Diplomarbeit / Master Thesis

Load Monitoring in a Time Virtualized Emulation Environment

Lastüberwachung in einer zeitvirtualisierten Emulationsumgebung

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Timeframe: 6 months, starting immediately

Description:

The NET (Network Emulation Testbed) project has established an emulation system for computer networks at the Distributed Systems department. The system is based on a PC cluster and consists of a combination of flexibly configurable hardware and software tools, which emulate specified network properties. This allows the comparative performance analysis of distributed applications and communication protocols.

To support the emulation of scenarios with a number of nodes beyond the number of physical cluster nodes, virtualization concepts are used to partition the available resources (CPU, memory). Using resource virtualization, it is possible to increase the number of supported nodes in a scenario. However, the available processing power and network capacity limits the size of the supported scenarios.

Understanding also time as a resource, we can run an experiment with a factor (called time dilation factor, TDF) slower or faster than realtime and, therefore, get a factor more processing power or network capacity. This allows us to emulate resources beyond those resources physically available in the testbed. To achieve best resource utilization, it is necessary to adapt TDF to the current load. Since the demand on the resource changes during an experiment, continuous adaptation of TDF is required.

The period of time between two TDF changes is called epoch. In previous work, we implemented a time virtualized environment running on a single node of the cluster able to change TDF at runtime.

In this work, a mechanism to monitor the current load of the emulation environment shall be developed and evaluated. The emulation environment is based on Linux and using the different virtualization techniques (virtual machines, virtual routing). These components are providing several independent load monitors, like for example average number of active processes. However, a inference between measured values and an overloaded emulation environment is missing. Since an overloaded environment prohibits realistic results, the metric to be developed must allow load forecasts for the near future to allow proactive TDF adjustments (increasing TDF results in decreasing load). During the thesis, the developed mechanism has to be evaluated by integrating a prototype implementation into the time virtualized emulation environment.

The achieved results have to be documented in a detailed written report and presented in a final talk.

NET project home page: http://net.informatik.uni-stuttgart.de