BioDynaMo

Biology Dynamics Modeller

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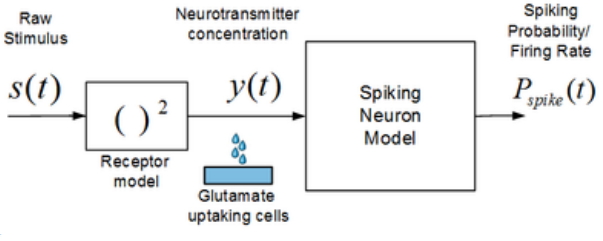
Outline

- Background
- Platform
- Future Challenges
- Summary

Background

Life Scientists → Neuroscience
Life Scientists → Immunology
Life Scientists → ...



http://hitconsultant.net/2016/09/26/infographic-future-personalized-medicine/

The Problem

More biological models

- Higher complexity
- Larger scale

} Computer Simulation

How to simulate fast?

Life scientists often make simulations

specifically for their own models

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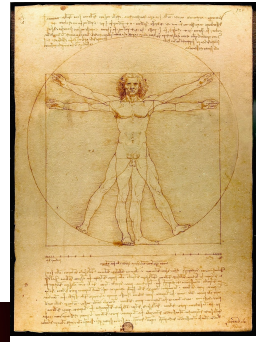
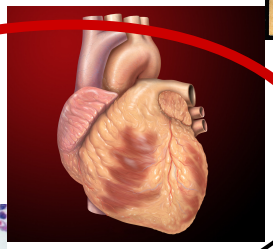
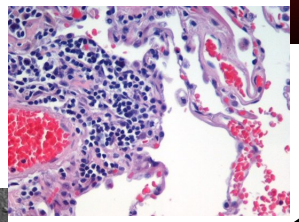
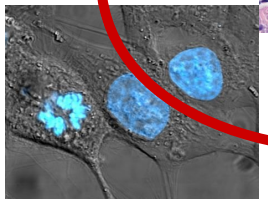
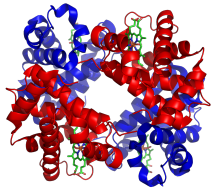
From atoms to organisms...

