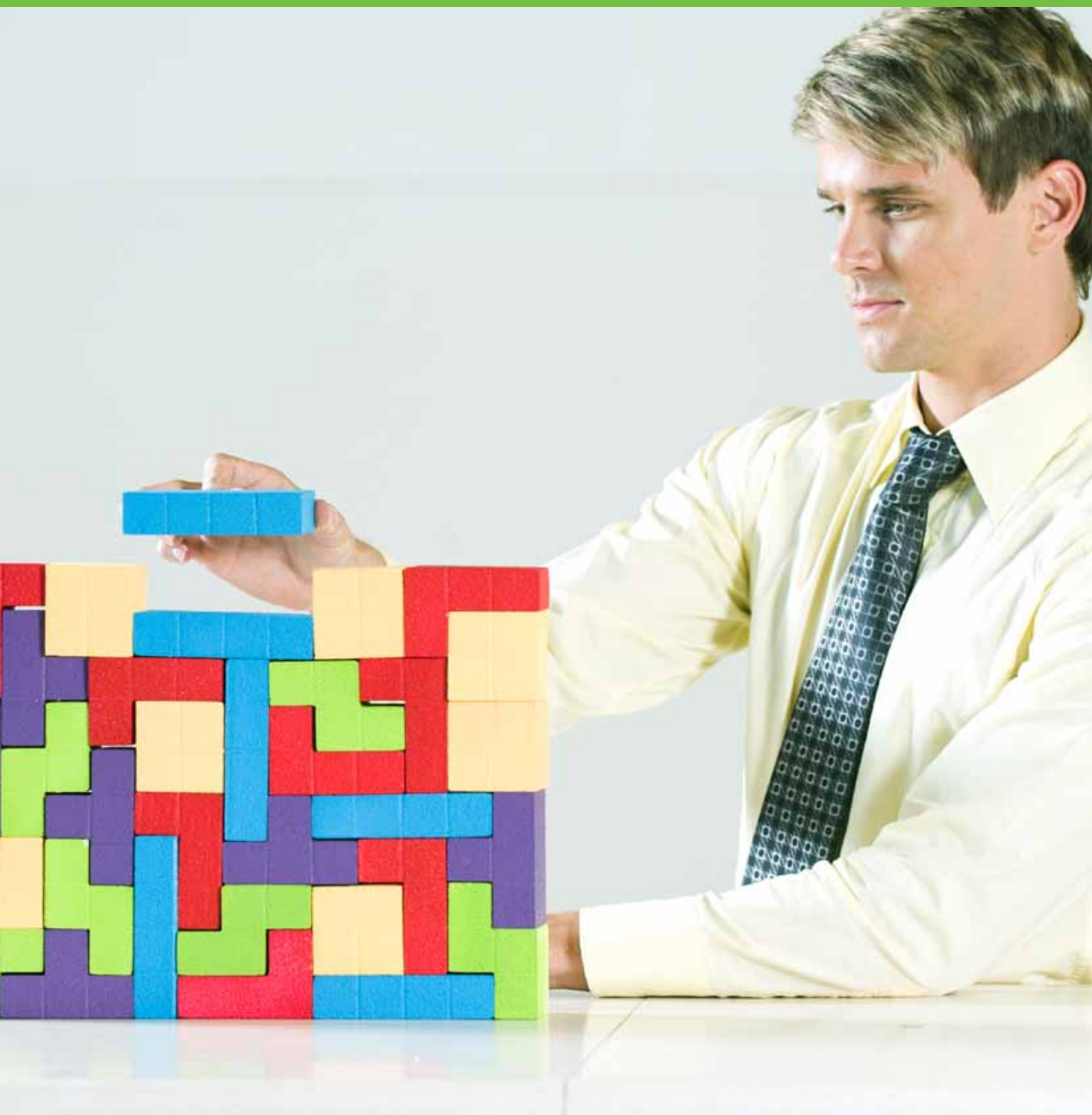


Understanding the software licencing implications around virtualisation

A practical guide to avoiding the pitfalls of virtualisation software licencing



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Intended for IT leaders and procurement professionals, this guideline describes the impact that different virtualisation scenarios can have on software licencing; and how to gain the maximum benefit from your software agreements.

