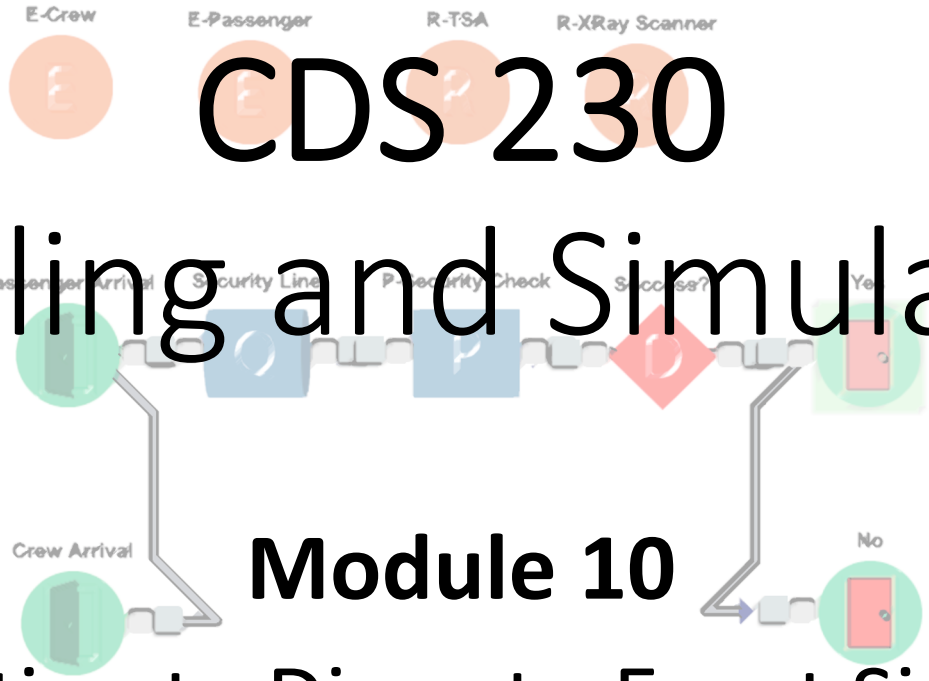


CDS 230
Modeling and Simulation I

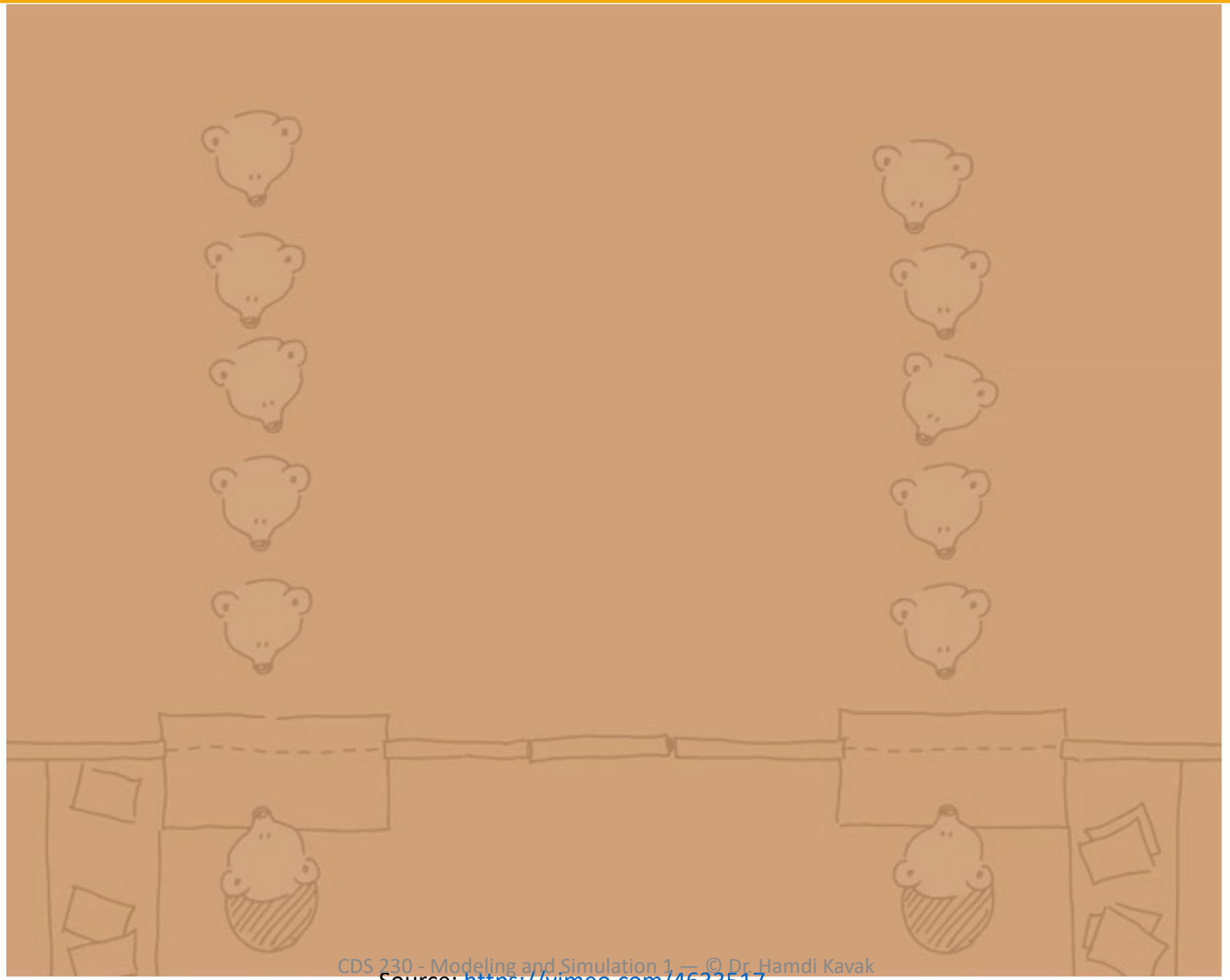
Module 10

Introduction to Discrete-Event Simulation

Dr. Hamdi Kavak
http://www.hamdikavak.com
hkavak@gmu.edu

GEORGE MASON UNIVERSITY

Center for Social Complexity



Source: https://vimeo.com/4633517

Where do we (used to) see queues or lines?

- Doorbusters
- Fast food restaurants at JC
- Coffee shops
- Banks
- Organ transplant
- …

