ATG Repositories Item Properties

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Agenda

- Repository items as properties
- Item descriptor inheritance

Learning Objectives

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

- Use repository items as properties of other repository items
- Use repository items in multi-valued properties using List, Map and Set
- Represent Many-to-Many relationships
- Understand and use cascade data relationships
- Learn about primary tables and auxiliary tables
- Extend repository definitions with item descriptor inheritance
- Use transient properties to store temporary values in repositories

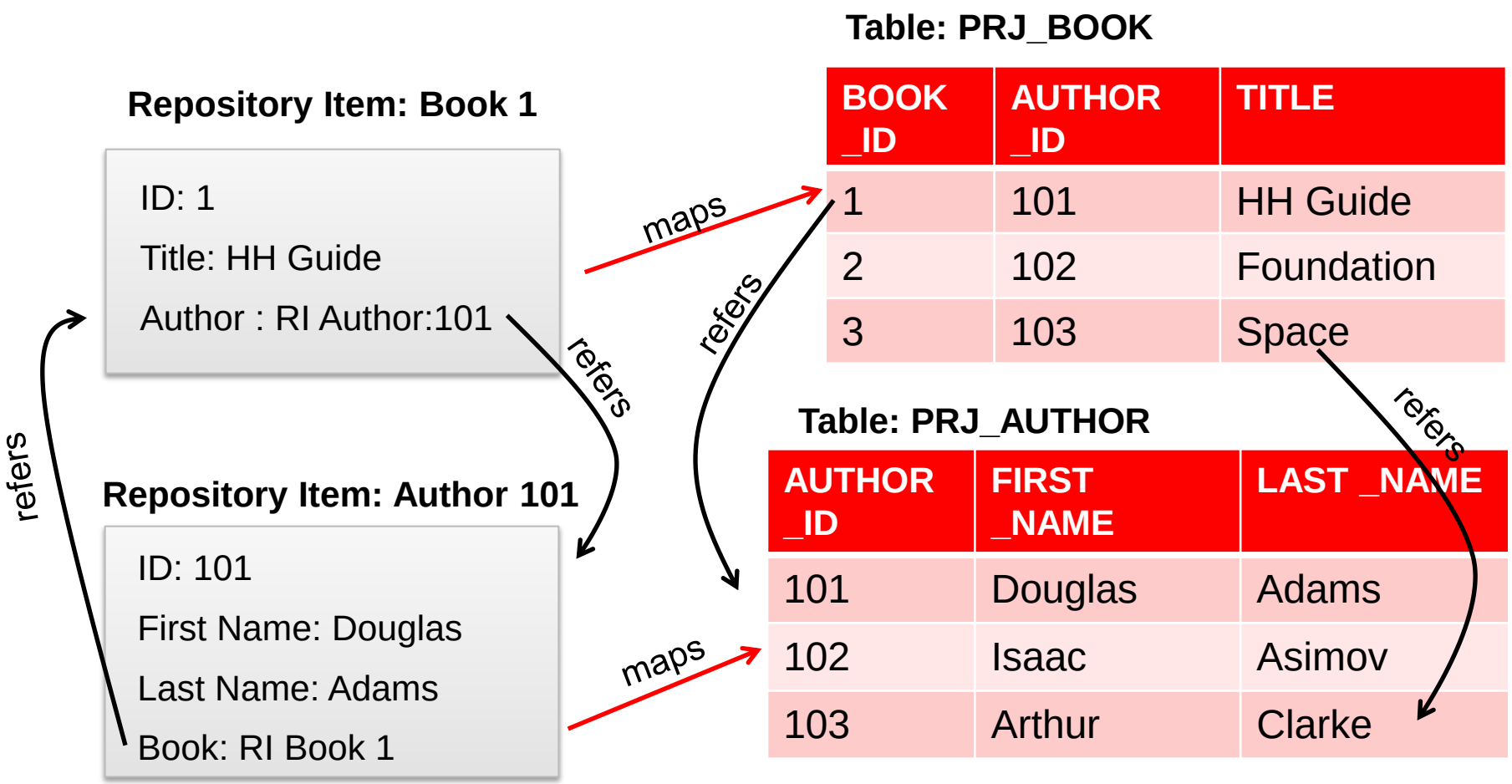
Section 1:
Repository Data Model Definition:

Repository Items as Properties

Repository Items as Properties

- The value of a property of a repository item can be another repository item.
- Both multi-valued properties and single-valued properties can have repository items as property values.
- Repository item properties are used to implement one-to-one and one-to-many relationships.
- The <property> tag for item properties must use attribute item-type instead of data-type.
- This is a powerful feature allowing for much greater flexibility in defining the data schema.

