

# Systems Modelling and Simulation (Lab session 1)

In this session we will cover:

1. The Arena simulation software environment.
2. Simulation project concepts such as *Entities*, *Resources*, *Queues*, *Attributes*, *Variables*, and *Statistical accumulators* in Arena.
3. *Flowchart* and *data* modules in Arena
4. The *Create*, *Process*, and *Dispose* modules in Arena.
5. Building and running a simple simulation model discuss the results of a simulation run.



# Run sample models

- Flexible manufacturing system
- Accident and Emergency Department
- Noise exposure demo



# Introduction to Arena

- A quick tour of the Arena environment
- Recap of basic concepts
- The three (3) basic modules
- Building your first model
- Before you run the model
- Running the model
- Viewing the results

# The Arena environment

The screenshot displays the Arena software interface for a project titled "Arena - [Model 03-01]". The interface includes a menu bar (File, Edit, View, Tools, Arrange, Object, Run, Window, Help), a toolbar, and a Project Bar on the left. The Project Bar lists categories like Advanced Transfer, Advanced Process, and Basic Process, with various icons for creating, disposing, processing, deciding, batching, separating, assigning, recording, and defining entities, resources, and variables. The "Separate" and "Queue" icons are circled in red and blue, respectively. The main Model Window is split into two views: a Flowchart View at the top and a Spreadsheet View at the bottom. The Flowchart View shows a process flow for "Model 3-1: A Simple Processing System" with steps: "Part Arrives to System", "Drilling Center", and "Part Leaves System". The Spreadsheet View displays two graphs: "Drilling Center Queue: Number Waiting" and "Drill Press: Number Busy", both plotted against "Time (Minutes)" from 0 to 20. The status bar at the bottom indicates "For Help, press F1" and the coordinates "(664, 2958)".

