

ModEDI

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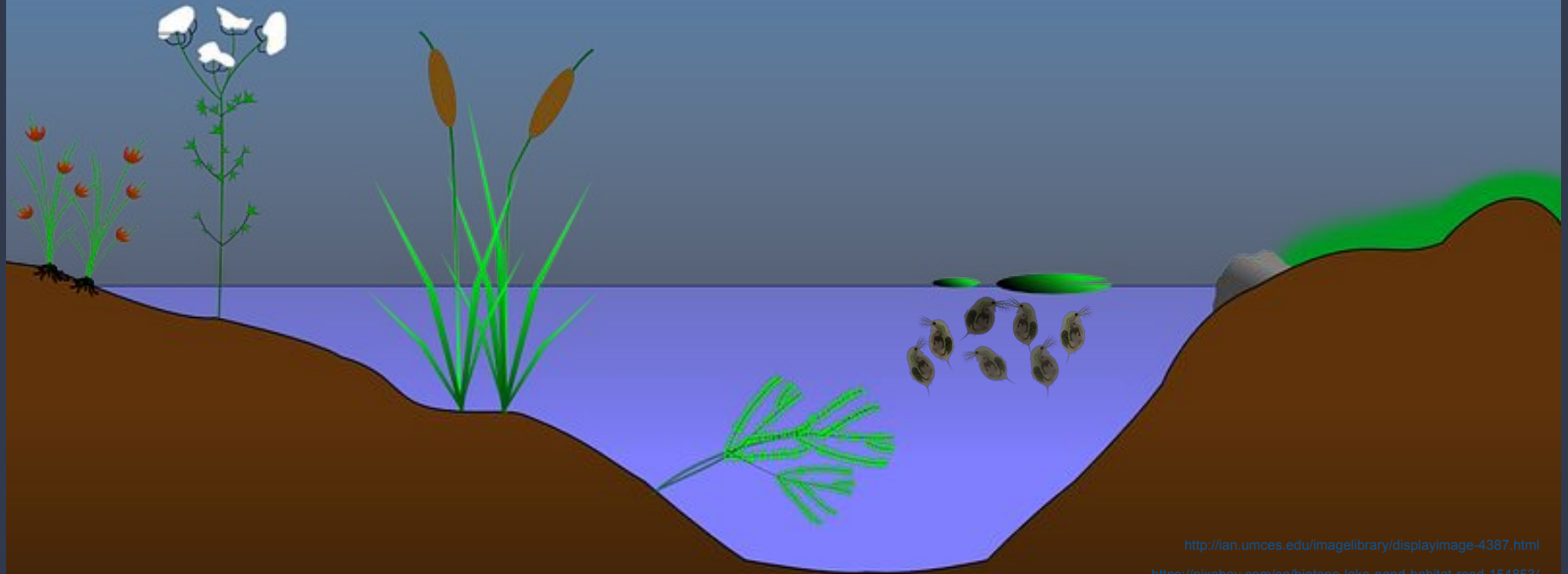
Background – *Quantitative Genetics*



