UTILIZING A MULTI-CLOUD FRAMEWORK TO ENABLE COLLABORATIVE CARE

“Cloud is not a destination, but a strategy.”
– Michael Dell
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Healthcare organizations have been working to deploy private and public clouds as part of their digital transformation strategies. As healthcare organizations work to move forward their modern infrastructure strategy, they have been deploying private and public clouds to store, access, manage, and protect their organizational data. Today, cloud is clearly an enabler of collaborative digital-care delivery and research—holding the potential to improve care and reduce costs. In fact, some 65 percent of healthcare organizations already rely on cloud services, and 90 percent plan to use multiple cloud services and platforms by 2021.

However, the uncontrolled adoption of cloud platforms and services can contribute to cloud sprawl and cloud silos—creating additional expense, interoperability, security, and management challenges which are all too familiar to IT organizations.

To take full advantage of emerging cloud services while avoiding the downside of cloud proliferation and data silos, healthcare organizations are working to adopt a multi-cloud operating framework. With the appropriate architectural approach, governance and standards, IT organizations can bring together private, hybrid, public, and specialty cloud services into a single comprehensive, multi-cloud operating approach to improve care, while reducing risk and complexity.

### HEALTHCARE OPERATES IN A MULTI-CLOUD WORLD

Across the diverse spectrum of healthcare providers, some have been leveraging cloud models for quite some time while others are just getting started. Regardless of market maturity, one thing is clear—adoption is accelerating as healthcare organizations realize the inherent value of cloud. In fact, according to recent surveys, 75 percent of healthcare organizations now believe that cloud will lead to better patient care.

And, indeed, advancements such as shared big data analytics platforms for precision medicine research, medical IoT, telehealth, and virtual care can all be enhanced through cloud delivery models.

With healthcare data growing at a staggering rate of 48 percent per year and mobile health applications growing 29 percent annually, cloud offers scalability with consumption-based pricing. The flexibility to scale up and down as requirements change eliminates the need to pay for idle, excess capacity.

A multi-cloud framework can provide a single, integrated platform to capture and access data across the healthcare ecosystem, simplifying intelligence at the point of care and collaboration among clinicians. The ability to recover data or migrate applications between cloud infrastructures also helps protect providers and patients from the impact of an outage or cyberattack.

Finally, a multi-cloud approach provides a pathway for IT organizations to reach the agility needed to meet the business demands of healthcare and avoid shadow IT—enabling care providers and research organizations to focus on business value and innovation to better support the patient population.

### What is multi-cloud?

Simply put, “multi-cloud” describes the growing mix of cloud environments and cloud services that healthcare organizations are coming to rely on.

Multi-cloud spans private clouds, which can operate on-premises or off, along with public cloud offerings from Amazon Web Services, Microsoft Azure, and Google Cloud Platform. That said, multi-cloud encompasses more than the “hybrid cloud” integration of private and public cloud, to include specialty clouds. These clouds, systems, data, and processes can be connected in secure ecosystems using an integration platform such as **Dell Boomi for Healthcare**. This Integration Platform as a Service (iPaaS) conforms with HL7, FHIR.

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EdgeX, and DICOM standards.

The top use case for cloud in healthcare today is Software as a Service (SaaS), in which the healthcare organization acts as a broker of IT services for hosting and maintaining applications. Indeed, 88 percent are currently using cloud to host clinical applications.

The use of cloud services continues to grow with the rapid adoption of Infrastructure as a Service (IaaS), and now Platform as a Service (PaaS), which is being used by healthcare systems to accelerate the deployment of new cloud-native applications.

WHY A MULTI-CLOUD OPERATING FRAMEWORK

As cloud adoption accelerates across the healthcare industry, IT organizations are facing challenges, both old and new.

Cloud sprawl with insufficient governance adds risk and cost. After spending $35 billion on Meaningful Use initiatives to unlock clinical data from disjointed point solutions, healthcare organizations need to ensure they do not reintroduce complexity and expense with the proliferation of cloud and new kinds of silos combined with vendor lock-in.

Proprietary technologies in private and public cloud stacks have begun to create new kinds of silos where data mobility is impeded by contract constraints, shadow IT, and/or the high cost of moving data from one platform to another. Lack of visibility into cloud services can mean unchecked expenses and contractual obligations; fragmented, suboptimal usage; and compromised security and data privacy risks. According to recent cloud studies, more than 50 percent of healthcare organizations lack visibility into the use of shadow IT within their organizations while more than 30 percent report they do not actively manage public cloud usage and spend. “Lost” and unmanaged cloud instances are not patched, for example, and become potential vectors for cyberattack.

