SAP on Private Cloud

Next Level Enterprise
with Hyperconverged Infrastructure

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Contents/

Executive Summary/

- **Hyperconverged Infrastructure = Infrastructure 2.0 –** Digital Transformation changes the demands made of IT Infrastructure. Global business models and highly scalable cloud or IoT workloads cannot be run optimally using traditional IT Infrastructure. Hyperconverged Infrastructure (HCI) deliver an important building block for the „Next-Generation Infrastructure" of companies. Indeed, already a huge number of companies especially with more than 500 employees already have Hyperconverged Infrastructure in place.

- **HCI is ready for enterprise use –** Hyperconverged Infrastructure have reached a high level of technological maturity in recent years in terms of performance, security and architecture. Current product generations are largely hardware-independent, highly automated and completely „software-defined", which offers a variety of advantages for users.

- **HCI as a central component of digital Infrastructure –** The combination of multiple implementation options (hybrid cloud environments, from web enterprise workloads), ease of administration, and low cost are increasingly turning HCI into an all-purpose weapon for businesses. In this way, companies that use HCI benefit from agile and flexible Infrastructure that support the digital transformation process.

- **Out of the complexity trap with Hyperconverged Infrastructure –** In comparison to conventional server, storage and network Infrastructure, HCI drastically reduces complexity and administrative effort for IT managers. This is especially true in terms of enterprise workloads and mission-critical applications within complex multi-tier architectures.

- **SAP and enterprise applications as HCI drivers –** While HCI was primarily being used for web workloads up until a few years ago, HCI is now mainly used for the operation of enterprise workloads. SAP applications based on SAP Netweaver, as well as SAP HANA-based workloads and analytics, have become the drivers of HCI usage among businesses.

- **SAP operation meets Nutanix –** SAP and HCI pioneer Nutanix have been working together in a strategic partnership for several years to make certified secure and compliant SAP workloads available on HCI. This is now the case for a large portion of SAP's application and technology portfolio, as well as for the „production" versions of the applications and not just for Test & Dev. This is an important step for SAP users who are looking for agile and automated Infrastructure for next generation SAP operations.

#01

HCI Evolution

from Niche Product to Datacenter Standard

#01

HCI Evolution – from Niche Product to Datacenter Standard

Hyperconverged Infrastructure (HCI) have enabled a new concept based on a highly integrated and efficient infrastructure stack to be developed further.

The HCI concept focuses on virtual machines as a basic component of every infrastructure stack. Hyperconverged Infrastructure combine hypervisor technology, data services, computing capacity (processors and RAM), storage systems (SSDs and hard disks) and connectivity as virtual and abstracted resources, which can be managed with a unified administration and management solution.

The use of cost-effective standard hardware (mostly X86) and the replacement of monolithic storage systems (NAS, SAN) through software-defined storage concepts offers significant potential and advantages in set-up, as well as in operational business. HCI functionality can be demonstrated via a meshed network of resources, in which each node represents an autonomous but redundant component of the network. In doing so, memory and computing capacities are virtualized, but also closely connected. This enables more flexibility, as well as outage protection.

Hyperconverged Infrastructure have reached a high level of technological maturity in recent years in terms of performance, security and architecture. Thus, today's product generations are mostly hardware-independent, highly automated and completely „software-defined", which offers users a wide variety of advantages. For example, HCI empowers data center managers and IT administrators to achieve simple and effective integration between individual basic components (network, server, storage). One could also say that HCI builds the „bridge between the silos" that is still missing within many companies.

Because despite a large number of partnerships and certifications between the providers, these oft-quoted IT infrastructure „silos" (departments) resulted primarily from a lack of abstraction and integration. This approach, which utilizes different manufacturers across servers, storage and networks is still popular today. Unfortunately, in many scenarios, it blocks a holistic way of thinking and innovative approaches within the framework of an organization's own infrastructure. Since the operational business includes different hardware components and the manufacturer's own administration and management tools, a holistic perspective and a unified, efficient IT operation become more difficult to achieve.

In order to meet the infrastructure challenges and requirements that have arisen over the last few years, so-called „Converged Systems" or „Converged Infrastructure" have been developed and promoted. These „Converged Systems/ Infrastructure" focus on closer integration of the core components (servers, storage and network) within a framework of pre-configured and consistently certified appliances. However, the problem with these Converged Systems/Infrastructure was always that they involved a bundling of subcomponents from different suppliers and - above all - a combination of different management tools and processes for servers, storage and networks. For this reason, a Converged Systems/Infrastructure can only really be seen as a stepping stone to a highly automated IT operation.

