Digital Transformation Driving the Need for Integrated Cloud Solutions

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IDC OPINION

For enterprises to compete and succeed in their digital transformation (DX) journey, they must create digital experiences, business models, and presence using cloud infrastructure and cloud-native applications.

Modern applications are built with new cloud-native architectures and developed with Agile methodologies. Consequently, this is driving the need for a different, more reactive type of infrastructure. This infrastructure is entirely software defined, with programmatic API access, and supports new constructs such as software containers.

Containers have rocketed in interest in the past few years and are the preferred vessel for delivering next-generation apps. Containers are lean, agile, and portable, making them a perfect fit for a world that is heading toward microservices, multicloud, and continuous integration (CI)/continuous deployment (CD)-enabled Agile development. Some existing applications can also be containerized, so the technology isn't limited to only new applications. Containers also are not replacing virtualization. Containers and virtual machines (VMs) operate at different layers of the stack and solve different problems and are extremely complementary.

The rising challenge for enterprises embarking on the journey of cloud infrastructure and cloud-native apps is one of management and transition. Enterprises have large investments in existing assets, and many applications built on existing platforms will continue to live for a very long time. Some will be refreshed and modernized, but that is a long journey with many challenges. Old and new will coexist for a long time, and managing this very diverse set of technologies (VMs, containers, on-premises datacenters, and multiple public clouds) is the key to success.

The flood of new technologies can overwhelm enterprises, and many are looking for highly integrated full-stack solutions that go from the hypervisor all the way up to the application platform. To be viable for enterprises, these solutions must also be able to accommodate existing as well as new cloud-native applications and provide transitional mechanisms and technologies. Management must also be simplified and unified, allowing management of not only datacenter stacks but also multiple public clouds. Integration and testing of multiple piece parts are quickly becoming impractical and too complex for many enterprises, and holistic, integrated, and unified solutions such as Red Hat Cloud Suite are coming to market to fill that need.

SITUATION OVERVIEW

The new online world is having a massive effect on the way companies do business around the globe. Nearly every industry is under threat from new, innovative digital companies that are disrupting the status quo with new business models. To compete, companies are having to rethink their digital strategies and undergo significant transformation. This digital transformation, or DX for short, is sweeping the global economy as businesses figure out how to leverage new technologies for competitive advantage in a race against the clock.

The technology driving DX is what IDC terms the 3rd Platform, a major new era of computing. The 1st Platform was the mainframe, which kicked off digital computing technology. The 2nd Platform was the rise of client/server, which also gave rise to the internet. The 3rd Platform is built on four core technology tenets, cloud, mobile, social, and analytics. The core technologies serve as innovation accelerators, giving rise to the development of cognitive/AI, robotics, IoT, augmented/virtual reality, and many others that attracted developers to build new applications for industry-specific clouds and ecosystems. As digital transformation makes its mark on every type of business, the applications and technology driving that change and fueling disruption are rooted in the 3rd Platform.

IDC forecasts that by 2020, over 50% of the Global 2000 companies will see the majority of their business depend on their ability to create digital experiences for customers. Thus the shift in spending from the 2nd Platform to the 3rd Platform is already under way. As shown in Figure 1, today in 2017, 3rd Platform spending is already twice that of 2nd Platform spending, with future growth of the 3rd Platform at the expense of the 2nd Platform, which is already in decline. IDC predicts that by 2019, spending on the 3rd Platform will reach $3.4 trillion.

