



Bachelor Thesis

2015-05-04

CPU Scheduling for Virtual Machines

Context

Cloud Computing or more precise Infrastructure as a Service (IaaS) offers flexible and on-demand virtual machines (VMs) to its users. Such VMs are deployed side by side on one shared hardware pool in a data centre. This resource sharing requires an encapsulation for each VM and an execution environment of VMs on the actual physical hardware. IaaS uses virtualisation or containers for creating enclosed resource parts of the overall hardware. For virtualisation, popular open-source hypervisors are KVM or Xen. Containers are built by tools like Docker or LXC.

Focusing on one physical machine, an important resource to share across multiple VMs is the CPU. Different hypervisor and container software realise the representation of virtual CPUs of VMs differently towards a physically available CPU. Using KVM or Xen, the VM (or guest) contains an operating system (OS) with virtual, internally scheduled CPU cores, which appear as processes on the outer host level. Containers on the other hand skip the guest OS but have application processes to be scheduled directly on the physical CPU by the host.

Scope of the Thesis

This thesis focuses on sharing a physical CPU for multiple virtual machines. The goal is the analysis of CPU Scheduling in KVM, XEN and LXC/Docker for VMs. Questions you should answer in this thesis are:

i) what scheduling algorithms exist? ii) how do they cope together (in guest, on host, on hypervisor)?

Finally an evaluation of identified scheduling algorithms should be done. The result should show how the CPU algorithms (in combination) utilise the physical CPU the best possible and how the choosing of CPU algorithms can influence the performance of VM execution.

Requirements and Comments

If this thesis achieves good progress and outcome, its results are to be integrated in the CACTOS research project (<http://www.cactosfp7.eu>) which is released under an OpenSource license. For that reason, we appreciate if you are ready to OpenSource your results.

We focus on Linux based server operating systems in VMs and on hypervisor level. For that reason basic knowledge and experience with Linux systems is recommended (but not a must).

If you are interested in this or similar theses, please contact Christopher Hauser either by mail or directly in his office.

mail: christopher.hauser@uni-ulm.de
office: Uni West, 43.2.209

**Faculty of Engineering and
Computer Science**

Institute of Information
Resource Management