

DTD Elements

Declaring an Element

With an element declaration XML elements are declared in the DTD. An element declaration has the following syntax:

```
<!ELEMENT element-name category>  
or  
<!ELEMENT element-name (element-content)>
```

```
<!ELEMENT brand (#PCDATA)>
```

Example of a DTD (author2.dtd)

```
<!ELEMENT note (body)>  
<!ELEMENT body (#PCDATA)>
```

Example 1 of XML using this DTD

```
<?xml version="1.0" standalone="no"?>  
<!DOCTYPE note SYSTEM "author2.dtd">  
<note>  
<body>example</body>  
</note>
```

Example of XML not obeying this DTD

```
<?xml version="1.0" standalone="no"?>  
<!DOCTYPE note SYSTEM "author2.dtd">  
<note></note>
```

Empty Elements

Empty elements are declared with the category keyword **EMPTY**:

```
<!ELEMENT element-name EMPTY>
```

example:

```
<!ELEMENT br EMPTY>
```

XML example:

```
<br />
```

Example of a DTD (author3.dtd)

```
<!ELEMENT note (body)>  
<!ELEMENT body EMPTY>
```

Example 1 of XML using this DTD

```
<?xml version="1.0" standalone="no"?>  
<!DOCTYPE note SYSTEM "author3.dtd">  
<note>  
<body/>  
</note>
```

Example of XML not obeying this DTD

```
<?xml version="1.0" standalone="no"?>  
<!DOCTYPE note SYSTEM "author3.dtd">  
<note>  
<body>example</body>  
</note>
```

Elements with only character data

Elements with only character data are declared with #PCDATA inside parentheses:

```
<!ELEMENT element-name (#PCDATA)>
```

example:

```
<!ELEMENT from (#PCDATA)>
```

The description (**#PCDATA**) stands for parsed character data.

It's the tag that is shown and also will be parsed (interpreted) by the program that reads the XML document. You can also define (**#CDATA**), this stands for character data. CDATA will not be parsed.

Elements with any contents

Elements declared with the category keyword ANY, can contain any combination of parsable data:

```
<!ELEMENT element-name ANY>
```

example:

```
<!ELEMENT note ANY>
```

“|” means either-or ”,” means succession. EMPTY (without parenthesis) means no contained data.

Example of a DTD (author1.dtd)

```
<!ELEMENT author (givenname,surname)>
<!ELEMENT givenname (#PCDATA)>
<!ELEMENT surname (#PCDATA)>
```

<p><u>Example 1 of XML using this DTD</u></p> <pre><?xml version="1.0" standalone="no"?> <!DOCTYPE author SYSTEM "author1.dtd"> <author> <givenname>Margaret</givenname> <surname>York</surname> </author></pre>	<p><u>Example of XML not obeying this DTD</u></p> <pre><?xml version="1.0" standalone="no"?> <!DOCTYPE author SYSTEM "author1.dtd"> <author> <givenname>Margaret</givenname> </author></pre>
---	---

Example of a DTD (author.dtd)

```
<!ELEMENT author (givenname|surname)>
<!ELEMENT givenname (#PCDATA)>
<!ELEMENT surname (#PCDATA)>
```

<p><u>Example of XML obeying this DTD</u></p> <pre><?xml version="1.0" standalone="no"?> <!DOCTYPE author SYSTEM "author.dtd"> <author> <givenname>Margaret</givenname> </author></pre>	<p><u>Example of XML not obeying this DTD</u></p> <pre><?xml version="1.0" standalone="no"?> <!DOCTYPE author SYSTEM "author.dtd"> <author> <givenname>Margaret</givenname> <surname>York</surname> </author></pre>
--	--

Number of sub elements

If you use **<!ELEMENT car (brand, type) >**, the sub elements brand and type can occur once inside the element car. To change the number of possible occurrences the following indications can be used:

If an element name in DTD is followed by

- the star [*] - This element can occur zero, once or several times.
- the plus [+] - This element can occur once or several times.
- the question mark [?] - This element can occur zero or one times.

The indications are used behind the sub element name. For instance:

```
<!ELEMENT animal (color+) >
```

(a*) means that a is repeated 0, 1 or more times.

