ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

Εισαγωγή στην Επιστήμη και Τεχνολογία των Υπηρεσιών

Ενότητα 7: XSLT

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Ευρωπαϊκή Ένωση
Ευρωπαϊκό Κοινωνικό Ταμείο
ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ
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επένδυση στην κοινωνία της γνώσης
ΥΠΟΥΡΓΕΙΟ ΠΑΙΔΕΙΑΣ & ΘΡΗΣΚΕΥΜΑΤΩΝ, ΠΟΛΙΤΙΣΜΟΥ & ΑΘΛΗΤΙΣΜΟΥ
ΕΙΔΙΚΗ ΥΠΗΡΕΣΙΑ ΔΙΑΧΕΙΡΙΣΗΣ
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ΕΥΡΩΠΑΪΚΟ ΚΟΙΝΩΝΙΚΟ ΤΑΜΕΙΟ
Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης

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- Το παρόν εκπαιδευτικό υλικό έχει αναπτυχθεί στα πλαίσια του εκπαιδευτικού έργου του διδάσκοντα.
- Το έργο «**Ανοικτά Ακαδημαϊκά Μαθήματα στο Πανεπιστήμιο Κρήτης**» έχει χρηματοδοτήσει μόνο τη αναδιαμόρφωση του εκπαιδευτικού υλικού.
- Το έργο υλοποιείται στο πλαίσιο του Επιχειρησιακού Προγράμματος «Εκπαίδευση και Δια Βίου Μάθηση» και συγχρηματοδοτείται από την Ευρωπαϊκή Ένωση (Ευρωπαϊκό Κοινωνικό Ταμείο) και από εθνικούς πόρους.

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XML
XSLT
605.444 / 635.444

David Silberberg

Lecture 14

Guts of XSLT

- XSLT operates on programmer-defined templates
- An XSLT document can have 0, 1, or many templates defined
- Templates match against patterns in the incoming XML document
- If a portion (or all) of the XML document is matched by a template
  - The internals of the template are executed
  - Their results are output
- If multiple templates match, there are rules that determine which one to apply.

Example

```
<?xml version=“1.0”?>
<xsl:stylesheet version=“1.0”
    xmlns:xsl=“http://www.w3.org/1999/XSL/Transform”>
     <xsl:template match=“/”>
          <HTML>
          <TITLE>Name document</TITLE>
          <BODY>
          <xsl:for-each select=“//name”>
               <P>Name: <xsl:value-of select=“.”/></P>
          </xsl:for-each>
          </BODY>
          </HTML>
     </xsl:template>
</xsl:stylesheet>
```

Template Characteristics

```
<xsl:template match="/" >
   <HTML>

   <TITLE>Name document</TITLE>
   <BODY>
   <xsl:for-each select="//name">
         <P>Name: <xsl:value-of select="."/></P>
   </xsl:for-each>
   </BODY>
   </HTML>
</xsl:template>
```

Match criteria

Output specification

Output Specifications

- The inside of the <xsl:template …> … </xsl:template> tags describe the output
- All XML tags are output
- All text is output
- Tags that start with **<xsl:** are special operations
  - XSLT process performs operations on the matching template
  - The result of the operations is output
  - <xsl:for-each select="//name"> matches any tag <name> in the document
  - <xsl:value-of select="."/> does something with the matched tag

Example

- Remember *customer.xml*?

```
<?xml version="1.0"?>
<customers>
        <good>
                <name>Jones, Fred</name>
                <name>Li, Sue</name>
                <name>Carnot, John</name>
        </good>
        <bad>
                <name>Tell, William</name>
                <name>Carr, Sam</name>
        </bad>
</customers>
```

Example Output

```
<HTML>
<TITLE>Name document</TITLE>
<BODY>
      <P>Name:Jones, Fred</P>
      <P>Name:Li, Sue</P>
      <P>Name:Carnot, John</P>
      <P>Name:Tell, William</P>
      <P>Name:Carr, Sam</P>
</BODY>
</HTML>
```

XSLT Order of Operations

- XSL processors do not:
  - Read your document in order and apply templates
  - Read the templates in order and apply them to the document
- XSL processors:
  - Look for the template(s) that match the root
  - Apply it (them) to the document
- Common match to root:
  - <xsl:template match="/">
- Another matches to root:
  - <xsl:template match="/[transaction]" >
  - Matches a root with the name <transaction>
- The most specific match is checked first and applied, if possible.

Default Templates

- Highest level match

```
<xsl:template match="*|/">
        <xsl:apply-templates/>
</xsl:template>
```

  - Applied if there is no other document root match defined

- Lowest level match

```
<xsl:template match="text()|@*">
        <xsl:value-of select="."/>
</xsl:template>
```

  - Applied to tag if nothing else matches it

Default Templates (cont.)

- Both are active if your XSL document has no templates.
- By default, the XSL processor will output the values of the elements and the attributes.
- When the root is matched, the entire document is "read in" to the processor.
- <xsl:apply-templates/> informs the processor to apply other templates to what was "read in."
- Any match, such as <xsl:template match="/">, overrides the default.

Recall sales.xml

```
<?xml version=“1.0”?>
<transaction>
	<salesman>
		<lastname>Smith</lastname>
		<firstname>Fred</firstname>
		<mi>P</mi>
	</salesman>
	<customer>
		<name>Frank Thomas</name>
		<address>10 Maple Street</address>
		<city>Columbia</city>
		<state>MD</state>
		<zip>22222</zip>
	</customer>
```

Recall sales.xml - (cont.)

```
        <date>
                <year>2001</year>
                <month>12</month>
                <day>22</day>
        </date>
        <item>
                <name>Cat Chow</name>
                <size>30</size>
                <qty>2</qty>
                <unitprice>9.95</unitprice>
        </item>
</transaction>
```

Context Nodes from Templates

- Whatever is matched becomes the context
- Children of <salesman>:

```
<xsl:template match="/transaction/salesman">
        <xsl:value-of select="*">
</xsl:template>
```

- All parent tags that contain <name>:

```
<xsl:template match="//name">
        <xsl:value-of select="parent::*">
</xsl:template>
```

