Session 1: Managing Software Licenses in Virtual Environments

Paul Baguley, Principal, Advisory Services – KPMG
This Talk will focus on how to successfully manage software licenses in highly virtualized server environments. It will:

- Summarize the complexity and challenges
- Highlight the potential benefits/cost savings
- Explain possible approaches and tools available.
Virtualization Overview
What is Virtualization?

• Virtualization: is the creation of a virtual (rather than an actual) version of something, such as an operating system, a server, a storage device or network resources, etc.

• Virtualization disassociates the tight bond between software and hardware

• Areas of virtualization include:
  - Server
  - Network
  - Storage
  - Desktop
  - Application
Server virtualization allows you to run multiple virtual instances on a single physical machine to maximize CPU (processor) usage.

Different virtual machines can run different operating systems and multiple applications on the same physical computer.
## Advantages and Disadvantages of Virtualization

<table>
<thead>
<tr>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Asset consolidation</td>
</tr>
<tr>
<td>Improved IT agility, efficiency</td>
</tr>
<tr>
<td>Less hardware needed, less net new licenses</td>
</tr>
<tr>
<td>Reduced maintenance costs</td>
</tr>
<tr>
<td>Savings on power, data center space etc.</td>
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<tr>
<td>Dynamic Load Balancing, improved application availability</td>
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<table>
<thead>
<tr>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>More single points of hardware failure</td>
</tr>
<tr>
<td>May be some impact on performance</td>
</tr>
<tr>
<td>Managing virtual environment more complicated</td>
</tr>
<tr>
<td>Inconsistent virtualization licensing requirements by software vendors. Easier to inadvertently over deploy the software.</td>
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</table>
Virtualization Technologies

One physical host server supports multiple virtual servers (virtual machines or VMs)

Each VM supports an Operating System (OS) and one or more applications

Multiple Virtualization Technologies:

- VMware vSphere
- IBM Logical Partitioning (LPAR), PowerVM
- Oracle Solaris Containers (Zones), VM Server for SPARC (LDoms)
- Microsoft Hyper-V
- HP nPar (Hard Partitioning) / vPar (Soft Partitioning), Integrity VM
- Citrix Xen
Virtualization Impacts - licensing and compliance

Software Companies
- How to license?
- How to count and report?
- How to enforce compliance?
- How to maintain licensing revenue?

End Users
- What is the best licensing option?
- How to count and report?
- How to maintain compliance?
- How to reduce licensing costs?

*Virtualization adds significant license management complexity*
Virtualization - Licensing Challenges

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for significantly less license and maintenance revenue for server based products</td>
<td>Unique virtual licensing models are used across a number of software vendors</td>
</tr>
<tr>
<td>Reality of modern day, virtualized IT infrastructure is out of balance with (pre-virtualization licensing rules)</td>
<td>Not all software vendors have a clear position on virtual licensing</td>
</tr>
<tr>
<td>Deployments of virtual server are done rapidly with ease, leading to increased software deployments</td>
<td>Can easily get out of compliance (if not monitored)</td>
</tr>
<tr>
<td>Few reporting tools available to accurately measure and report back on actual virtualized usage</td>
<td>Deployments of virtual server are done rapidly with ease, leading to increased software deployments</td>
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<td>Actual usage can vary depending on when deployment information is gathered</td>
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<td>Follow the sun compliance</td>
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</tr>
<tr>
<td></td>
<td>Follow the sun compliance</td>
</tr>
<tr>
<td></td>
<td>Who has compliance liability – hosting company or end user?</td>
</tr>
</tbody>
</table>
Each Vendor has different Virtualization Rules

<table>
<thead>
<tr>
<th>Eligible Software Products</th>
<th>IBM</th>
<th>Oracle</th>
<th>Microsoft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Processor Value Unit (PVU) based products</td>
<td>Processor based products</td>
<td>Server and processor based</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eligible Virtualization Technologies</th>
<th>IBM</th>
<th>Oracle</th>
<th>Microsoft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Most</td>
<td>No soft partitioning</td>
<td>Hyper-V, VMware</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Licensing Rules</th>
<th>IBM</th>
<th>Oracle</th>
<th>Microsoft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CPU core – max over 24 hrs</td>
<td>CPU core – max per machine</td>
<td>Per Server / Processor – license mobility rules</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Restrictions</th>
<th>IBM</th>
<th>Oracle</th>
<th>Microsoft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>•IBM Licensing Metric Tool (ILMT) or Flexera required</td>
<td>•Hard Partitioning v. Soft Partitioning</td>
<td>•Virtualization rules based on edition</td>
</tr>
</tbody>
</table>
Virtualization Example 1 – Reduced Licensing Costs

- License for the lower of Virtualization Capacity (using LPARs, Partitions, Virtual Machines) or Full Capacity available in the Server.

