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Composable infrastructure, with its inherent flexibility, will be critical for future proofing today's IT infrastructure for the needs of tomorrow's healthcare organizations.

Composable Infrastructure: Taking Software-Defined Infrastructure to the Next Level

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Written by: Lynne A. Dunbrack, Group Vice President, IDC Health Insights

Introduction

Modernizing IT infrastructure has become a business imperative as healthcare organizations (HCOs) attempt to keep up with the rapid pace of change occurring today. New and evolving business models focused on value-based health are changing how care is delivered and reimbursed. Market disruptions — from big tech, retailers, new entrants in other industries, and start-ups and even from within HCOs digitally transforming themselves — underscore that HCOs must be nimble to remain competitive. IT needs to be agile, scalable, reliable, and flexible to support new business and clinical optimization opportunities. Unfortunately, most legacy systems are too rigid to respond quickly to new business, technology, and regulatory requirements.

Forward-thinking HCOs are modernizing their infrastructure by accelerating their adoption of 3rd Platform technologies (e.g., cloud, mobile, big data and analytics, social technologies) and deploying multicloud storage and software-defined infrastructure (SDI). A more modern architecture ensures the highest level of data availability, reliability, and cost efficiency.

AT A GLANCE

KEY STATS

65% of U.S. providers and 60% of U.S. payers reported that they are currently making investments to modernize their IT infrastructure, and the majority will continue to do so in 2020–2021.

WHAT'S IMPORTANT

To respond to today's rapidly changing healthcare environment, healthcare organizations are looking to composable infrastructure for its deployment speed measured in seconds, ability to support multiple workload types at enterprise scale, and highly flexible resource pools to deliver a cloudlike experience from an on-premises datacenter.

Composable infrastructure takes software-defined infrastructure to the next level. Components can be easily assembled into preferred configuration or resource pools to create the infrastructure IT needs to deliver a cloud experience from an on-premises datacenter. This enables IT to scale resources up or down to meet performance and service-level objectives for any workload. Resources can be allocated to GPU-intensive applications, such as medical imaging or genomics research, as needed to optimize performance through virtualization. A virtualized client experience provides secure access to patient data and clinical applications across the enterprise, from any device.

Composable Infrastructure Defined

Composable infrastructure abstracts compute, storage, and networking resources, which can be managed and provisioned by software as if they were cloud services. Composable infrastructure can also be described as "infrastructure as code." The resources can be quickly scaled up or down depending on the performance and service-level agreement (SLA) requirements of the workloads. While the approach is like a public cloud, composable infrastructure sits on-premises in an enterprise datacenter while providing the benefits of a cloud experience, including faster deployments and elastic compute and storage resource allocations.

Composable infrastructure provides IT with more flexible options (see Table 1). Unlike converged or hyperconverged systems, the highly scalable agile, composable systems are not preconfigured for specific workloads. Workload types can be bare metal, virtual machines, or containerized. It is easier to assemble components into preferred configurations or resource pools enabling IT to create the infrastructure it needs on demand. Deployment time is measured in seconds versus days or minutes for converged or hyperconverged infrastructures, respectively. Workflow automation for composable architecture is more advanced than for other infrastructure options.

TABLE 1: ***Key Differences Between Traditional, Converged/Hyperconverged, and Composable Infrastructure***

Attributes	Traditional	Converged	Hyperconverged	Composable
Deployment speed	Months	Days	Minutes	Seconds
Workload type	Bare metal and virtual machines	Bare metal and virtual machines	Virtual machines only	Bare metal, virtual machines, and containerized
Workload scale	Enterprise grade	Enterprise grade	SMB only	Enterprise grade
Resource scaling	Independent	Flexible	Fixed linear scaling	Highly flexible
Workflow automation	Limited	Limited	Virtual only	Advanced, single tool

Source: IDC, 2020

The ability to automate operations through software-defined infrastructure takes the complexity out of IT operations and service delivery, thus reducing the dependency on specialized teams. This is particularly critical considering the rapidly changing environment due to the global COVID-19 pandemic. IT staff are rallying to deploy the necessary connectivity, collaboration, and security infrastructure to enable certain staff to work from home and to light up temporary triage areas and ICUs to test and care for the surge of COVID-19 patients. Time savings from operational efficiency and staff productivity will accelerate the responsiveness of IT staff in supporting their clinical colleagues on the front line. Ultimately, cost savings can be reinvested in digital transformation initiatives that have been set in motion to find new ways to provide care and services safely during a pandemic and that will continue forward in the months to come.