To avoid these potential challenges, IT organizations must proactively assume a strong governance role, aligning business strategies, people, processes, and technologies in a multi-cloud operating capability. With it, they gain the agility, speed to delivery, transparency, and manageability to monitor and broker cloud services—private, hybrid, public, specialty—through a single pane of glass.

A multi-cloud operating framework provides the blueprint for a single operating model to efficiently and effectively manage applications in multiple cloud environments, provision new workloads, shift workloads as needed, and maintain visibility into and across cloud services.

**Figure 1.** Deploying a multi-cloud framework starts with an informed, cross-organizational business strategy

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**Business**

Begin with business and clinical opportunities, challenges, and priorities. Define specific objectives, initiatives, and metrics that will advance top priorities, such as quality of care, clinical workflow, patient engagement, cost reduction, provider experience, and so on.

**Technical**

With initiatives defined and prioritized, determine which technology barriers stand in the way. For example, understand what impedes or prevents access to real time data across the care continuum?

**Operational**

What organizational and process changes need to be made to fully leverage multi-cloud and IT as a Service delivery while maintaining regulatory and institutional requirements?

**Financial**

How will investments be funded? How will ROI be tracked? Will savings realized from first-phase improvements be earmarked for reinvestment in next-phase transformation?
IMPLEMENTING A MULTI-CLOUD OPERATING FRAMEWORK

Implementing and moving to a multi-cloud operational framework is integral to digital health transformation. Success starts, not with technology, but with the health mission and cross-functional collaboration across a broad spectrum of stakeholders to gain insight and drive consensus about priorities and next steps in multiple dimensions, including business, technical, operational, and financial (Figure 1).

Multi-cloud business processes

To enable a single multi-cloud operating environment in which workloads can be easily commissioned to any public, private, or specialty cloud, we believe that IT organizations should embrace the multiple business processes needed to design their unique organizational framework (Figure 2).

This framework separates business processes in the cloud management platform (CMP) from the underlying software-defined data center (SDDC) infrastructure enabling different kinds of clouds to provide portability, flexibility, and choice.

The four business processes you should own that are required for effective multi-cloud service delivery, management, and brokering are:

- **Self-service portal** – Where users (business and clinical end users, developers) can select and self-provision the applications and platforms they need
- **Business and operations management** – Where policies, processes, roles and responsibilities, and metrics are set, defined and modified as needed for control, compliance, authorization, and financial transactions
- **Automation** – Where processes for applying policy, management and governance are automated; the “brains” of multi-cloud operation
- **Orchestration** – Where functionality parameters in underlying software-defined infrastructure layers are sensed and controlled through the appropriate APIs; the “nervous system” of multi-cloud operation

As shown in Figure 2, the 'Infrastructure: Private Cloud' component represents software-defined infrastructure (virtualized compute, virtualized networking, and virtualized storage), and is separated by and connected to the orchestration layer through APIs.

**Top-down planning, bottom-up implementation**

By maintaining ownership and control of business processes in a layered cloud management platform separated from infrastructure, IT is able to leverage private and cloud service providers as utilities and run, monitor, and shift workloads in multiple clouds, using common automated processes, tools, and APIs.

Planning should start with your business processes, however once in execution mode, your team should first focus on delivering a supporting infrastructure. Modern data centers are software-defined virtualized compute, networking, and storage running on converged or hyper-converged platforms and/or provided by external cloud services.

Figure 2. IT organizations should own and maintain control over multi-cloud business processes.
Data Flow: From acquisition to action

The explosion of digital healthcare data from personal devices, EMR systems, medical IoT, and precision medicine is forcing healthcare organizations to rethink their data strategies. Multi-cloud services can help IT organizations meet demands for easier access and more sophisticated uses of data—while ensuring privacy and security. For example:

- Flexible, cost-efficient scaling for storing exponentially expanding volumes of data
- Cloud-based integration platforms for quickly and securely connecting and sharing data
- Shared cloud-based big data analytics platforms for researchers and clinicians to help transform massive amounts of raw healthcare data into intelligence and insight

Cloud enabled data lakes eliminate storage silos by aggregating and providing access to all types of healthcare data, both structured (e.g., EMR, administrative) and unstructured (e.g., PACS, monitoring, social media). The Dell EMC Elastic Data Platform takes the use of data lakes a step further by providing a scalable and efficient approach to the creation of analytics sandboxes—making it easier and more cost-effective for researchers and clinicians to develop new insights and advance healthcare innovation.

