Version 1: Summer '12

Database.com Workbook

Last updated: April 16 2012

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About the Database.com Workbook

The Database.com Workbook walks you through creating a database via a series of tutorials. The tutorials are centered around building a very simple system for a music store. You'll start developing the database from basic building blocks; that is, you'll first build objects for keeping track of audio tracks, which are the store's merchandise. You'll continue by adding security profiles and the relationships between the objects, such as a master-detail relationship. Next, you'll add business logic: validation rules to ensure data integrity, workflow rules to spot unusual conditions, and data sharing settings to control access. Once the database and business logic are complete, you'll have a complete database system.

Each of the tutorials builds on the previous tutorial to advance the database's development and simultaneously showcase a particular feature of the platform. It might sound like a lot, but it's all quite easy—as you'll soon see.

What is Database.com

Database.com is a cloud database that makes it easy to build collaborative, mobile enterprise applications. Secure sharing of data is at the heart of collaborative enterprise applications. The sophisticated identity and access management capabilities in Database.com ensure that you can get the right data, to the right people, at the right time, with the right access permissions. This workbook is intended to help you explore and learn about some of the unique capabilities of Database.com. Please look for other articles and future versions of this workbook which will highlight the Database.com unique social API set and the ability to create custom APIs using Apex REST.

Tip: You'll find the latest version of this workbook, as well as snippets of the code that you can easily copy, online at: www.database.com/workbook.

Workbook Version

This workbook is updated for Summer '12. You should be able to successfully complete all procedures using the Summer '12 version of Database.com, which became generally available on June 1, 2012.

To download the latest version of this workbook, go to http://developer.force.com/workbooks.

Intended Audience

This workbook is intended for experienced developers new to the Database.com platform. The workbook's code examples are in Java, so familiarity with Java is helpful, though all the programming tasks can also be done with .NET, Ruby, and other development tools.

Before You Begin

This workbook is designed to be used with a Base Edition organization, or *Base org* for short. Base orgs are multipurpose environments with all of the Database.com features and permissions that allow you to develop and test your database.

1. In your browser go to `www.database.com`.
2. Click **Sign up now**.
3. Fill in the fields about you and your company.
4. In the `Email Address` field, make sure to use a public address you can easily check from a Web browser.
5. The `Username` field is also in the *form* of an email address, but it does not have to be the same as your actual email address, or even an email that you use. It's helpful to change the username to something that describes the use of the organization. In this workbook we'll use admin-user@workbook.db.
6. Enter the Captcha words shown.
7. Read and then select the checkbox for the `Master Subscription Agreement` and supplemental terms.
8. Click **Sign up**.

9. After signing up, you'll be sent an email with a link that you must click to verify your account. Click the link.
10. Now supply a password, and a security question and answer.

Database.com Workbook Concepts

To reflect the added functionality provided by metadata-driven features, Database.com uses different terminology compared to a relational database.

Relational Database Term	Equivalent Term in Database.com
Database	Organization
Table	Object
Column	Field
Row	Record

In a relational database, tables contain columns (to define the data types) and rows (to store the data). You relate tables to other tables by using primary keys and foreign keys, which map the rows of one table to the rows of another table.

In Database.com, an *organization* is the equivalent of a database, but with built-in user identity, security, and social features. *Objects* contain *fields* and *records*. You relate objects to other objects by using *relationship fields*, such as *lookup relationships* and *master-detail relationships*, instead of primary and foreign keys.

Part 1: Database.com Fundamentals

In this part of the Database.com Workbook, you learn how to create a database, a test database, and objects that store data within the database. You'll also learn how to create and manage users, set up user authentication, write database triggers, and configure workflow and data sharing.

To show you how the pieces work together, each tutorial builds on the same scenario: managing albums and tracks for an online music business. You'll create a simple database that stores album and track data in two related objects. The story unfolds as you continue working—so let's begin!

Tutorial 1: Creating a Database and Test Database

In this tutorial, you create a database in the cloud. After signing up for Database.com, you'll get your first look at the Database.com Console, and then use it to create both a test database environment for development and an object to store data.

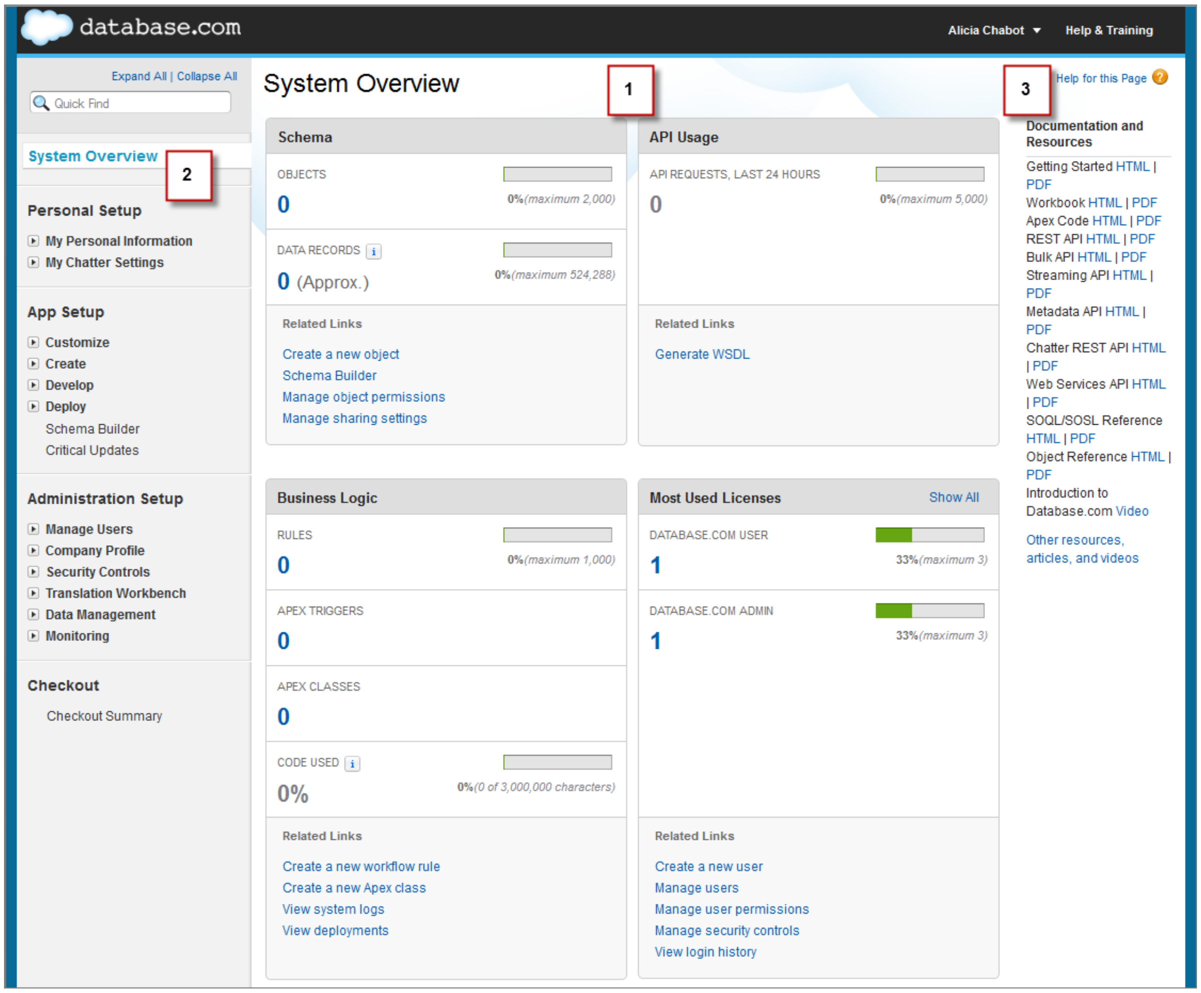
Step 1: Log in to Database.com

If you haven't already created a Database.com organization, do so now by following the procedure at Before You Begin on page 3.

If you're not already logged in to your production database, log in now.

1. Go to login.database.com.
2. Enter your user name and password.

That's it—you're now logged in to your production database. The first thing you'll see is the System Overview page.



System Overview

Schema
OBJECTS 0 — 0% (maximum 2,000)
DATA RECORDS 0 (Approx.) — 0% (maximum 524,288)

API Usage
API REQUESTS, LAST 24 HOURS 0 — 0% (maximum 5,000)

Business Logic
RULES 0 — 0% (maximum 1,000)
APEX TRIGGERS 0
APEX CLASSES 0
CODE USED 0% — 0% (0 of 3,000,000 characters)

Most Used Licenses
DATABASE.COM USER 1 — 33% (maximum 3)
DATABASE.COM ADMIN 1 — 33% (maximum 3)

Here's a quick guide to the System Overview page.

1. The primary section provides a dashboard of what's happening in your database. It provides quick summaries and handy links to your schema's objects and storage usage, business logic, such as database triggers and classes, API statistics, and your users.
2. The setup tree menus on the left provide access to the primary aspects of Database.com functionality, as well as administration configuration where you can manage users, data security, logs, and more.
3. The right-hand sidebar provides you with helpful links to documentation related to Database.com.

You can log in again at any time by navigating to login.database.com.

Step 2: Create a Test Database

Several databases are necessary during a typical Application Development Life Cycle (ADLC). These are development, test, and production databases. The cycle usually goes something like this:

1. Developers make a structural copy of the current production database, load it with a minimal amount of data, and then use this as a development database to support new development efforts.
2. Once the development iteration completes, Quality Assurance (QA) engineers make a copy of the development database and use it to test the latest version of the application.

3. Once QA testing completes, administrators roll the latest database changes into the production database to support the added application features.
4. The cycle repeats with each development effort.

After you sign up and first log in to Database.com, you are automatically working with your production database, also referred to as your production *organization*. To support the typical ADLC, Database.com allows your organization to create *test databases*.

Now create a test database to support subsequent tutorials in this workbook.

1. Click **Administration Setup** > **Data Management** > **Test Database**.
2. Click **New Test Database**.
3. For **Name**, enter `Workbook`. Ensure that **Type** is set to `QA Database`, and accept the defaults for everything else.
4. Click **Start Copy**.

Note: There are two types of test databases. A QA test database is a copy of your current production database configuration and code, but no data. A staging test database replicates all of your data as well. By default, you can create a single test database with Database.com. If you need additional test databases, please contact salesforce.com support.

Test database creation time varies. You'll get email from Database.com once the process completes. While Database.com creates your test database in the background, let's move on and use your production organization to get some work done. (If you were following the normal ADLC, you would work in the test database and move the work to production once it was tested. But this way you can proceed to the next step immediately.)

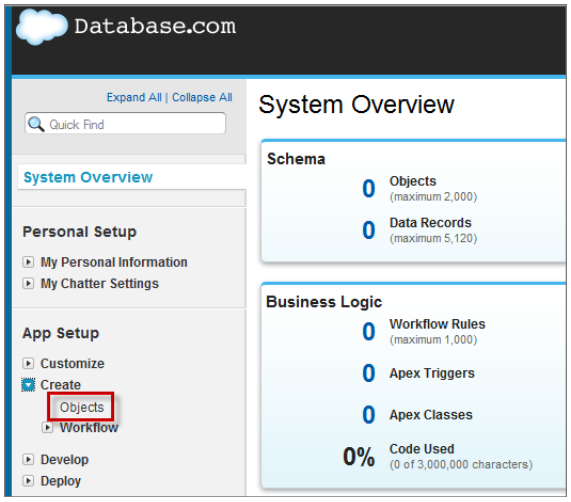
Step 3: Create an Object to Store Data

If you are familiar with relational databases, you'll understand the concept of *tables*—structures that store data. A table contains one or more *columns* (fields) and zero or more *rows* of data (records).

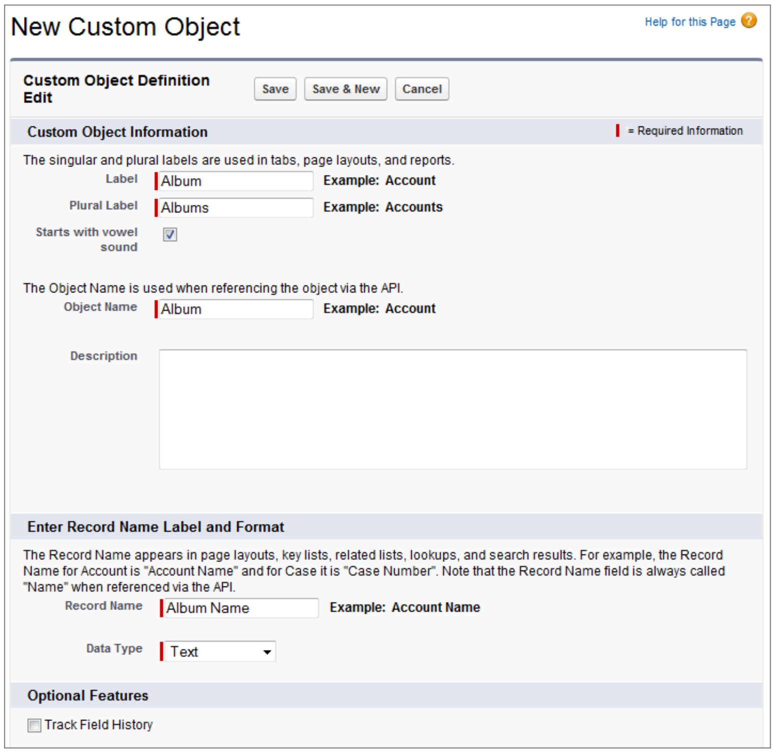
With Database.com, the traditional table data structure is referred to as an *object*. Every object in Database.com has a few standard fields, and can have custom fields that you create to store various types of data (numbers, text, dates, and so on).

Create an object in your production organization called Album that will be used to store data about music albums.

1. Click **App Setup** > **Create** > **Objects**.



2. Click **New Custom Object**.
3. For **Label**, type `Album`, then press TAB to set the **Object Name**.
4. For **Plural Label**, type `Albums`.
5. Check **Starts with a vowel sound**.
6. For **Record Name**, type `Album Name` and set its **Type** to `Text`.



New Custom Object

Custom Object Definition Edit

Custom Object Information | = Required Information

The singular and plural labels are used in tabs, page layouts, and reports.

Label	Album	Example: Account
Plural Label	Albums	Example: Accounts
Starts with vowel sound	✓	

The Object Name is used when referencing the object via the API.

Object Name	Album	Example: Account
Description		

Enter Record Name Label and Format

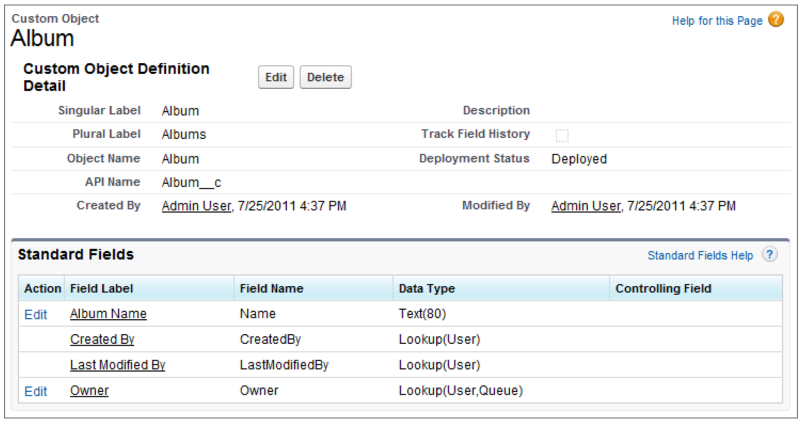
The Record Name appears in page layouts, key lists, related lists, lookups, and search results. For example, the Record Name for Account is "Account Name" and for Case it is "Case Number". Note that the Record Name field is always called "Name" when referenced via the API.

Record Name	Album Name	Example: Account Name
Data Type	Text	

Optional Features

7. Leave all other values as they are.
8. Click **Save** to finish creating the object.

You now have an object that can store data. The Album object has a field called Album Name that can store text strings and that you can set.



Custom Object
Album

Custom Object Definition Detail

Singular Label	Album	Description	
Plural Label	Albums	Track Field History	
Object Name	Album	Deployment Status	Deployed
API Name	Album__c		
Created By	Admin User, 7/25/2011 4:37 PM	Modified By	Admin User, 7/25/2011 4:37 PM

Standard Fields

Action	Field Label	Field Name	Data Type	Controlling Field
Edit	Album Name	Name	Text(80)	
	Created By	CreatedBy	Lookup(User)	
	Last Modified By	LastModifiedBy	Lookup(User)	
Edit	Owner	Owner	Lookup(User,Queue)	

All Database.com objects automatically include an Id field that contains a unique identifier for each record in the object. This field is analogous to a typical primary key in a relational database table. Objects also include other standard fields, such as Created By, Last Modified By, and Owner. Database.com automatically manages these fields.

Step 4: Create Custom Fields for the Album Object

The Album object already has an Album Name field. In this step, you add two custom fields to go along with the standard fields that are already in the object.

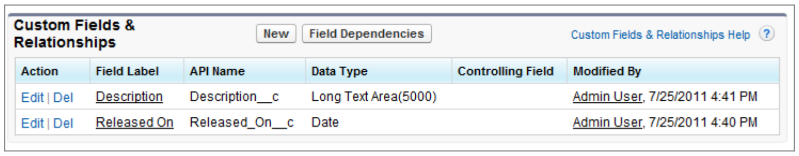
Create the Released On field.

1. If you're not already viewing the Custom Object-Album page, click **App Setup** > **Create** > **Objects** and then click **Album** on the Custom Objects page.
2. Scroll down to the **Custom Fields & Relationships** section.
3. Click **New** to launch the New Custom Field wizard.

   Notice the many different data types that Database.com supports.
4. For this field's **Data Type**, select `Date`, and click **Next**.
5. For **Field Label**, enter `Released On`, then press TAB to set the **Field Name**, and then click **Next**.
6. Click **Save** to accept the security defaults.

Create the Description field.