FIGURE 1

Worldwide 2nd Platform and 3rd Platform Solutions IT Spending, 2015-2021: 3rd Platform Dominates
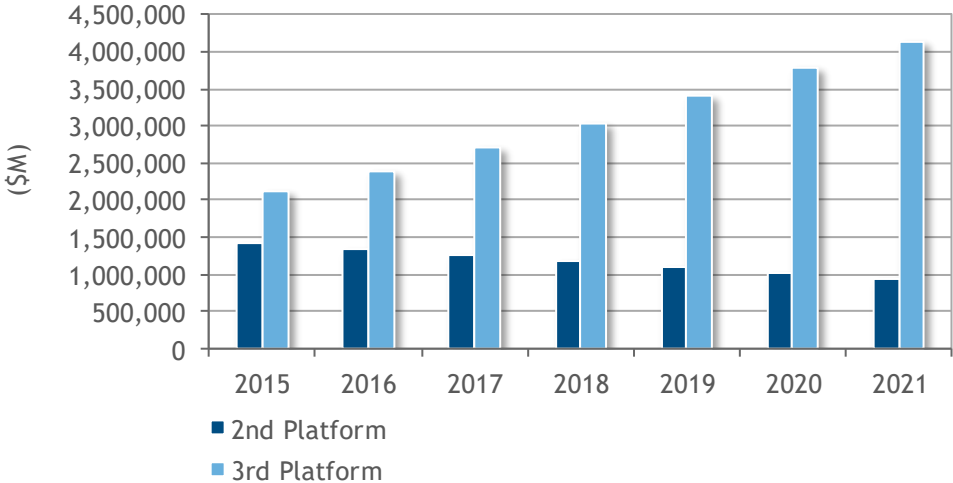
Source: IDC, 2018

DX Is Driving Cloud-Native Applications

Applications built on the 3rd Platform, referred to as cloud-native applications, are very different in fundamental architecture than traditional 2nd Platform applications. One of the challenges of digital transformation is to increase the speed of software innovation, and this means improving the speed at which software can be released.

As developers move to more Agile development techniques, one fundamental change is to break up the traditional application monolith into independent microservices that have a defined interface and common communications channels. Breaking up the application in this way allows each microservice to be developed, tested, and integrated simultaneously with other parts of the application, allowing greater development parallelization and thus faster development.

Companies are also employing DevOps methodologies, which better integrate development and operations teams, so that software can release faster. Typically, development and operations are siloed, and this leads to inefficiencies when developing and deploying new applications or updating applications. DevOps creates a set of highly automated processes between these two groups, which allows integration, testing, and release to happen much faster and at a higher frequency. The goal is to have a streamlined software supply chain that can push out incremental changes at a faster rate, often multiple times a day. This technique is referred to as continuous integration and continuous deployment, or CI/CD for short.

New Infrastructure to Support Cloud-Native Applications

As application architecture and development approaches change, it is driving the need for a new type of faster and more agile infrastructure that can better support the increased speed of application development.

The time required to provision traditional infrastructure was limited by the aspects of dealing with physical elements, for example, how long it would take for a server to be ordered, shipped, racked, and configured. Server virtualization, over the past 15 years or so, has dramatically changed the speed at which compute can be provisioned. But virtualization is only the beginning as customers are now doing the same with storage and networking to create a fully software-defined infrastructure (SDI). In a software-defined datacenter, virtualization across compute, storage, and networking is only the first step toward a larger goal. Traditional server virtualization was typically managed and controlled by server administrators through traditional management consoles using manual processes. One of the key differentiators with SDI is enabling programmatic access to the infrastructure, which allows infrastructure to be easily controlled by management software and even directly by applications and developers. This makes infrastructure as flexible as software code, which is often referred to as programmable infrastructure or infrastructure as code. Virtualization, scale-out architectures, and software-defined technologies and APIs make infrastructure much more malleable and, in the era of cloud, much more easily self-service enabled. Developers can get instant access to the infrastructure they need, eliminating a very common friction point and time delay in software development.

The Rise of Containers

As the IT industry entered the 3rd Platform era, hypervisor-based server virtualization was the software-defined compute technology that SDI and public cloud were built on. Today, containers are a

new mechanism for building, sharing, and deploying applications that is gaining momentum as the preferred compute technology to underpin cloud-native applications.

However, containers don't replace hypervisors and, for the most part, are complementary to virtualization because they solve different problems. Hypervisors are a machine construct, while containers are an operating system (OS) and application construct. Virtualization is still very useful when used with containers for security isolation, running mixed OSs on the same server, and running a combination of VMs and containers. Containers are a much more efficient way to package and distribute applications as they include only the application and its dependencies. Containers are ideal for the 3rd Platform and cloud-native applications for many reasons:

- The efficiency of container packaging and execution makes it ideal for microservices. Containers also start fast, basically at the speed of an OS starting a new process, but in a more isolated and protected space. VMs must boot an entire OS and define a full set of virtual hardware that consumes resources. As applications become more distributed, reactive, and scalable, they require a more lightweight and agile foundation, which containers provide.