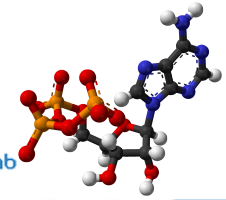


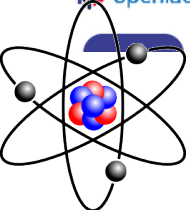












Organism

Organ

Tissue

Cell

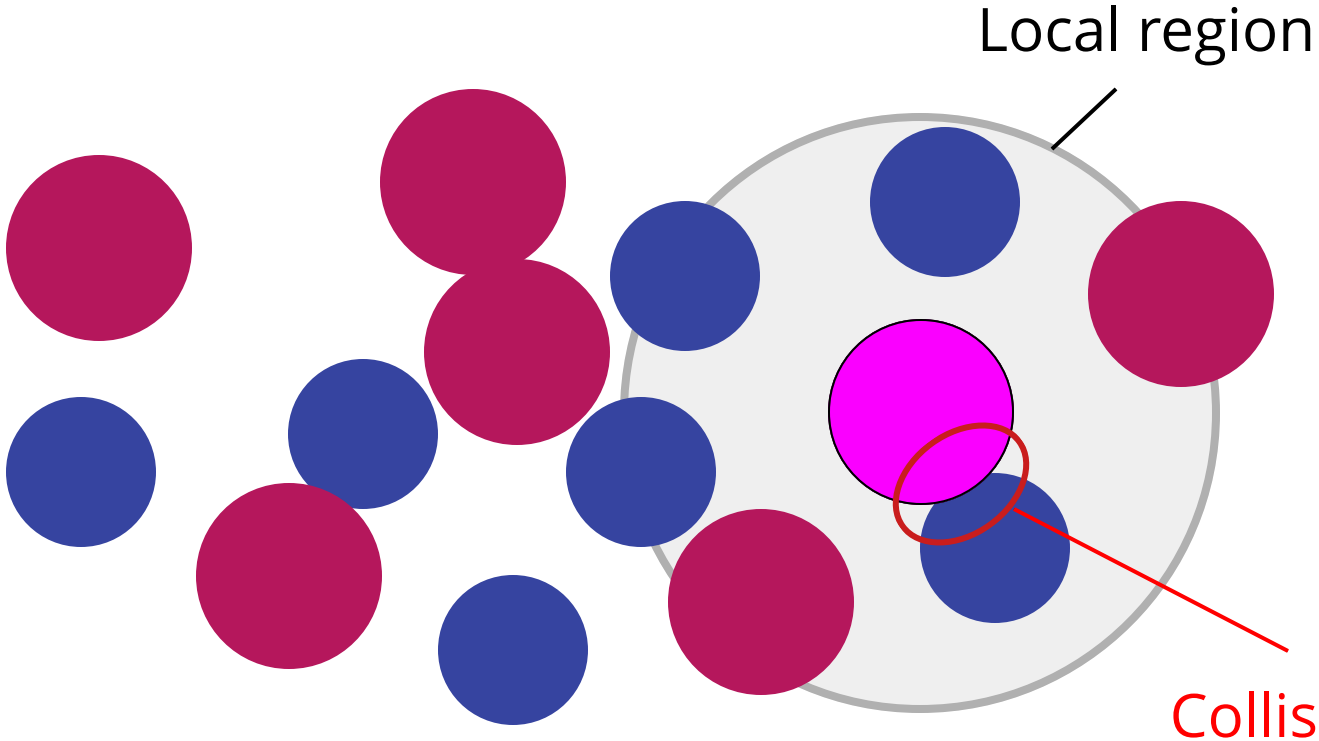
Macromolecule

Molecule

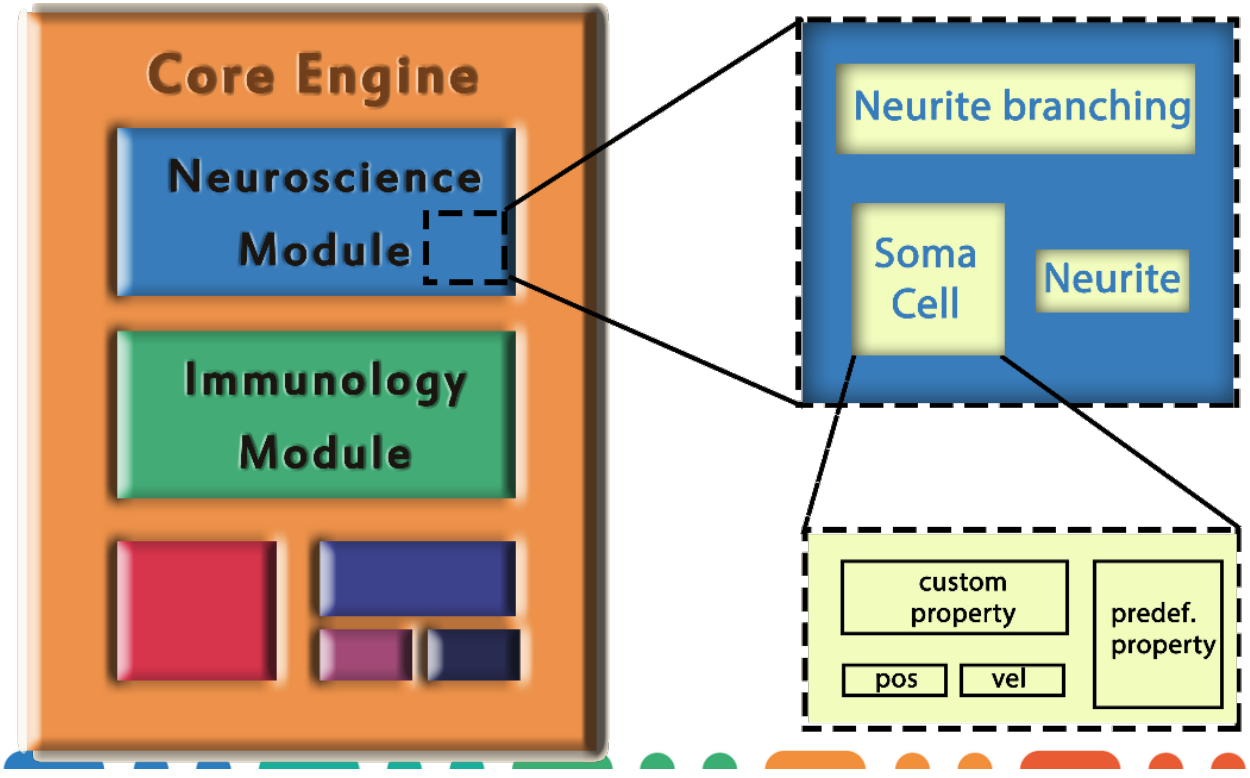
Atom

Agent-based simulations

Simulation object = *Agent*



Flexible / Modular Architecture

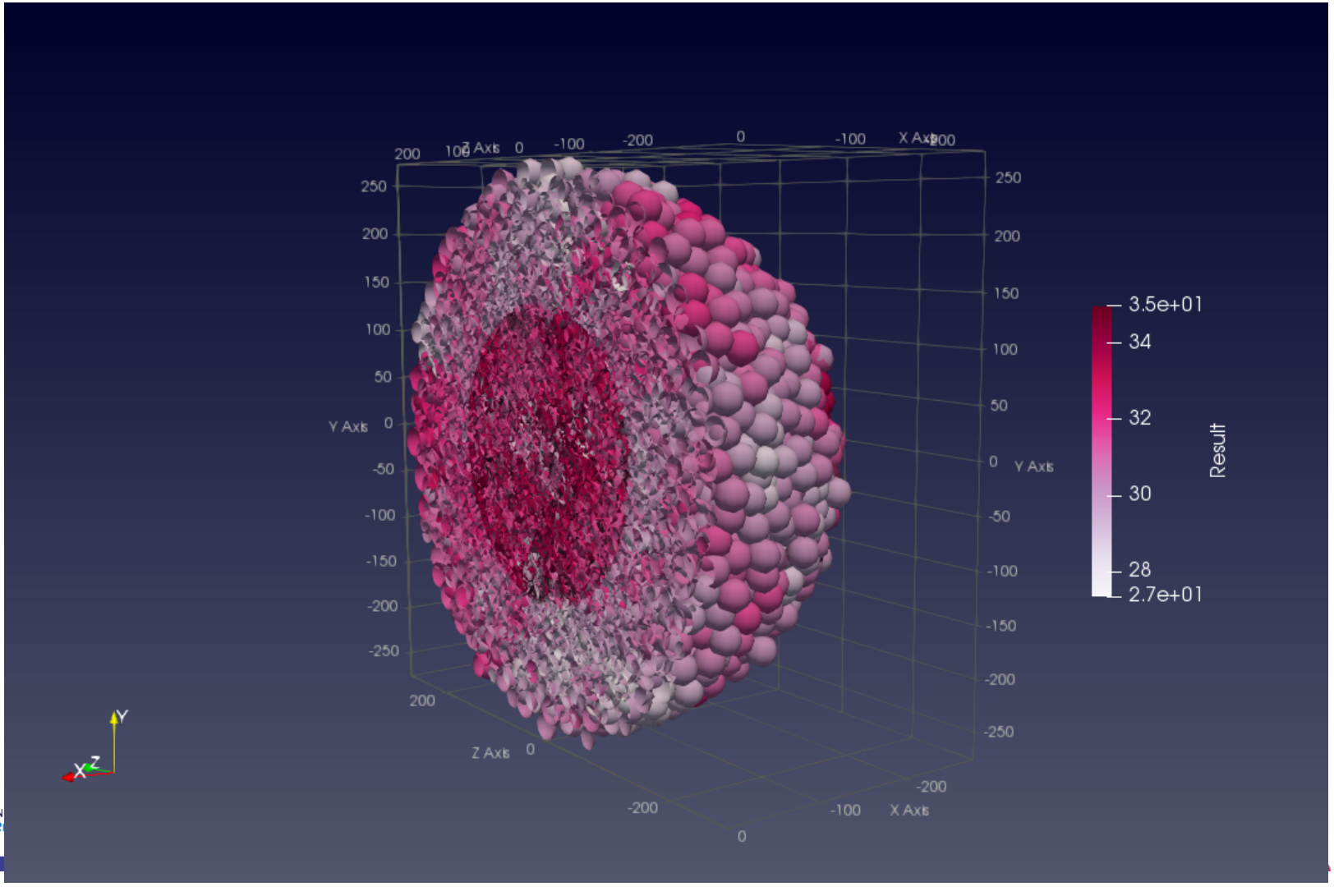


Overview Current Features

- **Modular simulation engine**
  - User defined cell behavior, cell types…
  - Mechanical interactions
  - Extracellular diffusion
- ROOT I/O for simulation **backups** , …
