

Masterpraktikum Scientific Computing

High Performance Computing Tutorial 5



Session 5: Project

Authors

Mantosh Kumar (Matriculation number : 03662915)

Course of Study: Master of Science Informatics



Repast HPC

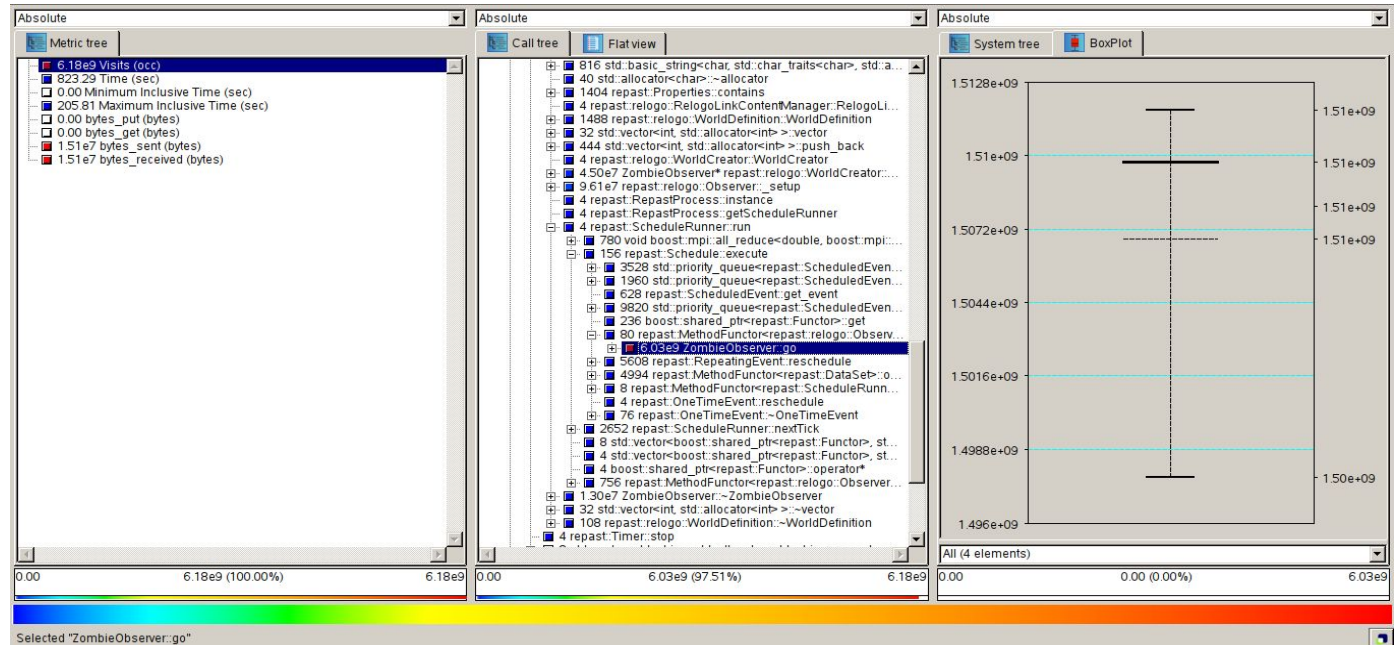
- Agent based modeling and simulation framework
- Target systems : High performance distributed computing platforms
- Written in c++
- Used MPI for parallel operations
- Agents distributed across processes
- Support prominent modeling methodologies : shared grid, shared network and shared continuous space or combination of them
- Request and synchronization are handled automatically

Repat HPC (Before optimisation)

- In project application , agents are located on 100 X 100 grid
- Agents are given their place randomly when simulation starts