<table>
<thead>
<tr>
<th>Cores to License</th>
<th>PAR 1</th>
<th>PAR 2</th>
<th>Virtualization Capacity</th>
<th>Full Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software X</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Software Y</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>
Virtualization Example 2 – Increased Licensing Costs

Before: Oracle running in Non Virtualized environment

- Server A
- Server B

Servers A & B have 2 Physical CPUs each. Licenses for both servers were purchased.

Now: Oracle running in Virtualized environment

- Server A
- Server B
- Server C
- Server D
- Server E
- Server F

Servers A & B were redeployed as part of a virtualized 6 server cluster. Each server has 2 physical CPUs. The deployed Oracle Enterprise edition licenses can run on any 2 servers at one point.

2 servers with 2 CPUs each licensed. 4 CPUs deployed

= OK

2 servers with 2 CPUs licensed. Up to 12 CPUs may be used in the cluster.

= 8 CPUs short.

4 CPUs deployed

2 servers with 2 CPUs each licensed.
Virtualization Example 3 – Licensing Complexity

License Counting – **Single Shared Pool** with Capped and Uncapped Partitions

**Server with 12 processor cores**

<table>
<thead>
<tr>
<th>Server</th>
<th>Capped</th>
<th>Uncapped</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>i5/OS</td>
<td>AIX</td>
</tr>
<tr>
<td>E</td>
<td>Capped AIX</td>
<td>DB2</td>
</tr>
<tr>
<td>F</td>
<td>Capped Linux</td>
<td>WAS DB2</td>
</tr>
<tr>
<td>G</td>
<td>Uncapped i5/OS</td>
<td>WAS</td>
</tr>
<tr>
<td>H</td>
<td>Uncapped AIX</td>
<td>DB2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core Count</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>VP</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>EC</td>
<td>1.00</td>
<td>2.00</td>
<td>2.00</td>
<td>3.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Shared Pool (9 processor cores)**

- **A**: i5/OS
- **B**: AIX
- **C**: Linux
- **D**: DB2

<table>
<thead>
<tr>
<th>Core</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WAS cores to license:**
- 2 from EC for capped partition F
- 10 from VP for uncapped partitions G and H
- 12 total reduced to 9, maximum cores available in the shared pool

**License Rules:**
- For Capped Partitions: The highest actual\* level of Entitled Capacity (EC);
  - EC was formerly referred to as Processing Unit (PrU).
- For Uncapped Partitions: The highest actual\* number of Online VP (Virtual Processors)
- Shared Pool: the lower of the sum of each partition for a product or the processor capacity of the shared pool
- The greater of what the partition starts with or the result of a DLPAR operation

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Licensing Complexities in Cloud

- New licensing models introduced to incorporate deployments in the cloud:
  - Subscriber Access License
  - Processor License with Cloud / Mobility restrictions
  - Pay per usage (time or data)

- Potential for license manipulation:
  - Follow the sun – mobility
  - Restrictions on physical location of deployments can be easily breached

- Who has compliance responsibility?
  - Microsoft places liability with licensee and not cloud provider
  - If cloud providers are audited, their customers could be held liable for findings
## Cloud – IAAS - Licensing Comparisons

<table>
<thead>
<tr>
<th>Company</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microsoft</strong></td>
<td>Customers must have software assurance to qualify for license mobility. Customers cannot BYOL for Windows OS in the public cloud (the IAAS vendor must supply the OS). There are 2,300 Authorised License Mobility Partners to which customers can BYOL such as Microsoft server application licenses e.g. SQL, Exchange, Sharepoint.</td>
</tr>
<tr>
<td><strong>IBM</strong></td>
<td>Customers can BYOL to public cloud, but only to IBM cloud, Azure and Amazon. Sub-capacity reporting rules still apply.</td>
</tr>
<tr>
<td><strong>Oracle</strong></td>
<td>Customers can BYOL to public cloud, but only to Oracle cloud, Azure and Amazon. Customers with unlimited license agreements cannot count licenses deployed in the public cloud in their end of term ULA certification.</td>
</tr>
<tr>
<td><strong>SAP</strong></td>
<td>More open on supported IAAS providers but a wide range of licensing models ranging from BYOL to subscription and combinations of both for different application components.</td>
</tr>
</tbody>
</table>
Common Pitfalls for Non-Compliance

- Non-compliance with defined licensing terms
- Incorrect calculation of processors and cores
- Blurred lines between metrics: Access v Use v Install
- Misunderstanding of Bundling
- Lack of awareness of vendor specific rules:
  - Cannot limit process cores operationally (IBM)
  - Fail over rules (DB2)
  - Soft v Hard partitioning (Oracle)
License Virtualization Approaches and Tools
How to stay on top of Virtualization