- **Fully parallelized** with OpenMP
- **Visualization** using ParaView
- Prototype of **messaging layer** using ZeroMQ

Still early stage

Visualization



Only at CERN

CERN: world's largest scientific experiment

IT: core competency

WLCG Geant ROOT ...

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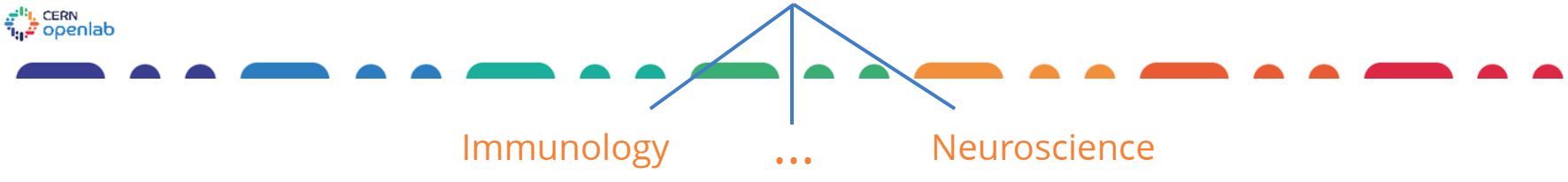
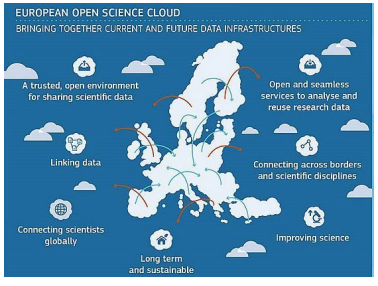


Future Challenges / Vision

- Distributed computing
- Heterogeneous computing
- Interfacing with well-established knowledge bases



THANK YOU!

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