

Cross Platform SOAP-based Web Services

- ▶ Lecture will begin shortly
- ▶ Download class materials from university.xamarin.com

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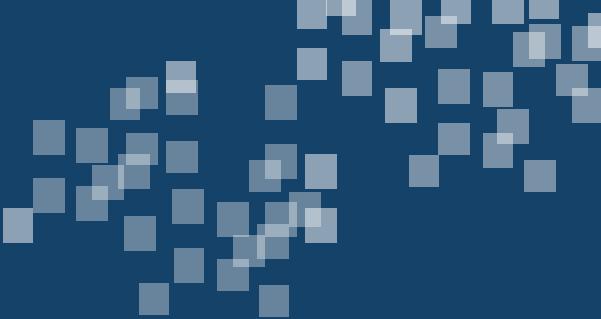
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Objectives

1. Working with SOAP services





Working with SOAP services

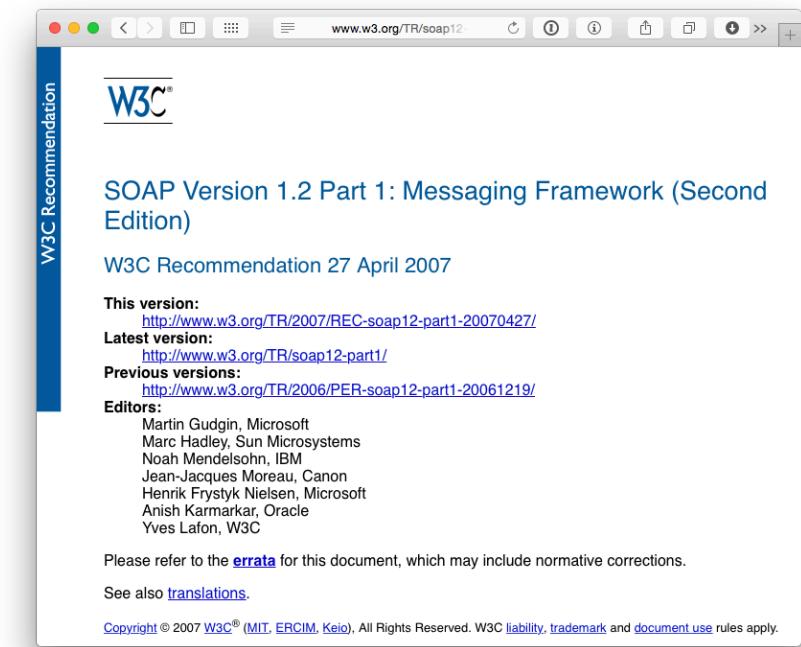
Tasks

1. What is SOAP and WCF?
2. Creating a WCF Client
3. Connecting to a SOAP service
4. Execute service methods



What is SOAP?

- ❖ SOAP is a RPC-based specification standard for web services which defines:
 - discovery
 - data format + transfer
 - security
 - data reliability
 - ...



The screenshot shows a web browser displaying the W3C Recommendation page for SOAP Version 1.2 Part 1: Messaging Framework (Second Edition). The page header includes the W3C logo and the title. Below the title, it states "W3C Recommendation 27 April 2007". It provides links for "This version", "Latest version", and "Previous versions". The "Editors" section lists Martin Gudgin, Microsoft; Marc Hadley, Sun Microsystems; Noah Mendelsohn, IBM; Jean-Jacques Moreau, Canon; Henrik Frystyk Nielsen, Microsoft; Anish Karmarkar, Oracle; and Yves Lafon, W3C. A note at the bottom encourages users to refer to the [errata](#) for normative corrections.

W3C Recommendation

SOAP Version 1.2 Part 1: Messaging Framework (Second Edition)

W3C Recommendation 27 April 2007

This version: <http://www.w3.org/TR/2007/REC-soap12-part1-20070427/>

Latest version: <http://www.w3.org/TR/soap12-part1/>

Previous versions: <http://www.w3.org/TR/2006/PER-soap12-part1-20061219/>

Editors:

Martin Gudgin, Microsoft
Marc Hadley, Sun Microsystems
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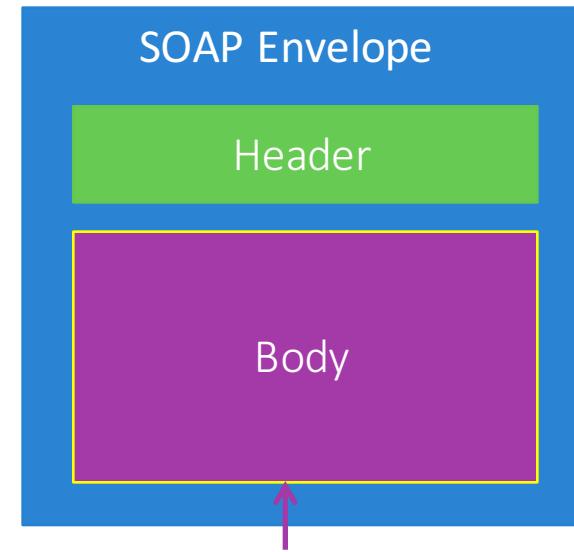
See also [translations](#).

