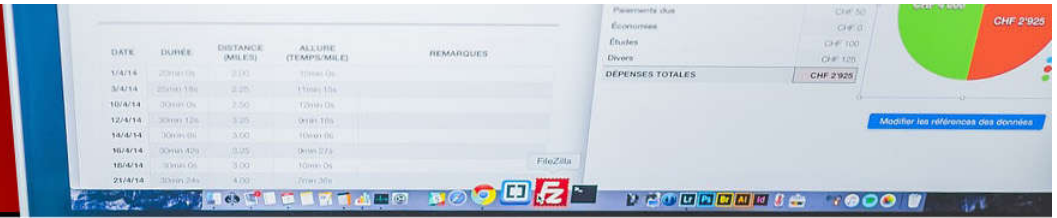


Simulación de Eventos Discretos



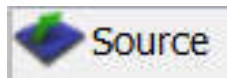
Estructura del Curso

- 1.- Simulación
- 2.- Sistemas, Procesos y Modelos
- 3.- Recomendaciones para Proyectos
- 4.- Generación de Números Aleatorios
- 5.- Método de Montecarlo
- 6.- Generación de Variables Aleatorias
- 7.- Modelación de Datos de Entrada
- 8.- Modelo Conceptual Operacional
- 9.- Diseño de Experimentos



Terminología en Flexsim

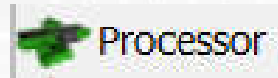
- Objetos de Flexsim



Source



Queue



Processor



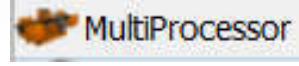
Sink



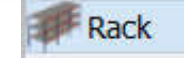
Combiner



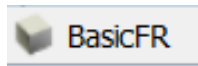
Separator



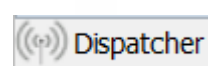
MultiProcessor



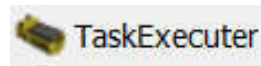
Rack



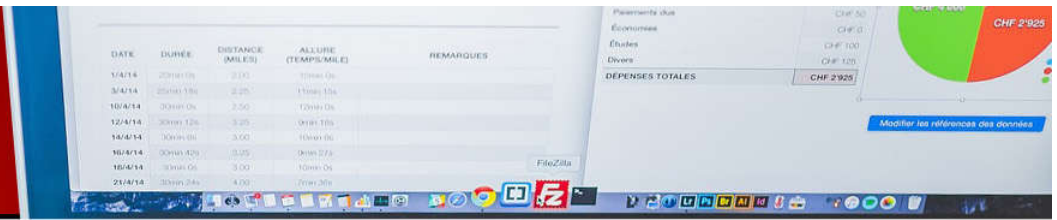
BasicFR



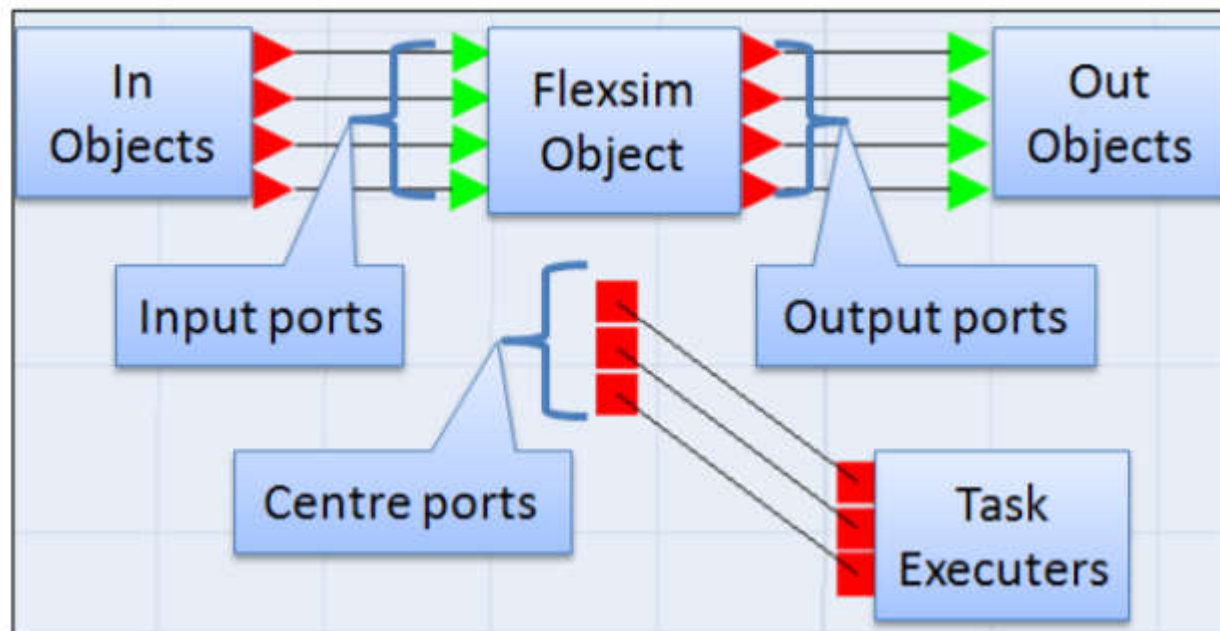
Dispatcher



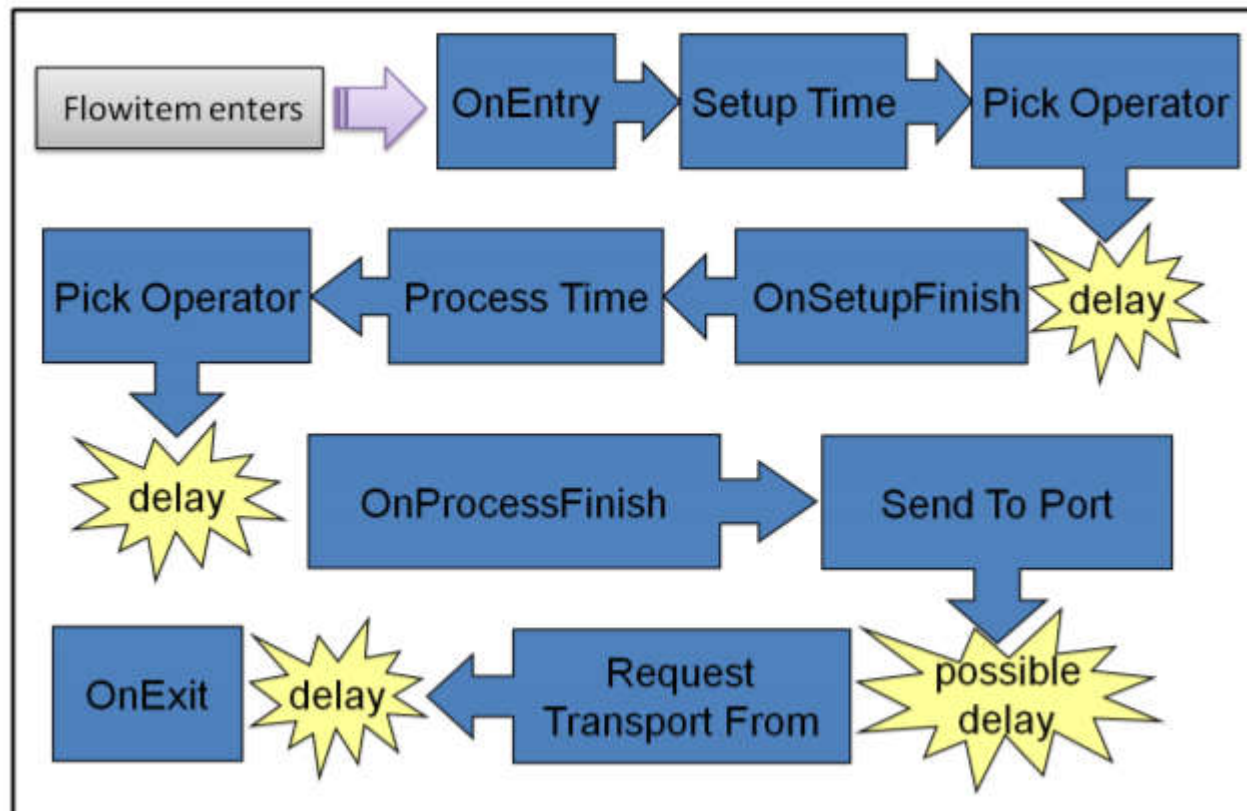
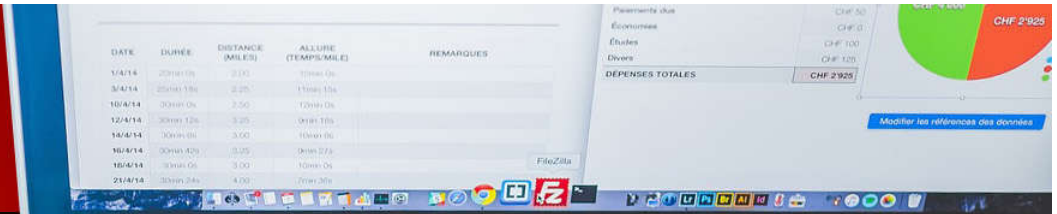
TaskExecutor



