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# **Understanding Data Flow Diagram with Power Designer**

Software Engineering (IT314)

Lab – 06 (21<sup>st</sup> March, 2022)

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# **Definition**

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- A Data Flow Diagram is (DFD) is a graphical representation of the “flow ” of the data in your system

**OR**

- A data flow diagram looks at how the data flows in your system.
- It concerns about the things like, how the data will come from and how the data will go and how the where will the data be stored as well.
- DFD does not tell about the processing of the information(i.e. Whether the processes happen in sequence or in parallel manner)

## WHY DFD?

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- Provides an overview of-
  - What data a system processes
  - What transformations are performed
  - What data are stored
  - What results are produced and where they flow
- Graphical nature makes it a good communication tool between-
  - User and analyst
  - Analyst and System designer

# **DFD is not FlowChart**

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- Flow Charts show “Flow of Control”
- DFD shows “Flow of Data”
- FlowChart describes boxes that describe computations, decisions, interactions and loops

## DFD Elements

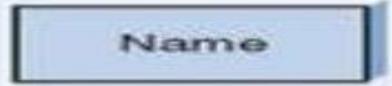
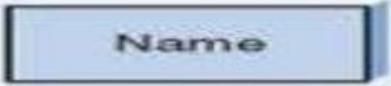
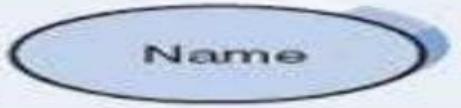
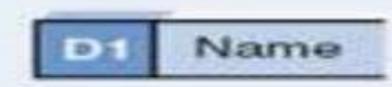
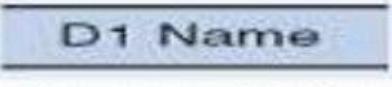
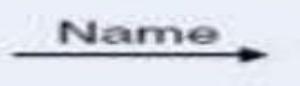
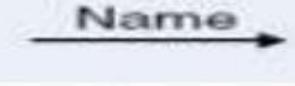
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- Source/Sinks (External entity)
- Processes
- Data Stores
- Data flows



# Symbols Used

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Symbol	Gane & Sarson Symbol	DeMarco & Yourdan Symbol
External Entity		
Process		
Data store		
Data flow		

# **Descriptions**

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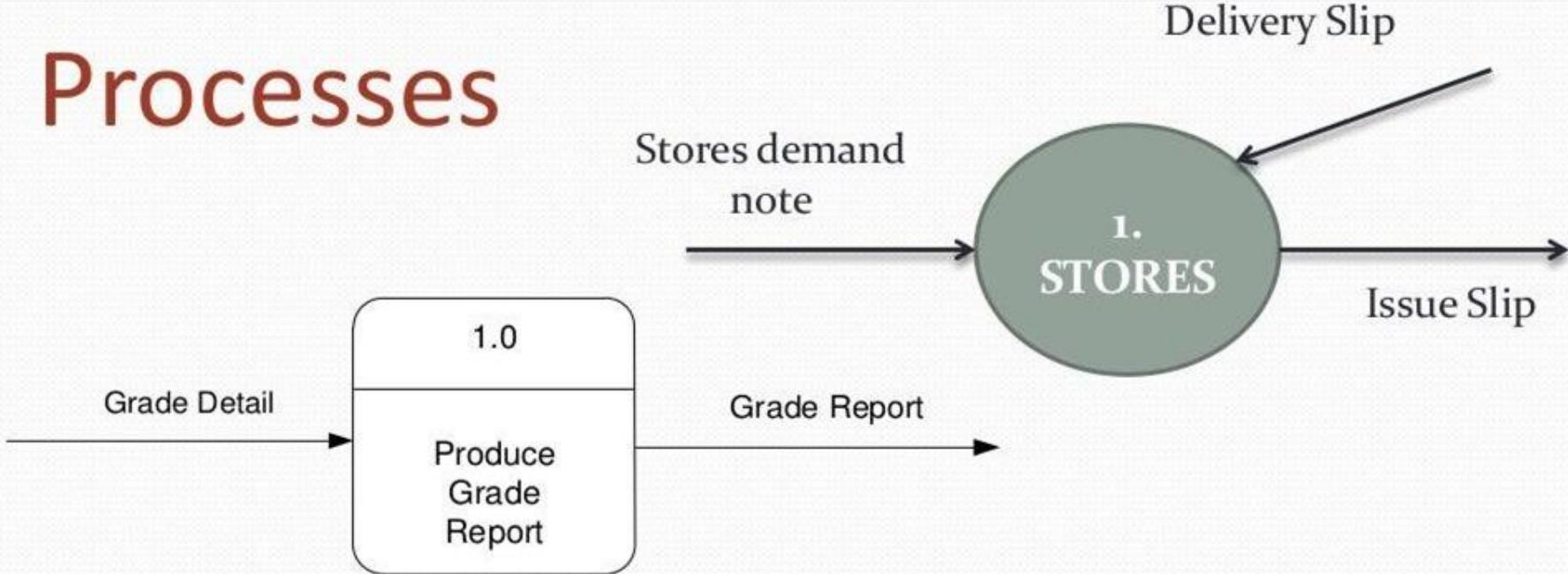
- **External Entity:** people or organization that sends data into the system or receives data from the system
- **Process:** It shows that what happens to the data
  - I.e. It transforms the incoming data into the outgoing data, by performing some operations.
- **Data Store:** Represents the permanent data that is being used by the system.
- **Data Flow:** It models the actual flow of the data between the other elements.

## External Entity

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- They either supply or receive data
  - **Source** – Entity that supplies data to the system.
  - **Sink** – Entity that receives data from the system.
- They do not process data

# Processes

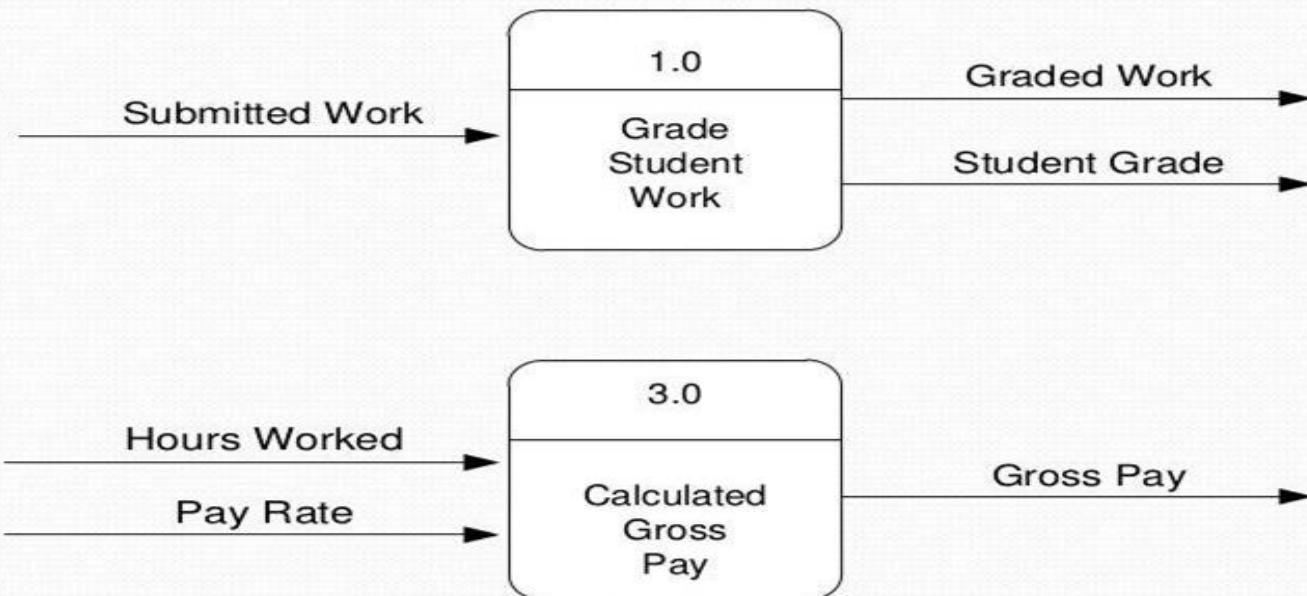


- Work or actions performed on data (inside the system)
- Straight line with incoming arrows are input data flows
- Straight lines with outgoing arrows are output data flows
- Labels are assigned to Data flow. These aid documentation

# Processes

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- Can have more than one outgoing data flow or more than one incoming data flow



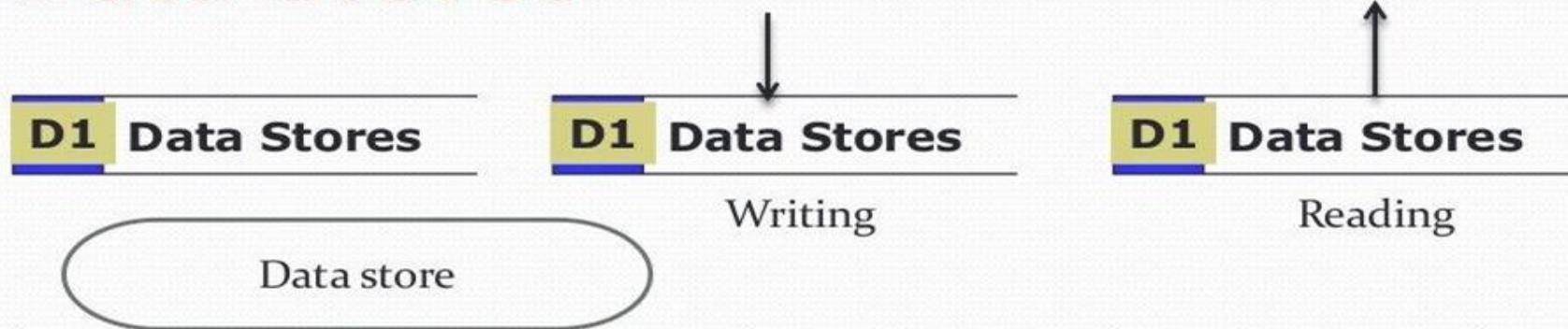
# Processes

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- Can connect to any other symbol (including another process symbol)
- Contain the business logic, also called business rules
- Referred to as a black box



# Data Stores



- A Data Store is a repository of data
- Data can be written into the data store. This is depicted by an incoming arrow
- Data can be read from a data store. This is depicted by an outgoing arrow

# Data Flows

Data Flow

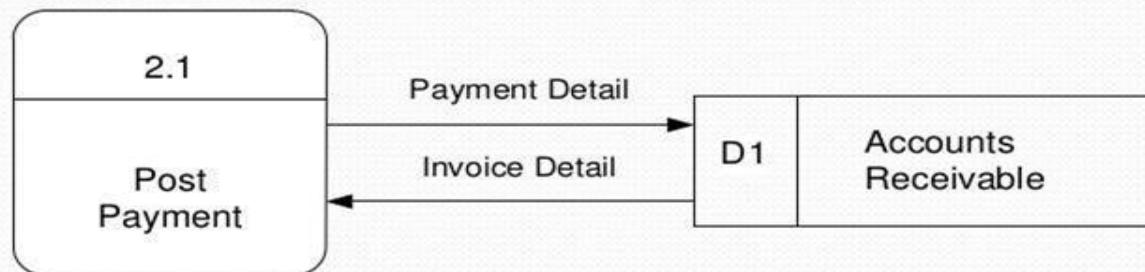


- Data in motion
- Marks movement of data through the system
  - a pipeline to carry data.
- Connects the processes, external entities and data stores.

# Data Flow

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- Generally unidirectional, If same data flows in both directions, double-headed arrow can be used.
- Can represent flow between process and data store by two separate arrows



## Rules of DataFlow

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- Data can flow from
  - ✓ External entity to process
  - ✓ Process to external entity
  - ✓ Process to store and back
  - ✓ Process to process
- Data cannot flow from
  - External entity to external entity
  - External entity to store
  - Store to external entity
  - Store to store

# Types of DFD's

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DFD's are categorized as follows:

1. Logical DFD
2. Physical DFD

**Logical DFD:** A Logical DFD focuses on the business and the how the business operates. It describes the business events that takes place and the data required and produced by each event

**Physical DFD:** Physical DFD shows that how system will be implemented.

# **L o g i c a l   D F D**

**V E R S U S**

# **P h y s i c a l   D F D**

## **Logical DFD**

A type of DFD that depicts how the business operates

Focuses on the business activities

A process is a business activity

A data store is a collection of information

Simple

## **Physical DFD**

A type of DFD that depicts how the system is implemented

Focuses on the system implementation

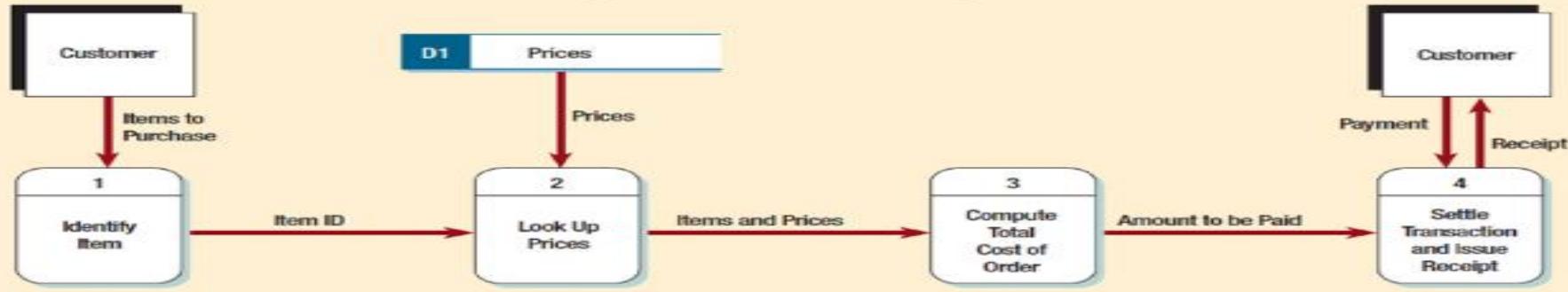
A process is a software program or manual procedures

Data stores are databases, computer files and paper files

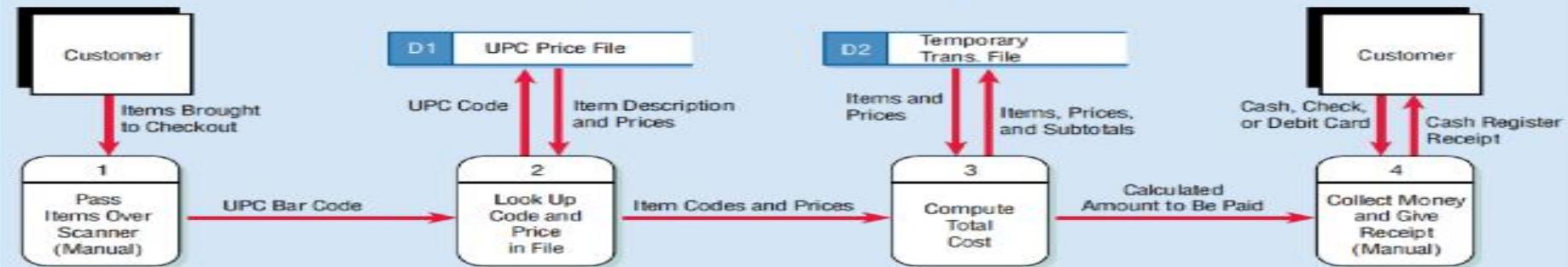
Complex

# Example of Logical and Physical DFD

Logical Data Flow Diagram



Physical Data Flow Diagram



## DFD Levels

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Levels	Description	Explanation
<b>Level 0</b>	Context diagram	Contains only one process
<b>Level 1</b>	Overview diagram	Utilizes all four elements
<b>Level 2</b>	Detailed diagram	A breakdown of a level 2 process

# Level - O DFD

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- Level - 0 DFD also known as the (context Level DFD ) is the simplest DFD
- DFD Level- 0 is concerned with how the system interacts with the outside world
- This level represents the input and output of the system
- DFD Level-0 combines the sets DFD fragments into one diagram.
- Generally moves from top to bottom and left to right.
- It's designed to be an at-a-glance view, showing the system as a single high-level process, with its relationship to external entities.

