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Creating and Using Oracle VM Templates: The Fastest Way to Deploy Any Enterprise Software

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Introduction

The intended audience for this paper is end-users of Oracle VM as well as third party ISVs (Independent Software Vendors), system-integrators, and value-added resellers interested in creating and using Oracle VM Templates to permit rapid deployment of enterprise software solutions for evaluation and production without requiring installation knowledge. This white paper provides an overview of Oracle VM Templates and how they can be used to deploy complex and sophisticated enterprise software in a few hours instead of a few weeks, while still allowing for customization to tailor to your specific environment.

Oracle VM Templates

An Oracle VM Template is a virtual machine (VM), or group of VMs, containing Oracle or other software that is pre-built, pre-installed, pre-configured and ready to use—no installation required. Simply download the Templates from Oracle E-Delivery, import to an Oracle VM instance, deploy and start-up the VM(s), to begin using the encapsulated product(s). Oracle VM Templates can be created by Oracle, by internal developers, or by third parties such as ISVs or solution providers using software available for download and even free re-distribution without a contract.

- Oracle VM Server: Server virtualization for x86 and x86_64 servers and the base platform for hosting Oracle VM Templates
- Oracle Enterprise Linux, both in its minimized build version known as the “Just enough OS” or “JeOS” edition and also in the full-install version

These products from Oracle provide the platform for any Oracle VM Template, but internal developers or third party solution providers can optionally add their own software to any Template they produce to create and distribute a unique, total solution. Using these components, Oracle, partners, and customers can create powerful enterprise software “appliances” that are fast, easy, and risk-free to distribute and deploy.

In addition to the core Template components mentioned above, Oracle further aids Template development with Oracle Database Express Edition (XE), which includes Oracle Application Express, a rapid web application development tool for the Oracle database, incorporating licensing that permits free redistribution without a distribution contract from Oracle.

Only Oracle, with the most complete enterprise software stack in the industry – from packaged applications such as PeopleSoft and Siebel, through the middleware and database, to the operating system and server virtualization – can provide a complete solution that is ready to go in a production with a few clicks from a browser. Oracle VM Templates are the fastest, easiest, most reliable way to deploy Oracle solutions, whether for production use or for evaluation.

Useful References To Get Started

This paper assumes the reader has at least basic familiarity with Oracle VM Server Virtualization and Management. Up-to-date information on Oracle VM requirements and functionality can be referenced on-line in the following locations:

- [Oracle VM user documentation](#)
- [Oracle VM Data Sheet](#).
- [Oracle VM product website](#)
- [Oracle VM site on the Oracle Technology Network website](#)

Best Practice for Guest VM Creation: Oracle VM Templates

The Challenge Without Templates: Slow and Error-Prone Deployment

The challenge for traditional enterprise software deployment is that it can be complex, time-consuming, and error-prone. Enterprise software often contains numerous components or modules, each of which may need to be installed and configured separately, with its own dependencies on patches, operating system versions, or other packages. Learning how to install products and researching all the patches can be a time-consuming experience and the complexity often generates a significant risk that something will be overlooked or done incorrectly, leading to more lost time or worse.

All of this time and effort is, in many ways, a waste: It's simply a cost burden on the business that ultimately reduces the return-on-investment for the project by lengthening the amount of time until the application or service is up and running reliably.

Oracle VM Templates Significantly Reduce Deployment Time and Risk

Oracle VM does away with that wasted time and expense by providing the ability to rapidly and easily deploy a pre-built, pre-configured, pre-patched guest virtual machine (or multiple machines depending on the application) in the form of an Oracle VM Template. Templates can contain a complete Oracle software solution, such as Siebel CRM or Oracle Database, including the operating system (Oracle Enterprise Linux) and even your internally developed or third party software. A complete solution: ready to start-up.

