Practical Study of Bare Metal Virtualization Solutions

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Resumo

With the hardware breakthroughs accomplished through the years, the idea of software defined hardware has become a reality. Hypervisors such as KVM, Xen, Hyper-V and ESXi enable the cloud of today, with hardware consolidation bringing a reduction in operating costs.
In this scope, it is imperative to address the performance of all the different virtualization implementations, in order to discover any potential bottlenecks and bugs.

Problema e questões de investigação | Objetivos

In this work, the performance of all the prominent Type-1 virtualization platforms is analyzed, using guests representative of the Windows NT and Linux kernels, in the form of Windows 10 LTSB and Ubuntu Server 16.04 LTS.
The effectiveness of the CPU scheduler of each hypervisor is put to the test, as well as the storage backend performance under multiple scenarios (iSCSI, NFS and local).
In short, this project provides a snapshot of the current state of the virtualization market, covering CPU, Memory, 2D & 3D Graphics performance of oVirt, Proxmox, XenServer, Hyper-V and VMware Vsphere.

Metodologia

All the benchmarks were executed using their own default settings, with some automation scripts, in order to accelerate the process and exclude variability as much as possible.
The hardware configuration is as follows:

CPU	i7 6700
RAM	32 GB DDR4
System Disk	Samsung 750 EVO 500GB
Filesystem	Hypervisor defaults

Table 1 – Host Hardware Configuration

vCPUs	1 Socket, 4 Cores
RAM	8 GB
System Disk	32 GB (NTFS/EXT4)
GPU	Nvidia Quadro 4000M

Table 2 – Guest Hardware Configuration

Among the selected benchmarks were:

- Passmark Performance Test 9 to benchmark Windows performance;
- Unixbench, providing a way to extrapolate the performance of Linux guests;
- (ez)FIO allowed in-depth analysis of filesystem performance across platforms.

Resultados

The final benchmark results are displayed below, starting with Passmark (Fig. 1), Unixbench (Fig. 2) and ezFIO (Fig. 3).

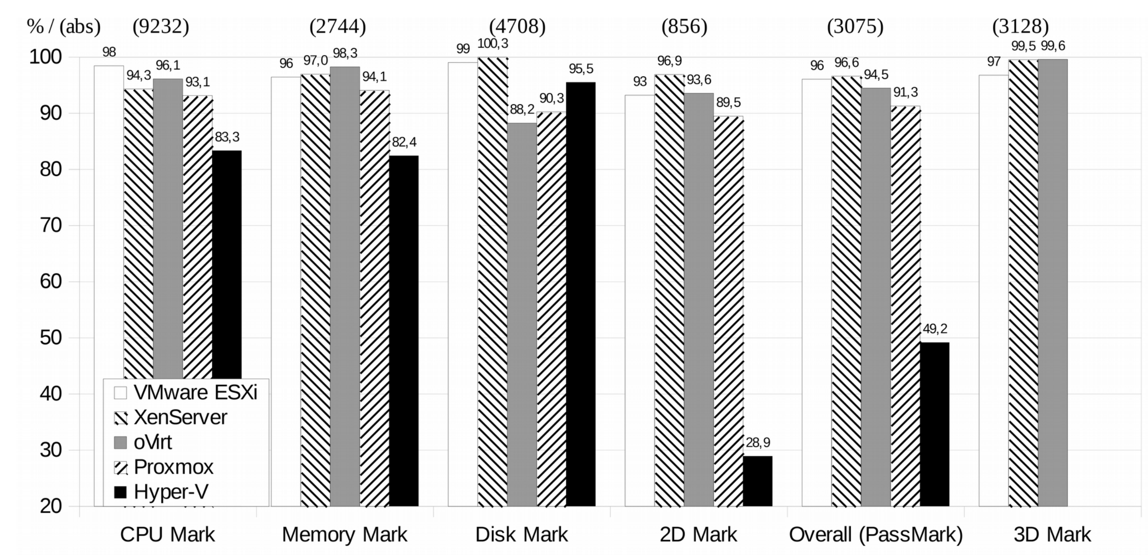

Fig.1 – Passmark Windows results.

