



Computer simulations create the future

# OACIS Hands-on(session1)

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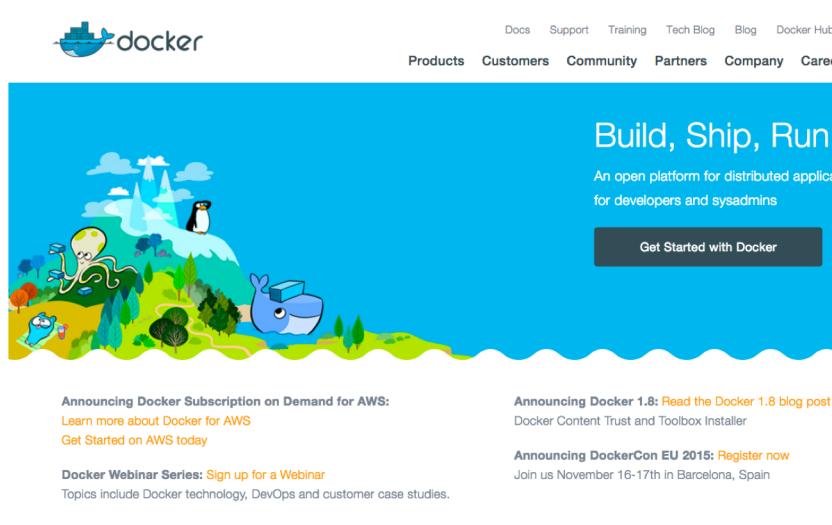
OACIS Hands-on  
2019/6/28 @ Tokyo



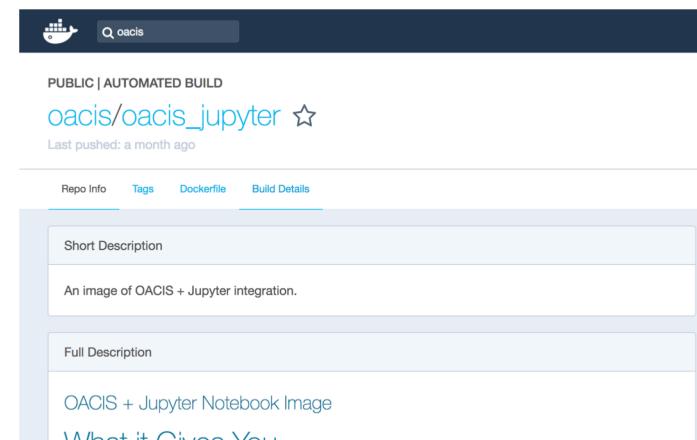
# Hands-on 1: How to submit jobs

# Virtual Machine used in this tutorial

- A Virtual Machine on Docker.
  - Docker is a software to manage virtual machines.
  - We distribute an image on which OACIS is pre-installed.



<https://www.docker.com/>



[https://hub.docker.com/r/oacis/oacis\\_jupyter/](https://hub.docker.com/r/oacis/oacis_jupyter/)

# Launching OACIS



- Launch OACIS

```
docker run --name my_oacis -p 127.0.0.1:3000:3000 -p 127.0.0.1:8888:8888 -dt  
oacis/oacis_jupyter
```

(for Docker toolbox users) `docker run --name my_oacis -p 3000:3000 -p 8888:8888 -dt  
oacis/oacis_jupyter`

```
docker logs -f my_oacis # wait until boot is ready. It may take 20-30 secs.
```

- Access OACIS web interface

- <http://localhost:3000>
- <http://192.168.99.100:3000> (Docker toolbox)

The screenshot shows the OACIS web interface. At the top, there is a navigation bar with links for "OACIS", "Simulators", "Runs", "Analyses", "Hosts", and "Document". Below the navigation bar, the title "Simulators" is displayed. A table lists a single simulator entry:

Name	Updated_at	Progress
NagelSchreckenberg	19 h ago	<div style="width: 100%;">100%</div>

At the bottom of the table is a button labeled "New Simulator". In the footer, the text "OACIS: Version v2.0.0" and "Send your feedback to [oacis-dev@googlegroups.com](mailto:oacis-dev@googlegroups.com)" is displayed.

OACIS web Interface

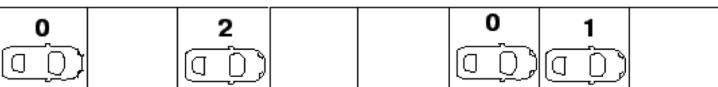
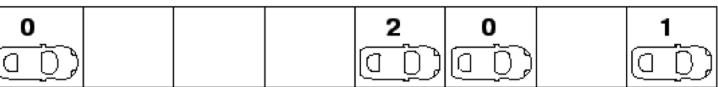
- You'll see an empty list of simulators.
- To conduct simulations, we need to register a simulator on OACIS.
  - Run the following command to register a sample simulator used in this tutorial.

```
docker exec -it -u oacis my_oacis bash -l  
( in the container)  
git clone https://github.com/yohm/sim\_ns\_model.git  
sim_ns_model/install_on_oacis.sh
```

- We will learn how to register our simulators in the next session.

