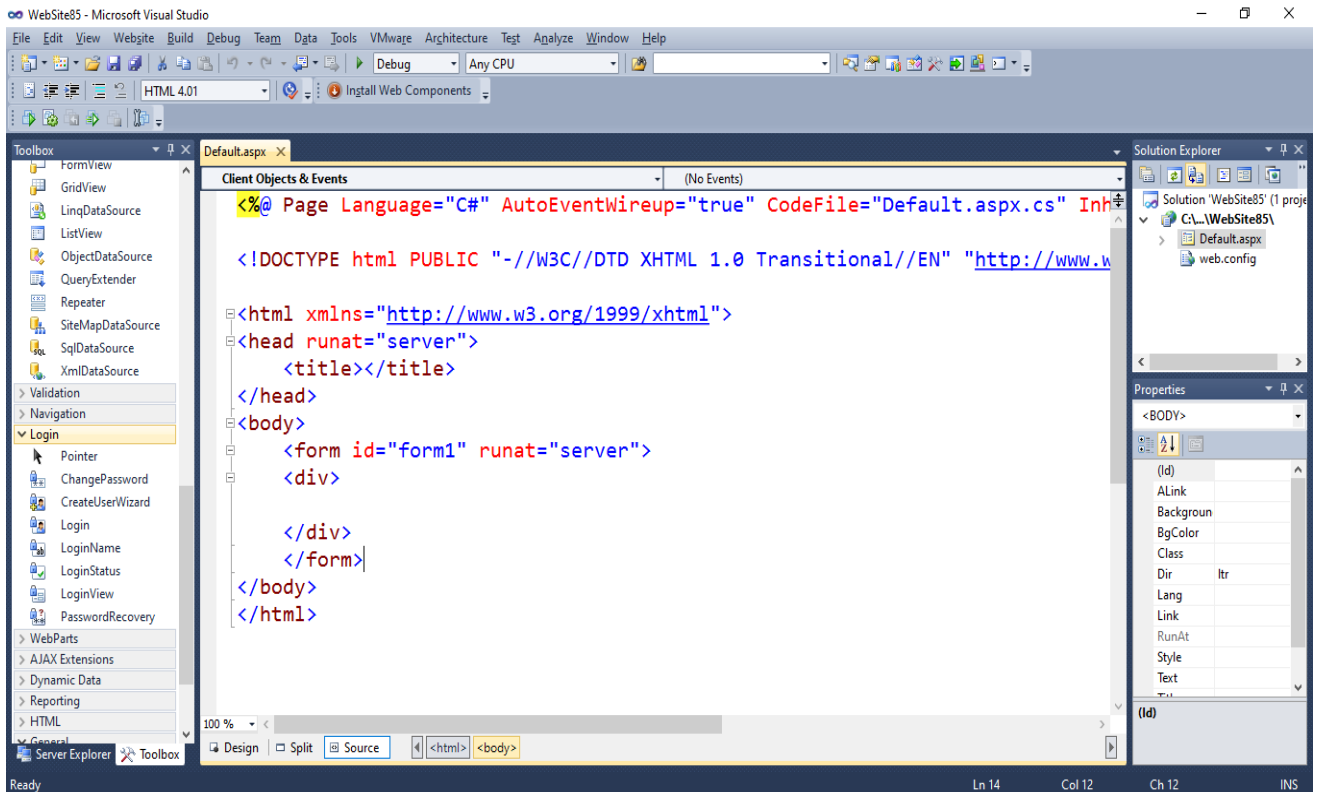
2. **Provides drag and drop interface:** When you need to add any control like Label, TextBox or Button into the webpage you need to write the HTML code for this as shown below.

```
<asp:Label ID="Label1" runat="server" Text="Label"></asp:Label>

<asp:TextBox ID="TextBox1" runat="server"></asp:TextBox>

<br />

<br />

<asp:Button ID="Button1" runat="server" Text="Button" />
```
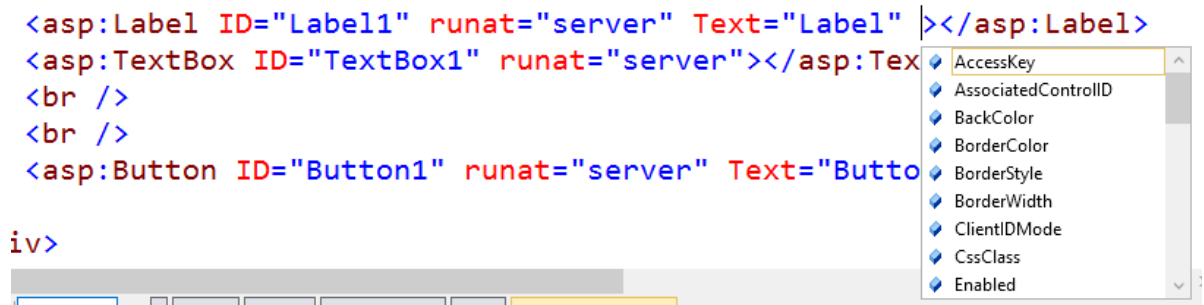
When we use, IDE like Visual Web Developer, in that case, you need to drag and drop the GUI components directly from the ToolBox, to the webpage. If you open the webpage in Source mode, you can find the coding is done automatically. Even if you press enter in the design mode, you will get
 HTML tag in the 'Source' mode of your webpage. This actually saves a lot of time for designing of webpages.

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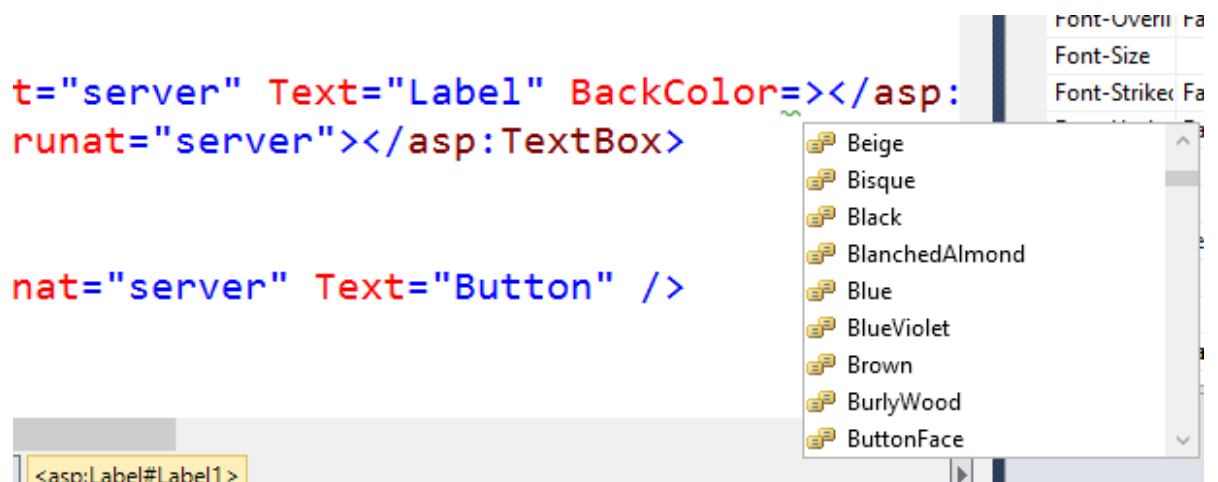
3. **Code editor of an IDE provides Rich IntelliSense functionality:** The code editor of Visual Web Developer provides rich IntelliSense functionality. When you write coding then a small popup window will appear, which provide the possible option for your code. For example, if you click any where in the 'Source' view, in the coding line of label, then you will get following screen.

If you want to set BackColor property then type Ba and then press spacebar, it will automatically write BackColor. After this if you type = then another small popup will appear as shown in the following figure.

You just need to choose the color from the popup window. This small window appears at the time of coding the webpage is called rich IntelliSense feature, which makes your coding much easier and hassle-free.
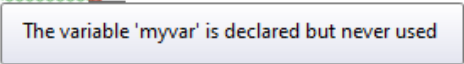
4. **It provides integrated access to SQL Server:** Visual Web Developer provides integrated access of SQL Server. Usually, most programmer prefer SQL server to be a backend, while they are developing their application in the ASP.NET. Here, IDE itself provides feature so that you can create database, you can create table, you can give primary key, you can do

data entry and so on. In short, you do not have to learn any other software to operate your database, which is in the SQL Server.

5. **Provides multi-language support:** When adding new page, you have choice to choose language for that specific webpage. You can choose your coding language is either VB.NET or C#.NET. It is possible that in one website there are sever pages are coded into C# and several pages are in the VB.

6. **Built in webserver:** IDE also provide dummy version of IIS. So, even if you are not good enough to install the webserver (IIS) or even if you don't know the configuration of IIS, still you can develop and run your webpages.

7. **Dynamic Compilation:** As we have discussed that once the webpage class is compiled and stored in the cache memory, it will not be compiled again and again, unless you are not making any change either in the designing or in the coding. That means, if you are running the same webpage many times, then obviously first time it will take some time for the compilation and other processing work but from second time onwards it will start responding faster as the compilation output is cached.

8. **Good Error-notification Assistant:** IDE Visual Web Developer provides very good error notification assistant. You can see the following figure where we have declared a variable but we have not utilized it.

```
protected void Button1_Click(object sender, EventArgs e)
{
    int myvar;
         The variable 'myvar' is declared but never used
}
```

In this case, error notification assistant of IDE, highlight myvar variable with green underline, which means it is a warning. If you want to know more about this warning then bring your mouse pointer on the variable, in a small pop-up error notification assistant will print that variable myvar is declared but not used. That means variable is extra and you are wasting memory. If you write 'myvar=5;' statement after your declarative statement then automatically green underline below myvar variable will be disappear.

Even if your page in the visual basic language then you can see the following screen layout, where the code written has blue underline, which represent error. If you want to know more about error, bring your mouse pointer on the underline, error notification assistant will show you that Each If statement should have matching 'End If' statement.

But still, you cannot understand the error message, then bring your mouse pointer at the end of the statement, you can see a red balloon, click on it, the error-notification assistant will guide you what to do?
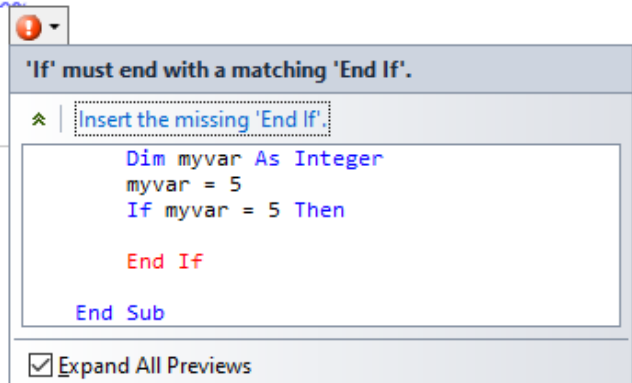
And still, you didn't get anything simply click on the popup windows, it will write 'End if' statement its own and your error will be resolved.

9. **Validating HTML:** You are worried about your HTML version, that the HTML code written on the webpage will work on all different types of browsers or not, you don't need to test your HTML code on different browser. In the tollbar of your IDE, there is one dropdown list is there. You can select different options and validate your HTML code.
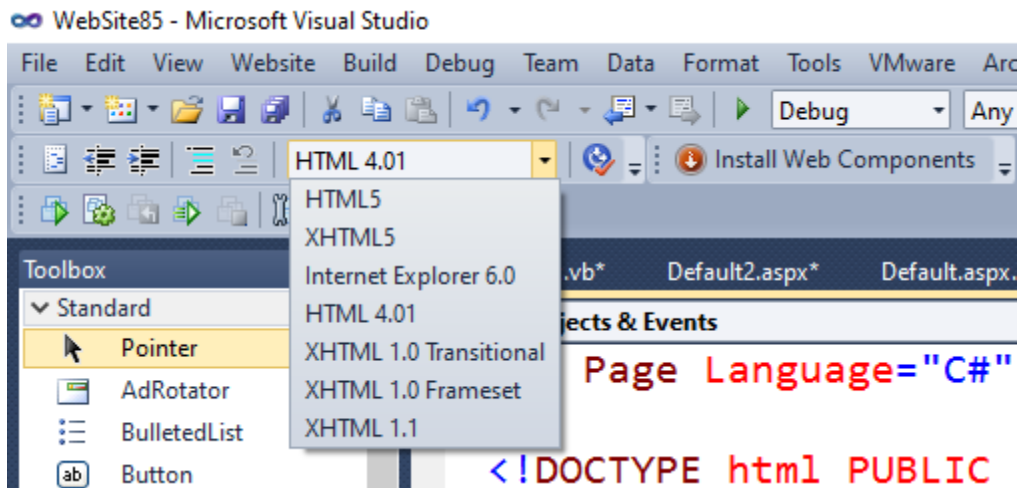
10. **Built-in Code snippets:** .NET IDE provides features of built-in snippets. If you want to do something, but if you don't know the code then snippet will help you. For example, you want to use foreach loop, but you don't know what code you need to write, then on the click event of the button do right click and choose insert snippet option as shown in the following figure.
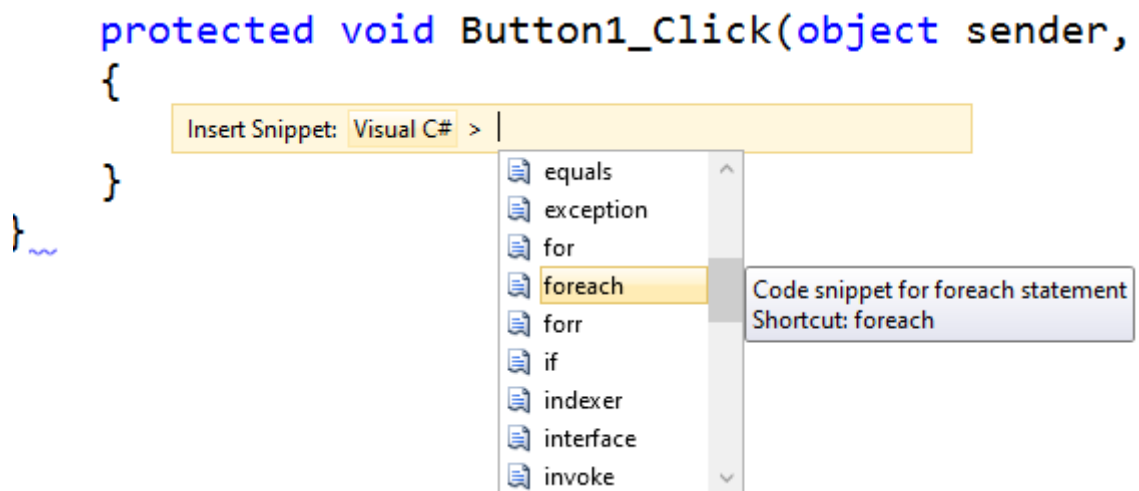
When, you press enter, it will automatically write the syntax of foreach loop as shown in the following figure.
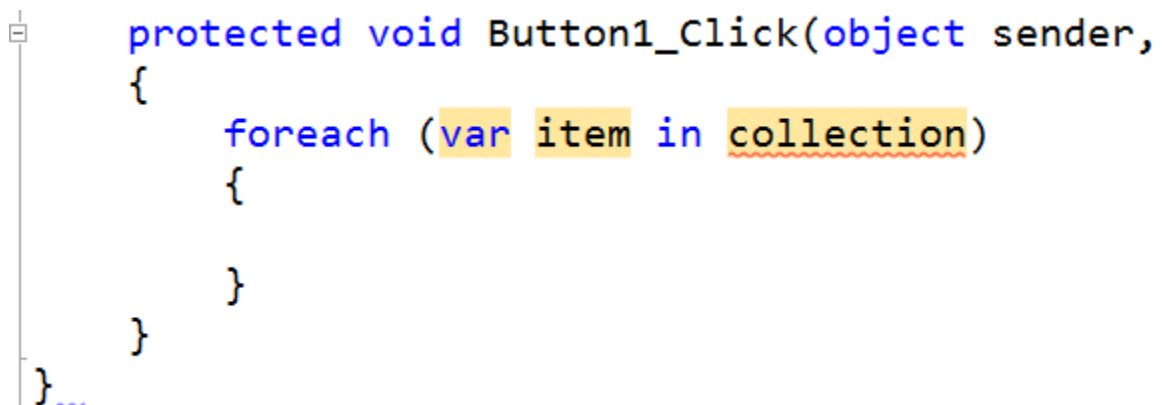
Because of lot many benefits are severed by Visual Web Developer IDE, we will use IDE for .NET development so that we can develop .NET websites, very rapidly with less efforts.

1.6   FRAMEWORK:

Framework of .NET provides basic infrastructure to the .NET developers, so that they can develop either desktop-based applications or web-based applications. Framework of .NET includes two main components in it.

1. **Common Language Runtime (CLR):** This is a language independent runtime environment of .NET Framework which manages the code at run (execution) time. Irrespective of which language is chosen by developer into the application. CLR manages the code for all.

2. **Framework Class Library (FCL):** This is a repository of primitive classes and interfaces that resembles to a specific functionality. FCL gives thousands of readily available pre-written classes to the developer of websites, so that developer can make the objects of the classes provided in the library and use the functionalities (by calling methods) of different classes. This reduces lots of development time and effort of the developer.

1.7   IIS: INTERNET INFORMATION SERVER

IIS stands for Internet information Server. It is a web-server software, use to process ASP.NET (.aspx) webpages. IIS web-server, comes free as bundle with Microsoft's Windows operating systems.

IIS is very ironic with features. The most common features offered by IIS are:
 IIS is used to host static websites (designed by using only HTML code) as well ASP.NET dynamic websites. It strongly supports for an FTP server, WCF host services, and be also extended to host websites built on other platforms like PHP.

IIS provides many built-in authentication options such as Form-based, Window-based and Passport authentication. IIS can also authenticate with, Windows Active Directory environment—users will be automatically signed into website using their domain account. Other built-in security features are also included such as TLS certificate management and binding for enabling HTTPS

and SFTP on your sites, request filtering for whitelisting or blacklisting traffic, authorization rules, request logging, and a rich set of FTP-specific security options.

Application pool is one important key feature of IIS. It also supports remote management. IIS can also be managed using the CLI or using PowerShell. You can script everything, which is great if you like the power that comes with being able to do so.

Check Your Progress-3

1. CLR stands for _____.

[A] Compile Language Runtime   [B] Compile Learning Read

[C] Computer Language Resource   [D] Common Language Runtime

2.FCL and CLR are two important components of _____.

[A] IDE   [B] Interpreter

[C] .NET Framework   [D] None of the Above

3. _____ IDE is used to develop webpages of a website in ASP.NET.

[A] VWD   [B] Notepad

[C] Code Block   [D]Notepad++

1.8 CREATING A NEW WEBSITE IN VISUAL STUDIO

To create a new website, using Visual Studio you need to open Visual Studio first. To open Visual Studio, you need to click on the start button of your windows. In the Start menu you need to go in the Programs and you need to click on Visual Studio 2010 directory. In this directory you need to find Visual Studio 2010, and you need to click on it. You can also open the Visual Studio 2010 by click on the Start button, click on Run, type devenv (Development Environment) and click on Open button. This will open the Visual Studio as shown in the following figure.
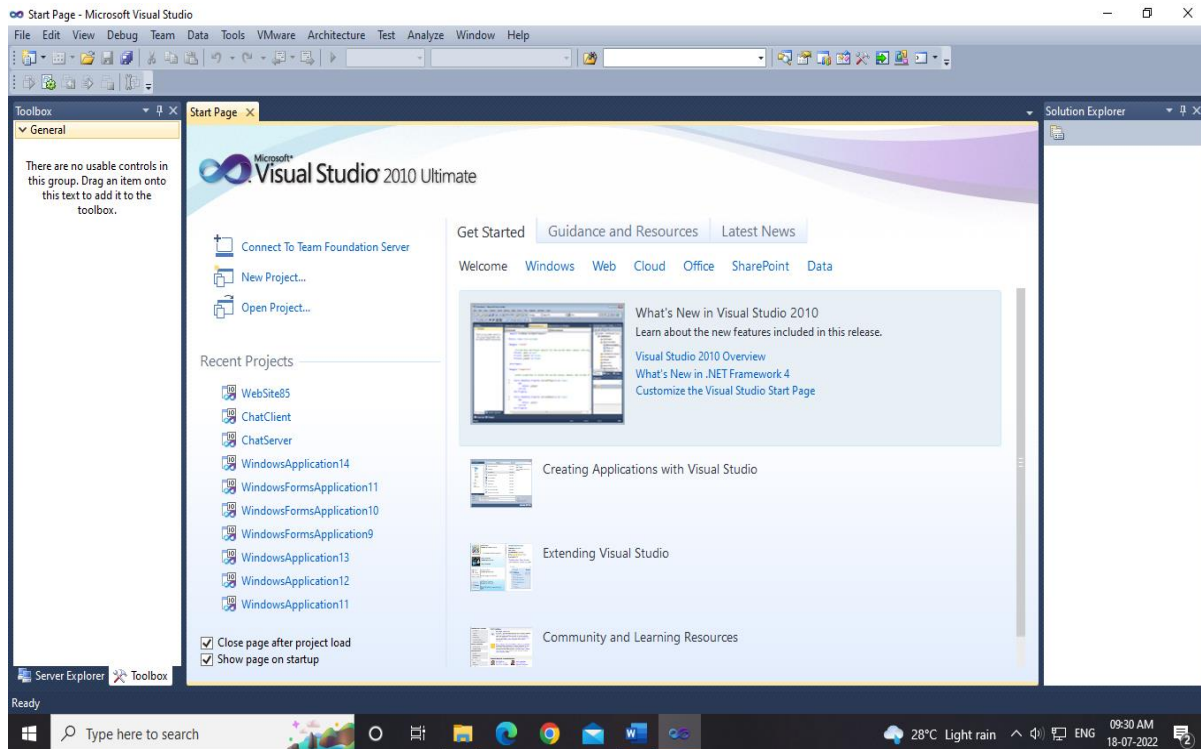
Now, you need to click on the File menu, and need to choose option New -> Web Site. It will open the following interface as shown in the following figure.
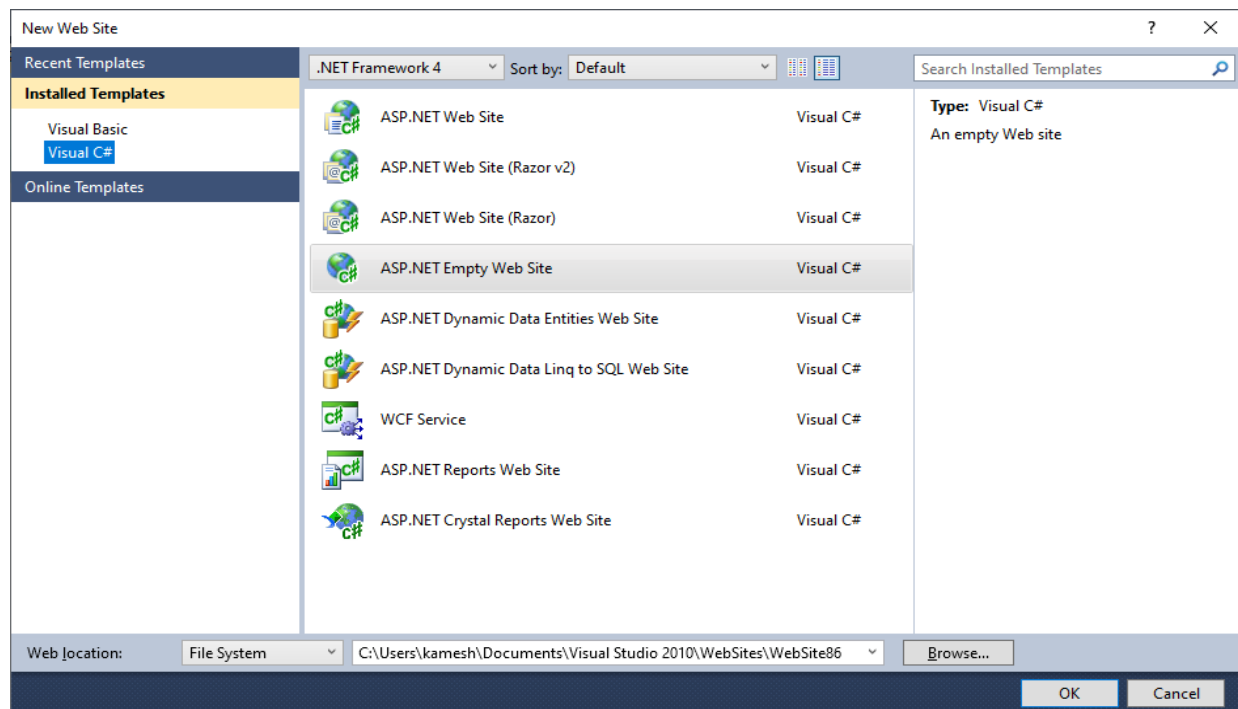
Now, from the left side panel, you need to choose your language wither Visual Basic or Visual C# (Choose Visual C# as in this course we will demonstrate all our examples in this language). From the middle panel choose proper template, initially you need to choose ASP.NET Empty Web Site. You can also set the path for you new website, as well as store

your website with any specific name by click on the browse button. By default, it will be created as WebSite1, WebSite2 and so on. Click on OK button.

This action will create new website for you and the following interface will be shown.
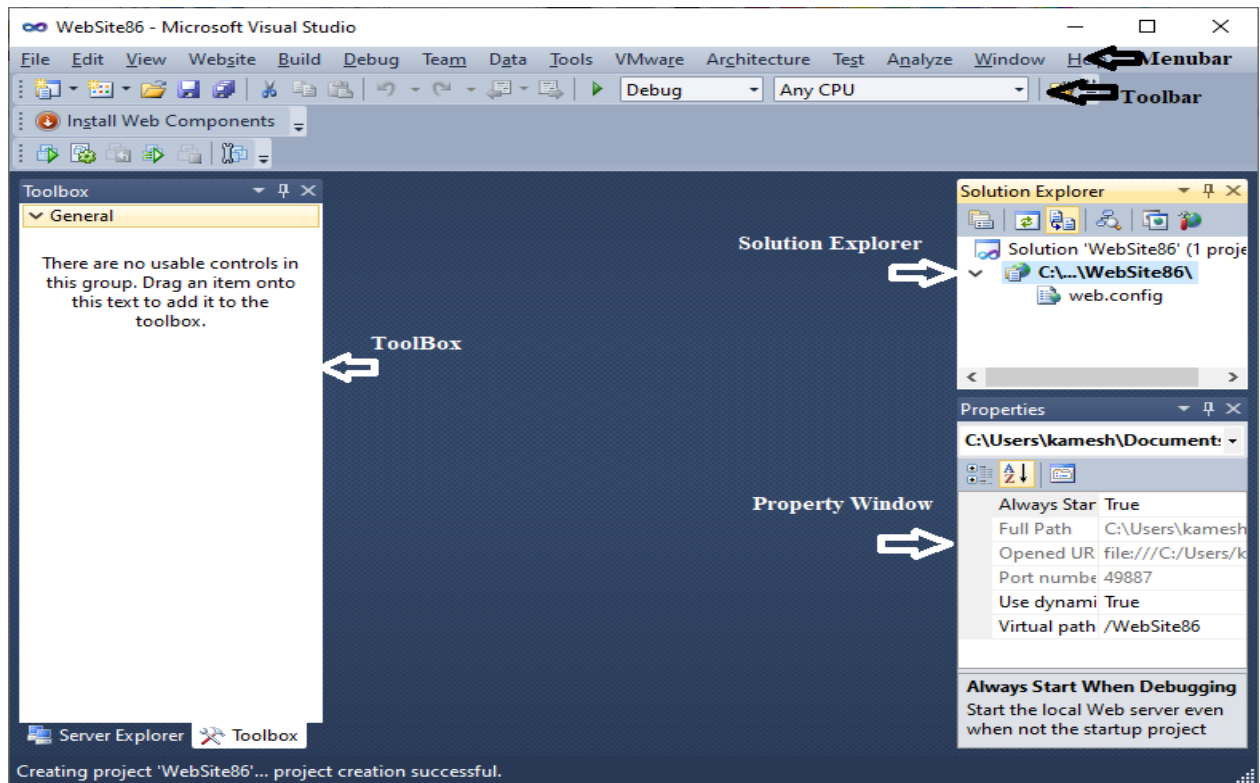
Now you need to Right-Click on the website name (in bold face) in the Solution Explorer, Choose Add New Item from the popup window. This will open the dialog box of 'Add New Item'. From this dialog box choose Web Form and click on the Add button as shown in the following figure.
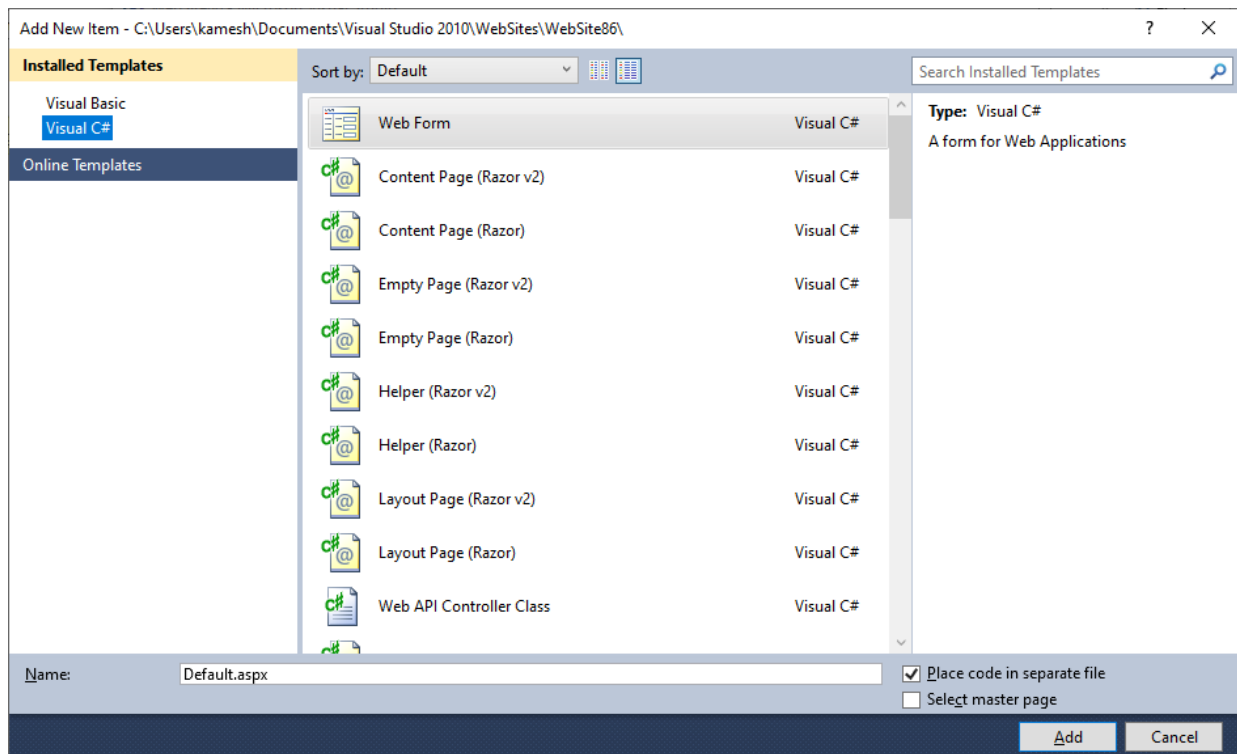
This will add a new webpage called default.aspx to you website. You can see the page in the Solution Explorer and you can open it any time by clicking on the page name from the solution explorer.
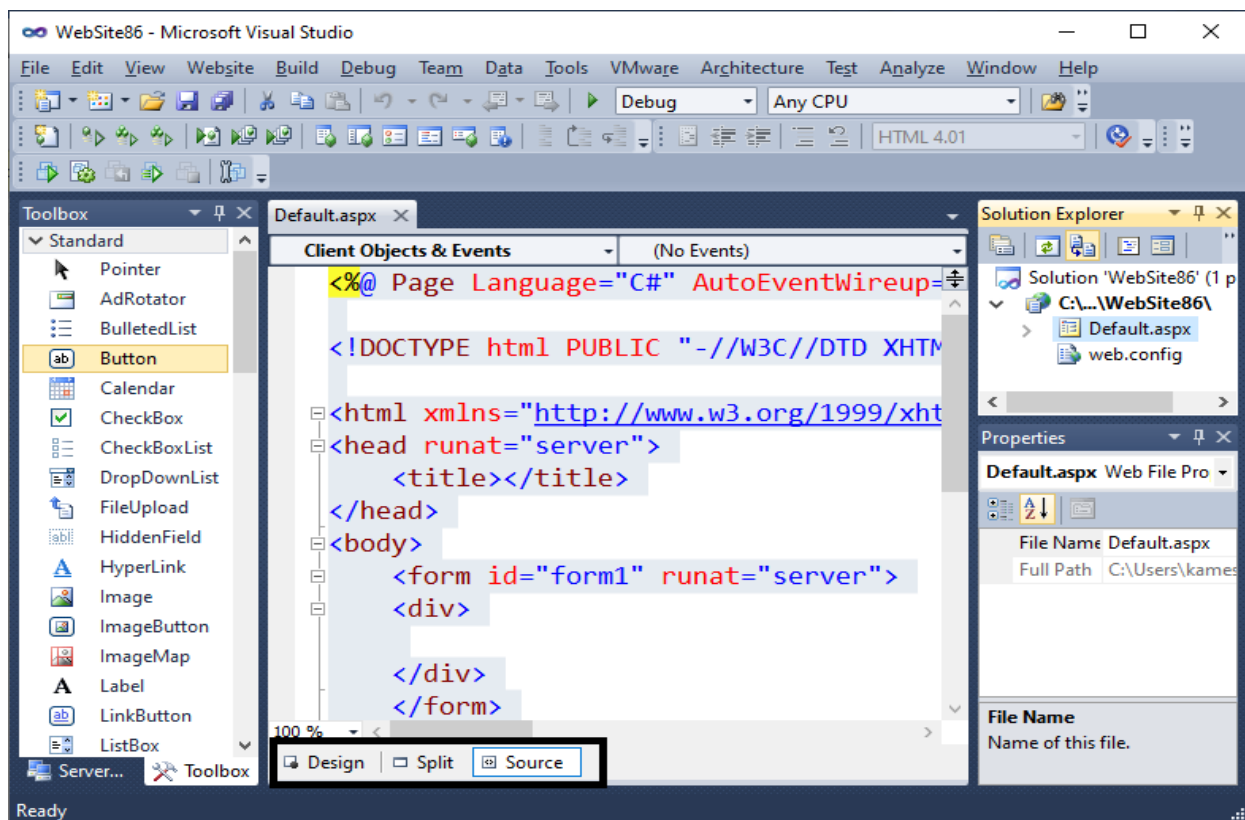
The highlighted region of the figure demonstrated above, provides option to navigate the page between Source and Design mode. Design mode will show you the actual design of

your web page. You can visualize different GUI based components like button, label, textbox, radio button etc. Whereas Source mode of a webpage will show its HTML code generated by IDE. Split option will provide both Design and Source view together by splitting the middle window in two halves.

1.9 LET US SUM UP

In this unit we have discussed Client and Server architecture in Web-based environment. We have demonstrated how the request will be sent by a client machine and it will be processed by a webserver. We have explained about ASP (Active Server Page), is a server-side technology and it is produced by Microsoft corporation. We have also learnt that this server-side technology (ASP) is now powered by .NET Framework (ASP.NET). How the execution of the web-page is commenced by a Server when Browser is demanding for some specific page. We have discussed the new features or ASP.NET and also discussed about the features of IDE. In this unit we have learnt that the Framework is nothing but combination of FCL (Framework Class Library) and CLR (Common Language Runtime). Finally, we have learnt how to create a new website using Visual Studio 2010. We hope, this discussion will help you in understanding ASP.NET technology and you will be aware different components of IDE, not only that you will be able to create a new website.

1.10 GLOSSARY

1. **.Net Framework:** .Net Framework is a framework provided by Microsoft corporation to develop Desktop-based and Web-based application. It is mainly consisting of FCL and CLR kind of components.
2. **ASP:** ASP stands for Active Server Page. It is a server-side technology where webpages are placed on the server. On the request of client, server will process the webpage and convert it into HTML language, which can be easily understood by a browser.
3. **Browser:** Browser is a software, with the help of it, user can browse any webpage. Internet Explorer, Microsoft Edge, Google Chrome, Netscape Navigator, Mozilla Firefox, Opera and Apple safari are the name of some browsers.
4. **IIS:** IIS stand for Internet Information Services. It is installed in the server machine on which we are going to host a website designed in ASP.NET. Once this software is installed, machine will act as a webserver. It will accept and understand the requests made by different browsers using HTTP protocol, and respond them accordingly.

1.11   SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

1. [C] Server
2. [A] Browser
3. [D] HTML

Check Your Progress-2

1. [D] JavaScript
2. [C] IIS
3. [B] Apache

Check Your Progress-3

1. [D] Common Language Runtime
2. [C] .NET Framework
3. [A] VWD

1.12   Assignment

1. Explain Client-Server architecture in Web-based systems.
2. What is ASP.NET? List and explain features of it.
3. List and explain different features of Visual Web Developer.

1.13   Activity

Design a web page in which you have to show "WelCome to ASP.NET". Make sure, you need to run a loop to increase the size of the <Font> tag from 1 to 8 in which the message "WelCome to ASP.NET" is encased.

1.14   Case Study

Try to find any 5 popular websites which are designed in the ASP.NET.

1.15   Further Reading

- ASP.NET 4.0 Unleased by Stephen Walter.
- Beginning ASP.NET by Wrox publication.
- Professional ASP.NET 4.0 by Wrox publication.

UNIT 2: UNDERSTANDING ARCHITECTURE OF ASP.NET

Unit Structure

2.0   LEARNING OBJECTIVES

In this unit, we will discuss about the basics of C required for beginners to understand this language.

After working through this unit, you should be able to:

- Comprehend the concept of constants and variables

- Elaborate on data types used to make a program

- Interpret variables

- Describe Constants and Keywords

2.1   INTRODUCTION

Usually in the case of Web development, developers are developing a website in his/her machine. Developers are writing the code for different functionalities, designing the webpages, running it and testing it into their machine. Once the website becomes ready, it has to be uploaded on the webserver, which run the service for that particular website for 24 * 7. Once the website is hosted on the server, all paths of the different resources used in the construction of different webpages of a website gets changed. Resources might be images, sitemap file, configuration files, database etc. So, it is possible that the particular website is working fine into the developer's machine, but might not run properly once it is hosted on the server. To deal with these issues, several measures are taken by the Microsoft. We should have to know about them. Not only that, we also should know about coding model of an ASP.NET. Let us, see all of these one by one in this unit.

2.2   CODING MODELS:

Coding model of an ASP.Net is nothing by the way of writing the code into .aspx pages. Usually in the development of any web page, developer needs to design the webpage and for that purpose developer need to write XHTML code into the webpage. Along with that, developers need to write the code either in the C#.NET or VB.NET language (which will be executed by the server) to implement various functionalities (Like what happen when the user is click on the button, of what happen when the particular item is selected by the user from the dropdown list). Because of in one page developer need to do design (XHTML) and code (VB.NET or C#.NET), there are two coding models are there, which are explained below:

1. Inline Coding Model.
2. Code-Behind Model.

2.2.1 Inline Coding Model

An Inline coding model is introduced prior to the Code-Behind model. It is introduced when Microsoft has released first version (Framework 1.0) of ASP.NET in that is year 2002. In this coding model, code required to implement various functionalities and code required to design the web page is placed in a common file called .aspx. That means one file will be maintain to design one webpage which stores your XHTML code and VB.NET or C#.NET code. Let us see how can we add a new web page into the website using Inline Coding Model.

