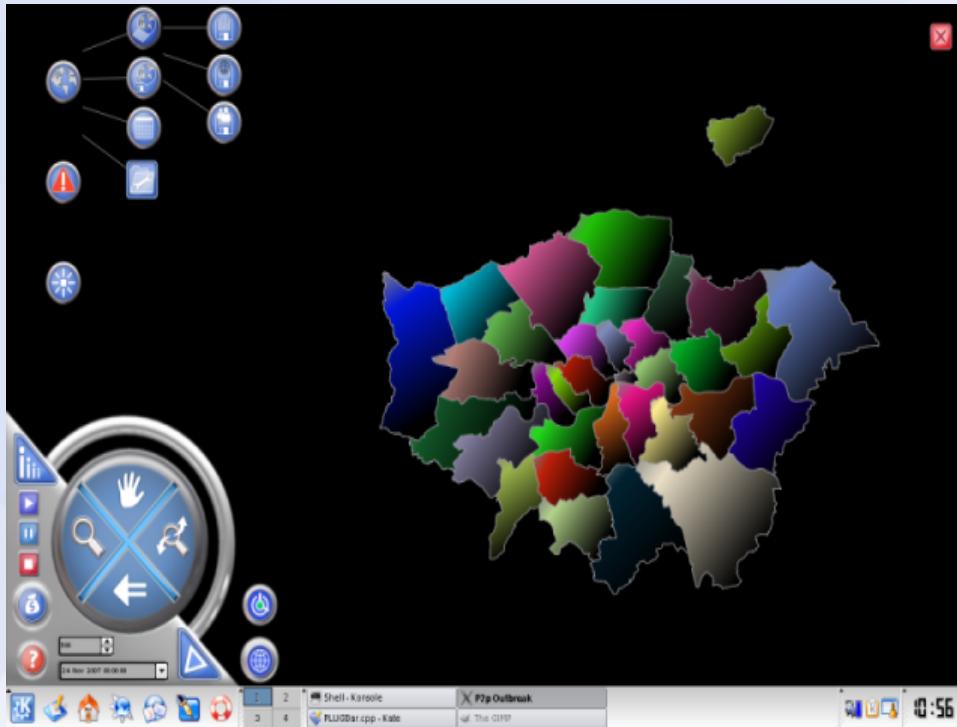


Iesim: Simulating and Understanding Real World Events in a Game-like Environment

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* Speaker



Outline

- Introduction
- Case Study: outbreakP2P
- Implementation Notes
- Final Remarks

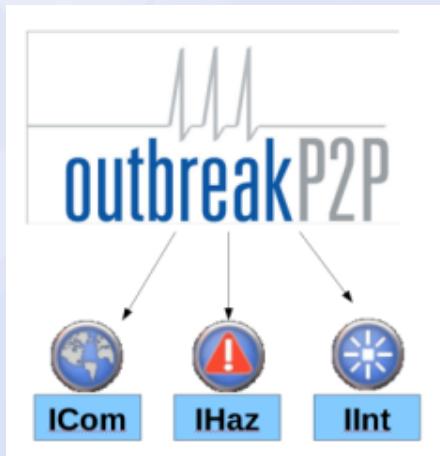


Introduction

- Modelling Environment, that implements models through a set of plugins.
- Targets: programmers and users.
- Intuitive and easy to use, as a computer game!
- Cope with lack of data, creating fictitious scenarios (as in games!)

Case Study: outbreakP2P

- Package built using lesim ADL.
- Simulates the spreading of a non-vector infectious disease.
- Split into three sub-models: community, hazard and intervention.
- Each sub-model is implemented in a separate plugin: *ICom*, *IHaz* and *IIInt*.

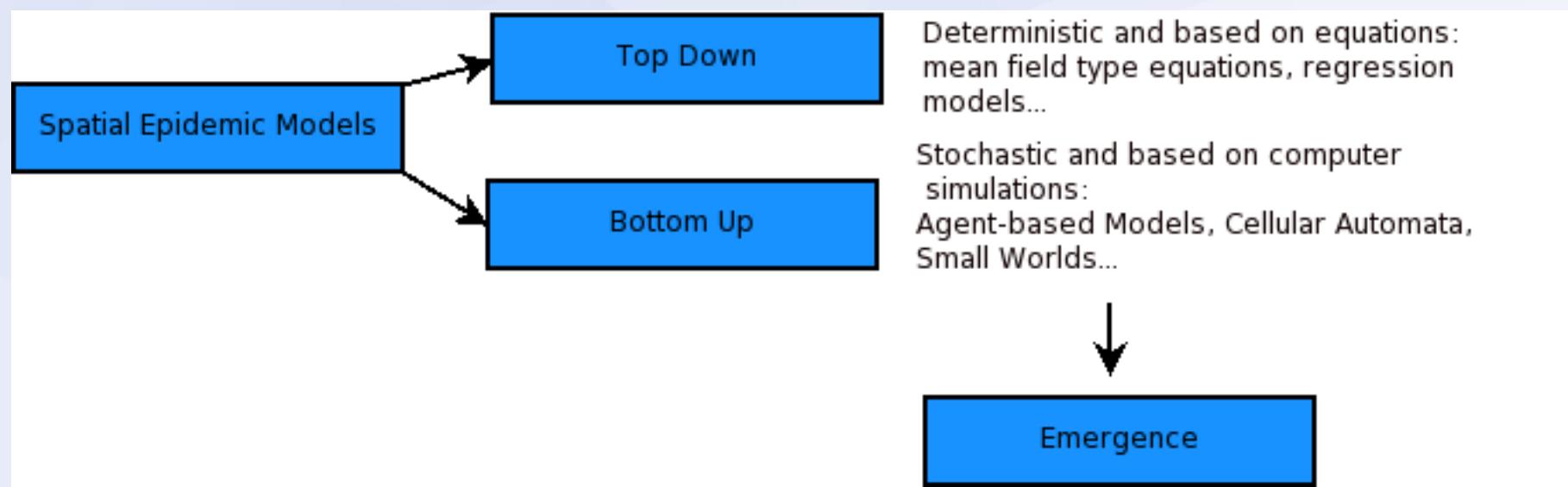


Each plugin is loaded at run-time and appears as an icon, which gives access to a set of sub-menus to configure the different model parameters.