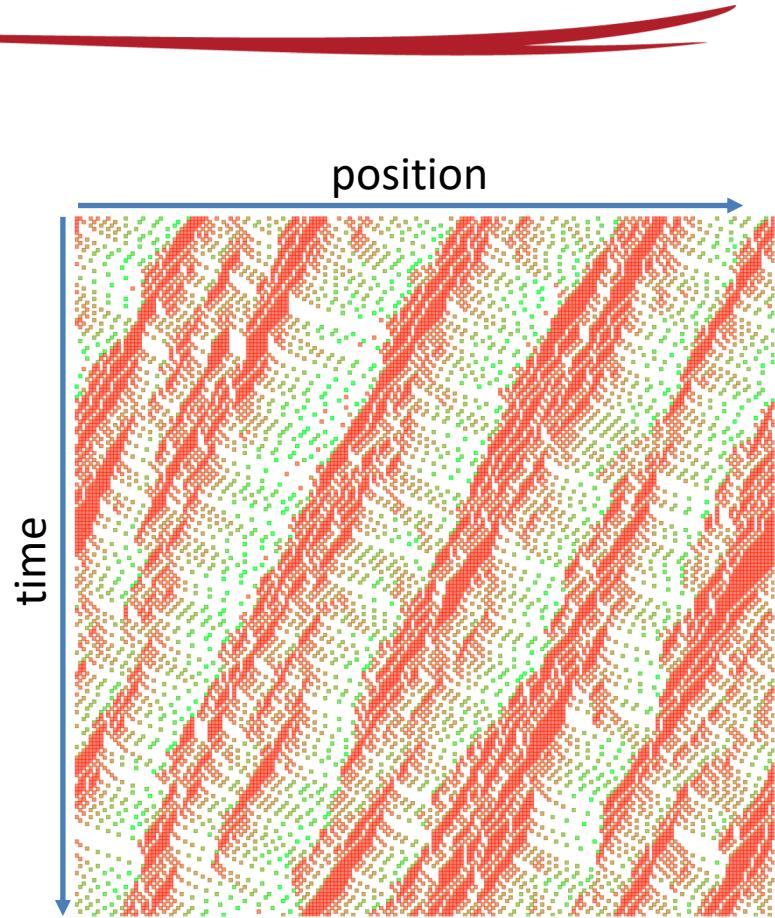
# Nagel–Schreckenberg model

- Nagel–Schreckenberg is a cellular-automaton model for traffic congestion, proposed in 1990s.
- Refer to [Wikipedia] ([https://en.wikipedia.org/wiki/Nagel%20%26%20Schreckenberg\\_model](https://en.wikipedia.org/wiki/Nagel%20%26%20Schreckenberg_model))

Actual position		Key	Description
Acceleration stage		$I$	Road length
Deceleration stage		$v$	Maximum velocity
Randomization		$\rho$	Car density
Vehicle update		$p$	deceleration probability
		$t_{init}$	thermalization steps
		$t_{measure}$	measurement steps

[http://www.civil.iitb.ac.in/tvm/1111\\_nptel/544\\_TrCA/plain/plain.html](http://www.civil.iitb.ac.in/tvm/1111_nptel/544_TrCA/plain/plain.html)

- It reproduces the phase transition between the free-flow phase and the congestion phase.
- Source code of this simulator
  - [https://github.com/yohm/sim\\_ns\\_model](https://github.com/yohm/sim_ns_model)
  - Output files of this simulator
    - a JSON file containing average velocity and flow
    - a snapshot PNG file.



# Selecting a Simulator

- Select a Simulator

OACIS Simulators Runs Analyses Hosts

- Check Simulator settings

Definition of input parameters & configurations of the simulator are registered.

## Simulators

Name

NagelSchreckenberg

Click

New Simulator

OACIS Simulators Runs Analyses Hosts

Simulators / NagelSchreckenberg

NagelSchreckenberg

About Parameter Set Progress

Click

Simulator Description

NagelSchreckenberg model simulation

- Nagel-Schreckenbergモデルは1990年代に提唱された交通流モデル
- 単純なセルルーアートマティクスでありながら自然な渋滞を再現した

詳細は[Wikipedia](#)を参照

Duplicate Edit Destroy

About

Parameter Input Type

Arguments

Support MPI

No

Support OMP

No

Executable On

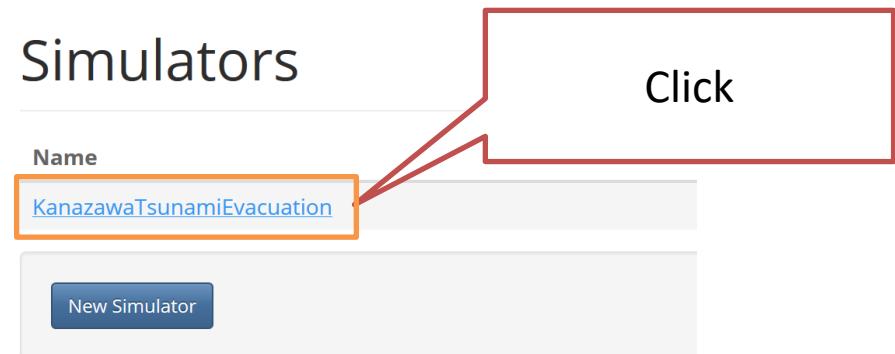
localhost

Defined Parameters

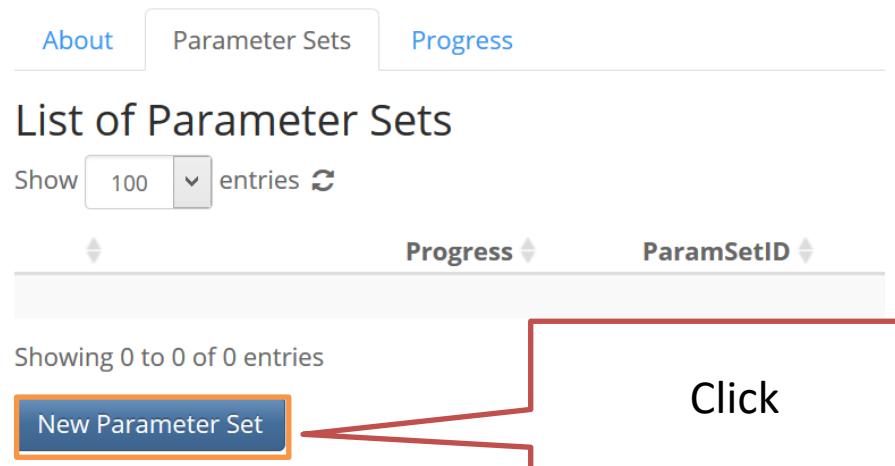
	Type	Default	Description
<i>l</i>	Integer	200	road length
<i>v</i>	Integer	5	maximum velocity
<i>rho</i>	Float	0.3	car density
<i>p</i>	Float	0.1	deceleration probability(0.0, 1.0)
<i>t_init</i>	Integer	1000	thermalization steps
<i>t_measurer</i>	Integer	300	measurement steps

