

XML Query Forms (XQForms): Declarative Specification of XML Query Interfaces

**Michalis
Petropoulos**

Computer Science Dept.
University of California,
San Diego /
Enosys Markets, Inc.
mpetropo@cs.ucsd.edu

**Vasilis
Vassalos**

Information Systems Dept.
New York University /
Enosys Markets, Inc.
vasilis@enosysmarkets.com

**Yannis
Papakonstantinou**

Computer Science Dept.
University of California,
San Diego /
Enosys Markets, Inc.
yannis@cs.ucsd.edu

Overview

Motives

- An increasing amount of sources export XML views of themselves
 - View = XML Schema + data
- XML Query will allow querying these views
- XQForms generates query forms and reports for querying these XML views

XQForm - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Links >

Proximity Sensors

General

Manufacturer: No preference

Supply Voltage: 2 to 20

Additional Attributes ▾

Part Number:

Mechanical

Body Type: Cylindrical

Dimensions: Dia 25 Length mm

Sorting & Options

Results/page: 10

Supply Voltage Min: DESC

DESC-Manufacturer: up + dn -

DESC-Output Type: up + dn -

Reset → Execute →

Next 10

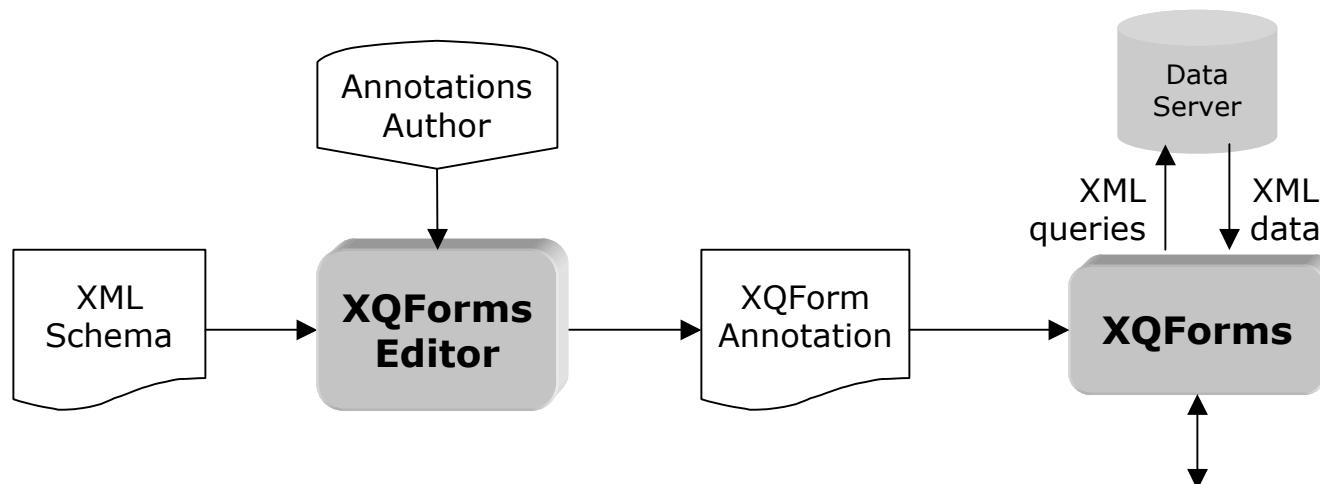
Manufacturer	Output Type	Part Number	Supply Voltage Ranges		
			Type	Min	Max
Turck	PNP	BES-516-396-SA1-G-S49-C	AC	5	7
		BES-516-383-G-SA4-S4-C	AC	7	9
		BES-516-384-G-SA2-S4-C	DC	6	12
		BES-516-3007-E4-C-PU-5	AC	2	6
		BES-516-3017-E4-C-PU-5	DC	6	12
		BES-516-3008-E4-C-PU-5	AC	3	6
		BES-516-3018-E4-C-PU-5	DC	6	12
		BES-516-3007-E5-C-S49	AC	2	12
		BES-516-3017-E5-C-S49	DC	3	9
		BES-516-3008-E5-C-S49	AC	12	18

Previous 10

Next **Next** **Next 10** **Previous 10**

Unknown Zone (Mixec)

Basic Architecture



The screenshot shows a Microsoft Internet Explorer window displaying an XQForm. The title bar reads "XQForm - Microsoft Internet Explorer". The main content area is divided into two sections: a search form on the left and a table on the right.

