Soya

A Programming Model and Runtime Environment for Component Composition using SSDL

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Outline

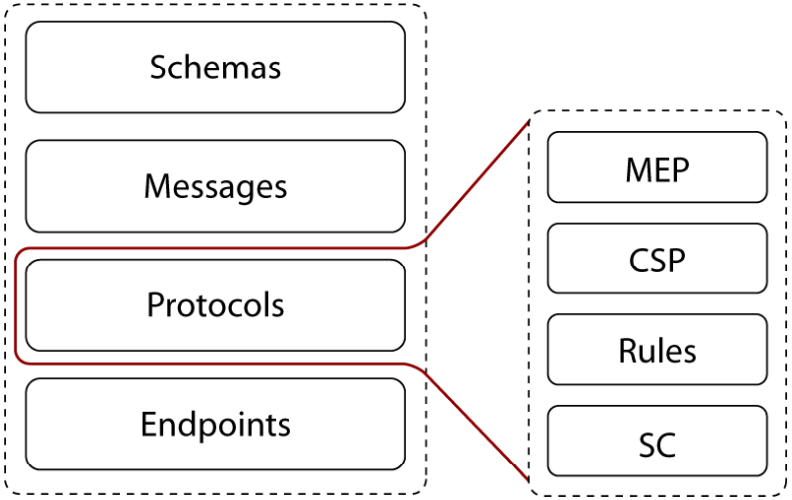
What we will discuss today:

1. SSDL
   (What is it, claimed benefits)
2. Soya – Programming Model
   (Creating SSDL Web Services using C# metadata)
3. Soya – Runtime Environment
   (Protocol validation, correlation, dispatching)

SSDL (SOAP Service Description Language)

What it is…

- **XML** language for describing Web Service contracts
- Assumes **SOAP doc/lit & WS-Addressing**
- Based on **MEST** ideas
- Focuses on **one-way** messages and protocols
- Extensible **protocol** framework



SSDL (SOAP Service Description Language)

Claimed Benefits

- **Simpler** Web Service descriptions
- Fosters creation of **loosely coupled** applications
- Enables **protocol-based** reasoning and integration

SSDL (SOAP Service Description Language)

SSDL Contract Code: Messages

```
<ssdl:messages targetNamespace="urn:my:messages" xmlns:s="urn:my:schema">
  <ssdl:message name="MsgA">
    <ssdl:header ref="s:MyHeaderX" mustUnderstand="true" />
    <ssdl:header ref="s:MyHeaderY" role=".../ultimateReceiver"/>
    <ssdl:body ref="s:MyBody"/>
  </ssdl:message>
</ssdl:messages>
```

SSDL (SOAP Service Description Language)

SSDL Contract Code: Protocols

```
<ssdl:protocol xmlns:mep="urn:ssdl:sc:v1">
  <sc:sc>
    <sc:participant name="ServiceX"/>
    <sc:participant name="ServiceY"/>
    <sc:protocol>
      <sc:sequence>
        <ssdl:msgref ref="MsgA" direction="in" sc:participant="ServiceX"/>
        <sc:choice>
          <ssdl:msgref ref="MsgB" direction="out" sc:participant="ServiceY"/>
          <ssdl:msgref ref="MsgC" direction="out" sc:participant="ServiceY"/>
        </sc:choice>
        <ssdl:msgref ref="MsgD" direction="in" sc:participant="ServiceY"/>
        <ssdl:msgref ref="MsgE" direction="out" sc:participant="ServiceX"/>
      </sc:sequence>
    </sc:protocol>
  </sc:sc>
</ssdl:protocol>
```

Research Opportunities

More research is needed:

- Lack of **theoretical** and **empirical data**
- Lack of SSDL-aware **middleware**
- Lack of **tool support**

Our Research Goals

Empirically investigate SSDL in order to:

- **Determine** if the way to describe Web Services implied by SSDL offers significant **benefits**, compared to incumbent approaches
- **Identify** patterns and **best practices** for describing Web Services
- **Provide** design and implementation of a **SSDL runtime**

Soya

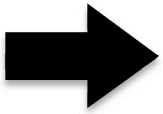
Programming Model

- Based on **Windows Communication Foundation** (WCF)
- **Supports** developers to build SSDL services in a straightforward manner
- Encourages creation of **service-oriented** applications without imposing unrealistic development burdens
- Contractual data defined using **metadata**