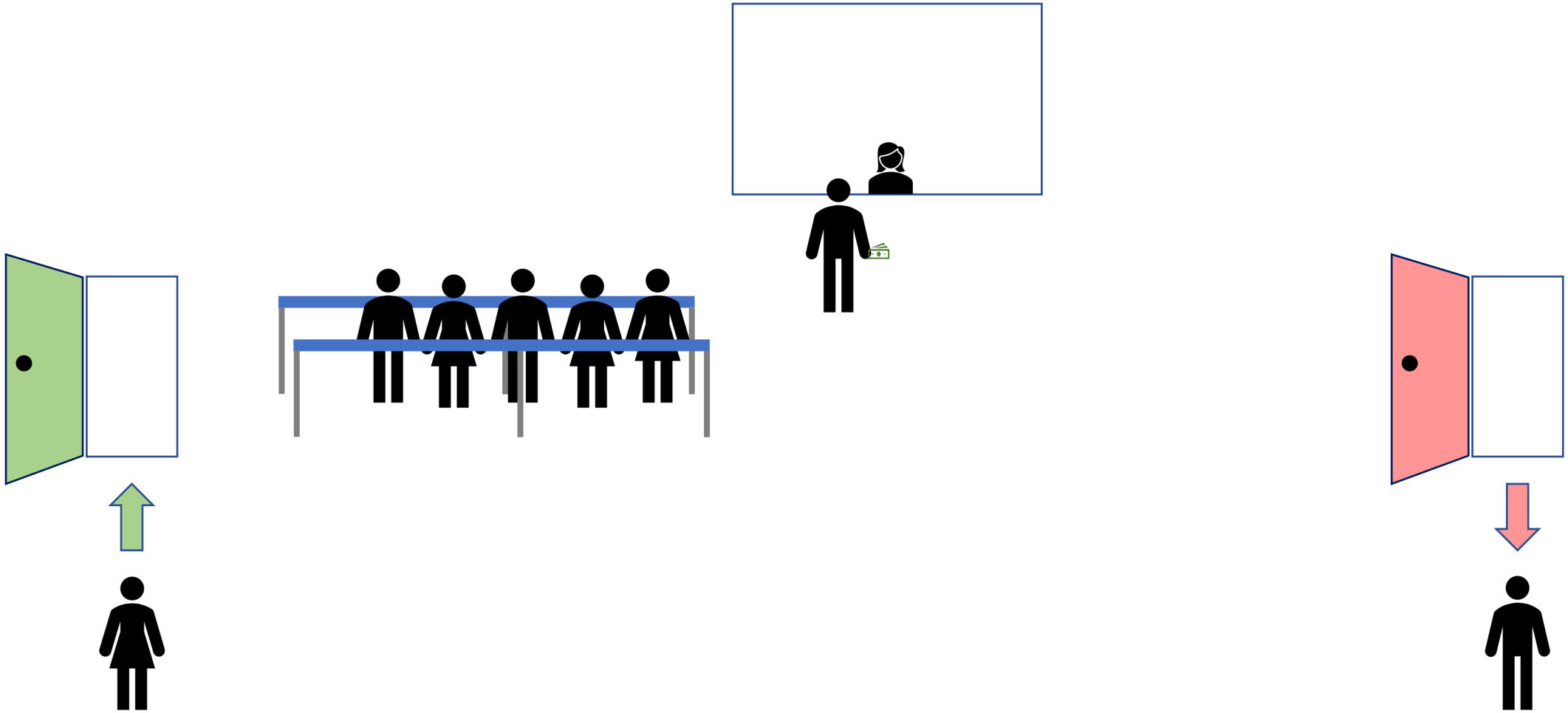
Why care about queues or lines?

- Improve customer/worker satisfaction
  - E.g., reduce call center wait time
  - E.g., provide more humane work experience
- Improve efficiency
  - E.g., use less resources (employees, machines etc.) and save money
  - E.g., better schedule employees
- Test new design alternatives
  - E.g., change layout
  - E.g., re-design an assembly line
  - E.g., changing organ transplant listing system

Discrete-event simulation

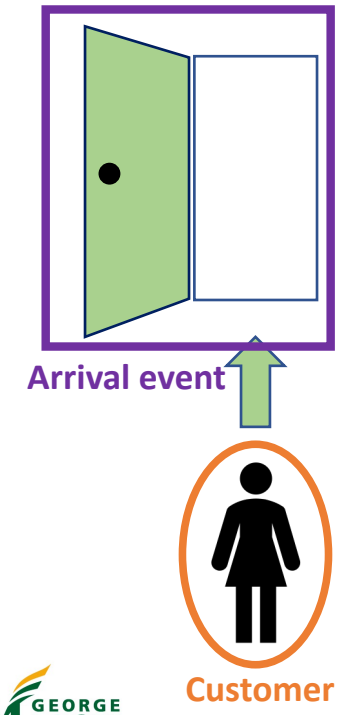
- A simulation method that allows us to study systems involving queues.
- Used in many sectors.
- The model developer needs to turn real-world things into discrete-event simulation concepts (introduced in the next slide)
- Relies on random numbers.