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SOAP specification

- ❖ SOAP has a defined XML structure, referred to as the **SOAP Envelope**

- ❖ Variety of additional specifications available to define various aspects of communication which plug into this structure
 - referred to as WS-*
 - not widely supported on all platforms



SOAP uses **HTTP POST** to call services; the API and parameters are passed in the message body

Comparing REST and SOAP

	REST	SOAP
Standardized	No	Yes (WS-*)
Transport	HTTP	HTTP, FTP, Pipes, MSMQ etc.
Data Format	any, prefer JSON	XML
Reach	Excellent	Good
Development tools	Basic	Good
Flexibility	Flexible	Rigid
Scalability	Excellent	Reasonable
Security	HTTPS	WS-Security
Operations	Stateless	Often statefull

What is WCF?

- ❖ Windows Communication Foundation is a highly configurable and flexible .NET library for building distributed, service-oriented applications
- ❖ Original vision was to be the "kitchen sink" of communication, but its flexibility has made it moderately complicated to use

Windows Communication Foundation

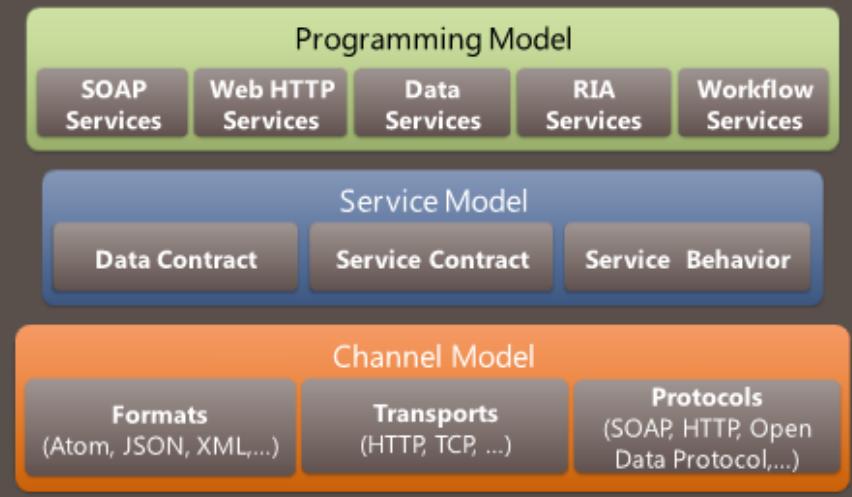
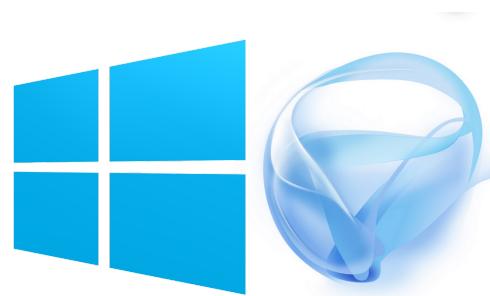


image from msdn.microsoft.com

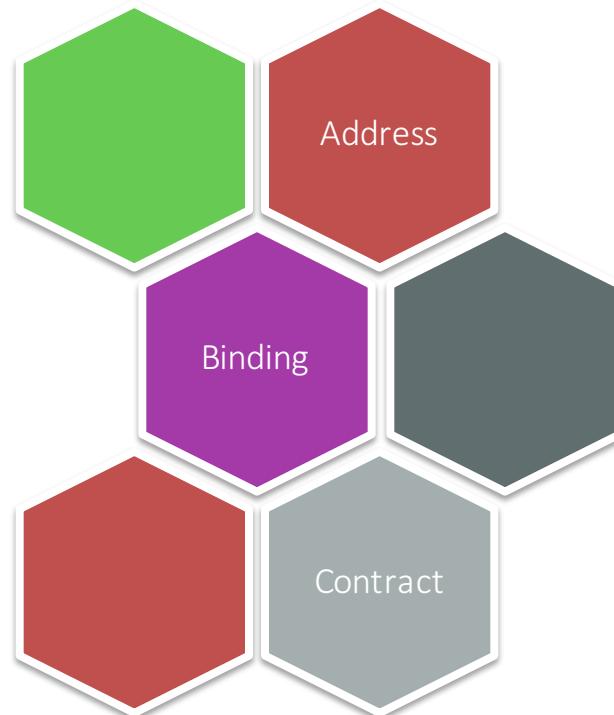
Using WCF with Xamarin

- ❖ Adding WCF client-side support to a mobile application today requires a Windows machine with Visual Studio or the **Silverlight SDK**



