



**Faculty of Science and Technology**  
**Laboratory of Computer Sciences**

# DEDIS

Dynamic distribution of an  
ecosystem model



# 1. Overview



1. Overview
2. Acknowledgments
3. DEDIS
  1. General description
  2. Distribution
  3. Load-balancing
4. Results
5. Conclusion



## 2. Acknowledgements



- » M. Cyrille BERTELLE, headmaster of the DEA-ITA and one of my tutors all along this time.
- » M. Damien OLIVIER, tutor and mentor, who accounted to me for every problem or trouble I encountered
- » M. Frédéric GUINAND, for having encouraged me to continue my studies at the University of Le Havre
- » M. Antoine DUTOT, PhD student and author of AntCO<sup>2</sup>, with whom I cooperated during the entire project and who was always ready to touch on new problems
- » Everybody else who helped me during the last few months ...



# 3. DEDIS (1/2)



## » Context

- » Aquatic ecosystems
- » Evolution
- » Sensibility

## » Objectives

- » Simulating an aquatic ecosystem
- » Test evolution
- » Make significant predictions



# 3. DEDIS (2/2)



## » Problems

- » Huge number of entities
- » Many communications
- » Emergence of group behaviour

## » Tasks

- » Development of a large-scale entity-based distributed simulation
- » Implementation of entities such that their individual characteristics cause emergence of group behaviour
- » Using the AntCO<sup>2</sup> algorithm to detect heavily related clusters of entities



## 3.1. DEDIS > General description



- » DEDIS = acronym of "**D**istributed **E**nvironment for **D**ynamic **I**ndividual-based **S**imulations"
- » Set of Java classes that offer different services to entities
  - » Communication
  - » Neighbour location
  - » Migration



## 3.2. DEDIS > Distribution (1/2)



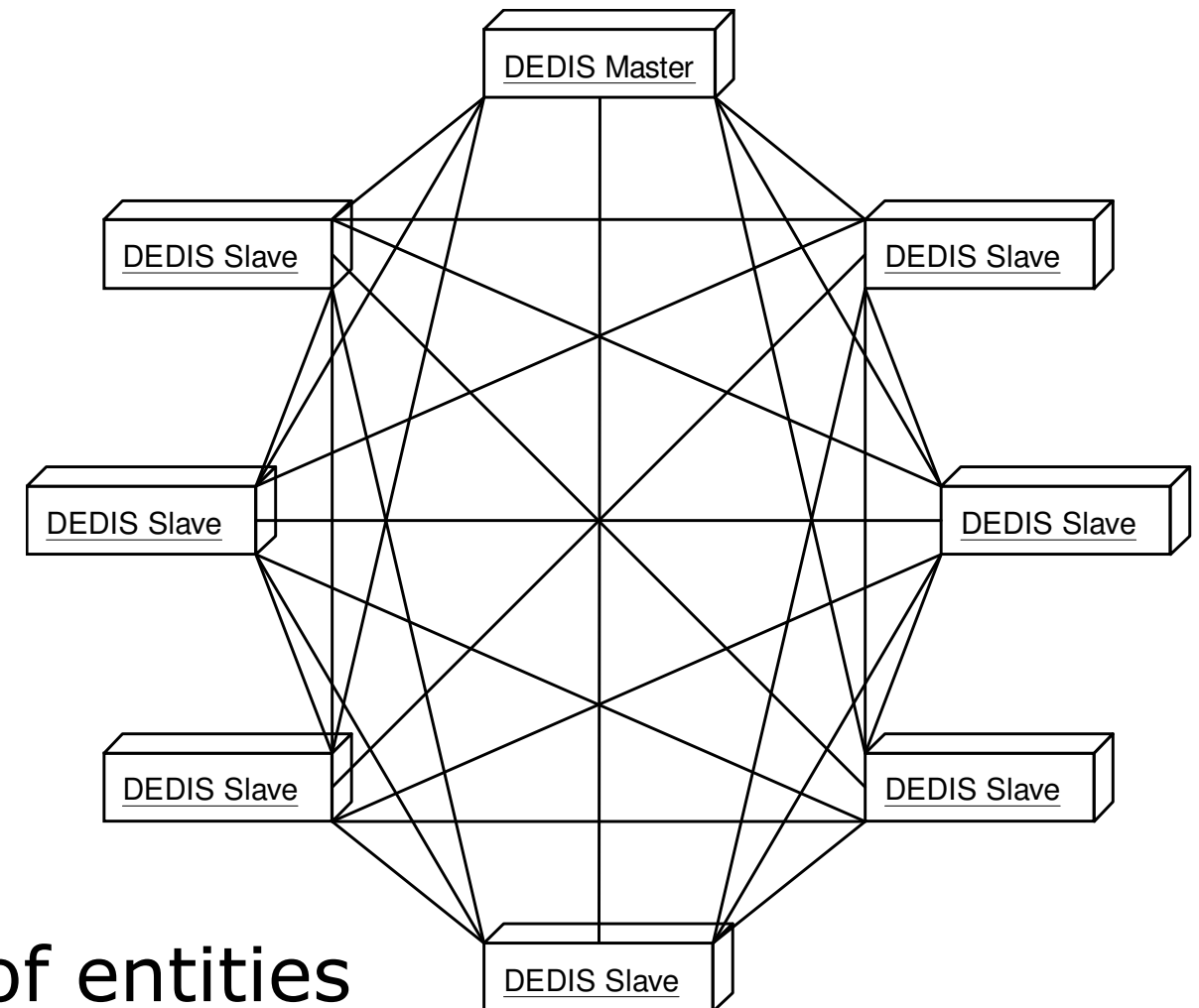
» Master-Slave architecture

» Master

- Simulation coordinator
- Entity directory

» Slave

- Contains a certain number of entities
- Connects to the master and all other slaves



↪ Communication between master and slaves form a complete graph.



