Harnessing Cloud Technologies for a Virtualized Distributed Computing Infrastructure

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INTRODUCTION

Over the past decade, the distributed computing field has been characterized by large scale grid deployments. The InterGrid system aims to provide an execution environment for running applications on top of interconnected infrastructures. The system uses virtual machines as building blocks to construct execution environments that span multiple computing sites. Such environments can be extended to operate on cloud infrastructures. This article show the scalability of an InterGrid managed infrastructure and how the system can benefit from using the cloud.

Virtualization Technology and Infrastructure

VM technologies' increasing ubiquity has enabled users to create customized environments atop physical infrastructure and has facilitated the emergence of business models such as cloud computing. VMs' use has several benefits:

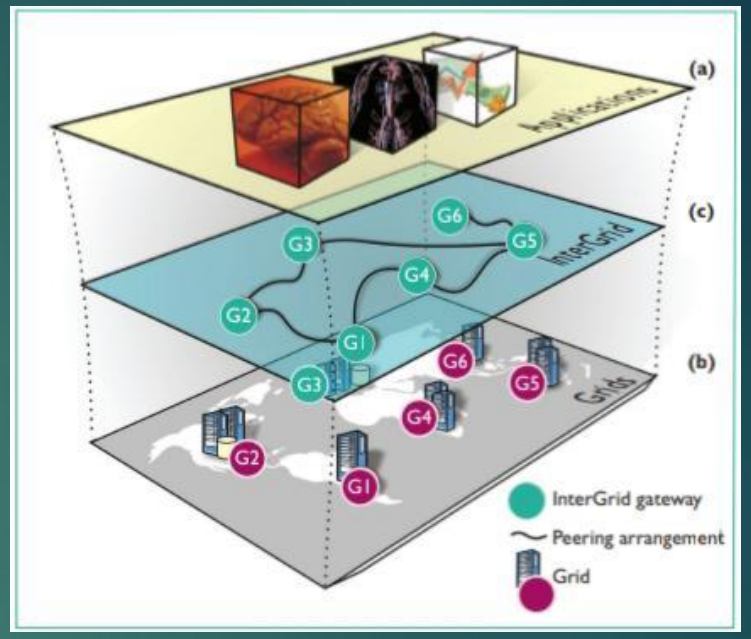
- Server consolidation, which lets system administrators place the workloads of several underutilized servers in fewer machines.
- The ability to create VMs to run legacy code without interfering with other

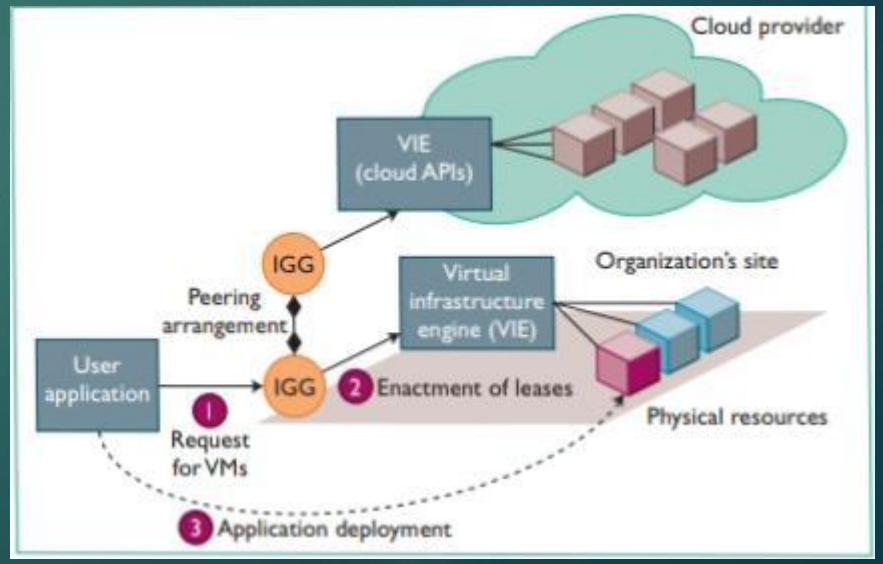
Application. Improved security through the creation of sandboxes for running applications with questionable reliability.