1. In the **Custom Fields & Relationships** section, click **New**.
2. For **Data Type**, select `Text Area (Long)`, and click **Next**.
3. For **Field Label**, enter `Description`.
4. For **Length**, enter `5000`.
5. Click **Next** to accept the remaining defaults, and click **Save** to accept the security defaults.


Custom Fields & Relationships
New
Field Dependencies
Custom Fields & Relationships Help

Action	Field Label	API Name	Data Type	Controlling Field	Modified By
Edit | Del	Description	Description__c	Long Text Area(5000)		Admin User, 7/25/2011 4:41 PM
Edit | Del	Released On	Released_On__c	Date		Admin User, 7/25/2011 4:40 PM

You now have an object that can store the name, release date, and description of music albums, as well as other standard field data such as each data record's owner—which by default is the user who created the data record. Later on, we'll add another field to Album called Price and automatically calculate each album's price based on the aggregate price of individual music tracks.

Note: For each object and field in Database.com, there is a label (the name you assigned) and an *API name* (by default, a system-generated name). The API names for custom objects and fields end with a "__c" suffix to prevent naming conflicts with system objects and fields. Standard fields do not have this suffix. The following tutorials reference these API names when building formulas and coding database triggers.

Leave the Database.com Console open so that you can quickly switch back to it in subsequent tutorials.

Summary

Congratulations—you've created your production and test database environments. You've also learned about objects, fields, records, and default values as you created your first object, Album, to store information about music albums.

Now let's learn how to browse and manage data using Workbench.

Tutorial 2: Using Workbench

In this tutorial, you learn how to manage and query records in Database.com objects using Workbench. Workbench is a powerful, web-based suite of tools that administrators and developers can use to interact with environments built on Database.com. You'll see how you can use Workbench to describe, query, and manipulate database objects. Along the way, you'll learn more about Database.com.

Note: Workbench is a free, open source, community-supported tool (see the Help page in Workbench). Salesforce.com provides a hosted instance of Workbench for demonstration purposes only—salesforce.com recommends that you do not use this hosted instance of Workbench to access data in a production database. If you want to use Workbench for your production database, you can download, host, and configure it using your own resources.

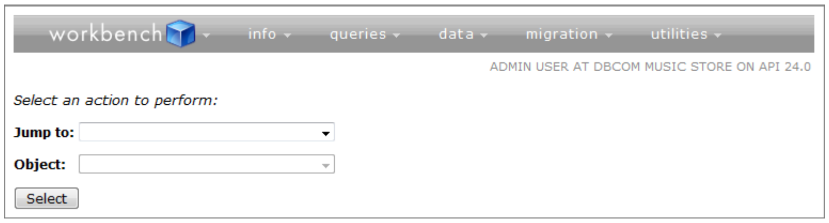
Step 1: Launch Workbench

To get started with Workbench, use the hosted version. Navigate to: `workbench.developerforce.com`.

Once Workbench loads, it presents a login screen. Use this screen to connect to your database.

1. For **Environment** select **Production**.
2. Accept the terms of service and click **Login with Salesforce**.

Once you successfully establish a connection to your production database using Workbench, you land on the Select page, which you can use to quickly jump to whatever interests you in your database.



ADMIN USER AT DBCOM MUSIC STORE ON API 24.0

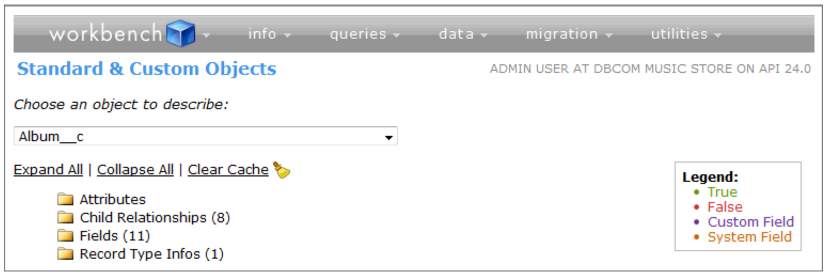
Select an action to perform:

Jump to:

Object:

For example, let's display summary information about our Album object.

1. For **Jump to**, select **Standard & Custom Objects**.
2. For **Object**, select **Album__c**, the API name for the Album object.
3. Click **Select**.



Standard & Custom Objects

ADMIN USER AT DBCOM MUSIC STORE ON API 24.0

Choose an object to describe:

Album__c

Expand All | Collapse All | Clear Cache

- Attributes
- Child Relationships (8)
- Fields (11)
- Record Type Infos (1)

Legend:
- True
- False
- Custom Field
- System Field

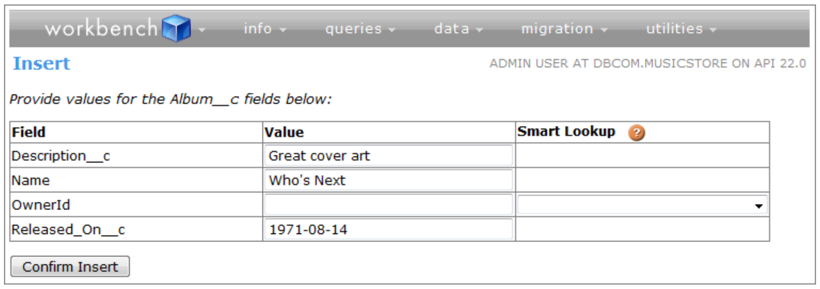
The Describe page reveals useful metadata that corresponds to the chosen object. Expand the component folders to review their contents.

- **Attributes** displays general information about an object, including its API name.
- **Child Relationships** lists information for all related objects, including relationships to system objects.
- **Fields** lists information for all standard and custom fields in an object, including each field's label, API name, and data type.
- **Record Type Infos** is an array of the record types supported by this object. You don't need access to all the returned record types to see them here. This object contains all of the existing fields of `RecordTypeMapping` except `layoutId` and `picklistForRecordType`.

Step 2: Insert Data Records with Workbench

You can use Workbench to insert data into the Album object by creating a few records. To insert the first record, complete the following steps:

1. With the **Album__c** object selected on the Standard & Custom Objects page, click **data** > **Insert**.
2. On the Insert page:
   a. For **Object Type**, select `Album__c`.
   b. Select **Single Record**.
   c. Click **Next**.
3. On the following Insert page:
   a. For **Description__c**, enter `Great cover art`.
   b. For **Name**, enter `Who's Next`.
   c. Leave **OwnerId** empty so that Database.com auto-assigns your user Id to this field.
   d. For **Released_On__c**, enter `1971-08-14`.
4. Click **Confirm Insert**.



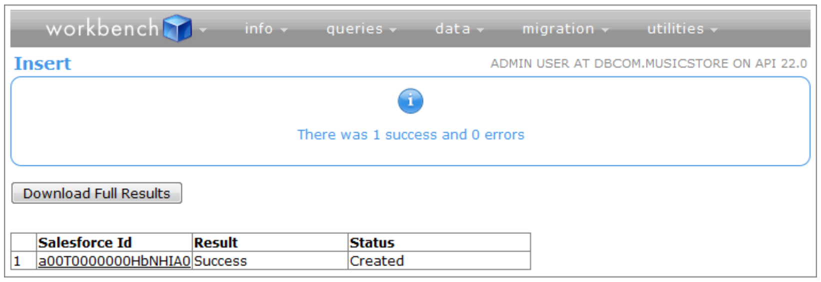
Insert

ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

Provide values for the Album__c fields below:

Field	Value	Smart Lookup
Description__c	Great cover art	
Name	Who's Next	
OwnerId		
Released_On__c	1971-08-14	

Workbench returns a message upon completion. Your Salesforce Id value will be different than the one shown here.



Insert

ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

There was 1 success and 0 errors

	Salesforce Id	Result	Status
1	a00T0000000HbNHIA0	Success	Created

Now repeat these steps to create more records with the following data so that you have some varying data to work with in the next part of this tutorial.

Description__c	Name	Released_On__c
A classic	Help!	1965-08-06
Great rock opera	The Wall	1979-11-30

Step 3: Query Data Records with Workbench

Now let's learn how to query Database.com with Workbench to retrieve records in an object. To build your first query, complete the following steps.

1. On the Workbench main menu, select **queries** > **SOQL Query** to display the Query page.
2. For **Object**, make sure to select `Album__c`.
3. Build a database query by selecting multiple fields in the **Fields** selection box. For this example, select the following fields and notice how they appear in the query field.

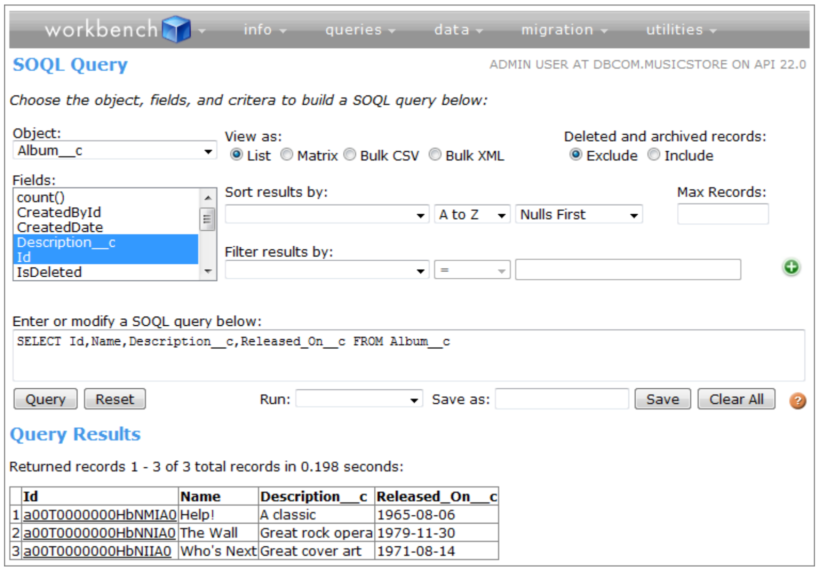
    - `Id`
    - `Name`
    - `Description__c`
    - `Released_On__c`

    You can select more than one field by holding down the CTRL key and clicking the field names.
4. Edit the query that Workbench builds to rearrange the order of the columns in the SELECT list. When you are finished, the query resembles the following:

```
SELECT Id, Name, Description__c, Released_On__c FROM Album__c
```

5. Click **Query** to execute the query.

Here's what your query results look like in Workbench (your Ids will be different).



SOQL Query

ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

Choose the object, fields, and critera to build a SOQL query below:

Object: Album__c

View as: [✓ List] Matrix Bulk CSV Bulk XML

Deleted and archived records: [✓ Exclude] Include

Fields: count() CreatedById CreatedDate [✓ Description__c] [✓ Id] IsDeleted

Sort results by: A to Z Nulls First

Max Records:

Filter results by: =

Enter or modify a SOQL query below:

```
SELECT Id,Name,Description__c,Released_On__c FROM Album__c
```

Run: Save as:

Query Results

Returned records 1 - 3 of 3 total records in 0.198 seconds:

	Id	Name	Description__c	Released_On__c
1	a00T0000000HbNMIA0	Help!	A classic	1965-08-06
2	a00T0000000HbNNIA0	The Wall	Great rock opera	1979-11-30
3	a00T0000000HbNIIA0	Who's Next	Great cover art	1971-08-14

The Database.com query language is SOQL. Notice that SOQL is similar to SQL, so getting started with SOQL is easy if you already understand SQL.

Note: In our scenario, we only have three records in the Album object. When querying larger data sets, consider using the LIMIT clause in a SELECT statement to limit the number of records in a query's return set.

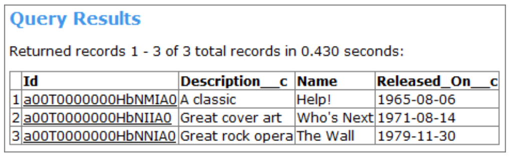
Now let's add a few bells and whistles to your first query.

1. On the SOQL Query page, the current query should still be present. In **Sort results by:**, choose `Released_On__c`.

   Your query now looks like the following (reformatted below for readability).

   ```
   SELECT Description__c, Id, Name, Released_On__c
     FROM Album__c
     ORDER BY Released_On__c ASC NULLS FIRST
   ```

2. Click **Query** to run the new query and notice that the query results are now ordered by the Released_On__c field in ascending order.



Query Results

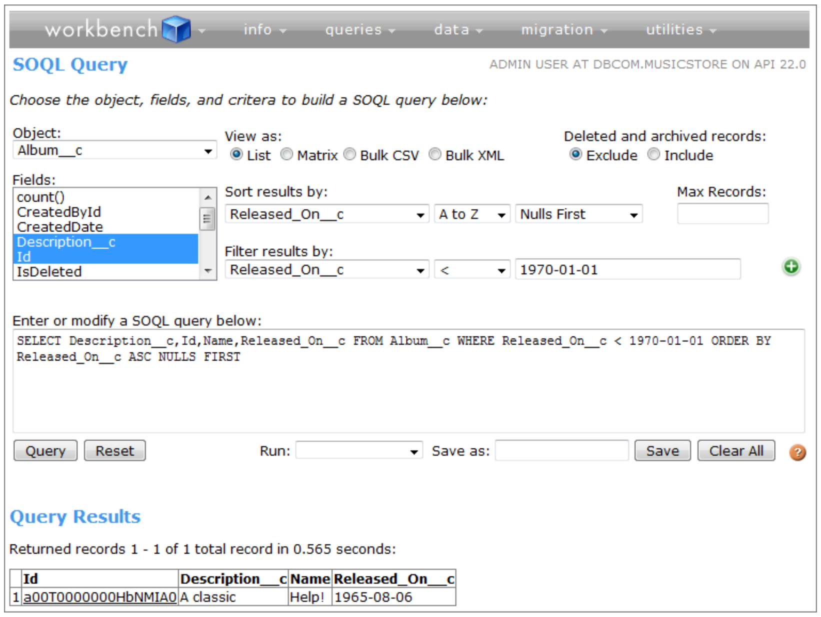
Returned records 1 - 3 of 3 total records in 0.430 seconds:

	Id	Description__c	Name	Released_On__c
1	a00T0000000HbNMIA0	A classic	Help!	1965-08-06
2	a00T0000000HbNIIA0	Great cover art	Who's Next	1971-08-14
3	a00T0000000HbNNIA0	Great rock opera	The Wall	1979-11-30

Let's enhance the query a bit more, so that it shows only specific records that meet a condition. Use **Filter results by:** to see if you can build the following query, one that shows albums that were released before `1970-01-01`.

```
SELECT Description__c, Id, Name, Released_On__c
  FROM Album__c
  WHERE Released_On__c < 1970-01-01
  ORDER BY Released_On__c ASC NULLS FIRST
```

When you execute the query, you'll only see one record in the result set, the data record for the album named "Help!" The description for this album can be more helpful (pun intended), and indicate that this particular record corresponds to the North American release of the album and not the British release.



SOQL Query

ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

Choose the object, fields, and critera to build a SOQL query below:

Object: Album__c

View as: [✓ List] Matrix Bulk CSV Bulk XML

Deleted and archived records: [✓ Exclude] Include

Fields: count() CreatedById CreatedDate Description__c Id IsDeleted

Sort results by: Released_On__c A to Z Nulls First

Max Records:

Filter results by: Released_On__c < 1970-01-01

Enter or modify a SOQL query below:

```
SELECT Description__c,Id,Name,Released_On__c FROM Album__c WHERE Released_On__c < 1970-01-01 ORDER BY
Released_On__c ASC NULLS FIRST
```

Query | Reset | Run: | Save as: | Save | Clear All

Query Results

Returned records 1 - 1 of 1 total record in 0.565 seconds:

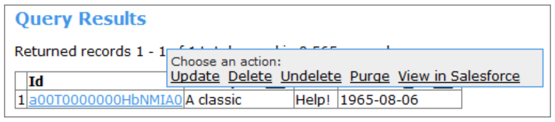
	Id	Description__c	Name	Released_On__c
1	a00T0000000HbNMIA0	A classic	Help!	1965-08-06

Next you'll learn how to update a data record quickly using Workbench.

Step 4: Update Data Records with Workbench

Workbench makes it easy to manage data records in Database.com. You'll now use Workbench to improve the album description that we discovered in the previous step.

Picking up from where you left off in the previous step, notice that the Id field for each record in a query's result set is actually a hyperlink. If you hover over a link, text appears that provides you with links to Update, Delete, Undelete, or Purge the associated data record. The View in Salesforce link opens the record in the Database.com console. If you click the Id link itself, Workbench loads a detail page for the record.



Query Results

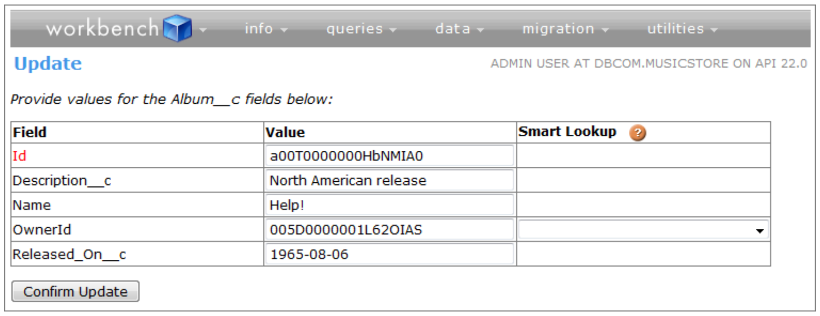
Returned records 1 - 1

Choose an action:
Update Delete Undelete Purge View in Salesforce

	Id			
1	a00T0000000HbNMIA0	A classic	Help!	1965-08-06

In this step, we want to update the record.

1. Click the **Update** link to display the Update page.
2. Update the `Description__c` field so that it is `North American release`.



Update

ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

Provide values for the Album__c fields below:

Field	Value	Smart Lookup
Id	a00T0000000HbNMIA0	
Description__c	North American release	
Name	Help!	
OwnerId	005D0000001L62OIAS	
Released_On__c	1965-08-06	

Confirm Update

3. Once you've made the change, click **Confirm Update** to execute the update.

You've finished this tutorial! Leave Workbench open so that you can quickly switch back to it in subsequent tutorials.