Terminología en Flexsim

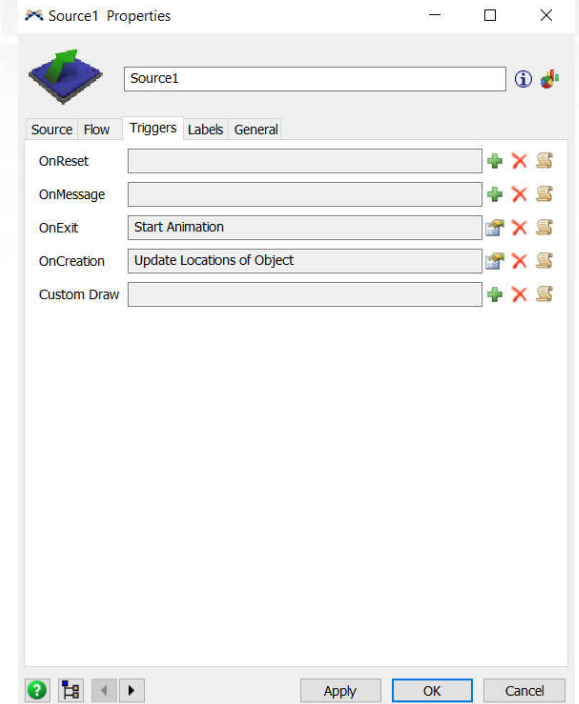
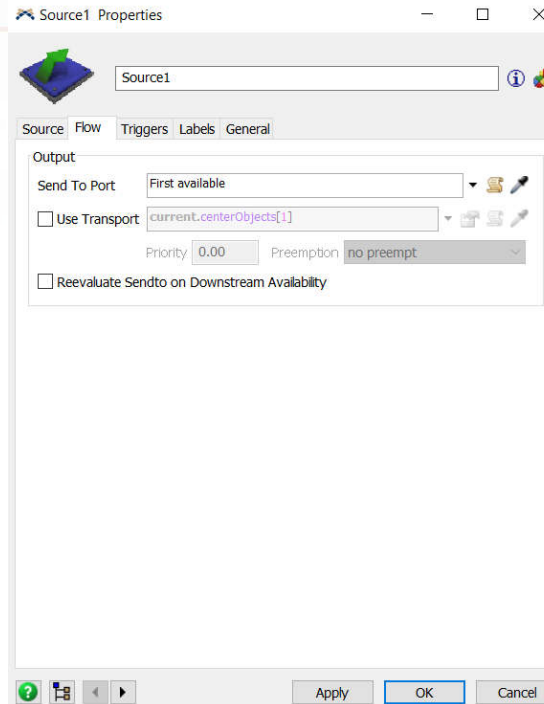
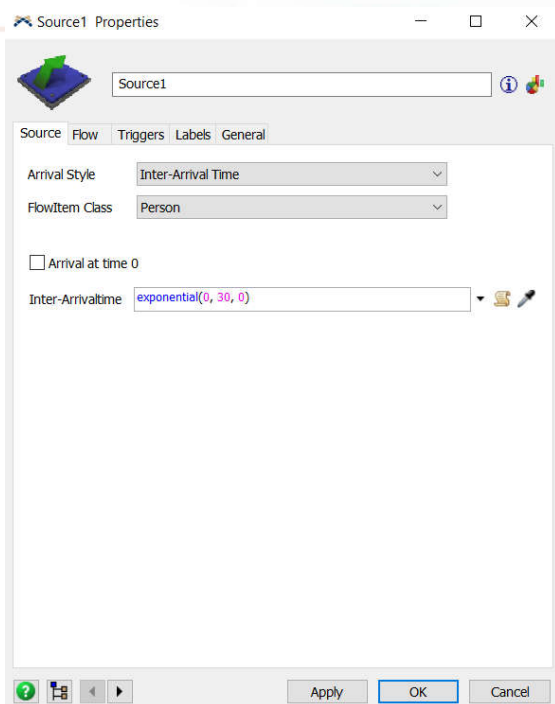


Terminología en Flexsim



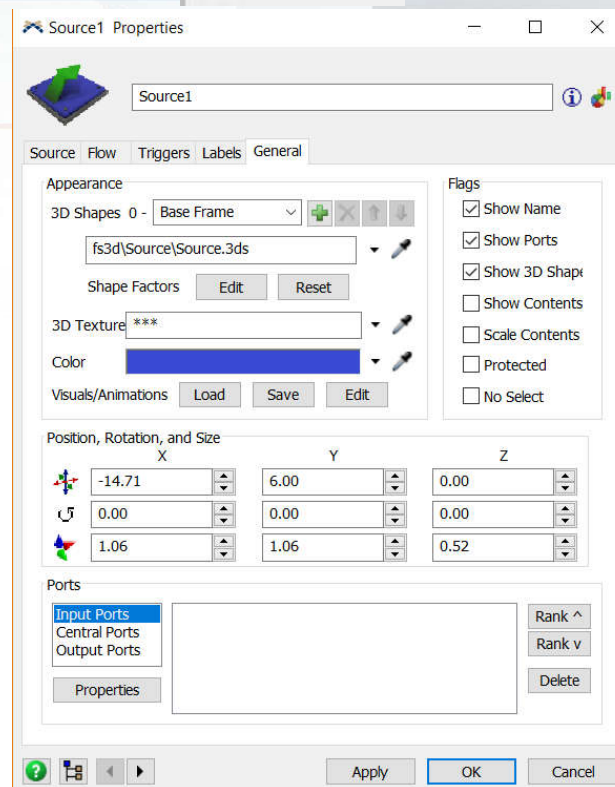
Terminología en Flexsim

- Source



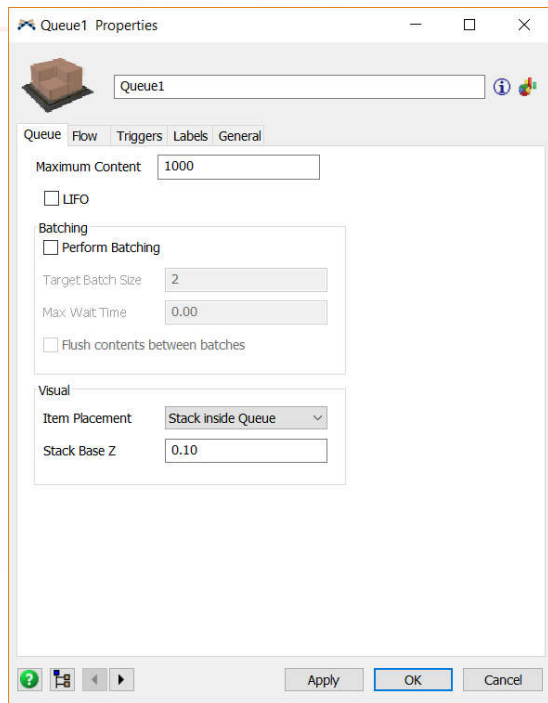
Terminología en Flexsim

- Source



Terminología en Flexsim

- Queue



Queue1 Properties

Queue1

Queue Flow Triggers Labels General

Maximum Content: 1000

☐ LIFO

Batching

☐ Perform Batching

Target Batch Size: 2

Max Wait Time: 0.00

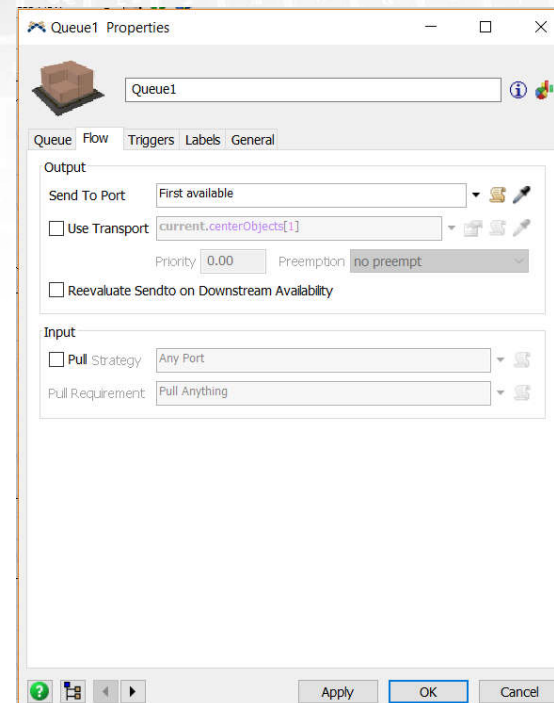
☐ Flush contents between batches

Visual

Item Placement: Stack inside Queue

Stack Base Z: 0.10

Apply OK Cancel



Queue1 Properties

Queue1

Queue Flow Triggers Labels General

Output

Send To Port: First available

☐ Use Transport: current.centerObjects[1]