WCF Endpoints

- ❖ Communication with WCF Services is performed over *endpoints* which define the **address**, **binding**, and **contract** that is exposed
- ❖ Client and service must agree on these three pieces of information, sometimes called the "ABCs" of WCF



Address

- ❖ Service address defines the *location* of the service with two pieces of information

```
http://itunes.apple.com/movies
```

```
net.tcp://23.75.234.144:5544
```

```
https://services.xamarin.com/account
```



Protocol used
to access it

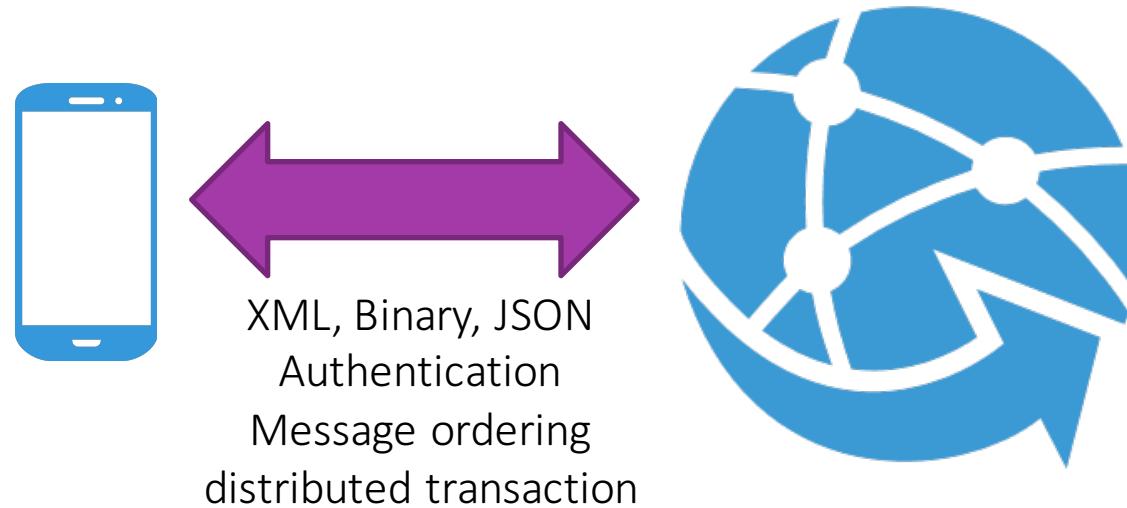
Address where it is hosted



Mobile applications can only utilize HTTP(s)-based addresses

Binding

- ❖ Selected **binding** determines how the client and service will communicate and what parts of the SOAP specifications are used



WCF includes pre-defined bindings for various scenarios but mobile apps only have access to a small subset of the defined bindings – that may change in the future

Contract

- ❖ The WCF **contract** defines what the service *can do* and is most often modeled as an interface which is shared by the client and service

```
[ServiceContract(Namespace = "http://services.xamarin.com/xamu")]
public interface ICourseCatalog
{
    ...
}
```



ServiceContract indicates that this is a contract definition; namespace must match service expectation as it is coded into the SOAP envelope

Contract

- ❖ The WCF **contract** defines what the service *can do* and is most often modeled as an interface which is shared by the client and service

```
[ServiceContract(Namespace = "http://services.xamarin.com/xamu")]
public interface ICourseCatalog
{
    [OperationContract]
    Course GetCourseById(int id);
    [OperationContract]
    IList<Course> GetAll();
    [OperationContract]
    void ScheduleCourse(int id, DateTime scheduledDate);
}
```



