

Discrete Event and Multi-Method Simulation with Anylogic

Modelling Approach/
Representation Form

Model Type

Event Graphs

leads
to

Discrete Event Simulation
Model

Compare:

System Dynamics

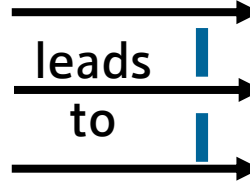
leads
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Differential Equation
Model

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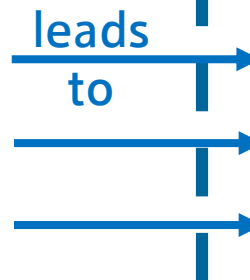
Event Graphs
SimEvents GUI
Anylogic GUI



Discrete Event Simulation
Model

Compare:

System Dynamics
Lagrange Formalism
Modelica/Dymola GUI

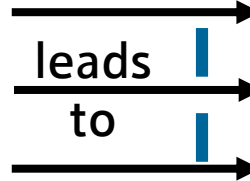


Differential Equation
Model

Modelling Approach/
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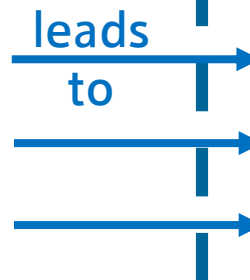
Event Graphs
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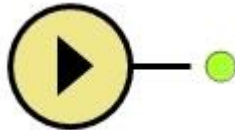
Discrete Event Simulation
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Compare:

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Differential Equation
Model



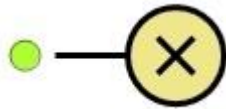
Source

Initializes the event „Arrival of *Entity/Entities*”

Parameters:

-) Arrival Rate & Interarrival time: When do Entities arrive?
-) Entities per Arrival: How much?



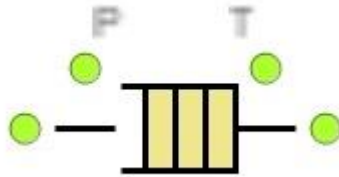


Sink

Initializes event „*Remove Entity/Entities*“



Passive without parameters



Queue

Initializes event „*Waiting Line*“



Parameters:

-) Capacity
-) Timeout
-) Preempted abort

Seize

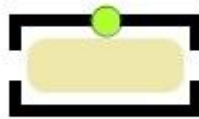
Initializes event „*get resources*“

Parameters:

-) Number of resources
-) Includes a queue
-) Timeout
-) Preempted abort

Stays attached until **Release**



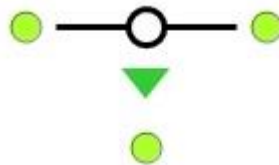


Resource Pool

Container of
resources of same
kind

Parameters:

-) Capacity (absolute or schedule)
-) Is used by *Seize*, *Release* and *Service*

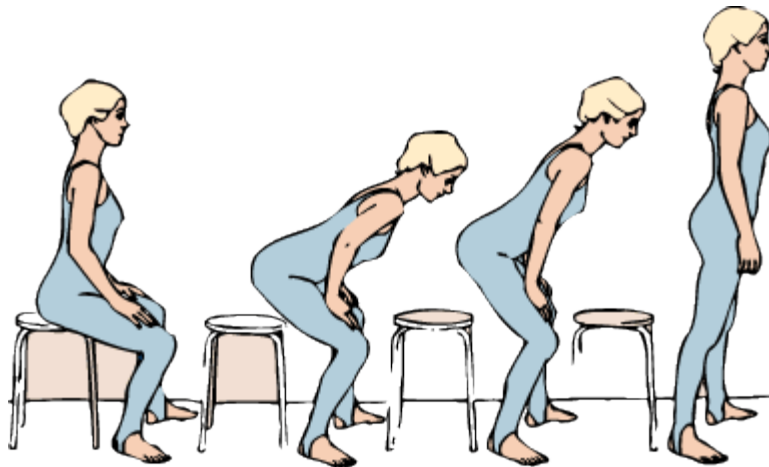


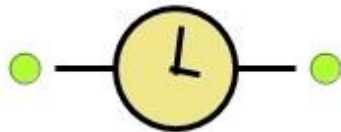
Release

Initializes event „*Release Resource*“

Parameters:

-) Capacity
-) Coupled to a *Resource Pool*





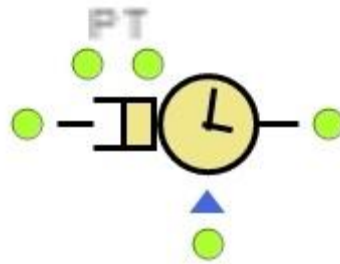
Delay

Initializes event „*Wait*“



Parameters:

