

CHAPTER 3

Constructing XML with T-SQL

T-SQL allows you to convert relational results sets into XML, by using the FOR XML clause in your SELECT statement. There are four modes that can be used with the FOR XML clause; FOR XML RAW, FOR XML AUTO, FOR XML PATH, and FOR XML EXPLICIT. This chapter will demonstrate how the FOR XML clause works in RAW mode, AUTO mode, PATH mode, and EXPLICIT mode. As the chapter progresses, we will move from simple to more complex examples.

Using FOR XML RAW

The simplest and easiest to understand of the FOR XML modes is FOR XML RAW. This mode will transform each row in a relational result set into an element within a flat XML document. Consider the query in Listing 3-1, which extracts details of sales orders from the WideWorldImporters database.

Listing 3-1. WideWorldImporters Sales Order Query

```
SELECT
    SalesOrder.OrderDate
    , Customers.CustomerName
    , SalesOrder.OrderID
    , LineItem.StockItemID
```

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```

, LineItem.Quantity
, LineItem.UnitPrice
FROM Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
    ON LineItem.OrderID = SalesOrder.OrderID
INNER JOIN Warehouse.StockItems Product
    ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Sales.Customers Customers
    ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele' ;

```

This query extracts the details of orders placed by a customer called Agrita Abele. A partial output of the query can be found in Figure 3-1.

	OrderDate	CustomerName	OrderID	StockItemName	Quantity	UnitPrice
1	2016-05-19	Agrita Abele	72787	Developer joke mug - when your hammer is C++ (Black)	2	13.00
2	2016-05-19	Agrita Abele	72787	Developer joke mug - when your hammer is C++ (White)	9	13.00
3	2016-05-27	Agrita Abele	73350	DBA joke mug - you might be a DBA f (Black)	4	13.00
4	2016-05-27	Agrita Abele	73350	Developer joke mug - that's a hardware problem (Black)	3	13.00
5	2016-05-19	Agrita Abele	72770	"The Gu" red shirt XML tag t-shirt (Black) 5XL	120	18.00
6	2016-05-18	Agrita Abele	72637	"The Gu" red shirt XML tag t-shirt (Black) XXL	24	18.00
7	2016-05-27	Agrita Abele	73350	Halloween zombie mask (Light Brown) S	24	18.00
8	2016-05-18	Agrita Abele	72669	Halloween skull mask (Gray) M	60	18.00
9	2016-05-19	Agrita Abele	72787	Fury gonits with big eyes slippers (Black) XL	9	32.00
10	2016-05-27	Agrita Abele	73350	Tape dispenser (Blue)	90	32.00
11	2016-05-18	Agrita Abele	72713	Tape dispenser (Red)	20	32.00
12	2016-05-19	Agrita Abele	72770	Superhero action jacket (Blue) S	8	25.00
13	2016-05-27	Agrita Abele	73350	RC toy sedan car with remote control (Red) 1/50 scale	2	25.00
14	2016-05-18	Agrita Abele	72637	Superhero action jacket (Blue) 3XS	1	25.00
15	2016-05-19	Agrita Abele	72770	Black and orange handle with care despatch tape 48mmx100m	96	4.10
16	2016-05-18	Agrita Abele	72671	Alien officer hoodie (Black) 4XL	6	35.00
17	2016-05-18	Agrita Abele	72637	Fury animal socks (Pink) S	96	5.00
18	2016-05-18	Agrita Abele	72669	Permanent marker black 5mm nib (Black) 5mm	84	2.70
19	2016-05-27	Agrita Abele	73340	Superhero action jacket (Blue) 5XL	2	34.00
20	2016-05-27	Agrita Abele	73356	Chocolate sharks 250g	192	8.55
21	2016-05-19	Agrita Abele	72787	Novelty chilli chocolates 250g	240	8.55
22	2016-05-18	Agrita Abele	72671	Packing knife with metal insert blade (Yellow) 9mm	35	1.89
23	2016-05-18	Agrita Abele	72671	Shipping carton (Brown) 480x270x320mm	150	2.74
24	2016-05-19	Agrita Abele	72770	Shipping carton (Brown) 356x229x229mm	175	1.14
25	2016-05-19	Agrita Abele	72787	Ride on big wheel monster truck (Black) 1/12 scale	4	345.00
26	2016-05-18	Agrita Abele	72669	10 mm Anti static bubble wrap (Blue) 10m	70	26.00
27	2016-05-27	Agrita Abele	73340	32 mm Double sided bubble wrap 50m	20	112.00

Query executed successfully. DATATYPES (14.0 RTM) | DATATYPES\Admin

Figure 3-1. WideWorldImporters sales order output

If we were to add a FOR XML clause using RAW mode, the results would be returned in the form of an XML fragment. The amended query in Listing 3-2 will return the XML document, instead of a relational result set.

Listing 3-2. WideWorldImporters Sales Orders Using FOR XML RAW

```
SELECT
    SalesOrder.OrderDate
    , Customers.CustomerName
    , SalesOrder.OrderID
    , Product.StockItemName
    , LineItem.Quantity
    , LineItem.UnitPrice
FROM Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
    ON LineItem.OrderID = SalesOrder.OrderID
INNER JOIN Warehouse.StockItems Product
    ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Sales.Customers Customers
    ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele'
FOR XML RAW ;
```

Listing 3-3 illustrates the XML fragment that is returned.

Listing 3-3. WideWorldImporters Sales Orders Using FOR XML RAW

```
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Developer joke mug - when your
hammer is C++ (Black)" Quantity="2" UnitPrice="13.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Developer joke mug - when your
hammer is C++ (White)" Quantity="9" UnitPrice="13.00" />
```

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```
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="DBA joke mug - you might be a
DBA if (Black)" Quantity="4" UnitPrice="13.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="Developer joke mug - that's a
hardware problem (Black)" Quantity="3" UnitPrice="13.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="&quot;The Gu&quot; red shirt XML
tag t-shirt (Black) 5XL" Quantity="120" UnitPrice="18.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72637" StockItemName="&quot;The Gu&quot; red shirt XML
tag t-shirt (Black) XXL" Quantity="24" UnitPrice="18.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="Halloween zombie mask (Light
Brown) S" Quantity="24" UnitPrice="18.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="Halloween skull mask (Gray) M"
Quantity="60" UnitPrice="18.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Furry gorilla with big eyes
slippers (Black) XL" Quantity="9" UnitPrice="32.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="Tape dispenser (Blue)"
Quantity="90" UnitPrice="32.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72713" StockItemName="Tape dispenser (Red)"
Quantity="20" UnitPrice="32.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="Superhero action jacket (Blue)
S" Quantity="8" UnitPrice="25.00" />
```

```
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="RC toy sedan car with remote
control (Red) 1/50 scale" Quantity="2" UnitPrice="25.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72637" StockItemName="Superhero action jacket (Blue)
3XS" Quantity="1" UnitPrice="25.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="Black and orange handle with care
despatch tape 48mmx100m" Quantity="96" UnitPrice="4.10" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72671" StockItemName="Alien officer hoodie (Black)
4XL" Quantity="6" UnitPrice="35.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72637" StockItemName="Furry animal socks (Pink) S"
Quantity="96" UnitPrice="5.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="Permanent marker black 5mm nib
(Black) 5mm" Quantity="84" UnitPrice="2.70" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73340" StockItemName="Superhero action jacket (Blue)
5XL" Quantity="2" UnitPrice="34.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73356" StockItemName="Chocolate sharks 250g"
Quantity="192" UnitPrice="8.55" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Novelty chilli chocolates 250g"
Quantity="240" UnitPrice="8.55" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72671" StockItemName="Packing knife with metal insert
blade (Yellow) 9mm" Quantity="35" UnitPrice="1.89" />
```

```

<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72671" StockItemName="Shipping carton (Brown)
480x270x320mm" Quantity="150" UnitPrice="2.74" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="Shipping carton (Brown)
356x229x229mm" Quantity="175" UnitPrice="1.14" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Ride on big wheel monster truck
(Black) 1/12 scale" Quantity="4" UnitPrice="345.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="10 mm Anti static bubble wrap
(Blue) 10m" Quantity="70" UnitPrice="26.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73340" StockItemName="32 mm Double sided bubble wrap
50m" Quantity="20" UnitPrice="112.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="Office cube periscope (Black)"
Quantity="20" UnitPrice="18.50" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73356" StockItemName="Ride on vintage American toy
coupe (Black) 1/12 scale" Quantity="10" UnitPrice="285.00" />

```

The first thing that we should note about this XML instance is that it is an XML fragment, as opposed to a well-formed XML document, because there is no root node. The `<row>` element cannot be the root node, because it repeats. This means that we cannot validate the XML against a schema. Therefore, when using the `FOR XML` clause, you should consider using the `ROOT` keyword. This will force a root element, with a name of your choosing, to be created within the document. This is demonstrated in Listing 3-4.