OperationContract
indicates that this is a specific
API that can be called

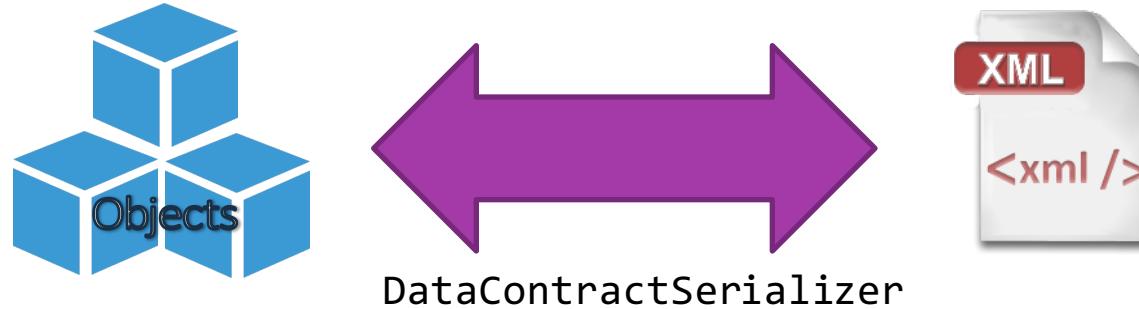
Serialization with SOAP + WCF

- ❖ SOAP must serialize the data passed to and from each API
- ❖ Serialization format is tied to the *binding*, preferred format for most bindings is XML + XSD

```
<?xml version="1.0"
    encoding="utf-16"?>
<Course xmlns="http://...">
    <Description>
        ...
    </Description>
    <Id>
        ...
    </Id>
    <Name>
        ...
    </Name>
</Course>
```

What is DataContractSerializer?

- ❖ WCF uses **DataContractSerializer** to convert objects into XML and vice-versa



This is the *default serializer*, however WCF is quite extensible and one of those extensibility points is in changing how data is serialized by supplying a different serializer

Controlling the serialization

- ❖ Attributes used to map an object and its members to an XSD schema

Objects to be serialized
must be marked with the
DataContract attribute



Fields to be serialized
must be marked with the
DataMember attribute



```
[DataContract(Namespace="urn:xamarin.com")]
public class Course
{
    [DataMember(Name="key")]
    public int Id { get; set; }

    [DataMember]
    public string Name { get; set; }

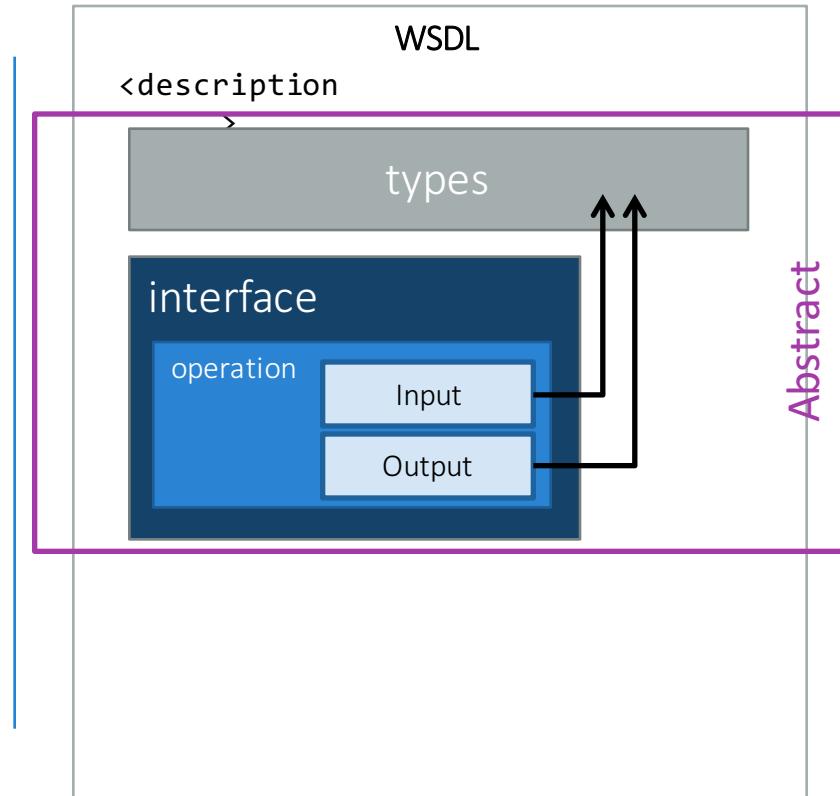
    [DataMember(IsRequired = false)]
    public string Description { get; set; }
}
```



Modern versions of **DataContractSerializer** do not require these attributes and will instead serialize all public properties, but being explicit is a good practice