Summary

In this tutorial, you learned how to work with data in your organization's data objects using Workbench, an open source tool that you can use to access Database.com databases. Specifically, you learned how to insert, update, and query records in an object. In the next lesson, you'll switch back to the Database.com Console and continue building your schema.

Tutorial 3: Creating and Relating Objects

In this tutorial, you create a second object, Track, representing music tracks in an album. You'll relate this new object to the Album object in a master-detail relationship, and learn about field validation and roll-up summary fields.

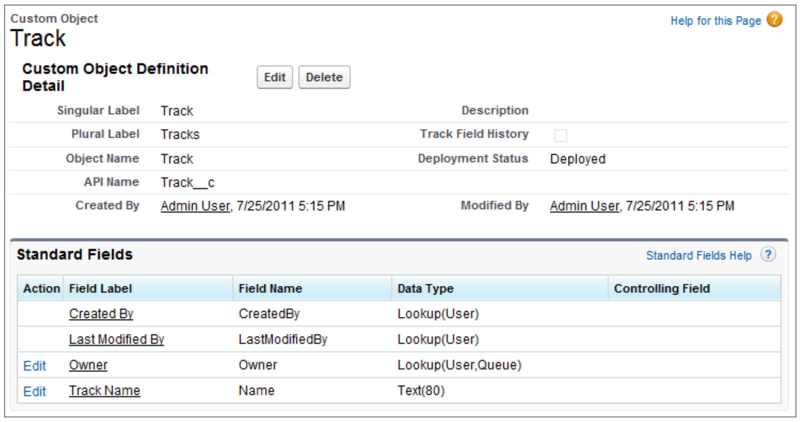
Step 1: Create and Relate a Detail Object

If you're familiar with relational databases, you'll notice a difference in Database.com when it comes to relating objects (tables). In Database.com, you don't work with primary and foreign keys, but instead with a higher-level abstraction of object relationships. You can declare a field in an object with a *relationship type*, and Database.com takes care of the underlying implementation for you.

In this step, you create a new object to represent music tracks in an album, and relate this new Track object to the existing Album object. Database.com supports two types of relationships: *lookup relationships* and *master-detail relationships*. In master-detail relationships, which we'll use for Track and Album, the detail (Track) derives its significance from the master (Album). In other words, tracks can't exist without albums.

From the Database.com Console, create and relate the new Track object.

1. Navigate to **App Setup** > **Create** > **Objects**.
2. Click **New Custom Object**.
3. For **Label**, enter `Track`, and then press TAB.
4. For **Plural Label**, enter `Tracks`.
5. Click **Save** to accept the remaining defaults and create the Track object.



Track

Custom Object Definition Detail

Singular Label	Track	Description	
Plural Label	Tracks	Track Field History	☐
Object Name	Track	Deployment Status	Deployed
API Name	Track__c		
Created By	Admin User, 7/25/2011 5:15 PM	Modified By	Admin User, 7/25/2011 5:15 PM

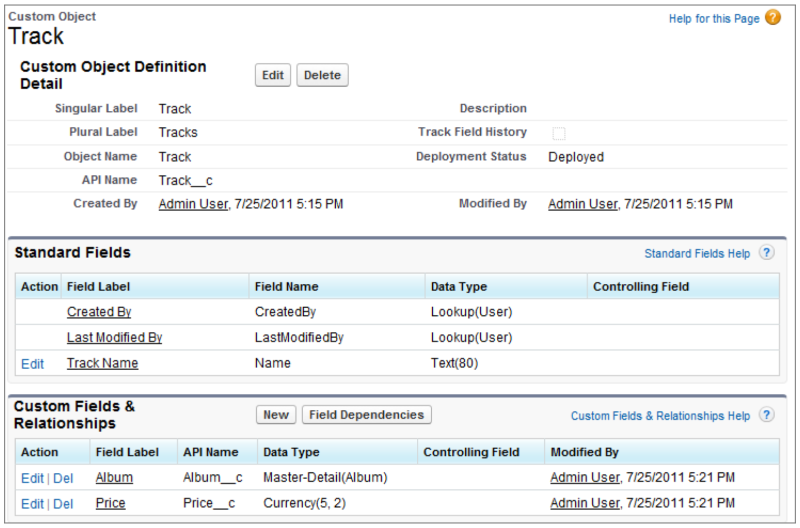
Standard Fields

Action	Field Label	Field Name	Data Type	Controlling Field
	Created By	CreatedBy	Lookup(User)	
	Last Modified By	LastModifiedBy	Lookup(User)	
Edit	Owner	Owner	Lookup(User,Queue)	
Edit	Track Name	Name	Text(80)	

Now create two fields—one for the price of the track, and another representing the relationship to the album.

1. In the **Custom Fields & Relationships** section, click **New**.
   a. Select **Currency** as the data type and click **Next**.
   b. For **Field Label**, type `Price`, and then press TAB.
   c. For **Length**, type `5`.
   d. For **Decimal Places**, type `2`.
   e. For **Default Value**, type `0.99`.
   f. Click **Next**, accept the security defaults, and click **Save**.
2. In the **Custom Fields & Relationships** section, click **New**.
   a. For **Data Type**, select **Master-Detail Relationship**, and click **Next**.
   b. In **Related To**, choose **Album**, and click **Next**.
   c. For **Field Label**, leave the default as `Album`, and press TAB for the next field, ensuring that the **Field Name** has a value of `Album` too.
   d. Click **Next**, accept the security defaults, and click **Save**.

The Field Label in the relationship field is how you will traverse to the related master record from any given detail record. You have now created a new object named Track, as well as two fields, Price and Album.


Custom Object
Track
Help for this Page

Custom Object Definition Detail Edit Delete

Singular Label	Track	Description	
Plural Label	Tracks	Track Field History	☐
Object Name	Track	Deployment Status	Deployed
API Name	Track__c		
Created By	Admin User, 7/25/2011 5:15 PM	Modified By	Admin User, 7/25/2011 5:15 PM

Standard Fields Standard Fields Help

Action	Field Label	Field Name	Data Type	Controlling Field
	Created By	CreatedBy	Lookup(User)	
	Last Modified By	LastModifiedBy	Lookup(User)	
Edit	Track Name	Name	Text(80)	

Custom Fields & Relationships New Field Dependencies Custom Fields & Relationships Help

Action	Field Label	API Name	Data Type	Controlling Field	Modified By
Edit | Del	Album	Album__c	Master-Detail(Album)		Admin User, 7/25/2011 5:21 PM
Edit | Del	Price	Price__c	Currency(5, 2)		Admin User, 7/25/2011 5:21 PM

Step 2: Insert and Query Detail Object Records

Now let's go back to Workbench and use it to insert some data records into our new Track object. In this step, you'll create three tracks for the Album named "The Wall." To create the first track, complete the following steps.

1. Return to the Workbench session that's connected to your production database.
2. On the Workbench main menu, select **data** > **Insert**.
3. For **Object Type**, select **Track__c**, select **Single Record**, then click **Next**.

Note: If you don't see the changes documented in this workbook when using Workbench, try clearing Workbench's cache to refresh your session—select **info** > **Session Information** and click **Clear Cache**. Retry your Workbench operation.

4. For the **Album__c Value** field, type `The Wall` and then select `Album__c.Name` in **Smart Lookup**.

5. For **Name**, type `01 - In The Flesh`.
6. For **Price__c**, don't enter anything — we'll use the default value of 0.99.
7. Click **Confirm Insert**.

Repeat the steps above using the following values for the Name and Price fields to create two more records in the Track object.

Name	Price
02 – The Thin Ice	0.59
03 – Another Brick in the Wall (Part 1)	1.49

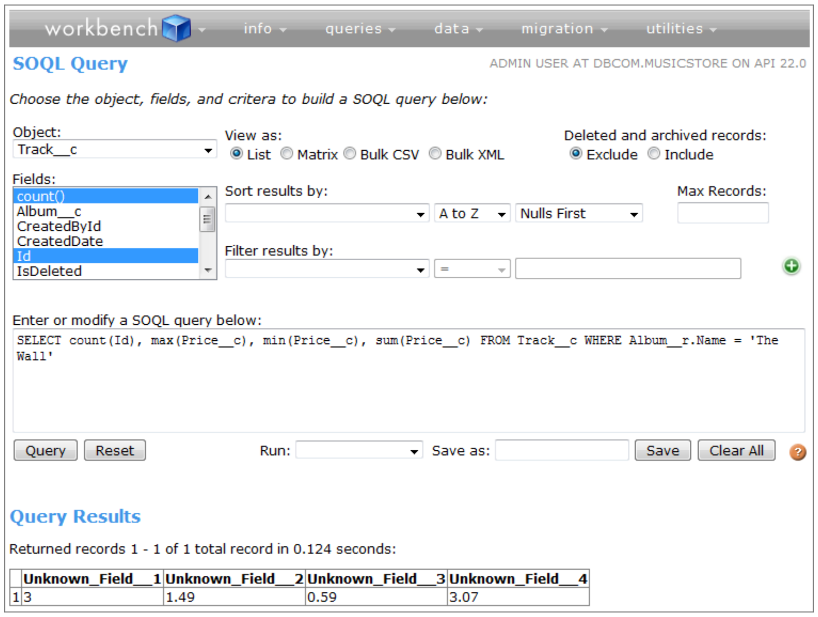
We could have just skipped entering a price for each new record to defer to the default value of 0.99, but we'll put in some varying prices so that subsequent queries are a bit more interesting.

Now let's learn how to build some new queries with Workbench that target the records in the Track object.

1. Select **queries** > **SOQL Query**.
2. Execute the following query to summarize information about specific records in the Track object.

```
SELECT count(Id), max(Price__c), min(Price__c), sum(Price__c)
  FROM Track__c
  WHERE Album__r.Name = 'The Wall'
```

The results appear as follows.



SOQL Query ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

Choose the object, fields, and critera to build a SOQL query below:

Object: Track__c

View as: [✓ List] Matrix Bulk CSV Bulk XML

Deleted and archived records: [✓ Exclude] Include

Fields: count() Album__c CreatedById CreatedDate Id IsDeleted

Sort results by: A to Z Nulls First

Max Records:

Filter results by: =

Enter or modify a SOQL query below:

```
SELECT count(Id), max(Price__c), min(Price__c), sum(Price__c) FROM Track__c WHERE Album__r.Name = 'The
Wall'
```

Query Results

Returned records 1 - 1 of 1 total record in 0.124 seconds:

	Unknown_Field__1	Unknown_Field__2	Unknown_Field__3	Unknown_Field__4
1	3	1.49	0.59	3.07

In the query itself, notice the following new concepts to understand about SOQL.

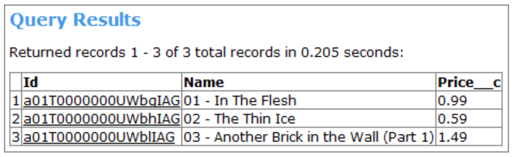
- The SELECT clause uses several functions (count, max, min, and sum) to aggregate information about the selected records in the Track object.
- The WHERE clause condition employs an object traversal with dot notation to target information in the Name field of the related Album object. Notice the "__r" suffix to indicate that this is a relationship. This points out one difference

between SQL and SOQL: With SQL, you can use a subquery in the WHERE clause condition to build an equivalent query.

One more example. Execute the following query.

```
SELECT Id, Name, Price__c
  FROM Track__c
  WHERE Album__r.Name = 'The Wall'
  ORDER BY Name ASC
```

This SOQL query is the equivalent of an inner join in SQL. Notice again how it uses dot notation in the WHERE clause to specify an object traversal. Your results of this query will be similar to the following output.



Query Results

Returned records 1 - 3 of 3 total records in 0.205 seconds:

	Id	Name	Price__c
1	a01T0000000UWbqIAG	01 - In The Flesh	0.99
2	a01T0000000UWbhIAG	02 - The Thin Ice	0.59
3	a01T0000000UWblIAG	03 - Another Brick in the Wall (Part 1)	1.49

Step 3: Add a Validation Rule

Database.com lets you create database-centralized validation rules to help ensure the integrity of data records. It's easy to create such rules because you simply declare them for an object (rather than build and maintain code to enforce them). In this step, modify the Track object to ensure that the price is never negative.

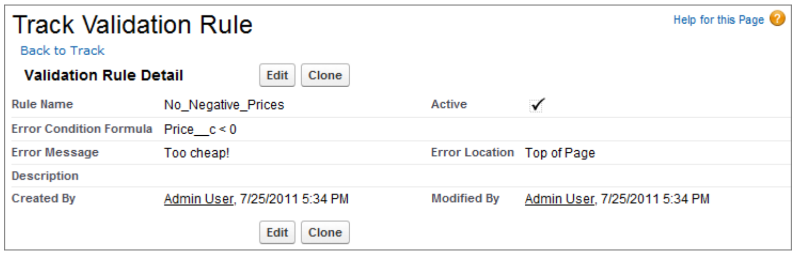
First, return to your browser window that has the Database.com Console connection to your production database. If you closed this window and don't remember how to get back to your production organization with the Database.com Console, please review Tutorial 1: Creating a Database and Test Database on page 5. Once you have the Database.com Console available, complete the following steps.

1. Click **App Setup** > **Create** > **Objects**.
2. Click **Track**.
3. In **Validation Rules**, click **New**.
4. For **Rule Name**, type `No Negative Prices`.
5. For **Error Condition Formula**, enter `Price__c < 0`.
6. Click **Check Syntax** and make sure you have no errors in your formula.
7. For **Error Message**, enter `Too cheap!`.
8. Click **Save** to finish creating the object.

The error condition formula specifies the condition under which the rule fires. In this case, it fires when the Price__c field is below zero.

Note: The Database.com formula language is very rich, letting you look up and manipulate values used in the rule. You'll use the same formula language in fields of type Formula, as well as in the Workflow functionality in Tutorial 6 on page 30.

Once you save the validation rule, you'll see a summary page for the new rule. Notice that the rule is active, by default. Database.com enforces validation rules that are active, but allows you to deactivate them when you might feel it is necessary (for example, prior to a bulk data load).



Track Validation Rule

Help for this Page

Back to Track

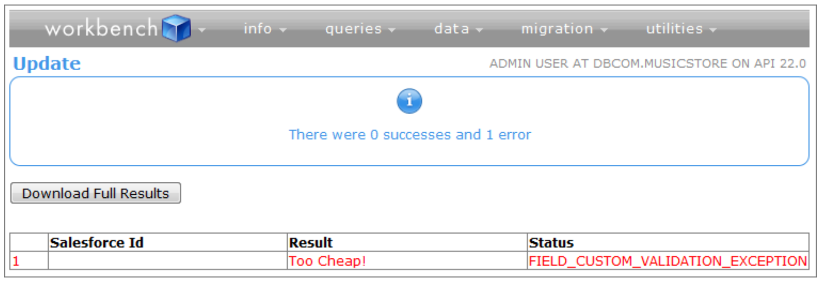
Validation Rule Detail

Rule Name	No_Negative_Prices	Active	✓
Error Condition Formula	Price__c < 0		
Error Message	Too cheap!	Error Location	Top of Page
Description			
Created By	Admin User, 7/25/2011 5:34 PM	Modified By	Admin User, 7/25/2011 5:34 PM

Step 4: Test the Validation Rule

The Database.com architecture is such that you can make changes to your schema in real time and see those changes immediately. For example, the new validation rule is in effect, so if you try to insert or update a record in the Track object that doesn't comply with the new rule, you'll get an error. Let's try it out.

1. Return to the Workbench session that's connected to your production database.
2. Hover over the Id link for any data record, select Update, and set the Price__c field to a negative number.
3. Click **Confirm Update**.



Update

ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

There were 0 successes and 1 error

Download Full Results

	Salesforce Id	Result	Status
1		Too Cheap!	FIELD_CUSTOM_VALIDATION_EXCEPTION

Notice that the update is not successful this time—Database.com raises a validation rule exception (returns an error) because of our new validation rule. Perfect—that's just the way we want it.

Step 5: Create a Roll-up Summary Field in a Master Object

Database.com provides a lot of functionality around objects in a master-detail relationship. For example, deleting the master record also deletes the detail records. This is known as a delete cascade.

Master-detail relationships let you create fields of a special roll-up summary type—these fields automatically aggregate information found in the detail records associated with each master record. In this step, add a roll-up summary field to Album that calculates the total album price based on the prices of individual tracks.

1. Return to your Database.com session.
2. Click **App Setup** > **Create** > **Objects** and then click **Album**.
3. In the **Custom Fields & Relationships** section, click **New**.
4. Select **Field Type**, **Roll-Up Summary** and click **Next**.
5. For **Field Label**, type `Price`, TAB, and click **Next**.
6. For **Summarized Object**, select **Tracks**.
7. For **Roll-Up Type**, select **Sum**.
8. For **Field to Aggregate**, select **Price**.
9. The remaining defaults are perfect, so just click **Next** and then **Save**.

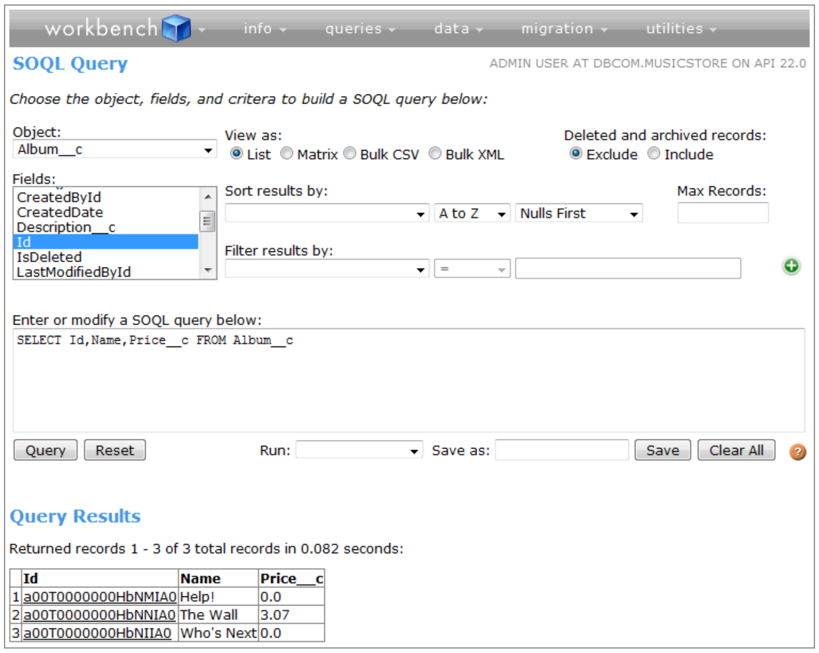
At this point, all of your Album records have an additional field, Price__c, which automatically calculates the total price of the album based on the sum of the prices for related tracks. As you saw during the creation of this field, you can use roll-up summary fields to count and find the minimum or maximum of particular fields.