We have already discussed that how can we add a new page to the website. To add a new page, you need to do right click on the website name in the Solution Explorer, you need to choose the option called 'Add New Item'. Which will open a dialog box as shown below.
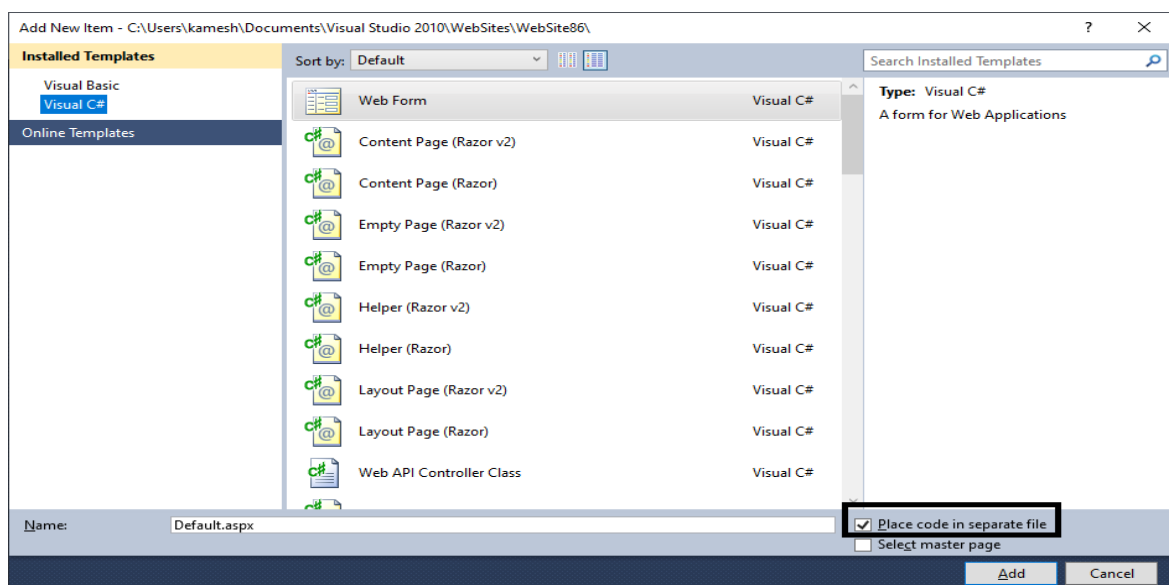
Here, in this dialog box you have to uncheck the check box (which is highlighted in the figure) showing text 'Place code in separate file' and then you need to click on Add button. This

will add a new page default.aspx into your website which will follow Inline Coding Model. The XHTML code of your default.aspx is shown below.
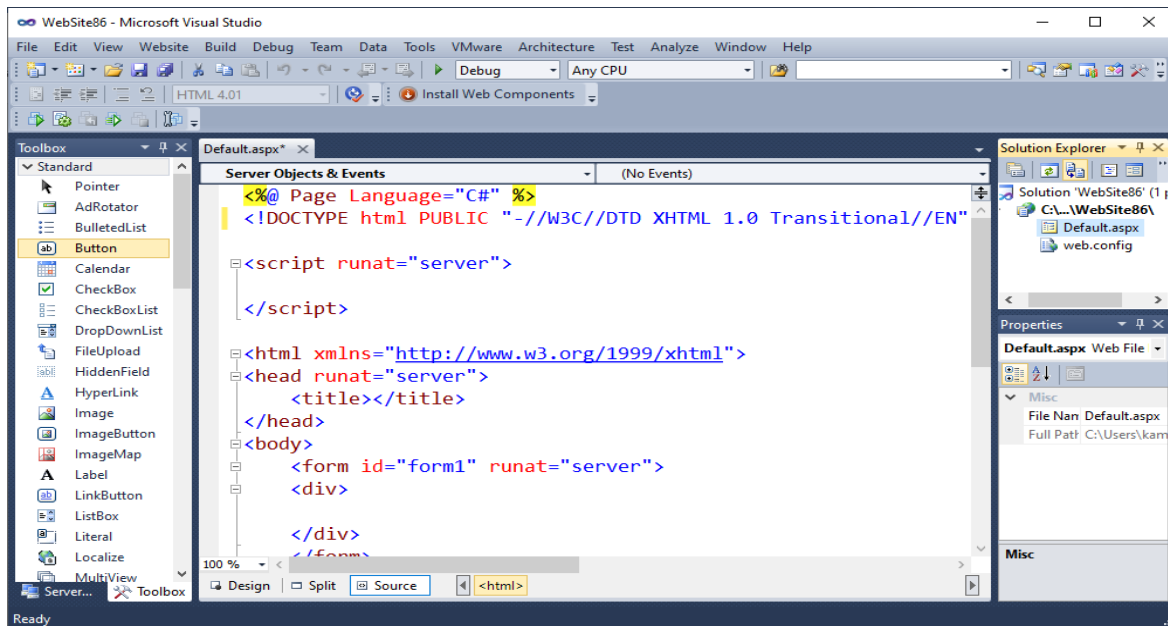
You can seen in the figure that in the XHTML code, in the first line only following code is written:

```
<%@ Page Language="C#" %>
```

Another thing is that in the XHTML code, there is a script tag is present. Whatever VB.NET or C#.NET code you are writing to implement functionalities has to be placed between this <Script> tag and its end </Script> tag. But below this <Script> </Script> tag you can see the <HTML> tag which has all designing code written in the XHTML. That means here only one file is maintained to a webpage that is default.aspx which stores your designing and coding.

2.2.2 Code-Behind Model

Most developers were faced problem, in writing the code in the Inline Coding Model as it stores coding as well as huge code written in the XHTML for designing. To provide clean interface for coding and to deal with the issue of Inline Coding Model, Microsoft has introduced Code-Behind model in the second release of .NET Framework 1.2 in the year 2003.

In this code-behind model, the designing (XHTML code) and coding (VB.NET or C#.NET) are placed in the separate file. That means there are two files are maintained or each of your webpage. To add a new web-page into your website with Code-Behind Model, you need to do right click on the website name in the Solution Explorer and choose 'Add New Item…' option. It will show the 'Add New Item' dialog box. Now before clicking on the 'Add' button

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you need to check the checkbox with the text 'Place code in the separate file'. After adding a webpage, you can see there are two files are added as shown below:
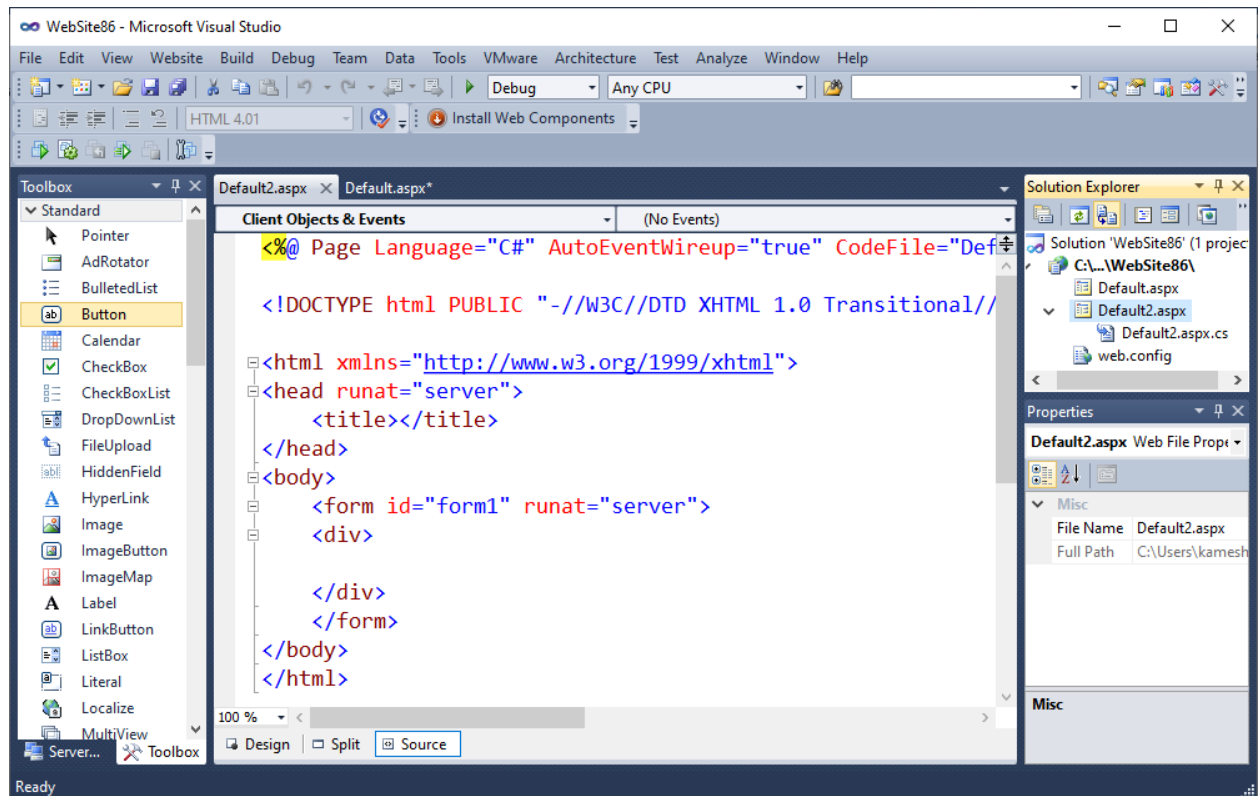
You can see in the Solution Explorer, for default2 web page there are two pages are created: [1] Default2.aspx which will store all your designing which will in the XHTML, which is shown in the middle panel and [2] Default2.aspx.cs which will store your C#.NET code. Here we have choosen a coding language for Default2 webpage is C#. Suppose, if you choose your coding language VB.NET instead of C#, then your second file will be default2.aspx.vb (instead of default2.aspx.cs). The first line of you default2.aspx is shown below:

```
<%@ Page Language="C#" AutoEventWireup="true"
CodeFile="Default2.aspx.cs" Inherits="Default2" %>
```

In the Page directive is mentioned that the code file will be "Default2.aspx.cs". Not only that you will not find any <Script> tag in the default2.aspx as now for the coding there is a separate file is created for you which is shown as below:
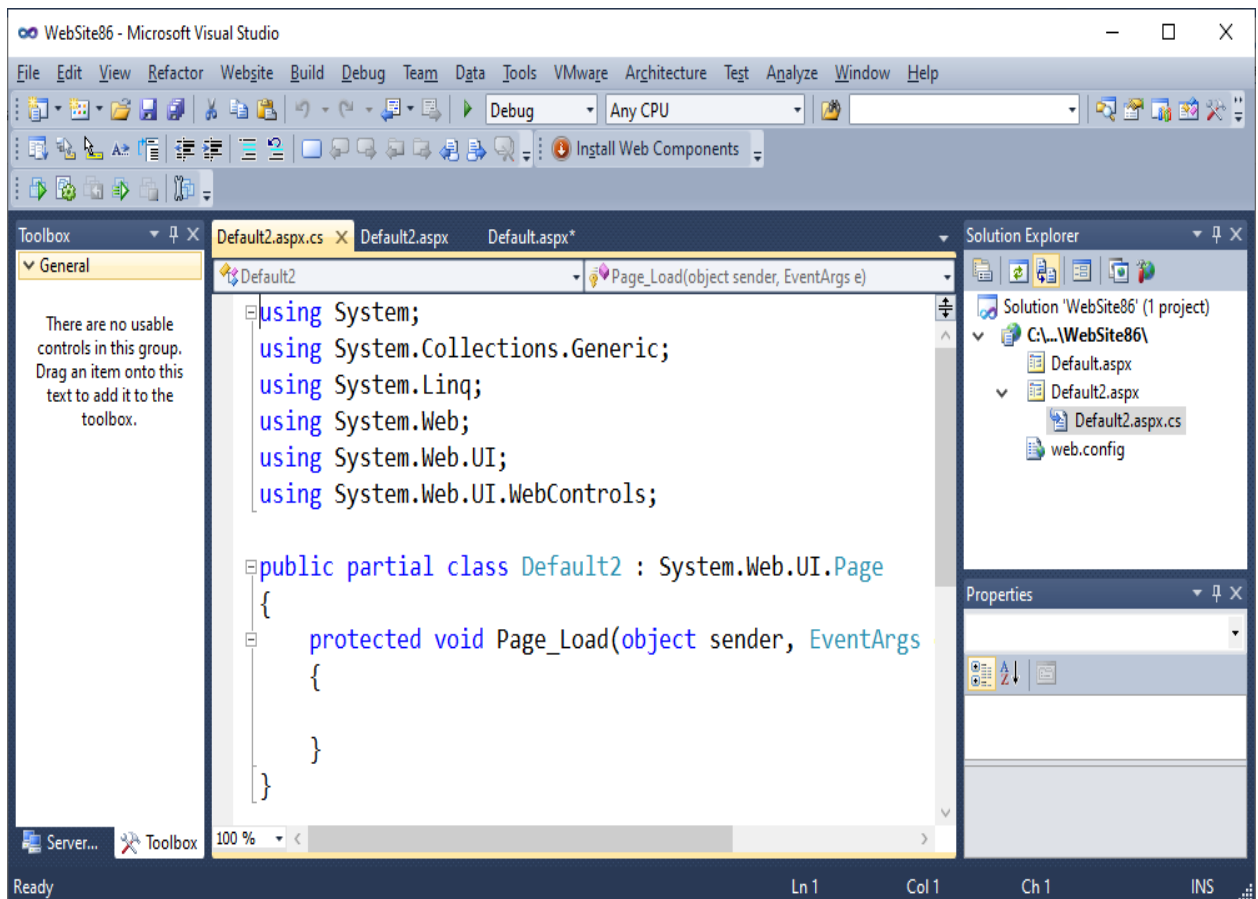
To provide this functionality Microsoft has introduced the concept of 'Partial Class'. Partial Class allows splitting of a class file on two or more phisical pages. Here your default2 webpage is a class, which is resided on two phisical files: default2.aspx which stores designing in XHTML and either default2.aspx.cs which stores your C# coding or default2.aspx.vb which stores your VB.NET coding.

Check your progress 1

1.In _____ coding model two separate files are maintained one for designing and one for coding.

[A] Inline   [B] Code-Behind

[C] Master page   [D] None of the Above

2.In _____ coding model the code required to implement any functionality is placed in the <Script> tag.

[A] Inline	[B] Code-Behind
[C] Master page	[D] None of the Above

3.A class spited on more than one physical file is called _____.

[A] Super Class	[B] Child class
[C] Inherited Class	[D] Partial class

2.3 ASP.NET PAGES

As we have discussed in the Inline Coding Model, there is only one physical file will store the designing (XHTML) and code (VB or C#). Therefore, in each case, in this model only one file is created and maintain which is responsible for designing as well as code. Here, in the following table we have given different types of files and their file extensions are described for the Inline coding model.

File Options Using Inline Model	File Created
Web Form	.aspx file
Master Page	.master file
Web User Control	.ascx file
Web Service	.asmx file

Similarly, as we have discussed in the earlier section, that in the Code-Behind model, two separate files are managed for each purpose. One file which is store the designing part which should be coded in the XHTML and another file which will store the coding of the webpage for different functionalities. Coding file will be depending upon language, you have chosen to write code in the webpage, at the time of file creation. If you have chosen coding language to be C#

then .cs file will be created and if you have chosen coding language to be VB then .vb file will be created which will store your coding.

File Options Using Code-Behind Model	File Created
Web Form	.aspx file .aspx.cs OR .aspx.vb
Master Page	.master file .master.cs OR .master.vb
Web User Control	.ascx file .ascx.cs OR .ascx.vb
Web Service	.asmx file .asmx.cs OR .asmx.vb

2.4   CODE RENDER BLOCK:

Code render blocks allows you to write an Inline-code within the designing part of your webpage. We have seen that, In Inline coding model coding and designing will be placed on a common .aspx file. Coding has to be written in the <Script> tag, whereas designing we are placing in the <HTML> tag. In the code-behind model two separate files are maintained for coding and designing of a webpage. In both coding model, code is separated from design part of a webpage. But what if you want to use a loop to repeat some designing part of a webpage? We already know that the HTML does not support loop kind of syntax as it just a markup language. Code render block allows you to do so. This allows you to write your C#.NET or VB.NET code withing <HTML> section. To write the code, you need to start your code render block with <% and you need to end your code render block with %>. Between <% and %> you can write your code. Make sure, between <% and %> you need to write the code only, means XHTML

designing is not allowed withing this block. You can create multiple code render blocks in a webpage, which will be executed in the top-down manner.

Consider the following example, in this example we have written a loop in the code render block to repeat the <font> tag.

```
<%@ Page Language="C#" AutoEventWireup="true"
CodeFile="Default3.aspx.cs" Inherits="Default3" %>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">

    <title></title>

</head>

<body>

    <form id="form1" runat="server">

    <div>

    <% int i;

        for (i=1;i<8; i++)

        { %>

        <font size="<%=i %>">Welcome to ASP.NET</font> <br />

        <% } %>

    </div>

    </form>

</body>

</html>
```

In this webpage, we have created three code render blocks. First block is used to declare variable i and to start for loop from variable i=0 to i=7. Second code render block is used to assign the value of variable i to the size attribute of <font> tag. <%= i %> means Response.Write (i). Finally, to close the curly bracket, which we have opened for the for loop, third core render block is used. If you run this page into the browser it looks like as shown below.
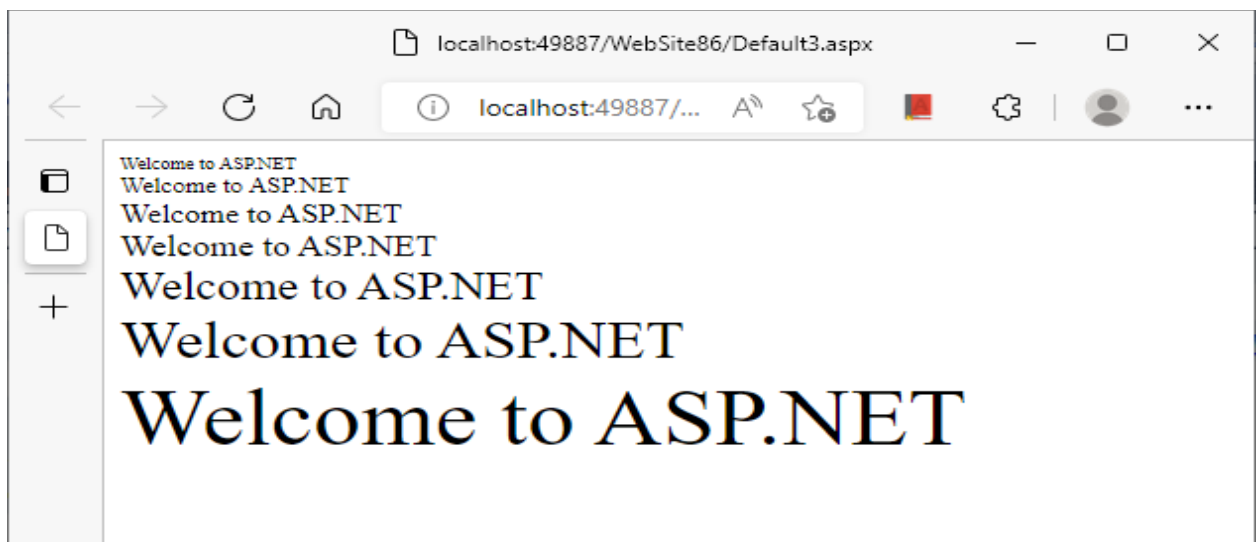
Check your progress 2

1.Extension for web user control page file is _____.

[A] .aspx   [B] .master

[C] .ascx   [D] .asmx

2.Webservices are stored with _____ extension in the ASP.NET.

[A] .aspx   [B] .master

[C] .ascx   [D] .asmx

3.Code render block starts and end with _____.

[A] <%   %>   [B] /*   */

[C] <!--   -->   [D] <?   ?>

2.5   BUILT-IN DIRECTORY STRUCTURE

As we know the websites are prepared in the developer's machine and after completion of deelopment and testing, it has to be uploaded on the webserver which will run the allplication for 24*7. In the development of a website, we have to specify path for serveral resources like database, classfile etc to use them on a web page. When you host website on the server, it is possible that those paths may change. For example, if you have specified a path for the database in to your machine it may differe on the server after hosting of your website.

To deal with this issue, Microsoft has provided serveral built-in directories. These directories has to be used for some specific purposes. If you put the specific resources, into some specific directories then you don't need to specify the absolute (full) path. This website will run if you copy it from one machine to another machine, and even you host it on the server. In this section we will discuss all these different directories, and it designed to hold what type of resources in greater details. Let see all of them one by one.

2.5.1 App_Data Directory

The App_Data directory is a built-in directory which holds all data stores utilized by your website. Database files which are used by your website has to be places in this directory. Most website developers are using MS-Access database (.mdb) file or MS-SQL Server Express edition database (.mdf) file are placed into this directory. If you have placed your database file into App_Data folder then you do not have to specify the absolute path (Like C:\Users\kamesh\Documents\Visual Studio 2010\ WebSites\ WebSite86\ App_Data\ Database1.mdf) to the database file but instead of that you need to use relative path like: |Data Directory| / Database1.mdf. Here if you specify only |Data Directory|, ASP.NET will automatically generate the path from the path of website up to App_Data directory. Therefore, all webpages of your website, can fetch the data from the App_Data directory, irrespective of where the website has been physically placed.

To add the directory, App_Data you need to right click on the website name in the Solution Explorer and then you need to choose option 'Add ASP.NET Folder' and inside that option you need to choose, App_Data directory. Now to add the database you need to do right click on the App_Data directory in the Solution Explorer and then you need to choose the option, 'Add New Item'. This will open the dialog box for 'Add New Item'. From this dialog box you need to choose 'SQL Server database' option, give the name to your database and click on the Add button which will add your database file (*.mdf) in the App_Data directory.

2.5.2 App_Code Directory

App_Code directory is used for Code sharing purpose. The code (class) file in the Text format (.cs or .vb) file are placed in this directory. These class files are automatically detected and compiled by compile, and it can be used (you can create objects of it) in any of the webpage of your website, irrespective of specifying the path. To use App_Code directory, first you need to add that directory into your website. Perform following steps to use App_Code directory:

1. Right click on the website name in the Solution Explorer and choose option Add ASP.NET Folder -> App_Code.
2. Right Click on the App_Code folder in the Solution Explorer and choose option 'Add New Item' and from the dialog box, Choose C#.NET as language and Class template. Give a class name to 'Arith.cs'. This will add a new file called Arith.cs in the App_Code folder which can be seen in the Solution Explorer.
3. Add the following code to Arith.cs class file.

```csharp
using System;

using System.Collections.Generic;

using System.Linq;

using System.Web;


public class Arith

{

    public Arith()

    {



    }

    public int Sum(int Num1, int Num2)

    {

        int result;

        result = Num1 + Num2;

        return result;

    }
```

```
    public int Subtract(int Num1, int Num2)

    {

        int result;

        result = Num1 - Num2;

        return result;

    }

}
```

4. Now add a new webpage to your website and design the interface as shown below:
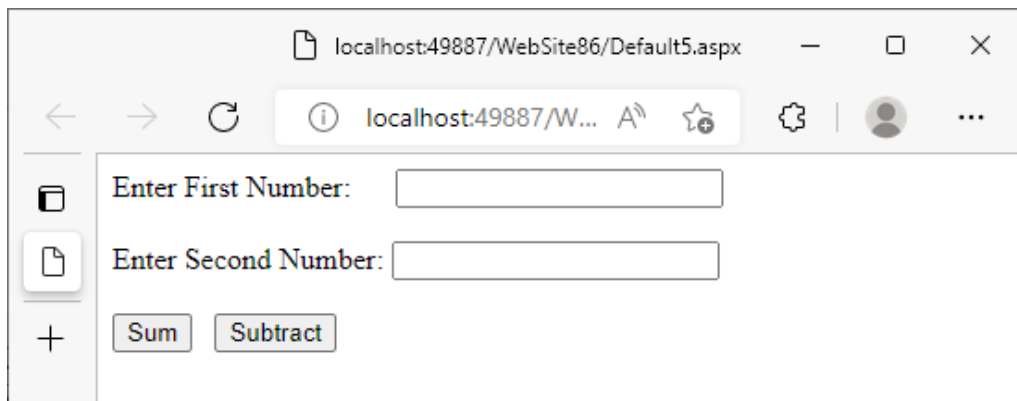
5. Now add the following code on the Click event of Button1 as well as Button2. To add the click event of the button, you need to do double click on the button in the design mode.

```
protected void Button1_Click(object sender, EventArgs e)

    {

        Arith obj = new Arith();

        int x = Convert.ToInt16(TextBox1.Text);

        int y = Convert.ToInt16(TextBox2.Text);

        int answer = obj.Sum(x, y);

        Response.Write("<B>Sum is:" + answer.ToString() + "</B>");

    }

    protected void Button2_Click(object sender, EventArgs e)

    {
```

```
        Arith obj = new Arith();

        int x = Convert.ToInt16(TextBox1.Text);

        int y = Convert.ToInt16(TextBox2.Text);

        int answer = obj.Subtract(x, y);

        Response.Write("<B>Subtraction is:" + answer.ToString() +
"</B>");

    }
```

6. Now tun the application by pressing F5 key, input the values into the Textbox1 and Texbox2 and click on either button1 or Button2. You will get the output as shown below:
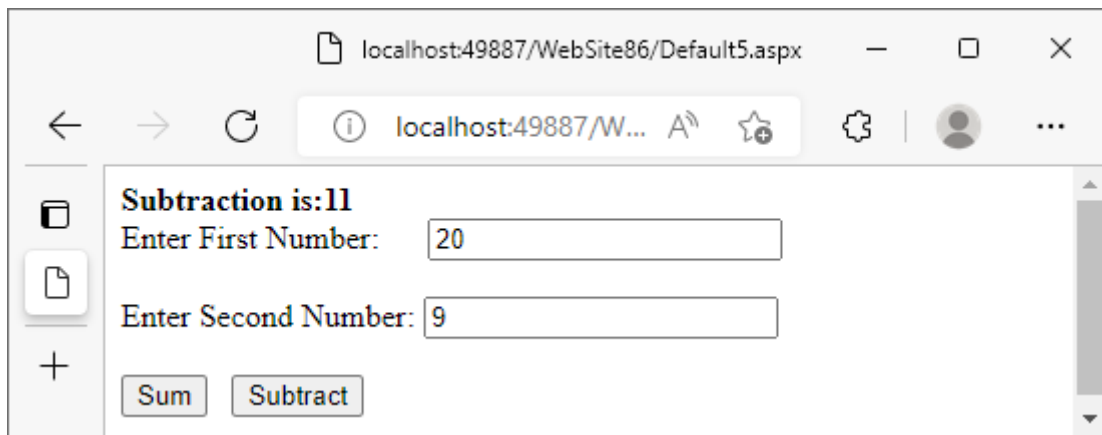
2.5.3 Bin Directory

Bin directory can also be added to the website by doing right click on the website name, and choosing option: Add ASP.NET Folder -> Bin. This directory is similar to App_Code directory, which is used to share the code. In App_Code directory we place only those class file which are text based. The class file in .cs or .vb can be open in the notepad kind or editor and user can view or edit the code. The compiler will automatically detect the class files placed in the App-Code folder and compile it. In the Bin directory we need to place precompiled class file (.dll). DLL stands for Dynamic Linked Library, which contains precompiled one or more class files (Class library). Because of this is already compiled version, it will not compiled again. Therefore it gives faster response along with that it can not be opened into the notepad kind of editor to view or edit the code. The code placed into the Bin directory, is accessible anywhere in the website.

2.5.4 App_Themes Directory

App_Themes directory providess a common look and feel to your website across all webpages. You can implement theme by a .skin files, .css files and images used the different server controls for your website. All these elements combinly makes a theme, which can be stored in the App_Themes directory. By storing all these resources into the App_Themes folder you can ensure that all the webpages within the website can take the advantage of these theme and you can easily apply its resources to the different controls you have placed on different webpages. Which gives professional look to your website.

2.5.5 App_GlobalResources Directory

App_GlobalResources directory is used to store the resource (.resx) file. Resource files are a table of strings, where you can store multiple strings in the different languages. This directory is used for the language trasnslation. For each new lagnauge, separate .resx files are created. When the browser is making a request to the webserver for specific webpage at that time the default langauge set in the browser's setting is evaluate. If the .resx file for that language is available then certain strings mentioned in that .resx file which written in that resource file will be replaced with English to user's native language. So, the purpose of this directory is for language translation. You migh have observed that if you change you default language to Hindi in stead of English in the setting of your Chrome broswer, and if you open the page of Google then you can see certain containt of webpage into the Hindi lanaguage.

App_Themes and App_GlobalResources directories can be add in the website by doing ritght click on the project and by choosing the option called "Add ASP.NET Folder". In fact, there are many other built-in directories are there which we are not discussing here as they are out of the context of the syllabus for this course.

Check your progress 3

1.Database files has to be placed in _____ directory of ASP.NET website.

[A] App_Code   [B] App_Data

[C] App_Database   [D] App_DB

2.Pre compiled class files, should be placed in _____ directory of ASP.NET.

[A] App_Code   [B] App_GlobalResources

[C] App_Data   [D] Bin

3._____ built-in directory of ASP.NET is used to store resource file, which will be used in the language translation

[A] Bin   [B] App_Data

[C] App_GlobalResources   [D] App_Theme

2.6   LET US SUM UP

In this unit we have discussed coding models of ASP.NET. Coding model is nothing but the way of writing the code into the .aspx pages. In Inline coding model one common file will store designing (XHTML) and coding (either C#.NET or VB.NET). In code-behind model two separate files are maintained one for storing designing code in XHTML and another file.aspx.cs to store C#.NET code or .aspx.vb to store VB.NET code. We have also discussed how the inline code can be written in the <HTML> section using code render block (<%   %>). After this we have discussed about some built-in directory structure which can be used to special types of files. For example, Database files has to be placed in App_Data directory, Class file has to be placed in App_Code directory, pre-compiled class files have to be placed in the Bin directory, Files related to skin and themes are placed in the App_Theme directory and .resx (resource) files which used to language translation has to be place in the App_GlobalResource directory.

2.7 GLOSSARY

1. **Coding model:** It is a methodology to write the code in the.aspx pages. ASP.NET supports Inline and Code-Behind models.
2. **App_Data:** It is a built-in directory of ASP.NET. Database files has to be placed in this directory. Once it is placed in App_Data directory, you can use relative path to your database resources which will not be changed if the location of your website gets changed.
3. **App_Code:** This built-in directory, allows user to place all class files. Class files placed in this directory will be automatically compiled and you can use those class files anywhere in the website.
4. **Bin:** This built-in directory structure is used to place all precompiled class file (.dll) files. DLL stand for Dynamic Linked Library files.

2.8   SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

1. [A] Inline
2. [A] Inline
3. [D] Partial class

Check Your Progress-2

1. [C] .ascx
2. [D] .asmx
3. [A] <% %>

Check Your Progress-3

1. [B] App_Data
2. [D] Bin
3. [C] App_GlobalResources

2.9   Assignment

1. Explain Coding models of ASP.NET in details.
2. Briefly explain the built-in directory structure of ASP.NET.
3. What is code-render block? Explain it with an example.

2.10   Activity

Find different methods by using it a browser request a webpage to the server. Make short note of each of these methods.

2.11 Case Study

Find any 2 Dynamic E-Commerce websites from the Internet and draw the flow of processes they possess.

2.12 Further Reading

- ASP.NET 4.0 Unleased by Stephen Walter.
- Beginning ASP.NET by Wrox publication.
- Professional ASP.NET 4.0 by Wrox publication.

UNIT 3   INFORMATION PASSING AND STATE MANAGEMENT

3.0   LEARNING OBJECTIVES

After working through this unit, you should be able to:

- Understand nature of HTTP protocol

- Learn how to pass information from one page to another

- Understand the concept of Query string and Cookies

- Learn state management of ASP.NET

- Know about Global.asax file

3.1   INTRODUCTION

As we have discussed in the last unit that the web is based on client-server architecture, here Browser act as client. It makes a request for different webpages to the server. Server receives these requests from the different browsers (clients), search, process and responses to the requested browsers. In this client (Browser) and Server (IIS of Apache) communication is done by a protocol called HTTP (Hypertext Transfer Protocol).

HTTP is an application layer protocol. HTTP protocol does not maintain persistent connectivity between browser and server, and therefore it is also known as stateless protocol. Every time, when browser requests to the webserver, server behave like a stranger to it.

Because of the Server and Client has their own predefined role, and communication between them is done by HTTP protocol, which is a stateless protocol it is difficult to pass information, which available on one page to another page. For example, you search something on one page Google, search result is displayed on another page, or you click on specific product on any Ecommerce site and its details you can see on another webpage. In the ASP.NET there are couple of ways are there, using that we can pass the information available on one page to another page. Let's see one by one them.

3.2 PASSING INFORMATION FROM PAGE TO ANOTHER

In fact, there are many approaches are there to pass the information from one page to another page, let's begin with Previouspage object and it's findcontrol method.

3.2.1 previouspage.findcontrol() method:

In all different methods of passing information from one page to another page, we will do the same exercise. We will add two web pages in the website. We will place a Textbox and a button on the one webpage and we will take a label on another page. User will run the first page and add some text into the Textbox and then click on the Submit button. On the click event of the button, we will redirect user to the second page where the string entered by the user in the Textbox of first page, is shown in the label of the second page. Let us do it, through previous page.findcontrol() method.

To implement and use a method called FindControl() of PreviousPage object, design an interface having a Textbox and a Button on one page and a label on another page. We assume that the first page is Default.aspx in which you have placed a Textbox and a Button, and in Default2.aspx you have placed a Label.

Now open Default.aspx page and select the Button. Go to Property window (if property window is not shown press F4 key to load property window). In the property window set PostBackUrl property to "~/Default2.aspx" (This will redirect user on the Default2.aspx page, when user will click on this button). Now, double click on Default2.aspx page in the Solution Explorer and open the Default2.aspx in the Design mode. Double click anywhere in the Default2.aspx, which will load Page_Load event of the Default2.aspx page. Here, you need to write the following code.

```
protected void Page_Load(object sender, EventArgs e)
    {
        if (PreviousPage != null)
        {
            TextBox tx;
            tx = (TextBox)PreviousPage.FindControl("Textbox1");
            Label1.Text = "Hello "+ tx.Text;
        }
    }
```

In this code we are checking that if PreviousPage object is exists then, we declare a pointer tx of TextBox class which will point to Textbox1 control of previous page. Finally, we are concatenating the text property of tx with "Hello " string and place it in the lable.

When user open the Default.aspx page, enter his/her name into the textbox and click on the button then, user will be redirected to the Default2.aspx as we have set the PostBackUrl property to button1 as 'Default2.aspx'. When Defualt2.aspx page is opened, the load event will fire and the written on the load event of Default2.aspx will be executed and it will bring the data from the text property of the Textbox1 which we have placed on the Default.aspx (PreviousPage). The example will be shown as follows:

Default.aspx	Default2.aspx
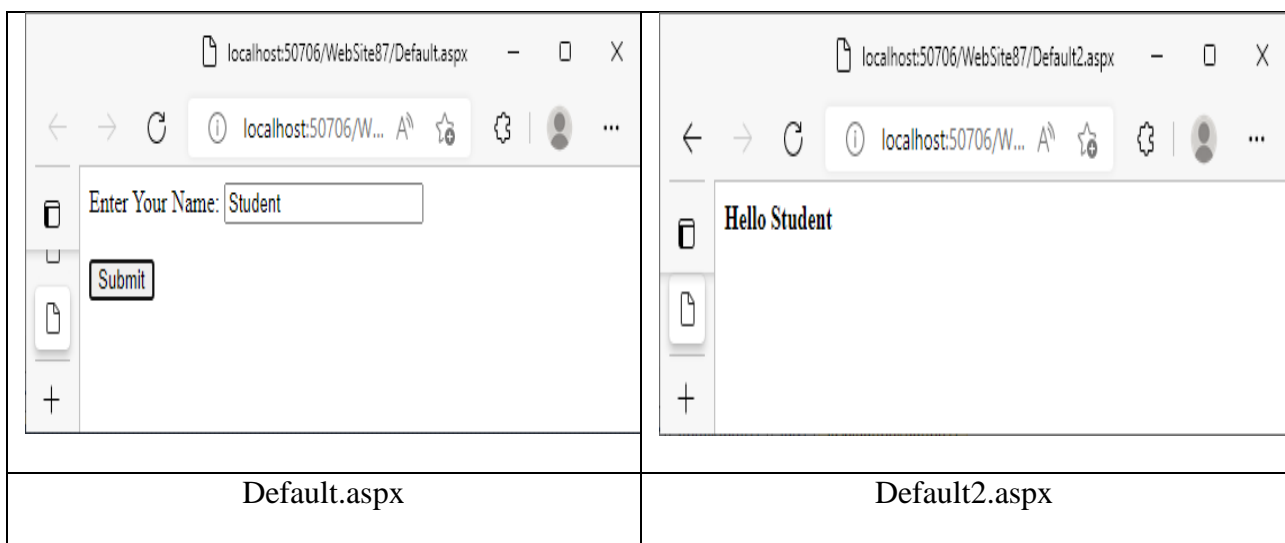
3.2.2 Using public property / method:

In this approach, we will perform the similar task. We will show the string added by the user on the TextBox of default.aspx, in the Label of Default2.aspx. To do this we will create a public method called myTxtBx as shown below in the default.asxp page (Make sure here we assume that the both the pages you have designed by placing TextBox and Button on default.aspx and Label on Default2.aspx and you have also set the property PostBackUrl of the Button to "~/Default2.aspx".)

```
using System;

using System.Collections.Generic;

using System.Linq;

using System.Web;

using System.Web.UI;
```

```
using System.Web.UI.WebControls;


public partial class _Default : System.Web.UI.Page

{

    public TextBox myTxtBx()

    {

        return TextBox1;

    }

}
```

See, Default2.aspx is outsider for Default.aspx class, and can not access the properties of Default class such as TextBox directly. So, we have made a public method 'myTxtBx' which returns TextBox1. Default2.aspx can not directly use TextBox1 but it can call to 'myTxtBx' method as it is public method. Now, we need to explain to Default2.aspx that its previous page will be Default.aspx. To this write the following code in the source mode of Default2.aspx page.

```
<%@ Page Language="C#" AutoEventWireup="true"
CodeFile="Default2.aspx.cs" Inherits="Default2" %>

<%@ PreviousPageType VirtualPath ="~/Default.aspx"  %>
```

Add the line <%@ PreviousPageType VirtualPath="~/Default.apx" %> after the line of page directive <%@ Page …. %> in the Default2.aspx. Now go to the Design mode of Default2.aspx page and double click on any blank area to open load event of the page. Write the following code on the load event of Default2.aspx page.

```
protected void Page_Load(object sender, EventArgs e)

    {

        if (PreviousPage != null)

        {

            TextBox tx;

            tx = PreviousPage.myTxtBx();

            Label1.Text = "Hello "+ tx.Text;

        }
```

```
        }
```

Here, we are calling the method called myTxtBx(), which we have created on the Default.aspx page. Run and test the web pages (It will run similar to the previous example).

3.2.3 Querystring:

Another method of passing information from one page to another page is Querystring. In this method we will create a variable in the URL (Uniform Resource Locator) of a browser, and the data which we want to pass to another page will be stored in this variable. We will redirect the user to the second page. Second page now fetch that data from the variable which we have created in the URL and use it. That means, here one page passes the information to the other page using URL of browser.

To implement querystring, design a website having two webpages default.aspx and default2.aspx. Place a TextBox and a Button control on the default.aspx page. Similarly place a label control on the default2.aspx page. Now do double click on the button, which will open a subroutine called Button1_Click(). On the click event of button write the following code.

```
protected void Button1_Click(object sender, EventArgs e)

    {

        Response.Redirect("Default2.aspx?Val=" + TextBox1.Text);

    }
```

In the code we are redirecting user to default2.aspx then to mention querystring we have done ? sign, then in the 'Var' variable we have encapsulated value of Textbox1. Now run the page, enter your name in the Textbox and click on the button. See in the URL.
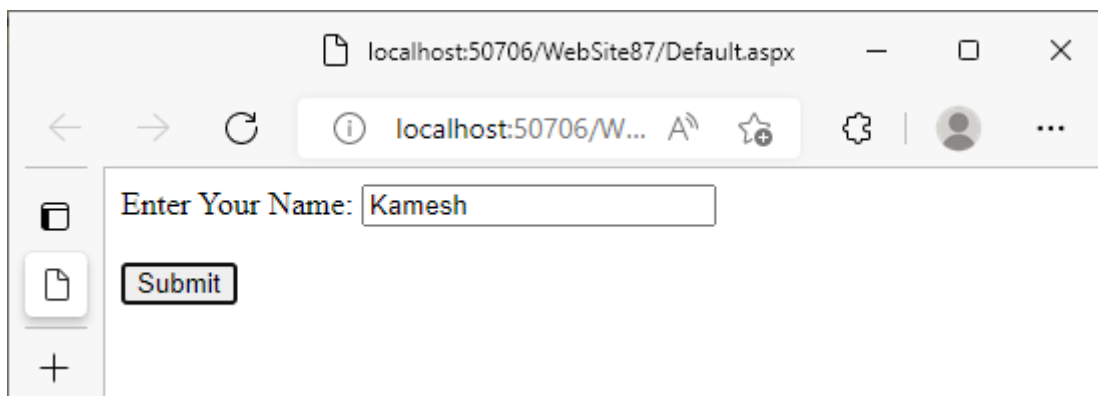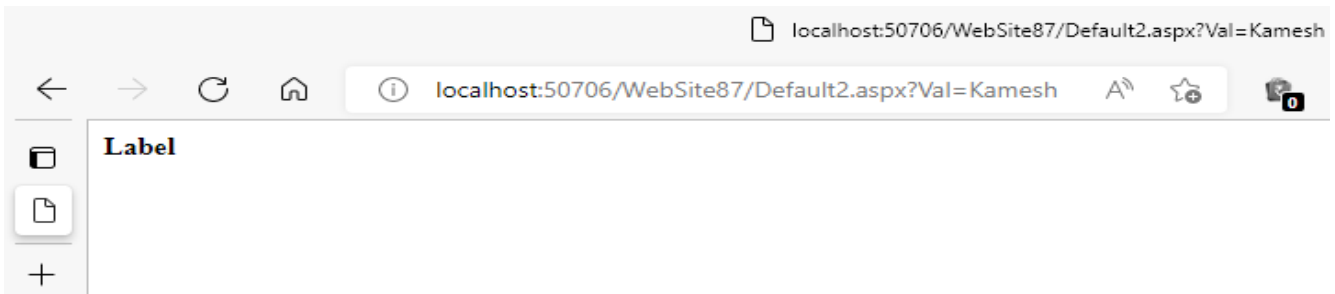
You can see the first webpage in which we have entered string 'Kamesh' and then on the click event of the button, Browser redirect us to Default2.aspx. See in the URL, you can see the value which needs to passed to the default2.aspx in the URL with Val variable. Now, we need to write the code on the load event of default2.aspx so that we can retrieve the value of Val variable from the URL and we can put it in the Label.

```
protected void Page_Load(object sender, EventArgs e)

    {

        Label1.Text = Request.QueryString["Val"];

    }
```

Check the google website, search a string called BAOU on the Google. You can see the search results related to your search appears on the next page. Check the URL of this second page, can you find your search string BAOU in the URL? If yes, then you can say that the Google is also using Querystring approach from passing information from one page to another. Make sure, in the Querystring approach we are writing code on the click event of the button, and hence you do not have to set 'PostBackURL' property. In the ASP.NET, if you want to execute code on the click event of the button then you do not have to set 'PostBackURL' property. You can navigate the user to another page by using Response.Redirect () method,

3.2.4 Cookies:

In the Querystring approach, default.aspx page redirect the user to the defaul2.aspx on the click event of the button, and pass the data to the default2.aspx using URL. In the case of cookies, first page (default.aspx) creates a small file under the client (browser) machine and stores the information in it. After creating cookies, we redirect user to the default2.aspx page, which in term retrieve the information from cookie file. Because we create a file in the secondary memory of the client computer, it will remain as it is for a longer period of time. So that in this approach you can set expiry for cookies. Suppose you set expiry of some cookies for 10 days, then after 10 days cookies file will be automatically deleted from the client computer.