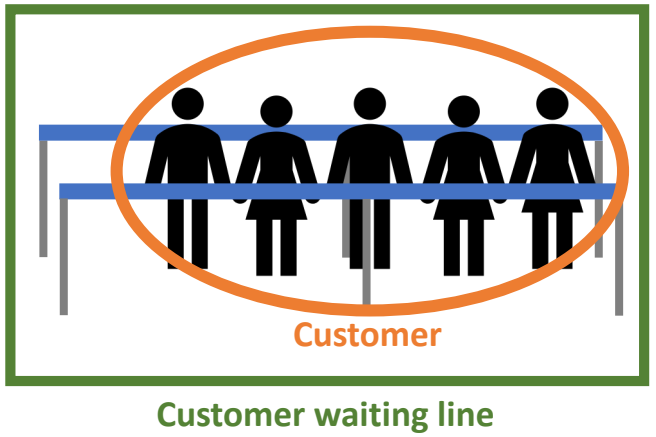
A simple queue example

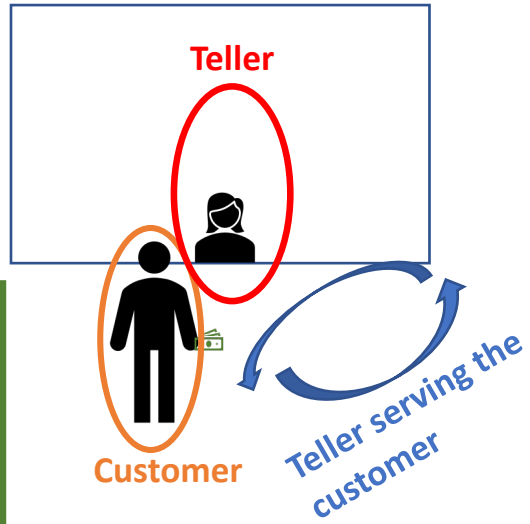


Discrete event model of the example

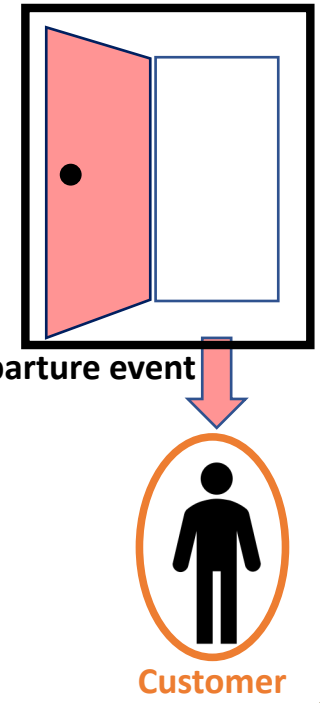
1. Entities (things go through the system)
2. Entities enter the system
3. Queues







4. Resources
5. Process
6. Entities leave the system

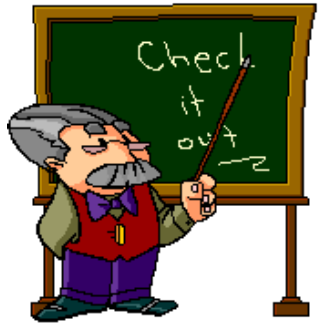


Discrete-event simulation tools today

Difficult to learn

Not available in mobile devices

Difficult to share



Experts only

Costly (soft/hardware)

Discrete-event simulation with

rethinking how we LEARN

BUILD & PLAY with

Simulations

cloudes.me

- Developed at Virginia Modeling Analysis and Simulation Center (VMASC)
- First prototype in 2013
- Fully web-based and running on the cloud
- Code-free development
- Mobile accessible
- Social
- Free

