



Expert Series Webinar

Deep Dive Into XPath

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Agenda

- ▶ What are XPath
- ▶ XPath Syntax
- ▶ Examples
- ▶ Best Practices

XPath – What is it?

- ▶ Primary query language
 - OQL is secondary query language
- ▶ Query on hierarchical structures

What is a query?

- ▶ A query is a command to obtain a specific set of data

XPath - Locations

▶ Pages

- Constrain on context - (i.e. data grid)
- Constrain on selectable data - (i.e. reference selector)

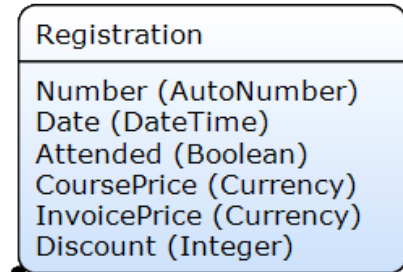
▶ Microflows

- Constrain on data retrieve

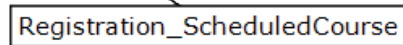
▶ Security

- Constrain on access rights

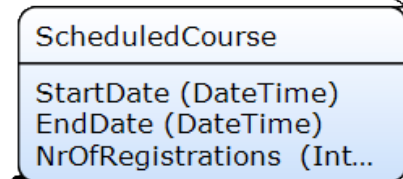
XPath - Query on hierarchical structures



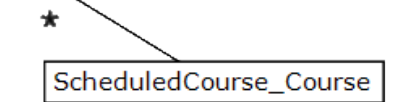
//Training.Registration



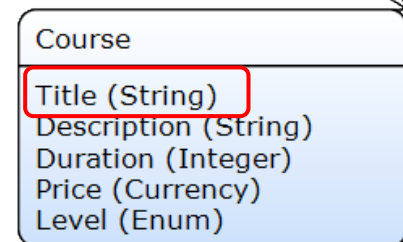
[Training.Registration_ScheduledCourse



/Training.ScheduledCourse



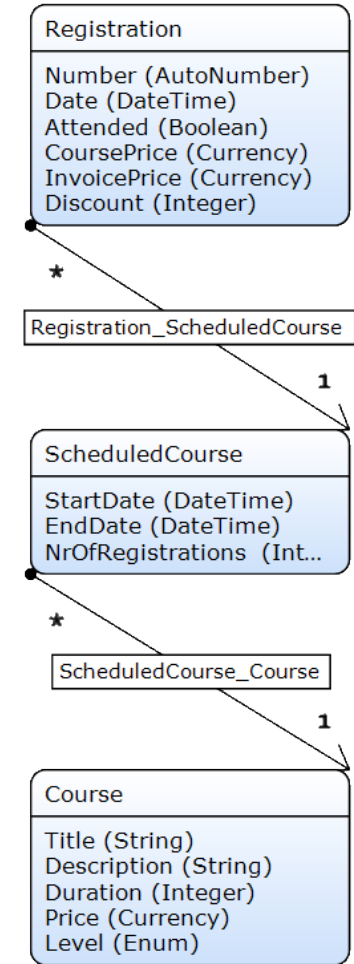
/Training.ScheduledCourse_Course



/Training.Course/Title = 'Advanced Course']

XPath – Total XPath query

```
//Training.Registration  
[Training.Registration_ScheduledCourse/Training.ScheduledCourse/  
Training.ScheduledCourse_Course/Training.Course/Title  
= 'Advanced Course']
```



XPath - Tokens

//	//Training.Course	Context (managed under the hood)
[]	[Title = 'Advanced Course']	Grouping of Xpath
.	Training.Course	Separate module & element
/	Training.Course/Title	Separate domain model elements
()	[not(Title = 'Introduction Course')]	Grouping of functions

XPath - Elements

- ▶ Attributes
- ▶ Entities
- ▶ Associations
- ▶ Variables

[**Name** = 'Jansen']

[**Training.Trainee**/Name = 'Jansen']

[**Training.Registration_Trainee**/

Training.Trainee/Name = 'Jansen']

[**Training.Registration_Trainee** = **\$Trainee**]

XPath - Operators

- ▶ + , -
- ▶ *, div
- ▶ =, !=, <, <=, >, >=
- ▶ or, and, **empty**

Examples

- [Grade < 5
or
Grade >= 7
and
Training.Registration_Trainee/Training.Trainee/FirstName = **empty**]