**Project Bar**

**Toolbars**

**Flowchart module**

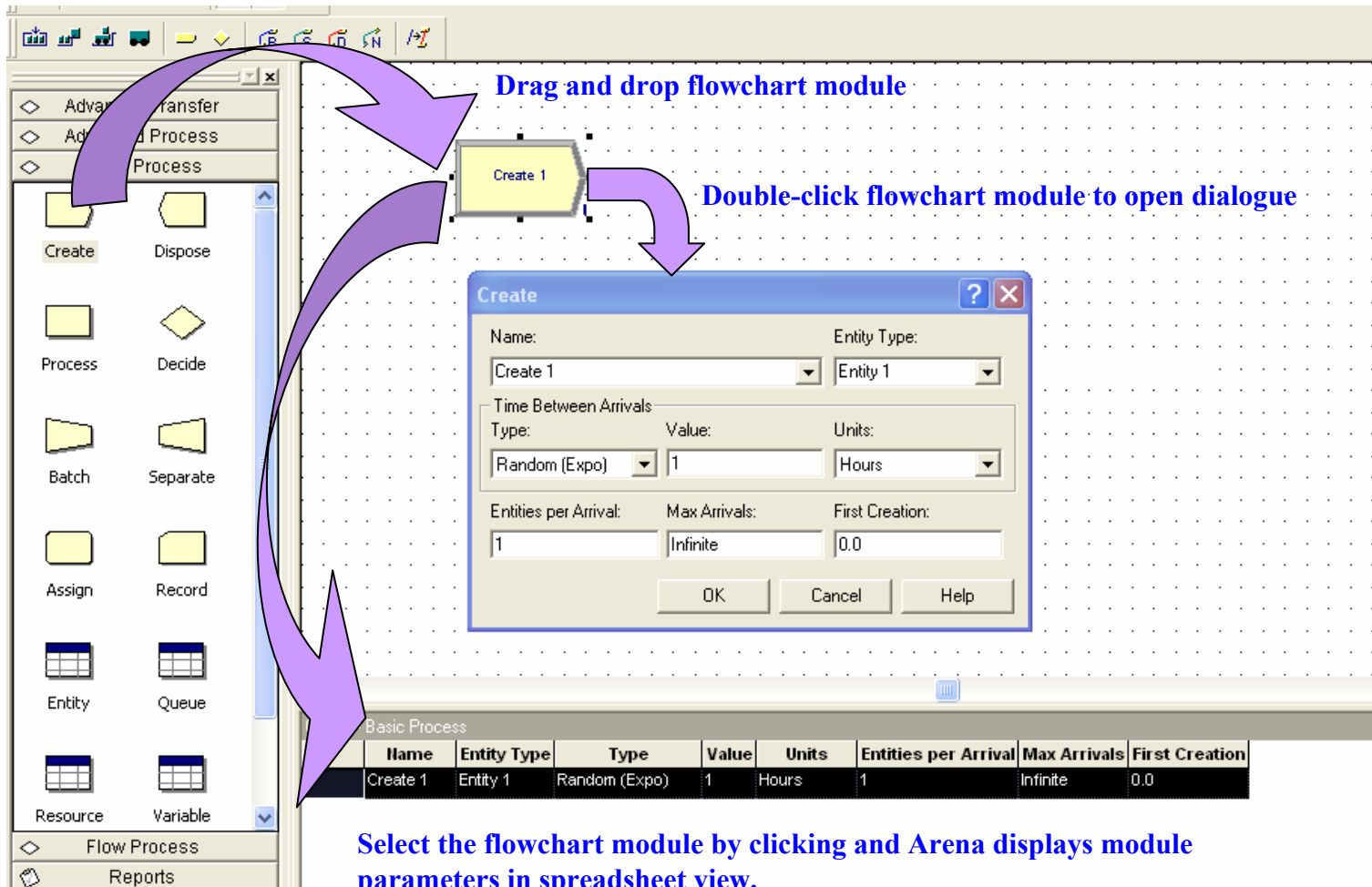
**Data module**

**Model Window Flowchart View**

**Model Window Spreadsheet View**

**Status Bar**

# Placing modules



**Drag and drop flowchart module**

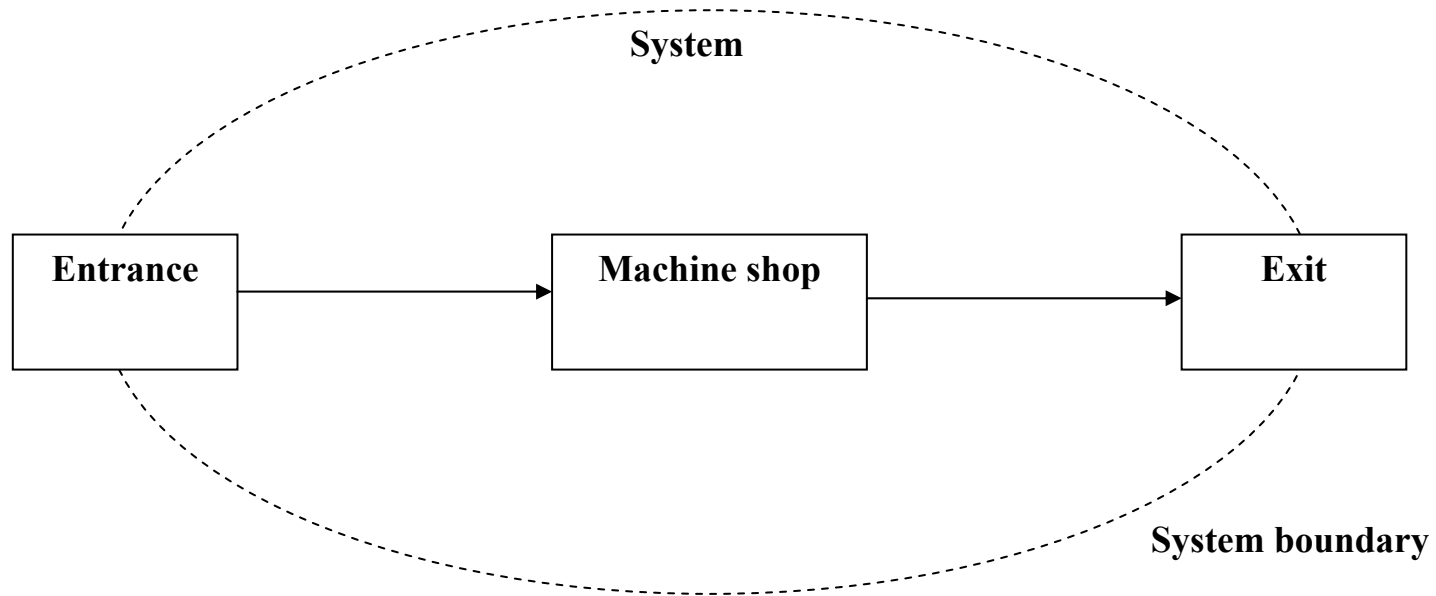
**Double-click flowchart module to open dialogue**

**Select the flowchart module by clicking and Arena displays module parameters in spreadsheet view.**

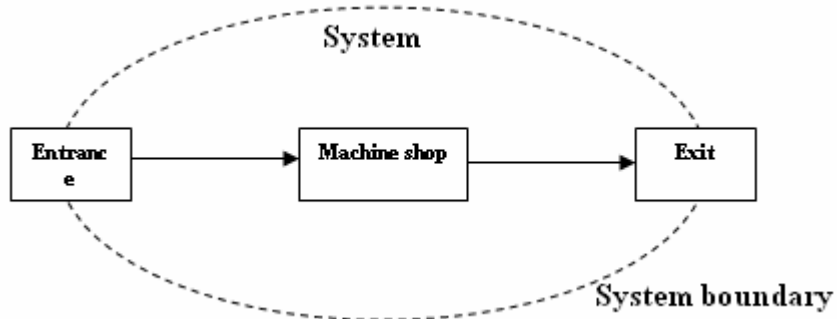
| Name     | Entity Type | Type          | Value | Units | Entities per Arrival | Max Arrivals | First Creation |
|----------|-------------|---------------|-------|-------|----------------------|--------------|----------------|
| Create 1 | Entity 1    | Random (Expo) | 1     | Hours | 1                    | Infinite     | 0.0            |