Oracle VM Templates produced by Oracle are available from Oracle E-Delivery, while third party developed Templates would be made available via their corresponding channels, ready to download and start-up in an Oracle VM infrastructure. Already licensed for production use, Oracle VM Templates can save users days or weeks learning to install and configure a sophisticated product such as Oracle Enterprise Manager Grid Control or Oracle Fusion Middleware SOA Suite.

Instead, users can focus on simply downloading and starting the VM(s) to begin using the product right away with the confidence that they are deploying an exact, validated copy of their

virtual machines and not a virtual machine hand-built from scratch where the risk of human error such as missing a patch dependency, or misconfiguring a parameter is far greater.

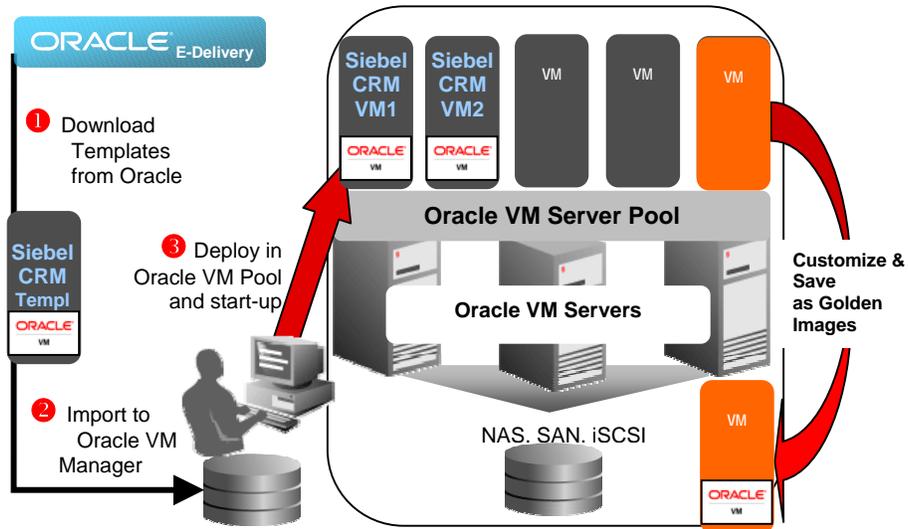


Figure 1: Download and Deploy Oracle VM Templates from Oracle or Third Party Websites

Some examples of Oracle VM Templates available today include:

- Oracle Application Server 10g Release 3 Webcenter
- Oracle Database 10g Release 2
- Oracle Database 11g
- Oracle Enterprise Linux
- Oracle Enterprise Manager 10g
- Oracle Fusion Middleware Service Oriented Architecture on WebLogic Server

More Templates are constantly being released so refer to the Oracle VM Template website for the latest updates.

Easy to Maintain and Customize

Transparent Adoption: No Change to Maintenance Procedures

Within these templates, Oracle software is laid-out in the same manner as the software would be if it were installed and patched manually “the old fashioned way”, meaning the exact same directories and Oracle “homes” are used, and the package and patch inventories are completely standard and up-to-date so that no changes to your normal Oracle operations procedures are required to maintain the instances over time.

This is unlike some third-party “software appliance” packaging solutions where key components such as patch and package inventories may not be maintained appropriately or are maintained based on some third party proprietary scheme, making it impossible to use Oracle tools to perform patching and making it more difficult to troubleshoot should there be any issues. As a result, the time to resolve an issue can actually increase when products are packaged inappropriately.

Directly Customizable and Flexible: Not a “Black Box”

While Oracle VM templates are pre-built to reflect the best practices for the included product(s), you may still want to tailor the solution to your particular environment. Oracle VMs created from Templates are still fully user-accessible and directly customizable in your environment. Some software appliance packaging tools create only a “black box” VM that cannot be directly modified by users once it is deployed, creating an inflexible environment and necessitating new change request/implementation processes. Templates, however, can be fully customized or tuned post-install and then re-saved as “golden image” templates in Oracle VM to serve as a user’s enterprise deployment standard to minimize risks and variation across multiple instance deployments in the enterprise.