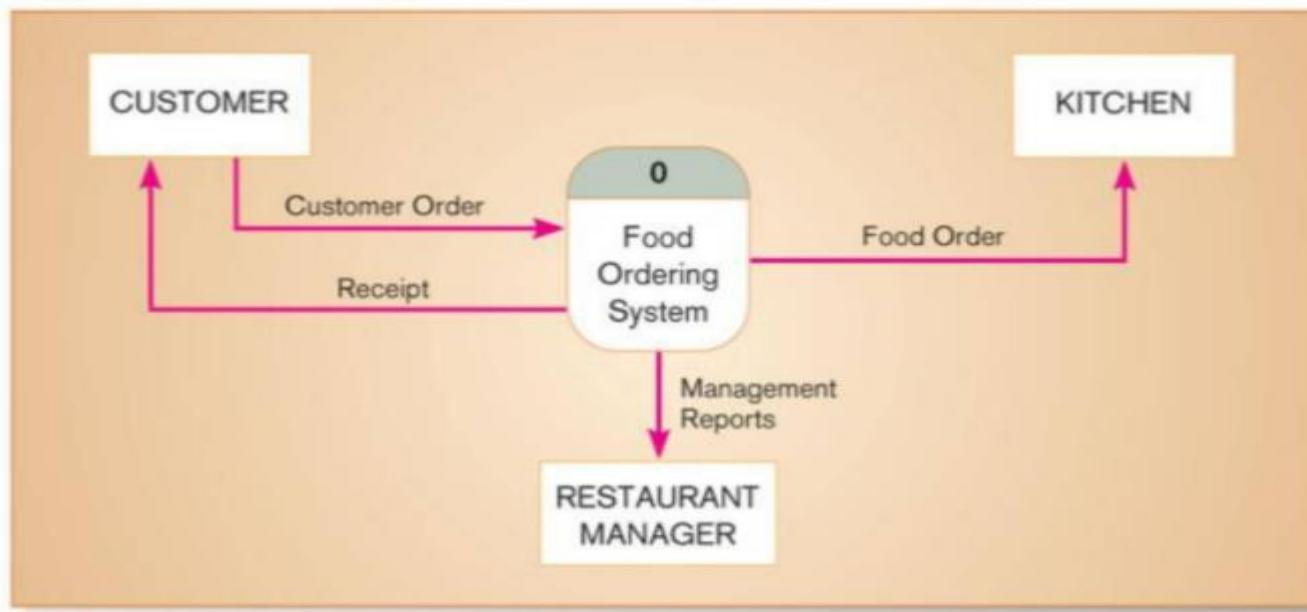
# How to Create Level - O DFD

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1. Identify your main system.
2. Identify the external people who will interact with the system
3. Decide what data will these entities enter into the system.
4. Determine what will be the output to these entities from the system.

# Example of DFD Level - O

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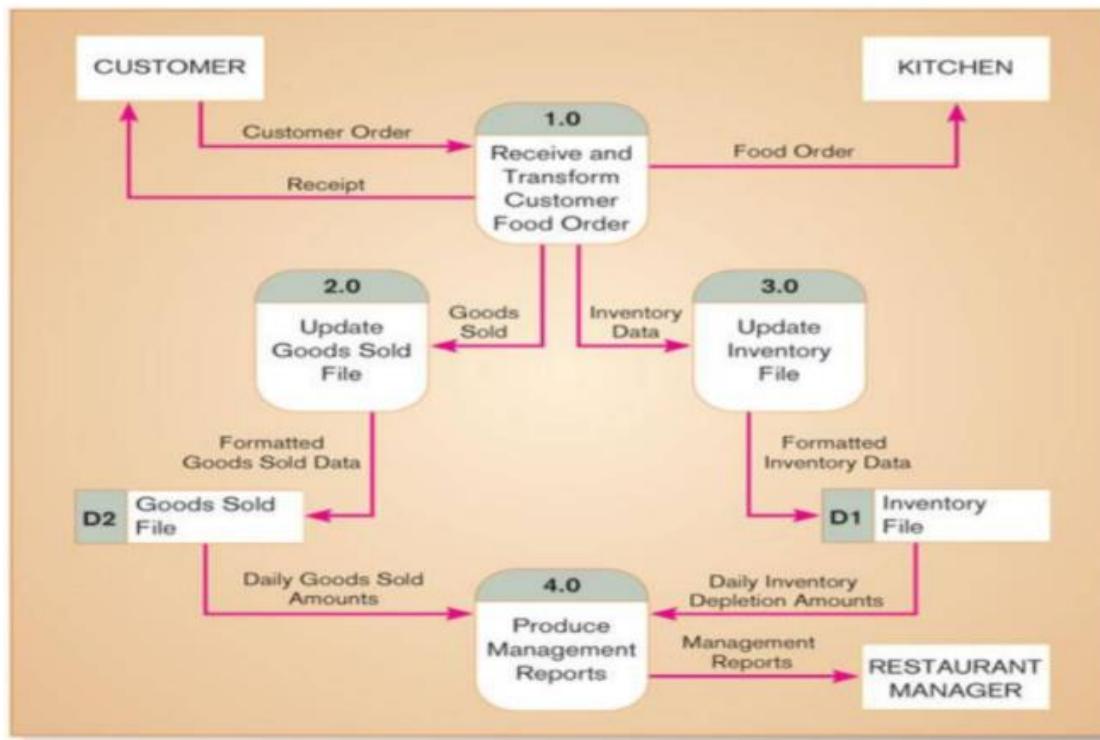


## **DFD Level - 1**

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- DFD Level 1 provides a more detailed breakout of pieces of the Context Level Diagram.
- Basic modules of the system are shown in this level and how the data moves through these modules is shown in this level.
- DFD Level - 1 provides a high level view of the system that identifies the major processes and how the data is stores

# Example of DFD level - 1



## **How to create level - 1 DFD**

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- 1. Primary focus should be on the processes that will process the data**
- 2. Identify what information will flow between the processes and what information will flow between the processes and the external entities.**
- 3. Identify what information will be stored permanently in the data store for future use by the system.**

## Level - 2 DFD and further Levels

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- Each process from level - 1 is exploded even more into sub processes. This decomposition continues at each level.
- DFD Level 2 then goes one step deeper into parts of Level 1. It may require more text to reach the necessary level of detail about the system's functioning.
- Number of levels possible depends on the complexity of the system.

# DFD Balancing

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- The conservation of inputs and outputs to a data flow process when that process is decomposed to a lower level

Balanced means:

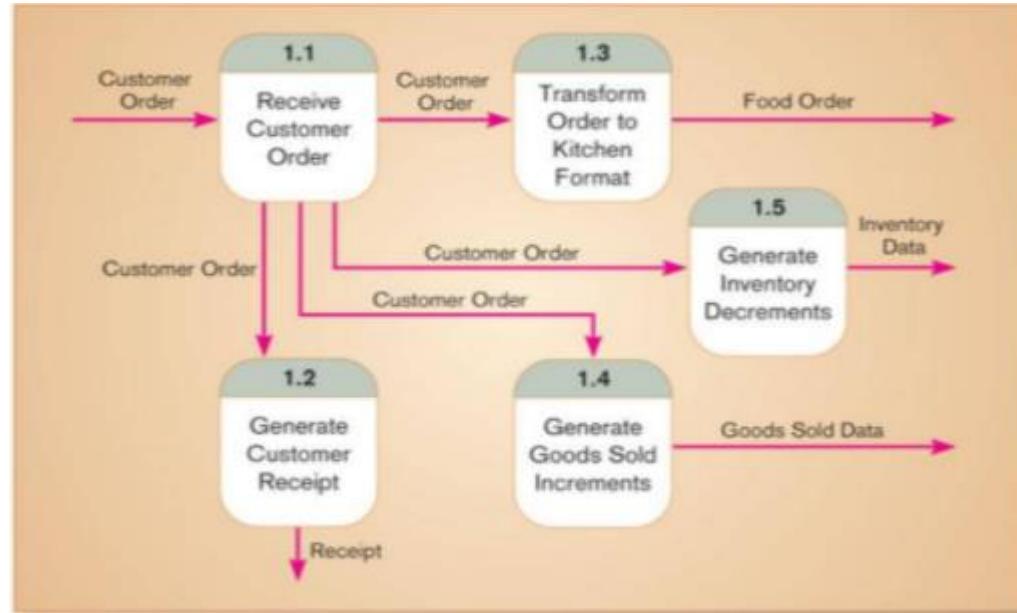
- Numbers of inputs to lower level DFD equal numbers of inputs associated process higher-level DFD
- Number of outputs to lower level DFD equal number of outputs to associated process of higher-level DFD

## Level-2 diagram of decomposition of process 1.0 from level- 1

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This are balanced because the number of inputs to outputs of process 1.0 of the Level-1 equals the number of outputs to Level-2 diagram.

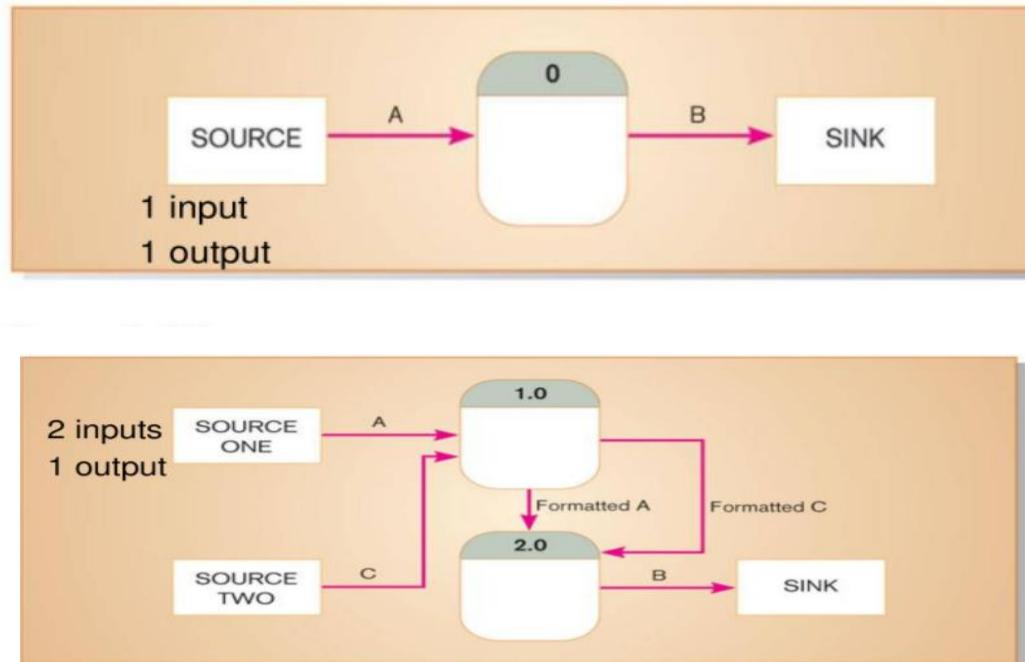
**1 Input  
4 outputs**



# Unbalance DFD

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This is unbalanced because the process of the level 0 diagram has only one input and level 1 has two inputs



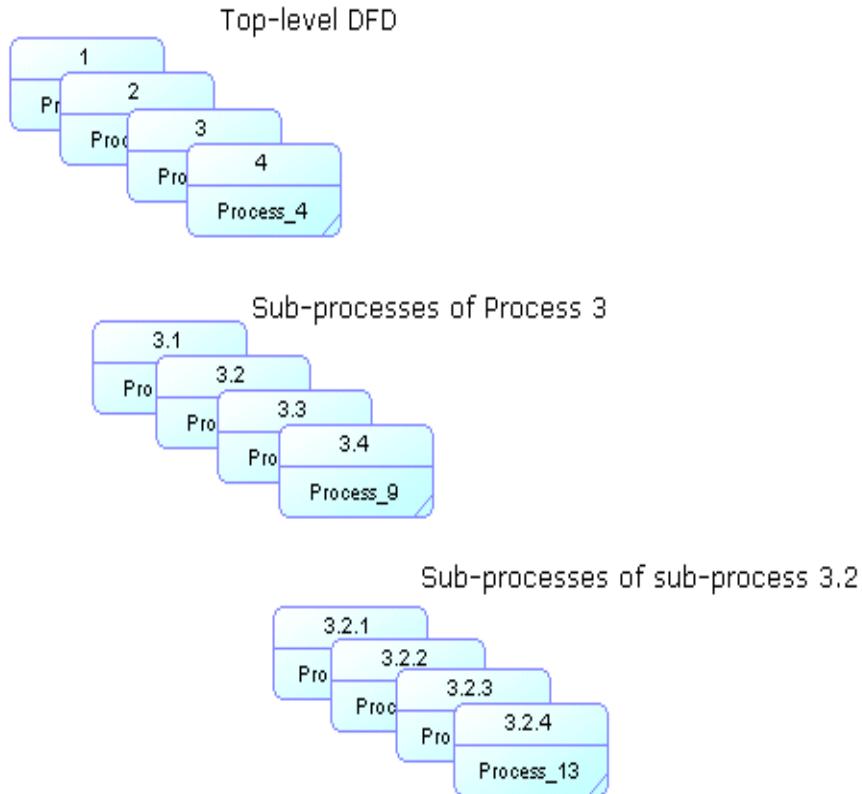
## Good Practices for Drawing DFD

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- Use meaningful names for data flows, processes and data stores.
- Use top down development starting from context diagram and successively levelling DFD
- Only previously stored data can be read
- A process can only transfer input to output. It cannot create new data
- Data stores cannot create new data

# Numbering DFD Process

- Numbering can be used in leveled data flow diagrams, where you decompose a process into lower level processes, to more closely analyze the various transformations carried out by the parent process.
- Child processes inherit the number ID of their parent process, so that, for example, a top level DFD would have processes 1 2 3 4, the sub-process of process 3 would have processes 3.1, 3.2, 3.3, and 3.4, and the sub-process of the sub-process 3.2 would have components 3.2.1, 3.2.2, 3.2.3, and 3.2.4:





# Structure Chart

# Module Structure Chart

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- Hierarchical structure of modules. It breaks down the entire system into lowest functional modules, describe functions and sub-functions of each module of a system to a greater detail.
- Modules at top level called modules at low level.
- Components are read from top to bottom and left to right.