-) Waitingtime
-) Capacity

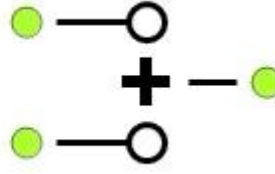
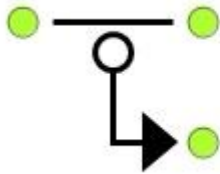


Server

Initializes event „Processing“

Parameters:

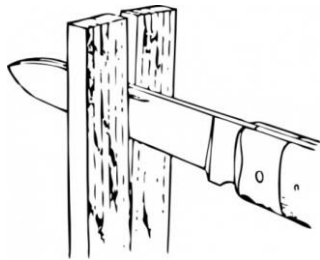
-) Consists of *Seize, Delay, Release*
-) Capacity
-) Timeout and preempted abort

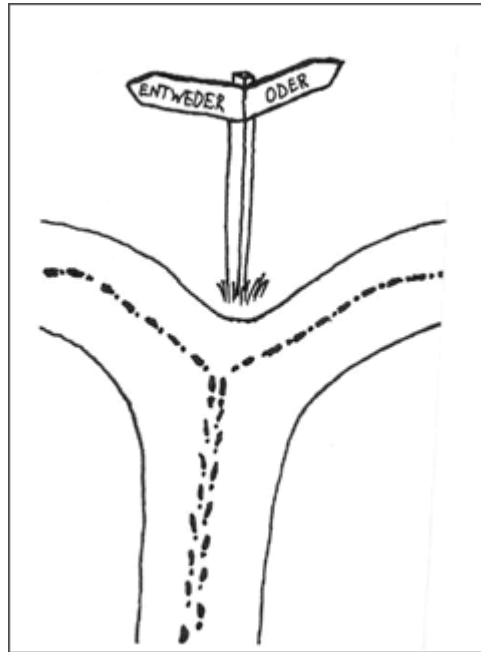
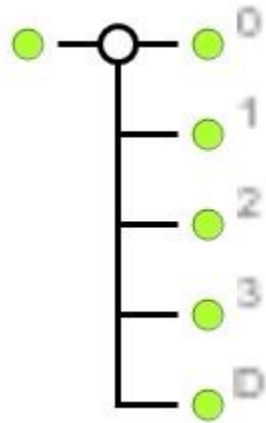


Split and Combine
Initialize events „Copy”
and „Join”

Parameters:

-) Number of copies
-) Different classes of copies possible
-) Does not forward the CLOCK



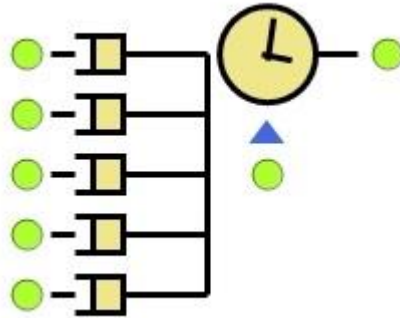


SelectOutput

Initializes event
„Decide“

Parameters:

-) On condition
-) On probability



Assembler

Initializes event
„*construction*“

Parameters:

-) Capacity of inputs
-) Delay
-) Can use resources
-) Different classes possible

