



جامعة القاهرة



بسم الله الرحمن الرحيم

DWH Final Project report

(Library Management System DWH)

TA: Samaa Mohamed Mahmoud

Group: all

Done by:

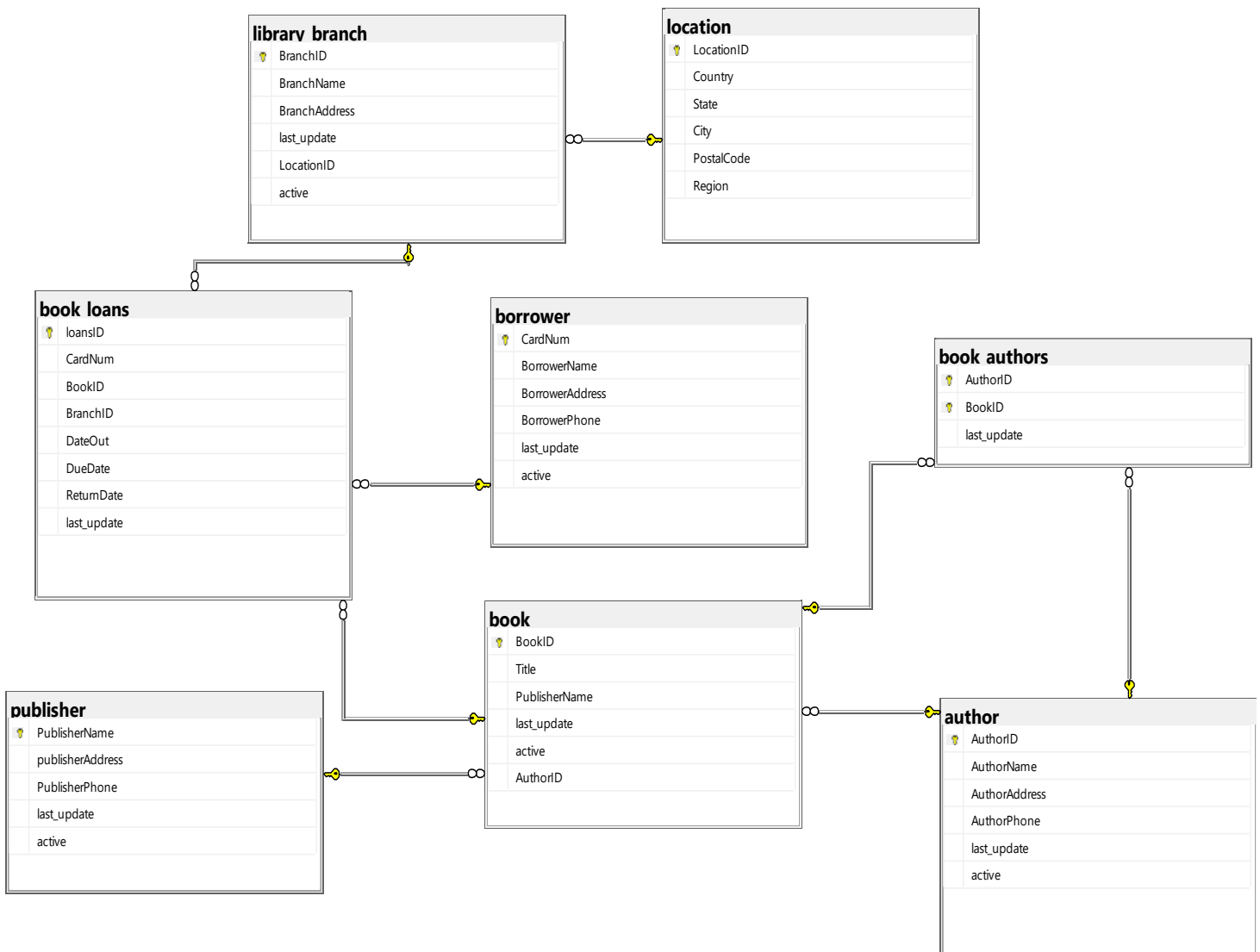
| | |
|-----------------------------|----------|
| Ahmed Mohamed Abass | 20220035 |
| Mohamed Hussien Aly | 20220286 |
| Ahmed Yasser Ahmed | 20220046 |
| Nourhan Mohamed Ahmed | 20220368 |
| Sarah Ibrahim abd el sattar | 20220150 |



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2. Physical model of the source system:





3. Dimensional model

a. Define the business processes that you will model.

1. Number of books borrowed analysis
 - Calculate the total number of books borrowed by a borrower from a specific branch.
2. Number of borrowers analysis
 - Calculate the total number of borrowers in each branch.
3. Number of loans in branch and location analysis
 - Calculate the total number of loans in each branch and location.
4. Number of loans per book and author analysis
 - Calculate the total number of loans per book and author.

Entities: Books, Borrower, Library Branches, Location, Author, Publisher, Book Loans.

Measures: Number of books borrowed, Number of borrowers, Total loans per branch and location, Total loans per book and author.

Dimensions: Time, Book, Borrower, Branch, Location, Author, Publisher, Book Loan.

b. Declare the grain of each fact table

- **F_NumBooksBorrower:** Total number of books borrowed by a borrower from a specific branch on a particular date.
- **F_NumBorrowers:** Total number of borrowers in a specific branch on a particular date.
- **F_loanDuration:** Total Number of loans per Branch and location on a particular date.
- **F_loans_book_author:** Total Number of loans per Book and Author on a particular date.



c. Define the type of each fact table.

- **F_NumBooksBorrower:** Transactional Fact
- **F_NumBorrowers:** Transactional Fact
- **F_loanDuration:** Transactional Fact
- **F_loans_book_author:** Transactional Fact

d. Define the dimensions and the type of each one.

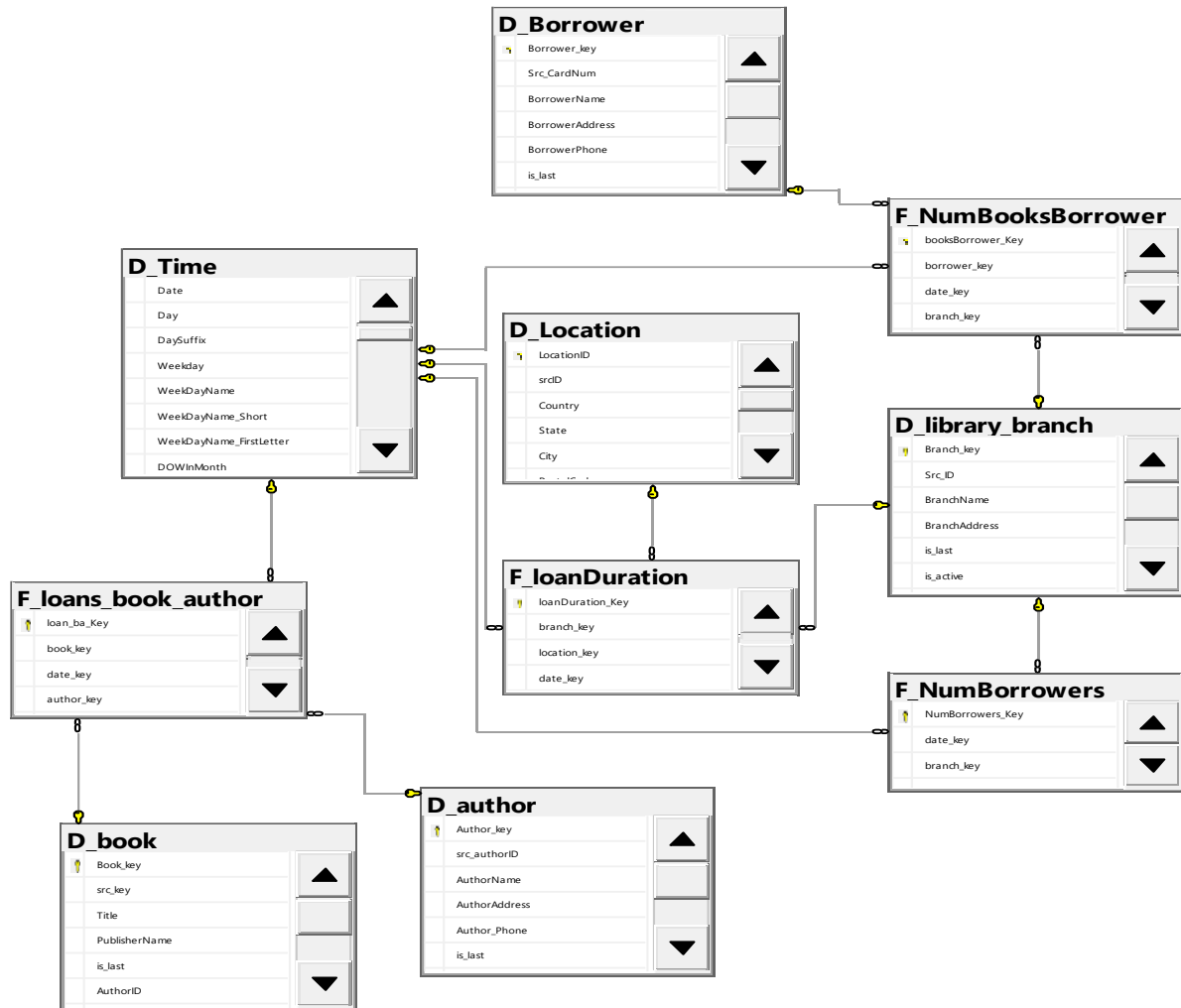
- Borrower → SCD Type 2 Dimension
- Publisher → SCD Type 2 Dimension
- Author → SCD Type 2 Dimension
- Book → SCD Type 2 Dimension
- Library_Branch → SCD Type 2 and Conformed Dimension
- Location → Static (Fixed) Dimension
- Time → Conformed Dimension

e. Define the measures that will appear in the fact tables and the type of each one.