Example: Repository Item as Properties



- In this example, Book repository Item has a reference to an Author Repository Item and vice versa.

Example code: Repository Items as properties

```
<!-- The "book" item type -->
<item-descriptor name="book" default="true">
  <table name="PRJ_BOOK" type="primary" id-column-names="id">
    <property name="title"/>
    <property name="author" column-name="author_id"
          item-type="author"/>
  </table>
</item-descriptor>

<!-- The "author" item type -->
<item-descriptor name="author">
  <table name="author" id-column-names="author_id"
                              type="primary">
    <property name="lastName" column-name="FIRST_NAME" />
    <property name="firstName" column-name="LAST_NAME" />
  </table>
  <table name="book" id-column-names="author_id"
                              type="auxiliary">
    <property name="book" item-type="book"
                  column-name="book_id"/>
  </table>
</item-descriptor>
```

Using Repository Items in Multiple Valued Properties

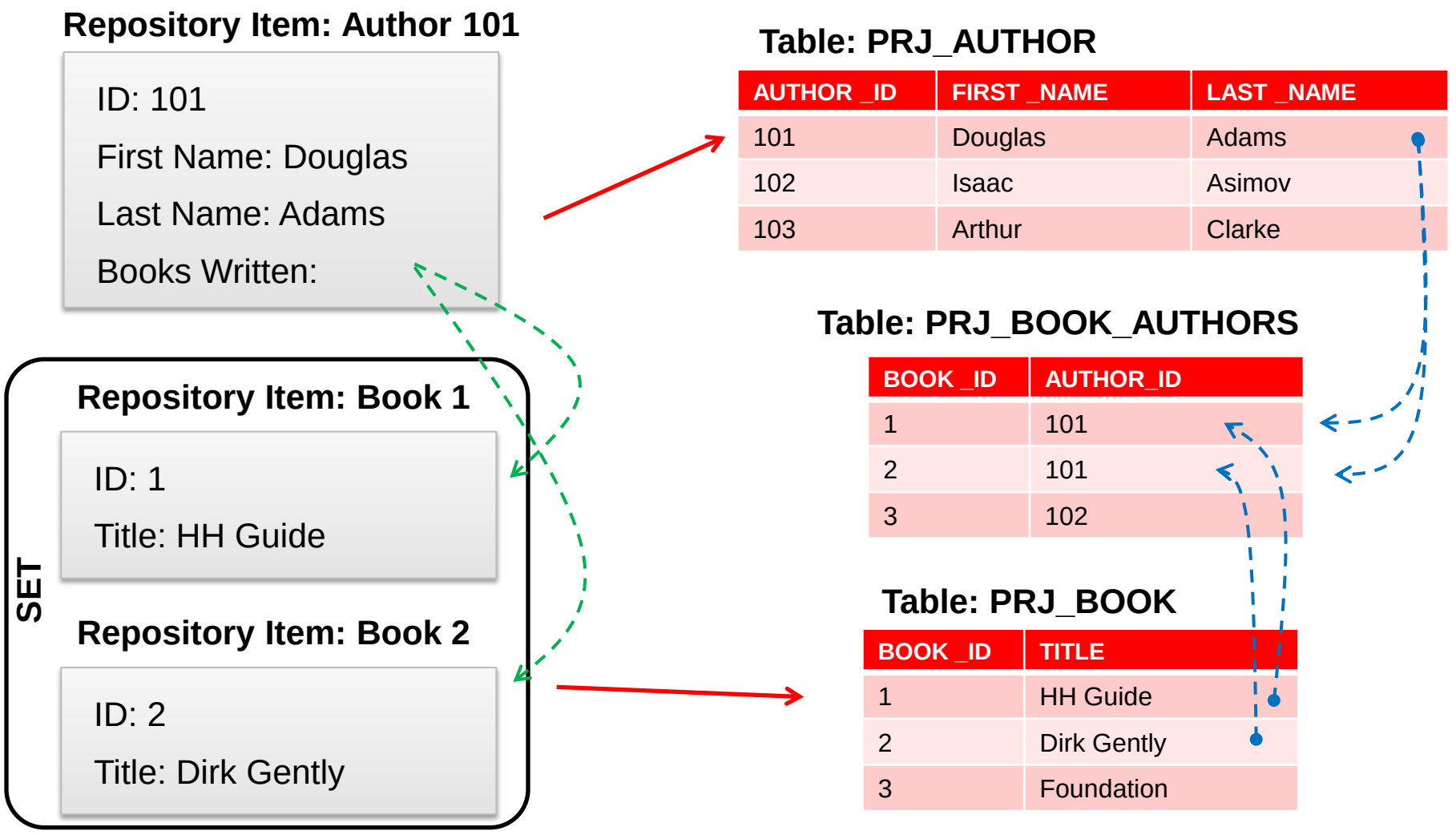
- Similar to using non repository items as multi valued properties, other repository items may be used as well.
- The <property> tag for multi-item properties needs to set the following attributes:
  - data-type:
    - Set,
    - List,
    - Map,
    - Array.
  - component-item-type: repository item type name. component-data-type attribute is used instead when defining multi-valued properties.