How Will Healthcare Organizations Benefit from Composable Infrastructure?

The benefits of a more modern healthcare IT infrastructure accrue to both IT and healthcare professionals and, ultimately, patients through improved clinician access to patient health information. Composable infrastructure, with its inherent flexibility, will be critical for future proofing today's IT infrastructure for the needs of tomorrow's healthcare organizations. Automated provisioning and orchestration free up IT resources to focus on innovation rather than maintenance. Workloads can be dynamically moved into a multicloud environment, allowing IT to respond quickly to new technology and business requirements and accelerating the speed to value for digital transformation initiatives. CIOs will therefore be able to play an increasingly strategic role and work more closely with lines of business (LOBs) on strategic initiatives.

IT Professionals Benefit from Composable Infrastructure

- Shared pool of resources optimized in real time
- Improved efficiency and flexibility
- Support for all workloads — physical, virtual, and containerized
- Ability to enable hybrid IT environment
- Improved capex and opex savings
- Scalable infrastructure available on a pay-as-you-use basis
- Everything as a service

Executives and Healthcare Professionals Benefit from Composable Infrastructure

- Reduced data silos across clinical departments
- Accelerated insights derived from aggregated patient data
- Higher availability of GPU-intensive applications
- Reduced EHR outages and performance degradation
- Secure access to patient health information from anywhere and at any time
- Greater clinical efficiency
- Improved outcomes and patient satisfaction

The Evolution of Intelligent Applications Using Composable Infrastructure

Forward-thinking healthcare enterprises are leveraging composable infrastructure to deploy edge-to-cloud computing to improve the clinical experience. Data is collected and aggregated from edge devices and processed locally, before select, relevant data is sent to the centralized datacenters. This approach is often referred to as "edge-to-cloud" computing.

In addition to reducing latency and optimizing bandwidth, edge-to-cloud computing provides the following benefits:

- **Reduced data processing costs.** Data is processed locally, reducing the distance data must travel and the amount of data that needs to be processed in a centralized, but distant datacenter.
- **Faster processing and data storage access**. Greater network throughput results in improved access to patient data, which is especially critical to enable clinician decision making at the point of care.
- **Improved real-time application performance**. The reduction in latency and bandwidth issues enables healthcare organizations to deploy more real-time applications that need to communicate with and respond to the Internet of Medical Things (IoMT).

As a result, healthcare organizations can deploy intelligent applications that ingest data collected from edge devices to respond to their environment and dynamically allocate resources for optimal performance. This ability to request more (or fewer) resources and trigger new automated workflows in real time is available only on composable infrastructure. Traditional, static hardware simply cannot respond to these demands without IT intervention. Increasingly, these intelligent applications are becoming more critical to business and clinical enterprise.

Other industries such as aviation have deployed intelligent applications that use streaming feeds from sensors and video surveillance positioned on the tarmac to monitor the movement of vehicles that service airplanes at the gate to accelerate turnaround time. Decreasing turnaround time increases on-time departures and improves passenger experience. In healthcare, an equivalent use case is optimizing operating room (OR) turnover time.

Scheduling OR block times that meet the demands of surgeons while meeting revenue and utilization key performance indicators (KPIs) is challenging. Machine learning can analyze usage patterns to inform more optimal scheduling. Sensors affixed to OR staff badges, hospital gurneys, and other OR equipment combined with artificial intelligence (AI) will draw inferences on where delays may occur and how to prevent them. AI-enabled surgical suites streamline patient flow, reduce delays, and optimize OR utilization, which should lead to improved patient outcomes and positive financial implications as well as improved patient and surgeon satisfaction.