## 3.2. DEDIS > Distribution (2/2)

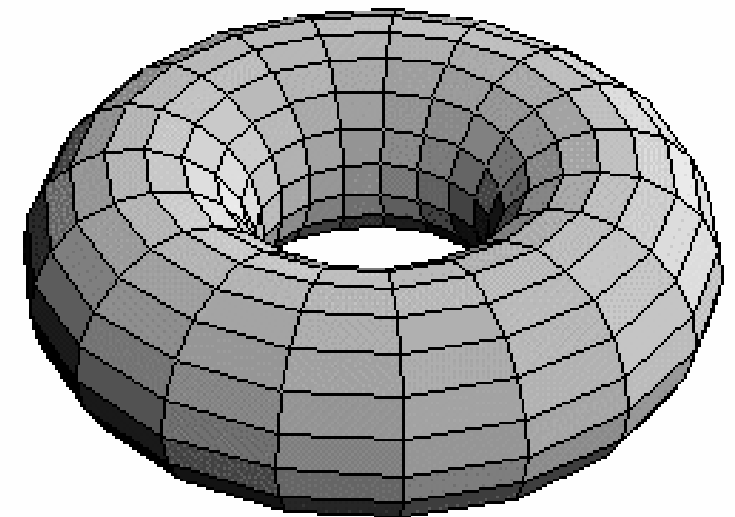


### » Entities

- Live on the slaves
- Communicate with other entities
- Can migrate from one slave to another one

### » Environment

- Forms a “torus”
- Contains the entities
- Is not shared
- Allows fast position lookup for entities








