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English 111

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Database Difference Checker (DBC)

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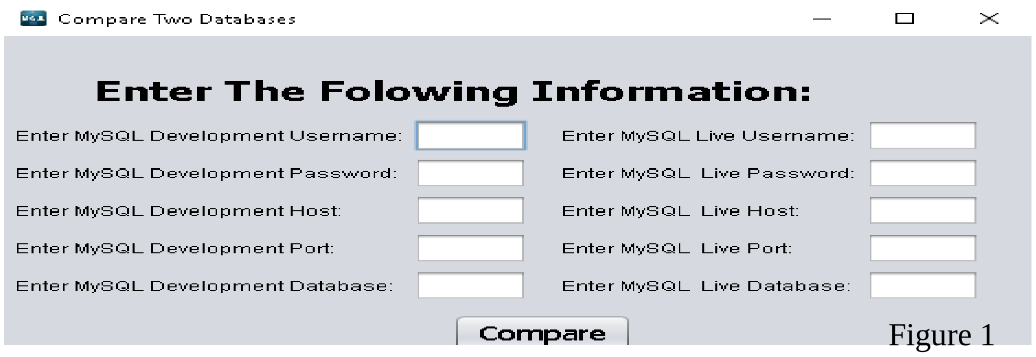
Abstract

Many organizations collect data for later use. This data can be stored in many different places, one of which is a MySQL database. There is often one that is used for a development (dev) environment and one for a live environment. As time goes on, the dev environment and database change. As a result, the live database needs to be updated for the environment to run the same as the dev environment. In order to make the live database the same as the dev database, DBC was created to compare the two databases and determine the SQL statements to make them the same. The database comparison works with column, table, view, and index differences. The DBC can also work with updating a database when the dev database cannot be connected to. This is done by taking a database (DB) snapshot, which stores the structure of a database schema in a JSON file (Aaron).

Introduction

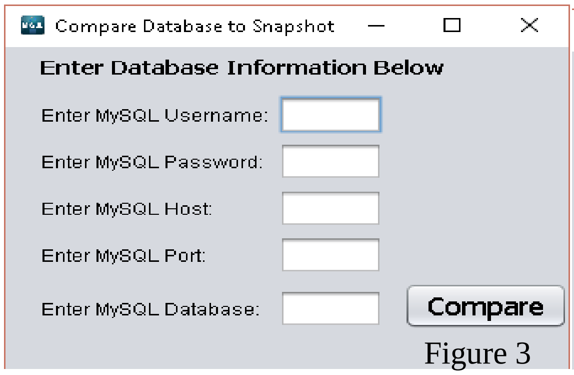
The DBC consists of twelve Java classes and JFrames and determines which columns, indices, and tables need to be added and dropped. The DBC can compare two databases using the MySQL username, password, host, port, and database name (Figure 1); take a DB snapshot (Figure 2); and compare a database to a DB snapshot (Aaron)(Figure 3).


Compare Two Databases

Enter The Folowing Information:

Enter MySQL Development Username:		Enter MySQL Live Username:	
Enter MySQL Development Password:		Enter MySQL Live Password:	
Enter MySQL Development Host:		Enter MySQL Live Host:	
Enter MySQL Development Port:		Enter MySQL Live Port:	
Enter MySQL Development Database:		Enter MySQL Live Database:	

Figure 1


Compare Database to Snapshot

Enter Database Information Below

Enter MySQL Username:

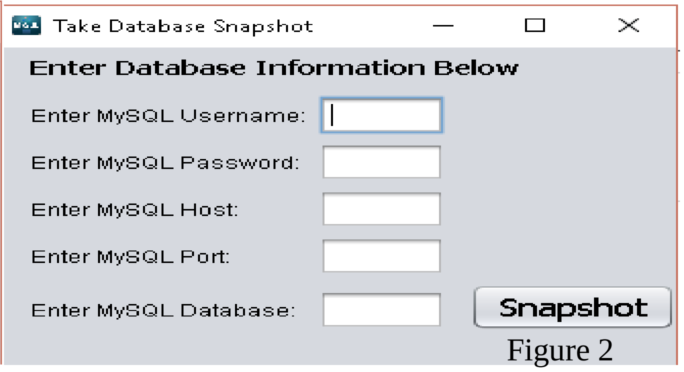
Enter MySQL Password:

Enter MySQL Host:

Enter MySQL Port:

Enter MySQL Database:

Figure 3


Take Database Snapshot

Enter Database Information Below

Enter MySQL Username:

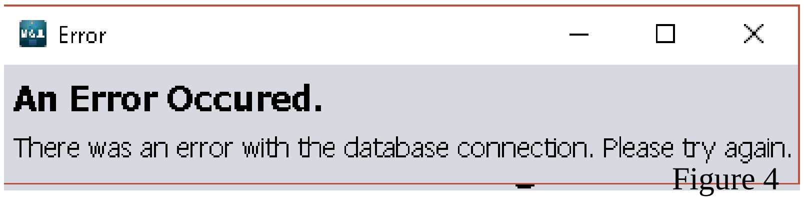
Enter MySQL Password:

Enter MySQL Host:

Enter MySQL Port:

Enter MySQL Database:

Figure 2


Error

An Error Occured.

There was an error with the database connection. Please try again.

Figure 4

Methodology

The DBC consist of twelve Java classes, uses Jackson2 and MySQL connector libraries, and uses a JSON file. The DBC uses multiple JFrames to allow the JFrames to be closed and opened when needed (The Use of Multiple JFrames: Good or Bad Practice?). This allows for a more user friendly experience. When a user chooses to compare two databases using two database connections, a new window pops for the user to input information to connect to the dev and live databases (Figure 1). Once the user inputs the necessary information, a database connection is made for each of the databases. For each database, the connection is tested. If the connection is unable to be established, then an error window will pop up and inform the user (Figure 4). If the connection is established, the views of the database are found using an SQL statement. In the process, each view's create statement is collected and added to the view ArrayList. Next, all of the tables, columns, and indices of the database are found. This information is then added by sorting the results by table name and column order. This allows Table objects to be made and its columns and indices to be added to the Table object. Collecting the index, table, and column information in one shot makes the program faster because there is no need to run several smaller queries to do what one larger query can do in one shot. After the Database objects have been initialized, the two Database objects are compared. First off, an ArrayList of Table objects from each Database object is compared to look for missing and extra tables. If any extra or missing tables are found, the appropriate SQL statement(s) is/are generated to make the table list the same. These tables are added to a list of tables to exclude from the rest of the comparisons. Second, a list of tables, which are to be updated, are compiled based on whether or not the create statements of a table with the same name in each database are the same. If any difference in the create statements is found, then the table name is added to the list. Third, this set of tables is then used to update these tables. The table information is compared column by column and index by index. If any are found to be extra or missing, the appropriate SQL statements are generated. Last, all of the views in the live database have their drop statements generated, and all the views in the dev database have their add statements generated. After each of these four comparisons, the SQL statements are added to a "master list." This list is displayed in a new JFrame where the user can copy the code in order to run it elsewhere. If the user chooses to do a database comparison with a DB snapshot, the process is the same except that a JSON file must be converted back into a Database object before the comparisons occur. Furthermore, if the user chooses to take a DB snapshot, a Database object is initialized, and then it is converted to a JSON file, which can be converted back to a Database object as desired later. If an error occurs at any time, a new JFrame will appear with an error message related to why the error occurred. Listed below are the most important methods of the DBC.

