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XML documents

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Overview

- Goals –
  - General appreciation of XML
  - Sufficient detail to understand WSDLs

- Structure –
  - Philosophy
  - Detailed XML Format
  - Namespaces

A Markup Language

XML = eXtensible Markup Language

- "Markup" means document is an intermixing of
  - Content – the actual information to be conveyed - payload
  - Markup – information about the content - MetaData

    <date>22/10/1946</date>

    <date> … </date> is markup – says that the content is a date
  - Self-describing document
  - date is part of a markup vocabulary –
    - a collection of keywords used to identify syntax and semantics of constructs in an XML document

Extensibility

XML = eXtensible Markup Language

- "Extensible" means the markup vocabulary is not fixed
- Compare with similar NON-extensible language
  - HTML (Hypertext Markup Language)
  - Fixed markup vocabulary e.g

    ** This is a paragraph. I like it. This is another paragraph **
  - A presentation language for describing how a document should be presented for human consumption –

    This *is a paragraph. I like it.*

    This is ***another*** *paragraph*
  - For HTML the language is fixed and implicit in the fact that this is an HTML document – single-language document
- XML requires explicit definition of the language
- One document can combine multiple languages

Multi-lingual Documents

```
<businessForms:Invoice>
        <date>
                <USnotations:date>        10/22/2004        </..>
        </..>
        <product>
                <businessForms:barCode>123-768-252        </..>
        </..>
        <quantity>
                <metricMeasures:kilos>    17.53             </..>
        </..>
</..>
```

- **businessForms:Invoice**
  - **An Invoice construct within the businessForms language**
- **BusinessForms (mythical)**
  - **A language defining structure of business documents**
  - **For business interoperability**
  - **Doesn't prescribe the language of individual items such as dates**
    - **Taken from separate languages - USnotations:date**
- **Language names are actually universally unique URIs – www.DesperatelyTryingToStandardise.org/BusinessForms - see later**

Multilingual Pros & Cons

```
<businessForms:Invoice>
        <date>          <USnotations:date>          10/22/2004      </..> </..>
        <product>       <businessForms:barCode>123-768-252          </..> </..>
        <quantity>      <metricMeasures:kilos>      17.53           </..> </..>
</..>
```

- Separation of concerns – Design Factoring
  - Design of purchase order structure and date format etc are independent concerns
  - Re-use of language definitions, e.g. date formats in many languages
  - Extensibility – Purchase order accommodates new product identification schemes (e.g. ISBN for book stores)
- Of course, only works if both ends “understand” all languages used
- Makes things more complex –
  - Creating and identifying the languages

Types of XML Language

- Fundamental Standards
  - E.g. SOAP - the language for soap messages
    - soap-envelope:header soap-envelope:body
    - A soap message is an XML document and its parts are identified using this vocabulary
  - Goal is a factoring that gives pick-and-mix of combinable standards
  - Associated with any WS standard will be a Schema definition of its XML language

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- Community conventions
  - Perhaps, our BusinessForms language
- Specialised Data Structure
  - Java configuration tables

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- Specific Application Language
  - myProgram:parameter1
  - The language used in invoking particular operations of a web service

Human & Machine Oriented

How it really looks

```
<businessForms:Invoice>
   <date>
      <USnotations:date>
         10/22/2004
      </USnotations:date>
   </date>
   <product>
      <businessForms:barCode>
         123-768-252
      </businessForms:barCode>
   </product>
   <quantity>
      <metricMeasures:kilos>
         17.53
      </metricMeasures:kilos>
   </quantity>
</ businessForms:Invoice >
```

- **Human readable**
  - Sort of - OK with decent editor
  - Is de-buggable
  - Important for meta-data documents,
    - E.g. WSDL
- **Machine processable**

  Self description enables
  - General tools for producing and consuming XML documents
- **Verbose**
  - OK except for large data
  - Messages may have attachments not in XML