To test that the new summary field is working properly, return to Workbench and build the following query.

```
SELECT Id, Name, Price__c FROM Album__c
```

If you don't see **Price__c** in the list of Fields available for the query, clear the Workbench cache, and retry the query.

Your output shows the price value that is automatically calculated for each album.



Object: Album__c

View as: [✓ List] Matrix Bulk CSV Bulk XML

Deleted and archived records: [✓ Exclude] Include

Fields: CreatedById, CreatedDate, Description__c, Id, IsDeleted, LastModifiedById

Sort results by: A to Z, Nulls First

Enter or modify a SOQL query below:

```
SELECT Id,Name,Price__c FROM Album__c
```

Returned records 1 - 3 of 3 total records in 0.082 seconds:

	Id	Name	Price__c
1	a00T0000000HbNMIA0	Help!	0.0
2	a00T0000000HbNNIA0	The Wall	3.07
3	a00T0000000HbNIIA0	Who's Next	0.0

Note: When you add a roll-up summary field to a master table, Database.com schedules a background job to calculate the summary data for all existing records. You might have to wait a few seconds to see results similar to those above.

Summary

In this tutorial, you discovered how to relate two objects, and how a master-detail relationship is reflected in SOQL queries. You then learned how to declare validation rules that help ensure objects contain records that adhere to your business rules. Finally, you saw how to take advantage of roll-up summary fields to automatically aggregate detail record information as fields in the master records.

Tutorial 4: Managing Users, Data Visibility, and Data Sharing

Up until now, you've been interacting with your database using a single user. The default user is an administrator, which has access to all records in the database. Database.com extends the traditional database models by offering users, permissions, data sharing, and other features that give you fine control over data visibility. You can easily hide complete objects, a field of an object, or just particular records from groups of users.

In this tutorial, you create a new user and security profile, and use this security profile to toggle field-level security and record sharing.

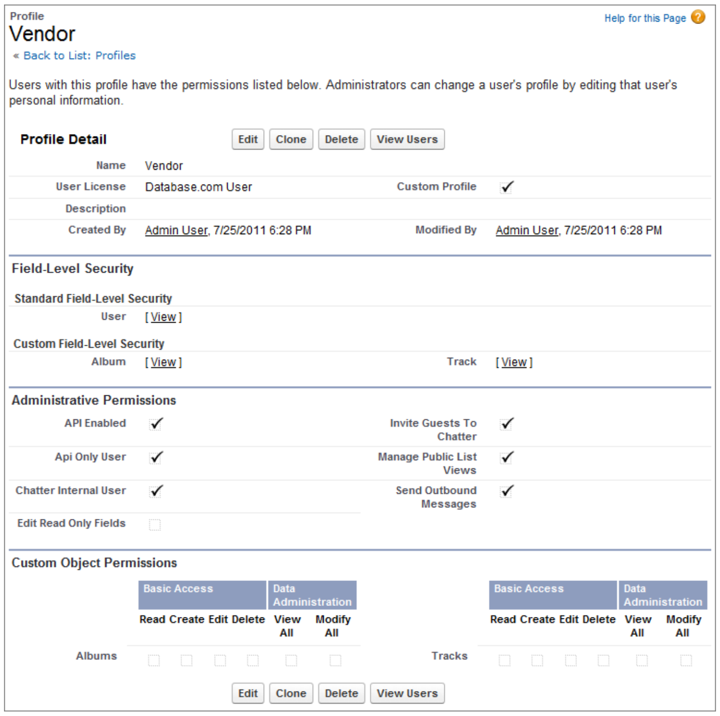
Step 1: Create a New User and Profile

One way to control data access for users is through their security profiles. In this step, create a new security profile for your vendors, add a new user to this profile, and discover how to toggle object visibility for the profile.

Begin by creating a new profile in your production database.

1. Using your Database.com Console, select **Administration Setup** > **Manage Users** > **Profiles**.
2. Click **Clone** next to the **Database.com User** entry.
3. For **Profile Name**, enter `Vendor`, and then click **Save**.

The Database.com Console displays a page that lists the permissions that are available to users who have the Vendor profile. For example, you can use this to set permissible login hours, or the range of IP addresses from which Database.com permits sessions.



Vendor

Users with this profile have the permissions listed below. Administrators can change a user's profile by editing that user's personal information.

Profile Detail

Name	Vendor		
User License	Database.com User	Custom Profile	✓
Description			
Created By	Admin User, 7/25/2011 6:28 PM	Modified By	Admin User, 7/25/2011 6:28 PM

Field-Level Security

Standard Field-Level Security

User	[View]		

Custom Field-Level Security

Album	[View]	Track	[View]

Administrative Permissions

API Enabled	✓	Invite Guests To Chatter	✓
Api Only User	✓	Manage Public List Views	✓
Chatter Internal User	✓	Send Outbound Messages	✓
Edit Read Only Fields	☐		

Custom Object Permissions

	Basic Access				Data Administration	
	Read	Create	Edit	Delete	View All	Modify All
Albums	☐	☐	☐	☐	☐	☐
Tracks	☐	☐	☐	☐	☐	☐

For the new Vendor profile, note how the Custom Object Permissions don't have any check marks next to the Album and Track objects. This indicates that users with this profile do not have access to any records at all.

To test this, create a new user and assign him to this profile.

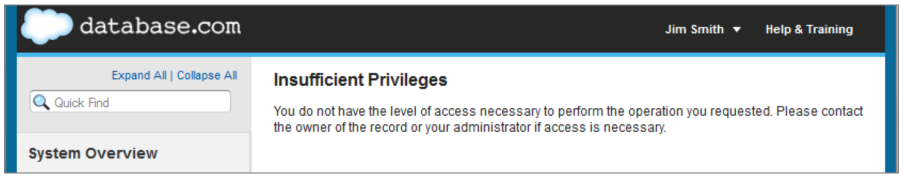
1. Select **Administration Setup** > **Manage Users** > **Users**.
2. Click **New User**.
3. For **First Name**, type `Jim` and press TAB.
4. For **Last Name**, type `Smith`.
5. For **Email**, type *your* email address (so that you receive the activation email).

6. For **Username**, type something memorable in the form of an email address, related to your current user. Note that this doesn't need to be an authentic email address, just something in the form of an email address. For example, our administrator username is admin-user@workbook.db, so we can call this new user jimsmith-user@workbook.db.
7. For **User License**, select Database.com User (the default).
8. For **Profile**, select the new `Vendor` profile you created earlier.
9. Click **Save**.

You've now created a new user, and assigned the user to the Vendor profile.

Next, go to your own email account and look for the new user's activation email message. Click the link and activate the new user through the default landing page for the Database.com Console's set password page.

Once you set the initial password for a non-administrator, the Database.com Console redirects the session to the default landing page, which is the System Overview page. Because non-administrators don't have access to this page, you'll likely see an "Insufficient Privileges" message. Don't worry—simply log out as the non-administrator and continue to the next step.



Insufficient Privileges

You do not have the level of access necessary to perform the operation you requested. Please contact the owner of the record or your administrator if access is necessary.

Note: To support an application's user password management page in a production setting, make sure to configure an alternative home page for Database.com password management using **Administration Setup** > **Password Policies** > **Alternative Home Page**.

Step 2: Toggle Object Visibility

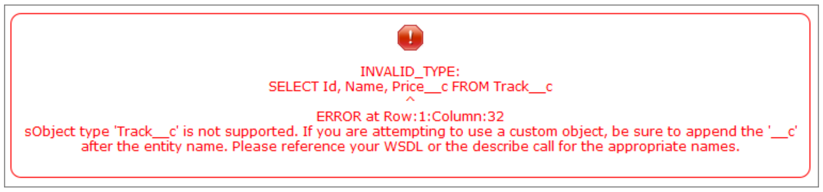
Now let's use Workbench, as the new user, to see what we can (and cannot) do.

1. Log out of Workbench with **workbench** > **Logout**.
2. Establish a new connection to the production database as your new user, starting with **workbench** > **Login**, and the login screen. Refer to Tutorial 1, Step 2 on page 11 if you need to review the procedure.
3. Once you are connected, select **queries** -> **SOQL Query**.
4. In the Object list, notice that there are no Album__c and Track__c objects to choose. That's what we expect, because the user's Vendor profile doesn't provide its users with access to these custom objects.

Let's see if we can sneak in by hand-coding a query. Try executing the following query.

```
SELECT Id, Name, Price__c FROM Track__c
```

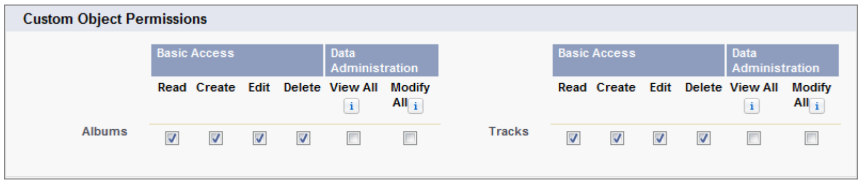
Workbench should return the following error.


```
INVALID_TYPE:
SELECT Id, Name, Price__c FROM Track__c
                               ^
ERROR at Row:1:Column:32
sObject type 'Track__c' is not supported. If you are attempting to use a custom object, be sure to append the '__c'
after the entity name. Please reference your WSDL or the describe call for the appropriate names.
```

In other words, because the new user has a profile that restricts object visibility, Database.com ensures that the object is not visible at all.

Switch back to the Database.com Console browser window. Because you logged out earlier (after setting the password for the new user), you'll have to log in again as the administrator.

1. Navigate to **Manage Users** > **Profiles**.
2. Click **Edit** next to the **Vendor** profile.
3. Check the boxes in the **Read, Create, Edit,** and **Delete** columns for both Album and Track, and click **Save**.



Custom Object Permissions

	Basic Access				Data Administration	
	Read	Create	Edit	Delete	View All	Modify All
Albums	✓	✓	✓	✓	☐	☐

	Basic Access				Data Administration	
	Read	Create	Edit	Delete	View All	Modify All
Tracks	✓	✓	✓	✓	☐	☐

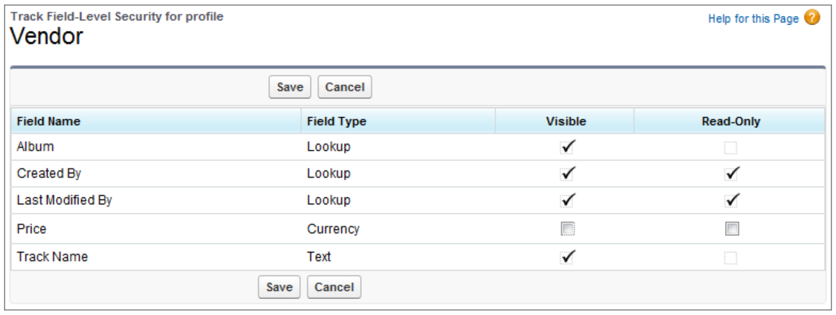
Any user with this profile will now be able to create, read, edit, and delete any record of the Album and Track object.

Now jump back over to your Workbench session (that's still tied to the Vendor profile) and simply re-execute the query. This time, it should successfully return all of the records in the Track object. If you still don't see all the records, clear the Workbench cache and then retry the query. Profiles and object visibility are very powerful ways of granting access for entire objects to sets of users.

Step 3: Set Field Level Security

Database.com offers finer control than toggling object permissions. You can also specify field-level security, granting or denying access to sets of fields. In this step, you prevent vendors from accessing the price field on individual tracks.

1. If necessary, navigate to **Manage Users** > **Profiles**.
2. Click the **Vendor** profile.
3. In the **Field Level Security** section, click the **View** link next to **Track**.
4. Click **Edit**.
5. Deselect **Visible** for the Price field, and click **Save**.

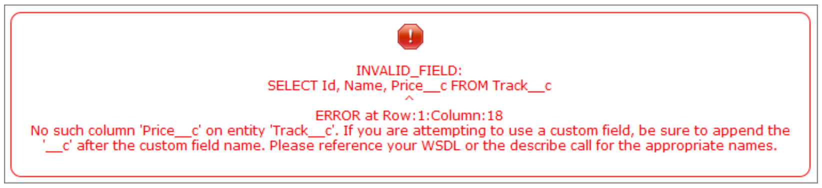


Track Field-Level Security for profile

Vendor

Field Name	Field Type	Visible	Read-Only
Album	Lookup	✓	☐
Created By	Lookup	✓	✓
Last Modified By	Lookup	✓	✓
Price	Currency	☐	☐
Track Name	Text	✓	☐

Now return to your Workbench session and re-execute the same query again. This time, the application will throw an exception.



```
INVALID_FIELD:
SELECT Id, Name, Price__c FROM Track__c
                 ^
ERROR at Row:1:Column:18
No such column 'Price__c' on entity 'Track__c'. If you are attempting to use a custom field, be sure to append the
'__c' after the custom field name. Please reference your WSDL or the describe call for the appropriate names.
```

If you reconnect as the administrator, which uses a more privileged profile, the query executes just fine. You can also remove Price__c from your query to make the query execute successfully.

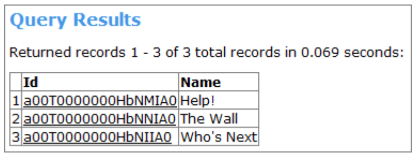
Step 4: Specify Organization-Wide Default Sharing Rules

You've just toggled object visibility and field visibility. Database.com adds a third approach to data security: *record sharing*. Record sharing determines when a user can access records owned by another user. For example, you might want to allow vendors to only view the albums they own, but not view albums owned by other vendors.

Organization-wide (database-wide) sharing settings specify the default level of access to records, and can be set separately for different objects. To see how this works, let's do some work before and after making a configuration change.

As a baseline, switch to the Workbench session, which should still be connected as Jim Smith. Execute the following query:

```
SELECT Id, Name from Album__c
```


Query Results

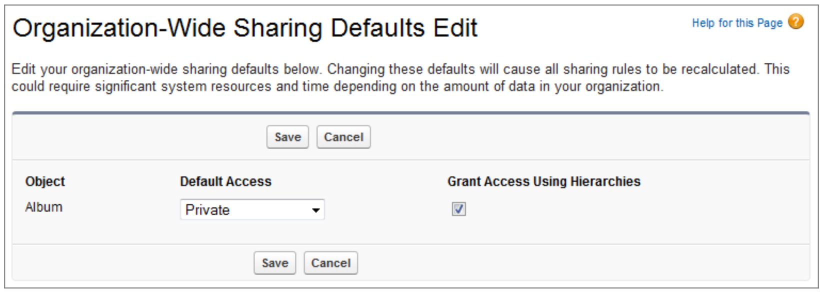
Returned records 1 - 3 of 3 total records in 0.069 seconds:

	Id	Name
1	a00T0000000HbNMIA0	Help!
2	a00T0000000HbNNIA0	The Wall
3	a00T0000000HbNIIA0	Who's Next

The result set includes all data records in the Album object, even though our vendor, Jim Smith, doesn't own any of them. That's because the default and current organization-wide sharing setting for the Album object is Public Read/Write.

We don't want vendors to see records that they don't own. If you change the organization-wide sharing setting for Album to Private, then all users (other than administrators) will only see the records they own. In our scenario, Jim Smith doesn't own any records, and so shouldn't have access to any. Change the setting to verify this.

1. In the Database.com Console, as the administrator, navigate to **Administration Setup** > **Security Controls** > **Sharing Settings**.
2. Click **Edit**, and change the **Default Access** for Album to **Private**.
3. Click **Save**.

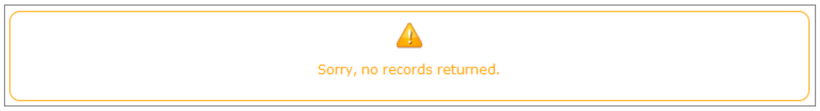

Organization-Wide Sharing Defaults Edit

Edit your organization-wide sharing defaults below. Changing these defaults will cause all sharing rules to be recalculated. This could require significant system resources and time depending on the amount of data in your organization.

Object	Default Access	Grant Access Using Hierarchies
Album	Private	✓

Note: When you set a master object's organization-wide sharing default to Private, Database.com automatically cascades this default to all detail objects that reference the master object. This means that, by default, a user won't be able to work with detail records unless the user can also access the master record.

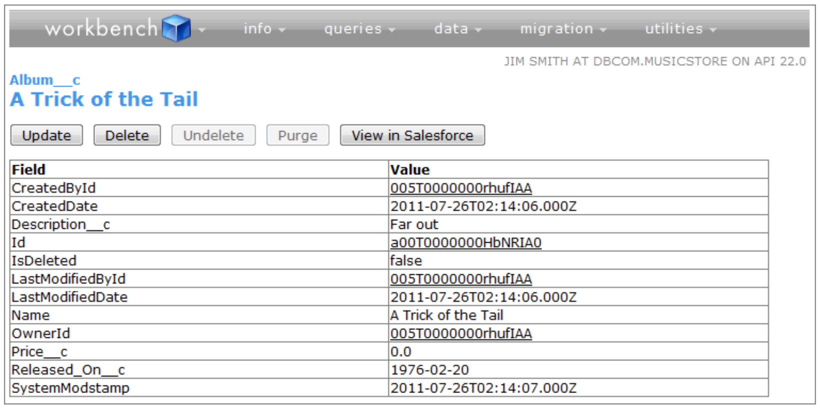
Now, go back to your Workbench session, still connected as Jim Smith, and re-execute the same query. Because Jim Smith doesn't own any records in the Album object, the query now doesn't return any records.