With evolving new regulatory, operations, clinical, and technology requirements for value-based health, there is no shortage of change facing healthcare organizations today. Composable infrastructure is applicable to other industries facing rapid changes due to digital transformation and increasing consumer expectations for an omni-channel experience. If architected properly, composable infrastructure allows the introduction of new technology and edge devices with minimal disruption.

Considering HPE Synergy

Hewlett Packard Enterprise (HPE) was established in 2015 when it was spun off from Hewlett-Packard Company, which became HP Inc. HPE focuses on enterprise information technology (e.g., servers, storage, networking), while HP Inc. focuses on personal computers and printers.

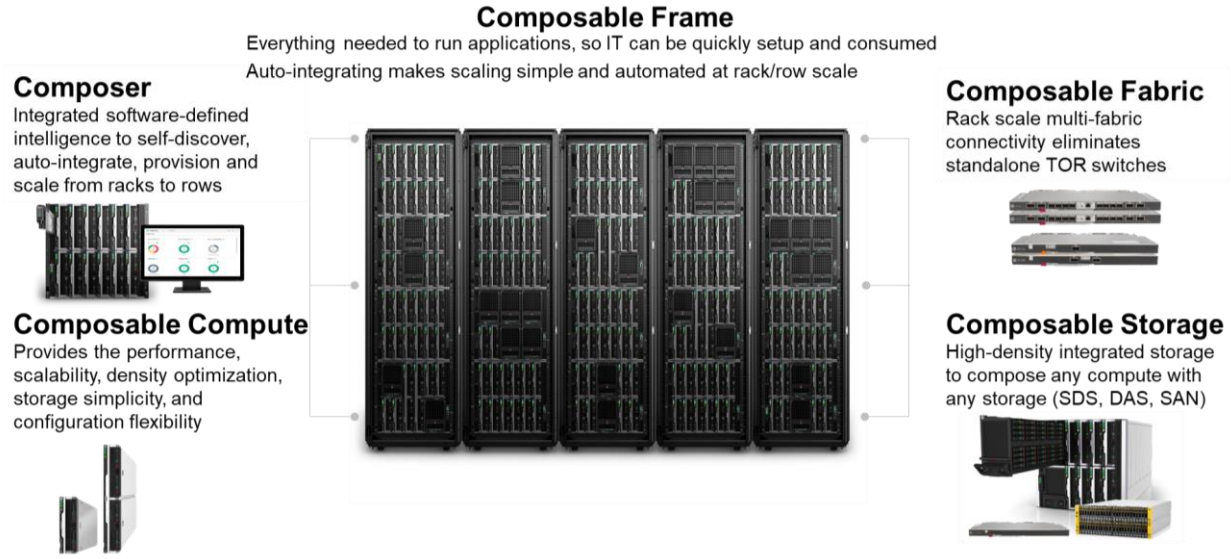
HPE Synergy

Announced in late 2016 and generally available in 2017, HPE Synergy is a composable infrastructure solution that bridges traditional and cloud-native applications for hybrid enterprises. Key architectural principles of HPE Synergy include:

- **Fluid resource pools.** Disaggregation of the underlying compute, storage, and network resources enables them to be scaled up (or down) as needed for the workload. The ability to scale resources independently avoids the unnecessary overprovisioning of certain resources to obtain other needed resources.
- **Unified application programming interface (API).** Using APIs, IT staff can program infrastructure such as code to automate provisioning, resource allocation, and optimization. Thus, healthcare organizations can reap the benefits of infrastructure as a service in their on-premises datacenters. Unified APIs provide the ability to compose consumable resources from the disaggregated pools.
- **Software-defined intelligence.** Compute, storage, and fabric resources are controlled virtually as software elements providing IT staff more control over the infrastructure because it has become an extension of the software layer.

Figure 1 depicts the modules of HPE Synergy's composable infrastructure.