Listing 3-4. Adding a Root Node

```

SELECT
    SalesOrder.OrderDate
    , Customers.CustomerName
    , SalesOrder.OrderID
    , Product.StockItemName
    , LineItem.Quantity
    , LineItem.UnitPrice
FROM Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
    ON LineItem.OrderID = SalesOrder.OrderID
INNER JOIN Warehouse.StockItems Product
    ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Sales.Customers Customers
    ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele'
FOR XML RAW, ROOT('SalesOrders') ;

```

Partial output of the resulting well-formed XML document can be found in Listing 3-5.

Listing 3-5. Output of XML Document with Root Node

```

<SalesOrders>
  <row OrderDate="2016-05-19" CustomerName="Agrita Abele"
  OrderID="72787" StockItemName="Developer joke mug - when your
  hammer is C++ (Black)" Quantity="2" UnitPrice="13.00" />
  <row OrderDate="2016-05-19" CustomerName="Agrita Abele"
  OrderID="72787" StockItemName="Developer joke mug - when your
  hammer is C++ (White)" Quantity="9" UnitPrice="13.00" />

```

```

<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="DBA joke mug - you might be a
DBA if (Black)" Quantity="4" UnitPrice="13.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="Developer joke mug - that's a
hardware problem (Black)" Quantity="3" UnitPrice="13.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="&quot;The Gu&quot; red shirt XML
tag t-shirt (Black) 5XL" Quantity="120" UnitPrice="18.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72637" StockItemName="&quot;The Gu&quot; red shirt XML
tag t-shirt (Black) XXL" Quantity="24" UnitPrice="18.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="Halloween zombie mask (Light
Brown) S" Quantity="24" UnitPrice="18.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="Halloween skull mask (Gray) M"
Quantity="60" UnitPrice="18.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Furry gorilla with big eyes
slippers (Black) XL" Quantity="9" UnitPrice="32.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="Tape dispenser (Blue)"
Quantity="90" UnitPrice="32.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72713" StockItemName="Tape dispenser (Red)"
Quantity="20" UnitPrice="32.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="Superhero action jacket (Blue)
S" Quantity="8" UnitPrice="25.00" />

```



```

<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73350" StockItemName="RC toy sedan car with remote
control (Red) 1/50 scale" Quantity="2" UnitPrice="25.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72637" StockItemName="Superhero action jacket (Blue)
3XS" Quantity="1" UnitPrice="25.00" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="Black and orange handle with care
despatch tape 48mmx100m" Quantity="96" UnitPrice="4.10" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72671" StockItemName="Alien officer hoodie (Black)
4XL" Quantity="6" UnitPrice="35.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72637" StockItemName="Furry animal socks (Pink) S"
Quantity="96" UnitPrice="5.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="Permanent marker black 5mm nib
(Black) 5mm" Quantity="84" UnitPrice="2.70" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73340" StockItemName="Superhero action jacket (Blue)
5XL" Quantity="2" UnitPrice="34.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73356" StockItemName="Chocolate sharks 250g"
Quantity="192" UnitPrice="8.55" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Novelty chilli chocolates
250g" Quantity="240" UnitPrice="8.55" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72671" StockItemName="Packing knife with metal
insert blade (Yellow) 9mm" Quantity="35" UnitPrice="1.89" />

```

```

<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72671" StockItemName="Shipping carton (Brown)
480x270x320mm" Quantity="150" UnitPrice="2.74" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72770" StockItemName="Shipping carton (Brown)
356x229x229mm" Quantity="175" UnitPrice="1.14" />
<row OrderDate="2016-05-19" CustomerName="Agrita Abele"
OrderID="72787" StockItemName="Ride on big wheel monster
truck (Black) 1/12 scale" Quantity="4" UnitPrice="345.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="10 mm Anti static bubble wrap
(Blue) 10m" Quantity="70" UnitPrice="26.00" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73340" StockItemName="32 mm Double sided bubble wrap
50m" Quantity="20" UnitPrice="112.00" />
<row OrderDate="2016-05-18" CustomerName="Agrita Abele"
OrderID="72669" StockItemName="Office cube periscope (Black)"
Quantity="20" UnitPrice="18.50" />
<row OrderDate="2016-05-27" CustomerName="Agrita Abele"
OrderID="73356" StockItemName="Ride on vintage American toy
coupe (Black) 1/12 scale" Quantity="10" UnitPrice="285.00" />
</SalesOrders>

```

The other important thing to note about the document is that it is completely flat. There is no nesting. This means that the document's granularity is at the level of line item, which does not make a lot of sense.

It is also worthy of note that all data is contained in attributes, as opposed to elements. We can alter this behavior by using the `ELEMENTS` keyword in the `FOR XML` clause. The `ELEMENTS` keyword will cause all data to be contained within child elements, as opposed to attributes. This is demonstrated in the modified query that can be found in Listing 3-6.

Listing 3-6. Using the ELEMENTS Keyword

```

SELECT
    SalesOrder.OrderDate
    , Customers.CustomerName
    , SalesOrder.OrderID
    , Product.StockItemName
    , LineItem.Quantity
    , LineItem.UnitPrice
FROM Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
    ON LineItem.OrderID = SalesOrder.OrderID
INNER JOIN Warehouse.StockItems Product
    ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Sales.Customers Customers
    ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele'
FOR XML RAW, ELEMENTS, ROOT('SalesOrders') ;

```

The well-formed XML document that is returned can be seen in Listing 3-7.

Listing 3-7. Using the ELEMENTS Keyword

```

<SalesOrders>
  <row>
    <OrderDate>2016-05-19</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72787</OrderID>
    <StockItemName>Developer joke mug - when your hammer is C++
    (Black)</StockItemName>
    <Quantity>2</Quantity>
    <UnitPrice>13.00</UnitPrice>
  </row>

```

```
<row>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72787</OrderID>
  <StockItemName>Developer joke mug - when your hammer is C++
  (White)</StockItemName>
  <Quantity>9</Quantity>
  <UnitPrice>13.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>DBA joke mug - you might be a DBA if
  (Black)</StockItemName>
  <Quantity>4</Quantity>
  <UnitPrice>13.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>Developer joke mug - that's a hardware
  problem (Black)</StockItemName>
  <Quantity>3</Quantity>
  <UnitPrice>13.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72770</OrderID>
```

```
<StockItemName>"The Gu" red shirt XML tag t-shirt (Black)
5XL</StockItemName>
<Quantity>120</Quantity>
<UnitPrice>18.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72637</OrderID>
  <StockItemName>"The Gu" red shirt XML tag t-shirt (Black)
  XXL</StockItemName>
  <Quantity>24</Quantity>
  <UnitPrice>18.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>Halloween zombie mask (Light Brown) S</
  StockItemName>
  <Quantity>24</Quantity>
  <UnitPrice>18.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72669</OrderID>
```

