

## -----WCF(Windows Communication Foundation)-----

### 1) What is WCF?

WCF is a platform for building distributed businesses and deploying services among various endpoints in Windows. WCF was initially called “Indigo” and we can build service-oriented applications and provide interoperability.

WCF or Windows Communication Foundation is a programming model to create service oriented applications. It is used to create and deploy the service that is accessible to lots of different clients. It provides an environment where you can create a service which can be accessible to Windows clients as well as Linux clients or any others. It provides more features compared to web services.

WCF is a Microsoft technology to create service oriented application. Before the WCF, the Web Service was used to create services but that type of service is only accessible to Windows client hosted on HTTP protocol. But WCF services are accessible with different protocols like http, tcp, msmq, etc.

### 2) Why Should We Use WCF Service?

1.A web service to exchange messages in XML format using HTTP protocol for interoperability.

2.A remoting service to exchange messages in binary format using TCP protocol for performance.

- A secure service to process business transactions.
- A service that supplies current data to others, such as a traffic report or other monitoring service.
- A chat service that allows two people to communicate or exchange data in real time.
- A dashboard application that polls one or more services for data and presents it in a logical presentation.

### 3) What are the features and advantage of WCF?

Features of WCF

Windows Communication Foundation (WCF) is a secure, reliable, and scalable messaging platform for the .NET Framework 3.0,

- Service Orientation
- Interoperability
- Multiple Message Patterns
- Service Metadata
- Data Contracts
- Security
- Multiple Transports and Encodings
- Reliable and Queued Messages
- Durable Messages
- Transactions
- AJAX and REST Support
- Extensibility

## **Advantages of WCF**

1. Service Oriented
2. Location Independent
3. Language Independent
4. Platform Independent
5. Support Multiple operation
6. WCF can maintain transaction like COM+ Does
7. It can maintain state
8. It can control concurrency
9. It can be hosted on IIS, WAS, Self hosting, Windows services.

It has AJAX Integration and JSON (JavaScript object notation) support.

- WCF can be configured to work independently of SOAP and use RSS instead.
- WCF is one of the fastest communication technologies and offers excellent performance compared to other Microsoft specifications.
- To improve communication, transmission speed needs to be optimized. This is done by transmitting binary-coded XML data instead of plain text to decrease latency.
- Object life-cycle management and distributed transaction management are applicable to any application developed using WCF.

### **4) What is the difference between WCF and Web services?**

**WCF:** Windows Communication Foundation (WCF) is a framework for building service-oriented applications. Using WCF, you can send data as asynchronous messages from one service endpoint to another.

**Web Services:** A Web Service is programmable application logic accessible via standard web protocols. One of these web protocols is the Simple Object Access Protocol (SOAP). SOAP is a W3C submitted note (as of May 2000) that uses standards based technologies (XML for data description and HTTP for transport) to encode and transmit application data.

Features	Web Service	WCF
Hosting	It can be hosted in IIS	It can be hosted in IIS, windows activation service, Self-hosting, Windows service
Programming	[WebService] attribute has to be added to the class	[ServiceContract] attribute has to be added to the class
Model	[WebMethod] attribute represents the method exposed to client	[OperationContract] attribute represents the method exposed to client
Operation	One-way, Request- Response are the different operations supported in web service	One-Way, Request-Response, Duplex are different type of operations supported in WCF
XML	System.Xml.serialization name space is used for serialization	System.Runtime.Serialization namespace is used for serialization
Encoding	XML 1.0, MTOM(Message Transmission Optimization Mechanism), DIME, Custom	XML 1.0, MTOM, Binary, Custom
Transports	Can be accessed through HTTP, TCP, Custom	Can be accessed through HTTP, TCP, Named pipes, MSMQ,P2P, Custom
Protocols	Security	Security, Reliable messaging, Transactions

##### 5) What is Contract? What are the types of Contract?

It is the agreement between client and service which specifies:

- [ServiceContract] - which services are exposed to the client.
- [OperationContract] - which operations the client can perform on the service.
- [DataContract] – which data types are passed to and from the service.
- [MessageContract] - allow the service to interact directly with messages. Message contracts can be typed or untyped and are useful in interoperability cases when another party has already dictated some explicit (typically proprietary) message format.
- [FaultContract] -which errors are raised by the service and how the service handles and propagates errors to its clients.
- 

##### 6) What is Fault Contract in WCF?

Fault Contract provides documented view for error accorded in the service to client. This helps to easily identify what error has occurred, and where. By default when we throw any exception from service, it will not reach the client side. The less the client knows about what happened on the server side, the more dissociated the interaction will be, this phenomenon (not allowing the actual cause of error to reach client) is known as error masking. By default all exceptions thrown on the service side always reach the client as FaultException, as by having all service exceptions indistinguishable from one another, WCF decouples the client from service.