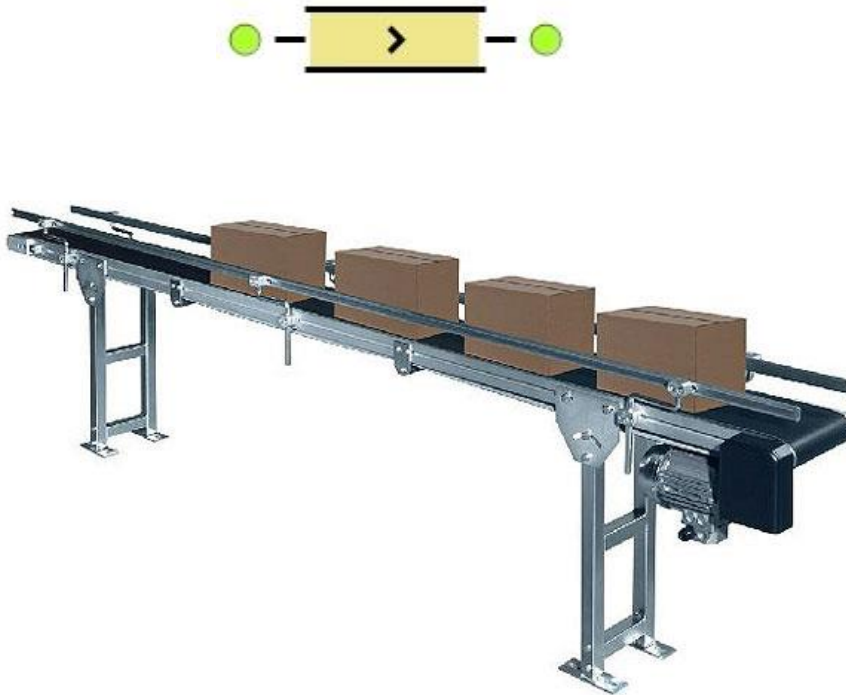


Conveyor

Initializes event
„conveyor“

Parameters:

-) Length
-) Space between entities
-) Speed



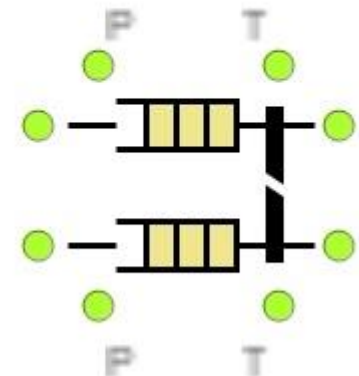
batch



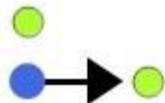
unbatch



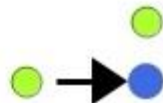
match



enter

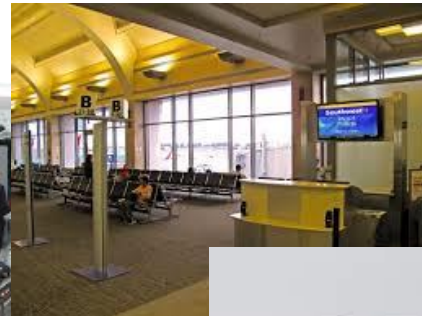


exit



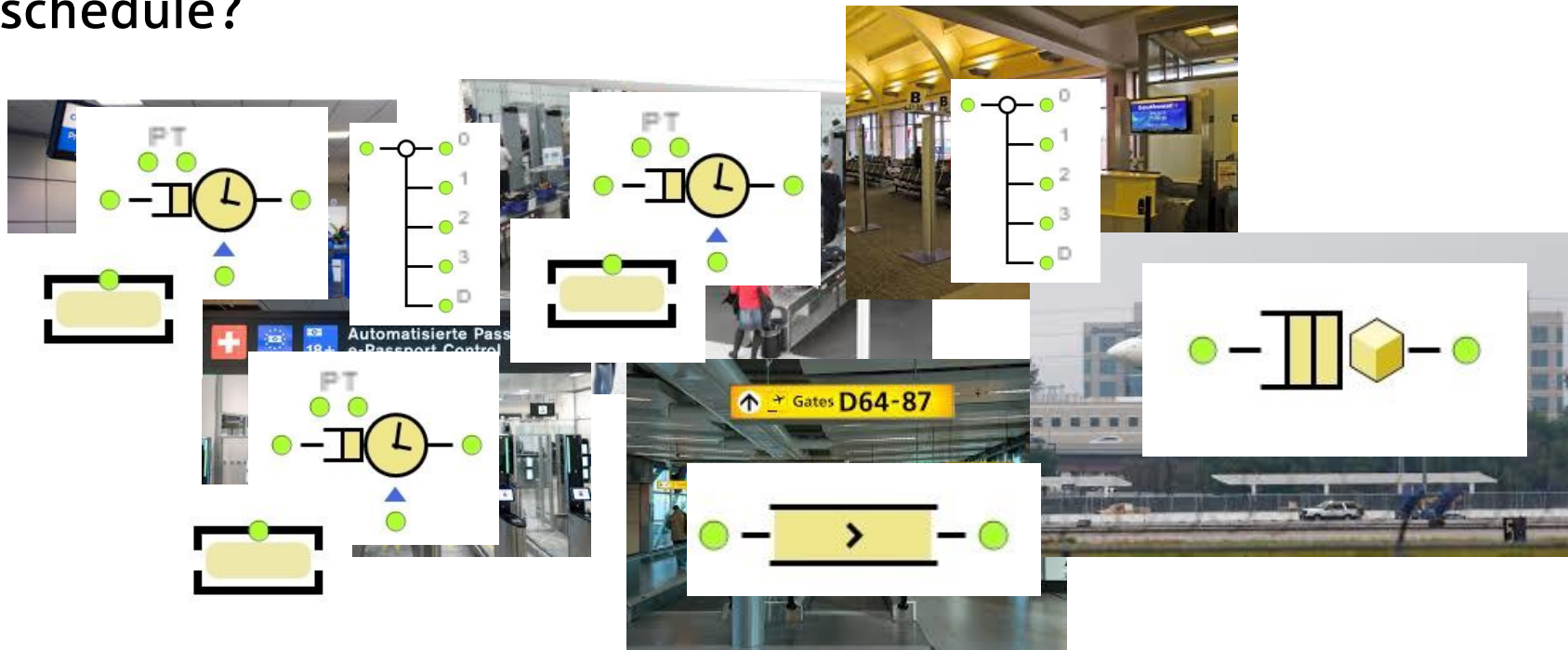
Research Question:

How many check-in counters, security control and counters for passport control do we need on an airport with given flight schedule?



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Let's build the model....

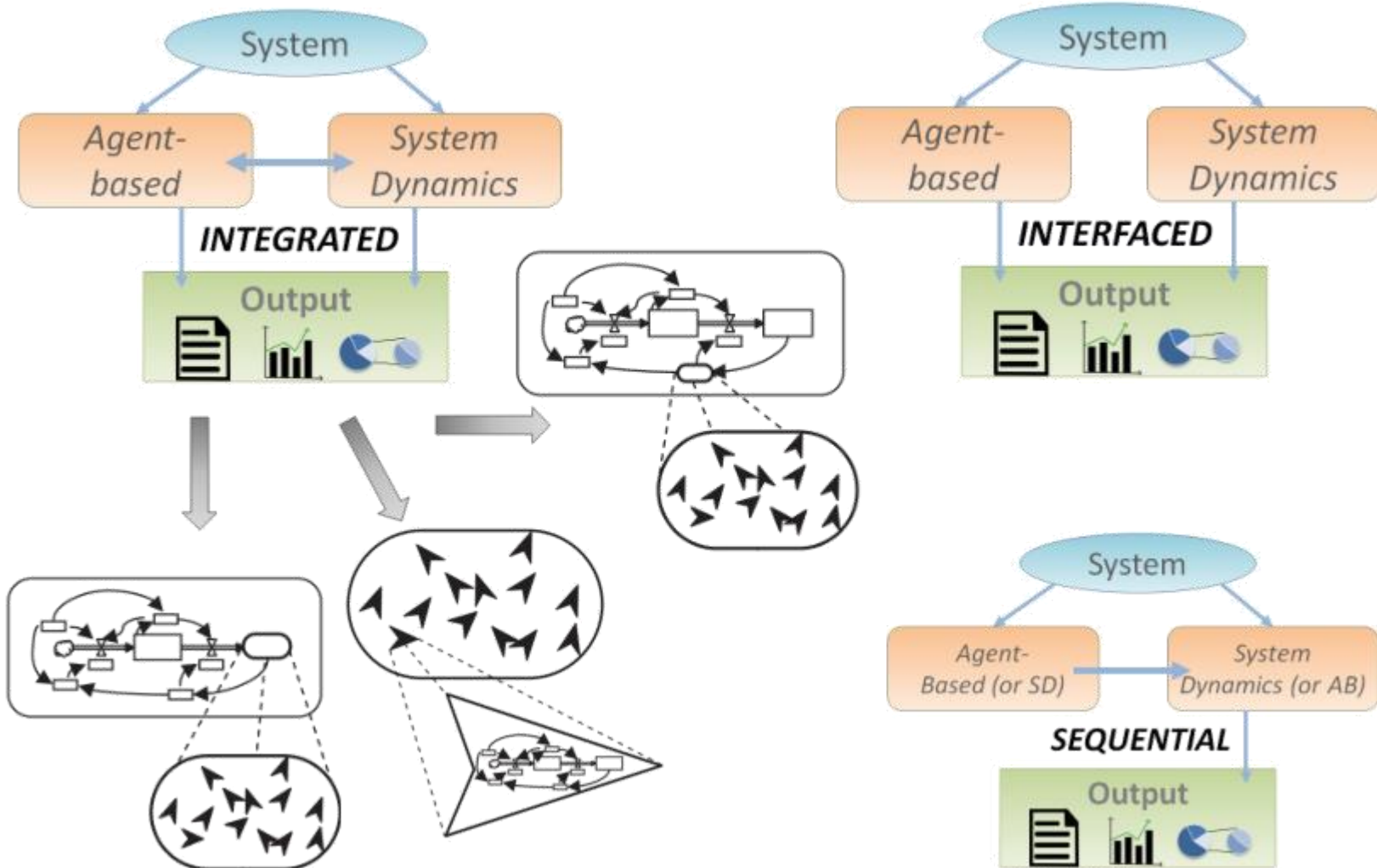
MULTI METHOD MODELLING

Definition

*If a system can be decomposed into subsystems and a model is applied to such a subsystem, this is called a **submodel**.*