To implement cookies, design a website having two webpages default.aspx and default2.aspx. Place a TextBox and a Button control on the default.aspx page. Similarly place a label control on the default2.aspx page. Now do double click on the button, which will open a subroutine called Button1_Click(). On the click event of button write the following code.

```
protected void Button1_Click(object sender, EventArgs e)

    {

        HttpCookie ck = new HttpCookie("myCookie");

        ck.Value = TextBox1.Text;

        ck.Expires = DateTime.Now.AddDays(10);

        Response.Cookies.Add(ck);

        Response.Redirect("Default2.aspx");

    }
```

In this code, first we have created an object 'ck' of type HttpCookieand we have given name 'myCookie' to cookie. Then we have set the value for the cookie by taking the value from the TextBox. We have set the expiry for this cookie for 10 days and finally cookie is added in the client computer. Now we redirect the user to the default2.aspx page.

Now, on the load event of the default2.aspx file, we need to check for 'myCookie'. If it exists then we need to fetch the value encapsulated in it and show that value in the Label. So, to do this you need to write following code on the load event of detault2.aspx page.

```
protected void Page_Load(object sender, EventArgs e)

    {

        if (Request.Cookies["myCookie"] != null)

        {

            Label1.Text = Request.Cookies["myCookie"].Value.ToString();

        }

    }
```

In most website, when you are opening login page, then you can find username, password and one check box showing 'Remember Me Next Time'. You check this checkbox after entering username and password, then your authentication details like username and

password will be stored in the cookies. When you come to this page after sometime or few days then it will take your login credentials from the cookies file and you do not have to enter username and password again and again.

In both the approaches Cookies and Querystring we have used Request and Response object. But when to write Response and when to write Request? Well, we will do the detail discussion on it one we complete all the methods of passing information from one page to another.

3.2.5 Session variables:

Session will be created, when any user makes a request for any webpage of the website by a server and it will be maintained by a server until user does not logout. For user a separate session is maintained by a server and hence the information stores in the session variable will not accessible by another user. Session has limited timespan (usually 10 minutes as default), hence the information stored in the session will be no longer available after few days (like cookies). To create a session variable and stores the information in it, write the following code on the click event of the button.

```
protected void Button1_Click(object sender, EventArgs e)

    {

        Session["MySession"] = TextBox1.Text;

        Response.Redirect("Default2.aspx");

    }
```

To read the data available in MySession variable on the default2.aspx page, write the following code on the load event of Default2.aspx page.

```
protected void Page_Load(object sender, EventArgs e)

    {

        if (Session["MySession"] != null)

        {

            Label1.Text = Session["MySession"].ToString();
```

```
        }
    }
```

 Check your progress 1

1._____ is the method of passing information from one page to another using URL of the browser.

[A] QueryString　　　　　　　　[B] Previouspage.FindControl()

[C] Public property/method　　　　[D] Cookies

2.In _____ a small file is created under client computer, to store the information which a webpage wants to pass to another page.

[A] QueryString　　　　　　　　[B] Previouspage.FindControl()

[C] Public property/method　　　　[D] Cookies

3. Information stored in _____ will remain as it is until user do not logout.

[A] QueryString　　　　　　　　[B] Previouspage.FindControl()

[C] Session　　　　　　　　　　[D] Cookies

3.3　HTTPREQUEST AND HTTPRESPONSE OBJECTS

You have noticed that, in the example of Querystring and Cookies, we have used Response and Request objects. Let us try to understand them so that you will come to know when to write Response and when to write Request.

From the past discussion, you know that the code written in the C#.NET or VB.NET, will be executed by a server, whereas code written in XHTML and JavaScript will be executed by the server. Now, when the server is clear with the instruction and server wants instruct client (Browser) to do something, may be in the form of order then we use HTTPResponse object. Therefore, in the case of Response.Redirect (), Response.Write (), or Response.Cookies.Add () kind of statements Server is instructing to the browser to perform particular actions like redirect

user to some page, or write something on the page or Add the cookies in the form of some order. Brower follows this order and act accordingly.

Now, when the we write the code on default2.aspx in the case of Querystring or Cookies approach, Server is executing the code as it is written in the C#. Server need to set Label1.Text from either retrieving values from QueryString or Cookies. QueryString is a variable in the URL and Cookies are file. Both are in the client computer. Here server needs a value from the client, and as you know if you want something from somebody, you can't order. You need to make a request. Therefore, in the situation where sever want something which is at the client side, server need to request to the client.

Check your progress 2

1._____ object is used when server wants to fetch the value from the cookies.

[A] Response   [B] Request

[C] Previouspage   [D] Page

2.With _____ object, server is instructing to the client to perform some desire actions.

[A] Response   [B] Request

[C] Previouspage   [D] Page

3. Which not a method of response object?

[A] write()   [B] FindControl()

[C] redirect()   [D] Cookies.Add()

3.4   STATE MANAGEMENT IN ASP.NET

In the ASP.NET, state management is done at three levels: [1] Page level using View state [2] Session level and [3] Application level. Let us try to understand it one by one.

3.4.1 View states:

When you add any new page to the ASP.NET then one hidden control is associated with it, which called as ViewState control. When the browser submits the page (on the click of a

button) all the controls placed in the page are packed (encapsulated) into this hidden control called ViewState. This ViewState is forwarded to the server. When server opens this, server can know what happens with different controls at client side. This is actually needed because server do not maintain a persistent connectivity with client (HTTP is a stateless protocol). ViewState is the only option, by using it server can come to know what is written by the user in the Textbox, or which Radiobutton is selected by a user or which button is clicked by a user on the page at client side.

View state helps to manage state at page level. If you want to know more about this hidden View state control then add a new page to your website (do not add or place any control on it). Run this page in the Internet Explorer browser (Right click on that page in the Solution Explorer, choose option browse with and choose Internet Explorer). When the page is loaded in the browser then open the View -> Source or press Ctrl + U keys. You will be able to get the source of this page. You can find following line in the source.

<input type="hidden" name="__VIEWSTATE" id="__VIEWSTATE" value = "/wEPDwULLTE2MTY2ODcyMjlkZMal+JVAQ93Ofs9tJE9mgC5+Vkmy4akDgEgU81VhcPk E" />

Now, you just think, if we have taken a new page, we have not placed any control in it then how this <input type = "hidden" ….> controls came? This is actually View state. Now let us discuss how view state will help you out in the state management at page level.

Design a webpage with a Label and a button control. The following HTML code will help you out to design you web page.

```
<%@ Page Language="C#" AutoEventWireup="true"
CodeFile="Default4.aspx.cs" Inherits="Default4" %>


<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">


<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">

    <title></title>

</head>

<body>

    <form id="form1" runat="server">
```

```
    <div>

        <asp:Label ID="Label1" runat="server" style="font-weight: 700"
Text="Label"></asp:Label>

        <br /><br />

        <asp:Button ID="Button1" runat="server" onclick="Button1_Click"
Text="Submit" />

    </div>

    </form>

</body>

</html>
```

Now write the following code behind code to your webpage.

```
using System;

using System.Collections.Generic;

using System.Linq;

using System.Web;

using System.Web.UI;

using System.Web.UI.WebControls;


public partial class Default4 : System.Web.UI.Page
{
    int myvar = 0;


    protected void Page_Load(object sender, EventArgs e)
    {
        if (!Page.IsPostBack)
        {
          Label1.Text = myvar.ToString();

        }
```

```
        }

    protected void Button1_Click(object sender, EventArgs e)

    {

        myvar = myvar + 1;

        Label1.Text = myvar.ToString();

     }

}
```

Code we have written is pretty simple. We have declared a global variable myvar and initialized it with 0. We want to increment the value of it by 1 every time when the button is clicked, and we need to show the value in the Label.

If you run and click the button of the first time, the value in the Label will be increased from 0 to 1. But then if you click on the button for second or third time the value in the Label will not change. But why this happen so, even if we have written the correct code? The reason is every time when you submit the button then you web will be posted back to server. Each time server will create the new instance of the page and along with it the new instance of the myvar will be created and initialized it with 0. But what is the solution for this problem? The solution is use of ViewState variables. If we use ViewState variable and do some changes in to the code written above, then every time when you click the value of myvar variable is retained in the ViewState variable and you will get the incremented value in the Label.

```
public partial class Default4 : System.Web.UI.Page

{

    int myvar = 0;


    protected void Page_Load(object sender, EventArgs e)

    {

        if (!Page.IsPostBack)

        {

            ViewState["vsvar"] = 0;
```

```
            Label1.Text = myvar.ToString();

        }



    }

    protected void Button1_Click(object sender, EventArgs e)

    {

        myvar = (int)ViewState["vsvar"];

        myvar = myvar + 1;

        Label1.Text = myvar.ToString();

        ViewState["vsvar"] = myvar;

    }

}
```

3.4.2 Session State:

The value stored in the Session variable remains persistent till the session end. When user opens any webpage from our website the session will be started, and it will be ended when user logs out from the site. Even if user does not log our and close the browser window, then server will wait for client up to some default session timeout period, if the session is idle for timeout time period, then session will be destroyed by the server. All session variables are maintained under session therefore they have similar life time. When the session is destroyed all the session variables held by that session will be also destroyed. We have already explained how can we store the value and retrieve the value in the section of passing information from one page to another.

3.4.3 Application State:

Application State has the longest lifetime span. Application starts when it is hosted on the server and its service has been started and it ends may after few years later (may be for maintenance reason). The Application variables are created in the memory when Application starts or particular code is executed and it will remain into the server memory till the application ends when server is in the maintenance mode.

The copy of the session variables is maintained separately for each user. One user cannot access the session variables of another user. Whereas, for Application variable only one copy of the variable is maintained which is shared among all the users.

3.5   GLOBAL APPLICATION CLASS

In the above section we discussed about application and session states and their life span. But suppose if we want to execute some code when the application is started or when the session is started then?

In this case, you need to write the code in the global application class file called 'global.asax'. You need to add this file by Right clicking on the website name from the Solution Explorer and choosing the option called 'Global Application Class' from the 'Add New Item' dialog box as shown below:
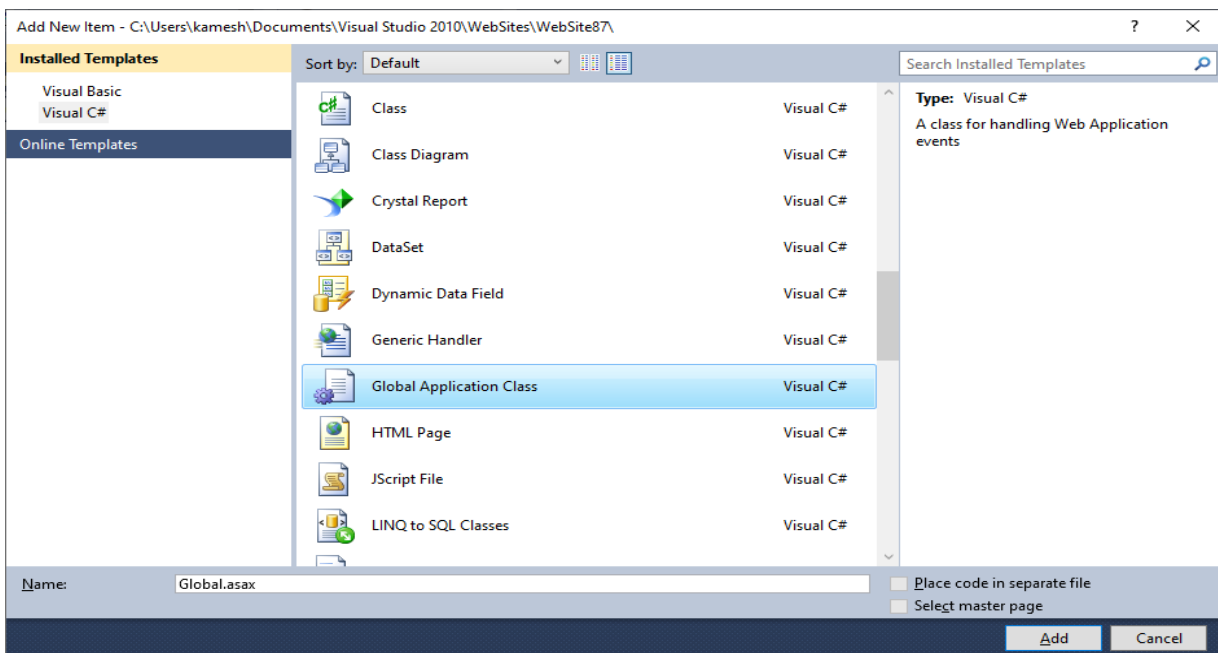
This will add a file called Global.asax file into your website. This file has certain subroutines which will executed on Application start, Application end, Application error, Session start and Session end. The file is shown below:

```
<%@ Application Language="C#" %>

<script runat="server">


    void Application_Start(object sender, EventArgs e)

    {
```

```
        // Code that runs on application startup



    }

    void Application_End(object sender, EventArgs e)

    {

        //  Code that runs on application shutdown



    }

    void Application_Error(object sender, EventArgs e)

    {

        // Code that runs when an unhandled error occurs



    }

    void Session_Start(object sender, EventArgs e)

    {

        // Code that runs when a new session is started



    }

    void Session_End(object sender, EventArgs e)

    {

        // Code that runs when a session ends.

        // Note: The Session_End event is raised only when the
sessionstate mode

        // is set to InProc in the Web.config file. If session mode is
set to StateServer

        // or SQLServer, the event is not raised.

    }

</script>
```

- In this file you need to write the code, which you want to execute it on the Application_Start (), Session_Start (), Session_End () type of events.
- The file stores code to be executed on the different events, and hence it is in the C#.NET or VB.NET language (Depending upon which language is chosen by a programmer at the time of adding the file to the website.
- There will be only one copy is there for Global.asax file in the whole website.
- The code to be executed for the Profile migration should also be written in this file.

Check your progress 3

1. Which object in ASP.NET provides a global storage mechanism for state data that needs to be accessible to all pages in a given Web application?

[A] Application   [B] ViewState

[C] Session   [D] None of the above

2.If you want to execute the code on the session_start() event, then in which file you will write the code?

[A] web.config   [B] master page

[C] global.asax   [D] ascx file

3. _____ is a ASP.NET state maintained at page level.

[A] Application   [B] ViewState

[C] Session   [D] None of the above

3.6 LET US SUM UP

In this we have discussed about how can we pass data or information which available with one webpage, to another web page. To pass the information in the ASP.NET, various methods are there for example: Previouspage.FindControl() method, By creating public property or method, QueryString, Cookies, Session variables and so on. We have also

discussed state management of ASP.NET and how Application, Session and ViewState are used in the website. Finally, we have discussed about Global Application Class (global.aspx) file and different event which it supports.

3.7   SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

1.   [A] QuesryString
2.   [D] Cookies
3.   [C] Session

Check Your Progress-2

1.   [B] Request
2.   [A] Response
3.   [B] FindControl

Check Your Progress-3

1.   [A] Application
2.   [C] Global.asax
3.   [D] ViewState

3.8   GLOSSARY:

1. Application State: Application state is the state in ASP.NET starts from when the application (website) is hosted on the server and its services is started. Application State ends when the service of the website is stopped due to some reasons like maintained or any other reason. Application state is the longest state (several years).
2. Session State: Session State represents session of the user. When user visit any page of the website or login into the website the session for that user will be started and, on the logout session state for that user will be ended. For each user separate session state is maintained.
3. View State: View State is also a state of ASP.NET website, which maintain page level information.
4. Global.asax: It is file which allows website developer to write the code which will be executed on Application_Start(), Application_End(), Session_Start() or Session_End() kind of events.

3.9   Assignment

1.   Elaborate State-management in the ASP.NET.
2.   List and explain all methods of passing information from one page to another.
3.   Write a short note on: Global.asax file.

3.10   Activity

Design a website, in which Application Hit counter is implemented. Application Hit counter is a counter which count how many time the website is visited from some specific date (Generally it is date, when the Application is started.

Hint: To count how many time website is visited you need to declare the Application variable on the Application_Start() event and initialize it with 0.

Application["Cntr"] =0;

On the session_start() event, it will be incremented by 1.

Application["Cntr"] = (int) Application["Cntr"] +1;

Show the value of Application variable Cntr on any of your webpage in the Label.

3.11   Case Study

Search about get and post methods of HTTP, and understand the use of both the methods.

3.12   Further Reading

- ASP.NET 4.0 Unleased by Stephen Walter.
- Beginning ASP.NET by Wrox publication.
- Professional ASP.NET 4.0 by Wrox publication.

UNIT 4   INTRODUCTION TO SERVER CONTROLS

Unit Structure

4.0 LEARNING OBJECTIVES

After working through this unit, you should be able to:

- Understand page object
- Learn about page life cycle
- Understand rendering process and types server controls
- Standard Server controls

4.1 INTRODUCTION

In this unit, we will focus on page object, which is actually represent your page. We will see two important properties of the page object and along with that we will also understand series of events executed on the server when particular page is requested by a client. It is also known as page life cycle.

Then we will be discussing on rendering process, which is done by the server. By understanding rendering process, you will get the reason, that why ASP.NET controls which will be discussing in out upcoming units are called server controls.

We, will get the brief idea on different types of server controls available in the ASP.NET and then we will start with the discussion on very basic controls which are known as standard controls.

4.2 PAGE OBJECT:

Before going in into the details of Standard Controls available in the ASP.NET we should have to understand our page object. Our webpage is represented as page object lets discuss some important properties of it.

4.2.1 Properties of Page

In reality there are many, properties are there of the page object. We will focus on only two important properties:

[1] IsPostBack:

This is an important property of a page, which returns Boolean value. When you open any page, we type the URL of that page in the URL section of the browser. At this point of time browser does not have a page. This request for the page is called HTTP_GET request. But once the browser gets the page, and user click on any button, which is placed on the page then the browser is submitting the page to the server. In this request browser do not send only URL of the page but entire page is submitted to the server, with all the controls which are placed in the page through ViewState. This request is called HTTP_POST request.

In many scenarios you need to write the code of the load event, which is eventually has to be executed for the first time, when the page is loaded because of HTTP_GET request. And you don't want to repeat the code if the page is posted back. Make sure Page_Load event will be raised on the both the request. At this time, IsPostBack property will help you out.

For example, on the Page_Load event, the code written in the following if block will be executed only on the HTTP_GET request.

```
if (!Page.IsPostBack)

    {

        //Write your code here which will be

        //Executed only on HTTP_GET request

    }
```

If IsPostBack property, returns TRUE that means page is posted back (HTTP_POST method) and if it is FALSE, that means the page is opened by a browser through URL for the first time (HTTP_GET method).

[2] IsValid:

This property of the page returns Boolean value, depending upon the page has any error which is generated by any validation control. If any of the validation control invalid the data entered by a user on the webpage then IsValid property will returns FALSE value.

```
if (!Page.IsValid)

        {

            //Show Error message

        }

else

      {

            //save the data to the Database

      }
```

4.2.2 Page Life Cycle:

When the browser is making a request for particular page to the server at that time there are series of events is raised by the server, which is called page lifecycle. The following events will be raised by the server.

1. **PreInit:** This is the first event, where request is checked for get or post request. Dynamic controls are created or recreated during this event. Master page or Themes are set during this event.
2. **Init:** This event will be raised after the initialization of all controls. During this event the unique ID is provided to each control. If skin is assigned to different controls of the webpage, then the applied during this event. This event can be used initialize or read different control properties.
3. **InitComplete:** Up to this event the ViewState is not loaded, therefore this event can be used to initialize or change ViewState. This event can be used for processing tasks that requires all initialization to be finished.
4. **PreLoad:** During this event ViewState and PostBack data is processed.
5. **Load:** This is the first event, which is raised after all values are restored. The important page properties which we have discussed in the earlier section i.e IsPostBack and IsValid can be used during this event. During this event, you can set the properties of different controls and establish the connection with the database server.
6. **LoadComplete:** This even will be raised after the end of event-handling stage. You can use this event for tasks that require that all controls on the page be loaded.

7. **PreRender:** This event raised after all controls are created and they are ready to be render. This event allows final changes to the page or its control. During this event, all the control which assign DataSource property, are applied and DataBind() method can be invoked.
8. **PreRenderComplete:** This event will be raised when all controls are rendered.
9. **SaveStateComplete:** This is the last event which will be raised when page and its controls are rendered and ready to deliver it to the Browser.
10. **UnLoad:** This the last event of page life cycle. It used for clean-up purpose. During this event the instance of a class are cleaned up from the memory, Data connection will be closed and all the files which are opened are closed during this event. The event occurs for all the controls first and then after for the page.

In order to execute the sequence of the event series, add a new web page to your website, and write the following code to the page. You can write the code for different events in any order. Run the page and observe the exact sequence of events which are executed by a server.

```csharp
using System;

using System.Collections.Generic;

using System.Linq;

using System.Web;

using System.Web.UI;

using System.Web.UI.WebControls;


public partial class Default5 : System.Web.UI.Page

{

    protected void Page_Load(object sender, EventArgs e)

    {

        Session["str"] = Session["str"] + "Load <br/>";

    }

    protected void Page_PreInit(object sender, EventArgs e)

    {

        Session["str"] = Session["str"] + "PreInit <br/>";

    }

    protected void Page_Init(object sender, EventArgs e)
```

```csharp
        {
            Session["str"] = Session["str"] + "Init <br/>";
        }
        protected void Page_InitComplete(object sender, EventArgs e)
        {
            Session["str"] = Session["str"] + "InitComplete <br/>";
        }
        protected void Page_PreLoad(object sender, EventArgs e)
        {
            Session["str"] = Session["str"] + "PreLoad <br/>";
        }
        protected void Page_LoadComplete(object sender, EventArgs e)
        {
            Session["str"] = Session["str"] + "LoadComplete <br/>";
        }
        protected void Page_PreRender(object sender, EventArgs e)
        {
            Session["str"] = Session["str"] + "PreRender <br/>";
        }
        protected void Page_PreRenderComplete(object sender, EventArgs e)
        {
            Session["str"] = Session["str"] + "PreRenderComplete <br/>";
        }
        protected void Page_SaveStateComplete(object sender, EventArgs e)
        {
            Session["str"] = Session["str"] + "SaveStateComplete <br/>";
            Label1.Text = Session["str"].ToString();
```

```
    }
}
```

You will get the following output, when you run the webpage.
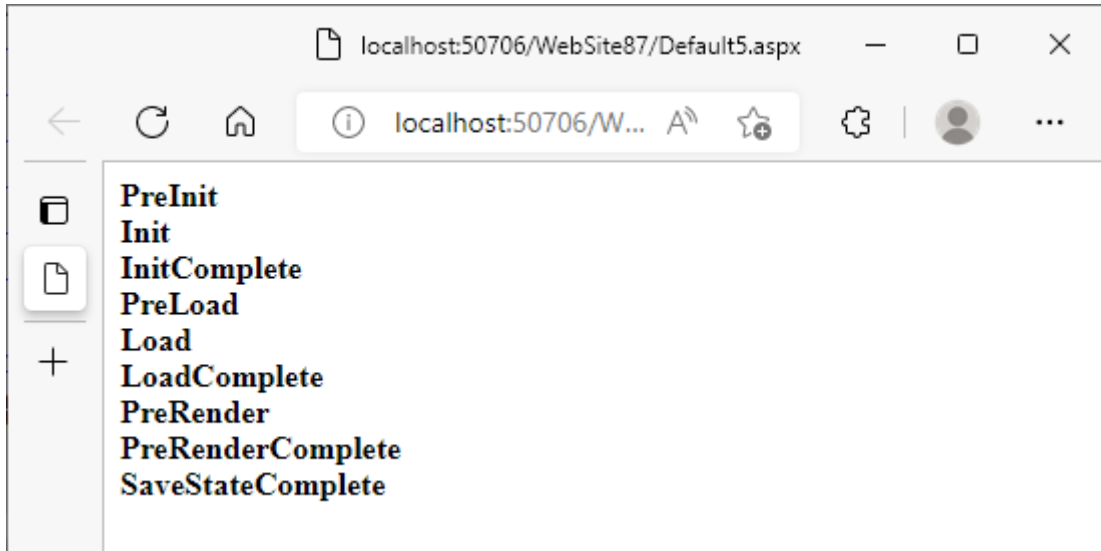
Check your progress 1

1. Which property of the Page object is useful to check the request for the page is get request or post request?

[A] HttpPost   [B] IsPostBack

[C] HttpGet   [D] IsValid

2. Which property of the Page object is useful to check there is no error is there in the submitted data?

[A] HttpPost   [B] IsPostBack

[C] HttpGet   [D] IsValid

3. From the given below option which event raised first among all.

[A] Prerender   [B] Load

[C] Init   [D] SaveStateComplete

4.3 PAGE RENDERING:

Rendering the process, where server converts all the components in the form so that browser can understand. Remember browser knows only HTML and JavaScript, where as all the GUI controls which we are placing on the webpage are the objects of some classes. For example, if you have placed 3 labels Label1, Label2 and Lable3 on the web page then they are the objects of Label class. This Label class, and similar to that all classes which represent a ASP.NET controls are coded into the .NET languages like (C#.NET or VB.NET), which can bot be executed by Browser and it does not have any compiler to compile C# or VB code.

That is the reason, server need to process this control and converts them into HTML, so that the Browser can represent the webpage to the user. This process, where server converts all .NET language coded classes are transform or converted into HTML is called Rendering. To understand the rendering process, add a webpage to your website and place a Label, a Textbox and a Button as follows:

```html
<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">

    <title></title>

</head>

<body>

    <form id="form1" runat="server">

    <div>

        <asp:Label ID="Label1" runat="server" Text="Label"></asp:Label>

        <asp:TextBox ID="TextBox1" runat="server"></asp:TextBox>

        <br />

        <br />

        <asp:Button ID="Button1" runat="server" Text="Button" />

    </div>

    </form>

</body>

</html>
```

You just drag and drop the controls on your webpage, and you can see, the code mentioned above will be automatically written. Now run the webpage in the Internet Explorer browser and open the View -> Source (or press Ctrl + U) of the webpage in the Internet Explorer. You will find the following thing.

```
<div>

    <span id="Label1">Label</span>

    <input name="TextBox1" type="text" id="TextBox1" />

    <br />

    <br />

    <input type="submit" name="Button1" value="Button" id="Button1" />

</div>
```

Now, you know that we have taken <asp: Label>, <asp: TextBox> and <asp: Button> control but when we seen in the source code of Browser window then we are getting <span>, <input type= "text"> and <input type= "submit"> types of tag. Then ask a question to yourself that, who has converted your <asp: Lable> into <span> tag? Or Who has converted your <asp: Button> to <input type= "submit"> tag?

The answer is Server, and the process of converting .NET controls into HTML is called Rendering process.

4.4   INTRODUCTION TO SERVER CONTROLS:

In the previous section we have discussed about rendering process. We have discussed that the controls are designed in the .NET languages, which has to processed by a Server and convert them into the HTML. Because the controls are processed by a server, the controls in ASP.NET are called server controls. Let us discuss what are the different categories are there in the ASP.NET server controls.

- Standard Controls: The standard controls enable you to render standard form of elements such as button, input fields, and labels.
- Validation Controls: The validation controls enable you to validate form data before you submit the data to server.
- Rich Controls: The rich controls enable you to render things such as calendars, file upload, rotating banner advertisement, and multi-step wizard. You can not see any special category of Rich controls, in the Toolbox but they are available in the category of Standard controls itself.

- Data Controls: The data controls enable you to work with data such as database data. For e.g., you can use this control to insert a new record in the database table or you can display a list of database record.
- Navigation Controls: The navigation controls enable you to display standard navigation elements such as menus and tree views.
- Login Controls: The login control enables you to display login, change password, and registration forms.
- Web Part Control: The Web Part controls enable you to build personalize portal application.
- HTML Controls: The HTML controls enable you to convert any HTML tag into a server-side control.

Check your progress 2

1. Label control renders into _____ tag?

[A] <input type= "Submit">   [B] <span>

[C] <input type= "Text">   [D] Label control do not render

2. The process of converting ASP.NET controls into HTML equivalent control tags is called ___.

[A] Converting   [B] Viewing

[C] Rendering   [D] Validating

3. File Upload control is a kind of _____.

[A] Standard Control   [B] Validation Control

[C] Webpart control   [D] Data Controls

4.5 STANDARD SERVER CONTROLS:

Now, let us discuss several standard server controls one by one and understand their important properties in details:

4.5.1 Label control

Whenever you want to modify text, displayed in the page dynamically you can use Label.

For example:

Label1.Text=DateTime.Now.ToString("T")

This line on a page load event will change the display of the text at run time, when page loads. The following important properties we should know about the Label control.

1. ID: This property represents unique identification to the control. Every control should have ID property and it should be unique in the page. Two controls within a page should not have same ID. By default, ASP.NET set the ID property for the Label control is Label1, Label2 and so on.
2. ForeColor: This property represents foreground color (color of Text). It gets / sets color.
3. BackColor: This property represents Background color. It gets / sets color.
4. BorderStyle: This property represents border style for the Label control. Possible values to be passed to this property are: None, Dashed, Dotted, Double, Grove, Inset or Ridge.
5. BorderWidth: This property gets /sets integer value. It represents width of the border in px (pixels).
6. BorderColor: This property represents color of the border. It gets/ sets color to the border of the Label.
7. ToolTip: This property takes a string, which will be appear when your bring mouse over the label at runtime.

See, the following example in which we have tried to use all these properties in one go:

```
<asp:Label ID="Label1" runat="server" Text="Label"
        BorderStyle= "Dashed"
         BorderWidth="2px"
          BorderColor ="Red"
           BackColor="Yellow"
            ForeColor="Blue"
             ToolTip ="This is Label"></asp:Label>
```

8. Visible: This property takes Boolean value. By default, value of visible property for the label is TRUE. That means when you place a Label on the webpage it will be visible at run time. If you set it to be FALSE then Label control will not be visible at runtime.

9. CSSClass: This property is used to assign cascading style sheet class to the Label. Whatever CSS coding is done in the class that all will be applied to the Label in one go. Consider the following example:

```html
<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">

    <title></title>

    <style type ="text/css">

    .lblStyle

    {

        color: Blue;

        background-color: Yellow;

        border: Solid 2px Red;

    }

    </style>

</head>

<body>

    <form id="form1" runat="server">

    <div>

        <asp:Label ID="Label1" runat="server" Text="Label"
CssClass="lblStyle" ></asp:Label>
```

```
      </div>

      </form>

</body>

</html>
```

In this, example we have applied "lblStyle" CSS class to the Label using CSSClass property. CSSClass "lblStyle" is defined in the <HEAD> section, in which forecolor, backcolor, border color, border style and border color is defined. All these formatting will be applied to your label in one go, when you apply 'lblStyle' class to the CSSClass property of the label.

10. AssociatedControlId: Label control is rendered as a <span> tag if the **AssociatedControlId** property is not set. If you are setting this property then Label control is rendered in the <label> tag. It is used for screen reader type of devices. Side benefit of using this property is by clicking on the label focus will be automatically set to associated control.
11. EnableViewState: As we have discussed earlier all controls are sent to the server, when user click any button placed on the webpage by a ViewState. By default, every control has EnableViewState property is TRUE. If you set this property of the Label is to be FALSE, then browser will not send this Label to the server through ViewState. In this case server can not access the values of different properties of this Label.

4.5.2 Literal control

Literal Control is similar to the Label control. You can use the Literal control to display text or HTML content in a browser. However, unlike label control, the Literal control is not rendered as a <span> tag. It is very light weight control does not have any formatting features. It has following properties:

1. Text: It is used to get/set text to the Literal Control.
2. EnableViewState: it is same as explained in the label control.
3. Mode: The default value for this property is Passthrough. You can change it to Encode if the text property having text value which match with some HTML tag.

4.5.3 Textbox control

Textbox control is used to take input from the user. Important properties of this control are described below:

1. AutoCompleteType: This property takes class name like FirstName, LastName, Email etc. Once the particular class is assigned then different values entered into the textbox are stored within this class in the client computer. If you try to enter details in another textbox of your website or any other website having same class name, then whatever values are stored in that class in that machine will appear. If your want to enter the same details, your do not have to type entire detail, but user can choose from the options which are shown at runtime.
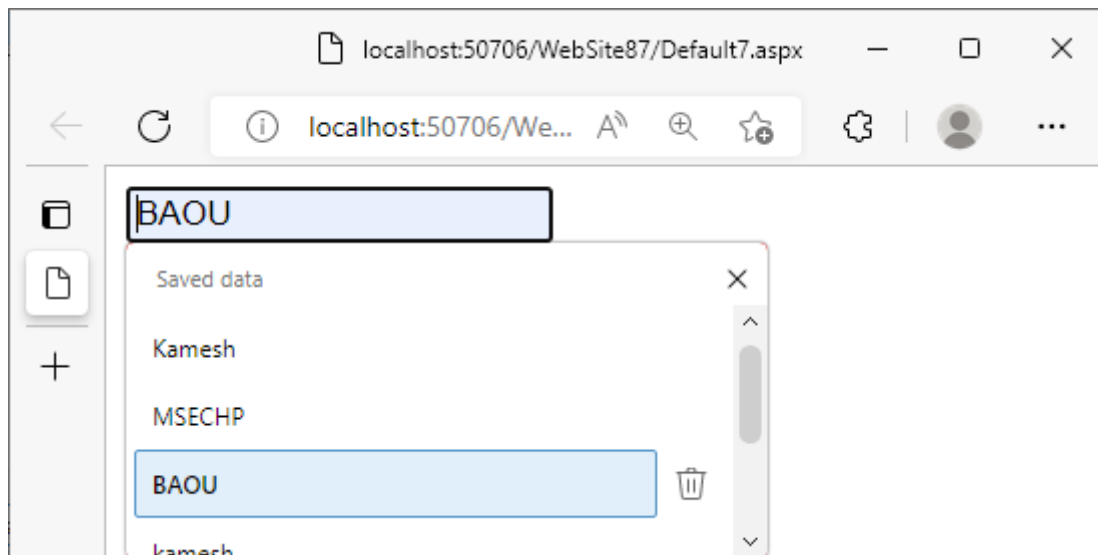
2. AccessKey: In this property you need to enter a character. For example, you have entered 'K'. Then at runtime, when user press Alt+K, the focus will be shifted to that Textbox directly.

3. TextMode: Depending upon the value set to this property, Textbox change its behaviour. The possible values are SingleLine, Multiline, Password etc. Default value is SingleLine. If you change it to MultiLine then Textbox can take multiline with vertical scrollbar. If you set this property to Password then textbox will be configured to take password and text entered by the user into this textbox will be masked with some symbols like ●.

4. MaxLength: This property takes integer value. Default value is 0, that means Textbox can take maximum 32,768 characters. If you set this property to 10 then, textbox will not allow user to enter more than 10 characters into this Textbox.

5. ReadOnly: This is a Boolean property. Default value of this property is False, so that user can enter the text in the Textbox. If you set this property to be TRUE, then Textbox will become ReadOnly and user can not enter anything into this Textbox.

6. AutoPostBack: This is also a Boolean property and default value of this property is FALSE, which means the page is not posted to the server immediately when you make any changes in it. If you set value TRUE to this property then when you make any changes into the Textbox, and focus will come out from the Textbox then page is immediately posted to the server. Usually, we need to set this property is TRUE, if you want to execute some code on the

TextChanged event immediately when the focus comes out from the Textbox and you do not want to wait for your press the Button.

4.5.4 Button controls

Next Standard control for your Web forms is a button which can be constructed using the Button server control. Buttons are useful element, and used to submit forms. In most of the cases you are simply dealing with items contained in your forms through the Button control's OnClick event. Let us discuss some important properties of the Button controls.

1. PostBackUrl: This property accepts string which is nothing but a path of any webpage. For example, if you set PostBackUrl property to "~/Default4.aspx", then on click user will be navigated to Default4.aspx. Make sure, once you set this property, code written on click() event will not be executed.
2. OnClick: This property accepts string value which should be any subroutine name. On the click event of the button, the code in C# or VB language, written in that subroutine will be executed by a server.
3. OnClientClick: This property accepts string value which should be any function of JavaScript. This code will be executed by Browser.

Consider the following example in which we have demonstrated source code and code-behind code of the webpage. We have set OnClick property to ServerClick() which is a subroutine created in C#, not only that we have also set OnClientClick property to JavaScript function ClientClick(). Now think at run time, which code will be executed? If your answer is both then which one will be executed first?

```
<%@ Page Language="C#" AutoEventWireup="true"
CodeFile="Default8.aspx.cs" Inherits="Default8" %>


<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">


<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">
```

```
    <title>Test OnClick and OnClientClick Properties</title>

    <script language="javascript" type="text/javascript">

        function ClientClick() {

            alert('This Code is Executed by Client');

        }

    </script>

</head>

<body>

    <form id="form1" runat="server">

    <div>


        <asp:Button ID="Button1" runat="server" Text="Button"
OnClick="ServerClick"  OnClientClick="ClientClick()"/>



    </div>

    </form>

</body>

</html>
```

The code-behind code is as shown below:

```
using System;

using System.Collections.Generic;

using System.Linq;

using System.Web;

using System.Web.UI;

using System.Web.UI.WebControls;


public partial class Default8 : System.Web.UI.Page

{
```

```
    public void ServerClick(object sender, EventArgs e)

    {

        Response.Write("This Subroutine is Executed by SERVER");

    }


}
```

4.5.5 LinkButton controls

The LinkButton server control is an alternative to the Button control. It is the same as Button except that the LinkButton control looks like a hyperlink. In fact, it is not a traditional hyperlink. In the case where, end user clicks the link, it performs like a button. This is an ideal control to use if you have too many of buttons on your Web form.

A LinkButton server control can be difined as follows:

<asp:LinkButton ID="LinkButton1" Runat="server" OnClick="LinkButton1_Click">

Submit your name to our database </asp:LinkButton>

4.5.6 ImageButton controls

The ImageButton server control is an alternative to the Button control. It is the same as Button except that the ImageButton control having a capability show images. It has almost all the properties, which is in the Button server control. The additional properties are discussed below:

1. ImageUrl: This property is used to give a path to the ImageButton. Whatever path you are giving of an Image, that image will be displayed in the ImageButton server control.
2. AlternateText: This property takes string from the user. If the images are disabled from the settings of the Browser in that, Browser is not be able to show the image to the user. In such situation the value assigned to AlternateText will be appeared.

4.5.7 ImageMap controls

The ImageMap controls enables you to create a client-side image map. When you click different areas of the image, different things happen. An ImageMap control is composed out of instances of the HotSpot class. A HotSpot defines the clickable regions in an image map.

- ➢ CircleHotSpot – Enables you to define circular region in an image map.
- ➢ PolygonHotSpot – Enables you to define an irregularly shaped region in an image map.
- ➢ RectangleHotSpot – Enables you to define a rectangular region in an image map.