Priority: 0.00 Preemption: no preempt

☐ Reevaluate Sendto on Downstream Availability

Input

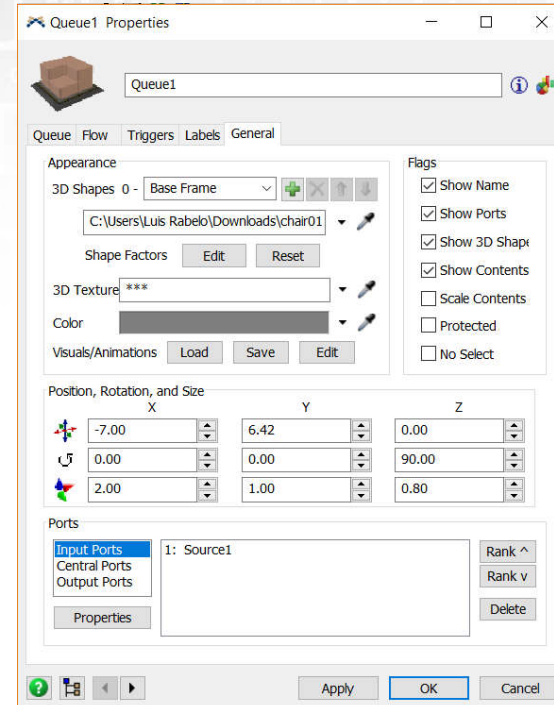
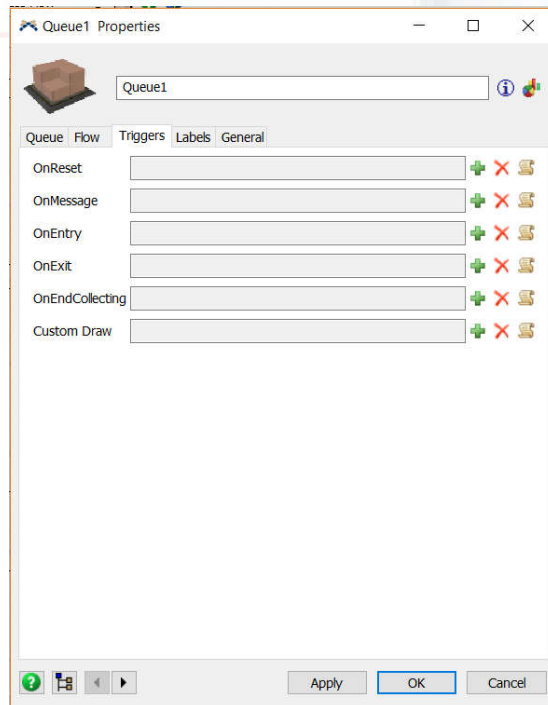
☐ Pull Strategy: Any Port

Pull Requirement: Pull Anything

Apply OK Cancel

Terminología en Flexsim

- Queue



Terminología en Flexsim

- Processor

Processor1 Properties

Processor Breakdowns Flow Triggers Labels General

Maximum Content: 1 ☒ Convey Items Across Processor Length

Setup Time: 0 ☐ Use Operator(s) for Setup Number of Operators: 1 ☒ Use Setup Operator(s) for both Setup and Process

Process Time: 20 ☐ Use Operator(s) for Process Number of Operators: 1

Pick Operator: currentCenterObjects[1] Priority: 0.00 Preemption: no preempt

Apply OK Cancel

Processor1 Properties

Processor Breakdowns Flow Triggers Labels General

This object is a member of the following MTBF MTTR's:

Remove Add... Edit

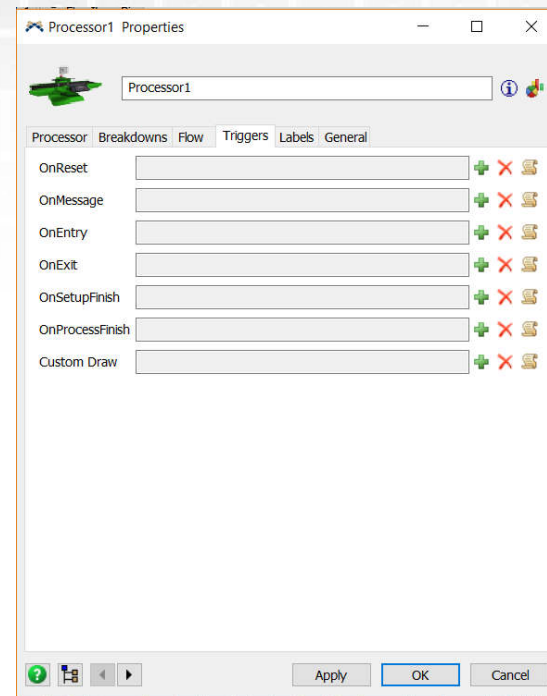
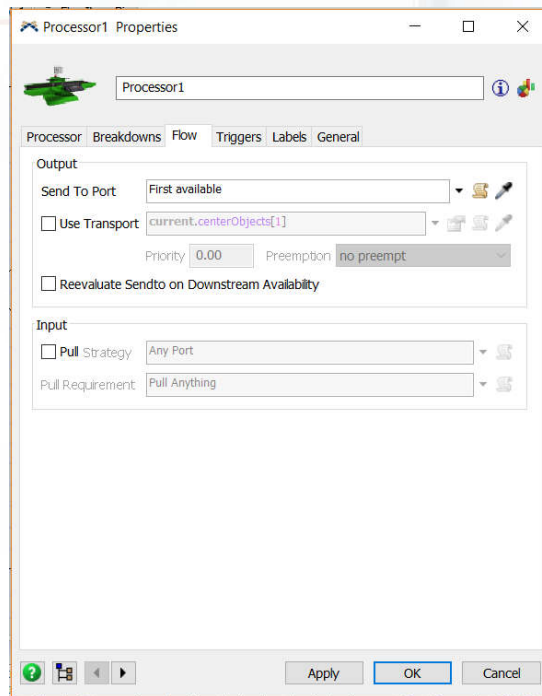
This object is a member of the following Time Tables:

Remove Add... Edit

Apply OK Cancel

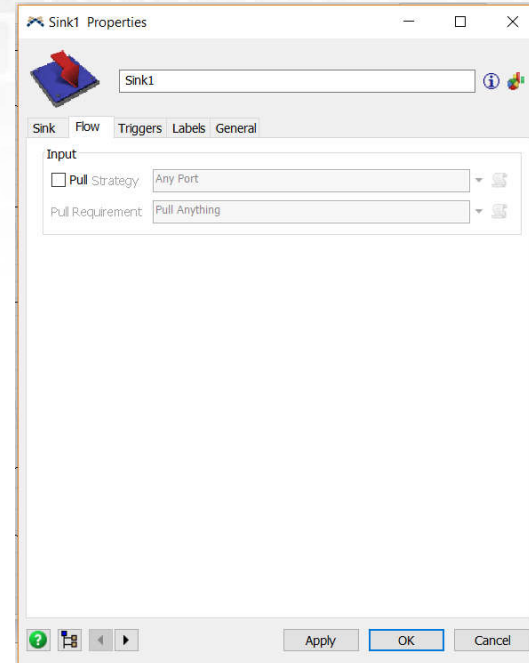
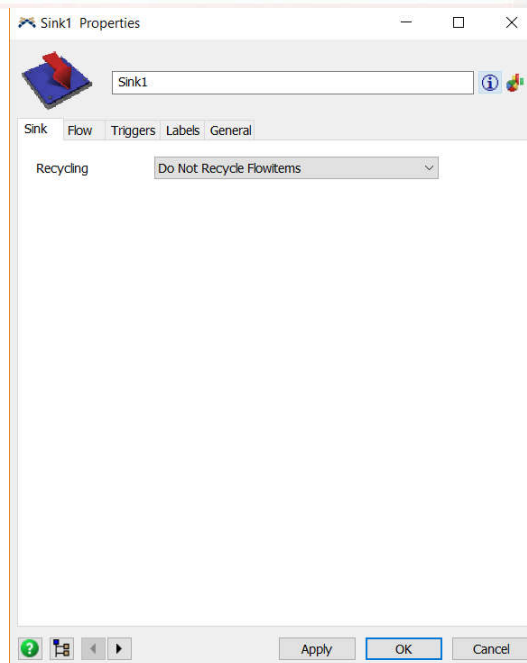
Terminología en Flexsim

- Processor



Terminología en Flexsim

- Sink



Terminología en Flexsim

- Combiner

Combiner1 Properties

ProcessTimes Breakdowns Combiner Flow Triggers Labels General

Setup Time: 0

☐ Use Operator(s) for Setup Number of Operators: 1

☒ Use Setup Operator(s) for both Setup and Process

Process Time: 10

☐ Use Operator(s) for Process Number of Operators: 1

Pick Operator: current.centerObjects[1]

Priority: 0.00 Preemption: no preempt

Apply OK Cancel

Combiner1 Properties

ProcessTimes Breakdowns Combiner Flow Triggers Labels General

This object is a member of the following MTBF MTTR's:

Remove Add... Edit

This object is a member of the following Time Tables:

Remove Add... Edit

Apply OK Cancel

Combiner1 Properties

ProcessTimes Breakdowns Combiner Flow Triggers Labels General

Combine: Pack

Recycle To: Do Not Recycle Items

☐ Convey Items Across Combiner Length

Components List

Add Table to MTEI

Apply OK Cancel

Terminología en Flexsim

- Separator

Separator1 Properties

Separator1

ProcessTimes Breakdowns Separator Flow Triggers Labels General

Setup Time: 0

☐ Use Operator(s) for Setup Number of Operators: 1

☒ Use Setup Operator(s) for both Setup and Process

Process Time: 10

☐ Use Operator(s) for Process Number of Operators: 1

Pick Operator: current.centerObjects[1]

