Choosing the Operating System for Oracle Workloads on Amazon EC2

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Abstract

Amazon Web Services (AWS) provides a comprehensive set of services and tools for deploying enterprise applications in a highly secure, reliable, available, and cost-effective manner. The AWS cloud is an excellent platform to run business-critical Oracle workloads in a very efficient way. In this whitepaper, we discuss the operating system choices that are best suited for running Oracle workloads on AWS. The target audience for this whitepaper includes enterprise architects, database administrators, IT managers, and developers who want to migrate Oracle workloads to AWS.

Introduction

Oracle software works very well on Amazon Web Services (AWS), and many enterprises run their critical Oracle workloads on AWS for both production systems and non-production systems. These applications can tremendously benefit from the many features of the AWS cloud like scriptable infrastructure, instant provisioning and de-provisioning, scalability, elasticity, and usage-based billing. Whether you are migrating your existing Oracle environments to AWS or implementing new Oracle applications on AWS, choosing the operating system on which these will run is a crucial decision. We highly recommend that you choose an Oracle-certified operating system to run Oracle

software on AWS, whether you are running Oracle Database, Oracle enterprise applications, or Oracle middleware. You can use the following Oracle-certified operating systems on AWS:

- Red Hat Enterprise Linux (RHEL)

- SUSE Linux Enterprise Server

- Oracle Linux

- Microsoft Windows Server

You can use any one of the four operating systems for all your Oracle workloads, or you can use a mix of them as needed. For example, to implement Oracle Siebel, you can run Oracle Database on RHEL while running web servers and application servers on Microsoft Windows Server.

All four of these operating systems are well suited for enterprise workloads, but each of them has features and capabilities that the others do not have. Knowing the differences will help you make the right decision about what is best for your environments.

If you migrate an existing Oracle environment on Intel platform to AWS, and if that environment currently uses one of the four operating systems in the preceding list, then it might be best to choose the same operating system on AWS, to keep any compatibility risks to a minimum. However, it might be worthwhile to evaluate other options. If you migrate from a non-Intel platform or implement a completely new environment on AWS, then you should carefully evaluate the operating systems before you choose the one that is best for your environment.

Oracle AMIs

An Amazon Machine Image (AMI) provides the information required to launch an instance, which is a virtual server in the cloud. You specify an AMI when you launch an instance, and you can launch as many instances from the AMI as you need.

An AMI includes the following:

- A template for the root volume for the instance

- Launch permissions that control which AWS accounts can use the AMI to launch instances

- A block device mapping that specifies the volumes to attach to the instance when it's launched

Oracle periodically provides official AMIs for some Oracle products including Oracle Database on AWS, but there are no official AMIs available for most Oracle products. In

addition, the AMIs that are available might not always be the latest version. Even when there are latest versions of the AMIs available, they will be based on the Oracle Linux operating system, so depending on your operating system of choice, this might not be the best option.

You do not need an Oracle-provided AMI to install and use Oracle products on AWS. You can start an Amazon Elastic Compute Cloud (Amazon EC2) instance with an operating system AMI, and then download and install Oracle software from the Oracle website, just as you would do in the case of a physical server. You can use any one of the four operating systems discussed in the preceding section for this purpose.

Once you have the first environment set up with all the necessary Oracle software, you can create your own custom AMI for subsequent installations. You can also directly launch AMIs from AWS Marketplace. You should closely scrutinize any community AMIs provided by third parties for security and reliability before using them. AWS is not responsible or liable for their security or reliability.

AMIs use one of two types of virtualization: paravirtual (PV) or hardware virtual machine (HVM). All current generation instance types support HVM AMIs. Some previous generation instance types, such as T1, C1, M1, and M2, do not support Linux HVM AMIs. Some current generation instance types, such as T2, I2, R3, G2, CR1, and CC2, do not support PV AMIs. The main difference between PV and HVM AMIs is the way in which they boot and whether they can take advantage of special hardware extensions (CPU, network, and storage) for better performance.

Note: For the best performance, we recommend that you use current generation instance types and HVM AMIs when you launch new instances. For more information on current generation instance types, see Amazon EC2 Instances.

Operating Systems and Oracle Licensing

On AWS, the operating system you use does not affect Oracle licensing. The number of Oracle licenses you need to run your Oracle workloads on AWS will be the same no matter which operating system you choose.