Consider the following example in which we have created 3 RectangleHotSpots, and we have liked up these HotSpots with Home.aspx, Product.aspx and Services.aspx. To implement this, take a webpage and place an ImageMap server control. Set the ImageUrl Property to ImageBar.jpg (We have copied ImageBar.jpg in our website). Now in the property window click on the Ellipse button (…) in the HotSpots property as shown in the following figure.
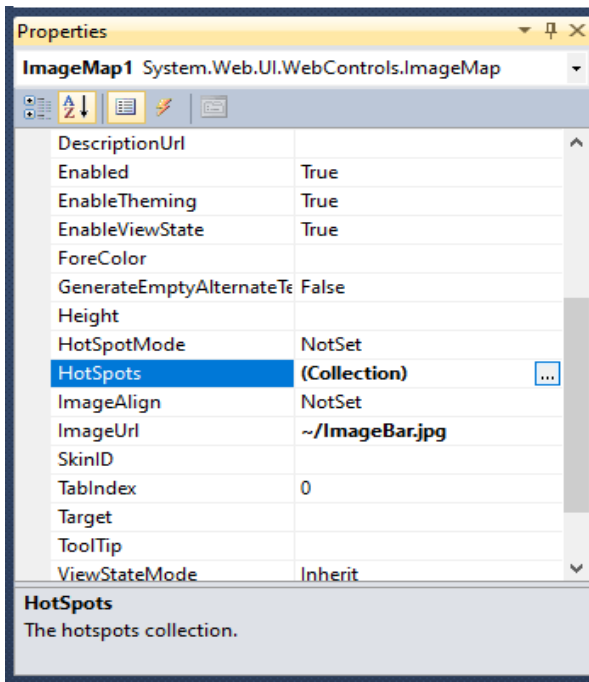
This will open Hotspot collection editor in this editor you need to add three rectangle hotspots as shown in the following figure. After adding three HotSpots, Click in the first Hotspot. On the right-hand side, you can get the properties of first hotspot. You need to set Bottom property to 30, Top to 0, Left to 0, and Right to 97 and NavigateUrl to ~/Home.aspx. That means from the image, if user clicks on the designed part of the image, then user need to be redirected to Home.aspx page. The dimensions you can get it by opening an image into MS-Paint or other image editor, and by moving your mouse you can visualize coordinates of the part of an image.
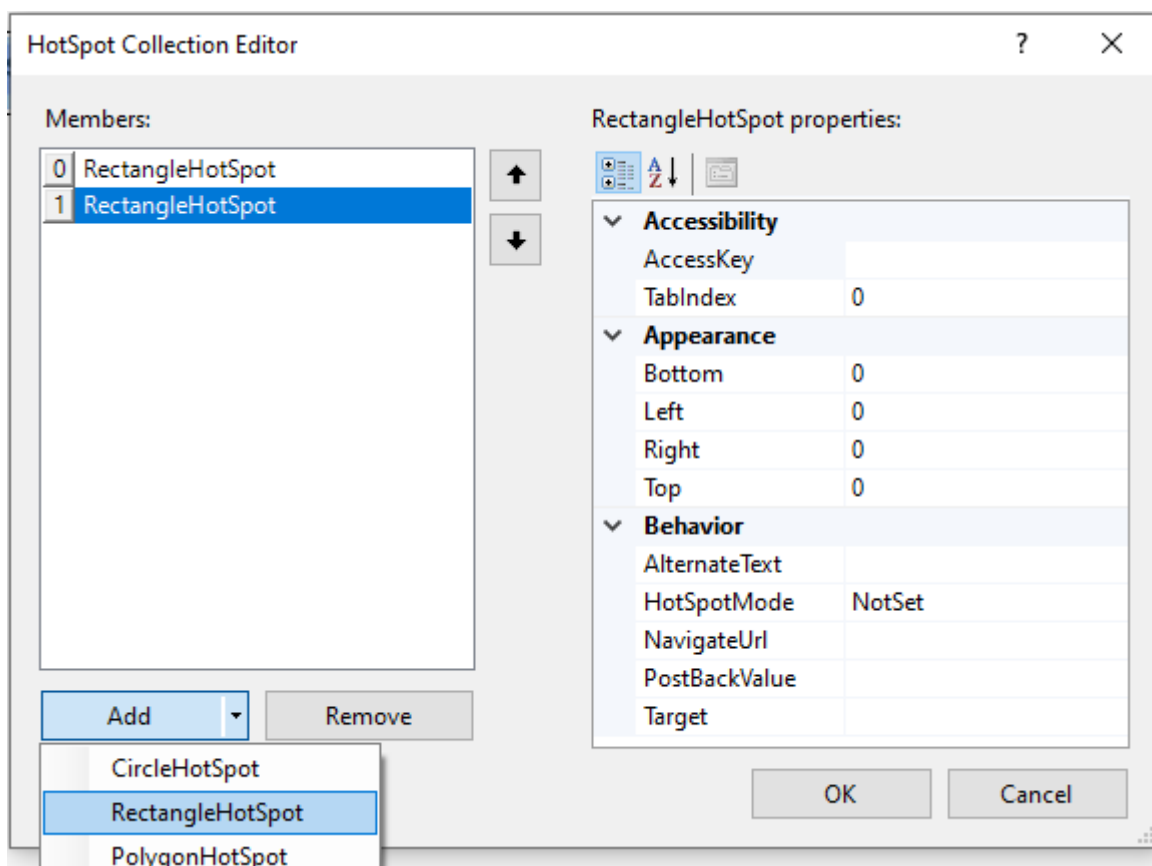
Similarly, you need to set all four properties to other two HotSpots. The Complete Source is given below, which will give you better idea of using Imagemap control. Here in our case, the image and its different HotSpot areas are in the form of Rectangle, that is the reason that we have

taken RectangleHotSpot. If you want to give link to a Circluar region then you can use CircleHotSpot or if your region of an image is uneven then you can go for PolugonHotSpot.

```
<asp:ImageMap ID="ImageMap1" runat="server" ImageUrl="~/ImageBar.jpg">

        <asp:RectangleHotSpot Bottom="30" NavigateUrl="~/Home.aspx"
Right="97" />

        <asp:RectangleHotSpot Bottom="30" Left="101"
NavigateUrl="~/Product.aspx"

            Right="197" />

        <asp:RectangleHotSpot Bottom="30" Left="201"
NavigateUrl="~/Services.aspx"

            Right="297" />

    </asp:ImageMap>
```
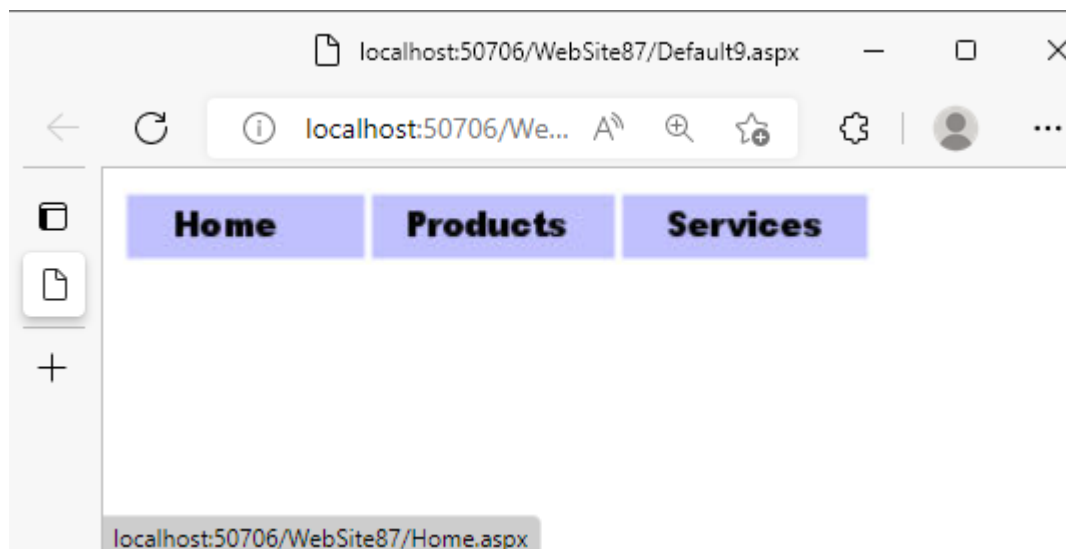

4.5.8 CheckBox controls

CheckBoxes on a web for enables your user to either make a selection from a collection of items or specify a value of an item to be yes/no, on/off, true/false. CheckBox control gives a freedom to choose multiple options like Hobby. One can have multiple hobbies.

Properties:

1. Text: This property takes string, which will be displayed on the CheckBox control.
2. AutoPostBack: This property accepts Boolean value. Default value of this property is False. It it changed to True, then the page is immediately posted to the server if user check or uncheck it.
3. TextAlign: This property has two possible values left and right. By default, TextAlign is right. It means first checkbox and then text. If you change it to left the Text will appear first and then checkbox.

4.5.9 RadioButton controls

The RadioButton server control is quite similar to the CheckBox server control. It places a radio button on your page. Unlike a checkbox, a single radio button on a form doesn't have much sense. Radio buttons are generally form elements that require at least two options. Usually, it is used to allow user to select any one option from the given. It is having simper properties as checkbox, one additional property of RadioButton is explained below:

Property:

1. GroupName: This property takes group name (string). All the radio buttons having same Group name are belongs to same group, and user can select any one from them.

4.6 LET US SUM UP

In this unit, we:

- Discussed about Page object. Its properties and Life cycle

- Explained rendering of the page by webserver

- Interpreted server controls.

- Elaborated Standard server controls.

4.7   SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

1.   [B] IsPostBack
2.   [D] IsValid
3.   [C] Init

1.   [B] <span>
2.   [C] Rendering
3.   [A] Standard Control

1.   [A] Literal
2.   [D] AutoPostBack
3.   [C] OnClientClick

1.   [C] ImageMap
2.   [C] ImageButton
3.   [D] RadioButton

4.8 Glossary

1.   **Literal:** Literal is a light-weight control, similar to the label control which can display the text dynamically on the webpage but it does not have any formatting features.

2.   **ImageMap:** ImageMap is a standard server control used to provide multiple links to the different pages, on the one image, on its different regions.

3.   **HotSpot:** The clickable region of an Image is called HotSpot.

4.   **Rendering:** Rendering is the process, where server converts all the ASP.NET controls into the HTML so that browser can understand them,

4.9   Assignment

1.   What Rendering? Explain rendering process with an example.
2.   List all standard controls and explain them.

4.10   Activity

Take a literal control in the head section of your webpage. Place a button control on the body and on the click event of it show the current time in the literal control.

4.11   Case Study

- Create an External Stylesheet, create a class in it. Generate the formatting using Style Builder. Take a webpage into your website and place a label control. Apply the external style sheet by dragging it to your webpage. Choose the CSSClass property of the Label control to your class name which you have created in the external stylesheet. Observe the result.

4.12 Further Readings

- ASP.NET 4.0 Unleased by Stephen Walter.
- Beginning ASP.NET by Wrox publication.
- Professional ASP.NET 4.0 by Wrox publication.

Block Summary

- ASP stand for Active Server Pages which is a server-side Technology. It is produced and marketed by Microsoft Corporation.

- ASP.NET is combination of classical ASP technology and .NET Framework which allows user to build dynamic and interactive websites.

- A machine in which we install IIS (Internet Information Services) will act as a webserver. You can host your website designed in the ASP.NET technology and host it on the server.

- Client can be any Browser which makes request for webpages to the server. Server will accept the request, find and process the page and give response to the requested client (Browser).

- Server will execute only C#.NET and VB.NET code and converts them into HTML equivalent code so that the browser can understand it. Browser is responsible to execute only HTML and JavaScript code.

- Coding Model is a methodology to write code in .aspx pages. ASP.NET supports two coding models [1] Inline and [2] Code-Behind Model.

- In Inline coding model code to implement various functionalities and HTML design are resided on a common file.

- In Code-Behind model two separate files are maintained for each webpage of your website. One will store HTML design (.aspx) and another will store your code (.aspx.cs or .aspx.vb).

- ASP.NET has built-in directory structure which are used for some specific purpose. App_Data is used to store all database files, App_Code is used to store your class files (.cs or .vb), Bin directory is used to store pre-compiled class file (.dll), App_Theme directory is used to store all themes and App_Global resource directory is used to store all resource files (.resx) which can be used for the language translation.

- To pass the information from one page to another different method like QueryString, Cookies, or Session variables can be used.

- In the QueryString method data is passed through URL and in the Cookies a small file is created in the client computer which will store the data.

- ASP.NET page has two important properties. IsPostBack property is use to determine whether the page is requested with get method or post method. IsValid property is used to check whether the page has any error or not.

- When the page is requested by a browser then series of events are raised in the server like PreInit, Init, InitComplete, PreLoad, Load, LoadComplete, PreRednder, PreRenderComplete, SaveStateComplete and Unload. It is called Page Life Cycle.

- ASP.NET is enrich with different types of GUI based components. Standard Controls, Validation Controls, Navigation Controls, Login Controls, Data Controls and Web - part Controls are some of the categories.

- Label. Literal, Textbox, Button, LinkButton, ImageButton, ImageMap, Checkbox, and Radio buttons are some of the standard controls.

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Client Server Architecture and Interface (C#)

BLOCK 4: **SERVER-SIDE TECHNOLOTY WITH ASP.NET-2**

UNIT 1

STANDARD CONTROLS-2

UNIT 2

VALIDATION CONTROLS, MASTER PAGES, AND
NAVIGATION CONTROLS

UNIT 3

ASP.NET SECURITY

UNIT 4

CONNECTING TO DATABSE

BLOCK 4: SERVER-SIDE TECHNOLOGY WITH ASP.NET - 2

Block Introduction

In this block we will discuss about some advanced standard control. We will discuss about collection controls which represent collection of data in different forms. We will also discuss about rich controls which are rich in terms of properties like Calendar control, File Upload control and AdRotator control.

We will also learn how to validate the data entered by the user using different validation controls available in the ASP.NET.

We will learn designing of Master page and provide navigations to different pages using navigation controls like TreeView, SiteMapPath and Menu controls. Finally, we will discuss about how to fetch the data from database table and represent it in the different form using different Data controls.

Block Objective

The objective of the block is to aware students, about how design a website using ASP.NET technology. After learning this block student can deal with collection controls like DropDownList, ListBox, CheckBoxList and RadioButtonList server controls. Student can use Calendar, FileUpload and AdRotator controls for different purposes into their website.

Main objective of this block is to aware students, designing dynamic and interactive website in ASP.NET technology. Student can provide professional look to their website using Master page, and provide navigations to different webpages of the website using Navigation controls.

Finally, the block will clear the concept website designing. Student can connect their webpages with database tables and can perform reading and writing operations, not only that student will also learn how to secure the website using different login controls of ASP.NET. We hope, this knowledge will help student in their professional life and after learning this course student can prepare themselves for professional web development.

Block Structure

BLOCK 4:   SERVER-SIDE TECHNOLOGY WITH ASP.NET-2

UNIT1   STANDARD CONTROLS – 2

Objectives, Introduction, Collection controls, Rich controls, Let Us Sum Up

UNIT2   VALIDATION CONTROLS, MASTER PAGE AND NAVIGATION

Objectives, Introduction, Validation controls, Working with Master page, Working with Navigation controls, Let us Sum Up

UNIT3   ASP.NET SECURITY

Objectives, Introduction, Authentication and Authorization, Authentication modes, Login controls, Setting up access rules, Role management, Enforcing Role-based security, Working with Navigation controls, Let us Sum Up

UNIT4   CONNECTING TO DATABASE

Objectives, Introduction, Reading data from the database, Writing data to databse, Let us Sum Up

UNIT 1 STANDARD CONTROLS – 2

Unit Structure

1.0   LEARNING OBJECTIVES

In this unit, we will be discussing about remaining standard controls.

After working through this unit, you should be able to:

- Learn Collection controls like CheckBoxList, RadioButtonList, DropDownList and ListBox.
- Understand how to upload file using file upload control.
- Know how AdRoatator control can be used.
- Use Calendar control.

1.1   INTRODUCTION

In our previous unit, we have discussed few Standard Controls such as Label, Literal, Textbox, Button, ImageButton and ImageMap controls. In this unit we will be focusing on other standard collection controls such as CheckBoxList, RadioButtonList, DropDownList and Listbox controls. Not only that we will be also discussing on Rich controls such as FileUpload, AdRotator and Calendar controls.

1.2   Collection Controls:

In ASP.NET, several controls are there which is used to represent collection (list of items). All controls can be populated with the data items using three methods: [1] Static method [2] Dynamic method, and [3] By fetching the data from Database tables. We will discuss all three methods with the checkbox list server control. Make sure the same methods you can use with RadioButtonList, ListBox and DropdownList server controls.

1.2.1 Inserting Static Data into Collection Controls

To insert the data elements into CheckBoxList server control add a new webpage to your web site and place CheckBoxList on the webpage. Now open smart menu by Clicking on small triangle appear on the top-right corner of the CheckBoxList control. It will open a smart-menu as shown in the following figure.
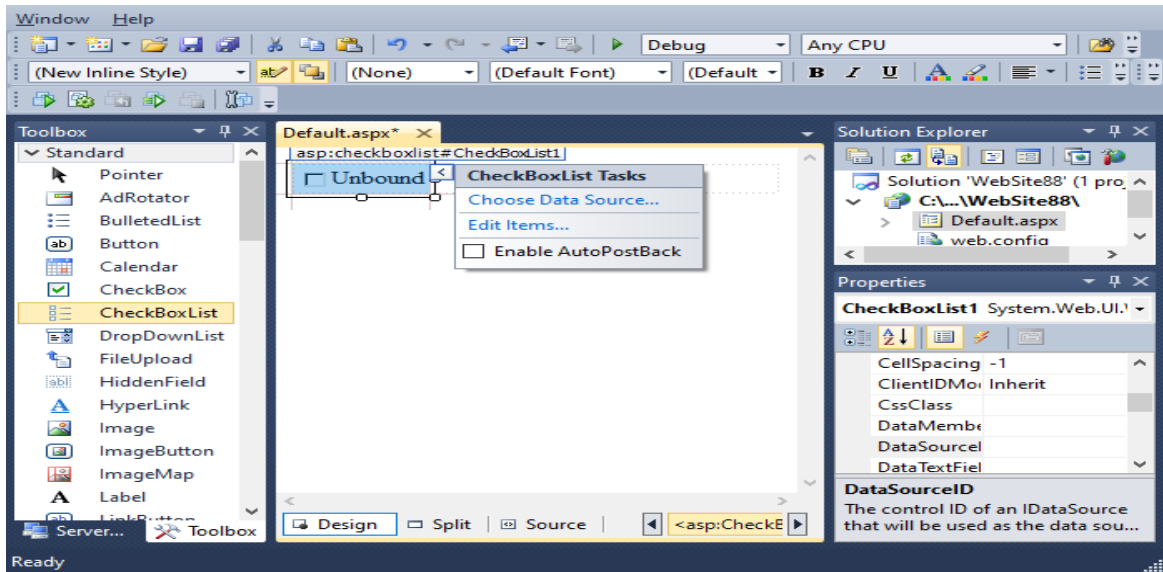
Now, click on the Edit Item link, it will open "ListItem Collection Editor" as shown below. Click on Add button to add multiple items. Select one item and set Text property. Repeat the same process for all data items and the click on OK button.
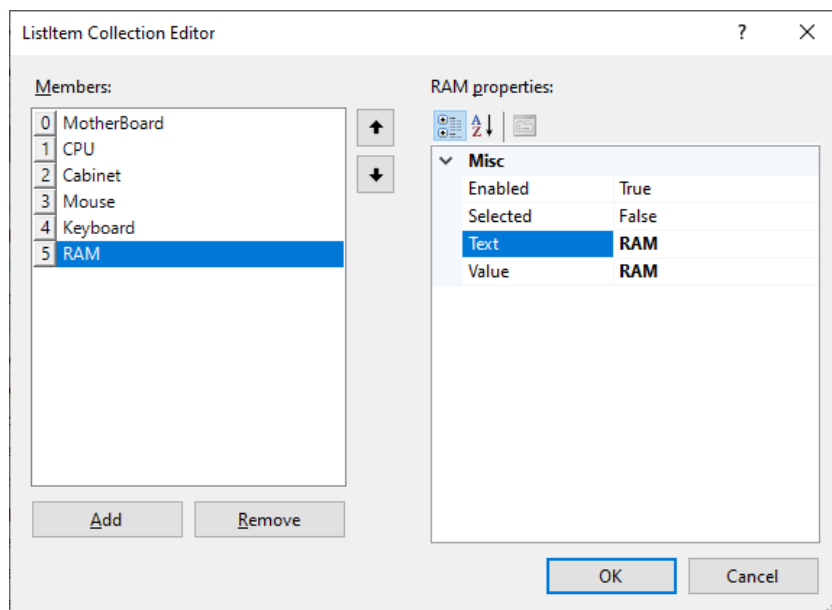
This will add multiple data items to your CheckBoxList server control. This approach is called static approach and can be used of you know all data items well in advance, not only that there are rare chances are there in the modification of data items which are already added to the CheckBoxList control. ListItem Collection Editor provides options to bring up selected data item (click on up Arrow button), bring down data item (click on down arrow button) and remove the data item (click on Remove button).

Now add a button and a label to the webpage as shown in the following figure, and write the following code on the click event of submit button.
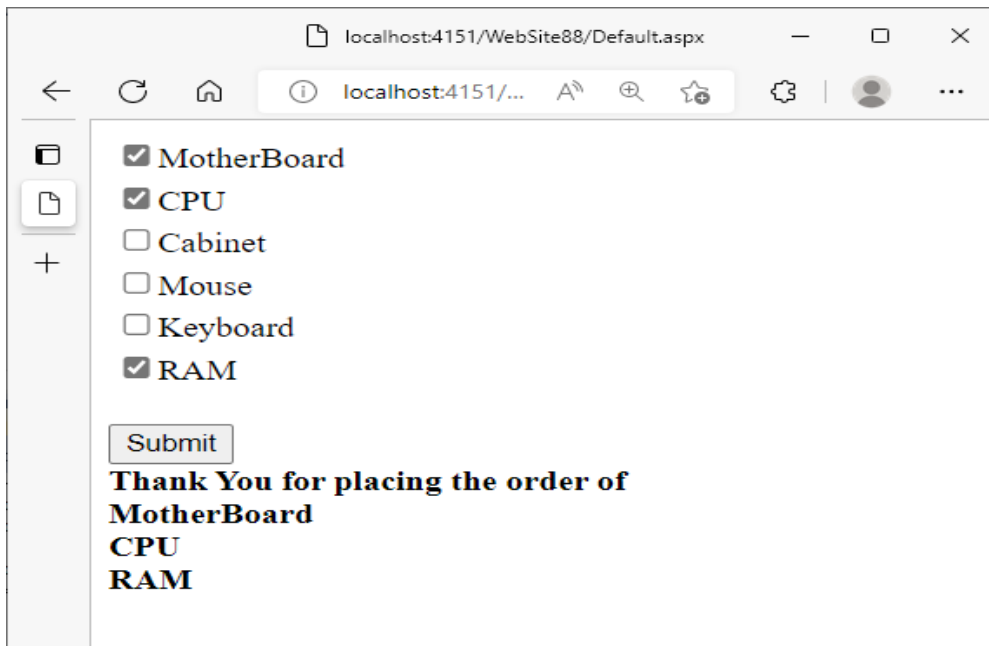
```
protected void Button1_Click(object sender, EventArgs e)

    {

        Label1.Text = "Thank You for placing the order of <br />";

        foreach (ListItem x in CheckBoxList1.Items)

        {

            if(x.Selected == true)

            {

                Label1.Text = Label1.Text + x.Text + "<br />";

            }

        }

    }
```

CheckBoxList server control allows user to check multiple checkboxes. This code will help you to know which checkboxes are selected by the user. CheckBoxList control also has properties line backcolor, forecolor, bordercolor, borderstyle, borderwidth. Some interesting properties are explained below:

1. RepeatColumns: This is an integer property and default value is 0. If you set this to 2 then your data items are arranged in 2 columns.
2. RepeatDirection: In the case of multiple columns by default direction of data items is Vertical. You can change this property to Horizontal if you wish your data-elements to be arranged row wise.

1.2.2 Inserting Dynamic Data into Collection Controls

To add the data using dynamic method, we need to write code to insert the data. For example, to add the data dynamically you need to write the following code.

```
protected void Page_Load(object sender, EventArgs e)

    {

        if (!Page.IsPostBack)

        {

            CheckBoxList1.Items.Add("CPU");

            CheckBoxList1.Items.Add("Motherboard");

            CheckBoxList1.Items.Add("RAM");

            CheckBoxList1.Items.Add("Cabinet");

            CheckBoxList1.Items.Add("HardDisk");

            CheckBoxList1.Items.Add("Keyboard");

        }

    }
```

Now, if you want to allow user so that user can add the item at runtime, place a Textbox and a Button on the webpage and then write the following code on the click event of the Button.

```
protected void Button1_Click(object sender, EventArgs e)

    {

        CheckBoxList1.Items.Add(TextBox1.Text);

    }
```
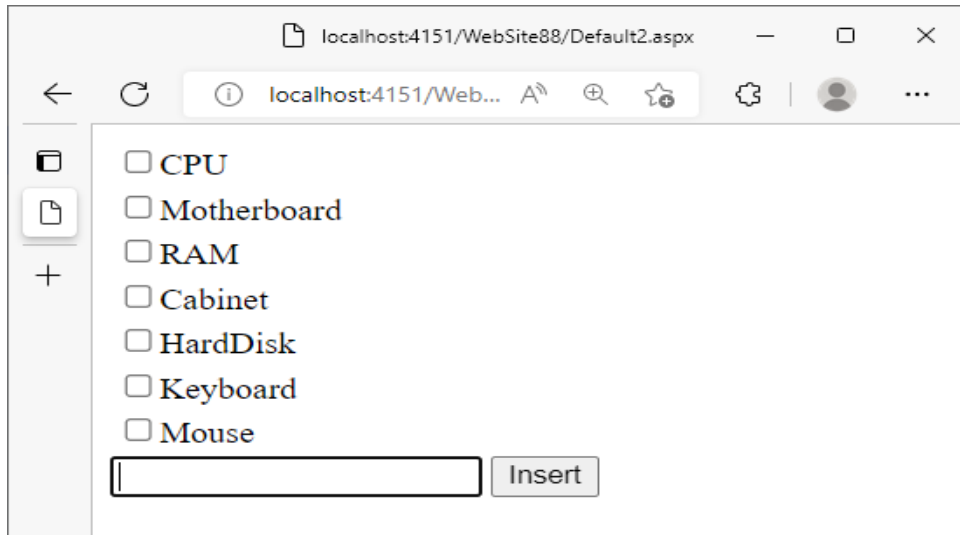
1.2.3 Inserting Data from Database to Collection Controls

To bring the data from the database table, first you need to add database into your website. You need to create a table into the database and you also need to insert some data into it. To do this follow the instructions given below:

1. Right click on the name of the website and choose option 'Add New Item' from the context menu. This will open the 'Add New Item' dialog box. From this dialog box select 'SQL Server Database' option and click on the Add button. This will add a database to your website.
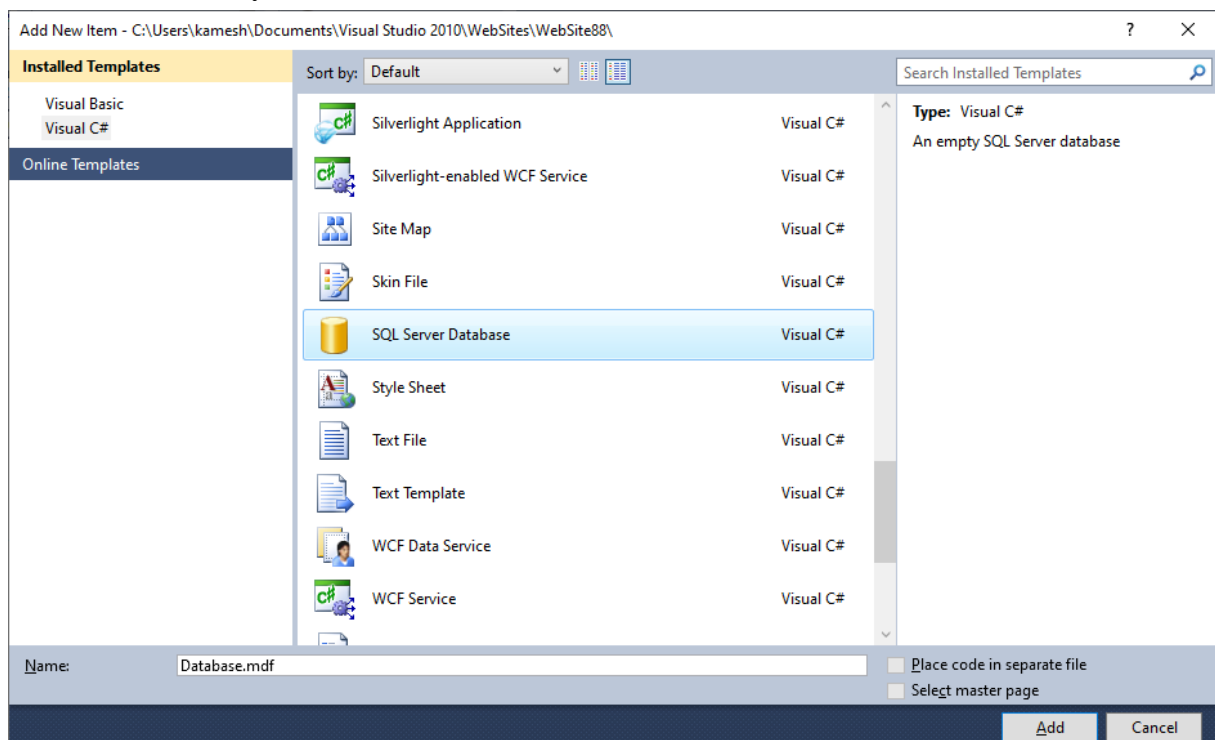
2. If any message is appeared while adding the database, related to database should be inserted into App_Data directory then press Yes. This will add your database automatically into App_Data directory. Now, left side of your IDE a server explorer will be opened (If not press ctrl+alt+S to open it). Now right click on the table and choose option 'Add New Table'. Design your table as shown below and save the table with name 'State'.

3. Once the table is saved then it will be appeared in the Server Explorer, under Table node. Right click on the 'State' table and choose 'Show Table Data', to do the data entry in it.

4. Now add a new webpage to your website. And place 'SQLDataSource' controls on it, which you can get from the Data category of your ToolBox.

5. To configure your SQLDataSource control, right click on the upper-right triangle of SQLDataSource control to open smart menu. From the smart menu option click on the 'Configure DataSource' option. This will start a wizard.

6. In the first step of the wizard, you just need to select the name of your database from the dropdown list. In the second step you don't need to do anything simply click on the next button. In the third step check the query which is automatically generated. It should be "Select * from State". Now click on the next button and then click on the finish button.

7. Now click on the CheckBoxList control and open the smart menu again. Choose option, "Choose Data Source" and assign your SqlDataSource1 to it. Run the page and at run time you will be able to find all the State name listed in your CheckBoxList server control.

[1] CheckBoxList:

CheckBoxList server controls is a collection of checkboxes. As per the nature user can select multiple checkboxes. You can populate the CheckBoxList control by using the above three methods.

[2]RadioButtonList:

RadioButtonList server control is a collection of RadioButtons. As per the nature user can select any one RadioButton. Here, you do not have to set GroupName property as all the RadioButtons are grouped as a single unit. For example, following code of RadioButtonList server control looks like as shown in the next figure.

```
<asp:RadioButtonList ID="RadioButtonList1" runat="server"
BorderColor="Blue"
        BorderStyle="Dashed" BorderWidth="1px">
        <asp:ListItem>Gujarat</asp:ListItem>
        <asp:ListItem>Maharastra</asp:ListItem>
        <asp:ListItem>Rajasthan</asp:ListItem>
        <asp:ListItem>Madhya Pradesh</asp:ListItem>
    </asp:RadioButtonList>
```
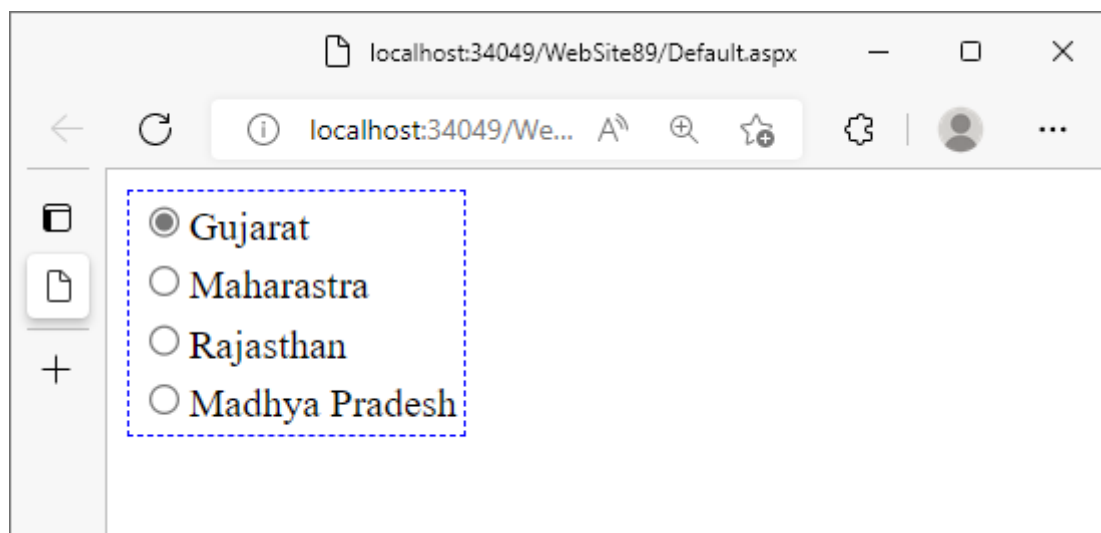

[3] ListBox:

ListBox server controls provide multiple options to the user. More than one data elements are visible in the Listbox server control. By default, the selection mode is 'Single', so that user can select any one data item from the ListBox. If you change the Selection Mode property to Multiple, then user can select more than one data items from the ListBox control by pressing either shift button (range selection), or ctrl button (individual selection). For example, following code for ListBox control will show the ListBox as shown in the following figure.

```
<asp:ListBox ID="ListBox1" runat="server" Height="66px"

        SelectionMode="Multiple" Width="91px">

        <asp:ListItem>Gujarat</asp:ListItem>

        <asp:ListItem>Maharastra</asp:ListItem>

        <asp:ListItem>Rajasthan</asp:ListItem>

        <asp:ListItem>Madhya Pradesh</asp:ListItem>

        <asp:ListItem>Punjab</asp:ListItem>

    </asp:ListBox>
```
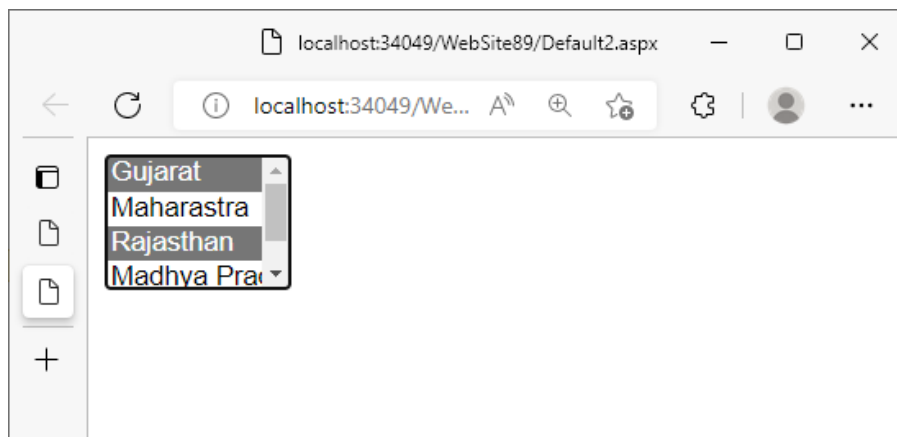

Check Your Progress-1

1. From the given below options, which control is not a collection control?

[A] CheckBoxList   [B] DropDownList

[C] TreeView   [D] ListBox

2.SelectionMode is the property of _____ control.

1.3 Rich Controls:

In section we will learning those standard controls which are Rich into the functionalities. They own huge amount of properites. FileUpload, AdRotator and Calender controls are fall under this category. Let us discuss and learn then one by one.

1.3.1 FileUpload Server Control:

File upload control allows user to upload a file from client machine. The uploaded files will be stored on the server at some specific location. Most social media sites allow us to upload profile picture. This can be achieved by using FileUpload control. By mean of uploading profile picture, we are uploading an image from client terminal, and it will be stored on the specific location of the server. Let us discuss how can we use FileUpload control in our website.

In order to use FileUpload control into your website you need to add a webpage into your website. Now, you place a FileUpload control on the web page. Not only that you also need to place a Button control having Text called 'Upload File' on the webpage as shown in the following figure.
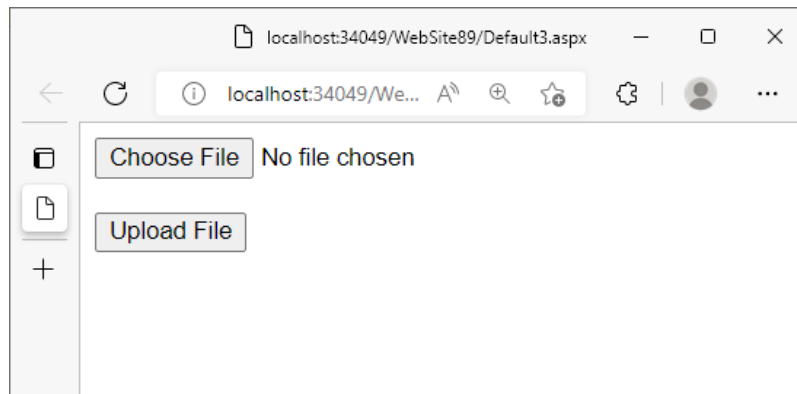
FileUpload control has a button called 'Choose File', when user clicks on it, File Open dialogbox will appear, which allows user to choose any file from client computer. After choosing the file user will click on the Upload File button which we have placed on the page. We need to write the following code on the click event of the 'Upload File' button, so that the file chosen by the user gets uploaded. But the question is, where the file has to be stored on the server? We need to set the destination for these files, which are uploaded by the different users. For that purpose, create a Folder called 'UploadImages' into your website, by doing right click on the website name in the Solution Explorer, and choose the option 'New Folder'. Set the name for this Folder as 'UploadImages'.

Now, you need to write the following code on the click event of 'Upload File' button so that the upload files will be saved into 'UploadImages' directory on the server.

```
protected void Button1_Click(object sender, EventArgs e)

    {

        if (FileUpload1.HasFile)

        {

            System.IO.FileInfo fi = new
System.IO.FileInfo(Server.MapPath(FileUpload1.FileName));

            if (fi.Extension == ".jpg" || fi.Extension == ".png" ||
fi.Extension == "jpeg")

            {

                FileUpload1.SaveAs(Server.MapPath("~/UploadImages/" +
FileUpload1.FileName));

            }
```

```
                else
                {
                    Response.Write("Select any Image file only");
                }
            }
    }
```

In the code first we check where user has selected any file or not using HasFile property of the file upload control. This property will return TRUE if and only if user has selected any file. If the file is selected by the user, then we are checking of its extension. If it is .jpg or .jpeg or .png file then we are allowing user to upload the file else we will show the message to select any image file only. If file is having proper extension .jpg, .jpeg or .png then we are saving this file into the UploadImages directory.

Here we have used Server.MapPath () method, because DirectoryInfo class and SaveAs method of FileUpload control needs absolute path (like C:\User\Kamesh\Documents … etc). We should not have to provide absolute path because if we provide it then it causes trouble which we host the website. We need to provide relative path like "/UploadImages" (here ~ sign means website root). Method Server.MapPath () converts our relative path into absolute path.

1.3.2 AdRotator Server Control:

Most social media and E-Commerce websites are generating revenue through showing advertisements. In the ASP.NET website you show advertisements using AdRotator server control. AdRotator control controls takes collection of advertisements either from the XML file, or from the database and take any one random advertisement from the collection and show it to the user, when user request a page.

To implement AdRotator control into your website a webpage to your website and place AdRotator control on it. Create a folder from the Solution Explorer into the website and place some images of different products. Now right click on the website name in the Solution Explorer and choose the option 'Add New Item'. From the dialog box select XML file. You can see one XML file is added into your website. Now write the following code into the XML file.

```
<?xml version="1.0" encoding="utf-8" ?>
<Advertisements>
  <Ad>
    <ImageUrl>~/ProductImages/Img1.jpg</ImageUrl>
    <NavigateUrl>https://www.gujaratuniversity.ac.in/</NavigateUrl>
    <Keyword>GU</Keyword>
    <AlternateText>GU</AlternateText>
  </Ad>
  <Ad>
    <ImageUrl>~/ProductImages/Img2.jpg</ImageUrl>
    <NavigateUrl>https://www.gtu.ac.in/</NavigateUrl>
    <Keyword>GTU</Keyword>
    <AlternateText>GTU</AlternateText>
  </Ad>
  <Ad>
    <ImageUrl>~/ProductImages/Img3.jpg</ImageUrl>
    <NavigateUrl>https://baou.edu.in//</NavigateUrl>
    <Keyword>BAOU</Keyword>
    <AlternateText>BAOU</AlternateText>
  </Ad>
</Advertisements>
```

In this website we have taken three images Img1.jpg, Img2.jpg, Img3.jpg into the directory called ProductImages into the website. In the ImageUrl you need to specify URL of the image which you want to show in the advertisement. In the NavigateUrl, you need to provide URL where user will be redirected when he/she clicks on the advertisement. You can also specify Keywords and AlternateText. AlternateText will be appear in the case where Browser is not be able to show images.

Now in the page where, you have taken AdRotator control, take XMLDataSource control from the Data section of the ToolBox. Click on the > icon to open smart menu of the XMLDataSource control and click on ConfigureDataSource option.
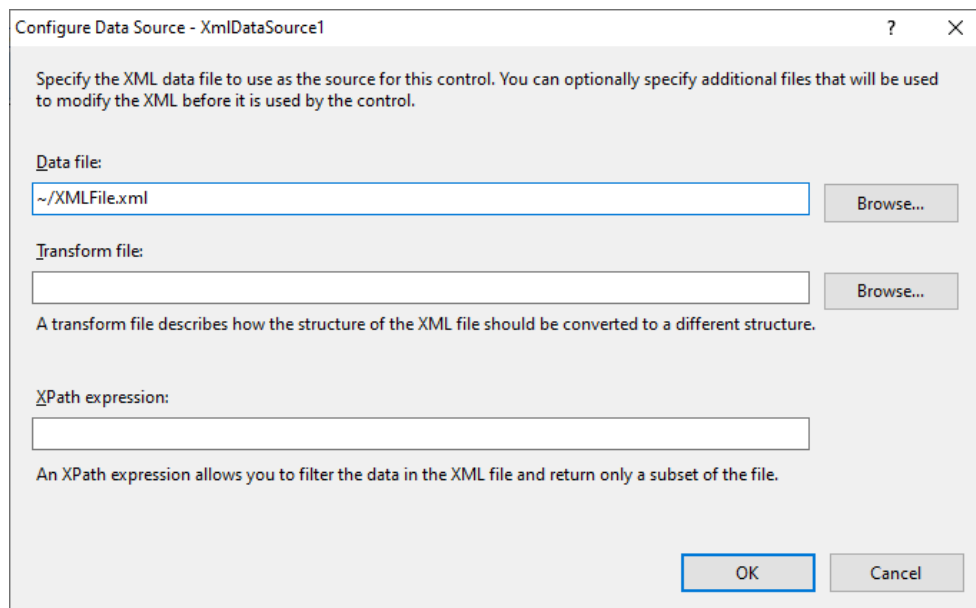
In the Data file section Browse your XML file, and click on the OK button. Now select AdRotator control and click on the top-right > Icon to open smart menu. Select Data Source to XMLDataSource1. Run and test the webpage.
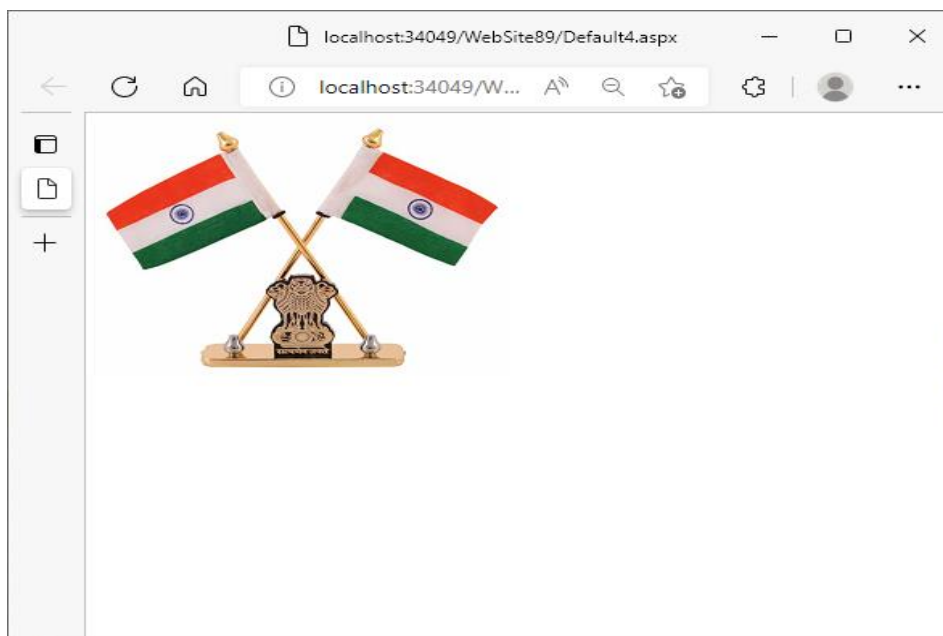
When you run the website any one random advertisement will be displayed on the page. If you click on the advertisement, you will be redirected to some specified site. You refresh the page (by pressing F5 key), you can see another advertisement.