# Creating a PS and Run

- Select a Simulator



- List of ParameterSets are shown.
- Click “New ParameterSet” button to create a new PS.



- Creating a ParameterSet and Runs
  - Fill in the values of parameters
    - $v = 5$
    - $\rho = 0.2$
  - Set “Target # of Runs” to ‘1’
  - Click “Create” button

Create a new parameter set on: NagelSchreckenberg

I (Integer)	<input type="text" value="200"/>	road length
v (Integer)	<input type="text" value="1,2,3,4,5"/>	maximum velocity
rho (Float)	<input type="text" value="0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9"/>	car density
p (Float)	<input type="text" value="0.1"/>	deceleration probability[0.0, 1.0]
t_init (Integer)	<input type="text" value="1000"/>	thermalization steps
t_measurer (Integer)	<input type="text" value="300"/>	measurement steps
Target # of Runs	<input type="text" value="1"/>	② Select “1”
Submitted to	<input type="text" value="localhost"/>	
Priorities of Runs	<input type="text" value="normal"/>	③ Click
<input type="button" value="Create"/> <input type="button" value="Cancel"/>		

- A new ParameterSet and a Run are created.
  - The status of the Run will change in a few seconds.

OACIS   Simulators   Runs   Analyses   Hosts

Simulators / NagelSchreckenberg / Param:561dfaad356339008d260000

## Parameter Set

/home/oacis/oacis/public/Result\_development/561cdf093135350450000000

About   Runs   **Analyses**   Plot

Runs on (l=200, v=4, rho=0.7, p=0.1, t\_init=1000, t\_measuer=300)

Show 10 entries ↻

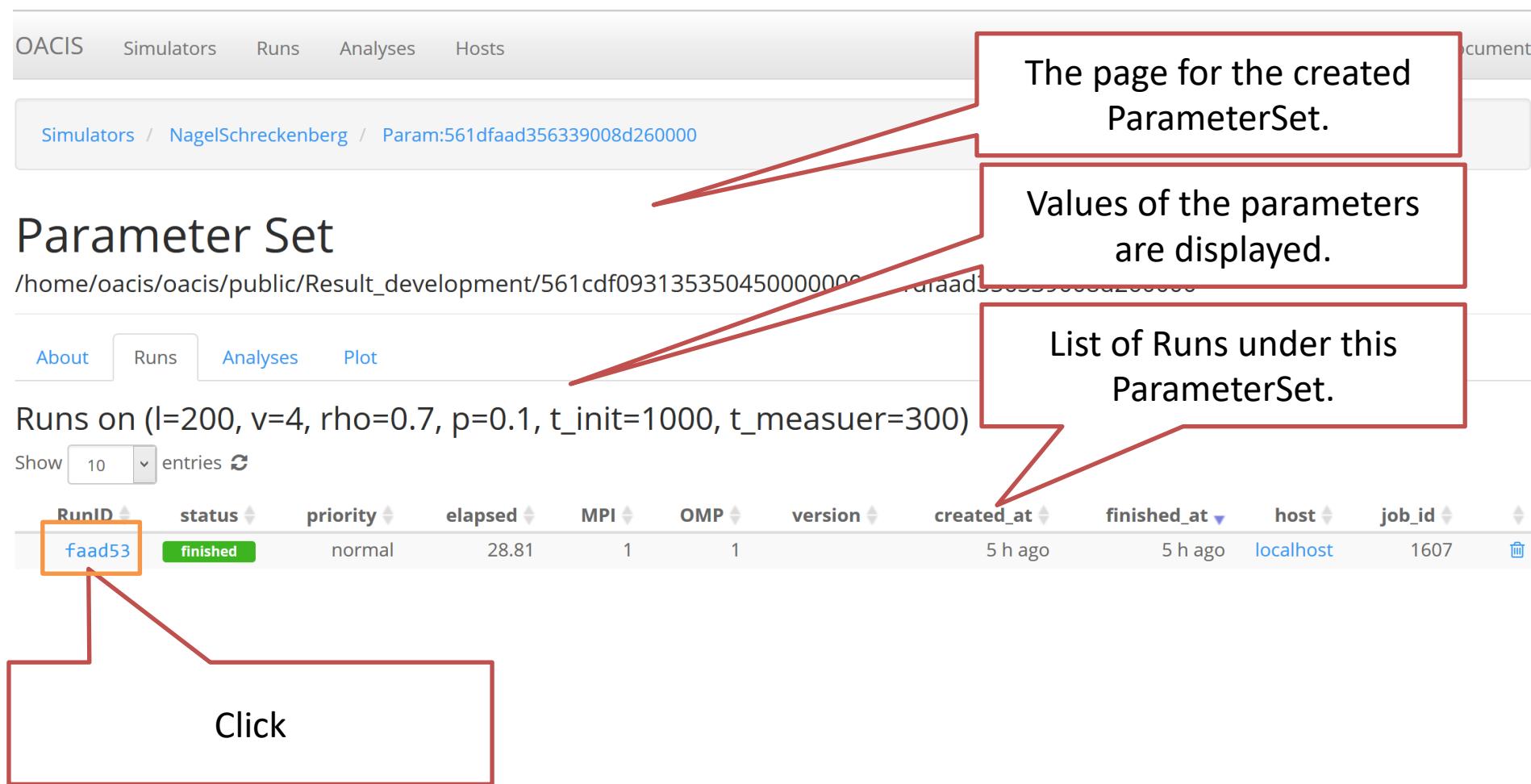
RunID	status	priority	elapsed	MPI	OMP	version	created_at	finished_at	host	job_id	
<b>faad53</b>	finished	normal	28.81	1	1		5 h ago	5 h ago	localhost	1607	trash

The page for the created ParameterSet.