XPath - Example Attribute value 1/3

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity

Options

Range ☒ All ☐ First ☐ Custom

XPath constraint

[FirstName = 'Tom']

Return

Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
1	Tom	Home	555-12345	Tom@mx.com	01/01/1975	premium
1	Tom	Home	555-12345	Tom@mx.com	01/01/1975	premium
2	Dylan	Street	555-54321	Dylan@mx.com	02/02/1980	professional
3	Jim	City	444-12345	Jim@mx.com	01/01/1975	excellent
4	Tomas	Place	345-54321	Tomas@mx.com	02/02/1980	excellent
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional

Trainee

FirstName (String)
LastName (String)
Address (String)
EmailAddress (String)
Level (Enum)

XPath - Example Association 2/3

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity Training.Trainee

Options

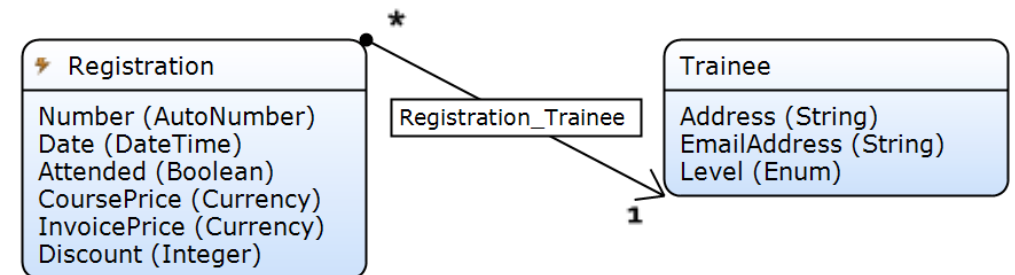
Range ☒ All ☐ First ☐ Custom

XPath constraint

[Training.Registration_Trainee/
Training.Registration/Discount > 30]

Return

Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
2	Dylan	Street	555-54321	Dylan@mx.com	02/02/1980	professional
6	Jeff	Daycare	444-96325	Jeff@mx.com	02/02/1980	professional
2	Dylan	Street	555-54321	Dylan@mx.com	02/02/1980	professional
3	Jim	City	444-12345	Jim@mx.com	01/01/1975	excellent
4	Tomas	Place	345-54321	Tomas@mx.com	02/02/1980	excellent
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional



XPath - Example Multiple Association 3/3

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity Training.Trainee

Options

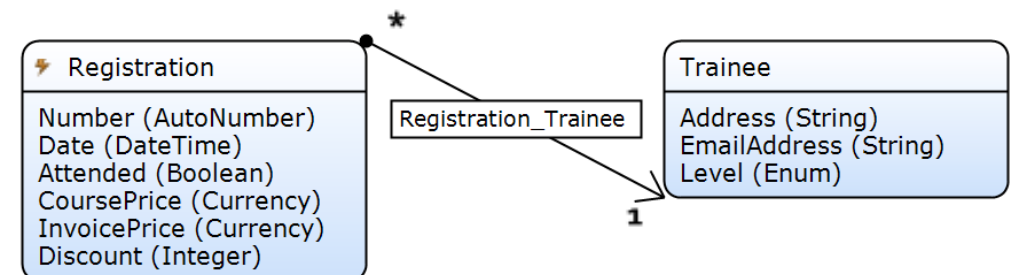
Range ☒ All ☐ First ☐ Custom

XPath constraint

[Training.Registration_Trainee/
Training.Registration/Discount < 30
or
Training.Registration_Trainee/
Training.Registration/Discount >= 50]

Return

Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
2	Dylan	Street	555-54321	Dylan@mx.com	02/02/1980	professional
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff		444-96325	Jeff@mx.com	02/02/1980	professional
3	Jim	City	444-12345	Jim@mx.com	01/01/1975	excellent
4	Tomas	Place	345-54321	Tomas@mx.com	02/02/1980	excellent
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional



Assignment 7.1.1 - XPath basics

Modify the “ScheduledCourse_Overview, It must show the following:

Tab	Content
Scheduled	Scheduled courses that have not yet started
In progress	Scheduled courses that are in progress at the moment
Finalized	Scheduled courses that have ended already
Incomplete	Scheduled course that haven't their full details set
All	All Scheduled courses

Assignment 7.1.2 - XPath basics

- ▶ Show the following on page XPathBasic
 - Unattended Registrations:
A Trainee did not attend
 - Unattended and < 50% Discount scheduled courses:
A Trainee did not attend and where a discount smaller than 50%
 - Attended or No Registrations scheduled courses:
A Trainee did attend or where there were no Registrations.
 - Attended, Professional and >50% Discount scheduled courses:
Trainees of a Professional level attended and where a discount was bigger than 50%.