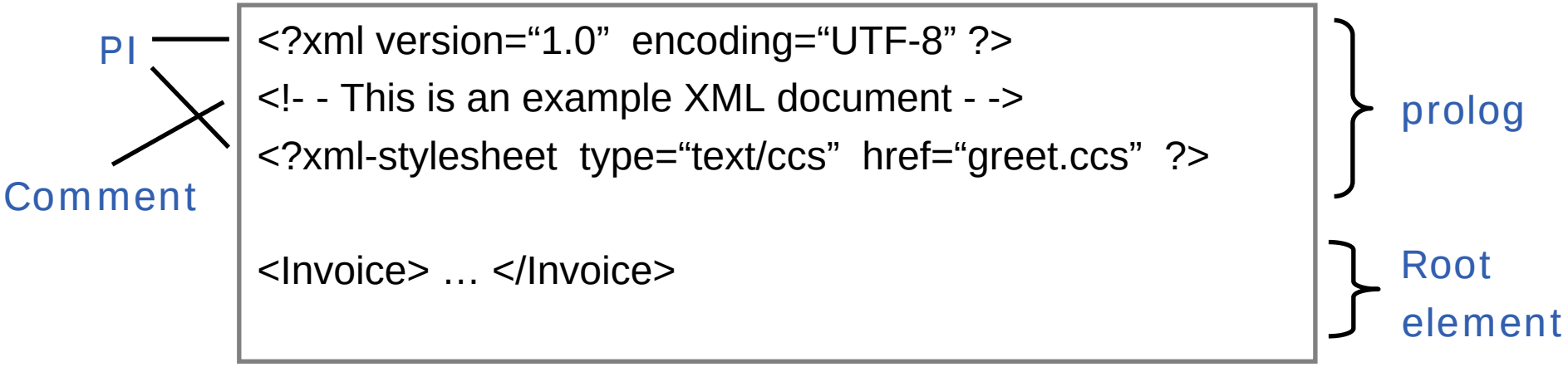
XML – DETAILED FORMAT

- Structure
  - Philosophy
  - Detailed XML Format
  - Namespaces

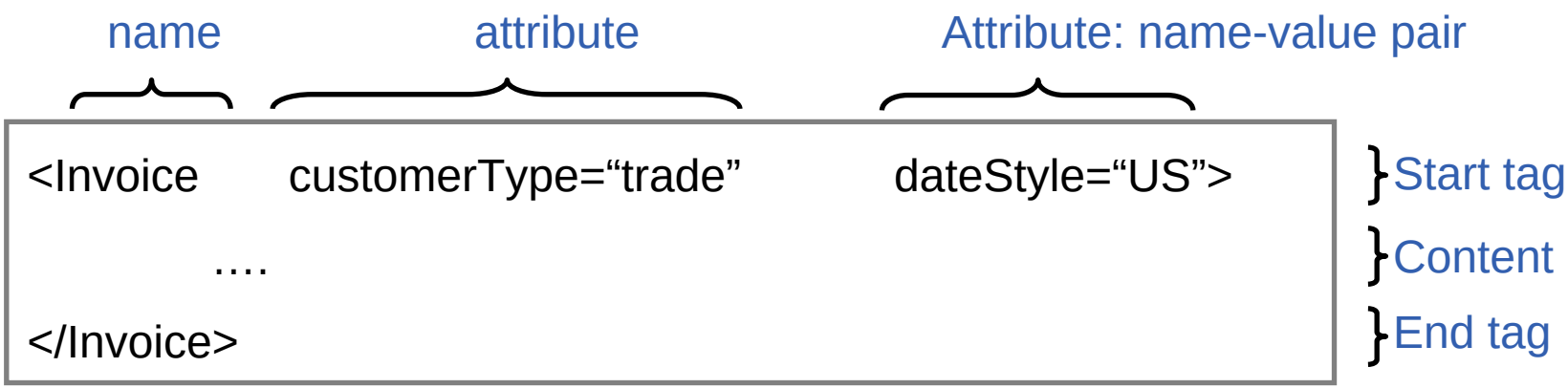
Document Structure

Main structure of document is

- **Prolog – like headers; usualy standard and un-interesting**
- **Element – the actual document – recursively has nested elements**
  - **Immediately following the prolog**
- **Miscellaneous –**
  - **white space and "supplementals" allowed throughout with some restrictions**
  - **Supplemental – a Comment**
    a Processing Instruction (PI)



