RESEARCH ARTICLE

ADVANTAGES OF WCF OVER WEB SERVICES

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Abstract— A Web service (WS*-) is a software system designed to support interoperable machine-to-machine interaction over a network (WSDL) i.e between a client and a service. It has an interface described in a machine-processable format . Other systems interact with the Web service in a manner prescribed by its description using SOAP messages which is a protocol define by world wide web consortium, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards. 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. A service endpoint can be part of a continuously available service hosted by IIS, or it can be a service hosted in an application like an .exe file. An endpoint can be a client of a service that requests data from a service endpoint. The messages can be as simple as a single character or word sent as XML document, or as complex as a stream of binary data. In this paper ,We gave the Adavantages that are Available by using wcf ,instead of webservices and other.

Key Terms: - WS*-Web Service; Internet Information Server (IIS); Windows Activatio Service(WAS); Microsoft Message Queing (MSMQ); Hyper Text Transfer Protocol(HTTP); WCF (Windows Communication Foundation); COM+ (Component Object Model)

I. INTRODUCTION

Web Services are platform-independent and language-independent, they use XML languages. A client program can be programmed in C++ and running under Windows, while the Web Service is programmed in Java and running under any Linux Operating System. The main benefit of Web service is that it uses HTTP for transmitting messages, because most of the Internet's proxies and firewalls will not block HTTP traffic.

The drawback using of Web Services is that they lack versatility and efficiency in transmiting of the data.
   Windows Communication Foundation(WCF)   is a Program development platform and runtime system for building, configuring and deploying network-distributed services like Secured Transactions between a ATM and a central server of a bank. It is the latest service oriented technology developed by MicroSoft.It is unified programming model provided in .Net Framework 3.0. WCF is a combined feature of old Microsoft Framework Service Technologies like Web Service, Remoting, MSMQ and COM+. WCF provides a common platform for all .NET communication.

WCF services provide better reliability and security when compared to ASMX web services. In WCF, there is no need to make much change in code for executing the security model and alter the binding. Small changes in the configuration file will match your requirements. The disadavantage of WCF is that method overloading is not supported.

Communication Between Endpoints in Web Services

Web services provide a means to interoperate between different software applications, running on a variety of platforms and frameworks. A Web service is an abstract conception that may be implemented by a concrete agent. The agent may be a software or hardware that sends and receives messages, while the service is the resource which is defined by the functionality that is provided.

The purpose of a Web service is to provide functionality to its owner who is a person or organization, such as a business or an individual. The provider entity is the person or organization that provides an appropriate agent to implement a particular service.

A requester entity is a individual person or organization that wishes to make use of a provider entity's Web service. It will make use of a requester agent to exchange messages with the provider entity's provider agent.
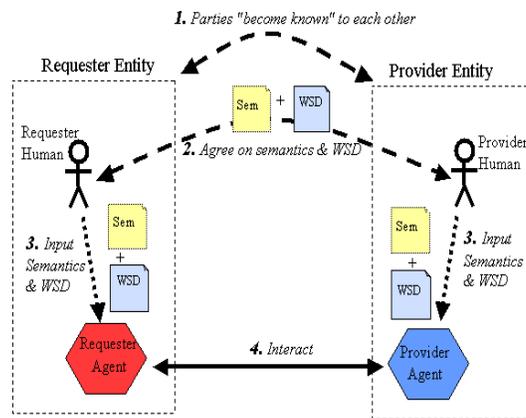.

Fig.1.Mechanism of Endpoint Communication in WebServices

The mechanics of the message exchange are documented in a Web service description (WSD). The WSD is a machine processable specification of the Web service's interface, written in WSDL. It contents are   the definition of message formats, datatypes, transport protocols, and transport serialization formats that should be used between the requester agent and the provider agent.

The semantics of a Web service is the shared expectation about the behavior of the service.There are many ways that a requester entity might engage and use a Web service. In general, the following steps are required, as illustrated in Figure 1:
(1) the requester and provider entities become known to one other (or at least one becomes know to the other)
(2) the requester and provider entities some how agree on the service description and semantics that will manage the interaction between the requester and provider agents
(3) the service description and semantics are realized by the requester and provider agents
and
(4) the requester and provider agents exchange messages, thus performing some task on behalf of the requester and provider entities.