// Evolution path of Hyper Converged Infrastructure

Traditional data center integrated system 1.Generation

Converged infrastructure 2.Generation

Hyperconverged Infrastructure 3.Generation
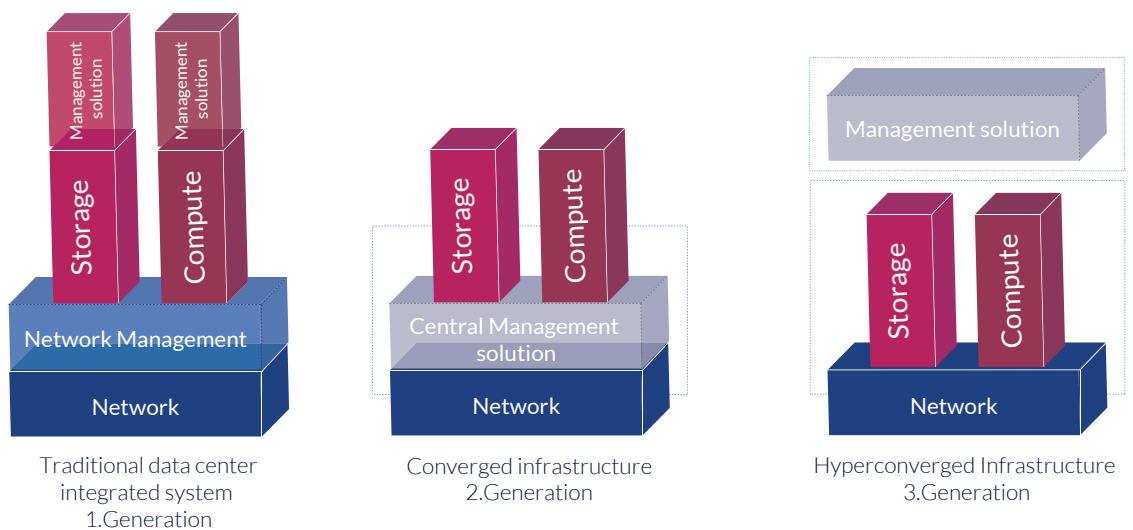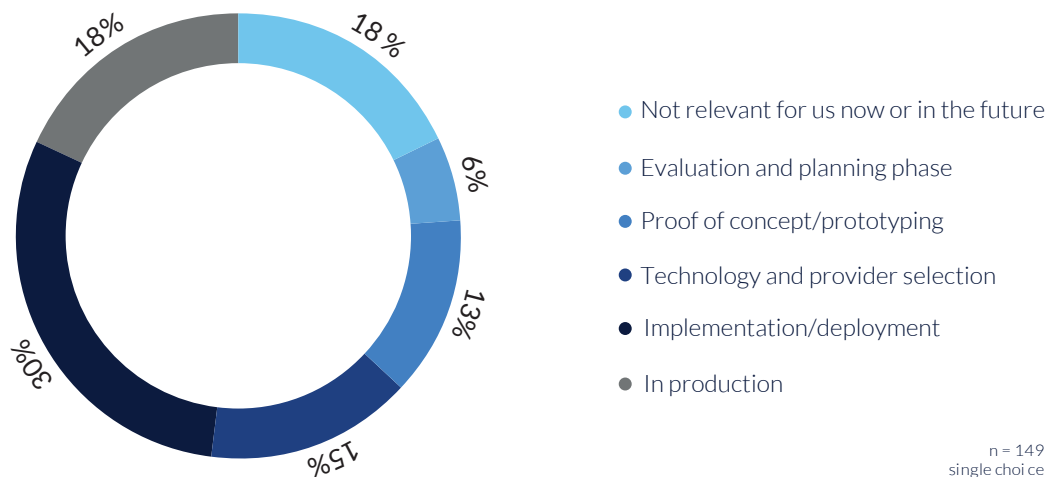
// Source: © crisp research AG, 2018

The question now arises as to whether HCI can establish itself within companies after two evolutionary phases, and the extent to which companies are already investigating HCI. The following picture emerges:

#01

HCI Evolution – from Niche Product to Datacenter Standard

// Source: © crisp research AG, 2018

For example, in Germany, according to a recent empirical study by Crisp Research, the majority of companies are actively involved with the Hyper-converged Infrastructure topic. Almost one in five companies already uses HCI in their production environments. This shows that medium-sized and large companies are actively searching for innovative technologies and infrastructure concepts for their data centers, especially as the global public cloud providers are putting pressure on internal IT departments with a wide range of innovative services.