Sorry, no records returned.

The records still exist, but the only user who can work with them is the person who owns them. To prove this last point, let's have Jim Smith create a new album and make sure that the new record is indeed visible to this user.

1. Back in your Workbench session, still connected as Jim Smith, click **data** > **Insert**.
2. For **Object type**, select **Album__c**, select **Single Record**, and click **Next**.
3. For the new album's fields, enter:
   - **Description__c**: `Far out`
   - **Name**: `A Trick of the Tail`
   - **Released_On__c**: `1976-02-20`
4. Click **Confirm Insert**.

In the result, click the link for the new record to show its detail page.



Album__c
A Trick of the Tail

Field	Value
CreatedById	005T0000000rhufIAA
CreatedDate	2011-07-26T02:14:06.000Z
Description__c	Far out
Id	a00T0000000HbNRIA0
IsDeleted	false
LastModifiedById	005T0000000rhufIAA
LastModifiedDate	2011-07-26T02:14:06.000Z
Name	A Trick of the Tail
OwnerId	005T0000000rhufIAA
Price__c	0.0
Released_On__c	1976-02-20
SystemModstamp	2011-07-26T02:14:07.000Z

And if you click the **OwnerId** link, you'll see that Jim Smith is the owner. Because in the current Workbench session you're connected as Jim Smith, you can see this new record even though the organization-wide record sharing default is Private.

Note: Users, such as administrators who use a profile with the **View All** or **Modify All** access rights for an object, can see all records in the object, despite the organization-wide record sharing setting of Private.

Organization-wide record sharing access is a powerful way to control data visibility at the record level. But Database.com sharing features are far more powerful than just this. For example, you can extend sharing by writing code (Apex Managed Shares) that explicitly grants control of certain records to groups of users under particular conditions.

Using Hierarchies

A refinement to organization-wide default record sharing is the ability to grant access to object records using a role hierarchy. In Database.com, you can create a hierarchical structure of roles, and assign users to these roles to give them a position in the hierarchy. Database.com then automatically opens access for a user to any records owned by other users lower down in the hierarchy.

For example, imagine a hierarchy in a company where a manager has access to records created by people that work for the manager. And above the manager, the CEO has access to all records that all managers have access to—all records! Role hierarchies let you easily manage data sharing policies like this efficiently with very little administrative overhead.

To set up a role hierarchy, click **Administration Setup** > **Manage Users** > **Roles**. You can create a role hierarchy, another user, and run the queries in your application as each of the users to see that the record visibility holds.

Summary

Database.com offers powerful ways of controlling data visibility. In this tutorial, you created a user and security profile, and modified that profile to control object-level visibility. You then refined the visibility by controlling field-level visibility. Finally, you changed the organization-wide default sharing settings to ensure users only saw records that they own. Role hierarchies let you refine this still further, as do sharing rules, queues, and groups.

Tutorial 5: Using Workflow Logic

Database.com workflow rules are sets of actions that fire when conditions are met on a record. You can specify criteria based on formulas or field conditions, as well with a time-based mechanism. For actions, you can update a field or send an outbound message to a URL of your choosing.

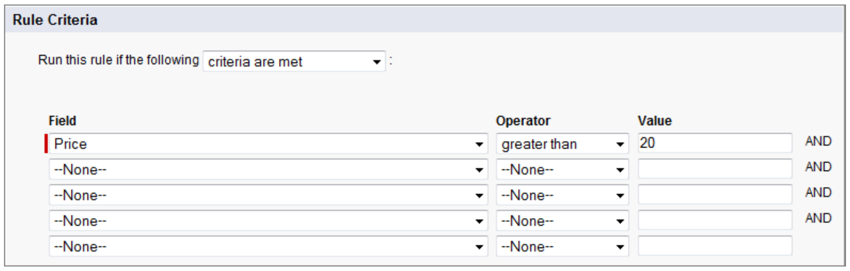
In this tutorial, you create a workflow rule to send an email alert to your auditor whenever an expensive album record is created or modified. In the context of this tutorial, $20 is expensive. You then add an additional action to the rule to send an outbound message as well.

Step 1: Create a Workflow Rule

Creating a workflow is purely declarative, and split into two parts. First create the rule, which defines the criteria under which it fires. Then define a set of actions that fire when the rule is met.

Using the Database.com Console connected to the production organization as the administrator, create a rule that fires when someone creates an expensive album.

1. Navigate to **App Setup** > **Create** > **Workflow** > **Workflow Rules**.
2. Click **Continue** if necessary, then click **New Rule**.
3. For **Select object**, choose `Album` and click **Next**.
4. For **Rule Name**, type `Expensive Album Alert`.
5. For **Evaluate rule**, choose **Every time a record is created or edited**.
6. In the **Rule Criteria** section, set the **Field** to Price, the **Operator** to greater than, and enter 20 for the **Value**.



Rule Criteria

Run this rule if the following: criteria are met

Field	Operator	Value	
Price	greater than	20	AND
--None--	--None--		AND
--None--	--None--		AND
--None--	--None--		AND
--None--	--None--		

7. Click **Save & Next**.

Although you've created the rule, it's not yet active, and it doesn't do anything when the criteria are met. So there's still some more work to do.

Step 2: Send an Outbound Message

In this step, configure an outbound message action for the workflow rule, which fires off a SOAP message to a configurable endpoint.

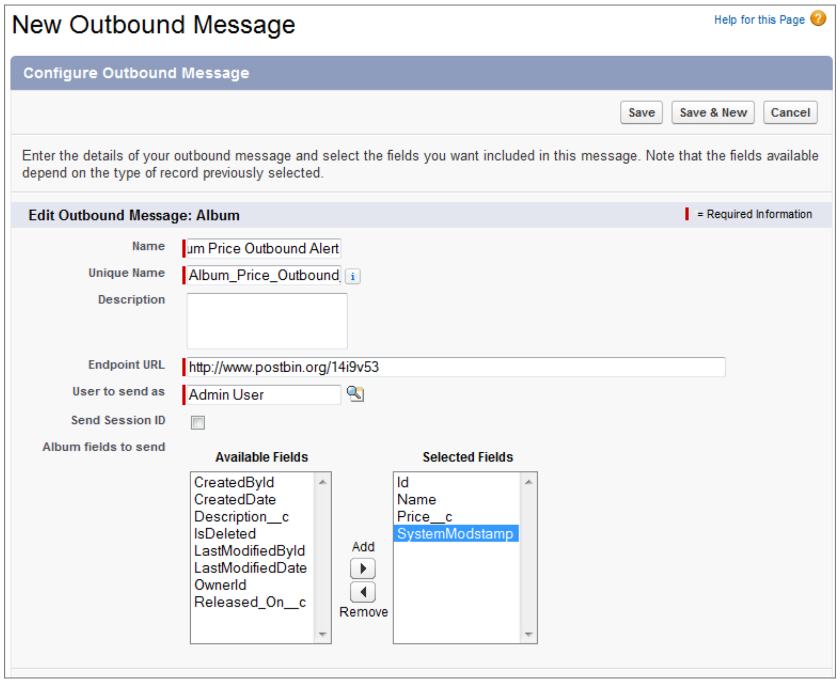
Testing this ordinarily requires creating a web service endpoint that can be invoked by the outbound message action. Instead, you're going to use an online service, PostBin, that intercepts SOAP messages. PostBin captures and logs the asynchronous requests made when actions happen.

Create your test endpoint first.

1. Navigate to www.postbin.org.
2. Click **Make a PostBin**.
3. Record the resulting URL. For example, `http://www.postbin.org/14i9v53`.

Back in the Database.com Console, configure the outbound message.

1. If necessary, return to the Edit Rule Expensive Album Alert page.
   a. Navigate to **App Setup** > **Create** > **Workflow** > **Workflow Rules**.
   b. Click **Expensive Album Alert**.
   c. Click **Edit** in the **Workflow Actions** section.
2. In the **Immediate Workflow Actions** section, click **Add Workflow Action** > **New Outbound Message**.
3. For **Name**, enter `Album Price Outbound Alert` and press TAB.
4. For **Endpoint URL**, enter your PostBin URL (for example, `http://www.postbin.org/14i9v53`).
5. For **Selected Fields**, ensure that `Id, Name, Price__c`, and `SystemModStamp` are selected. These selections identify the field data that Database.com sends to the endpoint whenever it fires the rule.



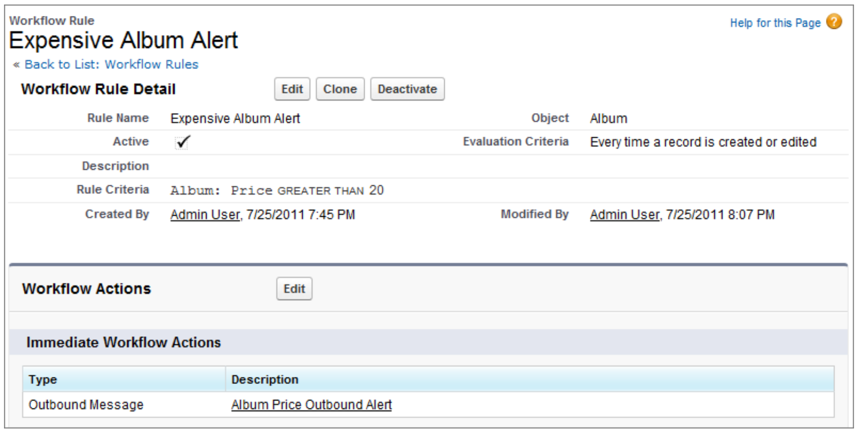
Enter the details of your outbound message and select the fields you want included in this message. Note that the fields available depend on the type of record previously selected.

Edit Outbound Message: Album | = Required Information

Name	um Price Outbound Alert
Unique Name	Album_Price_Outbound
Description	
Endpoint URL	http://www.postbin.org/14i9v53
User to send as	Admin User
Send Session ID	☐
Album fields to send	

Available Fields	Selected Fields
CreatedById	Id
CreatedDate	Name
Description__c	Price__c
IsDeleted	SystemModstamp
LastModifiedById	
LastModifiedDate	
OwnerId	
Released_On__c	

6. Click **Save**, and **Done**.
7. Click **Activate** to make the new work flow rule active.


Workflow Rule
Expensive Album Alert
« Back to List: Workflow Rules
Help for this Page

Workflow Rule Detail Edit Clone Deactivate

Rule Name	Expensive Album Alert	Object	Album
Active	✓	Evaluation Criteria	Every time a record is created or edited
Description			
Rule Criteria	`Album: Price` GREATER THAN 20		
Created By	Admin User, 7/25/2011 7:45 PM	Modified By	Admin User, 7/25/2011 8:07 PM

Workflow Actions Edit

Immediate Workflow Actions

Type	Description
Outbound Message	Album Price Outbound Alert

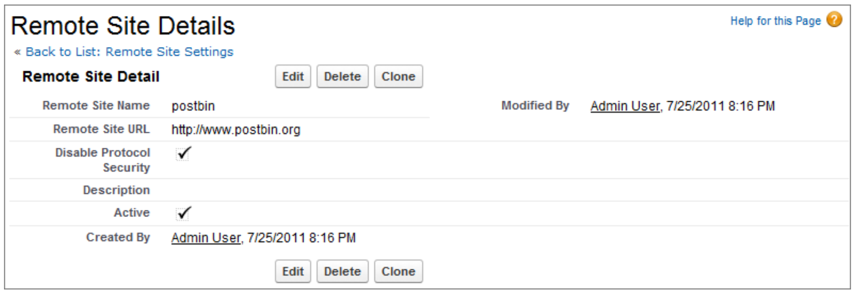
You can't test this rule yet though!

Step 3: Set Up Network Security

Database.com is locked down by default, and doesn't allow public access either into or out of your Database.com instance. If you're going to send data to an external Web address, a system administrator has to explicitly change the network permissions to enable such actions.

You need to explicitly allow communication to the PostBin website.

1. Navigate to **Administration Setup** > **Security Controls** > **Remote Sites Settings**.
2. Click **New Remote Site**.
3. For **Remote Site Name**, type `postbin`.
4. For **Remote Site URL**, type `http://www.postbin.org/`.
5. Check **Disable Protocol Security** (because PostBin does not provide a secure service).
6. Click **Save**.


Remote Site Details
« Back to List: Remote Site Settings
Help for this Page

Remote Site Detail Edit Delete Clone

Remote Site Name	postbin	Modified By	Admin User, 7/25/2011 8:16 PM
Remote Site URL	http://www.postbin.org		
Disable Protocol Security	✓		
Description			
Active	✓		
Created By	Admin User, 7/25/2011 8:16 PM		

Edit Delete Clone

Your Database.com instance will now be able to communicate with the PostBin site.

Step 4: Test the Outbound Messaging

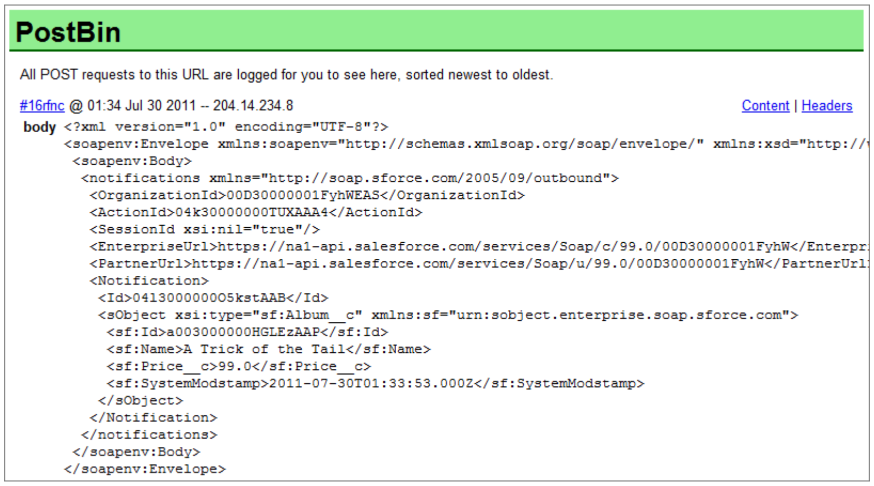
You're now ready to test the new workflow rule that triggers an outbound message using Workbench. Establish a new session connecting to the production database as your administrator account (vendors can't work with prices for tracks). Once you are active, insert a new track with a price greater than $20, making the album price greater than $20, triggering the work flow rule criteria and initiating an outbound message.

1. Click **data** > **Insert**.

2. For **Object Type**, select Track__c, **Single Record**, and click **Next**.
3. For **Album__c**, type `A Trick of the Tail`, and select **Album__c.Name** in **Smart Lookup**.
4. For **Name**, enter `01 - Dance on a Volcano`.
5. For **Price**, enter `22`.
6. Click **Confirm Insert**.

The record is inserted and fires the Expensive Album Alert workflow rule.

In another browser, visit the PostBin URL you created in Step 2. You'll see the SOAP data, including the fields you specified.



PostBin

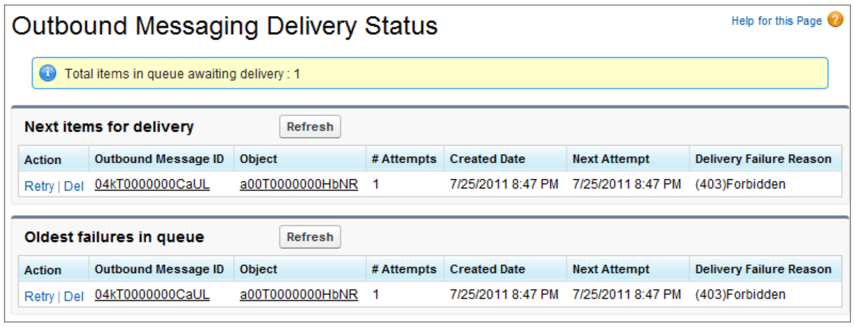
All POST requests to this URL are logged for you to see here, sorted newest to oldest.

#16rfnc @ 01:34 Jul 30 2011 -- 204.14.234.8 Content | Headers

```
body <?xml version="1.0" encoding="UTF-8"?>
     <soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/" xmlns:xsd="http://
      <soapenv:Body>
       <notifications xmlns="http://soap.sforce.com/2005/09/outbound">
        <OrganizationId>00D30000001FyhWEAS</OrganizationId>
        <ActionId>04k30000000TUXAAA4</ActionId>
        <SessionId xsi:nil="true"/>
        <EnterpriseUrl>https://na1-api.salesforce.com/services/Soap/c/99.0/00D30000001FyhW</Enterpr
        <PartnerUrl>https://na1-api.salesforce.com/services/Soap/u/99.0/00D30000001FyhW</PartnerUrl
        <Notification>
         <Id>04l300000005kstAAB</Id>
         <sObject xsi:type="sf:Album__c" xmlns:sf="urn:sobject.enterprise.soap.sforce.com">
          <sf:Id>a003000000HGLEzAAP</sf:Id>
          <sf:Name>A Trick of the Tail</sf:Name>
          <sf:Price__c>99.0</sf:Price__c>
          <sf:SystemModstamp>2011-07-30T01:33:53.000Z</sf:SystemModstamp>
         </sObject>
        </Notification>
       </notifications>
      </soapenv:Body>
     </soapenv:Envelope>
```

When you use asynchronous background processing operations with Database.com, it's a good idea to regularly monitor their status. You can monitor the status of Database.com outbound messages (and many other asynchronous operations) using the Database.com Console as follows.

1. Navigate to **Administration Setup** > **Monitoring** > **Outbound Messages**.
2. Review items scheduled for delivery and failures.