So how do we use the model?

Model Background:

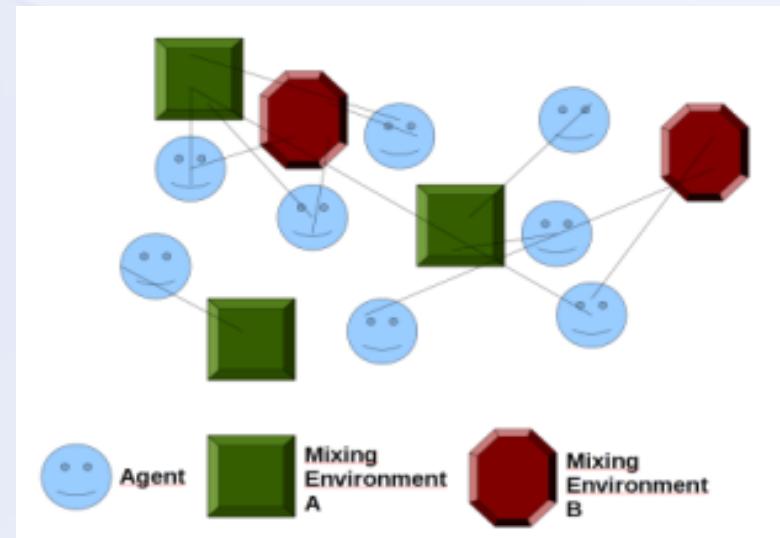
- Approaches in Epidemic Modelling:
“Top down” and “Bottom-up”.



- Mixed Agent-based/Network approach.

Community

- Agents and “Exposure” or “Mixing” environments (ME).
- Agents: households.
- ME: functional networks that link the households together.



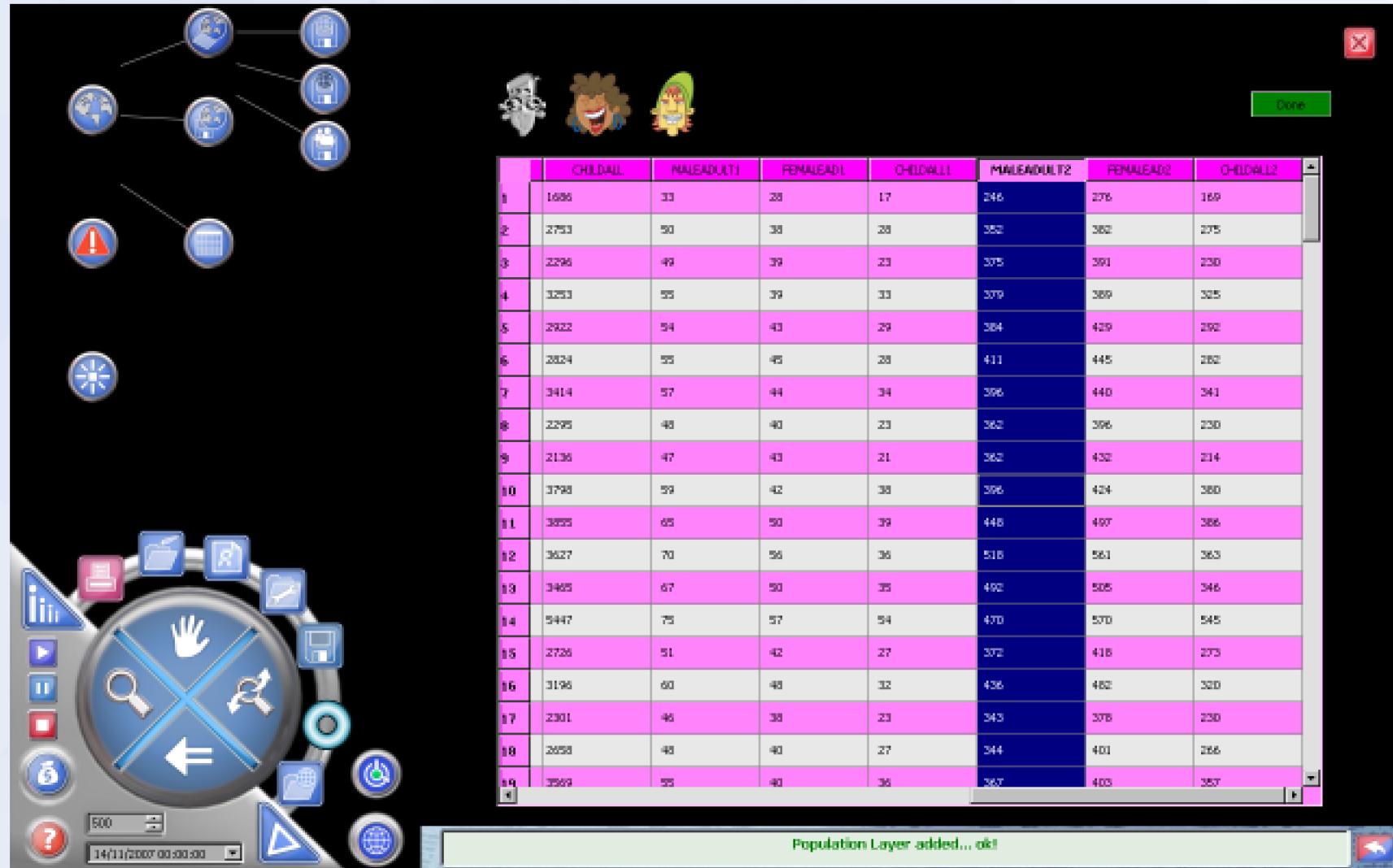
- ME considered in this model: workplaces, schools (others...).