- **NumBorrowers** : Non-additive Measure
- **NumBooksBorrowed** : Semi-Additive Measure
- **Total_Loans(2)**: Fully Additive Measure



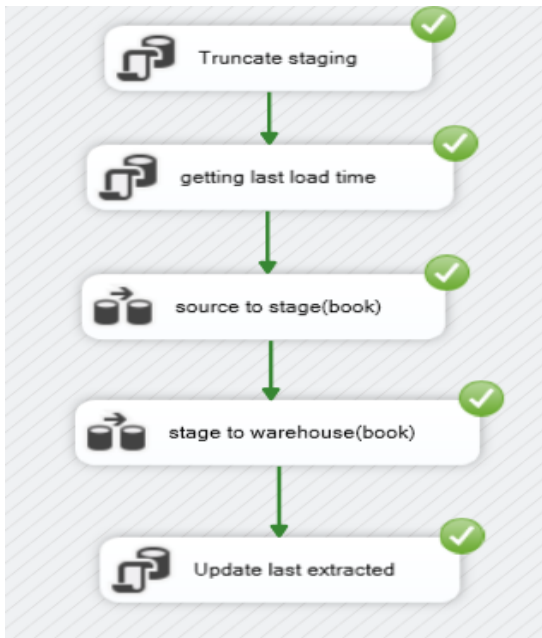
f. Physical model of your Star Schema Model



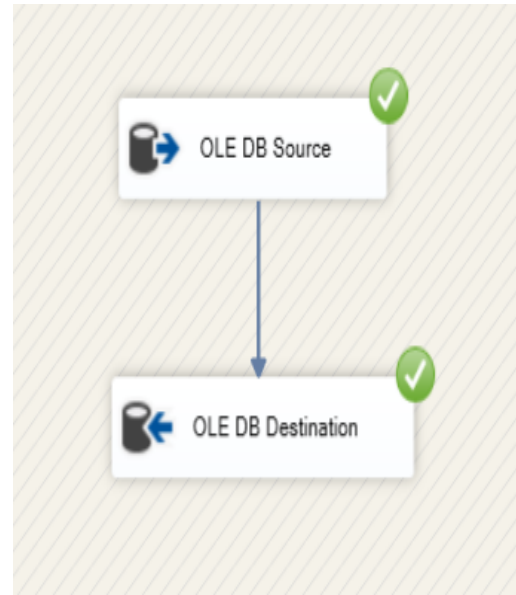
4. Screenshots of the data flow and control flow used for building the DWH.