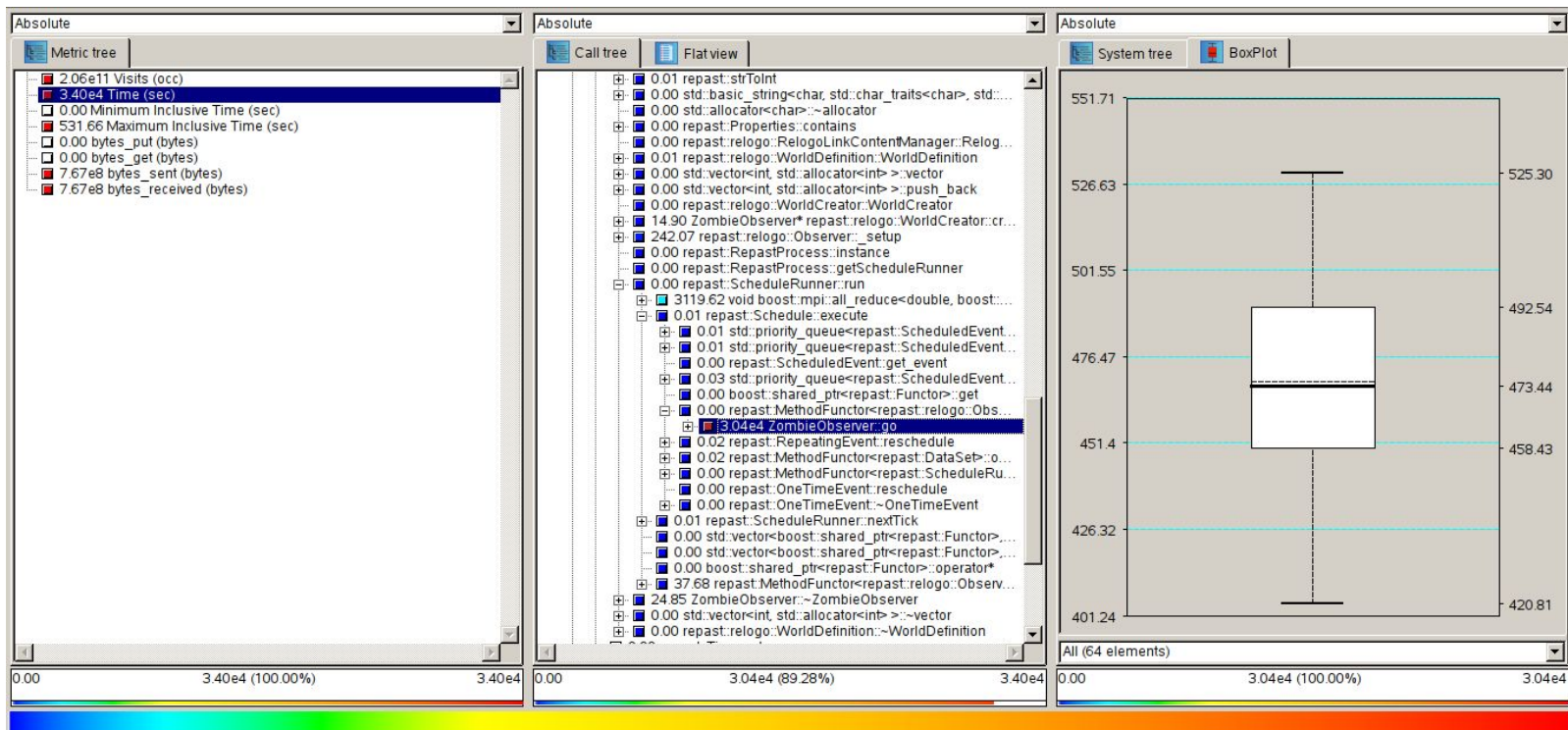
#Agents = 6000

#Processors = 2 X 2



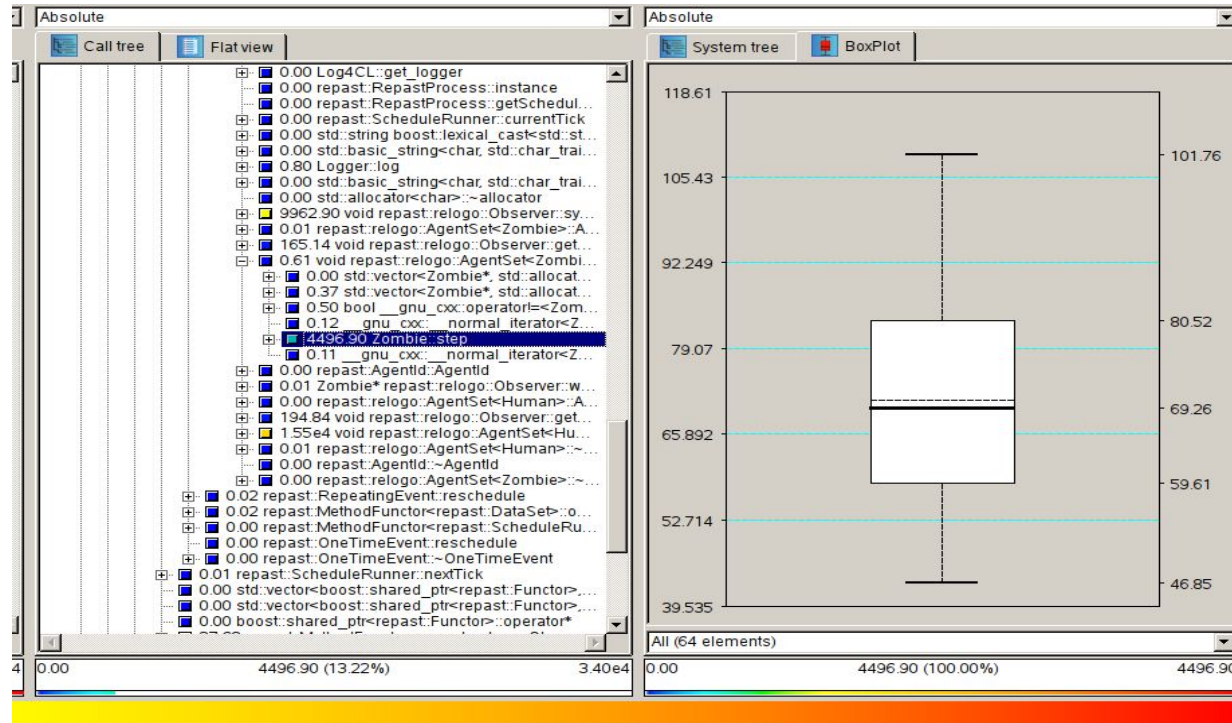
Repat HPC (Before optimisation)