Element Structure



- **Principal element structure –**
  - Start Tag – <…>
    - Name of element
    - Zero or more attributes
      - Each a name-value pair
      - Uniquely named;
      - Order insignificant
  - Content – possibly nested elements, and other things
  - End Tag - </ … >
    - Name – MUST be same name as in matching Start Tag
- **Like HTML – but stricter – must have end tag**

Attributes

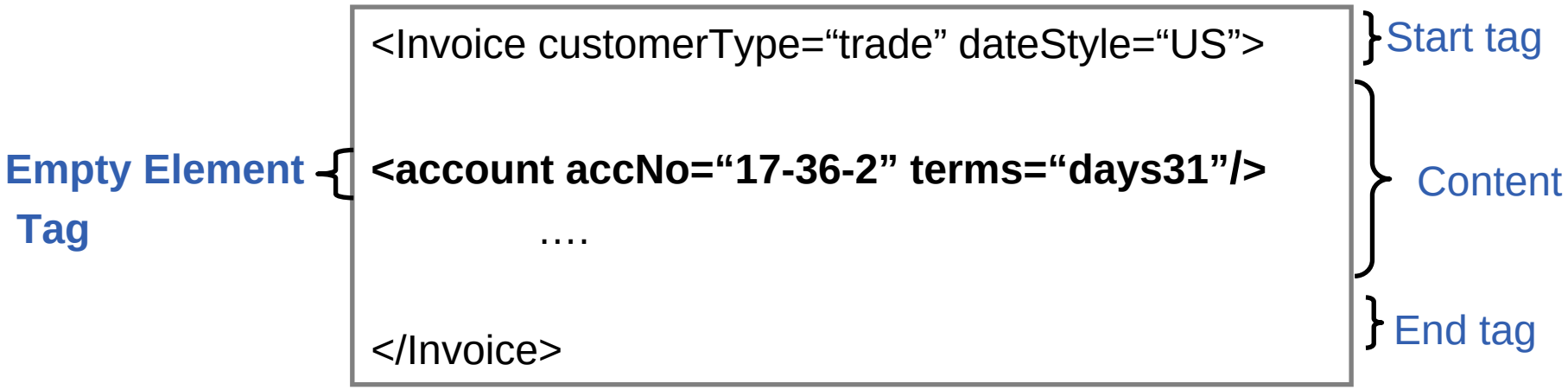
<Invoice customerType="trade" dateStyle="US"> …. </Invoice>

- **A name-value pair that is included in the start tag of an element**
- **Name is part of specific language**
- **Value may also be part of a specific language – QName – qualified name**
- **More properly the above might be**

```
< BusinessForms:Invoice
    BusinessForms:customerType ="BusinessForms:trade"
    BusinessForms:dateStyle="USnotations:date">
   …
</BusinessForms:Invoice>
```

- **This starts to get convoluted –**
  necessary for designing for multi-lingual documents