- Applications in containers are self-contained packages that contain the application and its dependencies, reducing the issues with different application environments. As customers move to DevOps release methodologies, moving an application from one stage to another in a consistent way with less variables is critical. Containers free the application from being tightly linked to the OS and the version differences of various shared libraries and frameworks.

- Standardization of container technology with the Open Container Initiative (OCI) makes containers highly portable and interoperable, something that was never realized with virtual machines. In addition, the industry is beginning to coalesce around Kubernetes for container orchestration, bringing possible standardization around container orchestration as well. As hybrid environments consisting of on-premises and public cloud become standard, containers bring a layer of consistency that can span different types of underlying infrastructure.

However, containers are not limited only to cloud-native applications. IDC research shows that in the enterprise, existing applications currently make up the majority of container deployments. While the full benefits of container technology may not be realized, containers still bring many benefits such as increased utilization, standardized packaging, consistent application environments, and portability to existing applications. Many customers begin with containerizing existing applications while continuing to build cloud-native expertise and slowly refactoring existing applications over time.

IDC forecasts that by 2020, nearly 1 billion enterprise and public cloud containers will exist in the install base (see Figure 2). This forecast excludes web hyperscalers such as Google that were early pioneers of container technology and already run billions of containers. Much of the current container technology and methodologies were developed by these hyperscalers as they sought to move faster and scale out. Digital start-ups also latched on to container technology and related software development techniques to disrupt established businesses. Now enterprises of all sizes and verticals are taking cues from these digital pioneers as they embark on digital transformation initiatives.

FIGURE 2

Worldwide Container Instances Installed Base, 2015–2020
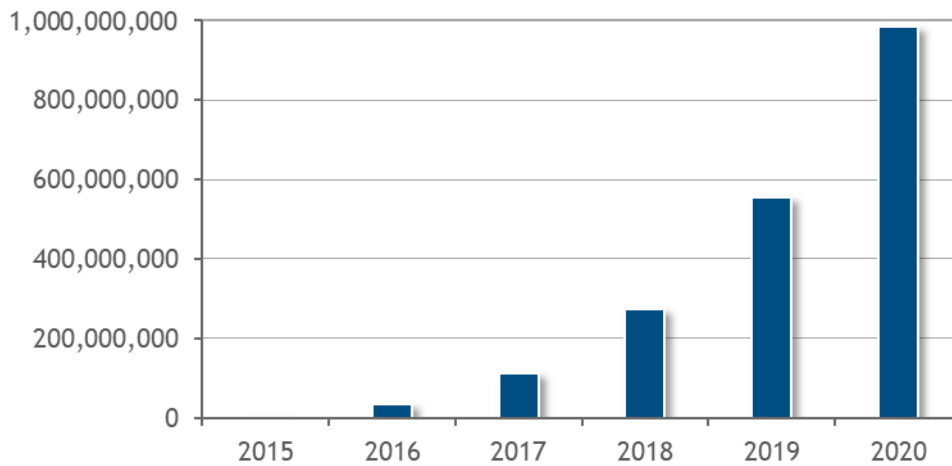
Note: See *x86 Software Containers Forecast, 2016-2020* (IDC special study #US42030116, December 2016) for more details.

Source: IDC, 2018

The Management Challenge

As the 3rd Platform emerges, managing it all becomes a crucial challenge. Companies will have both 2nd and 3rd Platform technologies for the foreseeable future, so the complexity and diversity of environments are only expanding. Companies need solutions that can manage across:

- Existing and cloud-native applications
- Traditional bare metal/virtual server and modern software-defined infrastructure
- VMs and containers
- Datacenter virtualization and private and public cloud

Management can no longer be done in silos because the interconnections between applications and infrastructure will span multiple generations of technology as companies transition further into the 3rd Platform. Without a unified and simplified management approach, managing the ever-growing diversity of environments can quickly overwhelm IT staff with multiple tools and inconsistent application of policies. IT also needs to provide a fast and consistent experience to users and developers, who are increasingly consuming infrastructure from a variety of sources.