- Performance isolation, letting providers offer some guarantees and better quality of service to customers' applications.

InterGrid Concepts

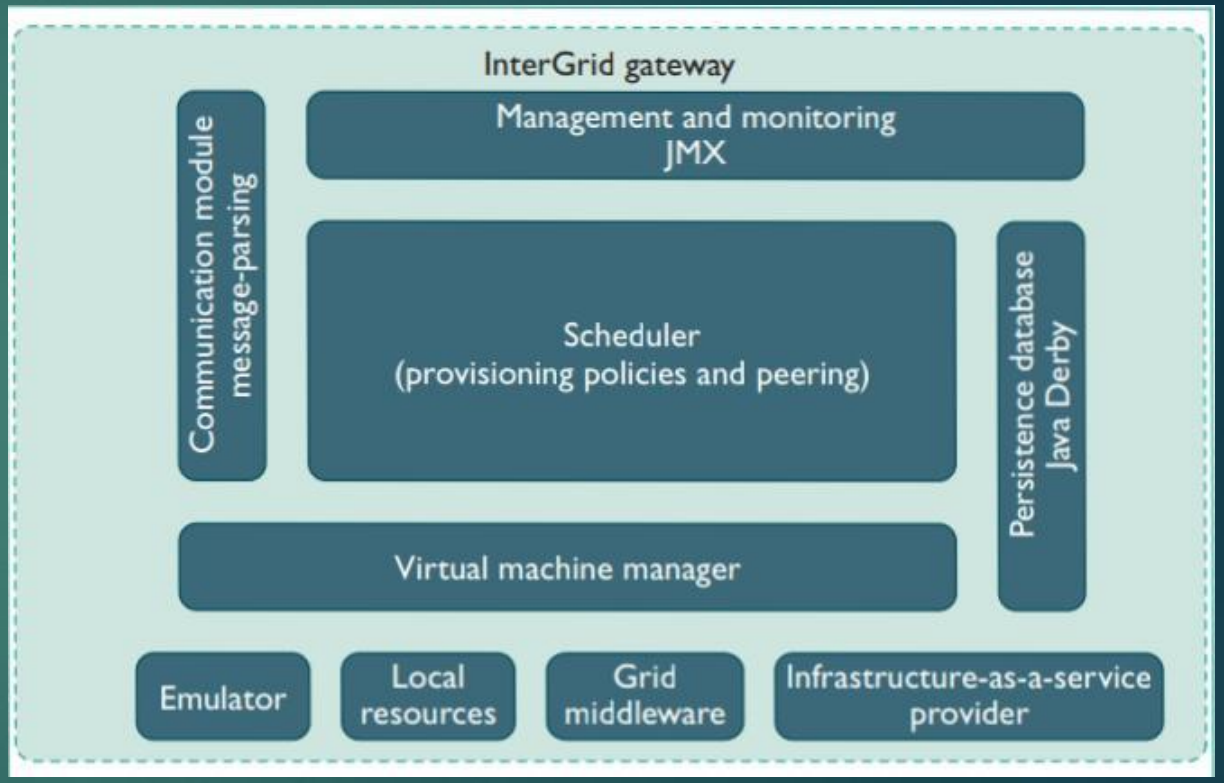
InterGrid software layers. InterGrid aims to provide a software system that lets users create execution environments for various applications on top of physical infrastructure that participating grids provide. Peering arrangements established between gateways enable the allocation of resources from multiple grids to fulfill the execution environments requirements.Also, Application deployment. An InterGrid gateway allocates resources from one organization's local cluster and interacts with another IGG that can allocate resources from a cloud computing provider.