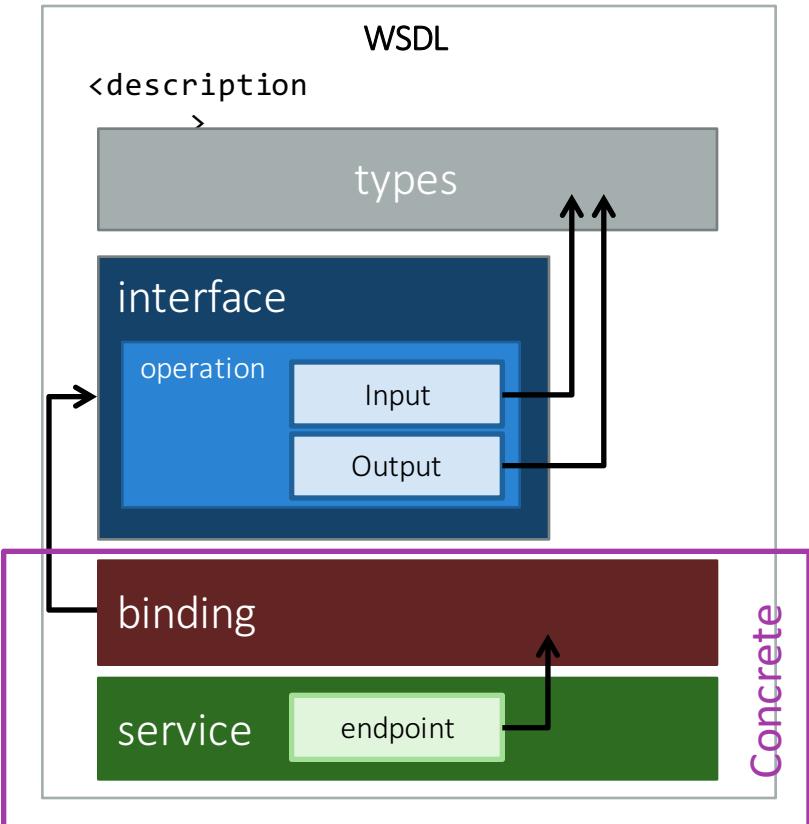
What is WSDL?

- ❖ Web Service Description Language (WSDL) is an XML document that provides the technical description for interacting with a specific web service
- ❖ Tools generate the contracts and necessary WCF binding code directly from WSDL documents



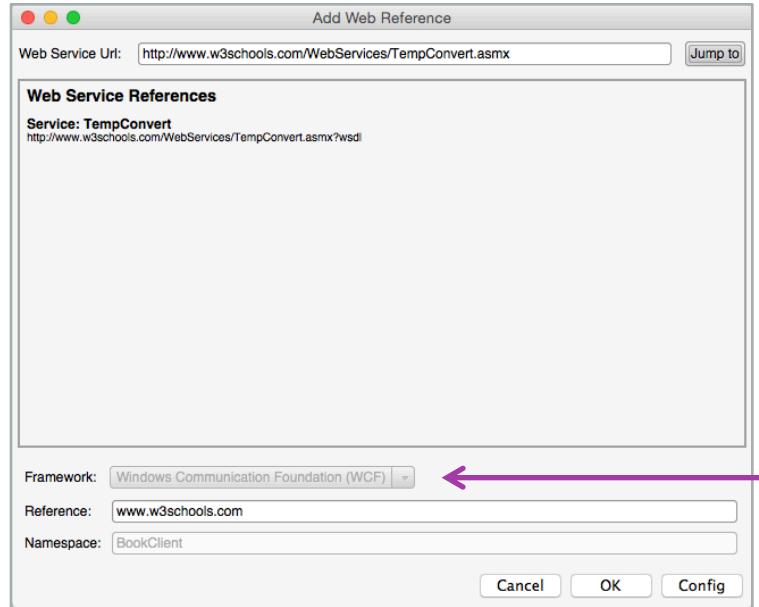
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Generating the contracts