1-Book dimension:-

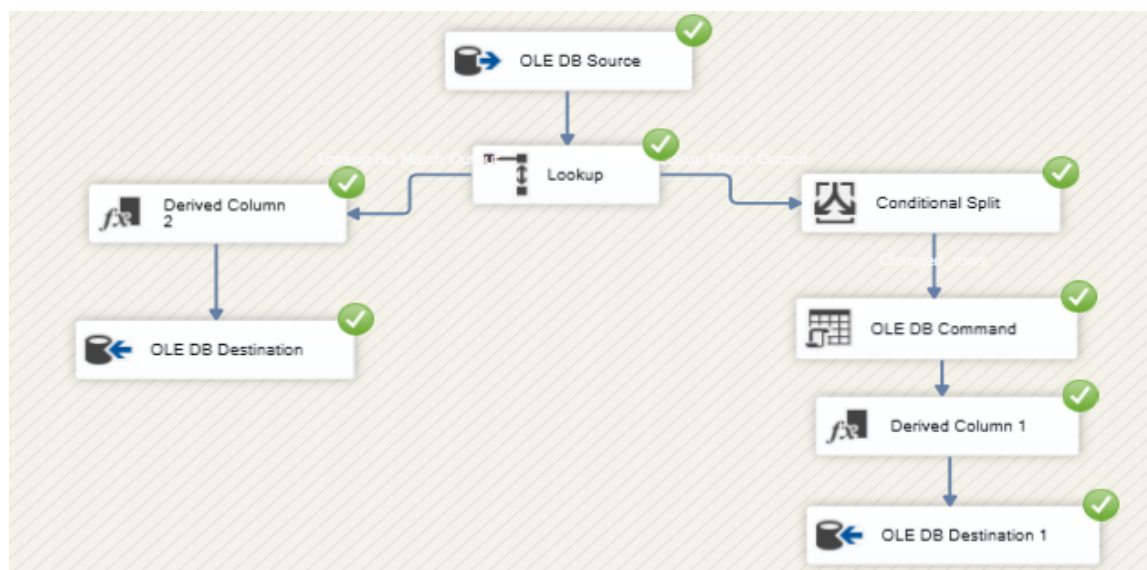
Control flow



dataflow from source to stage_area

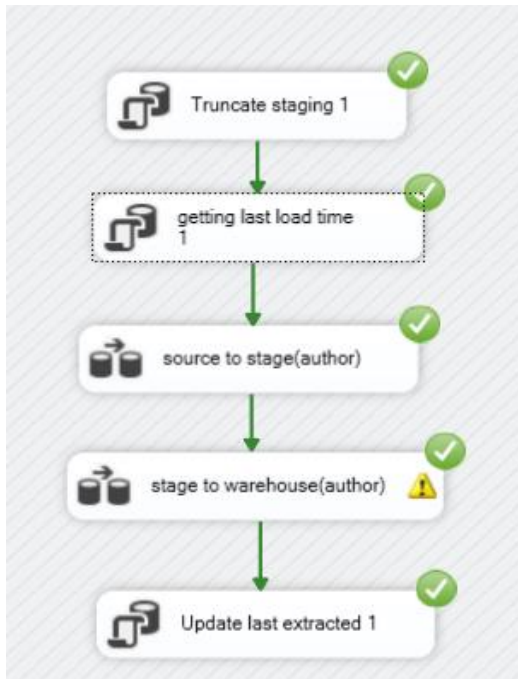


Data flow from stage_area to warehouse(destination) d_book

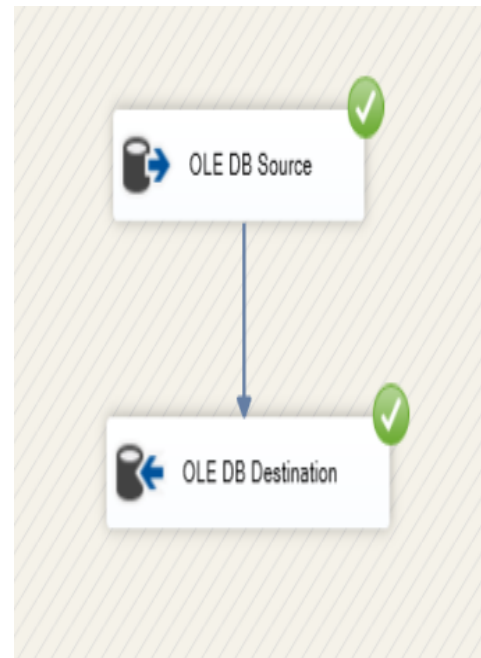


2-Author dimension:-

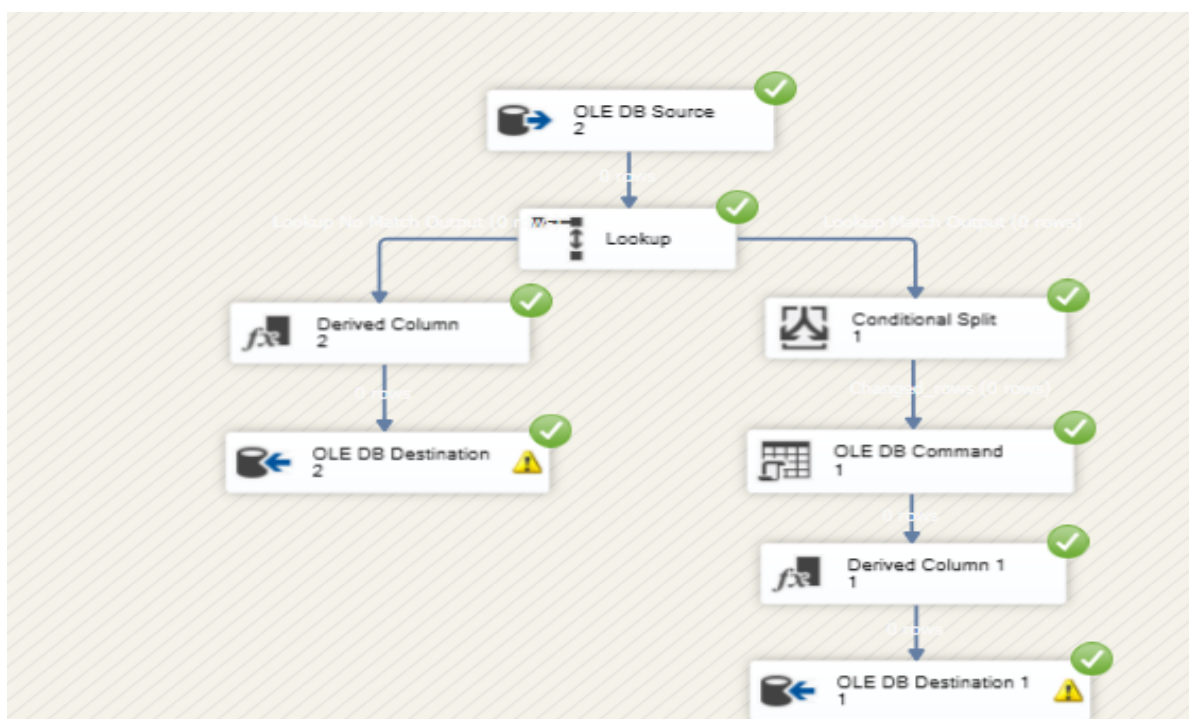
Control flow



dataflow from source to stage_area

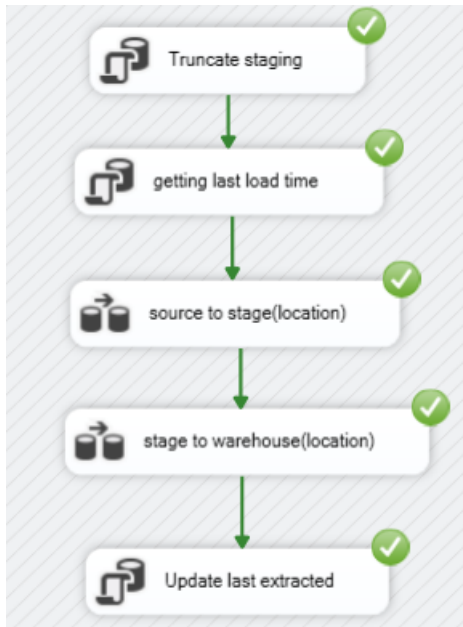


Data flow from stage_area to warehouse(destination) d_author

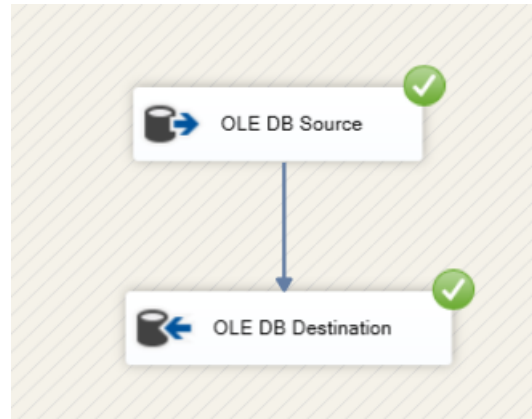


3-Location dimension:-

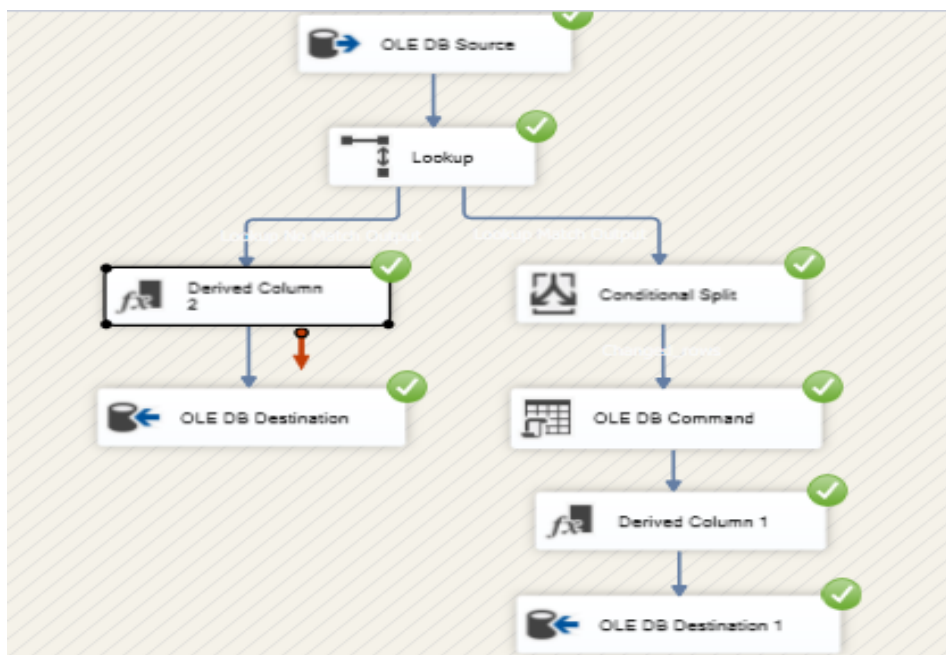
Control flow



data flow from source to stage



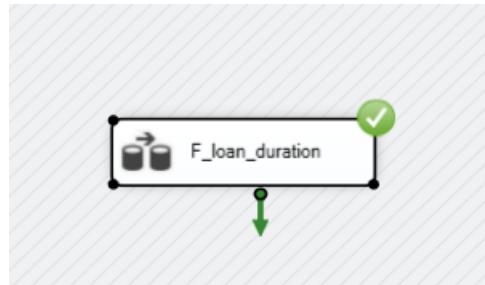
data flow from stage_area to warehouse for d_author



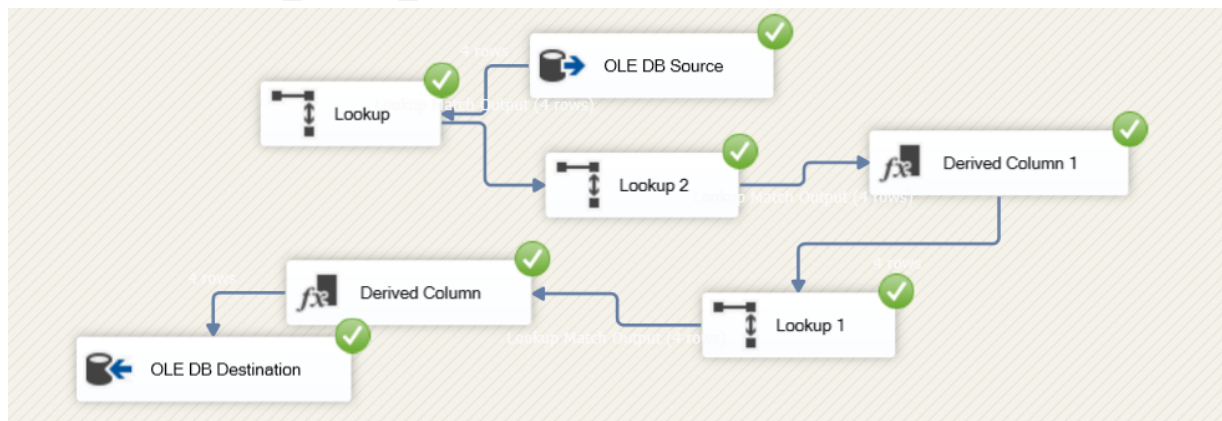


4-F_loans_book_author:-

Control flow

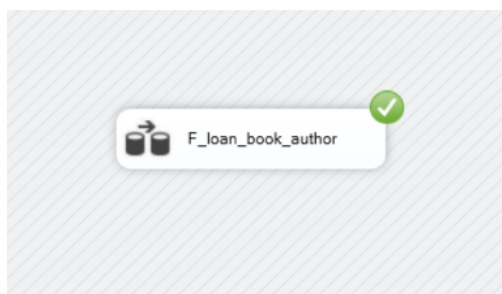


data flow from dimensions(D_time – D_location – D_library_branch)
to fact table (F_loans_book_author)

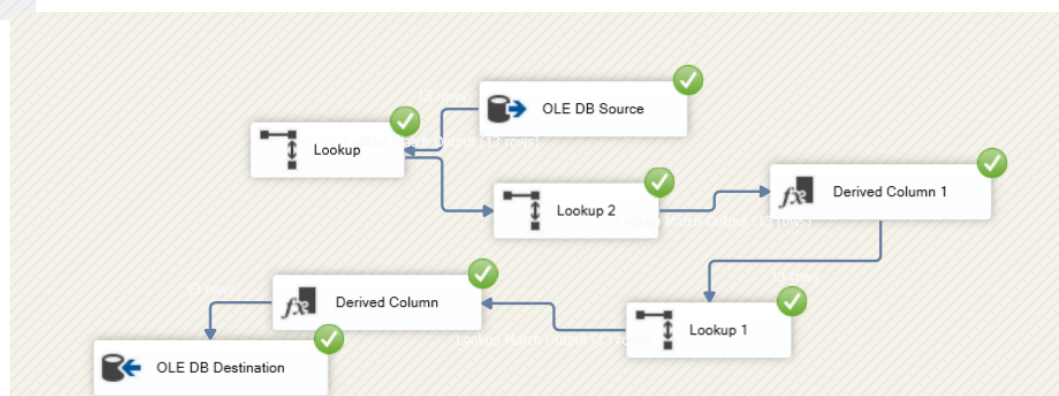


5- F_loans_book_author fact table:-

Control flow

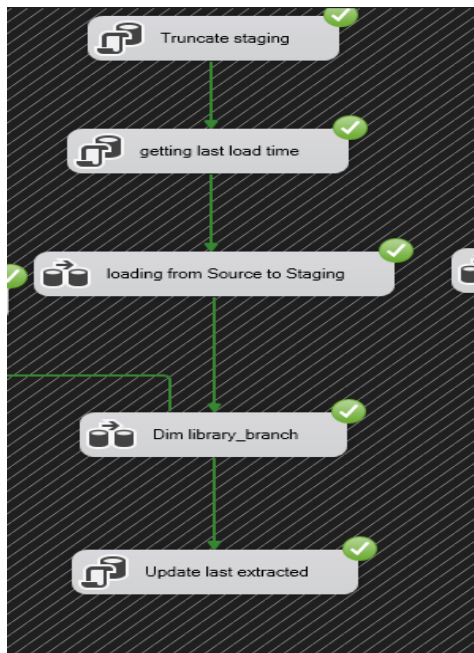


dataflow from dimensions (D_time – D_author
– D_book) to fact table(F_loan_book_author)

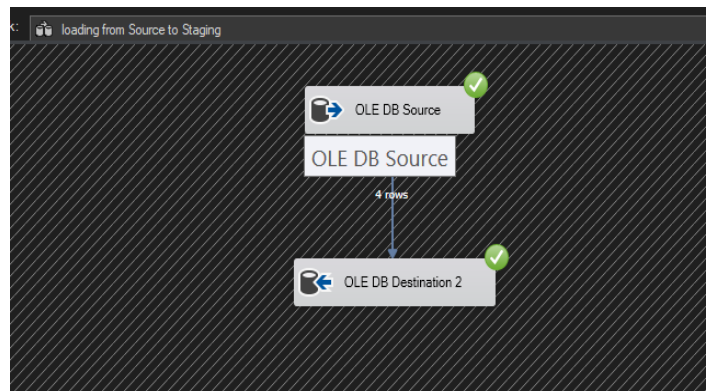


6- library_branch dimension:-

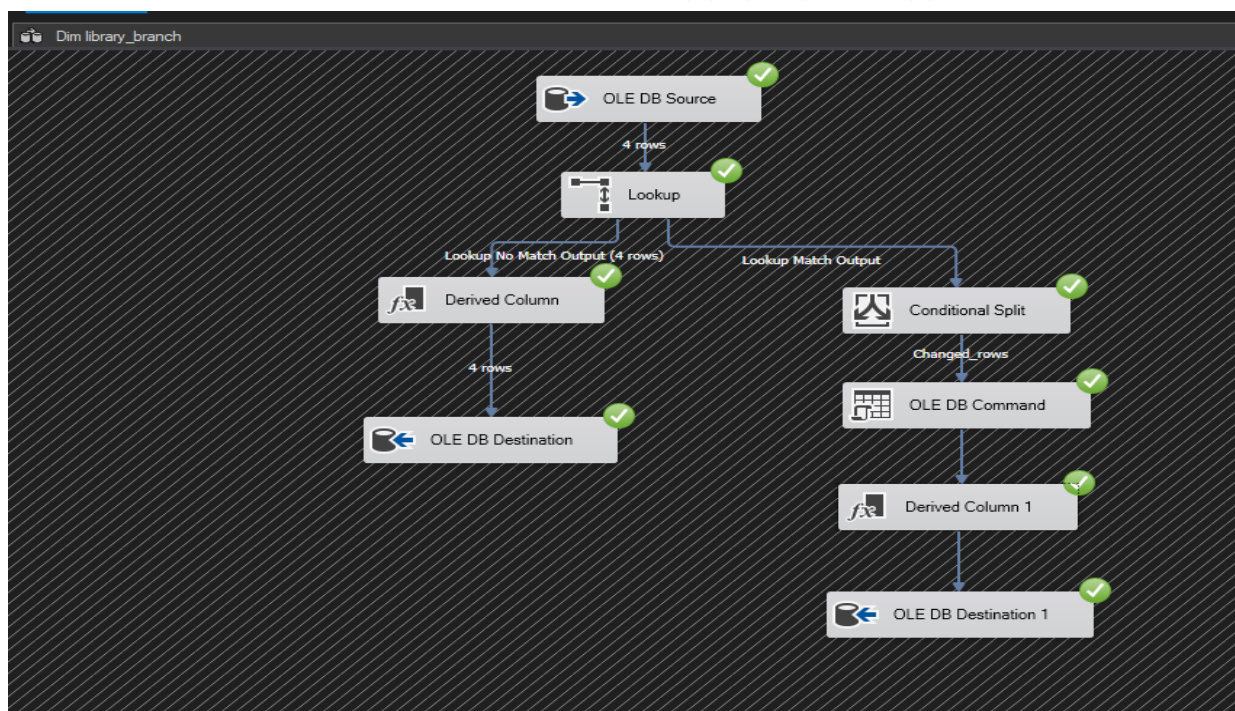
Control flow



Data Flow (Source to Stage)