Soya Programming Model

Defining Messages

```
[SsdlMessageContract]
public class MsgA {
  [MessageHeader]
  public string MyHeader;
  [MessageBodyMember]
  public MyData MyBody;
}
```



```
[DataContract(Namespace="urn:my:schema")]
public class MyData {
  [DataMember]
  public int id;
  [DataMember]
  public string code;
}
```

```
<xs:element name="MyHeader" type="xs:string"/>
<xs:element name="MyBody" type="s:MyData"/>
<xs:complexType name="MyData">
  <xs:sequence>
    <xs:element name="id" type="xs:int"/>
    <xs:element name="code" type="xs:string"/>
  </xs:sequence>
</xs:complexType>
```

```
<ssdl:message name="MsgA">
  <ssdl:header ref="s:MyHeader"/>
  <ssdl:body ref="s:MyBody"/>
</ssdl:message>
```

Soya Programming Model

Defining Messaging Behaviour (a.k.a. Protocols)

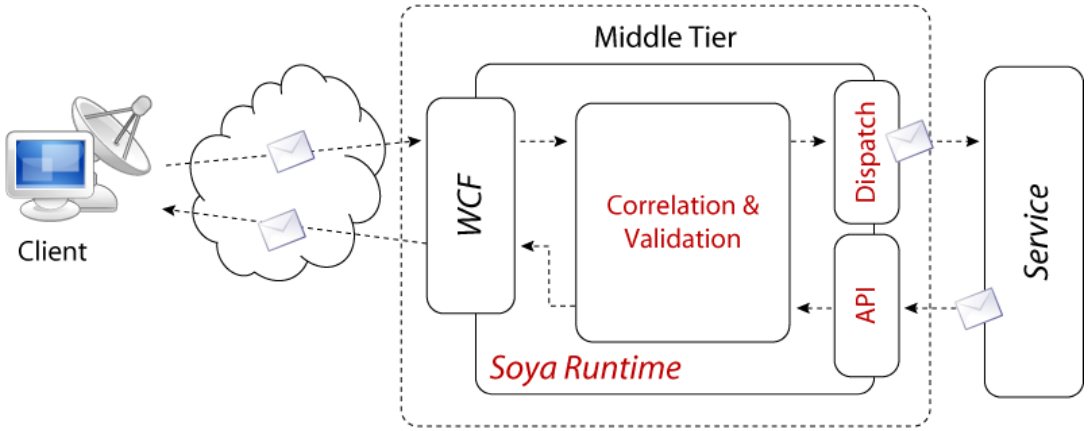
```
[ServiceContract(Namespace="urn:my:contract")]
[SsdlProtocolContract(Namespace="urn:my:protocol")]
public interface IService {
  [Mep(Style=MepStyle.InOnly)]
  void Process(MsgA msg);

  [Mep(Style=MepStyle.InOut,
   Out=typeof(MsgC), Fault=typeof(FaultX))]
  void Process(MsgB msg);
}
```

```
<ssdl:protocol targetNamespace="urn:my:protocol"
               xmlns:mep="urn:ssdl:mep:v1">
  <mep:in-only>
    <ssdl:msgref ref="m:MsgA" direction="in"/>
  </mep:in-only>
  <mep:in-out>
    <ssdl:msgref ref="m:MsgB" direction="in"/>
    <ssdl:msgref ref="m:MsgC" direction="out"/>
    <ssdl:msgref ref="m:FaultX" direction="out"/>
  </mep:in-out>
</ssdl:protocol>
```

Soya

Runtime Environment

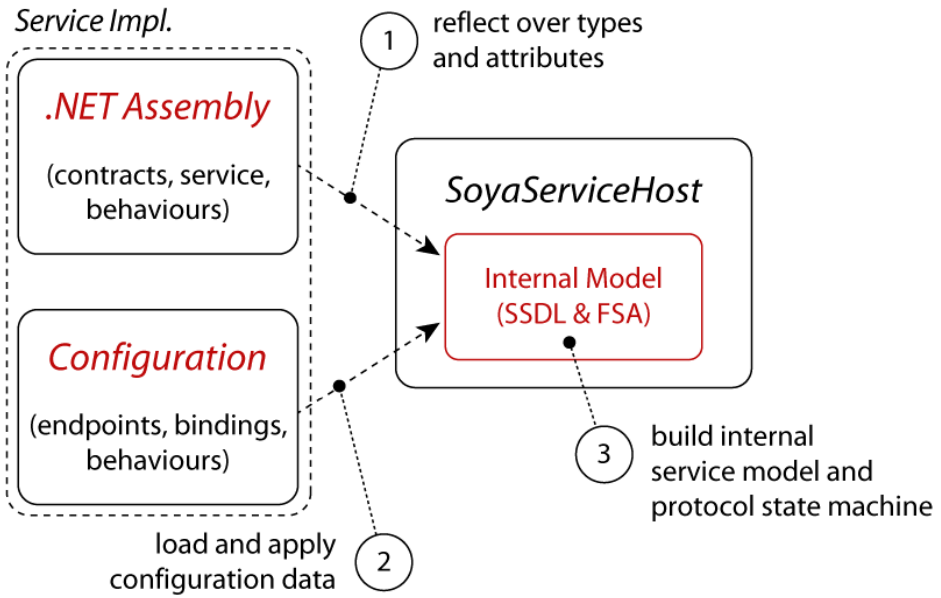
- Based on **WCF**
- **Processes** incoming and outgoing SOAP messages
- Ensures **contract conformance** (message structure and ordering)
- Features facilities for message **correlation** and **dispatching**