Instead of XML file you can also fetch the advertisement data from the database table. For that purpose, you need to create a table called Advertisements in the SQL Server database with Fields called ImageUrl, NavigateUrl, Keyword, and AlternateText. You need to enter the data about your advertisements into this table, and instead of XMLDataSource you need to take SqlDataSource countrol.

1.3.3 Calendar Control:

Calendar control facilitate user to select the data from the calendar. Calendar is another Rich control which has many different types of Looks and Feel. To work with Calendar control, add a webpage to your website and place Calendar controls in it. Click on top-right corner on > icon to open the smart menu. Choose Auto Format option as shown below. You can see different formats for you control here.
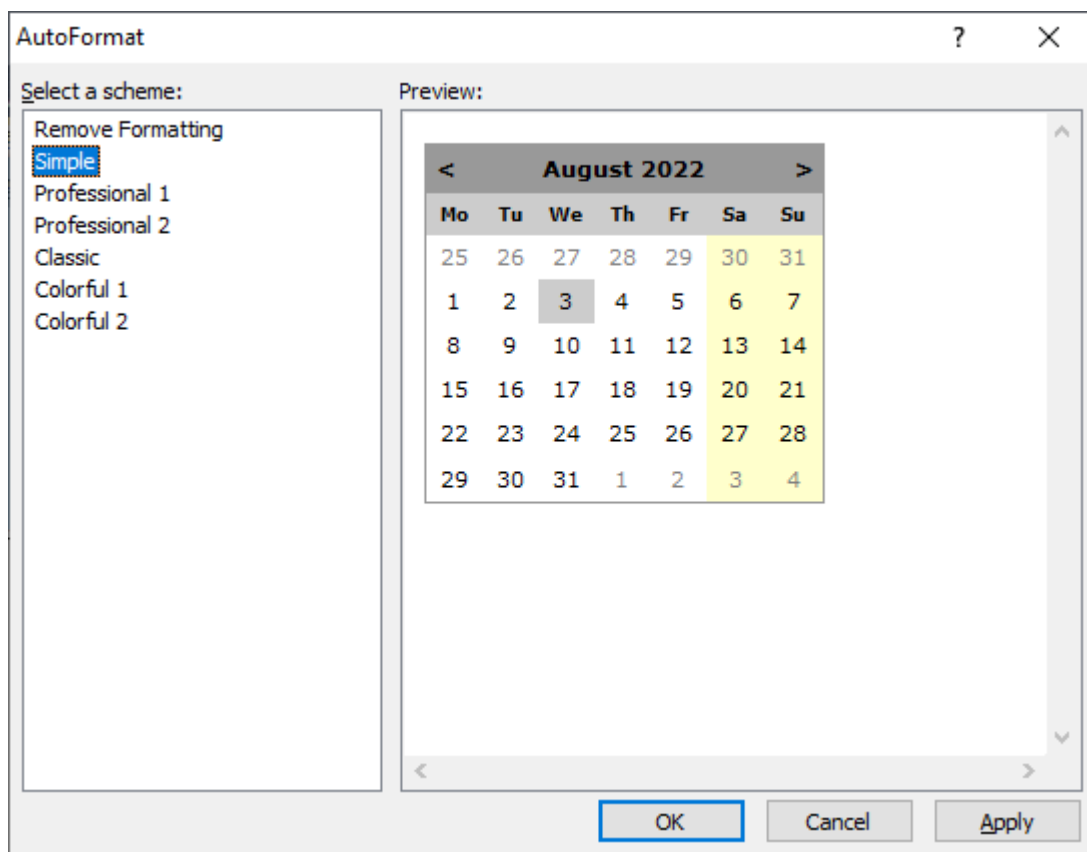
You can select any one design from the number options provided in left side panel. By default, use can select any one day from the Calendar control. Which date is selected by the user? To show that, add a button and Label controls in your web page. On the click event of the button write following code, which will print the data selected by the user from the Calendar control into the Label.
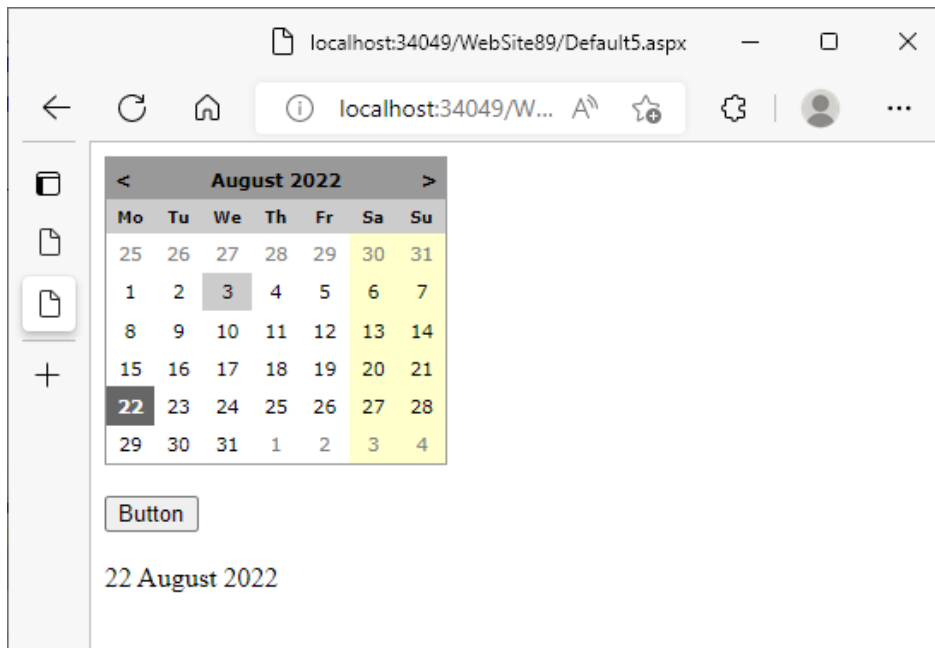
```
protected void Button1_Click(object sender, EventArgs e)

    {

        Label1.Text = Calendar1.SelectedDate.ToString("D");

    }
```

Calendar control has property called Selection Mode. Default value for this property is 'Day'. Due to this reason user can select one date from the control. You can change the value of it to 'DayWeek' or 'DayWeekMonth'. These option enable user to select entire week or month from the Calender control.

Set the property Selection Mode to DayWeekMonth and change the code you have written on the click event of the Button to:

```
protected void Button1_Click(object sender, EventArgs e)

    {

        Label1.Text = "You have Selected Following Dates:<br />";

        foreach (DateTime dt in Calendar1.SelectedDates)

        {
```

```
          Label1.Text = Label1.Text + dt.ToString("D") + "<Br />";

      }

  }
```

Now run the webpage, select a Week by click on the > sign placed in the Calendar control at left side and then click on the button. You will get following:
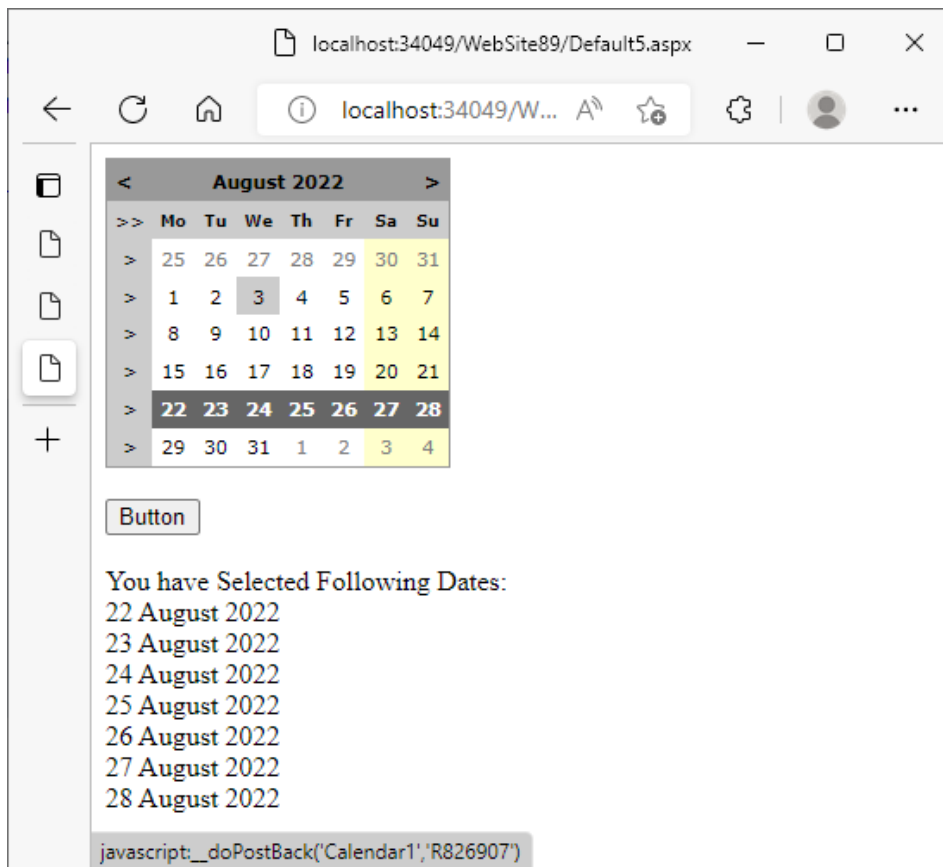
If you want to select entire month then you need to click on >> sign on the Top-Left side of your Calendar control. Calendar control is rich in the properties. If you see the property window you will have lot many options to customize your Calendar control. Calendar control also act as container control. You can place Hyperlink into any of the cell of calendar. For example, if there is an event called Birthday on 22-Aug, you can place a Hyperlink by writing the following code.

```
protected void Calendar1_DayRender(object sender, DayRenderEventArgs e)

    {

        if (e.Day.DayNumberText == "22")

        {

            LiteralControl lt = new LiteralControl("<br/><a
href='~/Birthday.aspx'>BirthDay</a>");

            e.Cell.Controls.Add(lt);

        }

    }
```

On the DayRender event of the calendar control we are writing the code. This event will be executed for each day of the calendar. When the event is executed for Day, whose DayNumberText is "22", we create the object of a LiteralControl with Hyperlink (because anchor <a> tag) and add it in that cell. If you run this page it looks like as shown in the figure given blow. On click of 'BirthDay' you will be redirected to BirthDay.aspx page, so you need to add that page with some suitable message, into your website.
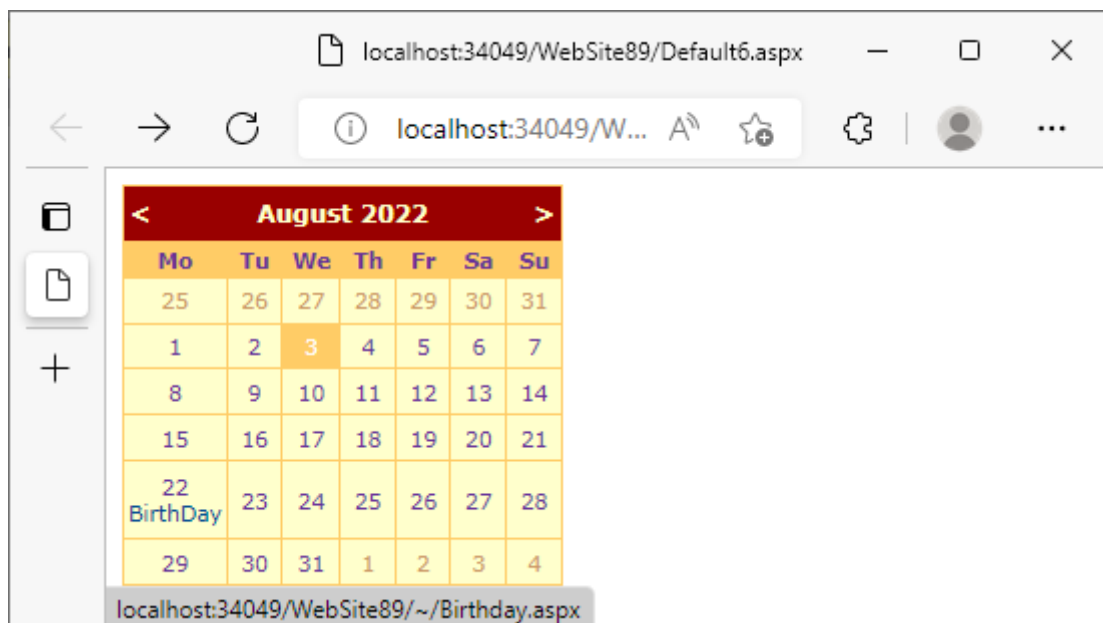
Check Your Progress-2

1. _____ control is used to show advertisements into your website.

1.4 LET US SUM UP

In this Unit, we have discussed about some collection controls and Rich Controls. Both controls are kind of Standard controls. Collection controls can be populated by Data using three methods: [1] By static method where you need to click on Edit Items link from the smart menu and you need to add data-items. [2] Dynamically by writing code and using <Control>.Items.Add() method and [3] From database table using DataSource property of the Control. CheckBoxList, RadioButtonList, ListBox and DropDownList are examples of Collection controls.

We have also discussed rich controls in this Unit. FileUpload control is used to enable user to upload any file from client machine to server. AdRotator control is used to show rotating advertisement banner and Calendar control allows user to select date from the calendar.

1.5 GLOSSARY

5. **Calendar:** It is a rich control of ASP.NET which allows user to show Calendar and pick up the date input value from it.

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6. **FileUpload:** It is a rich control of ASP.NET which allows user to upload a file from their terminal to Server. HasFile is important property of FileUpload control which returns Boolean value (True if user has selected any file and False if user has not selected any file from the client machine). SaveAs() method of FileUpload control is used to upload file from client to server.

7. **AdRotator:** It is a rich control of ASP.NET which is used to show rotating advertisement banner.

1.6 SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

4. [C] TreeView
5. [B] ListBox
6. [A] DataSource

Check Your Progress-2

4. [A] AdRotator
5. [B] HasFile
6. [C] Server.MapPath()

1.7 Assignment

4. List all Collection controls of ASP.NET and explain any two from them.
5. Write a short note on FileUpload control.
6. Explain Calendar control in brief.
7. What is AdRotator? Explain it in details.

1.8 Activity

Design a website for Image gallery. Take file upload control which allows user to upload only Images. The images uploaded by the user will be stored into some specific destination folder. Show all the Images of that folder on the same webpage using DataList control.

Hint:

```
<%@ Page Language="C#" AutoEventWireup="true" CodeFile="Default3.aspx.cs"
Inherits="Default3" %>


<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">


<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">

    <title></title>

</head>

<body>

    <form id="form1" runat="server">

    <div>


        <asp:FileUpload ID="FileUpload1" runat="server" />

        <br />

        <br />

        <asp:Button ID="Button1" runat="server" Text="Upload File"

            onclick="Button1_Click" />

    <hr />

    <br />

        <asp:DataList ID="DataList1" runat="server" RepeatColumns="4">

            <ItemTemplate>

                <asp:Image ID="Image1" runat="server"

    ImageUrl='<%# Eval("Name","~/UploadImages/{0}") %>' Height="175px"
Width="160px" />

            </ItemTemplate>

        </asp:DataList>

    </div>

    </form>
```

```
</body>

</html>
```

```
using System;

using System.Collections.Generic;

using System.Linq;

using System.Web;

using System.Web.UI;

using System.Web.UI.WebControls;


public partial class Default3 : System.Web.UI.Page
{
    protected void Page_PreRender(object sender, EventArgs e)

    {

        System.IO.DirectoryInfo di = new
System.IO.DirectoryInfo(Server.MapPath("~/UploadImages"));

        DataList1.DataSource = di.GetFiles();

        DataList1.DataBind();

    }

    protected void Button1_Click(object sender, EventArgs e)

    {

        if (FileUpload1.HasFile)

        {

            System.IO.FileInfo fi = new
System.IO.FileInfo(Server.MapPath(FileUpload1.FileName));

            if (fi.Extension == ".jpg" || fi.Extension == ".png" ||
fi.Extension == "jpeg")

            {

                FileUpload1.SaveAs(Server.MapPath("~/UploadImages/" +
FileUpload1.FileName));

            }
```

```
        else
        {
            Response.Write("Select any Image file only");
        }
    }
}
```

1.9   Case Study

---

1. Design a webpage which will take advertisement details from a SQL Server database and show it on the web page.
2. Search on the Internet about how can we upload multiple files using FileUpload control.

1.10   Further Reading

- ASP.NET 4.0 Unleased by Stephen Walter.
- Beginning ASP.NET by Wrox publication.
- Professional ASP.NET 4.0 by Wrox publication.

UNIT 2: VALIDATION CONTROLS, MASTER PAGE AND NAVIGATION CONTROLS

Unit Structure

2.0   LEARNING OBJECTIVES

In this unit, we will discuss about the basics of C required for beginners to understand this language.

After working through this unit, you should be able to:

- Comprehend the concept of constants and variables

- Elaborate on data types used to make a program

- Interpret variables

- Describe Constants and Keywords

2.1   INTRODUCTION

In the last Unit we have focused on collection controls and rich controls. Now in this Unit we will be focusing on how to validate data. When user enters the data into any webpage of a website then we need to validate that data. If the data entered by the user is proper then and then we need to submit that data into the database. ASP.NET has 6 controls to validate data. We will be discussing how these validation controls will help you to validate user's data.

Consistence and Professional look of the website is again important. All pages of your website should have same type of format. We can achieve this by using master page. In this Unit we will learn how to design master page and how different navigation controls can be used with it.

2.2   VALIDATION CONTROLS:

As we have discussed, validation is very important while taking the data from the user. But important thing is Validation should be performed by a client machine or a Server? Well, think if

give responsibility for the validation to the server. Server is already accepting many requests for different webpages from different clients. It is also processing the page, executing the code and rendering the page. It is also responsible to store the data into database. Now, additionally we are giving one more responsibility to server. Not only that, client submit the page to the server, server is validating it, suppose if the page has some error, then again page will come to the Browser with error message. No productive work is done and lots of Internet bandwidth is wasted in the round trip of the page. That is the reason that the validation has to be done by client machine.

But to validate the data by Browser we need to write JavaScript code. In the ASP.NET most validation controls are validating the data at client-side without writing JavaScript code. You just need to set some properties and all things will be done. Let us discuss all these controls one by one in details by designing a web form.

We will design a webpage, in which you need to insert a Table. To do this add a webpage to your website go to Table menu and choose option 'Insert Table'. In the Insert Table dialog box type Number of rows 8 and number of columns 3 (for Caption, User input textbox and validation controls).

2.2.1 RequiredField Validator

The main function of the RequiredField validator is to check whether the value is entered by the user into some field or not. If some field is mandatory (compulsory) and user has skipped the value into that particular field then the RequiredField validator show a validation error. Some important property for this validation controls are explained below:

1. ControlToValidate: By mean of this property you are associating your RequiredField validator with a control to be verified. For example, if you want to verify that the Textbox1 should not be empty then ControlToValidate property of the RequiredField validator has to set to TextBox1.
2. ErrorMessage: In this property you need to insert error message (string) to be displayed while user has kept TextBox1 to be left blank.
3. Display: Display property has two possible values: Static or Dynamic. Default value is Static. It means if two validation controls are used to validate same control, then validation controls show error message at the same place where you have placed it at the design time. If you change it to Dynamic then second validation control show its error message on the place of first validation control, if first validation doesn't show any error message.
4. Text: In the Text property you need to enter string which will be displayed when Validation summary control is used.

5. EnableClientScript: It is a Boolean property takes two possible values True or False. The default value is True.

To evaluate RequireFieldValidator control design the webpage as shown below. In the first column we need to write caption, in the second column we need to take Textbox to accept the input value from the user and in the third column, we need to add RequiredField validator in the second row of your table (Keep your first row to be empty, we will use it later when we will discuss about ValidationSummary control. To evaluate, RequiredFeild validator is functioning at client-side add a Button to the last row of the table as shown in the following figure and write the following code on the click event of the button.

```
protected void Button1_Click(object sender, EventArgs e)

    {

        Response.Write("Data is Submitted Successfully:");

    }
```
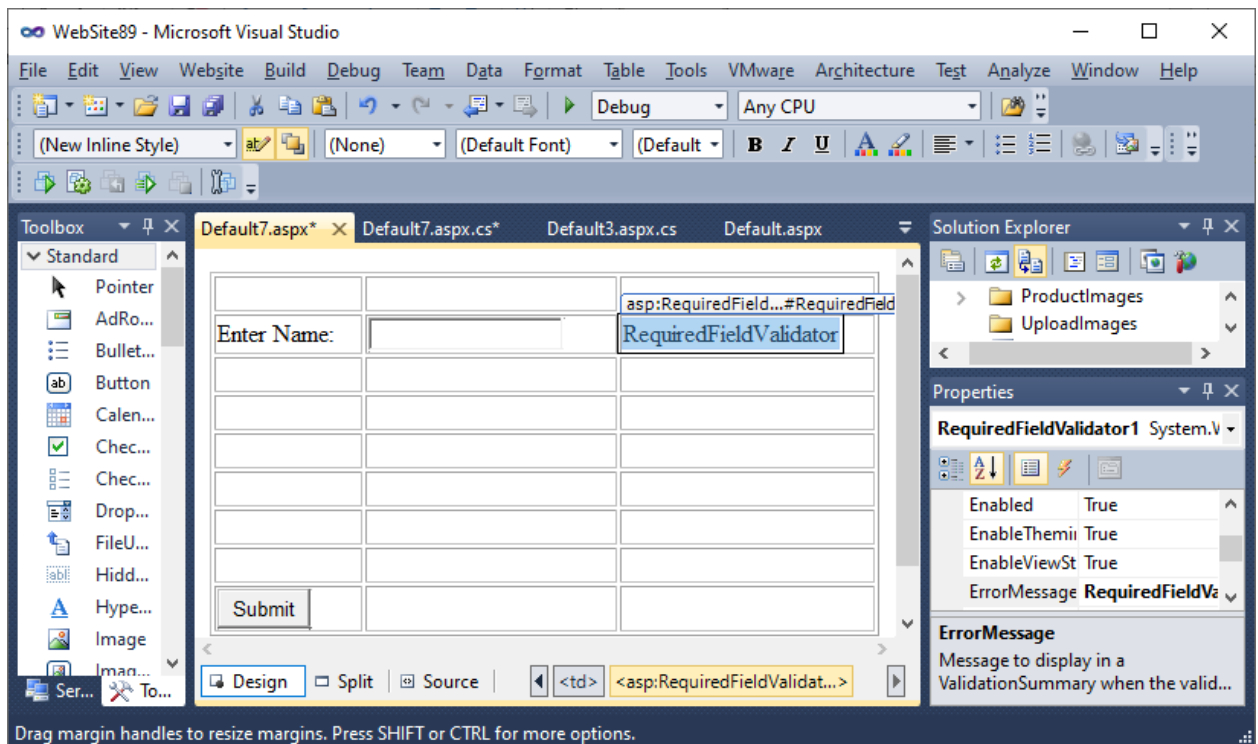

Now select the RequiredField validator control and set the following properties.

1. ControlToValidate: TextBox1
2. ErrorMessage: Name is mandatory field

Run the webpage and click on the 'Submit' button. You can see the ErrorMessage. You may notice that the code we have written on the click event of the Button will not be executed. That is because the validation is done by a Browser and because the RequiredField validator has generated error (because TextBox1 is empty), Browser do not send this page to the server. Server do not know about click on the button and that the reason the code we have written on the click event will not be executed.

But if you enter some data into the TextBox1, then RequiredField validator will not generate any error and page will be submitted to the server by a Browser. Here server will come to know about the click event of the button. Therefore, the code written on the click event of the button will be executed and you can see the message 'Data is submitted Successfully' on your webpage. That means, it is proven that RequiredField validator works at client-side.

2.2.2 Range Validator

The main function of the range validator is to check whether the data entered by a user is lies between the specific range of not. For example, for the field called age, if we want user can enter the from 1 to 100 then range validator is useful. The important properties of the range validator control are described below:

1. ControlToValidate: Here you need to specify the control ID, which you want to validate with Range Validator.
2. Text: Here you need to specify the string which will be used when error is generated by range validator control in the presence of Validation Summary control.
3. ErrorMessage: Here you need to specify the error message, which will be displayed when the range validator invalidate the data entered by the user.
4. MinimumValue: Here you need to specify the minimum value of your range.
5. MaximumValue: Here you need to specify the maximum value of your range.
6. Type: Here you need to specify the type of the comparison. Possible values of this property are String, Integer, Date and Currency.

Now for practical add one more field age in the 3rd row of your table. Write Age in the first column, place Textbox in the second column and Range validator in the 3rd column of 3rd of our table. Select the Range validator control and set the following properties.

ControlToValidate	Textbox2
Error Message	Age must between from 1 to 100
Type	Integer

MinimumValue	1
MaximumValue	100
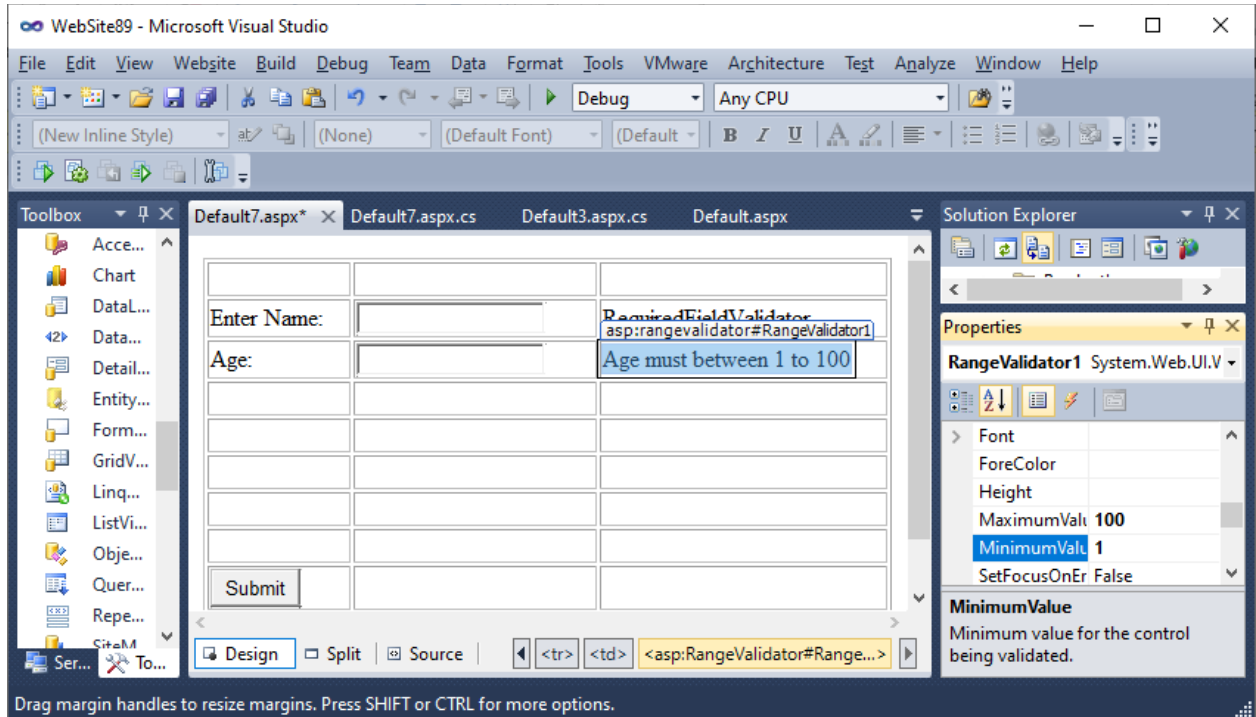
Now you run the page and input name to 'Abcd' and age to 555. You can see the error message will be apear. Now if you change the age to 55 and then if you click on the Submit button then you will get no error message and you will get the message from the server that the page is submitted successfully.

Let us try once again. Enter only name to be 'Abcd', don't eneter anything in the age field and then you click on the Submit button. You can see that the page will be submited to the server. The reason is, Range validator will validate the data if and only if the data is enterd by the user. You want to enforce user to inputer the data into the age field then you need to add one more validator control RequiredField validator for the Age field. So, two validators Range and RequiredField has to be used to Age field.

Place RequiredField validator control near Range validator and set ControlToValidate property to Textbox2, and ErrorMessage property to 'Age is mandatory'.
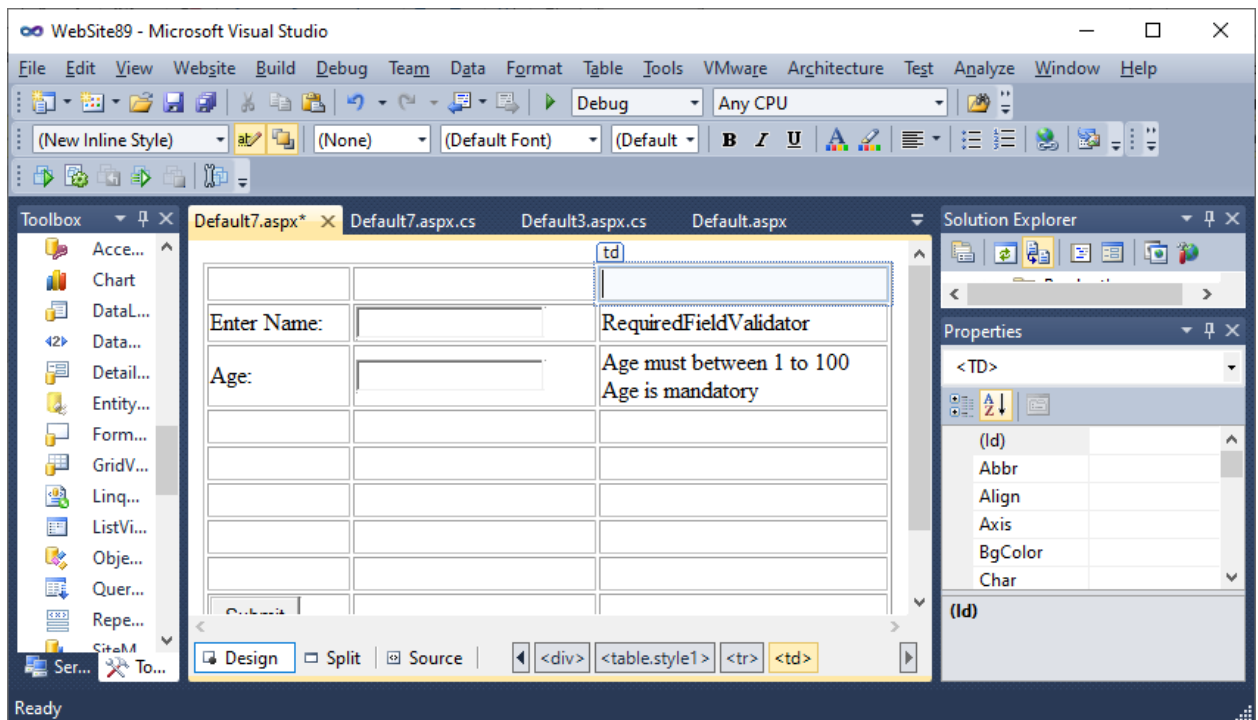
Now, if you run the page and click on the button then you will get following output.
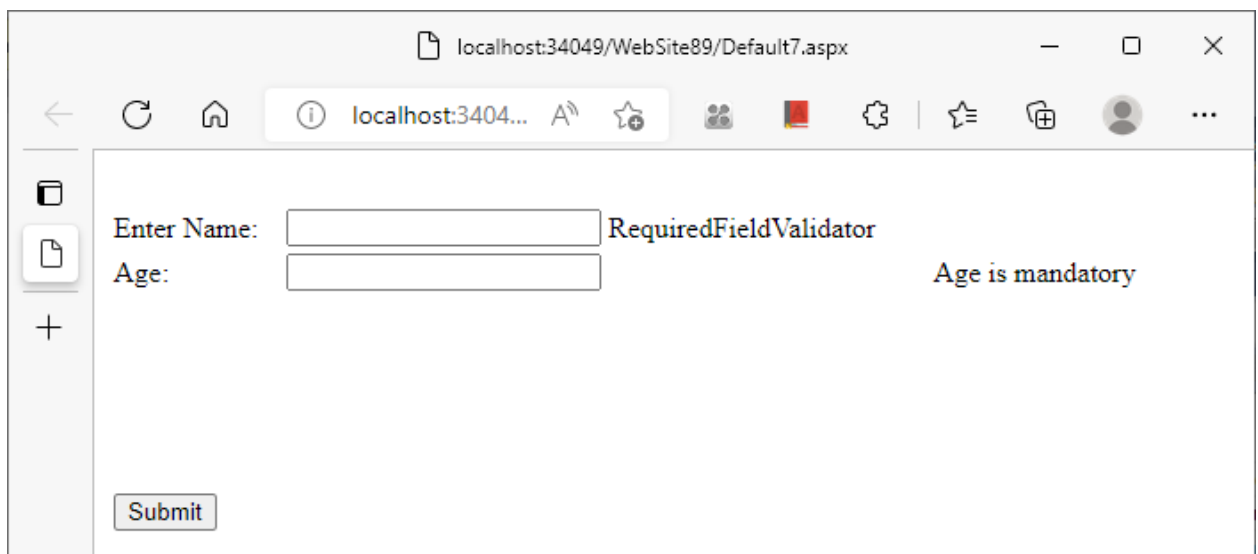
You can see that both RequiredField validator are showing error messages, but they are not aligned properly. This thing happens because of Range validator. To solve this problem, change the Display property of both Range and RequireField validators of age from 'Static' to 'Dynamic'. Run and test the webpage.

2.2.3 Compare validator

Compare validator can be used to three different purposes:[1] To check the Datatype [2] To compare with fixed value and [3] To compare with other control's value. Let us check all of them one by one:

[1] Checking Data Type:

In the fourth row of the table write Date or Birth in the 1st column, place Textbox3 in the second column and place compare validator in the 3rd column. Select the Compare validator and set the following properties:

ControlToValidate	Textbox3
Error Message	Invalid Date of Birth
Type	Date
Operator	Data Type Check

Run and test the page by inputting wrong value in the Textbox3. Enter 'abcd', or '123' in the Textbox3 and check, you will get error message as shown below:
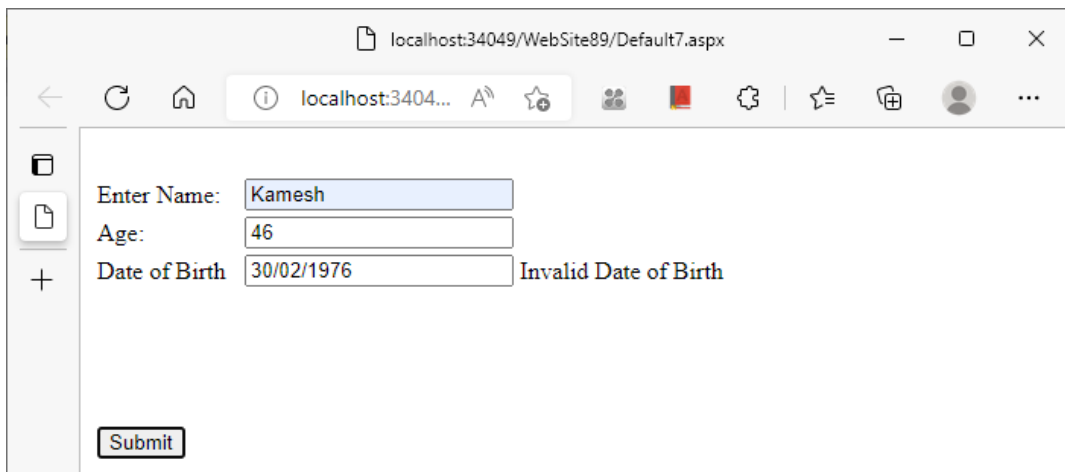
Compare validator is showing that 30-Feb-1976 is invalid date, but if you enter 29/02/1976, it won't show any error message. Because 1976 was a leap year. If you enter 29/02/1977 then again Compare validator shows error message as it was not leap year and, in the February 1977, there were only 28 days.

[2] Comparing with Fixed Value:

To evaluate this feature, add an additional field called salary. In the fifth row write 'Salary' in the 1st column, place Textbox4 in the 2nd column and place compare validator in the 3rd column. Select and set the following property of the compare validator.

ControlToValidate	Textbox4
Error Message	Salary should be greater than 5000
Type	Integer
Operator	Greater than
ValueToCompare	5000
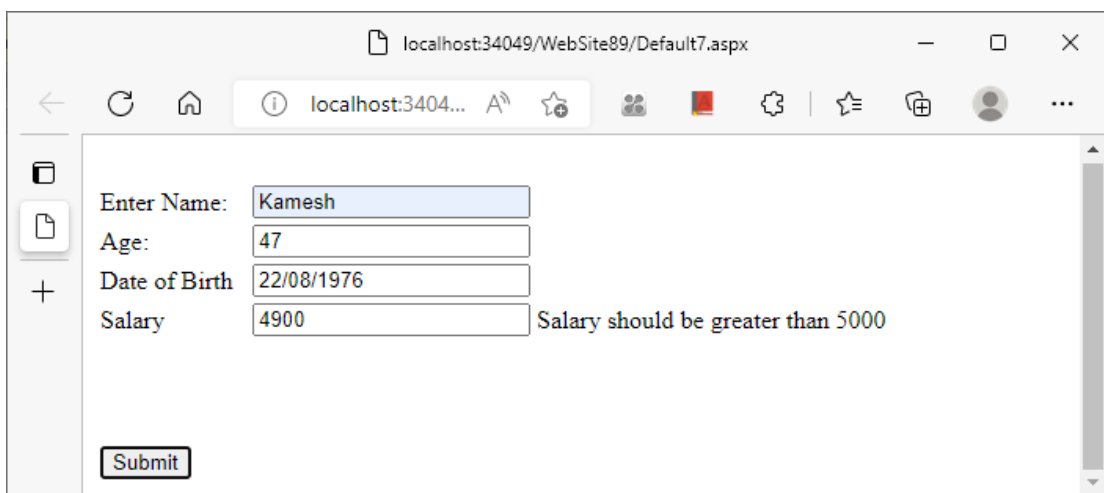
If you run and test the page with the values shown in the above figure, then CompareValidator will shows the error message as the value in the Salary field is less than 5000. But you change it to 49000. Then the page will be submited.

[3] Comparing with other control's Value:

To evaluate this, add another field to our form that is Date of Joining. Write Date of joining in the 1st column, place textbox5 in the 2nd column and Compare validator in the 3rd column in the sixth row. Select compare validator and set the following properties:

ControlToValidate	Textbox5
Error Message	DOJ has to be greater than DOB
Type	Date

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Operator	Greater than
ControlToCompare	Textbox3

Here, the value entered by the user in the Textbox5 with Textbox3. If the date value in the Textbox5 is less than the data value entered in the Textbox3 then compare validator will show error message that DOJ has to be greater than DOB.

2.2.4 RegularExpression validator

RegularExpression validator control is used if you want to validate Internet URL of Email address etc. To evaluate add another field to our webpage called Email. Type 'Email' in the 1st column, place Textbox6 in the second column and RegularExpression validator in the 3rd column of seventh row. Select RegularExpression control and set the property ControlToValidate to Textbox6 and Error message to 'Invalid Email'. Now click on the elipse button (…) of ValidationExpression property and select Email as shown in the following figure.
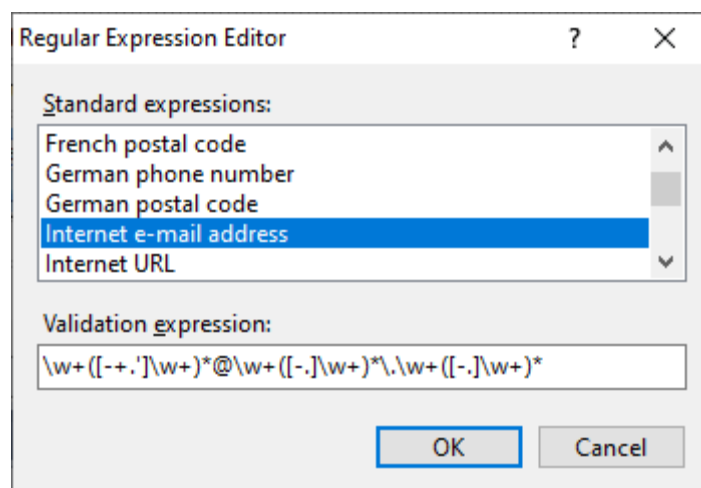
Click on OK button run and test the webpage by entering wrong and right email addresses.