Class	Method	Description
DB_Diff_Checker_GUI	jContinueMouseClicked	Determines which method the user has selected and opens the appropriate JFrame
DBCompare1	compare2	Compares a database to a database snapshot
DBCompare1	DB1btnActionPerformed	Determines whether to take a database snapshot or compare a database to a database snapshot based on the JFrame’s title
DBCompare1	takeSnapshot	Takes a snapshot of a database by converting a Database object to a JSON file
DBCompare2	jButton1ActionPerformed	Determines whether the information supplied by the user is adequate. If so 2 databases are compared otherwise a message is displayed
DBCompare1/DBCompare2	displayResult	Opens a new JFrame which displays the SQL statements to be run to make the dev and live database the same
DBCompare1/DBCompare2/Db_conn	Error	Opens a new JFrame which displays the error that occurred
Database	tablesDiffs	Updates the list of tables which are not the same in dev
Table	Equals	Takes in a Table and compares it to the current one, the result is the SQL statements to be run to make the two tables the same

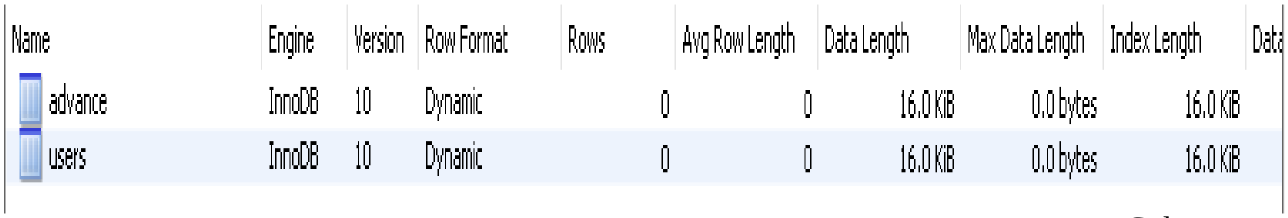
FileConversion	writeTo	Turns a Database object into a JSON file
FileConversion	readFrom	Turns a JSON file into a Database object
Db_conn	getTableList	Gets the tables, columns, and indices of the db
Db_conn	getViews	Gets the views of the db

Result & Discussion

Say there are two databases one called live and one called dev as shown below (Dev, Live). If the DBC is run to make the live database the same as the dev database, the result is shown below (DBC Result). When run, these SQL statements make the live database the same as the dev database. After running the above code, the result of running the DBC again is shown below (DBC Result2). The views are the only ones that show up because any views from the live database are automatically dropped and added regardless of whether or not they are different.

Dev:

Tables



Name	Engine	Version	Row Format	Rows	Avg Row Length	Data Length	Max Data Length	Index Length	Data
advance	InnoDB	10	Dynamic	0	0	16.0 KiB	0.0 bytes	16.0 KiB	
users	InnoDB	10	Dynamic	0	0	16.0 KiB	0.0 bytes	16.0 KiB	

Columns

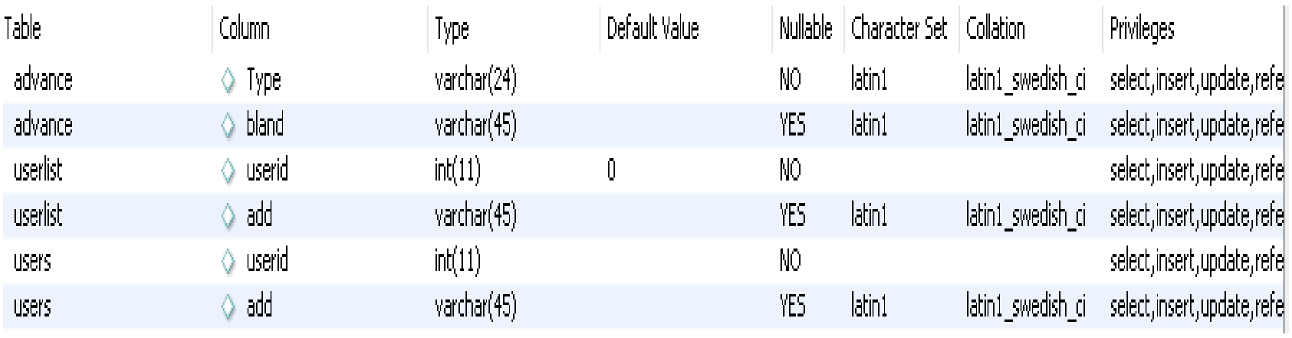


Table	Column	Type	Default Value	Nullable	Character Set	Collation	Privileges
advance	Type	varchar(24)		NO	latin1	latin1_swedish_ci	select,insert,update,refe
advance	bland	varchar(45)		YES	latin1	latin1_swedish_ci	select,insert,update,refe
userlist	userid	int(11)	0	NO			select,insert,update,refe
userlist	add	varchar(45)		YES	latin1	latin1_swedish_ci	select,insert,update,refe
users	userid	int(11)		NO			select,insert,update,refe
users	add	varchar(45)		YES	latin1	latin1_swedish_ci	select,insert,update,refe