As currently advised by Oracle, the key factors that affect licensing are the computing platform and CPU core count. If you are migrating to AWS from an Intel platform, the core factors for licensing will be similar except for a limitation on the maximum number of cores that can be used for standard editions, as per the Oracle Cloud licensing document. If you are migrating to AWS from Sun SPARC, the IBM P Series, HP PA-RISC, or Superdome platforms, the core factors used for licensing might be substantially different.

For example, if you migrate to AWS, an Oracle Database Enterprise Edition environment that is running on an IBM Power7 server with 16 cores, you will be able to use an Amazon EC2 instance on AWS with 32 virtual cores. This is because Oracle uses a core multiplication factor of 1.0 to calculate licenses needed for IBM Power, while a core multiplication factor of 0.5 is used for AWS. This is provided only as an example; you should consult your own Oracle license agreement for specific information. To learn more about licensing requirements for different platforms, see the Oracle Processor Core Factor Table. You can also consult the Oracle Cloud licensing document to understand how Oracle licensing applies to AWS. To find out the virtual core count of each Amazon EC2 instance type, see the Amazon EC2 virtual core web page.

Oracle-Certified Operating Systems

This section provides information about the four operating systems that are certified by Oracle and recommended for use with AWS.

Note: It is possible to run Oracle products on non-certified operating systems, but for the best performance and supportability, we recommend that you use an Oracle-certified operating system for use on AWS.

Red Hat Enterprise Linux

A large number of enterprises of all sizes use Red Hat Enterprise Linux (RHEL) to deploy Oracle workloads. RHEL is a great choice for any Oracle workloads on AWS. AWS and Red Hat have teamed to offer RHEL on Amazon EC2, providing a complete, enterprise-class computing environment with the simplicity and scalability of AWS. Red Hat maintains the base RHEL images for Amazon EC2. As an AWS customer, you will receive updates at the same time that updates are made available from Red Hat, so your computing environment remains reliable and your RHEL-certified applications maintain their supportability.

RHEL is available for all Amazon EC2 instance types on AWS, including HVM instances. On HVM instances, RHEL supports HugePages, which can especially enhance the performance of Oracle Database. HugePages is a Linux feature that makes it possible for the operating system to support very large memory pages. HugePages sizes can vary from 2 MB to 256 MB. On AWS, you can use HugePages only on HVM instances. For more information about HVM instances on AWS, see Virtualization Types.

Important: A special feature in RHEL named Transparent HugePages (THP) is not compatible with Oracle Database and should be disabled for best performance.

For licensing, you have two options:

- Transfer your existing RHEL licenses to AWS if you have a Red Hat Enterprise Linux Premium subscription. For instructions for transferring your licenses, go to Red Hat Cloud Access.

- Use the managed service model. This model means that AWS has taken on all the burdens of acquiring RHEL licenses to use in the Amazon EC2 service. You pay only for the Amazon EC2 instance, and AWS handles all RHEL licensing issues, so the managed service model is a very cost-effective way to scale up and scale out instances as needed to support enterprise workload spikes. This also helps you avoid costly license purchases up front. For this model, the cost of the RHEL license varies based on the Amazon EC2 instance type. For more information about Amazon EC2 instance costs with an RHEL license included, see Amazon EC2 Pricing.

On average, RHEL is the second lowest-cost operating system from among the four Oracle-certified operating systems discussed here. You can launch an RHEL-based Amazon EC2 instance directly from the AWS console or from the AWS Marketplace. For additional information about RHEL on AWS, see Red Hat and Amazon Web Services.

SUSE Linux Enterprise Server

SUSE Linux Enterprise Server (SLES) has been an operating system of choice for Oracle workloads for many large Oracle deployments. SLES is a great choice to run Oracle workloads on AWS as well. SUSE maintains the base SLES images for Amazon EC2, and as an AWS customer you will receive updates at the same time that updates are made available from SUSE.

SLES also is available for all Amazon EC2 instance types on AWS, including HVM instances. On HVM instances, SLES supports HugePages, which can especially enhance the performance of Oracle Database.

You can launch an SLES-based Amazon EC2 instance directly from the AWS console or from the AWS Marketplace. For additional information about SLES on AWS, see SUSE and Amazon Web Services.

SLES on AWS is available only with the managed service model. This model means that AWS has taken on all the burdens of acquiring SLES licenses to use in the Amazon EC2 service. You pay only for the Amazon EC2 instance, and AWS handles all SLES licensing issues, so the managed service model is a very cost-effective way to scale up and scale out instances as needed to support enterprise workload spikes. This also helps you avoid costly license purchases up front.

For pricing options, see Amazon EC2 Pricing. In general, SLES costs slightly more than RHEL for most Amazon EC2 instance types.