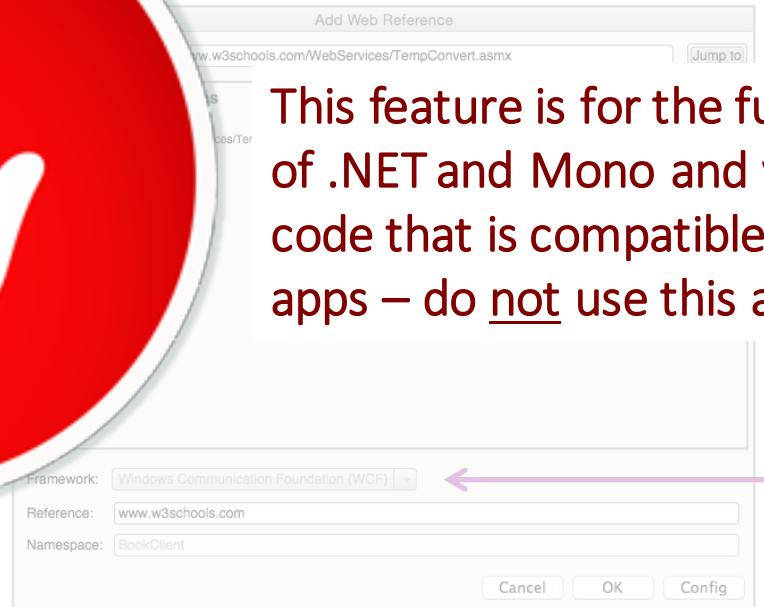
- ❖ Visual Studio and Xamarin Studio both have an "Add Web Reference" dialog which is commonly used to process WSDL



It even supports WCF ...

Generating the contracts

- ❖ Vista and Xamarin Studio both have an "Add Web Reference" dialog used to process WSDL

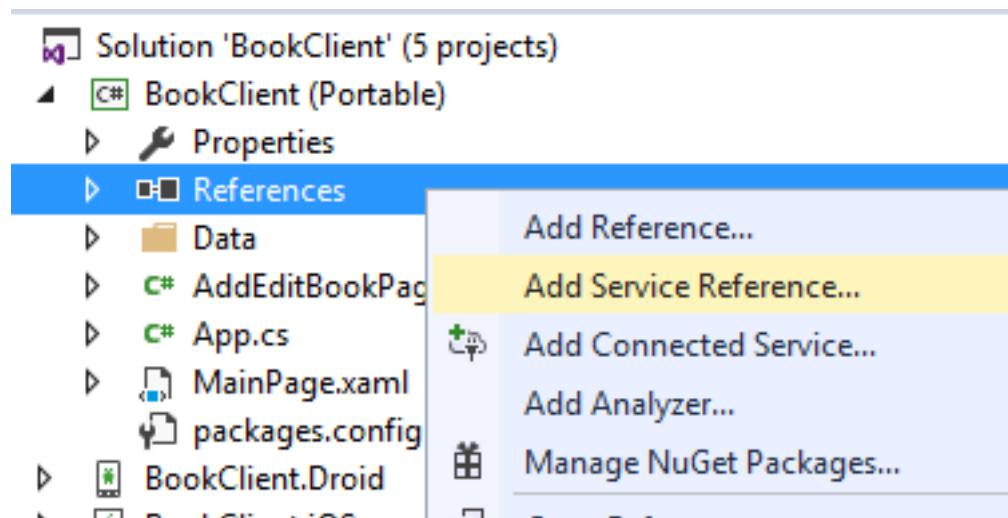


This feature is for the full desktop version of .NET and Mono and will not generate code that is compatible with your mobile apps – do not use this approach

It even supports WCF ...

Generating the contracts

- ❖ Can use the **Add Service Reference** on the **References** folder in a PCL, as long as the PCL does *not* support Windows Phone 8.1 (WinRT)



Generating the contracts

- ❖ Silverlight SDK ships with a command line tool which is used to generate all the client access code from a **WSDL** file