  – Yields both <customer> and <item>

Circumventing the Context Node

- You can still have access to nodes outside the context

```
<xsl:template match=“/transaction/customer”>
    <xsl:value-of select=“/transaction/salesman/lastname”/>
</xsl:template>
```

- You can also use axis specifications

```
<xsl:template match=“/transaction/customer”>
    <xsl:value-of select=“preceding-
                        sibling::salesman/lastname”/>
</xsl:template>
```

The Basics - Stylesheets

- <xsl:stylesheet>
- This defines the stylesheet for XSL processors
- Must follow <?xml …?> statement
- In <xsl:stylesheet …>
  - Specify version
  - Specify namespace
- Follow this by template list

Stylesheet Example

```
<?xml version=“1.0”?>
<xsl:stylesheet version=“1.0”
    xmlns:xsl=“http://www.w3.org/1999/XSL/Transform”>
     <xsl:template match=...>
          ...
     </xsl:template>
     <xsl:template match=...>
          ...
     </xsl:template>
     ...
</xsl:stylesheet>
```

Simplifying Stylesheets for HTML

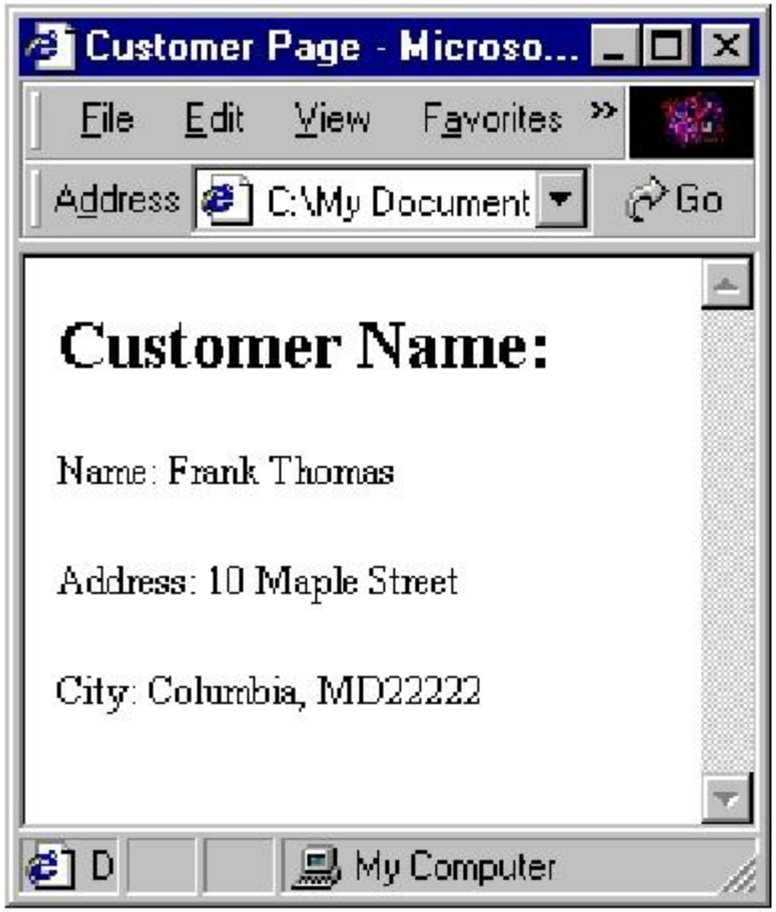
- Regular stylesheet that prints out customer information:

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
   <xsl:template match="/">
     <HTML><TITLE>Customer Page</TITLE>
        <BODY>
        <H1>Customer Name:</H1>
        <P>Name: <xsl:value-of select="/transaction/customer/name"/></P>
        <P>Address: <xsl:value-of select="/transaction/customer/address"/></P>
        <P>City: <xsl:value-of select="/transaction/customer/city"/>,
           <xsl:value-of select="/transaction/customer/state"/>
           <xsl:value-of select="/transaction/customer/zip"/> </P>
        </BODY>
     </HTML>
   </xsl:template>
</xsl:stylesheet>
```

Simplifying Version of Stylesheet

```
<HTML xsl:version="1.0"
    xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
<TITLE>Customer Page</TITLE>
<BODY>
  <H1>Customer Name:</H1>
  <P>Name: <xsl:value-of select="/transaction/customer/name"/></P>
  <P>Address: <xsl:value-of select="/transaction/customer/address"/></P>
  <P>City: <xsl:value-of select="/transaction/customer/city"/>,
    <xsl:value-of select="/transaction/customer/state"/>
    <xsl:value-of select="/transaction/customer/zip"/> </P>
</BODY>
</HTML>
```

Simplifying Version Display



Customer Name:

Name: Frank Thomas

Address: 10 Maple Street

City: Columbia, MD22222

Template Attributes

- <xsl:template match=“XPath Expression”
  name=“template name”
  priority=“number”
  mode=“mode name”>
- match
  - Matches XPath pattern
  - Not actual path!
  - Example: //name - matches all <name> nodes
- name
  - Lets you name the template
  - Can specifically call the template by name

Template Attributes (cont.)

- priority
  - There is normally a set of rules by which the XSLT processor uses to select template
  - On occasion, two or more might conflict
  - This provides a way to prioritize the templates
- mode
  - Allows multiple templates to be applied to same nodes
  - Will process the same templates in different “modes”
  - Will describe in more detail later

Apply Templates

- <xsl:apply-templates select="XPath Expression" mode="mode name">
- Used to call other templates
- Sets the context to the path defined in the XPath Expression
  - If not specified, the current context node is used
- The mode determines which templates to apply (more later)
- Remember the default

