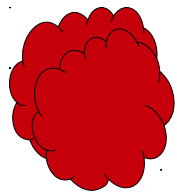


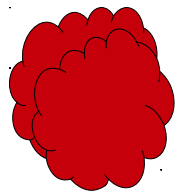
# **Modelling at the tissue scale: a concurrent approach**

Adam Sampson and Alexey Goltsov

CRISP

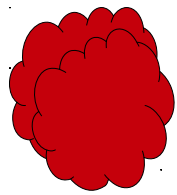
University of Abertay Dundee





measure,  
model



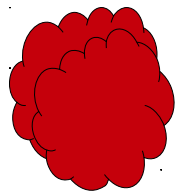


→  
measure,  
model



→  
replicate

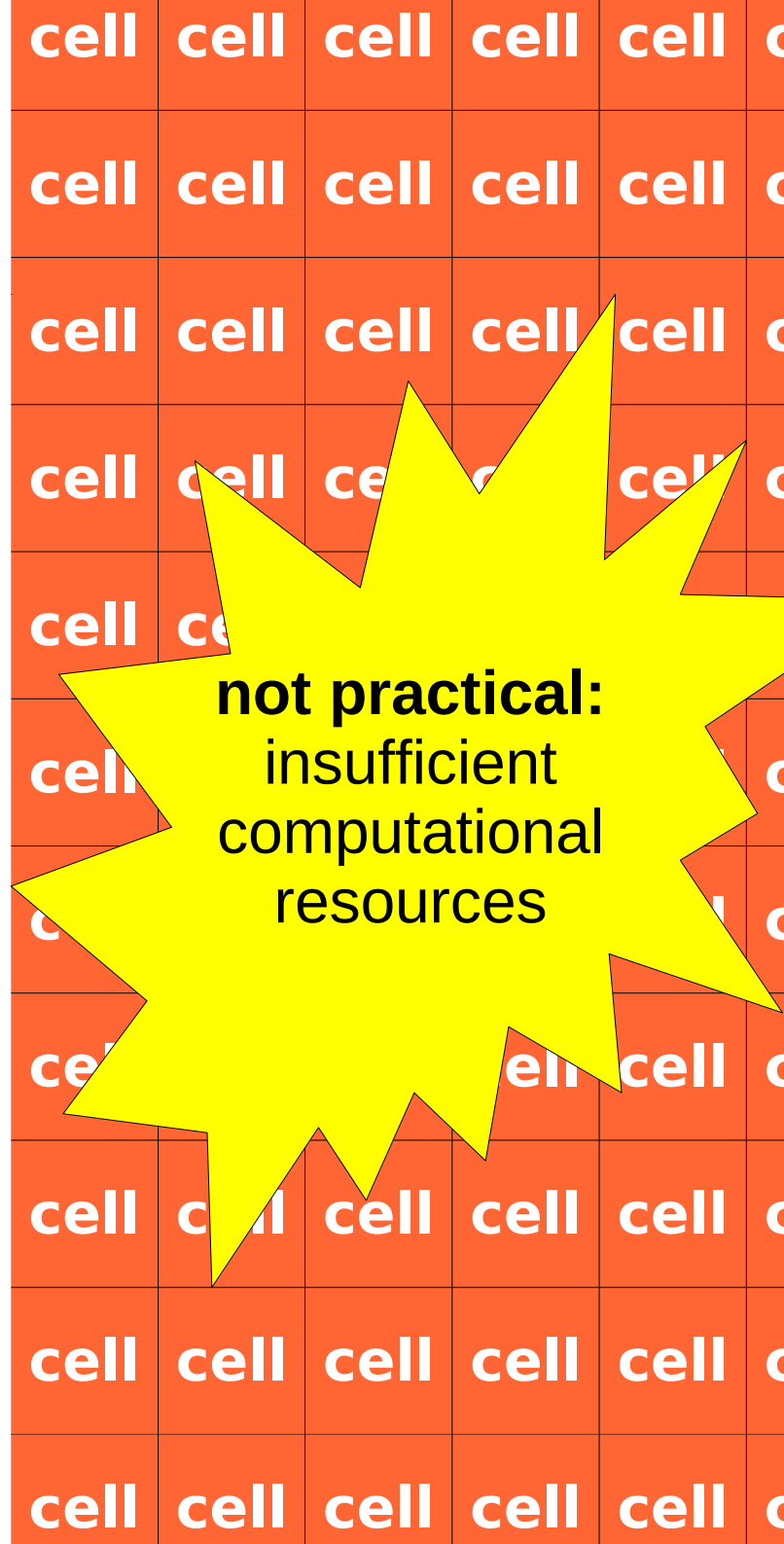




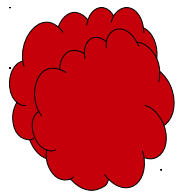
→  
measure,  
model



→  
replicate

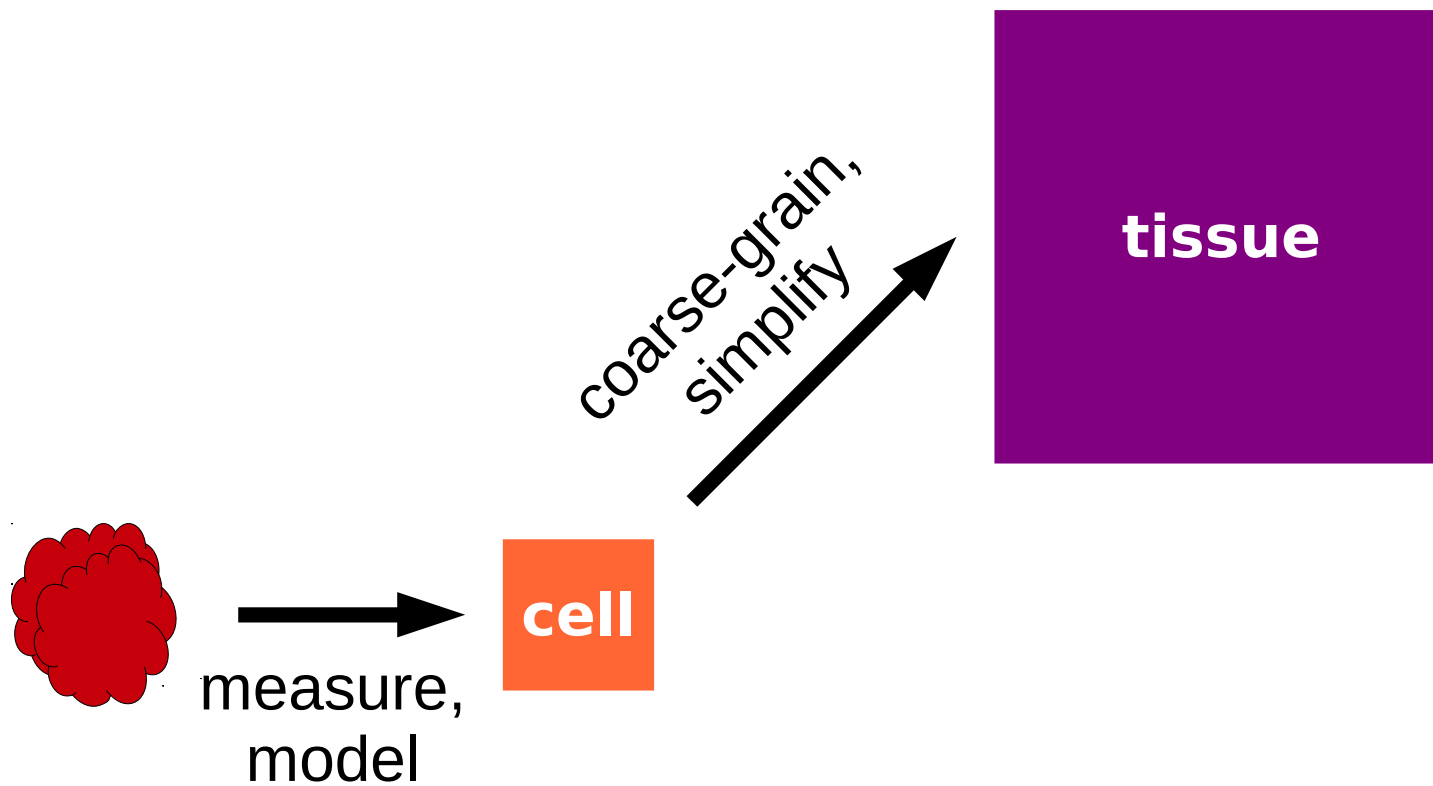


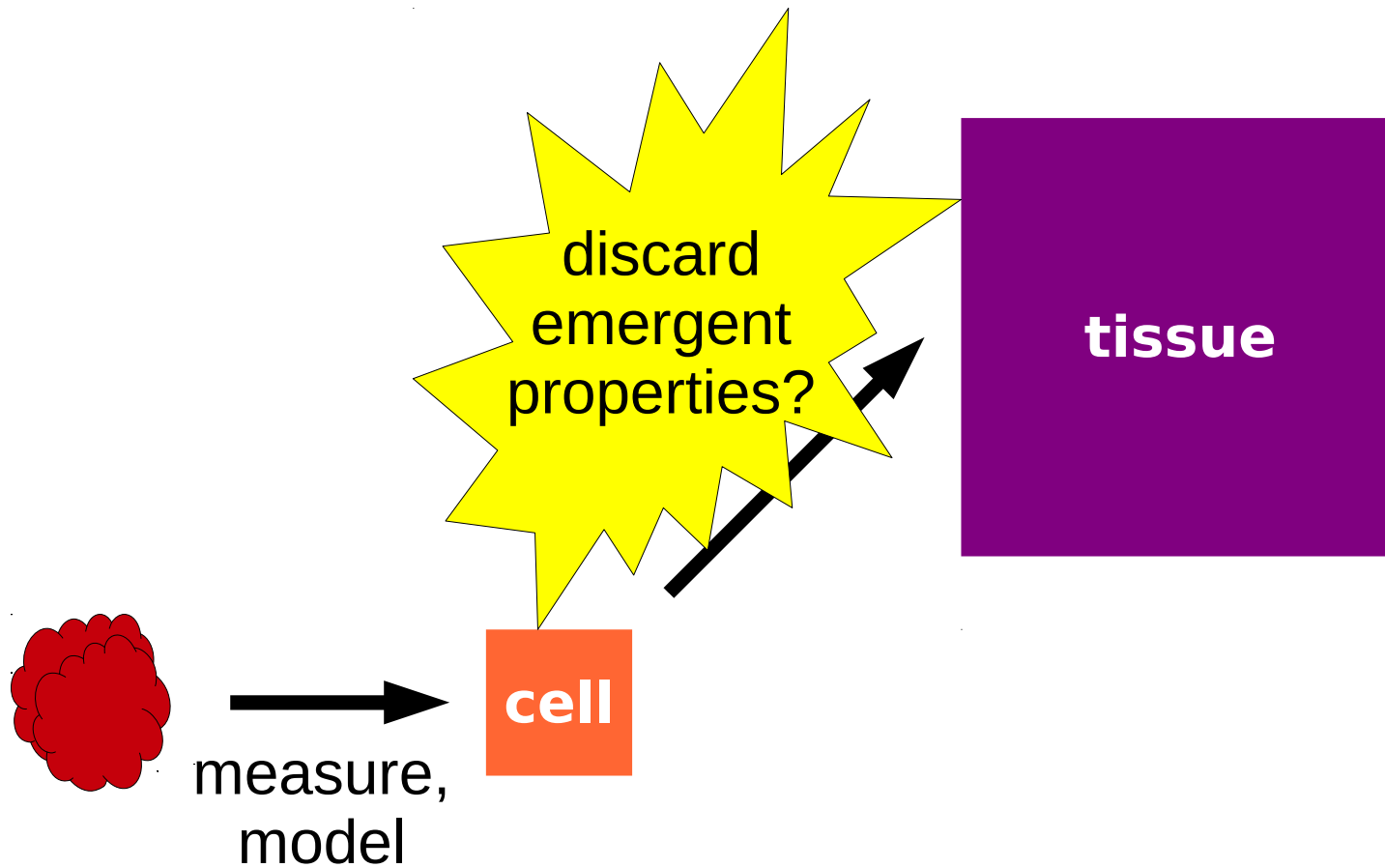
**not practical:**  
insufficient  
computational  
resources