XPath – Constraint functions

- ▶ id
- ▶ contains
- ▶ start-with, ends-with
- ▶ not
- ▶ True, false
- ▶ length
- ▶ date-time functions

- ▶ Examples
 - [**contains**(Name, 'an')]
 - [**not**(Name = 'Jansen')]
 - [**id** = \$currentUser]

XPath - System variables

Object related

- ▶ [%CurrentUser%]
- ▶ [%CurrentObject%]

User role related

- ▶ [%UserRole_Administrator%]

Date-Time related

- ▶ [%CurrentDateTime%]

Period related

- ▶ [%DayLength%]

Examples

```
[id = '[%CurrentUser%]']  
[System.UserRoles = '[%UserRole_Administrator%]']  
[DateRegistered > '[%BeginOfCurrentDay%' - 3 * '[%YearLength%]']]
```


XPath - Example function 1/5

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity

Options

Range ☒ All ☐ First ☐ Custom

XPath constraint

[not(FirstName = 'Tom'))]

Which is the same as

[FirstName != 'Tom']

Return

Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
2	Dylan	Street	555-54321	Dylan@mx.com	02/02/1980	professional
3	Jim	City	444-12345	Jim@mx.com	01/01/1975	excellent
4	Tomas	Place	345-54321	Tomas@mx.com	02/02/1980	excellent
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional

Trainee

- FirstName (String)
- LastName (String)
- Address (String)
- EmailAddress (String)
- Level (Enum)

XPath - Example function 2/5

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity

Options

Range ☒ All ☐ First ☐ Custom

XPath constraint

[not(Training.Registration_Trainee/
Training.Registration/Discount = 30)]

Which is not the same as

[Training.Registration_Trainee/
Training.Registration/Discount != 30]

Return

Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
2	Dylan	Street	555-54321	Dylan@mx.com	02/02/1980	professional
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff		444-96325	Jeff@mx.com	02/02/1980	professional
3	Jim	City	444-12345	Jim@mx.com	01/01/1975	excellent
4	Tomas	Place	345-54321	Tomas@mx.com	02/02/1980	excellent
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional

```
classDiagram
    class Trainee {
        FirstName String
        LastName String
        Address String
        EmailAddress String
        Level Enum
    }
```

XPath - Example function 3/5

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity

Options

Range ☒ All ☐ First ☐ Custom

XPath constraint

[contains(FirstName, 'Tom')]

Return

Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
1	Tom	Home	555-12345	Tom@mx.com	01/01/1975	premium
4	Tomas	Place	345-54321	Tomas@mx.com	02/02/1980	excellent
5	Jim	City	444-12345	Jim@mx.com	01/01/1975	excellent
4	Tomas	Place	345-54321	Tomas@mx.com	02/02/1980	excellent
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional

Trainee

FirstName (String)
LastName (String)
Address (String)
EmailAddress (String)
Level (Enum)

XPath - Example function 4/5

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity

Options

Range ☒ All ☐ First ☐ Custom

XPath constraint

`[DateOfBirth < '[%CurrentDateTime%]' - 15 * [%YearLength%]]`

Return

Id	First Name	Address	Telephone	Email Address	DateofBirth	Level
1	Tom	Home	555-12345	Tom@mx.com	01/01/1975	premium
2	Dylan	Street	555-54321	Dylan@mx.com	02/02/1980	professional
3	Jim	City	444-12345	Jim@mx.com	01/01/1965	excellent
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1955	premium
5	Daryl	Work	555-56789	Daryl@mx.com	01/01/1975	premium
6	Jeff	DayCare	444-96325	Jeff@mx.com	02/02/1980	professional

Trainee

FirstName (String)
LastName (String)
Address (String)
EmailAddress (String)
Level (Enum)