Example : Multiple Item Properties(Set)

- One author has a set of several books.
- The data-type attribute is set to set.
- We use an intermediate table called PRJ_BOOK_AUTHORS to store the relationships.

```
<item-descriptor name="author">
  <table name="PRJ_AUTHOR" type="primary" id-column-name="ID">
    <property name="id" column-name="ID" data-type="string"/>
        <property name="firstName" column-name="FIRST_NAME"
                                   data-type="string"/>
        <property name="LastName" column-name="LAST_NAME"
                                   data-type="string"/>
  </table>
  <table name="PRJ_BOOK_AUTHORS" type="multi"
                        id-column-name="AUTHOR_ID">
    <property name="booksWritten" data-type="set"
              component-item-type="book"  column-name="book_id"/>
  </table>
</item-descriptor>
```

Example: Multi Item Properties (Set)

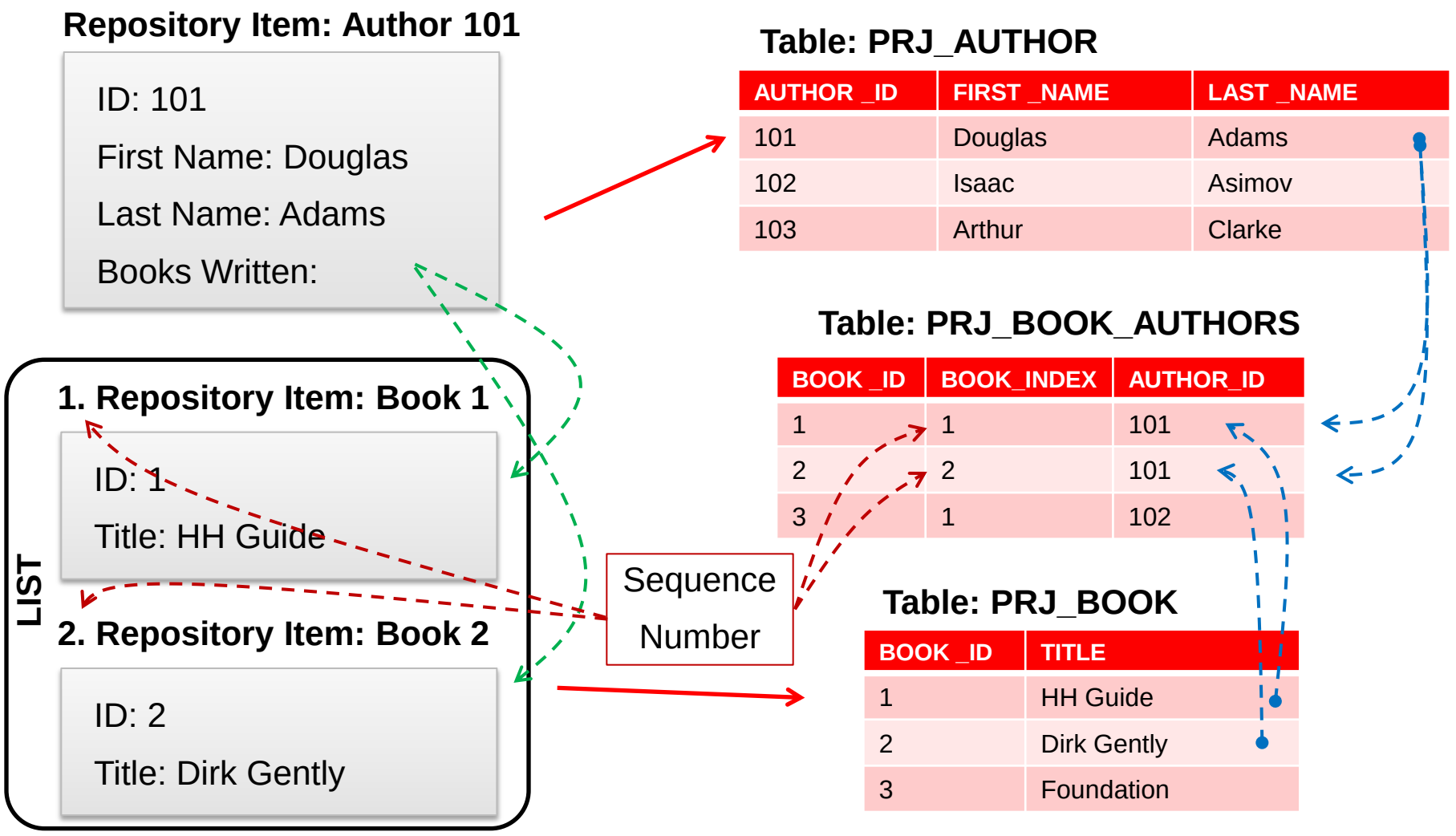


Example: Multiple Item Properties (List)

- One author has a list of ordered books. We need to store the sequence number.
- The data-type attribute should be set to list.
- A new column called BOOK_INDEX stores the sequence number.

```
<item-descriptor name="author">
  <table name="PRJ_AUTHOR" type="primary" id-column-name="ID">
    <property name="id" column-name="ID" data-type="string"/>
        <property name="firstName" column-name="FIRST_NAME"
             data-type="string"/>
        <property name="LastName" column-name="LAST_NAME"
             data-type="string"/>
  </table>
  <table name="PRJ_BOOK_AUTHORS" type="multi"
         id-column-name="AUTHOR_ID" multi-column-name="BOOK_INDEX" >
    <property name="booksWritten" data-type="list"
        component-item-type="book" column-name="book_id"/>
  </table>
</item-descriptor>
```

Example: Multi Item Properties (List)

