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Hybrid Cloud Management & Integration

THOUGHT LEADERSHIP Essential Technologies for On-Demand IT

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Enterprises expect more from their shift to the cloud. The new goal is to expose all IT resources as a set of consumable on-demand services. But today's enterprise IT architecture is hybrid, composed of a distributed set of disparate on-premises, private, public and multi-cloud infrastructures, each with its own administration and management tooling. On-demand IT requires the integration and interoperability of these tools – trends driving demand for next-generation uniform infrastructure management and hybrid integration platforms.

Key Findings

- Our research across a variety of IT industry surveys indicates that 62% of enterprises now use a hybrid IT environment with integrated on-premises systems and off-premises cloud/hosted resources; 39% of enterprises will be running the bulk of their workloads in public clouds by 2020, while 35% will be running workloads in a combination of hosted and on-premises private clouds by 2020. As enterprises began to subscribe to multiple clouds, cloud management platforms have extended their capabilities in kind to support them. Half of enterprises have cloud management platforms in use, in discovery or in plan in the next 12 months.

- There are no industry standards for hybrid multi-cloud architecture or management. Workload placement across multiple distributed execution venues is highly subjective to each enterprise and depends on a range of factors including the value/risk tied to workloads, lifecycle stages, usage patterns, application behavior characteristics, data criticality, data sovereignty, the price/performance and risk characteristics of various execution venues, and so on. This is creating a compelling need for a more uniform framework to provision, manage and deploy disparate and distributed IT infrastructure and resources.

- Enterprises must plan to protect against the unintended consequences of workload degradation or even failure. When anomalies occur, workloads may need to shift to another execution venue in another cloud region, an on-premises private cloud, edge cloud or a datacenter. Sometimes the workload may need to shift to a different cloud services provider. In these cases, the more portable the workload the better, driving the pursuit of other IT initiatives such as application modernization, cloud-native development, and containerized application and microservices architectures.

- Going forward, enterprise IT organizations need better ways to cope with the complexity of orchestration, administration and integration needed across hybrid multi-clouds and means to structure, automate and govern on-demand IT services intelligently. We believe the best way to get started is by crafting a hybrid IT strategy enabled and managed by essential technologies that include next-generation uniform infrastructure management and hybrid integration platforms.

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2. Cloud Migration Research Findings

In our recent _Voice of the Enterprise: Digital Pulse, Budgets and Outlook 2019 survey,_ we asked 916 IT professionals to describe their overall IT approach and strategy. Among the respondents, 62% say they now use a hybrid IT environment with integrated on-premises systems and off-premises cloud/hosted resources; 17% say their IT environment is completely off-premises, distributed across various SaaS, IaaS and PaaS clouds. Only 8% claim clouds are not an important part of their IT strategy.

Moreover, workloads continue to be redistributed to and across a variety of public and private clouds. In an _earlier VotE: Digital Pulse study,_ we asked more than 1,000 IT decision-makers and influencers about where they currently run workloads and where they expect to run them in 2020 (see Figure 2). Thirty-nine percent say they will be running the bulk of their workloads in public clouds by 2020, while 35% say they will be running workloads in a combination of hosted and on-premises, private clouds by 2020.
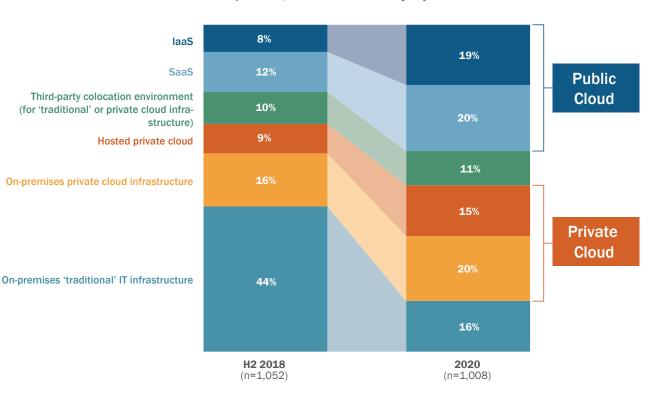
Figure 2: Primary Workload Deployment Venues, 2H 2018 vs 2020
Source: 451 Research's Voice of the Enterprise: Digital Pulse, Vendor Evaluations 2018
Q. Thinking about all of your organization's workloads/applications, where are the majority of these currently deployed?
Q. Thinking about all your organization's workloads/applications, where will the majority of these be deployed two years from now?