Oracle Linux

As the operating system Oracle uses to build and test their products, Oracle Linux is an excellent choice for running Oracle workloads on AWS. Oracle maintains the Oracle Linux AMIs available on AWS. For a list of all available versions of Oracle Linux, see Amazon Web Services and Oracle.

Unlike the other three operating systems discussed here, Oracle Linux has no cost for licensing, making it the lowest cost option. You can purchase support directly from Oracle, but support is not necessary to get updates and patches. Oracle provides public **yum** repositories to download updates and patches, even for customers who have not subscribed to support. For customers who have subscribed to support, Oracle Linux allows zero-downtime updates, which can be very useful for mission-critical applications.

Oracle Linux has a special feature named Database Smart Flash Cache that is not available in any of the other operating systems discussed here. Database Smart Flash Cache allows the database buffer cache to expand beyond the SGA in main memory to a second-level cache on flash memory. Making use of Database Smart Flash Cache for Oracle Database can substantially increase the database performance. This is a very good feature to use with Amazon EC2 instances that have a large amount of SSD instance storage.

At the time of writing this whitepaper, Oracle Linux AMIs are available only for PV instances. Because most of the newer, larger Amazon EC2 instances are HVM instances, this puts Oracle Linux at a disadvantage. However, Oracle Linux is still a good choice for PV instances. Once Oracle makes HVM AMIs available on AWS for Oracle Linux, Oracle Linux will be a good choice for any kind of workload.

Microsoft Windows Server

Microsoft Windows Server versions 2003 R2, 2008, 2008 R2, 2012, and 2012 R2 are available on Amazon EC2 as Oracle-certified operating systems to run Oracle workloads. Microsoft Windows Server is an excellent choice for many Oracle workloads, especially for running enterprise applications like PeopleSoft, Siebel, and JD Edwards. Microsoft Windows is available on all types of Amazon EC2 instances including HVM, making it a good choice for Amazon EC2 instance types with large memory configurations.

To access and launch all Microsoft Windows AMIs, see Windows AMIs. Microsoft Windows on Amazon EC2 is available with the managed service model, where AWS takes on all the burdens of acquiring Microsoft Windows licenses to use in the Amazon EC2 service. The Microsoft Windows license tends to be more expensive than the other three, Oracle-certified operating systems for the same instance type.

Conclusion

We recommend that you choose one of the four operating systems discussed in this whitepaper for any of your Oracle environments on AWS so that your Oracle workloads will be on an Oracle-certified operating system. You can use any one of the four operating systems for all your Oracle workloads, or you can use a mix of them as needed. Your choice typically will depend on familiarity, type of workload, instance choice, and cost preference.

Further Reading

For additional information about running Oracle workloads on AWS, consult the following resources:

Oracle Database on AWS:

- Advanced Architectures for Oracle Database on Amazon EC2
  http://d0.awsstatic.com/enterprise-marketing/Oracle/AWSAdvancedArchitecturesforOracleDBonEC2.pdf

- Strategies for Migrating Oracle Database to AWS
  http://d0.awsstatic.com/whitepapers/strategies-for-migrating-oracle-database-to-aws.pdf

- Determining the IOPS Needs for Oracle Database on AWS
  http://d0.awsstatic.com/whitepapers/determining-iops-needs-for-oracle-database-on-aws.pdf

- Best Practices for Running Oracle Database on AWS
  http://d0.awsstatic.com/whitepapers/best-practices-for-running-oracle-database-on-aws.pdf

- AWS Case Study: Amazon.com Oracle DB Backup to Amazon S3
  http://aws.amazon.com/solutions/case-studies/amazon-oracle/

Oracle on AWS

- http://aws.amazon.com/oracle/

- http://aws.amazon.com/rds/oracle/

Oracle on AWS FAQ

- http://www.oracle.com/technetwork/topics/cloud/faq-098970.html

Oracle on AWS Test Drives

- http://aws.amazon.com/solutions/global-solution-providers/oracle/labs/

Oracle licensing on AWS

- http://www.oracle.com/us/corporate/pricing/cloud-licensing-070579.pdf

Getting started with Oracle RMAN backups and Amazon S3:

- http://aws.amazon.com/backup-recovery/getting-started/

AWS service details

- http://aws.amazon.com/products/
- http://aws.amazon.com/documentation/
- http://aws.amazon.com/whitepapers/

AWS pricing information:

- http://aws.amazon.com/pricing/
- http://calculator.s3.amazonaws.com/index.html