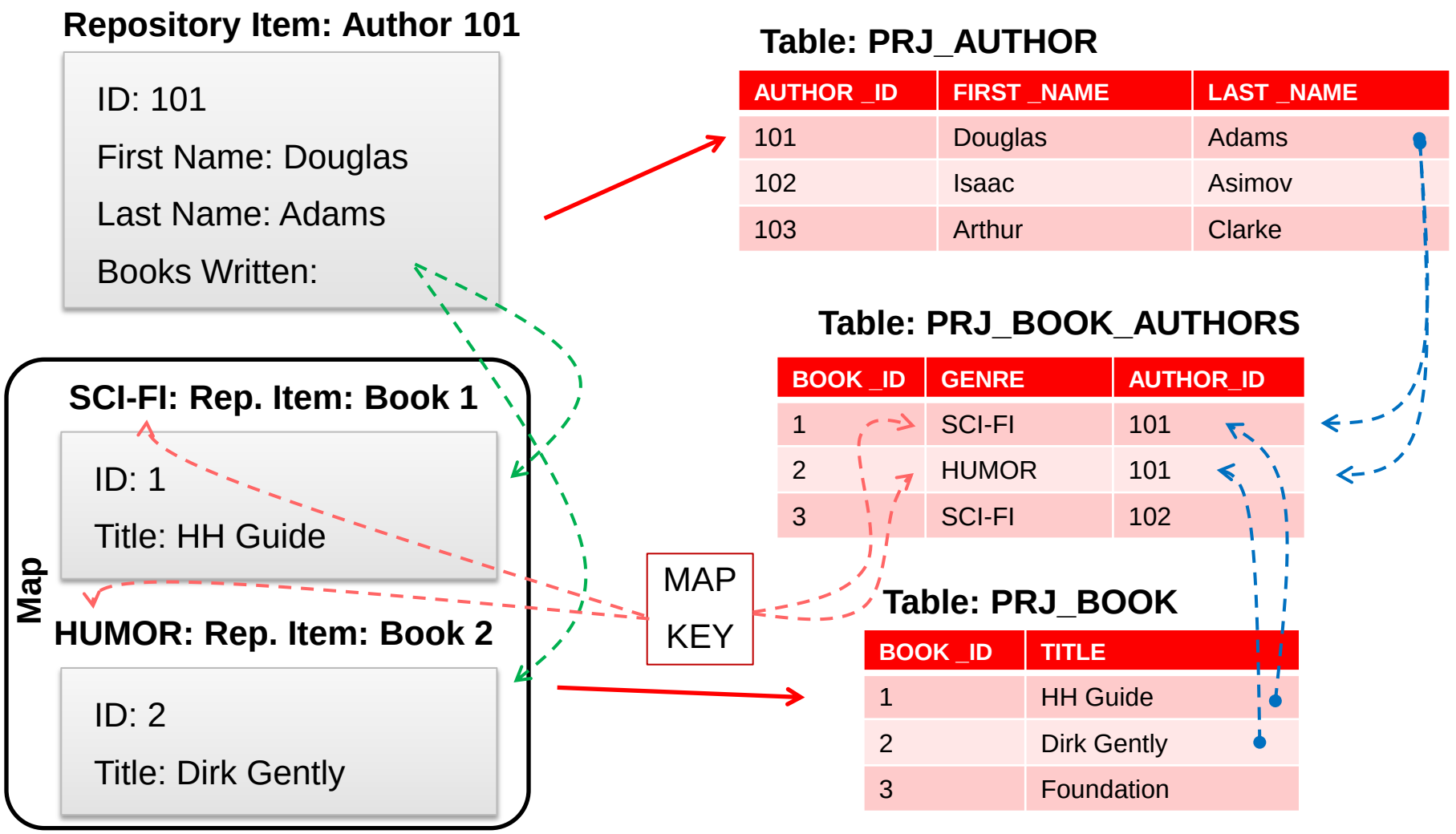


Example: Multiple Item Properties (Map)

- One author has a map of books. Genre is the key to the map.
- The data-type attribute should be set to map.
- A new column called GENRE stores the key.

```
<item-descriptor name="author">
  <table name="PRJ_AUTHOR" type="primary" id-column-name="ID">
    <property name="id" column-name="ID" data-type="string"/>
        <property name="firstName" column-name="FIRST_NAME"
             data-type="string"/>
        <property name="LastName" column-name="LAST_NAME"
             data-type="string"/>
  </table>
  <table name="PRJ_BOOK_AUTHORS" type="multi"
         id-column-name="AUTHOR_ID" multi-column-name="GENRE" >
    <property name="booksWritten" data-type="map"
        component-item-type="book‟ column-name="book_id" />
  </table>
</item-descriptor>
```

Example: Multi Item Properties (Map)



Many-to-Many Relationships

- Many-to-many relationships are one-to-many relationships from both sides.
- No extra table is necessary. The same intermediate table can be leveraged from both sides.
- The data-type attribute on both sides can be set to the appropriate one.
- The example provided shows a set relationship between authors to books and books to authors.

Example: Many-to-Many Relationships

```
<item-descriptor name="author">
  <table name="PRJ_AUTHOR" type="primary" id-column-name="ID">
    <property name="id" column-name="ID" data-type="string"/>
          <property name="firstName" column-name="FIRST_NAME"
                              data-type="string"/>
          <property name="LastName" column-name="LAST_NAME"
                              data-type="string"/>
  </table>
  <table name="PRJ_BOOK_AUTHORS" type="multi‟ id-column-name="AUTHOR_ID">