#Agents = 6000 #Processors = 8 X 8



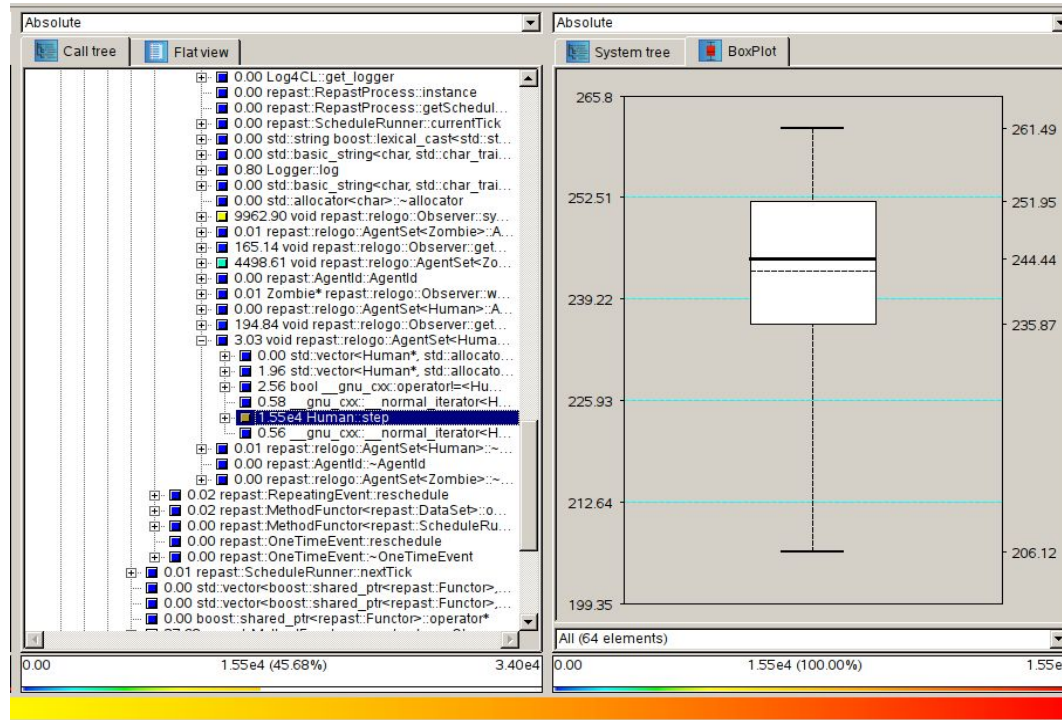
Repast HPC (Before optimisation)

