ATG Repositories Advanced Topics

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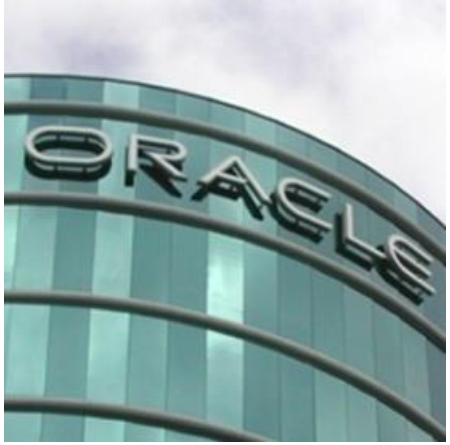
Agenda

- Derived and user defined properties
- Repository API

Learning Objectives

At the end of this lesson you should be able to:

- Create user-defined properties to custom functionality to repositories
- Use derived properties to derive the property value from other repository properties
- Learn about ATG Repository API
- Understand the core repository API elements
- Use query builder to programatically query the repository



Section 1:
User Defined Properties and Derived Properties

User-Defined Property Types

- In addition to the standard data types, the SQL Repository lets you add your own data types of properties.
- It uses custom Java classes that provide special handling for repository item properties.
- Examples:
  - Transient properties computed "on the fly" from values from the database. Compute age of a user given the birthday.
  - Values which must be modified or processed before storage or after retrieval from the database.

Creating a Custom Property Type

- Create a property descriptor java class which extends:
  - **`GSAPropertyDescriptor: stored property`**
  - **`RepositoryPropertyDescriptor: transient property`**
- Set property-type to your created class in the XML item descriptor property tag.

Property Descriptor Objects

- A Property Descriptor has methods to handle how property values are stored or retrieved:
  - `getPropertyValue()`
  - `setPropertyValue()`
- Developers may override any of the methods to change how the property attributes are handled.
- A Property Descriptor has methods to set all the attributes of a property.

Example: Age Calculator - Class

- Calculate the age of user given the birthday.

```
Class AgeCalculator extend GSAPropertyDescriptor{
   ...
   public Object getPropertyValue(RepositoryItemImpl pItem,
                                  Object pValue) {
     int age=0;
     Date birthDay = (Date) pItem.getPropertyValue("birthDay");

     Calendar dob = Calendar.getInstance();
     dob.setTime(birthDay);
     Calendar today = Calendar.getInstance();
     age = today.get(Calendar.YEAR) - dob.get(Calendar.YEAR);

     return Integer.valueOf(age);
  }
  ...
}
```

Example: Age Calculator – Item Descriptor

- Use the property-type attribute to specify your implementation class.

```
 <item-descriptor name="user">
   <property name="loggedIn" data-type="boolean">
   <table name="user" type="primary" id-column-names="id">
     <property name="login" data-type="string"
               column-name="login">
     <property name="birthDay" data-type="date"
               column-name="birth_day">
   </table>
   <property name="age" writable="false" data-type="int"
        property-type="com.myproject.AgeCalculator" />
</item-descriptor>
```

Property Attributes

- User-defined properties may use custom attributes to control behavior.
- Those attributes are passed to the setValue method of property descriptor.

```
<item-descriptor name="user">
  <property name="loggedIn" data-type="boolean">
  <table name="user" type="primary" id-column-names="id">
    <property name="login" data-type="string"
              column-name="login">
    <property name="birthDay" data-type="date"
              column-name="birth_day">
  </table>
  <property name="age" writable="false" data-type="string"
       property-type="com.myproject.AgeCalculator">
     <attribute name="format" value="inWords"/>
  </property>
</item-descriptor>
```

Example: Property Attributes – Class SetValue Method

- The SetValue is called for each attribute. Capture it and store the format.

```
// AgeCalculator.java
. . .
String format = "inNumbers";
public void setValue(String pAttributeName, Object pValue) {
  super.setValue(pAttributeName, pValue);

  if (pAttributeName.equalsIgnoreCase("format")){
    String lFormat = pValue.toString();
    if (lFormat.equalsIgnoreCase("inWords"))
      this.format = "inWords";
       else if (lFormat.equalsIgnoreCase("inNumbers"))
      this.format = "inNumbers";
    else // Should log error
      this.format="inNumbers";
  }
}
```