C:\Program Files (x86)\Microsoft
SDKs\Silverlight\v5.0\Tools\
SLSvcUtil.exe

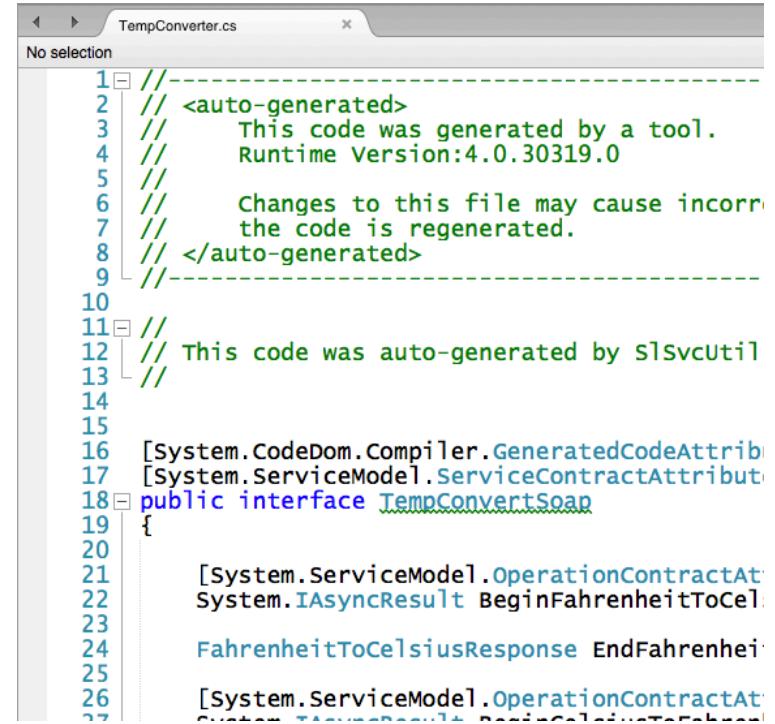
```
C:\> SLSvcUtil /noConfig  
http://www.w3schools.com/WebServices/TempConvert.asmx  
  
Microsoft (R) Silverlight Service Model Proxy  
Generation Tool  
[Microsoft (R) Silverlight SDK, Version 5.0.61118.0]  
Copyright (c) Microsoft Corporation. All rights  
reserved.  
  
Attempting to download metadata from  
'http://www.w3schools.com/WebServices/TempConvert.asm  
x' using W  
S-Metadata Exchange or DISCO.  
  
Generating files...  
C:\Users\Mark\Desktop\TempConvert.cs
```



Caution: There is also a desktop utility **SVCUtil.exe** but it generates desktop based code which will not run properly on the mobile platform today

What gets generated?

- ❖ Tool processes the WSDL and generates a single C# source file with all the necessary contracts and a proxy class used to invoke the operations on the web service



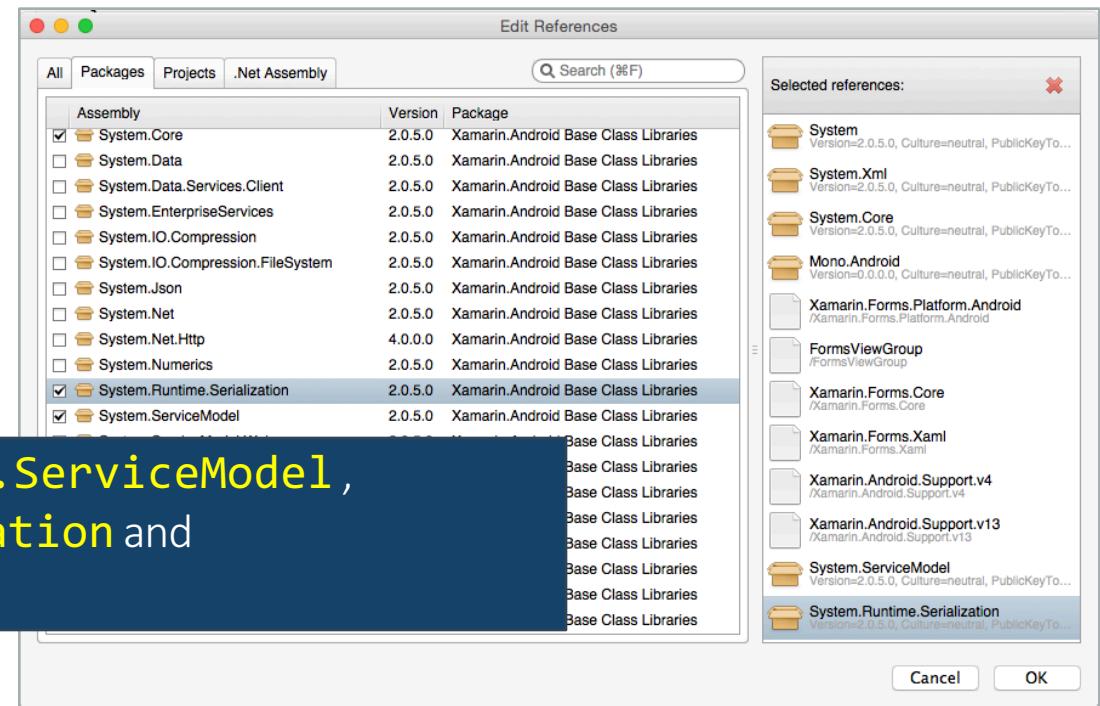
The screenshot shows a code editor window titled "TempConverter.cs". The code is auto-generated C# code for a web service proxy. It includes comments indicating it was generated by a tool, runtime information, and a warning about changes causing regeneration. The code defines a public interface named TempConvertSoap with two methods: BeginFahrenheitToCelsius and EndFahrenheitToCelsius, both decorated with OperationContract attributes.

```
1 //<auto-generated>
2 // This code was generated by a tool.
3 // Runtime Version:4.0.30319.0
4 //
5 // Changes to this file may cause incorrect results.
6 // the code is regenerated.
7 //</auto-generated>
8 //
9
10
11 // This code was auto-generated by slsvcutil
12 //
13
14
15
16 [System.CodeDom.Compiler.GeneratedCodeAttribute("System.ServiceModel", "4.0.0.0")]
17 [System.ServiceModel.ServiceContractAttribute("TempConvertSoap")]
18 public interface TempConvertSoap
19 {
20     [System.ServiceModel.OperationContractAttribute("BeginFahrenheitToCelsius")]
21     System.IAsyncResult BeginFahrenheitToCelsius(
22         string Fahrenheit,
23         System.AsyncResult EndFahrenheitToCelsius);
24
25     [System.ServiceModel.OperationContractAttribute("EndFahrenheitToCelsius")]
26     string EndFahrenheitToCelsius(
27         System.AsyncResult result);
28 }
```