Indices

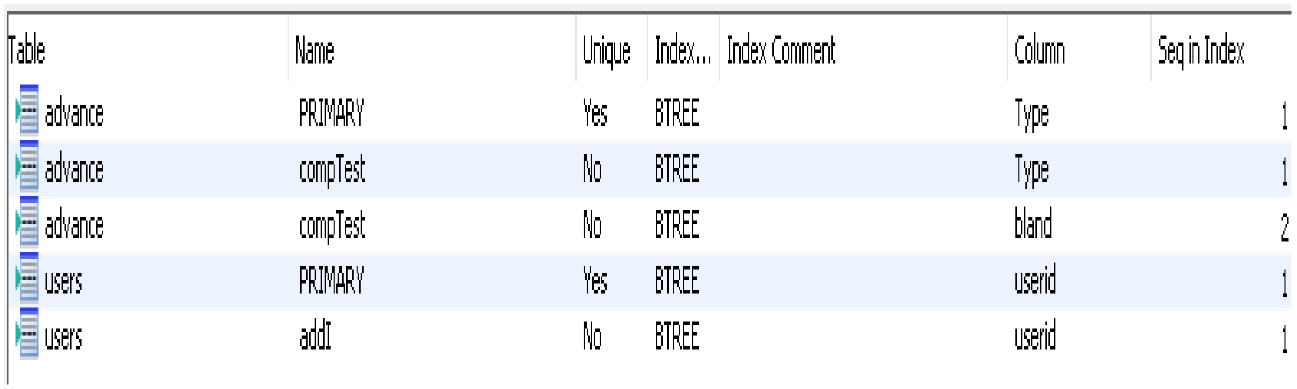
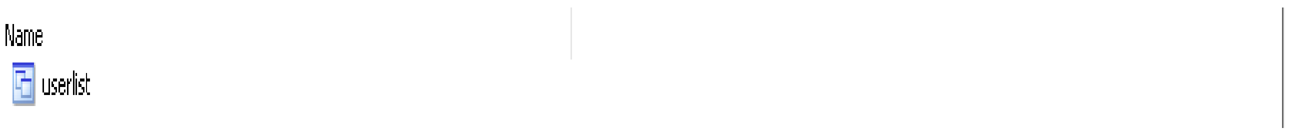


Table	Name	Unique	Index...	Index Comment	Column	Seq in Index
advance	PRIMARY	Yes	BTREE		Type	1
advance	compTest	No	BTREE		Type	1
advance	compTest	No	BTREE		bland	2
users	PRIMARY	Yes	BTREE		userid	1
users	addI	No	BTREE		userid	1

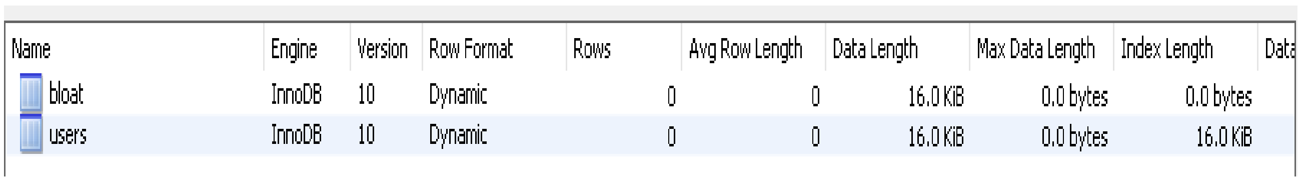
Views



Name
userlist

Live:

Tables



Name	Engine	Version	Row Format	Rows	Avg Row Length	Data Length	Max Data Length	Index Length	Data
bloat	InnoDB	10	Dynamic	0	0	16.0 KiB	0.0 bytes	0.0 bytes	
users	InnoDB	10	Dynamic	0	0	16.0 KiB	0.0 bytes	16.0 KiB	

Columns

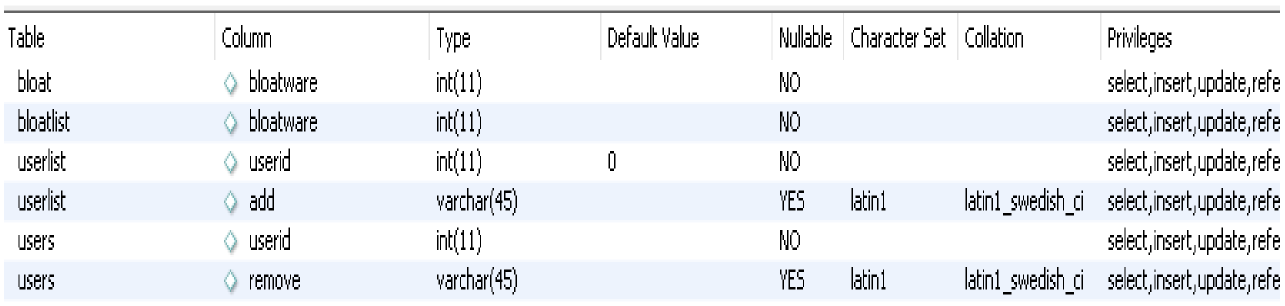


Table	Column	Type	Default Value	Nullable	Character Set	Collation	Privileges
bloat	bloatware	int(11)		NO			select,insert,update,refe
bloatlist	bloatware	int(11)		NO			select,insert,update,refe
userlist	userid	int(11)	0	NO			select,insert,update,refe
userlist	add	varchar(45)		YES	latin1	latin1_swedish_ci	select,insert,update,refe
users	userid	int(11)		NO			select,insert,update,refe
users	remove	varchar(45)		YES	latin1	latin1_swedish_ci	select,insert,update,refe

Indices

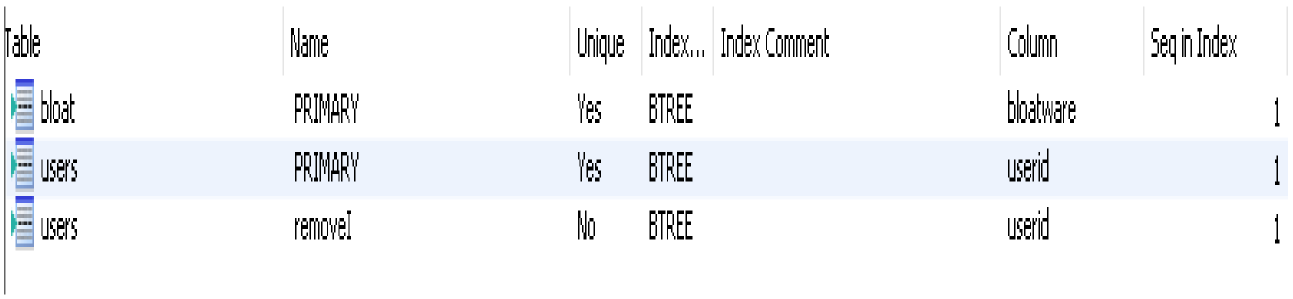
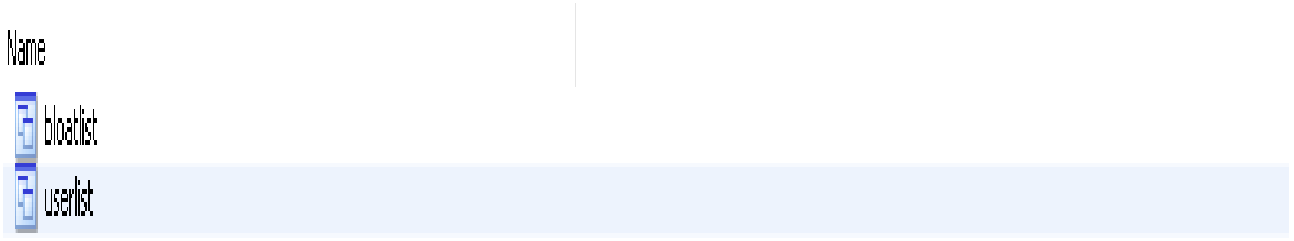
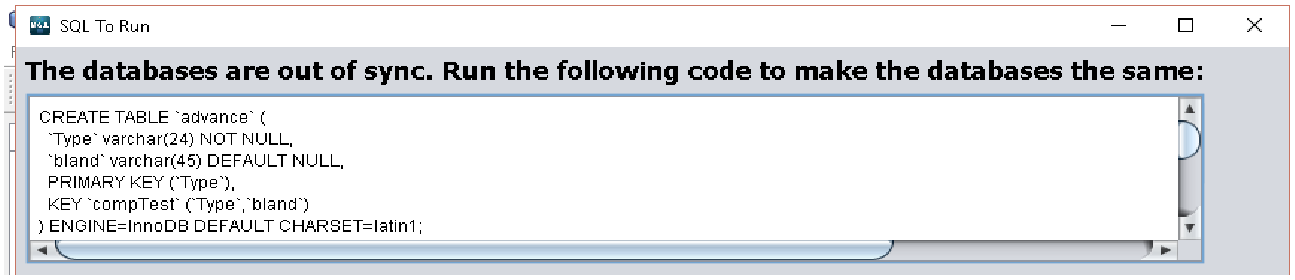