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```
<StockItemName>Halloween skull mask (Gray)
M</StockItemName>
<Quantity>60</Quantity>
<UnitPrice>18.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72787</OrderID>
  <StockItemName>Furry gorilla with big eyes slippers (Black)
  XL</StockItemName>
  <Quantity>9</Quantity>
  <UnitPrice>32.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>Tape dispenser (Blue)</StockItemName>
  <Quantity>90</Quantity>
  <UnitPrice>32.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72713</OrderID>
  <StockItemName>Tape dispenser (Red)</StockItemName>
  <Quantity>20</Quantity>
  <UnitPrice>32.00</UnitPrice>
</row>
```

```
<row>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72770</OrderID>
  <StockItemName>Superhero action jacket (Blue)
  S</StockItemName>
  <Quantity>8</Quantity>
  <UnitPrice>25.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>RC toy sedan car with remote control (Red)
  1/50 scale</StockItemName>
  <Quantity>2</Quantity>
  <UnitPrice>25.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72637</OrderID>
  <StockItemName>Superhero action jacket (Blue)
  3XS</StockItemName>
  <Quantity>1</Quantity>
  <UnitPrice>25.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72770</OrderID>
```

```

    <StockItemName>Black and orange handle with care despatch
    tape 48mmx100m</StockItemName>
    <Quantity>96</Quantity>
    <UnitPrice>4.10</UnitPrice>
</row>
<row>
    <OrderDate>2016-05-18</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72671</OrderID>
    <StockItemName>Alien officer hoodie (Black)
    4XL</StockItemName>
    <Quantity>6</Quantity>
    <UnitPrice>35.00</UnitPrice>
</row>
<row>
    <OrderDate>2016-05-18</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72637</OrderID>
    <StockItemName>Furry animal socks (Pink) S</StockItemName>
    <Quantity>96</Quantity>
    <UnitPrice>5.00</UnitPrice>
</row>
<row>
    <OrderDate>2016-05-18</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72669</OrderID>
    <StockItemName>Permanent marker black 5mm nib (Black)
    5mm</StockItemName>
    <Quantity>84</Quantity>
    <UnitPrice>2.70</UnitPrice>
</row>

```



```
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73340</OrderID>
  <StockItemName>Superhero action jacket (Blue)
  5XL</StockItemName>
  <Quantity>2</Quantity>
  <UnitPrice>34.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73356</OrderID>
  <StockItemName>Chocolate sharks 250g</StockItemName>
  <Quantity>192</Quantity>
  <UnitPrice>8.55</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72787</OrderID>
  <StockItemName>Novelty chilli chocolates
  250g</StockItemName>
  <Quantity>240</Quantity>
  <UnitPrice>8.55</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72671</OrderID>
```

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```
<StockItemName>Packing knife with metal insert blade  
(Yellow) 9mm</StockItemName>  
<Quantity>35</Quantity>  
<UnitPrice>1.89</UnitPrice>  
</row>  
<row>  
<OrderDate>2016-05-18</OrderDate>  
<CustomerName>Agrita Abele</CustomerName>  
<OrderID>72671</OrderID>  
<StockItemName>Shipping carton (Brown) 480x270x320mm  
</StockItemName>  
<Quantity>150</Quantity>  
<UnitPrice>2.74</UnitPrice>  
</row>  
<row>  
<OrderDate>2016-05-19</OrderDate>  
<CustomerName>Agrita Abele</CustomerName>  
<OrderID>72770</OrderID>  
<StockItemName>Shipping carton (Brown) 356x229x229mm  
</StockItemName>  
<Quantity>175</Quantity>  
<UnitPrice>1.14</UnitPrice>  
</row>  
<row>  
<OrderDate>2016-05-19</OrderDate>  
<CustomerName>Agrita Abele</CustomerName>  
<OrderID>72787</OrderID>  
<StockItemName>Ride on big wheel monster truck (Black)  
1/12 scale</StockItemName>
```

```
<Quantity>4</Quantity>
<UnitPrice>345.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72669</OrderID>
  <StockItemName>10 mm Anti static bubble wrap (Blue) 10m
</StockItemName>
  <Quantity>70</Quantity>
  <UnitPrice>26.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73340</OrderID>
  <StockItemName>32 mm Double sided bubble wrap 50m
</StockItemName>
  <Quantity>20</Quantity>
  <UnitPrice>112.00</UnitPrice>
</row>
<row>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72669</OrderID>
  <StockItemName>Office cube periscope (Black)</StockItemName>
  <Quantity>20</Quantity>
  <UnitPrice>18.50</UnitPrice>
</row>
```

```

<row>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73356</OrderID>
  <StockItemName>Ride on vintage American toy coupe (Black)
  1/12 scale</StockItemName>
  <Quantity>10</Quantity>
  <UnitPrice>285.00</UnitPrice>
</row>
</SalesOrders>

```

You can see that the element-centric document still returns one element, called `<row>`, per row in the relational result set. Instead of the data being contained in attributes, however, it is stored in the form of child elements. Each child element has been given the name of the column, from which the data has been returned. The data is still flat, however. There is no hierarchy based on logic or physical table structure.

It is possible to give the `<row>` element a more meaningful name. In our example, the most meaningful name would be `<LineItem>`. Listing 3-8 demonstrates how we can use an optional argument in our FOR XML clause, to generate this name for the element.

Listing 3-8. Generating a Name for the `<row>` Element

```

SELECT
    SalesOrder.OrderDate
    , Customers.CustomerName
    , SalesOrder.OrderID
    , Product.StockItemName
    , LineItem.Quantity
    , LineItem.UnitPrice

```

```

FROM Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
    ON LineItem.OrderID = SalesOrder.OrderID
INNER JOIN Warehouse.StockItems Product
    ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Sales.Customers Customers
    ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele'
FOR XML RAW ('LineItem'), ELEMENTS, ROOT('SalesOrders') ;

```

The resulting XML document can be found in Listing 3-9.

Listing 3-9. Generating a Name for the <row> Element Results

```

<SalesOrders>
  <LineItem>
    <OrderDate>2016-05-19</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72787</OrderID>
    <StockItemName>Developer joke mug - when your hammer is
    C++ (Black)</StockItemName>
    <Quantity>2</Quantity>
    <UnitPrice>13.00</UnitPrice>
  </LineItem>
  <LineItem>
    <OrderDate>2016-05-19</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72787</OrderID>
    <StockItemName>Developer joke mug - when your hammer is
    C++ (White)</StockItemName>
    <Quantity>9</Quantity>
    <UnitPrice>13.00</UnitPrice>
  </LineItem>

```

```

<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>DBA joke mug - you might be a DBA if
  (Black)</StockItemName>
  <Quantity>4</Quantity>
  <UnitPrice>13.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>Developer joke mug - that's a hardware
  problem (Black)</StockItemName>
  <Quantity>3</Quantity>
  <UnitPrice>13.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72770</OrderID>
  <StockItemName>"The Gu" red shirt XML tag t-shirt (Black) 5XL
  </StockItemName>
  <Quantity>120</Quantity>
  <UnitPrice>18.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72637</OrderID>

```

```

    <StockItemName>"The Gu" red shirt XML tag t-shirt (Black)
    XXL</StockItemName>
    <Quantity>24</Quantity>
    <UnitPrice>18.00</UnitPrice>
</LineItem>
<LineItem>
    <OrderDate>2016-05-27</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>73350</OrderID>
    <StockItemName>Halloween zombie mask (Light Brown) S
    </StockItemName>
    <Quantity>24</Quantity>
    <UnitPrice>18.00</UnitPrice>
</LineItem>
<LineItem>
    <OrderDate>2016-05-18</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72669</OrderID>
    <StockItemName>Halloween skull mask (Gray) M</StockItemName>
    <Quantity>60</Quantity>
    <UnitPrice>18.00</UnitPrice>
</LineItem>
<LineItem>
    <OrderDate>2016-05-19</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72787</OrderID>
    <StockItemName>Furry gorilla with big eyes slippers (Black)
    XL</StockItemName>
    <Quantity>9</Quantity>
    <UnitPrice>32.00</UnitPrice>
</LineItem>