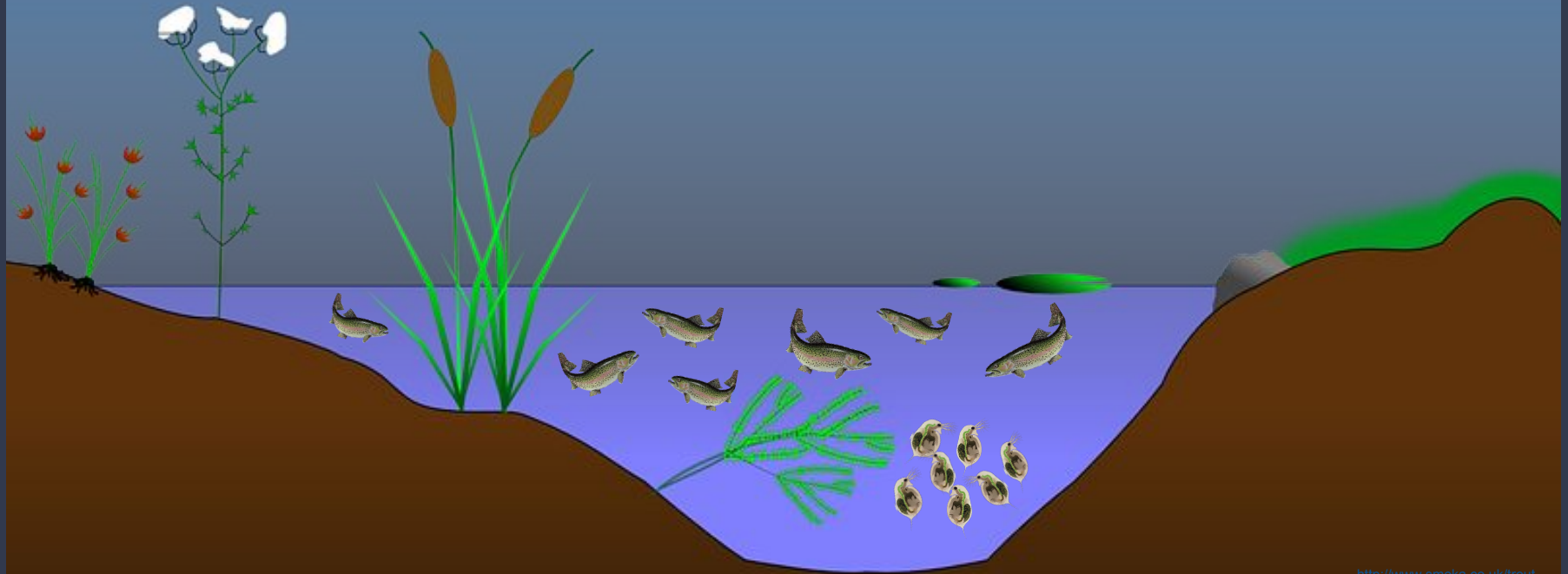
Case Study – *Models for Daphnia*



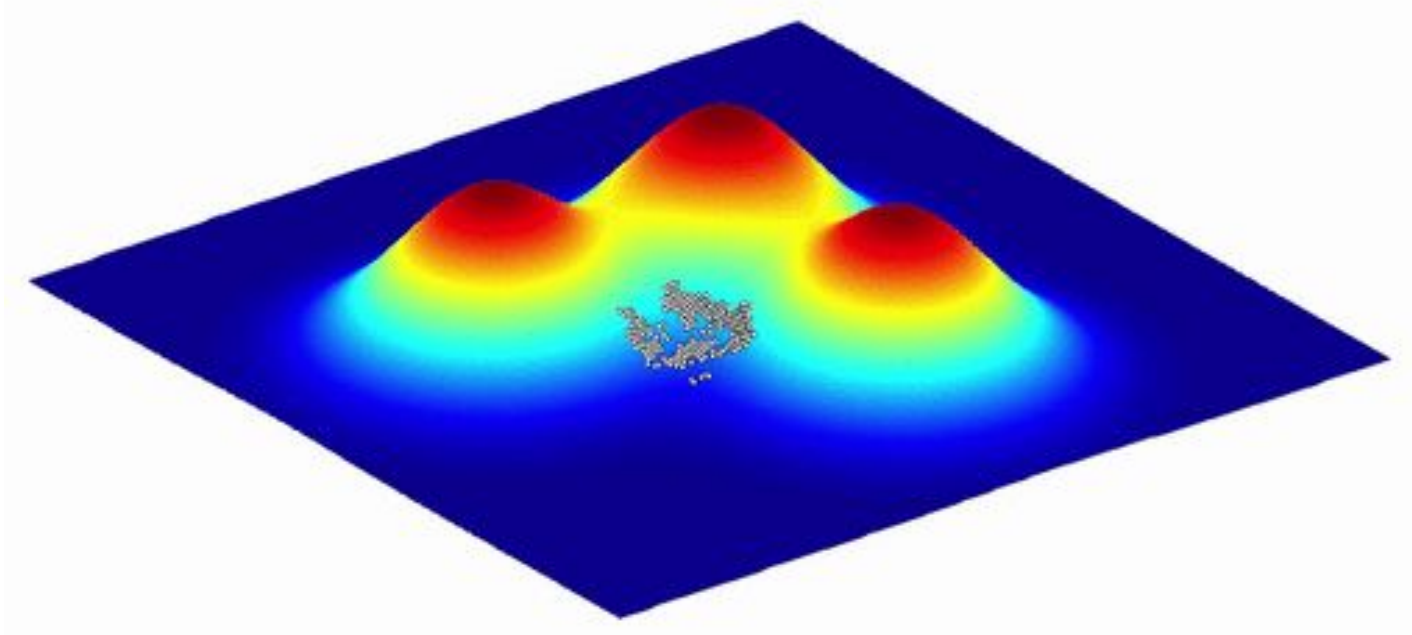
Nonlinear Developmental Interactions (NDI)