FIGURE 1: ***HPE Synergy Composable Infrastructure***



Source: HPE, 2020

HPE Synergy's compute modules use Intel Xeon family of processors, which results in higher scalability for virtualized workloads and the ability to run a wider variety of workloads on each system. In turn, healthcare organizations can process data and apply analytics, AI, and machine learning to glean insights faster at scale. Hybrid cloud performance is also improved.

HPE GreenLake: Everything as a Service

HPE GreenLake is HPE's hybrid IT-as-a-service consumption-based offering for applications and data. It enables healthcare organizations to pay for the IT services they use when they need them while avoiding expensive overprovisioning and underutilization. HPE GreenLake melds a public cloud experience — scalability, rapid deployment, and pay as you use — with an on-premises experience of control and security for workloads that cannot move to a public cloud. For example, healthcare organizations can opt to use HPE GreenLake services for backup, database management, big data, and edge computing, among others, in their own datacenters and managed by HPE via the cloud. HPE originally targeted large enterprises for HPE GreenLake; however, the company is now also targeting midsize customers, which will make HPE GreenLake more accessible to the broader healthcare market.

Challenges and Opportunities

The market challenges that HPE and its customers face can also present opportunities for a company with strong healthcare experience and a broad product portfolio:

- **Digital transformation — how organizations can keep the lights on while innovating.** Until now, digital transformation has been slower in healthcare organizations compared with organizations in other industries. The flexibility afforded by composable infrastructure enables healthcare organizations to incrementally compose the resources they need to support their digital transformation initiatives.
- **Value-based health — how organizations can balance fee for service and value-based reimbursement.** Healthcare organizations are still managing two very distinct business models that have real implications on how care is delivered. As healthcare organizations deploy more technologies to provide community-based care such as telehealth, virtual visits, and remote health monitoring, these technologies will require more performance and storage of more patient-generated data and analytic tools to process that data. Composable infrastructure provides the opportunity to introduce new technology without disruption in the datacenter.
- **Modernizing infrastructure is a long-term, ongoing project.** Modernizing the healthcare organization's underlying infrastructure daunting. It is an enterprisewide project that will span both IT and line-of-business units. Composable infrastructure will enable healthcare organizations to accelerate these initiatives.
- **While healthcare organizations report IT budgets are growing, resource constraints are an ongoing issue.** Limited IT budget to invest in upgrading to new technology was listed as a top 5 challenge by providers (38.6%) and payers (40%), according to IDC's February 2019 *Connected Health and Value-Based IT Investment Plans Survey*. HPE GreenLake provides a cost-effective consumption-based model for deploying HPE Synergy that enables healthcare organizations to pay for resources as they need them.

Conclusion

Static hardware is no longer an option because it limits the ability of healthcare IT organizations to be responsive to rapidly evolving business needs. Healthcare organizations should embrace composable infrastructure as a means of modernizing their IT infrastructure to meet current and future demands.

Composable infrastructure enables edge-to-cloud computing that will continue to grow with an expanded role for connected health technologies and great deployment of IoMT. Healthcare organizations will be able to deploy intelligent applications that leverage IoMT to improve clinical and business workflows because composable infrastructure can dynamically deploy IT resources. Thus, these new technologies and applications can be introduced without disruption to the datacenter. Healthcare organizations should look to best practices found in other industries such as financial services and retail for deploying composable architecture.

Healthcare organizations should embrace composable infrastructure to meet current and future demands.

IDC believes the composable infrastructure market will continue to be important in healthcare, and to the extent that HPE can address the challenges described in this paper, the company has significant opportunities for success.

About the Analyst

Lynne A. Dunbrack, *Group Vice President, IDC Health Insights*

Lynne Dunbrack is Group Vice President for Public Sector, which includes IDC Government Insights and IDC Health Insights. She manages a group of analysts who provide research-based advisory and consulting services for payers, providers, accountable care organizations, IT service providers, and the IT suppliers that serve those markets. Lynne also leads IDC Health Insights' Connected Health IT Strategies program.

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IDC Research, Inc.
5 Speen Street
Framingham, MA 01701, USA
T 508.872.8200
F 508.935.4015
Twitter @IDC
idc-insights-community.com
www.idc.com