After reading this guide, you will:

- Have an understanding of the licencing landscape around virtualisation
- Recognise the potential challenges of licencing a virtualised environment
- Realise how to derive maximum benefit from your software licencing strategy around virtualisation

1. Introduction

Most organisations around the world have implemented, or are considering, a mix of virtualisation strategies to improve the performance of their IT infrastructure, reduce their carbon footprint and lower operating costs. While the benefits of virtualisation are clear, the complexity of software licencing in a virtualised environment are not, and many organisations grapple with the implications virtualisation may have for their existing software licences.

Virtualisation brings about complexity when it comes to the interpretation of the usage entitlements under existing software licences and the identification of software licence consumption. The risk of misunderstanding or ignoring the situation could result in the risk of non-compliance and the need to incur significant costs to correct the situation.

In this guide, Dimension Data highlights the major challenges around licencing a virtualised environment and offers practical recommendations on gaining the maximum value from software licencing strategies.

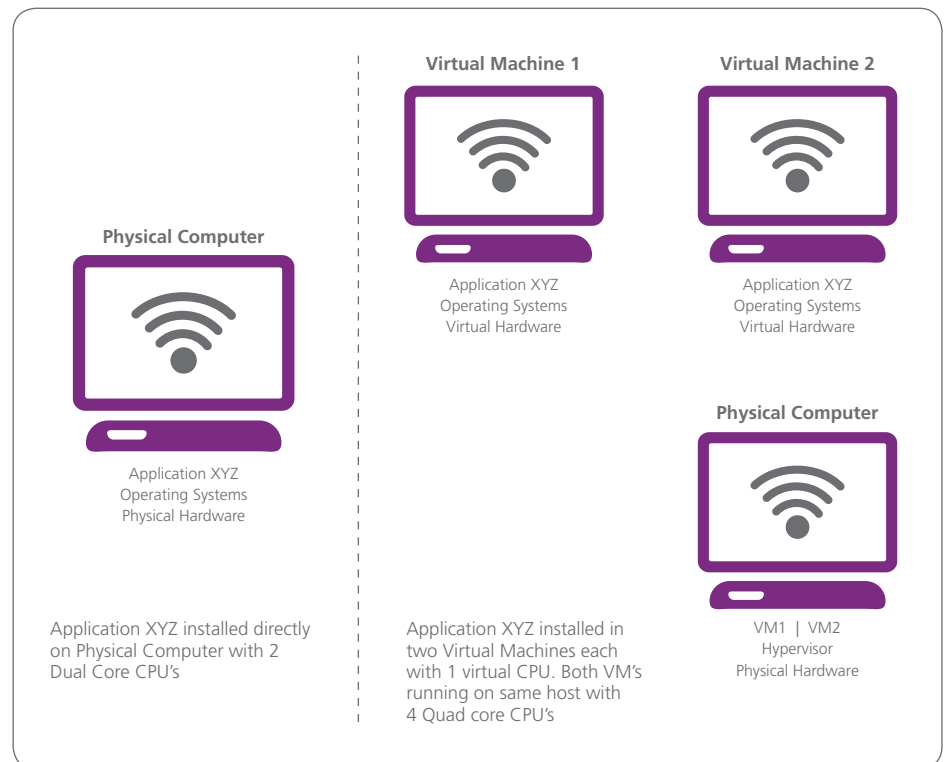
2. An overview of the major challenges with licencing a virtualised environment

2.1. Complexity in applying metrics

Desktop and server virtualisation technologies alter the relationship between the physical computer properties, the operating system (OS) and the computer user. This results in a number of potential challenges for licencing. For example, for many software licences, the "metric", or criteria used to measure the number of licences required for a computer, has traditionally been tied to the properties of a physical device. Applying the same licence metric may be inaccurate and inappropriate in a virtual environment.