```
<xsl:template match="*|/">
    <xsl:apply-templates/>
</xsl:template>
```

  - XPath or mode must be different if you want different results

Value Of

- <xsl:value-of select="XPath Expression"
  disable-output-escaping="yes or no" />
- Searches the context node for the path specified in XPath
- Then, inserts data from the context node into the output
  – <xsl:value-of select="name"/>
    - Inserts text value of name element
  – <xsl:value-of select="name/@id"/>
    - Inserts text value of id attribute of name element

Example Apply Templates to customer.xsl

ApplyTemplate.xsl:

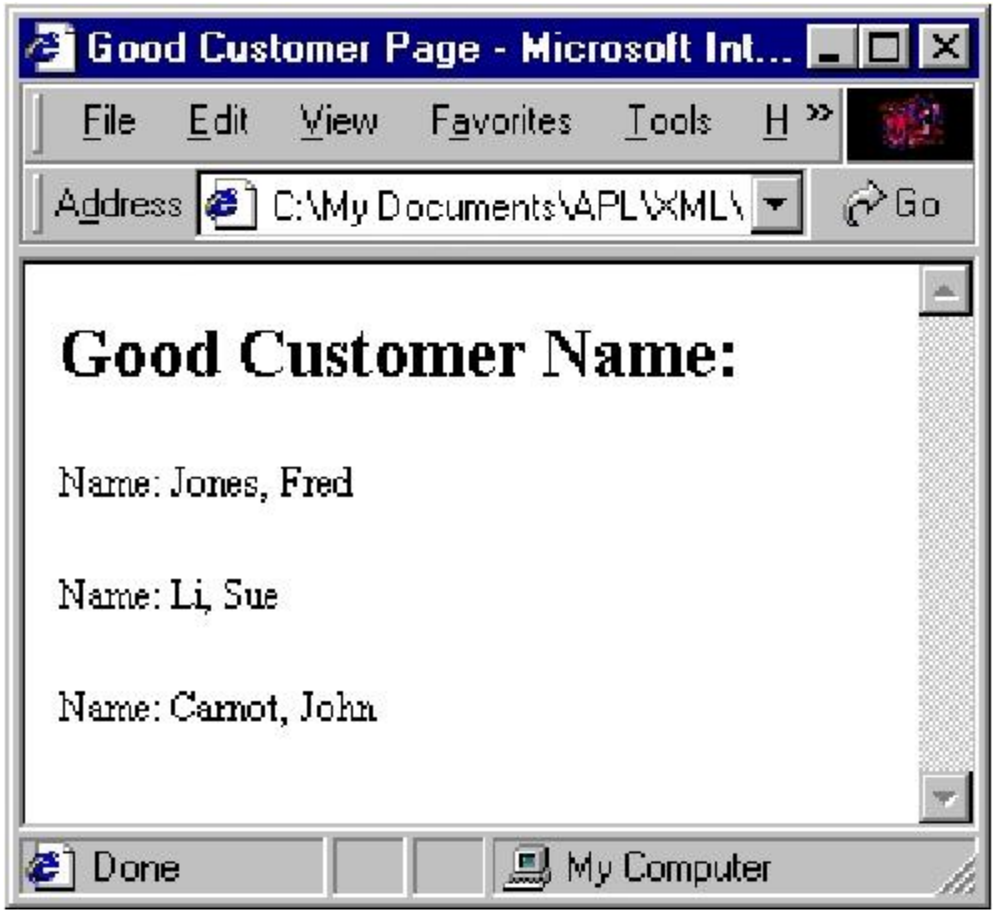
```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
   <xsl:template match="/">
     <HTML><TITLE>Good Customer Page</TITLE>
        <BODY>
        <H1>Good Customer Name:</H1>
        <xsl:apply-templates select="/customers/good" />
        </BODY>
     </HTML>
   </xsl:template>

   <xsl:template match=”name">
        <P>Name: <xsl:value-of select=“."/></P>
   </xsl:template>
</xsl:stylesheet>
```

Apply Templates Output

Running XSLT processor yields:

```
<HTML>
<TITLE>Good Customer Page</TITLE>
<BODY>
<H1>Good Customer Name:</H1>
        <P>Name: Jones, Fred</P>
        <P>Name: Li, Sue</P>
        <P>Name: Carnot, John</P>
</BODY>
</HTML>
```

Apply Templates Display


Good Customer Page - Microsoft Int...
File Edit View Favorites Tools H
Address C:\My Documents\APL\XML\
Go
Done
My Computer

Good Customer Name:

Name: Jones, Fred

Name: Li, Sue

Name: Carnot, John

More on Value Of Command

- disable-output-escaping
  - Enables XSLT to output “**&**” , “**<**“ , and “ “ instead of **&amp;** , **&lt;** , and **&nbsp;** with the **“yes”** option
  - With the **“no”** option, it will just produce **&amp;** , **&lt;** , and **&nbsp;**
- This is useful for many reasons
- Will discuss this later with the <xsl:text …> command

Output Command

- <xsl:output method="xml or html or text"

  version="version"

  encoding="encoding"

  omit-xml-declaration="yes or no"

  standalone="yes or no"

  cdata-section-elements="CDATA sections"

  indent="yes or no"/>

- Must be top-level element below <xsl:stylesheet …>
- Tells XSL processor how to format output

Rules for Output

- **method**
  - Specifies whether XML, HTML, or Text is produced
  - XSL processor can support other types of output if desired
- If <xml:output …> not specified, method is:
  - HTML if the root element of the result tree is <HTML>
  - XML otherwise
- XSL processor can do special things based on the method
  - Change <BR/> for XML-compliant documents to <BR> for HTML documents
  - etc.

More on Output

- **version**, **encoding** and **standalone**
  - Used for XML processing
  - Used to create the result tree of XML document
- **version** is the XML version
- **encoding** is the *suggested* encoding value
  - XSL processor may use it
  - However, it can ignore it
  - For example, XSL processor may change a “windows-1252” suggestion to a “utf-8” coding
    - Maybe XSL processor does not handle “windows-1252”
    - Maybe XSL processor may detect object platform
- **standalone=“yes”** indicates that there are no external references

Even More on Output

- **omit-xml-declaration**
  - As it states: omits XML declaration statement from the output
  - Might be for a number of reasons
  - Output document could be:
    - Included in another document
    - An XML-stylesheet
  - Default is “no” if the method is XML
    - In this case, XML declaration will appear in output document
- **indent**
  - “no” specifies that no indenting will occur - tags will be run on in some XSL processors
  - “yes” specifies that that pretty printing will occur

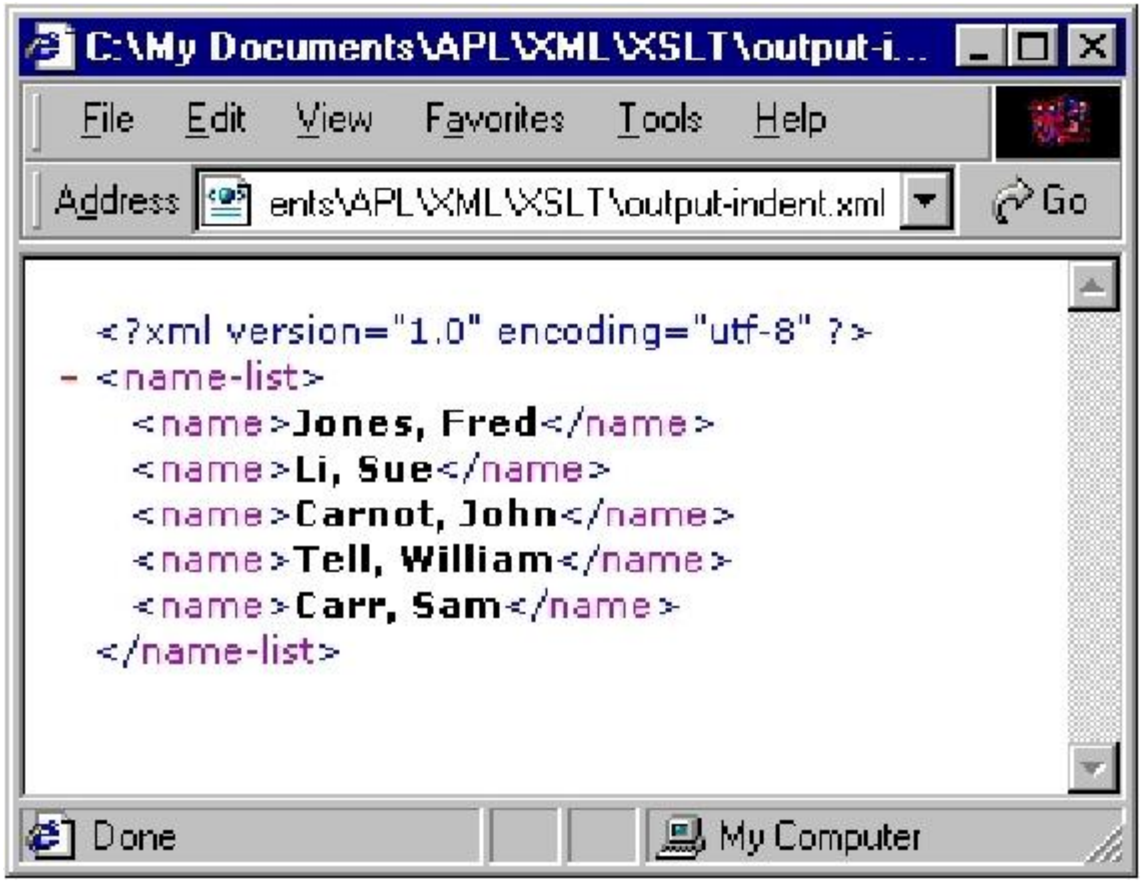
Indent Example

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
<xsl:output method="xml" indent="yes"/>

   <xsl:template match="/">
     <name-list>
     <xsl:apply-templates/>
     </name-list>
   </xsl:template>

   <xsl:template match="//name">
     <name><xsl:value-of select="."/></name>
   </xsl:template>
</xsl:stylesheet>
```

Indent Output

```
<?xml version="1.0" encoding="utf-8"?>
<name-list>

    <name>Jones, Fred</name>
    <name>Li, Sue</name>
    <name>Carnot, John</name>



    <name>Tell, William</name>
    <name>Carr, Sam</name>

</name-list>
```

Indent Display


C:\My Documents\APL\XML\XSLT\output-i...
File Edit View Favorites Tools Help
Address ents\APL\XML\XSLT\output-indent.xml
Go
Done
My Computer

```
  <?xml version="1.0" encoding="utf-8" ?>
- <name-list>
    <name>Jones, Fred</name>
    <name>Li, Sue</name>
    <name>Carnot, John</name>
    <name>Tell, William</name>
    <name>Carr, Sam</name>
  </name-list>
```

Element

- <xsl:element name=“element name”
  use-attribute-sets=“attribute set names”>
- This enables elements to be created dynamically.
- This is in case the element name in not known à priori
- Using the previous example, instead of:

```
<xsl:template match="//name">
   <name><xsl:value-of select="."/></name>
</xsl:template>
```

the following may be specified:

```
<xsl:template match="//name">
   <xsl:element name=“name”><xsl:value-of select="."/></xsl:element>
</xsl:template>
```

Element (cont.)

- This is not so interesting.
- However, the following may be done:

```
<xsl:template match="//name">
   <xsl:element name=“{.}”><xsl:value-of select="."/></xsl:element>
</xsl:template>
```

- This builds the element name dynamically.
- Any XPath Expression can be placed in the parentheses.