Empty Elements



Empty Element Tags –

<account accNo="17-36-2" terms="days31"/>

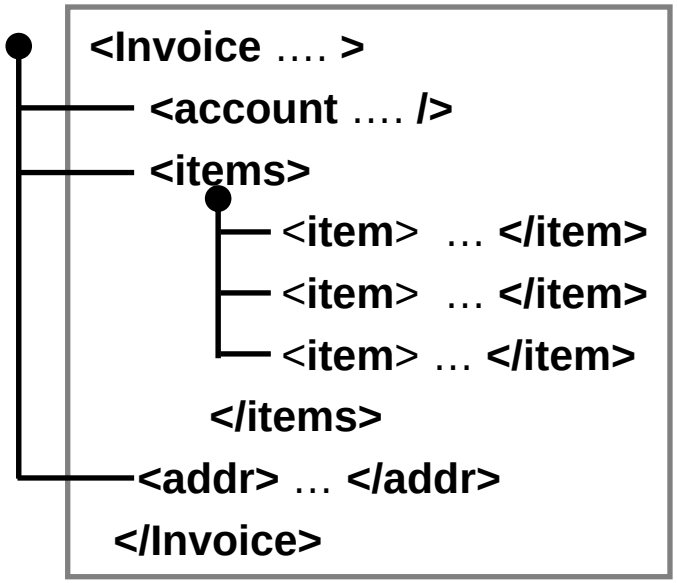
- **Shorthand for element with no content**
- **just attributes perhaps**
- **indicated by /> not >**

Same as

<account accNo="17-36-2" terms="days31">
</account >

Nested Elements

```
<Invoice customerType="trade" dateStyle="US">
    <account accNo="17-36-2" terms="days31"/>
    <item>  … </item>
    <item>  … </item>
    <item> … </item>
    <addr> … </addr>
</Invoice>
```



- **Account and Items are child elements –**
  - Non-unique names
  - Usually order is significant
- **This is not a usual programming language configuration**
- **Best if each compound item is either**
  - Structure (Struct) – uniquely named components
  - Array – multiple same-named components

Direct Character (Simple) Content

```
<Invoice customerType="trade" dateStyle="US">
    <account accNo="17-36-2" terms="days31"/>
    <item> <date>10/24/04</date>  <price> 17.35 </price> </item>
    <item> <date> 10/29/04 </date>  <price> 2173.35 </price> </item>
</Invoice>
```

- **<price> 17.35 </price> is an element with just character data**
  - **A simple value**
- **All simple values are text strings, but may have particular syntax and interpretation as decimal, integer, date, ….**

Notation

```
<Invoice customerType="trade" dateStyle="US">
  <item>
    <date>                          10/24/04        </>
    <price currency="Euro">         17.34           </>
    <productCode>                   17-23-57        </>
    <quantity>                      17.5            </> </>
  <item>                            …
                                                    </>
  <item>
    <date>                          10/24/04        </>
                                    ….              </> </> </>
```

- **Will use XML a lot - Schemas, Soap messages, WSDLs –**
  - so use clearer/briefer notations
- **Textual – direct translation to actual XML**
  - **Generally will use indentation to indicate structure**
  - **Abbreviate End Tags to just </>**
  - **Always have to actually put name in end tag !!!!**
- **Tree diagram – to emphasise structure**

XML - NAMESPACE

- **Structure**
  - **Philosophy**
  - **Detailed XML Format**
  - **Namespaces**

Namespaces

```
<invoice>                                   <!-- INT = International -->
   <deliveryAddress>
      <UK:address> …<INT:street>…</> …<UK:county>…</> <UK:postCode>…</></>
   <billingAddress>
      <US:address> …<INT:street>…</> …<US:state>…</>    <US:zip>…</> </>
    …. …. </>
```

- **A namespace (= “language”)**
  - Defines a collection of names (a vocabulary)
    - For UK : {address, county, postCode, …. }
  - Usually has an associated syntax (e.g. Schema definition)
    - address = … county, postCode, …
    - Syntax may be available to S/W processing it
  - Implies a semantics – the (programmer writing) S/W processing a UK:address knows what it means
  - Provides a unique prefix for disambiguating names from different originators
    - UK vs. US vs. INT

Namespace Names

- **To get uniqueness of namespace name, use a URI**
  - **UK:**postCode is really
    HTTP://www.UKstandards.org/Web/XMLForms:postCode
    (mythical)
  - The URI might be a real URL, for accessing the syntax definition, documentation, ….
  - But it may be just an identifier within the internet domain owned by the namespace owner