Search Form (Left):

Proximity Sensors	
General	
Manufacturer	No preference
Supply Voltage	2 to 20
Additional Attributes	
Part Number	<input type="text"/>
Mechanical	
Body Type	Cylindrical
Dia	<input type="text"/>
Length	<input type="text"/>
Dimensions	25 mm
Sorting & Options	
Results/page	10
Supply Voltage Min	DESC
DESC-Manufacturer	<input type="text"/>
DESC-Output Type	<input type="text"/>
<input type="button" value="Reset"/> <input type="button" value="Execute"/>	

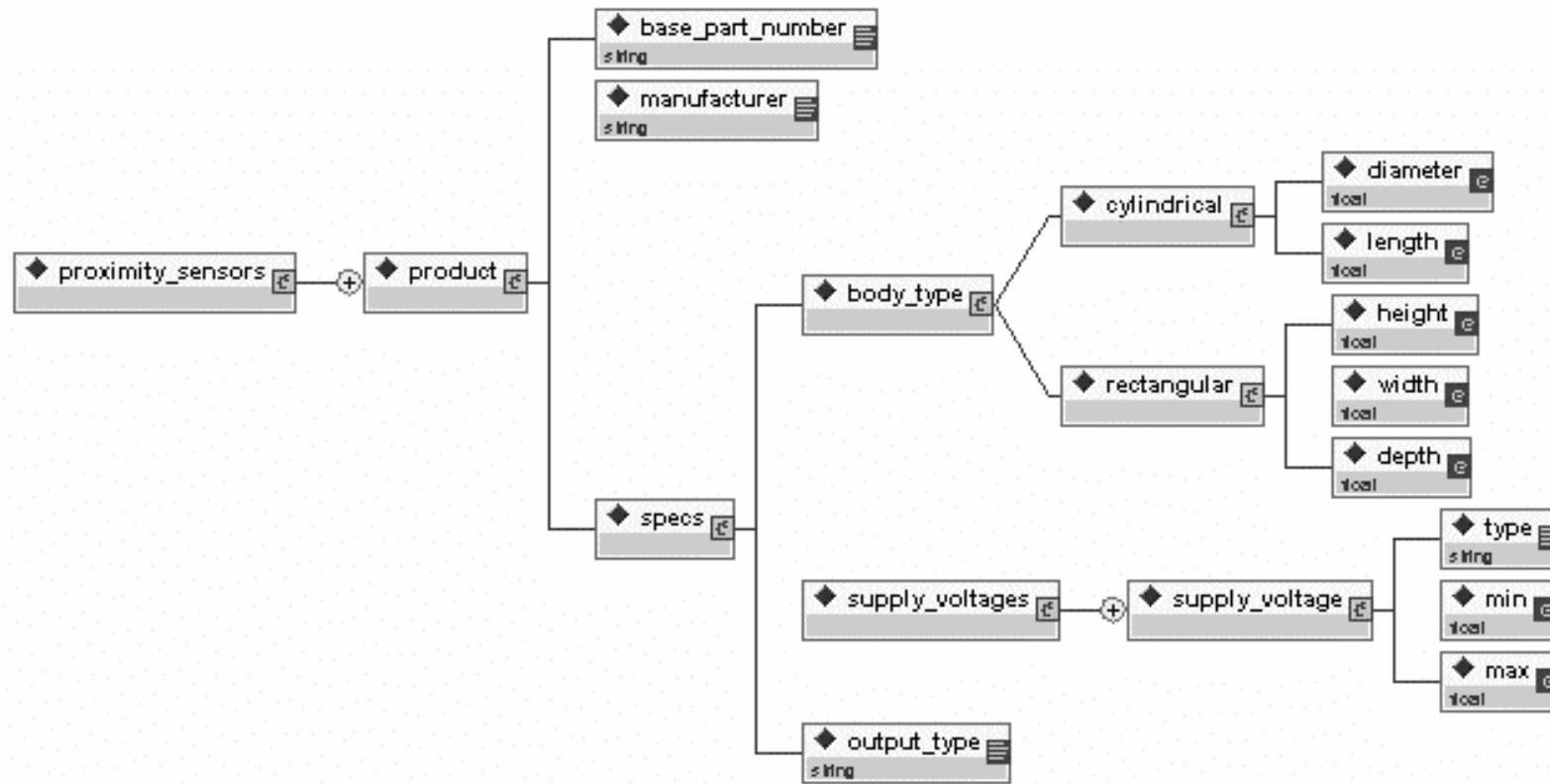
Table (Right):