Declaring minimum one occurrence of the same element

```
<!ELEMENT element-name (child-name+)>
```

example

```
<!ELEMENT note (message+)>
```

The + sign in the example above declares that the child element message must occur one or more times inside the note element.

Declaring zero or more occurrences of the same element

```
<!ELEMENT element-name (child-name*)>
```

example

<!ELEMENT note (message*)>

The * sign in the example above declares that the child element message can occur zero or more times inside the note element.

Declaring zero or one occurrences of the same element

<!ELEMENT element-name (child-name?)>

example

<!ELEMENT note (message?)>

The ? sign in the example above declares that the child element message can occur zero or one times inside the note element.

Example of a DTD (author4.dtd)

<!ELEMENT family (father,mother,child*)>

<!ELEMENT father (#PCDATA)>

<!ELEMENT mother (#PCDATA)>

<!ELEMENT child (#PCDATA)>

Example 1 of XML using this DTD

```
<?xml version="1.0"?>
<!DOCTYPE family SYSTEM "author4.dtd">
<family>
<father>John</father>
<mother>Margaret</mother>
<child>Eve</child>
<child>Peter</child>
</family>
```

Example 1 of XML not satisfies this DTD

```
<?xml version="1.0"?>
<!DOCTYPE family SYSTEM "author4.dtd">
<family>
<mother>Margaret</mother>
<child>Eve</child>
<child>Peter</child>
</family>
```

(a+) means that a is repeated 1 or more times.

Example of a DTD (author5.dtd)

<!ELEMENT child-family (father,mother,child+)>

<!ELEMENT father (#PCDATA)>

<!ELEMENT mother (#PCDATA)>

<!ELEMENT child (#PCDATA)>

Example 1 of XML using this DTD

```
<?xml version="1.0" ?>
<!DOCTYPE child-family SYSTEM "author5.dtd">
<child-family>
<father>John</father>
<mother>Margaret</mother>
<child>Eve</child>
<child>Peter</child>
</child-family>
```

Example 1 of XML using this DTD

```
<?xml version="1.0" ?>
<!DOCTYPE child-family SYSTEM "author5.dtd">
<child-family>
<father>John</father>
<mother>Margaret</mother>
</child-family>
```

(a?) means that the element a is repeated 0 or 1 times.

Example of a DTD (d6.dtd)

<!ELEMENT basic-family (father?,mother?,child*)>

<!ELEMENT father (#PCDATA)>

<!ELEMENT mother (#PCDATA)>

<!ELEMENT child (#PCDATA)>

<u>Example of XML using this DTD</u>	<u>Example of XML not obeying this DTD</u>
<pre><?xml version="1.0" ?> <!DOCTYPE basic-family SYSTEM "d6.dtd"> <basic-family> <father>John</father> <child>Eve</child> <child>Peter</child> </basic-family></pre>	<pre><?xml version="1.0" ?> <!DOCTYPE basic-family SYSTEM "d6.dtd"> <basic-family> <father>John</father> <father>John2</father> <child>Eve</child> <child>Peter</child> </basic-family></pre>

Example of a DTD

```
<!ELEMENT operations (((get | put),uri)*)>
<!ELEMENT get EMPTY>
<!ELEMENT put EMPTY>
<!ELEMENT uri (#PCDATA)>
```

Example of XML using this DTD

```
<?xml version="1.0" standalone="no"?>
<!DOCTYPE operations SYSTEM
"http://www.dsv.su.se/~jpalme/internet-course/xml/operations.dtd">
<operations>
<get/><uri>http://cmc.dsv.su.se/file1</uri>
<get/><uri>http://cmc.dsv.su.se/file2</uri>
<put/><uri>http://cmc.dsv.su.se/file3</uri>
</operations>
```

Declaring mixed content

Example

```
<!ELEMENT note (to+,from,header,message*,#PCDATA)>
```

The example above declares that the element **note** must contain at least one **to** child element, exactly one **from** child element, exactly one **header**, zero or more **message**, and some other parsed **character data** as well.

- 1) Explain the uses of symbols ?, *,+ in element definitions in DTD
- 2) Explain <!ELEMENT > tag
- 3) Explain the difference between ' ' and '| ' operators in element definition of DTD
- 4) Explain keyword EMPTY and ANY
- 5) Explain with example how we define mixed element in DTD