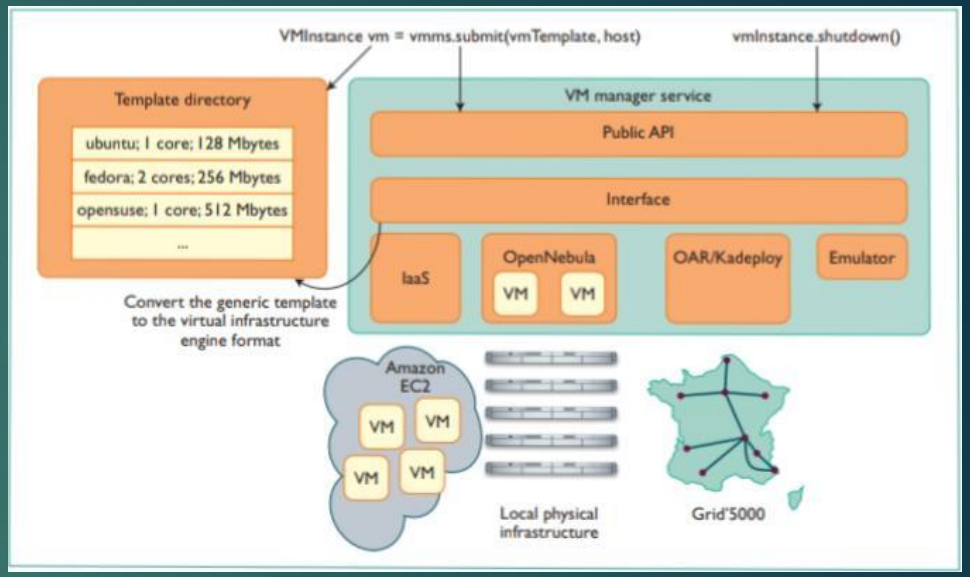
InterGrid Realization

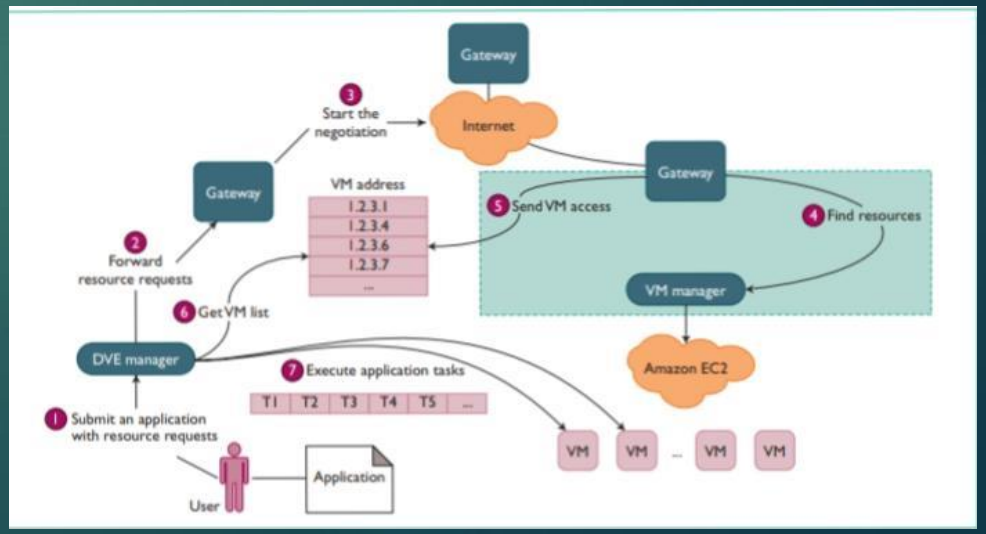
InterGrid gateway components. The core component is the scheduler, which implements the provisioning policies and peering with other gateways. The communication component provides an asynchronous message-passing mechanism, and received messages are handled in parallel by a thread-pool.