// In which stage of development does your company currently find itself, with regard to the implementation of hyperconverged infrastructure?

18%   18 %   6%   13%   15%   30%

- Not relevant for us now or in the future
- Evaluation and planning phase
- Proof of concept/prototyping
- Technology and provider selection
- Implementation/deployment
- In production

n = 149
single choice

#02

Engine of the digital age

HCI as basis for the Enterprise Cloud

#02

Engine of the digital age - HCI as basis for the Enterprise Cloud

HCI is a concept that allows for the operation of different workloads, based on virtual resources, while meeting the established requirements of an „Enterprise-Grade" IT infrastructure (e.g. reliability, availability). This means that on the one hand, Hyperconverged Infrastructure are suitable for the development and operation of new digital workloads, but on the other, it is also possible to maintain secure and agile "cloud-style" operation of business-critical workloads. The essential characteristics of the current generation of Hyperconverged Infrastructure are:

- **Predictable Performance:** Due to the virtualization of computing power and storage capacity, Flash-based memory can be addressed directly, without latency and connectivity problems causing bottlenecks. This in turn leads to a high level of I/O performance and scalability.

- **Complexity management and operational efficiency:** Through the combination of Distributed File Systems and technologies, HCI offers high compression, reduplication and efficient data management. Traditional and more complex NAS/SAN structures are no longer needed, which makes administration easier and has a positive impact on Total Cost of Ownership (TCO).

- **Reduced risk:** HCI can help to significantly reduce operational risks with regard to availability, reliability and data security. Through linear scaling - i.e. the ability to simultaneously add nodes and their associated resources to the environment such as servers, memory, and RAM - HCI is able to handle the failure of a node, since the data can be replicated on multiple nodes using Redundant Array of Independent Nodes (RAIN).

- **Improved flexibility & agility:** The HCI architecture, as well as the integrated administration and management tools, enable IT managers to deliver new environments in very short timeframes. This applies not only to test or integration, but also to complete production environments e.g. SAP workloads. Support for a wide range of hypervisors and operating systems gives administrators the necessary freedom to support new requests quickly and to create a new culture of „agility" in practice.
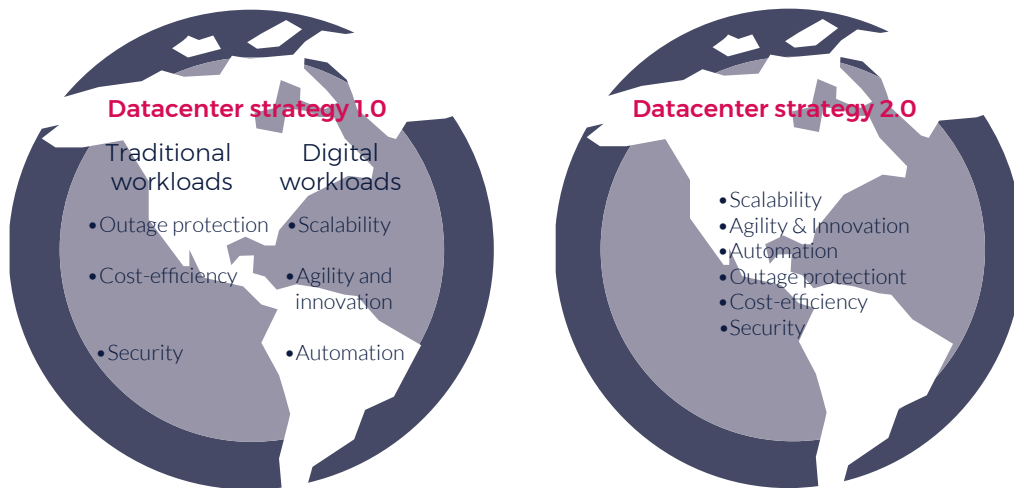
The advantages of HCI have now been established and play an important role within modern IT Infrastructure. Nevertheless, the specific design of a modern, future-proof infrastructure strategy is not a trivial matter, because it involves the reconciliation of different objectives and requirements.