The difficulty in understanding how to apply a licence metric stems from the "language" or absence of a clear statement of usage rights that describe how the software may be legally used in all virtualised environments and different scenarios. Typical licence agreements date from a time when virtualisation was not part of the environment or had not been considered by the vendor.

Practical example: Key challenge of virtualisation licencing



Most organisations around the world have implemented, or are considering, a mix of virtualisation strategies to improve the performance of their IT infrastructure, **reduce their carbon footprint and lower operating costs.**

An application, XYZ, is installed on a single physical computer (left) or on two virtual computers on the same physical host (right). The number of licences required for each scenario depends on the specifics of the licence metric. If the licence metric for application XYZ is “per-device” then the physical scenario requires 1 licence.

However, in the virtual scenario application XYZ may require 1, 2 or 3 licences, depending on the licence definition of “device”. If the metric only counts physical devices then 1 licence is required. If the metric counts OSs in which the software is installed, then 2 licences may be required. If the metric counts both physical and virtual devices, then 3 licences may be required.

If application XYZ were licenced “per processor” then the situation becomes more difficult. The licence count would vary depending on how the metric counted processors: virtual processors, physical processors or separate processor cores. In the virtual scenario, the number of processor licences that need to be acquired could be 2, 4 or 16 respectively.

“Virtualisation brings about **complexity** when it comes to the interpretation of the **usage entitlements** under existing software licences and the identification of software licence consumption.”

2.2. Virtual machine mobility

A key feature of desktop and server virtualisation is the ease with which a virtual machine can be moved between physical hosts. Virtual machine mobility provides a great deal of flexibility and makes many of the common virtualisation usage scenarios possible.

While greatly beneficial, mobility can create one of the primary challenges for managing licence compliance. Many software licences are still metered by, or assigned to, the physical properties of the host. When a virtual machine is moved to a new host the licence may be left behind, still assigned to the original physical host and therefore a new licence may be required for software on the new host.

Alternatively, if the licence moves and the new host has different physical properties, the licence metric may no longer be applicable or inadequate, thereby requiring additional or alternative licences to be acquired.

2.3. A lack of understanding within IT and procurement

The licencing complexities and compliance issues that arise from virtualisation are frequently not recognised by IT technical staff. Therefore, many technical virtualisation implementation and management operations may be performed without any consideration for the licencing implications.

Even if IT staff are following best practices for the management of their virtualisation technology, their activities may impact the licencing of other software running in the virtualisation environment. Minor changes can cause significant licencing compliance issues that remain undiscovered until a full licence compliance audit.

Equally, it is likely that licencing staff are not fully aware of the complex technical details of a virtualisation technology implementation or the actions performed in day-to-day operations. This raises the possibility that required licence usage rights have not been negotiated or purchased to support the virtual environment. Again, this may not be recognised until the next licence compliance audit.

2.4. An inconsistent approach from vendors

Software vendors have been varied in their response to providing clear guidance or usage rights to support virtualisation. From the vendors’ point of view the virtualisation landscape is diverse and complex, and is still changing at a rapid pace.

If a vendor were to provide additional usage rights to support virtualisation, the risk exists that its clients would utilise virtualisation technologies to reduce their licence requirements and expenditure. Most vendors would however prefer that customers pay for additional usage rights, to take advantage of the additional value offered by virtualisation.

A few vendors have begun to provide specific licences to support virtualisation. Having said that, these licences are often a trade-off and may well come with their own limitations. Frequently, licencing for virtualisation still requires the use of a metric tied to the physical properties of a host computer. This can make licence compliance for the metric difficult or near impossible, as the full details of both the virtual machine and its host must be known.