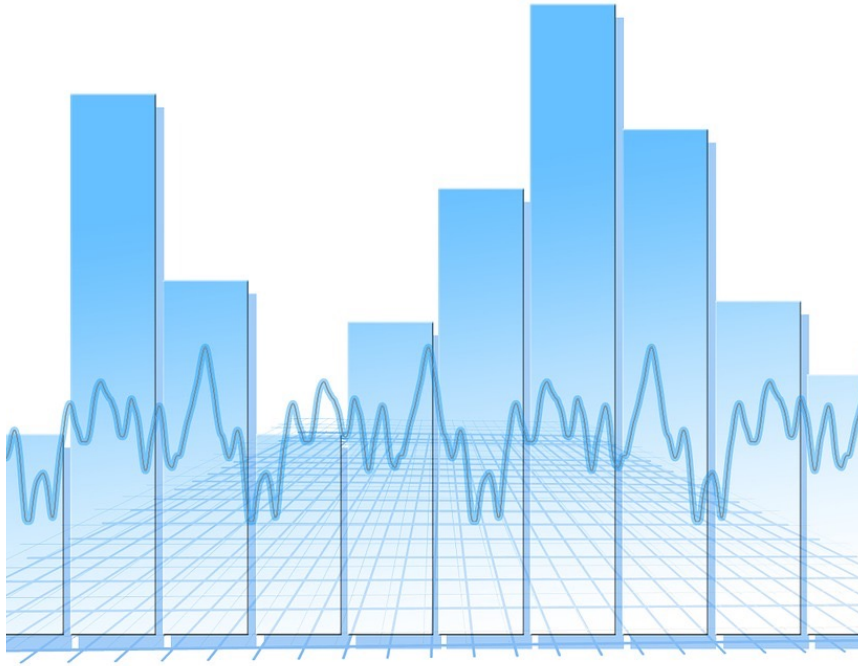
The CLOUDES team

- Jose Padilla
- Saikou Diallo
- Ross Gore
- Anthony Barraco
- Hamdi Kavak
- Christopher Lynch

Some usage information

As of August 2017.

- Over 1,150 registered users
- Users from 70 countries
- Users from Industry, Academia and high/middle school.
- Available in 7 languages
- More than 6,500 simulations created