    <property name="booksWritten" data-type="set"
              component-item-type="book‟  column-name="book_id"/>
  </table>
</item-descriptor>

<item-descriptor name="book">
  <table name="PRJ_BOOK" type="primary" id-column-name="ID">
    <property name="id" column-name="ID" data-type="string"/>
          <property name="title" column-name="TITLE‟ data-type="string"/>
  </table>
  <table name="PRJ_BOOK_AUTHORS" type="multi” id-column-name="BOOK_ID">
    <property name="authors" data-type="set"
              component-item-type="author‟ column-name="author_id"/>
  </table>
</item-descriptor>
```

Cascading Data Relationships

- When an item property refers to another item, both items can be deleted, inserted, or updated at the same time.
- It is recommended to use the cascade attribute in a <property> tag to handle hierarchical properties.
- Cascade attribute can be set to one or more of these values (separated with character “,”):
  - insert,
  - update,
  - delete.
- As an example in the author and books example:

If an author is deleted, related books can be deleted as well.

Cascade Insert

- When you create a repository item that contains a property with the item-type attribute and the properties cascade attribute is set to insert:
  - An item of the type declared by the item-type attribute is also created.
  - The property is set to point to the newly created item.
- In the example, creating an author will result in the creation of a new address as well.

```
<item-descriptor name="author" >
  <table name="PRJ_AUTHOR" type="primary"
                            id-column-names="id">
    <property name="name"/>
    <property name="address" column-name="address_id"
          item-type="address" cascade="insert"/>
  </table>
</item-descriptor>
```

