Lifecycle Management of HCI Systems

Every element of the solution needs attention

Introduction

The pressure on business to act and adapt ever-faster also puts pressure on the IT systems that underpin all the key business services. This in turn places enormous stress on IT departments where, despite a decade of infrastructure consolidation, IT remains technologically complex. For example, systems can be composed of multiple elements of hardware and software, each of which requires monitoring and management.

An increasingly popular way to simplify this IT infrastructure is to use appliance-like solutions which combine software and hardware into an integrated platform. One of the best current examples of this is Hyper-converged Infrastructure (HCI). The problem is that very few application software vendors are also expert in hardware, and vice-versa.

Yet just as these HCI systems are integrated platforms, so their operation and maintenance should also take an integrated approach. This paper therefore looks at the importance of taking a lifecycle view of HCI systems management and the challenges it seeks to address.

HCI usage today

In the last year or two HCI systems have matured rapidly and, just as importantly, experience of using the platforms has grown. The net result is that the use of HCI has extended beyond the workloads for which it was first employed, such as Virtual Desktop Infrastructure (VDI) and Virtual Machine (VM) hosting, to encompass many mainstream business applications.

Recent research by Freeform Dynamics confirms the increasing use of HCI to run enterprise applications, including production database systems, high-availability systems and also some mission critical systems.

This growing use of HCI to run business applications makes the operational management of such systems over their lifetime an essential matter for IT departments to address. After all, many, if not most, IT systems can now have a predicted usage cycle of anywhere between three and seven years.

So while the simplicity that HCI brings to bear is obvious, in terms of ease of installation and speed to get up and running, we must look at the impact that the operational requirements of HCI will have on IT.

Every HCI system is a compilation

As mentioned above, HCI is now firmly in the mainstream, and its use is broadening as it supports a growing diversity of business systems. But every HCI system is itself made up of a stack of components, each of which has its own lifecycle of upgrades. Keeping each of these in sync and functioning effectively and securely within an HCI system is no small matter. Let's take a high-level look at a few of the components in turn.

Hardware

Non-IT people often think that IT systems consist of three basic building blocks – servers, storage and networking, and therefore by association consider that HCI systems are built from the same components. While this is conceptually true, it vastly oversimplifies the real situation. Let's dig a bit deeper.

Servers consist of a surprising number of components, the major ones being the CPU(s), memory and I/O. Each of these elements may have its own firmware that enables its operation. And while such firmware does not change as frequently as software tools do, say, it does get updated. Some updates may be functional, and others may address security issues, but at some stage the firmware will need to be updated. In addition, the server itself may have its own management software to facilitate system administration.

The same applies when thinking about the storage in the system. It, too, will be managed using its own software and firmware, and these will also at some stage require updating. Ditto for the networking in the system.

Software

It is stating the obvious to say that, with very few exceptions, IT hardware only exists to run software, usually applications or other functional services. And as with the hardware stack, the software stack will probably consist of multiple components. Of these, the operating system (OS) will certainly receive periodic updates that need to be applied, potentially augmented with occasional emergency security patches.

On top of the OS, HCI systems will also have a virtualization stack, which will also be subject to both types of software updates. And the complexity and depth of today's virtualization stacks, whether you use VMware, Microsoft, Nutanix or some other option, can make their operational management a considerable challenge.

The importance of keeping everything in step

While updating any of these critical elements can be time consuming, there is another matter to bear in mind. This is that each of these elements is linked, directly or indirectly, to at least some of the others. As a consequence, in some circumstances it may not be possible to upgrade any one individual element without taking account of the state of the other elements that it links to.

This challenge is not unique to HCI systems; indeed, it is something that has haunted IT system managers since computing first started to be widely used in business. Understanding the interdependencies between the various hardware components, their firmware and then the various software stacks that run on them has consumed the time of system admins, and has frequently delayed upgrades. After all, no one wants to update any component, be it hardware, firmware or software, to find that the entire system ceases to function.

But one of the primary principles underlying HCI is that platforms should be simple to install, administer and operate over their lifetimes, which will often extend over four, five or six years, maybe longer. It is therefore clear that if we want to maintain the almost "self-managing" status of HCI systems, then we need to address the lifecycle management of the hardware, firmware and software stacks coherently.

So what is HCI lifecycle management?

Managing the lifecycle of applications, with templates for standard deployments, integration with other apps, and of course with software updates, is not trivial but it is at least a known process. Ditto managing the hardware lifecycle, with new firmware, driver updates, etc.

Where it gets interesting is combining the two while avoiding conflicts, assuring compatibility, managing dependencies, etc. For example, the software solution stack vendor will almost certainly have compliance requirements for hardware components and drivers, known as Hardware Compatibility Lists (HCLs). Similarly, the hardware vendor may have its own support matrix of tested firmware and software. Getting either of these wrong can make support calls to the hardware and software vendors difficult and can even cause severe system operation problems.