Using Oracle VM Templates To Create Guest Virtual Machines

Oracle VM Templates clearly represent the fastest, most reliable way for deploying any enterprise class software solution, so how does this work in practice? The rest of this paper will focus how Templates are downloaded and deployed, and then customized or even created from scratch.

Under the Covers: Key Components of a Template

Oracle VM Templates as available from Oracle E-Delivery all have the following components in common:

- One or more virtual machine images. For example, your template may simply contain a single VM with your standard OS build, or, if it is a more complex composite application, it may contain several different VMs, with many products. For example, it may include a VM for the web server, a VM for the app server, and a third for the database, etc.
- Each virtual machine in-turn includes a minimum of 2 or 3 files:
 - A binary `system.img` file containing the disk image with the boot OS
 - Optionally a binary file that is a disk image containing Oracle or other 3rd party software that is not a part of the OS. Often, this is dictated by software licensing. For example, Enterprise Linux is under a GPL license while other software may be under a proprietary license and thus it may be desirable to separate non-GPL software on to a different disk from that containing software under a proprietary license.

- A text file called the vm.cfg file that contains the configuration parameters for that virtual machine

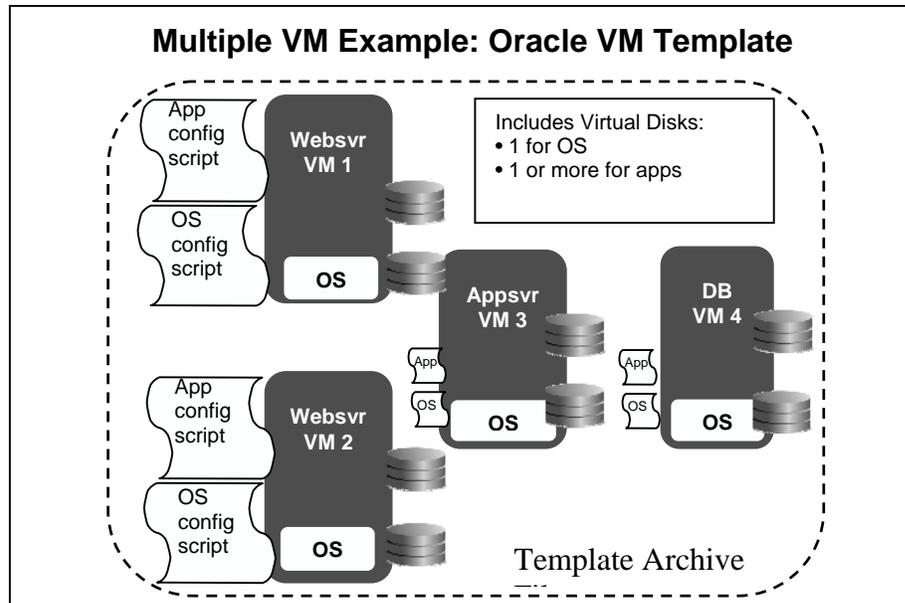


Figure 2: Oracle VM Template Contents

- For each virtual machine in the template, there is also typically two or more script files:
 - One script to perform a one-time configuration of the OS the first time the VM is booted. This can be used to interactively customize or set network parameters based on the environment for that VM. For example, to set-up dhcp or static IP address and related parameters.
 - One (or more) script(s) to configure the Oracle-, or other-, products at first boot of the VM. If there are multiple products to be configured in the same VM, it is at the developer's discretion as to whether there will be one script per product or a single combined script. Again, this script can prompt the administrator to configure parameters for that particular VM in that particular environment.

In the case of Oracle E-Delivery, all of the above files are packaged together in the compressed archive file (a 'tar' file) that represents the Oracle VM Template for that product or solution. This archive file is then downloaded and imported into Oracle VM to be used as the basis for creating guest VMs.