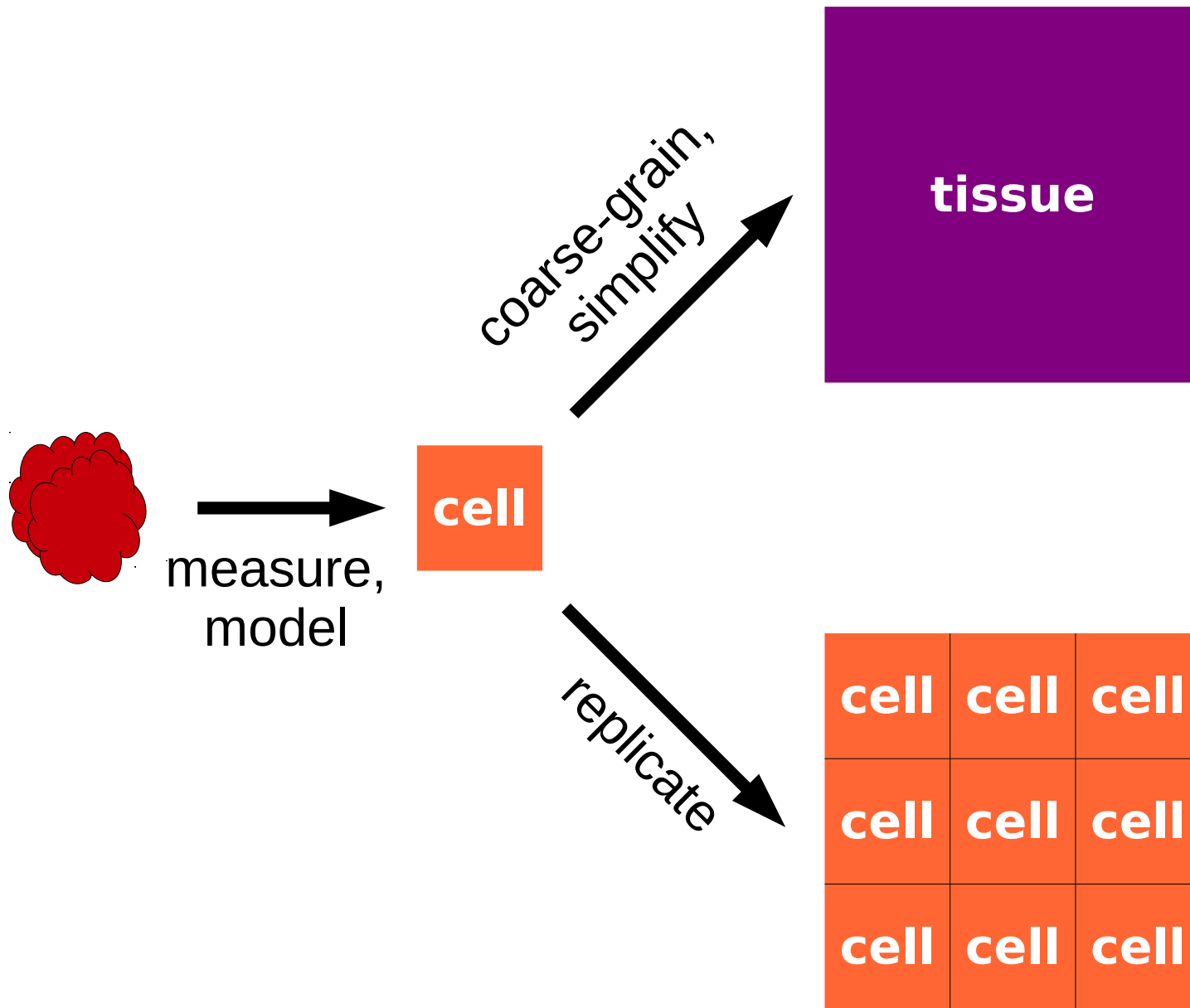
measure,  
model

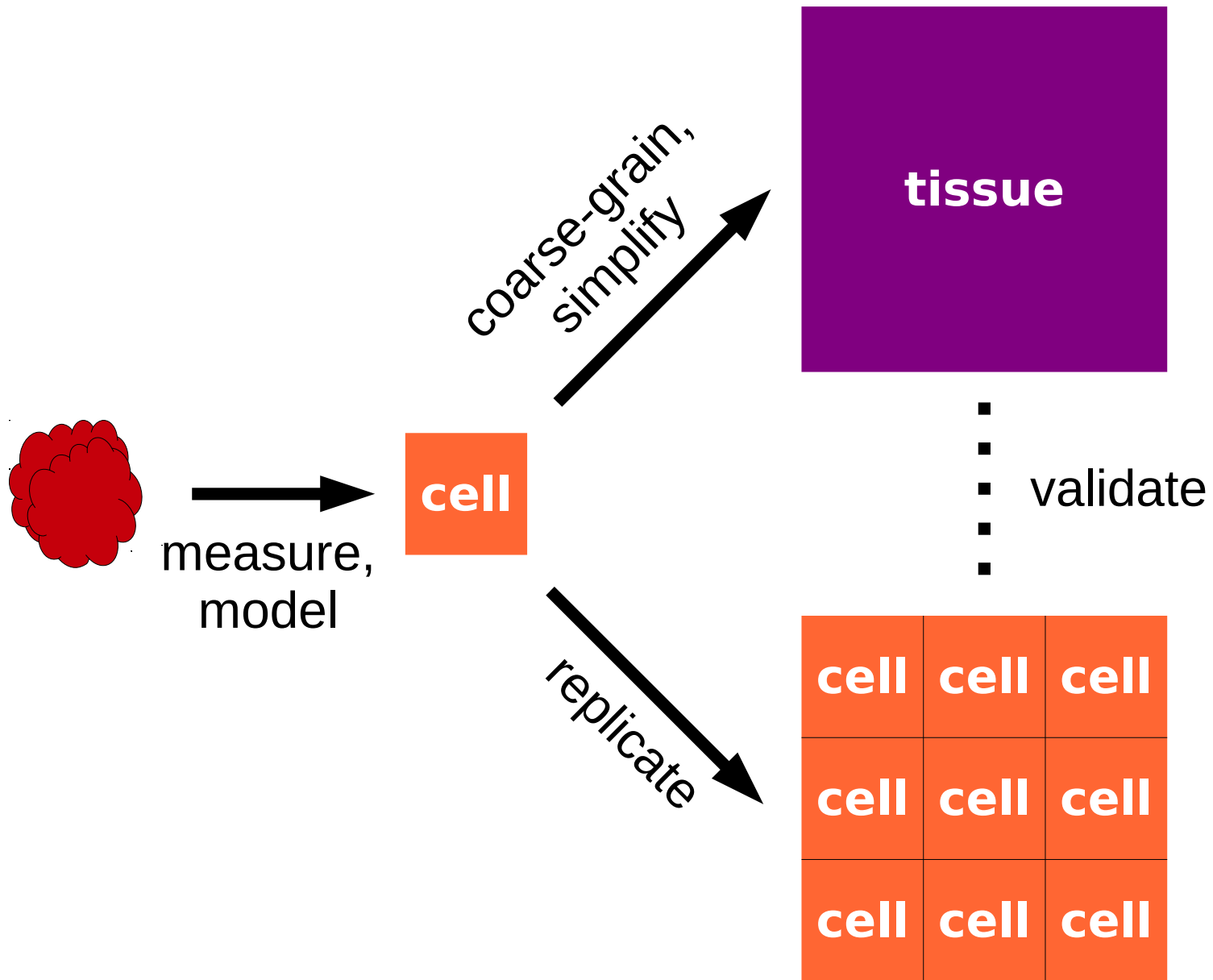


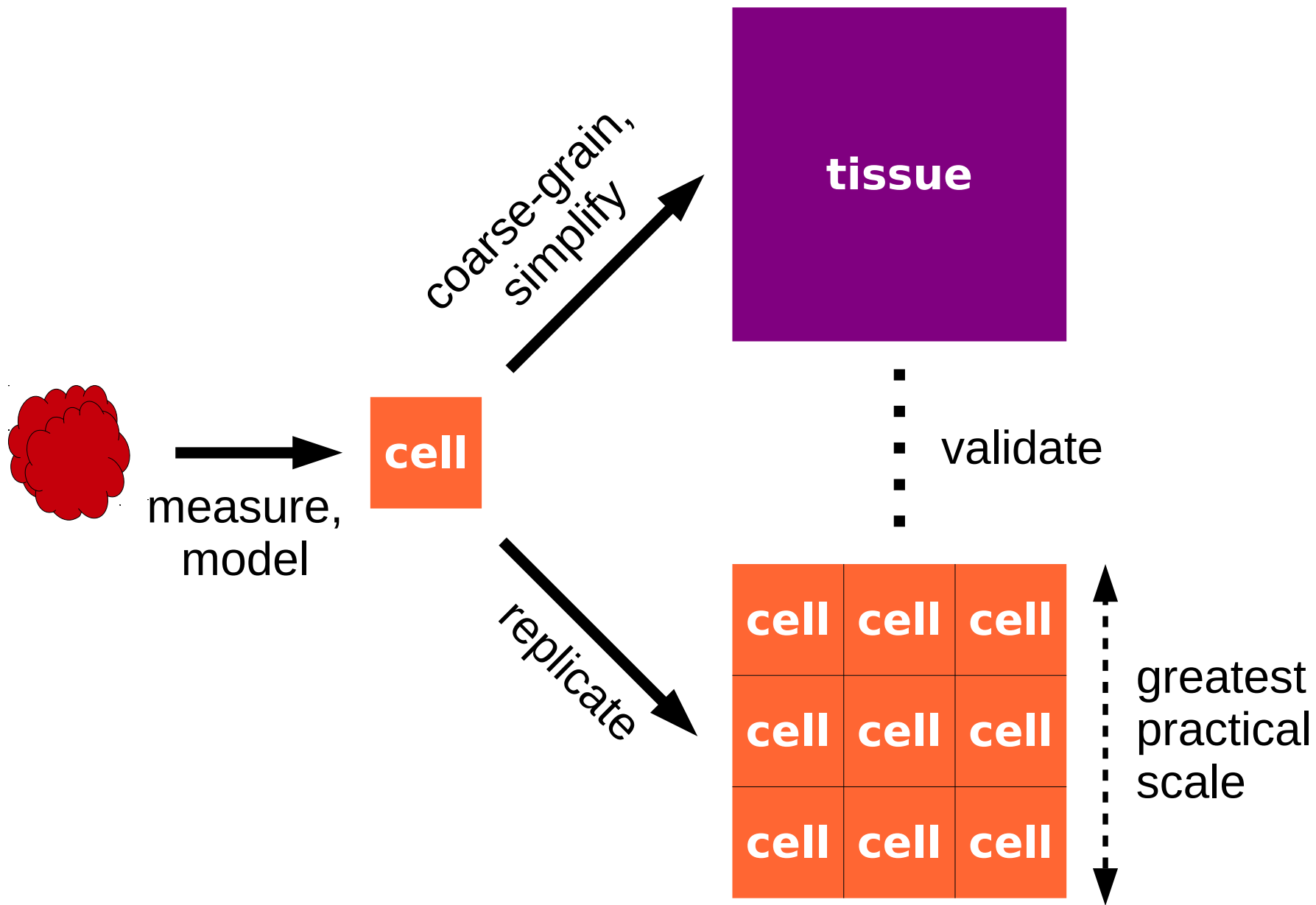