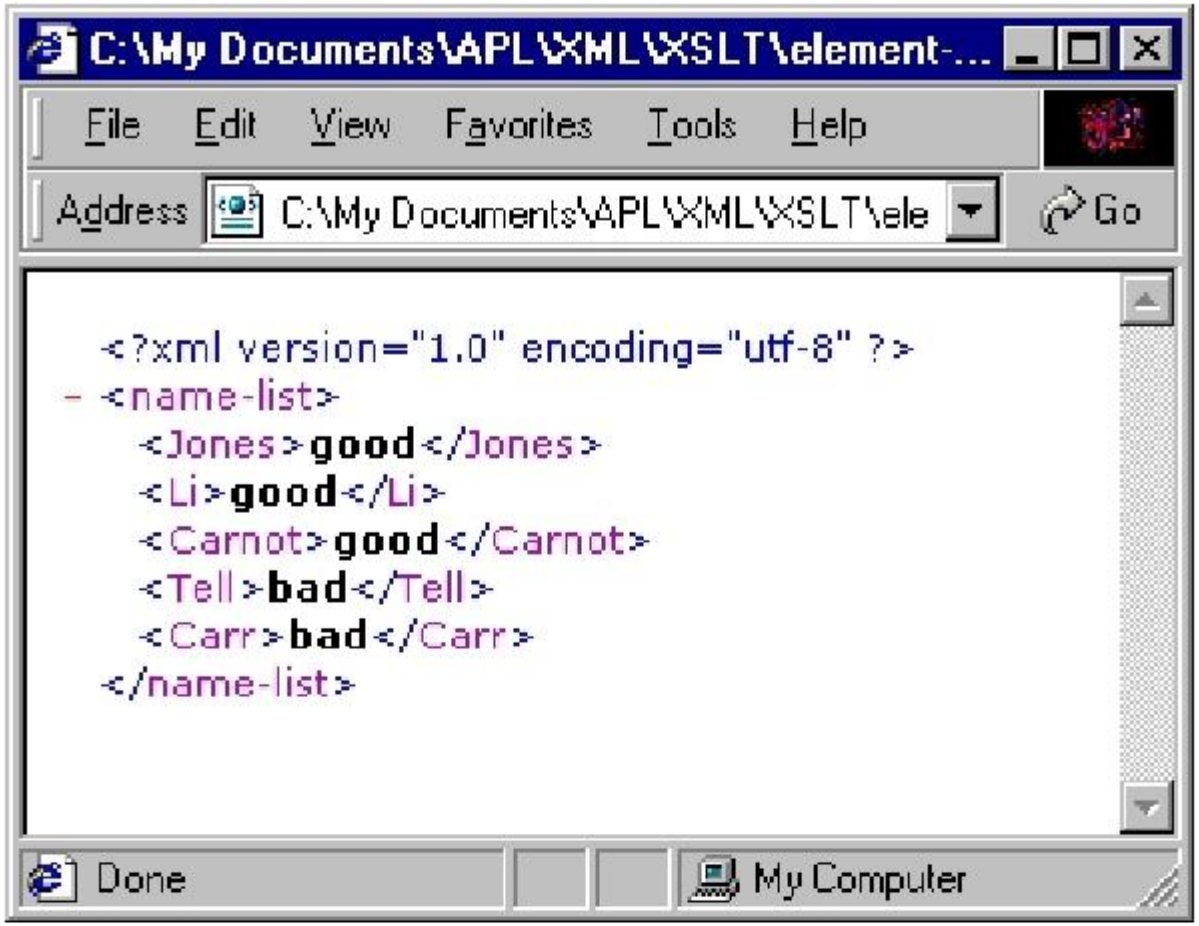
Element Example

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
    xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
    <xsl:template match="/">
      <name-list>
      <xsl:apply-templates/>
      </name-list>
    </xsl:template>
    <xsl:template match="//name">
      <xsl:element name="{substring-before(., ',')}">
                <xsl:value-of select="name(..)"/>
      </xsl:element>
    </xsl:template>
</xsl:stylesheet>
```

Element Output

```
<?xml version="1.0" encoding="utf-8"?>
<name-list>

    <Jones>good</Jones>
    <Li>good</Li>
    <Carnot>good</Carnot>


    <Tell>bad</Tell>
    <Carr>bad</Carr>

</name-list>
```

Element Display


C:\My Documents\APL\XML\XSLT\element-...
File Edit View Favorites Tools Help
Address C:\My Documents\APL\XML\XSLT\ele
Go
Done
My Computer

```
  <?xml version="1.0" encoding="utf-8" ?>
- <name-list>
    <Jones>good</Jones>
    <Li>good</Li>
    <Carnot>good</Carnot>
    <Tell>bad</Tell>
    <Carr>bad</Carr>
  </name-list>
```

Attributes

- <xsl:attribute name=“attribute name”>
- Creates attributes and their values

```
<xsl:template match=“//name”>
    <name>
        <xsl:attribute name=“last”>
            <xsl:value-of  select=“substring-before(., ',')”/>
        </xsl:attribute>
        <xsl:attribute name=“first”>
            <xsl:value-of  select=“substring-after(., ',')”/>
        </xsl:attribute>
    </name>
</xsl:template>
```

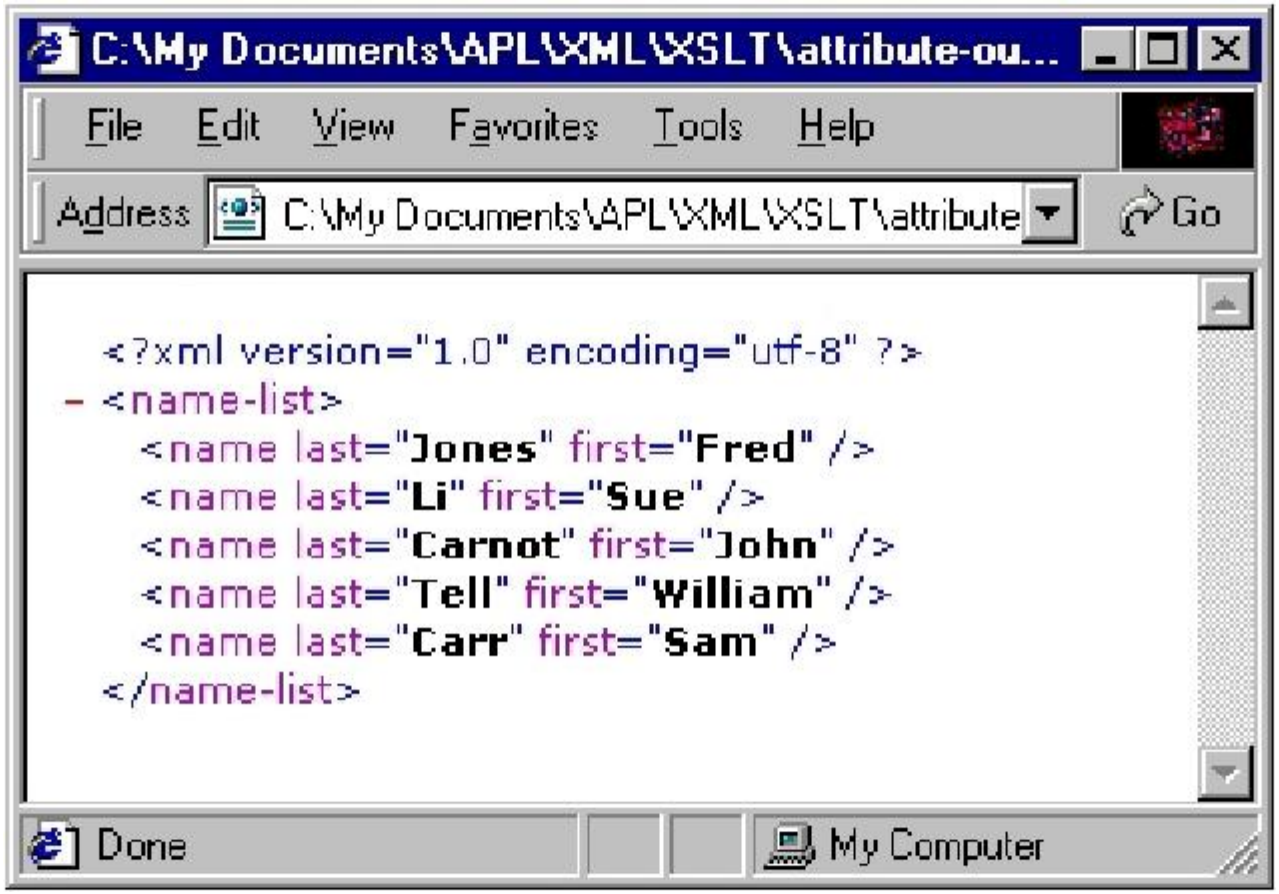
Attributes Example

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
   <xsl:template match="/">
      <name-list>
      <xsl:apply-templates/>
      </name-list>
   </xsl:template>
   <xsl:template match="//name">
      <name>
            <xsl:attribute name="last"> <xsl:value-of  select="substring-before(., ',')"/></xsl:attribute>
            <xsl:attribute name="first"><xsl:value-of  select="substring-after(., ',')"/></xsl:attribute>
      </name>
   </xsl:template>
</xsl:stylesheet>
```