```

```
<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>Tape dispenser (Blue)</StockItemName>
  <Quantity>90</Quantity>
  <UnitPrice>32.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72713</OrderID>
  <StockItemName>Tape dispenser (Red)</StockItemName>
  <Quantity>20</Quantity>
  <UnitPrice>32.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72770</OrderID>
  <StockItemName>Superhero action jacket (Blue)
  S</StockItemName>
  <Quantity>8</Quantity>
  <UnitPrice>25.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73350</OrderID>
  <StockItemName>RC toy sedan car with remote control (Red)
  1/50 scale</StockItemName>
```



```

    <Quantity>2</Quantity>
    <UnitPrice>25.00</UnitPrice>
</LineItem>
<LineItem>
    <OrderDate>2016-05-18</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72637</OrderID>
    <StockItemName>Superhero action jacket (Blue)
    3XS</StockItemName>
    <Quantity>1</Quantity>
    <UnitPrice>25.00</UnitPrice>
</LineItem>
<LineItem>
    <OrderDate>2016-05-19</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72770</OrderID>
    <StockItemName>Black and orange handle with care despatch
    tape 48mmx100m</StockItemName>
    <Quantity>96</Quantity>
    <UnitPrice>4.10</UnitPrice>
</LineItem>
<LineItem>
    <OrderDate>2016-05-18</OrderDate>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderID>72671</OrderID>
    <StockItemName>Alien officer hoodie (Black)
    4XL</StockItemName>
    <Quantity>6</Quantity>
    <UnitPrice>35.00</UnitPrice>
</LineItem>

```

```

<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72637</OrderID>
  <StockItemName>Furry animal socks (Pink) S</StockItemName>
  <Quantity>96</Quantity>
  <UnitPrice>5.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72669</OrderID>
  <StockItemName>Permanent marker black 5mm nib (Black)
  5mm</StockItemName>
  <Quantity>84</Quantity>
  <UnitPrice>2.70</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73340</OrderID>
  <StockItemName>Superhero action jacket (Blue)
  5XL</StockItemName>
  <Quantity>2</Quantity>
  <UnitPrice>34.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73356</OrderID>
  <StockItemName>Chocolate sharks 250g</StockItemName>

```

```
<Quantity>192</Quantity>
<UnitPrice>8.55</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72787</OrderID>
  <StockItemName>Novelty chilli chocolates 250g
</StockItemName>
  <Quantity>240</Quantity>
  <UnitPrice>8.55</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72671</OrderID>
  <StockItemName>Packing knife with metal insert blade
  (Yellow) 9mm</StockItemName>
  <Quantity>35</Quantity>
  <UnitPrice>1.89</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72671</OrderID>
  <StockItemName>Shipping carton (Brown) 480x270x320mm
</StockItemName>
  <Quantity>150</Quantity>
  <UnitPrice>2.74</UnitPrice>
</LineItem>
```

```
<LineItem>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72770</OrderID>
  <StockItemName>Shipping carton (Brown) 356x229x229mm
</StockItemName>
  <Quantity>175</Quantity>
  <UnitPrice>1.14</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-19</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72787</OrderID>
  <StockItemName>Ride on big wheel monster truck (Black)
1/12 scale</StockItemName>
  <Quantity>4</Quantity>
  <UnitPrice>345.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72669</OrderID>
  <StockItemName>10 mm Anti static bubble wrap (Blue) 10m
</StockItemName>
  <Quantity>70</Quantity>
  <UnitPrice>26.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73340</OrderID>
```

```

    <StockItemName>32 mm Double sided bubble wrap 50m
  </StockItemName>
  <Quantity>20</Quantity>
  <UnitPrice>112.00</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-18</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>72669</OrderID>
  <StockItemName>Office cube periscope (Black)</
  StockItemName>
  <Quantity>20</Quantity>
  <UnitPrice>18.50</UnitPrice>
</LineItem>
<LineItem>
  <OrderDate>2016-05-27</OrderDate>
  <CustomerName>Agrita Abele</CustomerName>
  <OrderID>73356</OrderID>
  <StockItemName>Ride on vintage American toy coupe (Black)
  1/12 scale</StockItemName>
  <Quantity>10</Quantity>
  <UnitPrice>285.00</UnitPrice>
</LineItem>
</SalesOrders>

```

Using FOR XML AUTO

Unlike FOR XML RAW, for XML AUTO can return nested results. It is also refreshingly simple to use, because it will automatically nest the data, based on the joins within your query. The modified query in Listing 3-10 uses AUTO mode to return a hierarchical XML document.

Listing 3-10. Using FOR XML AUTO

```

SELECT
    SalesOrder.OrderDate
    , Customers.CustomerName
    , SalesOrder.OrderID
    , Product.StockItemName
    , LineItem.Quantity
    , LineItem.UnitPrice
FROM Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
    ON LineItem.OrderID = SalesOrder.OrderID
INNER JOIN Warehouse.StockItems Product
    ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Sales.Customers Customers
    ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele'
FOR XML AUTO ;

```

The XML fragment that is returned by this query can be partially seen in Listing 3-11.

Listing 3-11. Using FOR XML AUTO Results

```

<SalesOrder OrderDate="2016-05-19" OrderID="72787">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Developer joke mug - when your
hammer is C++ (Black)">
      <LineItem Quantity="2" UnitPrice="13.00" />
    </Product>
  </Customers>
</SalesOrder>

```

```

    <Product StockItemName="Developer joke mug - when your
    hammer is C++ (White)">
      <LineItem Quantity="9" UnitPrice="13.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="DBA joke mug - you might be a DBA
    if (Black)">
      <LineItem Quantity="4" UnitPrice="13.00" />
    </Product>
    <Product StockItemName="Developer joke mug - that's a
    hardware problem (Black)">
      <LineItem Quantity="3" UnitPrice="13.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="&quot;The Gu&quot; red shirt XML
    tag t-shirt (Black) 5XL">
      <LineItem Quantity="120" UnitPrice="18.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72637">
  <Customers CustomerName="Agrita Abele">

```

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```
<Product StockItemName="&quot;The Gu&quot; red shirt XML
tag t-shirt (Black) XXL">
  <LineItem Quantity="24" UnitPrice="18.00" />
</Product>
</Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Halloween zombie mask (Light Brown) S">
      <LineItem Quantity="24" UnitPrice="18.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Halloween skull mask (Gray) M">
      <LineItem Quantity="60" UnitPrice="18.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72787">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Furry gorilla with big eyes
slippers (Black) XL">
      <LineItem Quantity="9" UnitPrice="32.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Tape dispenser (Blue)">
      <LineItem Quantity="90" UnitPrice="32.00" />
    </Product>
  </Customers>
</SalesOrder>
```



```

    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72713">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Tape dispenser (Red)">
      <LineItem Quantity="20" UnitPrice="32.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Superhero action jacket (Blue) S">
      <LineItem Quantity="8" UnitPrice="25.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="RC toy sedan car with remote
    control (Red) 1/50 scale">
      <LineItem Quantity="2" UnitPrice="25.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72637">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Superhero action jacket (Blue) 3XS">
      <LineItem Quantity="1" UnitPrice="25.00" />
    </Product>
  </Customers>
</SalesOrder>

```

```

<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Black and orange handle with care
    despatch tape 48mmx100m">
      <LineItem Quantity="96" UnitPrice="4.10" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72671">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Alien officer hoodie (Black) 4XL">
      <LineItem Quantity="6" UnitPrice="35.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72637">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Furry animal socks (Pink) S">
      <LineItem Quantity="96" UnitPrice="5.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Permanent marker black 5mm nib
    (Black) 5mm">
      <LineItem Quantity="84" UnitPrice="2.70" />
    </Product>
  </Customers>
</SalesOrder>

```