XPath - Example function 5/5

//Training.Trainee

Retrieve Objects

Retrieve

Source ☐ By association ☒ From database

Entity Training.Trainee

Options

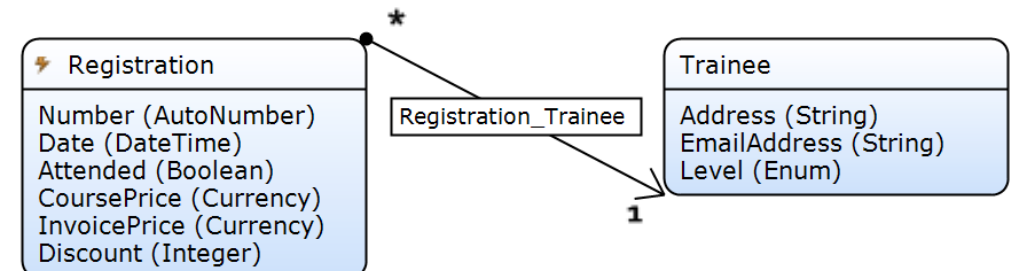
Range ☒ All ☐ First ☐ Custom

XPath constraint

[Training.Registration_Trainee = '%CurrentUser%']

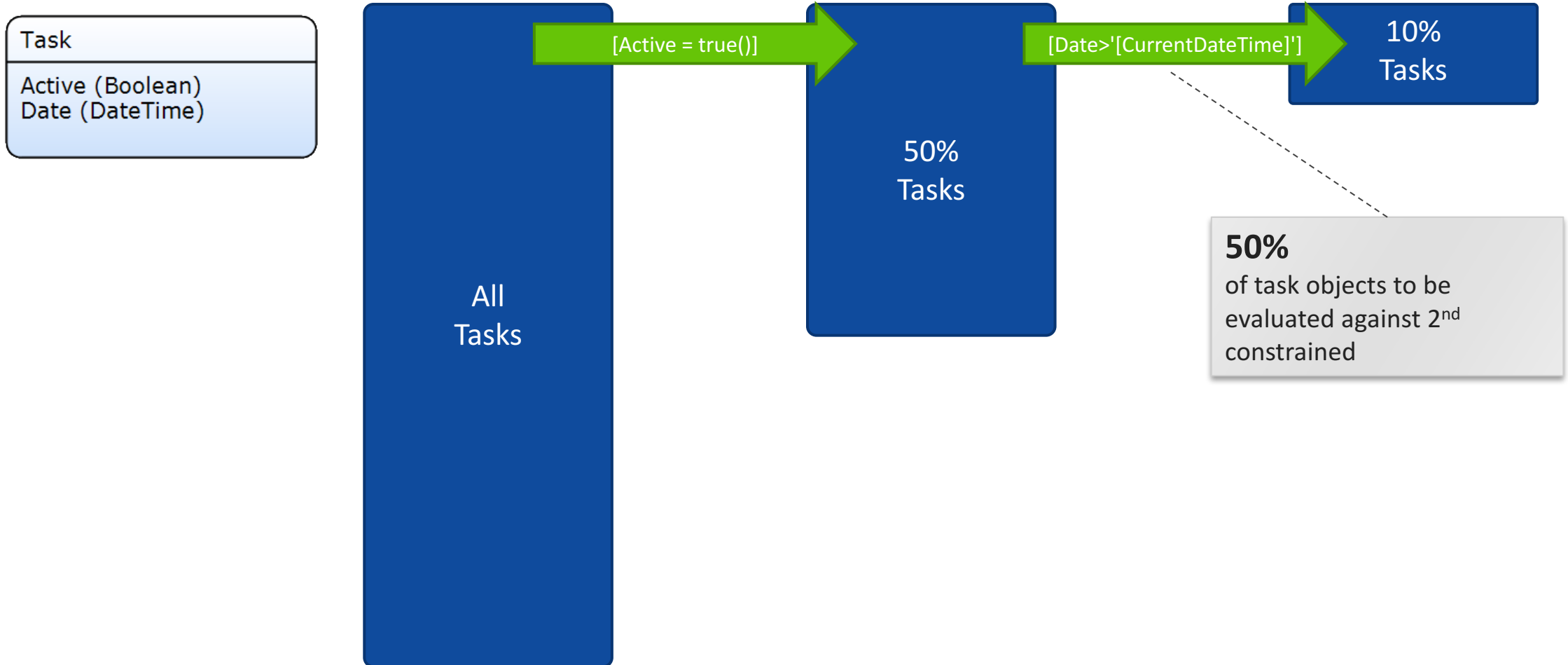
Return

- ▶ All registrations of the user who triggered this microflow will be returned