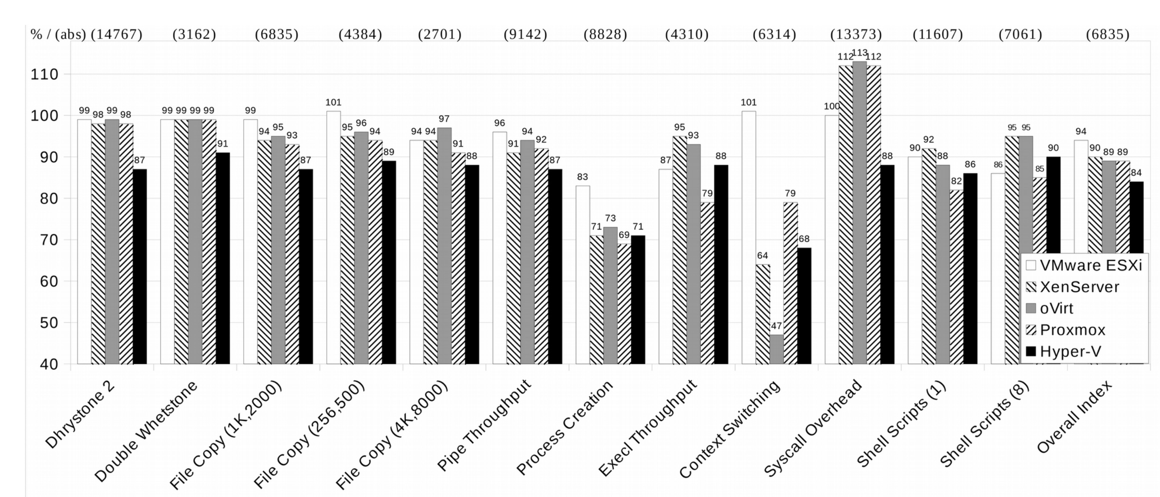

Fig.2 – Unixbench Linux results.

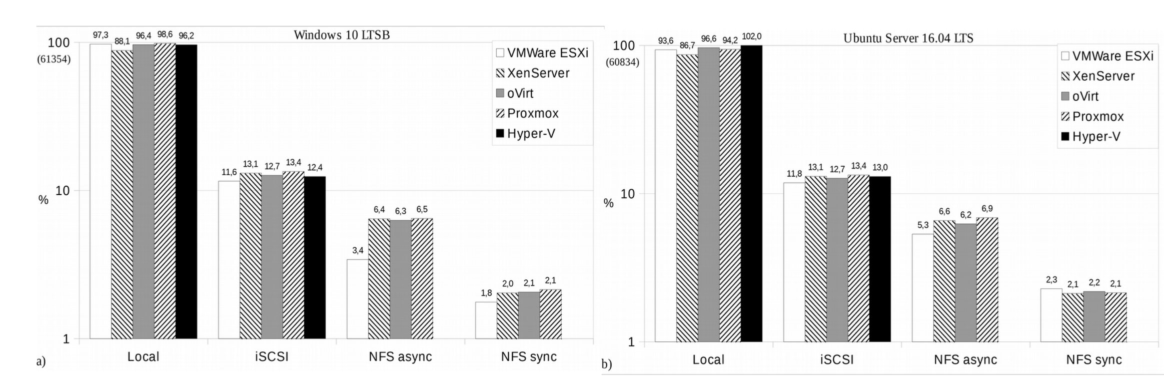

Fig.3 – ezFIO Windows/Linux results.

Conclusão

Concluding, there are a few generalizations that can be made from the information gathered:

•XenServer, oVirt and Proxmox require the presence of xentools/virtio in order to provide good I/O throughput;
•GPU passthrough provides native performance as long as there is no resource overcommitment;
•VMware's Vsphere provides impressive CPU performance, edging out the competition, with 98% of the native performance;
•Hyper-V offers mediocre 2D Desktop performance (28% of the native performance), as such, it should not be used in VMs that provide interactive desktops;
•Similarly, Hyper-V's performance plunges in memory related workloads, when compared to the remaining platforms and bare metal, with a mere 83%;
•The remote I/O results crown iSCSI as best performer, with double the performance of NFS;
•All the open source platforms (Proxmox, oVirt and XenServer) display impressive remote I/O performance, in both iSCSI and NFS.

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