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CST-321

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Assessing Virtualization Software

# Oracle VirtualBox

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| **Overview** | An open-source options that’s easy to use and allows an individual to run virtual machines on desktop. |
| **Company** | Oracle Corporation |
| **Product** | VirtualBox |
| **Version** | 7.1.6 |
| **Most Recent Release** | January 21st, 2025 |
| **Performance** | Lots of performance complaints when used on Windows 10 operating systems. Digging further, it seems like the issue is linked with Spectre2/Meltdown mitigation that was introduced with Windows 10. |
| **Cost** | Free version for personal and educational use, commercial license is $50 per month per user. |
| **Disaster Recovery** | It has Active-Active and Active-Passive disaster recovery options. |
| **Availability** | Available on Windows, Linux, Mac OS X, and Solaris x86 computers. |
| **Security** | Safe when kept up to date (like most software) |
| **Infrastructure Scaling** | **To be Determined** |
| **Type 1 or 2 Hypervisor** | Type 2 hypervisor because it run on top of an operating system. |
| **Management Tools** | Many features including VBoxManage, Shared Folders, Clipboard, etc. |

# Hyper V

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| **Overview** | A Microsoft product that provides hardware virtualization, allowing users to create virtual hard drives. |
| **Company** | Microsoft |
| **Product** | Hyper V |
| **Version** | Hyper-V Server 2019 |
| **Most Recent Release** | 2019 |
| **Performance** | Decent performance, some complaints revolve around the host computer running slow due to allocation of resources to the virtual machine. |
| **Cost** | Pro versions start at $1,323 per year. |
| **Disaster Recovery** | Rapid recovery and the ability to restore VM’s in minutes. |
| **Availability** | Available on Windows Server, Windows 10, 8, 8.1, and Windows 11. |
| **Security** | Has a high security standard and a $250,000 public bug bounty program. |
| **Infrastructure Scaling** | Has live-migration which enables the dynamic movement of VM’s. |
| **Type 1 or 2 Hypervisor** | Type 1 due to hardware-assisted virtualization. |
| **Management Tools** | Many management tools, including loads of third-party options like SolarWinds, NinjaOne, and Veeam Software. |

# Parallels Desktop

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| **Overview** | A Mac-centric option that allows users to run a Windows desktop environment in parallel with MacOS. |
| **Company** | Parallels |
| **Product** | Parallels Desktop |
| **Version** | 20.0.0 |
| **Most Recent Release** | September 10th, 2024 |
| **Performance** | If kept in “performance mode”, then it is good apparently. |
| **Cost** | Starts at $99 per year |
| **Disaster Recovery** | Has Business Continuity and Disaster Recovery plans |
| **Availability** | Mac OS |
| **Security** | All connections to the Parallels Cloud are secured and encrypted. |
| **Infrastructure Scaling** | TBD |
| **Type 1 or 2 Hypervisor** | Type 2 Hypervisor |
| **Management Tools** | Has Parallels Desktop Management, RAS Console, and Desktop DevOps Service. |

# QEMU

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| **Overview** | An open-source machine emulator that can emulate many different hardware architectures. |
| **Company** | Fabrice Bellard |
| **Product** | QEMU |
| **Version** | 9.2.0 |
| **Most Recent Release** | December 10th, 2024 |
| **Performance** | When run on a kernel, it is reasonably fast. |
| **Cost** | Free and open-source. |
| **Disaster Recovery** | Basic backups and restores to VM’s. |
| **Availability** | Linux, Windows, Mac OS |
| **Security** | Quite safe when paired with KVM. |
| **Infrastructure Scaling** | TBD |
| **Type 1 or 2 Hypervisor** | Mainly a Type 2 hypervisor but can be used as Type 1 when paired with KVM. |
| **Management Tools** | Has some tools including disk image utility, and storage daemon. |

# Xen

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| **Overview** | A free and open-source virtual machine monitor (VMM) that allows a user to run multiple operating systems on the same hardware. |
| **Company** | Linux Foundation and Intel |
| **Product** | Xen |
| **Version** | 4.19.0 |
| **Most Recent Release** | July 29th, 2024 |
| **Performance** | Exceptional performance due to separate OS |
| **Cost** | Free |
| **Disaster Recovery** | Has tools to recover VM’s and VMM’s after catastrophic failure of hardware. |
| **Availability** | Windows? |
| **Security** | Has many guides that thoroughly go though ways to increase security of the system. |
| **Infrastructure Scaling** | Has ways to balance performance and power consumption through CPU frequency scaling. |
| **Type 1 or 2 Hypervisor** | Type 1 Hypervisor |
| **Management Tools** | Loads of tools including Zentific, Xen Orchestra, Ganeti, and OpenQRM. |

# Research Results

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| **Software** | **Score** | **Reasoning** |
| Oracle VirtualBox | 8 | Mostly due to bias since we’ve used this software for the course, but, the multi-platform availability and ease-of-use sold me the most. Only downside is the performance complaints and random crashes on startup that I have experienced personally. |
| Hyper-V | 7 | High security standards, developed and maintained by a well-known company, and rapid recovery for failures. |
| Parallels Desktop | 6 | Main reasoning for score is the low performance and somewhat of a barrier to entry with it being a paid service and no free tier. |
| QEMU | 5 | “Unknown” developer (I have not heard of them until now) but the performance perks are nice. |
| Xen | 5 | Could not find confirmation on the exact platforms it’s available on. Many search results brought up topics completely unrelated to the software in question. |

# Justification

All-in-all, VirtualBox is my top pick for this research group. With all the integrations and customized settings, VirtualBox provides great experience in terms of compatibility and ease of use. Performance and reliability are decent, and it is paired with many features that make any workload relatively easy. Some disadvantages include error finding. VirtualBox can be non-specific about some errors which makes finding a solution harder. Another angle is the lack of migration options which implies keeping programs running while upgrading/replacing broken hardware.