For a long time, very few Infrastructure were compatible with these objectives (and most infrastructure architectures still aren't). For example, the planning and operation of traditional IT Infrastructure is still based around the credos of reliability, cost efficiency (TCO) and performance i.e. they remain faithful to the „Faster, Better, Cheaper" philosophy. For the operation of traditional enterprise applications such as ERP or databases, these requirements will remain valid.
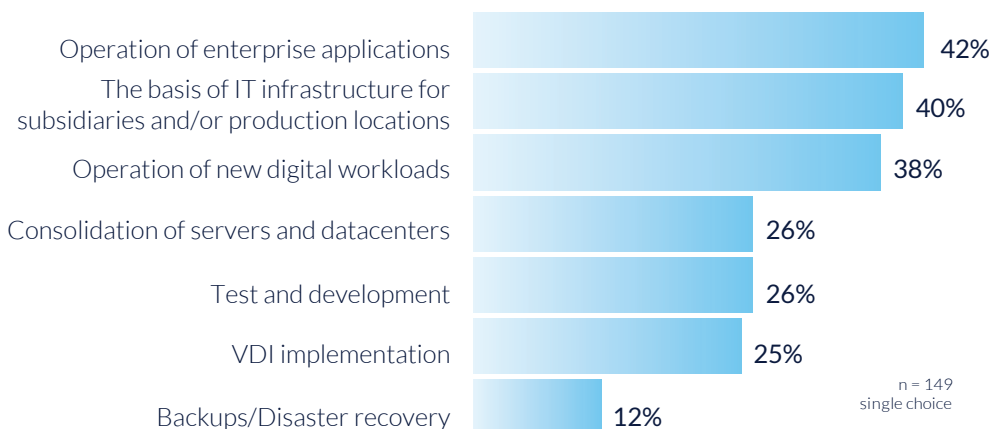
However, new requirements are coming into play, especially in relation to the generation of new, digital workloads, in terms of higher innovation speed, greater scalability and the compatibility of public cloud resources within the context of hybrid cloud and multi-cloud architectures. Here, too, these requirements are an essential component of traditional enterprise applications.

#02

In addition to high cost efficiency, a significantly greater level of infrastructure complexity must be managed. This makes a higher degree of automation and a deeper integration of the core components indispensable, and leads on the technological side to „Hyperconverged Infrastructure" (HCI).

// Datacenter strategy in a changing world

Datacenter strategy 1.0

Traditional workloads

- Outage protection
- Cost-efficiency
- Security

Digital workloads

- Scalability
- Agility and innovation
- Automation

Datacenter strategy 2.0

- Scalability
- Agility & Innovation
- Automation
- Outage protectiont
- Cost-efficiency
- Security

The development of HCI application scenarios is just as exciting to observe. HCI, for example, is now mainly used for the operation of enterprise workloads such as SAP. This change has been driven by the development and technological maturity of HCI on the one hand, and on the other, the fact that many organizations have discovered the benefits of HCI for themselves in the meantime.

// In which application areas will Hyperconverged Infrastructure be used primarily in the future (until 2020)?

Application area	%
Operation of enterprise applications	42%
The basis of IT infrastructure for subsidiaries and/or production locations	40%
Operation of new digital workloads	38%
Consolidation of servers and datacenters	26%
Test and development	26%
VDI implementation	25%
Backups/Disaster recovery	12%