2.2.5 ValidationSummary validator

Now place validation summary control in the first row. Select one by one all validation controls we have used in this page and set their Text property to *. Run and test the page.
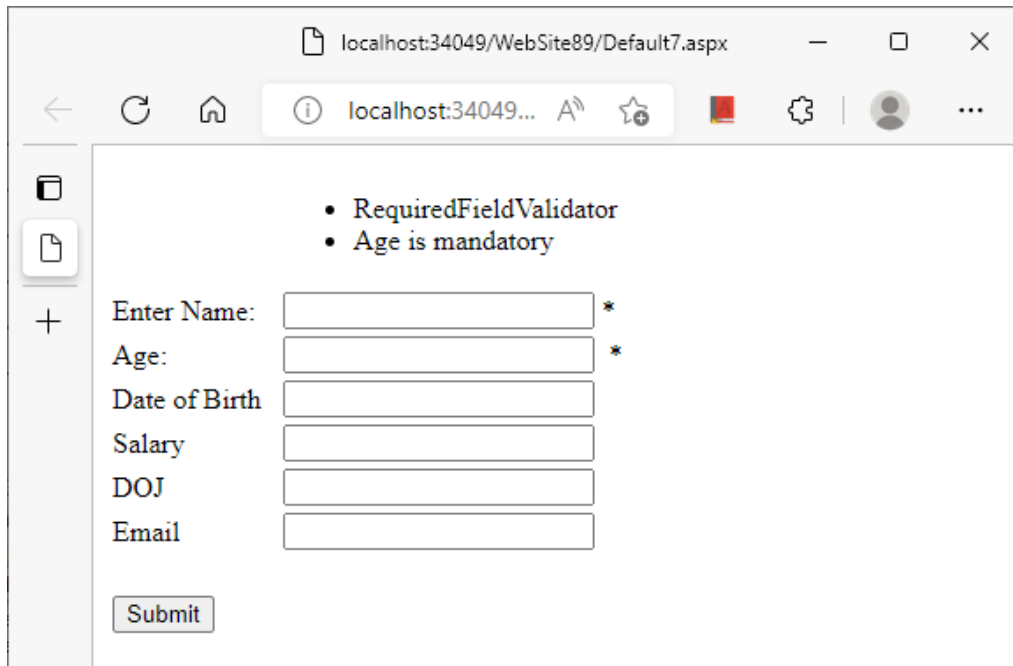
Now Error messages will be apeared in the ValidationSummary, and instead of all validation controls '*' will be apear if any error is genertaed by any validation control. You can also set the property ShowMessageBox property of the ValidationSummary control to True, if you want summary in the form of message box.

2.2.6 Custom validator

All the validation controls we have explored above are functioning at client-side. Custom validator is the only control which works at server side. If you feel, no validation control works well for your validation then you can use custom validator. Here you need to write the code in server-side languages like C#.NET or VB.NET. To work with Custom validation add a new page to your website and add a Textbox1, a Button and CustomeValidator1 to your webpage. Set ControlToValidate property of the CustomValidator to Textbox1 and Error message property to 'Text Should have less than 10 characters'. Now double click on the custom validator and write the following code.

```csharp
protected void Page_Load(object sender, EventArgs e)

    {

        if (Page.IsValid)

        {

            Response.Write("Data is Submitted Successfully:");

        }
```

```
    }

    protected void CustomValidator1_ServerValidate(object source,
ServerValidateEventArgs args)

    {

        if (args.Value.ToString().Length > 10)

            args.IsValid = false;

    }
```

Run and test the page if you enter more than 10 characters in the textbox and click on the button then Custom validator shows error message otherwise your page will be submitted successfully.

Check Your Progress-1

1. _____ validation control is used to check data type.

[A] RequiredField   [B] Range

[C] Compare   [D] RegularExpression

2._____ validation control is used to validate Email address.

[A] RequiredField   [B] Range

[C] Compare   [D] RegularExpression

3. _____ is an essential property for all validation controls except Validation Summary.

[A] Type   [B] ControlToCompare

[C] ControlToValidate   [D] Operator

2.3   WORKING WITH MASTER PAGE:

Master page is an example of Visual Inheritance. It is first in the version ASP.NET 2.0 and enhanced in the ASP.NET 3.5. Master page provides consistent and structured looks to all of your webpages of the website. In the website, all webpages should have consistent look. Same

type if designing in every page is a tedious task. Master pages allows you to design only one page and that design will be inherited across all the pages of your website. So, you don't have to design each page separately. This will save our lots of effort and time.

How Master page works:

Master pages are an easy way to provide a template that can be used by any number of .aspx pages in your application. To deal with master pages, you create a master file which act as the template referenced by a content page. Master pages use a .master file extension. You can place anything to the master page. You can place header, sidebar, footer anything whatever you want into the master file and prepare the Template. Later on, this template design will be used to design other content pages.

Remember master pages are just design or template. User cannot run this page directly. User will make a request for the content page only, but at run time content of content page and design of the master page is merged and user can see both together in the browser. See the following figure, it will help you to understand the concept of Master page properly. As seen in the figure, when browser requests of content page C then server will apply the designing feature of its master page M to the content page and this combine page MC will be delivered to the server in which designing of M and content of C both should be present.
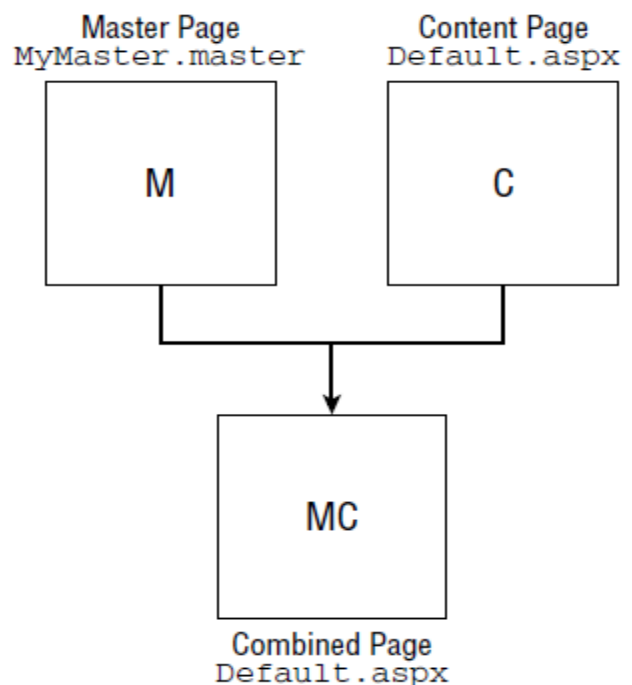
To design the master page, right click on the name of the website in the Solution Explorer and select Add New Item option. From Add New Item dialog box select Master page and then click on Add button. This will add a master page to your website. Take a table with 4 rows and 2 columns. By dragging adjust the hight and with as show in the figure below.

Now, place the image control in the top-left cell of the table. Download and copy the logo of BAOU website and place it in your website. Select image you have placed on Top-Left corner of your master page and set its ImageUrl property to that logo file. Now click on the header section of the master page apply new style as shown below.
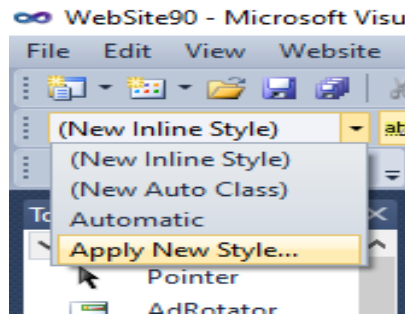
This will open the New Style Sheet dialog box. Set the value as given below. And click on OK button.
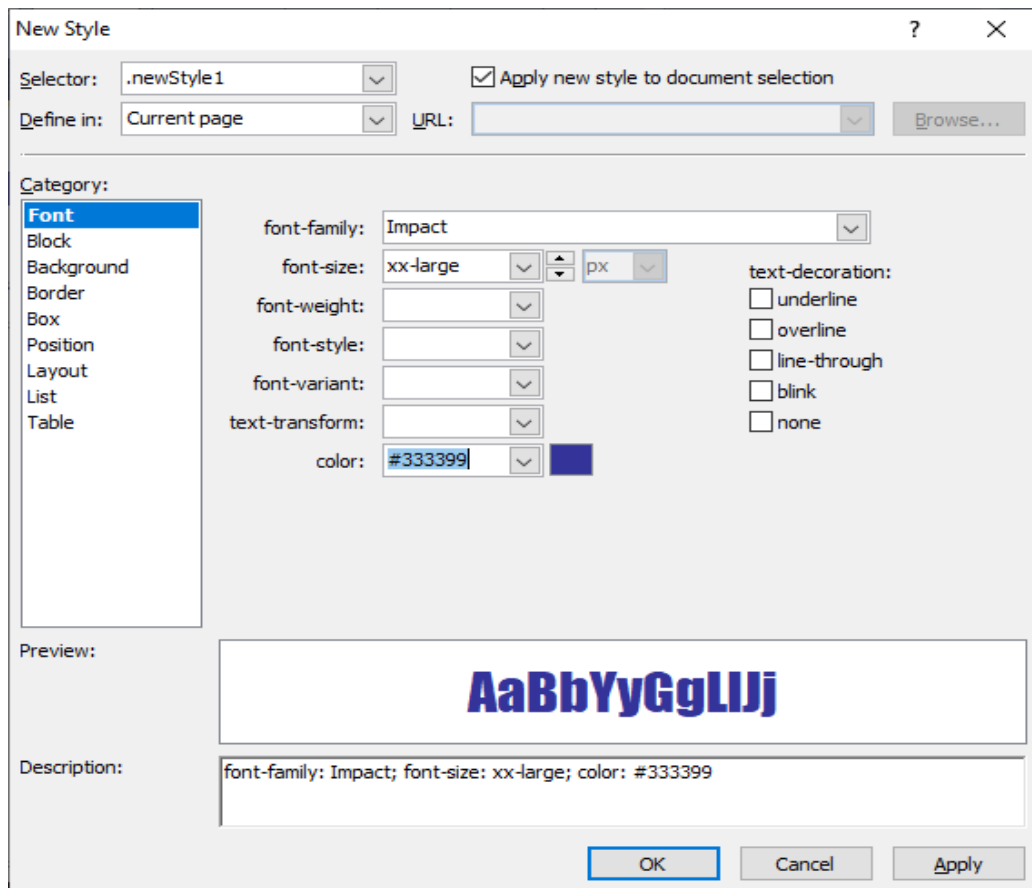
After this enter the name of your university in the header section of your master page. In the footer section you have to show the copyright © warning: (to generate copyright symbol press and hold Alt key and then type 0169 from the numerical keyboard). Now in the detail section place Content place holder and in the sidebar place TreeView control from Navigation category of ToolBox. The complete source code and designing interface is shown below:

```
<%@ Master Language="C#" AutoEventWireup="true"
CodeFile="MasterPage.master.cs" Inherits="MasterPage" %>
```

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">


<html xmlns="http://www.w3.org/1999/xhtml">

<head runat="server">

    <title></title>


    <style type="text/css">

        .style1

        {

            width: 100%;

        }

        .style2

        {   width: 141px;

        }

        .style3

        {

            width: 141px;

            height: 83px;

        }

        .newStyle1

        {

            font-family: Impact;

            font-size: xx-large;

            color: #333399;

        }

        .newStyle2

        {

            vertical-align: top;
```

```
                    text-align: left;

            }

        .newStyle3

        {

                vertical-align: top;

                text-align: left;

        }

        .newStyle4

        {

                vertical-align: top;

                text-align: left;

        }

        .style4

        {

                vertical-align: top;

                text-align: left;

                height: 322px;

        }

    </style>

</head>

<body>

    <form id="form1" runat="server">

    <div>

        <table class="style1" border='1'>

            <tr>

                <td class="style3">

                    <asp:Image ID="Image1" runat="server"
ImageUrl="~/logo.png" />

                </td>
```

```html
            <td class="newStyle1">

                Dr. BABASAHEB AMBEDKAR OPEN UNIVERSITY</td>

        </tr>

        <tr>

            <td class="style2" rowspan="2">

                <asp:TreeView ID="TreeView1" runat="server">

                </asp:TreeView>

            </td>

            <td>

                 </td>

        </tr>

        <tr>

            <td class="style4">

                <asp:ContentPlaceHolder ID="ContentPlaceHolder1"
runat="server">

                </asp:ContentPlaceHolder>

            </td>

        </tr>

        <tr>

            <td class="style2">

                 </td>

            <td>

                Copyright © warning:

                <br />

                <br />

            </td>

        </tr>

    </table>
```

```
    </div>

    </form>

</body>

</html>
```
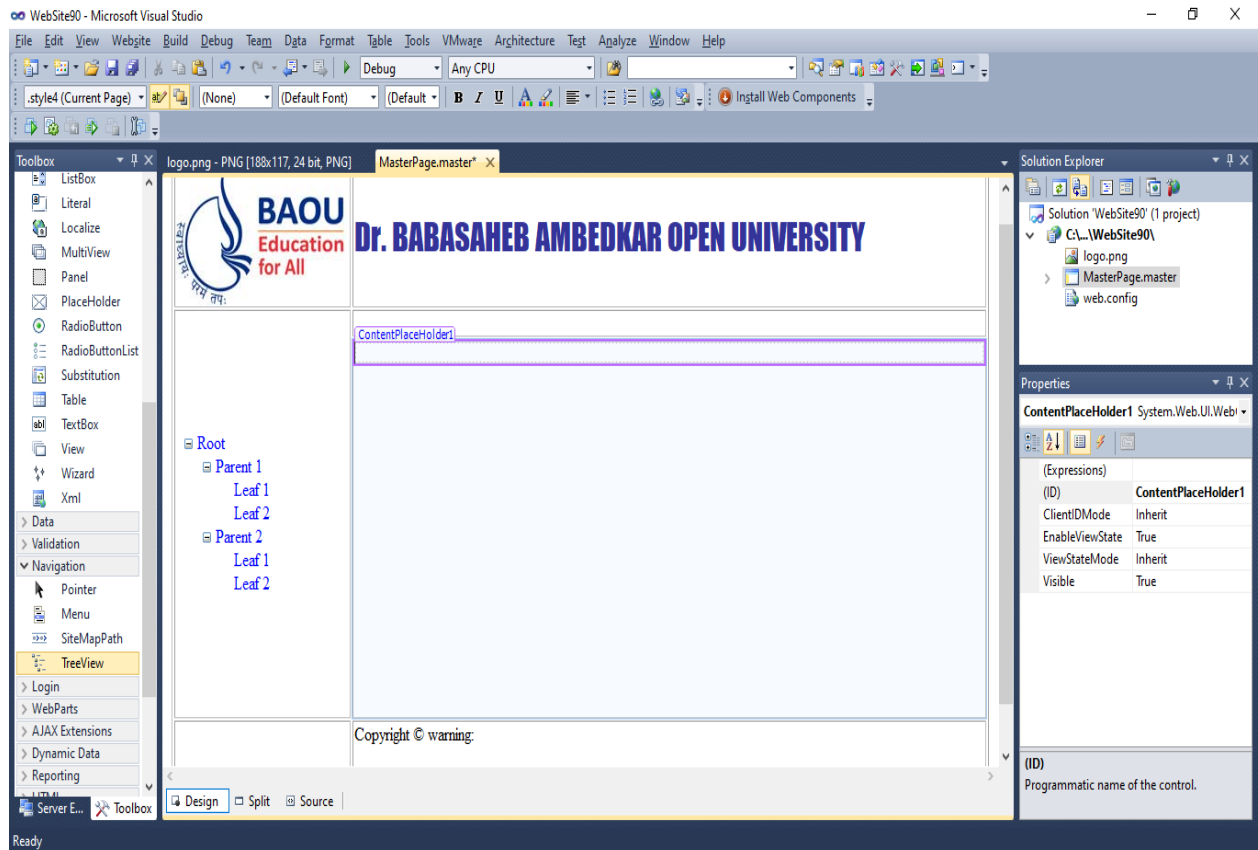

Now add a new webpage default.aspx to your website. Make sure from the 'Add new Item' dialog box when you are taking default.aspx page at that time you also need to do check on the checkbox called select master page as shown in the figure given below.
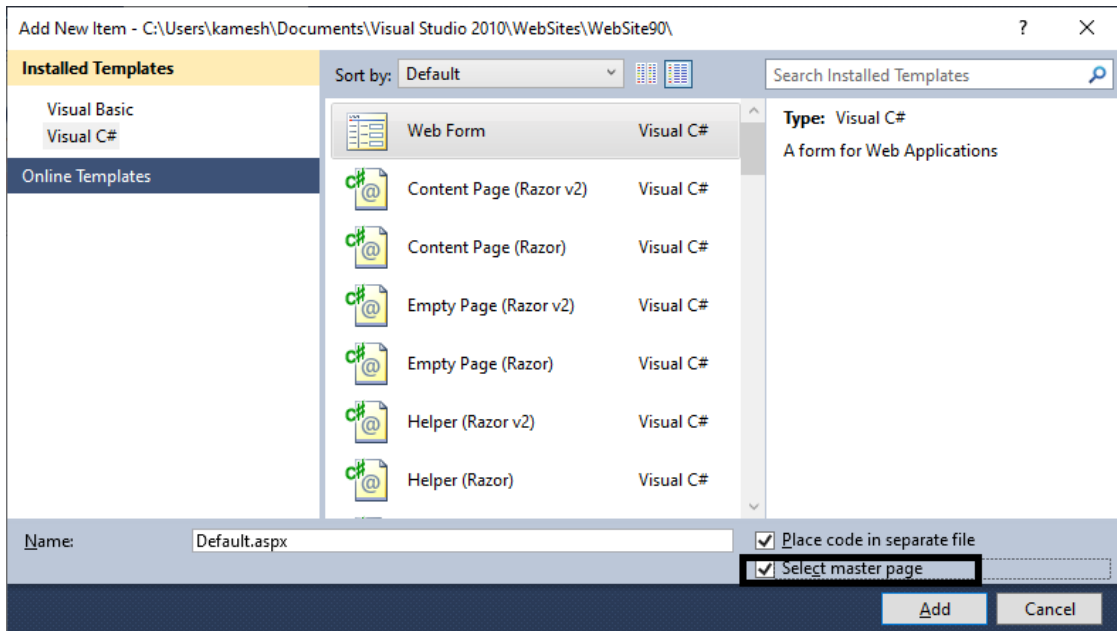
Now click on the add button and from the next dialogbox select your master page as shown in the figure given below.
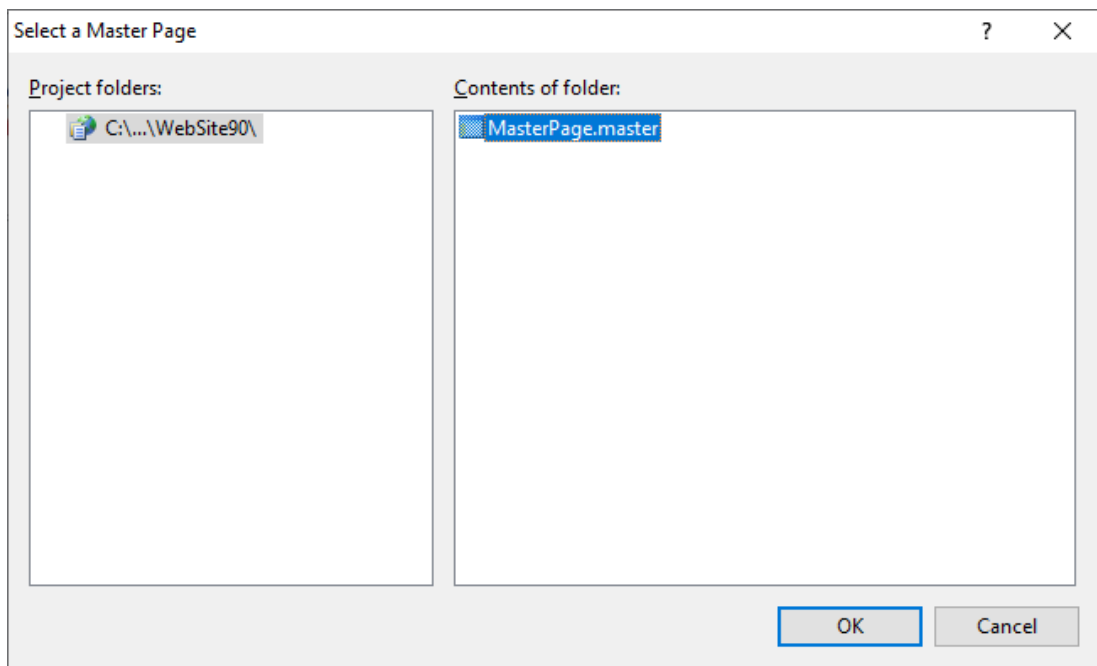
Click on the OK button. You can see your default.aspx page is ready. This page has the same design which you have made in the master page. You can notice that all design parts are not editable, you only edit the content place holder part. Here, you write 'Welcome to BAOU University in the <H1> tag.

```
<%@ Page Title="" Language="C#" MasterPageFile="~/MasterPage.master"
AutoEventWireup="true" CodeFile="Default.aspx.cs" Inherits="_Default" %>
```

```
<asp:Content ID="Content1" ContentPlaceHolderID="ContentPlaceHolder1"
Runat="Server">

<h1>Welcome to BAOU University</h1>

</asp:Content>
```

2.4 WORKING WITH NAVIGATION CONTROLS:

In this section we will be discussing about all navigation controls. In the ASP.NET there are three navigation controls are there.: [1] TreeView control [2] Menu Controls and [3] SiteMapPath control. Before we discuss each of them create two directories into your website called BCA and BSCIT. In each directory, create three pages default.aspx, admission.aspx and faculty.aspx. Make sure while adding all these pages you have to select your master page. Specify the text so that you can recognize each page separately as follows:

Page	Message
~/BSCIT/default.aspx	<H1>Welcome to BSCIT program </H1>

~/BSCIT/admission.aspx	<H1>Here is the admission procedure for BSCIT program </H1>
~/BSCIT/faculty.aspx	<H1>Here is the faculty list of BSCIT program </H1>
~/BCA/default.aspx	<H1>Welcome to BCA program </H1>
~/BCA/admission.aspx	<H1>Here is the admission procedure for BCA program </H1>
~/BCA/faculty.aspx	<H1>Here is the faculty list of BCA program </H1>
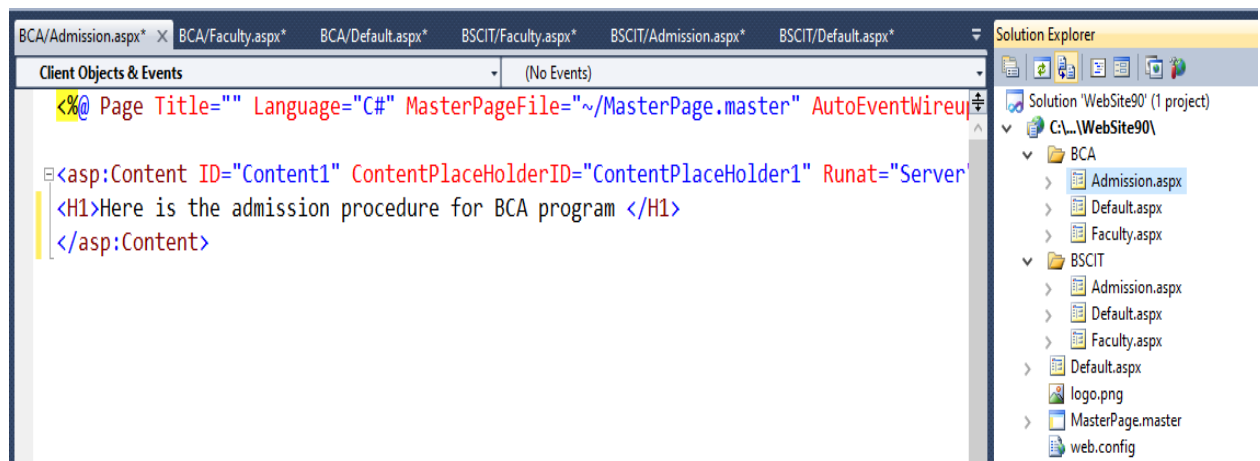
Now you need to add a sitemap file to the website. To do this right-click on the website name from the solution explorer and choose option 'Add New Item'. From the dialogbox choose option Site Map as shown in the figure given below and click on the Add button. This will add a file called Web.sitemap to your website.
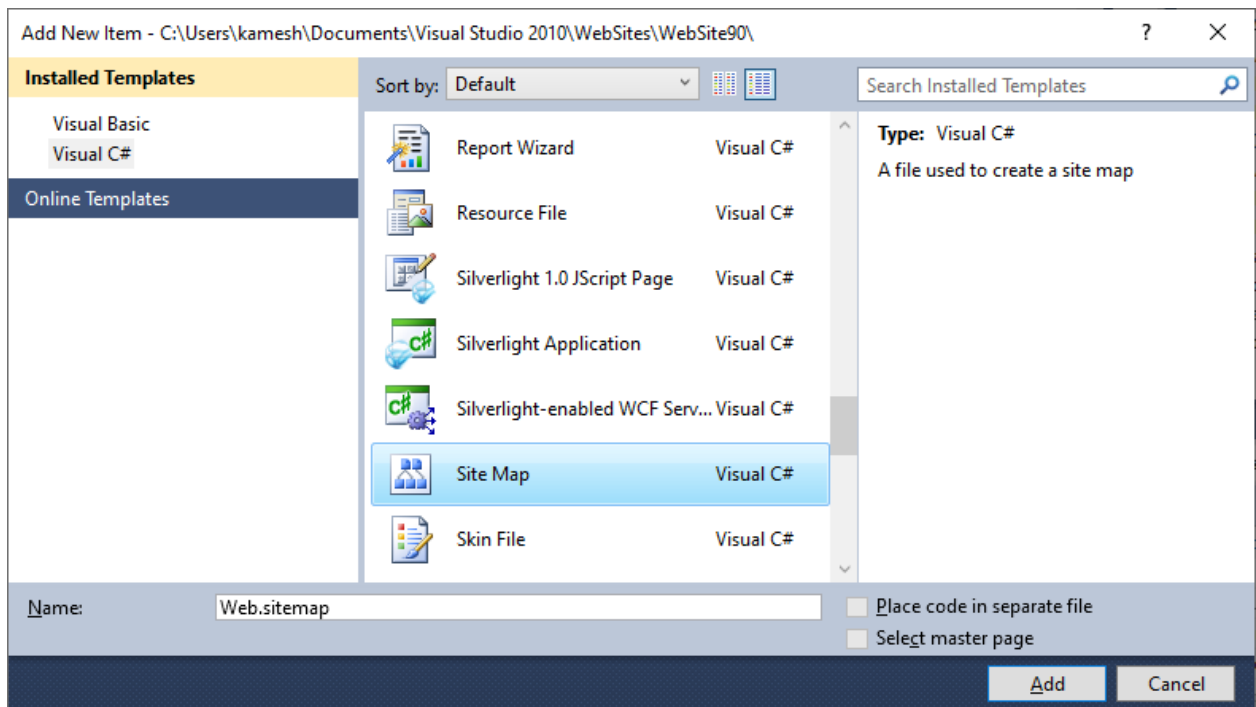
Web.sitemap is an XML file, which represent site map of your website. Site map is kind of Map of your website. Search engines like Google can find those webpages very easily from the website which has Web.sitemap file is implemented. Write the following code into the Web.sitemap file.

```xml
<?xml version="1.0" encoding="utf-8" ?>

<siteMap xmlns="http://schemas.microsoft.com/AspNet/SiteMap-File-1.0" >

    <siteMapNode url="~/Default.aspx" title="BAOU"  description="BAOU
University">

        <siteMapNode url="~/BSCIT/default.aspx" title="BSCIT"
description="Bachelor in Science with IT" >

            <siteMapNode url="~/BSCIT/Faculty.aspx" title="Faculty"
description="" />

            <siteMapNode url="~/BSCIT/Admission.aspx" title="Admission"
description="" />

        </siteMapNode>


        <siteMapNode url="~/BCA/default.aspx" title="BCA"
description="Bachelor in Computer Applications" >

            <siteMapNode url="~/BCA/Faculty.aspx" title="Faculty"
description="" />
```

```
            <siteMapNode url="~/BCA/Admission.aspx" title="Admission"
description="" />

        </siteMapNode>

    </siteMapNode>

</siteMap>
```

Now add a control called SiteMapDataSource to the master page. SiteMapDataSource control you can find from the Data category of the ToolBox. Select the TreeView control you have placed in the Sidebar of the master page and select on > sign on the top-left corner of the TreeView contrl to open the smart menu. From the smart menu choose Data Source option and apply SiteMapDataSource1.

Now in the second row of the table of master page (below header section) place SitMapPath control as shown in the following figure. From the smart menu or the SiteMapPath control (Navigation category of ToolBox) choose AutoFormat option. From AutoFormat dialog box choose colorful theme. Run any content page it looks like shown in the following figure.
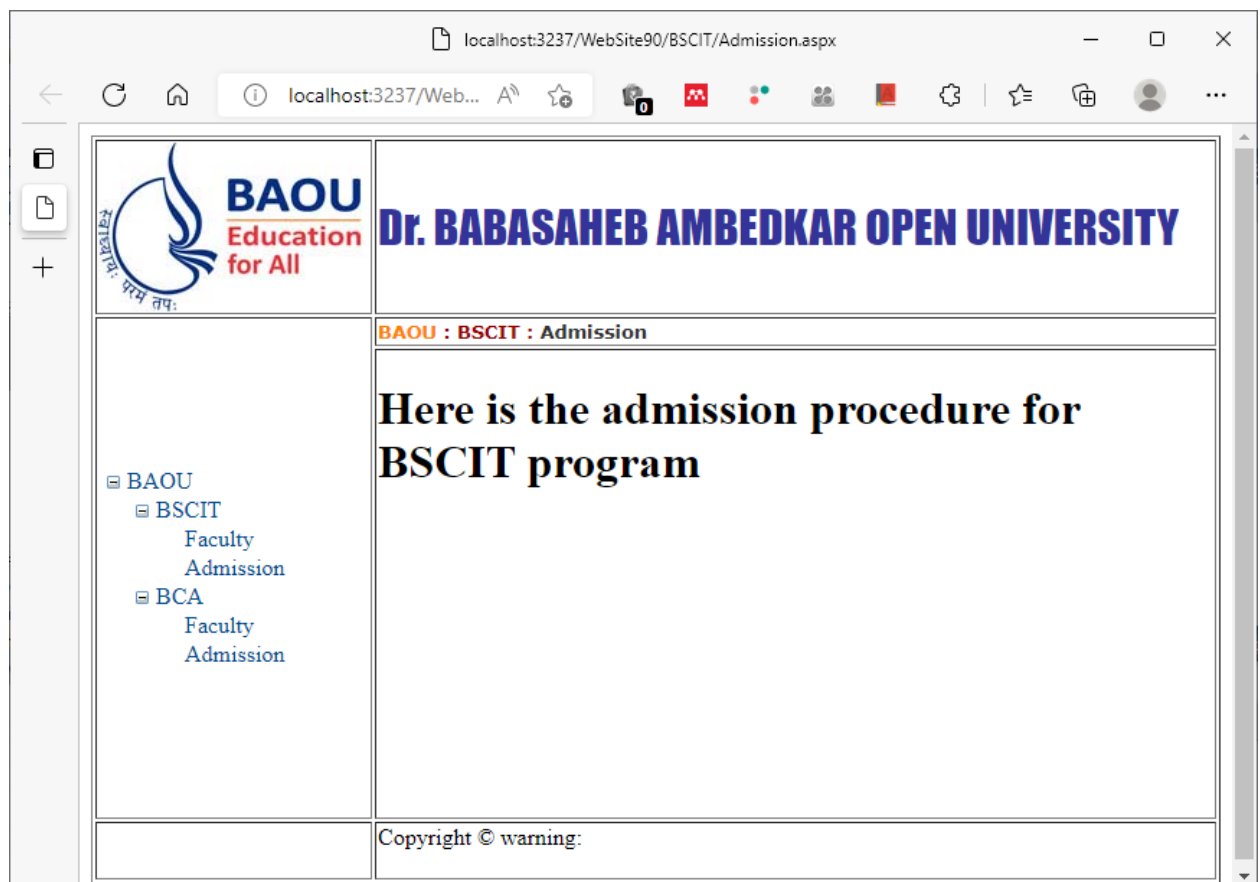
Instead of SiteMapPath control, you may also use Menu control as a navigation tool for your website. Click on the different nodes of TreeView control as well as SiteMapPath control and note down your observations.

Check your progress 3

1.From the given below which is not a navigation control?

[A] SiteMapPath   [B] TreeView

[C] Calendar   [D] Menu

2.The coding language for Web.sitemap is _____.

[A] C#.NET   [B] XHTML

[C] JavaScript   [D] XML

3._____ navigation control represents navigation options in hierarchical mode.

[A] TreeView   [B] SiteMapPath

[C] Literal   [D] Calendar

2.5   LET US SUM UP

In this unit we have discussed the concept of Master page. Master page provides a main designing temple, which will be inherits its design across other webpages of website which are also known as content pages. We have also discussed about how to validate the data entered by the user in the web form using built-in validation controls. In the ASP.NET total six validation controls are there. RequiredField validator, Range validator, Compare validator, RegularExpression validator, Custom validator and Validation Summary. All validation controls work client-side, except one that is Custom validator. At the end we have discussed how to provide navigation thorough out the different webpages using TreeView, SiteMapPath and Menu kind of Navigation controls.

2.6 GLOSSARY

5. **Master page:** It is a page which consist of design for the webpages. It acts as a template for the other webpages of the website and inherits its design across different webpages.
6. **Web.sitemap:** It is an XML file which provides a hierarchical sitemap for the website.
7. **Validation controls:** This controls are used to validate the data entered by the user. Most validation controls in the ASP.NET validates the data at client-side. If data is validated then and then it will be sent to the server for further processing.

2.7 SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

4. [C] Compare
5. [D] RegularExpression
6. [C] ControlToValidate

Check Your Progress-2

4. [B] .master
5. [C] Inheritance
6. [D] ContentPlaceHolder

4. [C] Calendar
5. [D] XML
6. [A] TreeView

2.8 Assignment

4. List all validation controls and explain any two of them.
5. What is master page? List the advantages of using master page.
6. List and explain all navigation controls in details.

2.9 Activity

Take 2 Textboxes, Add 2 RequiredFiledValidator. Set EnableClientScript property to "FALSE" and type the following code on the Page_PreRender event.

```
For Each valcontrol As BaseValidator In Page.Validators

 Dim assControl As WebControl =
Page.FindControl(valcontrol.ControlToValidate)

          If Not valcontrol.IsValid Then

                assControl.BackColor = Drawing.Color.Yellow

          Else

                assControl.BackColor = Drawing.Color.White

          End If

      Next
```

2.10   Case Study

Download any free CSS temple from the Internet and design your master page of the website using this CSS template.

2.11   Further Reading

- ASP.NET 4.0 Unleased by Stephen Walter.
- Beginning ASP.NET by Wrox publication.
- Professional ASP.NET 4.0 by Wrox publication.

UNIT 3   ASP.NET SECURITY

Unit Structure

3.0   LEARNING OBJECTIVES

After working through this unit, you should be able to:

- Understand authentication mode

- Learn how to use ASP.NET configuration tools

- Understand different types of login controls

- Learn securing implementation in the website using access rules enforcement

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3.1   INTRODUCTION

In this Unit we will be focusing on Security mechanism of ASP.NET. Usually when we host our website on the Internet many users are simultaneously using our website. To protect our website from unwanted security threats we have to secure our website. There are many different features are provided by ASP.NET to protect our website from unwanted security threats and to maintain users' integrity by protecting user's data confidentially.

In this unit we will discuss all the different types of Login controls available in the ASP.NET but we will also learn how to enforce access rules using ASP.NET Configuration tools.

3.2   AUTHENTICATION AND AUTHORIZATION

When we talk about security, there are two main things we need to focus. First is Authentication and another is Authorization.

3.2.1 Authentication:

Authentication is the process of Identifying user. Different methods are used to identify a user. Authentication can be by done by following different methods.

1. Taking password or PIN (Personal Identification Number)
2. Face recognition.
3. Scanning finger print
4. By retina scan

By mean of authentication process we are actually identifying the user. In the ASP.NET user is identified by password. A user who has not provided any authentication credentials like username and password is called 'Anonymous' user or simply visitor. A user who passthrough the authentication system by giving login credential is known as Authenticated user. ASP.NET provides Login control, with the help of it we can validate the identity of the user.

3.2.2 Authorization:

Authorization is another process, which will be started after completion of authentication process. One the user is validated by the login credential supplied by the user; another process of Authorization starts. In this process we need to check the privileges granted to that user. That means, which area of the website is accessible by that user and which area of the website is hidden from that user. For example, on any E-Commerce site without login, you can see the different product categories, you can also view different products and services. This sites also allows you to add the product or service into the Cart. But you think can you place the order? Answer is no. Unless and until you are not revealing your identity E-Commers sites are not allowing you to place the order or even you can not view the past orders given by you. To place the order or to view your past orders you need to provide your login credentials. Now thing if logs into the E-Commerce website. Can you add or deleted any product from the site? Or can you change the details of any product? Again, the answer is no. To do this we have to login as an administrator. This is actually authorization.

Once the user is identified, then based on users' identity we are granting to use certain resources of the website, as well we deny to use certain resources. This process of granting or denying user to use certain resources of the website from the user on the basis of user identity is called Authorization. In the ASP.NET, you can set several Access Rules to provide authorization to the user.

3.3   AUTHENTICATION MODE

Authentication mode provides options to the developer that how developer, wants to authenticate user into the website. There are two types of websites are there. If a website is designed to works only within the range of Local Area Network (LAN) which is also known as Intranet site. For Intranet type of sites Authentication mode is 'Windows'. Here website uses the authentication mechanism of the Windows operating system. All those windows users are also

user of website. If the user login into the windows, it is to be assumed that user has also logged into the website. The website does not have its own user mechanism. To do any modification related to the user management we need to access user management of the windows operating system. Authentication mode = "windows" is suitable for Intranet type of sites, which will not be hosted on the Internet.

Another type of site is Internet site. Here we are hosting a website on any webserver on Internet. The site has its own database to maintain different users of a website. The users of website do not have any relation with the users of operating system. Website maintain its own independent user mechanism.

In ASP.NET by default authentication mode is 'Windows'. To change it you need to run ASP.NET configuration tool from the Website menu. You can also access ASP.NET Configuration from the Solution Explorer. You can see a small icon for ASP.NET configuration tools on the top of Solution Explorer as shown in the figure given below.

Click on this ASP.NET Configuration Icon and you can see a separate website to configure your website will be opened which shown as below.
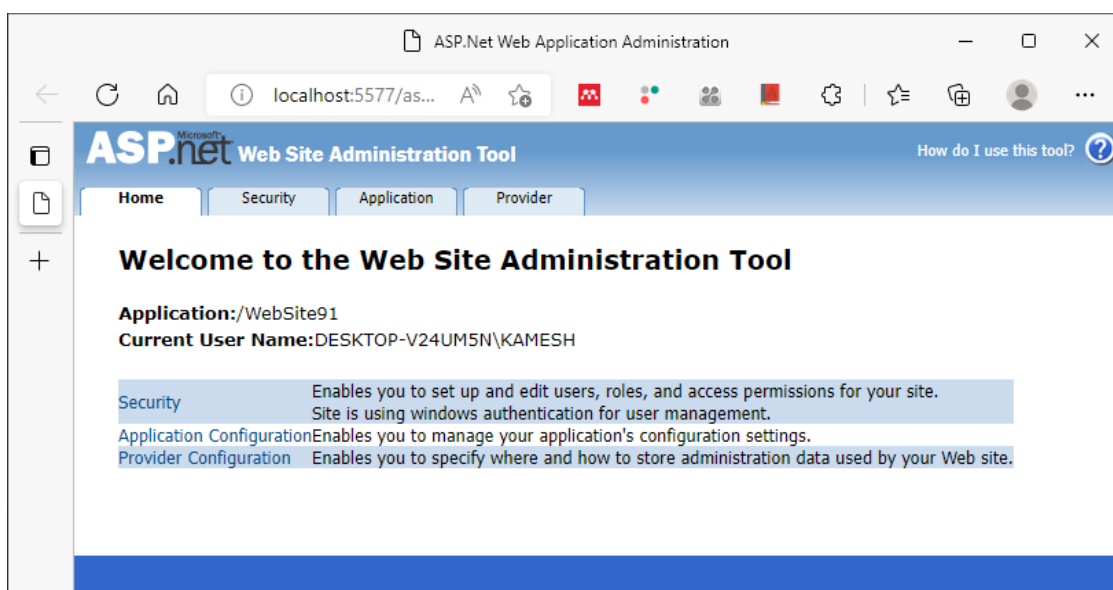
Now click on the security tab. In the User section you can see the following message – "The current authentication type is **Windows**. User management from within this tool is therefore disabled." Now click on the "Select Authentication Type" link exactly below this message. You will get the following screen. You can see option button 'From a local network' is

selected. This is nothing but Authentication mode 'Windows'. Now change it to 'From Internet' as shown in the following figure.
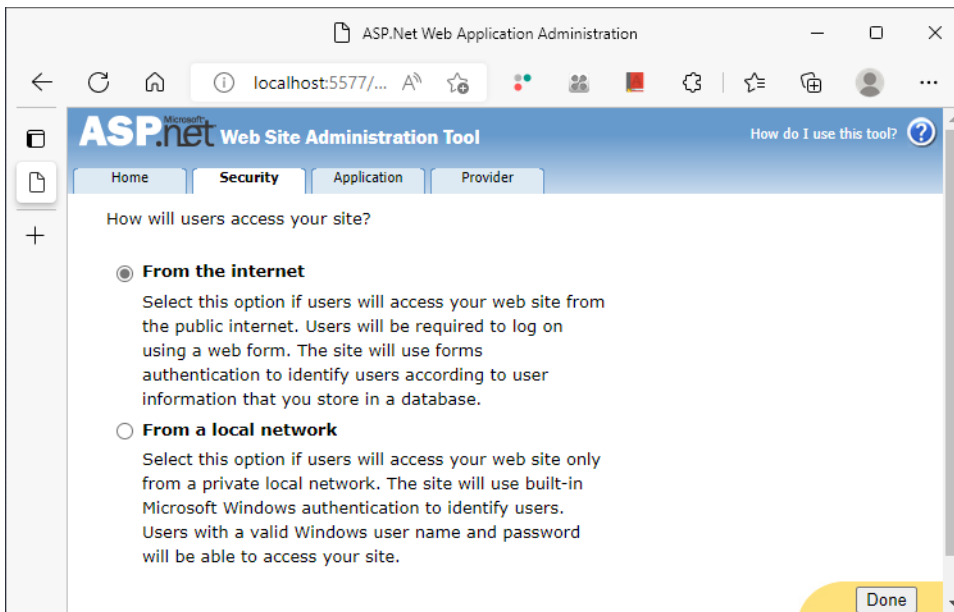
Now click on the Done button. Your authentication mode is changed from the 'Windows' to 'Forms'. Now your website maintains its own independent user database. Now double click on the web.config file in the website root directory. You will get the following code.