Attributes Output

```
<?xml version="1.0" encoding="utf-8"?>
<name-list>

    <name last="Jones" first=" Fred"/>
    <name last="Li" first=" Sue"/>
    <name last="Carnot" first=" John"/>


    <name last="Tell" first=" William"/>
    <name last="Carr" first=" Sam"/>

</name-list>
```

Attribute Output Display


C:\My Documents\APL\XML\XSLT\attribute-ou...
File Edit View Favorites Tools Help
Address C:\My Documents\APL\XML\XSLT\attribute
Go
Done
My Computer

```
  <?xml version="1.0" encoding="utf-8" ?>
- <name-list>
    <name last="Jones" first="Fred" />
    <name last="Li" first="Sue" />
    <name last="Carnot" first="John" />
    <name last="Tell" first="William" />
    <name last="Carr" first="Sam" />
  </name-list>
```

Attribute Sets

- <xsl:attribute-set   name=“name of this attribute set”

  use-attribute-sets=“attr set names”>
- Sets of attributes can be related in an attribute set
- We can define a set of attributes that always give first and last names

```
<xsl:attribute-set name=“FirstAndLast”>
    <xsl:attribute name="last"> <xsl:value-of  select="substring-before(.,',')"/>
    </xsl:attribute>
    <xsl:attribute name="first"><xsl:value-of  select="substring-after(.,',')"/>
    </xsl:attribute>
</xsl:attribute-set>
```

- Attribute sets can also use other attribute sets!