Virtual Machine Manager

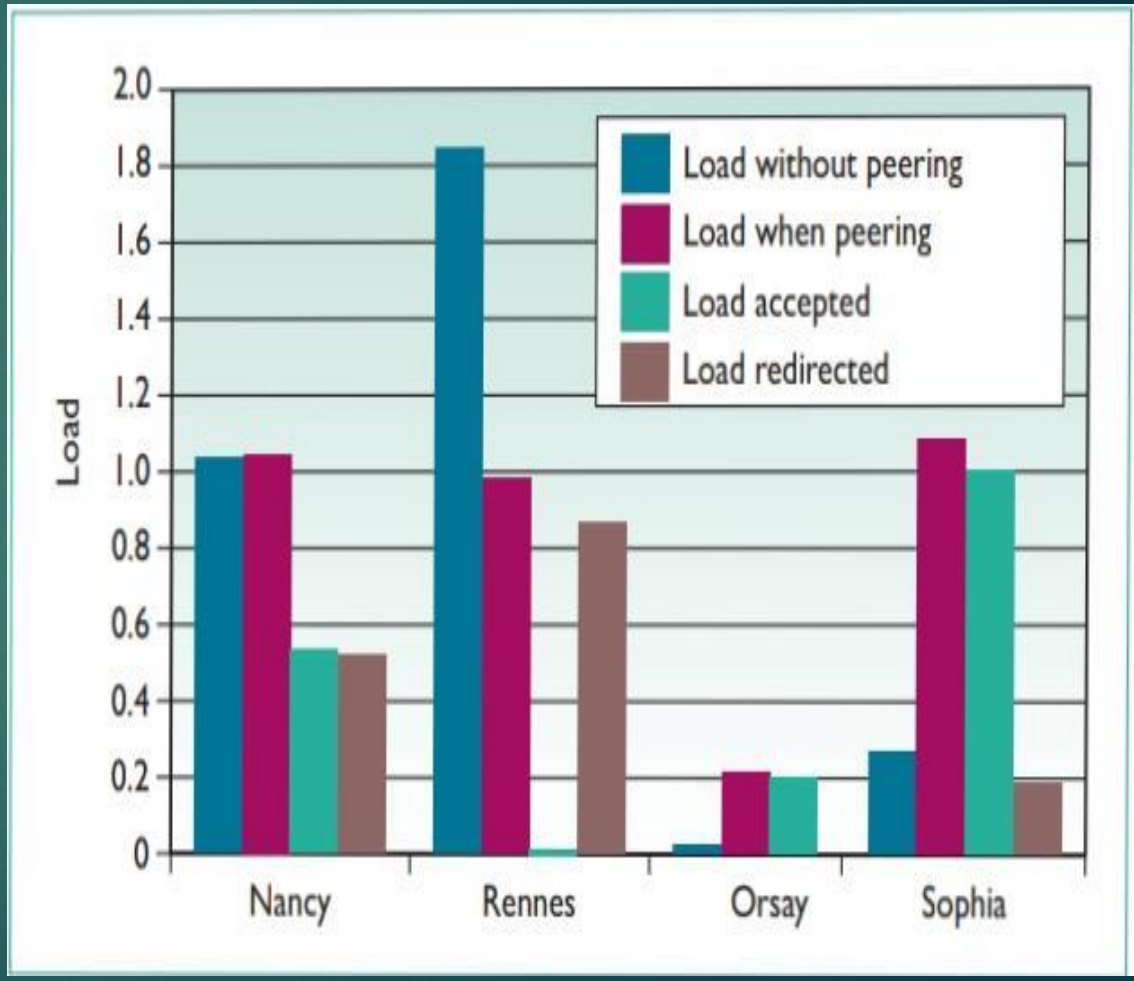
Design and interactions within the virtual machine manager. The manager provides a public API for submitting and controlling VMs. This API is abstract, and we provide a few implementations for deploying VMs on different types of resources. The main interactions among InterGrid components. On the user's behalf, the distributed virtual environment manager requests resources to a gateway. The gateway then tries to serve the request locally or starts negotiating with other gateway to fulfill it. Once a gateway can serve the request, the virtual machine manager deploys the resources on top of the infrastructure and returns the access information about the VM to the requesting gateway. Finally, the DVE manager fetches the VM access from the gateway and deploys the user's application.





