Quick Intro to XML Schemas & SOAP

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How SOAP uses Schemas

- To define SOAP's XML vocabulary
- Optionally: to define your msg. vocabulary
- SOAP encoding uses schema "types"
  - Schema builtin datatypes: integer, float, date, etc.
  - SOAP builtins for arrays & structs
  - Types you define in schema
  - You can indicate types:
    - Directly in your message using xsi:type
    - Optionally: in an external schema document

Schema WG Status

- Hope for candidate recommendation soon
- Three documents
  - Structures: the overall language
  - Datatypes: integer, float, date, etc.
  - Primer: start with this!
- Public working drafts available

A Schema

```
<xsd:schema xmlns:xsd="..." targetNamespace="yourURI">
 <xsd:element name="purchaseOrder" type="POType"/>
 <xsd:element name="comment" type="xsd:string"/>

 <xsd:complexType name="POType">
  <xsd:sequence>
   <xsd:element name="shipTo" type="USAddress"/>
   <xsd:element name="billTo" type="USAddress"/>
   <xsd:element ref="comment" minOccurs="0"/>
   <xsd:element name="items"  type="Items"/>
  </xsd:sequence>
  <xsd:attribute name="orderDate" type="xsd:date"/>
 </xsd:complexType>
        ........
</xsd:schema>
```

Namespaces and Schema Documents

One Schema Doc per Namespace

```
<xsd:schema xmlns:xsd="..." targetNamespace="yourURI">
 <xsd:element name="purchaseOrder" type="POType"/>
 <xsd:element name="comment" type="xsd:string"/>

 <xsd:com
  <xsd:se
   <xsd:e                                    ess"/>
   <xsd:e                                    ess"/>
   <xsd:e                                    "/>
   <xsd:e                                    />
  </xsd:s
  <xsd:at                                    d:date"/>
 </xsd:co
        .
</xsd:schema>
```

Validates:

```
<po:purchaseOrder
   xmlns:po="yourURI">
  ....
</po:purchaseOrder>
```

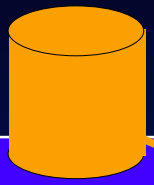
A SOAP Message

```
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://{soaporg}/envelope/"
  SOAP-ENV:encodingStyle=
       "http://{soaporg}/encoding/">

   <SOAP-ENV:Body>
       <m:GetLastTradePrice xmlns:m="Some-URI">
           <symbol>DIS</symbol>
       </m:GetLastTradePrice>
   </SOAP-ENV:Body>

</SOAP-ENV:Envelope>
```

SOAP Schema



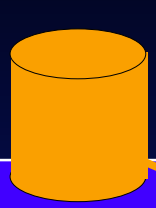
soapenv.xsd: *validates SOAP's vocabulary*

```
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://{soaporg}/envelope/"
  SOAP-ENV:encodingStyle=
       "http://{soaporg}/encoding/">

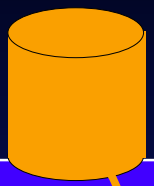
   <SOAP-ENV:Body>
       <m:GetLastTradePrice xmlns:m="Some-URI">
           <symbol>DIS</symbol>
       </m:GetLastTradePrice>
    </SOAP-ENV:Body>

</SOAP-ENV:Envelope>
```

SOAP Schema & User Schema



soapenv.xsd



stockquote.xsd

```
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://{soaporg}/envelope/"
  SOAP-ENV:encodingStyle=
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   <SOAP-ENV:Body>
       <m:GetLastTradePrice xmlns:m="Some-URI">
           <symbol>DIS</symbol>
       </m:GetLastTradePrice>
    </SOAP-ENV:Body>

</SOAP-ENV:Envelope>
```

Declaring Elements and Attributes

A Sample Instance

```
<?xml version="1.0"?>
<purchaseOrder orderDate="1999-10-20">
    <shipTo country="US">
        <name>Alice Smith</name>
        <street>123 Maple Street</street>
        <city>Mill Valley</city>
        <state>CA</state>
        <zip>90952</zip>
    </shipTo>
    <billTo country="US">...</billTo>
    <comment>Hurry, my lawn is going wild!</comment>
    <items>
        <item partNum="872-AA">...</item>
        <item partNum="926-AA">...</item>
    </items>
</purchaseOrder>
```

A Schema

```
<xsd:schema xmlns:xsd="..." targetNamespace="yourURI">
 <xsd:element name="purchaseOrder" type="POType"/>
 <xsd:element name="comment" type="xsd:string"/>

 <xsd:complexType name="POType">
  <xsd:sequence>
   <xsd:element name="shipTo" type="USAddress"/>
   <xsd:element name="billTo" type="USAddress"/>
   <xsd:element ref="comment" minOccurs="0"/>
   <xsd:element name="items"  type="Items"/>
  </xsd:sequence>
  <xsd:attribute name="orderDate" type="xsd:date"/>
 </xsd:complexType>
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</xsd:schema>
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Elements have Types

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 <xsd:complexType name="POType">
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 </xsd:complexType>
        ........
</xsd:schema>
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Elements have Types