Outbound Messaging Delivery Status

Total items in queue awaiting delivery : 1

Next items for delivery

Action	Outbound Message ID	Object	# Attempts	Created Date	Next Attempt	Delivery Failure Reason
Retry | Del	04kT0000000CaUL	a00T0000000HbNR	1	7/25/2011 8:47 PM	7/25/2011 8:47 PM	(403)Forbidden

Oldest failures in queue

Action	Outbound Message ID	Object	# Attempts	Created Date	Next Attempt	Delivery Failure Reason
Retry | Del	04kT0000000CaUL	a00T0000000HbNR	1	7/25/2011 8:47 PM	7/25/2011 8:47 PM	(403)Forbidden

Because PostBin does not respond to our outbound message (authentic SOAP servers would do so), Database.com thinks there is an error. That's why you'll see one or more failures and an outbound message remaining for delivery. To end the test, simply click the **Del** link in the **Next items for delivery** section. You might want to disable the workflow rule as well.

If you were implementing this in a production environment, you'd want to use the WSDL that's automatically generated by Database.com to generate the web service endpoint. Access the WSDL as follows:

1. Navigate to **App Setup** > **Create** > **Workflow** > **Outbound Messages**.
2. Click **Album Price Outbound Alert**.
3. Click **Click for WSDL** for **Endpoint WSDL**.

Summary

Workflow is a powerful, declarative, approach to executing actions when records meet specified conditions. In this tutorial you created a workflow rule that triggers an outbound SOAP message action in response to a field update.

Tutorial 6: Creating and Deploying Change Sets

In the next tutorial we'll be developing some code, which needs to be done in a test database. To prepare for this development effort, we'll need to replicate some of the objects that we have in our production database to our test database. To do this, we'll use a *change set*. A change set is the feature of Database.com that you employ to move database *metadata* changes (object definitions and modifications, Apex classes and code, profiles, and so on) from one database to another. Change sets do not contain data records.

When you want to send changes from your source database or organization to a destination organization, you create an outbound change set. Once you send the change set, the receiving organization sees it as an inbound change set.

Before you can send a change set between two organizations, you need to create a deployment connection. Currently, you can only send change sets between related organizations—for example, a production organization and a test database, or two test databases created from the same organization.

In this tutorial, you learn how to set up a deployment connection, create an outbound change set in your production organization, and validate and deploy it to your test database.

Step 1: Connect to the Test Database

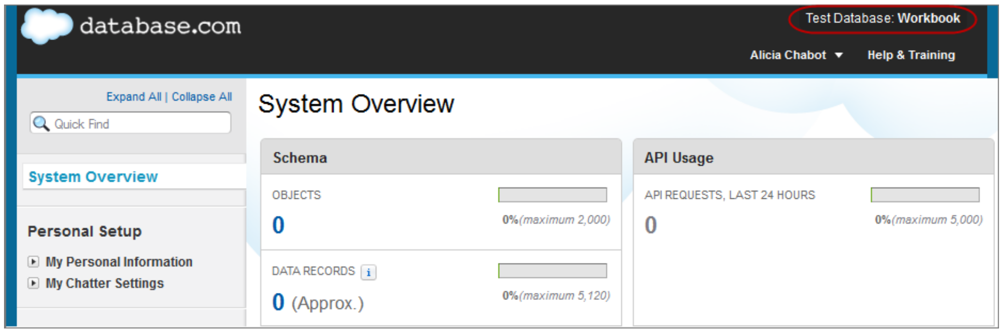
When Database.com creates a test database, it creates a user in the test database by appending `.<testdatabasename>` to your production database username. For example:

Production Username	Workbook Test Database Username
admin-user@workbook.db	admin-user@workbook.db.workbook

The password for the corresponding administrator account in the test database will be the same as it is in production. Once you receive an email that the test database is ready, you can use the Database.com Console to connect to the test database. Navigate to the default deployment connection.

1. Open a new browser window and load the URL test.database.com.
2. Enter the test database username and password, and log in.

Once you connect to your test database, look at the top right portion of your screen and confirm that you see an indicator that you are using your test database.



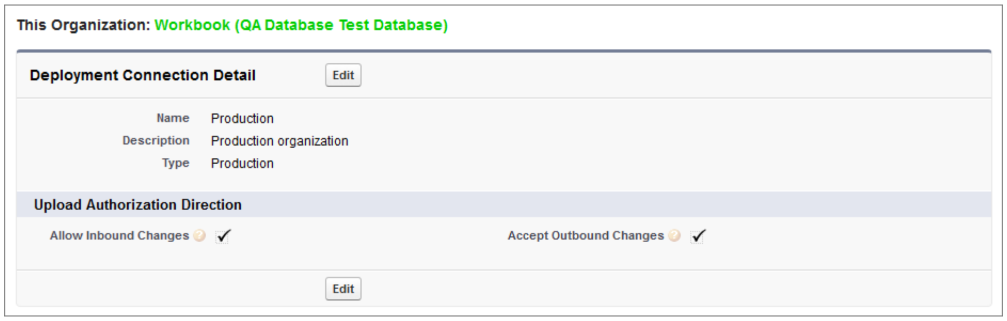
System Overview

Schema		API Usage	
OBJECTS	0%(maximum 2,000)	API REQUESTS, LAST 24 HOURS	0%(maximum 5,000)
0		0	
DATA RECORDS	0%(maximum 5,120)		
0 (Approx.)			

Step 2: Configure a Deployment Connection

In the Database.com Console session that's using your test database, navigate to **App Setup** > **Deploy** > **Deployment Connections** (also click **Continue**, if necessary). You'll see that Database.com already created a deployment connection to your production database to the test database. However, the deployment connection does not allow inbound changes by default. Now that you are ready to send a change set to the test database, complete the following steps to accept inbound changes from the production organization.

1. Click **Edit** next to the **Production** deployment connection.
2. Select **Allow Inbound Changes**.
3. Click **Save**.



This Organization: Workbook (QA Database Test Database)

Deployment Connection Detail

Name	Production
Description	Production organization
Type	Production

Upload Authorization Direction

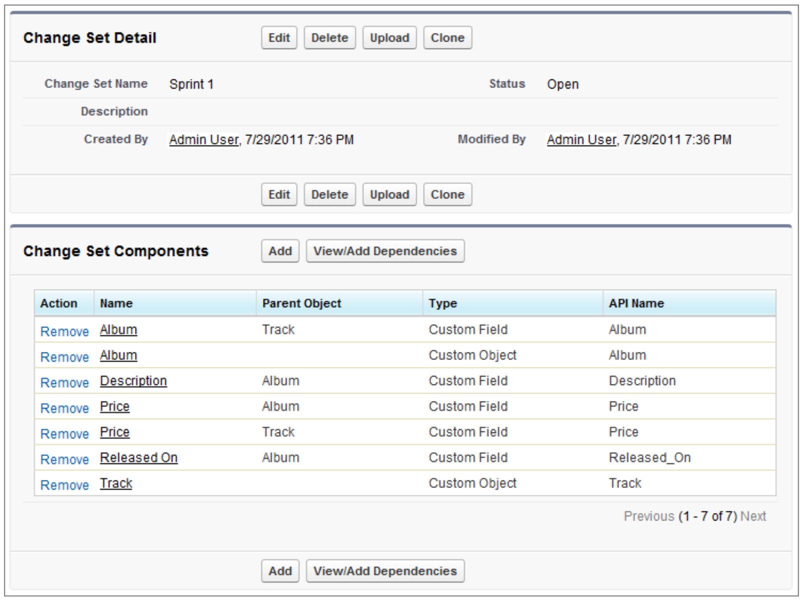
Allow Inbound Changes	✓	Accept Outbound Changes	✓

Step 3: Create and Upload an Outbound Change Set

In this step, create an outbound change set in the production organization and then upload it to the test database.

1. In a browser, log in to your production database at login.database.com as the administrator.
2. Navigate to **App Setup** > **Deploy** > **Outbound Change Sets**.
3. Click **Continue**, if necessary, to bypass the description page.
4. Click **New**.
5. For **Name**, enter `Sprint 1`.
6. Click **Save**.
7. Use the **Add** button next to **Change Set Components** repeatedly to add various metadata to your change set.

   If you want, you can add everything you've created in production so far to the change set. However, you'll only need to iterate through Custom Object and Custom Field to build the change set necessary to support the following tutorial. Make sure your change set has the custom objects (Album, Track) and all custom fields for these objects, as shown in the following screen.



Change Set Detail

Change Set Name	Sprint 1	Status	Open
Description			
Created By	Admin User, 7/29/2011 7:36 PM	Modified By	Admin User, 7/29/2011 7:36 PM

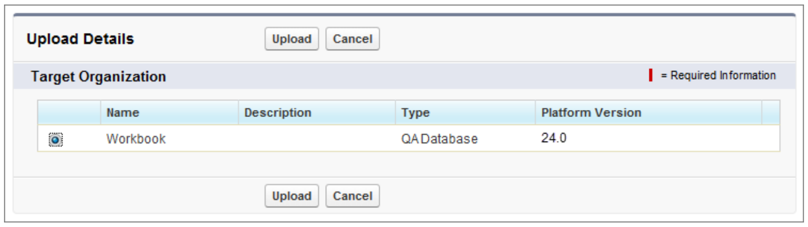
Change Set Components

Action	Name	Parent Object	Type	API Name
Remove	Album	Track	Custom Field	Album
Remove	Album		Custom Object	Album
Remove	Description	Album	Custom Field	Description
Remove	Price	Album	Custom Field	Price
Remove	Price	Track	Custom Field	Price
Remove	Released On	Album	Custom Field	Released_On
Remove	Track		Custom Object	Track

Previous (1 - 7 of 7) Next

Once you're sure you have everything in the change set, complete the following steps to send the change set to the test database.

1. Click **Upload**.
2. Select **Workbook**, the name of the production database.



Upload Details

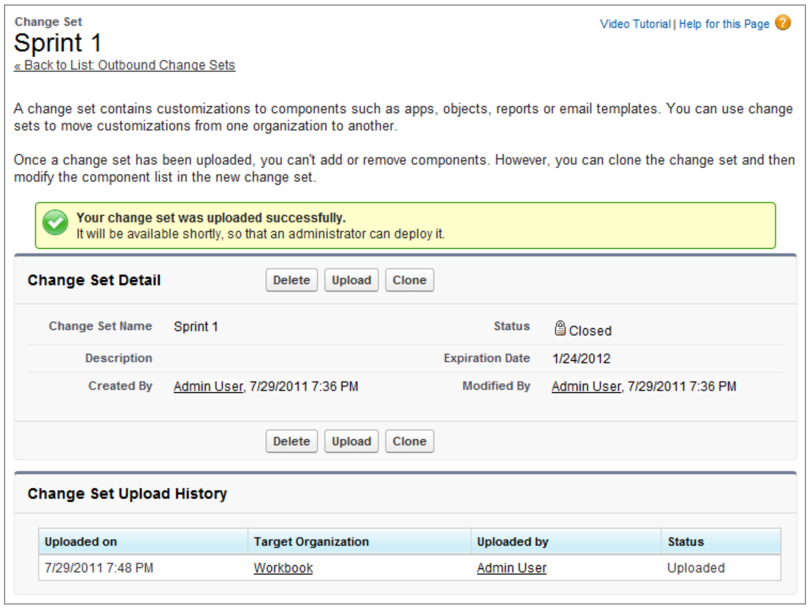
Target Organization

= Required Information

	Name	Description	Type	Platform Version
●	Workbook		QA Database	24.0

3. Click **Upload**.

When the upload completes, you'll see a confirmation page.



Change Set

Sprint 1

« Back to List: Outbound Change Sets

A change set contains customizations to components such as apps, objects, reports or email templates. You can use change sets to move customizations from one organization to another.

Once a change set has been uploaded, you can't add or remove components. However, you can clone the change set and then modify the component list in the new change set.

Your change set was uploaded successfully.
It will be available shortly, so that an administrator can deploy it.

Change Set Detail

Change Set Name	Sprint 1	Status	Closed
Description		Expiration Date	1/24/2012
Created By	Admin User, 7/29/2011 7:36 PM	Modified By	Admin User, 7/29/2011 7:36 PM

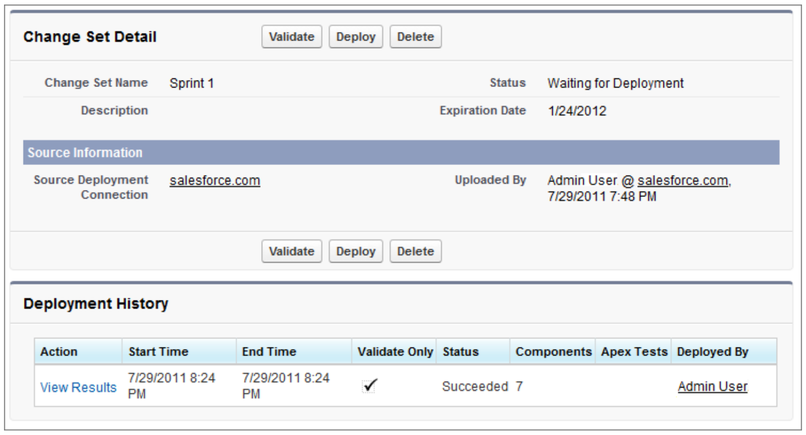
Change Set Upload History

Uploaded on	Target Organization	Uploaded by	Status
7/29/2011 7:48 PM	Workbook	Admin User	Uploaded

Step 4: Validate and Deploy Inbound Change Set

Soon after you send a change set to your test database, you'll receive an email stating that the upload is complete. Once this happens, switch back over to your Database.com Console session that's connected to the test database. The next steps are to validate and deploy the inbound change set received from the production organization.

1. Navigate to **App Setup** > **Deploy** > **Inbound Change Sets**.
2. Click **Continue** if necessary.
3. Click the link for the **Sprint 1** change set. There may be a delay before the change set becomes available.
4. Click **Validate** and **OK** to validate that when you deploy the change set, no errors arise.

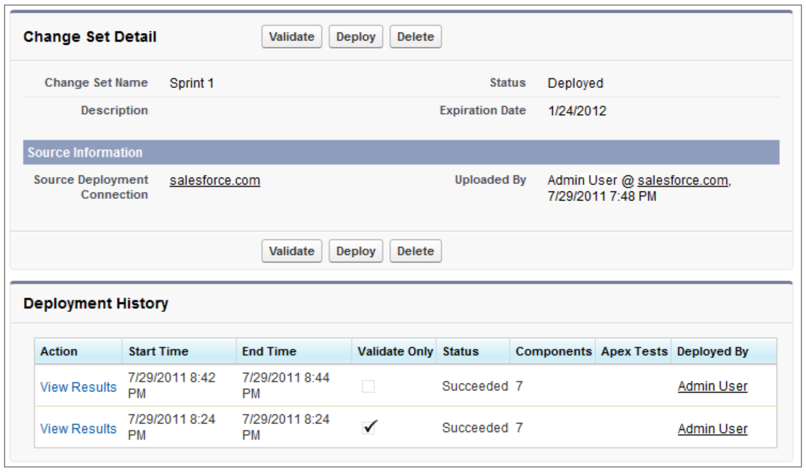

Change Set Detail

Change Set Name	Sprint 1	Status	Waiting for Deployment
Description		Expiration Date	1/24/2012
Source Information			
Source Deployment Connection	salesforce.com	Uploaded By	Admin User @ salesforce.com, 7/29/2011 7:48 PM

Deployment History

Action	Start Time	End Time	Validate Only	Status	Components	Apex Tests	Deployed By
View Results	7/29/2011 8:24 PM	7/29/2011 8:24 PM	✓	Succeeded	7		Admin User

5. Upon successful validation, click **Deploy**, and then **OK** to deploy the change set.



Change Set Detail Validate Deploy Delete

Change Set Name	Sprint 1	Status	Deployed
Description		Expiration Date	1/24/2012

Source Information

Source Deployment Connection	salesforce.com	Uploaded By	Admin User @ salesforce.com, 7/29/2011 7:48 PM

Validate Deploy Delete

Deployment History

Action	Start Time	End Time	Validate Only	Status	Components	Apex Tests	Deployed By
View Results	7/29/2011 8:42 PM	7/29/2011 8:44 PM	☐	Succeeded	7		Admin User
View Results	7/29/2011 8:24 PM	7/29/2011 8:24 PM	✓	Succeeded	7		Admin User

And that's it! You've just migrated the custom objects and fields from your production organization to the test database. Now you're ready to develop some code in the next tutorial.

Note: Change sets never include users in the source database.

Step 5: Disallow Inbound Changes

Once you deploy an inbound change set to a database, it's a good idea to lock down the database so that you have absolute control over future change sets arriving. You can do this very simply using the Database.com Console:

1. Navigate to **App Setup** > **Deploy** > **Deployment Connections**.
2. Click **Edit** next to the `Production` deployment connection.
3. Clear **Allow Inbound Changes**.
4. Click **Save**.

Summary

In this tutorial, you learned about Database.com deployment connections and change sets, and how you use them to move changes from one database to another.

Tutorial 7: Using Custom Business Logic and Database Triggers

Database.com workflow rules can centralize many common types of business logic that an organization's applications need to accommodate, but there will always be custom work flows and business logic that declarative workflows cannot anticipate.

You can implement such logic in your application, but then you have to inefficiently repeat this process for every application that the database supports. A better way to address these cases with Database.com is to create centralized database triggers that enforce your custom business logic.

Database.com provides you with a strongly-typed, object-oriented programming language, Apex, to implement such database-side logic requirements. The language will be familiar to anyone who knows Java. Apex supports:

- Data manipulation language (DML) calls, such as INSERT, UPDATE, and DELETE.
- Embedded Salesforce Object Query Language (SOQL) and Salesforce Object Search Language (SOSL).
- Looping constructs that provide for bulk processing of record sets.
- A locking syntax that prevents record update conflicts.

In this tutorial, you create a simple database trigger to change some default behavior of the master-detail relationship between the Album and Track objects. As it stands now, when someone deletes an Album record, Database.com also deletes related tracks. Let's say that, for our business, it's OK to delete albums that don't have any tracks, but we want to prevent the deletion of an album that does have tracks. We enforce this rule with a database trigger.

Note: In traditional relational database parlance, Database.com enforces the delete cascade referential action for every master-detail relationship. In this tutorial, what we are doing is implementing the delete restrict action with a trigger.

As a bonus, you learn about another great Database.com feature in this tutorial: the Recycle Bin. You'll see how to locate and recover deleted records from the Recycle Bin.