```xml
<?xml version="1.0"?>

<!--

  For more information on how to configure your ASP.NET application, please visit

  http://go.microsoft.com/fwlink/?LinkId=169433

  -->

<configuration>

    <system.web>

        <authentication mode="Forms" />

        <compilation debug="false" targetFramework="4.0" />

    </system.web>

</configuration>
```

The file web.config file is an XML file which store all the website settings of your site. You can see that the authentication mode of your website is changed to Forms. Now refresh the Solution Explorer. You can see one directory App_Data is added in the site. If you expand it,

you will get a ASPNETDB.MDF datafile. Double click on that database file, you can see different tables are generated automatically to store the users' details for your site in the Server Explorer.
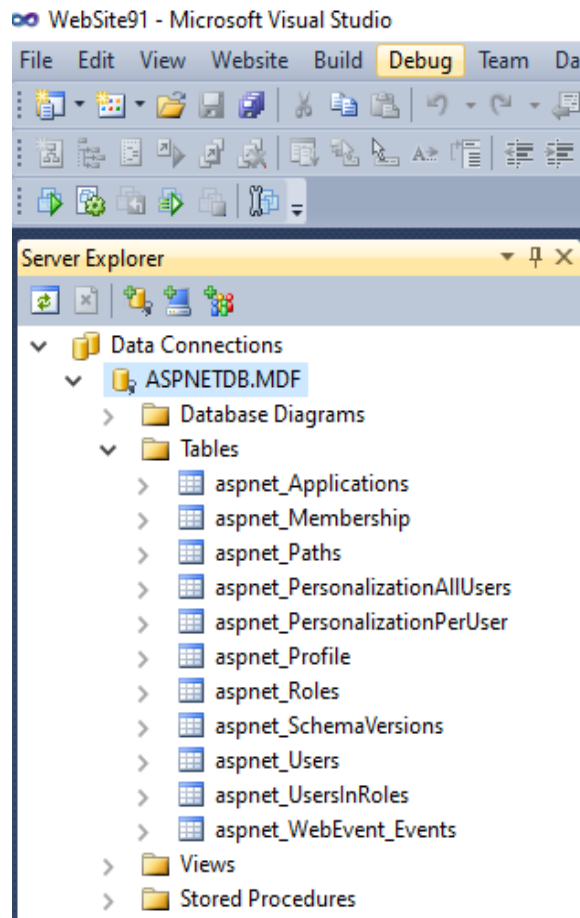
3.4   LOGIN CONTROLS

In ASP.NET, some ready controls are available which will help you to enforce security to your website without writing huge amount of code or with minimal effort. We will discuss all different types of Login controls in details in this section. All the login controls are available in the Login category of the ToolBox.

3.4.1 LoginView:

LoginView controls render different view to the different types of users. It has multiple templates. If you do anything in the Anonymous template then it will be only seen by Anonymous user and whatever modification you have made in the template of Authenticated user, will be only seen by authenticated user. So, depending upon types of users LoginView control change its templates automatically and render different view to different users.

Add a new webpage to your website and place LoginView control in it. If you click on the top-right > sign to open the smart menu you can see the following options in the View.
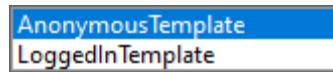
3.4.2 LoginName:

This control can be used for Authenticated users to show their name. This control is similar to the Label, it fetches the username of the authenticated user and display it on the webpage. If the user is an anonymous user, then it shows null string.

Now, in the LoginView select Anonymous Template and type "Welcome Visitor" and in the LoggedIn Template write "Welcome" and then place LoginName control as shown below:
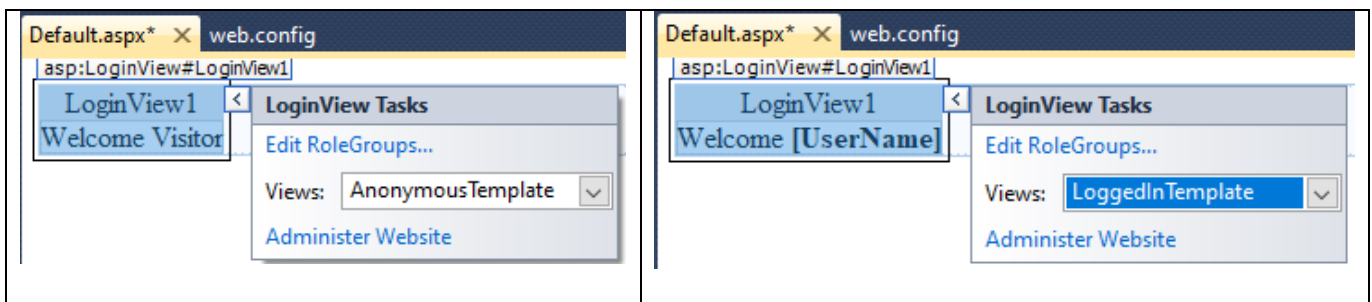
3.4.3 LoginStatus:

LoginStatus control also has two templates. For LoggedOut user it shows the 'Login' link. If any anonymous visit the webpage, then user gets 'Login' link which will redirect user to the login page. For LoggedIn user it provides a link to 'Logout'. When any user login to the website the user will get the link for Logout. If user click on the Logout link, then the session for that user will be terminated.

Place LoginStatus control on your webpage outside of the webpage. If you run the website, at that time you will be Anonymous (Loggedout) user. Login status will show you the 'Login' link, but when we click on this link where it will redirect us? We have not yet designed the login page. Let's design the login page. Add a new page called 'Login.aspx' into your website.

3.4.4 Login:

Login control takes user name and password from the user and it will help user to authenticate with the user database of the website. Login control is shown as below:
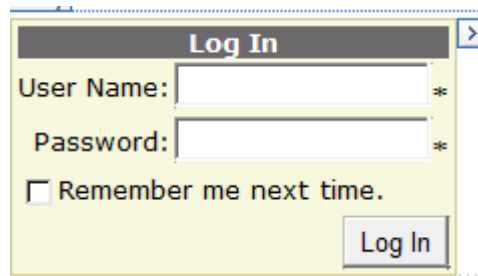
You can Autoformat it, with different designing templates by clicking on > on top-right corner of the control and by choosing the option called AutoFormat. Furthermore, this control is fully customizable. You can change the background color, TitleText, LoginButtonText, LoginButtonType and all validation messages from the property window.

Place the Login control to Login.aspx page and choose suitable format from the Autoformate option. Run the default.aspx and click on the 'Login' link provided by LoginStatus control. You will be automatically redirected to a Login page. Now the question is how you login to the website? Yet we have not created any user account for our site.

To create the user again open the ASP.NET configuration, click on Security tab. Now from the user section click on the Create User link. You will get the following interface.
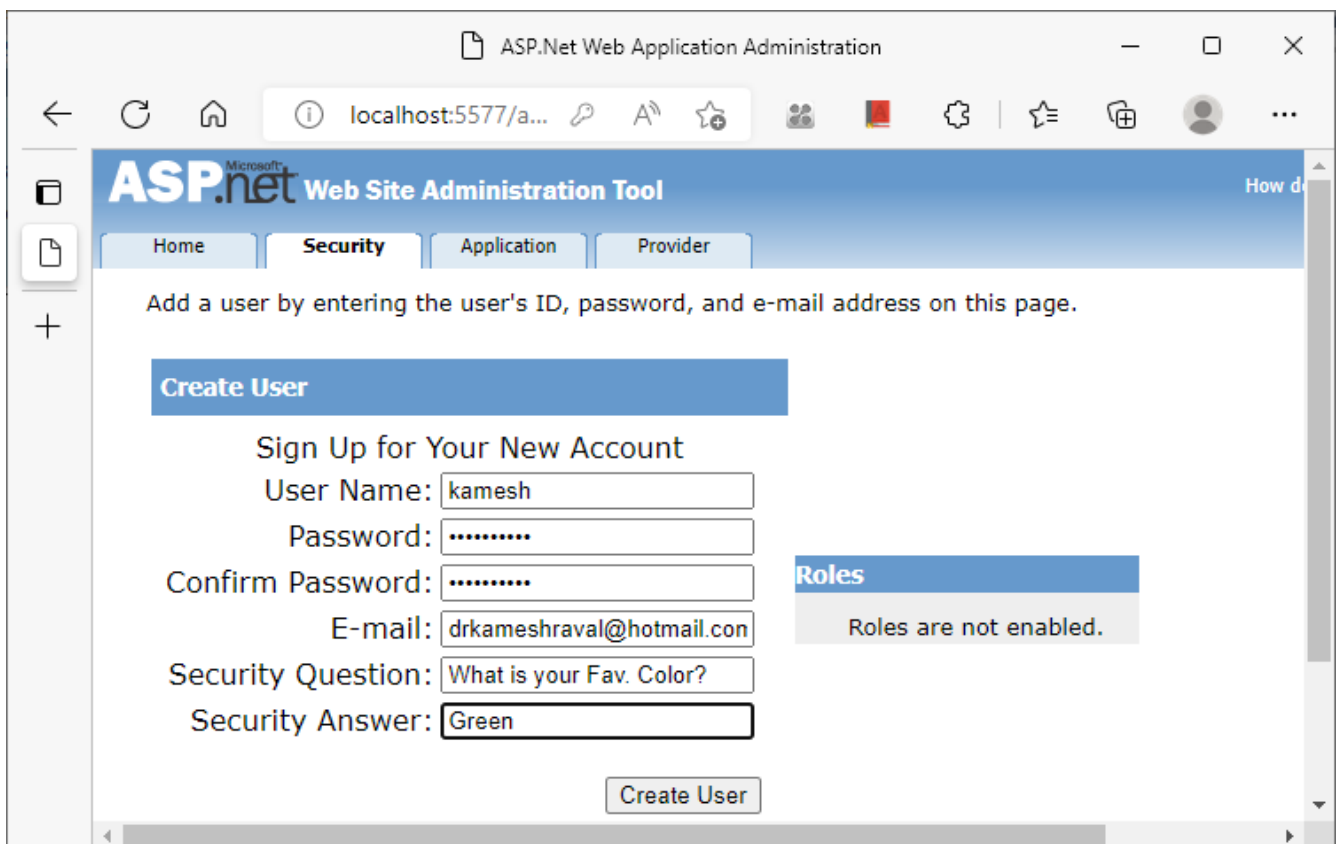
Fill all required information. Make sure password and confirm password must be same and password must be strong with minimum length 7 with combination of alphabets, numbers and special symbols. Click on the Create User button the user will be created. Close .NET configuration window, run the default.aspx page, click on the 'Login' link and Login with the username and password. After login you will be redirected to default.aspx page where you can

see LoggedIn template of LoginView control with Welcome and username. Login status control will now provide a link to Logout from the website.

3.4.5 CreateUserWizard:

We have created the user with .NET Configuration administrative tool of ASP.NET. But what if we want to allow to do the registration their own. For that purpose, we need to design a SignUp page. Add a new webpage called SignUp.aspx to your website. Place CreateUserwizard control on it. Open the smart menu and choose any format from the AutoFormat option.
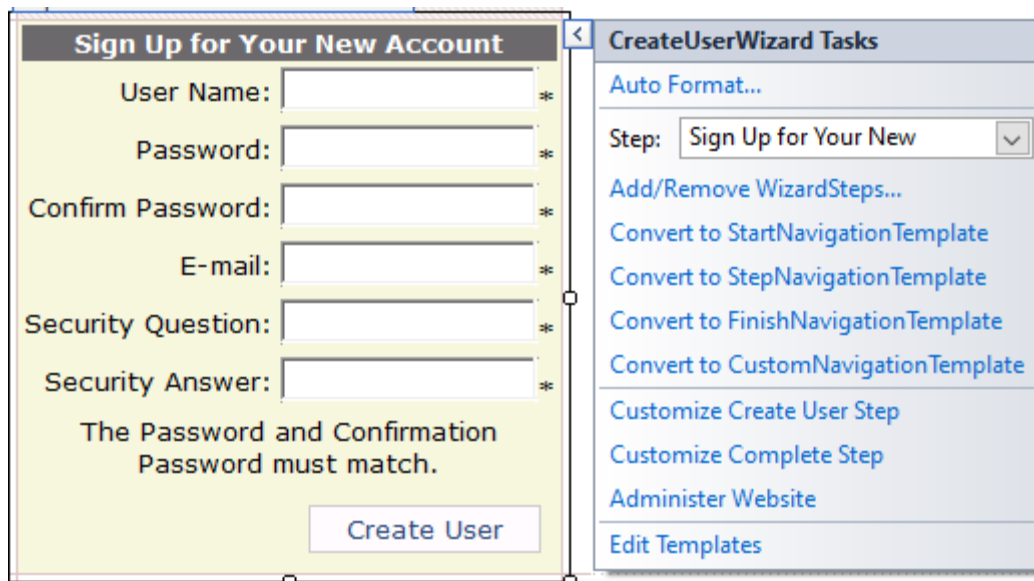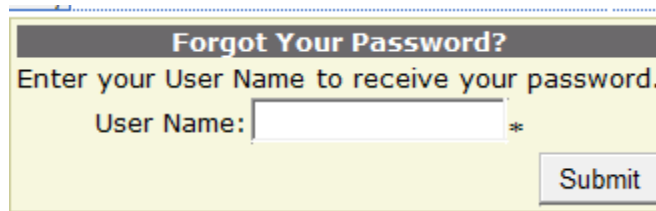
CreateUserWizard control allows users to Register themselves to the website. In the figure given above CreateUserWizard control with its smart menu is shown. This also customizable control and you can do any type of changes as per your requirement from the property windows by selecting this control. Set the ContinueDestinationPageUrl property of this control to 'default.aspx' so after registration user will be redirected to Default.aspx page.

3.4.6 PasswordRecovery:
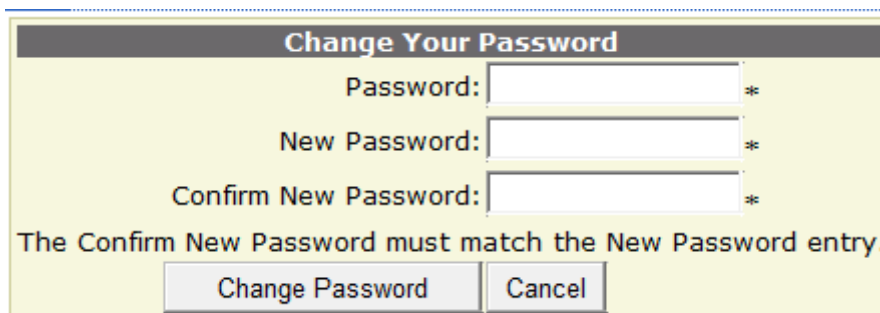
PasswordRecovery control helps user, if user forgot the password and want to logs into the website. This control takes username from the user and shows security question, which is entered by the user at the time of Registration (SignUp) and prompt user to enter security answer. If user enters correct answer, then ASP.NET will reset the password for that user account and send password to the email account which is given by the user at the time of Registration. Make sure it can do the mail if and only if proper SMTP setting you have made in the site. You need to enter details about your SMTP server in the website. For that, open .NET Configuration tool, click on the Application tab and click on 'Configure SMTP Email setting' link. Here you need to provide your SMTP server, its port number and your email address. If you don't have any SMTP server in your network then you can also use your Google account for that purpose.

The PasswordRecovery control is shown in the figure given below:

3.4.7 ChangePassword:

ChangePassword controls allow user to change his/her password. Usually, this functionality should be provided to only authenticated users. Those users who have passed authentication by giving their login credentials, they are allowed to change the password. Anonymous (LoggedOut) should not have access to this page. This control takes, just old password, new and confirm password in the process of change password. ChangePassword control is shown in the figure given below.

To implement this functionality, create a new directory called SecurePages and add a new webpage called changepass.aspx under this directory. Now one question will arise into your mind that why we have placed this page under a separate directory. The answer is, because we are setting up some access rules on the SecurePages directory, such that no user can access the webpages which are placed under this directory without login. But how can we set access rules? Well let's learn it.

3.5   SETTING UP ACCESS RULES

Access rules are those rules, which we are giving to enforce authorization. As we have discussed in the section of authorization that all users should not have access of all parts of our website. Some user can access some part of the website, whereas some other type of user can access other part of website.

On our website we have allowed all the user, even Anonymous users too. Now we don't want to allow anonymous user to access the page called changpass.aspx. So, we have placed that page into the separate directory called SecurePages. Now, we will set access rules on this directory so that anonymous user can not access any of the page placed in this directory.

To apply access rules, click on the ASP.NET configuration and click on the security tab. On third section you can find create or manage access rules. Click on Create Access Rule. You will get the following screen.
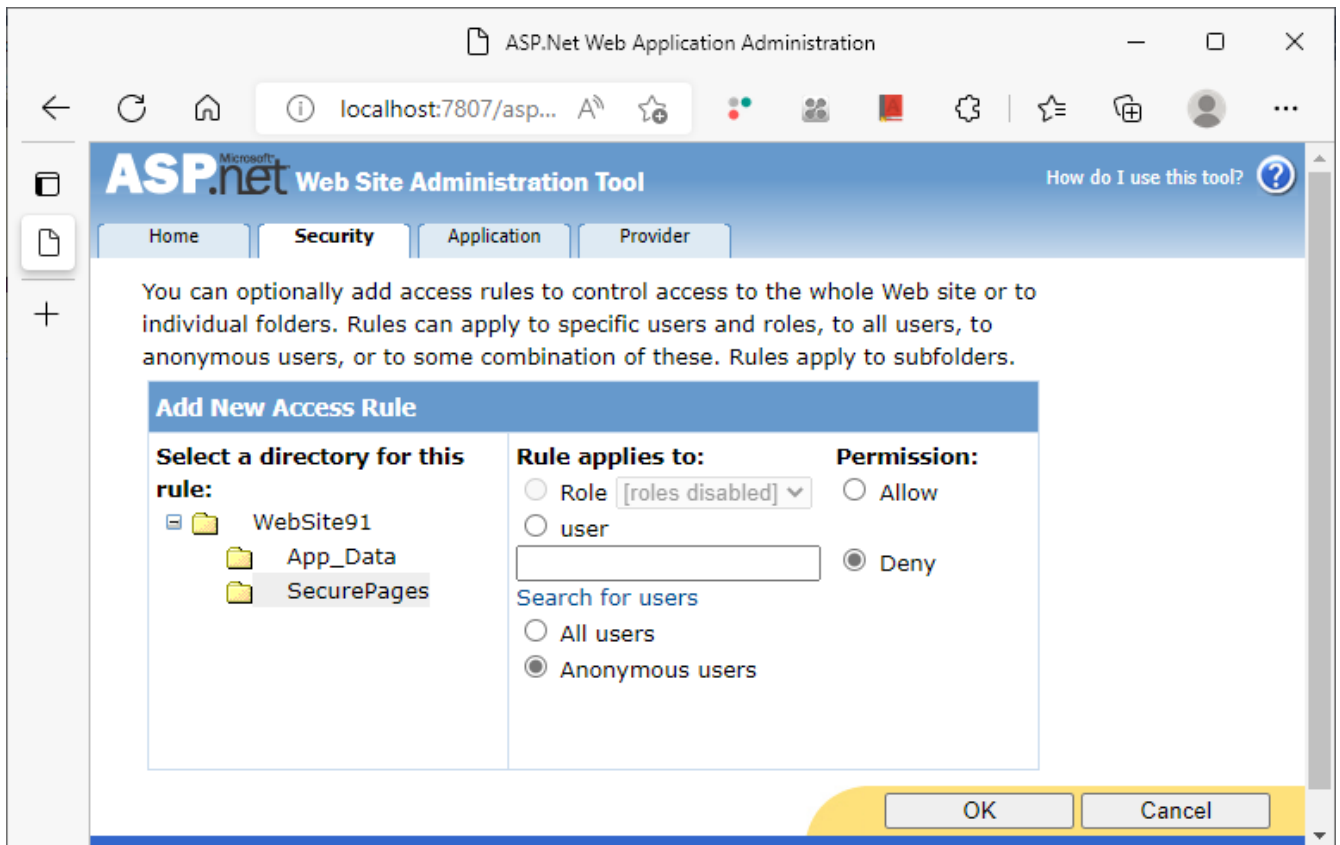
Here you need to select your directory on which you want to enforce the access rule. So, select directory SecurePages, then select user (Anonymous users) and then set Permission to Deny as shown in the image. Now click on the OK button and then Rule is applied.

Close the window of .NET Configuration tool and place a link of changepass.aspx on the default.aspx. Run Default.aspx and click on the link of changepass.aspx. You can see ASP.NET will redirect you on the Login page instead of changepass.aspx. Now go back to default.aspx. do the login and click on the link of changepass.aspx. You can see that the page of changepass.aspx will be opened.

3.6   ROLE MANAGEMENT

A Role in ASP.NET is nothing but the group of users. You can assign a specific role to one or more users. The key benefits of the Role management are if you define any access rule on

the specific role, then that access rules will be applicable to all the users who are member of that Role. For example, if we want to assign Admin role to two or more user, and if you wish certain pages of your website should allow to all the user who belong to Admin role then it is possible. It is good idea to set only one access rule on the role rather than access rule for each individual user. Let us learn how to create and manage Role in the ASP.NET.

To create or manage Roles, open .NET Configuration tool and click on the security tab. You can see that the second session is of Role. First you need to click on Enable roles. You can see the following screen.
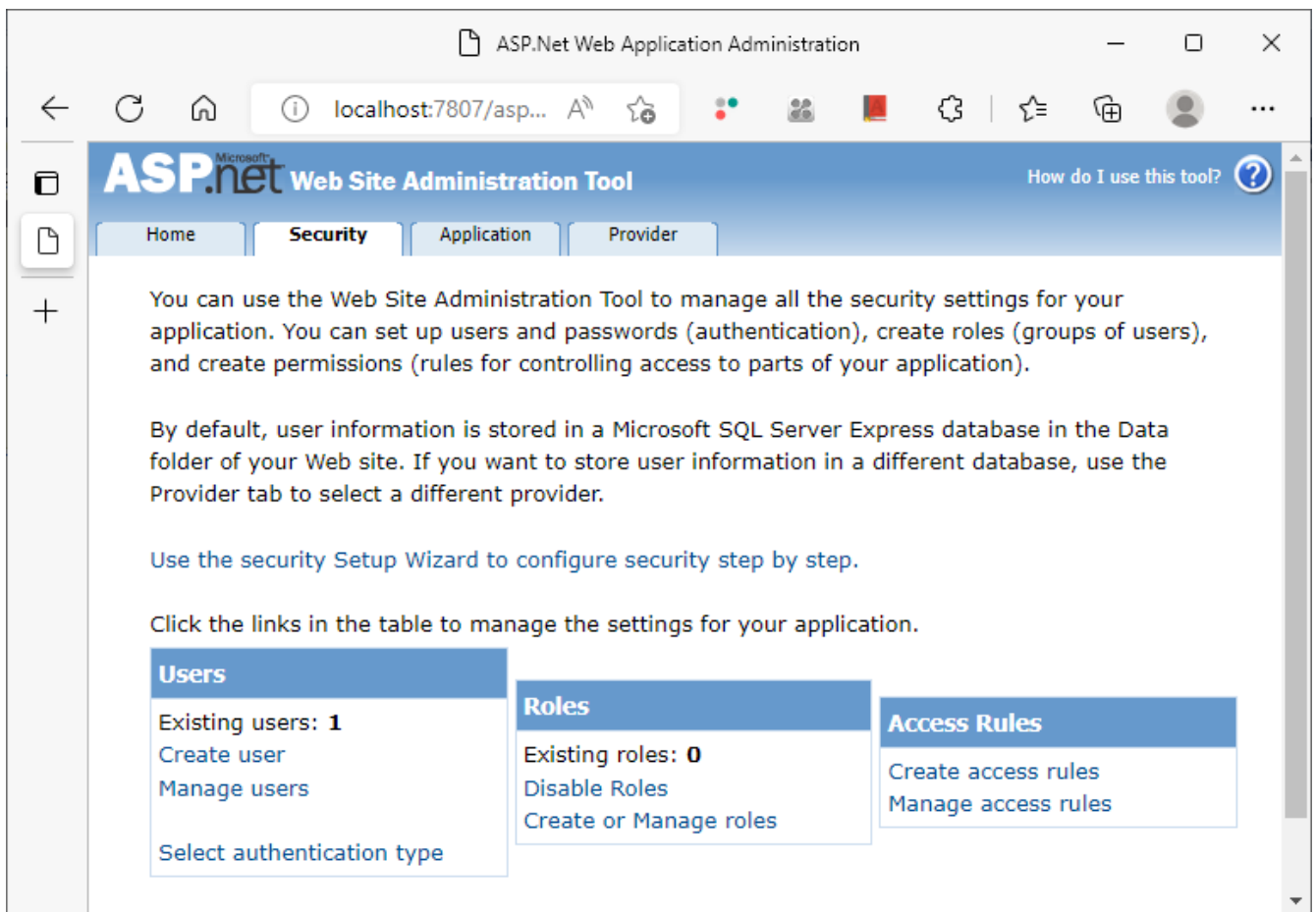
Now you need to click on the Create of Manage roles. It will ask for New Role Name. Enter new role name to be 'Admin' and then click on Add role button. Your role gets created, and you will get the following screen.
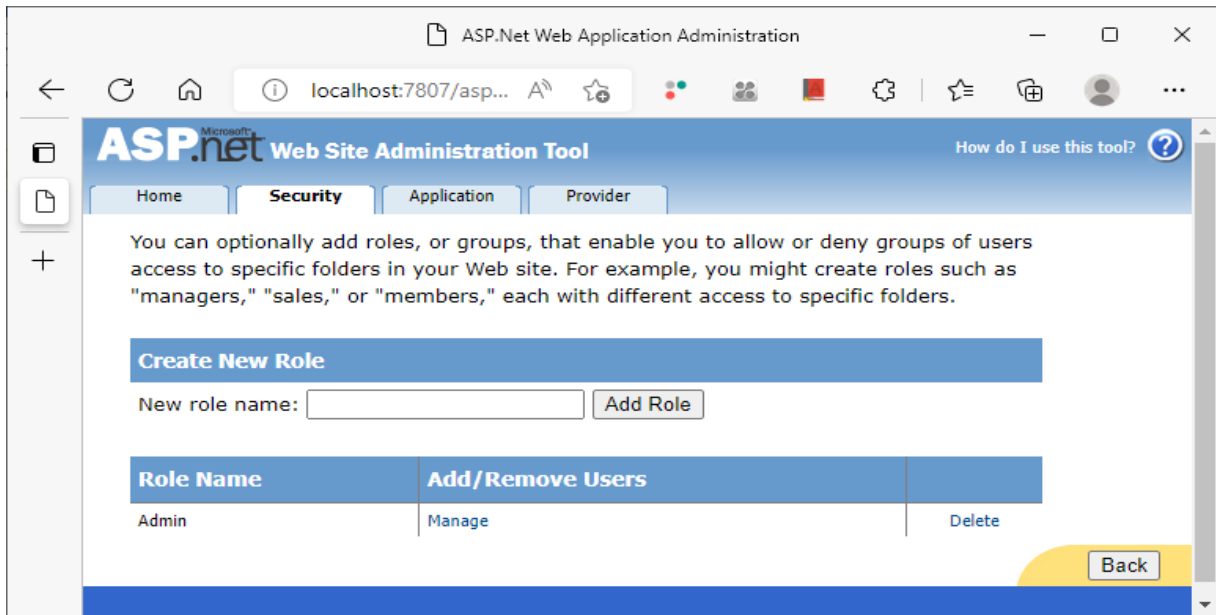
Now, click on the Manage link, you can see there is no user is there in this Role. Now click on 'All'. It will show you all the users. We have created 3 users for the demo purpose.
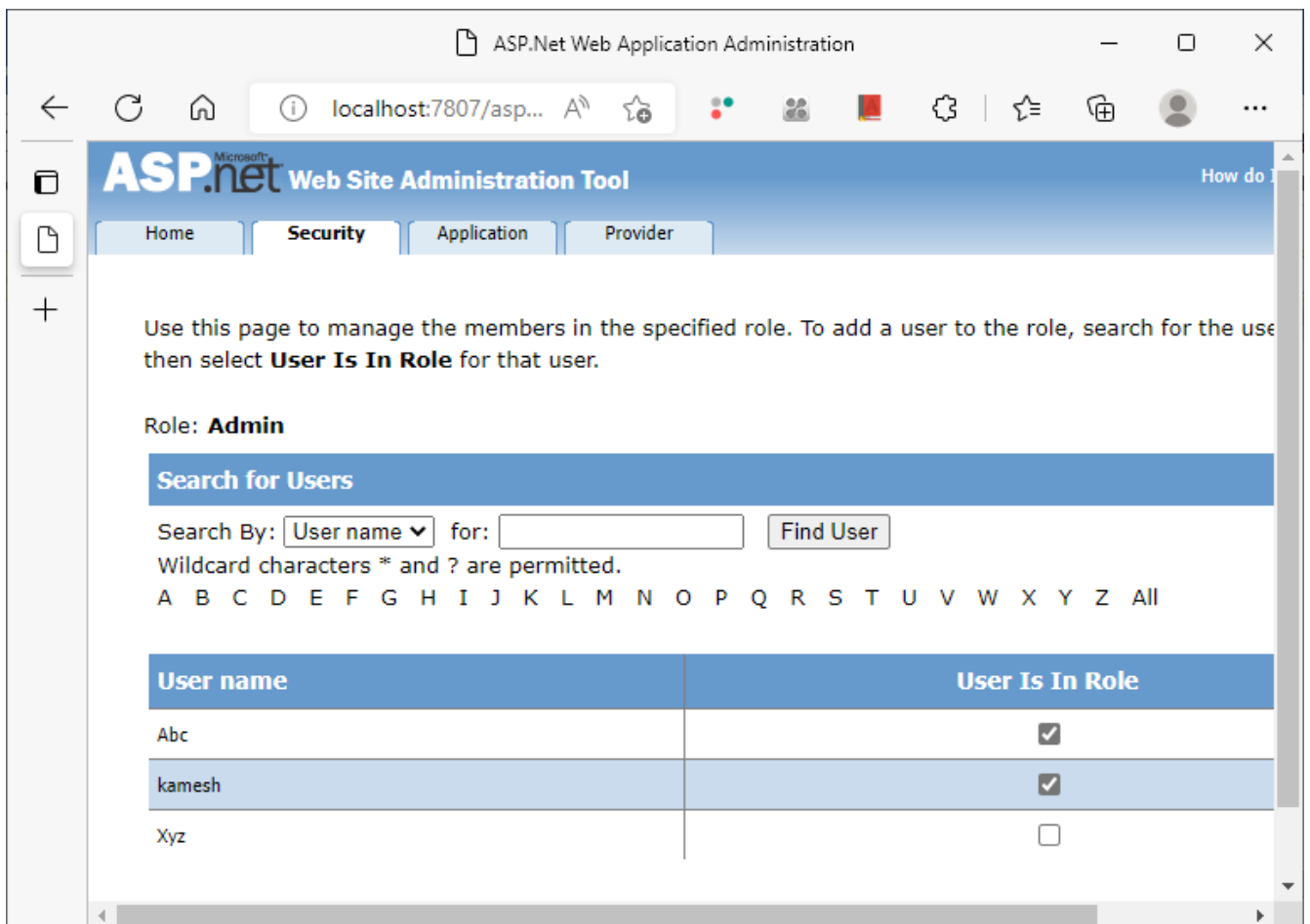
I want to assign Admin role to the user kamesh and Abc. So, check the applicable checkboxes. Now both users are there in the Admin role. You can also assign role, while you are creating the user. Click on the security tab and then choose option to Create User. You will get the following screen.
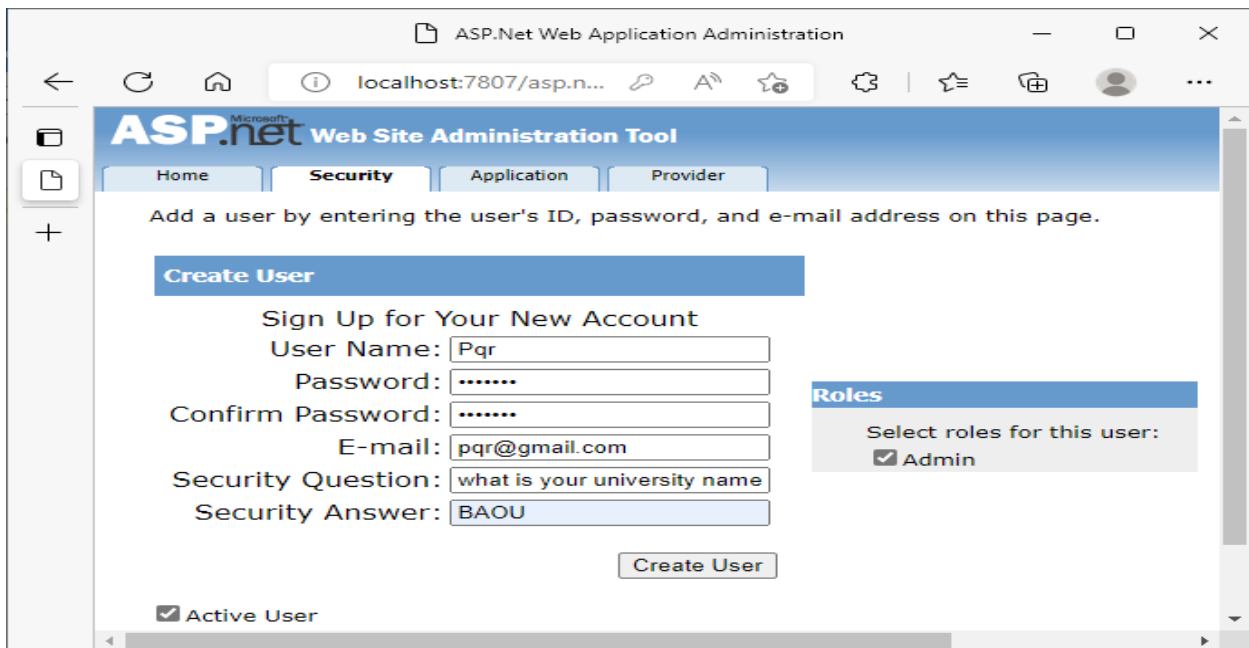
Make sure at the time of user creation, you need to select the role for newly created user from the Roles panel which is given at the right-side of the screen.

3.7   ENFORCING ROLE-BASED SECURITY

To enforce role-based security, create a new directory called AdminPages and create a webpage call admin.aspx in it. Now place a link of this admin.aspx on the default.aspx page of our website. We want to allow those users, who are member of Admin role in the directory AdminPages. No other user (who is not member of Admin role, even though it is an authenticated user) can access webpages which are placed in this directory.

To do this, open .NET Configuration tools and the click on create access rules. Set the first Rule to be: On directory <u>AdminPages</u> Role <u>Admin</u> <u>Allow</u> which is shown below.
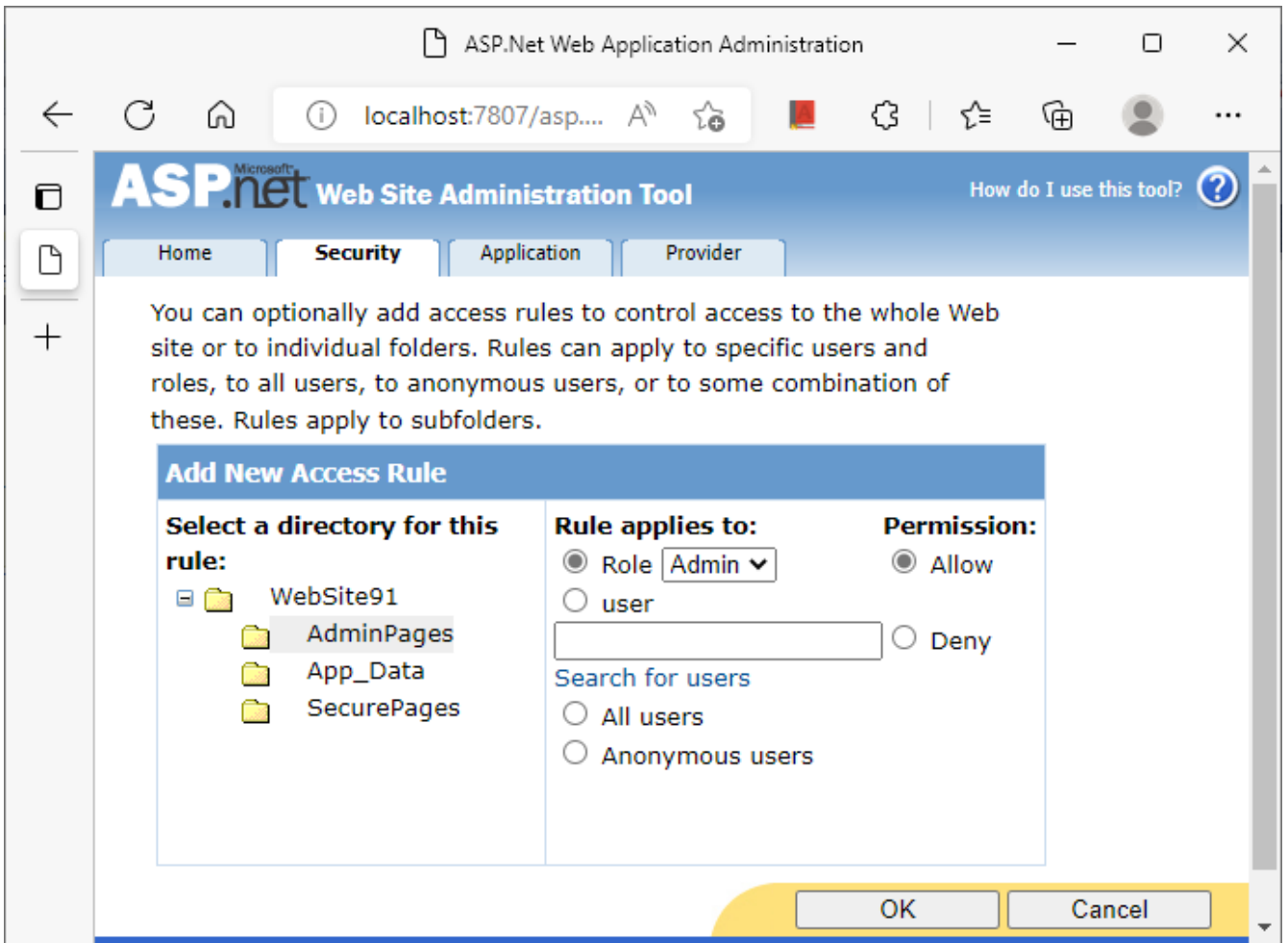
Similarly create another rule that: On the directory <u>AdminPages</u> - <u>All users</u> – <u>Deny.</u> Run the default.aspx and try to open admin.aspx with that user who is member of Admin role and with that user who is not member of Admin role.

Now refresh the Solution Explorer. You can find in both the directories named SecurePages and AdminPages one new web.config file is created automatically. Open both the files, observe it and write down your observations.

Check your progress 1

1. _____ is the process of identifying user.

[A] Authentication   [B] Authorization

[C] Security   [D] None of the above

2.From the given below options, which option is correct for Authentication method?

[A] Password   [B] PIN

[C] Face recognition   [D] All of the above

3. Term Access Rule is related to _____.

[A] Authentication   [B] Authorization

[C] Creating User   [D] None of the above

4. Which control needs SMTP server setting?

[A] Login   [B] CreateUserWizard

[C] PasswordRecovery   [D] ChangePassword

5. Group of users is called _____.

[A] Role   [B] Access Rule

[C] UserGroup   [D] None of the above

3.8   LET US SUM UP

In this we have discussed about built-in security mechanism provided in the ASP.NET. Initially we have discussed authentication and authorization process, then we have discussed all Login controls available in the ASP.NET. We have learnt about how to create and enforce access rules. Finally, we have discussed about, How to create role? How to manage role? and How we can enforce role-based security? into our website.

3.9   SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

4.   [A] Authentication
5.   [D] All of the Above
6.   [B] Authorization
7.   [C] PasswordRecovery
8.   [A] Role

3.10 GLOSSARY:

5. Role: Role is the group of users, who have been assigned particular role. All the user member belongs to same role should get similar type of privileged access to the website.
6. Access Rules: Access rules are those rules which we are using for authorization purpose. Using access rules, we can grant or restring user or group of users to access certain resources of the website.
7. Authentication: Authentication is the process of identifying the user.

3.11 Assignment

4. Explain Authentication and Authorization in details.
5. List and explain all Login controls available in the ASP.NET.
6. Write a short note on: Access Rule.
7. What is Role? Explain in details.

3.12 Activity

Learn how to implement profile in the ASP.NET from the Internet and try implement profile into your website.

3.13 Case Study

Search about Membership class, Use class and Role class of the ASP.NET. Make collection of important properties and methods of these classes.

3.14 Further Reading

- ASP.NET 4.0 Unleased by Stephen Walter.
- Beginning ASP.NET by Wrox publication.
- Professional ASP.NET 4.0 by Wrox publication.

UNIT 4   CONNECTING TO DATABASE

Unit Structure

4.0   LEARNING OBJECTIVES

After working through this unit, you should be able to:

- Understand page object
- Learn about page life cycle
- Understand rendering process and types server controls
- Standard Server controls

4.1   INTRODUCTION

In this unit, we will focus on how can we connection our ASP.NET application with Database. Initially we use ready database called pubs.mdf (SQL Express edition file) and we will try to read the data from one of the tables of this database and then we will represent it in a different way using different data controls.

Similarly, we will learn how to create a database, tables withing a database and how can we allow user to perform Insert, Update and Delete operation in the database table.

4.2   READING DATA FROM DATABASE:

Before going in into the details of how to read the data from SQL Server Express edition database file, you need to download pubs.mdf from the Internet. We will learn how to read the data from the 'Author' table of this database file.

4.2.1 Inserting Database to ASP.NET website

As we know that the database files are always kept into the App_Data folder, first you need to add App_Data folder into your website. To do this right-click on the website name in the Soulution Explorer and choose option Add ASP.NET Folder option and then App_Data directory. Now copy the pubs.mdf file, which you have downloaded from the Internet, and paste it into the App_Data folder. Now, double click on the pubs.mdf database file. The database file will be opened in the Solution Explorer. Now, right-click on the Author table and select option

'Show table Data'. You will be able to see the data stored in the Author table as shown in the following figure.