#Agents = 6000 #Processors = 8 X 8

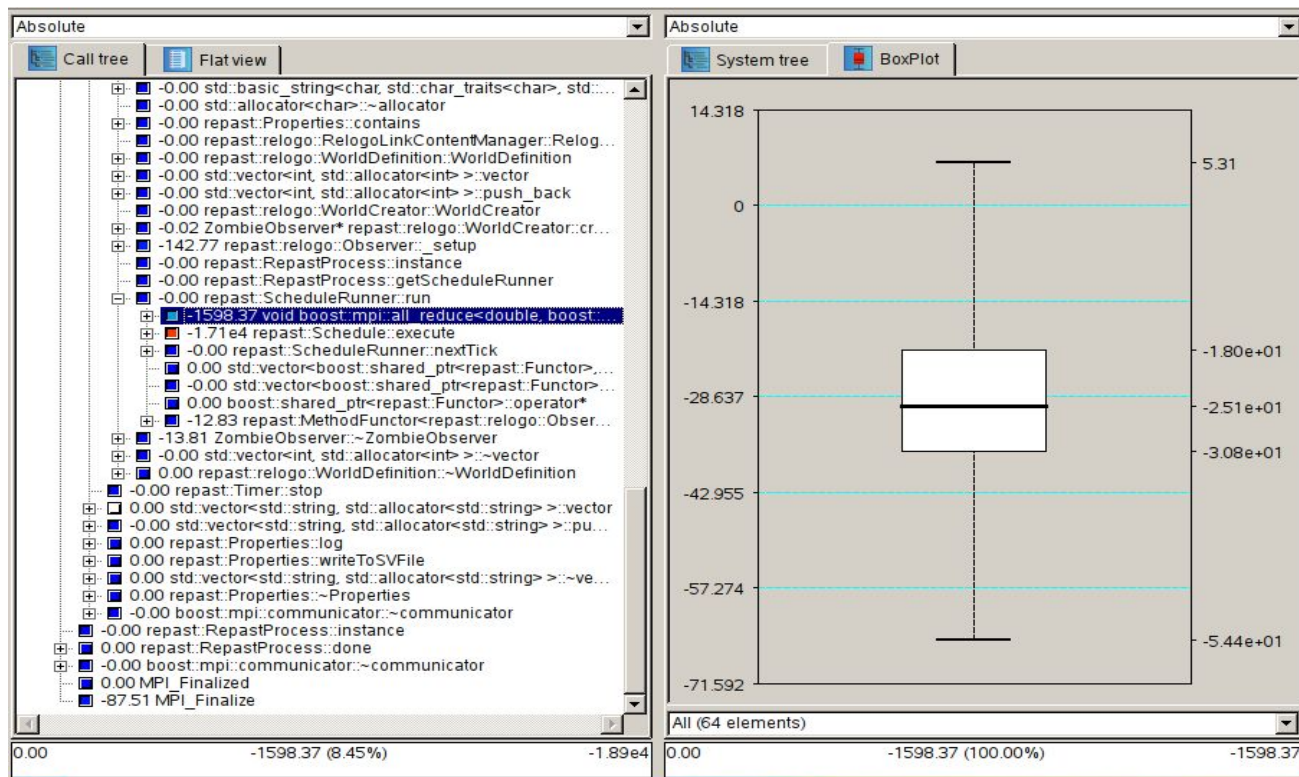


Repat HPC (Before optimisation)