PRIMARY WORKLOAD DEPLOYMENT VENUES, H2 2018 AND 2020

% of respondents, IT environment for majority of workloads

| | **H2 2018**
(n=1,052) | **2020**
(n=1,008) |

The migration to a distributed cloud architecture is being driven by many factors. 47% of respondents seek to improve performance and availability, and 40% need to optimize for costs. Isolating sensitive data, migrating between infrastructure environments, meeting regulatory requirements, and adding new functions to existing deployments all factor equally in using multiple infrastructure environments to operate.
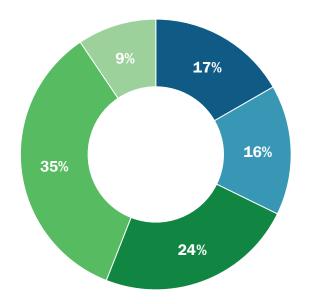
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The cloud era has also spawned the need to modernize applications and infrastructure in the face of changing and ever-demanding customer expectations and to stay ahead of aggressive or disruptive digitally enabled rivals. When asked to describe their organization's overall IT infrastructure approach to mission-critical legacy applications and workloads going forward, 44% of our survey respondents seek to retain existing applications on-premises but move to more modern application and infrastructure architectures (see Figure 4). Eighteen percent will re-architect and/or redesign existing applications using cloud-native frameworks and deploy in off-premises clouds.

Figure 4: Modernization Strategies Exploit Best Execution Venues
Source: 451 Research's Voice of the Enterprise: Digital Pulse, Workloads & Key Projects 2019
Q: Which of the following best describes your organization's overall IT infrastructure approach to mission-critical legacy applications and workloads going forward?

■ **Lift and shift.** Migrate existing on-premises applications to off-premises/cloud environments with minimal changes to the application code or business logic.

■ **Repurchase and shift.** Replace current on-premises applications with SaaS or off-premises hosted versions of the applications.

■ **Refactor and shift.** Re-architect/redesign existing applications using cloud-native frameworks and deploy in off-premises cloud environments.

■ **Modernize.** Retain existing applications on-premises but move to more modern application and infrastructure architectures.

■ **Retain.** Keep current applications unchanged on existing on-premises infrastructure.

These findings signify the move by many enterprises toward a hybrid multi-cloud architecture – one that makes available near-limitless options for application and workload development and deployment. But it also introduces complexity, with new challenges to assemble, integrate, orchestrate and decommission consumption-based services on-demand that must be overcome to fulfill the benefits of on-demand hybrid IT.

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5. Managing Hybrid Multi-Cloud Architecture

Once crafted, executing a hybrid cloud strategy will require an array of tools to shift and migrate workloads to their BEVs, and manage and monitor them across a hybrid multi-cloud architecture. New means for analysis, automation, provisioning, access control, capacity management, performance analysis, governance, billing and cost control (among other needs) will be required. But separate tools for such tasks can diminish overall control and introduce too much complexity. These capabilities must be assembled for interoperability within a uniform framework and controlled by what we refer to as a UIM platform.
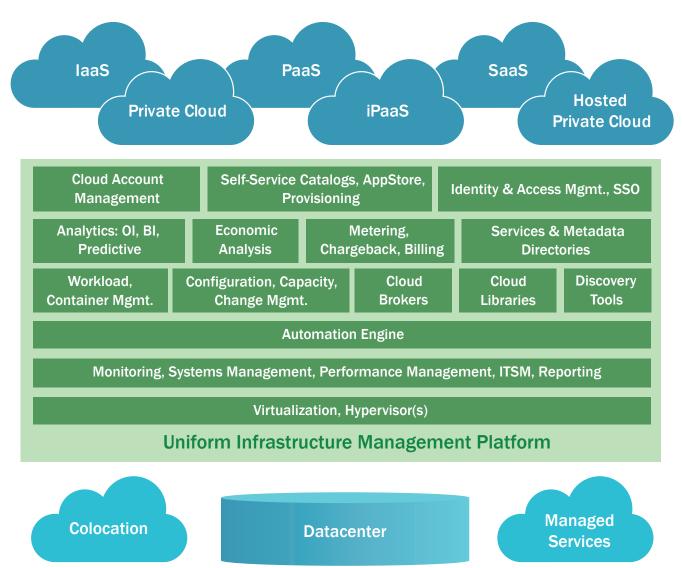
Uniform Infrastructure Management

A UIM platform embodies many of the technologies found in current ITSM platforms designed for on-premises infrastructure and datacenter resource management, and includes the capabilities found in the current CMPs. However, UIMs also include more advanced analytics and automated operations tooling, are designed as automation frameworks, and can operate across the disparate IT vendor and CSP architectures. Figure 6 illustrates some of the core capabilities likely to be included within a UIM.

Figure 6: Uniform Infrastructure Management Platform Capabilities
Source: 451 Research, 2019

IaaS

Private Cloud

PaaS

iPaaS

SaaS

Hosted
Private Cloud

Cloud Account Management	Self-Service Catalogs, AppStore, Provisioning	Identity & Access Mgmt., SSO
Analytics: OI, BI, Predictive	Economic Analysis	Metering, Chargeback, Billing	Services & Metadata Directories
Workload, Container Mgmt.	Configuration, Capacity, Change Mgmt.	Cloud Brokers	Cloud Libraries	Discovery Tools

Automation Engine

Monitoring, Systems Management, Performance Management, ITSM, Reporting

Virtualization, Hypervisor(s)

Uniform Infrastructure Management Platform

Colocation

Datacenter

Managed
Services

Anatomy of a UIM

Beyond the capabilities illustrated in Figure 7, UIM platforms should be able to:

- Analyze and compare the economics (price/performance characteristics) of various execution venues.