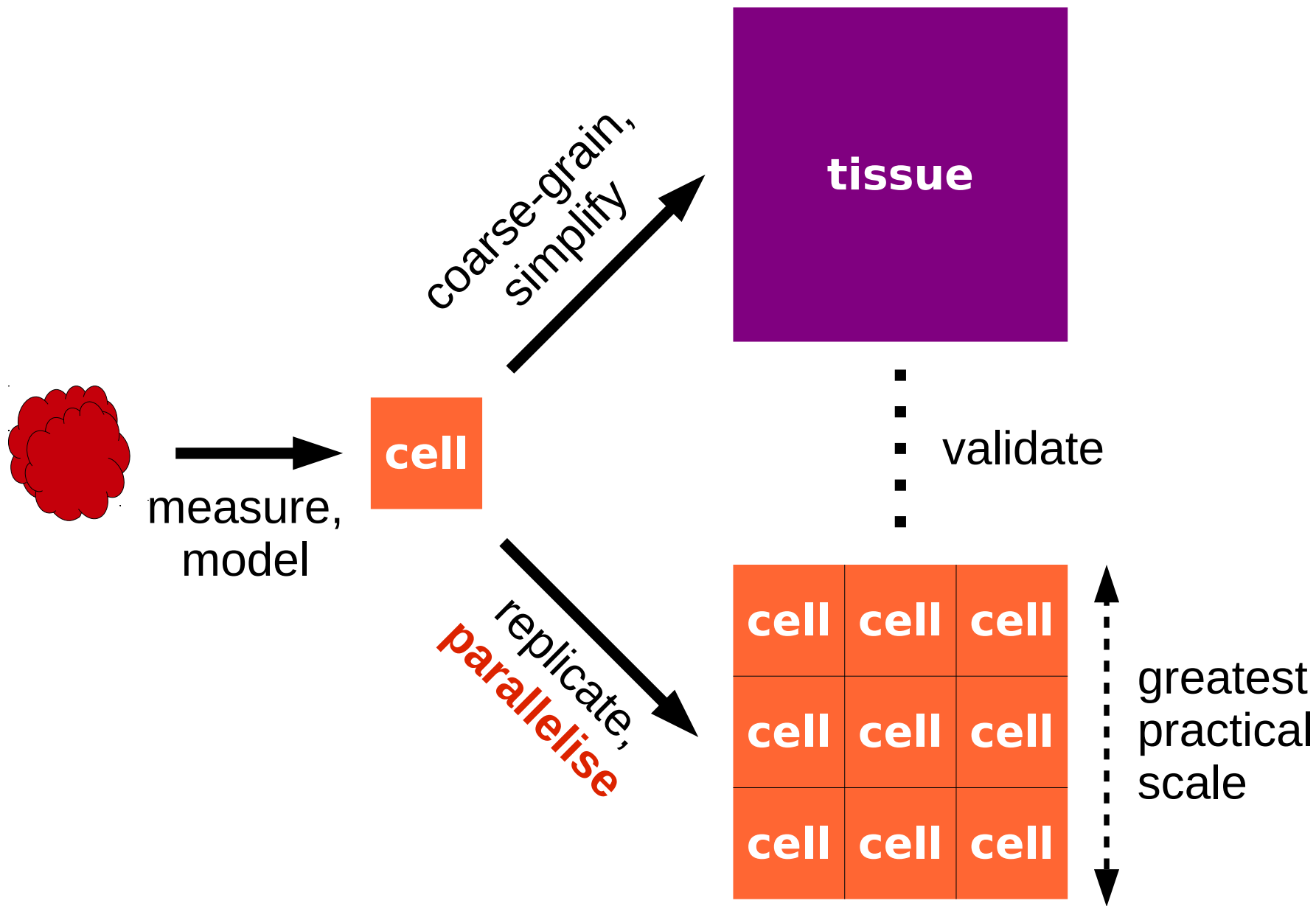


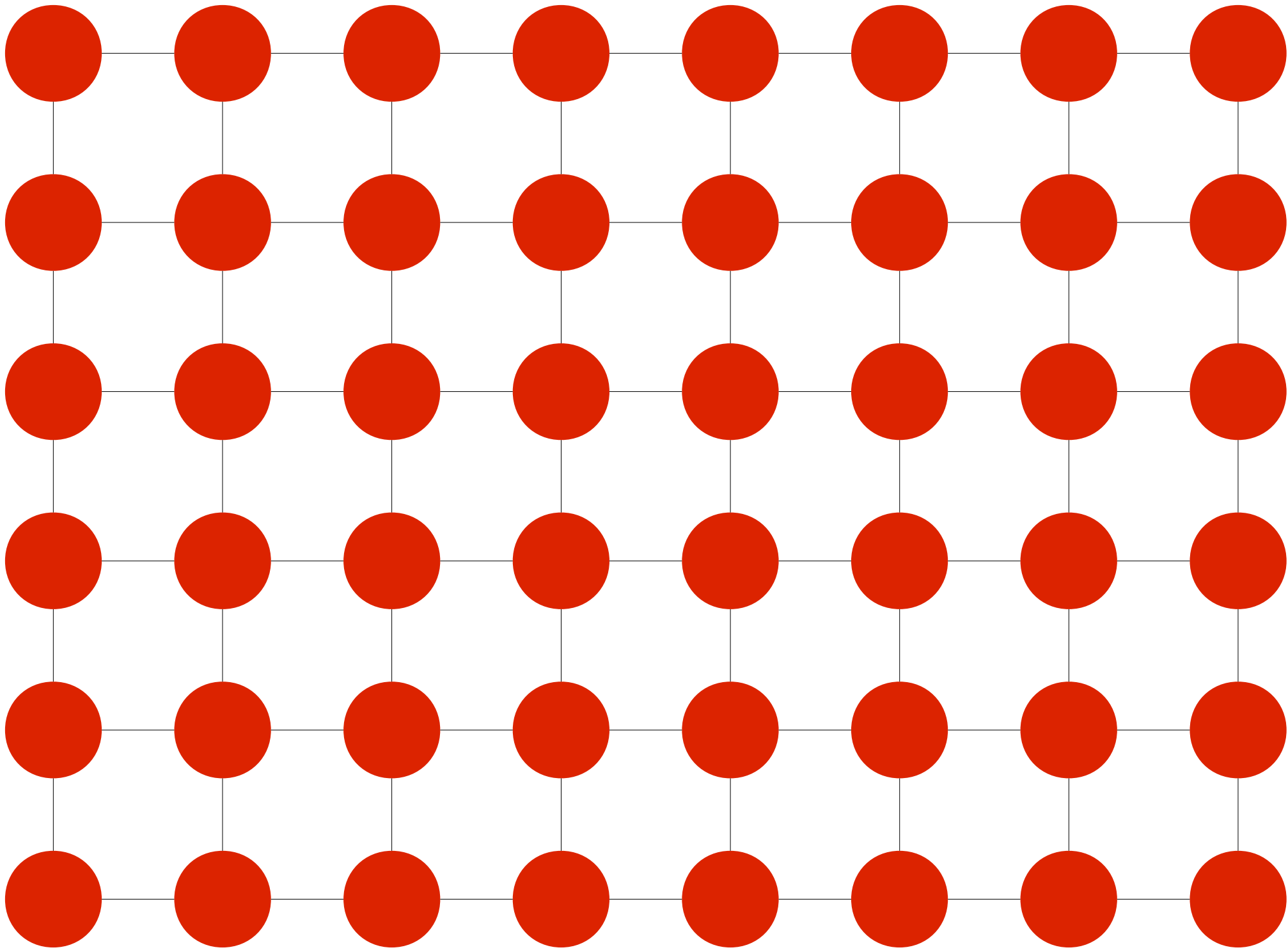


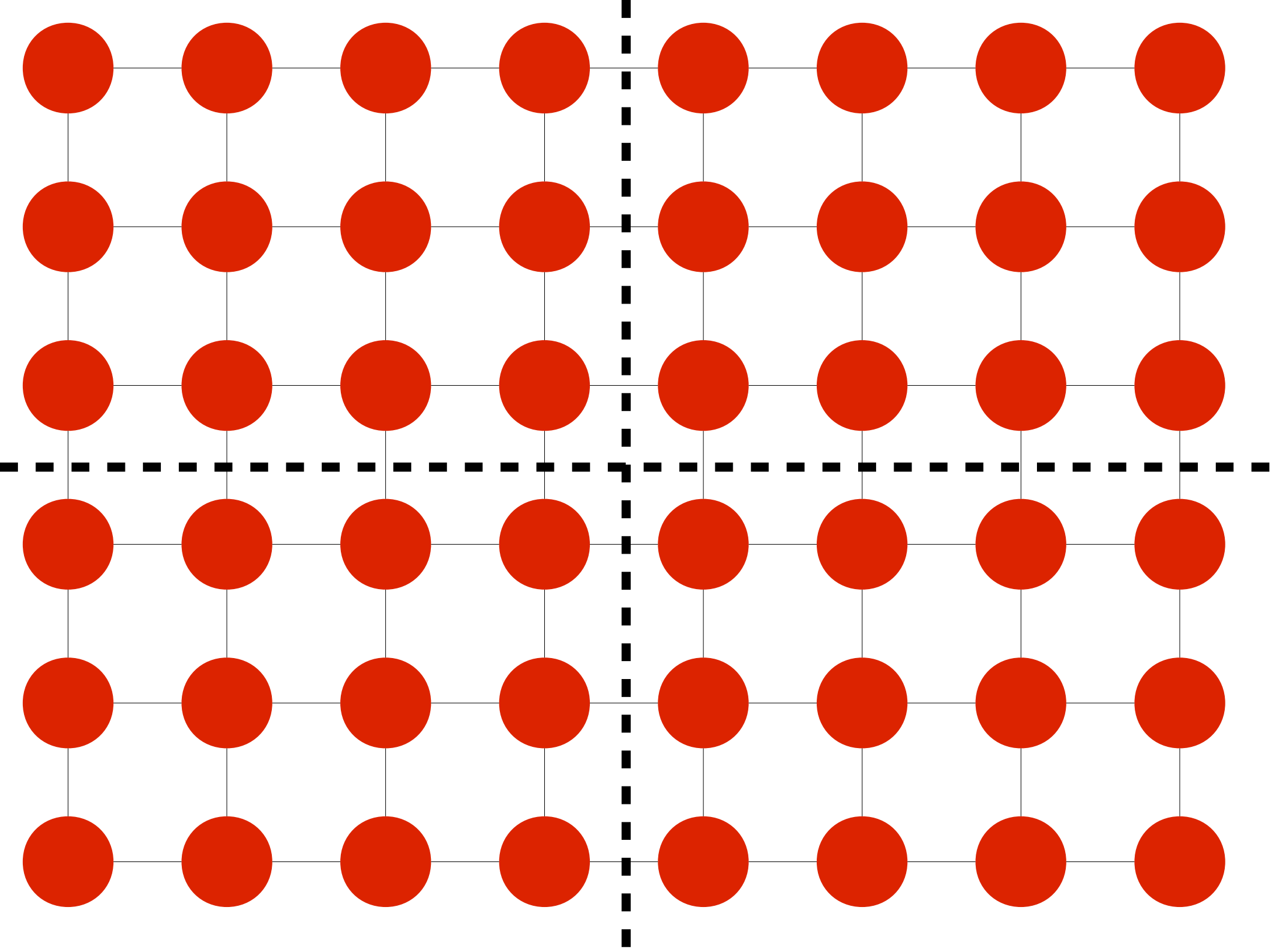


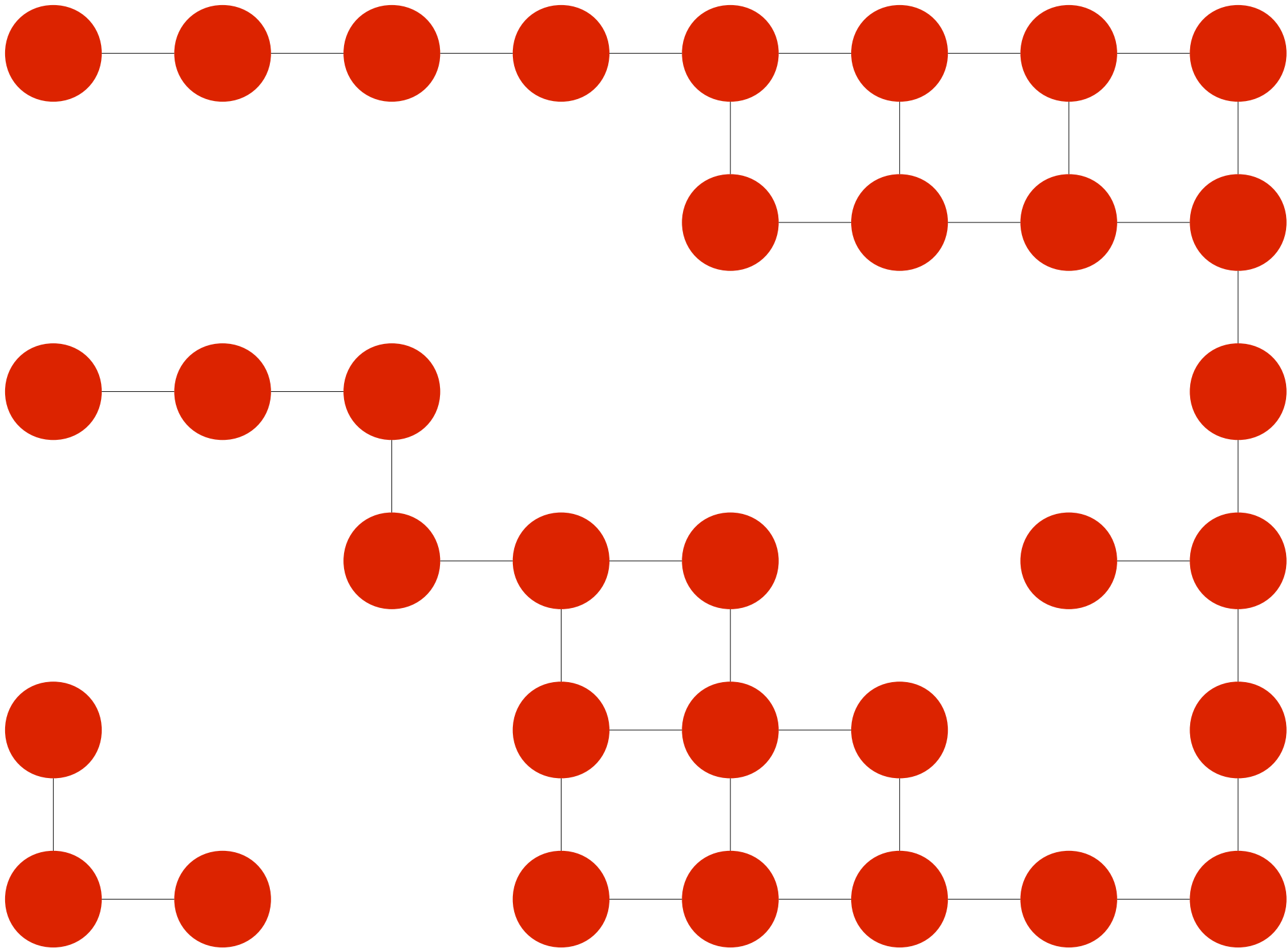