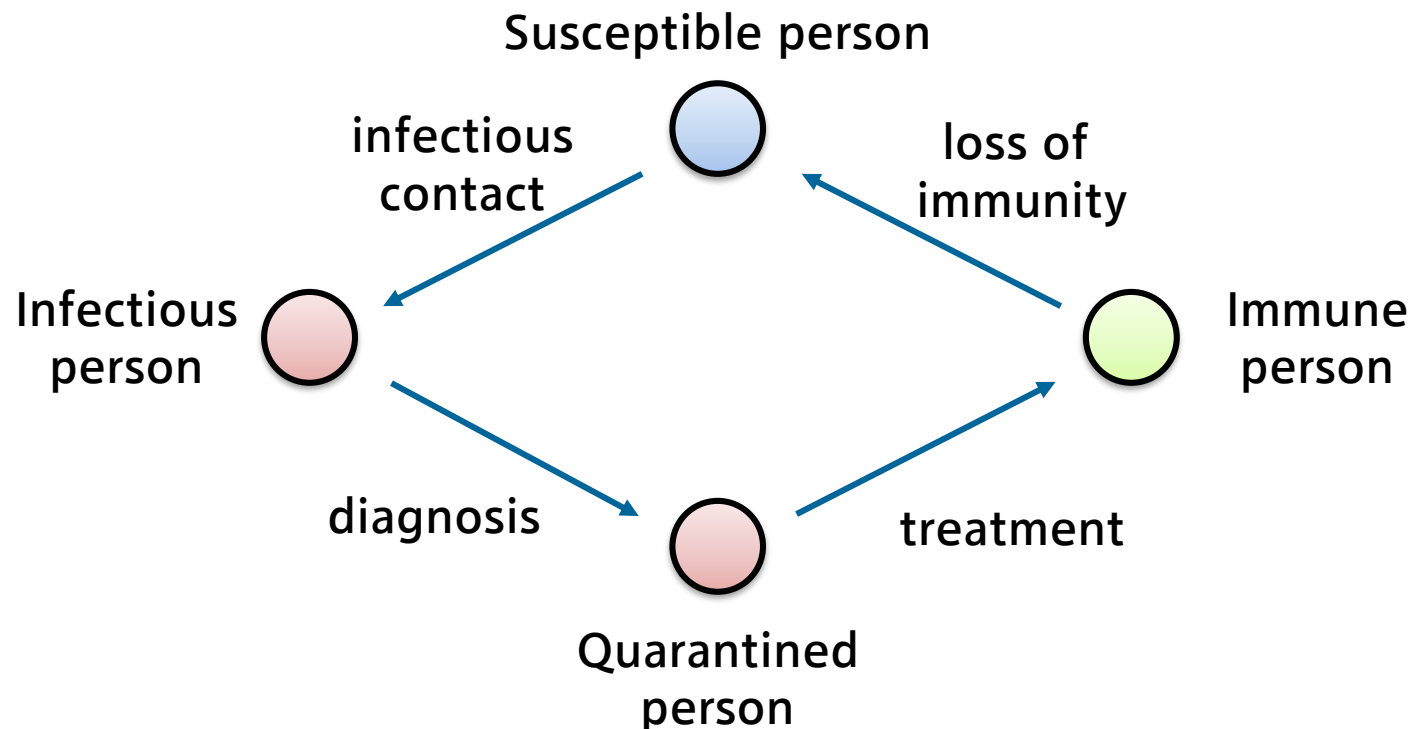
*A **multi-method model** is a model that consists of at least two submodels, where at least two different modelling techniques are used. These submodels exchange information in some way. This process of information exchange is called **combining**.*

Different Types of Multi Method Models



Research Question:

Investigate the utilization of health-care facilities (e.g. hospitals) in case of the outbreak of an epidemic



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Investigate the utilization of health-care facilities (e.g. hospitals) in case of the outbreak of an epidemic

Modelling Problem:

Modelling a disease requires either a nonlinear macroscopic model or a microscopic model with contacts



Modelling utilization of processes is best modelled with servers and queues.

Research Question:

Investigate the utilization of health-care facilities (e.g. hospitals) in case of the outbreak of an epidemic

Modelling Problem:

Modelling a disease transmission with a nonlinear macroscopic model

System Dynamics



Modelling with a stochastic model with servers

Discrete Event Simulation

Let's build the model....