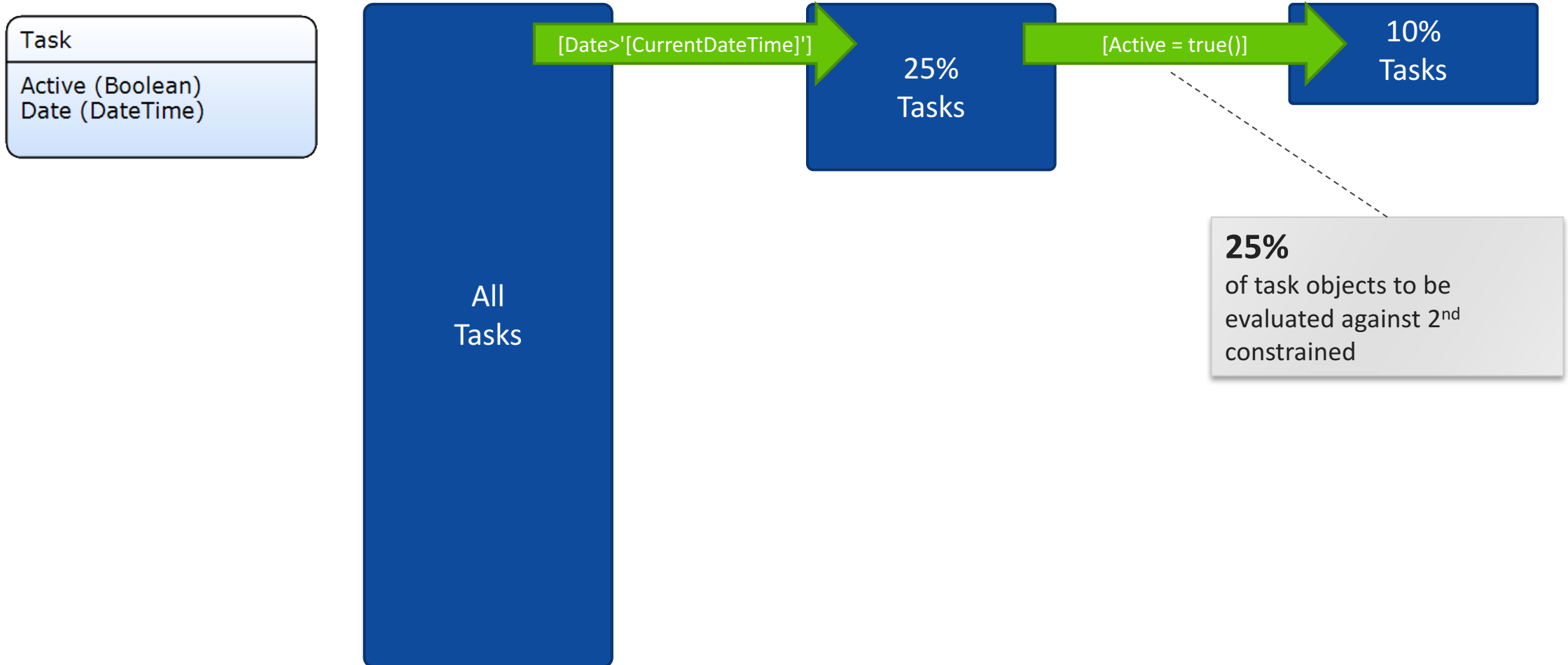
XPath - Best practices

- ▶ Start with the most restrictive constraint



XPath - Best practices

- ▶ Start with the most restrictive constraint



XPath - Best practices

- ▶ Optimize XPath if possible

[Training.Registration_Trainee/Training.Registration/Discount < 30
or
Training.Registration_Trainee/Training.Registration/Discount >= 50]