Example: Property Attributes – getPropertyValue Method

```
Class AgeCalculator extend GSAPropertyDescriptor{
   ...
   public Object getPropertyValue(RepositoryItemImpl pItem,
                                  Object pValue) {
     int age=0;
     Date birthDay = (Date) pItem.getPropertyValue("birthDay");

     Calendar dob = Calendar.getInstance();
     dob.setTime(birthDay);
     Calendar today = Calendar.getInstance();
     age = today.get(Calendar.YEAR) - dob.get(Calendar.YEAR);
     if (format.equals("inWords"))
        return convertToWords(age);
     else
        return String.valueOf(age);
   }
   ...
}
```

Derived Properties

- Derived properties derive their property values from another repository item or from another property.
- Derived properties must be transient properties.
- They are important to data structures that use a tree structure.
- Examples can be:
  - Can search through a series of properties to find a non-null value.
  - Employee has spending limits. If it is not set, the value of employee's department spending limit property is used.

Derivation Syntax

- Derived properties are defined through derivation tag.
- Each derivation tag encloses one or more expression tag(s).
  - Each expression tag encloses a property name.
  - Both the derived property and the expressions must be of the same type.
- By default, the repository will return the value of the first property in the list that is not null.

```
<property name="propertyName">
    <derivation>
        <expression> property1 </expression>
        <expression> property2 </expression>
        ...
    </derivation>
</property>
```

Example : Derived Properties (1)

- The following derivation uses the firstNonNull method to compute the spending limit.
- The result is stored in the property spendingLimit.

```
<item-descriptor name="employee">
   ...
   <property name="department" item-type="department"/>
   <property name="empSpendingLimit" data-type="int"/>
   <property name="spendingLimit" writable="false">
      <derivation method="firstNonNull">
         <expression>empSpendingLimit</expression>
         <expression>department.deptSpendingLimit</expression>
      </derivation>
</property>
</item-descriptor>

<item-descriptor name="department">
   ...
   <property name="deptSpendingLimit" data-type="int"/>
</item-descriptor>
```

Example : Derived Properties (2)

- In the previous example:
  - Employee's spendingLimit property is a derived property.
  - It will check first expression empSpendingLimit. If empSpendingLimit is not null, the value of empSpendingLimit will be used .
  - If empSpendingLimit is null, it will check the second expression department.deptSpendingLimit (its departement's deptSpendingLimit).
  - If department.deptSpendingLimit is not null, the value of department.deptSpendingLimit will be used.
  - Otherwise spendingLimit property value is null.

Derivation Methods

- Attribute method of derivation tag can specify one of several different derivation methods:
  - firstNonNull,
  - firstWithAttribute,
  - firstWithLocale,
  - alias,
  - union,
  - collectiveUnion.
- Method firstNonNull is default setting.
- User can define custom derivation method.

Derivation Method: firstWithLocale

- Performs the following actions:
  - Gets the user's current locale as the key.
  - Compares this locale to each expression's locale value.
  - Returns the first property matched.
- The properties are searched in a locale-specific way.
  - For example, if current locale is fr_FR_EURO, then the search order is : fr_FR_EURO, fr_FR, fr. Then first matched property is returned.
- Can set attribute defaultKey which is used when the current local key is null.

Example: Derivation Method - firstWithLocale

- If the current user local is de, then property value of displayName_de is returned.

```
<property name="displayName data-type="string">
   <derivation method="firstWithLocale">
     <expression>displayName_en</expression>
     <expression>displayName_de</expression>
   </derivation>
   <attribute name="defaultKey" value="en"/>
   <attribute name="derivationAttribute" value="locale"/>
   <attribute name="keyService"
           value="/atg/userprofiling/LocaleService"/>
   <attribute name="keySubProperty" value="locale"/>
</property>
```

Section 1 
Check Your Understanding

What are user defined properties?

