A Framework for the Development and Evaluation of Distributed Swarm Intelligence Algorithms on the OverSim Simulation Platform

What's the Goal?

Enabling a comprehensive experimental validation of network oriented swarm solutions. OverSwarm simplifies the development and evaluation of distributed swarm intelligence algorithms based on the concept of mobile ant agents.

By leveraging an existing peer-to-peer overlay simulation framework, namely OverSim. OverSwarm includes a domain specific language for describing agent's behavior. Our solution supports the development of new P2P overlays, extension of existing solutions, and execution of swarm algorithms on top of existing P2P overlays.

Faster prototyping

OverSwarm allows the programmer to focus on the collaborative aspect of the algorithm rather than on network related issues such as data serialization or the details of agents' execution. Distributed swarm intelligence solutions can be deployed and evaluated on top of peer-to-peer overlays already implemented in OverSim. Algorithms can be easily modified and tested, and can exploit existing OverSim modules or user defined functions written in C++.

Work like a scripting language

Automatic memory management

Strong transparent migration

Access to user-defined functions

Compiles to C++ code

More natural way of defining agent's behavior

Swarm intelligence algorithms are often detailed by describing the behavior of each agent. Accordingly, it can be awkward to translate this into a message based network protocol, with the flow of operations being more difficult to follow. Conversely, thanks to OverSwarm’s programming language agent’s behavior is easier to describe and understand.

About OverSim

OverSim is an open-source overlay and peer-to-peer network simulation framework based on OMNeT++ (an event based simulation environment). Several models for structured and unstructured P2P systems, such as Chord, Pastry, Kademlia, and GIA, are available. Oversim is developed by the Institute of Telematics at the Karlsruhe Institute of Technology. http://www.oversim.org

OverSwarm includes a compiler that takes the agent’s behavior and generates the corresponding C++ code. This code can be integrated within an OverSim module and compiled to create a complete package ready for testing with the OverSim platform.

Toolchain

Application Protocol

Swarm Based Application

Overlay

Underlay

Protocol Extension

Application

Overlay Protocol

Swarm Based Protocol

Overlay

Underlay

Standalone Protocol

Application

Swarm Based Overlay

Overlay

Underlay

Multiple targets

With OverSwarm it is possible to target different levels of the OverSim framework. The swarm algorithm can either be run as application on top of an existing overlay, as an extension of an existing protocol (for example Chord), or as a standalone overlay protocol. This flexibility enables a wide range of experimentation and testing.