A software-defined infrastructure helps to make healthcare data “cloud-ready” through virtualization. With virtualization comes new approaches to data privacy and security in the multi-cloud, enabling protection to be applied “from the inside out.” Examples include: VMware AppDefense, which uses a “least privilege” model to make sure users connected to applications in the multi-cloud have only as much access as they need; and Virtual Cloud Network built on VMware NSX and VeloCloud technology, a ubiquitous software layer that embeds security into the virtual infrastructure through micro-segmentation, to deliver secure, pervasive connectivity for apps and data, wherever they live, from the data center to the cloud to the edge, while also encrypting in-flight data and automatically detecting and responding to security threats.
Clinical and business application rationalization and modernization

Many healthcare organizations are burdened by legacy and acquired applications running on old infrastructure, while also having to respond to a rapid proliferation in new clinical and business applications that support initiatives such as precision medicine and telehealth.

By defining a unified, software-defined operating model for all application workloads, a multi-cloud framework can help guide application rationalization and modernization efforts, such as:

- Evaluating and retiring legacy/acquired applications that no longer deliver business value—while retaining data and data access for medical history, analysis, and compliance
- Modernizing and migrating critical to the appropriate software-defined platform in the data center or the cloud
- Implementing a “cloud-first” strategy for all new applications, by leveraging PaaS capabilities, such as Pivotal Cloud Foundry and Pivotal Container Service (PKS), multi-cloud platforms for building modern, cloud-native software that can run in every major private and public cloud

As shown in Figure 4, the first step is to inventory and evaluate existing applications for business and clinical value, cloud suitability, and an accurate understanding of application interdependencies to determine which can be retired and which should be migrated to which type of cloud, whether to software-defined infrastructure in the data center or an external cloud platform.

Figure 4. A multi-cloud operating framework also provides IT organizations with a M-A-T (modernize, automate, transform) structure for rationalizing and modernizing legacy and acquired applications. The ability to provision cloud-native PaaS accelerates the development of new software that can be deployed in multiple types of clouds to simplify digital healthcare transformation.

Clinical and Business Application Rationalization and Modernization

- **MODERNIZE**
  - Inventory and prioritize all applications
  - Virtualize/containerize all prioritized workloads
  - Build location independent data integration
  - Stage cloud-ready applications

- **AUTOMATE**
  - Begin load-based location decisions for all workloads
  - Migrate applications (in-house, private, hybrid, specialty, or public cloud)
  - Develop self healing algorithms

- **TRANSFORM**
  - Begin building cloud native applications
  - Develop micro-services for application resilience
  - Incorporate repeatable, standardized, enabling services

BECOME A DIGITAL LEADER IN CARE DELIVERY

Multi-cloud is the de facto operating model for digital healthcare transformation. To optimize data and collaborate in a digital care ecosystem, IT needs a multi-cloud operating model for standardizing and automating common provisioning, deployment, monitoring, data protection, and security services across multiple clouds.

Dell Technologies offers a broad range of solutions and services, from healthcare-specific cloud services and industry-leading software-defined infrastructure to solutions that simplify and accelerate the ability to leverage multiple clouds. For example:

- Turnkey, customizable Dell Enterprise Hybrid Cloud, built on Dell EMC Converged or Hyper-Converged Infrastructure and leveraging the VMware Validated Design for Software-Defined Data Center substantially cuts the time to stand up a private cloud platform and begin brokering private and public cloud services
- Virtustream for Healthcare, VMware Cloud, Dell EMC Cloud for Microsoft Azure Stack, and Google Cloud Platform bring new kinds of choices and flexibility to multi-cloud operations.
- Dell EMC Healthcare consultants, solution architects, and delivery teams bring experience in both healthcare and multi-cloud operating models and proven methodologies and services, including Multi-Cloud Operating Framework Business Case and Roadmap services to help IT organizations get started.
Find out more about how you can leverage the multi-cloud operating framework to unleash the power of your data—and deploy clinical and business workloads when and where needed. Accelerate your digital health transformation to participate, innovate, and deliver on the promise of improved patient care.

Learn more at:
DellEMC.com/healthcare
or contact a Dell EMC Healthcare Representative

6. https://www.hospitalemandehr.com/2016/07/08/34-7-billion-spent-on-meaningful-use/

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