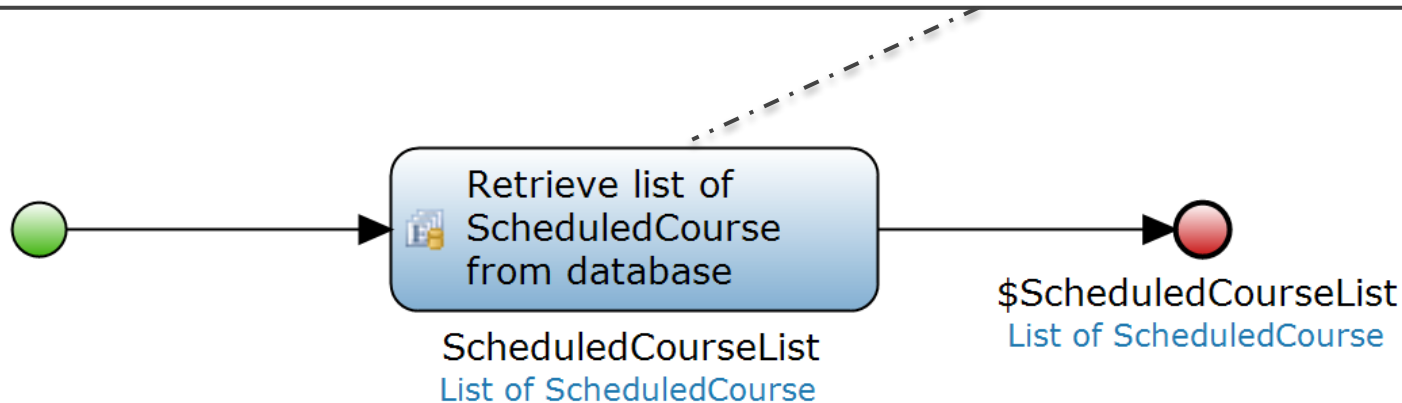
[Training.Registration_Trainee/Training.Registration
[Discount < 30 or Discount >= 50]]

XPath - Best practices

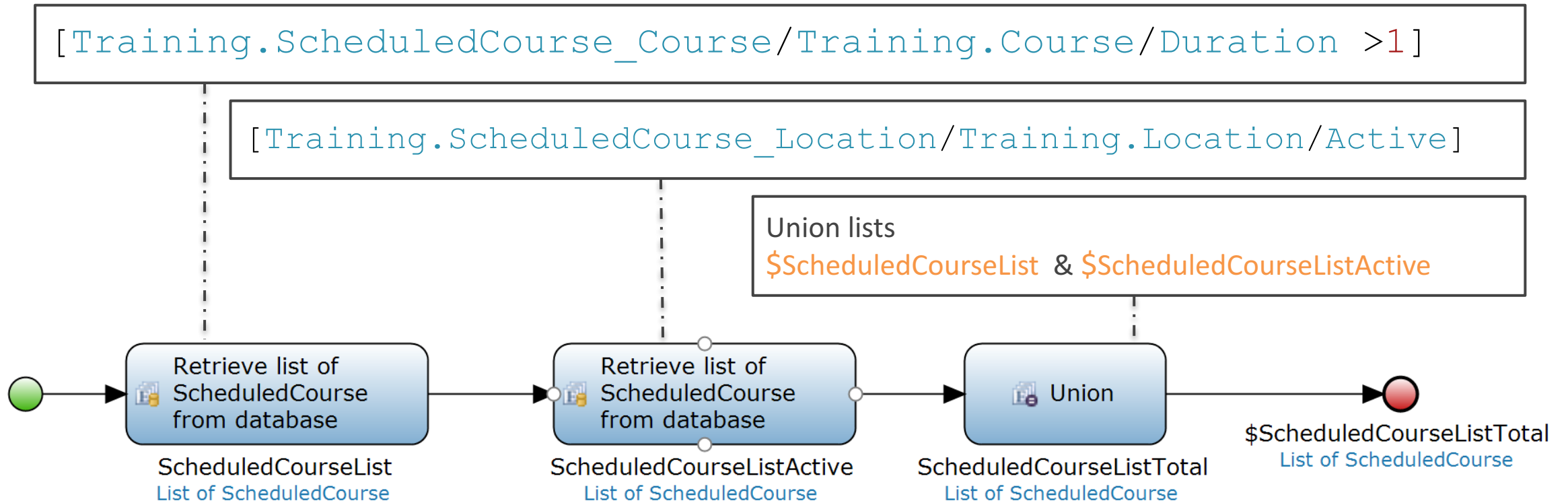
- ▶ Avoid 'OR' statement, where both sides follow an association & 'NOT' function with an association inside

These generates LEFT OUTER JOIN SQL queries; performance reduction
Separate retrieves with a join list operation can be quicker in certain cases.

```
[Training.ScheduledCourse_Course/Training.Course/Duration >1  
or  
Training.ScheduledCourse_Location/Training.Location/Active]
```



XPath – Optimize “or”