Cascade Update

- If a repository item property references other items and the property's cascade is set to update:
  - When you call addItem(), any new items referenced by this property are added automatically to the repository.
  - When you call updateItem(), any modified referenced items are automatically updated. Any referenced items that are new items are added.
- In the example below, when author is added or updated, address is also added or updated to the repository.

```
<item-descriptor name="author" >
  <table name="PRJ_AUTHOR" type="primary"
                           id-column-names="id">
    <property name="name"/>
    <property name="address" column-name="address_id"
          item-type="address" cascade="update"/>
  </table>
</item-descriptor>
```

Cascade Delete

- If a repository item property references other items and the property's cascade is set to delete:
  - When an item is deleted, the referenced item is deleted as well.
- Exercise caution when using with multi-valued items especially on the many side of the relationship.
- Use the cascadeDeleteOrder attribute to control the order of deletion.
- In the example below, when author is deleted, address is deleted as well.

```
<item-descriptor name="author" >
  <table name="PRJ_AUTHOR" type="primary"
                           id-column-names="id">
    <property name="name"/>
    <property name="address" column-name="address_id"
          item-type="address" cascade="delete"/>
  </table>
</item-descriptor>
```

Cascade Operations

- You can set cascade to a comma separated list of values as shown in the example.
- Whenever an author item is created, added, updated, or deleted, the same operation is reflected on the address repository item.

```
<item-descriptor name="author" >
  <table name="PRJ_AUTHOR" type="primary"
                            id-column-names="id">
    <property name="name"/>
    <property name="address" column-name="address_id"
        item-type="address" cascade="insert,update,delete"/>
  </table>
</item-descriptor>
```

Section 1
Check Your Understanding

What attribute on the property description indicates that the property refers to another repository item instead of a primitive type?

Answer: The item-type attribute indicates this. The data-type attribute indicates it is a primitive type property.

Section 1
Check Your Understanding

What data structures can be used to represent multi-valued properties referring to repository items?

Answer: Set, map, list, and array can be used

Section 1 
Check Your Understanding

What is the component-item-type set to when referring to multi-valued properties that refer to repository items?

Answer: Component-item-type refers to the reference by the multi-valued property.

Section 1 
Check Your Understanding

How are many-to-many relationships represented in ATG?

Answer: They are represented as one-to-many from both sides of the relationship.

Section 1 ✔
Check Your Understanding

What is the cascade attribute used for on a property?

Answer: It is used to specify insert, update, or delete cascade relationship between parent and child.

Summary

- Properties of repository items can refer to other repository items.
- This can be done for both single-valued and multi-valued properties.
- Multi-valued can be one-to-many. Many-to-many is implemented as one-to-many on both sides.
- One-to-many can be implemented as set, list, or map.
- Cascade data relationships can define how the referenced (child) repository items behave when operations are performed on the parent repository item.
- The cascade operations supported are insert, update, and delete.

Section 2:
Repository Data Model Definition:

Item Descriptor Inheritance and Other Advanced Concepts

Primary Table

- Each item-descriptor:
  - Must specify no more than one primary table with attribute type="primary.“
  - Must set id-column-names attribute as table primary key.
  - Can set id-space-names attribute to control ID generation.
- It can use additional tables to store values using one-to-one (auxiliary) or one-to-many (multivalued, repository items) or many-to-many(two sided).

```
<item-descriptor name="user">
   <table name="prj_user" type="primary" id-column-names="id">
      <property name="login" data-type="string"/>
   </table>
</item-descriptor>
```

Auxiliary Table

- An auxiliary table is used to add more properties to an existing item type in a new table.
- An auxiliary table definition:
  - Must set attribute type =" auxiliary ."
  - Must set id-column-names attribute to reference the original item ID.
  - Indicates how to join auxiliary tables to the primary table.
- Auxiliary tables allow for logical separation of data into various tables.
- In the example, the user item has login and address as properties.