Next 10				Previous 10		
Manufacturer	Output Type	Part Number	Supply Voltage Ranges	Type	Min	Max
All	All	All	All	All	All	All
Turck	PNP	BES-516-396-SA1-G-S49+C	AC	5	7	
		BES-516-383-G-SA4-S4-C	AC	7	9	
		BES-516-384-G-SA2-S4-C	DC	6	12	
		BES-516-3007-E4-C-PU-5	AC	2	6	
		BES-516-3017-E4-C-PU-5	DC	6	12	
NPN	NPN	BES-516-3008-E4-C-PU-5	DC	2	8	
		BES-516-3019-E4-C-PU-5	AC	2	12	
		BES-516-3007-E5-C-S49	DC	6	12	
		BES-516-3017-E5-C-S49	AC	3	9	
		BES-516-3009-E5-C-S49	DC	12	18	
			AC	2	12	
			DC	9	12	

Buttons at the bottom include "Next", "Next", "Previous", and "Previous".

Basic Architecture

Example XML Schema



XQForms Builder

File Edit Action Deploy Help

XAnnotate: 5 annotations found

	Name	Path
E	manufacturer	/proximity_sensors/product/manufacturer
E	max_distance	/proximity_sensors/product/specifications/spec...
E	sensing_technology	/proximity_sensors/product/specifications/spec...
E	operating_temp	/proximity_sensors/product/specifications/spec...
E	supply_voltage	/proximity_sensors/product/specifications/spec...

Control Properties: Select

Query Characteristics

Label: Manufacturer

Values:

	Label	Data Value	Binding Path	D	P
1	No preference	any		<input checked="" type="radio"/>	=
2	Balluff		proximity_sensors/product/manufacturer	<input type="radio"/>	=
3	Baumer		proximity_sensors/product/manufacturer	<input type="radio"/>	=
4	Turck		proximity_sensors/product/manufacturer	<input type="radio"/>	=

Multiple:

Size: 3

Unit:

Precision: 0

Dependencies: Annotation Name

Presentation Characteristics

Categories: Sensors
General

Attached Info:

Initially Hidden:

Cancel **OK**

Schema: E:\XSDesign\Projects\schemas\GS_SensorsProximity.xsd

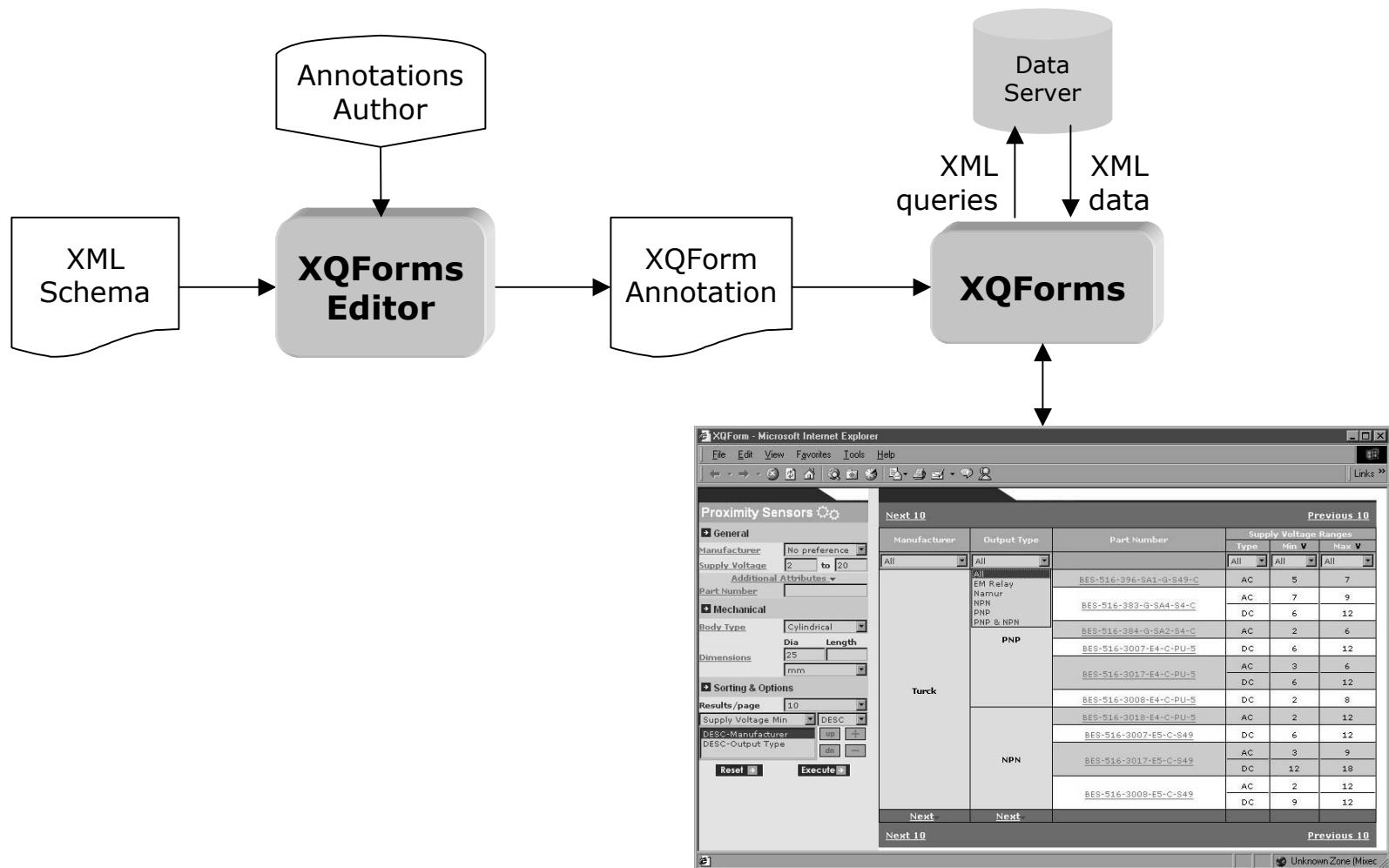
Annotation: E:\XSDesign\Projects\simple\simple.xqf

Basic Architecture

Query Control Annotation

```
<select>
  <label>Manufacturer</label>
  <values>
    <value default="true">
      <label>No preference</label>
      <data_value>any</data_value>
      <binding_path></binding_path>
      <condition>EQ</condition>
    </value>
    ...
    <value>
      <label>Turck</label>
      <binding_path>
        proximity_sensors/product/manufacturer
      </binding_path>
      <condition>EQ</condition>
    </value>
  </values>
  <multiple>false</multiple>
</select>
```

Basic Architecture



Detailed Architecture

Steps in a Query Control lifecycle

XML Schema



XMAS Query

```
1 WHERE
2 proxSource proximity_sensors.product $P
3 AND $P manufacturer._ $M
4 AND $M = "Turck"
```

Annotation

```
1 <select>
2   <label>Manufacturer</label>
3   ...
4   <value>
5     <label>Turck</label>
6     <binding_path>
7       proximity_sensors/product/manufacturer
8     </binding_path>
9     <condition>EQ</condition>
10    </value>
11    ...
12 </select>
```