Downloading and Importing Templates to Create Guest VMs

Oracle VM Templates can be created by anyone: by Oracle, by third parties, or by users for their own custom applications. All Oracle Templates on the E-Delivery site are packaged and licensed for production use so you can download them, customize them as needed, and take them straight into production when you are ready--the same as any other Oracle product.

Tip: Since Oracle Templates contain everything you need including the operating system and potentially multiple VM images with multiple disk images, the download file can be quite large despite being a compressed file – potentially many gigabytes. In fact, the most time-consuming step of using a Template may be the download time. As a result, it is recommended that you plan to download once to a central location and then internally distribute the Template using your local network or, if necessary, a portable drive.

Downloading Templates

Ideally, Oracle VM Templates should be downloaded directly to the shared `/OVS/seed_pool` directory used by every Oracle VM Manager instance. This directory serves as the central repository directory for all Oracle VM Template files associated with an Oracle VM. Of course, alternatively, they could be downloaded to anywhere, but ultimately they will need to be moved to the `/OVS/seed_pool` directory to be imported so a direct download to this directory will save a step.

After downloading the ‘tar’ file, the Template should be unzipped (uncompressed) and a directory structure will automatically be created in the `seed_pool` directory to contain all the previously described files that make up the template. Each VM in the tar file will result in the creation of an individual template directory with all the files associated with that VM.

For example, the Oracle Enterprise Manager Grid Control Template download file contains two VMs: One for the Management Server and one for the management repository database. The download is one tar file but, in this case, it will uncompress into two directories: one for each VM. Each individual VM will now appear in Oracle VM Manager as an individual Oracle VM Template, e.g. in the Enterprise Manager example, once imported, Oracle VM Manager will list an Enterprise Manager Server Template and an Enterprise Manager repository database Template.

Tip: If you are creating templates, it is a good idea to use a consistent and explicit naming scheme for the VMs included to avoid confusion with directory names. For example, if every database VM were named “Database” then, at a minimum, you will have a directory conflict but also there is also the risk of confusion as to what higher-level template this database a particular “database” is associated with. A good naming scheme would include the name of the overall template as well as the particular component VM in that directory.

The next step is to import these Templates into Oracle VM Manager so they can be used to create VMs.

Importing Templates

For the Templates to be used, each of the Templates associated with the included VMs must be imported into the desired instance of Oracle VM Manager by going to the ‘Resources’ tab in the UI and clicking on the ‘Virtual Machine Templates’ subtab, and then ‘Import’.

Within the Import wizard screens, you can choose to import from an external location, including directly from Oracle, via ftp or http if the Template is not in the /OVS/seed_pool directory, or you can ‘Discover and Register’ Templates that are already in the /OVS/seed_pool directory as described above.

Tip: A third option is to convert an existing physical server (“P2V”) or VMware® vmdk-based virtual machine (“V2V”) to use as your Oracle VM Template to create virtual machines hosted by Oracle VM. For details on how to use Oracle VM’s P2V and V2V conversion tools, refer to Oracle VM documentation as well as the conversion white paper found on Oracle’s Oracle VM website.

Once the Import is completed, the Template will be associated with that pool so that VMs can be created in that pool from that Template. If you want to use the Template to create VMs in another pool, you must import the Template to the other pool using the same Import process.

Before you can use the Template to create VMs, it needs to be approved by a user with an Administrator or Manager level account. This is to provide better control over the environment and ensure that unapproved Templates are not used to create guest VMs. Users with the appropriate privileges can approve Templates simply by going to the list of Templates on the Resources page and selecting the Template(s) in a ‘Pending’ state and then selecting ‘Approve’. Once the Template is approved, it is ready for use in creating VMs in that pool.

Initial VM Creation and Configuration

Creating VMs from Templates is very straight forward as the VM creation wizard initiated from the ‘Virtual Machines’ tab in the Manager UI walks you through the steps. Simply select the option to create a VM from a Template and follow the steps.