```

<SalesOrder OrderDate="2016-05-27" OrderID="73340">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Superhero action jacket (Blue) 5XL">
      <LineItem Quantity="2" UnitPrice="34.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73356">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Chocolate sharks 250g">
      <LineItem Quantity="192" UnitPrice="8.55" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72787">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Novelty chilli chocolates 250g">
      <LineItem Quantity="240" UnitPrice="8.55" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72671">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Packing knife with metal insert
blade (Yellow) 9mm">
      <LineItem Quantity="35" UnitPrice="1.89" />
    </Product>
    <Product StockItemName="Shipping carton (Brown)
480x270x320mm">
      <LineItem Quantity="150" UnitPrice="2.74" />
    </Product>
  </Customers>

```

```

</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Shipping carton (Brown) 356x229x229mm">
      <LineItem Quantity="175" UnitPrice="1.14" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72787">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Ride on big wheel monster truck
(Black) 1/12 scale">
      <LineItem Quantity="4" UnitPrice="345.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="10 mm Anti static bubble wrap
(Blue) 10m">
      <LineItem Quantity="70" UnitPrice="26.00" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73340">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="32 mm Double sided bubble wrap 50m">
      <LineItem Quantity="20" UnitPrice="112.00" />
    </Product>
  </Customers>
</SalesOrder>

```

```

<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Office cube periscope (Black)">
      <LineItem Quantity="20" UnitPrice="18.50" />
    </Product>
  </Customers>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73356">
  <Customers CustomerName="Agrita Abele">
    <Product StockItemName="Ride on vintage American toy coupe
    (Black) 1/12 scale">
      <LineItem Quantity="10" UnitPrice="285.00" />
    </Product>
  </Customers>
</SalesOrder>

```

You can see that when AUTO mode is used, the FOR XML clause has automatically nested the data based on the JOIN clauses within the query. Each element has been assigned a name, based on the table alias of the table from which it was retrieved. Just as with RAW mode, we can use the ROOT keyword to add a root node and make the document well-formed. We can also make the document element-centric with the ELEMENTS keyword.

If you look closely at the document in Listing 3-11, you will notice that the resulting hierarchy is not ideal. <Customers> is nested under <SalesOrders>, and <LineItem> is nested under <Product>. In this document, however, you would naturally expect the hierarchy to be <Customers> <SalesOrders> <LineItem> <Product>. To achieve this, we would have to rewrite the query, as per Listing 3-12.

Listing 3-12. Rewriting the Query to Nest Data Correctly

```

SELECT
    Customers.CustomerName
    , SalesOrder.OrderDate
    , SalesOrder.OrderID
    , LineItem.Quantity
    , LineItem.UnitPrice
    , Product.StockItemName
FROM Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
    ON LineItem.OrderID = SalesOrder.OrderID
INNER JOIN Warehouse.StockItems Product
    ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Sales.Customers Customers
    ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele'
FOR XML AUTO ;

```

Note that the order of columns has changed, so that the Customers table is referenced before the SalesOrders table, which, in turn, is referenced before the OrderLines table. The StockItems table is the last to be referenced. You will also notice that we did not have to change the order of the joins, to produce the document shown in Listing 3-13.

Listing 3-13. Results of Rewritten Query

```

<Customers CustomerName="Agrita Abele">
  <SalesOrder OrderDate="2016-05-19" OrderID="72787">
    <LineItem Quantity="2" UnitPrice="13.00">
      <Product StockItemName="Developer joke mug - when your
        hammer is C++ (Black)" />
    </LineItem>
  </SalesOrder>
</Customers>

```

```

<LineItem Quantity="9" UnitPrice="13.00">
  <Product StockItemName="Developer joke mug - when your
    hammer is C++ (White)" />
</LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <LineItem Quantity="4" UnitPrice="13.00">
    <Product StockItemName="DBA joke mug - you might be a DBA
      if (Black)" />
  </LineItem>
  <LineItem Quantity="3" UnitPrice="13.00">
    <Product StockItemName="Developer joke mug - that's a
      hardware problem (Black)" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <LineItem Quantity="120" UnitPrice="18.00">
    <Product StockItemName="&quot;The Gu&quot; red shirt XML
      tag t-shirt (Black) 5XL" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72637">
  <LineItem Quantity="24" UnitPrice="18.00">
    <Product StockItemName="&quot;The Gu&quot; red shirt XML
      tag t-shirt (Black) XXL" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <LineItem Quantity="24" UnitPrice="18.00">
    <Product StockItemName="Halloween zombie mask
      (Light Brown) S" />
  </LineItem>

```

```
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <LineItem Quantity="60" UnitPrice="18.00">
    <Product StockItemName="Halloween skull mask (Gray) M" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72787">
  <LineItem Quantity="9" UnitPrice="32.00">
    <Product StockItemName="Furry gorilla with big eyes
    slippers (Black) XL" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <LineItem Quantity="90" UnitPrice="32.00">
    <Product StockItemName="Tape dispenser (Blue)" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72713">
  <LineItem Quantity="20" UnitPrice="32.00">
    <Product StockItemName="Tape dispenser (Red)" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <LineItem Quantity="8" UnitPrice="25.00">
    <Product StockItemName="Superhero action jacket (Blue) S" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73350">
  <LineItem Quantity="2" UnitPrice="25.00">
    <Product StockItemName="RC toy sedan car with remote
    control (Red) 1/50 scale" />
  </LineItem>
</SalesOrder>
```



```

    </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72637">
  <LineItem Quantity="1" UnitPrice="25.00">
    <Product StockItemName="Superhero action jacket (Blue) 3XS" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <LineItem Quantity="96" UnitPrice="4.10">
    <Product StockItemName="Black and orange handle with care
    despatch tape 48mmx100m" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72671">
  <LineItem Quantity="6" UnitPrice="35.00">
    <Product StockItemName="Alien officer hoodie (Black) 4XL" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72637">
  <LineItem Quantity="96" UnitPrice="5.00">
    <Product StockItemName="Furry animal socks (Pink) S" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <LineItem Quantity="84" UnitPrice="2.70">
    <Product StockItemName="Permanent marker black 5mm nib
    (Black) 5mm" />
  </LineItem>
</SalesOrder>

```

```

<SalesOrder OrderDate="2016-05-27" OrderID="73340">
  <LineItem Quantity="2" UnitPrice="34.00">
    <Product StockItemName="Superhero action jacket (Blue) 5XL" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73356">
  <LineItem Quantity="192" UnitPrice="8.55">
    <Product StockItemName="Chocolate sharks 250g" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72787">
  <LineItem Quantity="240" UnitPrice="8.55">
    <Product StockItemName="Novelty chilli chocolates 250g" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72671">
  <LineItem Quantity="35" UnitPrice="1.89">
    <Product StockItemName="Packing knife with metal insert
    blade (Yellow) 9mm" />
  </LineItem>
  <LineItem Quantity="150" UnitPrice="2.74">
    <Product StockItemName="Shipping carton (Brown)
    480x270x320mm" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-19" OrderID="72770">
  <LineItem Quantity="175" UnitPrice="1.14">
    <Product StockItemName="Shipping carton (Brown)
    356x229x229mm" />
  </LineItem>
</SalesOrder>

```