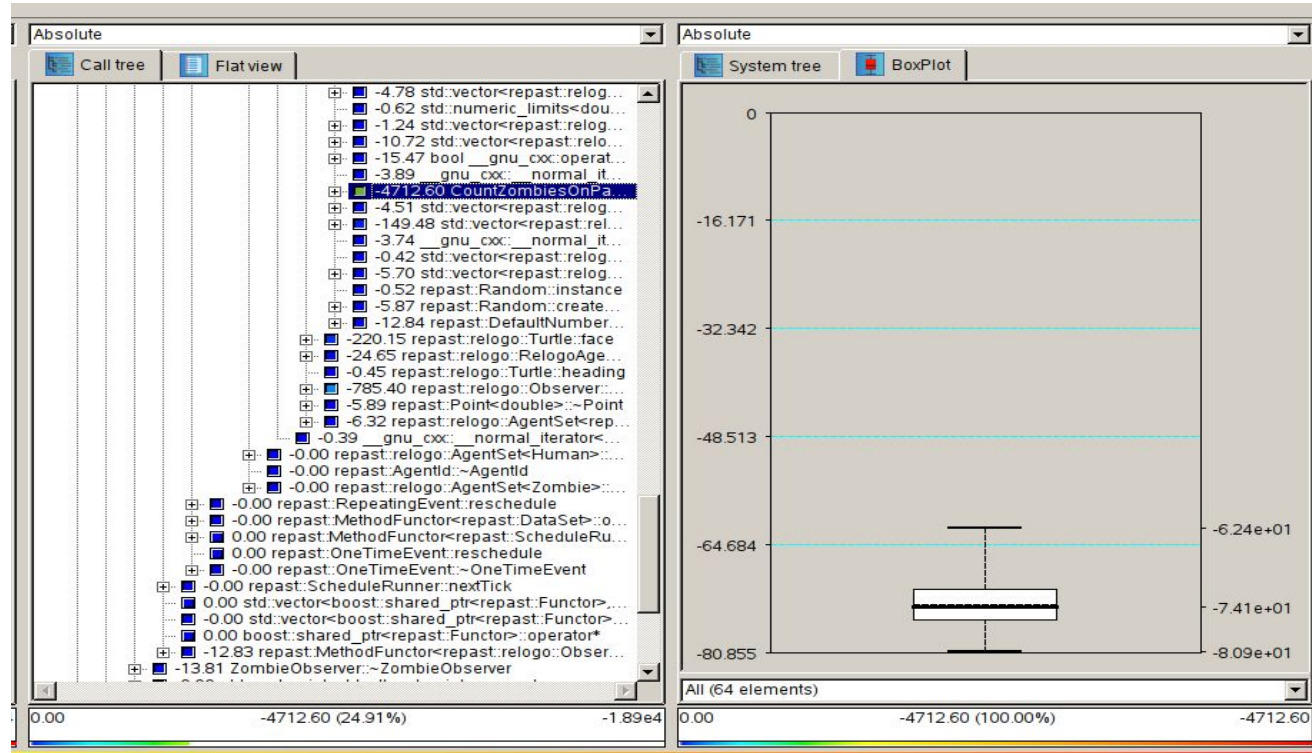
#Agents = 6000 #Processors = 8 X 8



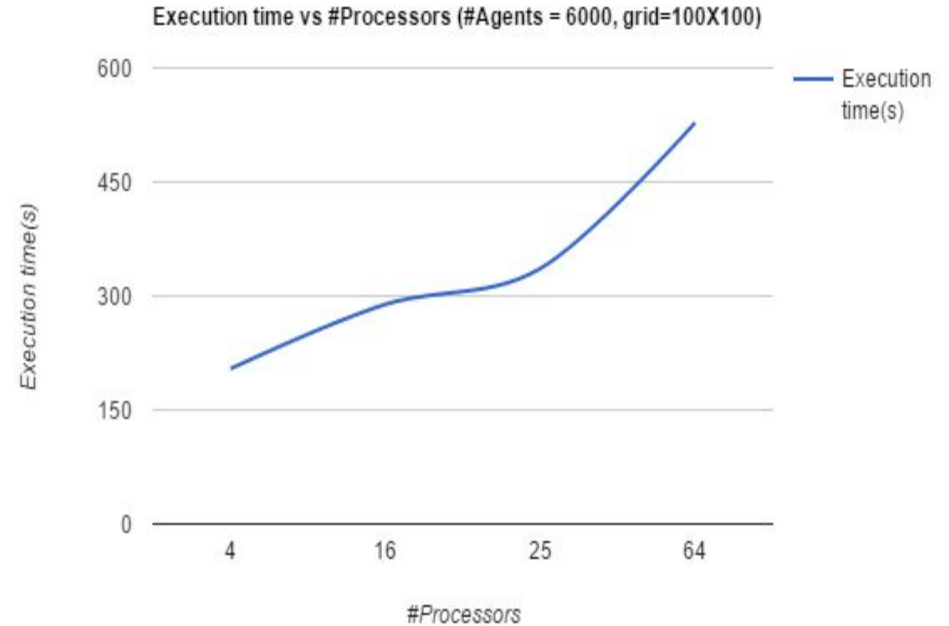
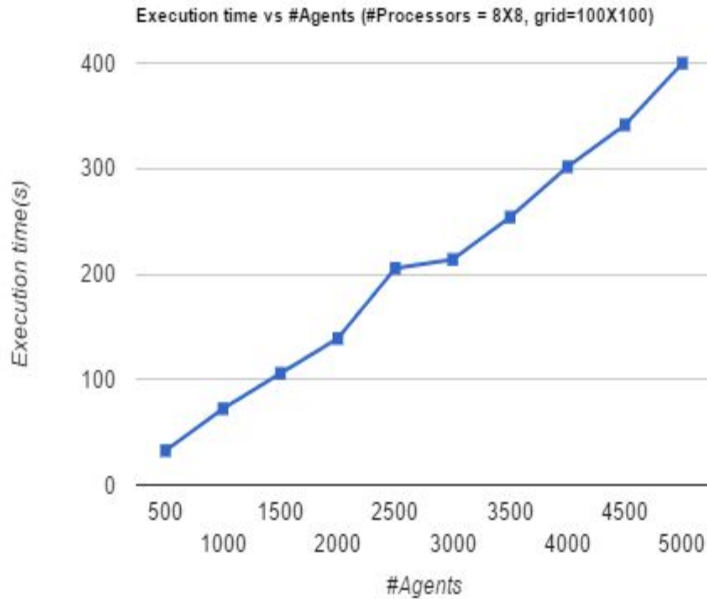
After merging different cubex data (Before optimisation)