Answer: They allow you to define a property on a repository item and provide a class implementation used to respond to it when the property is accessed.

Section 1 ✔
Check Your Understanding

How can you pass additional values to the user defined property descriptor to control its behavior?

Answer: You can use the attribute tag to pass additional values that can be used to control the behavior of the property.

Section 1 ✔
Check Your Understanding

What are derived properties?

Answer: Derived properties derive their value from other properties based on criterion such as non null, locale etc.

Section 1
Check Your Understanding

List common derivation methods for derived properties.

Answer: firstNonNull, firstWithLocale, alias, union etc.

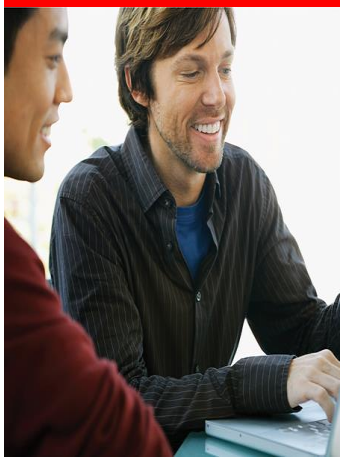
Section 1 ✔
Check Your Understanding

What tags are used to configure derived properties in the item descriptor?

Answer: Derivation and expression tags are used to specify derived properties.

Summary

- User defined properties and derived properties are ways to extend the concept of repositories to handle custom situations.
- User defined properties let you add your own properties to repository items and have a java class respond with results when the property is requested.
- Derived Properties derive their property value from another repository item or from another property.
- firstNonNull, firstWithAttribute, union are some of the supported derivation methods.



Section 3:
Repository API

Repository API Overview

- The ATG Repository API (atg.repository.*) is the foundation of persistent object storage, user profiling, and content targeting in ATG products.
- A repository is a data access layer that defines a generic representation of a data store.
- The Repository API is the generic representation that developers use to access the underlying data.

Core Repository API Elements

- atg.repository.Repository
  - An interface that provides methods to access RepositoryItems, RepositoryViews, and ItemDescriptors.
- atg.repository.RepositoryView
  - Used to search for items in the repository if you do not have an exact repository ID.
- atg.repository.RepositoryItem
  - An immutable interface that represents the elements in a repository.
- atg.repository.MutableRepository
  - Adds services to create, add, remove, and update items.
- atg.repository.PropertiesChangedEvent
  - The event that is broadcast when a repository item is modified.

Mutable Repository

- Base interfaces of a repository define an immutable data store.
- Some repository services implement MutableRepository.
- The SQL repository implements this interface.
- The MutableRepository interface defines these methods:
  - createItem(),
  - addItem(),
  - removeItem(),
  - updateItem().

Retrieving a Repository Item by ID

- **Use the following methods of the Repository object to retrieve a repository item by ID.**

```
RepositoryItem getItem(String pId, String pDescriptorName)

RepositoryItem[] getItems(String[] pIds,
                          String pDescriptorName)

RepositoryItem getItem(CompositeKey pId,
                          String pDescriptorName)

RepositoryItem [] getItems(CompositeKey [] pIds,
                               String pDescriptorName)
```

- **Examples:**

```
RepositoryItem user =
       myRepository.getItem("user1003","user");

RepositroyItem [] users = myRepository.getItem(
      String[]{"user1001","user10002"},"user")
```

Create a New Item

- There are two createItem methods:
  - createItem(String pDescriptorName),
  - createItem(String pId, String pDescriptorName).
- The createItem methods return a transient instance of a MutableRepositoryItem.

```
MutableRepositoryItem item =
        myRepository.createItem("user")

MutableRepositoryItem item =
        myRepository.createItem("user1003","user")
```

Add a New Item

- After you create an item, you can turn it into a persistent repository item with the addItem method.
- Call addItem methods:

```
try{
  MutbleRepositoryItem item =
            myRepository.createItem("user")
  RepositoryItem user = myRepository.addItem(item);
} catch(RepositoryException e){
 // log the exception
}
```

Update an Item

- Fetch a mutable version of the repository item through the getItemForUpdate and getItemsForUpdate methods.
- Use the setPropertyValue method of MutableRepositoryItem to change as many properties as you wish.
- Save the changes with the updateItem method.
- Depending on the transactional context, the update can be committed immediately or it can happen when the associated transaction commits.