```
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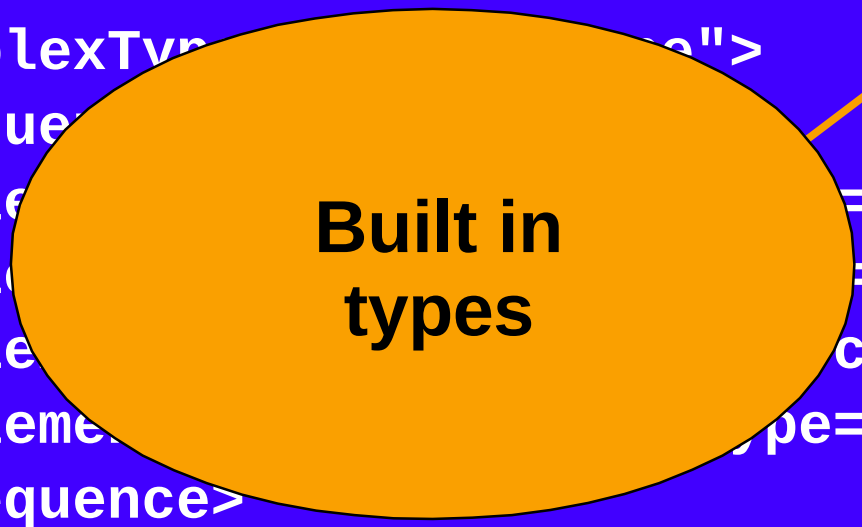
 <xsd:element name="purchaseOrder" type="POType"/>
 <xsd:element name="comment" type="xsd:string"/>

 <xsd:complexTyp                                  e">
  <xsd:seque
   <xsd:ele                                  ="USAddress"/>
   <xsd:el                                   ="USAddress"/>
   <xsd:ele                                  ccurs="0"/>
   <xsd:eleme                                pe="Items"/>
  </xsd:sequence>
  <xsd:attribute name="orderDate" type="xsd:date"/>
 </xsd:complexType>
        ........
</xsd:schema>
```



Elements have Types

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 <xsd:element name="purchaseOrder" type="POType"/>
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 <xsd:complexType name="POType">
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   <xsd:element name="shipTo" ty
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   <xsd:element ref="comment"
   <xsd:element name="items"  t
  </xsd:sequence>
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 </xsd:complexType>
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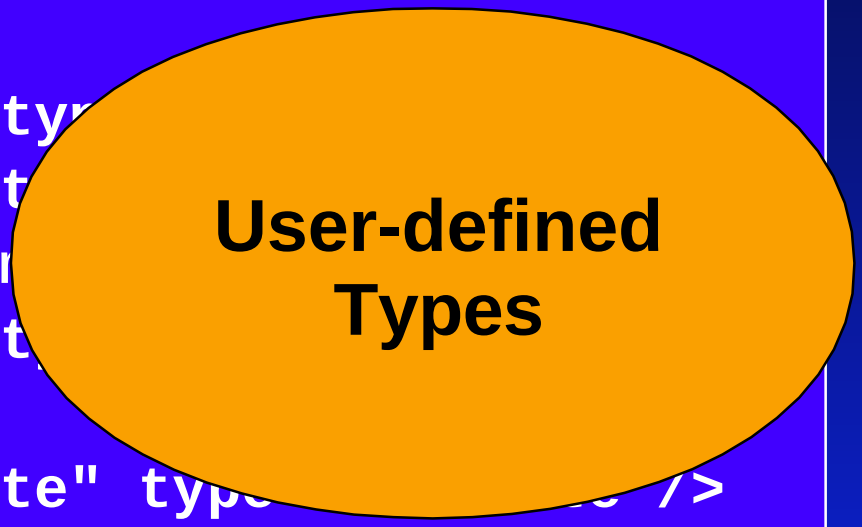

Global elements

```
<xsd:schema xmlns:xsd="..." targetNamespace="yourURI">
 <xsd:element name="purchaseOrder" type="POType"/>
 <xsd:element name="comment" type="xsd:string"/>

 <xsd:complexType name="POType">
  <xsd:sequence>
   <xsd:element name="shipTo" type="USAddress"/>
   <xsd:element name="billTo" type="USAddress"/>
   <xsd:element ref="comment" minOccurs="0"/>
   <xsd:element name="items"  type="
  </xsd:sequence>
  <xsd:attribute name="orderD
 </xsd:complexType>
        ........
</xsd:schema>
```

Locally scoped elements