Priority: 0.00 Preemption: no preempt

Apply OK Cancel

Separator1 Properties

Separator1

ProcessTimes Breakdowns Separator Flow Triggers Labels General

This object is a member of the following MTBF MTTR's:

Remove Add... Edit

This object is a member of the following Time Tables:

Remove Add... Edit

Apply OK Cancel

Separator1 Properties

Separator1

ProcessTimes Breakdowns Separator Flow Triggers Labels General

☒ Unpack ☐ Split ☒ Convey Items Across Separator Length

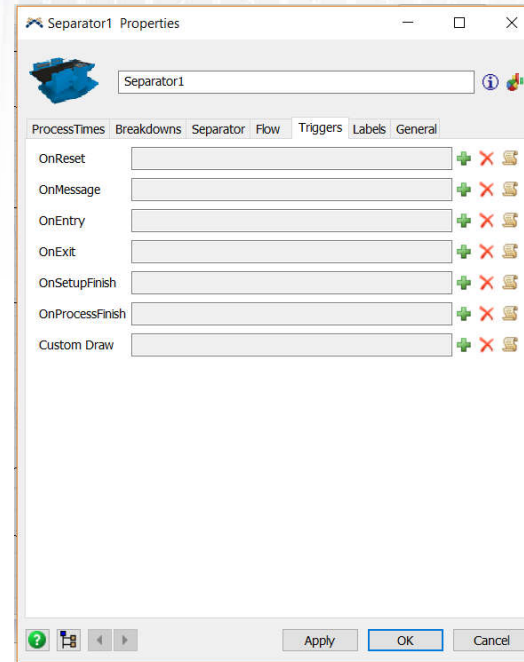
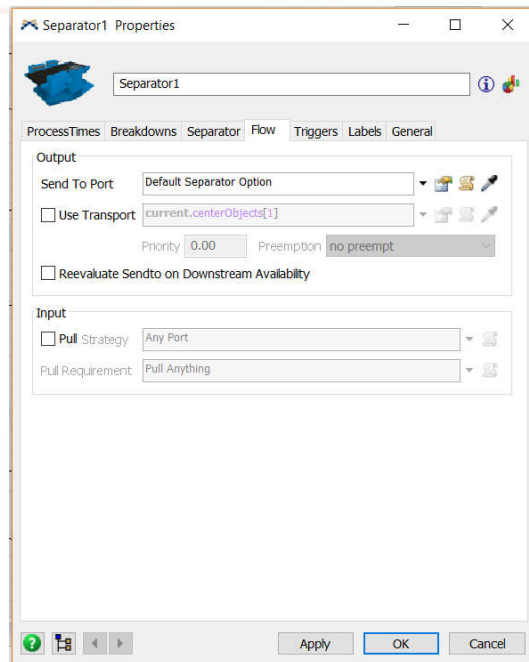
Split/Unpack Quantity: By Expression

Recycle From: Do Not Recycle Items

Apply OK Cancel

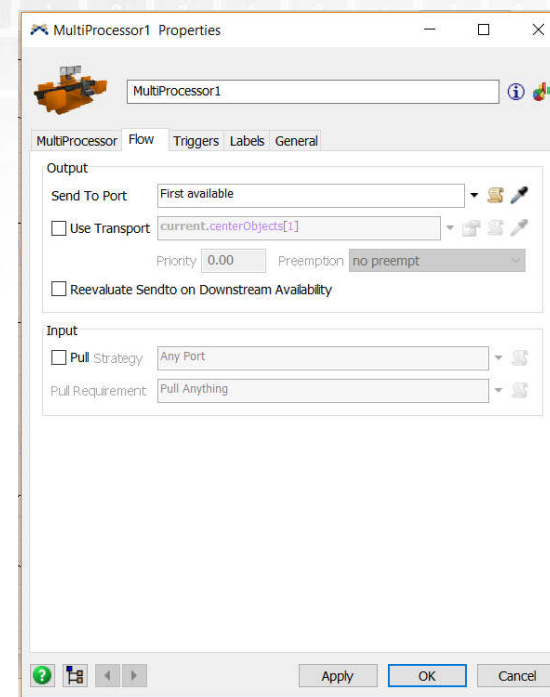
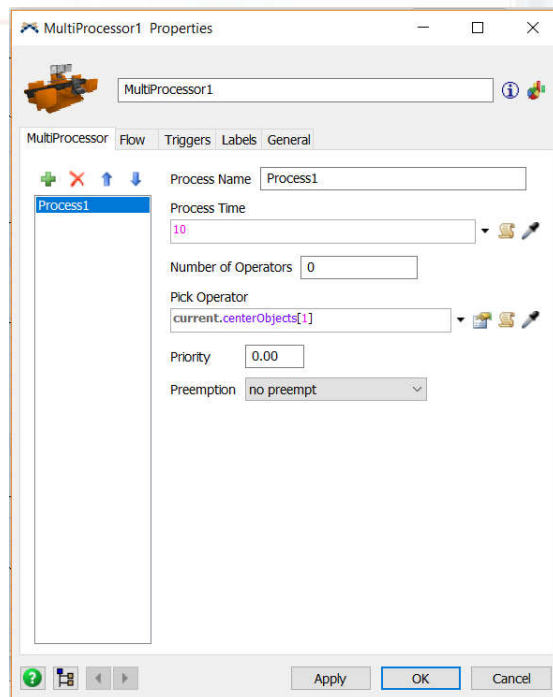
Terminología en Flexsim

- Separator



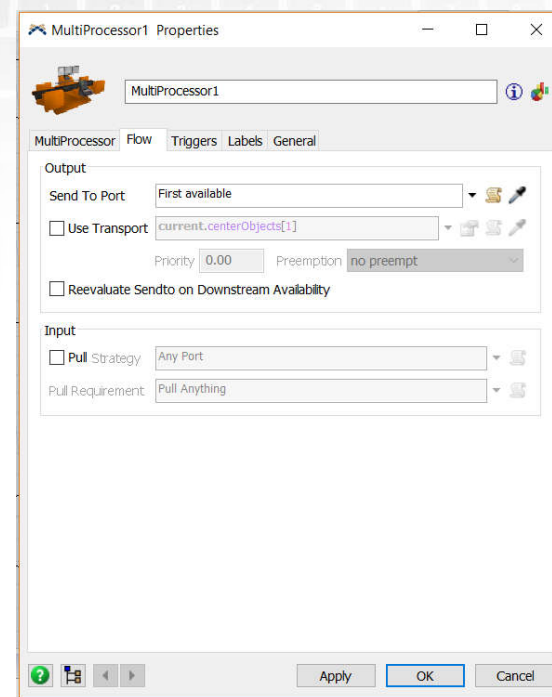
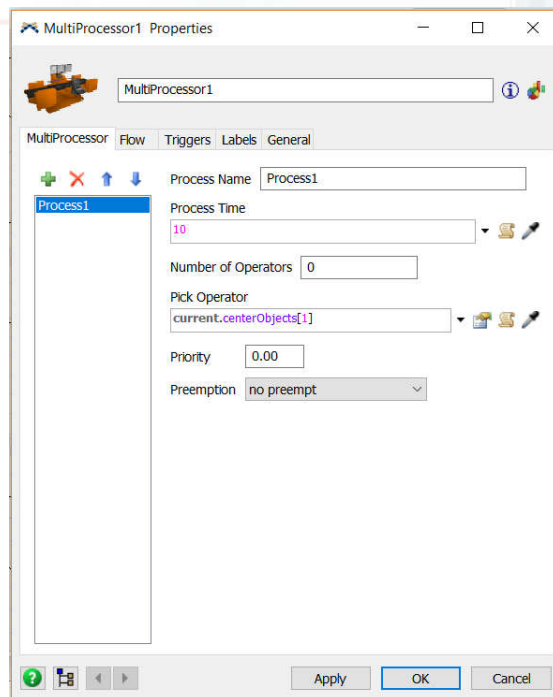
Terminología en Flexsim