```
<SalesOrder OrderDate="2016-05-19" OrderID="72787">
  <LineItem Quantity="4" UnitPrice="345.00">
    <Product StockItemName="Ride on big wheel monster truck
      (Black) 1/12 scale" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <LineItem Quantity="70" UnitPrice="26.00">
    <Product StockItemName="10 mm Anti static bubble wrap
      (Blue) 10m" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73340">
  <LineItem Quantity="20" UnitPrice="112.00">
    <Product StockItemName="32 mm Double sided bubble wrap 50m" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-18" OrderID="72669">
  <LineItem Quantity="20" UnitPrice="18.50">
    <Product StockItemName="Office cube periscope (Black)" />
  </LineItem>
</SalesOrder>
<SalesOrder OrderDate="2016-05-27" OrderID="73356">
  <LineItem Quantity="10" UnitPrice="285.00">
    <Product StockItemName="Ride on vintage American toy
      coupe (Black) 1/12 scale" />
  </LineItem>
</SalesOrder>
</Customers>
```

Nesting based on table joins is not always sufficient. In this example, it would be possible for some `<LineItem>` elements to contain multiple `<Product>` elements, which is obviously not correct. There cannot be more than one product per line on a sales order. This is because the primary key of the `Sales.OrderLines` table has not been included in the query, meaning that not every set of tuples returned from the `Sales.OrderLines` table must be unique. The values for `UnitPrice` and `OrderQty` happened to be repeated. If this occurred, `FOR XML AUTO` would group them. If the primary key had been included, the issue could not occur.

Using FOR XML PATH

Sometimes, you need more control over the shape of the resultant XML document than can be provided by either `RAW` mode or `AUTO` mode. When you have a requirement to define custom output, `PATH` mode can be used. `PATH` mode offers great flexibility, as it allows you to define the location of each node within the resultant XML. This is achieved by specifying how each column in the query maps to the XML, with the use of column names or aliases.

If a column alias begins with the `@` symbol, an attribute will be created. If no `@` symbol is used, the column will map to an element. Columns that will become attributes must be specified before columns that will be sibling nodes but defined as elements.

If you wish to define a node's location in the hierarchy, you can use the `/` symbol. For example, if you required the order date to appear nested under an element called `<OrderHeader>`, you could specify its column alias as `'/OrderHeader/OrderDate'` for the `OrderDate` column.

`PATH` mode allows you to create highly customized and complex structures. For example, imagine that you are required to create an XML document in the format displayed in Listing 3-14. Here, you will note that there is a root node called `<SalesOrders>`. The next node in the hierarchy

is `<Orders>`. This is a repeating element, with a new occurrence for every order raised by the customer, which is the same as when we explored AUTO mode. The difference is that each sales order has its own hierarchy. First, there is a section for generic order information, stored within a node called `<OrderHeader>`. This element is the parent element for `<CustomerName>`, `<OrderDate>`, and `<OrderID>`. These values are to be stored as simple elements.

There is also a section for the line details of the order, which are stored in a node called `<OrderDetails>`. This element contains a repeating child element named `<Product>`. This repeating element is the parent node for each `<ProductName>` (StockItemName) and `<ProductID>` (StockItemID) within the order, as well as the `<Price>` (unitprice) and `<Qty>` of each item. These values are all stored as attributes of the `<Product>` element.

Listing 3-14. Required Format of XML Output

```
<SalesOrders>
  <Order>
    <OrderHeader>
      <CustomerName>Agrita Abele</CustomerName>
      <OrderDate>2016-05-18</OrderDate>
      <OrderID>72637</OrderID>
    </OrderHeader>
    <OrderDetails>
      <Product ProductID="96" ProductName="&quot;The Gu&quot;
red shirt XML tag t-shirt (Black) XXL" Price="18.00"
Qty="24" />
      <Product ProductID="107" ProductName="Superhero action
jacket (Blue) 3XS" Price="25.00" Qty="1" />
      <Product ProductID="138" ProductName="Furry animal socks
(Pink) S" Price="5.00" Qty="96" />
    </OrderDetails>
  </Order>
```

```

<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-18</OrderDate>
    <OrderID>72669</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="147" ProductName="Halloween skull
    mask (Gray) M" Price="18.00" Qty="60" />
    <Product ProductID="206" ProductName="Permanent marker
    black 5mm nib (Black) 5mm" Price="2.70" Qty="84" />
    <Product ProductID="165" ProductName="10 mm Anti static
    bubble wrap (Blue) 10m" Price="26.00" Qty="70" />
    <Product ProductID="3" ProductName="Office cube periscope
    (Black)" Price="18.50" Qty="20" />
  </OrderDetails>
</Order>
<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-18</OrderDate>
    <OrderID>72671</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="105" ProductName="Alien officer
    hoodie (Black) 4XL" Price="35.00" Qty="6" />
    <Product ProductID="209" ProductName="Packing knife with
    metal insert blade (Yellow) 9mm" Price="1.89" Qty="35" />
    <Product ProductID="183" ProductName="Shipping carton
    (Brown) 480x270x320mm" Price="2.74" Qty="150" />
  </OrderDetails>
</Order>

```

```

<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-18</OrderDate>
    <OrderID>72713</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="204" ProductName="Tape dispenser
      (Red)" Price="32.00" Qty="20" />
  </OrderDetails>
</Order>
<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-19</OrderDate>
    <OrderID>72770</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="99" ProductName="&quot;The Gu&quot; red
      shirt XML tag t-shirt (Black) 5XL" Price="18.00" Qty="120" />
    <Product ProductID="110" ProductName="Superhero action
      jacket (Blue) S" Price="25.00" Qty="8" />
    <Product ProductID="196" ProductName="Black and orange handle
      with care despatch tape 48mmx100m" Price="4.10" Qty="96" />
    <Product ProductID="181" ProductName="Shipping carton
      (Brown) 356x229x229mm" Price="1.14" Qty="175" />
  </OrderDetails>
</Order>

```

```

<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-19</OrderDate>
    <OrderID>72787</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="37" ProductName="Developer joke mug -
when your hammer is C++ (Black)" Price="13.00" Qty="2" />
    <Product ProductID="36" ProductName="Developer joke mug -
when your hammer is C++ (White)" Price="13.00" Qty="9" />
    <Product ProductID="133" ProductName="Furry gorilla with
big eyes slippers (Black) XL" Price="32.00" Qty="9" />
    <Product ProductID="220" ProductName="Novelty chilli
chocolates 250g" Price="8.55" Qty="240" />
    <Product ProductID="75" ProductName="Ride on big wheel
monster truck (Black) 1/12 scale" Price="345.00" Qty="4" />
  </OrderDetails>
</Order>

<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-27</OrderDate>
    <OrderID>73340</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="117" ProductName="Superhero action
jacket (Blue) 5XL" Price="34.00" Qty="2" />
    <Product ProductID="164" ProductName="32 mm Double sided
bubble wrap 50m" Price="112.00" Qty="20" />
  </OrderDetails>
</Order>

```



```

<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-27</OrderDate>
    <OrderID>73350</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="21" ProductName="DBA joke mug - you
might be a DBA if (Black)" Price="13.00" Qty="4" />
    <Product ProductID="33" ProductName="Developer joke mug -
that's a hardware problem (Black)" Price="13.00" Qty="3" />
    <Product ProductID="142" ProductName="Halloween zombie
mask (Light Brown) S" Price="18.00" Qty="24" />
    <Product ProductID="205" ProductName="Tape dispenser
(Blue)" Price="32.00" Qty="90" />
    <Product ProductID="59" ProductName="RC toy sedan car
with remote control (Red) 1/50 scale" Price="25.00"
Qty="2" />
  </OrderDetails>
</Order>
<Order>
  <OrderHeader>
    <CustomerName>Agrita Abele</CustomerName>
    <OrderDate>2016-05-27</OrderDate>
    <OrderID>73356</OrderID>
  </OrderHeader>
  <OrderDetails>
    <Product ProductID="225" ProductName="Chocolate sharks
250g" Price="8.55" Qty="192" />

```

```

    <Product ProductID="74" ProductName="Ride on vintage American
    toy coupe (Black) 1/12 scale" Price="285.00" Qty="10" />
  </OrderDetails>
</Order>
</SalesOrders>

```

Queries to build XML documents using FOR XML PATH can seem a little complicated at first, but once you understand the principles, they become quite straightforward. Let's examine each requirement and how we can achieve the required shape.

First, we will require a root node called <SalesOrders>, and we will also need to rename the <row> element to <Orders>. This can be achieved in the same way as we did when we were exploring RAW mode, using the optional argument for the <row> element and the ROOT keyword in the FOR XML clause and the root node, as shown in Listing 3-15.

Listing 3-15. Creating a Root and Naming the <row> Element with FOR XML PATH

```
FOR XML PATH('Order'), ROOT ('SalesOrders') ;
```

The next requirement is to create a complex element called <OrderHeader>, which will contain the <CustomerName>, <OrderDate>, and <OrderID> elements. This can be achieved by specifying a path to the element, as well as the element name. As demonstrated in Listing 3-16, when using this technique, the / character denotes a step down the hierarchy.

Listing 3-16. Creating Hierarchy Levels

