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**SimGrid VM: Virtual Machine Support for a Simulation Framework of Distributed Systems**

**Abstract:**

As real systems become larger and more complex, the use of simulator frameworks grows in our research community. By leveraging them, users can focus on the major aspects of their algorithm, run in-siclo experiments (i.e., simulations), and thoroughly analyze results, even for a large-scale environment without facing the complexity of conducting in-vivo studies (i.e., on real testbeds). Since nowadays the virtual machine (VM) technology has become a fundamental building block of distributed computing environments, in particular in cloud infrastructures, our community needs a full-fledged simulation framework that enables us to investigate large-scale virtualized environments through accurate simulations. To be adopted, such a framework should provide easy-to-use APIs as well as accurate simulation results. In this paper, we present a highly-scalable and versatile simulation framework supporting VM environments. By leveraging SimGrid, a widely-used open-source simulation toolkit, our simulation framework allows users to launch hundreds of thousands of VMs on their simulation programs and control VMs in the same manner as in the real world (e.g., suspend/resume and migrate). Users can execute computation and communication tasks on physical machines (PMs) and VMs through the same SimGrid API, which will provide a seamless migration path to IaaS simulations for hundreds of SimGrid users. Moreover, SimGrid VM includes a live migration model implementing the precopy migration algorithm. This model correctly calculates the migration time as well as the migration traffic, taking account of resource contention caused by other computations and data exchanges within the whole system. This allows user to obtain accurate results of dynamic virtualized systems.We confirmed accuracy of both the VM and the live migration models by conducting several micro-benchmarks under various conditions. Finally, we conclude the article by presenting a first usecase of one consolidation algorithm dealing with a significant number of VMs/PMs. In addition to confirming the accuracy and scalability of our framework, this first scenario illustrates the main interest of SimGrid VM: investigating through in-siclo experiments pros/cons of new algorithms in order to limit expensive in-vivo experiments only to the most promising ones.

**Existing System:**

Such a gap prevents researchers from corroborating the relevance of managing VMs in a more dynamic fashion, since valid assumptions on small infrastructures sometimes become completely erroneous on much larger ones. The reason behind this pitfall is that it is not always possible for researchers to evaluate robustness and performance of cloud computing platforms through large-scale “in vivo” (i.e., real-world) experiments.

**Proposed System:**

We present SimGrid VM, the first highlyscalable and versatile simulation framework supporting VM environments.We chose to build it upon SimGrid since its relevance in terms of performance and validity has already been demonstrated for many distributed systems Our simulation framework allows users to launch hundreds of thousands of VMs on their simulation programs and accurately control VMs in the same manner as in the real world.