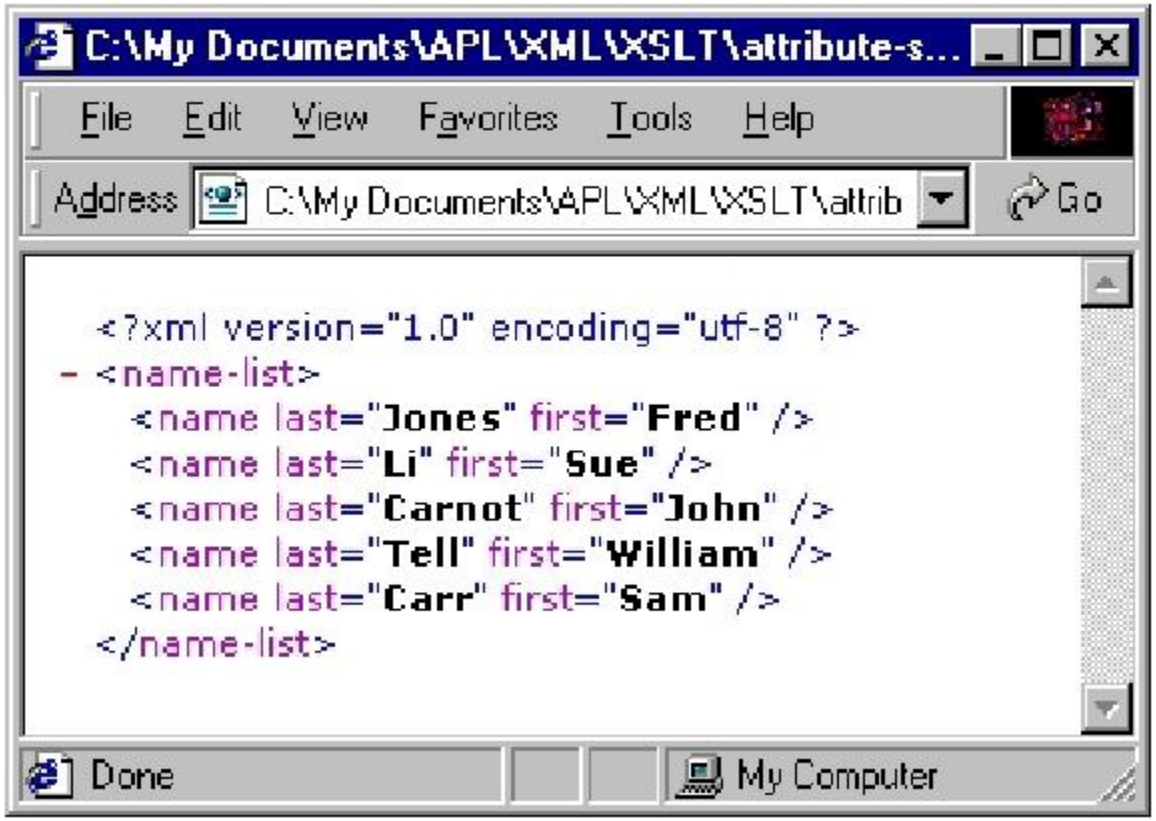
Attribute Sets Example

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
<xsl:template match="/">
      <name-list>
      <xsl:apply-templates/>
      </name-list>
   </xsl:template>
   <xsl:template match="//name">
      <xsl:element name="{name()}" use-attribute-sets="FirstAndLast"/>
   </xsl:template>
   <xsl:attribute-set name="FirstAndLast">
      <xsl:attribute name="last"><xsl:value-of select="substring-before(.,',')"/></xsl:attribute>
      <xsl:attribute name="first"><xsl:value-of select="substring-after(.,',')"/></xsl:attribute>
   </xsl:attribute-set>
</xsl:stylesheet>
```

Attribute Sets Output

```
<?xml version="1.0" encoding="utf-8"?>
<name-list>

    <name last="Jones" first=" Fred"/>
    <name last="Li" first=" Sue"/>
    <name last="Carnot" first=" John"/>


    <name last="Tell" first=" William"/>
    <name last="Carr" first=" Sam"/>

</name-list>
```

Attribute Sets Display


C:\My Documents\APL\XML\XSLT\attribute-s...
File Edit View Favorites Tools Help
Address C:\My Documents\APL\XML\XSLT\attrib
Go
Done
My Computer

```
  <?xml version="1.0" encoding="utf-8" ?>
- <name-list>
    <name last="Jones" first="Fred" />
    <name last="Li" first="Sue" />
    <name last="Carnot" first="John" />
    <name last="Tell" first="William" />
    <name last="Carr" first="Sam" />
  </name-list>
```

Text

- <xsl:text>
- Inserts PCDATA text into the output
- Most of the time, XSL processors output text anyway
- However, it is useful in two cases
  - If white spaces are to be inserted into output
  - If output escaping is to be disabled
- Suppose the names are to be transposed

```
<xsl:template match=“name”>
        <P><xsl:value-of select=“substring-after(., ‘,’)”/>
                <xsl value-of select=“substring-before(., ‘,’)”/> </P>
</xsl:template>
```

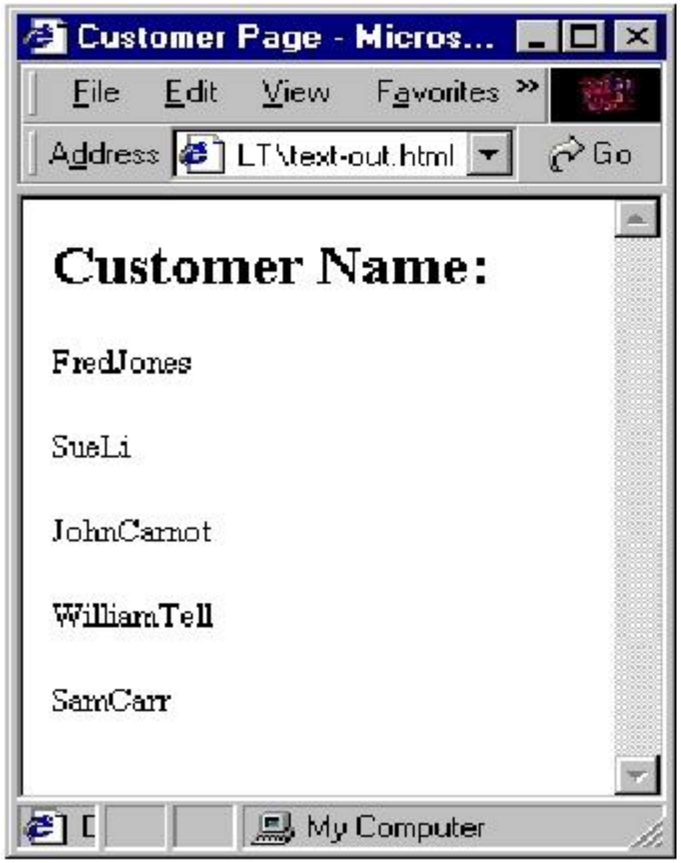
Text Example

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
   <xsl:template match="/">
      <HTML><TITLE>Customer Page</TITLE>
         <BODY>
               <H1>Customer Name:</H1>
               <xsl:apply-templates/>
         </BODY>
      </HTML>
   </xsl:template>
   <xsl:template match="//name">
      <P><xsl:value-of select="substring-after(., ',')"/>
        <xsl:value-of select="substring-before(., ',')"/> </P>
   </xsl:template>
</xsl:stylesheet>
```

Text Output

```
<HTML>
<TITLE>Customer Page</TITLE>
<BODY>
<H1>Customer Name:</H1>


      <P> FredJones</P>
      <P> SueLi</P>
      <P> JohnCarnot</P>



      <P> WilliamTell</P>
      <P> SamCarr</P>

</BODY>
</HTML>
```

Text Display



Customer Name:

FredJones

SueLi

JohnCarnot

WilliamTell

SamCarr

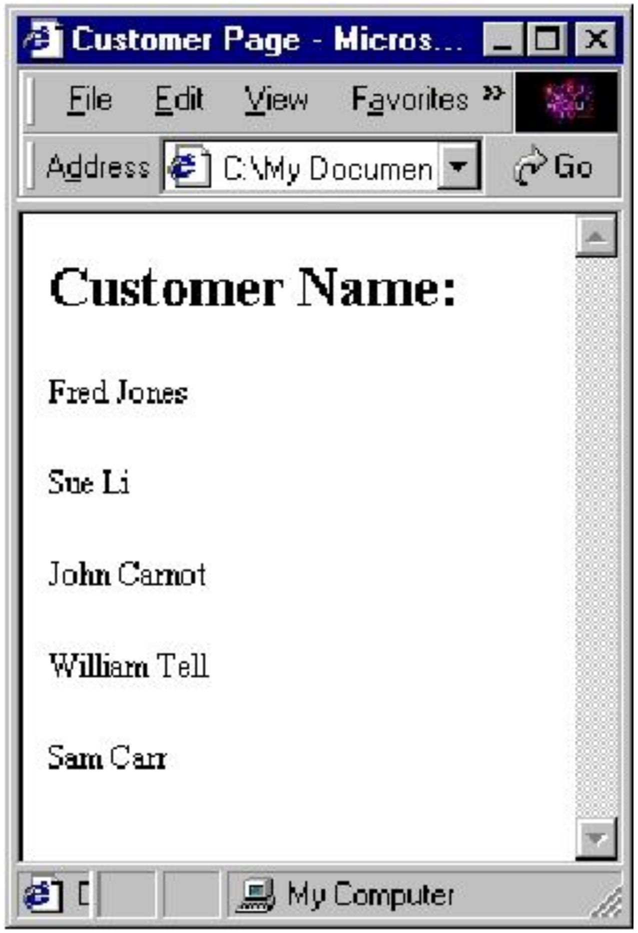
Corrected Text Example

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
   <xsl:template match="/">
      <HTML><TITLE>Customer Page</TITLE>
         <BODY>
                <H1>Customer Name:</H1>
                <xsl:apply-templates/>
         </BODY>
      </HTML>
   </xsl:template>
   <xsl:template match="//name">
      <P><xsl:value-of select="substring-after(., ',')"/>
        <xsl:text> </xsl:text>
        <xsl:value-of select="substring-before(., ',')"/> </P>
   </xsl:template>
</xsl:stylesheet>
```

Corrected Text Output

```
<HTML>
<TITLE>Customer Page</TITLE>
<BODY>
<H1>Customer Name:</H1>

    <P> Fred Jones</P>
    <P> Sue Li</P>
    <P> John Carnot</P>



    <P> William Tell</P>
    <P> Sam Carr</P>


</BODY>
</HTML>
```

Corrected Text Display



Customer Name:

Fred Jones

Sue Li

John Carnot

William Tell

Sam Carr

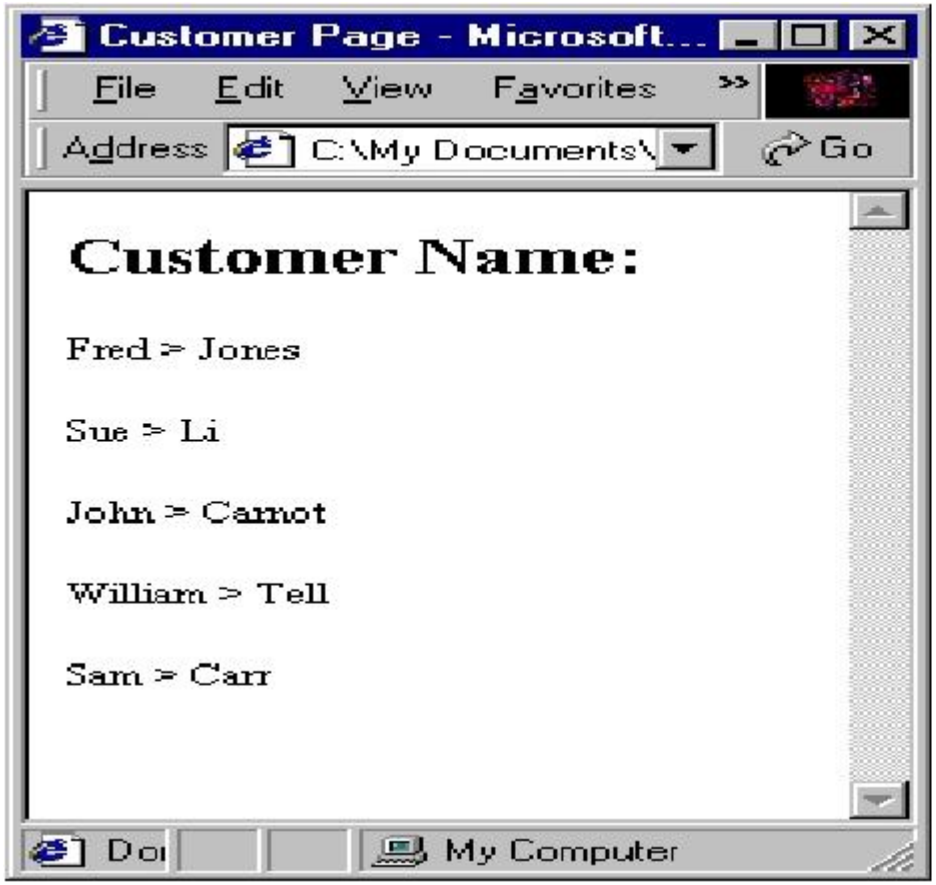
Text Example for Special Characters

```
<?xml version="1.0"?>
<xsl:stylesheet version="1.0"
   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
   <xsl:template match="/">
      <HTML><TITLE>Customer Page</TITLE>
         <BODY>
                <H1>Customer Name:</H1>
                <xsl:apply-templates/>
         </BODY>
      </HTML>
   </xsl:template>
   <xsl:template match="//name">
      <P><xsl:value-of select="substring-after(., ',')"/>
        <xsl:text disable-output-escaping="yes"> &gt; </xsl:text>
        <xsl:value-of select="substring-before(., ',')"/> </P>
   </xsl:template>
</xsl:stylesheet>
```

Text Output for Special Characters

```
<HTML>
<TITLE>Customer Page</TITLE>
<BODY>
<H1>Customer Name:</H1>

    <P> Fred > Jones</P>
    <P> Sue > Li</P>
    <P> John > Carnot</P>



    <P> William > Tell</P>
    <P> Sam > Carr</P>

</BODY>
</HTML>
```

Special Character Display



Customer Name:

Fred > Jones

Sue > Li

John > Carnot

William > Tell

Sam > Carr

Τέλος Ενότητας