The New Role of Open Source

One of the key influencers in modern cloud infrastructure and containerized applications is open source. When Linux and open source were first getting started in the 1990s, the focus was on proving themselves as a sustainable, valid software development model that could produce enterprise and production-quality software. Most of the projects focused on providing open source versions of existing proprietary software, such as operating systems and web servers.

Today, the open source landscape has changed dramatically. Open source is a well-proven and widely accepted software development model, with many successful and widely used projects. Nearly every

software vendor today is involved in open source in some way, with many formerly classic proprietary software vendors now embracing open source. In the era of cloud, containers, Agile, and DevOps, open source is at the forefront of innovation. In some areas of the market, open source has become the mainstream model and a requirement for entry.

Many of the open source projects and cloud-native concepts have been put into heavy use by innovative public cloud providers and digital, web, and software-as-a-service (SaaS) tech companies. They are serving as the pioneers and testing ground for the rest of the industry. Enterprises are now emulating these architectures and approaches to infrastructure and applications and are finding a way to fit them into an enterprise framework.

RED HAT CLOUD SUITE

Red Hat is a leader in enterprise open source software, having earned the trust of customers that want to leverage open source in a highly tested and supported way for critical business functions. Red Hat initially made its mark with its Linux operating system but has been building a comprehensive open source portfolio that now includes a hypervisor, storage, private cloud, hybrid management, containers, and application platform.

Red Hat Cloud Suite is Red Hat's most comprehensive product suite, which addresses the needs of both traditional and cloud-native applications. Key components of Red Hat Cloud Suite include:

- Red Hat OpenShift is a container application platform built on Docker and Kubernetes that developers can leverage to build and deploy modern applications. Red Hat OpenShift can be deployed across multiple types of infrastructure, such as Red Hat OpenStack as well as public clouds, to create a consistent application environment for the hybrid cloud.
- Red Hat OpenStack Platform provides a modern software-defined infrastructure that delivers IaaS. OpenStack forms the core infrastructure for creating an on-premises private cloud.
- Red Hat CloudForms is a unified hybrid cloud manager that can provide a consistent set of management capabilities across datacenter virtualization, OpenStack private cloud, and public clouds such as AWS and Azure.

The solution also includes Red Hat Virtualization, a commodity virtualization alternative, and Red Hat Satellite and Red Hat Insights for enhanced management capabilities. Figure 3 illustrates the Red Hat Cloud Suite architecture.