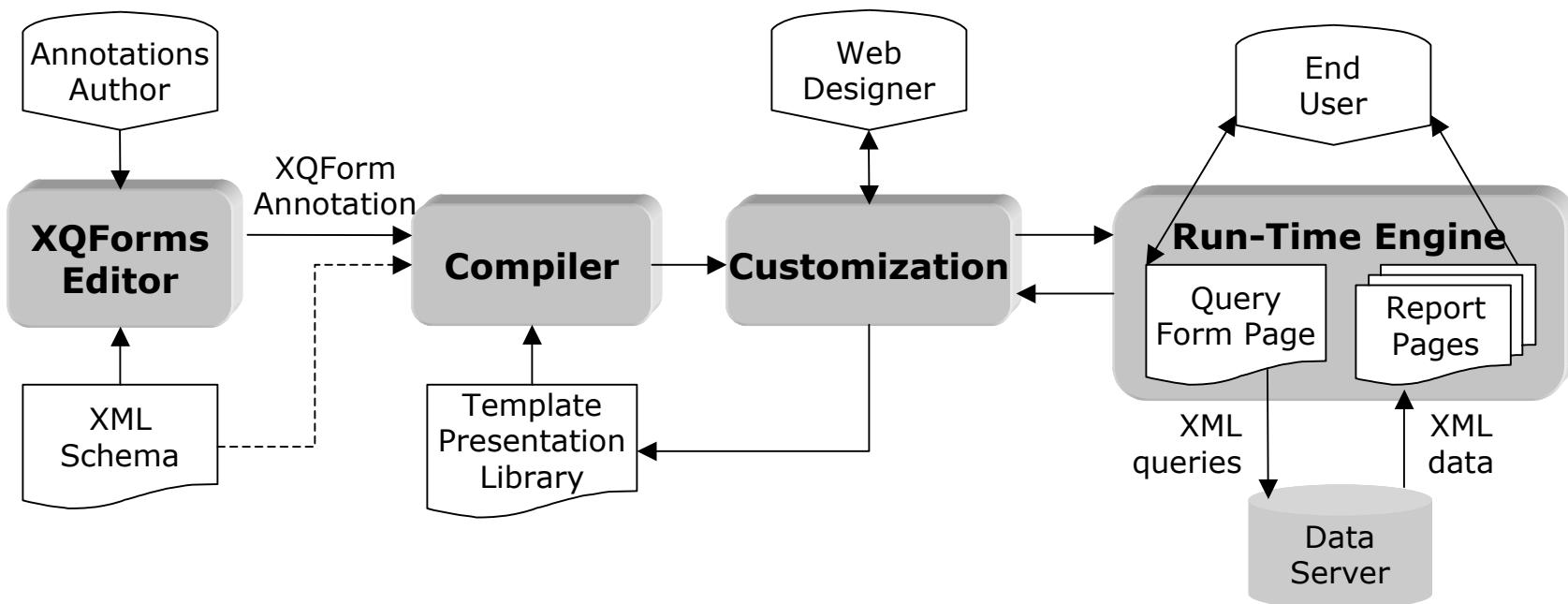
Form Elements

Manufacturer

- No preference
- Balluff
- Baumer
- Turck

Detailed Architecture

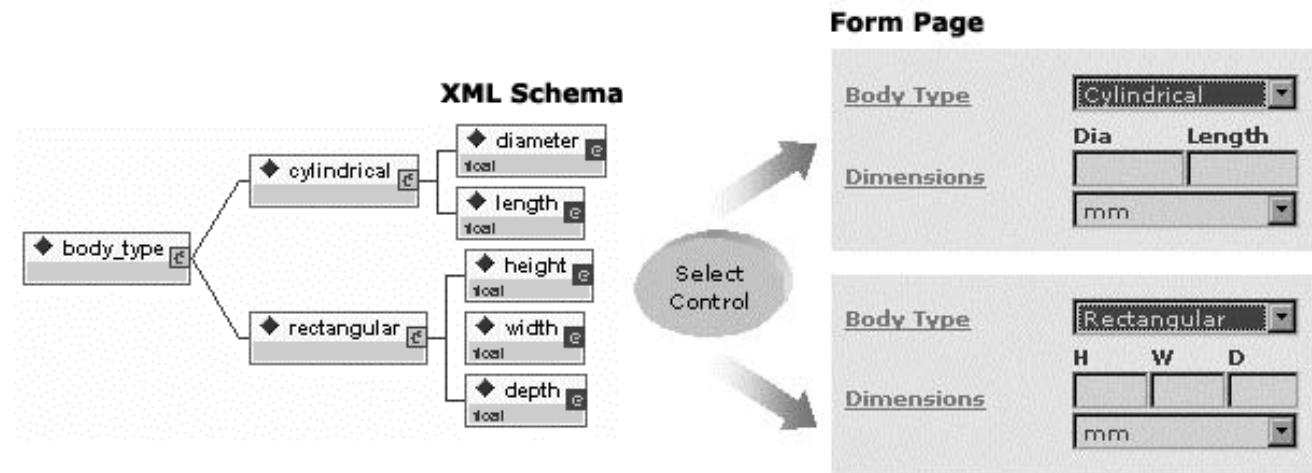
Steps in an XQForm lifecycle



- Separation of content, query semantics and presentation

Detailed Architecture

Dependencies among Query Controls



- Ability to express CASE statements
- Different query controls contribute in querying
- The corresponding form elements are shown on the query form page

Reports

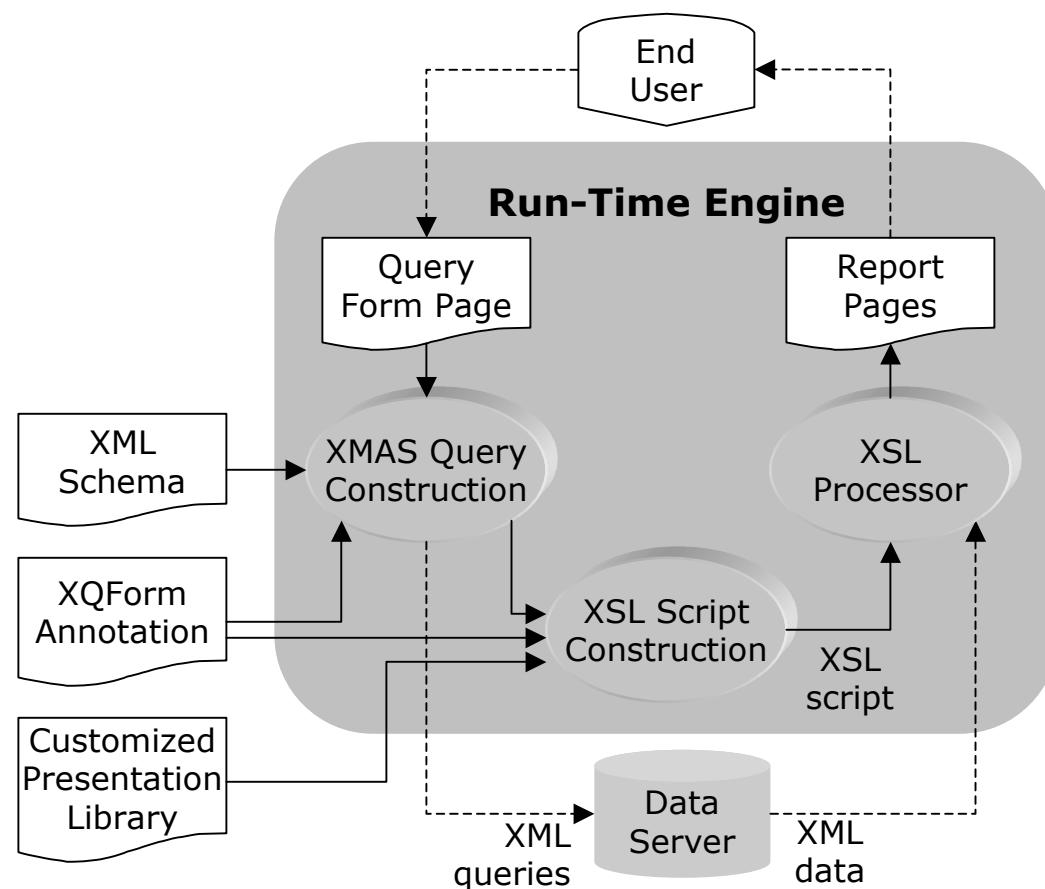
Annotation

```
<report>
  <main_result_unit>
    <binding_path>
      proximity_sensors/product
    </binding_path>
  </main_result_unit>
  <result>
    <label>Manufacturer</label>
    <binding_path>manufacturer</binding_path>
    <pattern>concat(., ' Manufacturer')</pattern>
    <summarize order="ASC">true</summarize>
  </result>
  <result>
    <label>Part Number</label>
    <binding_path>base_part_number</binding_path>
    <template>base_part_number.xsl</template>
    <summarize>false</summarize>
  </result>
  ...
</report>
```