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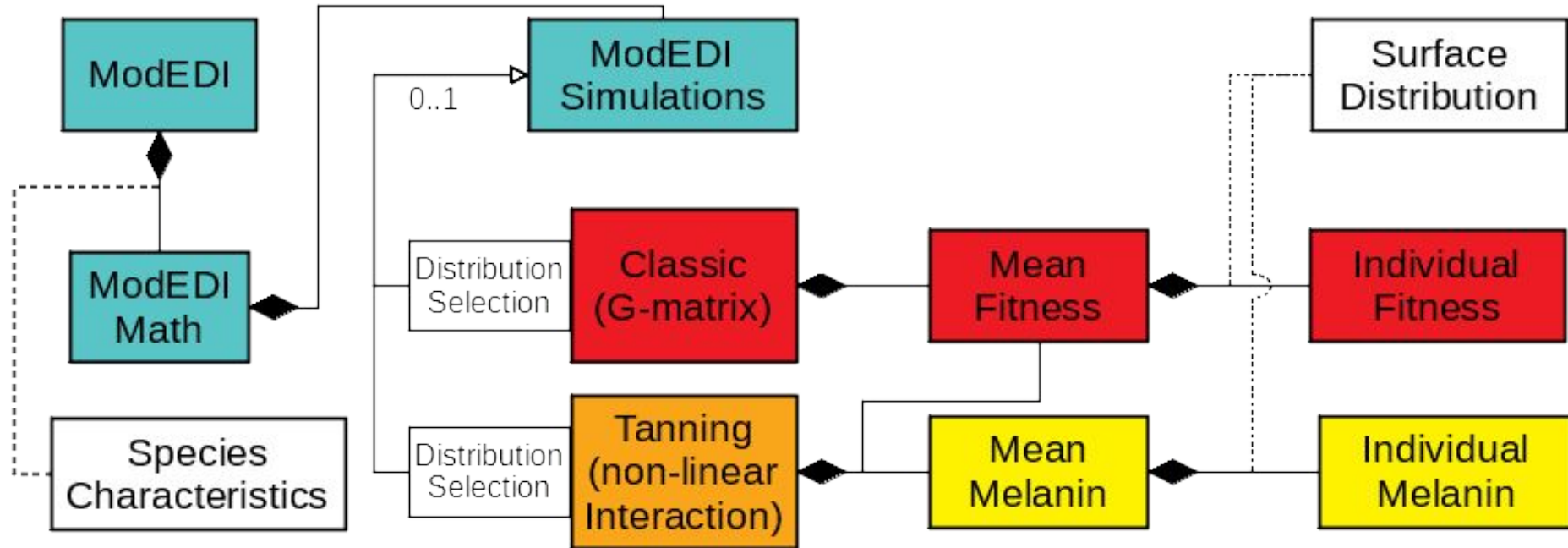
Central Concept – *Fitness Surface*



