Redo/ Undo Logging

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Assumption:

We are going to reuse the city.csv file and the country.csv file from previous project as our database.

Redo logging need to save whole modified blocks in buffers till the transaction is committed and the records of log is flushed.

Undo logging ask for data be written to disk once the transaction is finished.

Rules for undo/redo logging: The update data record should appear on disk before the element in transaction is modified.

Use the undo/redo log to recover/update data to newest.

Design:

Logging Design:

Modified ID	Modified element	Original data	Update data

```
The data in the log file:
------------------------------------------------
1, Population, 1965263, 2004568
2, Population, 262217, 267461
3, Population, 206239, 210363
4, Population, 141100, 143922
5, Population, 807302, 823448
6, Population, 655071, 668172
7, Population, 486787, 496522
8, Population, 258709, 263883
9, Population, 222847, 227303
10, Population, 213348, 217614
11, Population, 190674, 194487
```

Project Design:

DB
The class has 3 important methods: update(), redo() and undo().

update():
This method load the csv file first, update the data in the csv file *city.csv*, then save the   new data into a new csv file, generate a log file *city.log* and generate a backup csv file *cityA.csv*.

redo():
This method use the log file to redo the change to the backup file. help update the data in backup file to newest.

undo():
This method use the log file to undo the change.

Validation:

Due to the size of the database, We only display the first 10 items. Please load the generated csv files if you want to see more record.

To test update, we used this method in main method. We call update() to increase the population column by 2 percent.

After calling the method update():

```
The data in the data file:
-----------------------------------------------------
ID, Name, CountryCode, District, Population,
1,'Kabul','AFG','Kabol',1815600,
2,'Qandahar','AFG','Qandahar',242250,
3,'Herat','AFG','Herat',190536,
4,'Mazar-e-Sharif','AFG','Balkh',130356,
5,'Amsterdam','NLD','Noord-Holland',745824,
6,'Rotterdam','NLD','Zuid-Holland',605187,
7,'Haag','NLD','Zuid-Holland',449718,
8,'Utrecht','NLD','Utrecht',239009,
9,'Eindhoven','NLD','Noord-Brabant',205879,
10,'Tilburg','NLD','Noord-Brabant',197102,
```

```
The data in the backup file:
-----------------------------------------------------
ID, Name, CountryCode, District, Population,
1,'Kabul','AFG','Kabol',1780000,
2,'Qandahar','AFG','Qandahar',237500,
3,'Herat','AFG','Herat',186800,
4,'Mazar-e-Sharif','AFG','Balkh',127800,
5,'Amsterdam','NLD','Noord-Holland',731200,
6,'Rotterdam','NLD','Zuid-Holland',593321,
7,'Haag','NLD','Zuid-Holland',440900,
8,'Utrecht','NLD','Utrecht',234323,
9,'Eindhoven','NLD','Noord-Brabant',201843,
10,'Tilburg','NLD','Noord-Brabant',193238,
```

```
The data in the log file:
-----------------------------------------------------
1, Population,1780000,1815600
2, Population,237500,242250
3, Population,186800,190536
4, Population,127800,130356
5, Population,731200,745824
6, Population,593321,605187
7, Population,440900,449718
8, Population,234323,239009
9, Population,201843,205879
10, Population,193238,197102
11, Population,172701,176155
```

We call method redo() to update the change to the backup file based on undo/redo logging as following:

After calling the method redo():

```
The data in the data file:
-------------------------------------------------
ID, Name, CountryCode, District, Population,
1,'Kabul','AFG','Kabol',1815600,
2,'Qandahar','AFG','Qandahar',242250,
3,'Herat','AFG','Herat',190536,
4,'Mazar-e-Sharif','AFG','Balkh',130356,
5,'Amsterdam','NLD','Noord-Holland',745824,
6,'Rotterdam','NLD','Zuid-Holland',605187,
7,'Haag','NLD','Zuid-Holland',449718,
8,'Utrecht','NLD','Utrecht',239009,
9,'Eindhoven','NLD','Noord-Brabant',205879,
10,'Tilburg','NLD','Noord-Brabant',197102,
```

```
The data in the backup file:
-------------------------------------------------
ID, Name, CountryCode, District, Population,
1,'Kabul','AFG','Kabol',1815600
2,'Qandahar','AFG','Qandahar',242250
3,'Herat','AFG','Herat',190536
4,'Mazar-e-Sharif','AFG','Balkh',130356
5,'Amsterdam','NLD','Noord-Holland',745824
6,'Rotterdam','NLD','Zuid-Holland',605187
7,'Haag','NLD','Zuid-Holland',449718
8,'Utrecht','NLD','Utrecht',239009
9,'Eindhoven','NLD','Noord-Brabant',205879
10,'Tilburg','NLD','Noord-Brabant',197102
```

```
The data in the log file:
-------------------------------------------------
1, Population,1780000,1815600
2, Population,237500,242250
3, Population,186800,190536
4, Population,127800,130356
5, Population,731200,745824
6, Population,593321,605187
7, Population,440900,449718
8, Population,234323,239009
9, Population,201843,205879
10, Population,193238,197102
11, Population,172701,176155
```

We call the method undo() to recover data, and the data return to the original based on the undo/redo logging as following:

After calling the method undo():

```
The data in the data file:
--------------------------------------------------------
ID, Name, CountryCode, District, Population,
1,'Kabul','AFG','Kabol',1815600,
2,'Qandahar','AFG','Qandahar',242250,
3,'Herat','AFG','Herat',190536,
4,'Mazar-e-Sharif','AFG','Balkh',130356,
5,'Amsterdam','NLD','Noord-Holland',745824,
6,'Rotterdam','NLD','Zuid-Holland',605187,
7,'Haag','NLD','Zuid-Holland',449718,
8,'Utrecht','NLD','Utrecht',239009,
9,'Eindhoven','NLD','Noord-Brabant',205879,
10,'Tilburg','NLD','Noord-Brabant',197102,
```

```
The data in the backup file:
--------------------------------------------------------
ID, Name, CountryCode, District, Population,
1,'Kabul','AFG','Kabol',1780000
2,'Qandahar','AFG','Qandahar',237500
3,'Herat','AFG','Herat',186800
4,'Mazar-e-Sharif','AFG','Balkh',127800
5,'Amsterdam','NLD','Noord-Holland',731200
6,'Rotterdam','NLD','Zuid-Holland',593321
7,'Haag','NLD','Zuid-Holland',440900
8,'Utrecht','NLD','Utrecht',234323
9,'Eindhoven','NLD','Noord-Brabant',201843
10,'Tilburg','NLD','Noord-Brabant',193238
```

```
The data in the log file:
--------------------------------------------------------
1, Population,1780000,1815600
2, Population,237500,242250
3, Population,186800,190536
4, Population,127800,130356
5, Population,731200,745824
6, Population,593321,605187
7, Population,440900,449718
8, Population,234323,239009
9, Population,201843,205879
10, Population,193238,197102
11, Population,172701,176155
```