Unique cloudes.me features

- Data collection
- Conceptual modeling
- Collaboration
- Sharing

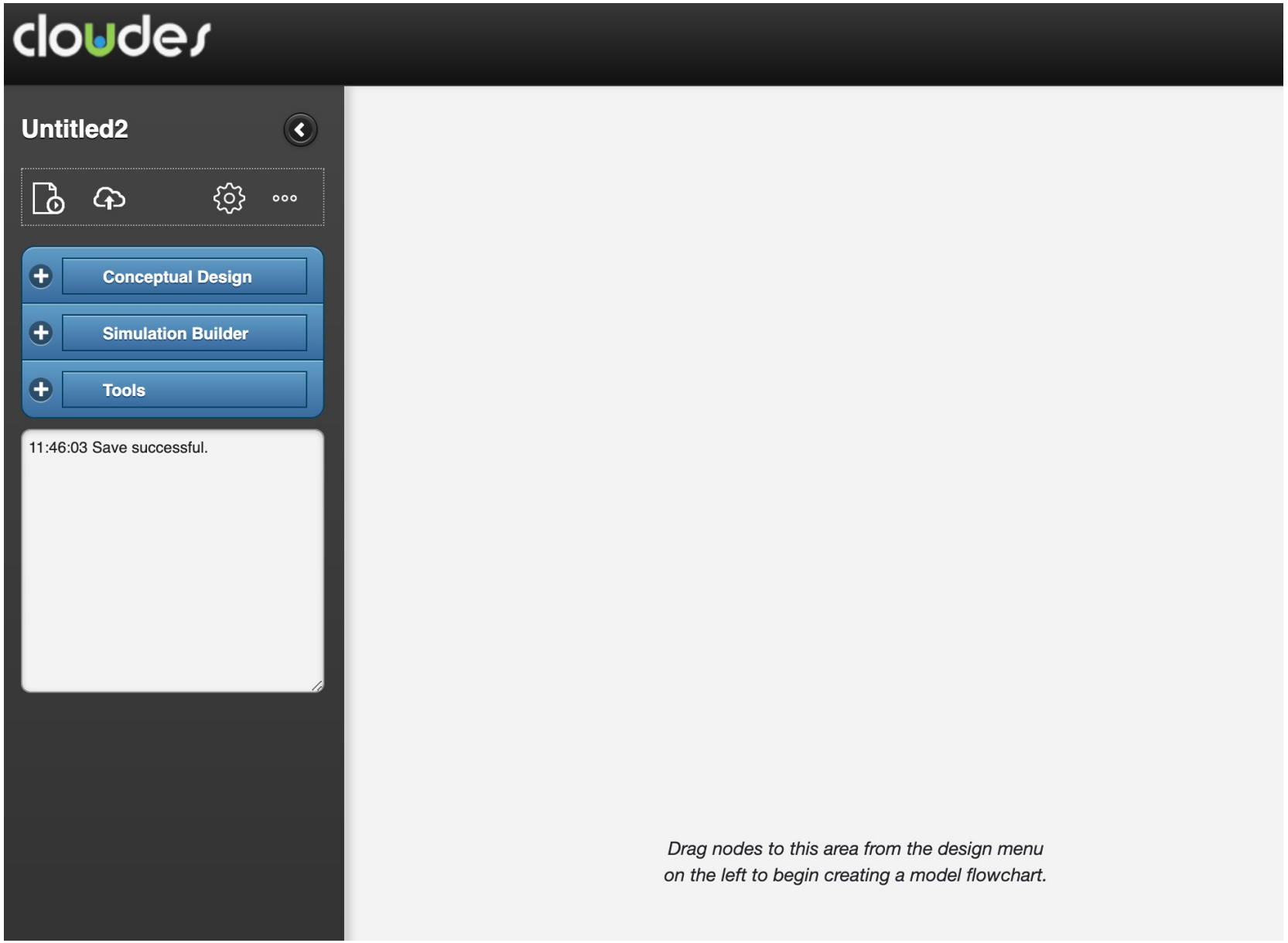
How to learn cloudes.me

- User manual
  - http://blog.cloudes.me/wp-content/uploads/2014/10/cloudes_manual-v-314-.pdf
- Tutorials, Videos
  - http://blog.cloudes.me
- Example models

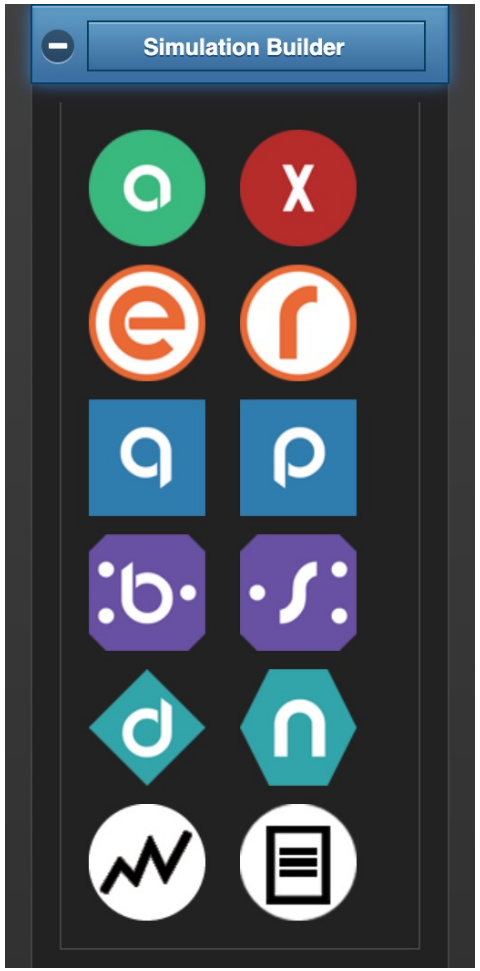
Getting started

- Registration
- Home
  - Simulation types
    - Examples and exercises
    - Your own simulations
    - Collaboration
    - Public
  - Search
- Profile