“While the benefits of virtualisation are clear, **the complexities of software licencing** a virtualised environment are not, and many organisations grapple with the **implications virtualisation** may have for their **existing software licences.**”

3. Licencing scenarios in different virtualisation environments

Vendors provide a range of different virtualisation technology and configuration options. This leads to a number of virtualisation implementation scenarios that are dictated by the business requirements and user profiles. It is important to understand the licencing implications for each scenario to avoid the pitfalls.

3.1. Application virtualisation

Application virtualisation benefits:

- Virtual applications may be assigned to individual users and then “streamed” to any computer that the user accesses to run the application
- Virtual applications can be installed, executed and removed from a system without having any impact on the host OS or other applications
- Multiple copies or versions of an application can be run side by side on the same computer
- A virtual application can be added to a computer for a specific user and then completely removed when no longer required
- Virtual applications can typically be secured to prevent execution by unauthorised users, even when they are utilising the same computer

Application virtualisation separates an application from running directly in the host OS. Instead, the application runs in a sandboxed environment or isolated “bubble” on the host. This means that the application is not installed in the traditional sense and is fooled at runtime into believing that it is directly interfacing with the original OS.

Application virtualisation is commonly used in the desktop environment. Therefore, many virtual applications will be desktop applications that are licenced on a “per device” basis. A common usage scenario with application virtualisation is to target applications to individual users rather than devices, causing a number of potential licencing challenges. When a user logs onto and executes a virtual application on more than one desktop, depending on the specific usage rights granted by the software licence, a separate licence may be required for each physical device where the virtual application was accessed.

Even if the virtual application could not be executed by any other user on the computer, the software would have been executed on more than one device. Most desktop software per device licences have not been modified to provide specific usage rights for application virtualisation and so the usage rights granted are only to physical devices and the usage metric remains the physical device, not the assigned user.

The situation is not ideal. One of the great benefits of application virtualisation is to target virtual applications to users and only allow the application to be available to the allocated user(s), irrespective of the computer they utilise. Unfortunately, even if the user was only running the virtual application on one device at a time, a per device licence is not equivalent to a concurrent user licence.

When utilising application virtualisation, the usage rights granted by the software licence should be considered when determining how the application will be deployed. In most cases, a per device licence should be assigned to a device rather than a user, and it may be necessary to track all devices on which an application is executed in order to establish licence usage and compliance.

Application virtualisation may be combined with other virtualisation technologies, such as desktop virtualisation (or hosted virtual desktop). The combination provides great benefits in flexibility but also increases the complexity and potential issues for software that is licenced per device.

3.2. Desktop virtualisation

Desktop virtualisation benefits:

- The user’s desktop environment is extremely mobile and accessible on any device that can access the virtual desktop infrastructure (VDI). This may include a user’s home computer
- Data security is improved as all data utilised within the virtual desktop is kept in the data centre and data is not stored on the local computer
- Provision of IT support for virtual desktops is simpler and avoids many scenarios that require a physical visit
- Deployment and provisioning of new virtual desktops may also be simpler than physical desktops

Desktop virtualisation moves the desktop OS environment from a physical computer to a virtual machine. In most cases, the virtual desktop is hosted on servers in a data centre and accessed through VDI technology. A user’s virtual desktop environment is presented to the user on their local end-user device as if it were a locally running OS.

In a similar way to physical desktops, a virtual desktop may be assigned to a specific user or may be shared by multiple users by being placed in a pool. Virtual desktops can be persistent, which means that the user’s virtual desktop environment, including OS, user settings, applications and other customisations, are retained when the user logs off or the virtual desktop is shut down.

Unlike physical desktops however, virtual desktops may also be non-persistent, which means that the virtual desktop is provisioned from a base OS image and the user state, which is stored separately from the base OS image. Applications are typically provided dynamically to the user by application virtualisation and/ or presentation virtualisation. Each scenario has different implications for different licences.