Table	Name	Unique	Index...	Index Comment	Column	Seq in Index
bloat	PRIMARY	Yes	BTREE		bloatware	1
users	PRIMARY	Yes	BTREE		userid	1
users	removeI	No	BTREE		userid	1

Views

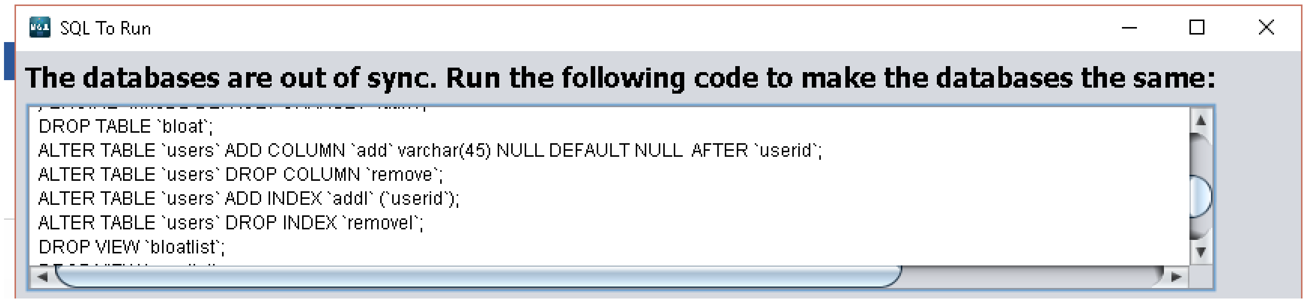


DBC Result:



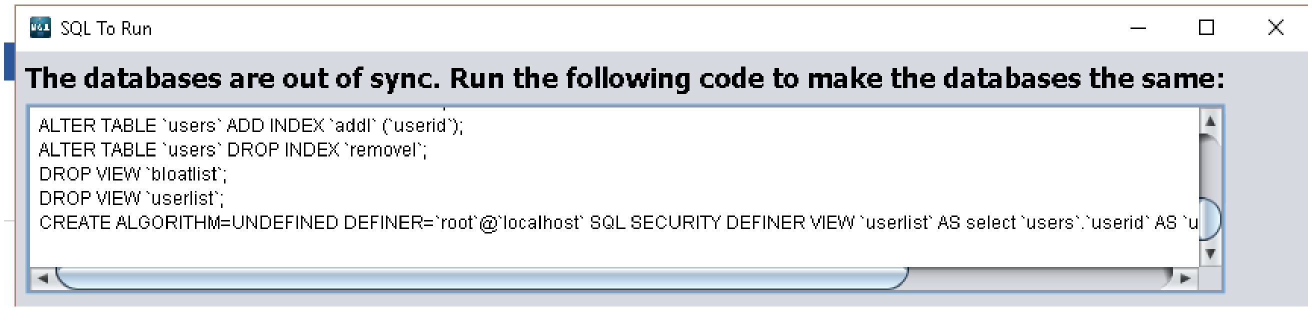
The databases are out of sync. Run the following code to make the databases the same:

```
CREATE TABLE `advance` (
  `Type` varchar(24) NOT NULL,
  `bland` varchar(45) DEFAULT NULL,
  PRIMARY KEY (`Type`),
  KEY `compTest` (`Type`,`bland`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```



The databases are out of sync. Run the following code to make the databases the same:

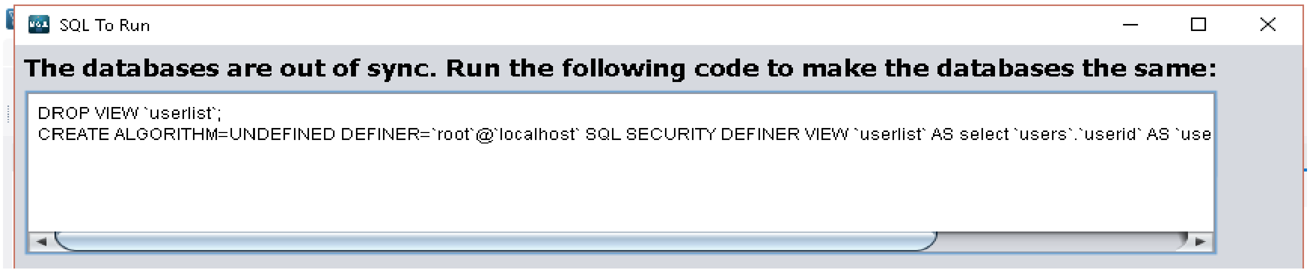
```
DROP TABLE `bloat`;
ALTER TABLE `users` ADD COLUMN `add` varchar(45) NULL DEFAULT NULL  AFTER `userid`;
ALTER TABLE `users` DROP COLUMN `remove`;
ALTER TABLE `users` ADD INDEX `addI` (`userid`);
ALTER TABLE `users` DROP INDEX `removeI`;
DROP VIEW `bloatlist`;
```



The databases are out of sync. Run the following code to make the databases the same:

```
ALTER TABLE `users` ADD INDEX `addI` (`userid`);
ALTER TABLE `users` DROP INDEX `removeI`;
DROP VIEW `bloatlist`;
DROP VIEW `userlist`;
CREATE ALGORITHM=UNDEFINED DEFINER=`root`@`localhost` SQL SECURITY DEFINER VIEW `userlist` AS select `users`.`userid` AS `u
```

DBC Result2:



The databases are out of sync. Run the following code to make the databases the same:

```
DROP VIEW `userlist`;
CREATE ALGORITHM=UNDEFINED DEFINER=`root`@`localhost` SQL SECURITY DEFINER VIEW `userlist` AS select `users`.`userid` AS `use
```

Conclusion

The DBC makes comparing two databases' tables, columns, indices, and views easy regardless of whether or not the comparison is made using a DB snapshot or two database connections (Aaron). Running the DBC generates the SQL statements, which make two databases the same. The DBC can be used when updating software and bringing a live database up to speed with a dev database.

Works Cited:

Aaron, Rance. Personal Interview. 1 June 2017 – 11 Aug. 2017.

“The Use of Multiple JFrames: Good or Bad Practice?,” *Stack Overflow,* Stack Exchange Inc, 4 Mar. 2012, stackoverflow.com/questions/9554636/the-use-of-multiple-jframes-good-or-bad-practice.