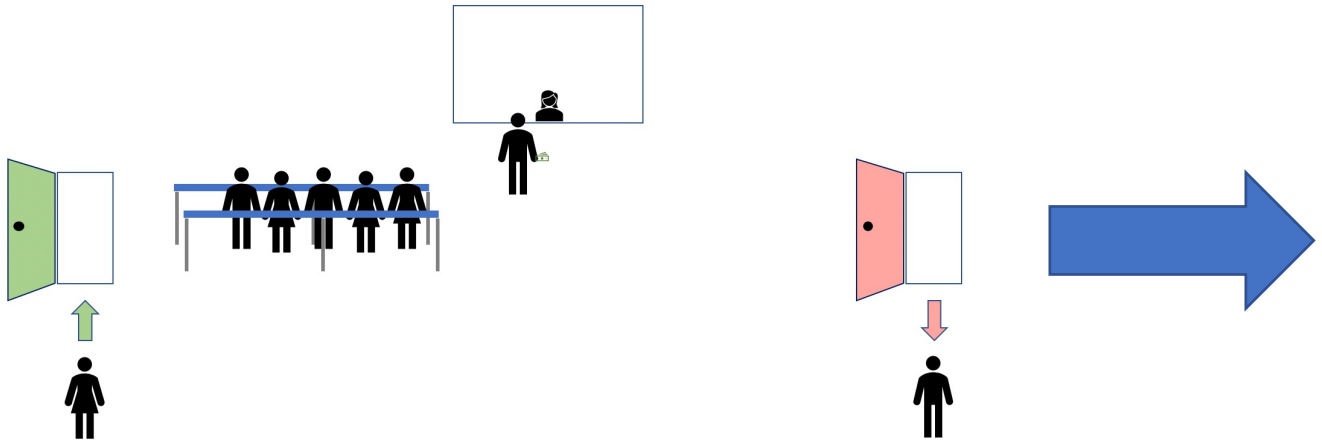
User interface

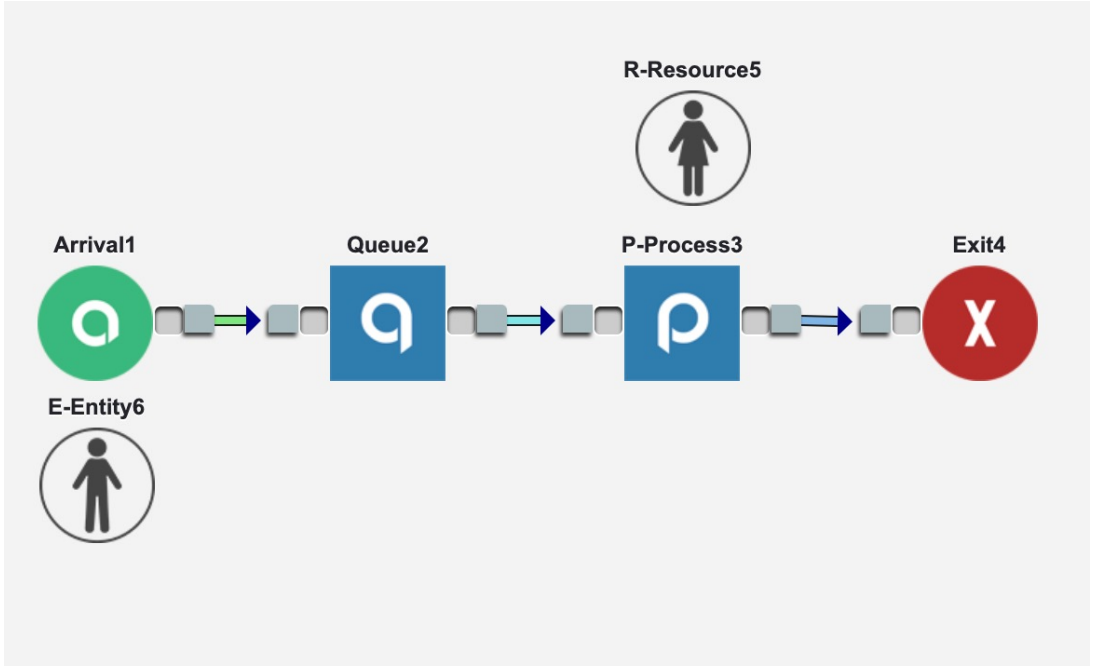


User interface (left bar expanded)