You can download the code for this tutorial at https://gist.github.com/1132445 and https://gist.github.com/1132449.

Step 1: Create a Trigger

Use the Database.com Console to create a trigger. Connect to your test database as the administrator, and complete the following steps.

1. Navigate to **App Setup** > **Create** > **Objects**.
2. Click **Album** on the Custom Objects page.
3. Scroll down, if necessary, to display the Triggers section and click **New**.

Notice that the Database.com Console provides you with an interface for declaring your trigger. The basic syntax for a trigger is as follows:

```
trigger name on object (event) {
  body
}
```

where:

- *name* is a unique name for the trigger.
- *object* is the object associated with the trigger.
- *event* is the event that determines when the trigger fires. Valid events include any combination of before/after and insert/update/delete/merge/upsert/undelete.
- *body* is the Apex code that executes when the trigger fires. Use this to implement your business logic.

Note: It's important to realize that a Database.com trigger can fire in the context of a single-row transaction or a bulk processing transaction. Consequently, you need to design all triggers with bulk processing in mind.

In the Apex trigger window, enter the following trigger declaration:

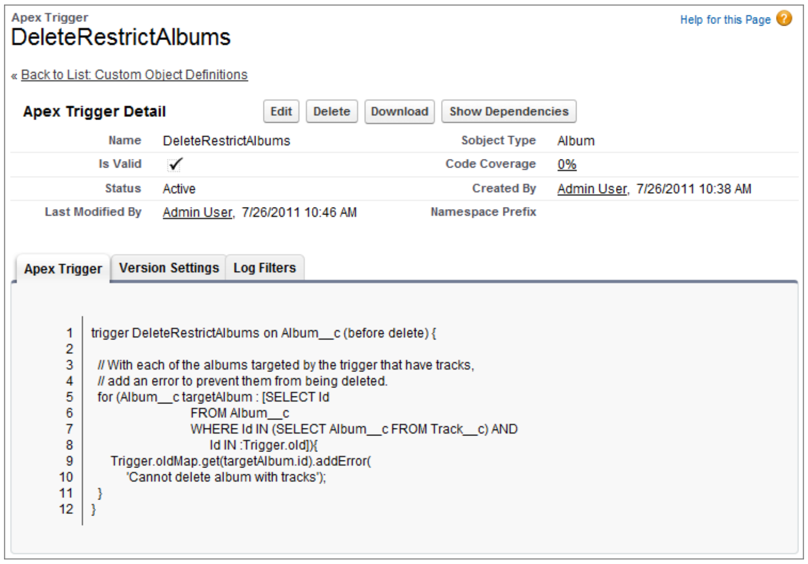
```
trigger DeleteRestrictAlbums on Album__c (before delete) {

  // With each of the albums targeted by the trigger that have tracks,
  // add an error to prevent them from being deleted.
  for (Album__c targetAlbum : [SELECT Id
                             FROM Album__c
                             WHERE Id IN (SELECT Album__c FROM Track__c) AND
                                   Id IN :Trigger.old]){
      Trigger.oldMap.get(targetAlbum.id).addError(
           'Cannot delete album with tracks');
  }
}
```

Let's do a code walk-through so that you understand exactly what the trigger does and learn some Apex.

- The name of the trigger is `DeleteRestrictAlbums`.
- The trigger is associated with the `Album__c` object.
- The trigger fires before the execution of a triggering statement that deletes one or more records from the `Album__c` object.
- The trigger body consists of a SOQL for loop that processes a set of albums. The compound `WHERE` clause of the loop's defining query limits the return set to albums with tracks that the triggering statement is targeting for deletion (using `Trigger.old`).
- For each record in the result set, the body of the for loop adds an error to the corresponding album record, thus preventing Database.com from deleting these albums.

Click **Quick Save** to check your syntax before leaving the page. Once there are no errors, make sure to enable **Is Active** and then click **Save**.



Name	DeleteRestrictAlbums	Sobject Type	Album
Is Valid	✓	Code Coverage	0%
Status	Active	Created By	Admin User, 7/26/2011 10:38 AM
Last Modified By	Admin User, 7/26/2011 10:46 AM	Namespace Prefix	

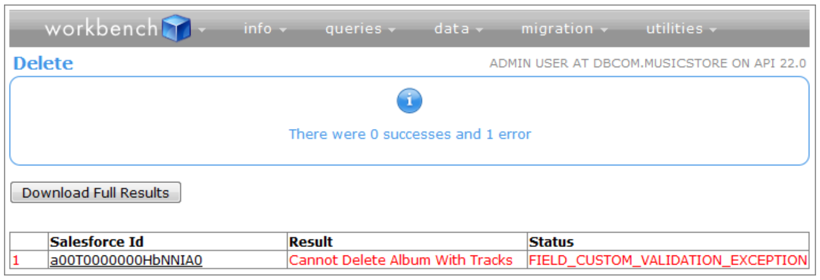
```
trigger DeleteRestrictAlbums on Album__c (before delete) {

 // With each of the albums targeted by the trigger that have tracks,
 // add an error to prevent them from being deleted.
 for (Album__c targetAlbum : [SELECT Id
                             FROM Album__c
                             WHERE Id IN (SELECT Album__c FROM Track__c) AND
                                   Id IN :Trigger.old]){
      Trigger.oldMap.get(targetAlbum.id).addError(
           'Cannot delete album with tracks');
 }
}
```

Note: Similar to declarative workflow rules, you can deactivate and activate triggers to meet your situational requirements.

Step 2: Logically Test the Trigger

To test that the trigger does what we intend, log in to Workbench for your test database and insert some albums and tracks. Then try to delete an album that has at least one track. When you do, you should see an error such as the following.



Delete

ADMIN USER AT DBCOM.MUSICSTORE ON API 22.0

There were 0 successes and 1 error

Download Full Results

	Salesforce Id	Result	Status
1	a00T0000000HbNNIA0	Cannot Delete Album With Tracks	FIELD_CUSTOM_VALIDATION_EXCEPTION

Next, try to delete an album that does **not** have any tracks to make sure that the trigger does not prevent the deletion of such albums. Don't worry, we'll recover the deleted album later in this tutorial.

Step 3: Programmatically Test the Trigger

Apex provides built-in support for unit test creation and execution, including test results that indicate how much code is covered. Before you can add Apex classes and database triggers in your production database, you must create unit tests that programmatically validate at least 75% of the code in your organization.

This testing helps verify that your code executes as you expect it to, and that it doesn't consume unnecessary or extraordinary amounts of system resource. As a side-effect, it also helps ensure the integrity of Database.com releases.

Unit test methods take no arguments and commit no data to the database. To create unit tests for the DeleteRestrictAlbums trigger, complete the following steps.

1. Navigate to **App Setup** > **Develop** > **Apex Classes**.
2. Click **New**.
3. Copy the following code into the **Apex Class** field.

```
@isTest
private class TestDeleteRestrictAlbums {
  // Random number generator
  static double getRandomNumber() {
    return Math.random();
  }

  // Album generator, with or without a track
  static Album__c createNewAlbum(Boolean withTrack) {
    // Create test album and insert it into the database
    Album__c album = new Album__c(name = 'Test' + getRandomNumber());
    insert album;

    // Create test track and insert it into the database, if withTrack == true
    if (withTrack) {
      Track__c track = new Track__c(
        name = 'Test' + getRandomNumber(),
        Album__c = album.Id
      );
      insert track;
    }
    return album;
  }

  // Single row album with no tracks => delete
  static testMethod void verifyAlbumNoTracksDelete() {
    // Create test album and insert it
    Album__c album = createNewAlbum(false);

    // Delete the album, capture the result.
    Database.DeleteResult result = Database.delete(album, false);

    // Assert success, because target album has tracks.
    System.assert(result.isSuccess());
  }

  // Single row album with tracks => delete restrict
  static testMethod void verifyAlbumTracksRestrict() {
    // Create test album and track and insert them
    Album__c album = createNewAlbum(true);

    // Delete the album, capture the result.
    Database.DeleteResult result = Database.delete(album, false);

    // Assert not success, because target album has tracks.
    System.assert(!result.isSuccess());
  }

  // Bulk delete of album, one without tracks, another with
  static testMethod void verifyBulkAlbumDeleteRestrict() {
    // Create two test albums, one with and without track
    Album__c[] albums = new List<Album__c>();
    albums.add(createNewAlbum(false));
    albums.add(createNewAlbum(true));

    // Delete the albums, opt_allOrNone = false, capture the results.
    Database.DeleteResult[] results = Database.delete(albums, false);

    // Assert success for first album
    System.assert(results[0].isSuccess());
    // Assert not success for second album
    System.assert(!results[1].isSuccess());
  }
}
```

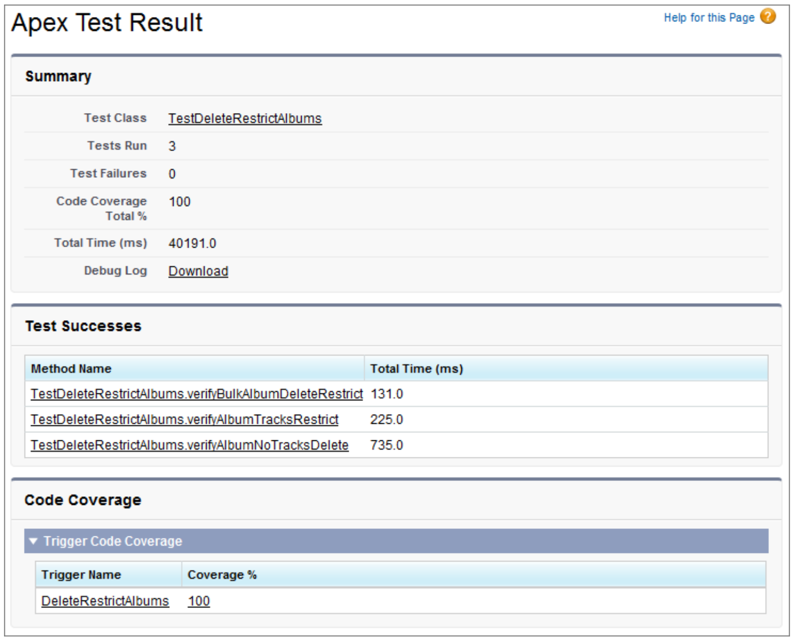
The comments in the code explain the gist of the test methods. Notice that it's important, when building and testing triggers, to keep in mind that triggers can fire as the result of both single-row and bulk triggering statements.

Here are a few important points to understand about building unit tests.

- Use the `@isTest` annotation to define classes or individual methods that only contain code used for testing.
- Test classes must be top-level classes.
- Unit test methods are static methods that are defined with the `@isTest` annotation or the `testMethod` keyword.

After you enter the `TestDeleteRestrictAlbums` test class, test, save, and run it.

1. Click **Quick Save** to test the code for compilation errors.
2. Once the class compiles without errors, click **Save**.
3. Click **Run Test** on the **TestDeleteRestrictAlbums** class page to run the test class and see what happens.



Apex Test Result

Help for this Page

Summary

Test Class	TestDeleteRestrictAlbums
Tests Run	3
Test Failures	0
Code Coverage Total %	100
Total Time (ms)	40191.0
Debug Log	Download

Test Successes

Method Name	Total Time (ms)
TestDeleteRestrictAlbums.verifyBulkAlbumDeleteRestrict	131.0
TestDeleteRestrictAlbums.verifyAlbumTracksRestrict	225.0
TestDeleteRestrictAlbums.verifyAlbumNoTracksDelete	735.0

Code Coverage

Trigger Code Coverage

Trigger Name	Coverage %
DeleteRestrictAlbums	100

When you run a test class, Database.com executes all of the unit test methods in the class and returns a report for the test run.

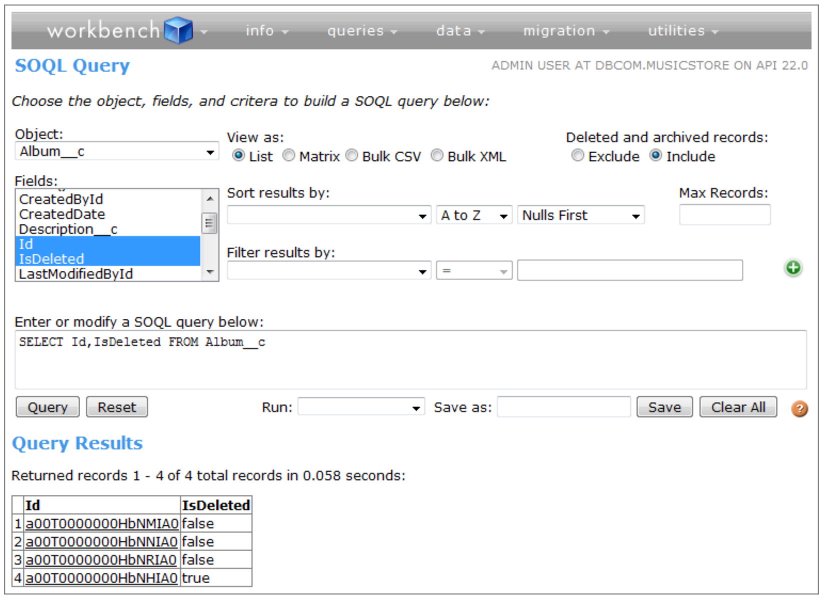
Step 4: View Recycle Bin Records and Restore Them

When someone deletes a record from an object, Database.com "soft deletes" the record by setting its `IsDeleted` field to true. Effectively, such records exist in what is called the *Recycle Bin*. The Recycle Bin keeps your database's deleted records for 15 days before permanently deleting them. So, if you change your mind, you have a way to gracefully restore recently deleted records.

In this step, use Workbench to view and restore the record that you deleted in Step 2 of this tutorial. Using your Workbench session that's connected to the test database as the administrator, execute the following query after making sure **Deleted and archived records** is set to the default **Exclude** option.

```
SELECT Id, IsDeleted, Name FROM Album__c
```

This first result set contains three records, all with `IsDeleted` equal to false. Now re-execute the query after setting **Deleted and archived records** to the **Include** option. The new result set includes an extra record, a record with `IsDeleted` equal to true. This is the record you deleted in Step 2; a record that's in the Recycle Bin.



Choose the object, fields, and critera to build a SOQL query below:

Object: Album__c

View as: [✓ List] Matrix Bulk CSV Bulk XML

Deleted and archived records: Exclude [✓ Include]

Fields: CreatedById, CreatedDate, Description__c, [✓ Id], [✓ IsDeleted], LastModifiedById

Sort results by: A to Z, Nulls First

Max Records:

Filter results by: =

Enter or modify a SOQL query below:

```
SELECT Id,IsDeleted FROM Album__c
```

Run: Save as:

Returned records 1 - 4 of 4 total records in 0.058 seconds:

	Id	IsDeleted
1	a00T0000000HbNMIA0	false
2	a00T0000000HbNNIA0	false
3	a00T0000000HbNRIA0	false
4	a00T0000000HbNHIA0	true

You have a few options for working with the Recycle Bin.

- Wait 15 days for Database.com to permanently delete the record.
- Use Workbench to manually restore or undelete the record.
- Use Workbench to manually purge or permanently delete the record.

Let's learn how to restore the record.

1. Hover over the link for the deleted record.
2. Click **Undelete**.
3. Click **Confirm Undelete**.

If you re-execute the previous query, you can confirm that Database.com restored the record and updated the record's `IsDeleted` field to false.

Note: The Database.com APIs provide complete access to Recycle Bin functionality, including bulk processing of Recycle Bin records.

Step 5: Move the Trigger and Unit Tests to Production

As an optional exercise, use what you learned in the previous tutorial about change sets to move your trigger and unit test from the test database to production. Here's a list of things you'll need to accomplish.

1. In the production organization, allow inbound changes for the test database deployment connection.
2. In the test database, create a new outbound change set with the trigger and Apex unit test class.
3. In the test database, upload the new outbound change set to the production organization.
4. In the production organization, validate and deploy the inbound change set received from the test database.

Summary

Database.com triggers provide a way for you to centralize logic that should be executed under various conditions associated with a record. In this tutorial, you learned how to write triggers in Apex, the object-oriented programming language supported by Database.com. You also discovered how to write test classes for Apex code, as well as how to use the Recycle Bin.

Part 2: External Application Integration

In this part of the Database.com Workbook, you learn how to access your database from an external client application that uses the Database.com REST API. Database.com exposes many APIs, and the primary API used to access your data is the Database.com REST API. There is also a Metadata API, which is used to access the configuration of your database, and a Chatter REST API, which is used to access the Chatter feeds. In this part, we'll focus exclusively on the Database.com REST API.

Database.com uses OAuth 2.0, an open standard for authorization. OAuth lets you construct applications that delegate the actual authentication to the Database.com platform. In the following tutorial, we'll use pre-built OAuth libraries to do the heavy lifting for us.

The following tutorial shows you how to integrate using Java. You can just as well use other languages such as C#, PHP, or Ruby. If you're not a Java programmer, look through the Java tutorial and you'll see that the same principles apply in your own language—interacting with a REST API is just issuing HTTP actions to the correct URLs. As a result, the principles are the same in any language. For additional integration samples using a different schema, see the Integration Workbook.

You can also create mobile applications that access Database.com. See the Mobile SDK Workbook for tutorials that demonstrate Database.com connections on iOS and Android platforms.

Tutorial: Creating a Java Web Application to Access the Database

In this tutorial, you create and configure a Java Web application. You won't have to code it, though—instead, you'll create it using a Maven template, which ensures all library dependencies are installed. The final step in this tutorial performs a code walk-through so that you can see how it works under the hood. Feel free to make changes to the code and experiment.

Prerequisites

1. You need to have Maven installed. You can install the latest version from *`maven.apache.org`*.
2. You need to have completed Tutorials 1-3 of Part 1 on page 5.