Update Item Example

```
try {
  RepositoryItem user = ... // get a reference to the user
  MutableRepository mutableRepository
                   =(MutableRepository)user.getRepository();
  MutableRepositoryItem mutableUser =
       mutableRepository.getItemForUpdate(user.getRepositoryId(),
              user.getItemDescriptor().getItemDescriptorName());

  mutableUser.setPropertyValue("name", "bob");
  mutableUser.setPropertyValue("age", new Integer(26));
  mutableRepository.updateItem(mutableUser);
}
catch (RepositoryException exc) {
  // Log the exception
}
```

Remove Item

- Call remove method and pass the ID and ItemDescriptor name of the item that needs to be removed.

```
try{
  MutableRepository mutableRepository =
        (MutableRepository)getRepository();
  mutableRepository.removeItem(userid, "user101");
} catch(RepositoryException e){
   // Log the exception
}
```

- The item's property values are deleted and are no longer accessible from the repository.

Querying the Repository

- A repository query defines a request to find all items of a specified item type that fit a set of criteria.
- The Repository API can express a wide variety of queries:
  - queries that match patterns in text,
  - query through collections,
  - query through complex values.
- Queries can be built and executed with the Repository API or can be represented in the Repository Query Language (RQL).

Parameters in Queries

- ?{number} represents a parameterized value that is supplied on query execution.
- Where RQL queries are used to represent finder methods, the parameters are filled in from the arguments of the finder methods.
- Parameter expressions can generally be used wherever constant values are used but cannot be used in array expressions and cannot be used as substitutes for property names.

```
RepositoryView view = repository.getView("person");
RqlStatement statement =
          RqlStatement.parseRqlStatement("age > ?0");
Object params[] = new Object[1];
params[0] = new Integer(23);
RepositoryItem [] items = statement.executeQuery (view,
                                                  params);
```

Repository Query API

- Querying the database can be performed using:
  - RQL Queries,
  - Repository Query API.
- The Repository Query API has two basic elements:
  - Query Builder provided as atg.repository.QueryBuilder,
  - Query Options provided as atg.repository.QueryOptions.
- The Query Builder interface enables you to build Query objects that can be passed to the repository.
- The Query Options class is used to specify ways the query can be modified.

Query Builder

- Query Builder interface defines the available query operations that the repositories support.
- The Query Builder enables you to build the Query Object.
- A Query is constructed from one or more QueryExpressions and a query operation.
- The following logical operations are supported:
  - AND, OR,
  - NOT,
  - EQUALS, GREATER THAN, LESS THAN,
  - GREATER THAN OR EQUALS, LESS THAN OR EQUALS.

Query Builder Steps

- Given a RepositoryView, initialize a QueryBuilder:

```
QueryBuilder qb = view.getQueryBuilder();
```

- Create a QueryExpression for the property:

```
QueryExpression gender =
                  qb.createPropertyQueryExpression("gender");
QueryExpression female =
                  qb.createConstantQueryExpression("female");
```

- Create a comparisonQuery that uses the expressions:

```
Query femaleQuery = qb.createComparisonQuery(
                        gender, female, QueryBuilder.EQUALS);
```

- Pass the resulting Query to the Repository View:

```
items = view.executeQuery(femaleQuery);
```

Query Options

- The QueryOptions class is used to modify the query.
- The QueryOptions class is passed to the executeQuery method or the RepositoryView:

```
RepositoryItem[] executeQuery(
                 Query pQuery, QueryOptions pQueryOptions);
```

- The following are the QueryOptions properties:
  - startingIndex: Index of the first element that should be returned.
  - endingIndex: Index of the last element that should be returned.
  - sortDirectives: Specifies the sort order.
  - precachedPropertyNames: A list of properties to pre cache.