Auxiliary Table Example

Repository Item: User

ID: 1
Login: jbruin
Address1: My Street
City: My City
State: CA
Zip: 90210

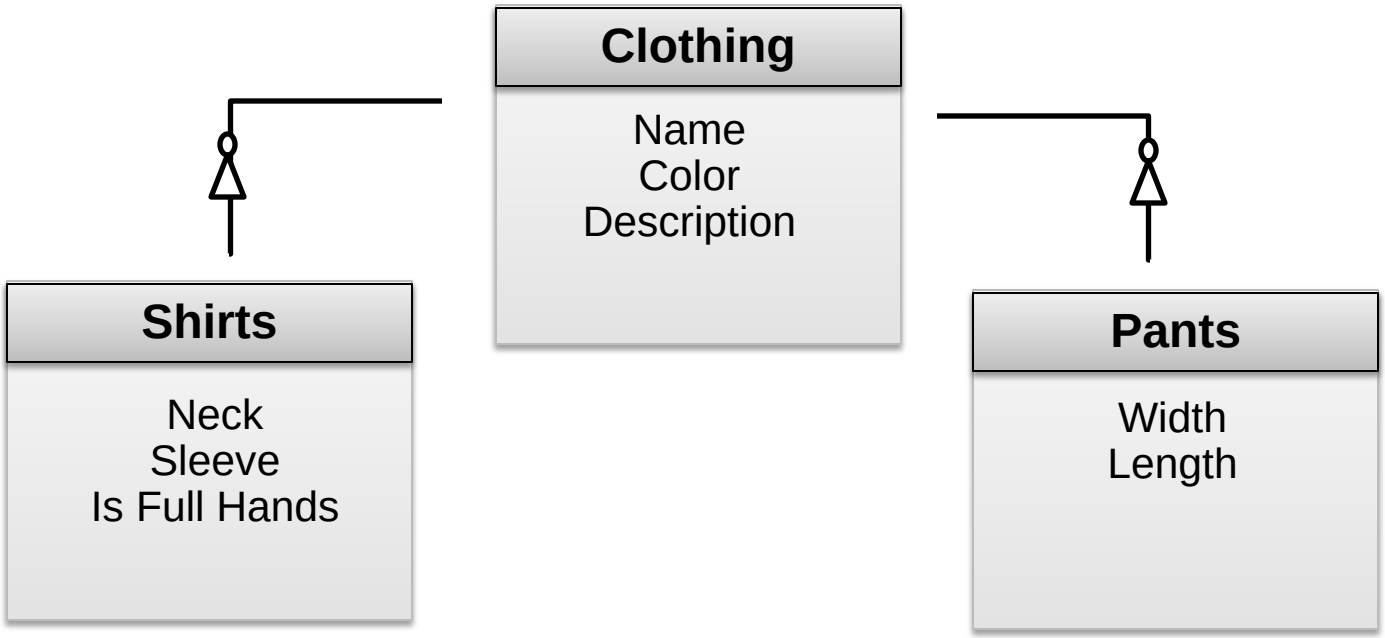
```
<item-descriptor name="user">
   <table name="prj_user" type="primary" id-column-names="id">
      <property name="login" data-type="string"/>
   </table>
   <table name="prj_address" type="auxiliary"
                id-column-names="id">
     <property name="address1" data-type="string"/>
     <property name="city" data-type="string"/>
     <property name="state" data-type="string"/>
     <property name="zip" data-type="string"/>
   </table>
</item-descriptor>
```

Item Descriptor Inheritance

- SQL Repository supports a simplified form of inheritance.
- It uses optional one-to-one relationship between the primary and an auxiliary table.
- It is similar to object-oriented sub-classing.
- Item types may be created as sub-types of other item types:
  - Super-type properties are inherited.
  - Sub-type may add properties stored in an auxiliary or multi table.

Example of Item Descriptor Inheritance

- The base item descriptor is clothing. It defined properties common to shirts and pants.
- The item descriptors shirts and pants are sub types of clothing.
- They inherit the common properties and add their own.



Example of Inheritance – Base Item

- The base or parent item descriptor uses the sub-type-property attribute set to an enumerated data-type.
- An enumerated property type is defined for each sub type repository item.

```
<!-- The "clothing" item type, a base type -->
<item-descriptor name="clothing" sub-type-property="type">
  <table name="clothing" type="primary" id-column-names="id">
    <property name="type" data-type="enumerated">
      <option value="shirt"/>
      <option value="pants"/>
    </property>
    <property name="name"/>
    <property name="color"/>
    <property name="description"/>
  </table>
</item-descriptor>
```

Example of Inheritance – Sub Item

- The sub types define a super-type attribute pointing to the base item.
- The sub-type-value is set to one of the enumerated types.

```
<item-descriptor name="shirt" super-type="clothing"
        sub-type-value="shirt">
  <table name="shirt" type="auxiliary" id-column-names="id">
    <property name="neck"/>
       <property name="sleeve"/>
       <property name="isFullHands" data-type="boolean"/>
  </table>
</item-descriptor>
<item-descriptor name="pants" super-type="clothing"
          sub-type-value="pants">
  <table name="pants" type="auxiliary" id-column-names="id">
    <property name="length"/>
       <property name="width"/>
  </table>
</item-descriptor>
```

Benefits of Item Descriptor Inheritance

- Item Descriptor inheritance is built in capability of SQL Repositories.
- It lets you easily query across complex hierarchy of sub types.
- It optimizes the database by not having duplicate columns.
- It lets you extend repository items to handle custom fields that are not applicable to all sub types.
- Your application needs only to be modified to handle the new sub type where it is different.