The World Wide Web Consortium (W3C) has defined message formats and protocols to call and pass parameters to an XML page server . Most applications require query string parameters or specific form fields be filled in with appropriate values in order to generate the HTML or XML document. The W3C developed the Simple Object Access Protocol (SOAP) and related standards that extend XML so that computer programs can easily pass parameters to server applications, and then receive and understand the returned semi –structured XML data document.

Structure of webservices

The web service project will create a class definition   that inherits from the System.Web.Services.WebService class. This helps to retrieve data to/from XML and send/receive SOAP messages.Visual Studio .NET will create a project containing a set of source files. There are two files that differentiate a ASMX web service from from any other type of .NET application,Those are the ".asmx" file and the ".asmx.cs" file.The ".asmx.cs" file contains the Class definition statement that names our web service class and inherits from the System.Web.Services class. The ".asmx" file is a simple text file ,which is used by the ASP.NET run-time to locate the web service implementation class when invoked by a client side SOAP request.

The web service class is implemented like any other public class. Public methods that can be invoked or called using the SOAP protocol are decorated with the [WebMethod] attribute immediately preceding the declaration of the public method.

In breif, A web service is a class containing public methods decorated with the [WebMethod] attribute. This attribute hides all the details to implement proxies and stubs, binding to the web service, and generating the metadata that clients need to invoke the web service.

II. COMMUNICATION BETWEEN ENDPOINTS OF WCF

Windows Communication Foundation (WCF) is a framework for building service-oriented applications (SOA) **.** Service Oriented Architecture is taken into account in Windows Communication Foundation and services are in order to communicate and exchange messages in distributed systems.Invoking (calling) methods placed on distinct nodes on WCF services is similar to invoking web methods from web services.

Creating a WCF client is even simpler. All that's required is to create a local stand-in for the service which is called a proxy, that's connected to a particular endpoint on the required target service, and then invoke the service's operations via the proxy.

Creating a proxy requires knowing exactly   what contract is exposed by the target endpoint, and then using the contract's Content to generate the proxy. In WCF, this process can be performed by a tool called svcutil.
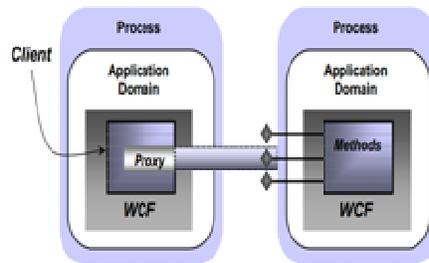

Fig.2.proxy generation in the server side of WCF

If the service is implemented using WCF architecture svcutil can access the service's DLL to learn about the contract and generate a proxy. If only the service's WSDL definition is available, svcutil can read this to produce a proxy. If only the service itself is available,svcutil can access it directly using either WS-Metadata Exchange to acquire the service's WSDL interface definition, and then generate the proxy.

Structure of WCF:

WCF "web services" are part of a much broader spectrum of remote communication enabled through WCF. You will get a much higher degree of flexibility and portability doing things in WCF than through traditional ASMX because WCF is designed, from the ground up, to summarize all of the different distributed programming infrastructures offered by Microsoft. ASMX is older than WCF, and anything ASMX can do so can WCF (and more).ASMX was just one of these many ways and so is now grouped under the WCF umbrella of capabilities.

WCF Service is a program that exposes a collection of Endpoints. Each Endpoint is a portal for communicating with the clients ends..Different End points can be created with a different port address in the configuration file of the client side.All the WCF communications are take place through end point. End point consists of three components.

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- Address
- Binding and
- Contracts

Address is where on the network messages should be sent so that the endpoint receives them. This is the location to which messages must be sent by the client in order to get hosted by the service.For HTTP, the address would look like http://myserver/myservice/; for TCP, it would look like net.tcp://myserver:8080/myservice.

The binding defines the channel used to communicate with an endpoint. Channels are the conduit through which all messages pass within a WCF application. The lowest level binding element is the transport, which delivers messages over the networks of different architecture. The built-in transports include HTTP, TCP, Named Pipes, PerChannel, and MSMQ.

Contract defines the capability, or feature set, offered by the endpoint. The contract defines the operations that an endpoint exposes to the client to avail that service and the message formats that the operations require. Contract operations map to class methods that implement the endpoint, including the signature of parameters passed in and out of the methods.