FIGURE 3

Red Hat Cloud Suite Architecture
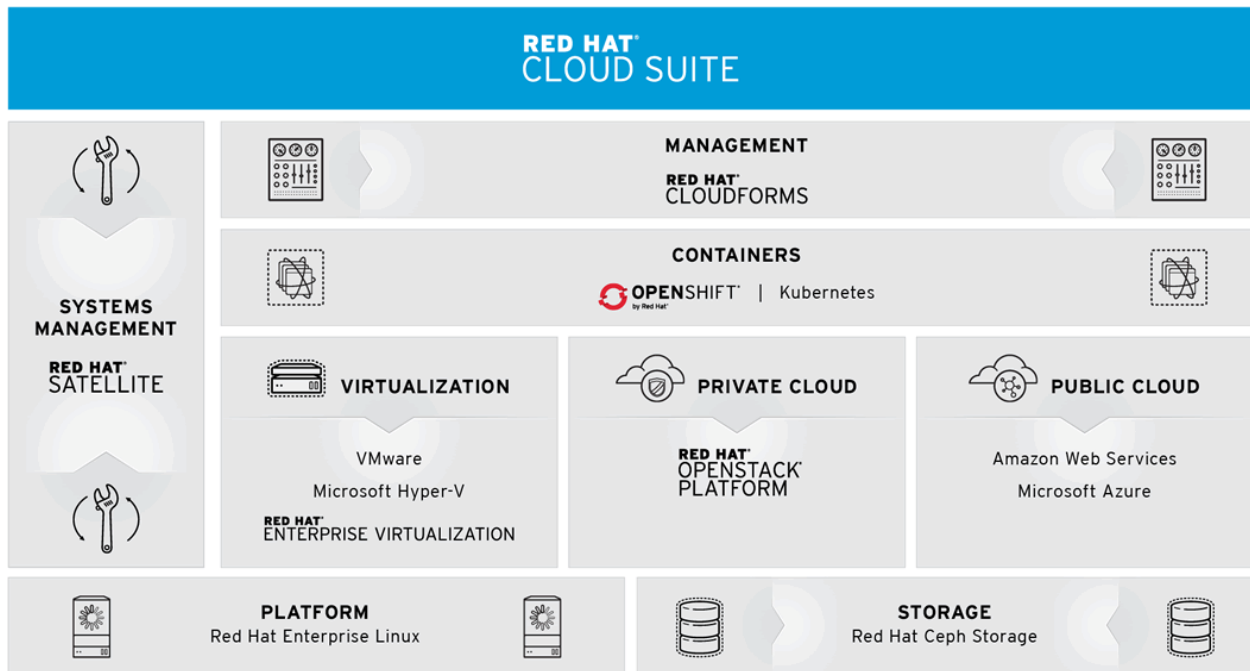
Source: Red Hat, 2018

Red Hat Cloud Suite is a fully open source, integrated, tested, and supported platform that addresses the needs of customers that are pursuing digital transformation and the transition to the 3rd Platform. Red Hat Cloud Suite addresses the full stack to help companies make this transition. It includes modern cloud infrastructure and a modern application platform but also makes accommodations for the needs of traditional VMs and containerizing existing applications. CloudForms ties it all together with unified management of various generations and types of infrastructure as well as traditional and cloud-native applications. Portability of applications and a consistent application platform will be key to supporting multicloud use cases. In addition, service catalogs and service brokers will need to natively integrate public cloud services to enable organizations to take advantage of cloud services in their own applications in a consistent and seamless manner.

CHALLENGES/OPPORTUNITIES

Challenges

- The transition to 3rd Platform applications is a major challenge for enterprises. Developers skilled in building these applications and managing next-generation infrastructure are few and are often snapped up by web and cloud companies. There are also many organizational and cultural barriers that prevent Agile and DevOps from being fully implemented. IDC research shows that the greatest obstacle is not technology, but inertia, attitudes, and resistance to change.

- Many existing applications are extremely complex and realistically may never be refactored for containers or cloud. These applications often have a long life cycle and a lot of existing investments and will not be replaced anytime soon.

Opportunities

- As open source continues to drive the cloud and container era, open source vendors such as Red Hat have tremendous opportunity to capitalize on the increasing role of open source by participating and providing leadership in key open source projects and communities. This can also translate into increased commercial opportunity as customers look more and more to open source to power the next generation of infrastructure and applications and want a supported, tested solution.
- Building cloud-native apps with Agile and DevOps methodologies requires a complex stack and the integration of many technologies. As this stack grows in complexity, it becomes harder for enterprises to integrate multiple piece parts as they often did in the past. Many will turn to a provider such as Red Hat that can integrate all these parts and provide a guarantee that they will all work together properly.

CONCLUSION

Businesses around the world, of every type and size, are being dramatically impacted by the expanding digital world. The ability to play in and have a significant presence in the online world will be an absolute necessity for business success, and this is driving many digital transformation initiatives within the enterprise. However, enterprises face a unique challenge. They need to not only keep up with technology and adopt the latest cutting-edge infrastructure and applications, itself no small task, but also maintain or migrate their existing assets. The road map for these kinds of transitions are never short or easy, and enterprises will be managing a mix of existing and new for many years to come. To help with the journey, enterprises need to look for solutions that can address the old and the new, provide for a transition path, and reduce complexity by integrating multiple technologies that span the entire stack, which can be tested and supported together.

About IDC

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