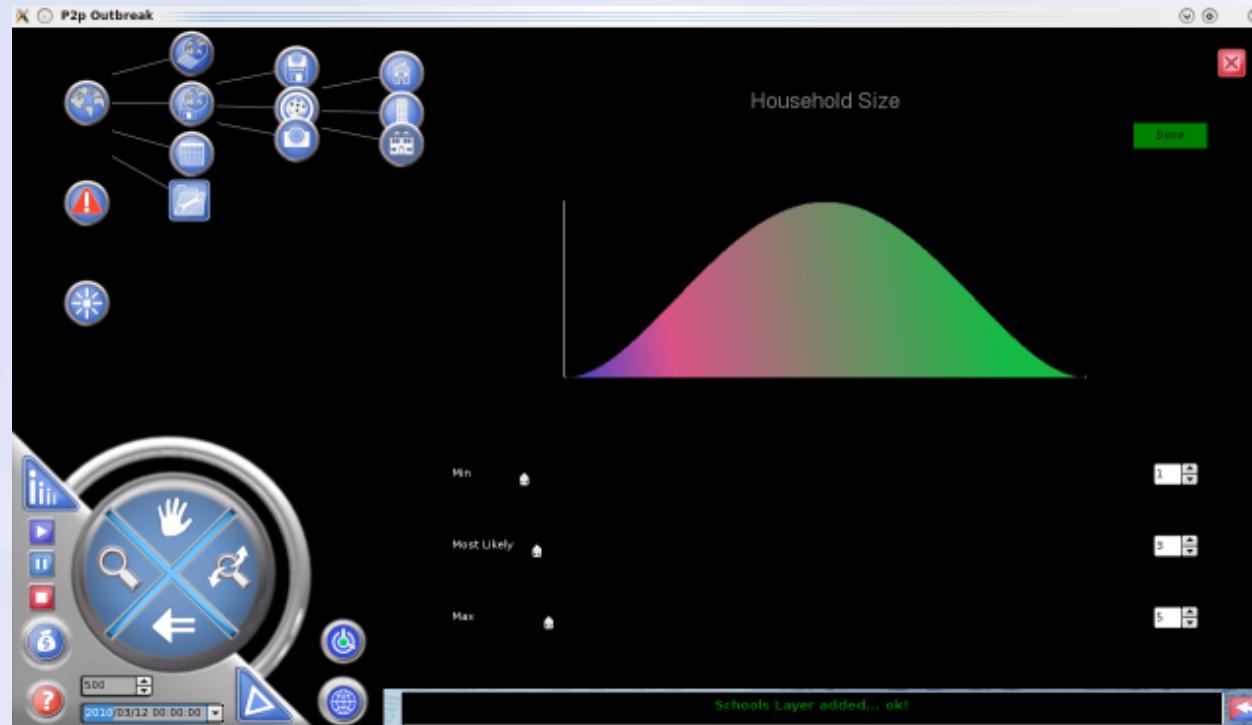
- During the configuration, the user loads/generates this information and aggregates the households around the ME.

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- Load Population Data from a Shapefile.



- Use aggregated data to generate households with a certain structure: Pert Distribution.



- Create ME: load them, generate them randomly or input them in the map.
- A buffer is used, to aggregate the households around the ME.



What about time?

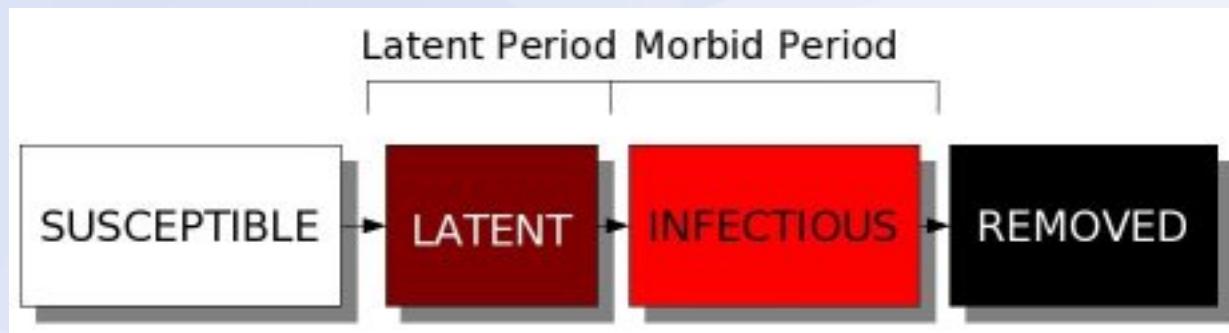


- Setting the time dynamics of the ME.
- Calendar control: a user friendly UI for a complex task.