# Symbols used for construction

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## 1. Module

It represents the process or task of the system. It is of three types.

- **Control Module**

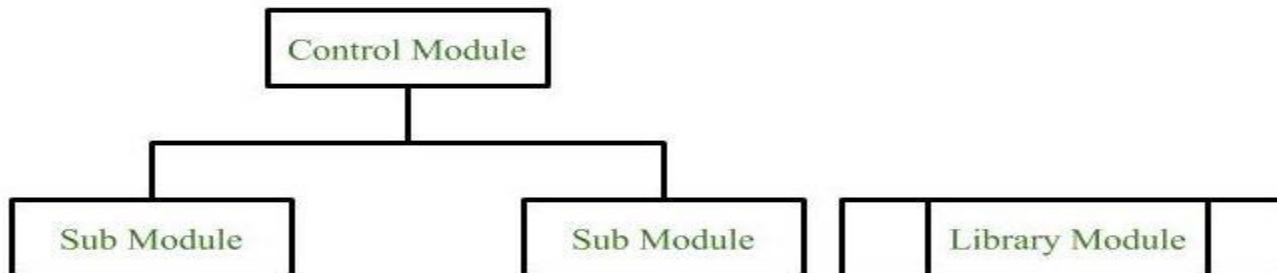
A control module branches to more than one sub module.

- **Sub Module**

Sub Module is a module which is the part (Child) of another module.

- **Library Module**

Library Module are reusable and invokable from any module.



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## **2. Conditional Call**

It represents that control module can select any of the sub module on the basis of some condition.

## **3. Loop (Repetitive call of module)**

It represents the repetitive execution of module by the sub module. A curved arrow represents loop in the module.

## **4. Data Flow**

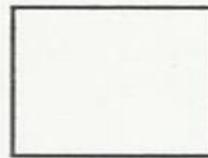
It represents the flow of data between the modules. It is represented by directed arrow with empty circle at the end.

## **5. Physical Storage :-**

Physical Storage is that where all the information are to be stored.

## **6. Control Flow**

It represents the flow of control between the modules. It is represented by directed arrow with filled circle at the end



Procedure



Or/selection



Predefined  
procedure



Loop

Procedure/  
module call



Data flag



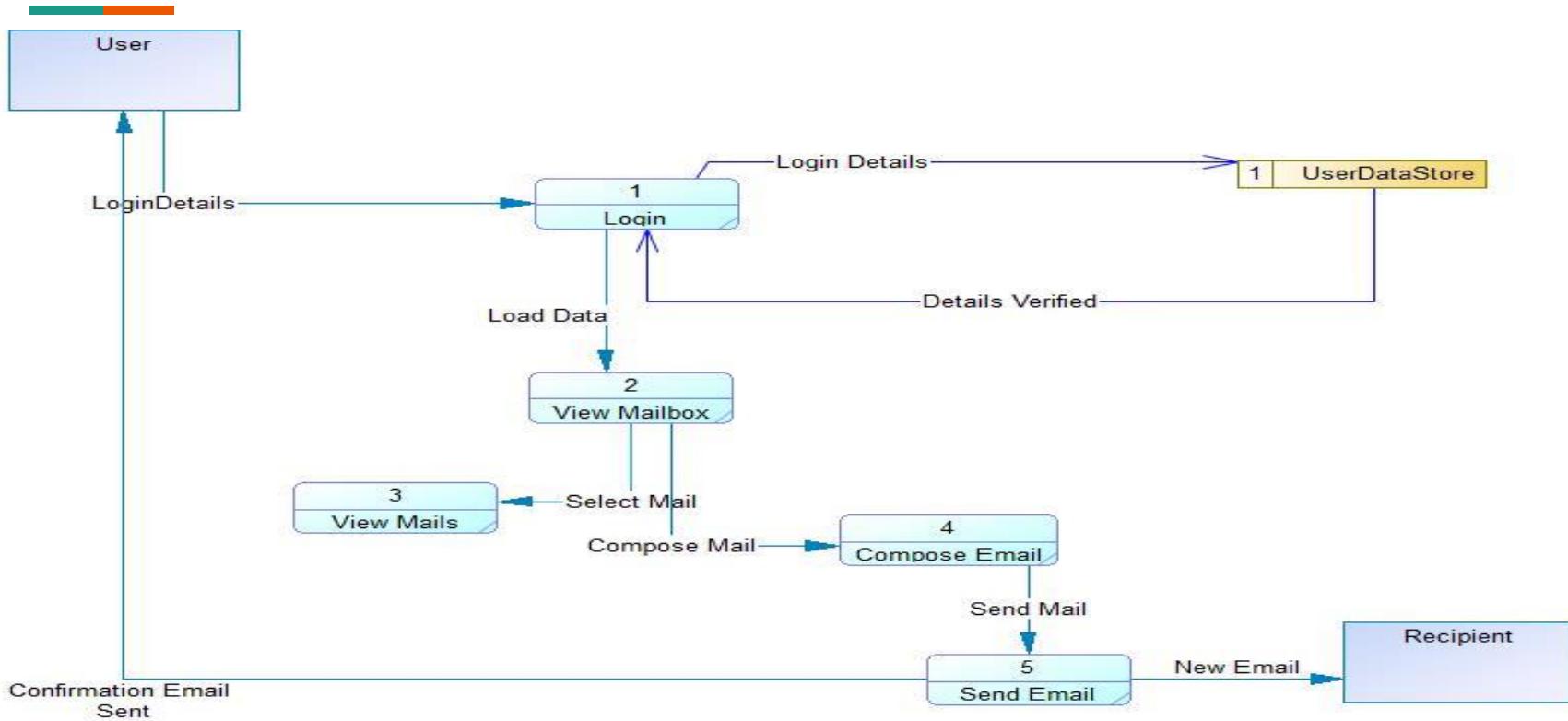
Control flag

# How Structure Chart Is Related To DFD

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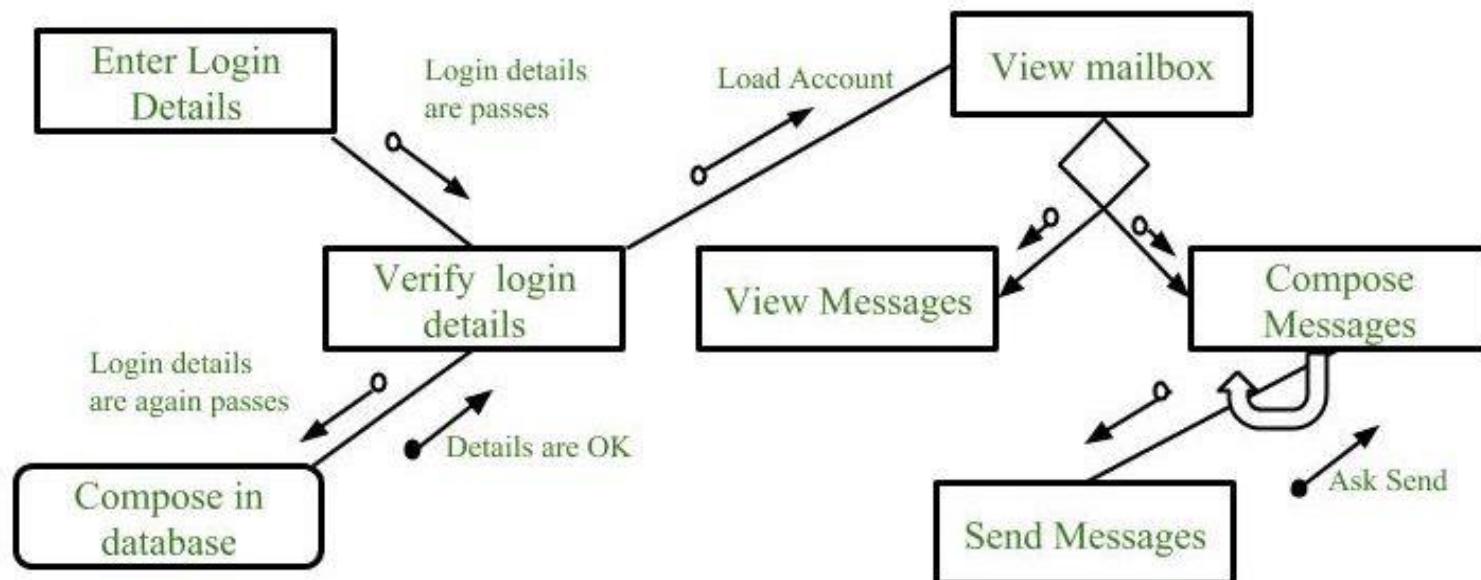
- Structure chart is derived from Data Flow Diagram.
- It represents the system in more detailed way than DFD, it breaks down the entire system into lowest functional modules, describes functions and sub functions of each module of the system to a greater detail than DFD