Desktop virtualisation is utilised primarily in the desktop space and so the applications running on a virtual desktop will frequently be per device applications. If an application licence does not recognise the virtual desktop as the per device metric and instead counts physical devices where the application is accessed, then a licence may be required for every device utilised to access a user's virtual desktop. If an application licence does recognise the virtual desktop as a valid metric and the virtual desktop is persistent, then accessing the virtual desktop from multiple physical devices may be less of an issue.

However, depending on the type of VDI model utilised, there may be different licencing issues. Pooled virtual desktops mean that a user may be allocated a different virtual desktop each time they log on. This virtual desktop will be provisioned from a base OS image and/or merged with the user's saved settings. Applications may be provided by application virtualisation or presentation virtualisation. In this case, a licence may be required for all virtual desktops in the virtual desktop pool or every physical device that may be utilised to present the per device software. The exact licences required will depend on the usage rights granted by the software licence.

Desktop virtualisation requires a careful examination of existing licence usage rights, and collaboration between technical and licencing experts to ensure that the virtual desktop implementation is clearly understood and is compatible with the available software licences. In many cases, desktop virtualisation will only be utilised to deliver a desktop environment to a targeted group of users, with traditional desktops used for the rest. There may therefore be a desire to utilise the same software licences in the virtual desktop as in the physical environment, however, there are cases where this approach would not be suitable.

The utilisation of some of the key features of desktop virtualisation, such as mobility and dynamic provisioning, can cause the most complexity with existing software licencing. The level of complexity of software licencing will vary depending on the virtual desktop scenario implemented.

3.3. Server virtualisation

Server virtualisation benefits:

- Multiple servers can be consolidated as virtual machines onto less physical servers, saving hardware, rack space and power
- The hypervisor provides a consistent hardware platform for all virtual machines, even across different physical hardware, allowing a virtual machine to move between physical hosts without any hardware issues
- A single server virtual hardware platform also greatly simplifies server deployment and management

Server virtualisation is possibly the best understood and widest utilised virtualisation model. Server virtualisation moves a server OS from physical server hardware into a virtual machine running on a hypervisor. A single physical server with a hypervisor can host many different virtual machine guests.

Licencing metric considerations

Licencing issues around server virtualisation again depend on the metric for licence usage. The most difficult metrics to work with are the ones tied to the physical device or physical server properties.