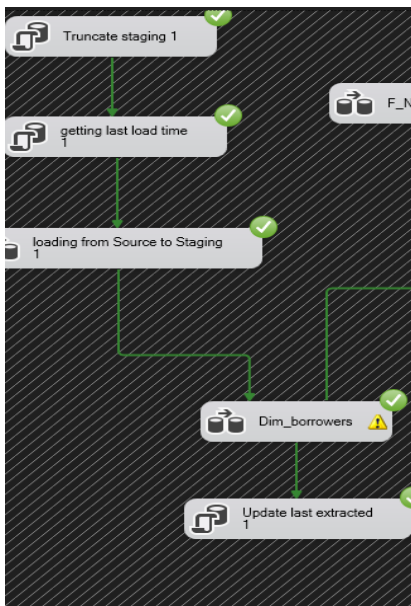


Data flow Dim library_branch(from staging to dimension library branch in datawarehouse applying scd type2):-

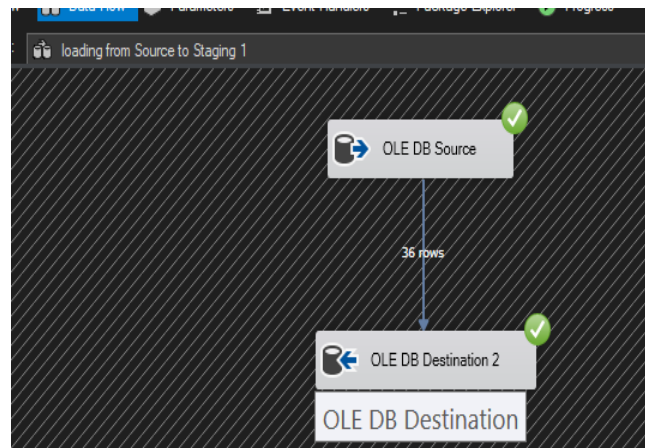


7-Borrower dimension:-

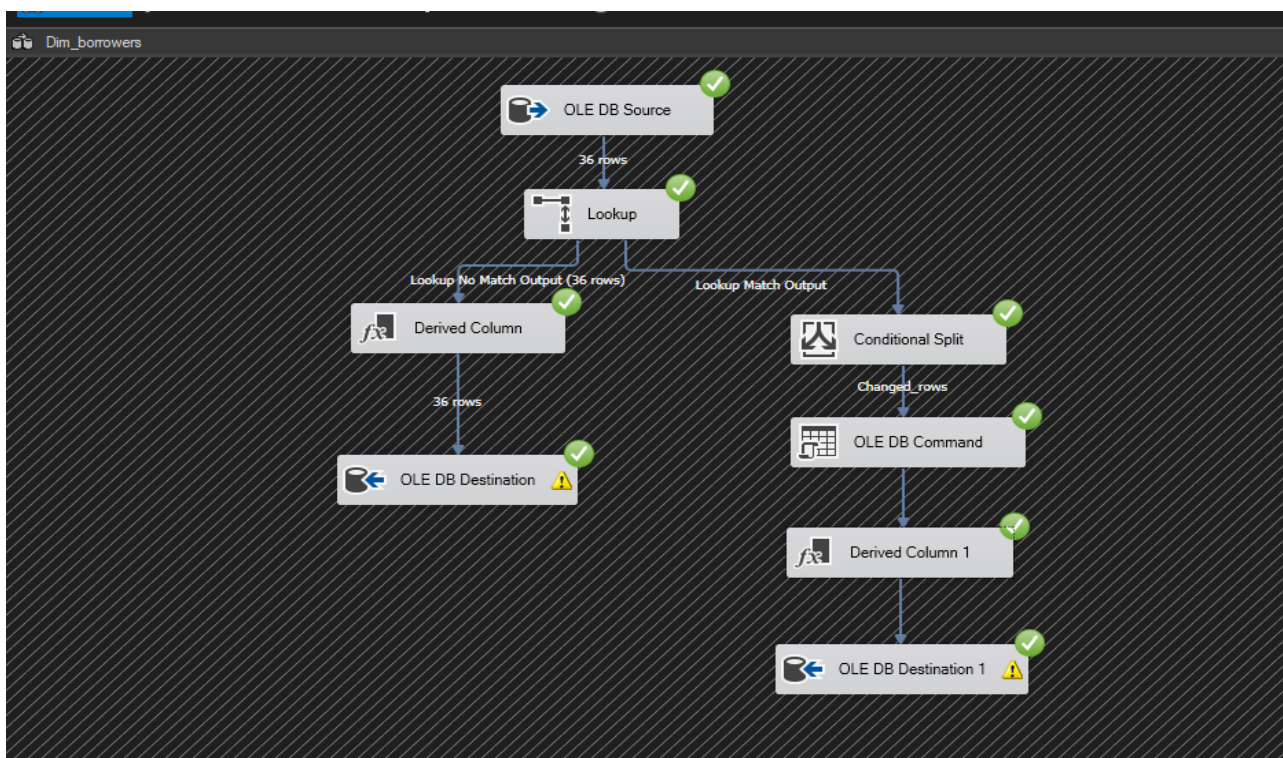
Control flow



Data flow(From source to stage)

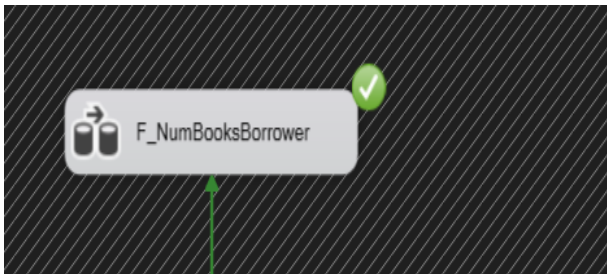


Data flow Dim Borrower(from staging to dimension borrower in datawarehouse applying scd type2):-

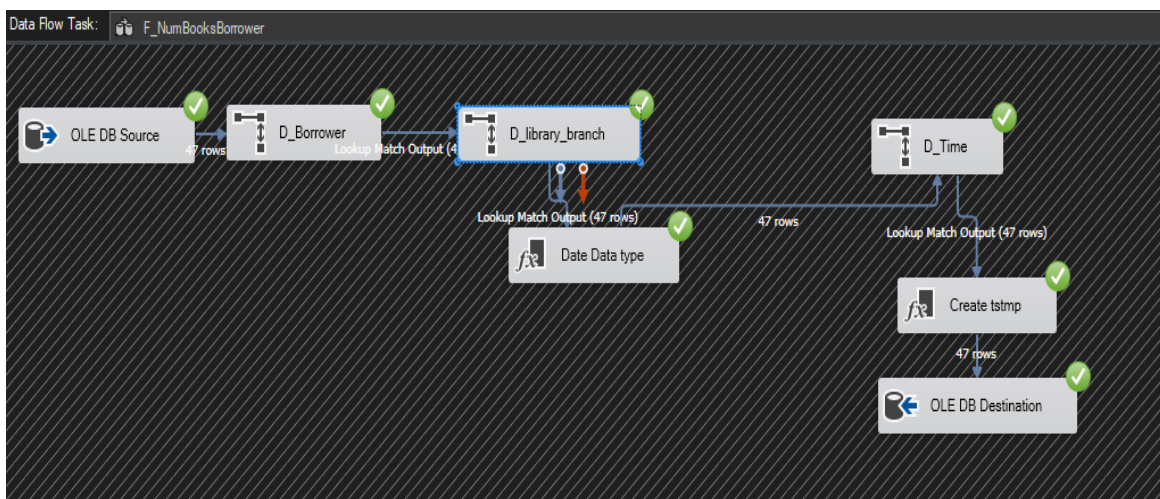


8-F_NumBooksBorrower

Control Flow



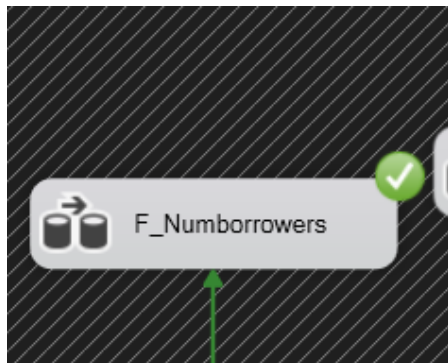
Data flow from dimensions (D_library_branch – D_borrower and D_time) to fact table (F_NumBooksBorrower):-



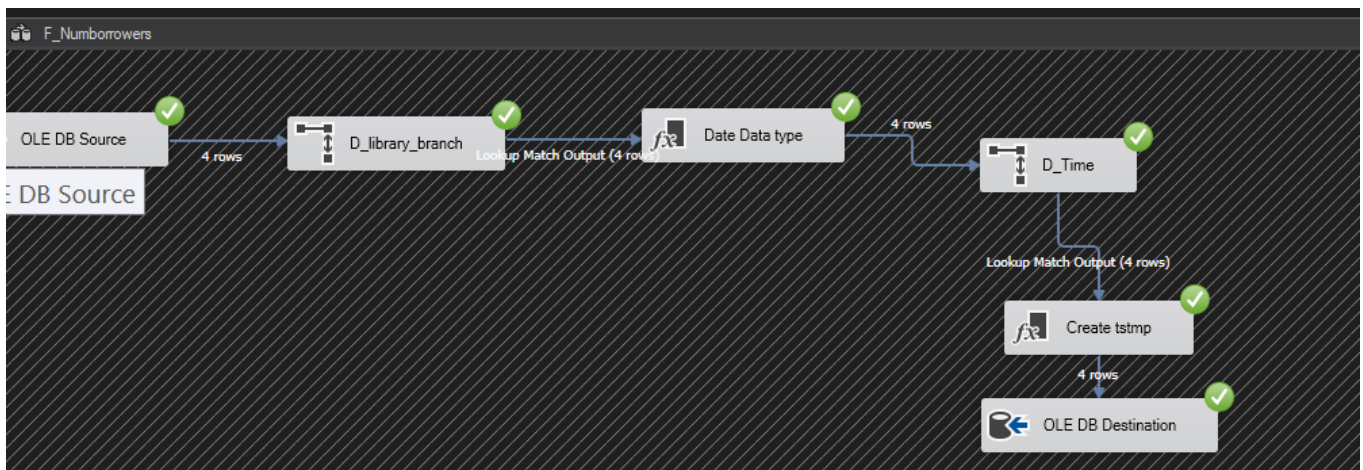


9-F_NumBorrowers

Control flow



Data flow from dimensions (D_library_branch - D_time) to fact table (F_NumBorrowers):-





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5. Queries on each fact table and a screenshot of the result set of each query.