After merging different cubex data (Before optimisation)



Repast HPC (Before optimisation)



Conclusion

- Execution time scales almost linearly with the number of cores for mainly independent agents
- Whereas speedup drops significantly in case of highly interdependent agents

Area of improvement

Most Expensive jobs:

- Giving agents coordinates
- Locating agents on grid or space

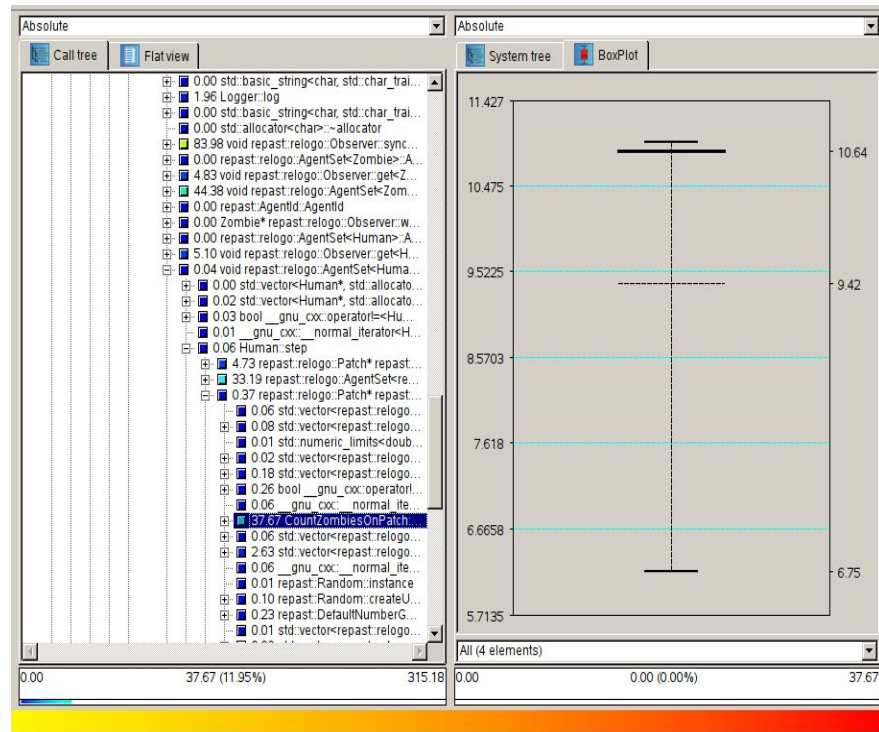
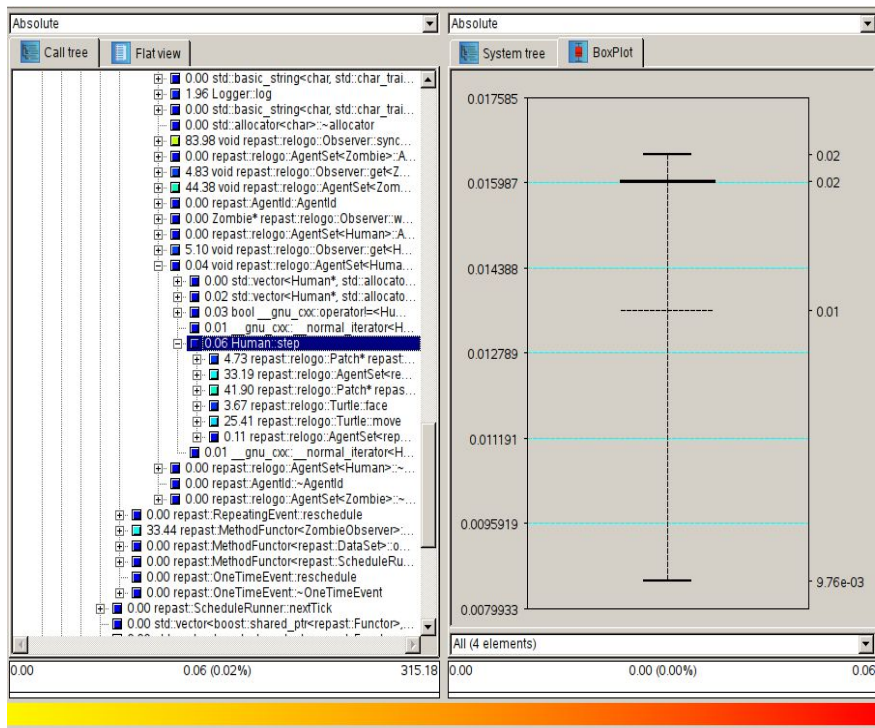
In our sample application the most expensive jobs