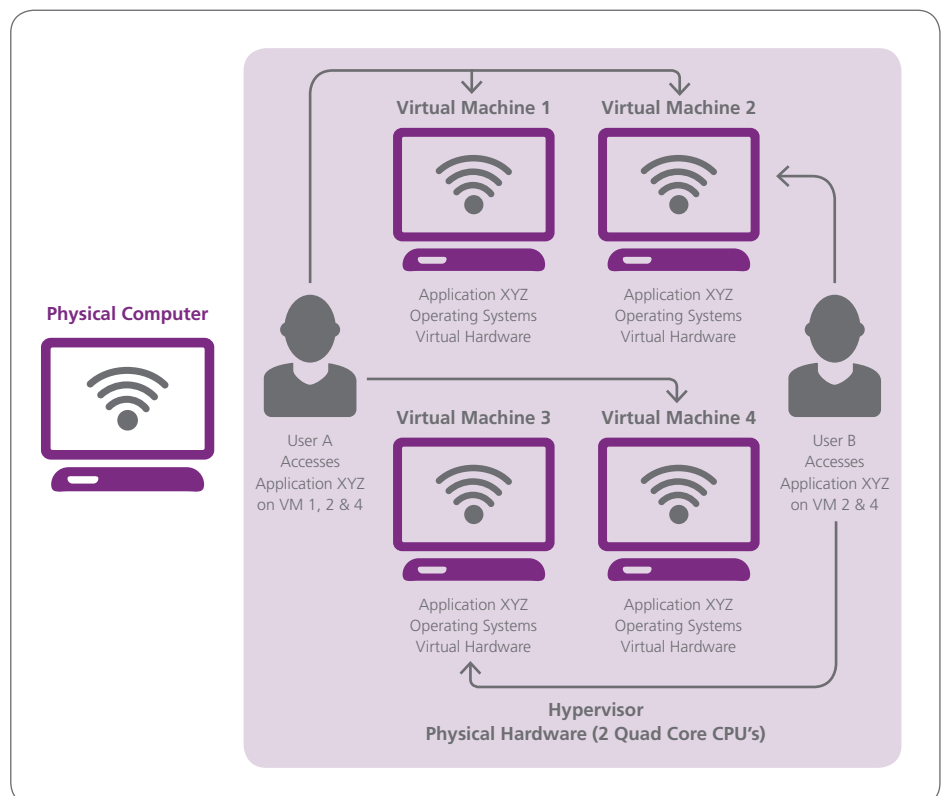


FIGURE 1: EXAMPLE OF DIFFERENT LICENCE METRICS

In the diagram above software XYZ has been installed on 4 virtual machines on the same physical host. Each virtual machine has two virtual processors and the physical host has 2 quad core processors. User A accesses software XYZ on three of the virtual machines and user B accesses the software on two of the virtual machines.

A “per-device” licence may be applied to a physical server and may then licence the application installed on any number of hosted virtual machines. Alternatively, the “per-device” licence may count each virtual machine with the software installed as a separate licence.

In the example above, if software XYZ is licenced per physical device, only a single licence is required. If licenced by both physical and virtual devices then four licences will be required.

A “per-processor” licence may count only the virtual processors of virtual machines that are running the licenced software or the software may require a licence for every physical processor on the physical host computer.

In this scenario, if software XYZ may be licenced by physical processors then two processors licences will be required. If licenced by virtual processors, eight processor licences will be required.

Even a Client Access Licence (CAL)-based licence may differ with server virtualisation. If there are two virtual servers running the same CAL-based software, then one licence model may consider a CAL a connection from a user/ device to the physical server and the other may consider the CAL a connection from a user/ device to the software on the virtual server.

In the example above, if a software XYZ user CAL licence connects to a physical device only, one CAL will be required per user to connect to the physical host (a total of two CAL licences). If a user CAL licence connects to the software on either physical or virtual devices running software XYZ, then five User CALs may be required. User A has a connection to 3 separate virtual machines running software XYZ and user B has two connections.

Licencing and virtual server mobility

As mentioned earlier in this document, one of the primary issues surrounding licencing arises from the mobility features of virtualisation. It can be extremely useful to move a virtual server between physical hosts to support load balancing, maintenance operations or disaster recovery. Some virtual technologies even allow a virtual machine to move between physical hosts without stopping. However, the licences for the software installed on the virtual server may have been tied to the original physical host. When the virtual server moves, it may

require additional or new licences for its new physical host.

For example, an application requires a licence for every physical processor on its host, but allows multiple virtual servers on the same host to run the application. A host with two processors contains two virtual servers running the application and therefore requires two processor licences. One of these virtual servers is then migrated to a different host with four processors. The licences for the migrated virtual server remain with the original host to licence the remaining virtual server and therefore four more processor licences are required for the migrated server on its new host.

Another example is an old single processor server that undergoes a physical to virtual migration, as part of a hardware consolidation, to a new, powerful eight processor server. Unknown to the implementing technician, the legacy server is running software that does not recognise virtual processors. Even though the new virtual server has been given a single virtual processor, it now requires eight processor licences.

These examples demonstrate the possibility of a disconnection between good technical practice for virtualisation and best licencing practice. An environment

may be fully licence compliant at a point in time through consolidation, load balancing and maintenance operations and end up in a non-compliant state without deploying any additional software.