- Multiprocessor



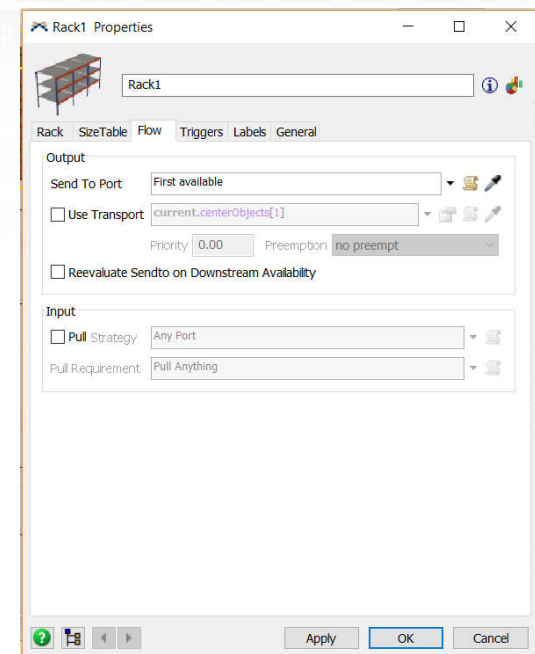
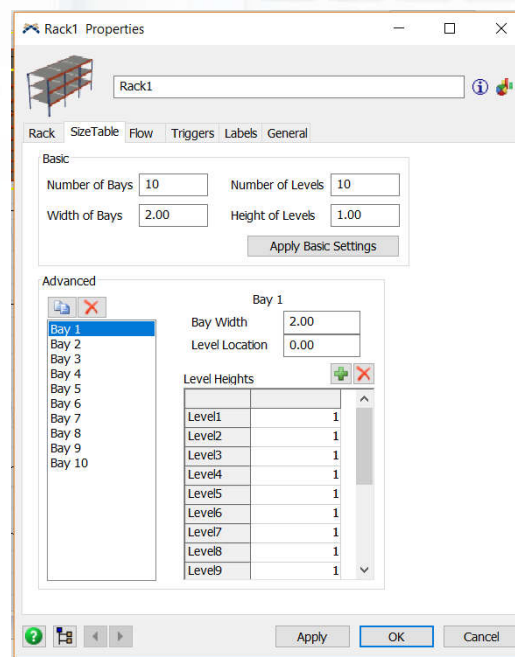
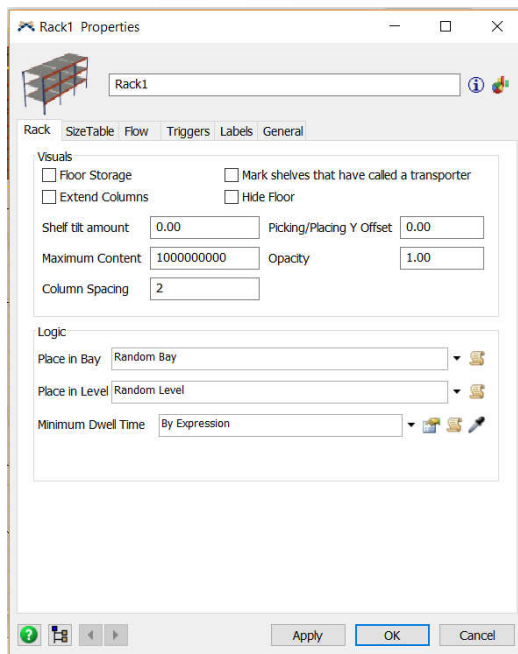
Terminología en Flexsim

- Multiprocessor



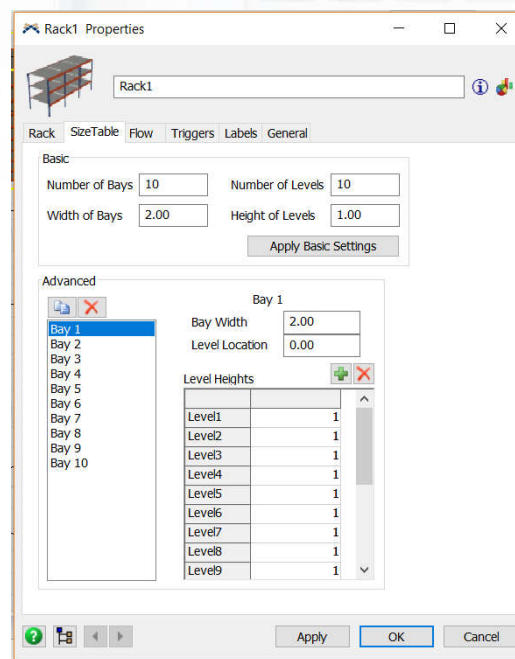
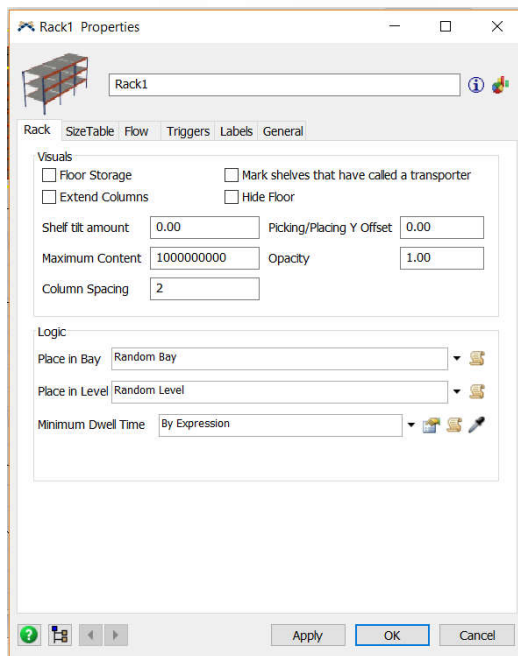
Terminología en Flexsim

- Rack



Terminología en Flexsim

- Rack



Terminología en Flexsim

- Flowitems

Objetos que se mueven a través del modelo. Pueden ser partes, pallets, ensambles, personas, órdenes, containers.

- Labels

Son cadenas de caracteres que son almacenados en Flowitems y Objects. Pueden ser alterados dinámicamente a lo largo del proceso

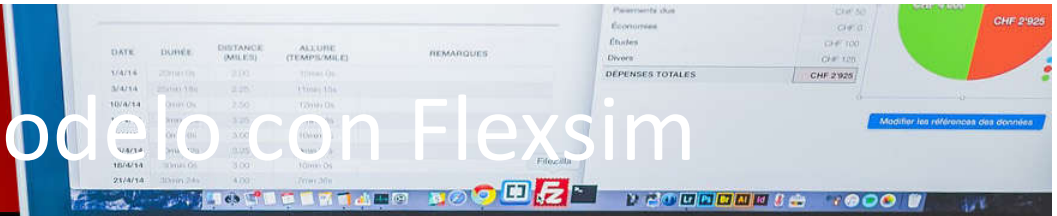
- Ports

Cada objeto de Flexsim tiene un número ilimitado de puertos a través de los cuales se puede comunicar con otros objetos

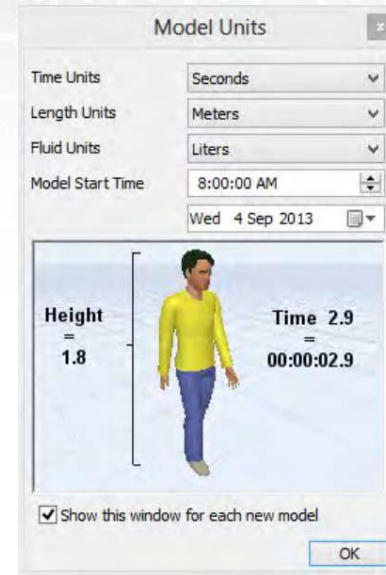
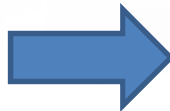


Pasos para el 1er modelo con Flexsim

- Paso 1: Iniciar FlexSim
- Paso 2: Seleccionar Unidades
- Paso 3: Crear Objetos
- Paso 4: Conectar Objetos
- Paso 5: Definir parámetros de Llegada
- Paso 6: Asignar a las entidades características particulares de acuerdo a su tipo
- Paso 7: Definir la capacidad máxima de la línea de espera
- Paso 8: Definir la ruta de acuerdo al proceso o las operaciones de cada tipo de entidad
- Paso 9: Definir tiempos de Proceso
- Paso 10: Resetear y correr el Modelo
- Crear un Dashboard
- Resultados