# Example - DFD



# Example

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# PowerDesigner

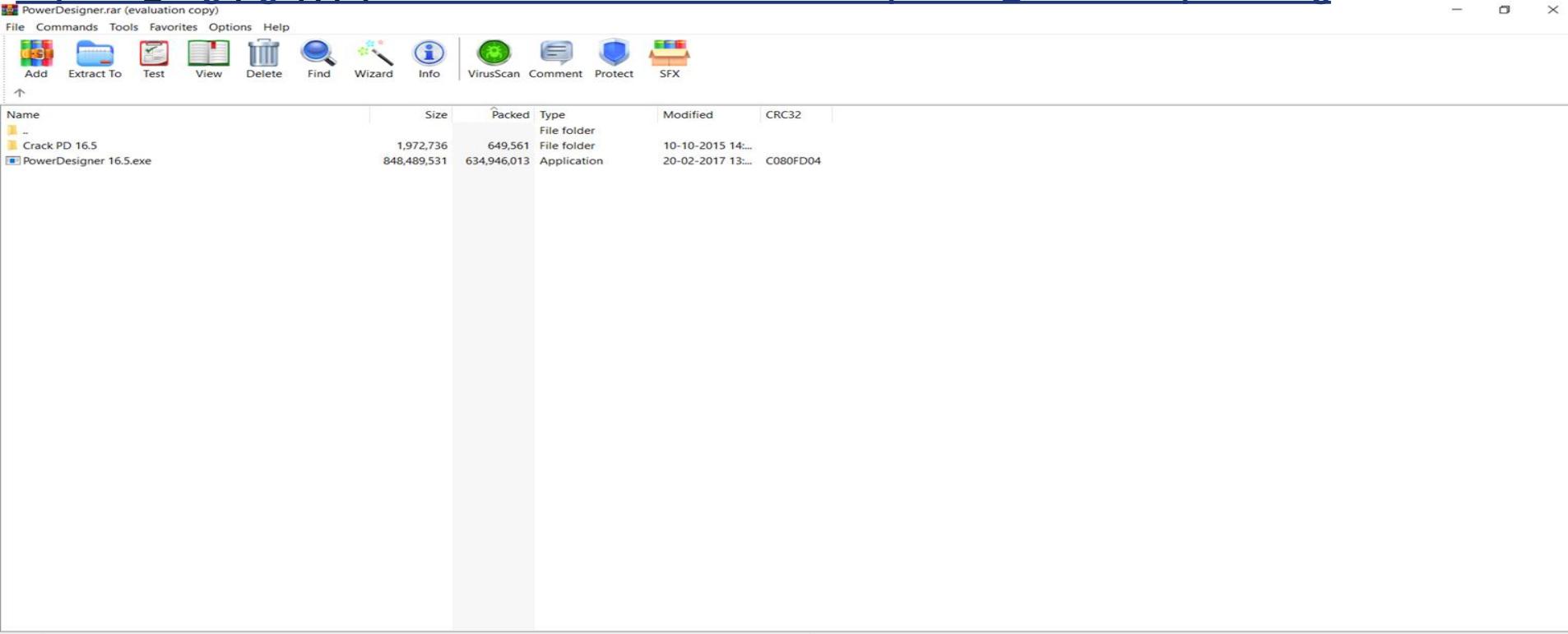
DEMONSTRATION

**Download Link:**

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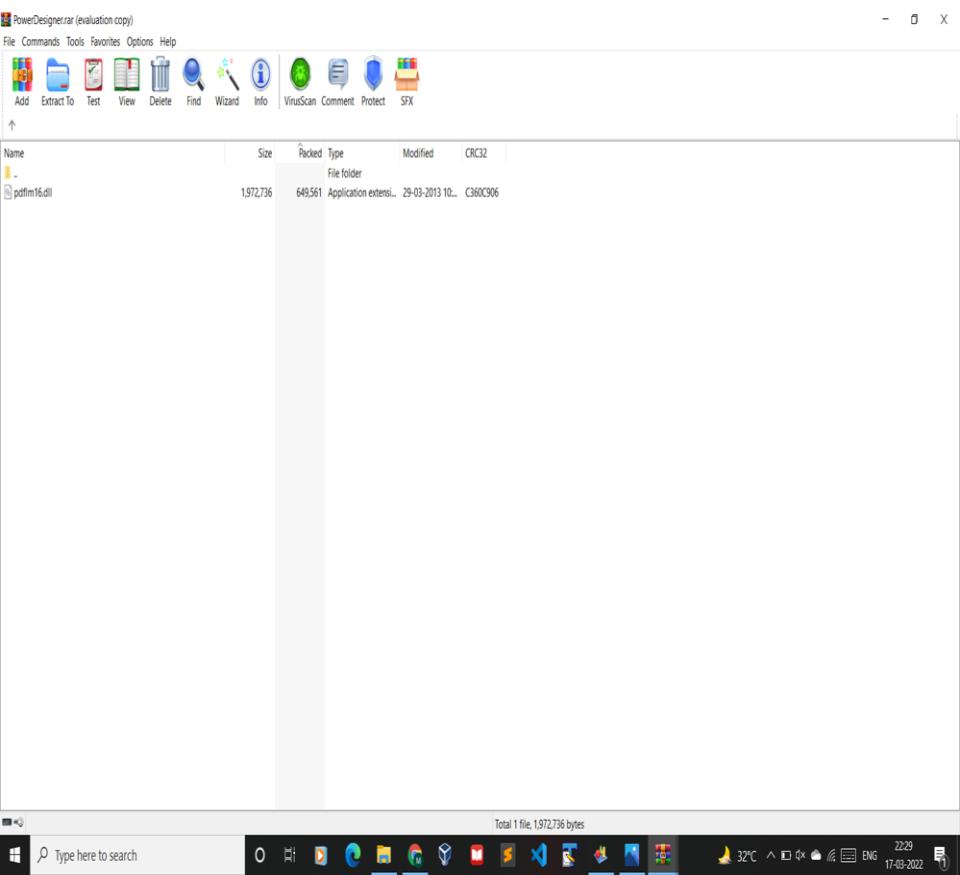
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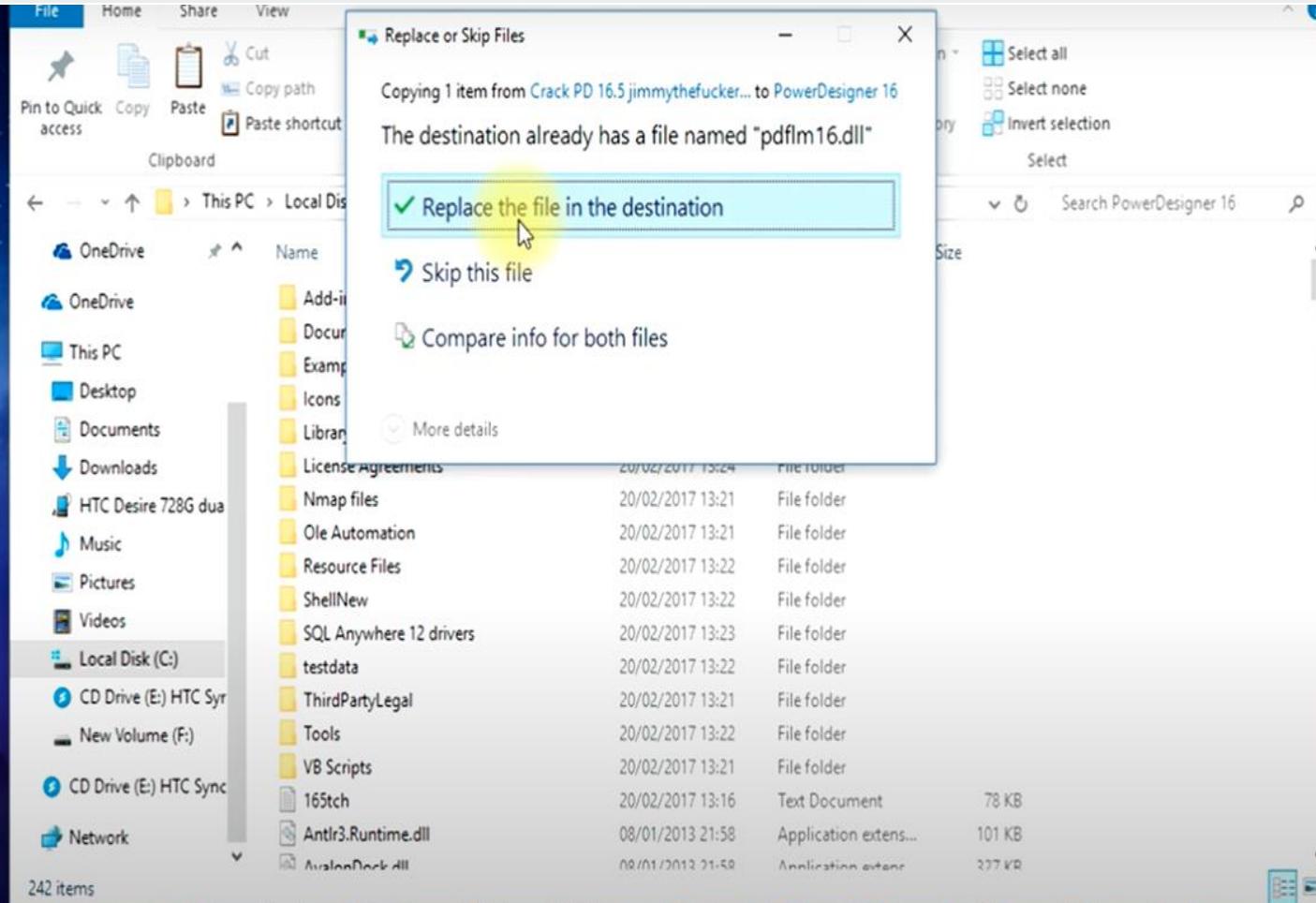
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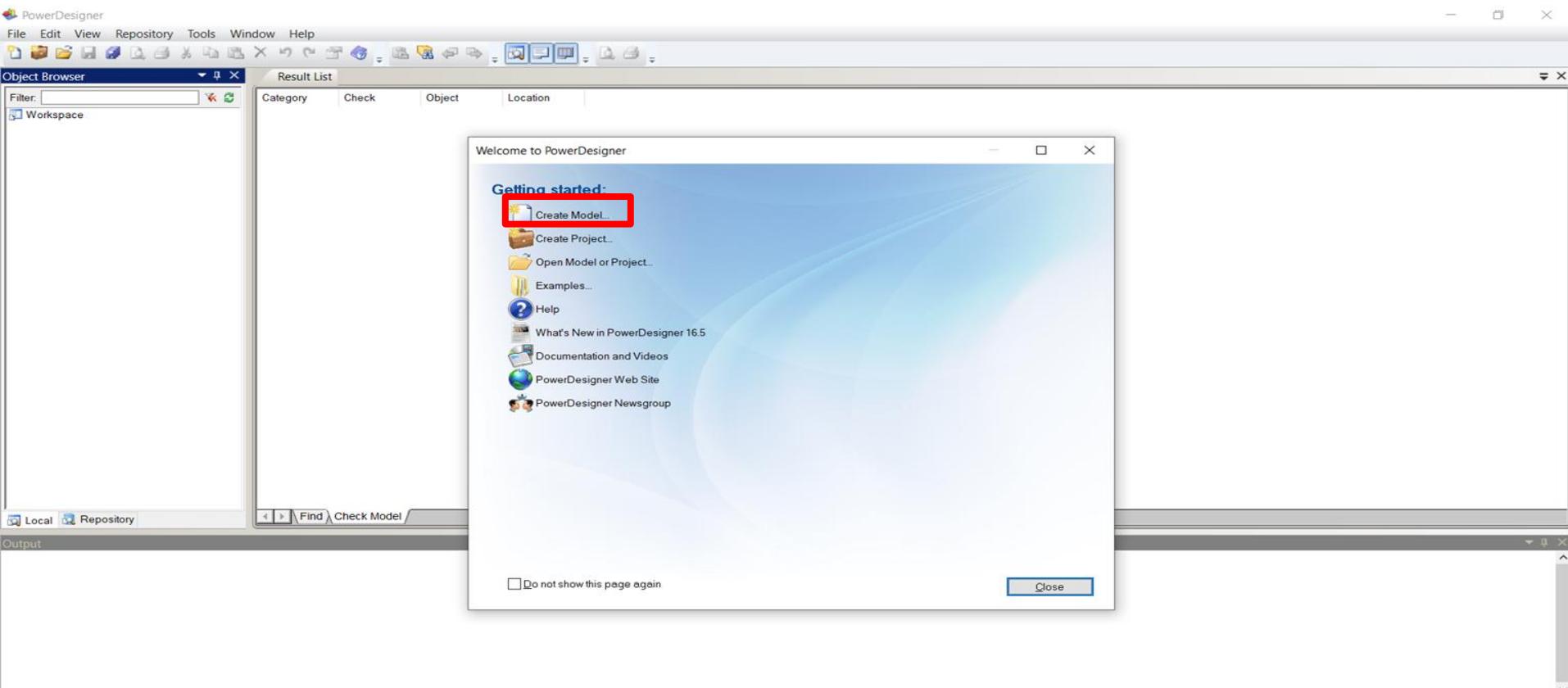


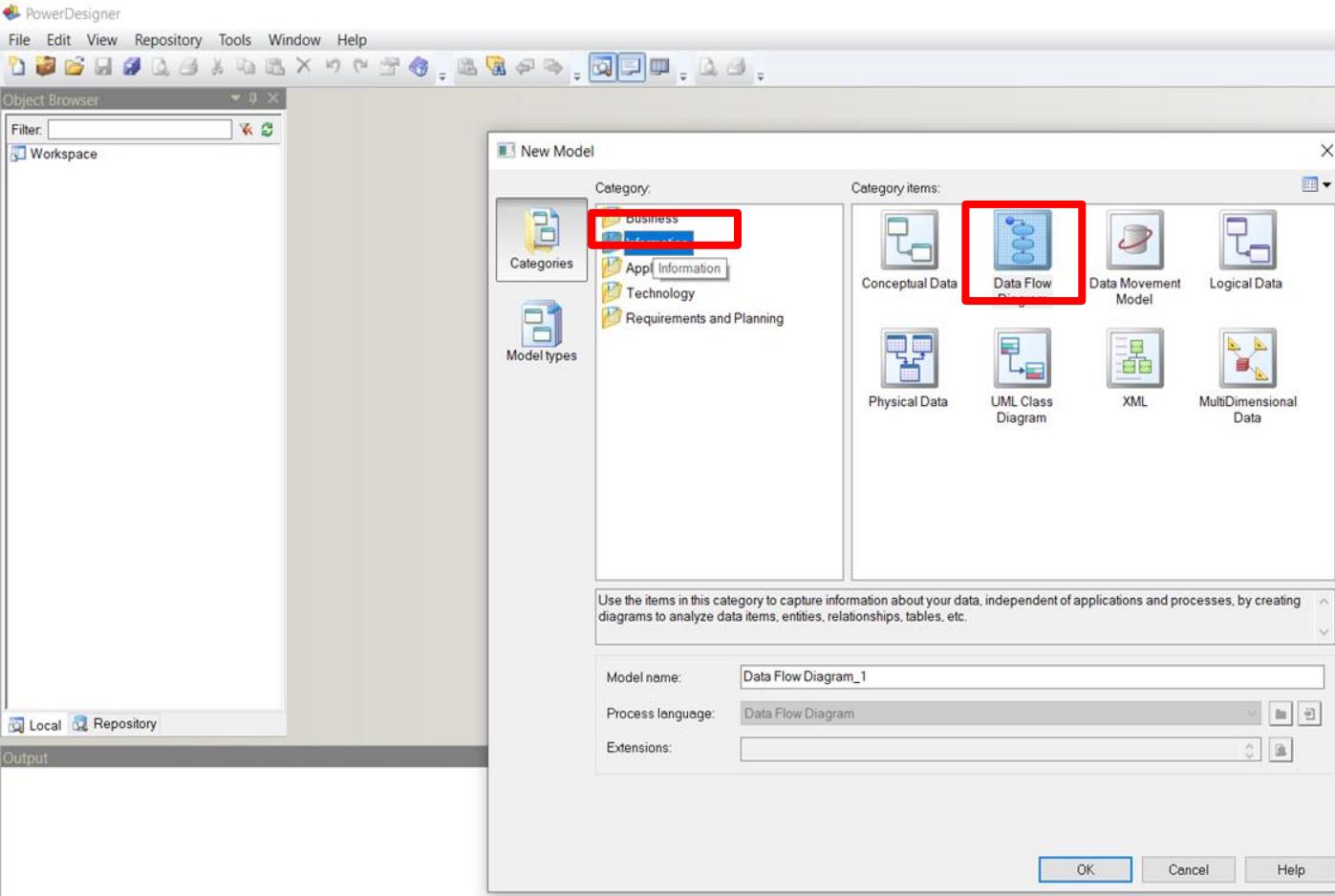
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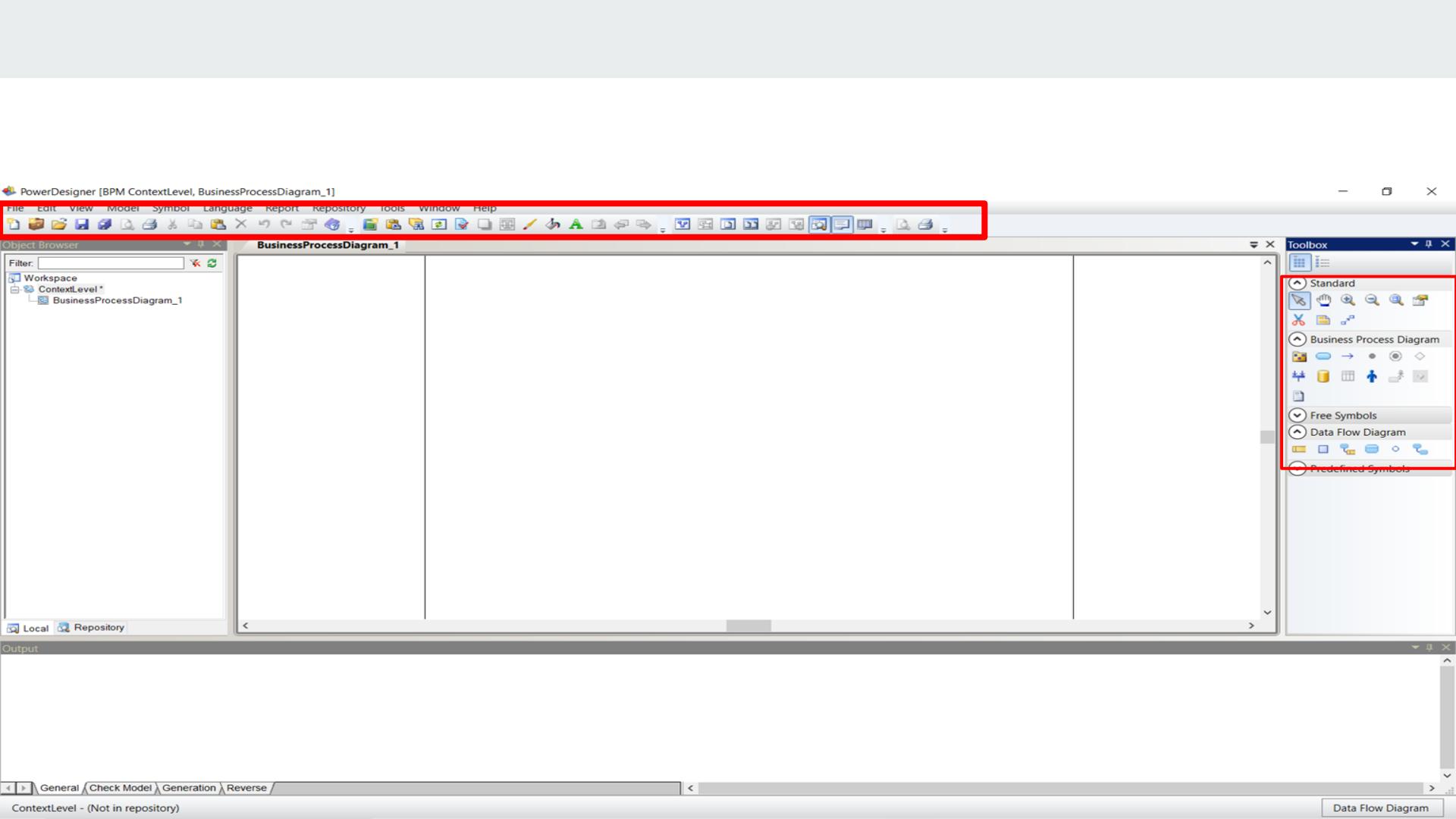