Values of the parameters are displayed.

List of Runs under this ParameterSet.

Click



# checking the results

OACIS Simulators Runs Analyses Hosts Document

Simulators / NagelSchreckenberg / Param:561dfaad356339008d260000 / Run:561dfaad356339008d530000

## Run

(l=200, v=4, rho=0.7, p=0.1, t\_init=1000, t\_measurer=300)  
`/home/oacis/oacis/public/Result_development/561cdf093135350450000000/561dfaad356339008d260000/561dfaad356339008d530000`

About Results and Analyses

### Results

velocity	0.2582833333333336
flow	0.1807983333333317

### Output Files

`/Result_development/561cdf093135350450000000/561dfaad356339008d260000/561dfaad356339008d530000/`

- `561dfaad356339008d530000_xsub.sh`
- `_output.json`
- `_status.json`
- `_stderr.txt`
- `_stdout.txt`
- `_time.txt`
- `initial_time_series.dat`
- `traffic.png`



Download Archive

The page of Run

Contents of “\_output.json” file is saved in OACIS DB.

List of output files. Click it to access.

Figures (bmp,jpg,png...) are displayed inline.

A button to download the archive of these results.

## Run

(l=200, v=4, rho=0.7, p=0.1, t\_init=1000, t\_measuer=300)

/home/oacis/oacis/public/Result\_development/561cdf093135350450000000/561dfaad356339008d260000/561dfaad356339008d530000

[About](#)   [Results and Analyses](#)

## Results

velocity	0.2582833333333336
flow	0.1807983333333317

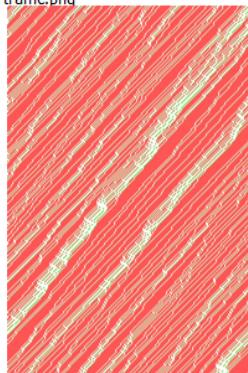
## Output Files

/Result\_development/561cdf093135350450000000/561dfaad356339008d260000/561dfaad356339008d530000/

```

├── 561dfaad356339008d530000_xsub.sh
├── _output.json
├── _status.json
├── _stderr.txt
├── _stdout.txt
├── _time.txt
└── initial_time_series.dat

```



[Download Archive](#)

Path in the file system.

Each result has its own URL.

Ex. URL for this figure file:

[http://192.168.99.100:3000/Result\\_development/561cdf093135350450000000/561dfaad356339008d26000/561dfaad356339008d530000/traffic.png](http://192.168.99.100:3000/Result_development/561cdf093135350450000000/561dfaad356339008d26000/561dfaad356339008d530000/traffic.png)

It is useful to summarize the results in your notebook by keeping this URL.

# Making multiple jobs

- In the form to create ParameterSets
  - fill in the values of parameters as comma-separated values
    - $v = "1, 2, 3, 4, 5"$
    - $\rho = "0.05, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5"$
  - Set “Target # of Runs” to ‘1’
  - Click Create

Create a new parameter set on: NagelSchreckenberg

I (Integer)	<input type="text" value="200"/>	road length
v (Integer)	<input type="text" value="1,2,3,4,5"/>	maximum velocity
<b>ρ (Float)</b>	<input type="text" value="0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9"/>	car density
p (Float)	<input type="text" value="0.1"/>	deceleration probability[0.0, 1.0]
t_init (Integer)	<input type="text" value="1000"/>	thermalization steps
t_measurer (Integer)	<input type="text" value="300"/>	measurement steps
Target # of Runs	<input type="text" value="1"/>	② Select “1”
Submitted to	<input type="text" value="localhost"/>	
Priorities of Runs	<input type="text" value="normal"/>	③ Click
<input type="button" value="Create"/> <input type="button" value="Cancel"/>		

① fill in values in a CSV form

② Select “1”

③ Click

# Making multiple jobs

OACIS Simulators Runs Analyses Hosts

Document

45 ParameterSets and 45 runs were created

45 ParameterSets are created in total.

Simulators / NagelSchreckenberg

## NagelSchreckenberg

About Parameter Sets Progress

### List of Parameter Sets

Show 100 entries ↻

List of ParameterSets

Values of parameters

	Progress	ParamSetID	Updated_at	I	v	rho	p	t_init	t_measurer	
	100%	faac24	1 min. ago	200	4	0.5	0.1	1000	300	
	100%	faac23	1 min. ago	200	4	0.4	0.1	1000	300	
	100%	faac22	1 min. ago	200	4	0.3	0.1	1000	300	
	100%	faad31	1 min. ago	200	5	0.9	0.1	1000	300	
		faad30	1 min. ago	200	5	0.8	0.1	1000	300	
		faad2f	1 min. ago	200	5	0.7	0.1	1000	300	
		faad2e	1 min. ago	200	5	0.6	0.1	1000	300	
		faad2d	1 min. ago	200	5	0.5	0.1	1000	300	

Progress bars for job executions.