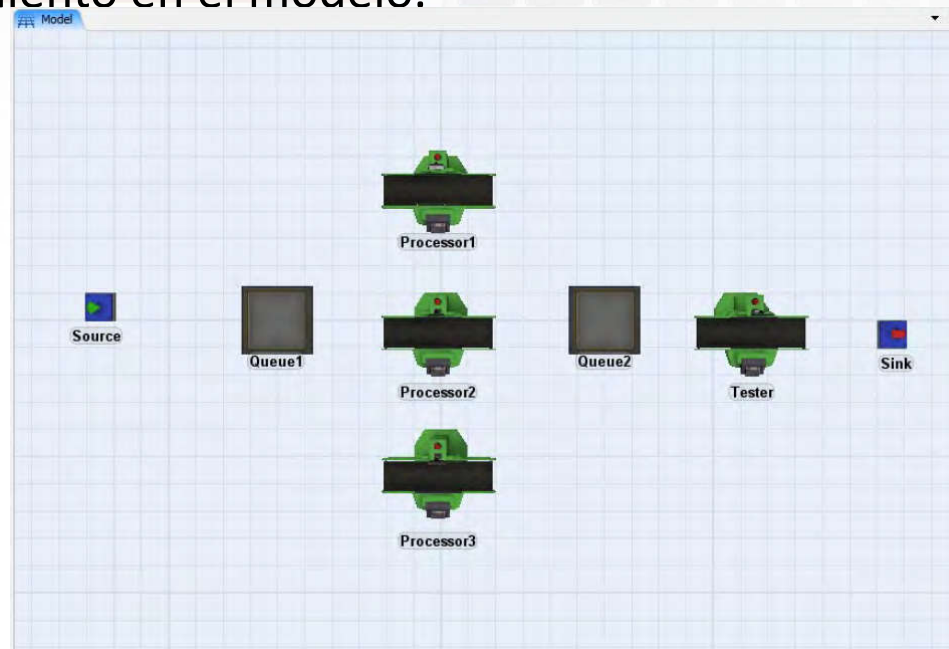


Pasos para el 1er modelo con Flexsim



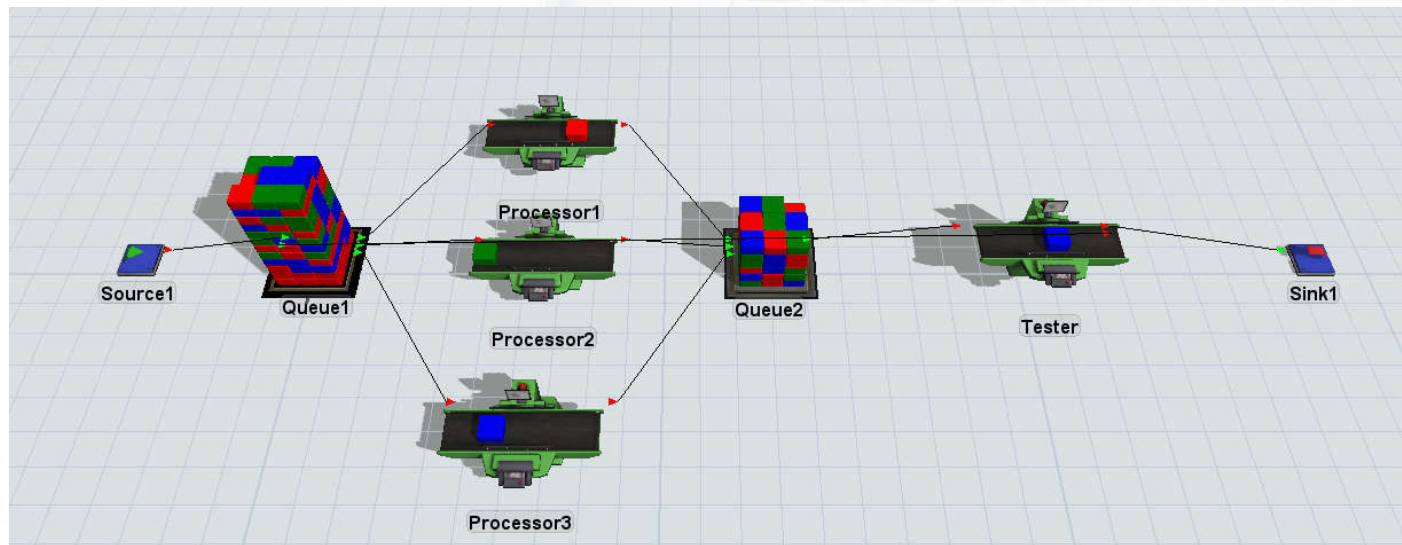
Pasos para el 1er modelo con Flexsim

- Crear una fuente(Source), dos colas, cuatro estaciones de proceso, y una fuente hundimiento en el modelo.



Pasos para el 1er modelo con Flexsim

- Layout



Ejemplos (Pg 135)

- **Modelo 1**

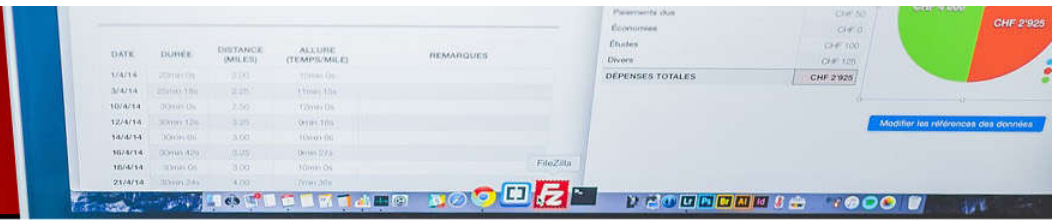
Crear un modelo de 3 procesos en paralelo con 3 tipos de items. Cada tipo de item con rutas de proceso diferentes .

- **Modelo 2**

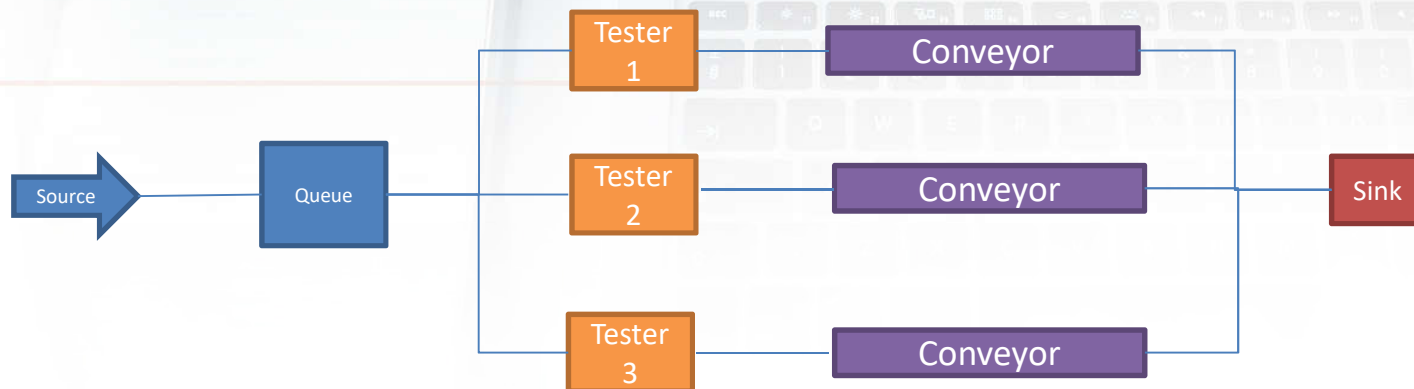
Utilizando el modelo 1 , se debe añadir Operadores y transportadores al proceso. Se introducirán propiedades de objetos adicionales y conceptos de análisis estadístico.

Modelo 2 Extra

Empleo de los gráficos 3D y tableros de datos además del empleo del objeto Visual Tool

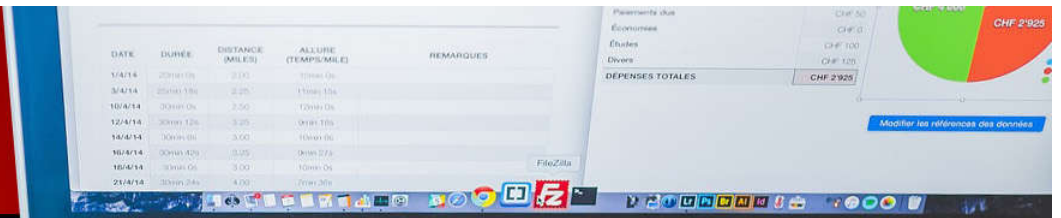


Modelo 1



- Source arrival rate: normal(20,2) seconds
Queue maximum size: 25 flowitems
Testing time: exponential(0,30) seconds
Conveyor speed: 1 meter per second
Flowitem routing: Type 1 to Tester 1, type 2 to Tester 2, type 3 to Tester 3

Modelo 1



The screenshot shows a financial application window. On the left is a table of expenses. On the right is a summary panel with a pie chart. The table has columns for DATE, DUREE, DISTANCE (MILES), ALLURE (TEMPS/MILE), and REMARQUES. The summary panel shows 'Dépenses totales' as CHF 2'925. The pie chart is divided into two segments: a green one representing CHF 1'500 and a red one representing CHF 1'425.

DATE	DUREE	DISTANCE (MILES)	ALLURE (TEMPS/MILE)	REMARQUES
1/4/14	20min 0s	2.00	30min 0s	
3/4/14	25min 15s	2.25	11min 15s	
10/4/14	30min 0s	2.50	12min 0s	
12/4/14	30min 12s	3.25	09min 18s	
14/4/14	30min 0s	3.00	10min 0s	
16/4/14	30min 42s	5.25	08min 27s	
16/4/14	30min 0s	3.00	10min 0s	
21/4/14	30min 24s	4.00	10min 24s	