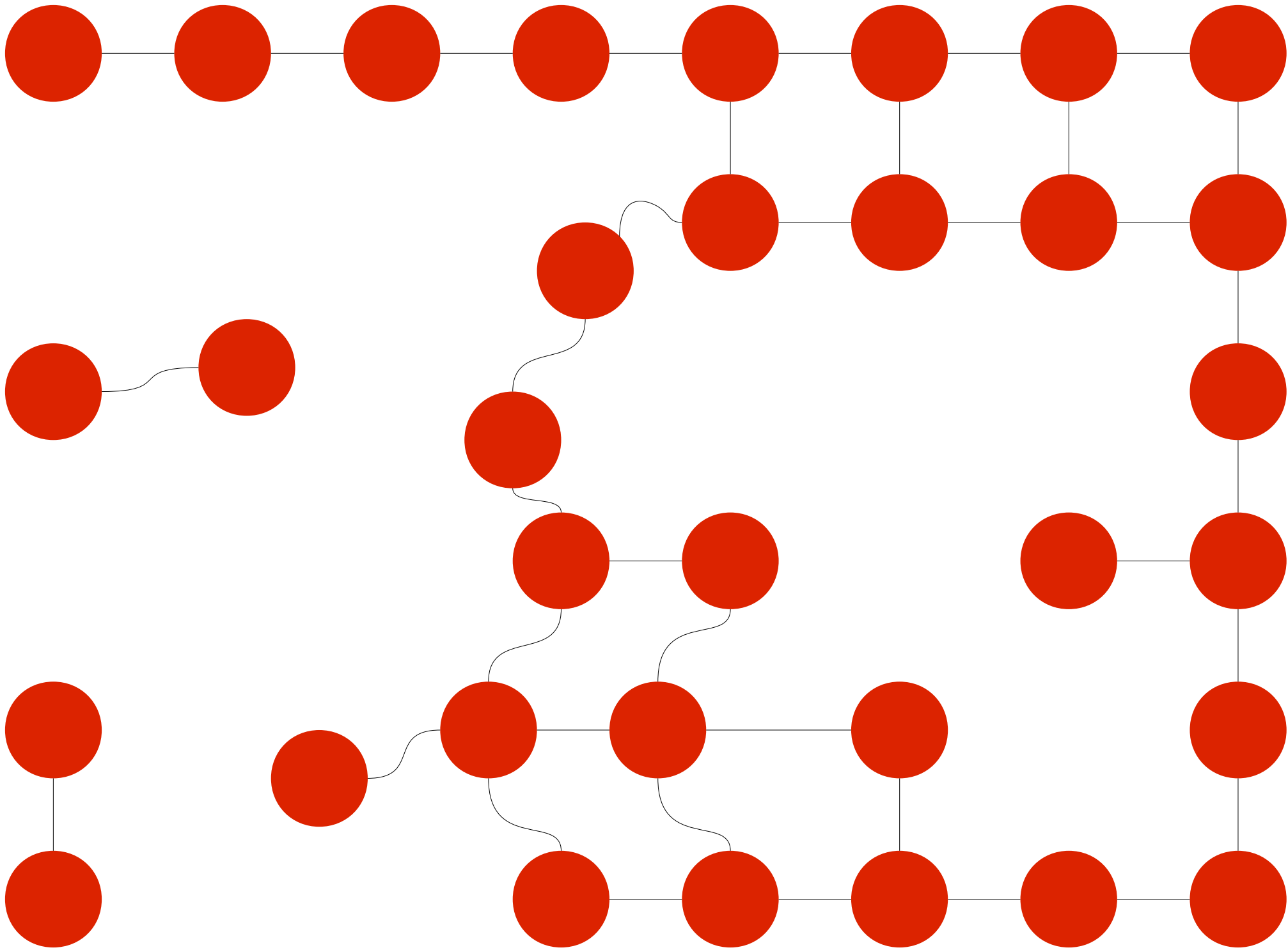


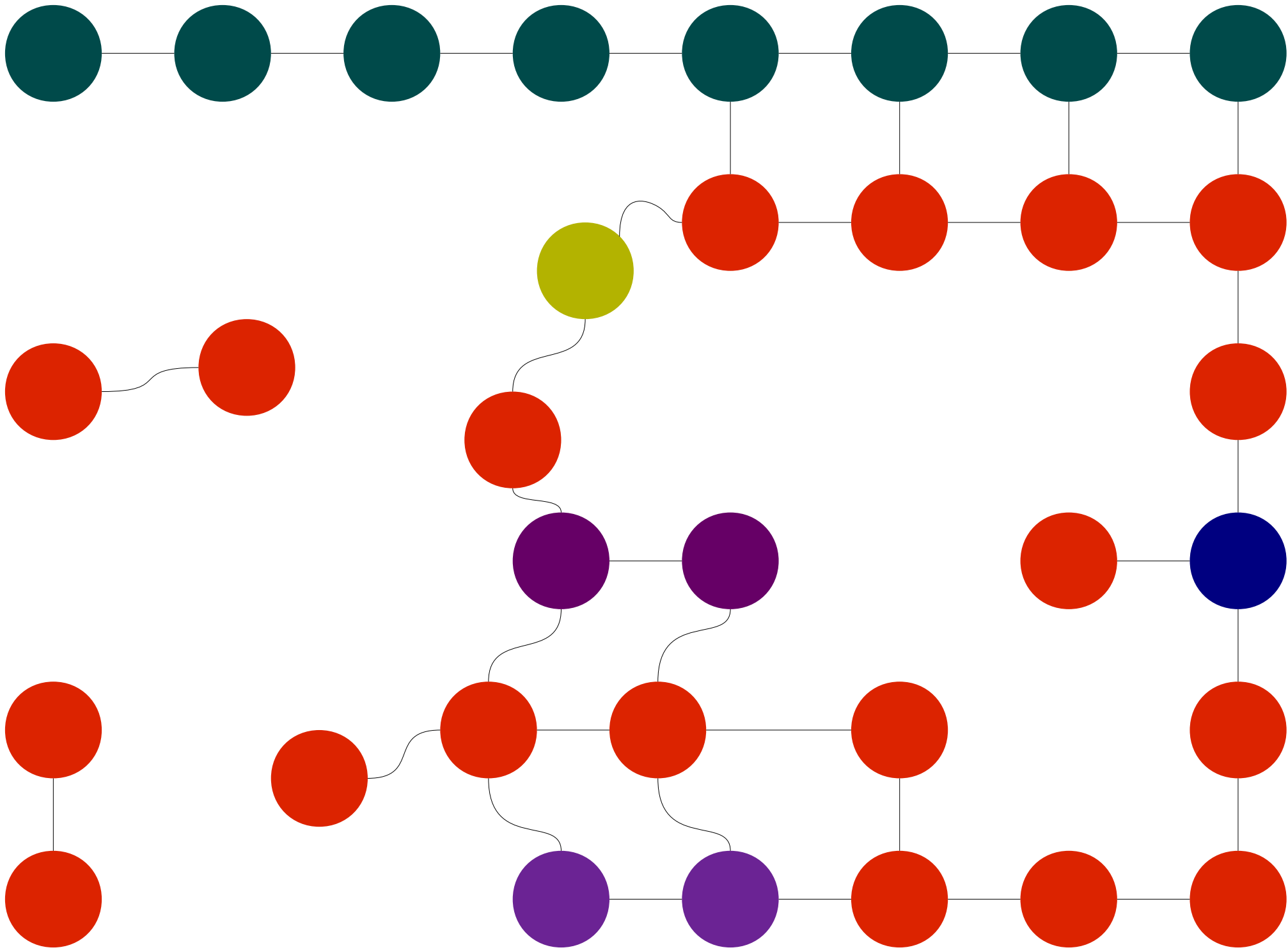




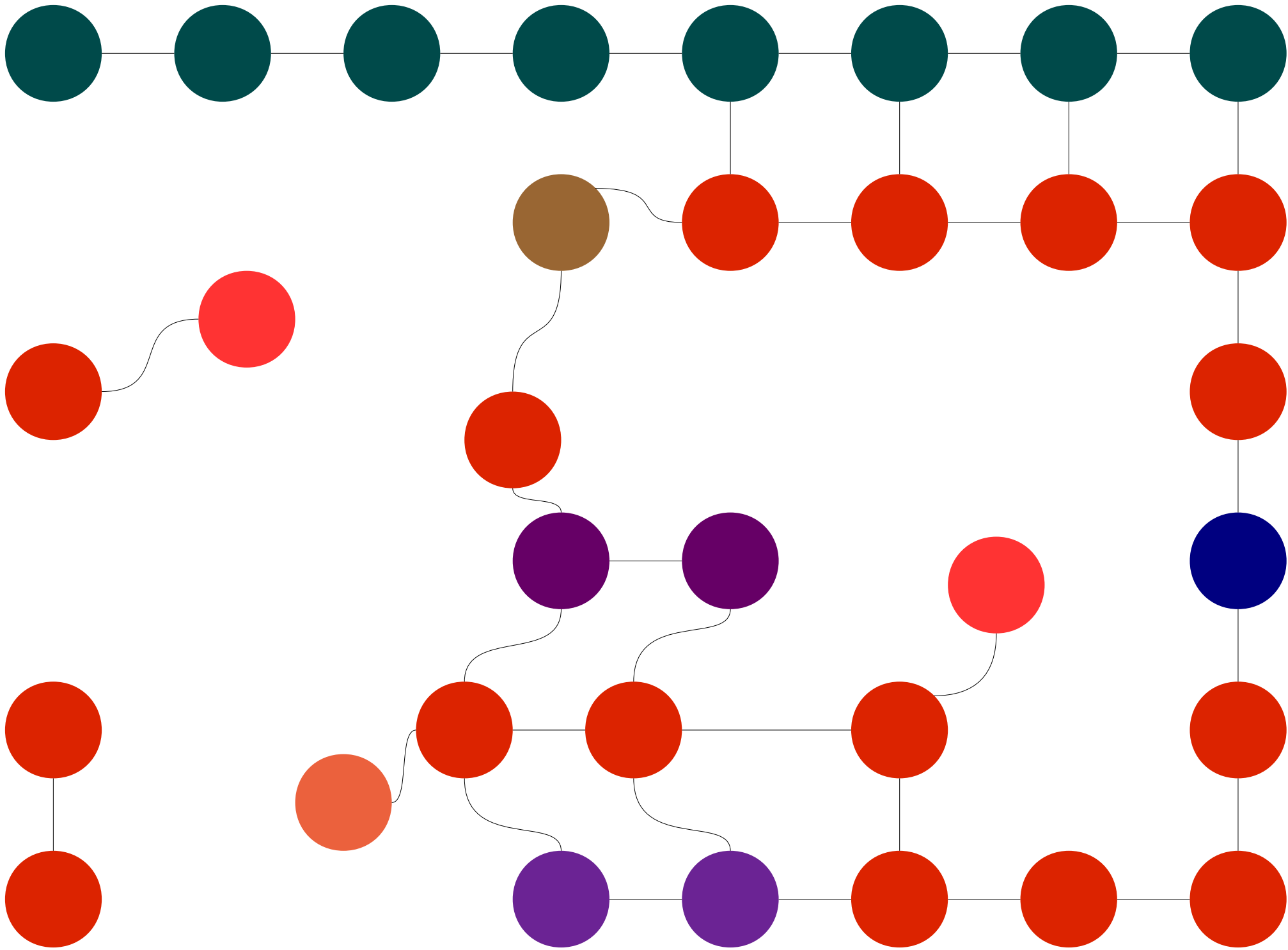






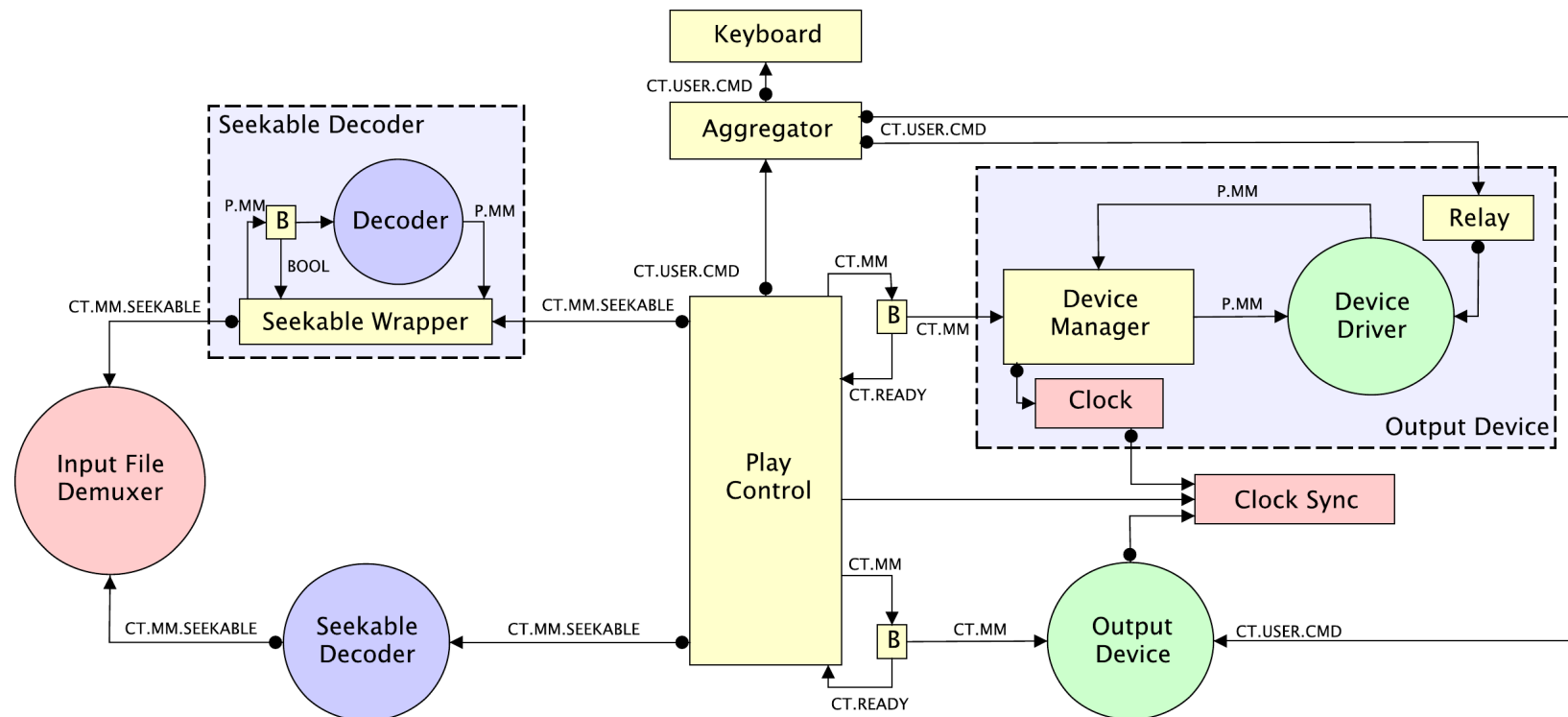






