

## 13.2.1 Virtual Machine Concepts: Part 1

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Click one of the buttons to take you to that part of the video.

Virtual Machine Concepts 0:00-0:33

Virtual machines allow you to run multiple operating systems on the same physical hardware using a hypervisor. The process for creating and managing virtual machines depends on the hypervisor you use. As a Linux administrator, you should be familiar with virtual machine concepts that are common to all hypervisor implementations.

In this video, we're going to discuss virtual machine templates. Bootstrapping techniques, VM disk storage, and VM management tools are also essential topics that you need to understand, but we're going to focus on templates right now. Let's get started.

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Create a Virtual Machine 0:34-1:07

No matter which hypervisor you use, you can create a virtual machine very quickly. When you create a VM, you simply define the hardware environment and save those settings. When the VM runs, the hypervisor uses those settings to instantiate, or create a new instance of, a hardware environment. The VM then boots in this environment just as if it were running on physical hardware. And just like a new physical computer, you must install the operating system from installation media and then install the applications you need. This installation process can take several minutes and often requires periodic user input.

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Virtual Machine Templates 1:08-2:00

To avoid installing the operating system and applications every time you create a new VM, you can create a template. A template is a set of files that make up a VM that already has the operating system and applications installed. To create a new VM, you copy the template to a new location and then tell the hypervisor to run the VM from there. What's remarkable is that the new location can even be a different hypervisor running on a different physical computer.

One challenge with creating templates this way is that the new VM will have the same operating system settings as the original template. This can be a problem because the two machines created from the same template will have the same hostname, the same security identifiers, and even the same IP address, if it was configured statically.

In a minute, we'll see how you can modify the template so that when it boots in the new location, it will prompt you for the settings that will make it unique. Before we do that, let's go over a few common template formats.

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Virtual Machine Template Formats 2:01-2:33

Hypervisors from different vendors have different template formats. If you're working with the same hypervisor or the same vendor's hypervisor on another physical machine, this isn't important. Usually, the hypervisor has utilities to export and import your VM templates. The challenge is being able to convert one format to another to accommodate different vendors' hypervisors. Fortunately, most hypervisors conform to industry standards, so this part of the process is usually pretty straightforward.

While this is not an exhaustive list, here are a few important formats.

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VM Template 2:34-2:52

The first is Microsoft's VM template. Microsoft has a tool called System Center Virtual Machine Manager, or SCVMM, that can be used to manage Microsoft Hyper-V virtual machines. Templates saved by SCVMM are called VM templates. This can be confusing, since we often refer to a virtual machine as a VM.

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VMware Template 2:53-3:05

VMware is another hypervisor vendor. A VMware template consists of a \*.vmx configuration file and \*.vmdk virtual disk files. It may include other VMware-specific files.

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#### OVF and OVA Template 3:06-3:46

Most hypervisors can export a template using OVF and OVA standards. The OVF standard was formed by an industry working group comprised of over 160 companies and organizations, and it's widely accepted. OVF stands for open virtualization format. The term OVF is used for both the packaging standard and a virtual machine package stored in an OVF package. An OVF package consists of a directory that contains virtual machine files created with the OVF format. Virtual machine templates can be exchanged as OVF packages. They are often sent as an OVA file, which is an OVF directory saved as a tar archive file.

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#### Cloud Templates 3:47-4:14

In the same way that a single virtual machine can be used as a template, a cloud environment, including virtual machines, storage, and networking, can be modularized as a template. A cloud provider can quickly instantiate a set of cloud resources using a template. Many cloud providers use a JSON file or a YAML file to encapsulate these templates. Both JSON and YAML are file formats that are self-describing, making them easy to understand. YAML is considered a superset of JSON.

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#### Container Templates 4:15-4:36

A container image can also be saved as a template, which can be copied and used to create multiple containers, each running the same applications. The Open Container Initiative, or OCI, has published standards for container images. A popular container engine, Docker, has also published a standard. Both the OCI and Docker standards rely on the JSON file format.

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#### Summary 4:37-4:49

So, let's review what we've discussed. In this video, we covered virtual machine templates and listed a few virtual machine template formats: VM templates, VMware templates, OVF and OVA templates, cloud templates that use JSON and YAML file formats, and container templates.

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