- Specifies the data that appear on the report page
- Mechanism for easy customization of the report page
- The complexity of the XSL script for rendering the XML data is hidden

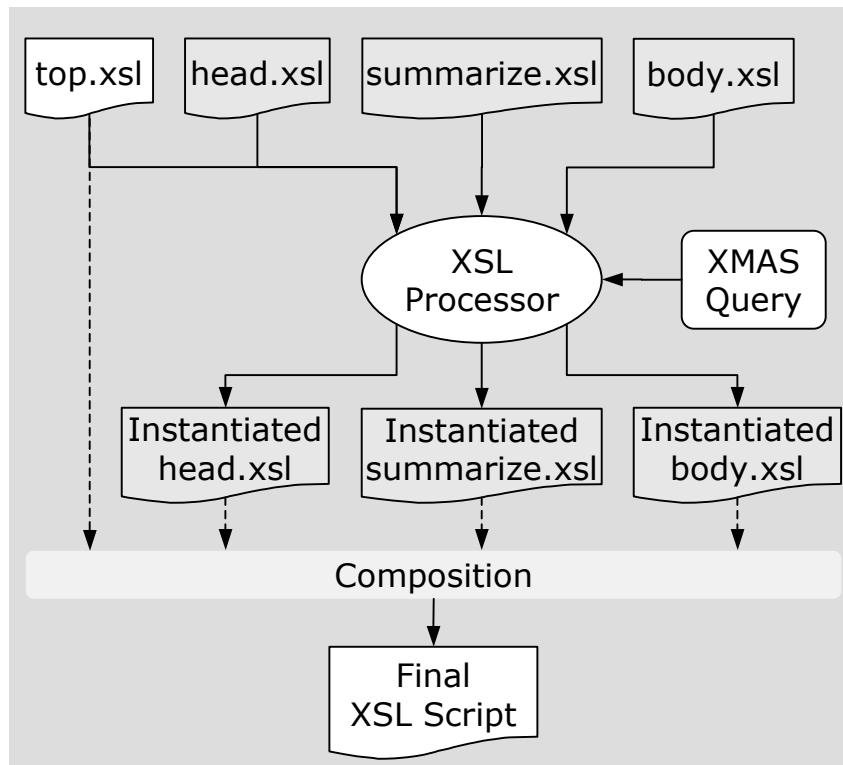
Reports

Architecture



Reports

Composition



- Engine applies system XSL scripts, called *metaXSL* scripts
- *metaXSL* scripts follow the structure of the XML query and construct the visual structure of the report page
- *metaXSL* scripts attach XSL templates to the simple and complex elements

XQForm - Microsoft Internet Explorer

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Results/page: 10

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DESC-Manufacturer: up + dn -

DESC-Output Type: up + dn -

Reset → Execute →

Next 10

Manufacturer	Output Type	Part Number	Supply Voltage Ranges		
			Type	Min V	Max V
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		BES-516-3017-E4-C-PU-5	DC	6	12
		BES-516-3008-E4-C-PU-5	AC	3	6
		BES-516-3018-E4-C-PU-5	DC	6	12
		BES-516-3007-E5-C-S49	AC	2	12
		BES-516-3017-E5-C-S49	DC	3	9
		BES-516-3008-E5-C-S49	AC	12	18

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Unknown Zone (Mixec)

Conclusions

Functionality Provided to Developers

- Declarative definition and generation of powerful query form and report pages for XML data modeled by XML Schemas
- Automated query construction and report formatting
- Separation of querying functionality and presentation
- High degree of customizability

Conclusions

Functionality Provided to End Users

- Ability to express arbitrary selection and projection conditions on the query form page
- Ability to express arbitrary sorting conditions
- Control on the number of elements that are returned from the data server
- Advanced navigation capabilities in the returned reports
- Ability to dynamically summarize and filter the query results on the reports pages
- On Line Demo:
<http://www10.enosysmarkets.com>