# Making multiple jobs

OACIS   Simulators   Runs   Analyses   Hosts

Document

45 ParameterSets and 45 runs were created

x

Simulators / NagelSchreckenberg

## NagelSchreckenberg

About   Parameter Sets   Progress

### List of Parameter Sets

Show 100 entries ↴

**Progress**  
 Green : finished  
 Orange : running  
 Blue : submitted  
 Red : failed

	Progress	ParamSetID	Updated_at	I	v	rho	p	t_init	t_measurer	
	100%	faad2a	< 1 min. ago	200	5	0.2	0.1	1000	300	
	100%	faad29	< 1 min. ago	200	5	0.1	0.1	1000	300	
	100%	faad26	< 1 min. ago	200	4	0.7	0.1	1000	300	
	100%	faad25	< 1 min. ago	200	4	0.6	0.1	1000	300	
	100%	faad28	< 1 min. ago	200	4	0.9	0.1	1000	300	
	100%	faad27	1 min. ago	200	4	0.8	0.1	1000	300	
	100%	faac24	1 min. ago	200	4	0.5	0.1	1000	300	
	100%	faac23	1 min. ago	200	4	0.4	0.1	1000	300	

# Checking the results

OACIS   Simulators   Runs   Analyses   Hosts

Document

45 ParameterSets and 45 runs were created

Simulators / NagelSchreckenberg

## NagelSchreckenberg

About   Parameter Sets   Progress

### List of Parameter Sets

Show  entries ↴

	Progress	ParamSetID	Updated_at	rho	p	t_init	t_measurer	
	100%	faad2a	< 1 min.	200	5	0.2	0.1	1000
	100%	faad29	1 min. ago	200	5	0.1	0.1	1000
	100%	faad26	< 1 min. ago	200	4	0.7	0.1	1000
	100%	faad25	< 1 min. ago	200	4	0.6	0.1	1000
	100%	faad28	< 1 min. ago	200	4	0.9	0.1	1000
	100%	faad27	1 min. ago	200	4	0.8	0.1	1000
	100%	faac24	1 min. ago	200	4	0.5	0.1	1000
	100%	faac23	1 min. ago	200	4	0.4	0.1	1000

Click  
(ID may be different on your  
environment)

OACIS Simulators Runs Analyses Hosts

Document

Simulators / NagelSchreckenberg /

Param:561dfaad356339008d260000

At the page of ParameterSet

Click “Plot”

## Parameter Set

/home/oacis/oacis/public/Result\_development/561cdf0931352150000000/561dfaad356339008d260000

About Runs Analyses Plot

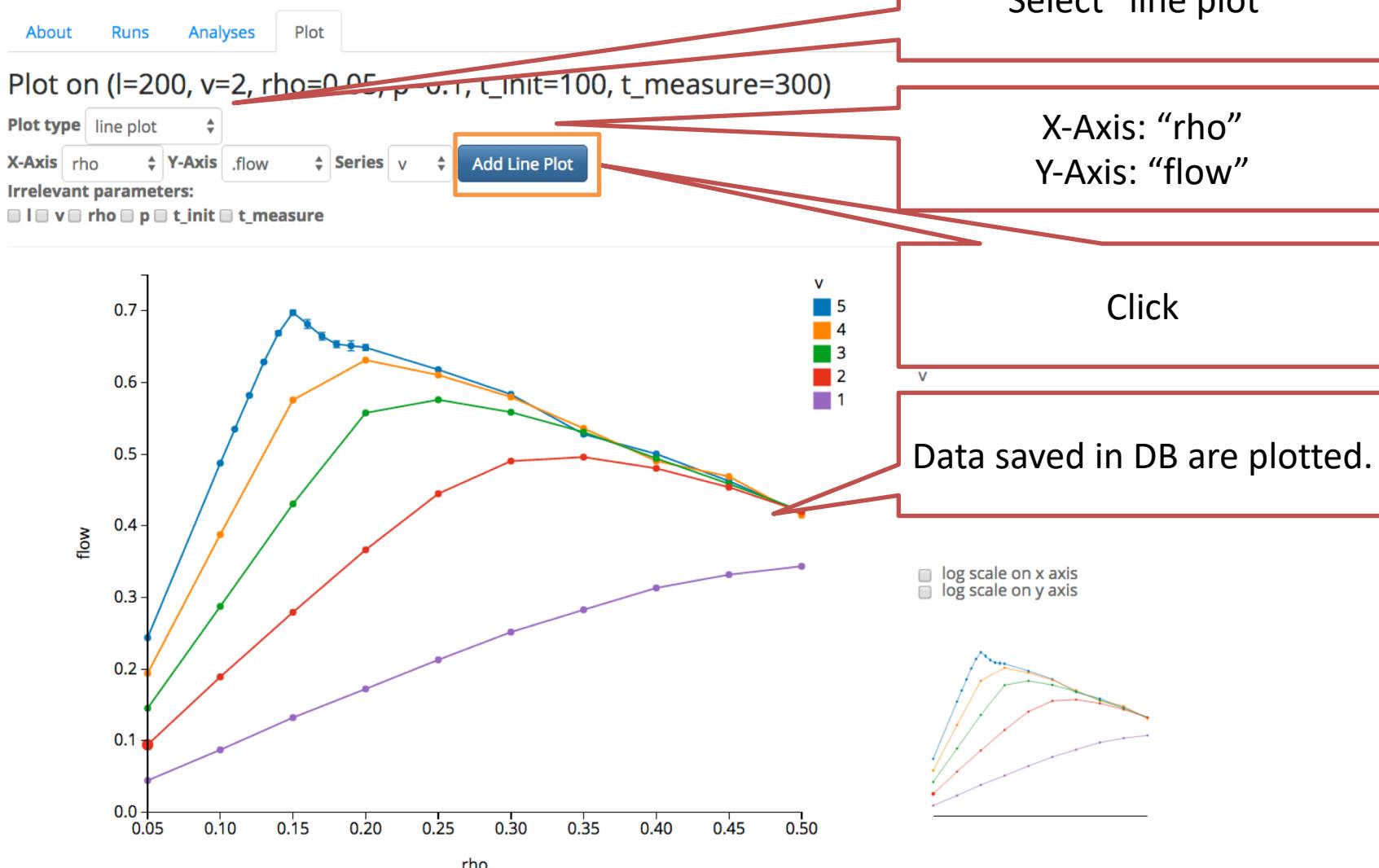
Runs on (l=200, v=4, rho=0.7, p=0.1, t\_init=1000, t\_measuer=300)