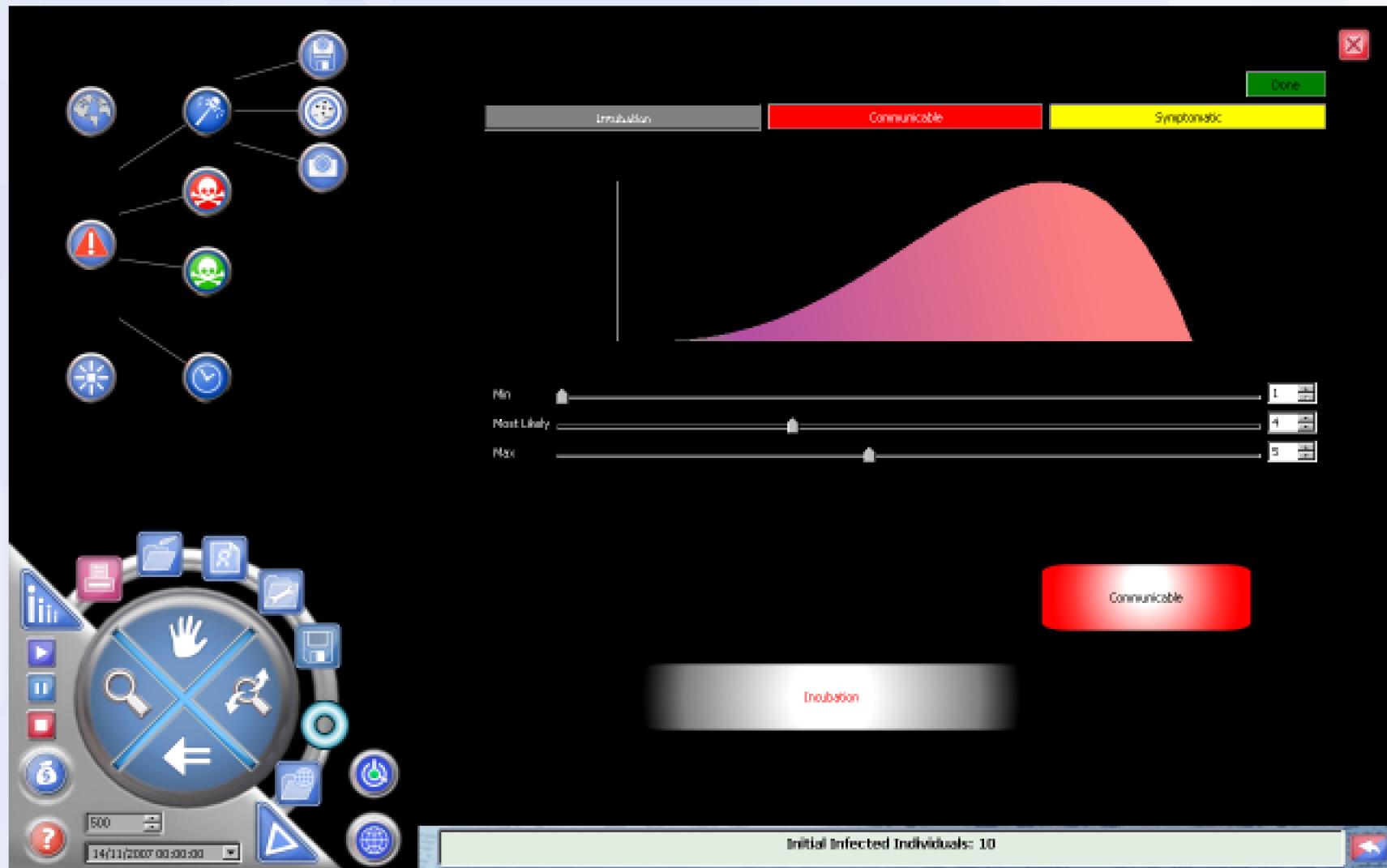
Hazard

- Hazard: infectious disease.
- SEIR model: susceptible, latent, infectious and Removed.

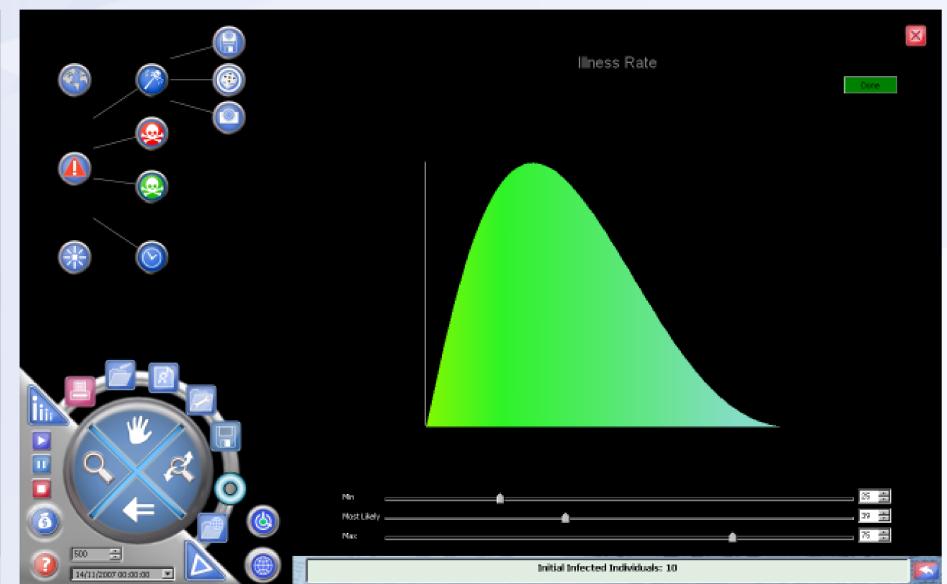
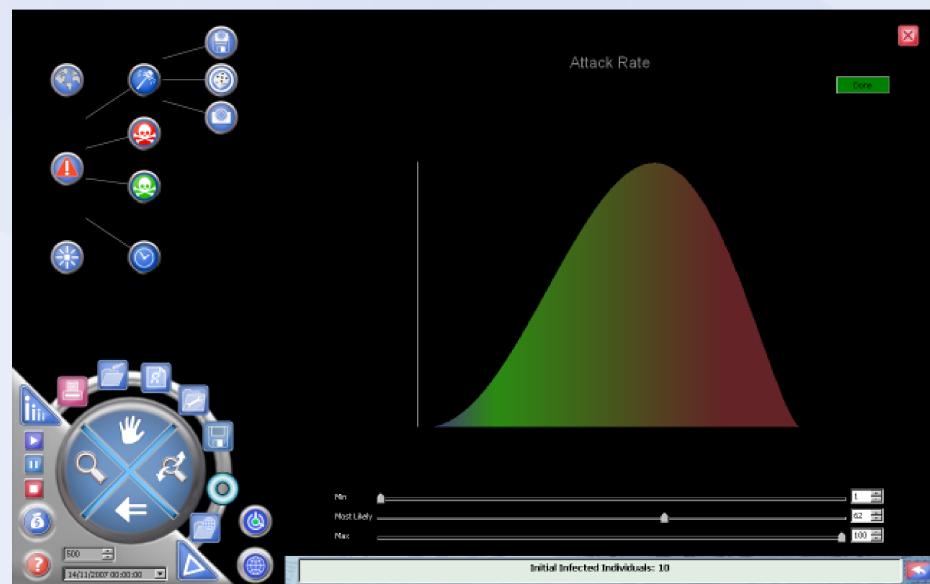


- Latent Period: symptomatic and asymptomatic periods.