- Zombie ::step (13.17%)
 - CountHumanOnPatch (5.76%)
- **Human ::step (45.46%)**
 - **CountZombieOnPatch (20.34%)**
- MPI_AllReduce (9.37%)
- relogo::Observer:Sync (29.44%)

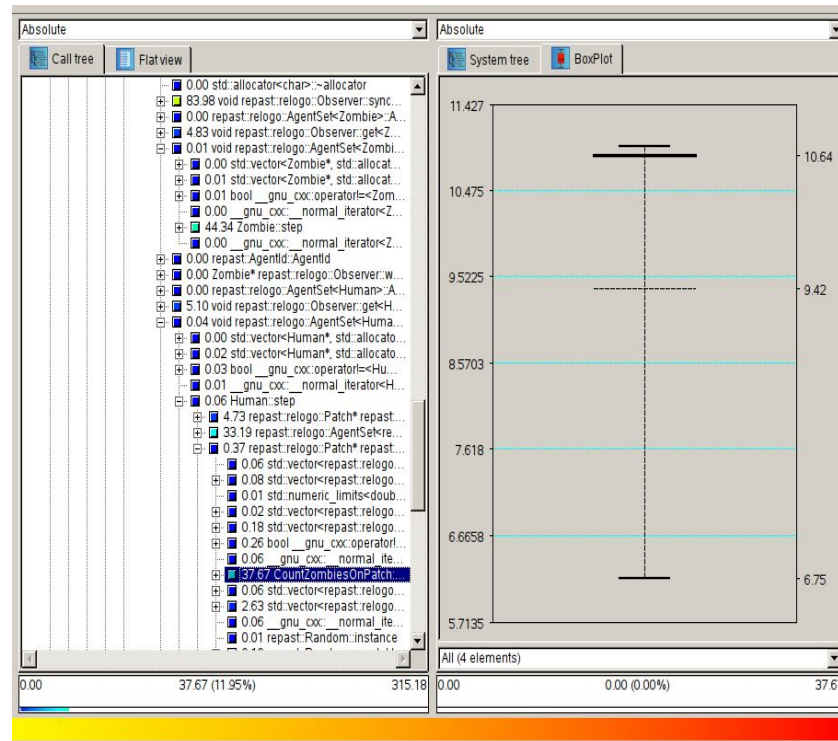
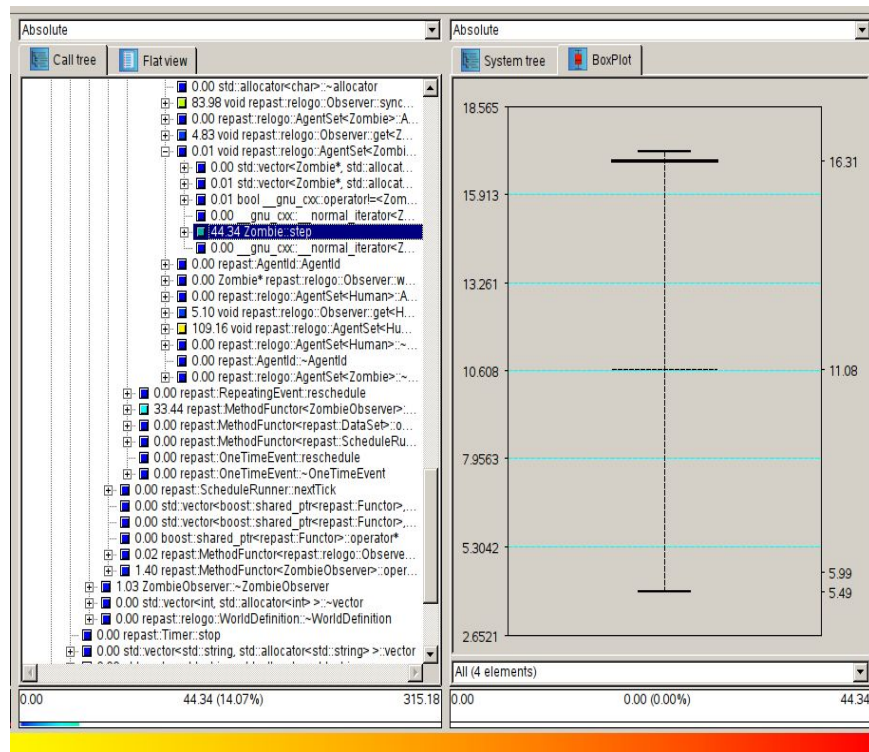
Optimisation Strategy

