OverSim

A Scalable and Flexible Overlay Framework for Simulation and Real Network Applications

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What is OverSim?

- OverSim is an **overlay framework**
  - providing common functions for rapid prototyping

- Once a protocol is implemented in OverSim, you can…
  - use OverSim as an **overlay simulator**
    - simulations with >100,000 nodes
    - strong GUI support (e.g. for debugging)
    - gathering of statistical data
  - run your protocol in **real networks**
    - deployment in PlanetLab
  - emulate an **overlay network**
    - connection to real network devices
    - for demonstrational purposes

- all without any code modification!
In a Nutshell

- **OverSim runs on**
  - Linux, Windows, Mac OS X, Nokia Internet Tablets
- **Written in C++**
  - based on OMNeT++
- **Well documented**
- **Open Source (GPL)**
- **Internationally and actively used**
  - up to now, more than 5,000 downloads
- **OverSim includes several structured and unstructured overlay protocols, and event distribution protocols:**
  - Chord, Kademlia, Pastry, Bamboo, Koorde, Broose, Gia, VAST, QuON, i3, Scribe, SimMUD, NICE
Flexible Architecture

- **Layered architecture**
  - Underlying network
  - Overlay layer
  - Application layer

- **Consistent interfaces between layers**
  - UDP between network and overlay
  - Common API between KBR overlay and application

→ *Exchange of one component is transparent to all other components*
OverSim offers different underlay models

- **Simple Underlay**
  - Low computational overhead
  - Coordinate-based delays calculated from CAIDA/Skitter measurements
  - Logical access network

- **INET Underlay**
  - Based on the INET framework
  - Complete IP stack is modeled
  - Backbone simulation
  - Extendable by INET framework models, e.g., 802.11
Overlay Protocol Support

**Base class** for structured overlays to facilitate implementation of new overlay protocols

- Overlay message handling (**RPCs**, statistics)
- **Generic lookup** function for KBR protocols
  - support for different **iterative and recursive routing modes**
- **Peer failure discovery**
- **Bootstrapping support**
- **Visualization**
  - Topology, messages, node state
- **Proximity awareness**
  - Vivaldi, GNP
P2P Applications

- Support for
  - layered (tiers)
  - component-based architectures
- Interfaces
  - CommonAPI
  - ALM API
  - XML-RPC interface
  - connection of external applications
- Trace Manager
  - scripted user behavior

XML-RPC

CommonAPI
Real world interconnection

- For real world **interconnection**:  
  - One single host is emulated  
  - Exchange packets with the real network  
  - **External applications** can be connected to the emulated host  
  - Deployment in **PlanetLab**

- For **demonstrational purposes**:  
  - Emulation of overlay networks with large numbers of nodes  
  - **External devices** can communicate with emulated overlay
Modeling of Churn

- Several Churn models provided, based on different lifetime distributions:
  - Weibull
  - Exponential
  - Pareto

- Simulations with several churn generators possible
  - different node configurations (parameters, applications)
  - overlay partitions, landmarks, i3-server
Statistics

- Central module for gathering statistics
- Post-processing scripts for statistical data
  - facilitate generation of publication quality plots: scatterplots, vectorplots, lineplots
  - gnuplot compatible output
Summary

OverSim is a modular and flexible overlay framework

- Various underlay models
  - different speed and accuracy
  - real network use
- Many implemented overlay protocols
  → can be used as a reference platform for overlay protocols
- Simulation, emulation, real network application
- Easily extendable, well documented
  → OverSim facilitates rapid prototyping
  → open for contributions, visit: http://www.oversim.org/
Thank you!

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