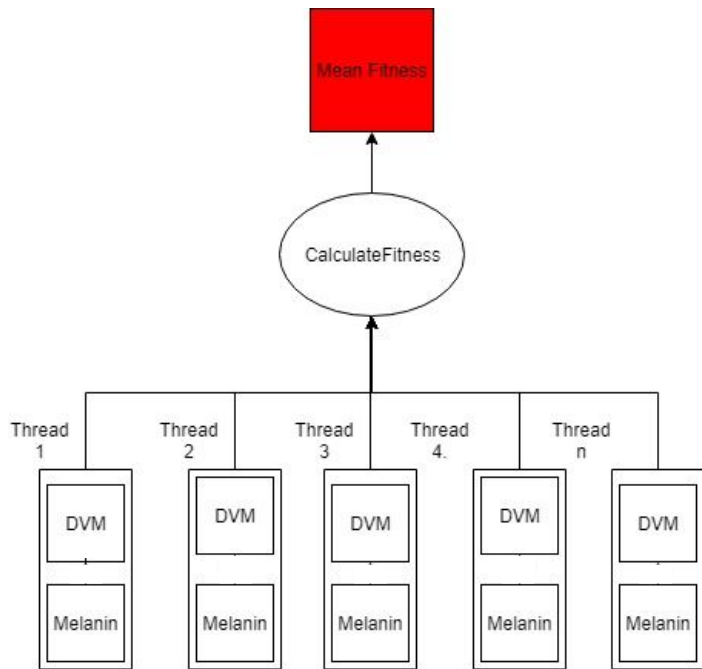
Motivations for parallelization:

- Fitness is an important function in evolutionary models
- Scalability for increased model complexity
- Parameter sweeps to efficiently test hypothesis
- Sequential execution time