Show 10 entries

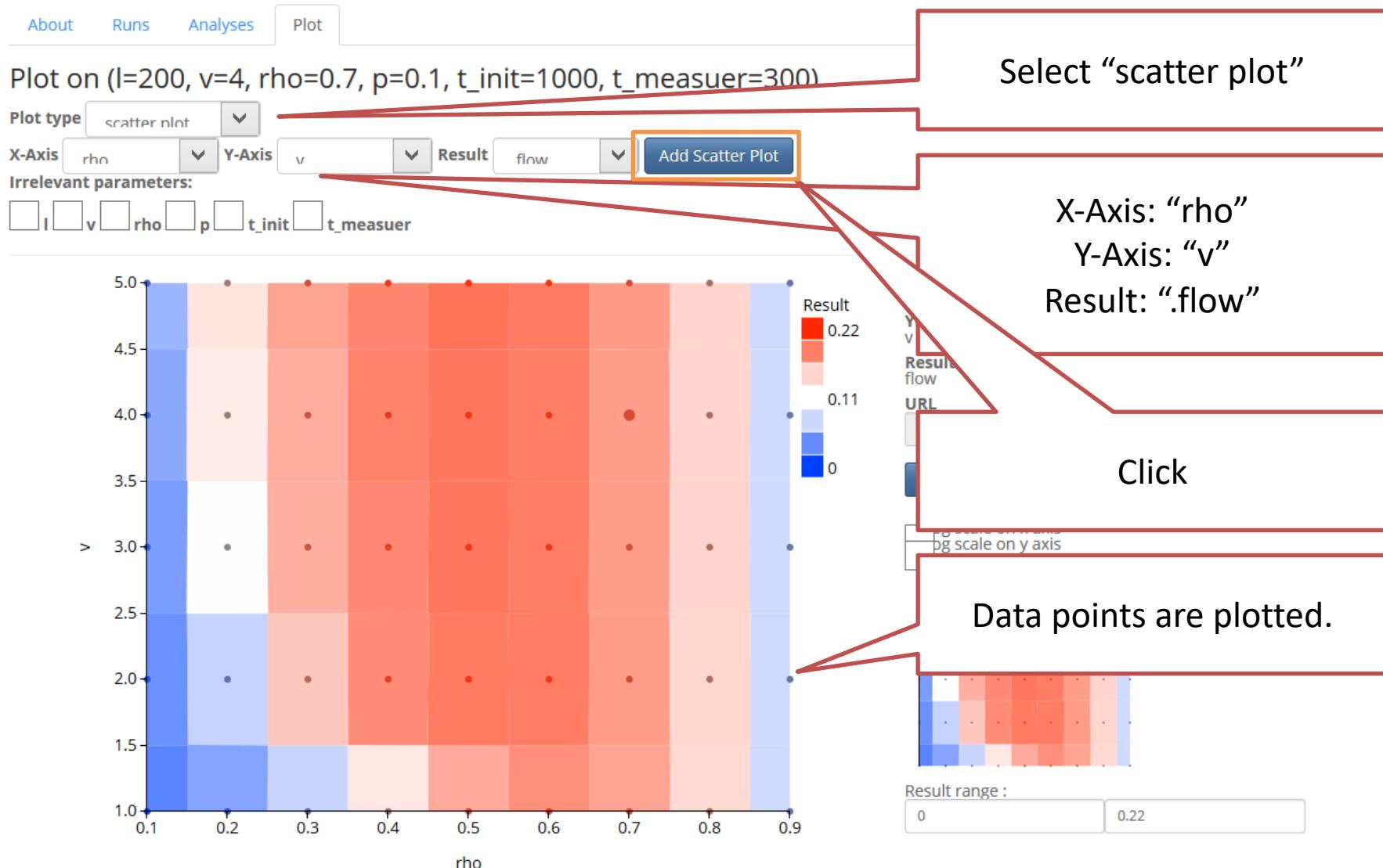
RunID	status	priority	elapsed	MPI	OMP	version	created_at	finished_at	host	job_id	
faad53	finished	normal	28.81	1	1		5 h ago	5 h ago	localhost	1607	

# Parameter Set

/home/oacis/oacis/public/Result\_development/5625a5533939360088030000/5625a7c8343