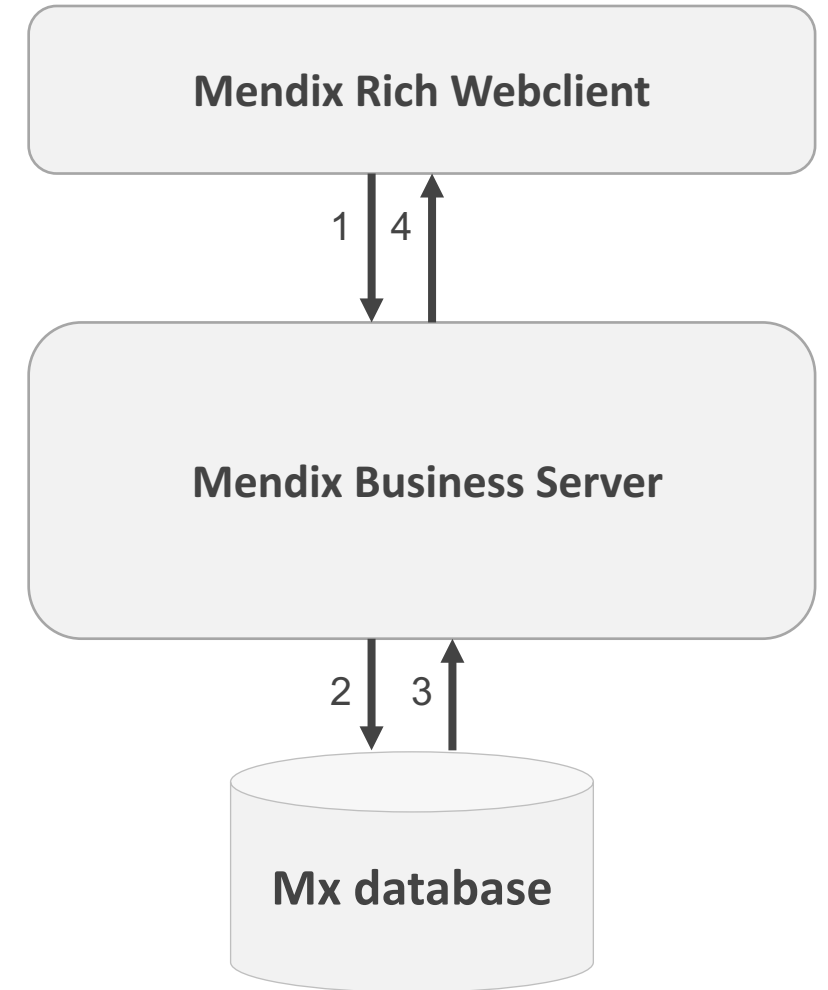
Pages

The data grid – XPath data source - retrieving a list

- ▶ Generates XPath queries based on:
 - Connected entity
 - Sort parameters
 - Search fields
 - Additional XPath constraints (specified in the modeler)
- ▶ Calls the RetrieveList() action in the MBS with:
 - ▶ The generated XPath
 - ▶ Retrieval schema
 - Specifying which attributes are required
 - Minimizes data transfer

The retrieve list action

1. Client -> MBS
Request: *RetrieveList (XPath)*
2. MBS-> Database
Request: *SQL Query (SELECT)*
3. Database -> MBS
Answer: *Record Set*
4. MBS -> Client
Answer: *Mendix Object List*