1A-F_loans_book_author fact table (first query)

Explanation: this query get all the author's name that there books have been loaned with the summation of the total loans and display it in decreasing order.

```
SELECT
a.AuthorName,
SUM(f.total_loans) AS TotalLoans
FROM
    F_loans_book_author f
JOIN
    D_author a ON f.author_key = a.Author_key
GROUP BY
    a.AuthorName
ORDER BY
    TotalLoans DESC;
```

124 %

Results Messages

| | AuthorName | TotalLoans |
|----|--------------------------|------------|
| 1 | Patrick Rothfuss | 10 |
| 2 | Frank Herbert | 9 |
| 3 | J.R.R. Tolkien | 9 |
| 4 | last222222 | 8 |
| 5 | Stephen King | 7 |
| 6 | nour | 7 |
| 7 | Chuck Palahniuk | 7 |
| 8 | Douglas Adams | 7 |
| 9 | last again22222222222222 | 6 |
| 10 | Mark Lee | 6 |
| 11 | Aldous Huxley | 5 |
| 12 | last | 5 |
| 13 | George R.R. Martin | 5 |



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1B-F_loans_book_author fact table (second query)

Explanation: this query get all the book's name that have been loaned at a specific month and specific year and return the summation of it.

```

SELECT
  t.Year,
  t.Month,
  b.Title AS BookTitle,
  SUM(f.total_loans) AS TotalLoans
FROM
  F_loans_book_author f
JOIN
  D_book b ON f.book_key = b.Book_key
JOIN
  D_Time t ON f.date_key = t.DateKey
GROUP BY
  t.Year, t.Month, b.Title
ORDER BY
  t.Year, t.Month, TotalLoans DESC;

```

124 %

Results Messages

| | Year | Month | BookTitle | TotalLoans |
|----|------|-------|-------------------------------------|------------|
| 1 | 2018 | 4 | The Hitchhikers Guide to the Galaxy | 8 |
| 2 | 2018 | 4 | Brave New World | 7 |
| 3 | 2018 | 4 | Nourhan | 7 |
| 4 | 2018 | 4 | Nourhannnnnnnnnnnnnnnn | 6 |
| 5 | 2018 | 4 | Holes | 6 |
| 6 | 2018 | 4 | The Giving Tree | 5 |
| 7 | 2018 | 4 | New again | 5 |
| 8 | 2018 | 4 | Nourhannnnnnnnnnnnnnnn111111111111 | 5 |
| 9 | 2018 | 5 | The Name of the Wind | 10 |
| 10 | 2018 | 5 | The Green Mile | 9 |
| 11 | 2018 | 5 | Dune | 9 |
| 12 | 2018 | 5 | It | 7 |
| 13 | 2018 | 5 | The Hobbit | 7 |



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2A-F_loanDuration fact table (first query)

Explanation: this query get all the library_branch's name and the summation of the total loans in it then sort data desc.

```
-- queryyyyyyyyyyyyyyyyy on fact tables

SELECT
    b.BranchName,
    SUM(f.total_loans) AS TotalLoans
FROM
    F_loanDuration f
JOIN
    D_library_branch b ON f.branch_key = b.Branch_Key
GROUP BY
    b.BranchName
ORDER BY
    TotalLoans DESC;
```

124 %

Results Messages

| | BranchName | TotalLoans |
|---|------------|------------|
| 1 | Ann Arbor | 46 |
| 2 | Saline | 32 |
| 3 | Central | 30 |
| 4 | Sharpstown | 22 |



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2B-F_loanDuration fact table (second query)

Explanation: this query get the summation of the total loans that was in specific month in specific year.

```
SELECT
  t.Year,
  t.Month,
  SUM(f.total_loans) AS TotalLoans
FROM
  F_loanDuration f
JOIN
  D_Time t ON f.date_key = t.DateKey
GROUP BY
  t.Year, t.Month
ORDER BY
  t.Year, t.Month;
```

124 %

Results Messages

| | Year | Month | TotalLoans |
|---|------|-------|------------|
| 1 | 2018 | 4 | 84 |
| 2 | 2018 | 5 | 46 |



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3A- F_NumBooksBorrower fact table (first query)

Explanation: this query gets top borrowers by total books borrowed

```
SELECT
    d_borrower.BorrowerName,
    SUM(f.NumBooksBorrowed) AS TotalBooksBorrowed
FROM F_NumBooksBorrower AS f
JOIN D_Borrower AS d_borrower ON f.borrower_key = d_borrower.Borrower_key
GROUP BY d_borrower.BorrowerName
ORDER BY TotalBooksBorrowed DESC;
```

| BorrowerName | TotalBooksBorrowed |
|--------------------|--------------------|
| Pierre Rosenfrucht | 14 |
| Anyia Munschay | 11 |
| Pam Carson | 8 |
| Gregoire Clapp | 7 |
| Fleurette Kleeborn | 6 |
| Boony Trevakis | 6 |
| Matheus Howard | 6 |
| Licha Inglese | 6 |
| Eugenia Worral | 5 |
| Damara Irvine | 5 |
| Jacintha Blackly | 3 |
| Brady Curtiss | 3 |
| Claudell Dipple | 3 |
| Baird Diggin | 3 |
| Bernette Rubino... | 3 |
| Malena Fawbert | 3 |
| Kath Griffen | 3 |
| Richmond Falcus | 3 |
| Rowen McGuane | 3 |
| Storm Edgeller | 3 |
| Sybyl Deem | 3 |
| Tressa Champe | 3 |
| Ulysses Landman | 2 |
| Neneu Waterfield | 2 |

3B-F_NumBooksBorrower fact table (second query)

Explanation: this query gets total number of books borrowed by branch and date

```
SELECT
    d_branch.BranchName,
    d_time.Month,
    SUM(f.NumBooksBorrowed) AS TotalBooksBorrowed
FROM F_NumBooksBorrower AS f
JOIN D_library_branch AS d_branch ON f.branch_key = d_branch.Branch_Key
JOIN D_Time AS d_time ON f.date_key = d_time.DateKey
GROUP BY
    d_branch.BranchName,
    d_time.Month
ORDER BY d_time.month;
```

| BranchName | Month | TotalBooksBorrowed |
|------------|-------|--------------------|
| Ann Arbor | 1 | 20 |
| Central | 1 | 5 |
| Saline | 1 | 10 |
| Sharpstown | 1 | 10 |
| Central | 2 | 6 |
| Ann Arbor | 3 | 1 |
| Central | 3 | 10 |
| Saline | 3 | 20 |
| Sharpstown | 3 | 9 |
| Ann Arbor | 4 | 21 |
| Central | 4 | 9 |
| Saline | 4 | 3 |
| Sharpstown | 4 | 6 |
| Ann Arbor | 5 | 5 |



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3c- F_NumBooksBorrower fact table (third query)

Explanation: this query gets total number of borrowed books per specific branch and date

```
-- Total Books Borrowed in a Specific Branch and Month (F_NumBooksBorrowed)
SELECT
    d_branch.BranchName,
    d_time.MonthName,
    SUM(f.NumBooksBorrowed) AS TotalBooks
FROM F_NumBooksBorrower AS f
JOIN D_library_branch AS d_branch ON f.branch_key = d_branch.Branch_Key
JOIN D_Time AS d_time ON f.date_key = d_time.DateKey
WHERE d_branch.BranchName = 'Ann Arbor' AND d_time.MonthName = 'May'
GROUP BY d_branch.BranchName, d_time.MonthName;
```

Messages

| BranchName | MonthName | TotalBooks |
|------------|-----------|------------|
| Ann Arbor | May | 5 |

4- F_NumBorrowers fact table

Explanation: this query gets total number of borrowers per branch per year

```
--Total Number of Borrowers Per Branch
SELECT
    d_branch.BranchName,
    d_time.Year,
    SUM(f.NumBorrowers) AS TotalBorrowers
FROM F_NumBorrowers AS f
JOIN D_library_branch AS d_branch ON f.branch_key = d_branch.Branch_Key
JOIN D_Time AS d_time ON f.date_key = d_time.DateKey
GROUP BY d_branch.BranchName, d_time.Year
ORDER BY d_time.Year;
```

Results

| | BranchName | Year | TotalBorrowers |
|---|------------|------|----------------|
| 1 | Ann Arbor | 2018 | 15 |
| 2 | Central | 2018 | 11 |
| 3 | Saline | 2018 | 13 |
| 4 | Sharpstown | 2018 | 8 |



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Report overview of deployment

| Overview - ...PM - sarah | | | | | SQLQuery1...brah (68)) | Dim Borrow...brah (72)) | warehouse....ibrah (71)) |
|-------------------------------|----------------|-----------------------|----------------------------------|--|------------------------|-------------------------|--------------------------|
| Filter: Result: All: (3 more) | | | | | | | |
| Result | Duration (sec) | Package Name | Task Name | Execution Path | | | |
| Succeeded | 17.125 | D_library_branch.dtsx | D_library_branch | \D_library_branch | | | |
| Succeeded | 16.484 | D_library_branch.dtsx | Dim library_branch | \D_library_branch\Dim library_branch | | | |
| Succeeded | 16.484 | D_library_branch.dtsx | Dim borrowers | \D_library_branch\Dim borrowers | | | |
| Succeeded | 0.313 | D_library_branch.dtsx | F_NumBooksBorrower | \D_library_branch\F_NumBooksBorrower | | | |
| Succeeded | 0.282 | D_library_branch.dtsx | F_NumBorrowers | \D_library_branch\F_NumBorrowers | | | |
| Succeeded | 0.016 | D_library_branch.dtsx | getting last load time | \D_library_branch\getting last load time | | | |
| Succeeded | 0.016 | D_library_branch.dtsx | getting last load time 1 | \D_library_branch\getting last load time 1 | | | |
| Succeeded | 0.125 | D_library_branch.dtsx | loading from Source to Staging | \D_library_branch\loading from Source to Staging | | | |
| Succeeded | 0.125 | D_library_branch.dtsx | loading from Source to Staging 1 | \D_library_branch\loading from Source to Staging 1 | | | |
| Succeeded | 0.062 | D_library_branch.dtsx | Truncate staging | \D_library_branch\Truncate staging | | | |
| Succeeded | 0.062 | D_library_branch.dtsx | Truncate staging 1 | \D_library_branch\Truncate staging 1 | | | |
| Succeeded | 0 | D_library_branch.dtsx | Update last extracted | \D_library_branch\Update last extracted | | | |
| Succeeded | 0 | D_library_branch.dtsx | Update last extracted 1 | \D_library_branch\Update last extracted 1 | | | |

| | | |
|-----------------|-------|---------|
| CALLER_INFO | | String |
| DUMP_EVENT_CODE | 0 | String |
| DUMP_ON_ERROR | False | Boolean |
| DUMP_ON_EVENT | False | Boolean |
| LOGGING_LEVEL | 1 | Int32 |
| SYNCHRONIZED | False | Boolean |