Note that the creation process may take some time depending on the size of the VM in the Template and the speed of your pool storage as the image files are cloned between directories as part of the creation process. This is done so that the original Template images will remain as pristine source images in one location (the seed_pool directory), while the created VM can then be customized in another location (the running_pool or publish_pool directory) without overwriting the source. However, if you wish to make changes and save those changes to the Template itself, that can be done using the Save As Template option described later in this paper.

First Power-On of VMs Created from a Template

Once the VM is created, it is associated with a specific server pool and put in a ‘Powered Off’ state, but it is not associated with a specific server in the pool until the VM is powered-on. At power-on, Oracle VM Manager places the VM on a server either automatically based on algorithms that determine which server has the most memory available, or it is placed based on a user-defined, preferred-server policy that specifies a named subset of servers that must be used to host that particular VM instance.

From the Virtual Machines page, click on the VM and select Power On. As was discussed briefly earlier in the paper, the VM created from the Template will execute any one-time OS-configuration and product configuration scripts on the first boot of the VM. Not all Templates require power-on configuration – it depends on what product(s) is/are contained in the Template - so a given Template may boot normally without any prompting at all.

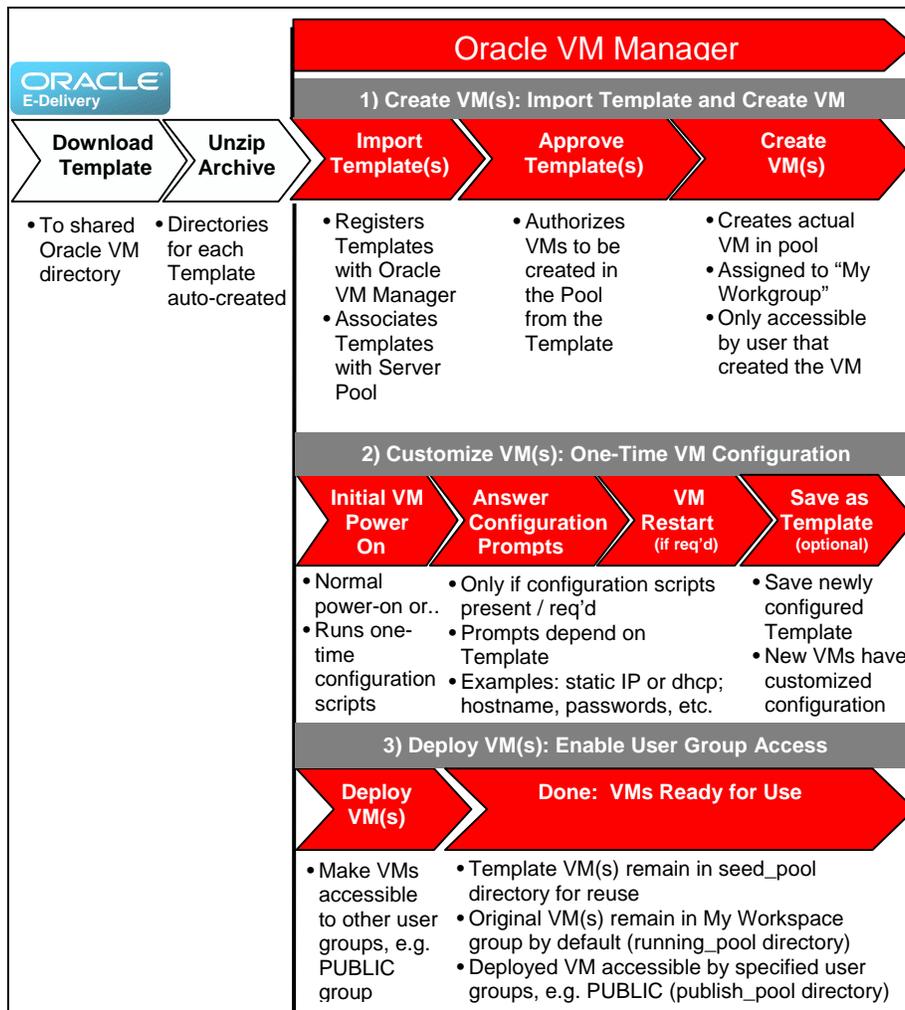


Figure 3: Overview of Process for Creating VMs from Oracle VM Templates

For scripts that do contain user prompts to enter information, the user can easily access the VM console from Oracle VM Manager to respond to the prompts to fully configure the VM and permit the boot cycle to complete.

To access the console, select the VM in Oracle VM Manager and click on the ‘Console’ button from the Virtual Machine page. You will be prompted for the VNC password.

Tip: Default passwords for the various elements of Oracle-produced Templates are documented in the readme files and Template documentation.

Once the console is available, the user may be prompted for any range of information. Typically, the user will be prompted on the desired network configuration (dhcp or static) and possibly other information that depends largely on the product(s) contained in the Template, but could include information such as hostnames, other account passwords, or other information necessary to fully configure the contained products. Once the information has been provided, the VM may need to restart for the changes to take effect.

Customizing Templates to Create “Golden Images”