Licencing and virtual server sprawl

Another common compliance risk with server virtualisation comes from the ease of virtual machine deployment. As a result of the simplicity in the deployment of new virtual machines, it is not unusual to see new virtual machines deployed as required to host new services or applications. Even when these systems are only required on a temporary basis, it is not unusual for them to remain in the data centre, especially when there is no asset life cycle management process in place. The “virtual machine sprawl” can be a real risk to licence compliance, because if the virtual servers remain available, they may be considered as part of a licence audit.

Server virtualisation has had the most progress with vendors providing specific guidance and licence types to support virtual environments. Unfortunately, even some of these “virtualisation-friendly” licences are sometimes tied to physical hardware properties and do not contain provisions for all features of server virtualisation, such as mobility.



4. Gaining the maximum benefit from software licencing in a virtualised environment

If your organisation has embarked on the road to virtualisation or is considering a virtualisation strategy in the future, there are a number of actions that can be taken to reduce the risk of unplanned licence costs and licence non-compliance.

4.1. Understand your licences and virtualisation environment

As a first step, you will need to gain a holistic view of your existing licencing agreements and software licence entitlements. These should be considered alongside your ideal virtualised environment. This requires bringing both licencing and technical resources together. It is extremely important to bring the appropriate staff together to develop an accurate understanding of the organisation's current licencing position, how software licences are applicable to their virtualisation environment and what virtualisation operations may have an impact on licence requirements.

Both the licence details and the implementation specifics of existing or planned virtualisation technologies require specialist knowledge. It is important to understand the usage rights and metrics of the existing licences. This may require speaking with licencing partners, resellers and software vendors about what usage rights and policies are applicable to your organisation's use of virtualisation. It is also worthwhile ensuring that licencing vendor or licencing partner (such as an organisation's Large Account Reseller) understand both the current and planned use of virtualisation technologies to ensure that they make appropriate licencing recommendations.

4.2. Implement Software Asset Management principles and technologies

Maintaining licence compliance requires robust Software Asset Management (SAM) processes and suitable technology. Implementing sound SAM practices has many benefits beyond simply maintaining licence compliance. SAM makes it possible to get the most value from existing software licences and can significantly reduce software licencing costs.

Sound SAM practices require full lifecycle management of both physical and virtual devices, management of software licence assignments to devices, clear consistent processes for software deployment, and an ongoing assessment of currently in-use software.

Virtualisation technologies increase the complexity and information required to perform SAM operations. Therefore, it becomes vital to implement clear SAM processes, as well as a suitable toolkit. Sound SAM processes should bring process, technical and licencing experts together to ensure that the licencing implications of any change in the environment are assessed as part of standard practices. In turn, a suitable toolkit should make it possible to have an up-to-date view of all physical and virtual assets, the relationship between them, their licence assignments and currently installed software.

4.3. Do not ignore the challenges or underestimate the risks

Most organisations do not realise that virtualisation technologies make it possible to be significantly under-licensed if implemented and managed in a way that is incompatible with the licence usage rights. There may be a perception that the worst that can result from a software audit is that an organisation will be required to purchase additional licences for any over-deployed software. This perception assumes that the additional licences required would only be a small fraction over the existing licences owned. However virtualisation may greatly magnify the degree of licence non-compliance and lead to greatly increased licencing costs that do not provide any significant benefit to the organisation.

4.4. Talk to the experts

As the adage goes, it's always better to be proactive. Building a clear understanding of the software licencing situation in a virtualised environment requires a high level of both licencing and specialised technical knowledge. It may be challenging to build the necessary team in-house and it may be worthwhile to engage with a company with appropriate expertise in licencing, SAM, systems management and virtualisation.

It is worthwhile for anyone with the responsibility for licence compliance to investigate and follow this topic further, as new information continues to become available. Vendor licence strategies are still changing to recognise virtualisation and will most likely continue to do so. An independent third party organisation with expertise in licencing (such as Dimension Data) can provide organisations with additional information and discussion and ensure that they remain compliant, whilst gaining the most from their software licencing.

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