Property Overrides

| Property Path | Property Value |
|---------------|----------------|
|---------------|----------------|

1 / 1

Overview - 5/11/2025 12:15 AM - DESKTOP-P2Q7NSM - Microsoft SQL Server Management Studio

Quick Launch (Ctrl+Q)

File Edit View Tools Window Help

Overview - 5/11/2025 12:15 AM - DESKTOP-P2Q7NSM

View Messages

View Performance

Execution Information

| | |
|--------------|--|
| Operation ID | 16 |
| Package | location:deployment(location)\Package.dtsx |
| Environment | - |
| Status | Succeeded |
| Machine | DESKTOP-P2Q7NSM |

| | |
|----------------|---------------------------------|
| Duration (sec) | 9.908 |
| Start Time | 5/11/2025 12:14:50 AM |
| End Time | 5/11/2025 12:15:00 AM |
| Caller | DESKTOP-P2Q7NSM\Mohamed_hussien |

Execution Overview

Filter Result: All (3 more)

| Result | Duration (sec) | Package Name | Task Name | Execution Path |
|-----------|----------------|--------------|------------------------------|---------------------------------------|
| Succeeded | 0.282 | Package.dtsx | Package | \Package |
| Succeeded | 0.172 | Package.dtsx | F_loan_duration | \Package\F_loan_duration |
| Succeeded | 0 | Package.dtsx | getting last load time | \Package\getting last load time |
| Succeeded | 0.062 | Package.dtsx | source to stage(location) | \Package\source to stage(location) |
| Succeeded | 0.141 | Package.dtsx | stage to warehouse(location) | \Package\stage to warehouse(location) |
| Succeeded | 0.031 | Package.dtsx | Truncate staging | \Package\Truncate staging |
| Succeeded | 0.016 | Package.dtsx | Update last extracted | \Package\Update last extracted |

Parameters Used

| Name | Value | Data Type |
|-----------------|-------|-----------|
| CALLER_INFO | | String |
| DUMP_EVENT_CODE | 0 | String |
| DUMP_ON_ERROR | False | Boolean |
| DUMP_ON_EVENT | False | Boolean |
| LOGGING_LEVEL | 1 | Int32 |
| SYNCHRONIZED | False | Boolean |

Property Overrides

| Property Path | Property Value |
|---------------|----------------|
|---------------|----------------|

1 / 1

Ready

Ready



Search



ENG

12:15 AM

5/11/2025



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Overview - 5/11/2025 12:10 AM - DESKTOP-P2Q7N5M - Microsoft SQL Server Management Studio

File Edit View Tools Window Help

New Query Execute

active

Overview - 5/11/2025 12:10 AM - DESKTOP-P2Q7N5M

[View Messages](#)

[View Performance](#)

Execution Information

| | |
|--------------|--|
| Operation ID | 14 |
| Package | loan-book(Integration Services Project1)Package.dtsx |
| Environment | - |
| Status | Succeeded |
| Machine | DESKTOP-P2Q7N5M |

| | |
|----------------|---------------------------------|
| Duration (sec) | 9.911 |
| Start Time | 5/11/2025 12:09:51 AM |
| End Time | 5/11/2025 12:10:01 AM |
| Caller | DESKTOP-P2Q7N5M\Mohamed_hussien |

Execution Overview

Filter: Result All (3 more)

| Result | Duration (sec) | Package Name | Task Name | Execution Path |
|-----------|----------------|--------------|---------------------------|--|
| Succeeded | 0.297 | Package.dtsx | Package | \Package |
| Succeeded | 0.203 | Package.dtsx | F_loan_book_author | \Package\F_loan_book_author |
| Succeeded | 0.016 | Package.dtsx | getting last load time | \Package\getting last load time |
| Succeeded | 0.062 | Package.dtsx | source to stage(book) | \Package\source to stage (book) |
| Succeeded | 0.157 | Package.dtsx | stage to warehouse (book) | \Package\stage to warehouse (book) |
| Succeeded | 0.031 | Package.dtsx | Truncate staging | \Package\Truncate staging |
| Succeeded | 0 | Package.dtsx | Update last extracted | \Package\Update last extracted |

Parameters Used

| Name | Value | Data Type |
|-----------------|-------|-----------|
| CALLER_INFO | | String |
| DUMP_EVENT_CODE | 0 | String |
| DUMP_ON_ERROR | False | Boolean |
| DUMP_ON_EVENT | False | Boolean |
| LOGGING_LEVEL | 1 | Int32 |
| SYNCHRONIZED | False | Boolean |

Property Overrides

| Property Path | Property Value |
|---------------|----------------|
|---------------|----------------|

1/1

Ready

Search

ENG 12:10 AM 5/11/2025



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Overview - 5/10/2025 11:26 PM - DESKTOP-P2Q7NSM - Microsoft SQL Server Management Studio

File Edit View Project Tools Window Help

master Execute

Object Explorer

Connect

DESKTOP-P2Q7NSM (SQL Server 16.0.1135.2 - DESKTOP-P2Q7NSM)

Databases

Security

Server Objects

Replication

Always On High Availability

Management

Integration Services Catalogs

SSISDB

author-deployment

Projects

author

Packages

Package.dtsx

Environments

SQL Server Agent (Agent XPs disabled)

XEvent Profiler

Overview - 5/10/2025 11:26 PM - DESKTOP-P2Q7NSM

SQLQuery1.sql - DE...amed_hussien (62)

This report provides an overview of the package tasks and parameters, including execution or validation information.

[View Messages](#)

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Execution Information

| | |
|--------------|---------------------------------------|
| Operation ID | 2 |
| Package | author-deployment(author)Package.dtsx |
| Environment | . |
| Status | Succeeded |
| Machine | DESKTOP-P2Q7NSM |

Duration (sec) 6.512

Start Time 5/10/2025 11:26:27 PM

End Time 5/10/2025 11:26:34 PM

Caller DESKTOP-P2Q7NSM\Mohamed_hussien

Parameters Used

| Name | Value | Data Type |
|-----------------|-------|-----------|
| CALLER_INFO | | String |
| DUMP_EVENT_CODE | 0 | String |
| DUMP_ON_ERROR | False | Boolean |
| DUMP_ON_EVENT | False | Boolean |
| LOGGING_LEVEL | 1 | int32 |
| SYNCHRONIZED | False | Boolean |

Property Overrides

| Property Path | Property Value |
|---------------|----------------|
|---------------|----------------|

Execution Overview

Filter Result All (3 more)

| Result | Duration (sec) | Package Name | Task Name | Execution Path |
|-----------|----------------|--------------|-----------------------------|--|
| Succeeded | 0.438 | Package.dtsx | Package | /Package |
| Succeeded | 0.016 | Package.dtsx | getting last load time 1 | /Package/getting last load time 1 |
| Succeeded | 0.078 | Package.dtsx | source to stage(author) | /Package/source to stage (author) |
| Succeeded | 0.125 | Package.dtsx | stage to warehouse (author) | /Package/stage to warehouse (author) |
| Succeeded | 0.156 | Package.dtsx | Truncate staging 1 | /Package/Truncate staging 1 |
| Succeeded | 0 | Package.dtsx | Update last extracted 1 | /Package/Update last extracted 1 |