# Checking the results

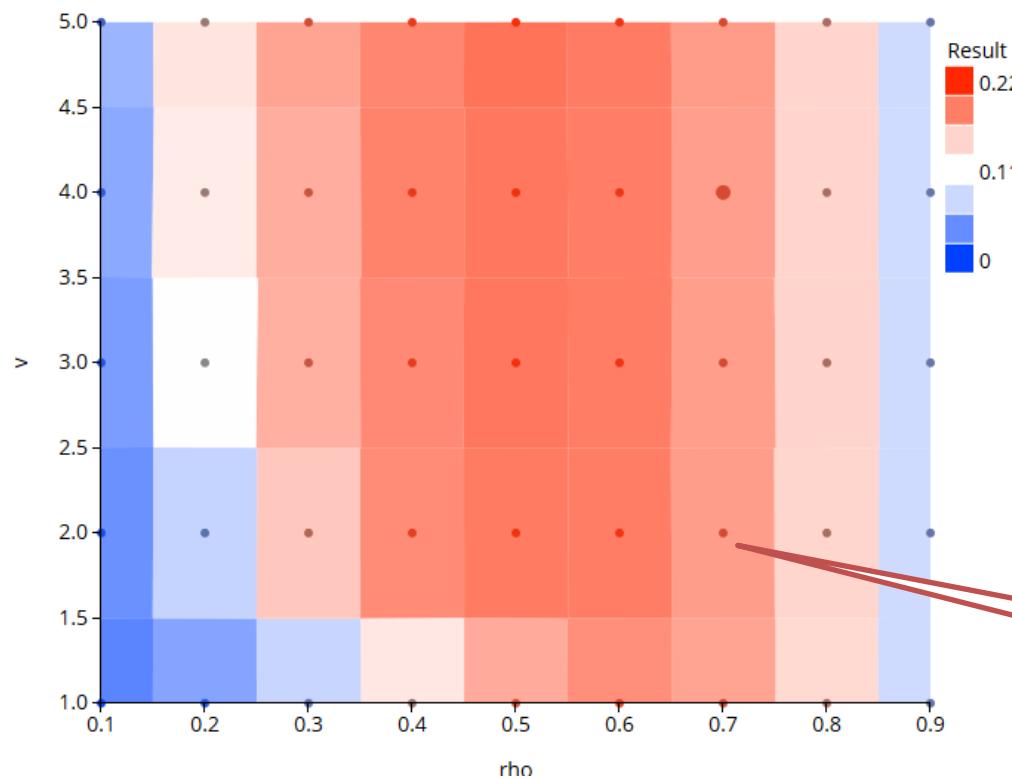


Plot on ( $l=200$ ,  $v=4$ ,  $\rho=0.7$ ,  $p=0.1$ ,  $t_{init}=1000$ ,  $t_{measurer}=300$ )

Plot type: scatter plot

X-Axis: rho Y-Axis: v Result: flow Add Scatter Plot

Irrelevant parameters:

 l  v  rho  p  t\_init  t\_measurer
 

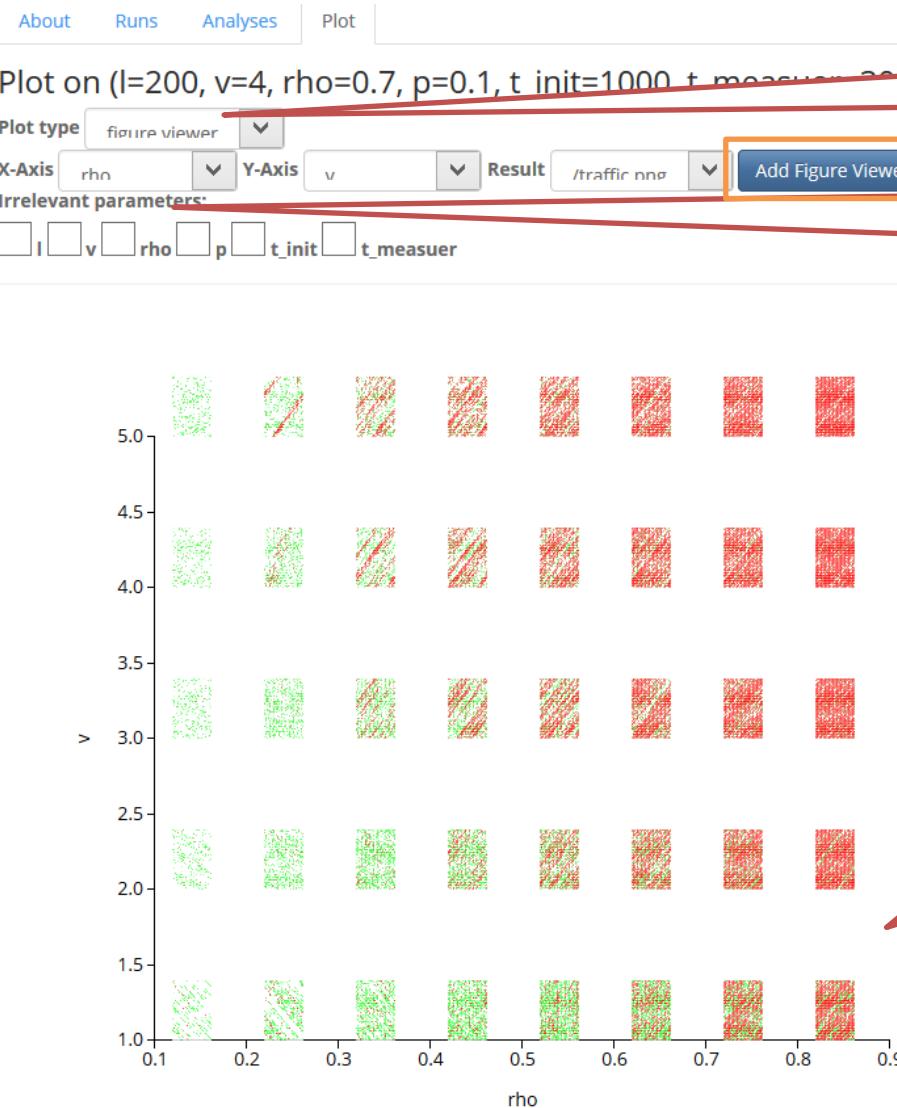
Each plot has its own URL.

X-Axis: rho  
Y-Axis: v  
Result: flow  
URL: [http://192.168.99.100:3000/parameter\\_sets/561dfaad35633f](http://192.168.99.100:3000/parameter_sets/561dfaad35633f)

Action ▾  
[show data in json](#)  
[download svg](#)  
[delete plot](#)

You can download SVG file.