In the table, you can see different fields like au_id, au-lname, au_fname, phone, address, city, state, zip and contract. Suppose, we want to show all the state in the DropDownList once. That means if there are more than one authors are there in the same state, then the state name should not be repeated in the DropDownList. To do this you need to add SqlDataSource on your webpage. SqlDataSource control you can get it from the Data section of the ToolBox.

| au_id	au_lname	au_fname	phone	address	city	state	zip	contract
172-32-1176	White	Johnson	408 496-7223	10932 Bigge Rd.	Menlo Park	CA	94025	True
213-46-8915	Green	Marjorie	415 986-7020	309 63rd St. #411	Oakland	CA	94618	True
238-95-7766	Carson	Cheryl	415 548-7723	589 Darwin Ln.	Berkeley	CA	94705	True
267-41-2394	O'Leary	Michael	408 286-2428	22 Cleveland Av...	San Jose	CA	95128	True
274-80-9391	Straight	Dean	415 834-2919	5420 College Av.	Oakland	CA	94609	True
341-22-1782	Smith	Meander	913 843-0462	10 Mississippi Dr.	Lawrence	KS	66044	False
409-56-7008	Bennet	Abraham	415 658-9932	6223 Bateman St.	Berkeley	CA	94705	True
427-17-2319	Dull	Ann	415 836-7128	3410 Blonde St.	Palo Alto	CA	94301	True
472-27-2349	Gringlesby	Burt	707 938-6445	PO Box 792	Covelo	CA	95428	True
486-29-1786	Locksley	Charlene	415 585-4620	18 Broadway Av.	San Francisco	CA	94130	True
527-72-3246	Greene	Morningstar	615 297-2723	22 Graybar Hou...	Nashville	TN	37215	False
648-92-1872	Blotchet-Halls	Reginald	503 745-6402	55 Hillsdale Bl.	Corvallis	OR	97330	True
672-71-3249	Yokomoto	Akiko	415 935-4228	3 Silver Ct.	Walnut Creek	CA	94595	True
712-45-1867	del Castillo	Innes	615 996-8275	2286 Cram Pl. #86	Ann Arbor	MI	48105	True
722-51-5454	DeFrance	Michel	219 547-9982	3 Balding Pl.	Gary	IN	46403	True
724-08-9931	Stringer	Dirk	415 843-2991	5420 Telegraph ...	Oakland	CA	94609	False
724-80-9391	MacFeather	Stearns	415 354-7128	44 Upland Hts.	Oakland	CA	94612	True
756-30-7391	Karsen	Livia	415 534-9219	5720 McAuley St.	Oakland	CA	94609	True
807-91-6654	Panteley	Sylvia	301 946-8853	1956 Arlington Pl.	Rockville	MD	20853	True
846-92-7186	Hunter	Sheryl	415 836-7128	3410 Blonde St.	Palo Alto	CA	94301	True
893-72-1158	McBadden	Heather	707 448-4982	301 Putnam	Vacaville	CA	95688	False
899-46-2035	Ringer	Anne	801 826-0752	67 Seventh Av.	Salt Lake City	UT	84152	True

Place the SqlDataSource control on the webpage and then click on the > icon which on the top-right corner of the control to access smart menu. From the smart menu select option called 'Configure Data Source'. This will start a wizard. In the first step of the wizard, you just need to select the datafile file from the DropDownList as shown below, you can notice that the ConnectionString will be generated automatically.
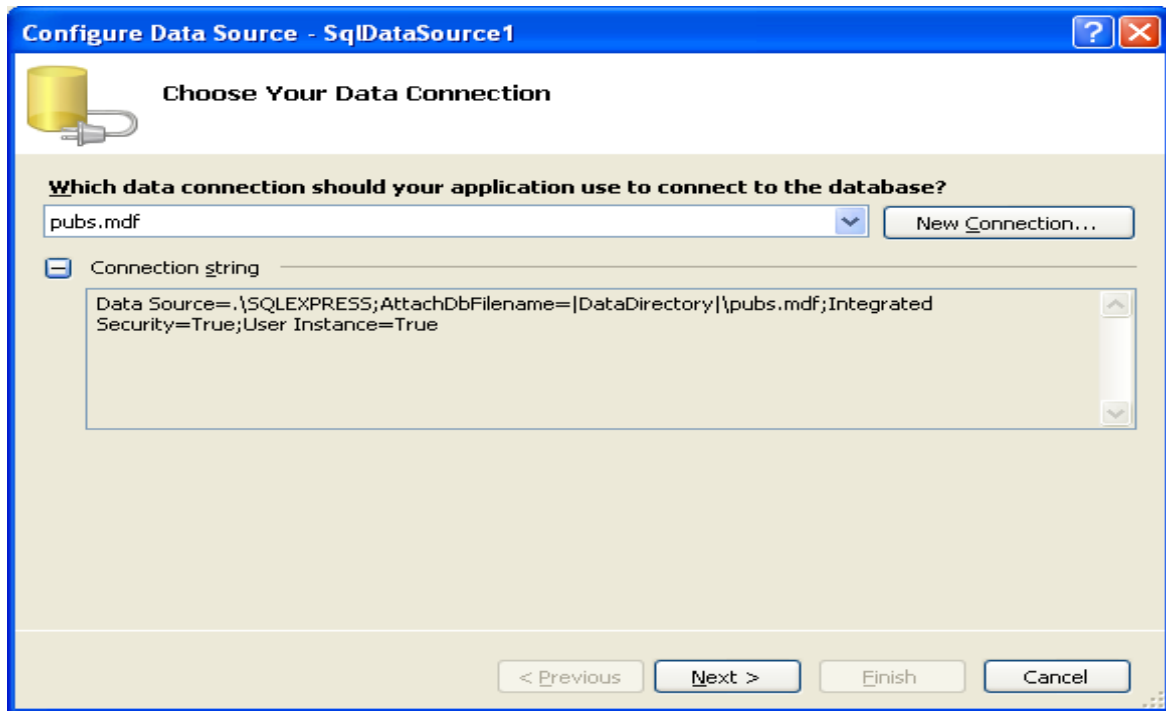
Now, you need to click on the Next Button. Second screen of wizard will tell you store this connection string into the web.config file, so simply click on the next button. In the third screen of the wizard, you need to select table 'Authors' from the DropDownList, you need to check the checkbox of state field, also check the checkbox for 'Return Only Unique Rows' as shown in the following figure.
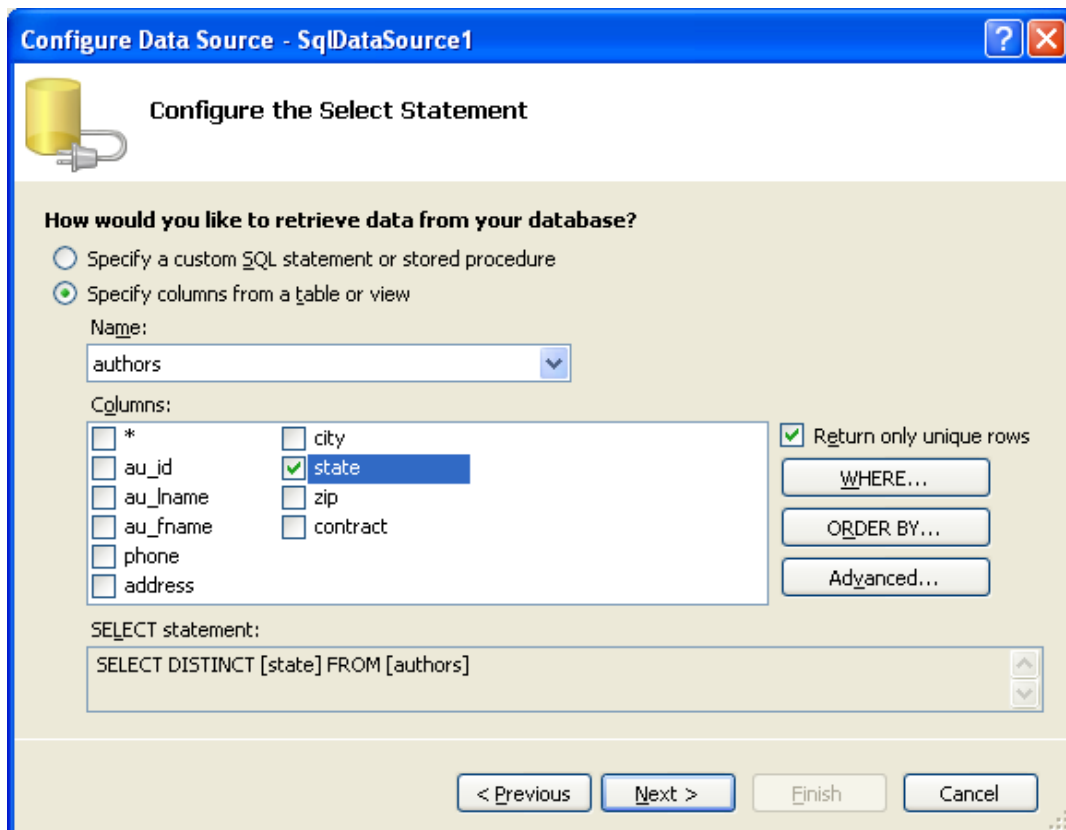
This will automatically generate the SQL query called 'SELECT DISTINCT [state] FROM [authors]". Now click on the Next button. The wizard screen will allow you to test your SQL query. If you want to test the query the click on 'Test Query' button.
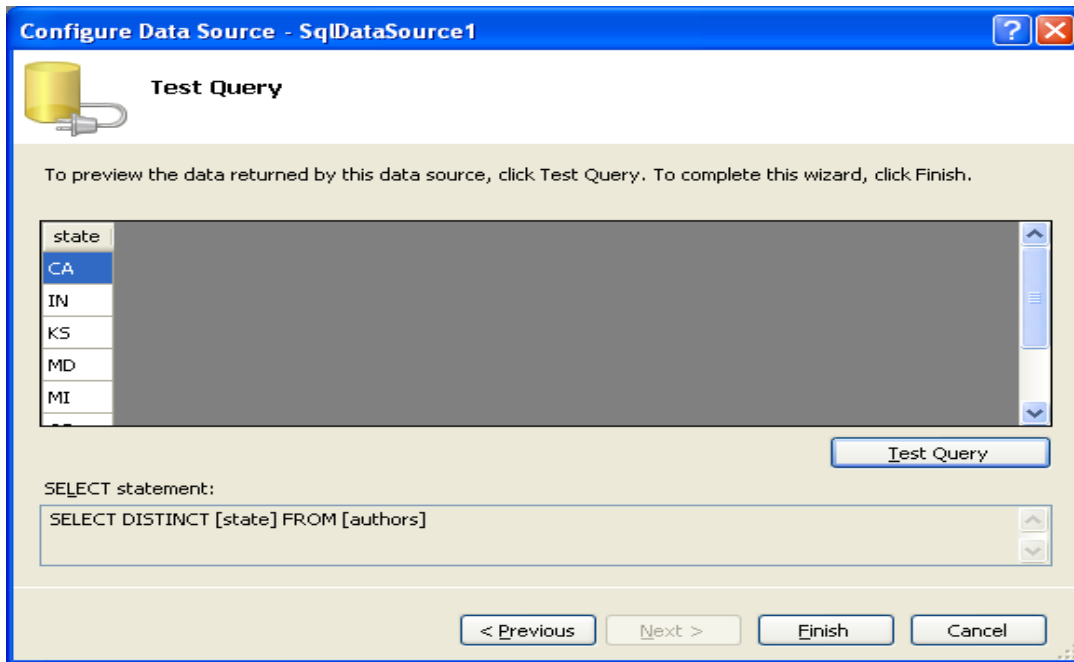
Click on the Finish button. Now on the webpage you write 'Select State:' and then you place a DropDownList, in which we want to show all our distinct states. Open the smart menu of the DropDownList and click on the Choose data source option. Provide data source to SqlDataSource1 which we have taken on the webpage and configured earlier. Also select the checkbox of Enable AutoPostBack in the smart menu of DropDownList.
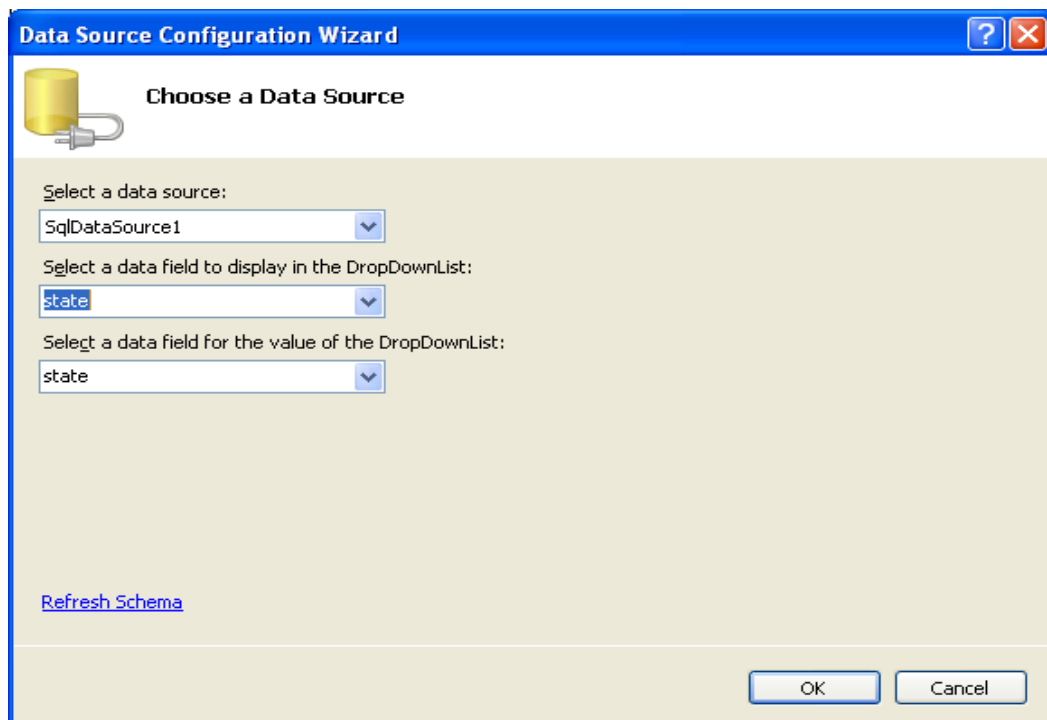
Run and test the webpage. Expland the DropdownList you will be able to see all of the state names in the DropDownList. Now we want to show other details of the author like au_lname, au_fname, phone, address etc. of those user's which belongs to that particular state.

To implement this place another SqlDataSource (SqlDataSource2) on the webpage and configure it in the same way except the second last step.
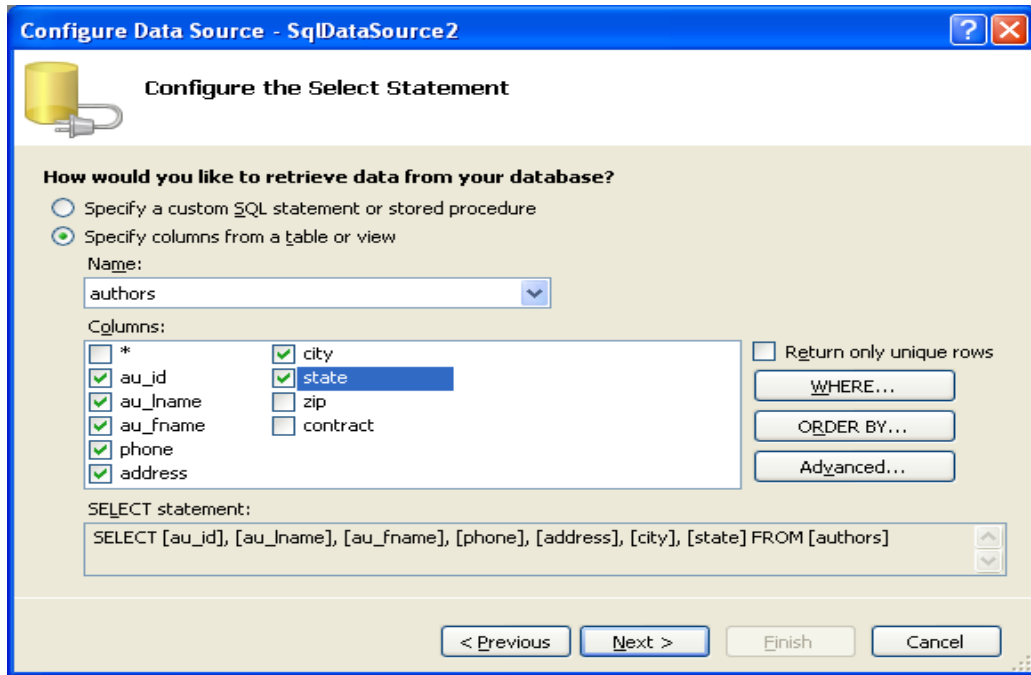

Here you need to select all field which you want to show to the user about the authors. Here you need to click on the WHERE button. Configure the WHERE clause of theSQL Query as shown below:
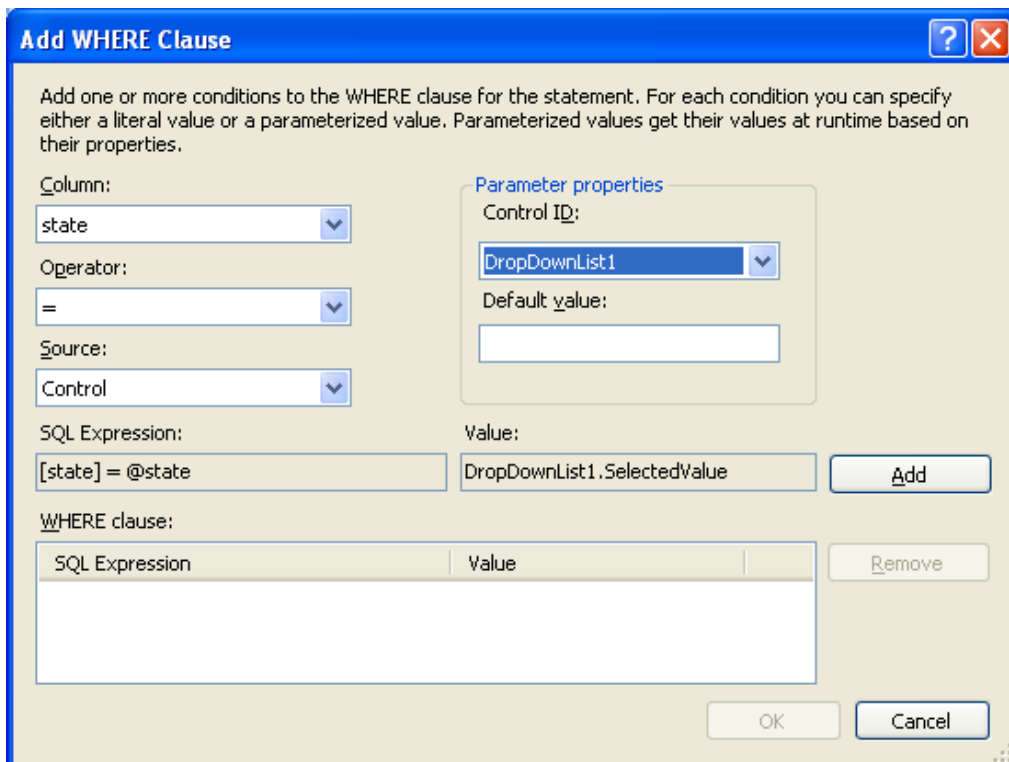
Click on Add button, then click on OK button again Click on Next and then Finish Button. Now take a GridView control from the Data Section of the Data category and open the smart menu of the GridView Control. From the smart menu of the GridView choose the Data Source to SqlDataSource2. You can see all of your selected columns will be appeared in the Grid View. Run and test the page by changing different states from the DropDownList.

The process of attaching SqlDataSource to any control by setting up the Data Source property of that control is called binding process and all those controls which we can bind with Database table are called Bounded Controls. DataGridView is a fully customizable, bounded control which shows the data in the Table format. Open the smart menu of the DataGridView control and observe the options provided in the smart menu of DataGridView.
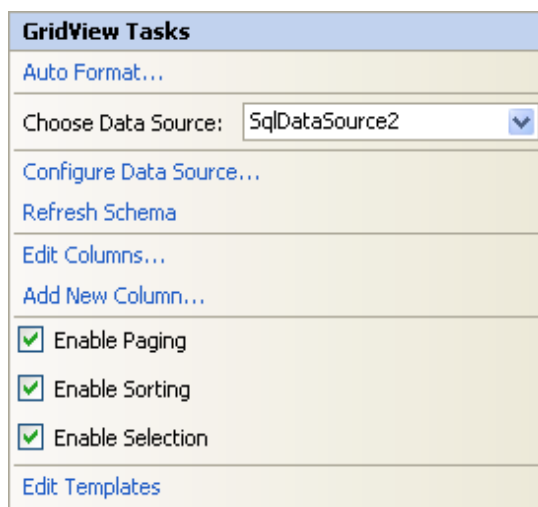

The first option is Auto Format which allows you to apply different colorful styles to the DataGridView. Smart menu also provides the option to Edit Columns in which you can change the Columns titles and many other column related customizations. Add New Column option allows us to add new column, which can be Image field, Hyperlink field or any other field. Now focus on the CheckBox fileds. First option enables paging. In each page you can see 10 records. If you want to show only 5 records per page then from the property window you can change the

Property called pazesize to 5 of the GridView control. If you check the CheckBox called Enable Sorting then user can do the Sorting on any field. To do the sorting user needs to click on the filed name which is appear on the top of the GridView (First Row). When user click on any field then the data will be organized into the ascending order on the basis of that field and if user is clicking on the same field again then the data will be organized in the descending order of that particular field. Finally last CheckBox add a new column with hyperlink which show 'Select' option. User can select any row by clicking on the 'Select' word in front of the row which user wants to select.

Now suppose if user select the row from the DataGridView then you need to show the record or Author with All fields then again you need to take sqlDataSource3 on your webpage and then you need to configure it from the smart menu. In the second last step of the wizard, you need to select * from the Author table. So that your query will be "Select * from Authors", now you need to click on where button to specify your where clause. In the where clause configuration you need to select Column to be 'au_id', Operator to be '=' , Source to be 'Control' and ControlID to be 'GridView1' now click on the OK button, then click on the Next and then Finish button.

Now place the DataList control on the webpage from the Data category from the Toolbox. Open the smart menu for the DataList1 and change the DataSource to SqlDataSource 3. You can see that the DataList is populated with all the fields from the Author table.

Now open the smart menu of the GridView1 control and select the option called Edit Columns. Now as show in the Figure you need to click on each field of the GridView and change the HeaderText property. From example you need to change au_id filed to AuthorID, au_lname to be LastName and so on as show in the following figure.
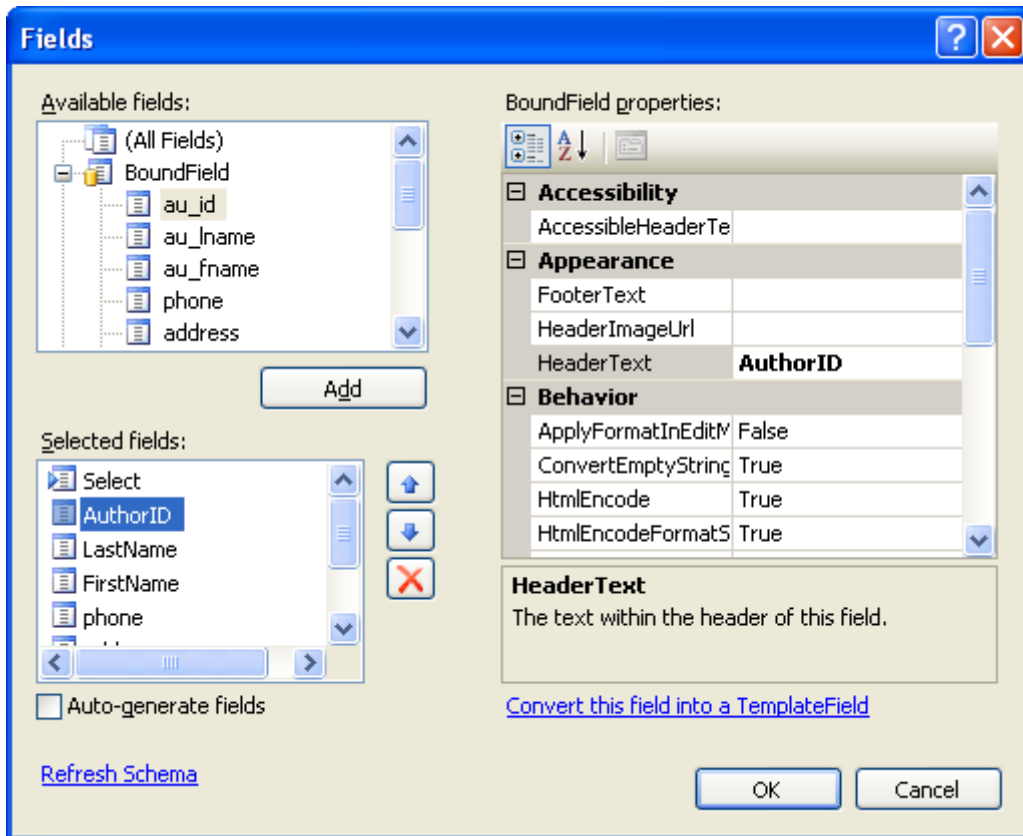
Similarly, you need to open the smart menu for the DataList1 control and you need to choose Edit Template for the DataList1. From the Item Template change the field names in the same way as we have changed it for GridView1. Also apply anu suitable format to the DataList1 control from the AutoFormat option of the smart menu of DataList1. Run the page and test it.
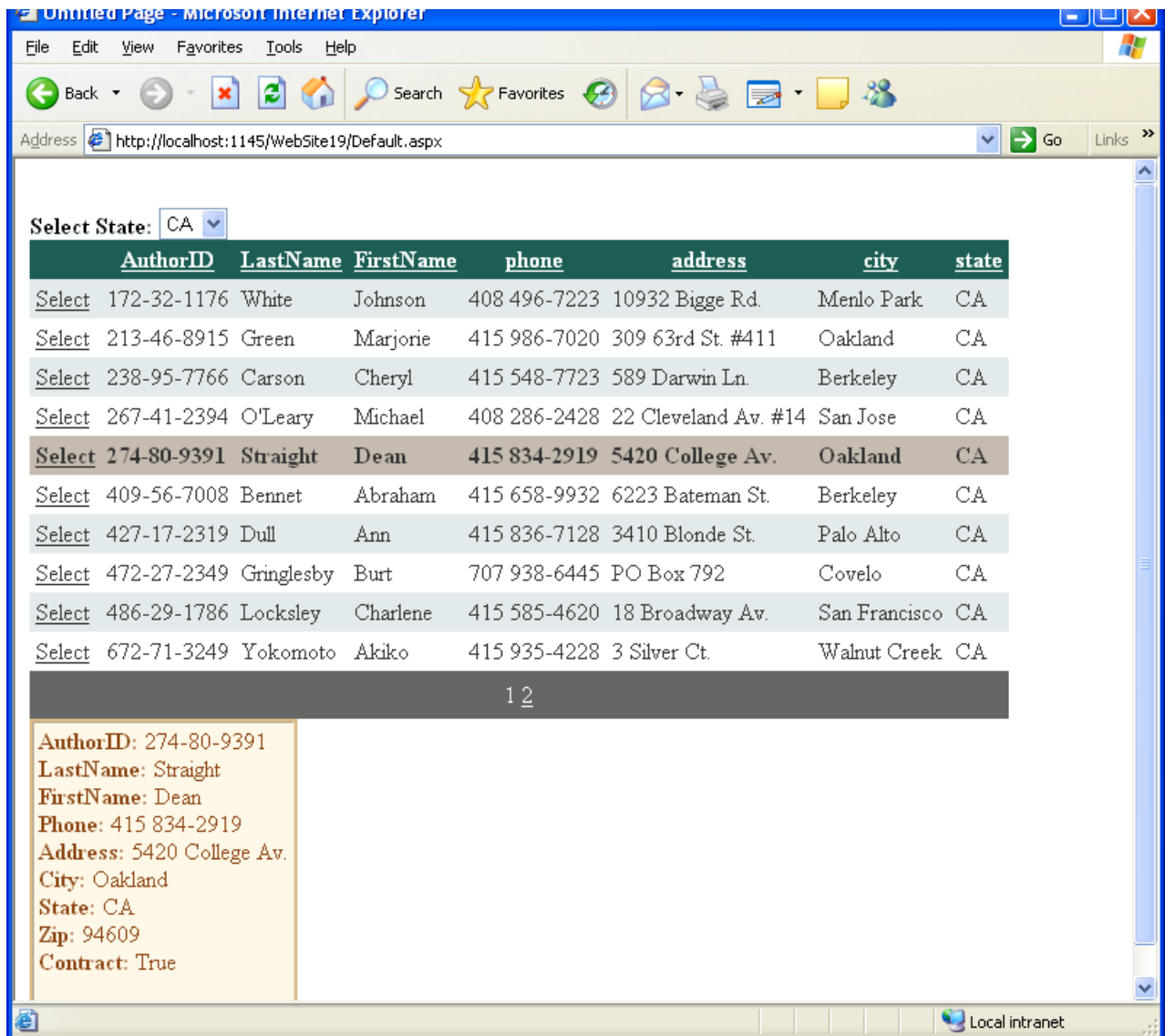
4.3   WRITING DATA TO DATABASE:

In the previous section we have discussed about how to fetch the data from the database table and represent the data in different form on the webpage. Now, this section we will learn about how to allow user so that user can do modifications in the data of the database table. Yes, here we will learn how to enable user to perform Insert, Update and Delete operation on the data.

To learn how to allow user to perform Insert, Update and Delete operation you need to create a database into the website. Take a new website and add a new database file as shown in the

section 1.2.2 of this block. Right-Click on the website name from the Solution Explorer and choose option 'Add New Item'. From the dialog box select SQL Server Database. This will add database.mdf file into App_Data folder. Double click on the database file, so that it will be opened in the Server Explorer. Now right-click on the Tables in the Server Explorer and choose the option called 'Add New Table'. A new table will be opened into the design mode. Design the table as shown below:

Make sure that you need to give Primary Key on the Field EmpCode by doing Right Click on the EmpCode and select the option for 'Primary Key'. Now save the table as 'Emp'. Right-click on the Emp table and choose option called 'Show Table Data' and enter at least 5 records in it.

Now, add a webpage and place SqlDataSource controls on it. Configure your SqlDataSource from smart menu. Now in the wizard on step 'Configure the Select Statement' screen (second last step of the wizard) check the checkbox of *. So, you will get the SQL query that "Select * from Emp", here need to click on the Advance button. The following screen will be appeared.
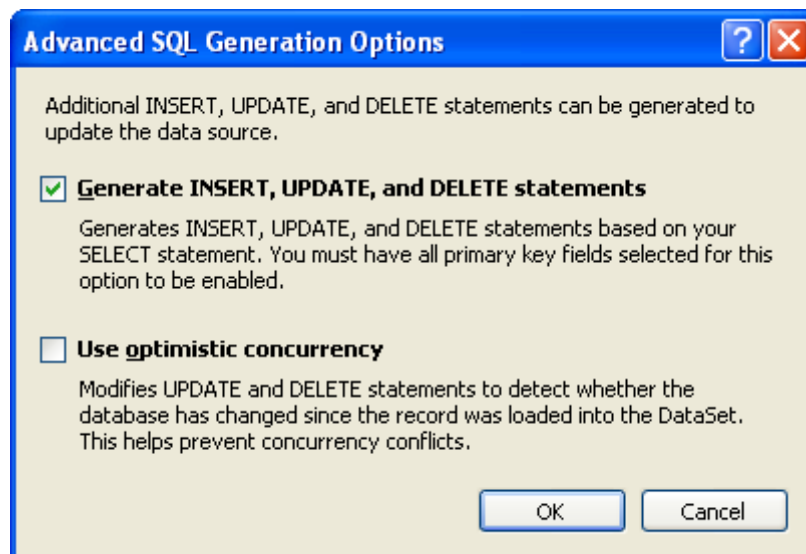

Do the check on the CheckBox called Generate INSER, UPDATE and DELTE statements. This will write Insert, Update and Delete queries automatically on the basis of your SELECT statement. One more thing your have to note that this option is available because of you have given a primary key on the table. If you do not provide a primary key then this option will be disabled and you can not generate insert, update and delete statements.

Now complete the wizard by click on OK, then Next and finally Finish button. Now we have configured our SqlDataSource with Select, Insert, Update and Delete capabilities.

Now, add GridView on the webpage and from the smart menu of the GridView apply Data Source to SqlDataSource1. Now open the smart menu og GridView again, you can see some additional options are available in the smart menu as shown below.
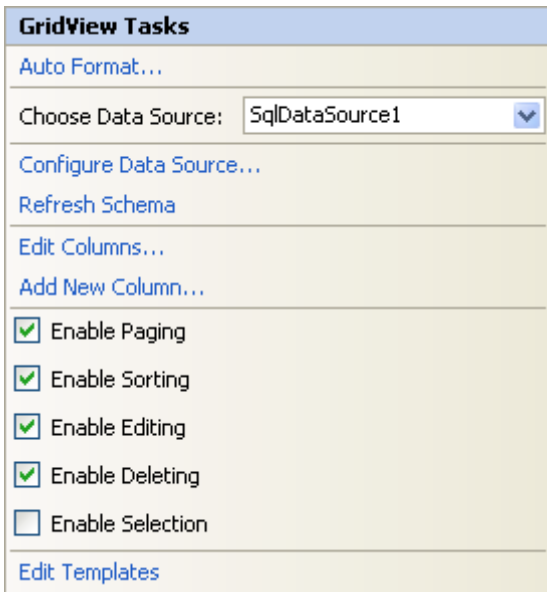
These additional options are 'Enable Editing' and 'Enable Deleting'. Check these Checkboxes as shown in the figure given at Left side. These options, we are getting that is just because of the Data Source we have provided to this GridView (SqlDataSource1) is capable enough to perform Insert, Update and Delete operations on the database table Emp. You might think that the Insert option is not there. Yes, that is just because of GridView bounded control do not support for Insertion. For that purpose, we will learn another bounded control which called FormView later. Now run the webpage and test Edit and Delete options provided by GridView.
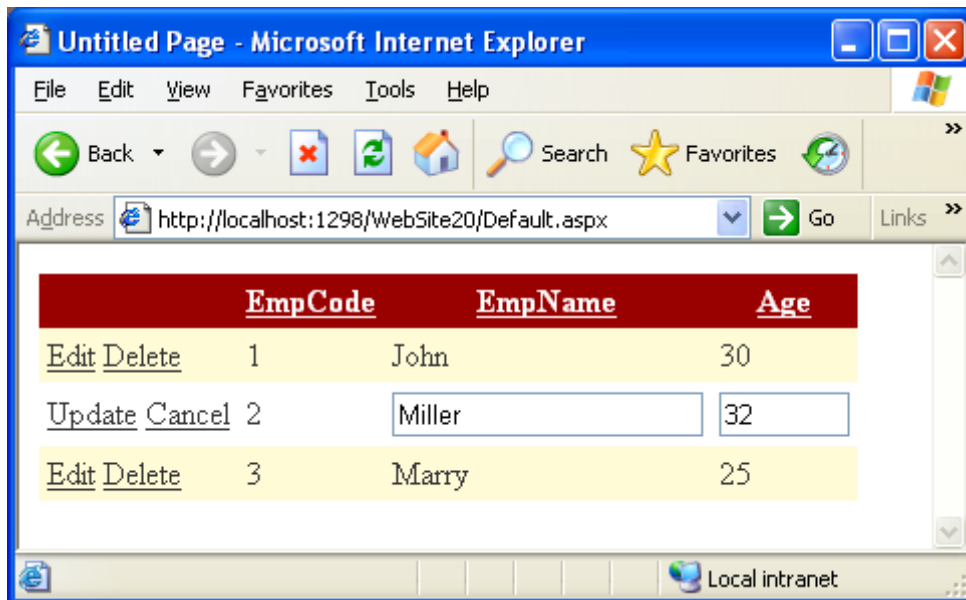

Click on the Edit button of any row, you will be able to see the row becomes editable. Make the changes and click on update button the row will be updated in the table. If you don't want to update you can also click on the Cancel button. On the click of the Delete link the designated row will be deleted from the database table.

Enable Insertion:

To allow user to insert the new database record, take a FormView control on the same webpage from the Data category of the ToolBox, and from the smart menu apply the SqlDataSource1 to the Data Source property of the FormView1.

Set the any desire format from Autoformat options of FormView1. Set the Header and Footer templates by selecting Edit Template options from the smart menu and also allow paging potion. Run and test the webpage. Your FormView control looks like…
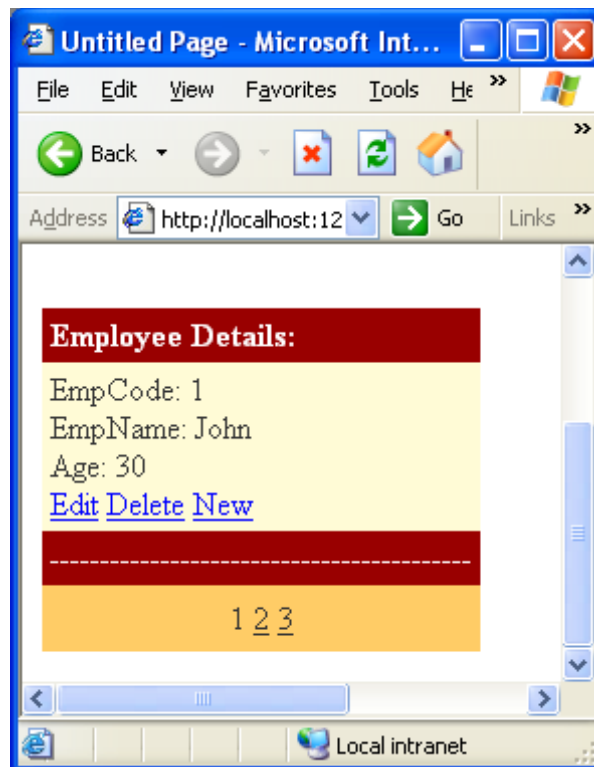
You can click on the New button if you want to insert a new record, you can click on the Edit button to edit the record and also click on the Delete button to delete the record from the database table.

4.4 LET US SUM UP

In this unit, we:

- Discussed about how the read the data from the database table

- Explained different data bound controls

- Interpreted different options and properties of SqlDataSource control

- Elaborated to allow changes into the database table.

4.5 SUGGESTED ANSWERS FOR CHECK YOUR PROGRESS

Check Your Progress-1

4.   [A] FormView
5.   [B] GridView
6.   [D] Data Source

4.6 Glossary

5.   **SqlDataSource:** It is a control of ASP.NET, available in the Data category of ToolBox which allow us to establish connection with particular database table.

6.   **GridView:** It is a control of ASP.NET, available in the Data category of ToolBox which can be bind with SqlDataSource. It represents the data in the table format.

7.   **FormView:** It is a control of ASP.NET, available in the Data category of ToolBox which can be bound with SqlDataSource. It allows inserting, updating and deleting the data.

4.7   Assignment

3.   List and explain data bound controls you know.

4.   Write a short note on: SqlDataSource control.

4.8   Activity

We have shown the details of the Author in the GridView in our example. Now add a Huperlink field to the GridView, in the click event of HyperLink show another page and pass the data (au_id) through Querystring approach. On the second page, fetch the value of au_id field and show the data of that particular Author in the DataList control.

4.9   Case Study

•   Learn about DetailsView. It is a control similar to FormView which allows Insert, Update, Delete operation in the database table.

4.10 Further Readings

•   ASP.NET 4.0 Unleased by Stephen Walter.
•   Beginning ASP.NET by Wrox publication.
•   Professional ASP.NET 4.0 by Wrox publication.

Block Summary

- ASP.NET provides different controls like CheckBoxList, RadioButtonList, ListBox and DropDownList to represent collection of data into different form.

- FileUpload control allows user to select and upload specific file from the client computer to server.

- Using AdRotator control user can show rotating banner advertisements in the website to the website users.

- Calendar control allows user to select specific date and dates from the calendar.

- Validation controls are used to validate the data entered by the user. Total 6 validation controls are available for different purposed. Those are: RequiredField validator, Range validator, Compare validator, RegularExpression validator, Custom validator and Validation summary.

- Master page is example of visual inheritance, which provide consistent look and feel across all the webpages of the website. It saves lots of designing time and effort of the developer.

- Authentication is the process or identifying user whereas authorization is the process of assigning rights on the basis of predefined access rules.

- To navigation to different webpage you can use navigation controls available in the ASP.NET. TreeView, SitMapPath and Menu are navigation controls

- To enforce the security into your ASP.NET website different login controls are available such as LoginStatus, LoginName, LoginView, Login, CreateUserWizard, PasswordRecovery and Change Password.

- To grant the access to particular user or restrict the user to access particular website resources you can set up access rules.

- Role is the group of users, who have been assigned particular role. If any resource is granted to the role then all the members belong to that particular role should get the access of that resource.

- SqlDataSource control which is available in the Data category of ToolBox can establish a connection with any of your database table.

- GridView, DataList, FormView and DetailsView are the bounded control which you can bind with any database table.

- You can read the data from the database table as well allow user to do modification in the database table using data controls of ASP.NET.