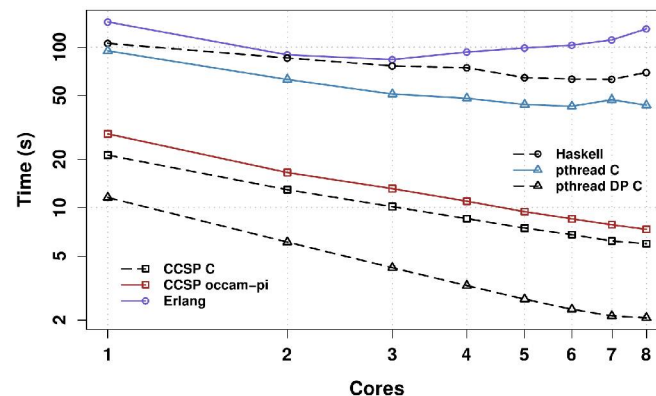
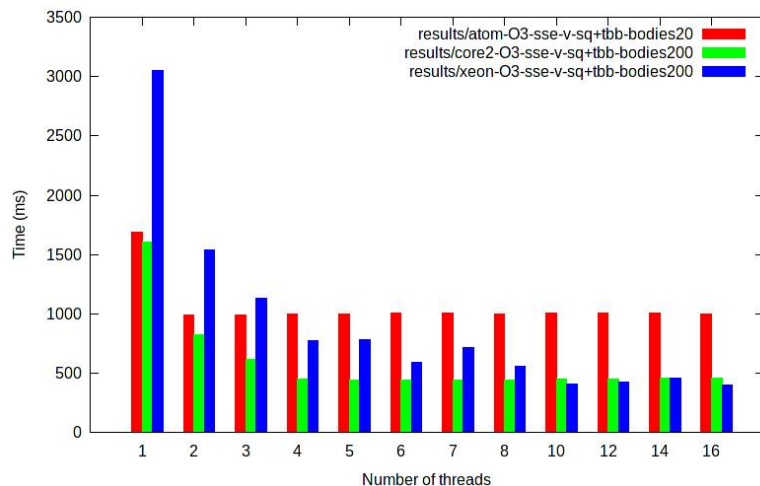
# Concurrent programming

- Design and write software in terms of **concurrent activities** and **how they interact**
  - Uses include: network servers, robotic control systems, multiplayer games, media processing...