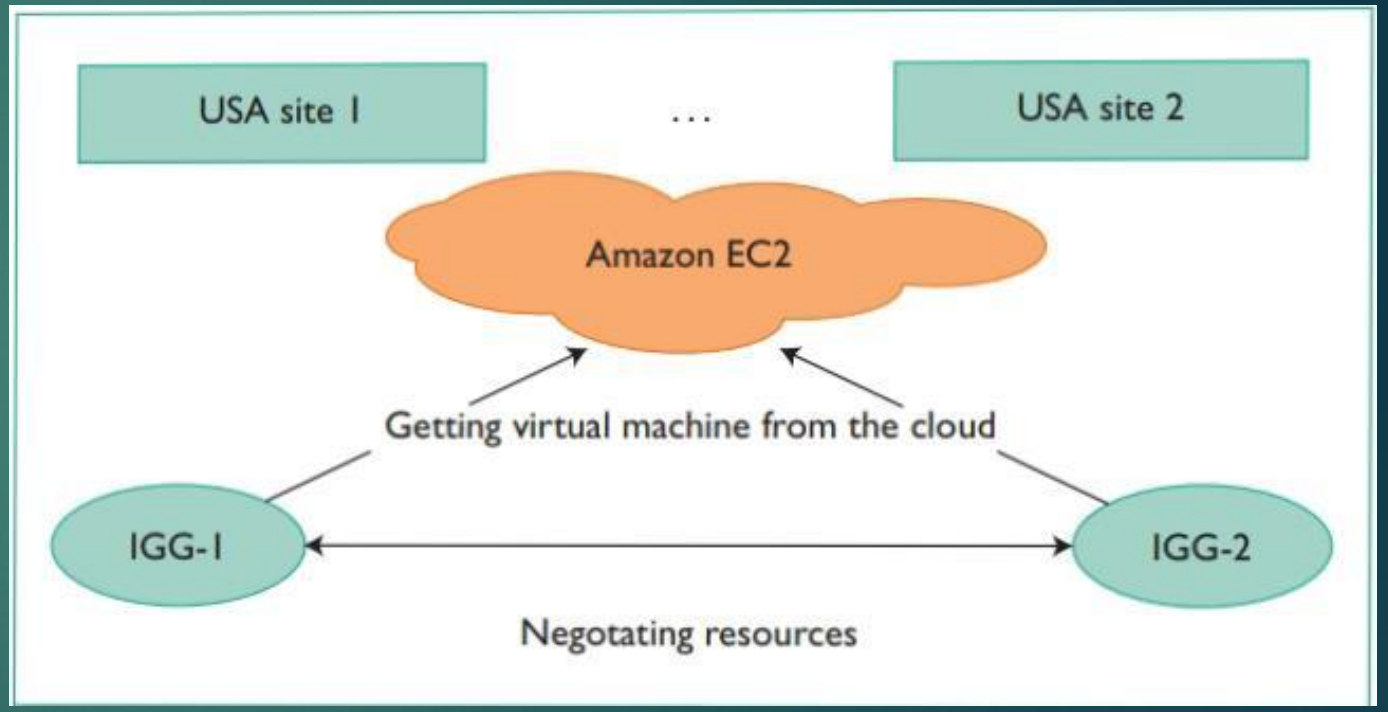
InterGrid Gateway at Runtime

Load characteristics under the four gateway scenario. The teal bars indicate each site's load when they aren't interconnected the magenta bars show the load when gateways redirect requests to one another; the green bars correspond to the amount of load each gateway accepts from other gateways; and the brown bars represent the amount of load redirected.



Peering Arrangements

Testbed used to run Evolutionary Multi-Criterion Optimization on a cloud computing provider. The testbed is composed of two InterGrid gateways, each using resources from Amazon EC2.



Conclusion

In this paper experiments with InterGrid have shown that it can balance load between distributed sites and have validated that a bag-of-tasks application can run on distributed sites using VMs. Currently provide a minimal gateway that lets resource providers interconnect sites and deploy VMs on different kinds of infrastructures, such as local clusters, Amazon EC2, and Grid'5000.

Thank You