Query Builder Example

```
MutableRepository pRepository =
 (MutableRepository)ServletUtil.getCurrentRequest().resolveName
              ("/atg/userprofiling/ProfileAdapterRepository");

RepositoryItemDescriptor userDesc =
                      pRepository.getItemDescriptor("user");
RepositoryView userView = userDesc.getRepositoryView();
QueryBuilder userBuilder = userView.getQueryBuilder();

QueryExpression userType =
    userBuilder.createPropertyQueryExpression("userType");
QueryExpression two =
    userBuilder.createConstantQueryExpression(new Integer(2));

Query userTypeIsTwo = userBuilder.createComparisonQuery(
                        userType, two, QueryBuilder.EQUALS);

RepositoryItem[] answer = userView.executeQuery(userTypeIsTwo);

System.out.println("running query: userType = 2");
if (answer != null)
  for (int i=0; i<answer.length; i++)
    System.out.println("id: " + answer[i].getRepositoryId());
```

Named Queries

- Developers can define a named query in an item-descriptor element in an SQL repository definition file.
- Use NamedQueryView interface method to create and access named queries.
- Named queries are supported only in SQL and Integration repositories.
- An item descriptor can define named queries in three ways:
  - RQL named queries,
  - SQL named queries,
  - Stored procedures.

Named Queries Example

- UserProfile.XML

```
…
<item-descriptor name="user">
    …
   <named-query>
       <rql-query>
          <query-name>myQuery</query-name>
          <sql>age>20 AND lastName ENDS WITH "son"</rql>
       </rql-query>
   </named-query>
</item-descriptor>
```

- Code

```
RepositoryView userView = getRepository().getView("user");
if(userView instanceof NamedQueryView) {
   NamedQueryView nameView = (NamedQueryView)songView;
   Query namedQuery =
             nameView.getNamedQuery("myQuery");
   RepositoryItem[] items = nameView.executeQuery(namedQuery);
}
```

Section 2 
Check Your Understanding

Name a few core API elements of the Repository API.

Answer: Repository, RepositoryView, RepositoryItem, etc.

Section 2

Check Your Understanding

What interface provides methods to create, add, remove, and update repository items?

Answer: The Mutable repository interface provides these methods.

Section 2 
Check Your Understanding

What are the two methods to query the repository?

Answer: Using RQL and the Query Builder.

Section 2 
Check Your Understanding

What are the main classes used in Query Builder?

Answer: QueryBuilder, QueryOptions, QueryExpression, and Query.

Section 2 
Check Your Understanding

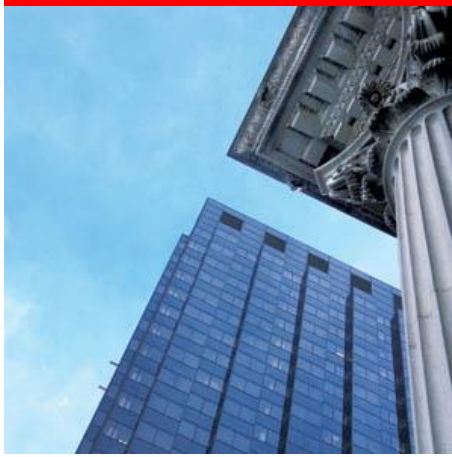
What are the some of the functionalities provided by Query Options?

Answer: Query Options provides range, sort, and propertyname pre caching functions.

Summary

- Repository API is the foundation of persistant object storage, user profiling, and content targeting in ATG.
- The core API elements of the Repository API are the Repository, RepositoryView, RepositoryItem, MutableRepository, and PropertiesChangedEvent.
- Base interfaces of a repository are immutable data store. Mutable Repository interface defines methods for CRUD operations.
- Repositories queries can be parameterized.
- Query Builder and Query Options allow for programmatic object based construction of queries.
- With named queries, developers can specify and name the query in the repository definition file and use all over the application.

Q&A



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