1/1

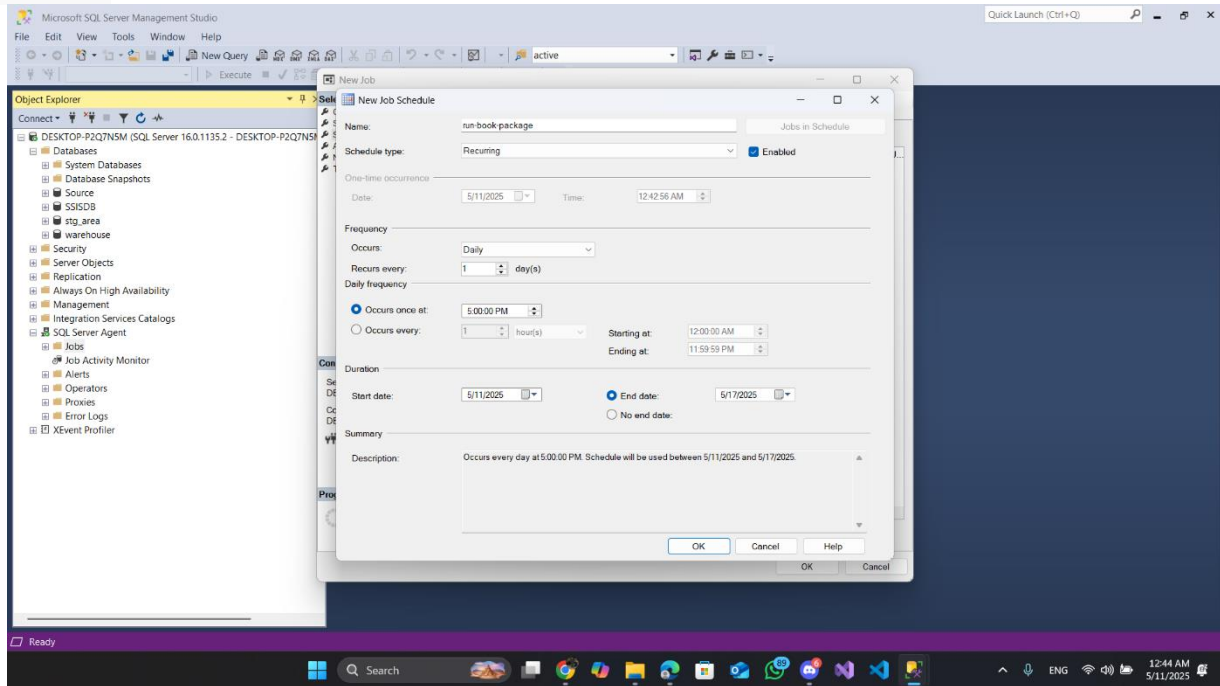
Ready

Search

ENG 11:26 PM 5/10/2025



جامعة القاهرة

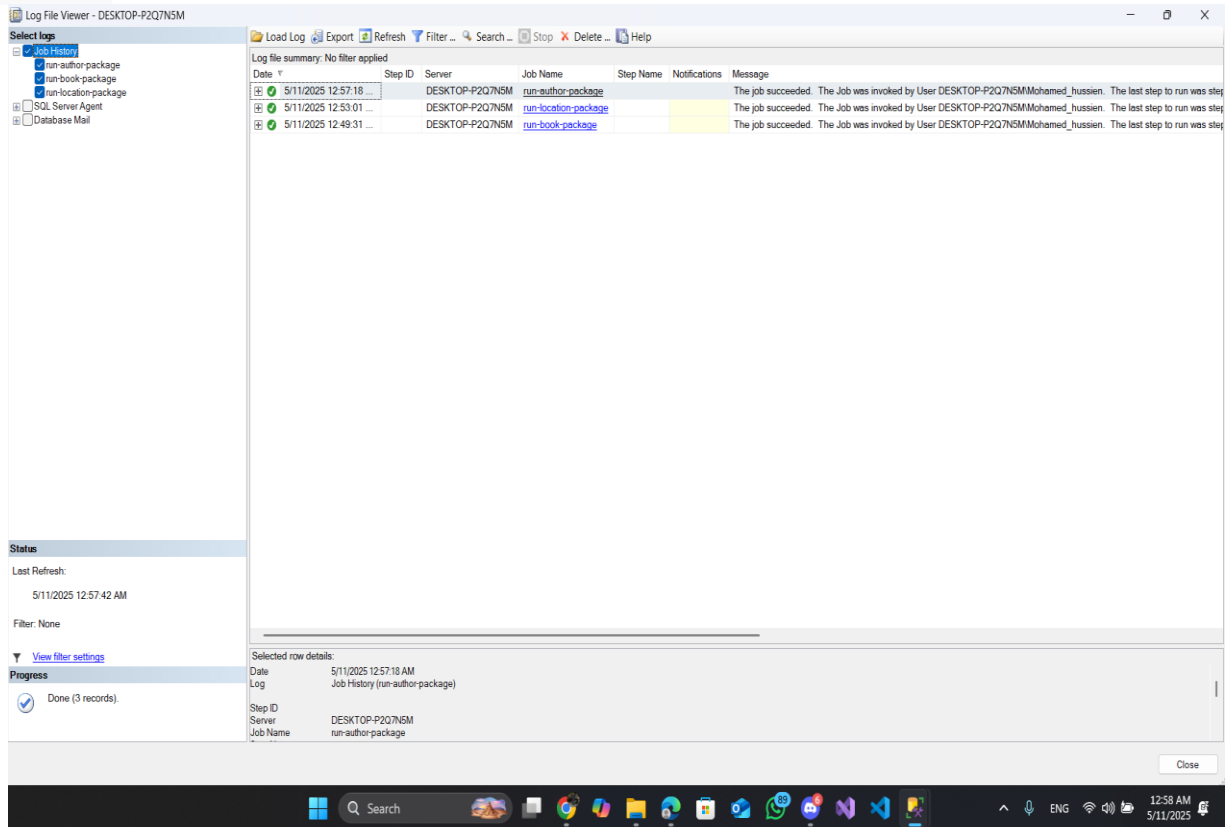


Jobs Scheduling Screenshots:

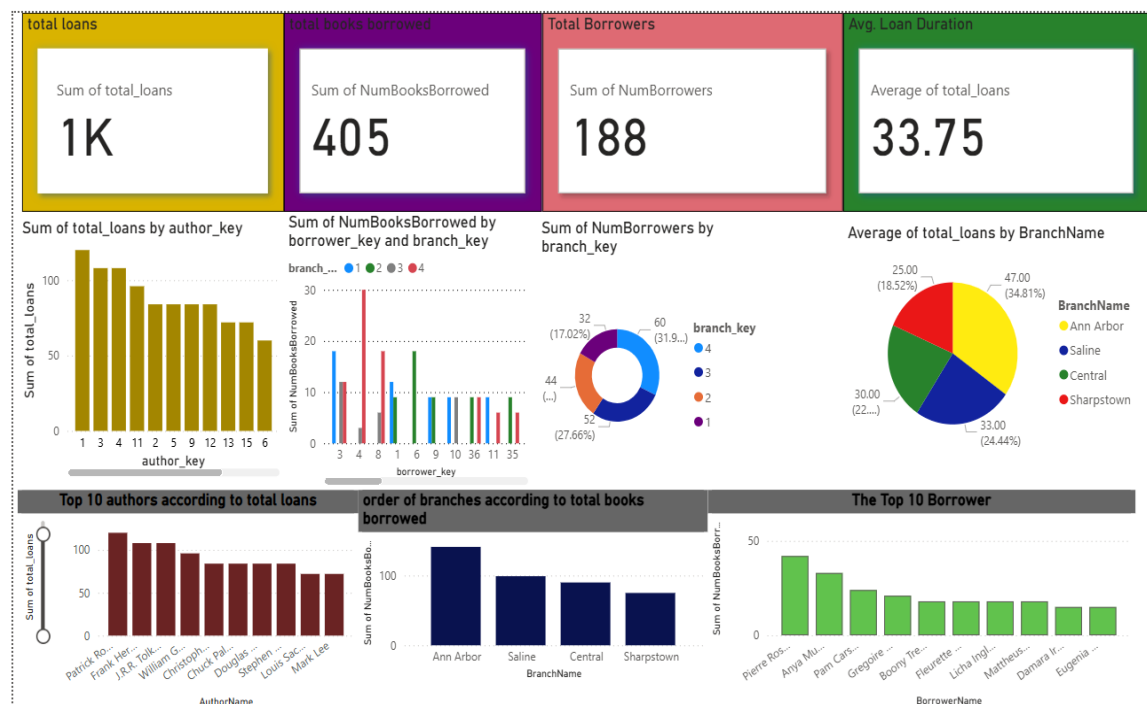
| Load Log Export Refresh Filter ... Search ... Stop X Delete ... Help | | | | | | | | | |
|--|---------|--------|---------------------|-----------|---------------|---|----------|--------|--|
| Log file summary: No filter applied | | | | | | | | | |
| Date | Step ID | Server | Job Name | Step Name | Notifications | Message | Duration | Sql Se | |
| 09/05/2025 08:41:58 PM | | SARAH | Run library package | | | The job succeeded. The Job was invoked by User sarah\brah. The last step to run was step 1 (Run SSIS Package). | 00:01:00 | 0 | |
| 09/05/2025 08:40:00 PM | | SARAH | Run library package | | | The job succeeded. The Job was invoked by Schedule 10 (package schedule). The last step to run was step 1 (Run SSIS Package). | 00:01:12 | 0 | |

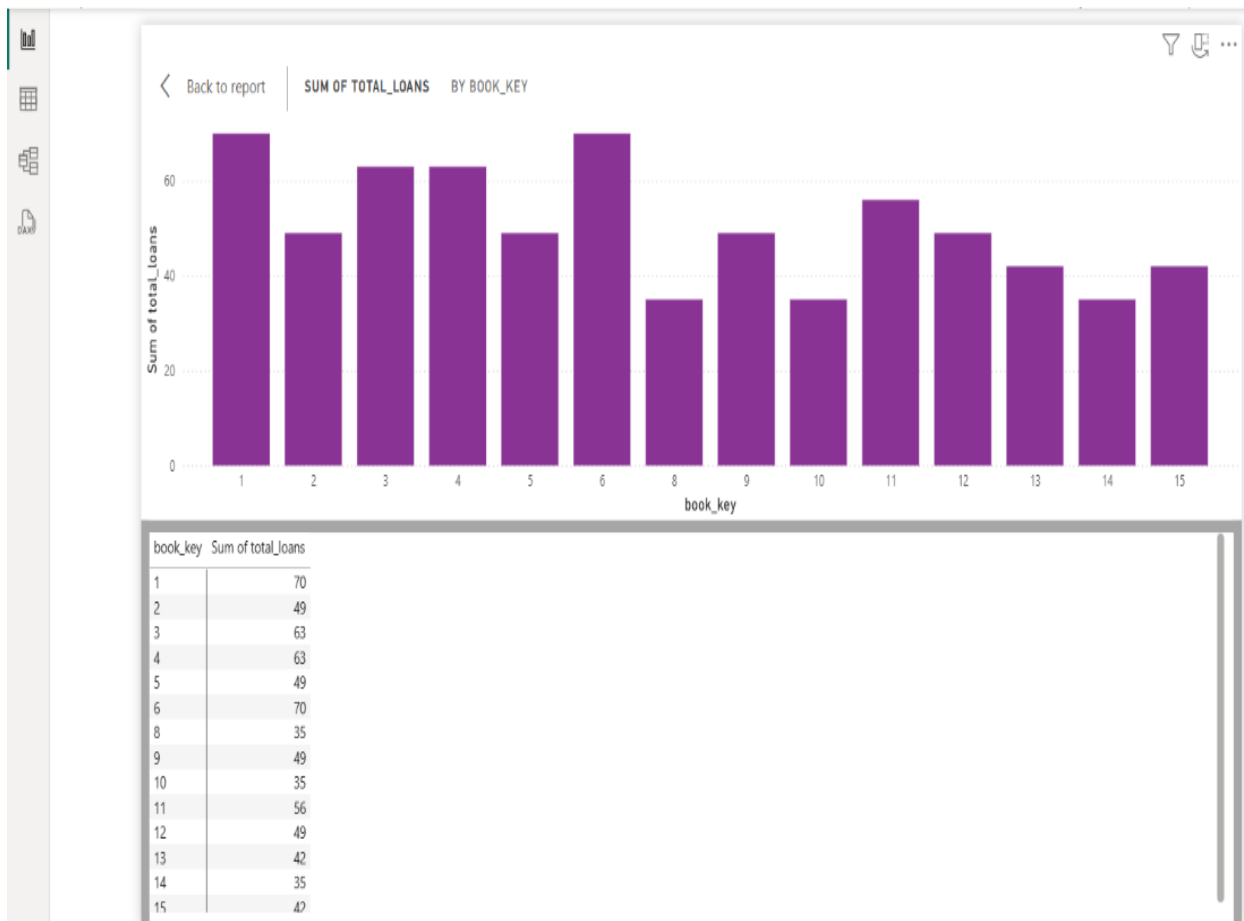
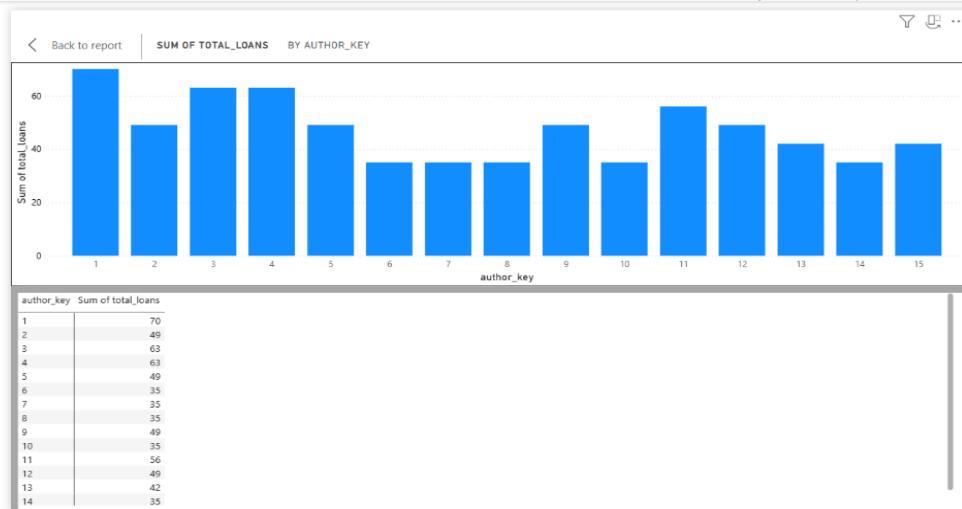