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## Object Browser

- Filter:  X
- Workspace
  - LEVEL0\*
  - BusinessProcessDiagram\_1
  - External Entity Objects
  - Processes
  - Flows

## BusinessProcessDiagram\_1 Result List

Process Properties - Process\_1 (Process\_1)

General Implementation Data Notes

Name:  ...

Code:  ...

Comment:

Stereotype:  ...

Organization unit:  ...

Timeout:  Duration:

Composite status:  Decomposed process  Atomic task

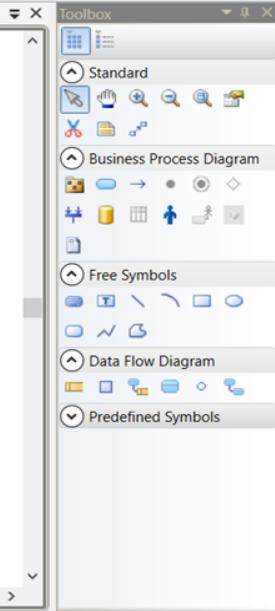
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Local Repository

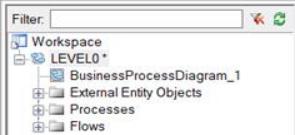
Output





Filter:

BusinessProcessDiagram\_1 Result List



Process Properties - College Management (College\_Management)

General Implementation Data Notes

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Stereotype:

Organization unit:

Timeout:  Duration:

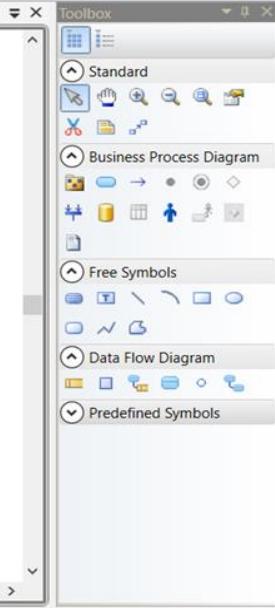
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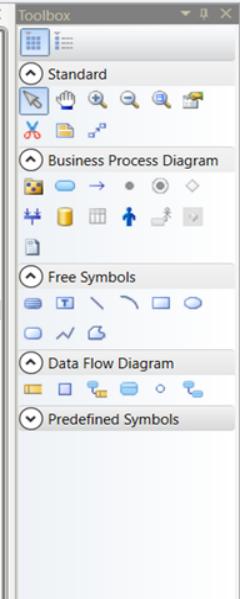
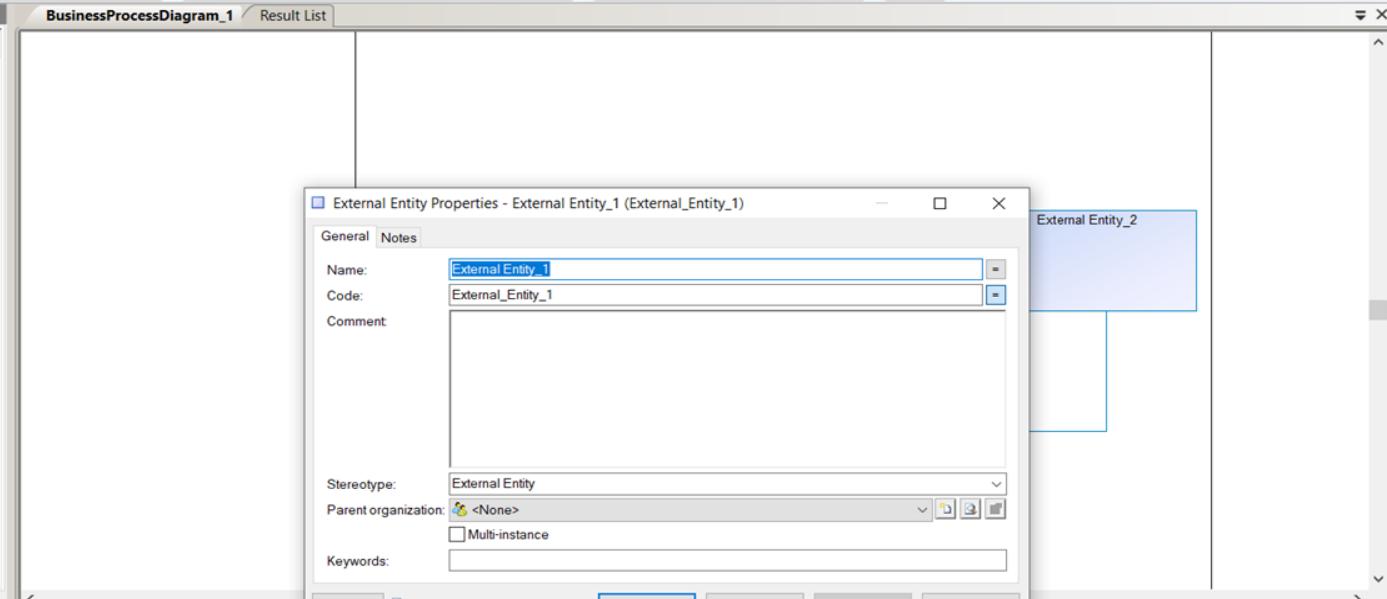
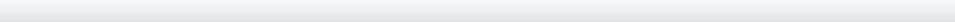
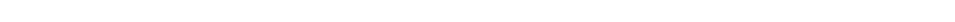
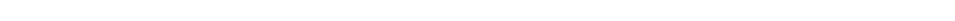
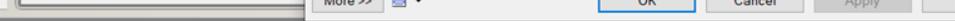
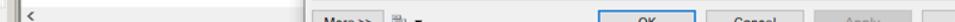
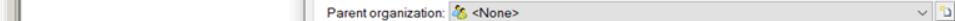
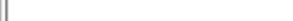
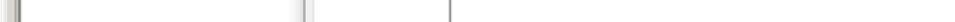
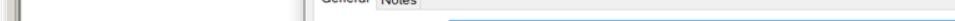
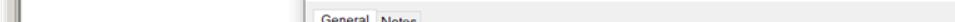
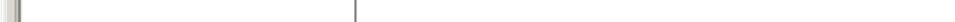
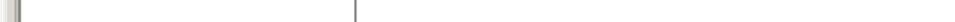
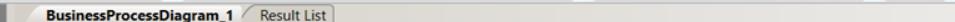
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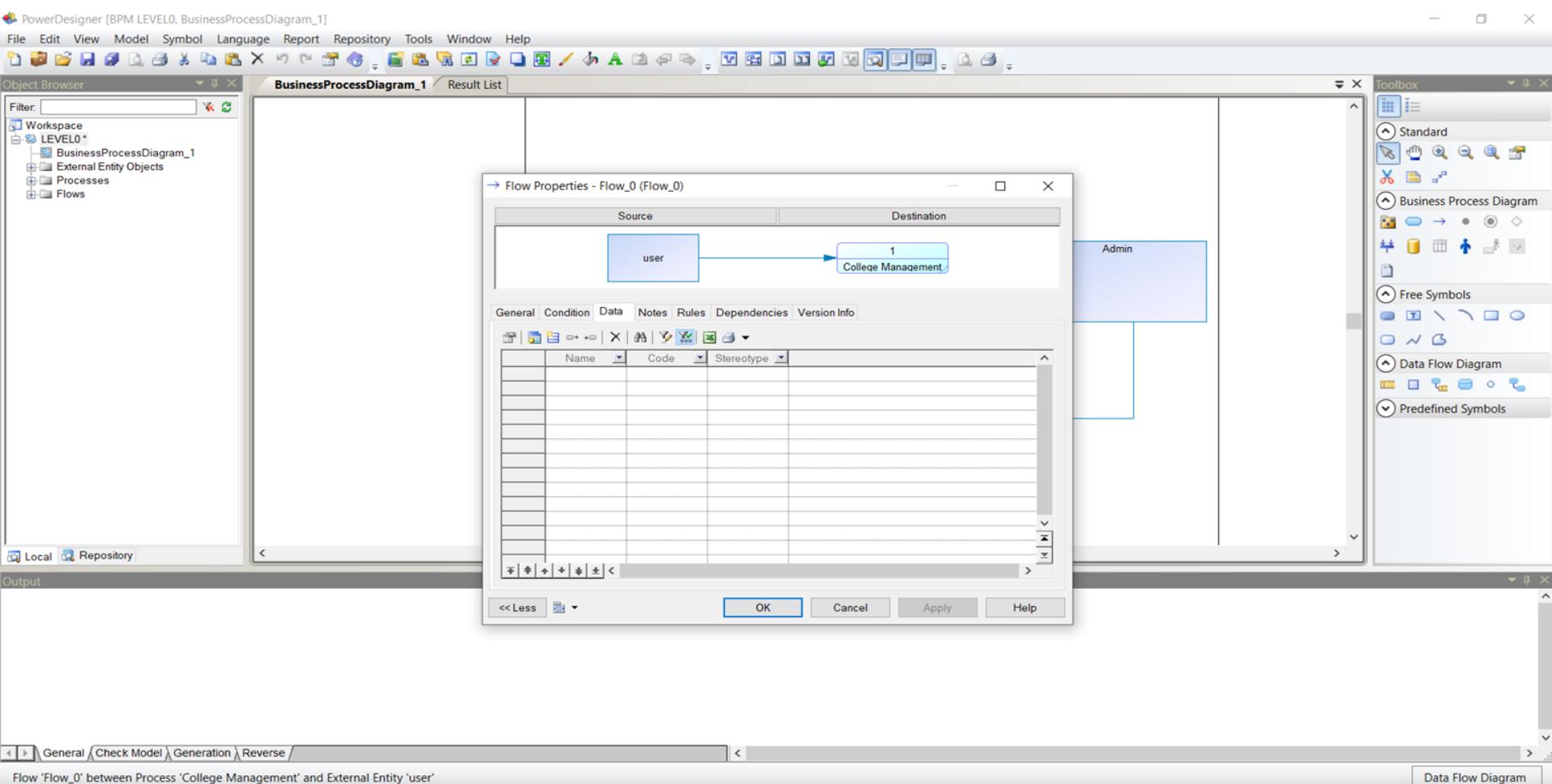
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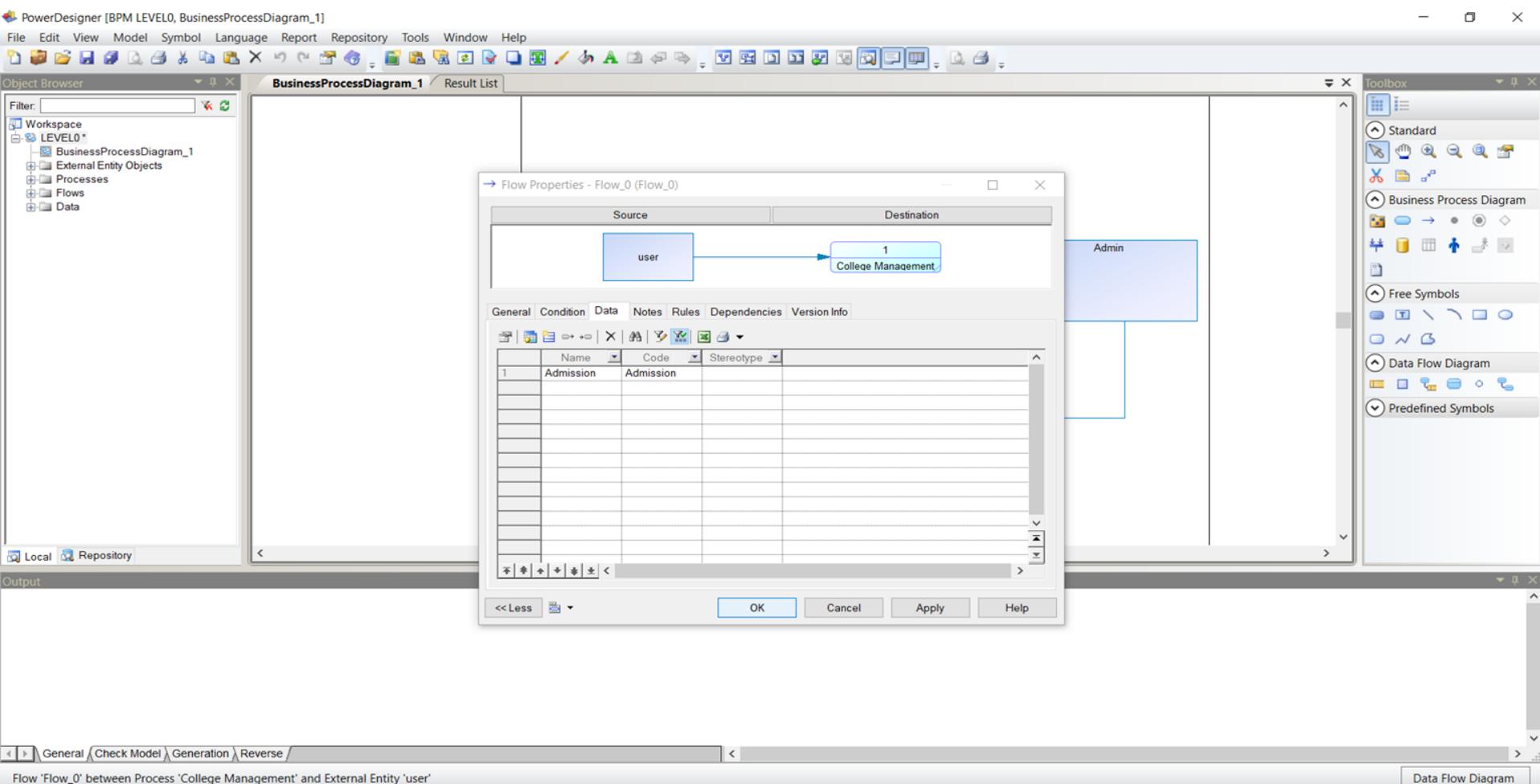
Local Repository