- Analyze workloads to determine their performance characteristics and operational requirements.

- Automate the provisioning of compute, storage, network, security, application stacks and data – codify workflows.

- Enable agile automation – tooling capable of rapidly designing workflows and processes, adapting as needed on the fly.

- Include, and be capable of curating, libraries of pre-packed operational workflows for deployment and process automation.

- Intelligently deploy workloads and services determined by economic analysis, as well as any compliance policies required of on-premises infrastructure, managed services, and private and public clouds.

- Auto-scale computational resources within each execution venue/CSP.

- Sense and intelligently redeploy workloads to other execution venues when venue or workload characteristics change.

- Interoperate with container and microservices coding platforms to coordinate cloud services for automated iterations of application and workload deployments.

- Craft pre-packaged infrastructure and services reference architectures preconfigured for common and anticipated workloads across target on-premises infrastructure (private cloud), CSPs, databases and hypervisors (minimizes continuous configuration efforts).

- Discover, expose and provision reference architectures, resources and services via a self-service catalog that can address a wide range of IT resource requests.

- Manage cloud services subscriptions and services.

- Expose data to other design, configuration management, analysis and orchestration tools.

- Manage security, identity authentication and access control for administrators, tenants and user accounts.

- Provide financial metering, reporting and chargeback/viewback by cloud, tenant, user, application, compute and other consumption-based services.

- Orchestrate events and manage runtime execution and performance of all venues, and enact policies to automate scaling, bursting, high availability and disaster recovery.

- Maintain a service library that includes operating system images, databases, middleware, message busses, load balancers and servers.

- Control and dynamically allocate network resources in response to the transmission, latency and security requirements of specific data and workloads.

- Expose capabilities to administrators and operators via visual, drag-and-drop graphical UI.

8. Trends Signaling Change

While the various IT markets have never been more dynamic, we believe the following trends will have near- and long-term implications on the design, structure and capabilities of UIM platforms and hybrid integration platforms (HIPs).

Containers, Microservices and Serverless Computing

A container is a standard unit of software that packages code along with all the operating systems capabilities it depends upon, so the application can run quickly and reliably in different computing environments. Containerized applications can be rapidly deployed and are portable across highly distributed architecture. Growth in the containers market is accelerating, driven by increasing enterprise interest to help application developers move faster, manage infrastructure more efficiently and meet digital transformation goals.

Microservices are part of an emerging next-generation application architecture, one that structures an application as a collection of loosely coupled services that implement business logic. Applications composed using a microservice architecture can be rapidly changed, adapted and redeployed. Theoretically, microservices are smaller code sets (as compared to earlier services composed within an SOA), and therefore easier for developers to understand, use/reuse, refactor and fix. Each can be deployed independently of other microservices, speeding the deployment of new versions when needed. Platforms equipped with microservices lifecycle management and orchestration tooling can also manage and orchestrate the function calls used within serverless computing offerings (e.g., AWS Lambda, Google Cloud Functions, IBM OpenWhisk).

Containers, microservices and serverless functions are changing the structure of application architecture. They will affect how UIM platforms and HIPs will be designed to enable their integration, interoperability, orchestration and management. To accommodate these trends, both UIM platforms and HIPs will likely need service mesh capabilities in future versions of their respective platforms.

10. Conclusions and Recommendations

Enterprise buyers will demand that IT vendors improve the tooling and services needed to manage and optimize the operational and economic performance of most, if not all, of their distributed infrastructure (e.g., datacenters, clouds, managed services providers, et al). If they have not already begun to, CMP vendors will likely be called upon first to enable many of the core UIM platform capabilities called out in this report. While HIP vendors are well along the path to enable interoperability across highly distributed infrastructure, they too will be called upon to enable greater agility and speed in the design and adaptability of data, application and process integrations.

In the era of hybrid multi-clouds and the accelerating demand for consumable IT services, we advise enterprises to formulate a comprehensive cloud strategy and, if they have not already done so, begin to explore emerging UIM and HIP solutions outlined in this report. Subsequent to implementation, track UIM/HIP performance against the criteria established by the strategy while examining the degree to which business objectives and outcomes are supported and realized. Such examination should be revisited at least annually.

Finally, there will be other enterprising DevOps, CSPs, cloud-enabling technology vendors and even global system integrators entering the emerging UIM and HIP markets, accelerating the pace of innovation within them. This will all be to the benefit of enterprises, which will have much of the automation framework they need to reliably expose, deliver and maintain all that is IT as an on-demand, consumption-based set of services.

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