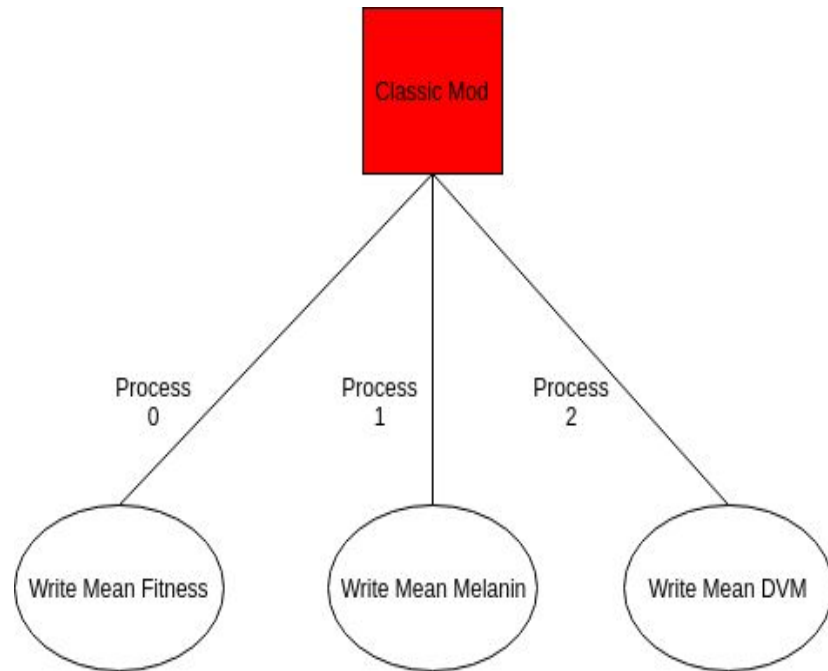
Software Architecture



Critical Section: Using OpenMP



I/O: Using MPI

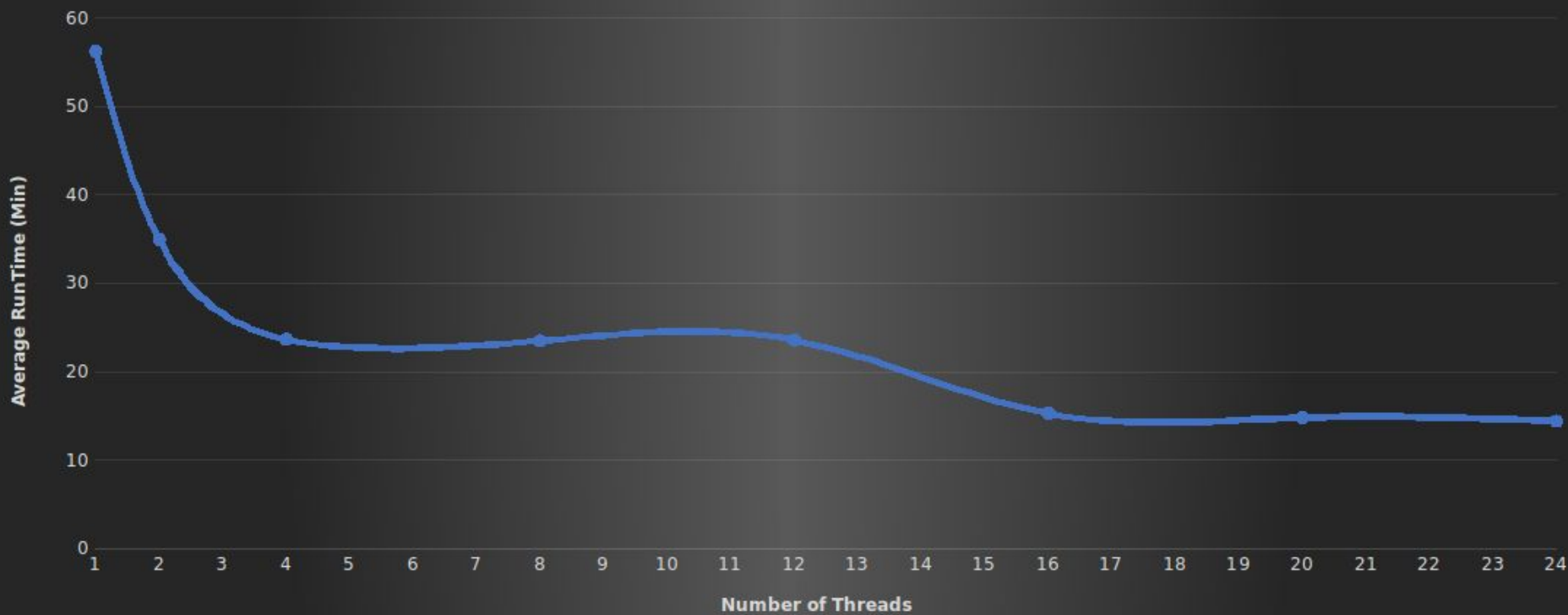


ModEDI Task Dependency Graphs

ModEDI Parallelization Workflow

1. Translate Java code base to C++
2. Parallelize critical section using OpenMP
3. Parallelize I/O using MPI
4. Optimize critical section
 - a. Compare run times by task size
 - b. Determine communication costs

Runtimes using OMP



Conclusions – Future Work

- Parallelized for scalability
 - Granularity of evolutionary hypothesis
 - Type of species
 - Number of physical traits
- Calculating mean fitness is nearly 70% of program computations
- Communicate in bulk to amortize startup costs
 - Reduce volume of communication
 - Reduce task size
 - Load imbalance
- Further improve I/O time with MPI

Questions?