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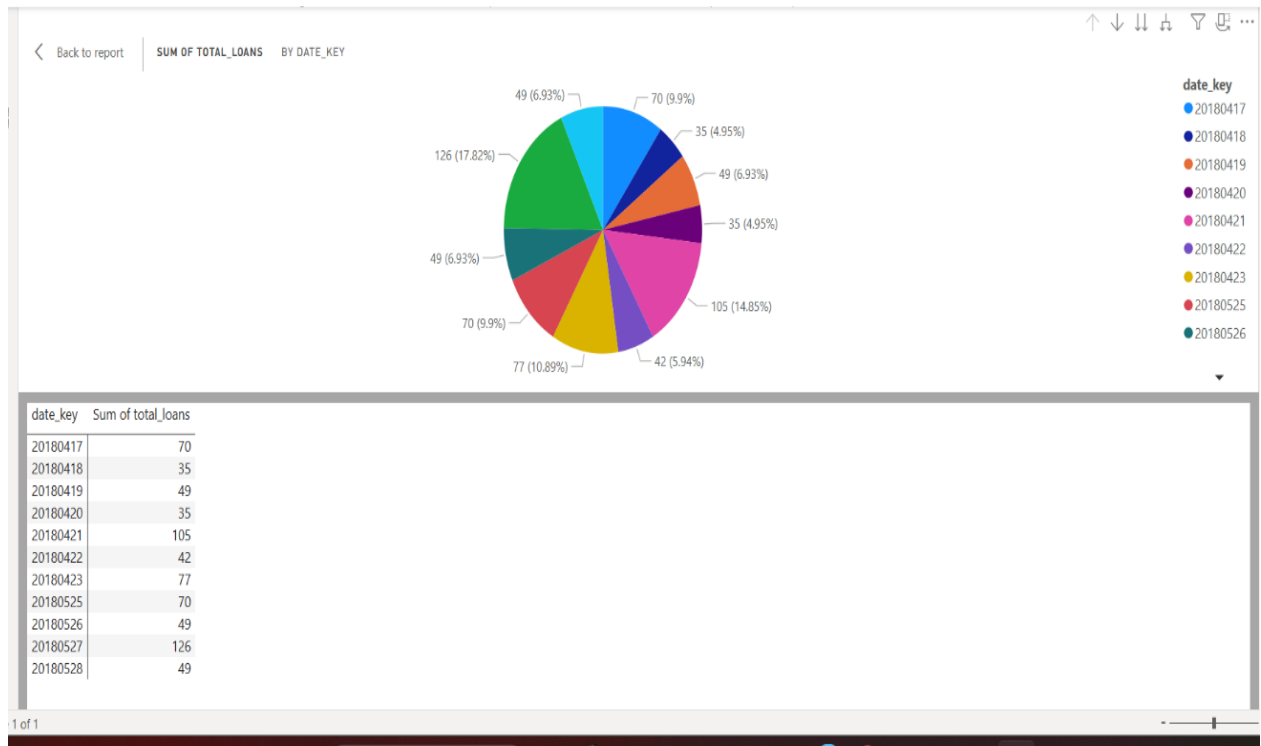
7. [Bonus] Build an interactive dashboard for the DWH using any data visualization tool (Ex: Microsoft Power BI).





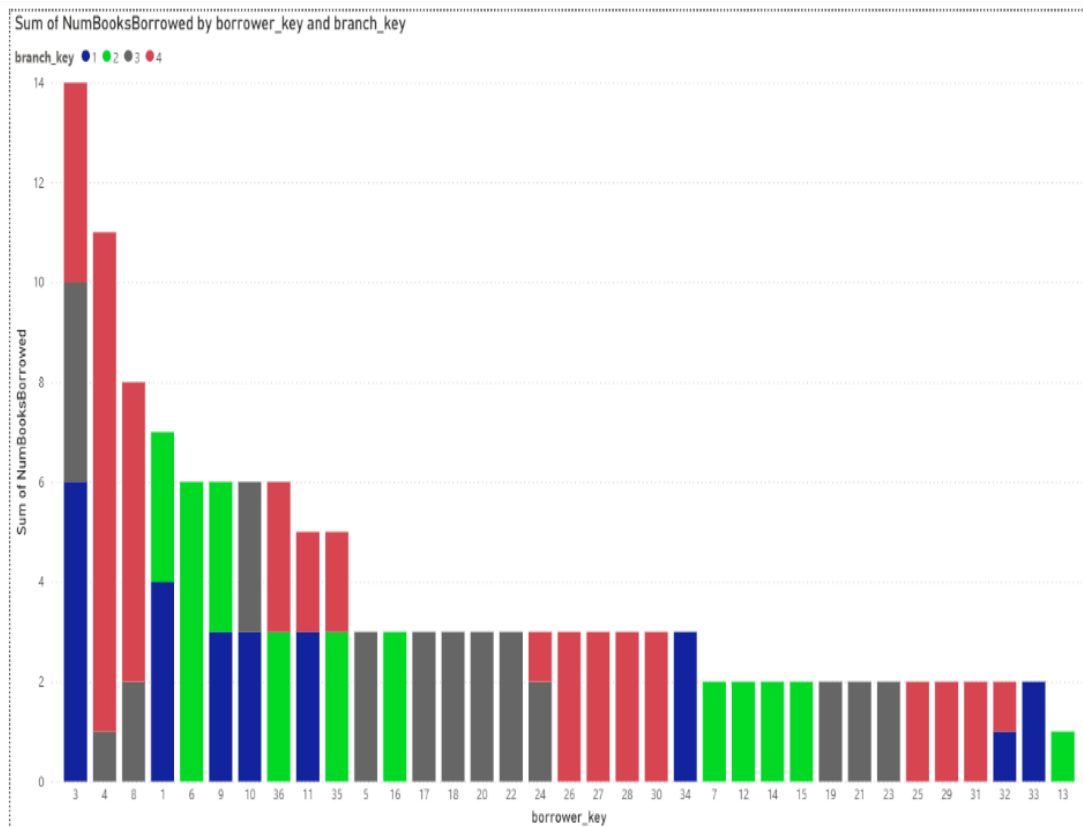
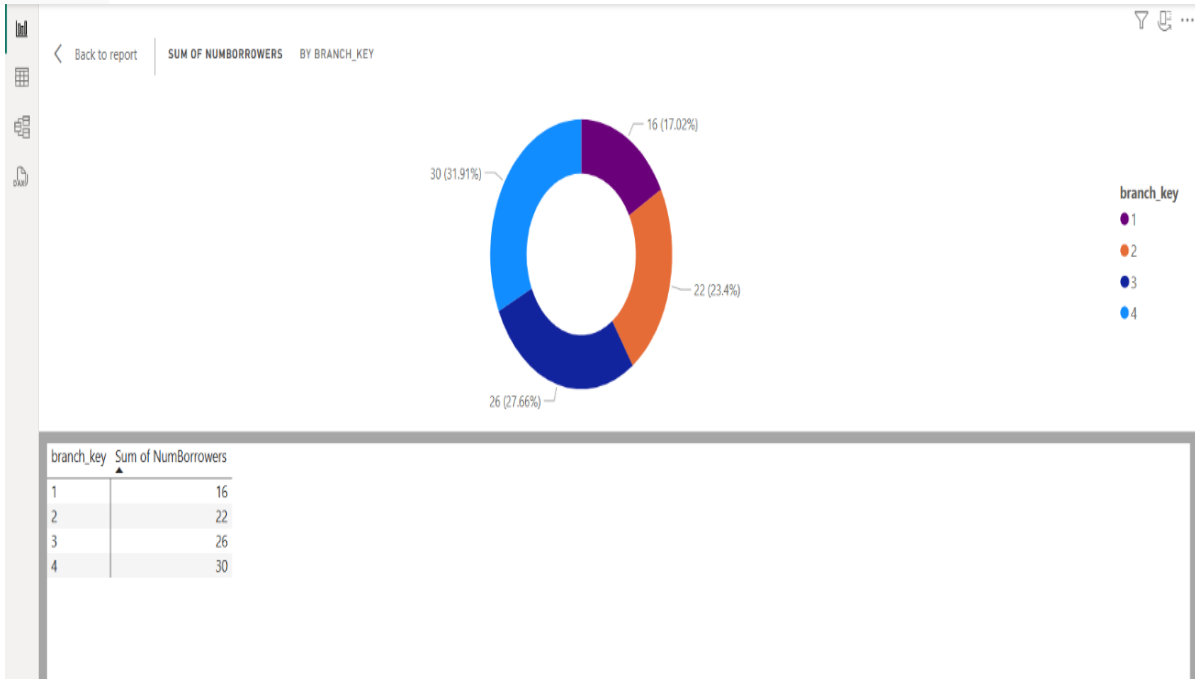


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Sum of total_loans by location_key