- Use HDF5 data as input
- use C++ standard library instead of Repast API as much as possible
- Try to design less interdependent agents

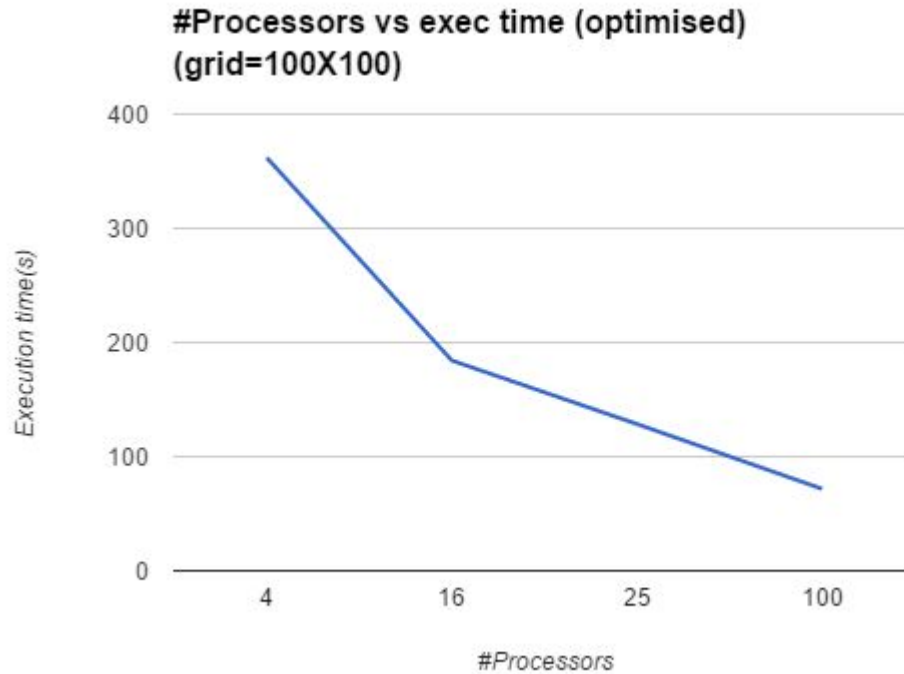
Repast HPC (After optimisation)



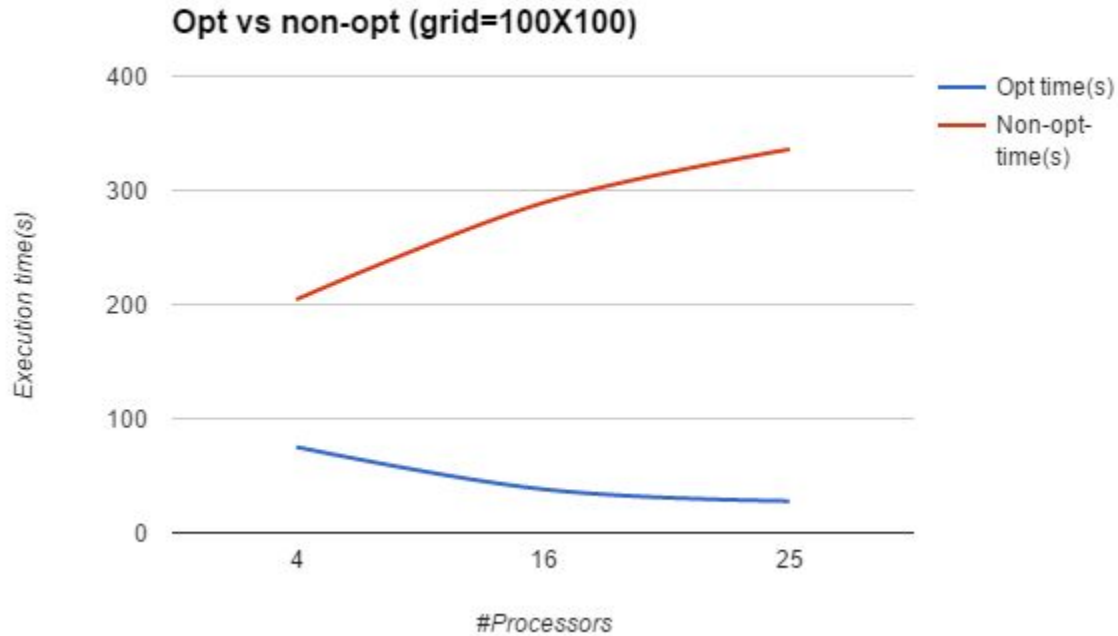
Repat HPC (After optimisation)



Repast HPC (After optimisation)



Repast HPC (opt vs non-opt)



Thank you!