



Università degli Studi di Firenze



Live Containers Migration between 2 Fog Servers

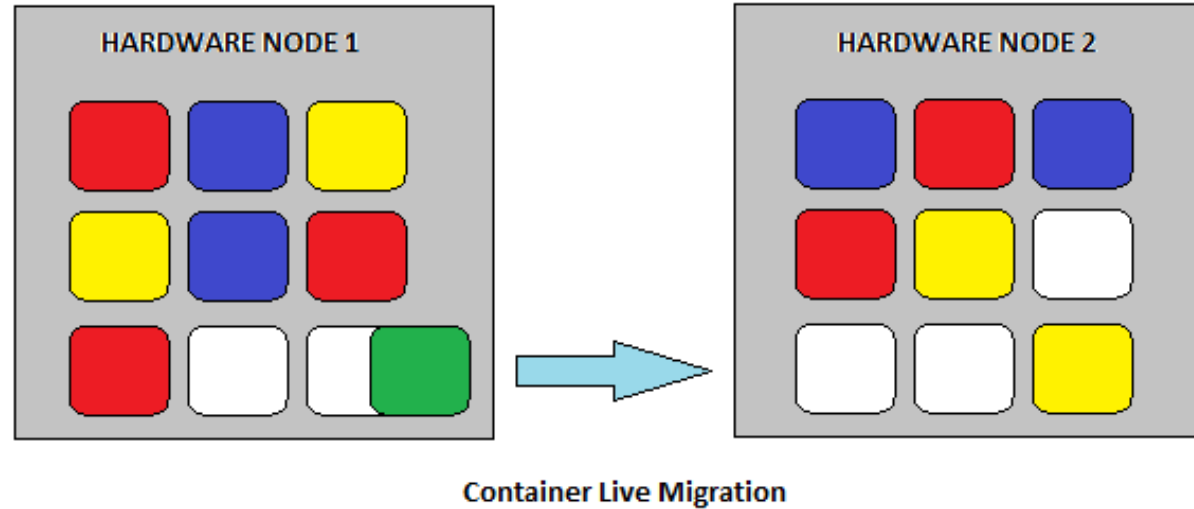




Live Migration



Live containers migration refers to the process of moving application between different physical machines or Cloud without disconnecting the Client. Memory, file system, and network connectivity of the containers running on top of bare metal hardware are transferred from the original host machine to the destination keeping the state without downtime.





Problems Live Migration Solves



- **Downtime during hardware maintenance.** When a system administrator needs to upgrade hardware, it's very painful to migrate all the customers from one hardware node to another hardware node, and in many cases it's just impossible without downtime.
- **Unbalanced cluster load.** When one hardware node becomes overloaded, the rebalance process can require implementation of specific application patterns narrowing the choice of workloads that can be hosted in the cluster.
- **Troubles within a Cloud.** Today there are so many Clouds on the market and sometimes they have downtimes, change pricing policy or degradate in the quality of services. And in most cases it is a problem to easily migrate the application from one Cloud Provider to another.

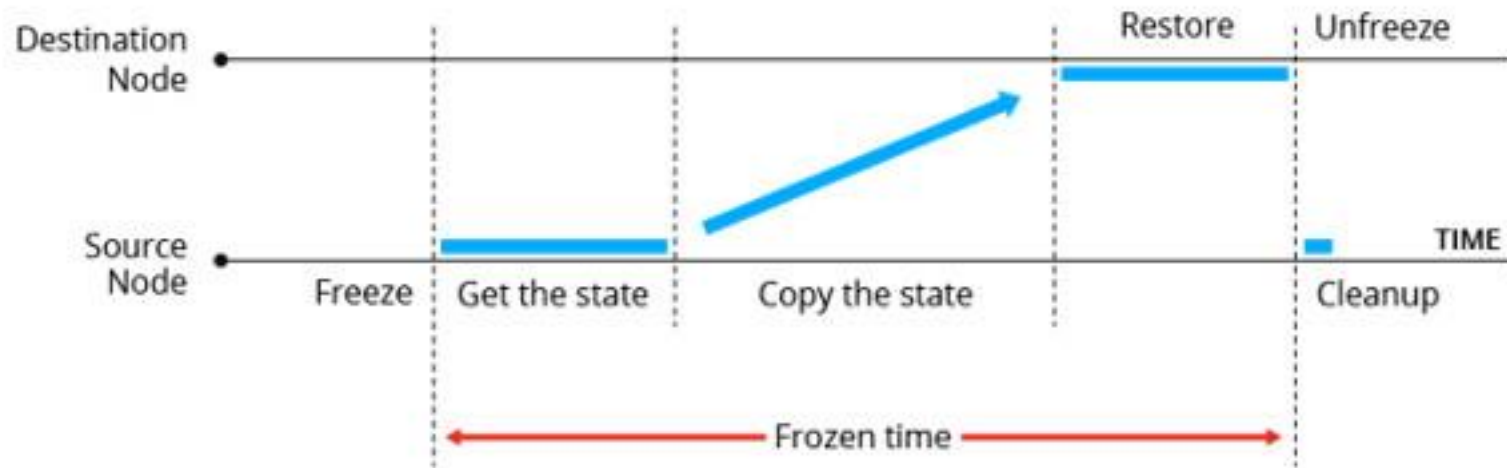




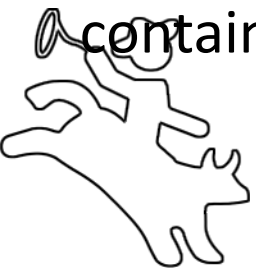
How Live Migration works



- **Source Node** - where a container is placed before live migration
- **Destination Node** - where a container will be placed after live migration



To perform the migration, the platform freezes container at the source node blocking memory, processes, file system and network connections, and gets the state of this container. After that, it is copied to the destination node. The platform restores the state and unfreezes the container at this node. Then, there is a quick cleanup process at the source node.





Testbed



- **Two Raspberry Pi 3 B+ (Fog Servers):** The Linux kernel (4.16.18-v7) has been cross-compiled and some features have been added.
- **CRIU (Checkpoint /Restore In Userspace):** CRIU is a Linux Software that can freeze a running application (or part of it) and checkpoint its state to disk. The data saved can be used to restore the application and run it exactly as it was during the time of the freeze.
- **RunC:** a lightweight universal container runtime, is a command-line tool for spawning and running containers according to the Open Container Initiative (OCI) specification.
- **Docker:** a tool designed to make it easier to create, deploy, and run applications by using containers.





Let's demonstrate an experiment...