In order to communicate efficiently, the structure of WCF define contracts mentioned in :
   • **service contracts**; they define which of the operations that are implemented by methods will the service make available for invocation as messages are sent to the service by client applications over the network;
     • **data contracts**; they define the data structures included in the messages that the service will send to the client.
     • **message contracts**; they are regarding the headers that appears in the messages and how the message structure is defined.

III. WAYS OF HOSTING WCF SERVICES

A WCF service can be hosted by any managed process running in the operating system. The service itself typically doesn't know or care about how it is hosted by the , although there are plenty of APIs through which it can find out.
 The mechanisms that are used to host a wcf service are given are :

- **IIS**:Internet information Service provides number of advantages if a Service uses Http as protocol. It does not require Host code to activate the service, it automatically activates service code.
- **Windows Activation Service:**(WAS) is the new process activation mechanism that ships with IIS , In addition to HTTP based communication, WCF can also use WAS to provide message-based activation over other protocols, such as TCP and named pipes.
- **.EXE:** WCF allows services to be run as executables (.EXE files).
- **COM+:**WCF allows services to be run as a COM+ application.
- **Self-Hosting:**WCF service can be self hosted as console application, WinForms or WPF application with graphical UI.
- **Windows Services:**WCF allows services to be run as a Windows service.

Advanatages of WCF over other Architectures

WCF has several important advantages over Web services and other Microsoft service architectures like .NET pipelining, Remoting. It supports more protocols for transporting messages than WS, which only support sending messages using HTTP. WCF supports sending messages using HTTP, as well as TCP, named pipes, and MSMQ.

WCF is based on the concept of message-based communication. Messages are sent between endpoints. Endpoints are places where messages are sent or received (or both), and they define all the information required for the message exchange. A service exposes one or more application endpoints and the client generates an endpoint that is compatible with one of the service's endpoints. An endpoint describes in a standard-based way where messages should be sent, how they should be sent, and what the messages should look like.

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Fig.3.The Technologies That are replaced by WCF

IV. PERFORMANCE COMPARISON OF WCF WITH WS

To test the performance of the proposed architectrue,tests have been developed by comparing WS of our WCF service. The web service executes the same actions as our WCF service does.A comparision has been made of the time both technologies consume when providing variable values to the client application. That is to say, we have recorded the time that elapses between when the client asks the service for variable values to when the service provides the client with these values.

There are two technologies that influences the amount of time consumption those are the service technology(WS or WCF) and MSMQ which were earlier proposed by Microsoft. Despite the time that MSMQ consumes in both the architectures,which is marked,there is a big time that MSMQ consumes in both architectures,which is marked,there is big time difference when using WS and WCF.   Figure 4 shows a figure where the two architectures are compared.The difference in velocity is significant. When the client requests the value of 10 variables, the values are received in 15 ms with WCF whereas it is 156 ms with WS.This shows the reliability and fastness of the applications that uses WCF services. When the variables requested are 100, the values are received in 234 ms with WCF and in 1953 ms with WS.
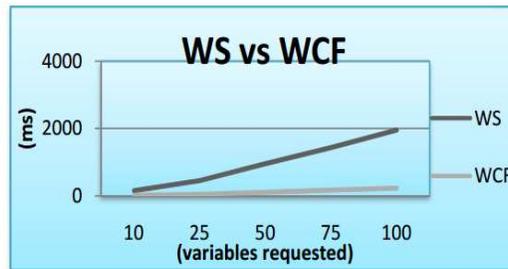

Fig.4.Graph Showing the performance of WCF VS Web Services

In the configuration of our WCF service,the transport protocol was set to TCP, and the encoding was binary. The only transport protocol available for WS however is HTTP and the encoding possible is text.This is the reason why this WCF configuration is much faster than WS.WCF communication over the TCP transport protocol is really more efficient than over HTTP and since the data transmitted is binary, there is no need to either encode or decode it.

V. CONCLUSION

From the Results From the above paper,We conclude that it is adavantageous to use WCF over Web Services and it replaces the older service oriented architectures developed by Microsoft in .NET Framework like .NET Remoting,MSMQ, Message Pipelining and It is very useful in Real time applications like Secured Transactions.

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