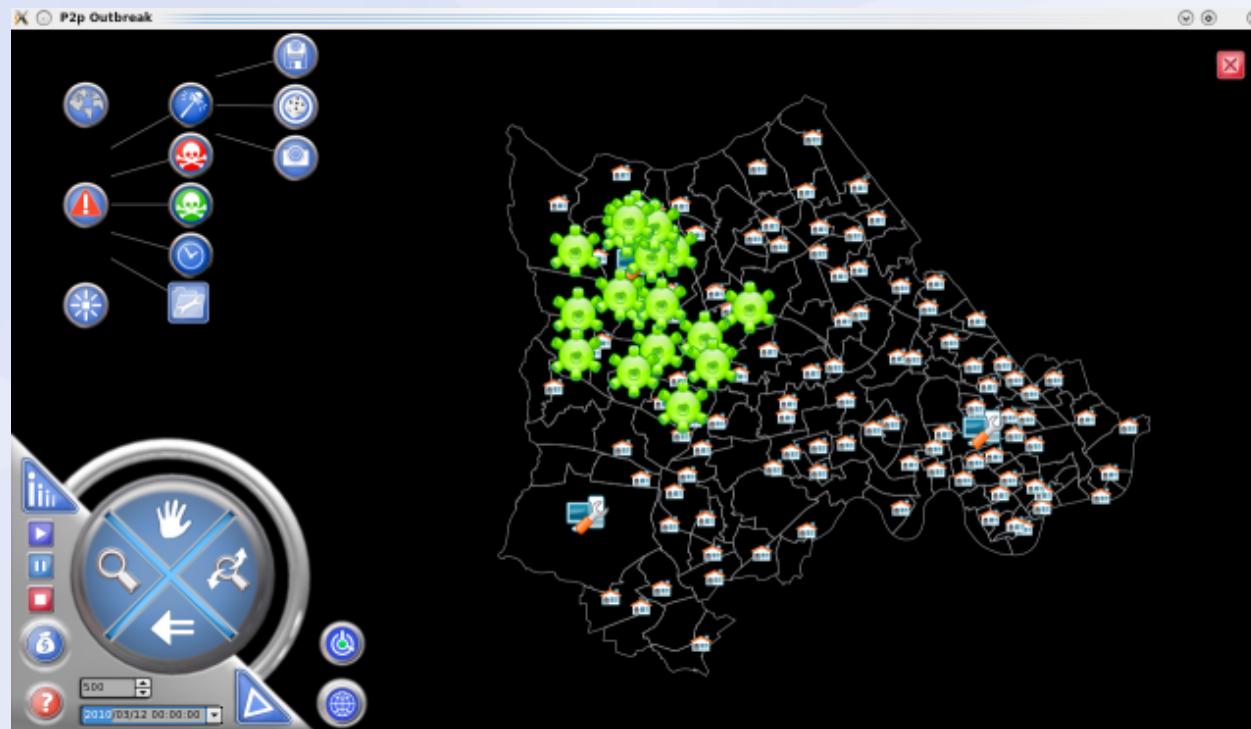
- Control for configuring the time dynamics.



- Attack rate (β) and Illness/Impact rate: Pert Distribution.



- Locate the source of the hazard: known locations of infected individuals.
- Load, generate or input.



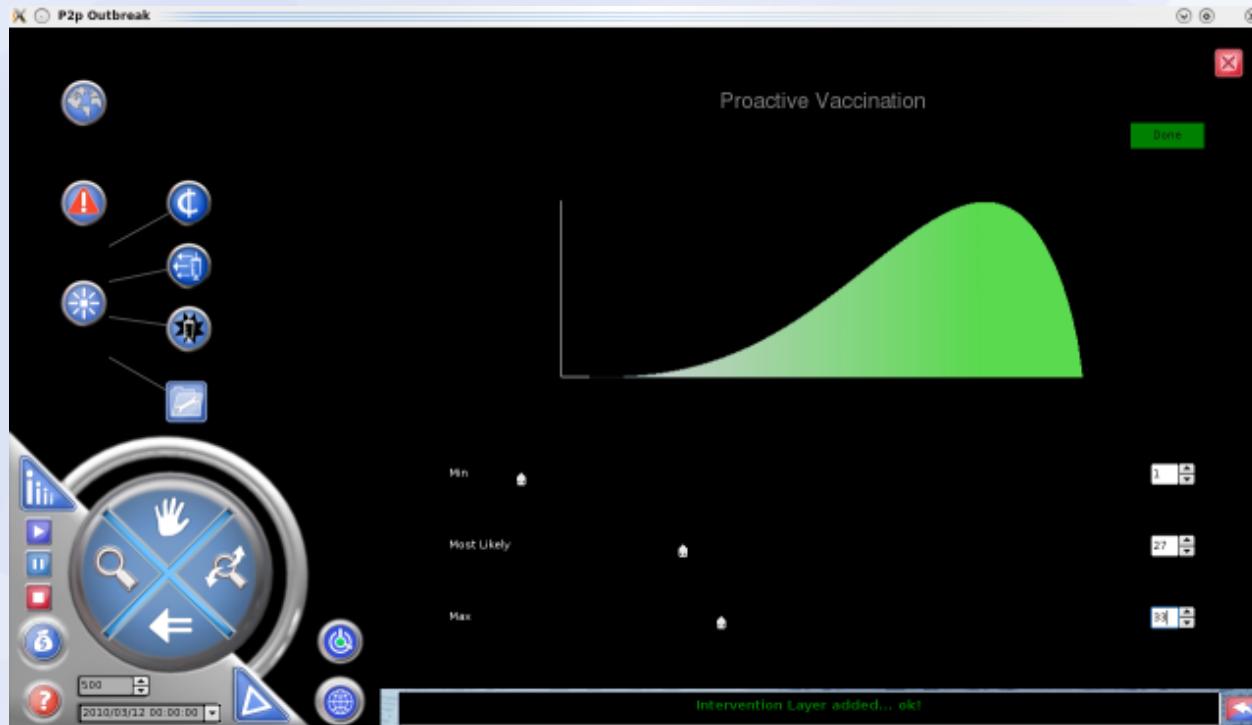
Intervention

- Test strategies for the optimal control of an infection in a spatial complex landscape..
- Heterogeneous populations: in space and in structure.
- Vaccination Strategies: proactive and reactive.