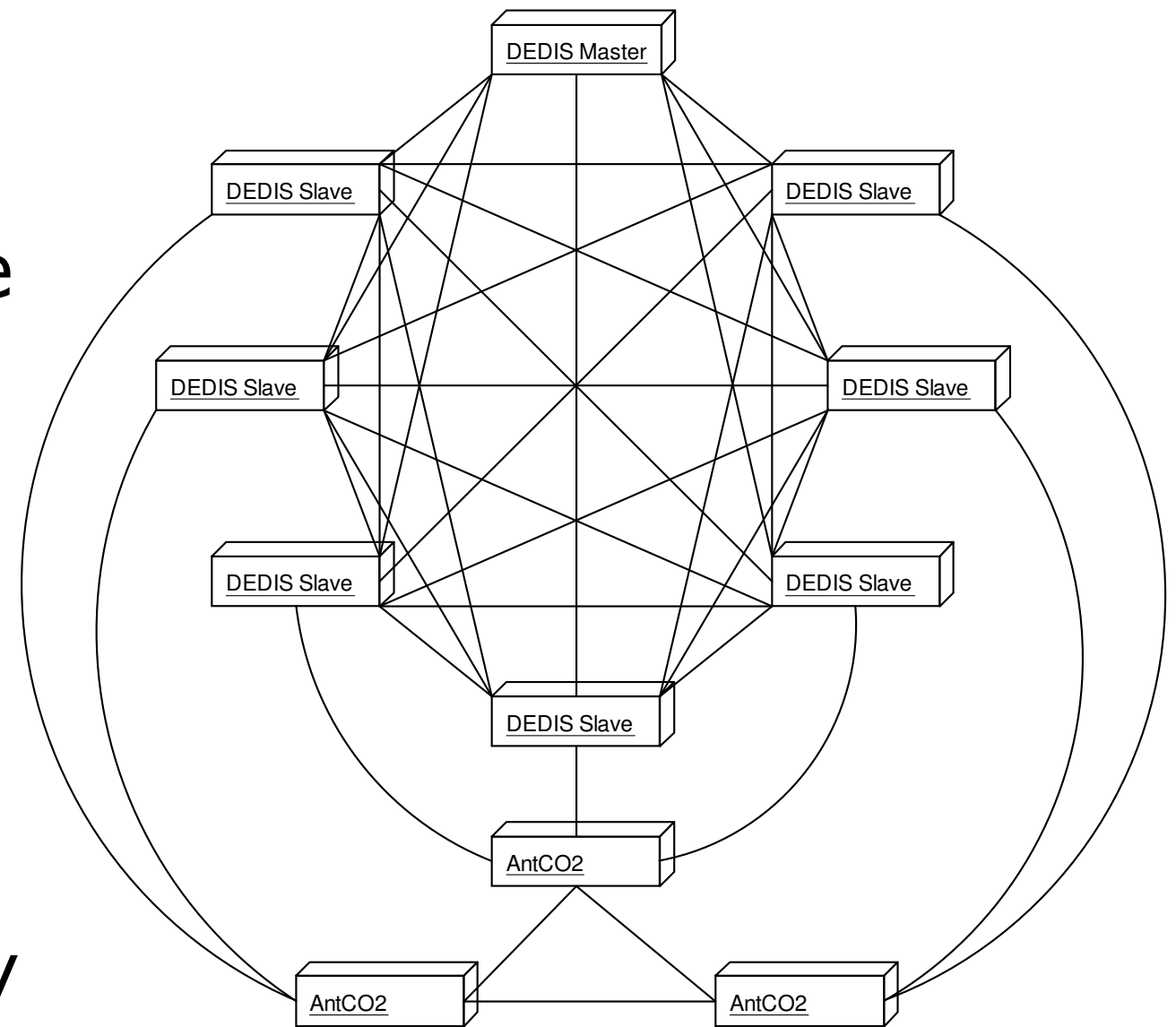


## 3.3. DEDIS > Load-balancing