Runtime Environment

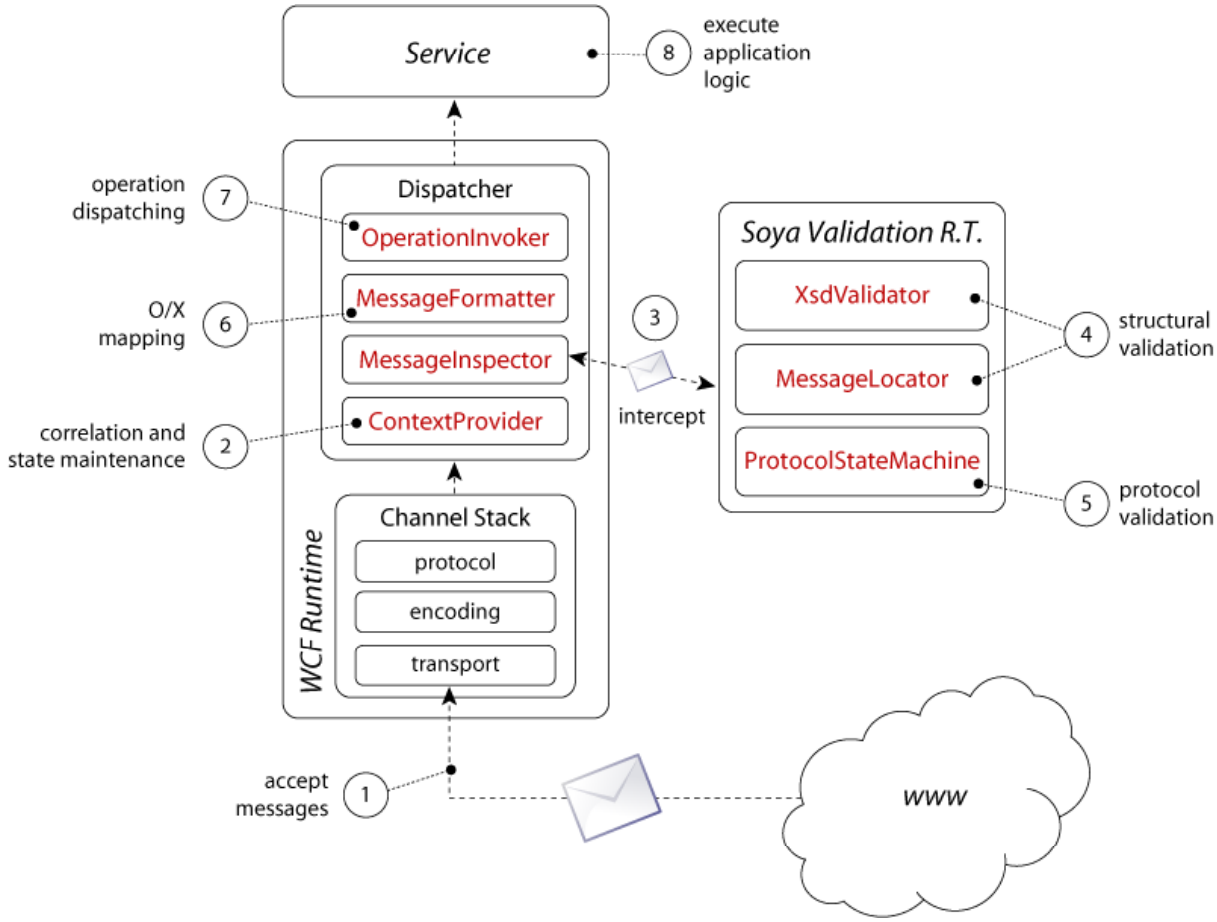
Building the Runtime

- Internal **service representation**
  - SSDL description
  - Protocol state machine
- **Creation** is protocol-specific and extensible
- **Usage** is protocol-agnostic



Runtime Environment

Processing Flow



Summary

What we have discussed today:

- **SSDL** is a message-centric approach for describing Web Services
  - SOAP & WS-Addressing
  - Protocols
- **Soya** is an SSDL **programming model**
  - C# metadata
- **Soya** is an SSDL **runtime environment**
  - Enacts contract conformance (message structure and ordering)
  - Facilities for correlation and state-based dispatching
  - Generates SSDL that can be exposed to other services

Questions

?

http://soya.sourceforge.net

http://patforna.blogspot.com