# Recap of basic concepts (1)

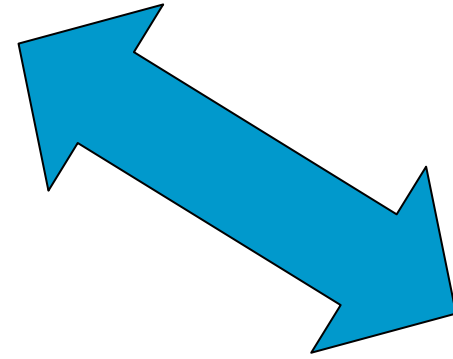
- System



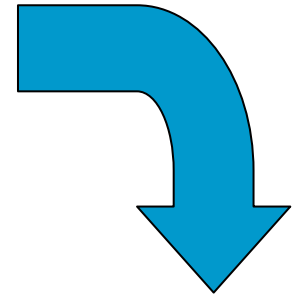
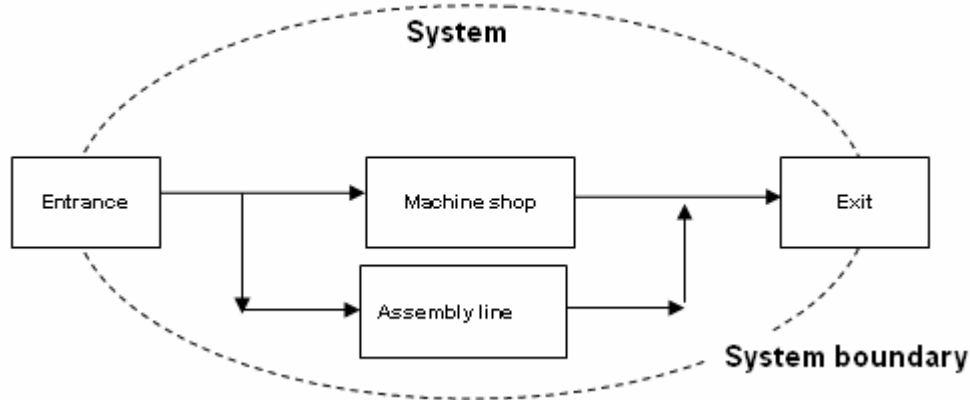
# A modelling approach



MODEL

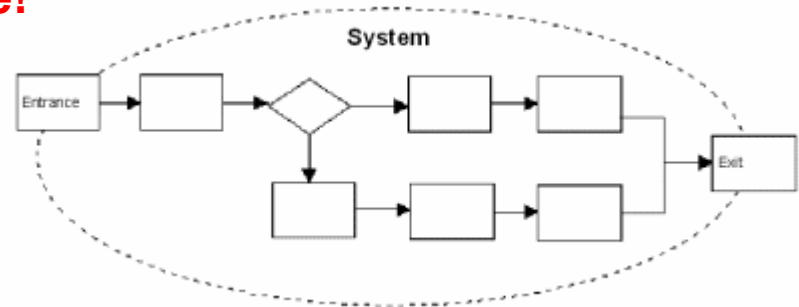


REAL SYSTEM



**It is best to build in a progressive style!**

**It's a journey to reality**





# Recap of basic concepts (2)

- Entities
- Resources
- Queues
- Attributes
- Variables
- Statistical accumulators

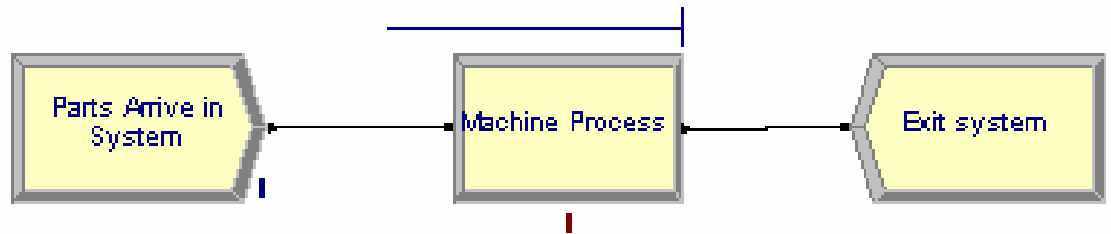




# The three (3) basic modules

- **Create:**
  - Entry point of entities into system
- **Process:**
  - Work is done on entities
- **Dispose:**
  - Exit point for entities from system

# The three (3) basic modules





# Build your first model

- **Before you run the model**
  - Run setup
- **Run the model**
- **View the results**
  - Siman summary report
  - Category overview