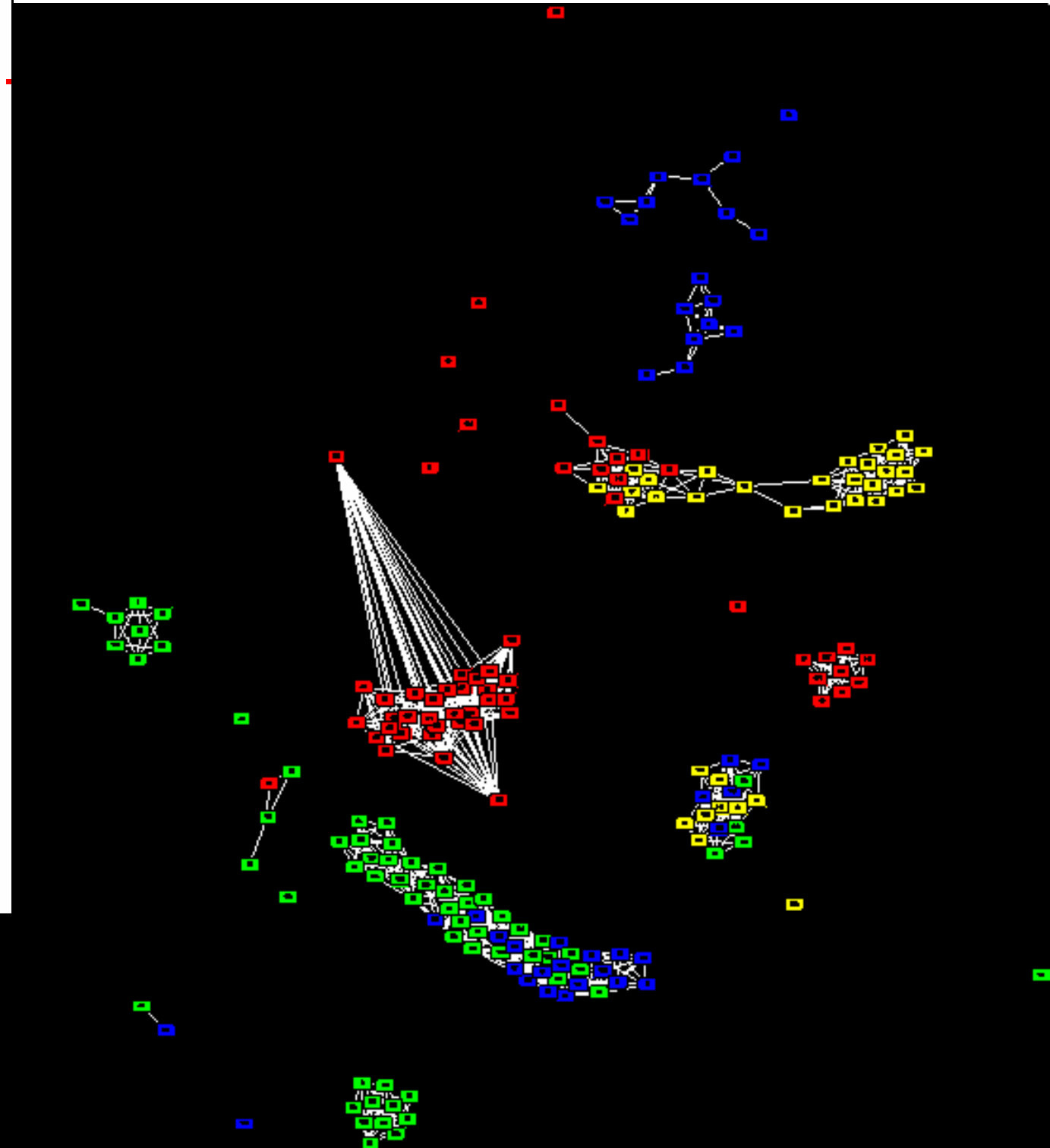
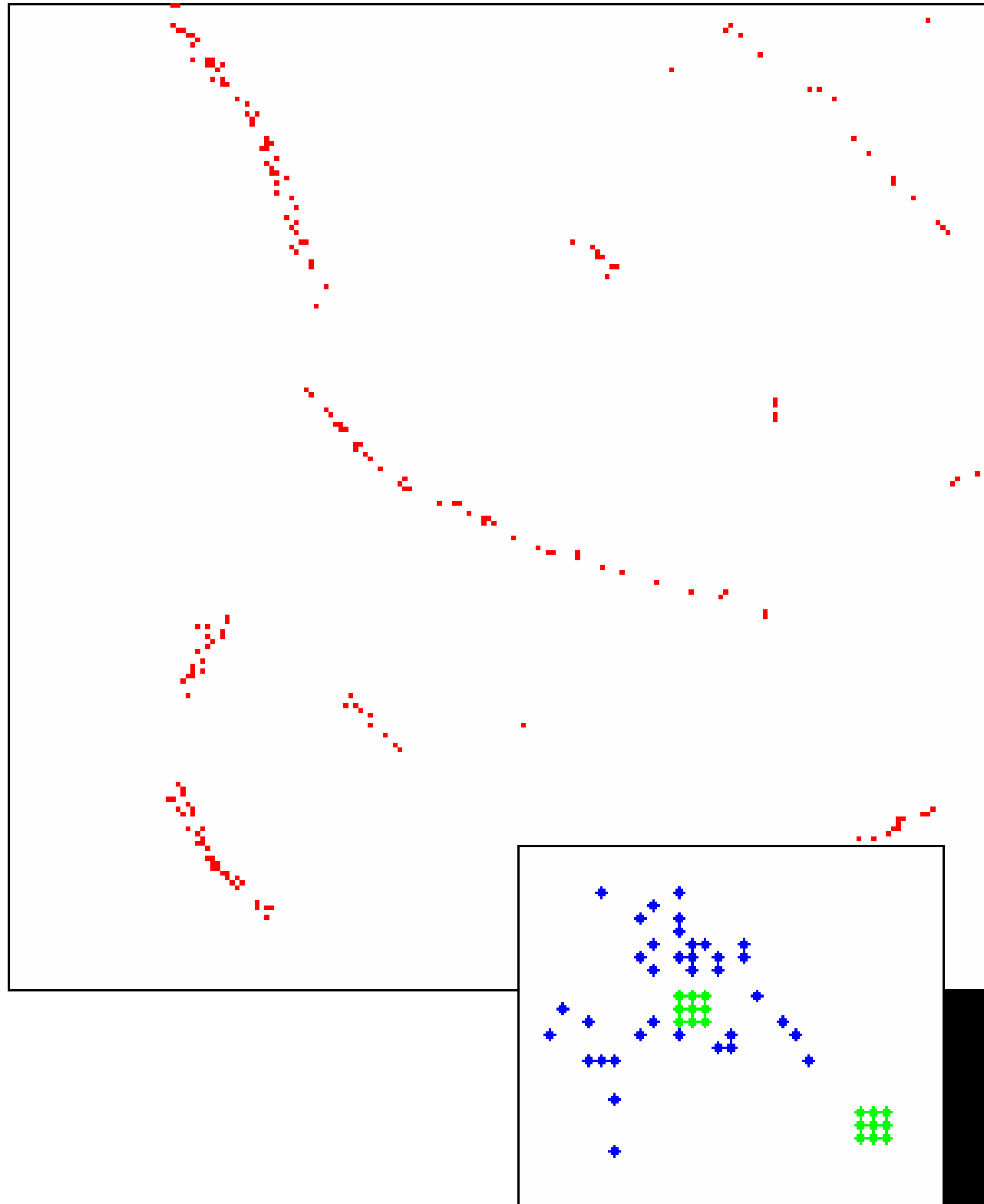
### AntCO<sup>2</sup>

