Overview

In this tutorial we will explain the basic symbols used in a data flow diagram, initialize a new diagram and create a context diagram depicting a Reservation System.

What is a Data Flow Diagram (DFD)?

A data flow diagram is a graphical process model that shows all the main requirements an information system in on diagram. It depicts 1 Inputs  2 Outputs  3 Processes, and 4 Data Storage entities.

A key advantage of a DFD is that it easy to read and understand with minimal training or technical background.

The symbols used in a DFD are as follows:

- **Process**
- **External Interactor**
- **Data Store**
- **Data Flow**
City Lights Bed and Breakfast – Case Study

Potential visitors to the Twin Cities call up City Lights Bed and Breakfast to inquire as to available locations to stay in over their visit to Minneapolis/St. Paul, MN. Each caller is interviewed over the phone by a bookings clerk. If the caller is interested in using the reservation service, the bookings clerk records the inquiry (the desired dates of arrival and departure, location and accommodation preferences) as a reservation request for the potential guest.

The bookings clerk then identifies host accommodations that may be suitable to fulfill the reservation request. Accommodations are referenced against the current host location bookings schedule to determine if they are available during the time period that the potential guests intend to stay in the Twin Cities. After finding suitable host accommodations that appear to be available at the requested time period, the bookings clerk contacts the host to verify if the desired accommodations are available and confirm that guest demographics (as described during the initial intake survey) contain no disqualifying criteria and meet with the hosts approval.

If all conditions are satisfactory, i.e. the dates are available and the host is willing to approve their stay, the bookings clerk now contacts the potential guests to confirm that the location is suitable and the guest wishes to authorize completion of the reservation transaction. With the guest’s approval, the clerk submits the guest’s credit card information to initialize a reservation transaction.

After confirming the credit card information electronically (via the Credit Card Bureau) and recording the reservation, the bookings schedule is updated and notification is sent to the host confirming the booking, along with the details of the stay. Concurrently, a final reservation confirmation (letter or fax) is dispatched the guest.

Creating a Context Diagram

Five steps are involved:

1. Identify one process that will be placed in the middle of the diagram to represent the total information processing system. This central information process, contained within an automation boundary, will be called the System Process.

2. Identify all potential actors from the case study narrative that produce or consume data from the system. These actors are called External Entities.

3. Identify primary potential stores of data used by the system its transactions. These are called Data Stores.

4. Brainstorm and elaborate all potential streams of data that flow to and from the System Process, i.e. to or from the External Entities and Data Stores). These are called Data Flows and must always flow into or out of a process.

5. Eliminate those external entities which do not have any Data Flows connecting them to the System Process.
How to Create our DFD in MS Visio

The System Process

Since this is a context diagram, our first step is to insert a single System Process in the center of our diagram. This automation boundary will represent the total reservation system of City Lights B&B.

2. From the Shapes Window Pane, drag the Data Process item to the center of the workspace grid. Double-click on the shape to name it City Lights B&B Reservation System.
The External Entities

DFD also contains “External Entities” that are producers and consumers of data transformed by processes. A context DFD depicts all the significant External Entities that either input Data Flows for the system to process, or consume Data Flows that are output from the system.

In our Case Study narrative, there are three such actors or External Entities: The (potential) Guest, the Host, and the Bookings Clerk (who mediates and facilitates between the other two).

3. Drag three External Entity items from the Shapes Window Pane to the workspace grid. Double-click on the shapes, one at a time, labeling them Guest, Clerk and Host respectively.

The Data Stores

DFD’s also contain “Data Stores” that represent flows of data that have been stored for a while prior to being used again, or more simply data flows in storage. (Think of them like a database or file cabinet). If we identify the Data Stores in our case study, we find that we there are two: The Host Location Booking Schedule (mentioned explicitly), and the Credit Card Bureau (implied in the process of payment confirmation from an external source).

4. Drag two Data Store items from the Shapes Window Pane to the workspace grid. To add text, click Insert on the Menu bar and select Text Box.
The Data Flows

Data Flows operate in one of two directions, and can be considered from different perspectives. The Visitors perspective includes “Producing” data flows, such as: ✔ Reservation Request and ✔ Payment Information; as well as “Receiving” data flows, such as: ✔ Potential Booking Options and ✔ Confirmation of a Completed Booking.

The Host’s perspective includes “Producing” data flows, such as: ✔ Confirmation of host location availability and ✔ Confirmation of Reservation Suitability; as well as “Receiving” data flows, such as: ✔ Reservation Request and ✔ Request for Suitability/Availability approval.

“Other” data flows include: ✔ Confirmation of Credit Card information, ✔ Potential availability of Host Location, and ✔ Completed Reservation.

Note: In Visio, data flows can be represented by a curved connector or a straight-lined/angular connector. In this tutorial, we will be using the straight-lined/angular which is the default connector that the connector tool supplies:

To use the connector tool, first, click the button on the toolbar; second, use the mouse to draw the connection, in the appropriate direction, on Visio work space grid.
In the next set of steps, we will place data flows onto the diagram, identifying those flows from the perspectives of each external entity, according to the case narrative:

5. Draw the following data flows from the **Guest’s Perspective:**
   - Reservation Request \((guest, \text{producing})\)
   - Payment Information \((guest, \text{producing})\)
   - Potential Booking \((guest, \text{receiving})\)
   - Confirmation of Completed Booking \((guest, \text{receiving})\)

![Guest's Perspective Diagram](image)

6. Draw the following data flows from the **Host’s Perspective:**
   - Reservation request Availability Confirmation \((host, \text{producing})\)
   - Reservation (location/dates etc.) Suitability Confirmation \((host, \text{producing})\)
   - Request for Availability/Suitability confirmation \((host, \text{receiving})\)
   - Request for Booking Confirmation \((host, \text{receiving})\)

![Host's Perspective Diagram](image)
Based on our narrative … the potential availability of a Host location is looked up by the Bookings Clerk in the Host Locations Booking Schedule data store. Similarly, the completed reservation is posted back to the Schedule by the Clerk.

7. Draw the following **Other** data flows:

- Reservation request Availability Confirmation (*host, producing*)
- Reservation (location/dates etc.) Suitability Confirmation (*host, producing*)
- Request for Availability/Suitability confirmation (*host, receiving*)
- Request for Booking Confirmation (*host, receiving*)

However, a closer look at the above diagram reveals that it is in violation of our key rule: **All data must flow to, or from, a process!** Stated differently, the DFD only shows data that undergoes transformation. Both of these data flows are in violation of this rule, since the Clerk does not represent a process, nor does any data get transformed through him/her.

Therefore, the next step is to **Delete the Clerk 1**, and present the data flow, rather as in 2:
8. Similarly, draw the following **Other** data flows:

- Confirmation of Credit Card Information (*system receiving from external data store*)
The Final Product

In this tutorial then, we learned how to construct a context data flow diagram.

In Part II - the next tutorial, we will learn how to construct a Level 0 DFD which depicts the processes and data flows at the next granular level of detail; and further refine our context diagram using some advanced rules of DFD presentation.
Creating an Intersection Table in a Relational Database