n = 149
single choice

#03

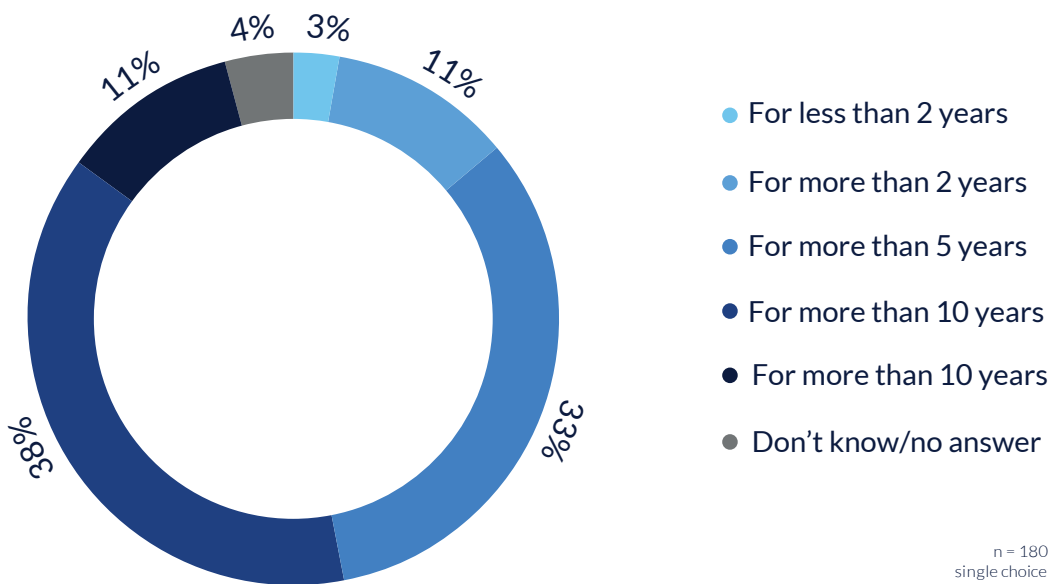# Future SAP operations

agile and stable

#03

Future SAP operations - agile and stable

The operation of enterprise applications is therefore one of the main uses for HCI. Medium-sized and large companies tend to use SAP for central ERP workloads. In fact, according to a recent study by Crisp Research, 75 percent of companies use SAP software to support their business processes.

The number of companies that have used SAP applications for a very long time is just as interesting as the proportion of them that have deployed SAP applications. The fact is, most companies have the benefit of a long history of using SAP. So, around 80 percent have been using SAP for more than 5 years. In addition, around 40 percent of companies started introducing SAP over 10 years ago. Moreover, almost 11 per cent have a „marriage-like" relationship of over 20 years with the Walldorf-based software and solution supplier.
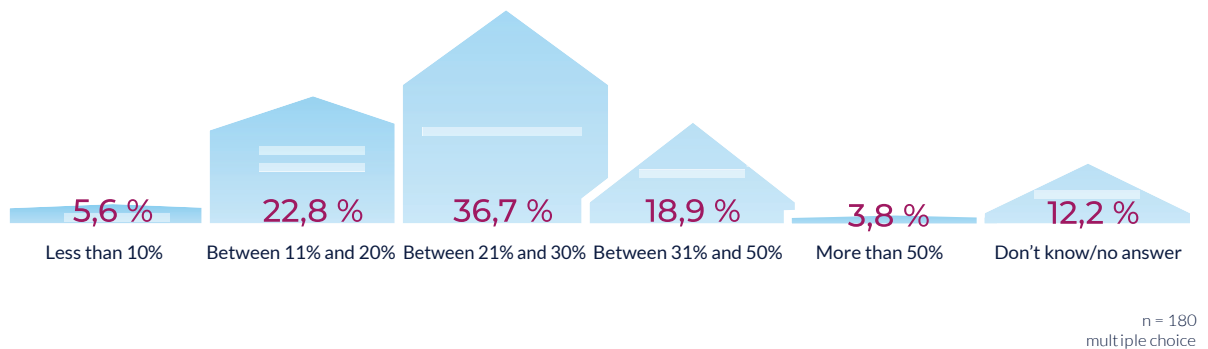
// How long has your company been using SAP solutions?

// Source: © crisp research AG, 2018

- For less than 2 years
- For more than 2 years
- For more than 5 years
- For more than 10 years
- For more than 10 years
- Don't know/no answer

n = 180
single choice

The significance of SAP as one of the central and strategic software plat-
forms within organizations is also indicated by SAP's share of their overall
IT budgets. In fact, every fifth company spends between 11-20 percent of
its IT budget on SAP. Around two thirds invest between 20-50 percent of
their funds in the development, integration and operation of SAP systems.
A small minority (4 percent) spend more than half of their IT budget on SAP.

// How significant was the SAP portion of your overall IT budget in 2017?

5,6 %	22,8 %	36,7 %	18,9 %	3,8 %	12,2 %
Less than 10%	Between 11% and 20%	Between 21% and 30%	Between 31% and 50%	More than 50%	Don't know/no answer

n = 180
multiple choice

// Source: © crisp research AG, 2018

It is clear that a large proportion of SAP users will migrate parts of their SAP
landscape to the public cloud platforms of Azure, SAP and others.

// How will you run your SAP workloads in the future?

7,3 %

12,7 %

15,3 %

64,7 %
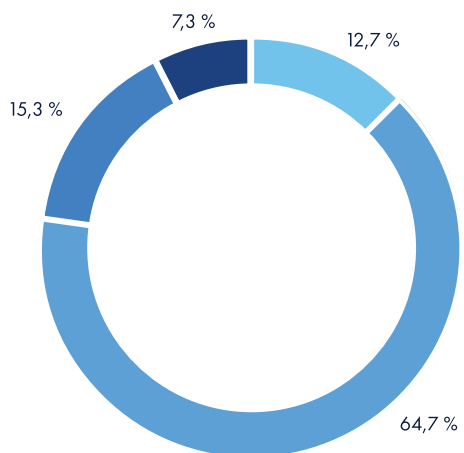
- Pure Public Cloud: We plan to migrate all our SAP Systems to the cloud and run them there
- Hybrid Cloud: We will run some of our SAP in the Public Cloud and integrate them closely with existing systems
- SaaS-first: We will buy SAP systems as "Software-as-a-Service" in the future
- Don't know/no answer