Step 1: Configure OAuth on Database.com

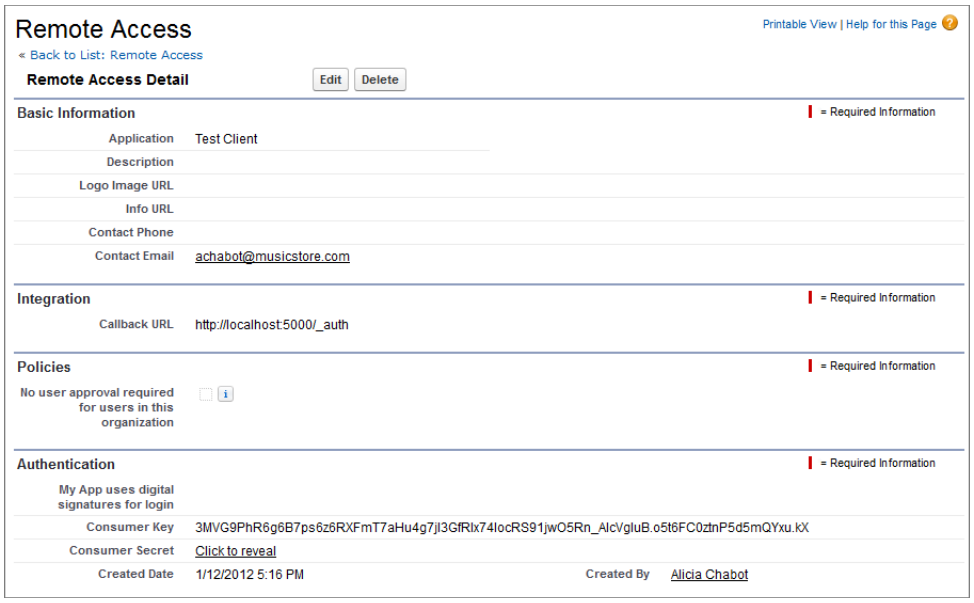
You are going to use a local web application, your client, to invoke OAuth 2.0 for authenticating users against your Database.com instance. With OAuth 2.0, a client application delegates the authentication to a provider, in this case Database.com, which in turn issues an access token if the user successfully authenticates.

As a result, your application doesn't need to handle authentication. It simply needs to ensure that a valid access token accompanies all interactions with the API.

To configure OAuth on Database.com, log into the production database as an administrator and configure a remote access application in the Database.com setup menu.

1. Navigate to **App Setup** > **Develop** > **Remote Access**.
2. Click **New** on the Remote Access page.
3. For **Application**, enter `Test Client`.
4. For **Callback URL**, enter `http://localhost:5000/_auth`.

5. For **Email**, enter your own email address.
6. Click **Save**.



Remote Access

« Back to List: Remote Access

Printable View | Help for this Page

Remote Access Detail Edit Delete

Basic Information = Required Information

Application	Test Client
Description	
Logo Image URL	
Info URL	
Contact Phone	
Contact Email	achabot@musicstore.com

Integration = Required Information

Callback URL	http://localhost:5000/_auth

Policies = Required Information

No user approval required for users in this organization	☐

Authentication = Required Information

My App uses digital signatures for login			
Consumer Key	3MVG9PhR6g6B7ps6z6RXFmT7aHu4g7jl3GfRlx74locRS91jwO5Rn_AlcVgluB.o5t6FC0ztnP5d5mQYxu.kX		
Consumer Secret	Click to reveal		
Created Date	1/12/2012 5:16 PM	Created By	Alicia Chabot

The detail page for your remote access configuration displays a consumer key as well as a consumer secret (which you have to click to reveal). You'll need these in the next step.

The callback URL is particularly important—as part of the OAuth 2.0 authentication dance, this URL will be invoked upon successful completion. In the next step, you'll create an application that does all the OAuth work, including implementing this URL.

Step 2: Download and Compile the Java Application

You create an application by executing a Maven template. This does all the hard work for you, and produces a working Java application. To retrieve the application:

1. Go to `www.database.com/workbook` and download the Java template associated with this workbook.
2. Unzip the template file and create a folder named `Maven-Workbook-Template`.
3. Using a command prompt:
   a. Change the working directory to Maven-Workbook-Template. For example, `cd Maven-Workbook-Template`.
   b. Run the command `mvn install`.

Maven will download all of the dependencies of the application, compile it, and place all the run-time assets in the target directory.

Step 3: Configure and Run the Java Application

There are many implementations of the OAuth 2.0 standard in most current programming languages. Salesforce.com provides one as part of the Java SDK, which your Java application uses. It's a Java servlet filter that takes care of the hard authentication parts, and leaves you with the results of authentication—an access token and an instance URL.

Look at the `src/main/webapp/WEB-INF/web.xml` file and you will see the OAuth filter in operation.

```
<filter>
   <filter-name>AuthFilter</filter-name>
   <filter-class>com.force.sdk.oauth.AuthFilter</filter-class>
   <init-param>
     <param-name>connectionName</param-name>
     <param-value>FORCEDATABASE</param-value>
   </init-param>
</filter>
```

A servlet filter named `AuthFilter` is created. This has a `connectionName` parameter, the value of which needs to be defined in an environment variable. This variable ultimately references the login end point the application uses, and your OAuth credentials. Because the parameter has a value of `FORCEDATABASE`, you have to create an environment variable called `FORCE_FORCEDATABASE_URL` that holds these credentials.

The format of the `FORCE_FORCEDATABASE_URL` environment variable is as follows:

```
force://<LOGIN_ENDPOINT>;oauth_key=<OAUTH_KEY>;oauth_secret=<OAUTH_SECRET>
```

Because we're logging into the production database, `<LOGIN_ENDPOINT>` will be `login.database.com`. The OAuth key and secret must be set to the values of the consumer key and consumer secret in the remote application in Step 1 on page 42. As a result, your final environment variable value will look something like this:

```
force://login.salesforce.com;oauth_key=
3MVG9CVKiXR7Ri5qcjfWDZa0rvFSordUA5LfVJe0GIZ4mwUvFzM6WIPEiYCNcYS.gzFtFEjEWrFMFvEku1.FY;
oauth_secret=341524404139967490
```

You're almost there! From the same command prompt, create an environment variable with this same value. In Unix-like operating systems, you can execute something like this in the command line:

```
export FORCE_FORCEDATABASE_URL="force://login.salesforce.com;oauth_key=
3MVG9CVKiXR7Ri5qcjfWDZa0rvFSordUA5LfVJe0GIZ4mwUvFzM6WIPEiYCNcYS.gzFtFEjEWrFMFvEkU2.FY;
oauth_secret=391524404139967490"
```

On Microsoft Windows operating systems:

```
set FORCE_FORCEDATABASE_URL="force://login.salesforce.com;oauth_key=
3MVG9CVKiXR7Ri5qcjfWDZa0rvFSordUA5LfVJe0GIZ4mwUvFzM6WIPEiYCNcYS.gzFtFEjEWrFMFvEkU2.FY;
oauth_secret=391524404139967490"
```

The final bit of configuration needed is to set the port number. We want the Web server to run on the same port you configured in the remote application Callback URL, which is 5000. From the command prompt, execute the following line (on Unix):

```
export PORT=5000
```

For Microsoft Windows operating systems:

```
set PORT="5000"
```

Step 4: Run the Application

Now that you've configured the application, you can run it. The Maven command you executed earlier created two executable shells: one for Unix and one for Microsoft Windows. On Unix, run:

```
sh target/bin/webapp
```

On Windows, run:

```
target/bin/webapp.bat
```

The Java application now runs. The OAuth servlet filter picks up the environment variables you set for the OAuth credentials, as well as the port number. If all goes well, you'll see something like this in your log window:

```
INFO  : org.springframework.web.servlet.DispatcherServlet - FrameworkServlet 'appServlet': ini
tialization completed in 549 ms
INFO  : org.eclipse.jetty.util.log - Started SelectChannelConnector@0.0.0.0:5000 STARTING
```

Step 5: Test the Application

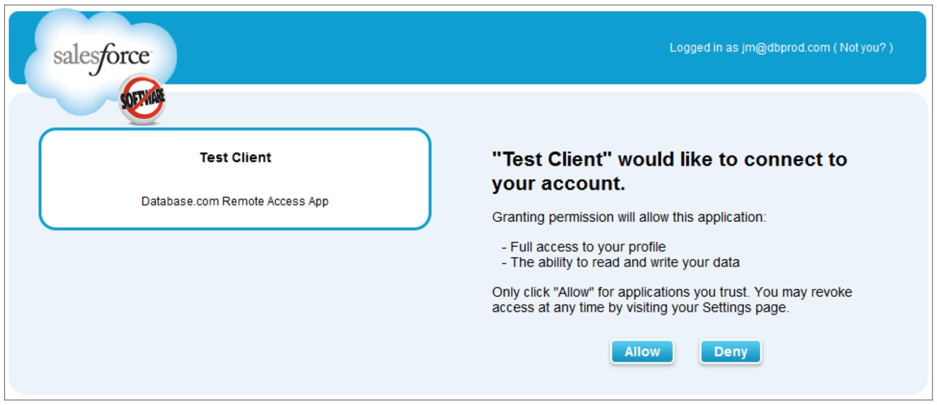
You are now running a local Java Web application server. When you visit your local web application, the OAuth servlet filter immediately kicks in because `web.xml` configures the application server to always run the authorization filter for all URLs:

```
<filter-mapping>
   <filter-name>AuthFilter</filter-name>
   <url-pattern>/*</url-pattern>
</filter-mapping>
```

As a result, as soon as you visit the website created by your application, you are redirected to Database.com, and invited to log in. To see this in action:

1. Open a browser.
2. Go to `http://localhost:5000/`.

Once logged in (use your admin credentials for now), you'll be asked whether you'd like to grant your application permission to access the database. This is part of the typical OAuth flow—you have to explicitly grant an application permission to access your data.


salesforce
Logged in as jm@dbprod.com (Not you?)
Test Client
Database.com Remote Access App
Allow
Deny

"Test Client" would like to connect to your account.

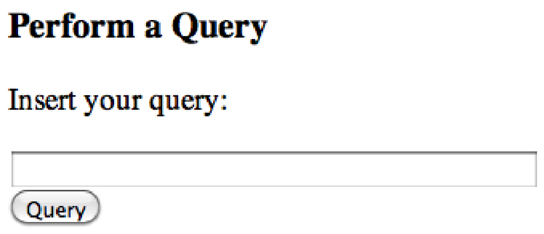
Granting permission will allow this application:

- Full access to your profile
- The ability to read and write your data

Only click "Allow" for applications you trust. You may revoke access at any time by visiting your Settings page.

- Click **Allow**.

You'll now be presented with the home page of the Web application, which allows you to query and create records on your Database.com instance. The application is basic, but provides you with a way to create a record, as well as perform a query. To query, insert a query in the text field and click **Query**.



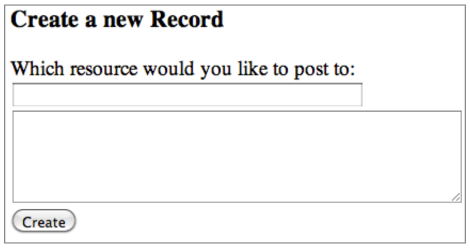
For example, enter `select name,description__c from album__c`. The application creates an HTTP request (a GET request) to the appropriate resource on Database.com for queries, and then displays the raw output. Here's an output example.

```
{
 "done": true,
 "records": [
   {
     "Description__c": "Reggae rock",
     "Name": "Ghost in the Machine",
     "attributes": {
       "type": "Album__c",
       "url": "/services/data/v20.0/sobjects/Album__c/a00T0000004xb2TIAQ"
     }
   },
   {
     "Description__c": "Swamp rock",
     "Name": "Green River",
     "attributes": {
       "type": "Album__c",
       "url": "/services/data/v20.0/sobjects/Album__c/a00T0000004xb2UIAQ"
     }
   },
   {
     "Description__c": "Great cover art",
     "Name": "Who's Next",
     "attributes": {
       "type": "Album__c",
       "url": "/services/data/v20.0/sobjects/Album__c/a00T0000004xb2PIAQ"
     }
   },
   {
     "Description__c": "North American release",
     "Name": "Help!",
     "attributes": {
       "type": "Album__c",
       "url": "/services/data/v20.0/sobjects/Album__c/a00T0000004xb2QIAQ"
     }
   },
   {
     "Description__c": "Great rock opera",
     "Name": "The Wall",
     "attributes": {
       "type": "Album__c",
       "url": "/services/data/v20.0/sobjects/Album__c/a00T0000004xb2RIAQ"
     }
   },
   {
     "Description__c": "Far out",
     "Name": "A Trick of the Tail",
     "attributes": {
        "type": "Album__c",
        "url": "/services/data/v20.0/sobjects/Album__c/a00T0000004xb2SIAQ"
      }
    }
  ],
  "totalSize": 6
}
```

Note how the query must use the "API name" for fields and objects that you created. In most cases, this is found by appending `__c` to the names. The API names are also listed in the administration console of Database.com when you navigate to fields and objects.

The output is in the *JSON* (JavaScript Object Notation) format. REST API can also use an XML format.

You can also create new records in the **Create New Record** section:


Create a new Record

Which resource would you like to post to:

1. The first field is the resource name. Enter `album__c`.
2. For the text box, enter the value of the fields in JSON format:

```
{ "name": "Out of the Blue",
  "description__c": "The best ELO album ever" }
```

3. Click **Create**.

At this point, the application performs an HTTP POST on a URL that includes the resource name, `album__c`. The body of the POST message includes the JSON. The Database.com REST API automatically takes this data and creates the resource—in this case, a new record.

If all goes well, you'll see the response (also JSON) formatted and displayed like this.

```
{"id":"a003000000HGUp1AAH","errors":[],"success":true}
```

Step 6: Investigate How it Works

Open up each of these files to view the application source code and understand a little more about how the application works.

src/main/webapp/WEB-INF/web.xml

This file contains the configuration of the Web application. It ensures that the OAuth filter is in place and mapped to all URLs.

src/main/webapp/WEB-INF/servlet-context.xml

The Web application uses the Spring Framework's MVC container to display the web page with forms and handle the interaction. This file configures the Spring container. In particular:

- It configures an HTTPClientFactory instance. This Java class provides the HTTP connection that is used to interact with the Database.com REST API.

- It configures a RESTHelper instance. This Java class performs the actual query and create calls.

src/main/java/com/developerforce/dbworkbook/HelloController.java

src/main/webapp/WEB-INF/views/home.jsp

These files contain the user-facing Web application home page. The JSP page simply contains two forms. The Java file displays the home page, and then responds to the forms. For example, here's the method that runs when the query form is used:

```
@RequestMapping(value = "/q", method = RequestMethod.POST)
public ModelAndView performQuery(ModelAndView mv, @RequestParam String query) {
    mv.setViewName("dumpresponse");
    mv.addObject("json", rest.query(query));
    return mv;
}
```

This method ensures that the `dumpresponse` view is called to display output. The hard work—the actual query—is a result of a call to the RESTHelper instance, `rest.query(query)`.

src/main/java/com/developerforce/dbworkbook/HTTPClientFactory.java

This Java class creates a singleton HTTP client. All REST APIs work on the basis of issuing simple HTTP actions. As a result, you need an HTTP workhorse to issue these actions.

The only tricky bit here is the establishment of a request interceptor. Successful OAuth authentication results in two things:

- An Instance URL. This URL should be used for all subsequent REST calls.
- An OAuth access token. This token should be inserted into every HTTP header of every call to the REST API. It effectively identifies you as a valid client for the period the token is valid.

Both of these data are made available by the `ForceSecurityContextHolder`, part of the OAuth framework. You'll notice how the request interceptor ensures that an HTTP header is automatically set, and uses the access token (using `getSessionId()`):

```
request.setHeader("Authorization", "OAuth " + sc.getSessionId());
```

src/main/java/com/developerforce/dbworkbook/RESTHelper.java

This class contains the meat of the interaction with the Database.com REST API. We'll walk through the `create()` method here, line by line:

```
String createURL = httpClientFactory.getInstanceURL()
+ "/services/data/" + VERSION + "/sobjects/" + resource + "/";
```

This line establishes the URL that we want to POST to in the Database.com REST API. Every URL is based on the Instance URL, concatenated with "/services/data," concatenated with a version number of the API you want to use, concatenated with "/sobjects/," and finally, the name of the resource.

For example, if you created a new object called `Foo`, it would be automatically represented by a URL such as `https://na1.salesforce.com/services/data/v20.0/sobjects/Foo__c/`.

The next few lines create an HTTP POST request to this URL, specifying the JSON description in the payload:

```
HttpPost httppost = new HttpPost(createURL);
httppost.setEntity(new StringEntity(recordDescription, "application/json", null));
```

Finally, we ask the HTTP Client to execute the POST.

```
HttpResponse response = httpClientFactory.getHttpClient().execute(httppost);
```

The final set of lines just check for an error. Because you're simply performing HTTP actions, the response codes (we've all seen 404s!) determine success or not. If all goes well, we simply return the body of the response from the server, which is what's displayed in your Web application:

```
if (response.getStatusLine().getStatusCode() != 201)
  throw new Exception(EntityUtils.toString(response.getEntity()));
return EntityUtils.toString(response.getEntity());
```

That's it! Interacting with the Database.com REST API is a matter of:

- Using OAuth to perform authentication, which returns an instance URL and access token.
- Writing code to perform standard HTTP actions to a well-defined set of URLs defined by the Database.com REST API.

Summary

In this tutorial, you created, configured, and ran a Java Web application, and set up a Remote Access configuration on Database.com. The Web application used OAuth to authenticate against the database, and the Database.com REST API to execute HTTP GETs and POSTs to create records, and perform a query. These same techniques can be applied in other languages and platforms. The complete description of REST API, which also includes the full URL scheme, can be found in the documentation. See the Database.com REST API Developer's Guide for more information.

Next Steps

Now that you've completed this workbook, you should have a good introduction to Database.com concepts and a general idea of how to build applications using the Database.com REST API. To learn how to develop mobile applications for Database.com on iOS and Android, work through the Mobile SDK Workbook.

To continue exploring, visit the Dev Center at `www.database.com` and view the official documentation for Database.com and the APIs, read the articles and tutorials, and check out the other resources there to help you build awesome applications.