## 7) What is End Points and how many types of End points?

Endpoints provide the configuration required for the communication and create the complete WCF service application.

An Endpoint is a piece of information that tells WCF how to build the runtime communication channels to send and receive messages. An endpoint consists of the three things address, binding and contract.

All communication with a Windows Communication Foundation (WCF) service occurs through the endpoints of the service. Endpoints provide clients access to the functionality offered by a WCF service.

Each endpoint consists of four properties:

- An address that indicates where the endpoint can be found.
- A binding that specifies how a client can communicate with the endpoint.
- A contract that identifies the operations available.

### The Structure of an Endpoint-

Each endpoint consists of the following:

- A set of behaviors that specify local implementation details of the endpoint.
- Address: The address uniquely identifies the endpoint and tells potential consumers of the service where it is located. It is represented in the WCF object model by the [EndpointAddress](#) class. An EndpointAddress class contains:
  - A Uri property, which represents the address of the service.
  - An Identity property, which represents the security identity of the service and a collection of optional message headers. The optional message headers are used to provide additional and more detailed addressing information to identify or interact with the endpoint.
- Binding: The binding specifies how to communicate with the endpoint. This includes:
  - The transport protocol to use (for example, TCP or HTTP).
  - The encoding to use for the messages (for example, text or binary).
  - The necessary security requirements (for example, SSL or SOAP message security).
- Contracts: The contract outlines what functionality the endpoint exposes to the client. A contract specifies:
  - What operations can be called by a client.
  - The form of the message.
  - The type of input parameters or data required to call the operation.
  - What type of processing or response message the client can expect.

## 8) What is Address in WCF?

Address - Where - Where to send messages

An Address is a unique Uniform Resource Locator (URI) that identifies the location of the service. It defines the network address for sending and receiving the messages. It is divided into four parts:

In WCF every service are associated with unique address. The address provided two imported elements the location of services and the transport protocol which will help to communicate with the services

.WCF support the following transport schemes. Here is the answer for what are the supported transport protocols in WCF.

- HTTP/HTTPS ,TCP ,IPC ,Peer Network , MSMQ ,Service BUS

## 9) What is Binding in WCF?What are the types of binding?

Answer: Binding describes how client will communicate with service. There are different protocols available for the WCF to communicate to the Client. You can mention the protocol type based on your requirements.

A binding has several characteristics, including the following:

Transport - Defines the base protocol to be used like HTTP, Named Pipes, TCP, and MSMQ are some type of protocols.Encoding (Optional) - Three types of encoding are available-Text, Binary, or Message Transmission Optimization Mechanism (MTOM). MTOM is an interoperable message format that allows the effective transmission of attachments or large messages (greater than 64K).Protocol(Optional) - Defines information to be used in the binding such as Security, transaction or reliable messaging capability.

Binding	Description
BasicHttpBinding	Basic Web service communication. No security by default.
WSHttpBinding	Web services with WS-* support. Supports transactions.
WSDualHttpBinding	Web services with duplex contract and transaction support.
WSFederationHttpBinding	Web services with federated security. Supports transactions.
MsmqIntegrationBinding	Communication directly with MSMQ applications. Supports transactions.
NetMsmqBinding	Communication between WCF applications by using queuing. Supports transactions.
NetNamedPipeBinding	Communication between WCF applications on same computer. Supports duplex contracts and transactions
NetPeerTcpBinding	Communication between computers across peer-to-peer services. Supports duplex contracts
NetTcpBinding	Communication between WCF applications across computers. Supports duplex contracts and transactions

10) What are the possible ways of hosting a WCF service?

1. Windows Service
2. Internet Information Services (IIS)
3. Windows Activation Services (WAS)
4. Self-Hosting

11) What is REST and how to create a WCF RESTful Service ?

Answer: REST-

Representational State Transfer (REST) is a protocol for exchanging data over a distributed environment. The main idea behind REST is that we should treat our distributed services as a resource and we should be able to use simple HTTP protocols to perform various operations on that resource.

JSON

The JavaScript Object Notation (JSON) data format, or JSON for short, is derived from the literals of the JavaScript programming language. JSON helps us to present and exchange data in a self-descriptive, independent and light way. This data can then be easily consumed and transformed into JavaScript objects.

In most browser-based applications, WCF can be consumed using JavaScript, jQuery, AngularJS and so on. When a client makes a call to WCF, JSON or XML is used as the format of the communication. WCF has the option to send the response in JSON object. This can be configured with the WebGet or WebInvoke attribute and the WebHttpBinding. This allows you to expose a ServiceContract as a REST service that can be invoked using either JSON or plain XML.