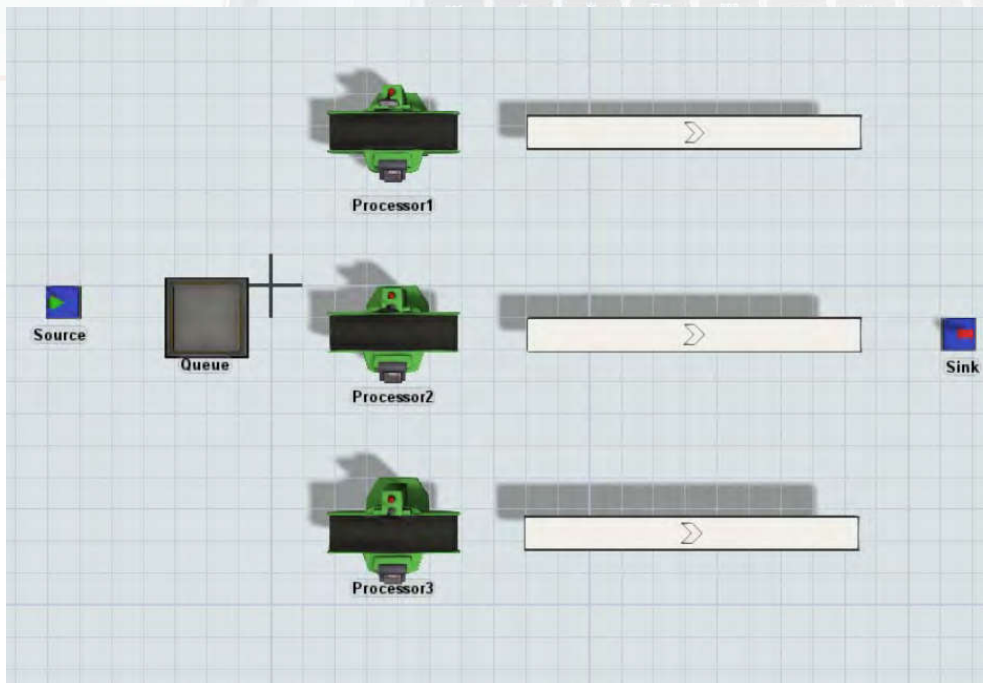
Summary Panel:

- Paiements dus: CHF 50
- Economies: CHF 0
- Études: CHF 100
- Divers: CHF 125
- DÉPENSES TOTALES: CHF 2'925**

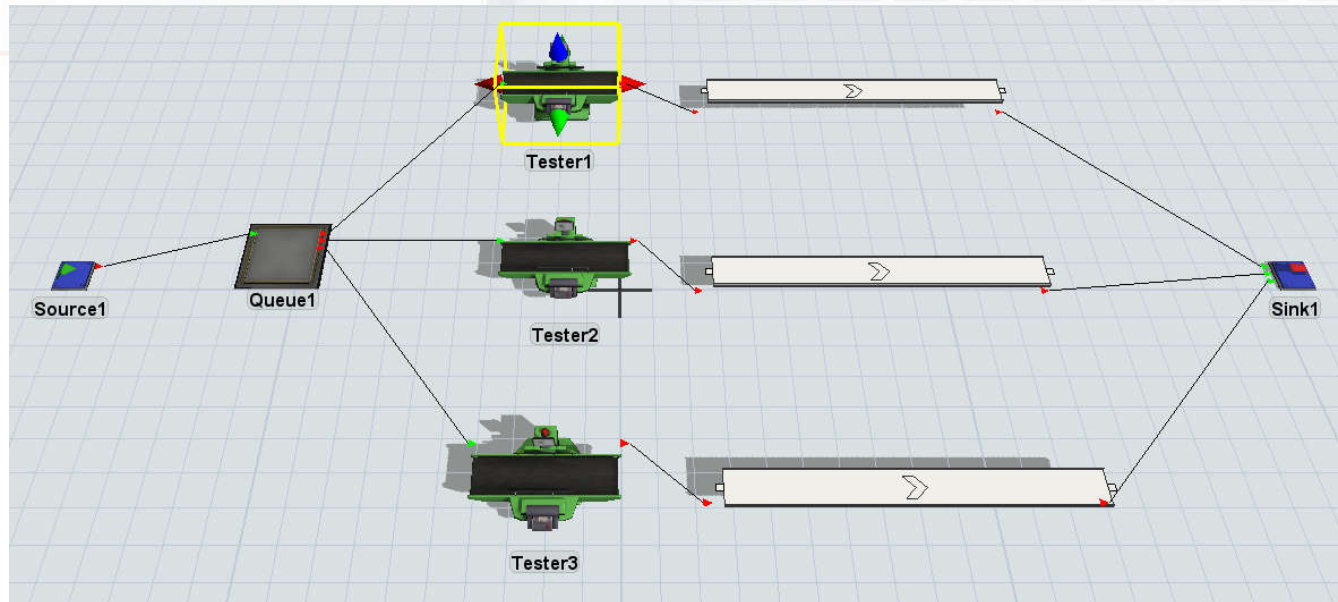
Pie Chart Legend:

- CHF 1'500 (Green)
- CHF 1'425 (Red)

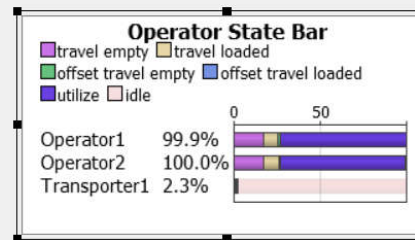
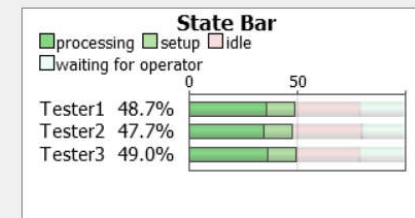
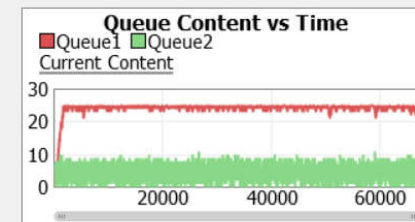
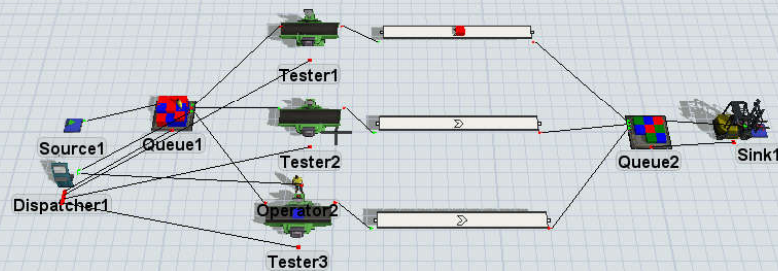
Buttons: 'Modifier les références des données', 'FileZilla'



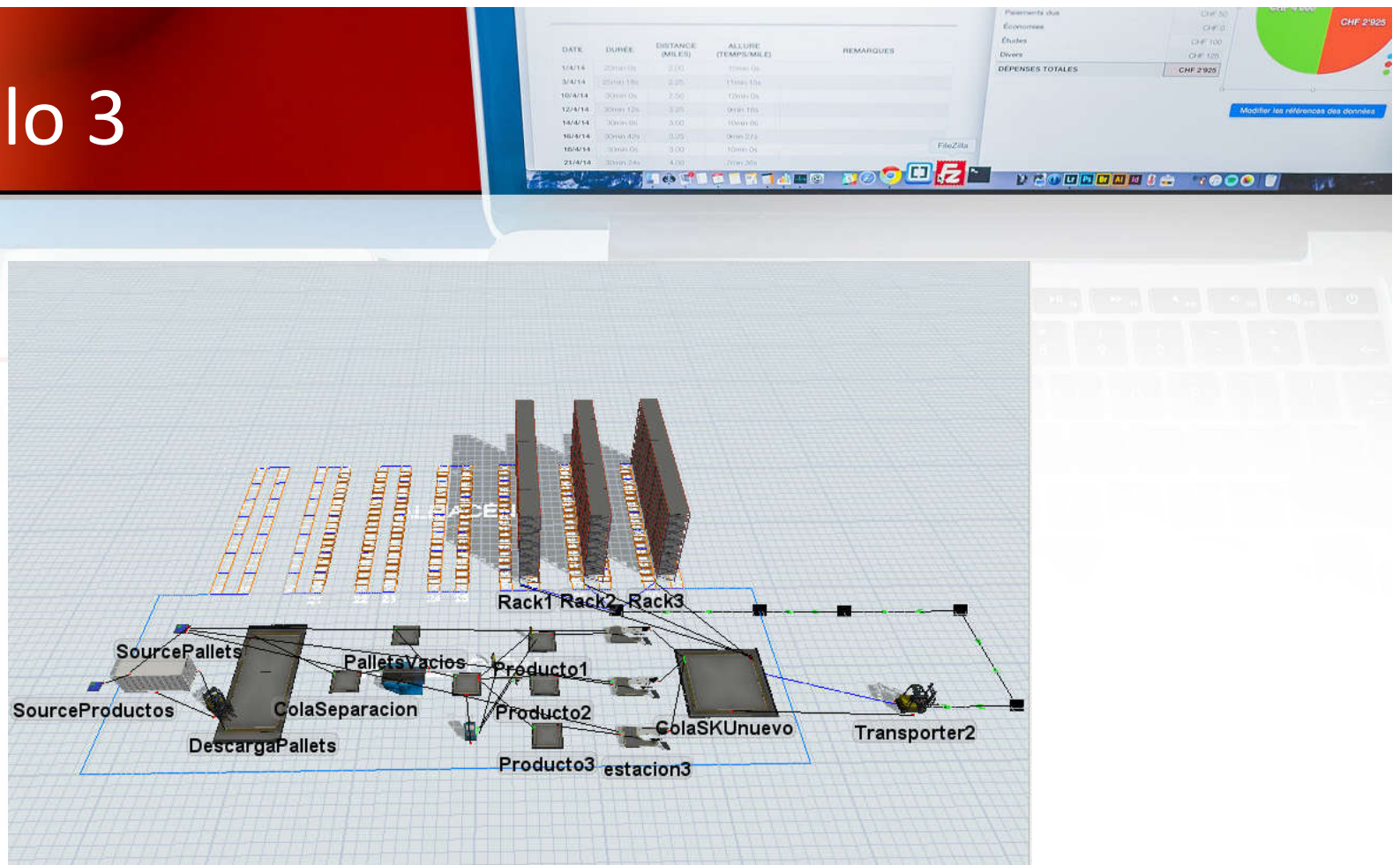
Modelo 1 completo



Modelo 2



Modelo 3



Modelo 3

Table with 5 columns: DATE, DUREE, DISTANCE (MILES), ALLURE (TEMPS/MILE), REMARQUES.