By their nature, Templates typically reflect the general best practices for the products they contain, but any one configuration cannot cover all scenarios, especially in complex, enterprise environments. As a result, you may wish to update the Templates and then save those changes in your Template VMs so that any future VMs created from that Template would automatically reflect those customizations. This is easily done by making the changes and then selecting the “Save As Template” option while the VM is in a Powered Off state. By using this option, the VM is then saved in the central /OVS/seed_pool directory as a template that can be used to create VMs in the future. Note that the amount of time required to Save as Template depends on the VM size and the performance of your shared storage since the VM is effectively cloned in to the /OVS/seed_pool directory.

Whether the scripts included in the initial template will be re-run when VMs are created from the modified Template depends on the way the Template was created. Templates support the ability to specify that the scripts are re-run every time a new VM is created. Re-running the scripts is desirable in some cases, but not necessary in other cases.

For example, if the initial Template was used to create VMs with a static IP address, it is very likely you would want to prompt for the IP address to occur each time a new VM is created. But if the network option selected was dhcp, and a network address is dynamically assigned, then there is no need to prompt for the IP address for each new VM. Generally, if a static IP address is specified, a flag should be set to re-run the script each time a completely new VM instance is created, but this should be verified by checking the script(s) and/or by performing the first power-on in an appropriately isolated environment.

Making a Newly Created VM Accessible for General Use

When any VM is first created from any resource (Templates or other resources), it is deployed to the 'My Workspace' group by default which is a user group that contains only the account of the single user that created the VM. No other users can see or access VMs that are in the 'My Workspace' group of another user.

By default, Oracle VM Manager includes only one other group called 'Public' that contains all Oracle VM user accounts although Administrators may create additional user groups. As a result, if you wish to have other users access the newly created VM, you need to select the VM and then select the 'Deploy' action. You will be asked to specify the group(s) to deploy-to from a list of available groups. You will need to do this for each VM contained in the Template if you need to make all of them accessible to the group. Note that the deployment process may take some time depending on the size of the VM and the speed of your storage infrastructure given image files must be copied between directories as a part of this process.

Tip: When VMs are Deployed from the My Workspace group to any other group, they are also copied from the /OVS/running_pool directory into the /OVS/publish_pool directory. Having the two copies allows the "author" of the VM to continue to modify the original VM in the My Workspace group without affecting the copy of the VM that is deployed for general use. However, if you do not wish to maintain a copy in My Workspace, it is a good idea to delete that VM copy in order to save storage space. You can always create a new VM from Template if you need a new copy to modify.