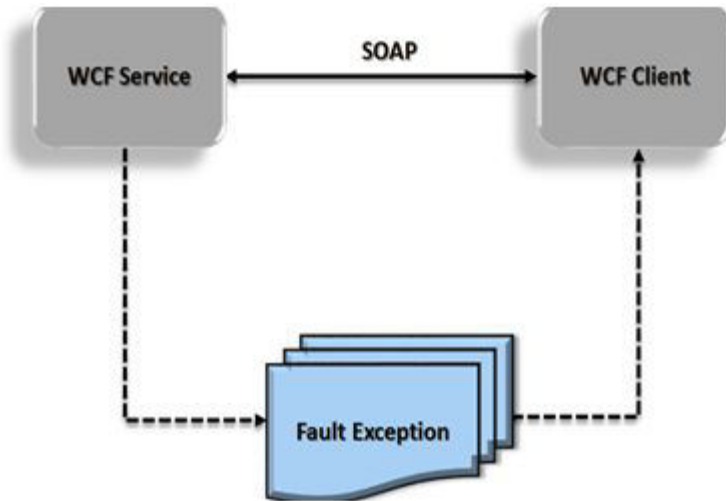
- GET: Retrieves the information.
- PUT: Replaces the entire collection with another collection.
- POST: Creates a new entry in the collection.
- DELETE: Deletes the entire collection.

12) What is Exception Handling in WCF? What are the ways for WCF Exception Handling?

Answer: Exception handling is critical to all applications for troubleshooting the unexpected problems in applications. The Windows Communication Framework (WCF) provides several options for handling exceptions in WCF services. This article discusses these approaches and describes the advantages and disadvantages of each. The following options are provided to handle exceptions in WCF:

1. Using returnUnknownExceptionsAsFaults: Debugging Mode
2. Using FaultException: Best Option.
3. Using IErrorHandler: Only when the exception can't be handled by Fault

## Exception handling in WCF



### 13) What is Tracing in WCF?

Answer: The tracing mechanism in the Windows Communication Foundation is based on the classes that reside in the System.Diagnostics namespace. The important classes are Trace, TraceSource and TraceListener.

Configuring WCF to emit tracing information/Define Trace Source, we have the following options:

- System.ServiceModel
- System.ServiceModel.MessageLogging
- System.ServiceModel.IdentityModel
- System.ServiceModel.Activation
- System.Runtime.Serialization
- System.IO.Log
- Cardspace

### 14) What are the Various Types of Bindings WCF Supports?

Answer: Binding describes how a client is going to communicate to WCF service. Binding is used as per client need. It supports different types of protocol to communicate with client and different types of encoding to transfer the data over the internet. So, basically binding is nothing but it is a way of communication between client and service as per client need.

#### **Basic binding**

This binding is provided by the BasicHttpBinding class. It is designed to expose a WCF service as an ASMX web service, so that old clients (that are still using an ASMX web service) can consume the new service. By default, it uses the HTTP protocol for transport and encodes the message in UTF-8 text format. You can also use HTTPS with this binding.

**Web binding**

This binding is provided by the WebHttpBinding class. It is designed to expose WCF services as HTTP requests using HTTP-GET and HTTP-POST. It is used with REST based services that may provide output in XML or JSON format. This is very much used with social networks for implementing a syndication feed.

**Web Service (WS) binding:**

This binding is provided by the WsHttpBinding class. It is like a basic binding and uses HTTP or HTTPS protocols for transport. But this is designed to offer various WS - \* specifications such as WS – Reliable Messaging, WS - Transactions, WS - Security and so on which are not supported by Basic binding.

wsHttpBinding= basicHttpBinding + WS-\* specification

**WS Dual binding:**

This binding is provided by the WsDualHttpBinding class. It is like a WsHttpBinding except it supports bi-directional communication which means both clients and services can send and receive messages.

**TCP binding:**

This binding is provided by the NetTcpBinding class. It uses TCP protocol for communication between two machines within intranet (means same network). It encodes the message in binary format. This is a faster and more reliable binding compared to the HTTP protocol bindings. It is only used when the communication is WCF-to-WCF which means both client and service should have WCF.

**IPC binding:**

This binding is provided by the NetNamedPipeBinding class. It uses named pipe for communication between two services on the same machine. This is the most secure and fastest binding among all the bindings.

**MSMQ binding:**

This binding is provided by the NetMsmqBinding class. It uses MSMQ for transport and offers support to a disconnected message queued. It provides solutions for disconnected scenarios in which the service processes the message at a different time than the client sending the messages.

**Federated WS binding:**

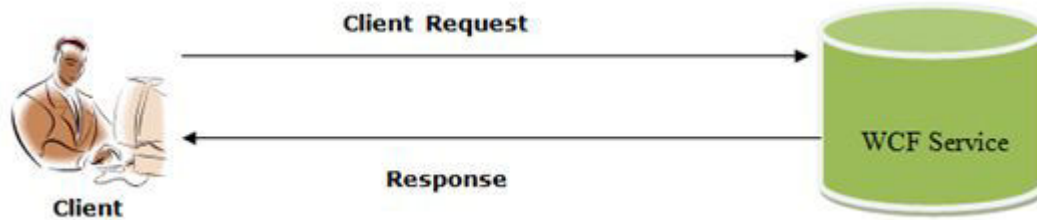
This binding is provided by the WSFederationHttpBinding class. It is a specialized form of WS binding and provides support to federated security.