```

SELECT
    CustomerName 'OrderHeader/CustomerName'
    , OrderDate 'OrderHeader/OrderDate'
    , OrderID 'OrderHeader/OrderID'

```

To create the nested line items, we must use a subquery, which returns the XML data type. For the process to work properly, we must use the `TYPE` keyword in the `FOR XML` clause of the subquery. This will cause the results to be returned to the outer query in native XML, as it can be processed server-side. Failure to use this keyword will result in some characters being replaced by control character sequences.

Because we want the values to be stored as attributes of an element called `<Product>`, we will have to rename the `<row>` element and prefix our column aliases with the `@` symbol. Finally, to ensure that the `<Product>` elements are nested under an element named `<OrderDetails>`, we will use `OrderDetails` as the alias for the column returned by the subquery, as demonstrated in Listing 3-17.

Listing 3-17. OrderDetails Subquery

```
(
    SELECT
        LineItems2.StockItemID '@ProductID'
        , StockItems.StockItemName '@ProductName'
        , LineItems2.UnitPrice '@Price'
        , Quantity '@Qty'
    FROM Sales.OrderLines LineItems2
    INNER JOIN Warehouse.StockItems StockItems
        ON LineItems2.StockItemID = StockItems.Stock
        ItemID
    WHERE LineItems2.OrderID = Base.OrderID
    FOR XML PATH('Product'), TYPE
) 'OrderDetails'
```

Listing 3-18 pulls together the aspects that we have discussed and returns an XML document in the required format.

Listing 3-18. Putting It All Together

```

SELECT
    CustomerName 'OrderHeader/CustomerName'
    , OrderDate 'OrderHeader/OrderDate'
    , OrderID 'OrderHeader/OrderID'
    , (
        SELECT
            LineItems2.StockItemID '@ProductID'
            , StockItems.StockItemName '@ProductName'
            , LineItems2.UnitPrice '@Price'
            , Quantity '@Qty'
        FROM Sales.OrderLines LineItems2
        INNER JOIN Warehouse.StockItems StockItems
            ON LineItems2.StockItemID = Stock
            Items.StockItemID
        WHERE LineItems2.OrderID = Base.OrderID
        FOR XML PATH('Product'), TYPE
    ) 'OrderDetails'
FROM
    (
        SELECT DISTINCT
            Customers.CustomerName
            , SalesOrder.OrderDate
            , SalesOrder.OrderID
        FROM Sales.Orders SalesOrder
        INNER JOIN Sales.OrderLines LineItem
            ON SalesOrder.OrderID = LineItem.OrderID
        INNER JOIN Sales.Customers Customers
            ON Customers.CustomerID = SalesOrder.CustomerID
        WHERE customers.CustomerName = 'Agrita Abele'
    ) Base
FOR XML PATH('Order'), ROOT ('SalesOrders') ;

```

Using FOR XML EXPLICIT

FOR XML EXPLICIT is the most complex of the FOR XML modes, but it also provides ultimate flexibility. It uses the concept of tags and parents to control nesting. A tag designates a node's position within the hierarchy, and parent indicates the tag of the node that resides above it in the hierarchy. Therefore, the top-level node will have a tag of 1 and a parent of NULL. Each node is specified in a separate query, and the queries are joined using UNION ALL.

For example, imagine that we want to expand the example in Listing 3-18 so that we return an OrderDetails element that has two child elements. The first will contain the name of the salesperson who took the order. The second will be a repeating element, detailing the line items within the order. We could achieve this by using the query in Listing 3-19.

Listing 3-19. Order Details with XML Explicit

```
SELECT
    1 AS Tag
    , 0 AS Parent
    , SalesOrder.OrderID AS
    [OrderDetails!1!SalesOrderID]
    , SalesOrder.OrderDate AS
    [OrderDetails!1!OrderDate]
    , SalesOrder.CustomerID AS
    [OrderDetails!1!CustomerID]
    , NULL AS [SalesPerson!2!SalesPersonName]
    , NULL AS [LineItem!3!LineTotal!ELEMENT]
    , NULL AS [LineItem!3!ProductName!ELEMENT]
```

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```
                , NULL AS [LineItem!3!OrderQty!ELEMENT]
FROM    Sales.Orders SalesOrder
INNER JOIN Sales.Customers Customers
        ON Customers.CustomerID = SalesOrder.CustomerID
WHERE customers.CustomerName = 'Agrita Abele'
UNION ALL
SELECT
        2 AS Tag
        , 1 AS Parent
        , SalesOrder.OrderID
        , NULL
        , NULL
        , People.FullName
        , NULL
        , NULL
        , NULL
FROM    Sales.Orders SalesOrder
INNER JOIN Sales.Customers Customers
        ON Customers.CustomerID = SalesOrder.CustomerID
INNER JOIN Application.People People
        ON People.PersonID = SalesOrder.SalespersonPersonID
WHERE customers.CustomerName = 'Agrita Abele'
UNION ALL
SELECT
        3 AS Tag
        , 1 AS Parent
        , SalesOrder.OrderID
        , NULL
        , NULL
        , People.FullName
        , LineItem.UnitPrice
```

```

        , Product.StockItemName
        , LineItem.Quantity
FROM    Sales.Orders SalesOrder
INNER JOIN Sales.OrderLines LineItem
        ON SalesOrder.OrderID = LineItem.OrderID
INNER JOIN Sales.Customers Customers
        ON Customers.CustomerID = SalesOrder.CustomerID
INNER JOIN Warehouse.StockItems Product
        ON Product.StockItemID = LineItem.StockItemID
INNER JOIN Application.People People
        ON People.PersonID = SalesOrder.SalespersonPersonID
WHERE customers.CustomerName = 'Agrita Abele'
ORDER BY
        [OrderDetails!1!SalesOrderID]
        , [SalesPerson!2!SalesPersonName]
        , [LineItem!3!LineTotal!ELEMENT]
FOR XML EXPLICIT, ROOT('SalesOrders') ;

```

There are various things that we should note about the query in Listing 3-19. First, each complex node is in its own query, and these queries are connected by using UNION ALL. Just like every use of UNION ALL, each query must have the same number of columns. Therefore, NULL values are used when a node does not exist within the complex node being defined by the query. Also, note that the OrderID column is used in all three queries. This column is used to define which salespeople, and line details should be ordered under each sales order.

Because the SalesPerson and LineItem nodes are siblings, both the second and third queries have their parent configured as 1, which is the tag of the first query. This means that both will be nested under the OrderDetails node, at the same level of the hierarchy. The query defining the OrderDetails node has its parent configured as NULL. This denotes

that it is at the top of the hierarchy, with the exception of the root node, which is defined in the FOR XML clause.

As with other UNION ALL queries, where column names are derived from the first query, the node names are taken from the first query. If you examine the column aliases in the first query, you will clearly see how the structure of the node names is defined. The name parts are separated with a !. The first name part defines the name of the complex node. The second part describes the ID of the tag that is being named. The third part of the name defines the name of the node that will store the data within the column. By default, FOR XML EXPLICIT is attribute-centric. Therefore, if you require a node to be an element, you must add a fourth part to the name, known as the ELEMENT directive.

The query in Listing 3-19 produces the XML document in Listing 3-20.