Output









## PowerDesigner [BPM LEVEL0, BusinessProcessDiagram\_1]

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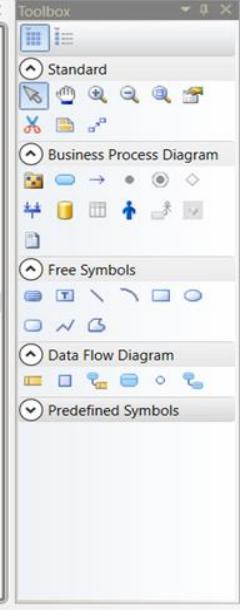
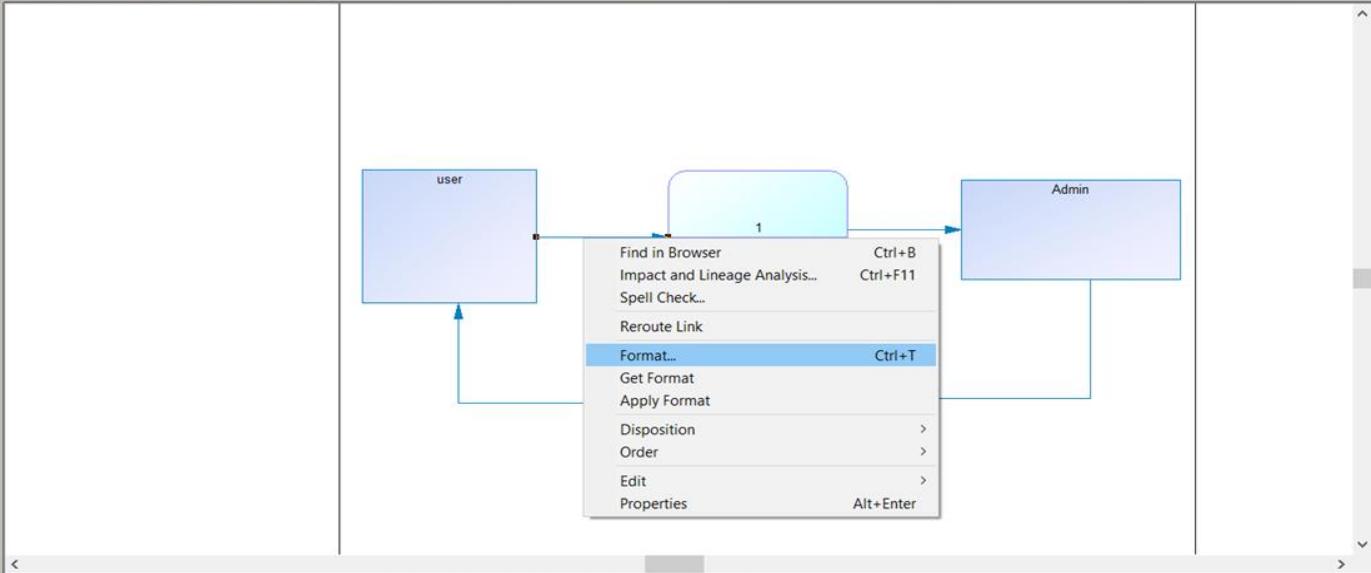


## Object Browser

Filter:  X

- Workspace
- LEVEL0\*
  - BusinessProcessDiagram\_1
  - External Entity Objects
  - Processes
  - Flows
  - Data

## BusinessProcessDiagram\_1 Result List



Local Repository

Output

General Check Model Generation Reverse

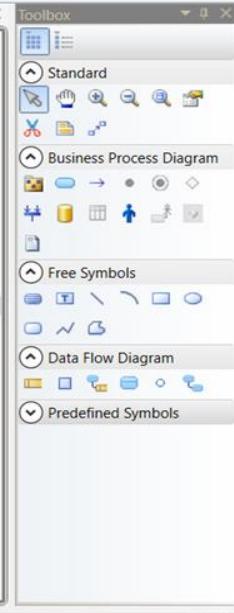
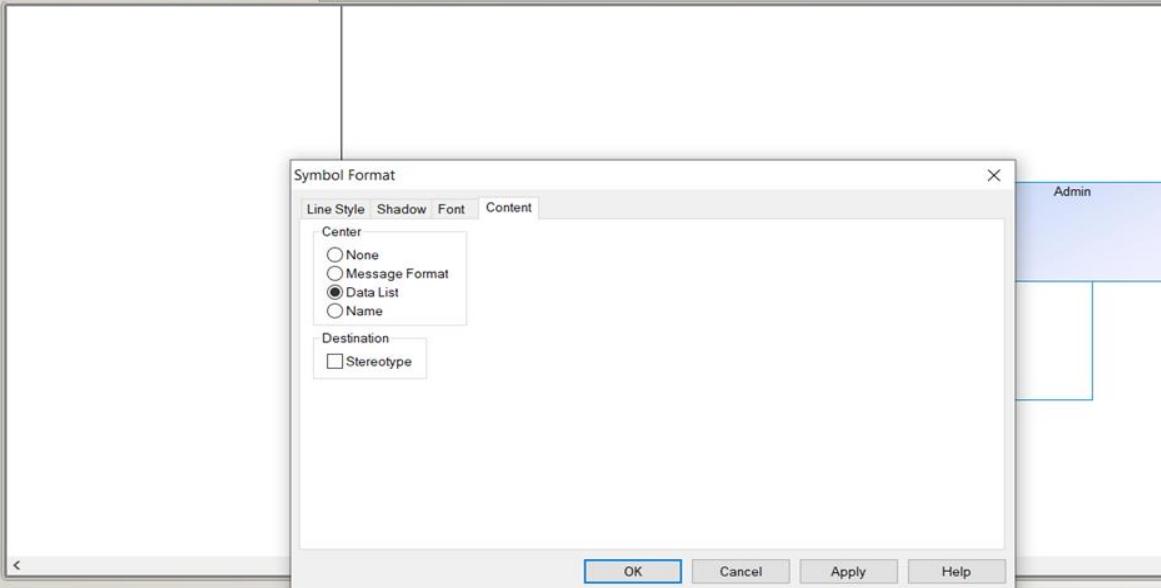
Data Flow Diagram



## Object Browser

- Filter:  X
- Workspace
  - LEVEL0 \*
    - BusinessProcessDiagram\_1
    - External Entity Objects
    - Processes
    - Flows
    - Data

## BusinessProcessDiagram\_1 Result List



## Local Repository

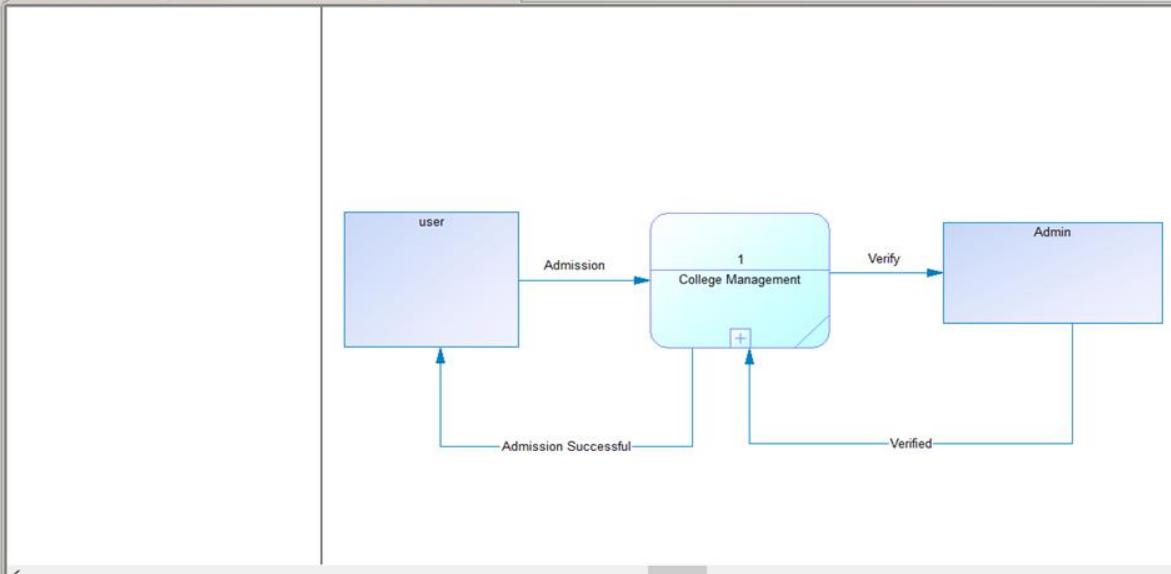
Output



## Object Browser

- Filter:
- Workspace
  - LEVEL0 \*
    - BusinessProcessDiagram\_1
    - External Entity Objects
    - Data Store Objects
    - Processes
    - Flows
    - Data
  - Data Flow Diagram\_2 \*
    - BusinessProcessDiagram\_1
    - External Entity Objects
    - Processes
    - Flows

## BusinessProcessDiagram\_1 BusinessProcessDiagram\_1 Result List



## Toolbox

- Standard
- Business Process Diagram
- Free Symbols
- Data Flow Diagram
- Predefined Symbols

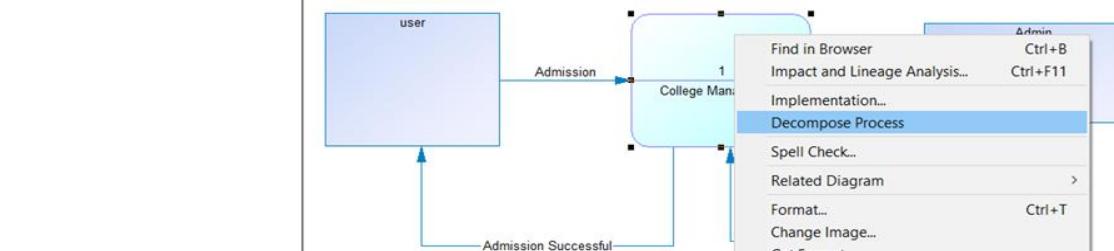
## Output



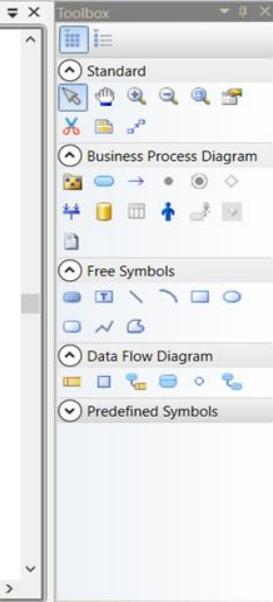
## Object Browser

- Filter:  X
- Workspace
  - LEVEL0\*
    - BusinessProcessDiagram\_1
    - External Entity Objects
    - Processes
    - Flows
    - Data

## BusinessProcessDiagram\_1 / Result List



- Admin Find in Browser Ctrl+B
- Impact and Lineage Analysis... Ctrl+F11
- Implementation...
- Decompose Process**
- Spell Check...
- Related Diagram >
- Format... Ctrl+T
- Change Image...
- Get Format
- Apply Format
- Adjust to Text Ctrl+J
- Disposition >
- Order >
- Edit
- Rename F2
- Properties Alt+Enter



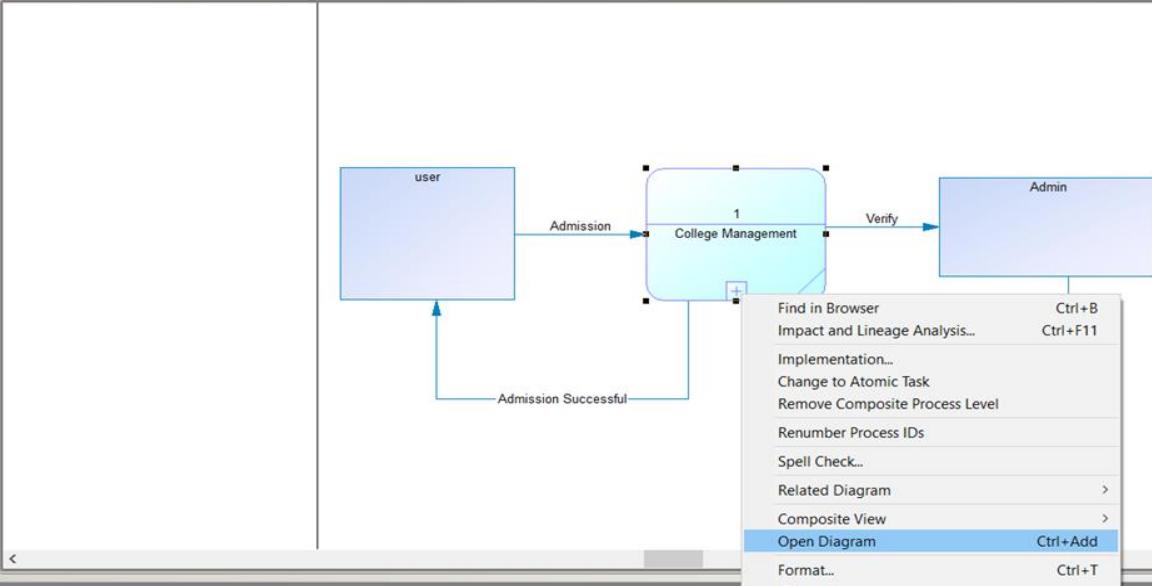
## Output



## Object Browser

- Filter:  X
- Workspace
  - LEVEL0\*
  - BusinessProcessDiagram\_1
  - External Entity Objects
  - Processes
  - Flows
  - Data

## BusinessProcessDiagram\_1 Result List



- Find in Browser
- Impact and Lineage Analysis...
- Ctrl+B
- Ctrl+F11

- Implementation...

