Virtualized Distributed Cloud Hosting Various Applications

Cloud computing is a popular paradigm for hosting online applications. Virtualization techniques are widely used to host applications ranging from Multi-tier web applications to desktop VMs.

Virtual Desktop gains popularity

Hosting virtualized desktop VMs in remote servers or clouds is gaining popularity for either enterprises or third-party providers. Users are using remote desktop protocol, e.g., Windows RDP and VNC to access such VMs and use various applications. However, not all desktop VMs are latency or location sensitive. The location-sensitive rank is determined by the applications running inside. And applications that are characterized as high interactivity or refresh rate contribute to higher rank.

Placing Desktop VMs in Distributed Cloud

We place each VM in an initial cloud location based on the immediate request. We treat each desktop VM as a black box and infer their location sensitivities based on their network activities.

Periodically, we make intelligent decisions to dynamically adjust the mapping between desktop VMs and cloud locations depending on application needs and environment demand.

VMShadow Design Goal

Fingerprinting Engine: Uses black-box VM fingerprinting technique to infer the location sensitivity of VMs.

Greedy Shadow Algorithm: Uses cost-benefit metrics to judiciously move highly location-sensitive VMs at the least cost.

Connection Migration Proxy: Transparently migrates active TCP connections to ensure seamless connectivity despite IP changes.

WAN Live Migrator: Uses WAN-specific optimizations to migrate VMs’ disk and memory state.

Case Study

Decisions are made to migrate VM1 and VM2 to VA, to be closer to user. When VA is resource constrained, low-ranked VM3’s resources are reclaimed by migrating it back to OR, after which VM1 and VM2 are migrated to VA.

In this case study, we demonstrate VMShadow’s ability to discriminate between location sensitive and insensitive desktop VMs and to trigger appropriate WAN migrations to improve VNC response time in an artificially constrained cloud environment.