-  Runs as service on the network
-  Creates a dynamic communication graph based DEDIS' output
-  May be queried by any entity in order to give a suggestion about where to migrate



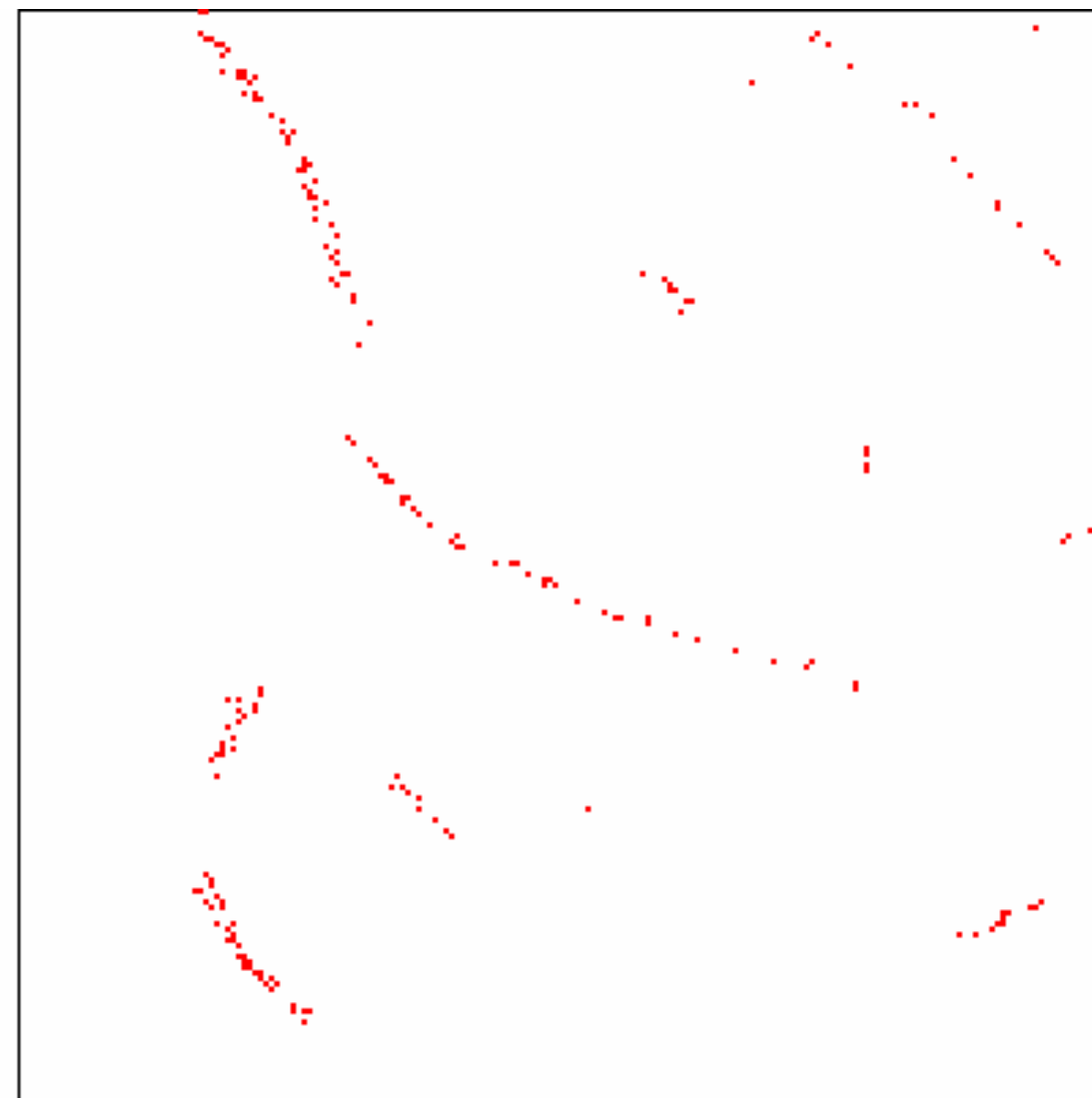
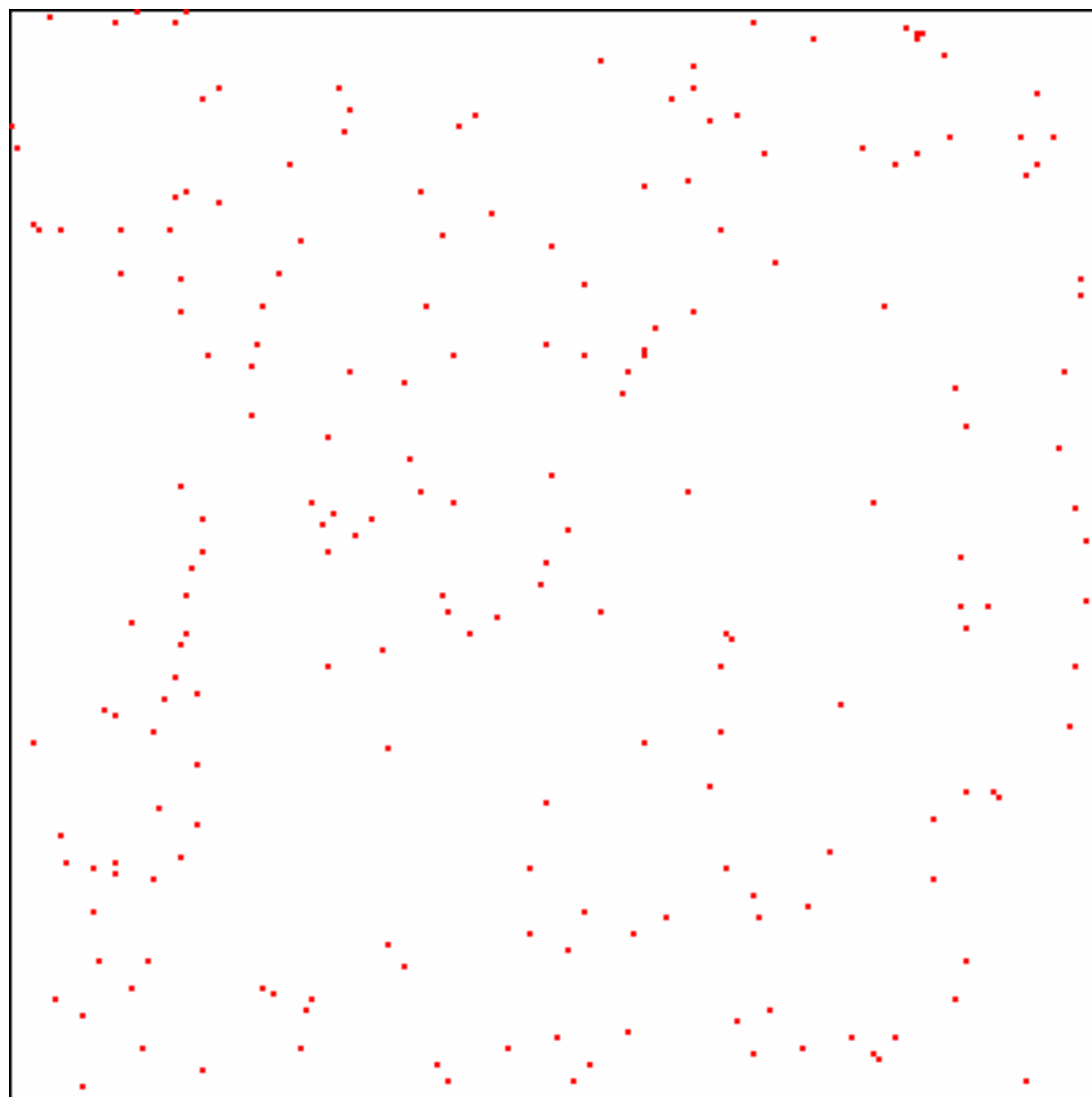