1. Understand the rules, use cases and how to count (per vendor)

2. Get a good Software Asset Management (SAM) tool!

3. Virtualize to your advantage
1. Understand the Rules and how to apply them (for each vendor)

- **Understand the ground rules**
  - Technology eligibility
  - Reporting Obligations
  - Point in time or maximum over a defined period?
  - Location restrictions

- **Assess use cases**
  - impact of clustering
  - impact of moving machines
  - different terms for development, test, staging and Disaster Recovery

- **Calculate deployments accurately**
  - Processor core types
  - Conversion ratios
  - Thresholds
Example: Rules for calculating IBM Deployments

**PVU Calculation**

1. Determine total number of Processor Cores in the Machine
2. Determine PVU conversion ratio
3. Multiply total number of cores by conversion ratio

Sockets x Cores per Socket x PVU Conversion = Full Capacity Deployments

2 x 4 x 50 = 400 PVUs

**Processor Type**

2 Intel Xeon 5450 (Quad Core)

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Processor Technologies

<table>
<thead>
<tr>
<th>Processor Brand</th>
<th>Processor Type</th>
<th>Proc. Model Number</th>
<th>Cores per socket</th>
<th>Maximum number of sockets per server</th>
<th>PVUs per Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xeon®</td>
<td>3000 to 3399</td>
<td></td>
<td>(1) (2) (4) (6) (10) (12) (16)</td>
<td>All</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>5000 to 5499</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7000 to 7499</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core®</td>
<td>All i3, i5, i7</td>
<td></td>
<td></td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>AMD</td>
<td>Opteron</td>
<td>All</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Any</td>
<td>Any single-core</td>
<td>All</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

http://www-01.ibm.com/software/passportadvantage/about_software/licensing.html
2. Get a good SAM tool

- **Discovery**
  - Multi-platform: Windows, UNIX, Linux, MAC OS
  - Virtual Machines, Hard Partitions and Clusters (VMware, MS Hyper-V, LPAR, vPar, nPar, Solaris Zones)
  - Citrix XenApp, XenDesktop user access rights & app usage
  - Microsoft App-V

- **Correlate VMs to physical host servers**

- **Normalize software discovery data to obtain a deployment inventory**

- **Compare deployments to entitlements and use rights to obtain a licensing position**
Example: FlexNet Manager for IBM Overview

**Built on the FlexNet Manager Platform**

**IBM License Types Supported:**
- PVU, UVU, Resource Value Unit (RVU)
- Authorized User
- Concurrent User
- Floating User

**Supports PVU Full Capacity & Subcapacity**

**Integration with ILMT**

**PVU subcapacity calculation, independent of ILMT**

**Server Cluster Support, Including DRS Host Affinity Rules for VMware**

**Automated License Reconciliation and License Optimization for IBM products**
- IBM Product Use Rights Library
Example: Flexnet Manager – License analysis

Product Use Rights:
- Second Use
- Multiple Installations
- Virtual Use
- DR, etc.

Contracts

FlexNet Manager Suite Optimization Engine

Virtual Use Rights

Product Use Rights Library

Microsoft, Adobe, IBM, Oracle, SAP and Symantec

Reports
Optimized License Position
Savings
Annual True-up Reports
3. Virtualize to Your Advantage

**IBM**

- Take advantage of sub capacity rules. These can be significant in terms of cost savings.
- Understand all of the requirements and Sub Capacity Terms.
- Install the IBM reporting tool (ILMT or equivalent such as Flexera).

**Oracle/Microsoft**

- **Oracle Enterprise Edition**: understand implications of your cluster configurations to manage licensing costs.
- **SQL Server Enterprise Core**: investigate “unlimited virtualization” licensing options to license all cores or processors of an ESX host (with Software Assurance).
- Consider:
  - Consolidating virtual machines running the virtualized software, to a limited number of clusters
  - Restricting the dynamic movement of virtual machines to a subset of physical hosts within a cluster
  - Migrating deployments of physical deployments to clusters already fully licensed for the virtualized software (this would directly decrease your licensing footprint)
• Virtualized environments offer significant operational benefits – but do significantly increase license complexity.

• Each vendor is different – need to understand specific vendor and product rules.

• It is too complex to manage without an effective SAM tool. Not all tools are capable of capturing required information for calculating virtual deployments.

• There are significant benefits/cost savings to be obtained from effectively managing and analyzing virtualized licenses.

• With the introduction of the cloud and new virtualization technologies, vendors are constantly reviewing and updating licensing terms.
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