Reminder: add WCF references

- ❖ When using `SLSVCUtil` to generate the proxy source file, you must also manually add the DLL references to support WCF

Must add references to `System.ServiceModel`,
`System.Runtime.Serialization` and
`System.ServiceModel.Web`



Calling the web service

- ❖ Tools generate a web *proxy* which exposes asynchronous RPC-style methods representing the operations on the web service

```
var client = new TempConvertSoapClient(  
    new BasicHttpBinding(BasicHttpSecurityMode.None),  
    new EndpointAddress(  
        "http://www.w3schools.com/WebServices/TempConvert.asmx"));  
  
client.FahrenheitToCelsiusCompleted += (sender, e) => {  
    Dev...  
    () => label.Text = e.Result);  
};  
  
client.Fa...  
);
```

Must provide **binding** and
address to proxy constructor

Calling the web service

- ❖ Tools generate a web *proxy* which exposes asynchronous RPC-style methods representing the operations on the web service

```
var client = new TempConvertSoapClient(new BasicHttpBinding(BasicHttpBindingType.Soap11),  
    new EndpointAddress("http://tempconvert.wrox.com/Services/Tem  
pConvert.asmx"));  
  
client.FahrenheitToCelsiusCompleted += (sender, e) => {  
    Device.BeginInvokeOnMainThread(() => label.Text = e.Result);  
};  
  
client.FahrenheitToCelsiusAsync("75");
```

Async methods use event model, wire up to Completed event

Calling the web service

- ❖ Tools generate a web *proxy* which exposes asynchronous RPC-style methods representing the operations on the web service

```
var client = new TempConvertSoapClient(  
    new BasicHttpBinding(BasicHttpSecurityMode.None),  
    new EndpointAddress("http://www.w3schools.com/WebServices/Tem  
pConvert.asmx"));  
  
client.FahrenheitToCelsiusCompleted += (sender, e) => {  
    Device.BeginInvokeOnMainThread(() => label.Text = e.Result);  
};  
  
client.FahrenheitToCelsiusAsync("75");
```



.. and then call method

Calling the web service

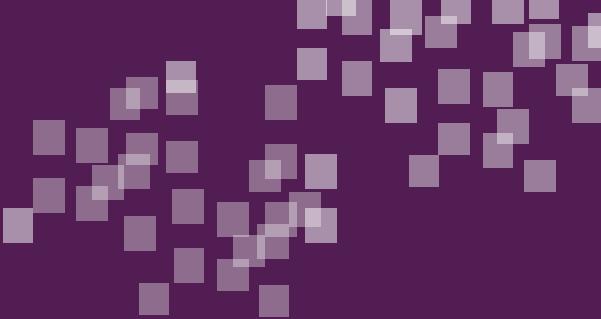
- ❖ Tools generate a web *proxy* which exposes asynchronous RPC-style methods representing the operations on the web service

```
var client = new TempConvertSoapClient(  
    new BasicHttpBinding(BasicHttpSe  
    new EndpointAddress("http://www.  
pConvert.asmx"));
```

```
client.FahrenheitToCelsiusCompleted += (sender, e) => {  
    Device.BeginInvokeOnMainThread(() => label.Text = e.Result);  
};  
  
client.FahrenheitToCelsiusAsync("75");
```

Completed callback occurs
with status + response on
background thread

em



Individual Exercise

Calling a SOAP Book Service

Summary

1. What is SOAP and WCF?
2. Creating a WCF Client
3. Connecting to a SOAP service
4. Execute service methods



Thank You!

Please complete the class survey in your profile:
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