# 4. Results



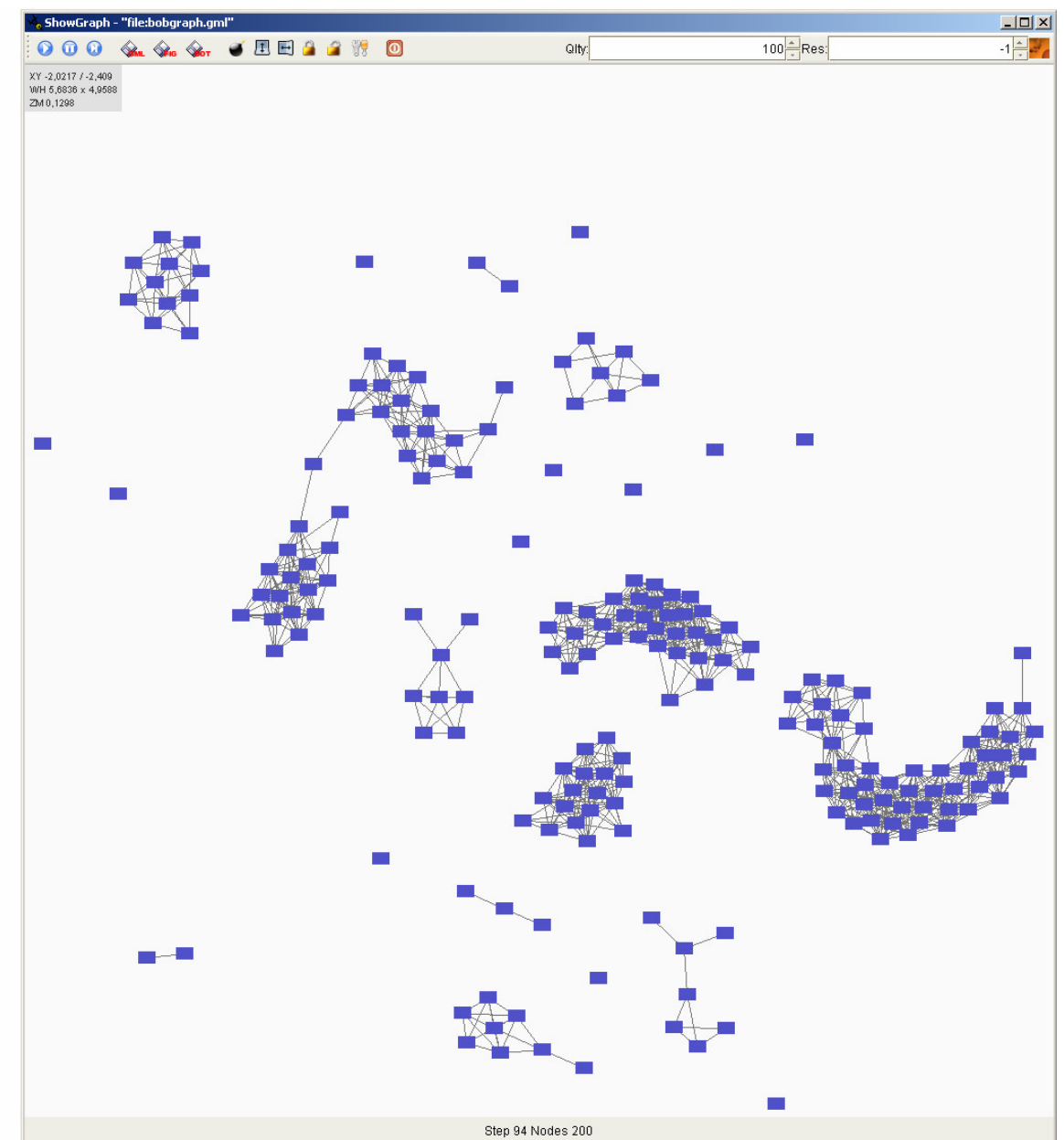
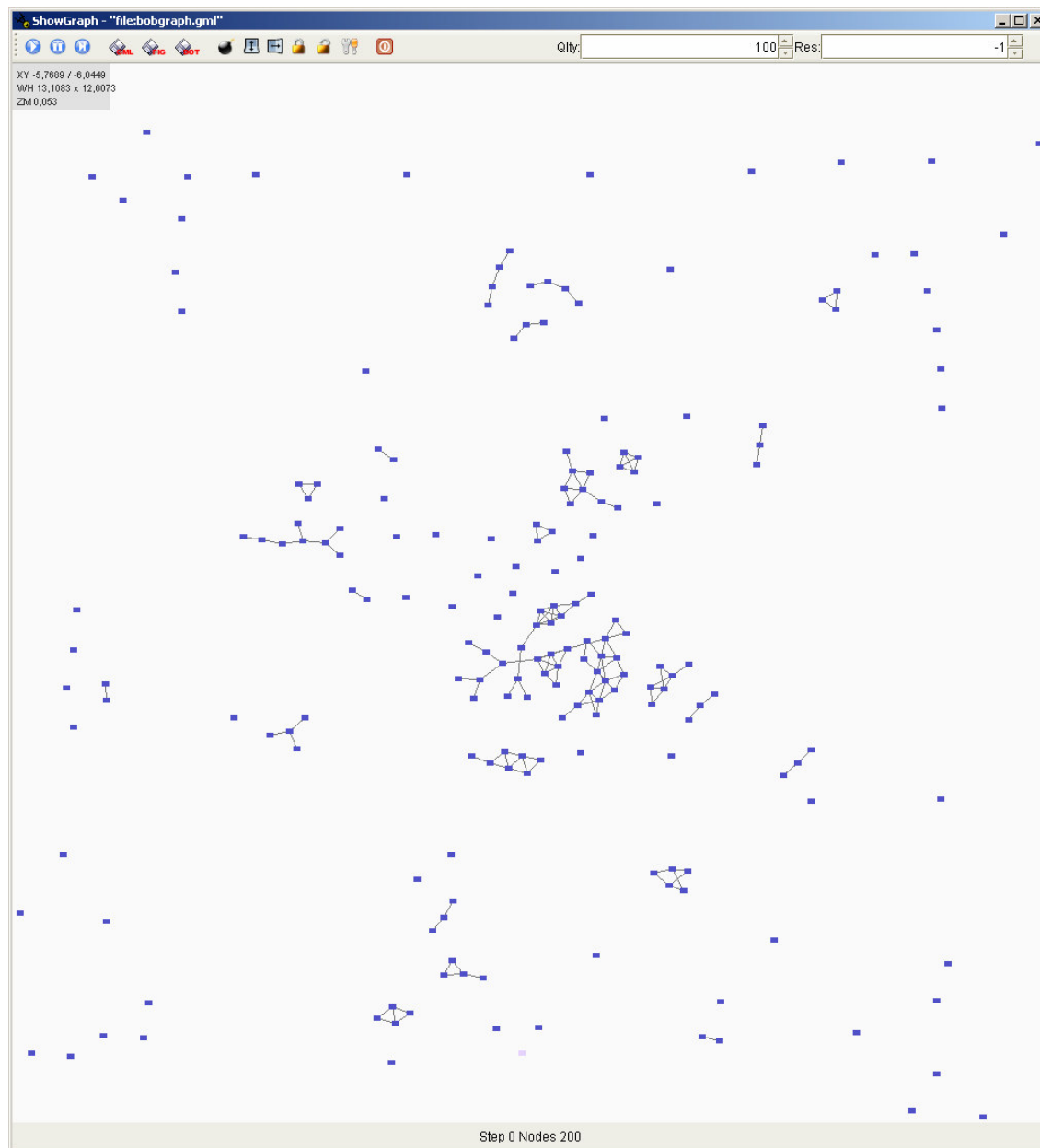