DATE	DUREE	DISTANCE (MILES)	ALLURE (TEMPS/MILE)	REMARQUES
1/4/14	20min 0s	2.00	30min 0s	
3/4/14	25min 15s	2.25	11min 15s	
10/4/14	30min 0s	2.50	12min 0s	
12/4/14	30min 12s	3.25	09min 15s	
14/4/14	30min 0s	3.00	10min 0s	
16/4/14	30min 42s	5.25	09min 27s	
16/4/14	30min 0s	3.00	10min 0s	
21/4/14	30min 24s	4.00	12min 24s	

Summary section:

- Payements dus: CHF 50
- Economies: CHF 0
- Etudes: CHF 100
- Divers: CHF 125
- DEPENSES TOTALES: CHF 275

Modifiez les références des données

SourceProductos Properties

SourceProductos

Source Flow Triggers Labels General

Arrival Style: Arrival Schedule

FlowItem Class: Box

☒ Repeat Schedule/Sequence

Arrivals: 2 Labels: 0 Add Table to MTEI

	ArrivalTime	ItemName	Quantity
Arrival1		0 Product	1728
Arrival2		86400 Product	0

Apply OK Cancel

SourceProductos Properties

SourceProductos

Source Flow Triggers Labels General

OnReset

OnMessage

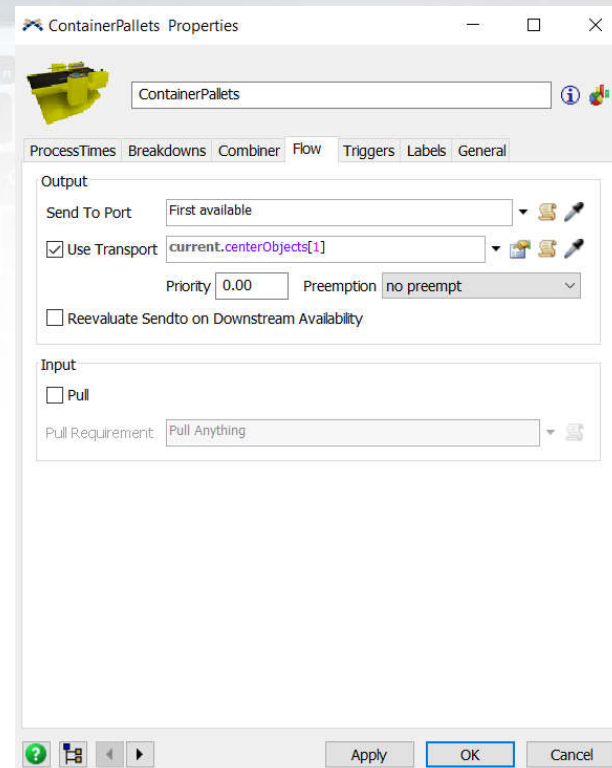
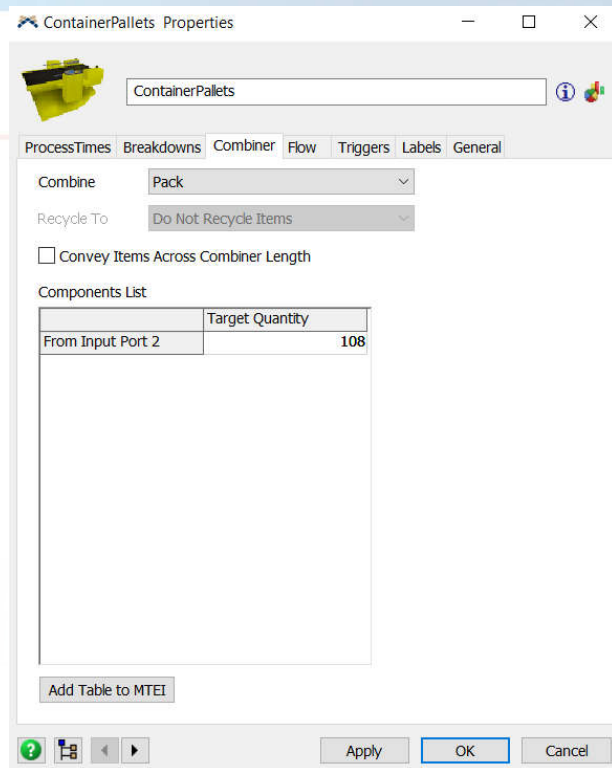
OnExit

OnCreation: Set Item Type and Color

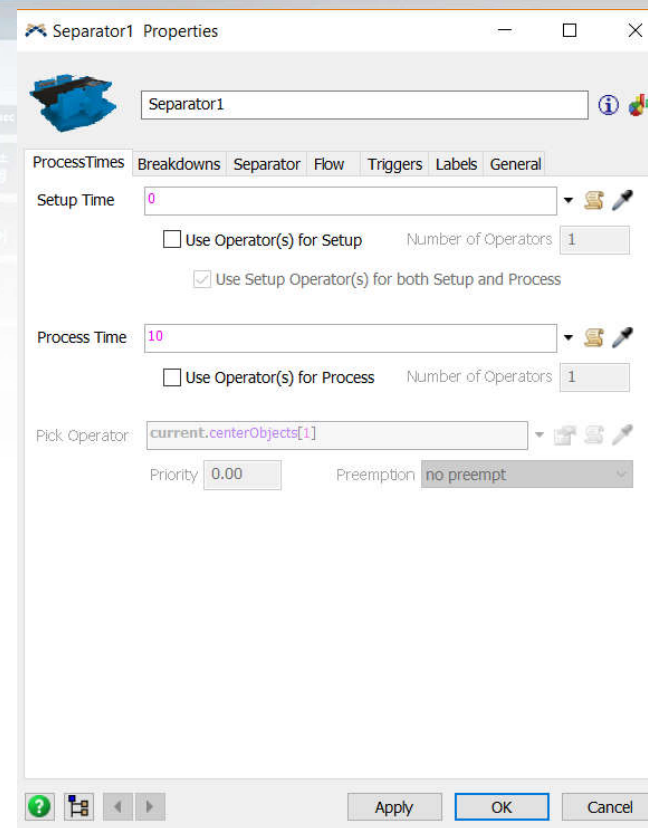
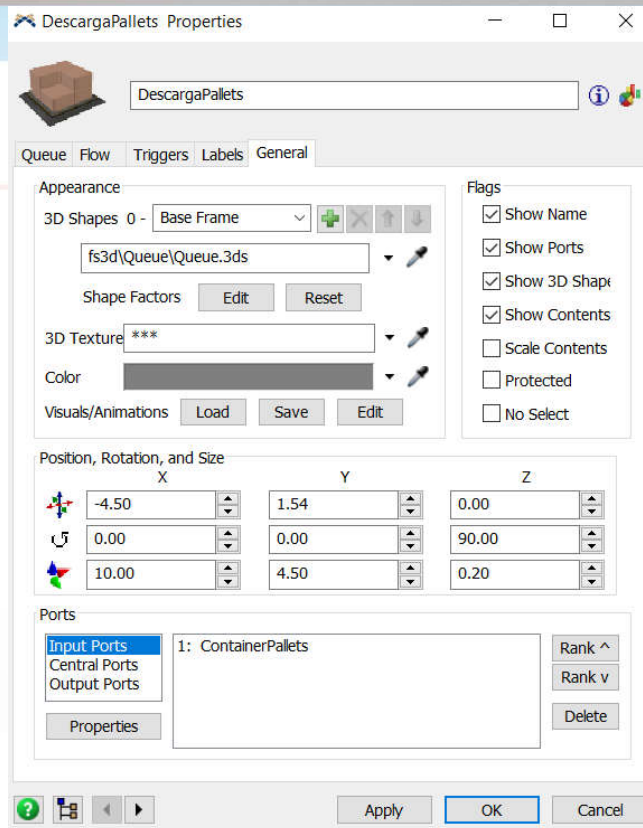
Custom Draw

Apply OK Cancel

Modelo 3



Modelo 3



Modelo 3

Dispatcher1 Properties

Dispatcher1

Dispatcher Triggers Labels General

Pass To Round Robin If Available

Queue Strategy Sort by TaskSequence Priority

Apply OK Cancel

estacion2 Properties

estacion2

ProcessTimes Breakdowns Combiner Flow Triggers Labels General

Setup Time 0

☐ Use Operator(s) for Setup Number of Operators 1

☒ Use Setup Operator(s) for both Setup and Process

Process Time 120

☐ Use Operator(s) for Process Number of Operators 1

Pick Operator current.centerObjects[1]

Priority 0.00 Preemption no preempt

Apply OK Cancel

Modelo 3