Allocating Resources to VMs Created from Templates

The initial VM size with regards to Memory and CPU sizing is specified in the vm.cfg (vm configuration) files contained in the Template and unless these values are manually edited before the VM is created, those values will be used to create the VM. However, Oracle VM Manager permits changing these values by editing the configuration information from the UI just as you would any other VM. For more information on how to change the amount of resources allocated, consult the user documentation or other best practices documents.

Creating Oracle VM Templates from Scratch

Oracle VM Templates can be developed by anyone, not just Oracle. Both end-users and independent product- and solution providers can create Oracle VM Templates.

Software and Licensing for Oracle VM Template Creation

Available from the Oracle virtualization website are documentation and software with the developer-friendly licensing to assist anyone in developing an Oracle VM Template, whether end-users or solution providers:

- Enterprise class product software:
 - **Operating system: "JeOS" edition of Enterprise Linux.** Oracle has made it easier to streamline your deployed footprint by making available for free re-

distribution minimized versions of Enterprise Linux 4 and 5 (32bit and 64bit): These “Just enough OS” (JeOS) editions of Enterprise Linux come complete with a set of scripts to allow tailoring of the image without having to start the VM(s).

These JeOS editions are completely standard Enterprise Linux and any applications that are already certified to run on Enterprise Linux 4 or 5 are thus certified for these minimized-install editions by default, but only the absolute minimum required packages are included. As a result, depending on your applications, you should be able to save 2GB of on-disk space or more per VM, as well as benefit from the reduced opportunity for security exploits, reduced maintenance expense, and improved reliability that comes with only having the absolute minimum number of packages installed. No other Enterprise Linux distributor provides this for free today.

- **Server virtualization software: Oracle VM** – a free and freely re-distributable enterprise server virtualization solution certified and supported by Oracle

Oracle Enterprise Linux and Oracle VM Server are core platform components required to create Oracle VM Templates by themselves or as a platform for other third party or internally developed software. But Oracle also makes available optional software to further assist Template developers in creating a powerful, customized solution:

- **Database: Oracle Database Express Edition (XE)**: Available from Oracle for free integration and re-distribution from Oracle without requiring a re-distribution contract, a streamlined version of the world’s most powerful enterprise database.
- **Advanced application development software: Oracle Application Express (APEX)**: Available as part of the Database Express Edition, APEX allows rapid development of powerful applications on top of Oracle databases.

Simply download the software from the Oracle Technology Network, create the Templates incorporating your developed best practices and software, and re-distribute through your preferred method.

Note: The packaging and re-distribution of Oracle software as a part of an Oracle VM Template, whether solely with other Oracle software or in association with other, non-Oracle software does not alter or in any way reduce the licensing terms of that software or its components. The author of any Oracle VM Templates that are produced is bound by the terms and conditions of all licenses of each included product, particularly with regards to the potential mixing of software with open source and proprietary licenses. Consult oracle.com or your Oracle Account Manager for more information on the licensing terms for Oracle products.

Summary

Oracle VM Templates are the fastest, easiest, and lowest risk way to deploy software and solutions based on Oracle products, providing many benefits:

Benefits to Users:

- Rapid product evaluation without requiring extensive time researching or performing complex installation and configuration tasks just to get up and running;
- Significantly lower risk of a mistake based on a missed dependency or component;
- Licensed for production: go straight to production with the same instance you have tweaked as part of your trial;
- Does not alter existing software maintenance operations procedures for updating or maintaining software in production.

Benefits to Solution Providers and Internal Developers:

- Create complete enterprise software solutions encapsulating your best practices and software for free re-distribution without a contract from Oracle;
- Leverage the most complete enterprise technology stack including Oracle Enterprise Linux JeOS, server virtualization, and, optionally, Oracle Database XE with Oracle Application Express for powerful application development to create a total solution backed by Oracle.

For the latest information on Oracle VM Templates, consult the Oracle VM Templates webpage at oracle.com/technology/products/vm/templates.html



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