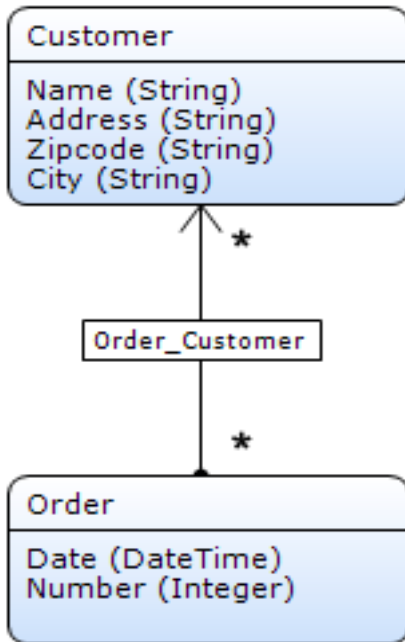
XPath to SQL

Xpath

```
//CRM.Customer[Name = 'Tom']
```

Schema

```
Name, City
```



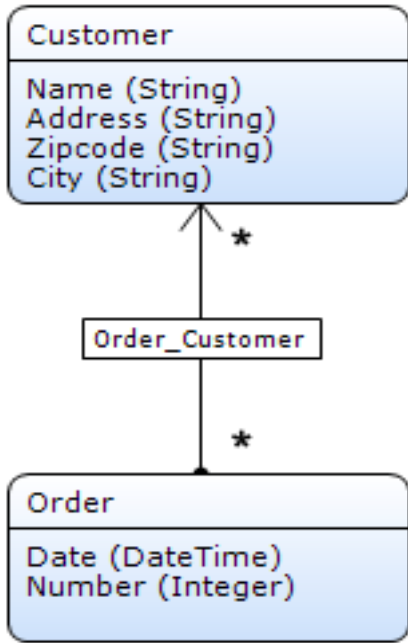
OQL

```
SELECT Name, City
FROM CRM.Customer
WHERE Name = 'Tom'
```

SQL

```
SELECT CRM$Customer.ID, CRM$CustomerName, CRM$CustomerCity
FROM CRM$Customer
WHERE Name = 'Tom'
```

XPath to SQL



Xpath

```
//CRM.Order[Order_Customer = 1]
```

Schema

```
Date, Number
```

OQL

```
SELECT Date, Number
FROM CRM.Order
WHERE CRM.Order/CRM.Order_Customer = 1
```


SQL

```
SELECT crm$order.id, crm$order.date, crm$order.number
FROM crm$order
WHERE crm$order.id IN
    (SELECT clcrm$order_customer.crm$orderid
     FROM crm$order_customer clcrm$order_customer
     WHERE clcrm$order_customer.crm$customerid = 1)
```

Performance – Reference selectors



Drop down

- ▶ Each reference selector triggers its own RetrieveList() action

 [ScheduledCourse, caller of the page]

Course

[ScheduledCourse_Course/Course/Title]



Pop up page

- reference selector will trigger its own RetrieveList() action at opening of the select page

[ScheduledCourse, caller of the page]

Course

[ScheduledCourse_Course/Course/Title]

+ [icon]

[icon]

[illegible]

- Avoid lots of editable reference selectors (dropdown) in one page; use wizards or lookup pages (popups)

Performance – Associated data

- ▶ For each widget connected to a path, a separated retrieve will be done.

[ScheduledCourse, caller of the page]

Planning Registrations

Title [ScheduledCourse_Course/Course/Title]

Description [ScheduledCourse_Course/Course/Description]
(5 lines)

Duration [ScheduledCourse_Course/Course/Duration]

Price [ScheduledCourse_Course/Course/Price]

- ▶ When displaying multiple attributes of same associated object use a nested data view

[ScheduledCourse, caller of the page]

Planning Registrations

[Course, over association 'ScheduledCourse_Course']

Title [Title]

Description [Description]
(5 lines)

Duration [Duration]

Price [Price]

Data source – Selectable objects

▶ Data source microflow

Allows the retrieve of a constrained list depending on multiple variables

‘XPath constraint’ vs. ‘Constrained by’

▶ ‘XPath constraint’ will be added to the database query which is performed at opening of the page (Static)

▶ ‘Constrained by’ will act on changes in page, which effects the result (Dynamic)

i.e. when selecting a car brand only the brands’ car models should be available.

Properties
Reference selector 'referenceSelector2'

Common	
Name	referenceSelector2
Class	
Style	
Tab index	0
Data source	
Attribute path	ScheduledCourse_Co
Editability	
Editable	Default
Condition	
Events	
On change	
On change settings	
General	
Select using	Form
Select form	CourseLocation_Sele
Select form settings	(Pop-up)
Required	No
Required message	
Go-to form	(none)
Go-to form settings	
Selectable objects	
Microflow	
Microflow settings	
XPath constraint	
Apply context	No
Remove from context	
Constrained by	
Sort order	

[ScheduledCourse_CourseLocation/CourseLocati... ▼]

Data source – XPath constraint

▶ XPath on page context

- Adds additional constraints to the query (XPath)
- Constraints can be modified using tool such as firebug
- NOT Security!
It's just Usability
I.e. courses in the past or future

```
[StartDate < '%BeginOfDay%']
```

[illegible]

```
[StartDate >= '%BeginOfCurrentDay%']
```

Best practices

- ▶ Avoid having many editable reference selectors (dropdowns) in one page
 - Use wizards or lookup pages (popups)
- ▶ Show multiple attributes of same associated object in a nested data view
- ▶ Avoid pages which trigger more than 5 queries
- ▶ Check if your page constraints deals with usability or security & adjust accordingly



Q&A