Listing 3-20. FOR XML EXPLICIT Results

```
<SalesOrders>
  <OrderDetails SalesOrderID="72637" OrderDate="2016-05-18"
  CustomerID="1061">
    <SalesPerson SalesPersonName="Taj Shand" />
    <LineItem>
      <LineTotal>5.00</LineTotal>
      <ProductName>Furry animal socks (Pink) S</ProductName>
      <OrderQty>96</OrderQty>
    </LineItem>
    <LineItem>
      <LineTotal>18.00</LineTotal>
      <ProductName>"The Gu" red shirt XML tag t-shirt (Black)
      XXL</ProductName>
      <OrderQty>24</OrderQty>
    </LineItem>
    <LineItem>
```



```

    <LineTotal>25.00</LineTotal>
    <ProductName>Superhero action jacket (Blue) 3XS</ProductName>
    <OrderQty>1</OrderQty>
  </LineItem>
</OrderDetails>
<OrderDetails SalesOrderID="72669" OrderDate="2016-05-18"
CustomerID="1061">
  <SalesPerson SalesPersonName="Hudson Onslow" />
  <LineItem>
    <LineTotal>2.70</LineTotal>
    <ProductName>Permanent marker black 5mm nib (Black) 5mm
    </ProductName>
    <OrderQty>84</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>18.00</LineTotal>
    <ProductName>Halloween skull mask (Gray) M</ProductName>
    <OrderQty>60</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>18.50</LineTotal>
    <ProductName>Office cube periscope (Black)</ProductName>
    <OrderQty>20</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>26.00</LineTotal>
    <ProductName>10 mm Anti static bubble wrap (Blue) 10m
    </ProductName>
    <OrderQty>70</OrderQty>
  </LineItem>
</OrderDetails>

```

```

<OrderDetails SalesOrderID="72671" OrderDate="2016-05-18"
CustomerID="1061">
  <SalesPerson SalesPersonName="Hudson Hollinworth" />
  <LineItem>
    <LineTotal>1.89</LineTotal>
    <ProductName>Packing knife with metal insert blade
(Yellow) 9mm</ProductName>
    <OrderQty>35</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>2.74</LineTotal>
    <ProductName>Shipping carton (Brown) 480x270x320mm
</ProductName>
    <OrderQty>150</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>35.00</LineTotal>
    <ProductName>Alien officer hoodie (Black) 4XL</ProductName>
    <OrderQty>6</OrderQty>
  </LineItem>
</OrderDetails>
<OrderDetails SalesOrderID="72713" OrderDate="2016-05-18"
CustomerID="1061">
  <SalesPerson SalesPersonName="Hudson Onslow" />
  <LineItem>
    <LineTotal>32.00</LineTotal>
    <ProductName>Tape dispenser (Red)</ProductName>
    <OrderQty>20</OrderQty>
  </LineItem>
</OrderDetails>

```

```

<OrderDetails SalesOrderID="72770" OrderDate="2016-05-19"
CustomerID="1061">
  <SalesPerson SalesPersonName="Hudson Onslow" />
  <LineItem>
    <LineTotal>1.14</LineTotal>
    <ProductName>Shipping carton (Brown) 356x229x229mm
</ProductName>
    <OrderQty>175</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>4.10</LineTotal>
    <ProductName>Black and orange handle with care despatch
tape 48mmx100m</ProductName>
    <OrderQty>96</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>18.00</LineTotal>
    <ProductName>"The Gu" red shirt XML tag t-shirt (Black)
5XL</ProductName>
    <OrderQty>120</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>25.00</LineTotal>
    <ProductName>Superhero action jacket (Blue) S
</ProductName>
    <OrderQty>8</OrderQty>
  </LineItem>
</OrderDetails>

```

```
<OrderDetails SalesOrderID="72787" OrderDate="2016-05-19"
CustomerID="1061">
  <SalesPerson SalesPersonName="Jack Potter" />
  <LineItem>
    <LineTotal>8.55</LineTotal>
    <ProductName>Novelty chilli chocolates 250g</ProductName>
    <OrderQty>240</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>13.00</LineTotal>
    <ProductName>Developer joke mug - when your hammer is
C++ (White)</ProductName>
    <OrderQty>9</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>13.00</LineTotal>
    <ProductName>Developer joke mug - when your hammer is
C++ (Black)</ProductName>
    <OrderQty>2</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>32.00</LineTotal>
    <ProductName>Furry gorilla with big eyes slippers (Black)
XL</ProductName>
    <OrderQty>9</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>345.00</LineTotal>
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```

    <ProductName>Ride on big wheel monster truck (Black) 1/12
    scale</ProductName>
    <OrderQty>4</OrderQty>
  </LineItem>
</OrderDetails>
<OrderDetails SalesOrderID="73340" OrderDate="2016-05-27"
CustomerID="1061">
  <SalesPerson SalesPersonName="Taj Shand" />
  <LineItem>
    <LineTotal>34.00</LineTotal>
    <ProductName>Superhero action jacket (Blue) 5XL
    </ProductName>
    <OrderQty>2</OrderQty>
  </LineItem>
  <LineItem>
    <LineTotal>112.00</LineTotal>
    <ProductName>32 mm Double sided bubble wrap 50m
    </ProductName>
    <OrderQty>20</OrderQty>
  </LineItem>
</OrderDetails>
<OrderDetails SalesOrderID="73350" OrderDate="2016-05-27"
CustomerID="1061">
  <SalesPerson SalesPersonName="Sophia Hinton" />
  <LineItem>
    <LineTotal>13.00</LineTotal>
    <ProductName>DBA joke mug - you might be a DBA if
    (Black)</ProductName>
    <OrderQty>4</OrderQty>
  </LineItem>

```

```

<LineItem>
  <LineTotal>13.00</LineTotal>
  <ProductName>Developer joke mug - that's a hardware
  problem (Black)</ProductName>
  <OrderQty>3</OrderQty>
</LineItem>
<LineItem>
  <LineTotal>18.00</LineTotal>
  <ProductName>Halloween zombie mask (Light Brown) S
  </ProductName>
  <OrderQty>24</OrderQty>
</LineItem>
<LineItem>
  <LineTotal>25.00</LineTotal>
  <ProductName>RC toy sedan car with remote control (Red)
  1/50 scale</ProductName>
  <OrderQty>2</OrderQty>
</LineItem>
<LineItem>
  <LineTotal>32.00</LineTotal>
  <ProductName>Tape dispenser (Blue)</ProductName>
  <OrderQty>90</OrderQty>
</LineItem>
</OrderDetails>
<OrderDetails SalesOrderID="73356" OrderDate="2016-05-27"
CustomerID="1061">
  <SalesPerson SalesPersonName="Anthony Grosse" />
  <LineItem>
    <LineTotal>8.55</LineTotal>
    <ProductName>Chocolate sharks 250g</ProductName>
    <OrderQty>192</OrderQty>
  </LineItem>

```

```

<LineItem>
  <LineTotal>285.00</LineTotal>
  <ProductName>Ride on vintage American toy coupe (Black)
  1/12 scale</ProductName>
  <OrderQty>10</OrderQty>
</LineItem>
</OrderDetails>
</SalesOrders>

```

Summary

The `FOR XML` clause can be used to construct XML data from a T-SQL query. The `FOR XML` clause can be used in four modes: `RAW`, `AUTO`, `PATH`, and `EXPLICIT`.

When used in `RAW` mode, `FOR XML` will produce a flat XML instance, with no nesting. It is very simple to use and allows for the XML instance to be either attribute-centric or element-centric. It can also produce well-formed XML, by adding a root node. It provides very little control over formatting, however.

`FOR XML AUTO` is very simple to use and allows the developer to create nested XML instances. Just as with `FOR XML RAW`, `FOR XML AUTO` can produce either element-centric or attribute-centric documents, which can be well-formatted with the addition of a root node. Data within the XML document will be nested automatically, based on table joins. Nodes will derive their names from table aliases.

When used in `PATH` mode, `FOR XML` provides much more granular control over the layout of the XML document. Each column can be defined as either an element or an attribute, by including or omitting the `@` prefix. Hierarchical position can be defined through column aliases, and complex nesting requirements can be achieved through subqueries.

FOR XML EXPLICIT is the most complex of the FOR XML modes but also the most powerful. It is implemented by defining each complex node in a separate query, with the queries joined by using the UNION ALL clause. Hierarchical positioning is defined through tag and parent columns, which are always the first and second columns, respectively, in the SELECT list. Column aliases allow for the declaration of node names and define if each node should be element-centric or attribute-centric.