Only Reactive vaccination was implemented!

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- Choose immunisation rate.



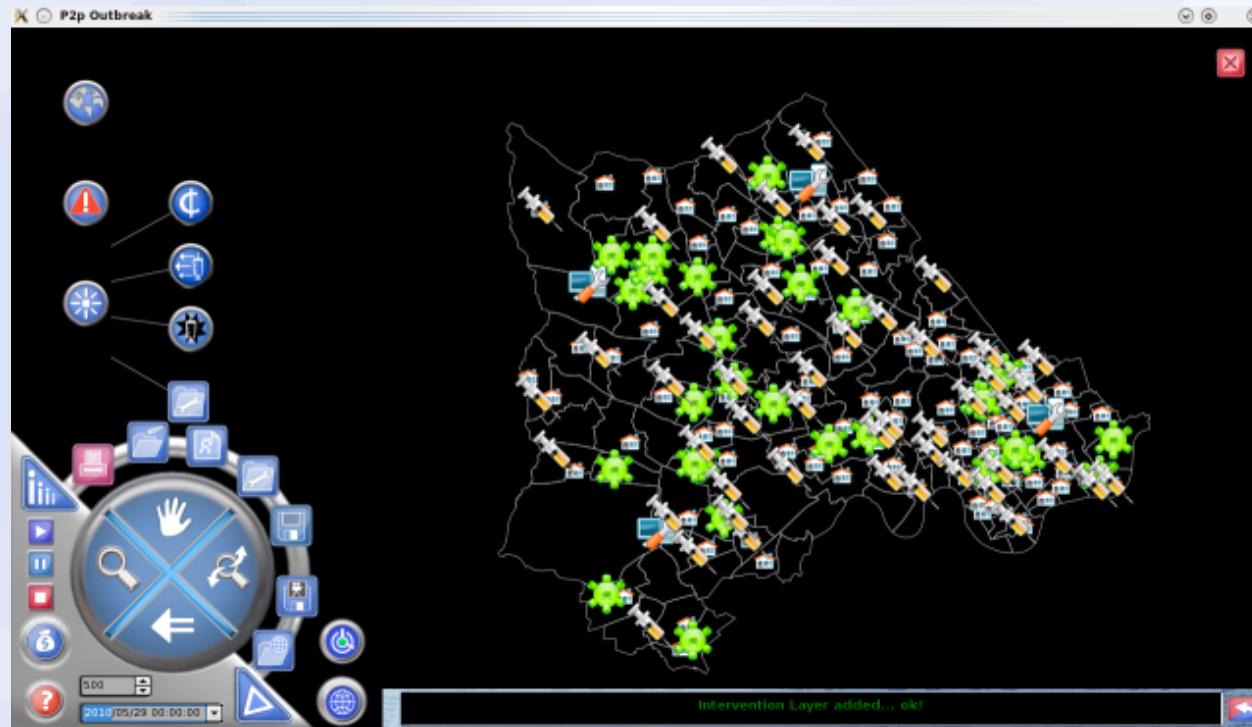
2

- Define costs (currency, budget).



3

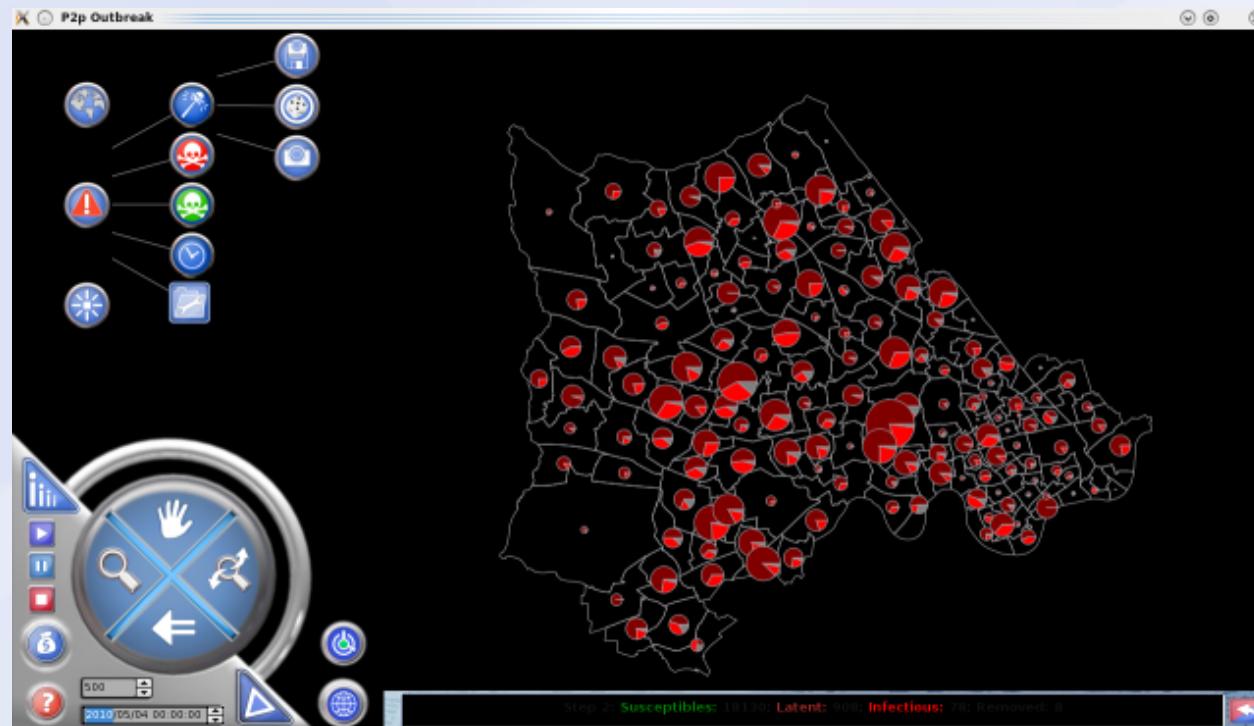
- Randomly vaccinate population.