# 4. Results (1/4)



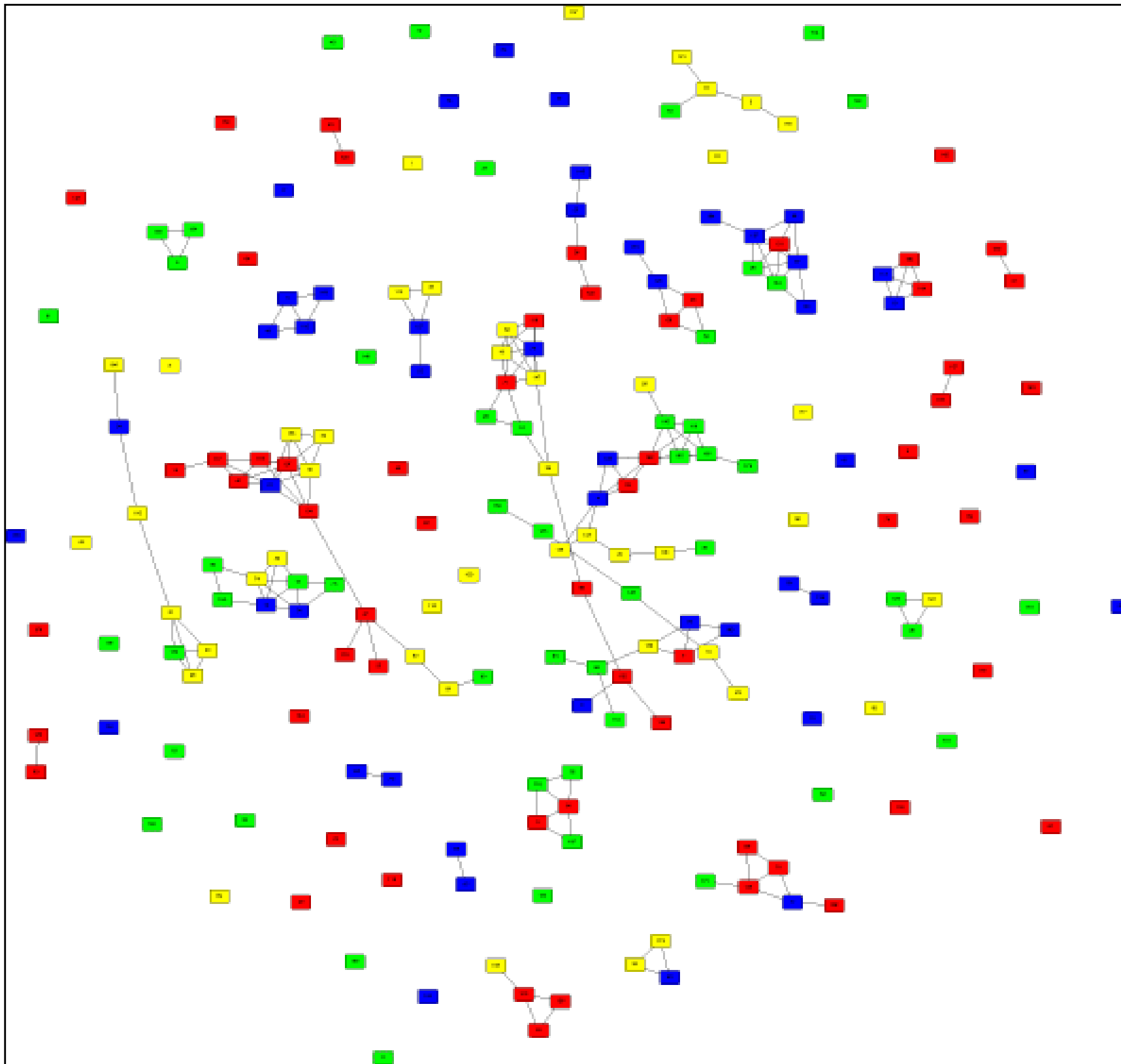


# 4. Results (2/4)



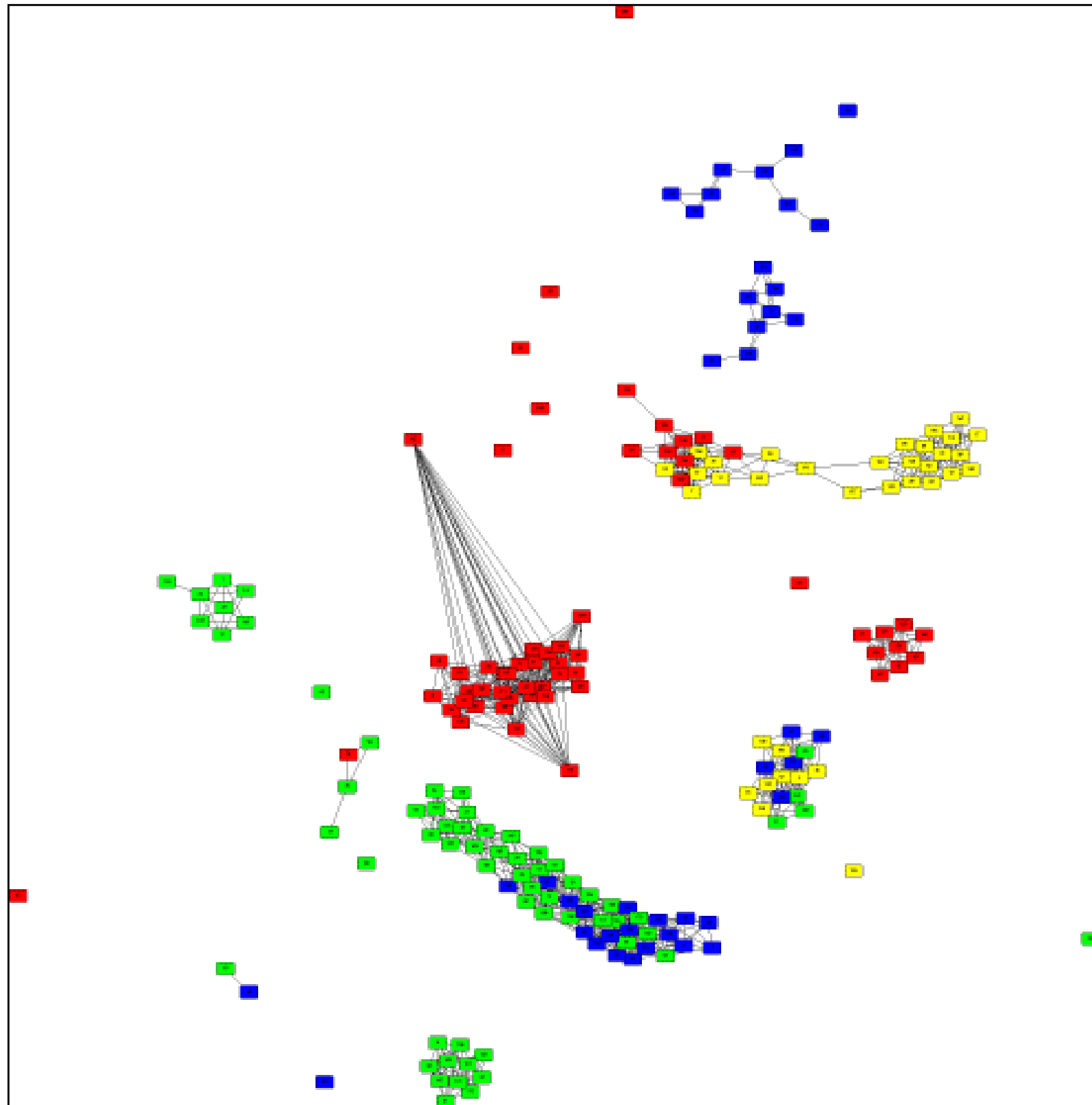


# 4. Results (3/4)





# 4. Results (4/4)





## 5. Conclusion



- » Although an aquatic ecosystem should have been modelled, the emergence of group behaviour turned out to be more important.
- » Very fascinating, especially the research for conceiving entities.
- » I learned a lot in the following domains:
  - Research
  - Teamwork for interfacing projects



## 6. References



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# 7. Questions