```
<xsd:schema xmlns:xsd="..." tar
 <xsd:element name="purchaseOr
 <xsd:element name="comment" t

 <xsd:complexType name="POType
  <xsd:sequence>
   <xsd:element name="shipTo" type
   <xsd:element name="billTo" type="USAdd
   <xsd:element ref="comment" minOccurs="0"/>
   <xsd:element name="items"  type="Items"/>
  </xsd:sequence>
  <xsd:attribute name="orderDate" type="xsd:date"/>
 </xsd:complexType>
        ........
</xsd:schema>
```

Locally scoped elements useable only in parent type

Attributes have Types

```
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 <xsd:element name="purchaseOrder" type="POType"/>
 <xsd:element name="comment" type="xsd:string"/>

 <xsd:complexType name="POType">
  <xsd:sequence>
   <xsd:element name="shipTo" type="USAddress"/>
   <xsd:element name="billTo" type="USAddress"/>
   <xsd:element ref="comment" minOccurs="0"/>
   <xsd:element name="items"  type="Items"/>
  </xsd:sequence>
  <xsd:attribute name="orderDate" type="xsd:date"/>
 </xsd:complexType>
        ........
</xsd:schema>
```

Simple and Complex Types

Simple types

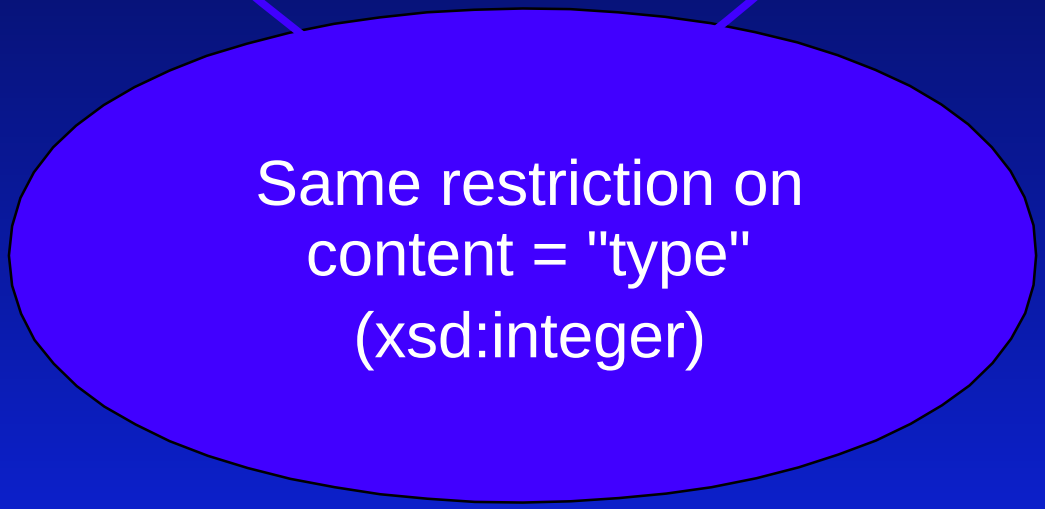
Attributes

```
width="10"   height="20"
```

Simple types

Attributes

```
width="10"   height="20"
```



Simple types

Attributes

```
width="10"   height="20"
```

Elements

```
<width>      <height>
   10           20
</width>     </height>
```

Simple type captures what's common:

- It's an integer
- Type has a name (xsd:integer)
- Simple types work on attrs and elements

Types for Elements

Simple type

```
<width>
   10
</width>
```

```
<height>
   20
</height>
```

Complex type

```
<width unit="cm">
   10
</width>
```

```
<height unit="cm">
   20
</height>
```

Type(s) capture what's common:

- It's an integer + attribute
- Type has a name (yourns:measure)

More Complex Types for Elements

Element

```
<ShipTo>
    <street>1 Main St.</street>
    <city state="NY">Albany</city>
</ShipTo>

<BillTo>
    <street>13 Market St.</street>
    <city state="CA">San Jose</city>
</BillTo>
```

Complex types are for elements:

- Sharing content models, attr lists.
- Type has a name (somens:address)

Self-describing SOAP Msgs

```
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://{soaporg}/envelope/"
  SOAP-ENV:encodingStyle=
       "http://{soaporg}/encoding/">

   <SOAP-ENV:Body>
       <m:GetLastTradePrice xmlns:m="Some-URI">
           <symbol xsi:type="xsd:string">
              DIS
           </symbol>
           <quoteDate xsi:type="xsd:date">
              1999-05-21
           </quoteDate>
       </m:GetLastTradePrice>
   </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Summary:
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