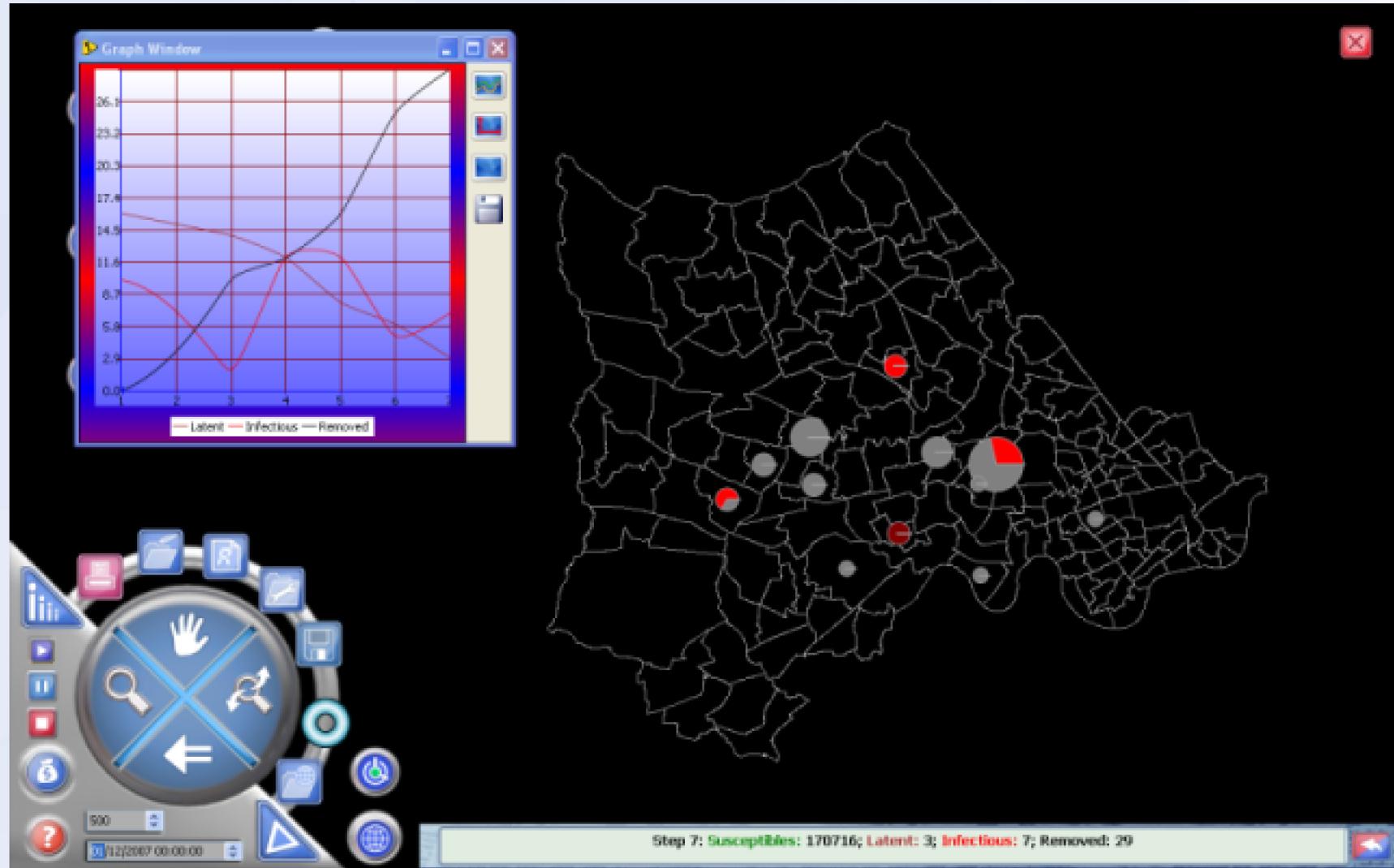
Play: Simulate

- The simulation integrates information from the three sub-models.
- Play, stop and pause.
- The output of each time step is presented in real time.

- Map with distributed pie charts, containing the proportion of population states.



- Three different ways of displaying information: map, chart and text (log).