n=150

// Source: © crisp research AG, 2018

#03

This means that mixed and/or hybrid IT and cloud environments will emerge. Indeed, the majority of IT decision-makers (65 percent) expect to operate parts of their SAP systems in the public cloud but integrate them tightly with the company's existing systems. Increasingly, companies will therefore choose a hybrid environment - public and private cloud – for their SAP operations, in order to accommodate the requirements of digital transformation. In this way, a hybrid cloud can combine the advantages of these two concepts in a unified operational and management concept. For business and data protection-critical applications in particular, a hybrid cloud provides more choice and security, in that certain application elements and data sets can remain on their own Infrastructure.

Different dependencies exist between Hyperconverged Infrastructure and hybrid cloud environments:

- Cost-effectiveness
- Scalability
- Geographical diversity and disaster recovery

Hyperconverged Infrastructure are ideal for building and operating private cloud environments, because they significantly reduce complexity and accelerate time-to-market across planning, implementation and operation. That's because through the coordination of individual hardware components and management tools, users no longer have to deal with them directly (see comparison above).

#04

SAP on HCI

Opportunities and Benefits for SAP users

#04

SAP on HCI - Opportunities and Benefits for SAP users

- **Predictive performance and high scalability:** SAP on Hyperconverged Infrastructure offer companies the opportunity to work with „small" deployments (e.g. test, regional rollouts, etc.) initially, before implementing them company-wide or globally. Linear scalability enables consistent application deployment and smooth rollouts without interruptions and maintenance windows.

- **Improved availability:** HCI now also provides high availability options for SAP application servers and databases. Snapshot-based data backups also enable simple and cost-effective disaster recovery with sync options. The result is that running SAP Applications on HCI offers one of the most resilient operating environments available.

- **Reduced TCO and operational complexity:** The use of standard hardware and integrated management tools for servers, storage and networks, as well as largely automated scalability over a large number of nodes, enable significantly lower operating costs.

- **Reliable deployment of SAP applications:** SAP HANA as well as SAP NetWeaver applications and stacks can be operated without any problems on Hyperconverged Infrastructure. In fact, the Enterprise Cloud Platform OS from Nutanix is the first Hyperconverged Infrastructure certified for SAP HANA and NetWeaver. SAP and Nutanix provide organizations with seamless support in this area.

#05

SAP on HCI

Architecture and Solution Concepts

#05

A number of requirements must be met to operate SAP workloads in a secure and certified manner on a specific infrastructure. Hyperconverged pioneer Nutanix and SAP have been working together for several years to address this challenge.

The key results / milestones of the partnership are:

- Nutanix announces first partnership including certification for the operation of SAP workloads on Hyperconverged Infrastructure

- Support for SAP Netweaver and SAP HANA

- Nutanix Enterprise Cloud OS platform for production and for Dev/Test environments becomes available

- Hybrid architectures and operational concepts possible

The following graphic illustrates the logical design of the Nutanix solution with SAP HANA and SAP Netweaver, and shows the distribution of different roles at the infrastructure level. On the left-hand side is the SAP NetWeaver Application Server. On the right-hand side are the E7-based appliances, on which the SAP HANA databases are run.

// Source: Nutanix

www.crisp-research.com
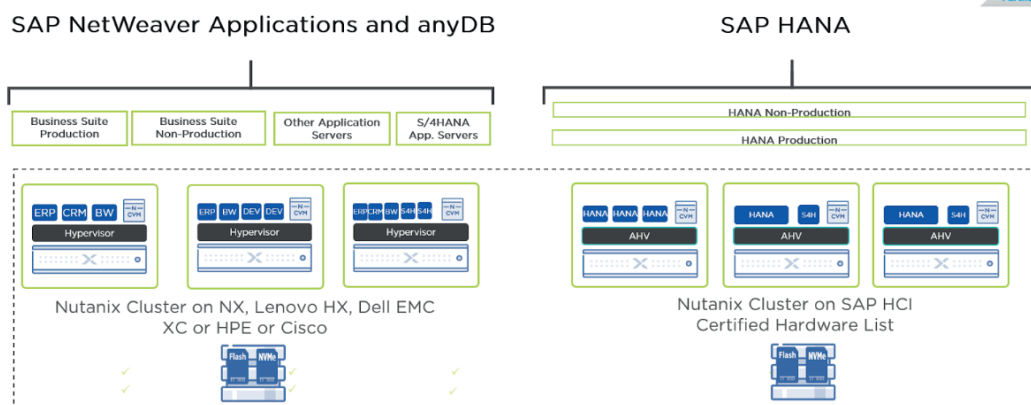
Before SAP Applications can run on Hyperconverged Infrastructure, you must initially consider the following issues/ ask and answer the following questions:

SAP Netweaver vs. SAP HANA DB

With HCI on Nutanix, companies can simplify the operation of their SAP landscape.