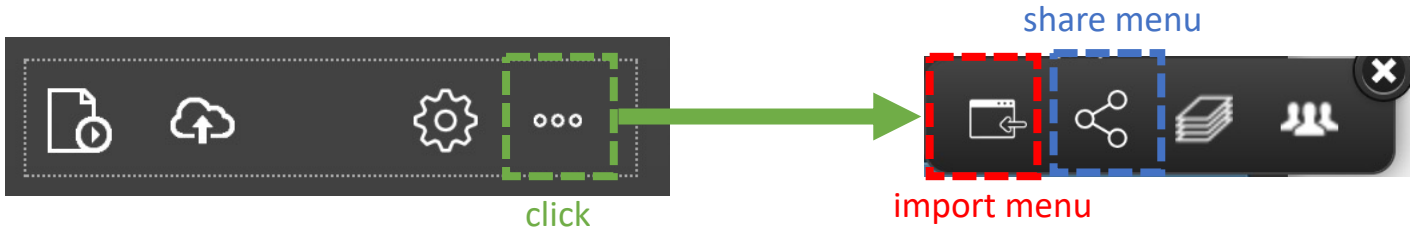
Building a simple queuing model





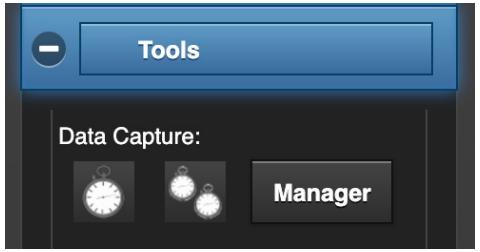
Some useful features of CLOUDES

- Import existing models and share your model



- Adding integrated plots

- Data collection



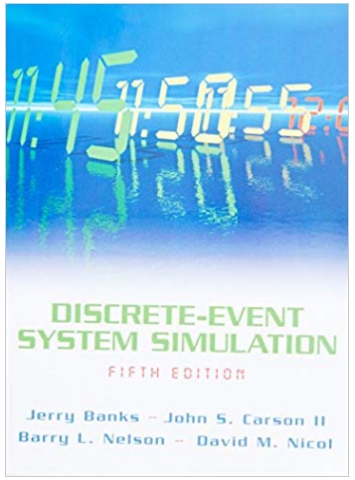
Making more complex models

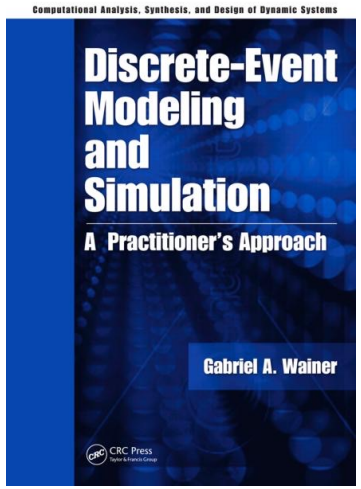
- Multiple entries 
- Multiple exits 
- Including a decision block 

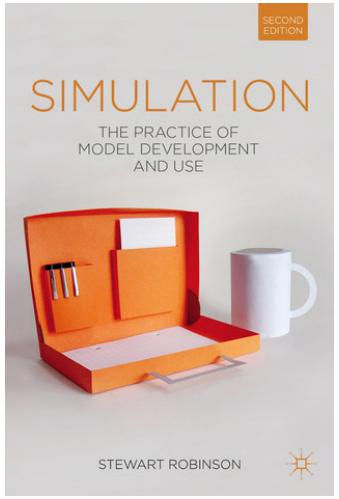
Example models on CLOUDES

More about discrete-event simulation

- blog.cloudes.me
- Books







- PS: Let me know if you notice any bugs or request new features on CLOUDES.