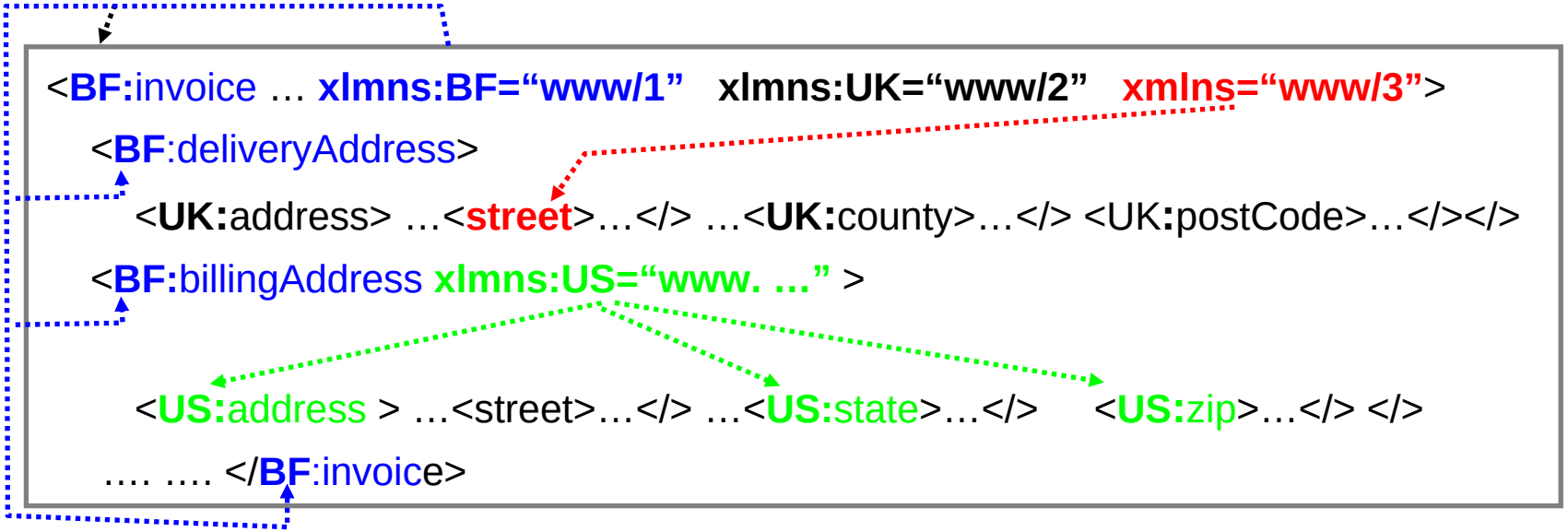
Namespace Prefixes

UK:postCode is really **www.UKstandards.org/Web/XMLForms**:postCode

- **But HTTP://www.UKstandards.org/Web/XML/Forms:postCode is**
  - Tediously long to use throughout the document
  - Outside XML name syntax
    - Namespaces are not part of XML
    - A supplementary standard http://www.w3.org/TR/REC-xml-names
      A W3C recommendation

- **In an XML document**
  - declare a namespace prefix, as an attribute of an element
    - xmlns:**UK**="HTTP://www.UKstandards.org/Web/XML/Forms"
  - then use that for names in that namespace - UK**:**postCode
    - **UK:**post code is called a **QName** (qualified name)

Namespace Prefix Declarations



- **Namespace declaration occurs as an attribute of an element**
  - i.e. within a start tag
- **Scope is from beginning of that start tag to matching end tag**
  - Excluding scope of nested re-declarations of same prefix
- **Can declare a default namespace**
  - xlmns="www/3" – this is the name space for all un-qualified names in the scope of this declaration, eg. Street
  - But no defaulting for attributes – if no prefix, no namespace

Well-formed and Valid

- **Well-formed means it conforms to the XML syntax, e.g.**
  - Start and end tags nest properly with matching names
- **Valid means it conforms to the syntax defined by the namespaces used**
  - Can't check this without a definition of that syntax –
    - Normally a Schema
    - DTD (document Type Definitions) – deprecated
    - Others type definition system
      - *– some more sophisticated than Schemas*

THE END

- **THE END**