Nutanix offers a certified SAP HANA solution to deploy SAP NetWeaver workloads on the Nutanix Enterprise Cloud Platform, and to integrate and operate SAP HANA databases on certified appliances from Nutanix partners. In this way, enterprises can enjoy the full functionality of SAP NetWeaver and SAP HANA on HCI from Nutanix. The benefits include:

- Localized I/O and Flash for index and key database files enable low latency operation.

- Uninterrupted upgrades and scalability, including one-click node addition without system downtime.

- Nutanix VM, and app-centered data protection and disaster recovery for backup automation.

- Ease of use for storage management, and the elimination of complicated configurations, manual provisioning and mapping with hard disks, RAID and LUNs.

Dev/Test vs. production environment

SAP HANA applications can be run on the Nutanix Enterprise platform in non-production (test/dev) or production environments. The test and development environment within the infrastructure should correspond with the production environment, especially with regard to SAP applications and the associated production processes. Significant differences between the test/development environment and the production environment, and a lack of proper alignment between the two may have a negative impact on the infrastructure.

#05

Database, Application and User Interface tier architecture concept

A Database, Application and User Interface tier SAP architecture is recommended for the operation of business-critical SAP systems for the following reasons:

- Operational efficiency

- Security/ Reliability

- Easy scalability when needed

With multi-tiered deployments, organizations can fully utilize the virtualization of an SAP landscape. Administrators can deploy separate application servers on demand with little manual effort. In addition, administrators can use the SAP load-balancing mechanisms and distribute the payload efficiently among the application servers. Since application servers and database servers have completely different resource consumption patterns, they are improved by this separate provisioning. In addition, a multi-tier architecture simplifies the monitoring of resource usage.

Compared to a Database, Application and User Interface tier architecture, a combined Database/Application tier architecture would appear to be easier to implement. However, it may be more difficult to use and synchronize later on.

Hypervisor selection

The choice of hypervisors is an essential element in the architecture planning and configuration of SAP applications on HCI because they guarantee the ability to operate SAP applications on different operating systems. Nutanix supports three different hypervisors for its Enterprise Cloud Platform, providing freedom of choice for users:

- Nutanix AHV

- VMware ESXi

- Microsoft Hyper-V

Sizing and Capacity Management

When sizing SAP HANA and SAP NetWeaver environments, it's important to observe how many virtual machines and containers are required for the different phases of the planned deployment.

SAP HANA requires considerable expertise in dimensioning. The correct dimensioning strongly depends on the usage scenario for the SAP HANA database.

When dimensioning SAP NetWeaver, the key criteria are:

- Controller VM Utilization

- Virtualization

- CPU Oversubscription

- Memory IOPS

HCI in hybrid IT operation on the Public Cloud

For hybrid operating concepts consisting of HCI and additional Public Cloud-resources, it is important to dimension the SSD layer for scheduled workloads correctly. The SSD or Flash level must be able to handle the entire active work record of the application. This applies to the database server in particular.
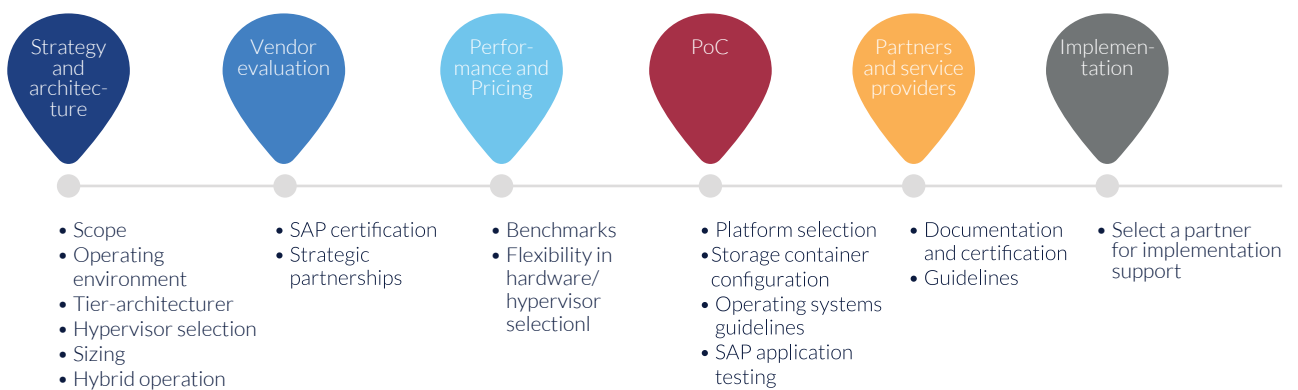
#06