## 15) What is Instance Context Mode in WCF?

An Instance Context mode defines how long a service instance remains on the server.

### Request Response Cycle



**PerCall:** A new instance of the service will be created for the request from the same client or a different client, meaning every request is a new request. In this mode no state is maintained. In per-call service, every client request achieves a new dedicated service instance and its memory consumption is less as compared to other types of instance activation.

```
[ServiceContract]
interfaceIMyContract
{...}
[ServiceBehavior(InstanceContextMode=InstanceContextMode.PerCall)]
classMyService:IMyContract
{...}
```

**Per-Session Service:** A new Instance will be created for every new client session and the scope of that object will be the scope of that session.

```
[ServiceBehavior(InstanceContextMode=InstanceContextMode.PerSession)]
classMyService:IMyContract
{...}
```

**Singleton Service:** A single instance will be created for the service object that will take care of all the requests coming from the same client or a different one.

By decorating the service with a service behavior, an Instance Context mode can be set.

```
[ServiceBehavior(InstanceContextMode=InstanceContextMode.PerCall)]
```

### Single

You want share global data through your WCF service.

Scalability is not a concern.

16) What is the difference between BasicHttpBinding and WsHttpBinding?

Answer: Below is a detailed comparison table between both the entities from security, compatibility, reliability, and SOAP version perspectives.

Criteria	BasicHttpBinding	WsHttpBinding
Security support	This supports the old ASMX style, i.e., WS-BasicProfile 1.1.	This exposes web services using WS-* specifications.
Compatibility	This is aimed for clients who do not have .NET 3.0 installed and it supports wider ranges of clients. Many of the clients like Windows 2000 still do not run .NET 3.0. So an older version of .NET can consume this service.	As it is built using WS-* specifications, it does not support wider ranges of clients and it cannot be consumed by older .NET versions less than 3 version.
SOAP version	SOAP 1.1	SOAP 1.2 and WS-Addressing specification.
Reliable messaging	Not supported. In other words, if a client fires two or three calls you really do not know if they will return back in the same order.	Supported as it supports WS-* specifications.
Default security options	By default, there is no security provided for messages when the client calls happen. In other words, data is sent as plain text.	As WsHttpBinding supports WS-*, it has WS-Security enabled by default. So the data is not sent in plain text.
Security options	<ul style="list-style-type: none"><li>• None</li><li>• Windows – default authentication</li><li>• Basic</li><li>• Certificate</li></ul>	<ul style="list-style-type: none"><li>• None</li><li>• Transport</li><li>• Message</li><li>• Transport with message credentials</li></ul>

One of the biggest differences you must have noticed is the security aspect. By default, BasicHttpBinding sends data in plain text while **WsHttpBinding** sends it in an encrypted and secured manner. To demonstrate the same, let's make two services, one using **BasicHttpBinding** and the other using WsHttpBinding and then let's see the security aspect in a more detailed manner.

17) What is Security Implementation in WCF? How many are there?

**Answer:** As WCF supports various protocols i.e. TCP, HTTP, and MSMQ, user must be sure enough to take necessary steps to guard your message and also must establish security policies for protecting messages and for authenticating and authorizing calls. WCF provide a very easy and rich configurable environment to implement security. WCF supports following securities:

Message

- Transport
- TransportWithMessageCredential

**Message Security :** Message security uses the WS-Security specification to secure messages. The message is encrypted using the certificate and can now safely travel over any port using plain http. It provides end-to-end security.

**Transport Security :** Transport security is a protocol implemented security so it works only point to point. As security is dependent on protocol, it has limited security support and is bounded to the

protocol security limitations.

### **TransportWithMessageCredential:**

This we can call a mixture of both Message and Transport security implementation.

18) What Message Exchange Patterns (MEPs) are Supported by WCF? Explain Each of Them Briefly.

1. Request/Response
2. One Way
3. Duplex

### **Request/Response**

It's the default pattern. In this pattern, a response message will always be generated to consumer when the operation is called, even with the void return type. In this scenario, response will have empty SOAP body.

### **One Way**

In some cases, we are interested to send a message to service in order to execute certain business functionality but not interested in receiving anything back. OneWay MEP will work in such scenarios. If we want queued message delivery, OneWay is the only available option.

### **Duplex**

The Duplex MEP is basically a two-way message channel. In some cases, we want to send a message to service to initiate some longer-running processing and require a notification back from service in order to confirm that the requested process has been completed.