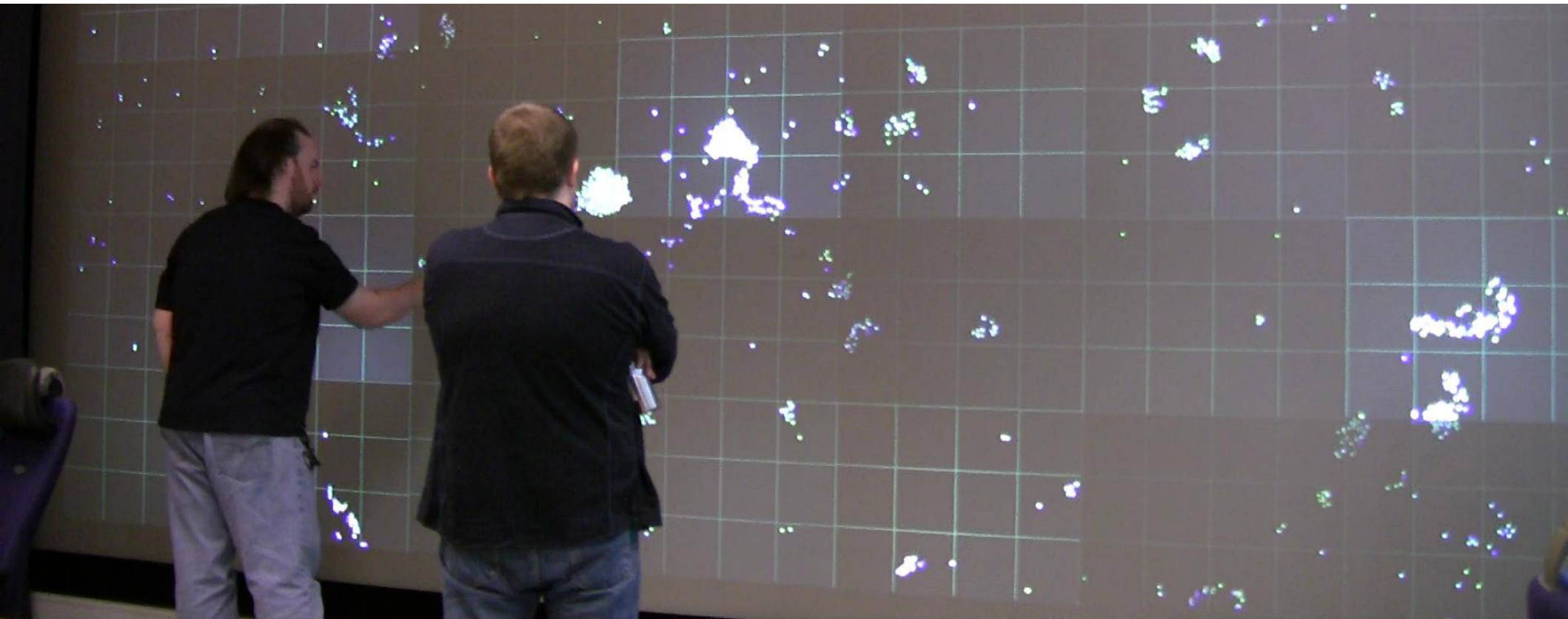
# Concurrency to parallelism

- The **runtime system** divides activities dynamically among the available processors
  - ... so it exploits the **natural concurrency** of the system you're modelling to execute in **parallel**
- Modern runtime systems (CCSP, TBB...) look at the **interactions** to decide how best to do this
  - ... giving you better **locality** of execution



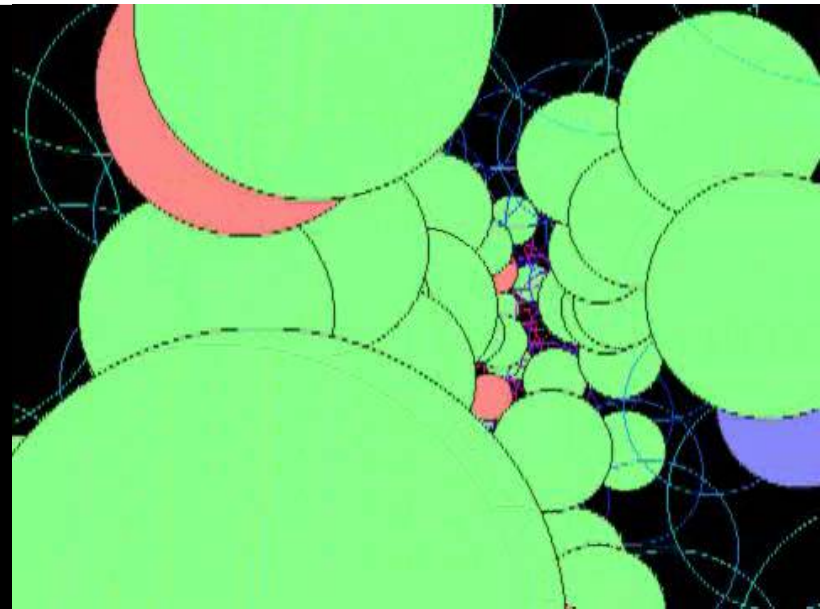
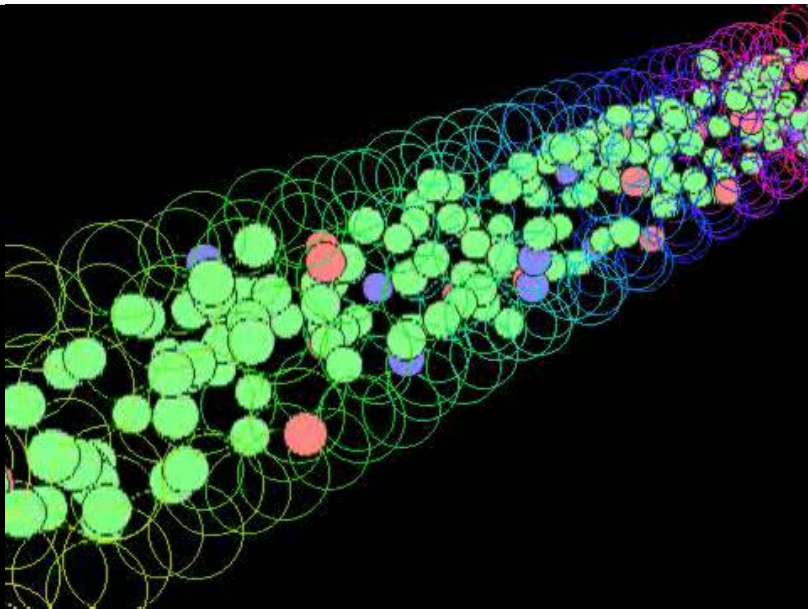
# Distributed simulation

- Building your program out of **interacting processes** makes it relatively simple to **distribute** across a cluster of machines
  - Developed techniques to minimise latency effects



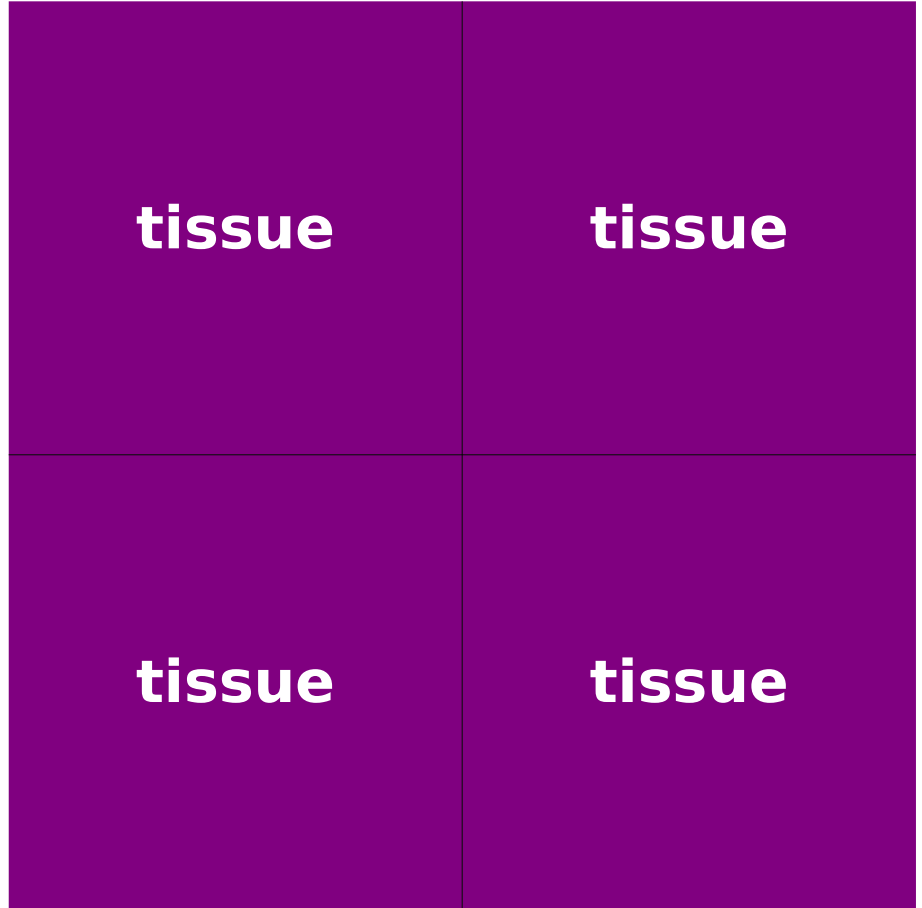
# Playing games with space

- Spatial interactions are key to our applications
  - Needs to be **accurate** and **fast**
- We use techniques developed for real-time **collision detection** in computer games
  - ... and plan to make our runtime system aware of space for even better scheduling





**tissue**



# Thanks to...

- **CoSMoS**

[www.cosmos-research.org](http://www.cosmos-research.org)  
esp. Paul Andrews,  
Carl Ritson, Peter Welch



- **CRISP**

Abertay/Edinburgh/St. Andrews  
esp. Jim Bown, Dana Faratian,  
Simon Langdon, David Harrison



- Any questions?