And finally, the organization may have its own standards to be followed if they do not wish to have to implement every hardware, firmware or software update.

There are several approaches to lifecycle management that could be applicable to HCI platforms.

Administer every element individually: The first involves the IT team administering every element of the HCI platform individually. That's the underlying hardware and firmware, the hypervisor itself and then the entire hypervisor stack. As mentioned above, this approach is complex and time consuming, but perhaps most importantly it goes against one of the founding concepts behind HCI, namely simplicity of administration.

Manage the hardware/firmware/drivers: This approach seeks to look after the core hardware and firmware in the HCI platform automatically. Indeed, some platform vendors have developed sophisticated solutions to administer these core elements, usually on platforms built by the supplier.

This approach helps speed up platform installation, set-up and ongoing operations by coming packaged as an appliance. This takes away the need for the IT team to design and build the HCI system from blueprints or reference architectures.

It is important to look for vendors that include full certification of the hardware components, because this should allow automatic updating of firmware without creating any internal system conflicts. However, while this approach is a good start, it does not usually link to the hypervisor system on which the VMs will run. It therefore

leaves open the possibility that the hypervisor platform and its management stack may conflict with the underlying hardware platform.

Manage hardware/firmware/hypervisor and hypervisor stack: To make the entire HCI system more straight-forward to install and operate, a few vendors have included tools that extend the functionality described above to include the hypervisor software, and then integrate into the management stack of the hypervisor itself.

This approach takes the lifecycle management concept closer to becoming an "end to end" solution. But in order to function effectively, the tool must be able to check the software components against the underlying hardware and firmware to identify potential conflicts between software and firmware levels. The tool must then be able to automatically install the appropriate upgrades in the correct order to ensure that the upgraded system is fully operational and secure.

The automation of updates, along with the remediation of potential software / firmware conflicts, is likely to be extremely valuable, especially given that HCI systems are designed to be simple to expand and modify by the addition of hardware nodes. Without automation tools to help with the software installation and updating, it can be challenging to keep clusters of nodes operating resiliently. More importantly, the lack of automation may compromise the ability to quickly and easily modify HCI systems to meet changing user requirements.

HCI lifecycle management via integrated solutions

Today most of these HCI lifecycle management tools are delivered via integrated HCI systems, i.e. complete systems that are acquired directly from a trusted enterprise solution vendor. If this approach is not taken, the alternatives are to build systems from a template using prescribed components from the hardware compatibility list mentioned above or to do everything bespoke. Both approaches are time intensive and, as has been mentioned, prone to manual error with so many components and interdependencies. They also, to a greater or lesser degree, run counter to the underlying "keep it simple" idea behind HCI.

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But when acquiring an HCI solution that has integrated tools to assist in the lifecycle management, there are some key points to bear in mind, both technically and in terms of the supplier relationship.

Things to think about

Here are a few questions to consider as you look at acquiring HCI solutions:

- Does your supplier have solutions with the operational characteristics you need to support the range of business applications to be run on HCI?
    - After all, one size will probably not fit all of your potential use cases.
- How comprehensive are the HCI lifecycle management capabilities your vendor provides?
    - Are they restricted to the hardware / firmware stack or do they reach deep into the hypervisor and its management stack?
- Does the supplier understand the whole virtualization stack, or stacks, that you will be using?
    - If not, what takes priority, the hypervisor software stack or the hardware?
- How well do these tools handle multiple generations of HCI systems?
    - As your use of HCI expands you will probably acquire HCI kit over many years, but it all needs to function together.
- Does the supplier have local support wherever you plan to use HCI?
    - Rapid 24x7, local-language help when needed.
- Does the HCI lifecycle management solution integrate with the broader IT ecosystem you have in place?
    - HCI is growing rapidly, but from a relatively small base and unless you are a small company you are unlikely to replace your entire infrastructure with HCI in one go.

In summary

The use of HCI systems is growing and the range of business workloads it supports is spreading to encompass even some mission-critical ERP systems. But for HCI usage to continue to expand rapidly, it is essential that the operational management and administration of the systems be as simple and automated as possible.

This not only saves time and money, it can also enhance reliability and resilience, as well as enabling IT to respond quickly to changing business demands. But it also needs to fit into your broader IT ecosystem, and crucially, to be able to do so for many years ahead. As the digital transformation of businesses ramps up, the importance of IT will continue to grow.

On-site IT is not yesterday's requirement: Hybrid IT combining on-site and public/private cloud solutions is the new-normal. This means that internal IT, including HCI, needs to have cloud-like characteristics such as simplicity and longevity. However, you cannot afford to think that the underlying system is unimportant just because it is built from "commodity" components; in HCI, the platform components are essential and foundational, and they need to be managed as such.

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