Related Work

- XForms
 - Based on XML Schemas
 - Focus on end user interaction and XML instance creation
- Strudel
 - Graph model
 - Site graph
 - Functions on edges/links
- Commercial systems
 - Visual InterDev
 - Relational databases

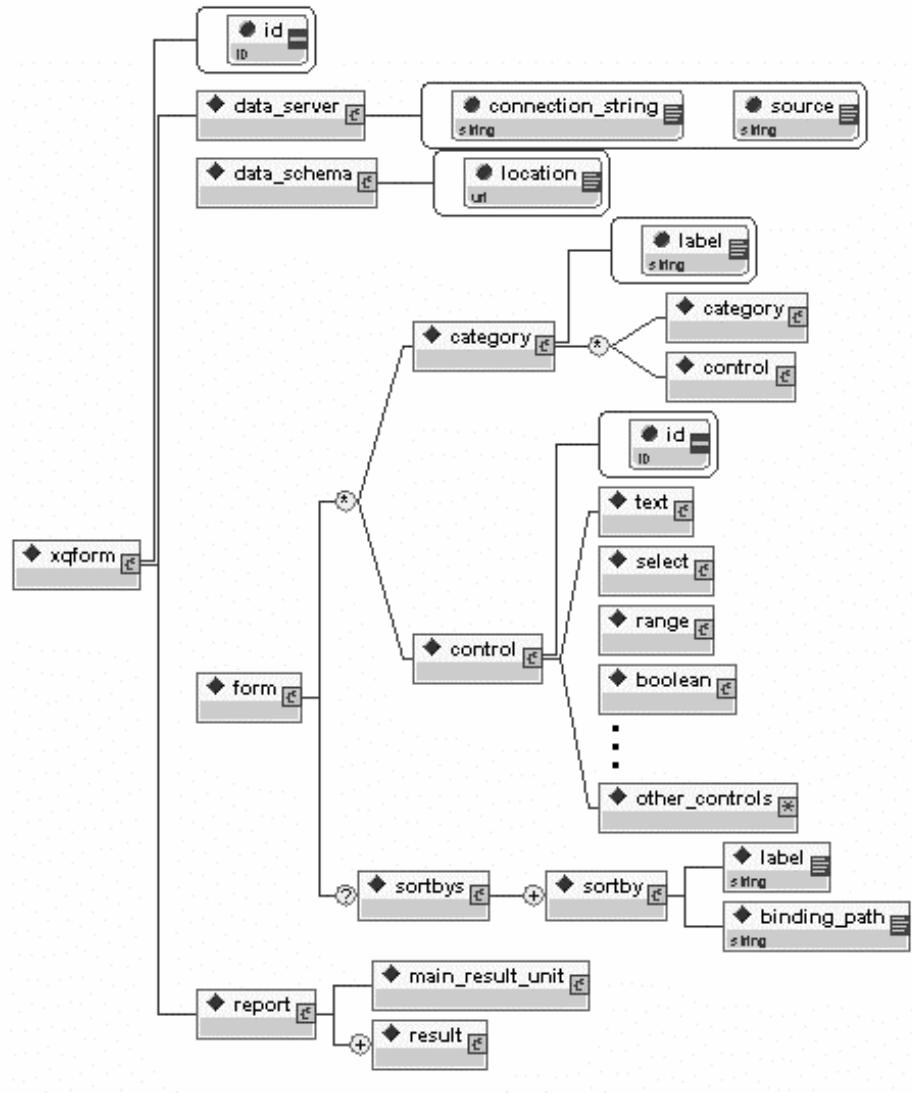
Future Directions

- Expanded XML schema
 - Disjunction of repeatable elements
- Decision trees
 - Multi-step forms
 - More powerful dependencies
- Comparison reports
- Report customization
- Updates

Outline

- Overview
- Basic Architecture
- Detailed Architecture
 - The four steps of the XQForms' lifecycle
- Reports
 - Automatic report construction
- Summary
 - Functionality provided
- Related work
- Future directions

Annotation Scheme



- Captures the general attributes of an XQForm
- Expresses the structure and the semantics of the query form page
- Specifies the syntax of an easily extensible collection of query controls
- Specifies which data elements will appear on the report page

Overview

XQForms Editor