SAP on HCI

SAP on HCI - from POC to implementation

Hyperconverged Infrastructure bring many of the advantages of the big cloud players into the enterprise data center environment. The opportunities and innovation potential are enormous (see above). In particular, when it comes to operating high-performance architectures and workloads such as SAP HANA, there are also additional requirements to consider. Therefore, these workloads must be run on HCI or hypervisor architectures which have exceptional levels of performance, API-based automation and analytics, as well as specialized storage models / technologies (e.g. Nutanix AHV).

However, IT and corporate decision makers must take into account that the use of HCI presents key challenges and requires changes with regard to IT organizations and processes. In this way, the boundaries and processes between server and storage Infrastructure are eliminated or become blurred. Companies whose teams are working autonomously against the backdrop of legacy Infrastructure today will have to rethink their approach in order to to play an important role within their own organization in the future.

The following procedural model can be used as a blueprint to find an optimal route from the PoC to the operation of Hyperconverged Infrastructure in the data center:

// Roadmap for implementation of SAP auf HCI

Strategy and architecture	Vendor evaluation	Performance and Pricing	PoC	Partners and service providers	Implementation
• Scope • Operating environment • Tier-architecturer • Hypervisor selection • Sizing • Hybrid operation	• SAP certification • Strategic partnerships	• Benchmarks • Flexibility in hardware/ hypervisor selectionl	• Platform selection • Storage container configuration • Operating systems guidelines • SAP application testing	• Documentation and certification • Guidelines	• Select a partner for implementation support

// Source: © crisp research AG, 2018

#07

Outlook & Recommendation

Despite the simplified administration and the significantly lower complexity offered by Hyperconverged Infrastructure, IT infrastructure modernization and the conception of new operational models are challenges that many companies – and small and medium-sized enterprises in particular – are tackling together with a service partner.

In the meantime, HCI has evolved to the point that it can support a wide range of services and IT operational concepts. When it comes to planning and implementation, organizations should consider the following:

- **Holistic integration into overall organizational IT strategy:** To exploit the full potential of HCI, the concept must be fully integrated into the company's own IT strategy.

- **Analysis and definition of the relevant applications areas:** Before individual tests and PoCs can be started, it's important to define in which application areas HCI will play an important role.

- **Implementation of PoCs:** Companies should test HCI themselves extensively and decide whether the solution meets their own requirements. HCI manufacturers generally offer the opportunity to perform a feasibility study for solution implementation.

- **Definition of the impact on IT operations including personnel/organizational planning:** The company-wide use of Hyperconverged Infrastructure has organizational and procedural implications. Companies should actively integrate their HCI providers and service providers in designing the new teams and processes (or the reorganization thereof), and evaluate the effects in advance.

- **TCO Analysis:** Users should evaluate the possible savings effects as precisely as possible and, together with consultants/partners, evaluate the additional consequences in terms of personnel deployment and process automation.

About Nutanix/

Nutanix is a global leader in cloud software and hyper-converged infrastructure solutions, making infrastructure invisible so that IT can focus on the applications and services that power their business. Companies around the world use Nutanix Enterprise Cloud OS software to bring one-click application management and mobility across public, private and distributed edge clouds so they can run any application at any scale with a dramatically lower total cost of ownership. The result is organizations that can rapidly deliver a high-performance IT environment on demand, giving application owners a true cloud-like experience.

Learn more at www.nutanix.com or follow us on Twitter @nutanix.

About Crisp Research/

Crisp Research is an independent IT research and advisory company headquartered in Kassel, Germany. With a team of experienced analysts, consultants and software developers Crisp Research evaluates and predicts future technology and market trends. We help IT vendors strengthen their market position, enable sales teams with cloud-based sales instruments and provide competitive insights.

For CIOs, we offer a wide range of research-based advisory and benchmarking services. Our main research focus topics are Cloud Computing, Digital Business Transformation and the Internet of Things.

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