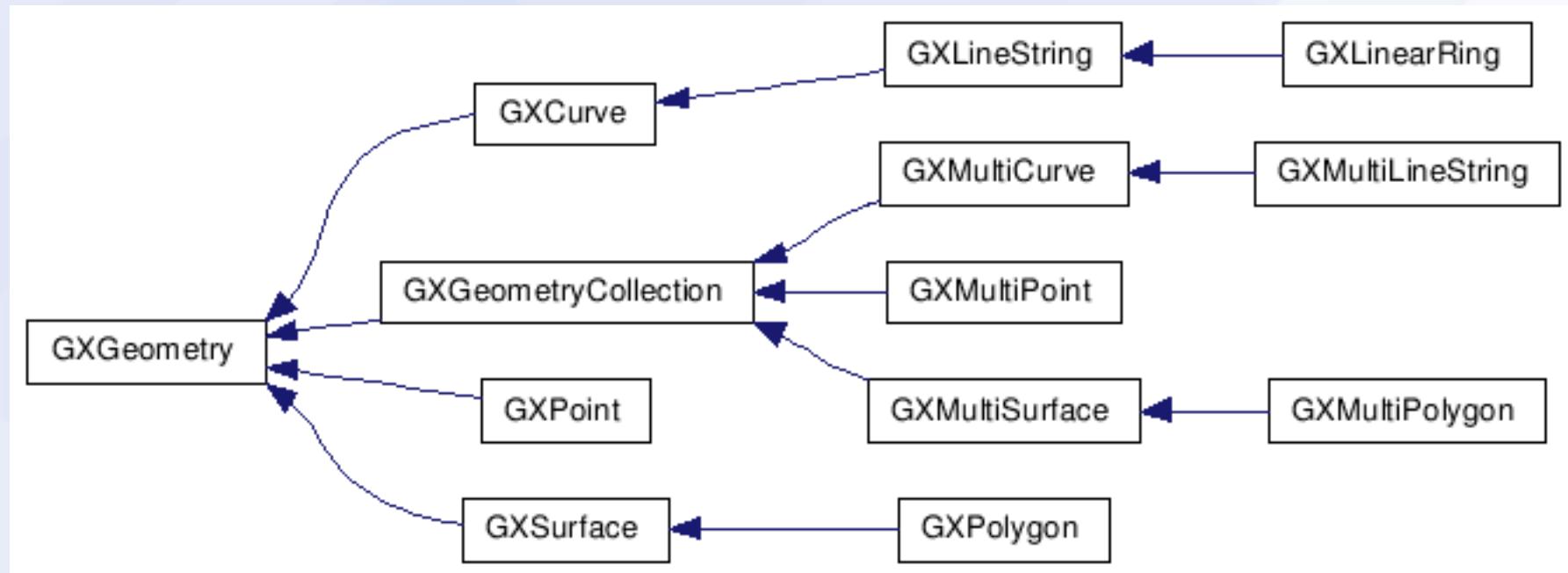


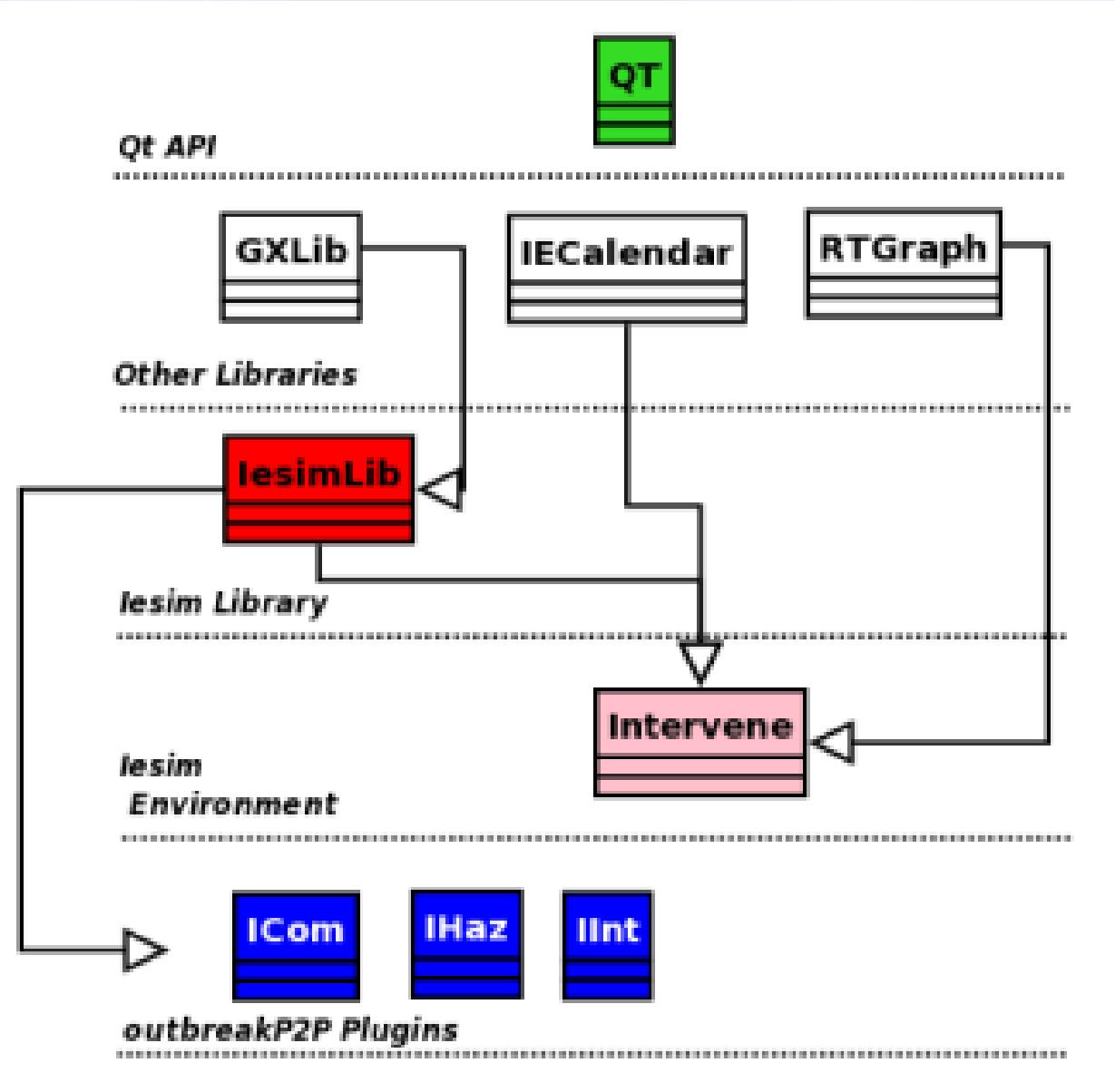
Implementation Notes

- C++ using Qt framework.
- Native but easily portable (Linux and Windows).
- GIS importance: justified the development of an in-house library.

Target: Load and manipulate geographic data in an efficient way!

Inheritance Diagram of the Geometry class (GIS Library)





Final Remarks

- “Game” approach in scientific modelling.
- Tools to be used by non experts.
- The product is still under development.
- Collaboration, both with programmers and users could “push” the development of the product (and extend it to new areas)

Some Links:

- <http://www.iesim.co.uk>
- <http://www.iesim.co.uk/api/index.html>
- <http://e-geo.fcsh.unl.pt/uk/index.asp>
- <http://casa.ucl.ac.uk/JoanaMargarida/>

Thank You for Listening!