- Change to Atomic Task

- Remove Composite Process Level

- Renumber Process IDs

- Spell Check...

- Related Diagram

- >

- Composite View

- >

- Open Diagram

- Ctrl+D

- Format...

- Ctrl+T

- Change Image...

- Get Format

- Apply Format

- Adjust to Text

- Ctrl+J

- Disposition

- >

- Order

- >

- Edit

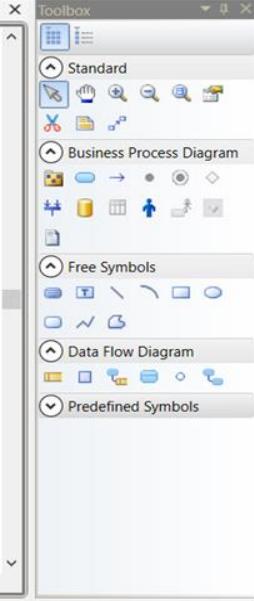
- >

- Rename

- F2

- Properties

- Alt+Enter



## Local Repository

## Output

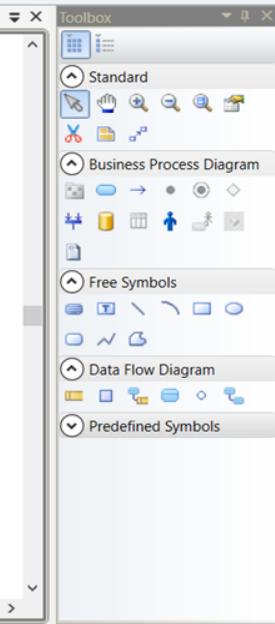
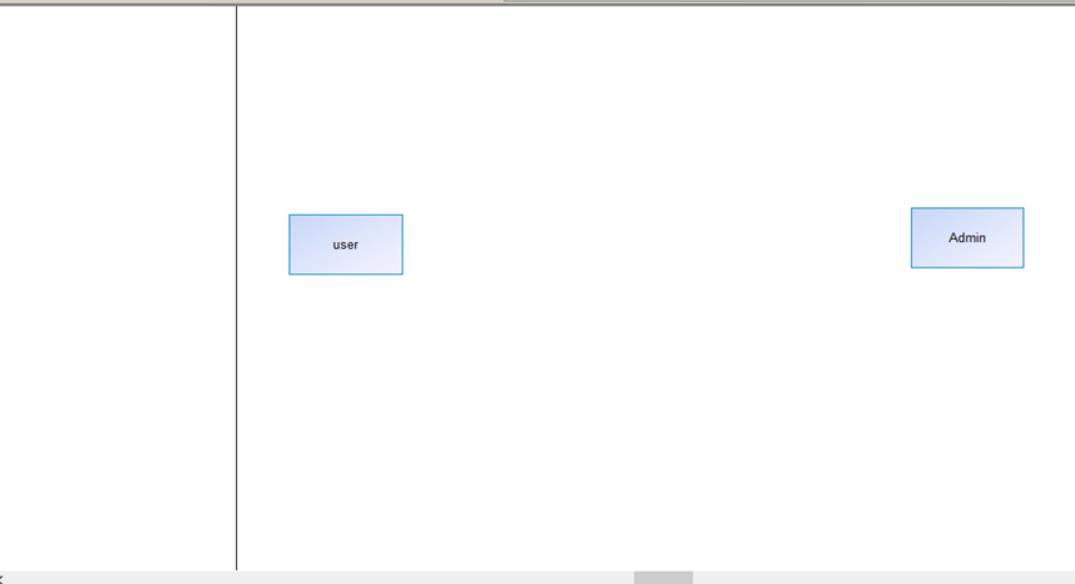


## Object Browser

Filter:

- Workspace
- LEVEL0\*
- BusinessProcessDiagram\_1
- External Entity Objects
- Processes
- Flows
- Data

## BusinessProcessDiagram\_1 BusinessProcessDiagram\_1 Result List



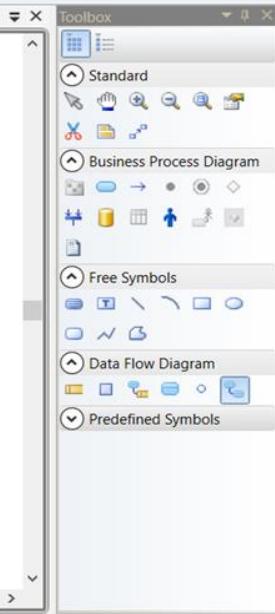
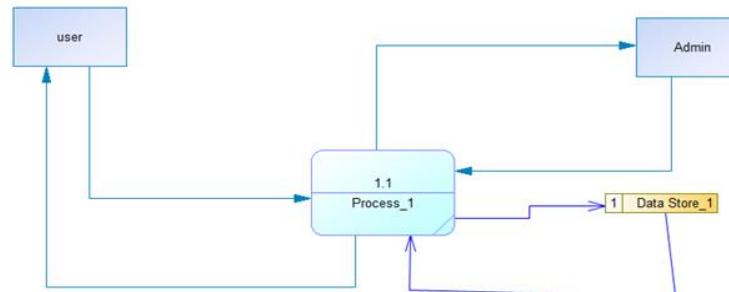
Local Repository

Output

## Object Browser

- Filter:
- Workspace
  - LEVEL0\*
    - BusinessProcessDiagram\_1
    - External Entity Objects
    - Data Store Objects
    - Processes
    - Flows
    - Data

## BusinessProcessDiagram\_1 / BusinessProcessDiagram\_1 / Result List



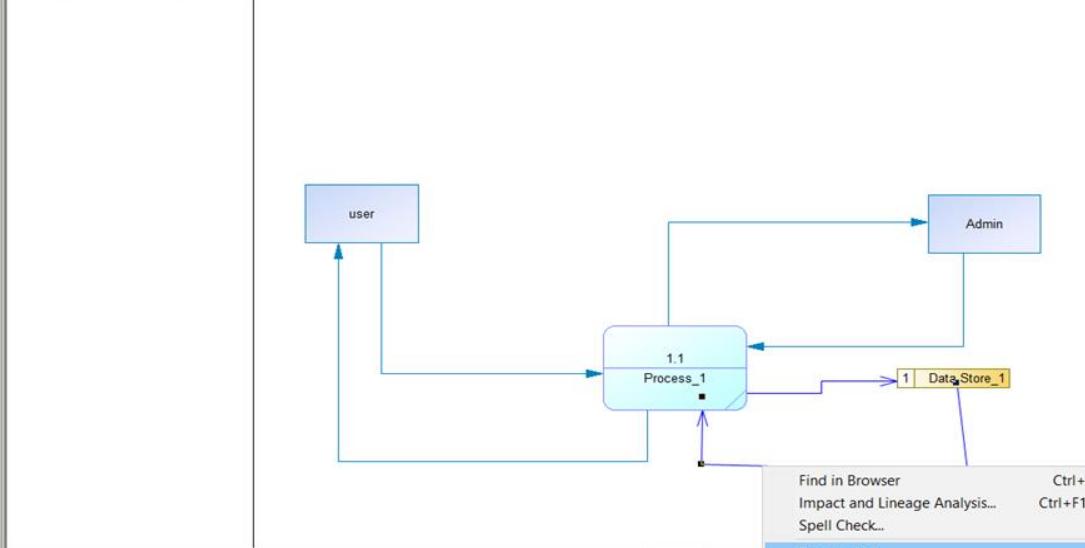
Local Repository

Output

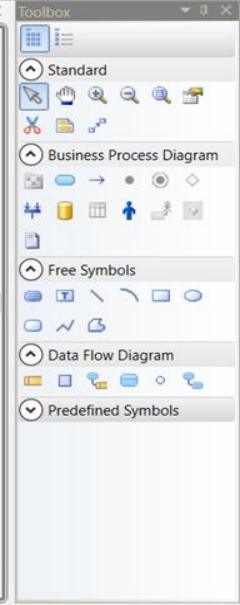


Filter:

- Workspace
- LEVEL0 \*
  - BusinessProcessDiagram\_1
  - External Entity Objects
  - Data Store Objects
  - Processes
  - Flows
  - Data



- Find in Browser Ctrl+B
- Impact and Lineage Analysis... Ctrl+F11
- Spell Check...
- Reroute Link
- Format... Ctrl+T
- Get Format
- Apply Format
- Disposition >
- Order >
- Edit >
- Properties Alt+Enter



Local Repository

Output



## Object Browser

- Filter:
- Workspace
  - LEVEL0\*
  - BusinessProcessDiagram\_1
    - External Entity Objects
    - Data Store Objects
    - Processes
    - Flows
    - Data

## BusinessProcessDiagram\_1 / BusinessProcessDiagram\_1 / Result List

Flow Properties - Flow\_4 (Flow\_4)