Item Descriptor Inheritance Queries

- Easily query across a complex hierarchy of sub-types.
- Query against a parent item descriptor returns items of a child item descriptor.
- Given below, you can query for:
  - Clothing whose neck is 15,
  - Clothing whose color is red (returns shirts and pants),
  - Clothing whose Length is 32.

Limitations of Item Inheritance

- An item type can only inherit from one parent.
- An item type hierarchy can only have one sub-type-property value.
- All parent item descriptors must be fully defined by the time they are referenced in the XML.
- Avoid using too many levels of inheritance.
- Queries against items whose properties span multiple sub-types may require joins to all tables in the hierarchy.
- There may be performance implications to the join tables.

Transient Properties

- Transient property is not associated with any column in tables.
- It is never stored or read from the persistent data store.
- It is readable and writable, but not query able.
- You can specify a transient property by defining a <property> tag that is not associated with any database table, but it must be a direct child of an <item-descriptor> tag.
- When a repository item is destroyed, the transient value is lost.
- A common example is the users' LoggedIn state.

Example: Transient Properties

- In the following example, the user item descriptor has a transient property that specifies whether the user is logged in.
- As can be seen, the loggedIn property is a child of the item-descriptor tag and does not appear in any table definition.

```
<item-descriptor name="user" sub-type-property="userType">
    <property name="loggedIn" data-type="boolean">
    <table name="user" type="primary"
                       id-column-names="id">
        <property name="userType" data-type="enumerated"
                  column-name="user_type">
    </table>
</item-descriptor>
```

Property Fetching Groups

- To improve performance, you can group properties into logical groups.
- Properties in the same group are retrieved in the same select statement.
- By default, properties in the same table are in the same group.
- Specify a different group name using the group property attribute tag.

```
<property name="login" group="display"/>
<property name="name" group="display"/>
<property name="address1" group="address"/>
<property name="city" group="address"/>
<property name="state" group="address"/>
<property name="zip" group="address"/>
```

Categorization and Sorting Properties

- To control properties displaying in BCC:
  - Use category attribute to group similar properties.
  - Using propertySortPriority attribute to control display order of categorized properties.

```
<property category="Basics" name="firstName"
          data-type="string" display-name="First name">
   <attribute name="propertySortPriority" value="-3"/>
</property>

<property category="Basics" name="middleName"
        data-type="string‟ display-name="Middle name">
   <attribute name="propertySortPriority" value="-2"/>
</property>

<property category="Basics" name="lastName"
        data-type="string"  display-name="Last name">
   <attribute name="propertySortPriority" value="-1"/>
</property>
```

Section 2 
Check Your Understanding

How many primary and auxiliary tables can be there for a given item descriptor?

Answer: An item descriptor can have at most one primary table and many auxiliary tables.

Section 2 
Check Your Understanding

How do you identify auxiliary tables in the repository definition file?

Answer: The type attribute must be set to auxiliary for auxiliary tables.

Section 2

Check Your Understanding

How many repository items can an item inherit from?

Answer: Repository item can at most inherit from one other repository item.

Section 2 
Check Your Understanding

How do you identify a repository item that extends to another repository item?

Answer: The super-type attribute on the item will point to the parent repository item.

Section 2 
Check Your Understanding

How do you create properties that are not stored in the repository?

Answer: You can create transient properties by declaring them outside the table tag in the item-descriptor.

Questions

- How many primary and auxiliary tables can be there for a given item descriptor?
  - An item descriptor can have at most one primary table and many auxiliary tables.
- How do you identify auxiliary tables in the repository definition file?
  - The type attribute must be set to auxiliary for auxiliary tables.
- How many repository items can an item inherit from?
  - Repository item can at most inherit from one other repository item.
- How do you identify a repository item that extends to another repository item?
  - The super-type attribute on the item will point to the parent repository item.
- How do you create properties that are not stored in the repository?
  - You can create transient properties by declaring them outside the table tag in the item-descriptor.

Summary

- There should be one primary table per item descriptor. There can be many auxiliary or multi valued tables.
- Item descriptor inheritance uses auxiliary table relationships to extend and inherit a parent repository item to form a child item.
- Transient properties are properties that are not persisted in the data store.
- Properties can be grouped to optimize data retrieval.
- Properties can be categorized and sorted to facilitate merchandizing through the BCC.

Q&A

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