When you double click each data point, you'll go to a page for the ParameterSet.



Select “figure viewer”

X-Axis: “rho”

Y-Axis: “v”

Result: “.traffic.png”

Click

A magnified image is displayed by mouse-over.  
Double-click leads you to the ParameterSet page.

# If you have time...

- Open documentation page
  - There is a link on the upper-right corner.
- Run simulation with  $\rho=0.0$ 
  - The simulator will fail.
- Try other sample simulators.

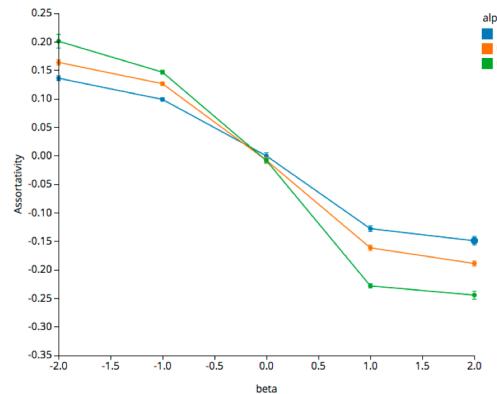
# [optional] Another samples

- [https://github.com/yohm/sim\\_power\\_mean\\_sampling](https://github.com/yohm/sim_power_mean_sampling)
  - J. Torok, Y. Murase, H.-H. Jo et al., "What Big Data tells: Sampling the social network by communication channels", Phys. Rev. E (2016)

```
docker exec -it -u oacis my_oacis bash -l  
(in the container)  
git clone https://github.com/yohm/sim_power_mean_sampling.git  
sim_power_mean_sampling/install.sh
```

Create ParameterSets with various alpha and beta for "NetworkSamplingTunedFO" simulator, and see how the assortativity of the sampled network depends on these parameters.

alpha = [0.6, 0.8, 1.0], beta = [-2.0, -1.0, 0.0, 1.0, 2.0]

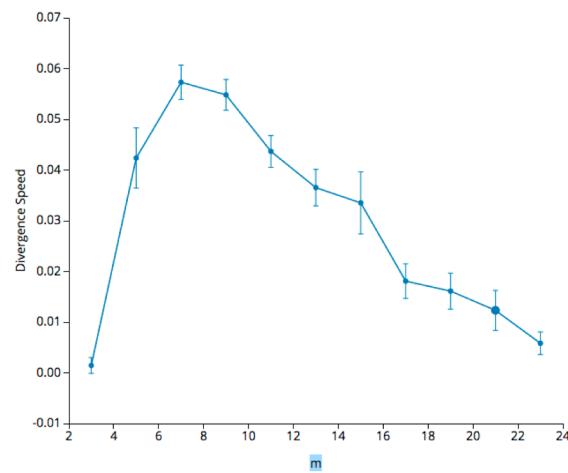


# [optional] sample 2

- [https://github.com/yohm/sim\\_eos\\_model](https://github.com/yohm/sim_eos_model) courtesy of T. Shimada
  - T. Shimada ["A universal transition in the robustness of evolving open systems"](#) Sci. Rep. 4: 4082 (2014).

```
docker exec -it -u oacis my_oacis bash -l  
(in the container)  
git clone https://github.com/yohm/sim_eos_model.git  
sim_eos_model/install.sh
```

Run "EOS\_model" simulator for  $m=[3,5,7,9,11,13,15,17,19,21,23]$ ,  
and see that "Divergence Speed" is positive only for  $5 \leq m \leq 17$ .



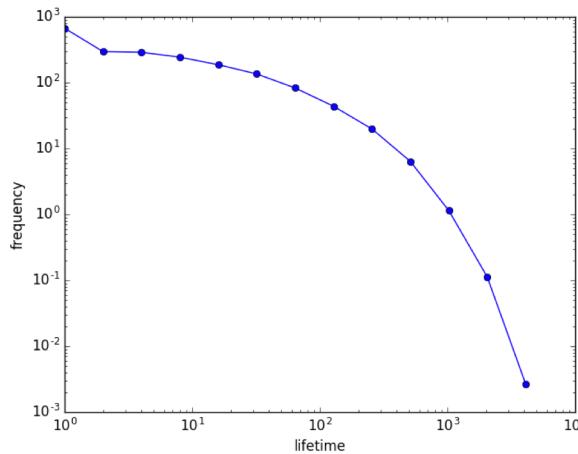
To see a clear transition,  
set "t" to a much bigger value than the default value.

## [optional] sample 3

- [https://github.com/yohm/dynamical\\_graph\\_model](https://github.com/yohm/dynamical_graph_model)
  - Y. Murase et al., "A simple model for skewed species-lifetime distributions", New J. Phys. (2010)

```
docker exec -it -u oacis my_oacis bash -l  
(in the container)  
git clone https://github.com/yohm/dynamical_graph_model.git  
dynamical_graph_model/install.sh
```

Run "DynamicalGraphModel" simulator with the default parameters, and see how the lifetime distribution looks like.



# Stopping OACIS



- From the terminal
  - stopping OACIS

```
docker stop -t 60 my_oacis
```

- 
- restarting OACIS

```
docker start my_oacis
```

- logging in to the container

```
# user  
docker exec -it -u oacis my_oacis bash -l
```

- removing the container

```
docker stop my_oacis; docker rm -v my_oacis
```

# Conclusion

- Installation of Docker and OACIS
  - hands-on of simulation execution by OACIS
    - selecting the Simulator
    - creating ParameterSets and Runs
    - accessing the results
      - output files
      - plots
- ⇒ In the next hands-on  
we will instruct how to implement YOUR simulator