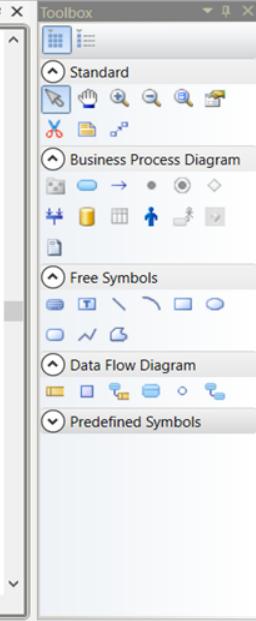
Source	Destination
user	1.1 Process 1

General Condition Data Notes Rules Dependencies Version Info

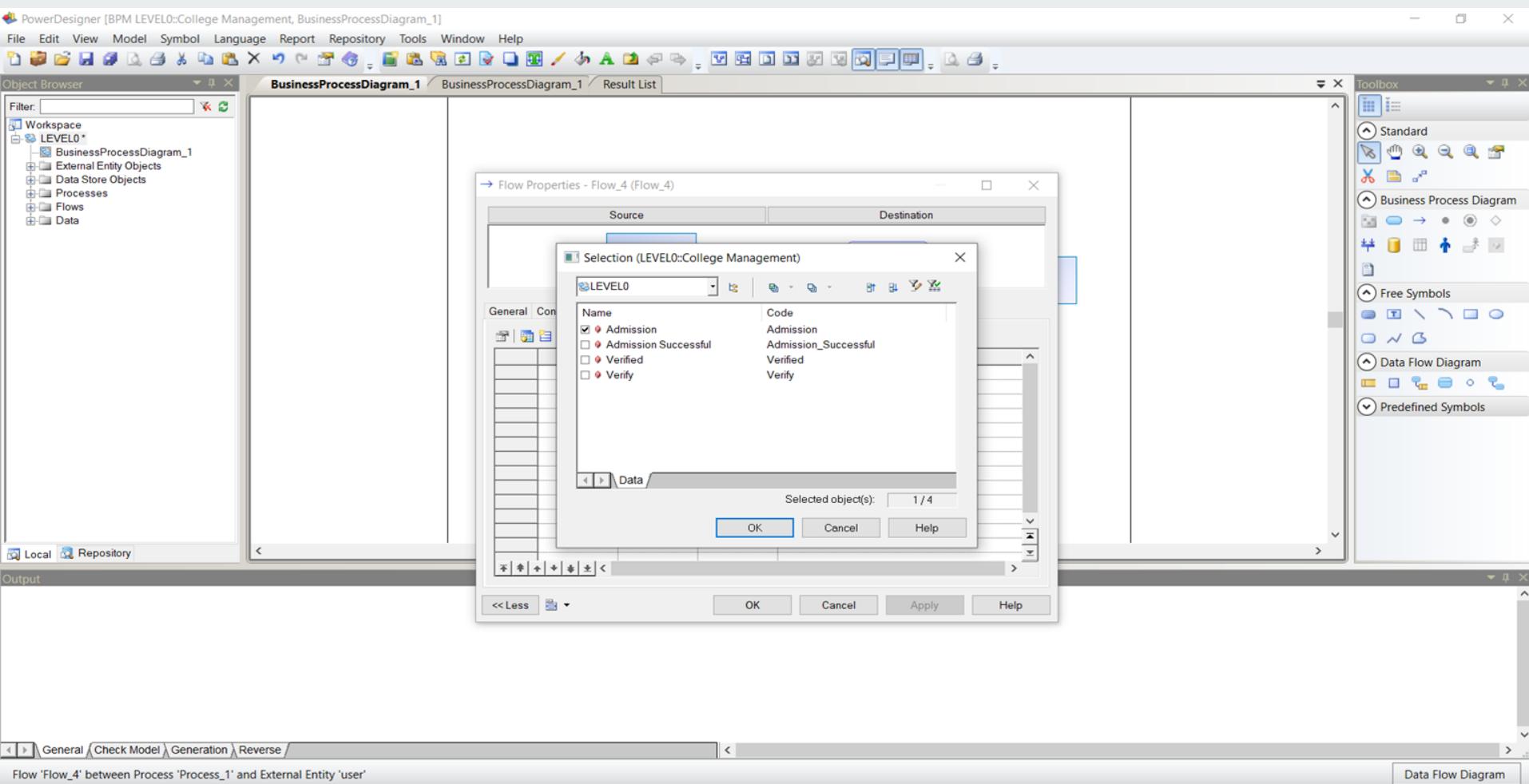
Add Objects (Ctrl+Add) Stereotype

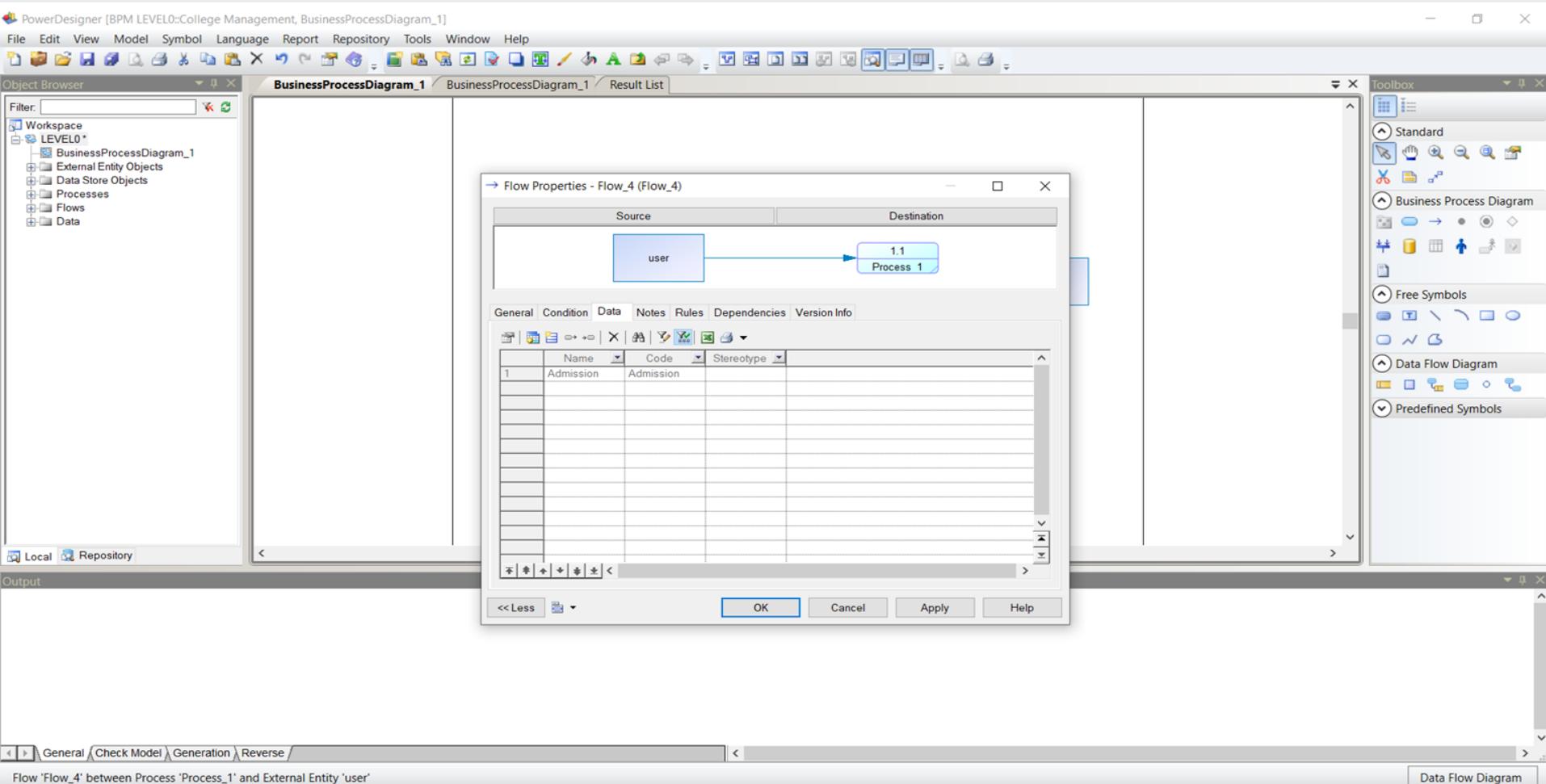
<< Less OK Cancel Apply Help >>

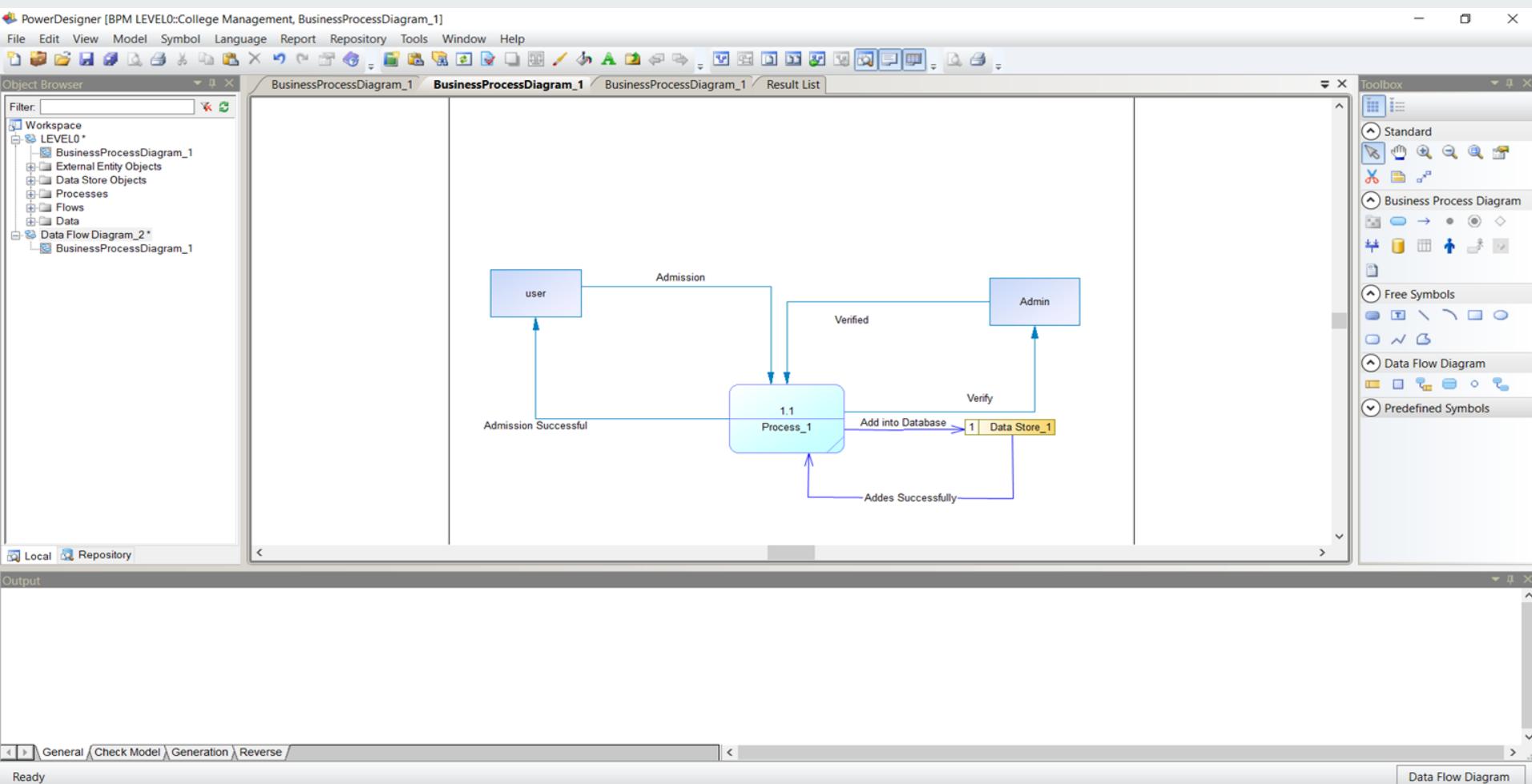
Flow 'Flow\_4' between Process 'Process\_1' and External Entity 'user'



## Output









## Object Browser

- Filter:
- Workspace
  - LEVEL0\*
  - BusinessProcessDiagram\_1
    - External Entity Objects
    - Data Store Objects
    - Processes
    - Flows
    - Data
  - Data Flow Diagram\_2\*
    - BusinessProcessDiagram\_1
      - External Entity Objects
      - Processes
      - Flows

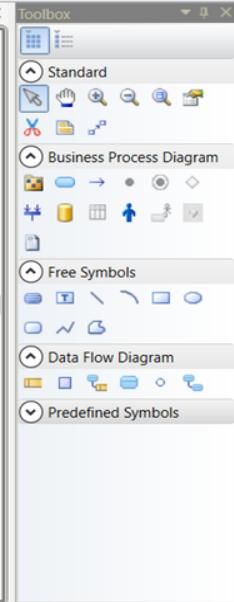
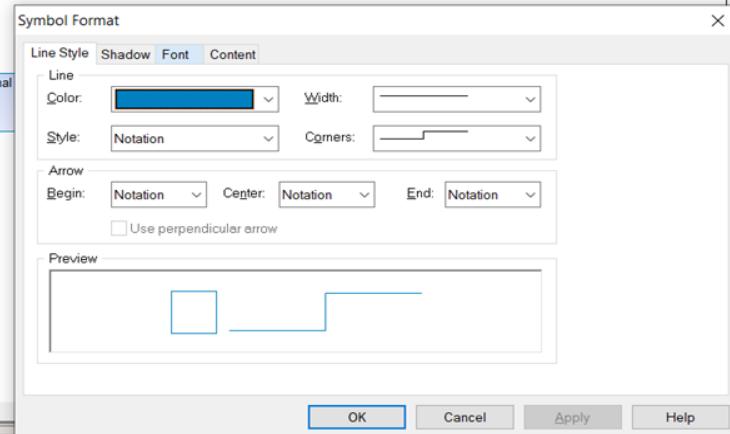
## BusinessProcessDiagram\_1

## BusinessProcessDiagram\_1

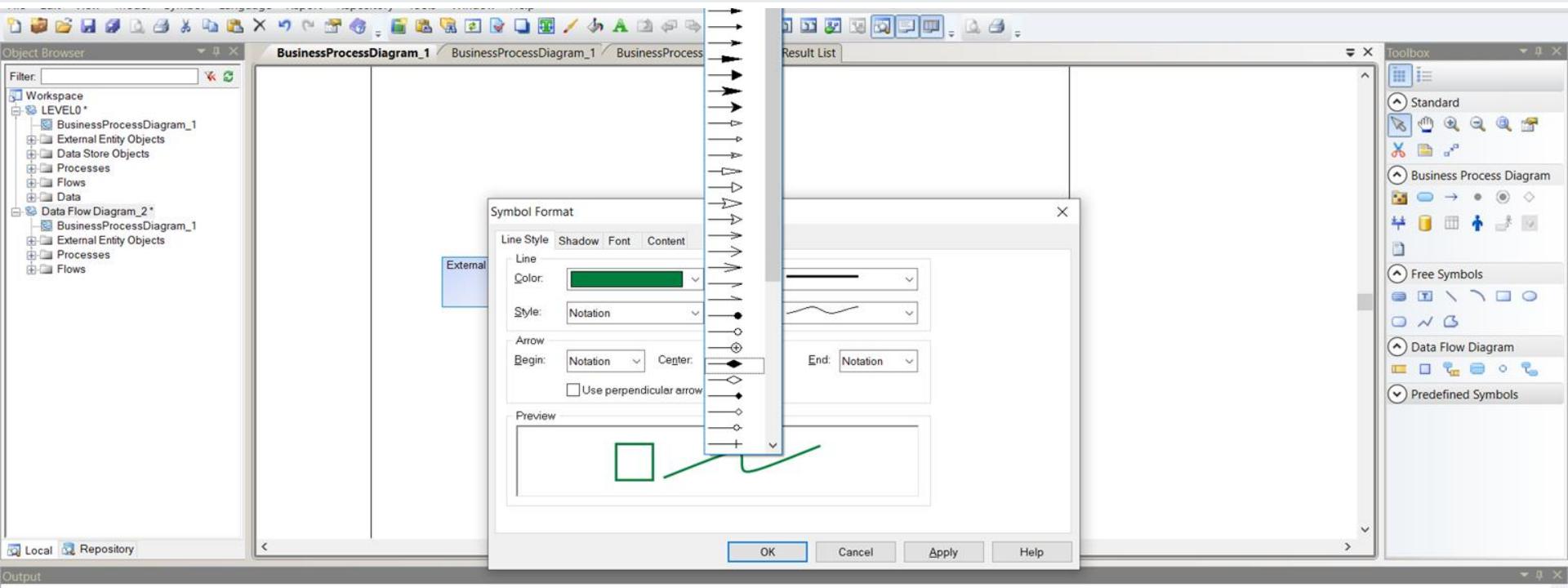
## BusinessProcessDiagram\_1

## Result List

External



## Output



Flow 'Flow\_1' between External Entity 'External\_Entity\_2' and Process 'Process\_1'



## Object Browser

Filter:  X

Workspace  
LEVEL0\*  
BusinessProcessDiagram\_1  
External Entity Objects  
Data Store Objects  
Processes  
Flows  
Data  
Data Flow Diagram\_2\*  
BusinessProcessDiagram\_1  
External Entity Objects  
Processes  
Flows

## BusinessProcessDiagram\_1 BusinessProcessDiagram\_1 BusinessProcessDiagram\_1 Result List

Symbol Format

Size Line Style Fill Shadow Font Custom Shape Content

Current size (pixel)

Width: Height: 

Normal size (pixel)

Width: Height: 

- Auto adjust to text  
 Keep aspect ratio  
 Keep center  
 Keep size

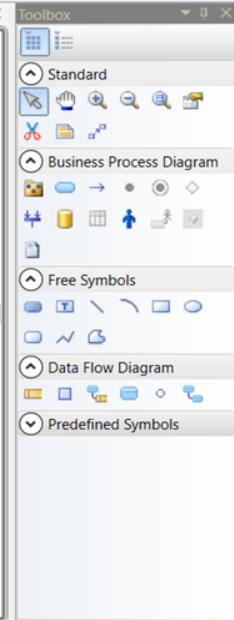
OK

Cancel

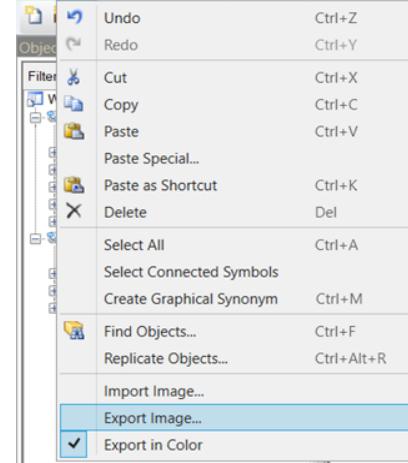
Apply

Help

## Toolbox



## Output



## ProcessDiagram\_1 BusinessProcessDiagram\_1 Result List

